Northern Kentucky Water District

EXHIBIT A-5

SPECIFICATIONS

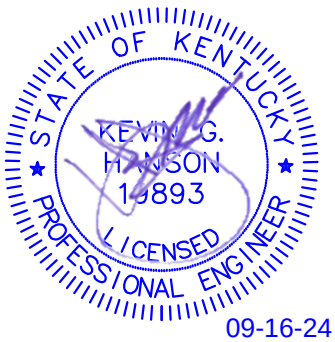
SPECIFICATIONS

NORTHERN KENTUCKY WATER DISTRICT

Sub-District HB Water Main Extension
Campbell County, Kentucky

August 2024

COMPILED BY:
Northern Kentucky Water District (Owner)
2835 Crescent Springs Road
Erlanger, Kentucky 41018



09-16-24

S P E C I F I C A T I O N S

FOR

NORTHERN KENTUCKY WATER DISTRICT

Sub-District HB Water Main Extension
Campbell County, Kentucky

August 2024

GOVERNING BODY

COMMISSIONERS:

FRED MACKE, JR – CHAIR
JODY R. LANGE, CPA, CGMA – VICE CHAIR
DOUG WAGNER - SECRETARY
NICHOLAS WINNIKE - TREASURER
GARY E. HOLLAND - COMMISSIONER
JOSEPH J. KOESTER – COMMISSIONER

LINDSEY RECHTIN, PRESIDENT/CEO

COMPILED BY:
Northern Kentucky Water District (Owner)
2835 Crescent Springs Road
Erlanger, Kentucky 41018

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Section 00020

INVITATION TO BID

Date: August 13, 2024

The Northern Kentucky Water District (Owner) is requesting Bids for the construction of the following Project:

PROJECT: Sub-District HB Water Main Extension, Campbell County, Kentucky

BID SUBMISSION: SEALED BIDS WILL BE RECEIVED BY THE NORTHERN KENTUCKY WATER DISTRICT (OWNER) ONLY THROUGH THE ONLINE QUEST CDN WEBSITE (www.questcdn.com)

UNTIL: Date: September 5, 2024
Time: 2:00 PM (Local Time)

At said place and time, and promptly thereafter, all Bids that have been duly received will be opened electronically via Microsoft Teams meeting. Entities on the registered list of plan holders will be sent a link to attend the virtual bid opening. The public may access the virtual bid opening by emailing Cassandra Zoda at czoda@nkywater.org to get the meeting number and password.

BRIEF PROJECT DESCRIPTION: The proposed Work is generally described as follows: Construction of approximately 2,575 feet of 8" ductile iron water main and 215 feet of 2" HDPE water main along Blangey Road (from 700' west of Mary Ingles Highway to the end of County maintenance), 1,430 feet of 8" ductile iron and PVC water main along Enzweiler Road (from the AA Highway to the end of County maintenance), 2,760 feet of 8" ductile iron and PVC water main along Gunkel Road (from Mystic Rose to the end of County maintenance), 7,835 feet of 8" ductile iron water main along Oneonta Road (from Washington Trace Road to Mary Ingles Highway), 3,615 feet of 8" ductile iron and PVC water main along Upper Lick Branch Road (from Grandview to house #2421), 5,000 feet of 8" ductile iron and PVC water main along Poplar Thicket Road (from Licking Pike to house #446), 1,755 feet of 8" ductile iron water main along Pond Creek Road (from house #10365 to Visalia Road), and 9,950 feet of 8" ductile iron water main along Rifle Range Road from #539 to the end of County maintenance), together with the appurtenances and related work in Campbell County, Kentucky. Owner reserves the right to make partial awards.

PROJECT DOCUMENTS: To view the bid documents, go to Northern Kentucky Water District (nkywater.org/procurement) in the section labeled "Current Procurement Items" at the top of the page and click the link to be click the link titled "Quest CDN Online Interface" redirected to the Quest CDN Electronic Bid Online Interface.

This bid is listed as Quest eBid Doc **# 9261616**.

The project documents may be downloaded by registering with Quest CDN online at www.questcdn.com or by calling 952-233-1632. After registration is complete, an On-Line Bid ID code must be created by clicking on "My Account", then the "User Info" tab. A prospective bidder will create this code in the designated field per requirements noted.

To be considered a Plan-holder, a bidder must complete registration and download the Proposal Documents in digital form for a $22.00 charge. There will be a charge of $42.00 to submit a bid. Plan-holders will receive addenda and other proposal document updates via Quest CDN. Prospective bidders must be on the plan holders list through Quest CDN for a bid to be accepted.

BIDDER QUALIFICATIONS & AWARD: All Bids must be in accordance with the Bidding and Contract Documents. Bids will be received on a unit price and/or lump sum basis as described in the Contract Documents.

Bid security, in the form of an electronic Bid Bond (insuring/bonding company shall be rated "A" by AM Best) in the amount of ten percent (10%) of the maximum total bid price, must accompany each Bid.

The Successful Bidder will be required to furnish a Construction Payment Bond and a Construction Performance Bond (insuring/bonding company shall be rated "A" by AM Best) as security for the faithful performance of the contract and the payment of all bills and obligations arising from the performance of the Contract.

Owner reserves the right to reject any or all Bids, including without limitation the right to reject any or all nonconforming, non-responsive, incomplete, unbalanced, or conditional Bids, to waive informalities, and to reject the Bid of any Bidder if Owner believes that it would not be in the best interest of Owner to make an award to that Bidder. Owner also reserves the right to negotiate with the apparent successful Bidder(s) to such an extent as may be determined by Owner, and/or to make multiple or partial awards.

Small, Minority, and Disadvantaged Business Enterprises are encouraged to bid on this project.

Bids shall remain subject to acceptance for 90 days after the day of bid opening or for such longer period of time to which a Bidder may agree in writing upon request of the Owner. If a Contract is to be awarded, the Owner will give the successful Bidder a Notice of Award during the period of time during which the successful Bidder's bid remains subject to acceptance.

INSTRUCTIONS TO BIDDERS: For all further requirements regarding bid submittal, qualifications, procedures, and contract award, refer to the Instructions to Bidders that are included in the Bidding Documents.

FUNDING: This project is funded by Kentucky Infrastructure Authority – Cleaner Water Program funds. The Successful Bidder and all Subcontractors will be required to conform to the Uniform Guidance Contract Requirements set forth in the Contract Documents.

Bidders must comply with Title VI of the Civil Rights Act of 1964, the Anti-Kickback Act, and the Contract Work Hours and Safety Standard Act. Bidders must comply with the President's Executive Order No. 11246 as amended, which prohibits discrimination in employment regarding race, creed, color, sex or national origin. Bidders must comply with 41 CFR 60-4, in regard to affirmative action. Bidders will make positive efforts to use small, minority, women owned, disadvantaged businesses.

The Northern Kentucky Water District is an Equal Opportunity Employer.

KRS 424.145 NOTICE OF ADVERTISEMENT

Northern Kentucky Water District Invitation to Bid – Sub-District HB Water Main Extension – Construction of approximately 2,575 feet of 8" ductile iron water main and 215 feet of 2" HDPE water main along Blangey Road (from 700' west of Mary Ingles Highway to the end of County maintenance), 1,430 feet of 8" ductile iron and PVC water main along Enzweiler Road (from the AA Highway to the end of County maintenance), 2,760 feet of 8" ductile iron and PVC water main along Gunkel Road (from Mystic Rose to the end of County maintenance), 7,835 feet of 8" ductile iron water main along Oneonta Road (from Washington Trace Road to Mary Ingles Highway), 3,615 feet of 8" ductile iron and PVC water main along Upper Lick Branch Road (from Grandview to house #2421), 5,000 feet of 8" ductile iron and PVC water main along Poplar Thicket Road (from Licking Pike to house #446), 1,755 feet of 8" ductile iron water main along Pond Creek Road (from house #10365 to Visalia Road), and 9,950 feet of 8" ductile iron water main along Rifle Range Road from #539 to the end of County maintenance), together with the appurtenances and related work in Campbell County, Kentucky. Owner reserves the right to make partial awards.

Access to the Invitation to Bid can be found on the Northern Kentucky Water District website (https://nkywater.org/procurement) by clicking the section labeled "Quest CDN Online Interface". Alternatively potential bidders may contact Cassandra Zoda at czoda@nkywater.org, 859-578-5455, or by visiting 2835 Crescent Springs Rd., Erlanger, KY 41018 for delivery of the Invitation to Bid.

Section 00100

INSTRUCTIONS TO BIDDERS

1. DEFINED TERMS. Terms used in these Instructions to Bidders will have the meanings indicated in the General Conditions and Supplementary Conditions. Additional terms used in these Instructions to Bidders have the meanings indicated below which are applicable to both the singular and plural thereof:

   a. *Bidder* - The individual or entity who submits a Bid directly to Owner.

   b. *Successful Bidder* - The Bidder submitting a responsive Bid to whom Owner (on the basis of Owner's evaluation as hereinafter provided) makes an award.

2. COPIES OF CONTRACT DOCUMENTS. Complete sets of Contract Documents must be used in preparing Bids; Bidder shall have sole responsibility for errors or misrepresentations resulting from the use of incomplete sets of Bidding Documents.

Owner and Engineer, in making copies of Bidding Documents available on the above terms, do so only for the purpose of obtaining Bids for the Work and do not confer a license or grant for any other use.

Contract Documents are available electronically via QuestCDN. In accord with NKWD Open Record Policy, planholders may request larger plan drawings in paper form by submitting an open records request form.

3. QUALIFICATIONS OF BIDDERS. Owner may conduct such investigations as Owner deems necessary to establish the responsibility, qualifications, and financial ability of Bidders to perform the services in accordance with the Contract Documents. To demonstrate Bidder's qualifications to perform the Work, within five days of Owner's request Bidder shall submit written evidence such as financial data, previous experience, present commitments, and such other data as may be requested by Owner. Bidders who have not, in the Owner's opinion, had sufficient experience in the size and type of work involved may not be considered.

Each Bid must contain evidence of Bidder's qualifications to transact business in the State of Kentucky or covenant to obtain such qualifications prior to award of the Contract. The Bidder's Organization Number from the Kentucky's Secretary of State and principal place of business as filed with Kentucky's Secretary of State must be included where applicable.

Each Bidder must be registered as a plan holder with Owner via QuestCDN. There shall be no substitution of bidders without proper registration with the Owner.

4. EXAMINATION OF CONTRACT DOCUMENTS AND SITE. It is the responsibility of each Bidder, before submitting a Bid, to:

   a. thoroughly examine and study the Instructions to Bidders and the Contract Documents, including any Addenda;

b. visit the Site and become familiar with and satisfy Bidder as to the general, local, and site conditions that may affect cost, progress, performance, or furnishing of the Work;

c. become familiar with and satisfy Bidder as to all federal, state, and local Laws and Regulations that may affect cost, progress, performance, or furnishing of the Work;

d. agree at the time of submitting its Bid that no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of its Bid for performance of the Work at the price bid and within the times and in accordance with the other terms and conditions of the Contract Documents;

e. correlate the information known to Bidder, information and observations obtained from visits to the Site, and all additional examinations, investigations, explorations, tests, studies, and data with the Contract Documents;

f. promptly give Owner written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder discovers in the Contract Documents and confirm that the written resolution thereof by Owner is acceptable to Bidder; and

g. determine that the Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work.

4.01. Underground Facilities. Information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the Site is based upon information and data furnished to Owner and Engineer by owners of such Underground Facilities, including Owner or others, and Owner and Engineer disclaim responsibility for the accuracy or completeness thereof, unless it is expressly provided otherwise in the Supplementary Conditions.

4.02. Additional Information. Before submitting a Bid, each Bidder may, at Bidder's own expense, make or obtain any additional examinations, investigations, explorations, tests, and studies and obtain any additional information and data which pertain to subsurface or physical conditions at or contiguous to the Site or otherwise, which may affect cost, progress, performance, or furnishing of the Work and which Bidder deems necessary to determine its Bid for performing and furnishing the Work in accordance with the time, price, and other terms and conditions of the Contract Documents. Each Bidder shall be responsible for any claims for personal injury, death or damage to property caused by Bidder's entry on public or private property and shall defend and indemnify Owner and all other parties against any such claims.

4.03. Bidder's Representation. The submission of a Bid will constitute an incontrovertible representation and covenant by Bidder that Bidder has complied with every requirement of this Article 4, that without exception the Bid is premised upon performing and furnishing the Work required by the Contract Documents and applying any specific means, methods, techniques, sequences, and procedures of construction that may be shown or indicated or expressly required by the Contract Documents, that Bidder has given Owner written notice of all conflicts, errors, ambiguities, and discrepancies that Bidder has discovered in the Contract Documents and the written resolutions thereof are acceptable to Bidder, and that the Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performing and furnishing the Work.

5. SITE AND OTHER AREAS. The Site is identified in the Contract Documents. All additional lands and access thereto required for temporary construction facilities, construction equipment, or storage of materials and equipment to be incorporated in the Work are to be obtained and paid for by Contractor. Easements for permanent structures or permanent changes in existing facilities are to be obtained and paid for by Owner unless otherwise provided in the Contract Documents.

6. INTERPRETATIONS AND ADDENDA. All questions about the meaning or intent of the Bidding Documents are to be submitted to Owner in writing. Any interpretations or clarifications that are considered necessary by Owner in response to such questions will be issued by Addenda mailed or delivered to all parties recorded by Owner as having received the Bidding Documents. Questions received less than 72 hours prior to the date for opening of Bids may not be answered. The person submitting questions shall be responsible for their prompt delivery. Only questions answered by Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.

Addenda may be issued to clarify, correct, or change the Bidding Documents as deemed advisable by Owner or Engineer.

Owner will not be responsible for explanations or interpretations of the Bidding Documents or Contract Documents except as issued in accordance herewith.

7. BID SECURITY. Each Bid must be accompanied by Bid security made payable to Owner in an amount of 10 percent of Bidder's maximum Bid price and in the form of a Bid Bond (on the form attached) issued by a surety meeting the requirements of paragraphs 5.01 and 5.02 of the General Conditions and shall be rated “A” by AM BEST.

Bid security of the Successful Bidder will be retained until such Bidder has executed the Contract Documents, furnished the required contract security, and met the other conditions of the Notice of Award, whereupon the Bid security will be returned. If the Successful Bidder fails to execute and deliver the Contract Documents and furnish the required contract security within 15 days after the Notice of Award, Owner may annul the Notice of Award and Bid security of that Bidder will be forfeited. Bid security of other Bidders whom Owner believes to have a reasonable chance of receiving the award may be retained by Owner until the earlier of seven days after the Effective Date of the Agreement or one day after the last day the Bids remain subject to acceptance, whereupon Bid security furnished by such Bidders will be returned.

8. CONTRACT TIMES. The numbers of days within which, or the dates by which, the Work is to be (a) Substantially Completed and (b) also completed and ready for final payment are set forth in the Agreement.

9. LIQUIDATED DAMAGES. Provisions for liquidated damages, if any, are set forth in the Agreement.

10. SUBSTITUTE OR "OR-EQUAL" ITEMS. The Contract, if awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents without consideration of possible substitute or "or-equal" items. Whenever it is specified or described in the Bidding Documents that a substitute or "or-equal" item of material or equipment may be

furnished or used by Contractor if acceptable to Owner, application for such acceptance will not be considered by Owner until after the Effective Date of the Agreement. The procedure for submission of any such application by Contractor and consideration by Owner is set forth in the General Conditions and may be supplemented in the General Requirements.

11. SUBMITTING AN ONLINE BID. Proceed to the QuestCDN website at www.questcdn.com. You will be asked to sign into your account or create a free QUESTCDN account by clicking the 'join' link. Contact QUESTCDN at 952-233-1632 or success@questcdn.com for assistance in membership registration, downloading the project and vbid online bid submittal.

To access the bid form, click the online bidding button at the top of bid advertisement. The on-line bid button will be available when the project is published and open for bidding. There is a fee of $42.00 to submit your bid.

12. PREPARATION OF BID. In addition to the Bid Worksheet in QuestCDN, a Bid Disclosure Form is included with the Bidding Documents. The Bid Disclosure Form must be submitted via QuestCDN.

All blanks on the Bid Disclosure Form shall be completed by printing in ink or by typewriter and the Bid signed. A Bid price shall be indicated for each lump sum bid item and/or unit price item listed therein, or the words "No Bid", "No Change", or "Not Applicable" entered.

A Bid by a corporation shall be executed in the corporate name by the president or a vice-president or other corporate officer accompanied by evidence of authority to sign. The corporate seal shall be affixed and attested by the secretary or an assistant secretary. The corporate address and state of incorporation shall be shown below the signature.

A Bid by a partnership shall be executed in the partnership name and signed by a partner (whose title must appear under the signature), accompanied by evidence of authority to sign. The official address of the partnership shall be shown below the signature.

A Bid by a limited liability company shall be executed in the name of the firm by a member (if member-managed) or manager (if manager-managed) and accompanied by evidence of authority to sign. The state of formation of the firm and the official address of the firm must be shown below the signature.

A Bid by an individual shall show the Bidder's name and official address.

A Bid by a joint venture shall be executed by each joint venturer in the manner indicated on the Bid Disclosure Form. The official address of the joint venture must be shown below the signature.

All names shall be typed or printed in ink below the signatures.

The QuestCDN system will require Bidders to download and acknowledge all addenda prior to submitting a Bid.
The address, email, and telephone number for communications regarding the Bid shall be shown on the Bid Disclosure Form.

The Bid shall identify whether the Bidder is a resident or nonresident bidder for purposes of Kentucky's reciprocal preference statute (KRS 45A.490 to 45A.494 and 200 KAR 5:400). If the Bidder is claiming a "resident bidder" status as defined in KRS 45A.494(2), the Bid shall include a properly executed and notarized affidavit affirming that it meets the criteria to be considered such a resident bidder. If requested by Owner, Bidder shall also provide documentation proving such resident bidder status; failure to do so shall result in disqualification of the Bidder or contract termination.

While the Bidder should consult the applicable statutes and regulation, generally speaking, a "resident bidder" is an individual or business entity that, on the date the contract is first advertised or announced as available for bidding: (a) is authorized to transact business in the Commonwealth; AND (b) has for one (1) year prior to and through the date of the advertisement, (i) filed Kentucky corporate income taxes, (ii) made payments to the Kentucky unemployment insurance fund established in KRS 341.490, and (iii) maintained a Kentucky workers' compensation policy in effect. A "nonresident bidder" is any other individual or business entity.

13. BASIS OF BID. Bidders shall submit a Bid on the specified unit price and/or lump sum basis (as specified) for each item of Work listed in the Bid schedule. The total of all estimated prices will be determined as the sum of the products of the estimated quantity of each item and the unit and/or lump sum price Bid for the item. The final quantities and Contract Price will be determined in accordance with paragraph 11.03 of the General Conditions and as amended in the Supplemental Conditions.

Discrepancies between the multiplication of units of Work and unit prices will be resolved in favor of the unit prices. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum. Discrepancies between words and figures will be resolved in favor of the words. Discrepancies between the QuestCDN bid worksheet and the Bid Disclosure Form shall be resolved in favor of the QuestCDN bid worksheet.

14. SUBMITTAL OF BID. A Bid shall be submitted via QuestCDN no later than the date and time prescribed and at the place indicated in the advertisement or invitation to Bid. Bidder shall assume full responsibility for timely submission of Bids. Bids will not be accepted after the time and date for receipt of Bids. Paper, oral, telephone, facsimile, email, or telegraph Bids are invalid and will not receive consideration.

15. MODIFICATION AND WITHDRAWAL OF BIDS. Prior to the bid opening, a Bid may be modified or withdrawn via the QuestCDN electronic bid service only. For a period ending 72 hours after Bids are opened, any Bidder may request the withdrawal of its Bid by filing with Owner a duly signed written notice and otherwise demonstrating by clear and convincing evidence to the reasonable satisfaction of Owner that the Bid was submitted in good faith but there was a material and/or substantial mistake in the preparation of its Bid. If the withdrawal of the Bid is approved by the Owner in its sole discretion, the Bid security will be returned. Without the advanced full disclosure by the withdrawing Bidder to and written consent of the Owner, (a) no Bid shall be withdrawn under this section when the result would be the awarding of the contract on another Bid of the same Bidder or of another Bidder in which the withdrawing Bidder has a direct or indirect equitable interest and (b) no Bidder who is permitted to withdraw a Bid shall, for compensation, supply any material or labor to or perform

any subcontract or other work agreement for the Bidder to whom the contract is awarded or otherwise benefit, directly or indirectly, from the performance of the Project.

16. OPENING OF BIDS. Bids will be opened electronically via Microsoft Teams meeting at the time indicated in the advertisement or Invitation to Bid. An abstract of the amounts of the base Bids and major alternates, if any, will be made available to Bidders after the opening of Bids.

17. BIDS TO REMAIN SUBJECT TO ACCEPTANCE. All Bids will remain subject to acceptance for the period of time stated in the Bid Disclosure Form, but Owner may, in its sole discretion, release any Bid and return the Bid security prior to the end of this period.

18. AWARD OF CONTRACT. Owner reserves the right to reject any or all Bids, including without limitation, nonconforming, non-responsive, incomplete, unbalanced, or conditional Bids. Owner further reserves the right to reject the Bid of any Bidder which it finds, after reasonable inquiry and evaluation, to be non-responsive. Owner may also reject the Bid of any Bidder if Owner believes that it would not be in the best interest of the Owner to make an award to that Bidder. Owner also reserves the right to waive all and to negotiate with the apparent Successful Bidder(s) to such an extent as may be determined by Owner. The Owner also reserves the right to increase or decrease the quantities of work per the General Conditions.

Owner reserves the right to make partial awards, meaning that based on factors such as the bid prices and available budget, Owner may elect to make award for only part of the eight base bid streets listed in sections A through H.

In evaluating Bids, Owner will consider, among other lawful considerations, the following:

a. Whether or not the Bid complies with the prescribed requirements, and provides such alternates, unit prices and other information or data as may be requested in the Bid Form or prior to the Notice of Award.

b. The qualifications of the Bidder.

c. If the Bidder maintains a permanent place of business.

d. If the Bidder has adequate personnel and equipment to perform the Work properly and expeditiously.

e. Bidder's financial status to meet all obligations and incidentals to the Work.

f. Whether the Bidder has appropriate technical expertise and experience.

g. Bidder's performance record.

h. The amount of the TOTAL BASE BID, exclusive of any additive alternates, if applicable. Any additive alternates will be considered after selection of the lowest Total Base Bid. Each additive alternate will be considered and selected or not selected individually, at Owner's discretion, for inclusion in the work.

Owner may conduct such investigations as Owner deems necessary to establish the responsibility, qualifications, and financial ability of Bidders to perform the Work in accordance

with the Contract Documents, including, without limitation, a Bidder's claim that it is a resident bidder for purposes of Kentucky's preference statute.

19. CONTRACT SECURITY AND INSURANCE. Article 5 of the General Conditions, as may be modified by the Supplementary Conditions, sets forth Owner's requirements as to performance and payment Bonds and insurance. When the Successful Bidder delivers the executed Agreement to Owner, it must be accompanied by such Bonds.

20. SIGNING OF AGREEMENT. When Owner gives a Notice of Award to the Successful Bidder, it will be accompanied by the required number of unsigned counterparts of the Agreement with the other Contract Documents identified in the Agreement as attached thereto. Within **15 days** thereafter, the Successful Bidder shall sign, leaving the dates blank, and deliver the required number of counterparts of the Agreement and attached documents to Owner. Within **15 days** thereafter, Owner shall deliver one fully signed counterpart to Successful Bidder with a complete set of the Drawings with appropriate identification.

21. SALES TAX EXEMPTION. The Contract Price shall not include sales tax for building materials, fixtures, or supplies purchased by the Successful Bidder which will be permanently incorporated into a structure or improvement to real property, or will be completely consumed, in fulfilling a construction contract for the purpose of furnishing water or sewer services to the general public under KRS 139.480. The Successful Bidder agrees to utilize Kentucky Department of Revenue Form 51A383 when making sales tax exempt purchases for the Work.

22. RETAINAGE. Provisions concerning retainage are set forth on the Agreement.

End of Section

Section 00300

BID DISCLOSURE FORM

PROJECT IDENTIFICATION: ***Sub-District HB Water Main Extension***

THIS BID IS SUBMITTED ELECTRONICALLY VIA QUEST CDN TO THE NORTHERN KENTUCKY WATER DISTRICT

THIS BID IS SUBMITTED BY: _____
(Bidder's Company Name)

1. The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with Owner in the form included in the Contract Documents to perform all Work as specified or indicated in the Contract Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Contract Documents.

2. Bidder accepts all of the terms and conditions of the Invitation to Bid and the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. This Bid will remain subject to acceptance for 90 calendar days after the Bid opening, or for such longer period of time to which the Bidder may agree in writing upon request of Owner. Bidder understands that certain extensions to the time for acceptance of this Bid may require the consent of the surety for the Bid Bond.

3. In submitting this Bid, Bidder represents and covenants, as set forth in the Agreement, that:

    a. Bidder has examined and carefully studied the Contract Documents, the other related data identified in the Contract Documents, and all Addenda, receipt of all of which is hereby acknowledged.

    b. Bidder has visited the Site and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

    c. Bidder is familiar with and is satisfied as to all federal, state, and local Laws and Regulations that may affect cost, progress, and performance of the Work.

    d. Bidder has obtained and carefully studied (or assumes responsibility for having done so) all additional or supplementary explorations, investigations, explorations, tests, studies and data concerning conditions (surface, subsurface, and Underground Facilities) at or contiguous to the Site which may affect cost, progress, or performance of the Work or which relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, including applying the specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents to be employed by Bidder, and safety precautions and programs incident thereto.

    e. Bidder does not consider that any further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for performance

of the Work at the price(s) bid and within the times and in accordance with the other terms and conditions of the Bidding Documents.

f. Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.

g. Bidder has correlated the information known to Bidder, information and observations obtained from visits to the Site, reports and drawings identified in the Bidding Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Bidding Documents.

h. Bidder has given Owner written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and the written resolution thereof by Owner is acceptable to Bidder.

i. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work for which this Bid is submitted.

j. Bidder's Organization Number from Kentucky's Secretary of State is #_____ [if applicable] and Bidder is qualified to transact business in the State of Kentucky or hereby covenants to obtain such qualifications prior to award of the Contract.

4. Bidder further represents that this Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any agreement or rules of any group, association, organization, or corporation; Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid; Bidder has not solicited or induced any individual or entity to refrain from bidding; and Bidder has not sought by collusion to obtain for itself any advantage over any other Bidder or over Owner.

5. The Bidder understands and agrees that during the performance of the Contract, it shall maintain a presence within such proximity of the Site which will allow it to respond to an emergency at the Site within one hour of receiving notice of an emergency, including emergencies occurring during non-working hours. The Bidder shall provide a list of emergency phone numbers for such purposes. If the Bidder does not have such a presence, it may satisfy this requirement by sub-contracting with a sub-contractor that does have such a presence, provided that any such sub-contractor must be approved by the Owner, in its sole discretion, prior to the project pre-construction meeting.

6. Bidder will complete the Work for Bidder's prices entered in the QuestCDN Bid Worksheet. Unit prices will be computed in accordance with paragraph of the General Conditions. Bidder acknowledges that estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for all Unit Price Bid items will be based on actual quantities provided, determined as provided in the Contract Documents. Bidder agrees to perform all the work described in the specifications and shown on the plans, for the Bidder's prices entered in the QuestCDN Bid Worksheet.

7. Bidder agrees that the Work will be substantially complete within 450 calendar days after the date when the Contract Times commence to run as provided in paragraph 4.01 of the General Conditions, and completed and ready for final payment in accordance with paragraph 15.06.B of the General Conditions within 480 calendar days after the date when the Contract Times commence to run.

   Note: The contract times listed above assume all 8 streets are awarded. If partial award is made, the contract times will decrease by the length of pipe removed divided by 100. Example: If a street totaling 5,000' of pipe is removed from the project (not part of the award), the contract times would be decreased by 50 days (5,000 / 100).

The terms used in this Bid with initial capital letters have the meanings indicated in the Instructions to Bidders, the General Conditions, and the Supplementary Conditions. The terms in this Bid, which are defined in the General Conditions included as part of the Contract Documents, have the meanings assigned to them in the General Conditions.

8. References

Contact Person	Company Name	Phone No.	Project Name
1.			
2.			
3.			
4.			

SUBMITTED on _____, 202_.

9. Communications concerning this Bid shall be sent to Bidder at the following address:

_____

_____

_____

_____

Phone: _____

Email: _____

AUTHORIZED SIGNATURE OF BIDDER

(see signature instructions below)

Individual/Entity Name/DBA _____(print)

By:_____(sign)
(Attach evidence of authority to sign if a corporation, LLC, joint venture, or partnership)

Title:_____

Business address _____

_____

Phone No.: _____Fax No.: _____

Email Address for Electronic Signatures: _____

Date _____

Signatures should meet the following requirements:

- Signatures for partnerships must be made by a general partner.
- Signatures for LLCs must be made by a manager or member, as dictated by the entity's Articles of incorporation/bylaws.
- If a joint venture, each venturer must complete the above complete the above authorized signature of bidder form and attach a copy to the Bid Disclosure Form.

BID BOND

BIDDER (Name and Address)

_____
_____
_____

SURETY (Name and Address of Principal Place of Business)

_____
_____
_____

OWNER (Name and Address)

_____
_____
_____

BID

BID DUE DATE _____

PROJECT (Brief Description Including Location)

_____
_____
_____

BOND

BOND NUMBER _____

DATE (Not later than Bid due date) _____

PENAL SUM _____ _____
(Words) (Figures)

IN WITNESS WHEREOF Surety and Bidder intending to be legally bound hereby subject to the terms printed on the reverse side hereof do each cause this Bid Bond to be duly executed on its behalf by its authorized officer agent or representative

BIDDER	SURETY
_____(Seal)	_____(Seal)
Bidder's Name and Corporate Seal	Surety s Name and Corporate Seal
By _____	By _____
Signature and Title	Signature and Title (Attach Power of Attorney)
Attest _____	Attest _____
Signature and Title	Signature and Title

Note (1) Above addresses are to be used for giving required notice
(2) Any singular reference to Bidder Surety OWNER or other party shall be considered plural where applicable

1 Bidder and Surety jointly and severally bind themselves their heirs executors administrators successors and assigns to pay to OWNER upon default of Bidder the penal sum set forth on the face of this Bond

2 Default of Bidder shall occur upon the failure of Bidder to deliver within the time required by the Bidding Documents (or any extension thereof agreed to in writing by OWNER) the executed Agreement required by the Bidding Documents and any performance and payment Bonds required by the Bidding Documents

3 This obligation shall be null and void if

3 1 OWNER accepts Bidder s Bid and Bidder delivers within the time required by the Bidding Documents (or any extension thereof agreed to in writing by OWNER) the executed Agreement required by the Bidding Documents and any performance and payment Bonds required by the Bidding Documents or

3 2 All Bids are rejected by OWNER or

3 3 OWNER fails to issue a Noti e of Award to Bidder within the time specified in the Bidding Documents (or any extension thereof agreed to in writing by Bidder and if applicable consented to by Surety when required by paragraph 5 hereof)

4 Payment under this Bond will be due and payable upon default by Bidder and within 30 calendar days after receipt by Bidder and Surety of written notice of default from OWNER which notice will be given with reasonable promptness identifying this Bond and the Project and including a statement of the amount due

5 Surety waives notice of and any and all defenses based on or arising out of any time extension to issue Notice of Award agreed to in writing by OWNER and Bidder provided that the total time for issuing Notice of Award including extensions shall not in the aggregate exceed 120 days from Bid due date without Surety s written consent

6 No suit or action shall be commenced under this Bond prior to 30 calendar days after the notice of default required in paragraph 4 above is received by Bidder and Surety and in no case later than one year after Bid due date

7 Any suit or action under this Bond shall be commenced only in a court of competent jurisdiction located in the state in which the Project is located

8 Notices required hereunder shall be in writing and sent to Bidder and Surety at their respective addresses shown on the face of this Bond Such notices may be sent by personal delivery commercial courier or by United States Registered or Certified Mail return receipt requested postage pre paid and shall be deemed to be effective upon receipt by the party concerned

9 Surety shall cause to be attached to this Bond a current and effective Power or Attorney evidencing the authority of the officer agent or representative who executed this Bond on behalf of Surety to execute seal and deliver such Bond and bind the Surety thereby

10 This Bond is intended to conform to all applicable statutory requirements Any applicable requirement of any applicable statute that has been omitted from this Bond shall be deemed to be included herein as if set forth at length If any provision of this Bond conflicts with any applicable statute then the provision of said statute shall govern and the remainder of this Bond that is not in conflict therewith shall continue in full force and effect

11 The term Bid as used herein includes a Bid offer or proposal as applicable

Section 00460

NON-COLLUSION AFFIDAVIT

STATE OF: _____)

COUNTY OF: _____) SS

_____, being first duly sworn, deposes

and says that he/she is the _____ of
(sole owner, a partner, president, secretary, etc.)

_____, the party making the foregoing bid; that such bid is genuine and not collusive or sham; that said bidder is not financially interested in, or otherwise affiliated in a business way with any other bidder on the same contract; that said bidder has not colluded, conspired, connived, or agreed, directly or indirectly, with any bidder or person, to put in a sham bid, or that such other person shall refrain from bidding, and has not in any manner directly or indirectly sought by agreement or collusion, or communication or conference, with any person, to fix the price or affidavit of any other bidder, or that of any other bidder, or to secure any advantage against Owner, or any person or persons interested in the proposed Contract; and that all statements contained in said bid are true; and further, that such bidder has not, directly or indirectly submitted this bid, or the contents thereof, or divulged information of data relative thereto to any association or to any member or agent thereof.

_____
AFFIANT

Sworn to and subscribed before me, a Notary Public in and for the above named

State and County, this _____ day of _____, 20 ____.

_____
Notary Public

Notary ID Number:_____

My Commission Expires:_____

End of Section

Bid Description: Sub-District HB Water Main Extension

REQUIRED NOTARIZED AFFIDAVIT FOR BIDDERS, OFFERORS AND CONTRACTORS CLAIMING KENTUCKY RESIDENT BIDDER STATUS

A. IS THE BIDDER OR OFFER CLAIMING KENTUCKY RESIDENT BIDDER STATUS? CHECK YES OR NO.

YES _____ NO _____

If yes, please proceed to complete Section B, a signed and notarized resident bidder affidavit is required.
If no, do not complete Section B, no resident bidder affidavit is required.

B. FOR BIDS AND CONTRACTS IN GENERAL:

The bidder or offeror hereby swears and affirms under penalty of perjury that, in accordance with KRS 45A.494(2), the entity bidding is an individual, partnership, association, corporation, or other business entity that, on the date the contract was first advertised or announced as available for bidding:

Is authorized to transact business in the Commonwealth of Kentucky; AND
Has for one year prior to and through the date this contract was first advertised or announced as available for bidding:
Filed Kentucky corporate income taxes;
Made payments to the Kentucky unemployment insurance fund established in KRS 341.490; and
Maintained a Kentucky workers' compensation policy in effect.

The undersigned acknowledges that the District reserves the right to request documentation supporting a bidder's claim of resident bidder status. Failure to provide such documentation upon request shall result in disqualification of the bidder or contract termination.

_____ _____
Signature Printed Name

_____ _____
Title (if signing on behalf of an entity) Date

State of _____)
)ss.
County of _____)

Sworn to and subscribed before me, a Notary Public in and for the above named State and County, this _____ day of _____, 20 ____.

_____
Notary Public
Notary ID Number:_____
My Commission Expires:_____

Section 00480

**CERTIFICATION REGARDING DEBARMENT,
SUSPENSION AND OTHER RESPONSIBILITY MATTERS**

The prospective participant certifies to the best of its knowledge and belief that it and its principals:

(a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;

(b) Have not within a three year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State, or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

(c) Are not presently indicted for or otherwise criminally or civilly charged by a government entity (Federal, State, or Local) with commission of any of the offenses enumerated in paragraph (1)(b) of this certification; and

(d) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State, or local) terminated for cause or default.

I understand that a false statement on this certification may be grounds for rejection of this proposal or termination of the award. In addition, under 18 USC Sec. 1001, a false statement may result in a fine of up to $10,000 or imprisonment for up to 5 years, or both.

_____
Typed Name of Authorized Representative

_____
Title of Authorized Representative

_____ _____
Signature of Authorized Representative Date

_____ I am unable to certify to the above statements. My explanation is attached.

Section 00490

CERTIFICATION REGARDING LOBBYING

The undersigned certifies, by signing and submitting this bid or proposal, to the best of his or her knowledge and belief, that:

1. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

2. If any funds other than the Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

3. The undersigned shall require that the language of this certification be included in the award documents for all sub-awards at all tiers (including subcontracts, sub-grants, and contracts under grants, loans, and cooperative agreements) and that all sub-recipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

_____

Typed Name of Authorized Representative

_____

Title of Authorized Representative

_____ _____

Signature of Authorized Representative Date

(Note: The following standard form will be used for
Preparation of the agreement, after award of contract.)

Section 00500

AGREEMENT
Sub-District HB Water Main Extension

THIS AGREEMENT is by and between the Northern Kentucky Water District (herein called Owner) and_____(herein called Contractor).

Owner and Contractor, in consideration of the mutual covenants herein set forth, agree as follows:

Article 1. WORK.

Contractor shall complete all Work as specified or indicated in the Contract Documents. The Work is generally described as follows: Construction of approximately 2,575 feet of 8" ductile iron water main and 215 feet of 2" HDPE water main along Blangey Road (from 700' west of Mary Ingles Highway to the end of County maintenance), 1,430 feet of 8" ductile iron and PVC water main along Enzweiler Road (from the AA Highway to the end of County maintenance), 2,760 feet of 8" ductile iron and PVC water main along Gunkel Road (from Mystic Rose to the end of County maintenance), 7,835 feet of 8" ductile iron water main along Oneonta Road (from Washington Trace Road to Mary Ingles Highway), 3,615 feet of 8" ductile iron and PVC water main along Upper Lick Branch Road (from Grandview to house #2421), 5,000 feet of 8" ductile iron and PVC water main along Poplar Thicket Road (from Licking Pike to house #446), 1,755 feet of 8" ductile iron water main along Pond Creek Road (from house #10365 to Visalia Road), and 9,950 feet of 8" ductile iron water main along Rifle Range Road from #539 to the end of County maintenance), together with the appurtenances and related work in Campbell County, Kentucky. Owner reserves the right to make partial awards.

Article 2. ENGINEER.

The Project has been designed by **Cardinal Engineering Corporation**, who is referred to in the Contract Documents as Engineer.

Article 3. CONTRACT TIMES, LIQUIDATED DAMAGES, DELAYS, AND DAMAGES.

All time limits for Milestones, if any, Substantial Completion, and completion and readiness for final payment as stated in the Contract Documents are of the essence of the Contract.

3.1. Contract Times. The Work will be substantially completed within **450** days after the date when the Contract Times commence to run as provided in paragraph 2.03.A of the General Conditions, and completed and ready for final payment in accordance with paragraph 14.07 of the General Conditions within **480** days after the date when the Contract Times commence to run.

(Note: The contract times listed above assume all 8 streets are awarded. If partial award is made, the contract times will decrease by the length of pipe removed divided by 100. Example:

If a street totaling 5,000' of pipe is removed from the project (not part of the award), the contract times would be decreased by 50 days (5,000 / 100).)

3.2. Liquidated Damages. Owner and Contractor recognize that time is of the essence of this Agreement and that Owner will suffer financial loss if the Work is not completed within the times specified in paragraph 3.1 above, plus any extensions thereof allowed in accordance with Article 12 of the General Conditions. The parties also recognize the delays, expenses, and difficulties involved in proving in a legal proceeding the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty), Contractor shall pay Owner $ 500.00 for each day that expires after the time specified in paragraph 3.1 for Substantial Completion until the Work is substantially complete. After Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Times or any proper extension thereof granted by Owner, Contractor shall pay Owner as liquidated damages (but not as a penalty) $ 500.00 for each day that expires after the time specified in paragraph 3.1 for completion and readiness for final payment until the Work is completed and ready for final payment.

Owner shall have the right to deduct the liquidated damages from any money in its hands, otherwise due, or to become due, to Contractor, or to initiate action to recover liquidated damages for nonperformance of this Contract within the time stipulated.

3.3. Delays and Damages. In the event Contractor is delayed in the prosecution and completion of the Work because of any delays caused by Owner or Engineer, Contractor shall have no claim against Owner or Engineer for damages (including but not limited to acceleration costs or damages) or contract adjustment other than an extension of the Contract Times and the waiving of liquidated damages during the period occasioned by the delay.

Contractor shall provide advance written notice to Owner and Engineer of Contractor's intention to accelerate the Work prior to commencing any acceleration. Such written notice shall include a detailed explanation of the nature and scope of the acceleration, the reason for the acceleration, the anticipated duration of the acceleration, and the estimated additional costs to Contractor, if any, related to the acceleration. This requirement shall not in any way affect or alter the agreement of Owner and Contractor with respect to delays and damages as set forth above and in Article 7 of the General Conditions.

Article 4. CONTRACT PRICE.

Owner shall pay Contractor for completion of the Work in accordance with the Contract Documents an amount in current funds equal to the sum of the established unit price for each separately identified item of Unit Price Work times the estimated quantity of that item as indicated in the Contractor's Bid, attached hereto as an exhibit, for the total amount of:

_____ _____

(words) **(figures)**

As provided in paragraph 11.03 of the General Conditions, estimated quantities are not

guaranteed, and determinations of actual quantities and classifications are to be made as provided in paragraph 9.08 of the General Conditions and as modified by the Supplementary Conditions. Unit Prices have been computed as provided in paragraph 11.03 of the General Conditions.

Contractor acknowledges that the Contract Price shall not include sales tax for building materials, fixtures, or supplies purchased by Contractor which will be permanently incorporated into a structure or improvement to real property, or will be completely consumed, in fulfilling a construction contract for the purpose of furnishing water or sewer services to the general public under KRS 139.480. Contractor agrees to utilize Kentucky Department of Revenue Form 51A383 when making sales tax exempt purchases under this Agreement.

Article 5. PAYMENT PROCEDURES.

Contractor shall submit Applications for Payment in accordance with Article 14 of the General Conditions. Applications for Payment will be processed by Owner as provided in the General Conditions and as modified by the Supplementary Conditions.

5.1. Progress Payments. Owner shall make progress payments on account of the Contract Price on the basis of Contractor's Applications for Payment on or about the 25th day of each month during performance of the Work. All such payments will be measured by the schedule of values established in paragraph 2.07.A of the General Conditions (and in the case of Unit Price Work based on the number of units completed) or, in the event there is no schedule of values, as provided in the General Requirements.

5.2. Retainage. In addition to any amounts withheld from payment in accordance with Paragraph 14.02 of the General Conditions, Owner shall retain from progress payments amounts equal to the following percentages:

a. Ten percent (10%) of the amount of the Work completed. This amount may be reduced by the Owner in its sole and absolute discretion, if the project is substantially completed; and

b. Ten percent (10%) of the value of materials and equipment that are not incorporated in the Work but are delivered, suitably stored, and accompanied by documentation satisfactory to Owner as provided in paragraph 14.02 of the General Conditions. Retainage for stored materials and equipment will be released when the materials and equipment are incorporated in the Work.

All retainage will be paid to Contractor when the Work is completed and ready for final payment in accordance with paragraph 14.07 of the General Conditions. Consent of the Surety shall be obtained before retainage is paid by Owner. Consent of the Surety, signed by an agent, must be accompanied by a certified copy of such agent's authority to act for the Surety.

5.3. Final Payment. Upon final completion and acceptance of the Work in accordance with paragraphs 14.07 of the General Conditions, Owner shall pay the remainder of the Contract Price as provided in said paragraph 14.07.

Article 6. CONTRACTOR'S REPRESENTATION.

In order to induce Owner to enter into this Agreement Contractor makes the following representations:

a. Contractor has examined and carefully studied the Contract Documents and the other related data identified in the Bidding Documents

b. Contractor has visited the Site and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

c. Contractor is familiar with and is satisfied as to all federal, state, and local Laws and Regulations that may affect cost, progress, and performance of the Work.

d. Contractor has obtained and carefully studied (or assumes responsibility for having done so) all additional or supplementary explorations, investigations, explorations, tests, studies and data concerning conditions (surface, subsurface, and Underground Facilities) at or contiguous to the Site which may affect cost, progress, or performance of the Work or which relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, including applying the specific means, methods, techniques, sequences, and procedures of construction, if any, expressly required by the Contract Documents to be employed by Contractor, and safety precautions and programs incident thereto.

e. Contractor does not consider that any further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract Documents.

f. Contractor is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Contract Documents.

g. Contractor has correlated the information known to Contractor, information and observations obtained from visits to the Site, reports and drawings identified in the Contract Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Contract Documents.

h. Contractor has given Owner written notice of all conflicts, errors, ambiguities, or discrepancies that Contractor has discovered in the Contract Documents, and the written resolution thereof by Owner is acceptable to Contractor.

i. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

Article 7. CONTRACT DOCUMENTS.

The Contract Documents, which are incorporated as part of the Agreement, consist of the following:

A. This Agreement;
B. Performance Bond;
C. Payment Bond;
D. General Conditions;
E. Supplementary Conditions;
F. Specifications as listed in the table of contents of the Project Manual;
G. Drawings consisting of a cover sheet and sheets numbered **C-000** through **C-577** inclusive, with each sheet bearing the following general title;
   Sub-District HB Water Main Extension Project
H. Addenda (numbers ___ to ___, inclusive);
I. Exhibits to this Agreement (enumerated as follows):
   1. Notice to Proceed;
   2. Contractor's Bid;
   3. Documentation submitted by Contractor prior to Notice of Award;
J. The following which may be delivered or issued on or after the Effective Date of the Agreement and are not attached hereto:
   1. Written Amendments;
   2. Work Change Directives;
   3. Change Orders.
K. Uniform Guidance 2 CFR 200 Contract Requirements

There are no Contract Documents other than those listed above in this Article 7. The Contract Documents may only be amended, modified, or supplemented as provided in paragraphs 3.05 of the General Conditions.

Article 8. CONTRACT CORRECTION PERIOD.

Notwithstanding the reference to "one year after the date of Substantial Completion" at the beginning of paragraph 13.07.A of the General Conditions, the Contractor's Correction Period with respect to the obligations set forth in paragraph 13.07.A of the General Conditions shall be twenty-four (24) months after the issuance of "Certificate of Substantial Completion" for all machinery, piping, materials, equipment, fittings, roadway pavement work, general restoration, shoulder & ditch restoration furnished under the Contract Documents. The correction period referenced in paragraph 13.07.C of the General Conditions shall be twenty-four (24) months for all machinery, piping, materials, equipment, fittings and all roadway pavement work.

Article 9. COMPLIANCE WITH KENTUCKY LAW.

Contractor represents and warrants that it has revealed to Owner any and all final determinations of a violation of KRS Chapters 136, 139, 141, 337, 338, 341, and 342 by Contractor or any subcontractor within the past five years. Contractor further represents and warrants that it and each of its subcontractors will remain in continuous compliance with the

provisions of KRS Chapters 136, 139, 141, 337, 338, 341 and 342 for the duration of this Agreement. Contractor understands that its failure to reveal a final determination of a violation or to comply with the above statutory requirements constitutes grounds for cancellation of the Agreement and for disqualification of Contractor from eligibility for any contracts for a period of two years.

Article 10. EQUAL OPPORTUNITY.

Unless exempted under KRS 45.590, during the performance of the Agreement, the Contractor agrees as follows:

a. Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, age forty (40) and over, disability, veteran status, or national origin;

b. Contractor will take affirmative action in regard to employment, upgrading, demotion, transfer, recruitment, recruitment advertising, layoff, termination, rates of pay or other forms of compensation, and selection for training, so as to ensure that applicants are employed and that employees during employment are treated without regard to their race, color, religion, sex, age forty (40) and over, disability, veteran status, or national origin;

c. Contractor will state in all solicitations or advertisements for employees placed by or on behalf of Contractor that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, age forty (40) or over, disability, veteran status, or national origin;

d. Contractor will post notices in conspicuous places, available to employees and applicants for employment, setting forth the provisions of the nondiscrimination clauses required by this section; and

e. Contractor will send a notice to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding advising the labor union or workers' representative of Contractor's commitments under the nondiscrimination clauses.

Article 11. MISCELLANEOUS.

a. Terms used in this Agreement will have the meanings indicated in the General Conditions.

b. No assignment by a party hereto of any rights under or interests in the Contract will be binding on another party hereto without the written consent of the party sought to be bound; and, specifically but without limitation, moneys that may become due and moneys that are due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility

under the Contract Documents.

c. Owner and Contractor each binds itself, its partners, successors, assigns, and legal representatives to the other party hereto, its partners, successors, assigns, and legal representatives in respect of all covenants, agreements, and obligations contained in the Contract Documents.

d. Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation shall be deemed stricken, and all remaining provisions shall continue to be valid and binding upon Owner and Contractor, who agree that the Contract Documents shall be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.

[Signature page follows.]

IN WITNESS WHEREOF, Owner and Contractor have signed this Agreement. One counterpart each has been delivered to Owner, Contractor, Surety, and Engineer.

This Agreement will be effective on _____ (which is the Effective Date of the Agreement).

OWNER: **Northern Kentucky Water District**

_____

John Moor
Vice President of Engineering, Production and Water Quality

Address for giving notices

2835 Crescent Springs Road
PO Box 18640
Erlanger, Kentucky 41018

CONTRACTOR:_____

By:_____
Signature

_____
Printed Name

_____
Title

(Corporate Seal)

Address for giving notices

_____

_____

_____

Joint Venture

CONTRACTOR:_____

By:_____
(Corporate Seal)

Address for giving notices

_____

_____

Uniform Guidance Contract Requirements

2 CFR 200 - ARPA Funded Projects

This Agreement, Contract, or Purchase Order ("contract") involves the use of funds from a Federal government grant. Due to the contract funding source, the following clauses from the Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards ("Uniform Guidance"), Appendix II are incorporated into and form a part of the terms and conditions of the contract. The full text of the Uniform Guidance may be found at 2 CFR Part 200. Contractor agrees to comply with all applicable clauses and to flow down all applicable clauses to lower-tier subcontractors. Undefined terms herein shall have the same definitions as used in the contract, or if undefined there, in 2 CFR 200.

1. **Equal Employment Opportunity. (2 CFR 200, Appendix II (C)).** *This Section applies if the contract is a "federally assisted construction contract."* Except as otherwise provided under 41 CFR Part 60, for all contracts that qualify as "federally assisted construction contracts" as defined in 41 CFR Part 60–1.3, contractor agrees to comply with the equal opportunity clause under 41 CFR 60-1.4(b), incorporated herein by reference, and E.O. 11246, "Equal Employment Opportunity," as amended by E.O. 11375, "Amending Executive Order 11246 Relating to Equal Employment Opportunity," and as supplemented by regulations at 41 CFR Part 60, "Office of Federal Contract Compliance Programs, Equal Employment Opportunity, Department of Labor.

   During the performance of this contract, the contractor agrees as follows:

   (1) The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, sexual orientation, gender identity, or national origin. The contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, sexual orientation, gender identity, or national origin. Such action shall include, but not be limited to the following: Employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.

   (2) The contractor will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, sexual orientation, gender identity, or national origin.

   (3) The contractor will not discharge or in any other manner discriminate against any employee or applicant for employment because such employee or applicant has inquired about, discussed, or disclosed the compensation of the employee or applicant or another employee or applicant. This provision shall not apply to instances in which an employee who has access to the compensation information of other employees or applicants as a part of such employee's essential job functions discloses the compensation of such other employees or applicants to individuals who do not otherwise have access to such information, unless such disclosure is in response to a formal complaint or charge, in furtherance of an investigation, proceeding, hearing, or action, including an investigation conducted by the employer, or is consistent with the contractor's legal duty to furnish information.

   (4) The contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the said labor union or workers' representatives of the contractor's commitments under this section, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

   (5) The contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.

   (6) The contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the administering agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

   (7) In the event of the contractor's noncompliance with the nondiscrimination clauses of this contract or with any of the said rules, regulations, or orders, this contract may be canceled, terminated, or suspended in whole or in part and the contractor may be declared ineligible for further Government contracts or federally assisted construction contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

   (8) The contractor will include the portion of the sentence immediately preceding paragraph (1) and the provisions of paragraphs (1) through (8) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The contractor will take such action with respect to any subcontract or purchase order as the administering agency may direct as a means of enforcing such provisions, including sanctions for noncompliance; provided, however, that in the event a contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the administering agency, the contractor may request the United States to enter into such litigation to protect the interests of the United States

2. **Contract Work Hours and Safety Standards Act (2 CFR 200, Appendix II (E); 40 U.S.C. 3701-3708).** *This section applies if the contract is in excess of $100,000 and involves the employment of mechanics or laborers.* contractor shall comply with 40 U.S.C. 3702 and 3704, as supplemented by Department of Labor regulations (29 CFR Part 5). Under 40 U.S.C. 3702 of the Act, contractor shall be required to compute the wages of every mechanic and laborer on the basis of a standard work week of 40 hours. Work in excess of the standard work week is permissible provided that the worker is compensated at a rate of not less than 1½ times the basic rate of pay for all hours worked in excess of 40 hours in the work week. The requirements of 40 U.S.C. 3704 are applicable to construction work and provide that no laborer or mechanic shall be required to work in surroundings or under working conditions which are unsanitary, hazardous or dangerous. These requirements do

not apply to the purchases of supplies or materials or articles ordinarily available on the open market, or contracts for transportation or transmission of intelligence.

3. **Clean Air Act (42 U.S.C. 7401—7671q) and the Federal Water Pollution Control Act (33 U.S.C. 1251— 1387), as amended (2 CFR 200, Appendix II (G)).** *This section applies if the contract is in excess of $150,000.* The contractor shall comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act (42 U.S.C. 7401—7671q) and the Federal Water Pollution Control Act as amended (33 U.S.C. 1251—1387). Violations shall be reported to the Federal awarding agency and the Regional Office of the Environmental Protection Agency(EPA). The contractor agrees to: i) comply with all applicable standards, orders, or regulations issued pursuant to the Clean Air Act, as amended, 42 U.S.C. § 7401 et seq. and the Federal Water Pollution Control Act, as amended, 33 U.S.C. 1251 et seq.; ii) report each violation to the Owner and understands and agrees that the Owner will, in turn, report each violation as required to assure notification to the Treasury Department and the appropriate Environmental Protection Agency Regional Office; and iii) include these requirements in each subcontract exceeding $100,000.

4. **Debarment and Suspension (2 CFR 200, Appendix II (H); E.O.s 12549 and 12689).** *This section applies to all federally funded contracts.* The project related to the procurement notice and/or contract is a federally funded project. In order to respond to this procurement notice, all non-federal entities, contractors, sub-recipients and sub-grantees are required to register in the System for Award Management (SAM) database. SAM is the official free, government operated website. There is NO charge to register or maintain your entity registration record in SAM. All contractors must be registered in SAM prior to receiving an award of contract from the Owner. In SAM, your company/business/organization is referred to as an "Entity". You must register your entity to do business with the U.S. Federal government by completing the registration process in SAM. Detailed instructions for how to register your company/business/organization can be found at https://sam.gov/content/entity-registration.Non-federal entities are subject to the non-procurement debarment and suspension regulations implementing Executive Orders 12549 and 12689, 2 CFR part 180. These regulations restrict awards, sub-awards, and contracts with certain parties that are debarred, suspended, or otherwise Contractor must comply with 2 CFR Part 180, Subpart C and must include a requirement to comply with this regulation in any lower tier covered transaction it enters into. Contractor shall have an ongoing duty during the term of this Contract to disclose to Owner on an ongoing basis any occurrence that would prevent contractor from making the certifications contained in this section. Such disclosure shall be made in writing to Owner within five (5) business days of when contractor discovers or reasonably believes there is a likelihood of such occurrence. This certification is a material representation of fact relied upon by Owner. If it is later determined that contractor did not comply with 2 CFR Part 180, Subpart C, in addition to remedies available to Owner, the Federal government may pursue available remedies, including but not limited to suspension and/or debarment.

5. **Byrd Anti-Lobbying Amendment (2 CFR 200, Appendix II (I); 31 U.S.C. 1352).** *This section applies if the contract is for $100,000 or more.* Contractor and its subcontractors shall file the certification required by this statute and associated regulations. Each tier certifies to the tier above that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a member of Congress, officer or employee of Congress, or an employee of a member of Congress in connection with obtaining any Federal contract, grant or any other award covered by 31 U.S.C. 1352. Each tier shall also disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award. Such disclosures are forwarded from tier to tier up to Owner.

6. **Procurement of recovered materials (2 CFR 200.323).** *This section applies where the purchase price of the item exceeds $10,000 or the value of the quantity acquired during the preceding fiscal year exceeded $10,000.* The contractor shall comply with the requirements of Section 6002 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act. The requirements of Section 6002 include procuring only items designated in guidelines of the Environmental Protection Agency (EPA) at 40 CFR Part 247 that contain the highest percentage of recovered materials practicable, consistent with maintaining a satisfactory level of competition.

7. **Domestic preferences for procurements (2 CFR 200.322).** *This section applies to all contracts covered by 2 CFR 200.* As appropriate and to the extent consistent with law, the contractor should, to the greatest extent practicable, provide a preference for the purchase, acquisition, or use of products, or materials produced in the United States (including but not limited to iron, aluminum, steel, cement, and other manufactured products). The requirements of this Section must be included in all subawards including all contracts and purchase orders for work or products under this contract. For purposes of this section: i) "Produced in the United States" means, for iron and steel products, that all manufacturing processes from the initial melting stage through the application of coatings, occurred in the United States; ii) "Manufactured products" means items and construction materials composed in whole or in part of non-ferrous metals such as aluminum; plastics and polymer-based products such as polyvinyl chloride pipe; aggregates such as concrete; glass, including optical fiber; and lumber.

8. **Contracting with Small and Minority Businesses, Women's Business Enterprises, and Labor Surplus Area Firms (2 CFR 200.321).** *This section applies to all contracts covered by 2 CFR 200.* The contractor shall take affirmative steps to include minority businesses, women's business enterprises, and labor surplus area firms when possible by: i) placing qualified small and minority businesses and women's business enterprises on solicitation lists; ii) assuring that small and minority businesses, and women's business enterprises are solicited whenever they are potential sources; iii) dividing total requirements, when economically feasible, into smaller tasks or quantities to permit maximum participation by small and minority businesses, and women's business enterprises; iv) establishing delivery schedules, where the requirement permits, which encourage participation by small and minority businesses, and women's business enterprises; v) using the services and assistance, as appropriate, of such organizations as the Small Business Administration and the Minority Business Development Agency of the Department of Commerce; vi) and requiring subcontractors, if subcontracts are to be let, to take the affirmative steps listed in in this Section.

CONFLICTS AMONG CLAUSES APPLICABLE TO THE CONTRACT

In the event of any conflict among the requirements of clauses applicable to contract, the most stringent requirements of the clauses will apply.

Performance Bond

Any singular reference to Contractor Surety Owner or other party shall be considered plural where applicable

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CONTRACTOR (Name and Address)

SURETY (Name and Address of Principal Place of Business)

OWNER (Name and Address)

CONTRACT
Date
Amount
Description (Name and Location)

BOND
Date (Not earlier than Contract Date)
Amount
Modifications to this Bond Form

Surety and Contractor intending to be legally bound hereby subject to the terms printed on the reverse side hereof do each cause this Performance Bond to be duly executed on its behalf by its authorized officer agent or representative

CONTRACTOR AS PRINCIPAL
Company (Corp Seal)

Signature _____
Name and Title

SURETY
Company (Corp Seal)

Signature _____
Name and Title
(Attach Power of Attorney)

(Space is provided below for signatures of additional parties if required)

CONTRACTOR AS PRINCIPAL
Company (Corp Seal)

Signature _____
Name and Title

SURETY
Company (Corp Seal)

Signature _____
Name and Title

EJCDC No 1910 28 A (1996 Edition)
Originally prepared through the joint efforts of the Surety Association of America Engineers Joint Contract Documents Committee the Associated General Contractors of America and the American Institute of Architects

1 The CONTRACTOR and the Surety jointly and severally bind themselves their heirs executors administrators successors and assigns to the Owner for the performance of the Contract which is incorporated herein by reference

2 If the CONTRACTOR performs the Contract, the Surety and the CONTRACTOR have no obligation under this Bond except to participate in conferences as provided in paragraph 3 1

3 If there is no OWNER Default, the Surety s obligation under this Bond shall arise after

3 1 The OWNER has notified the CONTRACTOR and the Surety at the addresses described in paragraph 10 below that the OWNER is considering declaring a CONTRACTOR Default and has requested and attempted to arrange a conference with the CONTRACTOR and the Surety to be held not later than fifteen days after receipt of such notice to discuss methods of performing the Contract If the OWNER the CONTRACTOR and the Surety agree the CONTRACTOR shall be allowed a reasonable time to perform the Contract, but such an agreement shall not waive the OWNER s right if any subsequently to declare a CONTRACTOR Default and

3 2 The OWNER has declared a CONTRACTOR Default and formally terminated the CONTRACTOR s right to complete the Contract Such CONTRACTOR Default shall not be declared earlier than twenty days after the CONTRACTOR and the Surety have received notice as provided in paragraph 3 1 and

3 3 The OWNER has agreed to pay the Balance of the Contract Price to

3 3 1 The Surety in accordance with the terms of the Contract,

3 3 2 Another contractor selected pursuant to paragraph 4 3 to perform the Contract

4 When the OWNER has satisfied the conditions of paragraph 3 the Surety shall promptly and at the Surety s expense take one of the following actions

4 1 Arrange for the CONTRACTOR, with consent of the OWNER to perform and complete the Contract, or

4 2 Undertake to perform and complete the Contract itself through its agents or through independent contractors or

4 3 Obtain bids or negotiated proposals from qualified contractors acceptable to the OWNER for a contract for performance and completion of the Contract, arrange for a contract to be prepared for execution by the OWNER and the contractor selected with the OWNER s concurrence to be secured with performance and payment bonds executed by a qualified surety equivalent to the Bonds issued on the Contract, and pay to the OWNER the amount of damages as described in paragraph 6 in excess of the Balance of the Contract Price incurred by the OWNER resulting from the CONTRACTOR Default or

4 4 Waive its right to perform and complete arrange for completion or obtain a new contractor and with reasonable promptness under the circumstances

4 4 1 After investigation, determine the amount for which it may be liable to the OWNER and as soon as practicable after the amount is determined tender payment therefor to the OWNER, or

4 4 2 Deny liability in whole or in part and notify the OWNER citing reasons therefor

5 If the Surety does not proceed as provided in paragraph 4 with reasonable promptness the Surety shall be deemed to be in default on this Bond fifteen days after receipt of an additional written notice from the OWNER to the Surety demanding that the Surety perform its obligations under this Bond and the OWNER shall be entitled to enforce any remedy available to the OWNER If the Surety proceeds as provided in paragraph 4 4 and the OWNER refuses the payment tendered or the Surety has denied liability in whole or in part without further notice the OWNER shall be entitled to enforce any remedy available to the OWNER

6 After the OWNER has terminated the CONTRACTOR s right to complete the Contract, and if the Surety elects to act under paragraph 4 1 4 2 or 4 3 above then the responsibilities of the Surety to the OWNER shall not be greater than those of the CONTRACTOR under the Contract, and the responsibilities of the OWNER to the Surety shall not be greater than those of the OWNER under the Contract To a limit of the amount of this Bond but subject to commitment by the OWNER of the Balance of the Contract Price to mitigation of costs and damages on the Contract the Surety is obligated without duplication for

6 1 The responsibilities of the CONTRACTOR for correction of defective Work and completion of the Contract

6 2 Additional legal design professional and delay costs resulting from the CONTRACTOR s Default and resulting from the actions or failure to act of the Surety under paragraph 4 and

6 3 Liquidated damages or if no liquidated damages are specified in the Contract, actual damages caused by delayed performance or non performance of the CONTRACTOR

7 The Surety shall not be liable to the OWNER or others for obligations of the CONTRACTOR that are unrelated to the Contract and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations No right of action shall accrue on this Bond to any person or entity other than the OWNER or its heirs executors administrators or successors

8 The Surety hereby waives notice of any change including changes of time to the Contract or to related subcontracts purchase orders and other obligations

9 Any proceeding legal or equitable under this Bond may be instituted in any court of competent jurisdiction in the location in which the Work or part of the Work is located and shall be instituted within two years after CONTRACTOR Default or within two years after the CONTRACTOR ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond whichever occurs first If the provisions of this paragraph are void or prohibited by law the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable

10 Notice to the Surety the OWNER or the CONTRACTOR shall be mailed or delivered to the address shown on the signature page

11 When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the Contract was be performed any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted here from and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein The intent is that this Bond shall be construed as a statutory bond and not as a common law bond

12 Definitions

12 1 Balance of the Contract Price The total amount payable by the OWNER to the CONTRACTOR under the Contract after all proper adjustments have been made including allowance to the CONTRACTOR of any amounts received or to be received by the OWNER in settlement of insurance or other Claims for damages to which the CONTRACTOR is entitled reduced by all valid and proper payments made to or on behalf of the CONTRACTOR under the Contract

12 2 Contract The agreement between the OWNER and the CONTRACTOR identified on the signature page including all Contract Documents and changes thereto

12 3 CONTRACTOR Default. Failure of the CONTRACTOR, which has neither been remedied nor waived to perform or otherwise to comply with the terms of the Contract

12 4 OWNER Default. Failure of the OWNER, which has neither been remedied nor waived to pay the CONTRACTOR as required by the Contract or to perform and complete or comply with the other terms thereof

(FOR INFORMATION ONLY Name Address and Telephone)
AGENT or BROKER OWNER S REPRESENTATIVE (Engineer or other party)

Payment Bond

Any singular reference to Contractor Surety Owner or other party shall be considered plural where applicable

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CONTRACTOR (Name and Address)

SURETY (Name and Address of Principal Place of Business)

OWNER (Name and Address)

CONTRACT
Date
Amount
Description (Name and Location)

BOND
Date (Not earlier than Contract Date)
Amount
Modifications to this Bond Form

Surety and Contractor intending to be legally bound hereby subject to the terms printed on the reverse side hereof do each cause this Payment Bond to be duly executed on its behalf by its authorized officer agent or representative

CONTRACTOR AS PRINCIPAL		SURETY	
Company	(Corp Seal)	Company	(Corp Seal)
Signature _____		Signature _____	
Name and Title		Name and Title (Attach Power of Attorney)	

(Space is provided below for signatures of additional parties if required)

CONTRACTOR AS PRINCIPAL		SURETY	
Company	(Corp Seal)	Company	(Corp Seal)
Signature _____		Signature _____	
Name and Title		Name and Title	

EJCDC No 1910 28 B (1996 Edition)
Originally prepared through the joint efforts of the Surety Association of America Engineers Joint Contract Documents Committee the Associated General Contractors of America the American Institute of Architects the American Subcontractors Association, and the Associated Specialty Contractors

1 The CONTRACTOR and the Surety jointly and severally bind themselves their heirs executors administrators successors and assigns to the OWNER to pay for labor materials and equipment furnished for use in the performance of the Contract, which is incorporated herein by reference

2 With respect to the OWNER this obligation shall be null and void if the CONTRACTOR

2 1 Promptly makes payment directly or indirectly for all sums due Claimants and

2 2 Defends indemnifies and holds harmless the OWNER from all claims demands liens or suits by any person or entity who furnished labor materials or equipment for use in the performance of the Contract provided the OWNER has promptly notified the CONTRACTOR and the Surety (at the addresses described in paragraph 12) of any claims demands liens or suits and tendered defense of such claims demands liens or suits to the CONTRACTOR and the Surety and provided there is no OWNER Default

3 With respect to Claimants this obligation shall be null and void if the CONTRACTOR promptly makes payment directly or indirectly for all sums due

4 The Surety shall have no obligation to Claimants under this Bond until

4 1 Claimants who are employed by or have a direct contract with the CONTRACTOR have given notice to the Surety (at the addresses described in paragraph 12) and sent a copy or notice thereof to the OWNER stating that a claim is being made under this Bond and with substantial accuracy the amount of the claim

4 2 Claimants who do not have a direct contract with the CONTRACTOR.

1 Have furnished written notice to the CONTRACTOR and sent a copy or notice thereof to the OWNER, within 90 days after having last performed labor or last furnished materials or equipment included in the claim stating with substantial accuracy the amount of the claim and the name of the party to whom the materials were furnished or supplied or for whom the labor was done or performed and

2 Have either received a rejection in whole or in part from the CONTRACTOR or not received within 30 days of furnishing the above notice any communication from the CONTRACTOR by which the CONTRACTOR had indicated the claim will be paid directly or indirectly and

3 Not having been paid within the above 30 days have sent a written notice to the Surety and sent a copy or notice thereof to the OWNER stating that a claim is being made under this Bond and enclosing a copy of the previous written notice furnished to the CONTRACTOR

5 If a notice required by paragraph 4 is given by the OWNER to the CONTRACTOR or to the Surety that is sufficient compliance

6 When the Claimant has satisfied the conditions of paragraph 4 the Surety shall promptly and at the Surety s expense take the following actions

6 1 Send an answer to the Claimant with a copy to the OWNER within 45 days after receipt of the claim stating the amounts that are undisputed and the basis for challenging any amounts that are disputed

6 2 Pay or arrange for payment of any undisputed amounts

7 The Surety s total obligation shall not exceed the amount of this Bond and the amount of this Bond shall be credited for any payments made in good faith by the Surety

8 Amounts owed by the OWNER to the CONTRACTOR under the Contract shall be used for the performance of the Contract and to satisfy claims if any under any Performance Bond By the CONTRACTOR furnishing and the OWNER accepting this Bond they agree that all funds earned by the CONTRACTOR in the performance of the Contract are dedicated to satisfy obligations of the CONTRACTOR and the Surety under this Bond subject to the OWNER s priority to use the funds for the completion of the Work

9 The Surety shall not be liable to the OWNER Claimants or others for obligations of the CONTRACTOR that are unrelated to the Contract The OWNER shall not be liable for payment of any costs or expenses of any Claimant under this Bond and shall have under this Bond no obligations to make payments to give notices on behalf of or otherwise have obligations to Claimants under this Bond

10 The Surety hereby waives notice of any change including changes of time to the Contract or to related Subcontracts purchase orders and other obligations

11 No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the location in which the Work or part of the Work is located or after the expiration of one year from the date (1) on which the Claimant gave the notice required by paragraph 4 1 or paragraph 4 2 3 or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs If the provisions of this paragraph are void or prohibited by law the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable

12 Notice to the Surety the OWNER or the CONTRACTOR shall be mailed or delivered to the addresses shown on the signature page Actual receipt of notice by Surety the OWNER or the CONTRACTOR however accomplished shall be sufficient compliance as of the date received at the address shown on the signature page

13 When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the Contract was to be performed any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein The intent is that this Bond shall be construed as a statutory Bond and not as a common law bond

14 Upon request of any person or entity appearing to be a potential beneficiary of this Bond the CONTRACTOR shall promptly furnish a copy of this Bond or shall permit a copy to be made

15 DEFINITIONS

15 1 Claimant An individual or entity having a direct contract with the CONTRACTOR or with a Subcontractor of the CONTRACTOR to furnish labor materials or equipment for use in the performance of the Contract The intent of this Bond shall be to include without limitation in the terms labor materials or equipment that part of water gas power light, heat, oil gasoline telephone service or rental equipment used in the Contract architectural and engineering services required for performance of the Work of the CONTRACTOR and the CONTRACTOR s Subcontractors and all other items for which a mechanic s lien may be asserted in the jurisdiction where the labor materials or equipment were furnished

15 2 Contract. The agreement between the OWNER and the CONTRACTOR identified on the signature page including all Contract Documents and changes pthereto

15 3 OWNER Default. Failure of the OWNER which has neither been remedied nor waived to pay the CONTRACTOR as required by the Contract or to perform and complete or comply with the other terms thereof

(FOR INFORMATION ONLY--Name Address and Telephone)
AGENCY or BROKER OWNER S REPRESENTATIVE (Engineer or other party)

CERTIFICATE OF INSURANCE

Issue Date:

PRODUCER:

Code Sub-Code

INSURED:

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW.

COMPANIES AFFORDING COVERAGE

COMPANY LETTER A	
COMPANY LETTER B	
COMPANY LETTER C	
COMPANY LETTER D	
COMPANY LETTER E	

COVERAGES

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES.

CO LTR	TYPE OF INSURANCE	POLICY NUMBER	POLICY EFFECTIVE DATE	POLICY EXPIRATION DATE	ALL LIMITS IN THOUSANDS	
	GENERAL LIABILITY				GENERAL AGGREGATE	$1,000,
	[X] COMMERCIAL GENERAL LIABILITY				PRODUCTS-COMP/OPS AGGREGATE	$1,000,
	[X] OCCURRENCE	(Completed Operations & Products Liability remains			PERSONAL & ADVERTISING INJURY	$1,000,
	[X] BLANKET CONTRACTUAL	in force for 2 years after final payment)			EACH OCCURRENCE	$1,000,
	[ ] _____					
	AUTOMOBILE LIABILITY					
	[X] ANY AUTO				COMBINED SINGLE LIMIT EACH OCCURRENCE Bodily Injury & Property Damage	$1,000,
	[X] HIRED AUTOS					
	[X] NON-OWNED AUTOS					
	EXCESS LIABILITY				EACH OCCURRENCE	$4,000,
	[X] UMBRELLA FORM	(Follows Form of the Primary)			AGGREGATE	$4,000,
	WORKERS' COMPENSATION AND EMPLOYERS' LIABILITY				STATUTORY	
					EACH ACCIDENT	$1,000,
		(Includes US Longshoremen and Harbor Workers Act and Maritime Coverage Where Applicable and All States Endorsement)			DISEASE-POLICY LIMIT	$1,000,
					DISEASE-EACH EMPLOYEE	$1,000,
	OTHER				EACH OCCURRENCE	
	[ ] _____				AGGREGATE	

DESCRIPTION OF OPERATIONS/LOCATIONS/VEHICLES/SPECIAL ITEMS:

1. Certificate Holder(s) & their Officers, Directors, Partners, Employees, & Agents Named as Additional Insured (all policies except WC). The coverage afforded the Additional Insured under these policies shall be primary insurance. If the Additional Insured has other insurance which is applicable to the loss, such other insurance shall be on an excess or contingent basis. (Copy of Additional Insured Endorsement attached.)
2. Blanket Coverage for XCU Hazards (General Liability & Excess Liability).
3. Waiver of Subrogation Against Certificate Holder(s), Their Officers, Directors, Partners, Employees, & Agents (all policies).
4. Contractual Coverage covers liability assumed in the Indemnification Clause of the Contract between Certificate Holder and Insured (General Liability & Excess Liability).
5. General and Products/Completed Operations aggregates apply for each Certificate Holder contract(s) or amendments (General Liability & Excess Liability).
6. Contractual Liability Limitation Endorsement CG2139 or its equivalent is not included in either General or Excess Liability policies.
7. Severability of Interest or Cross Liability clause or endorsement included (General Liability & Excess Liability).

CERTIFICATE HOLDERS	CANCELLATION
1.	SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELED, TERMINATED, OR MATERIALLY CHANGED BEFORE THE EXPIRATION DATE THEREOF, THE ISSUING COMPANY WILL MAIL 30 DAYS' WRITTEN NOTICE TO THE CERTIFICATE HOLDERS NAMED TO THE LEFT. ANY IMPAIRMENT OR EXHAUSTION OF AGGREGATES WILL BE THE SUBJECT OF IMMEDIATE NOTICE TO THE CERTIFICATE HOLDERS.
2.	AUTHORIZED REPRESENTATIVE

CERTIFICATE OF PROPERTY INSURANCE

ISSUE DATE _____ (mm/dd/yy)

THIS IS EVIDENCE THAT INSURANCE AS IDENTIFIED BELOW HAS BEEN ISSUED IS IN FORCE AND CONVEYS ALL THE RIGHTS AND PRIVILEGES AFFORDED UNDER THE POLICY

PRODUCER	COMPANY
Code Sub-Code	
INSURED	POLICY NUMBER
	EFFECTIVE DATE (mm/dd/yy) / EXPIRATION DATE (mm/dd/yy)

PROPERTY INFORMATION

LOCATION/DESCRIPTION

COVERAGE INFORMATION

COVERAGES/PERILS/FORMS	AMOUNT OF INSURANCE	DEDUCTIBLE
BUILDERS RISK/INSTALLATION FLOATER All Risk of Physical Damage or Loss to Equipment and Materials at or Incidental to the Jobsite on Completed Value Form	Insurable value of completed work.	

REMARKS (Including Special Conditions)

1 Certificate Holder and others identified in the property insurance paragraph of the Contract Documents are Named Insureds
2 Waiver of Subrogation against Named Insureds
3 Any similar insurance carried by Named Insureds is excess of coverage described hereon
4 Losses are payable to Owner as fiduciary for the Named Insureds

CANCELLATION

THIS POLICY IS SUBJECT TO THE PREMIUMS FORMS AND RULES IN EFFECT FOR EACH POLICY PERIOD SHOULD THE POLICY BE TERMINATED OR MATERIALLY CHANGED THE COMPANY WILL GIVE THE CERTIFICATE HOLDERS IDENTIFIED BELOW 30 DAYS' WRITTEN NOTICE AND WILL SEND NOTIFICATION OF ANY CHANGES TO THE POLICY THAT WOULD AFFECT THAT INTEREST IN ACCORDANCE WITH THE POLICY PROVISIONS OR AS REQUIRED BY LAW

CERTIFICATE HOLDERS

Name and Address	Nature of Interest
1	X Additional Named Insured
2	SIGNATURE OF AUTHORIZED AGENT OF THE COMPANY

Engineers Joint Documents Committee
Design and Construction Related Documents
Instructions and License Agreement

Instructions

Before you use any EJCDC document:

1. Read the License Agreement. You agree to it and are bound by its terms when you use the EJCDC document.

2. Make sure that you have the correct version for your word processing software.

How to Use:

1. While EJCDC has expended considerable effort to make the software translations exact, it can be that a few document controls (e.g., bold, underline) did not carry over.

2. Similarly, your software may change the font specification if the font is not available in your system. It will choose a font that is close in appearance. In this event, the pagination may not match the control set.

3. If you modify the document, you must follow the instructions in the License Agreement about notification.

4. Also note the instruction in the License Agreement about the EJCDC copyright.

License Agreement

You should carefully read the following terms and conditions before using this document. Commencement of use of this document indicates your acceptance of these terms and conditions. If you do not agree to them, you should promptly return the materials to the vendor, and your money will be refunded.

The Engineers Joint Contract Documents Committee ("EJCDC") provides **EJCDC Design and Construction Related Documents** and licenses their use worldwide. You assume sole responsibility for the selection of specific documents or portions thereof to achieve your intended results, and for the installation, use, and results obtained from **EJCDC Design and Construction Related Documents**.

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License:

You have a limited nonexclusive license to:

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2. Use **EJCDC Design and Construction Related Documents** in printed form for bona fide contract documents.

3. Copy **EJCDC Design and Construction Related Documents** into any machine readable or printed form for backup or modification purposes in support of your use of **EJCDC Design and Construction Related Documents**.

You agree that you will:

1. Reproduce and include EJCDC's copyright notice on any printed or machine-readable copy, modification, or portion merged into another document or program. All proprietary rights in **EJCDC Design and Construction Related Documents** are and shall remain the property of EJCDC.

2. Not represent that any of the contract documents you generate from **EJCDC Design and Construction Related Documents** are EJCDC documents unless (i) the document text is used without alteration or (ii) all additions and changes to, and deletions from, the text are clearly shown.

You may not use, copy, modify, or transfer EJCDC Design and Construction Related Documents, or any copy, modification or merged portion, in whole or in part, except as expressly provided for in this license. Reproduction of EJCDC Design and Construction Related Documents in printed or machine-readable format for resale or educational purposes is expressly prohibited.

If you transfer possession of any copy, modification or merged portion of EJCDC Design and Construction Related Documents to another party, your license is automatically terminated.

Term:

The license is effective until terminated. You may terminate it at any time by destroying **EJCDC Design and Construction Related Documents** altogether with all copies, modifications and merged portions in any form. It will also terminate upon conditions set forth elsewhere in this Agreement or if you fail to comply with any term or condition of this Agreement. You agree upon such termination to destroy **EJCDC Design and Construction Related Documents** along with all copies, modifications and merged portions in any form.

Limited Warranty:

EJCDC warrants the CDs and diskettes on which **EJCDC Design and Construction Related Documents** is furnished to be free from defects in materials and

workmanship under normal use for a period of ninety (90) days from the date of delivery to you as evidenced by a copy of your receipt.

There is no other warranty of any kind, either expressed or implied, including, but not limited to the implied warranties of merchantability and fitness for a particular purpose. Some states do not allow the exclusion of implied warranties, so the above exclusion may not apply to you. This warranty gives you specific legal rights and you may also have other rights which vary from state to state.

EJCDC does not warrant that the functions contained in **EJCDC Design and Construction Related Documents** will meet your requirements or that the operation of **EJCDC Design and Construction Related Documents** will be uninterrupted or error free.

Limitations of Remedies:

EJCDC's entire liability and your exclusive remedy shall be:

1. the replacement of any document not meeting EJCDC's "Limited Warranty" which is returned to EJCDC's selling agent with a copy of your receipt, or

2. if EJCDC's selling agent is unable to deliver a replacement CD or diskette which is free of defects in materials and workmanship, you may terminate this Agreement by returning EJCDC Document and your money will be refunded.

In no event will EJCDC be liable to you for any damages, including any lost profits, lost savings or other incidental or consequential damages arising out of the use or inability to use **EJCDC Design and Construction Related Documents** even if EJCDC has been advised of the possibility of such damages, or for any claim by any other party.

Some states do not allow the limitation or exclusion of liability for incidental or consequential damages, so the above limitation or exclusion may not apply to you.

General:

You may not sublicense, assign, or transfer this license except as expressly provided in this Agreement. Any attempt otherwise to sublicense, assign, or transfer any of the rights, duties, or obligations hereunder is void.

This Agreement shall be governed by the laws of the State of Virginia. Should you have any questions concerning this Agreement, you may contact EJCDC by writing to:

Arthur Schwartz, Esq.
General Counsel
National Society of Professional Engineers
1420 King Street
Alexandria, VA 22314

Phone: (703) 684-2845
Fax: (703) 836-4875
e-mail: aschwartz@nspe.org

You acknowledge that you have read this agreement, understand it and agree to be bound by its terms and conditions. You further agree that it is the complete and exclusive statement of the agreement between us which supersedes any proposal or prior agreement, oral or written, and any other communications between us relating to the subject matter of this agreement.

This document has important legal consequences; consultation with an attorney is encouraged with respect to its use or modification. This document should be adapted to the particular circumstances of the contemplated Project and the controlling Laws and Regulations.

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

Prepared by

ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

and

Issued and Published Jointly by

ACEC
American Council of Engineering Companies

The Associated General Contractors of America — Skill Responsibility Integrity

ASCE American Society of Civil Engineers

National Society of Professional Engineers
Professional Engineers in Private Practice

AMERICAN COUNCIL OF ENGINEERING COMPANIES

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CONSTRUCTION SPECIFICATIONS INSTITUTE

These General Conditions have been prepared for use with the Suggested Forms of Agreement Between Owner and Contractor (EJCDC C-520 or C-525, 2007 Editions). Their provisions are interrelated and a change in one may necessitate a change in the other. Comments concerning their usage are contained in the Narrative Guide to the EJCDC Construction Documents (EJCDC C-001, 2007 Edition). For guidance in the preparation of Supplementary Conditions, see Guide to the Preparation of Supplementary Conditions (EJCDC C-800, 2007 Edition).

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

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ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

A. Wherever used in the Bidding Requirements or Contract Documents and printed with initial capital letters, the terms listed below will have the meanings indicated which are applicable to both the singular and plural thereof. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.

1. *Addenda*—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.

2. *Agreement*—The written instrument which is evidence of the agreement between Owner and Contractor covering the Work.

3. *Application for Payment*—The form acceptable to Engineer which is to be used by Contractor during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.

4. *Asbestos*—Any material that contains more than one percent asbestos and is friable or is releasing asbestos fibers into the air above current action levels established by the United States Occupational Safety and Health Administration.

5. *Bid*—The offer or proposal of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

6. *Bidder*—The individual or entity who submits a Bid directly to Owner.

7. *Bidding Documents*—The Bidding Requirements and the proposed Contract Documents (including all Addenda).

8. *Bidding Requirements*—The advertisement or invitation to bid, Instructions to Bidders, Bid security of acceptable form, if any, and the Bid Form with any supplements.

9. *Change Order*—A document recommended by Engineer which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, issued on or after the Effective Date of the Agreement.

10. *Claim*—A demand or assertion by Owner or Contractor seeking an adjustment of Contract Price or Contract Times, or both, or other relief with respect to the terms of the Contract. A demand for money or services by a third party is not a Claim.

11. *Contract*—The entire and integrated written agreement between the Owner and Contractor concerning the Work. The Contract supersedes prior negotiations, representations, or agreements, whether written or oral.

12. *Contract Documents*—Those items so designated in the Agreement. Only printed or hard copies of the items listed in the Agreement are Contract Documents. Approved Shop Drawings, other Contractor submittals, and the reports and drawings of subsurface and physical conditions are not Contract Documents.

13. *Contract Price*—The moneys payable by Owner to Contractor for completion of the Work in accordance with the Contract Documents as stated in the Agreement (subject to the provisions of Paragraph 11.03 in the case of Unit Price Work).

14. *Contract Times*—The number of days or the dates stated in the Agreement to: (i) achieve Milestones, if any; (ii) achieve Substantial Completion; and (iii) complete the Work so that it is ready for final payment as evidenced by Engineer's written recommendation of final payment.

15. *Contractor*—The individual or entity with whom Owner has entered into the Agreement.

16. *Cost of the Work*—See Paragraph 11.01 for definition.

17. *Drawings*—That part of the Contract Documents prepared or approved by Engineer which graphically shows the scope, extent, and character of the Work to be performed by Contractor. Shop Drawings and other Contractor submittals are not Drawings as so defined.

18. *Effective Date of the Agreement*—The date indicated in the Agreement on which it becomes effective, but if no such date is indicated, it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.

19. *Engineer*—The individual or entity named as such in the Agreement.

20. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but which does not involve a change in the Contract Price or the Contract Times.

21. *General Requirements*—Sections of Division 1 of the Specifications.

22. *Hazardous Environmental Condition*—The presence at the Site of Asbestos, PCBs, Petroleum, Hazardous Waste, or Radioactive Material in such quantities or circumstances that may present a substantial danger to persons or property exposed thereto.

23. *Hazardous Waste*—The term Hazardous Waste shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 USC Section 6903) as amended from time to time.

24. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.

25. *Liens*—Charges, security interests, or encumbrances upon Project funds, real property, or personal property.

26. *Milestone*—A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all the Work.

27. *Notice of Award*—The written notice by Owner to the Successful Bidder stating that upon timely compliance by the Successful Bidder with the conditions precedent listed therein, Owner will sign and deliver the Agreement.

28. *Notice to Proceed*—A written notice given by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work under the Contract Documents.

29. *Owner*—The individual or entity with whom Contractor has entered into the Agreement and for whom the Work is to be performed.

30. *PCBs*—Polychlorinated biphenyls.

31. *Petroleum*—Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute), such as oil, petroleum, fuel oil, oil sludge, oil refuse, gasoline, kerosene, and oil mixed with other non-Hazardous Waste and crude oils.

32. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising the Contractor's plan to accomplish the Work within the Contract Times.

33. *Project*—The total construction of which the Work to be performed under the Contract Documents may be the whole, or a part.

34. *Project Manual*—The bound documentary information prepared for bidding and constructing the Work. A listing of the contents of the Project Manual, which may be bound in one or more volumes, is contained in the table(s) of contents.

35. *Radioactive Material*—Source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954 (42 USC Section 2011 et seq.) as amended from time to time.

36. *Resident Project Representative*—The authorized representative of Engineer who may be assigned to the Site or any part thereof.

37. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.

38. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements to support scheduled performance of related construction activities.

39. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

40. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work.

41. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements for access thereto, and such other lands furnished by Owner which are designated for the use of Contractor.

42. *Specifications*—That part of the Contract Documents consisting of written requirements for materials, equipment, systems, standards and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable thereto.

43. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work at the Site.

44. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion thereof.

45. *Successful Bidder*—The Bidder submitting a responsive Bid to whom Owner makes an award.

46. *Supplementary Conditions*—That part of the Contract Documents which amends or supplements these General Conditions.

47. *Supplier*—A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or Subcontractor.

48. *Underground Facilities*—All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.

49. *Unit Price Work*—Work to be paid for on the basis of unit prices.

50. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction, and furnishing, installing, and incorporating all materials and equipment into such construction, all as required by the Contract Documents.

51. *Work Change Directive*—A written statement to Contractor issued on or after the Effective Date of the Agreement and signed by Owner and recommended by Engineer ordering an

addition, deletion, or revision in the Work, or responding to differing or unforeseen subsurface or physical conditions under which the Work is to be performed or to emergencies. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the change ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Times.

1.02 *Terminology*

A. The words and terms discussed in Paragraph 1.02.B through F are not defined but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.

B. *Intent of Certain Terms or Adjectives:*

1. The Contract Documents include the terms "as allowed," "as approved," "as ordered," "as directed" or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives "reasonable," "suitable," "acceptable," "proper," "satisfactory," or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Paragraph 9.09 or any other provision of the Contract Documents.

C. *Day:*

1. The word "day" means a calendar day of 24 hours measured from midnight to the next midnight.

D. *Defective:*

1. The word "defective," when modifying the word "Work," refers to Work that is unsatisfactory, faulty, or deficient in that it:

a. does not conform to the Contract Documents; or

b. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or

c. has been damaged prior to Engineer's recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 14.04 or 14.05).

E. *Furnish, Install, Perform, Provide:*

1. The word "furnish," when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.

2. The word "install," when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.

3. The words "perform" or "provide," when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.

4. When "furnish," "install," "perform," or "provide" is not used in connection with services, materials, or equipment in a context clearly requiring an obligation of Contractor, "provide" is implied.

F. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2 – PRELIMINARY MATTERS

2.01 *Delivery of Bonds and Evidence of Insurance*

A. When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner such bonds as Contractor may be required to furnish.

B. *Evidence of Insurance:* Before any Work at the Site is started, Contractor and Owner shall each deliver to the other, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance which either of them or any additional insured may reasonably request) which Contractor and Owner respectively are required to purchase and maintain in accordance with Article 5.

2.02 *Copies of Documents*

A. Owner shall furnish to Contractor up to ten printed or hard copies of the Drawings and Project Manual. Additional copies will be furnished upon request at the cost of reproduction.

2.03 *Commencement of Contract Times; Notice to Proceed*

A. The Contract Times will commence to run on the thirtieth day after the Effective Date of the Agreement or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Agreement. In no event will the Contract Times commence to run later than the sixtieth day after the day of Bid opening or the thirtieth day after the Effective Date of the Agreement, whichever date is earlier.

2.04 *Starting the Work*

A. Contractor shall start to perform the Work on the date when the Contract Times commence to run. No Work shall be done at the Site prior to the date on which the Contract Times commence to run.

2.05 *Before Starting Construction*

A. *Preliminary Schedules:* Within 10 days after the Effective Date of the Agreement (unless otherwise specified in the General Requirements), Contractor shall submit to Engineer for timely review:

1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract Documents;

2. a preliminary Schedule of Submittals; and

3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.06 *Preconstruction Conference; Designation of Authorized Representatives*

A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in Paragraph 2.05.A, procedures for handling Shop Drawings and other submittals, processing Applications for Payment, and maintaining required records.

B. At this conference Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit instructions, receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

2.07 *Initial Acceptance of Schedules*

A. At least 10 days before submission of the first Application for Payment a conference attended by Contractor, Engineer, and others as appropriate will be held to review for acceptability to Engineer as provided below the schedules submitted in accordance with Paragraph 2.05.A. Contractor shall have an additional 10 days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to Contractor until acceptable schedules are submitted to Engineer.

1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of

the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor.

2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.

3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to component parts of the Work.

ARTICLE 3 – CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

3.01 *Intent*

A. The Contract Documents are complementary; what is required by one is as binding as if required by all.

B. It is the intent of the Contract Documents to describe a functionally complete project (or part thereof) to be constructed in accordance with the Contract Documents. Any labor, documentation, services, materials, or equipment that reasonably may be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the indicated result will be provided whether or not specifically called for, at no additional cost to Owner.

C. Clarifications and interpretations of the Contract Documents shall be issued by Engineer as provided in Article 9.

3.02 *Reference Standards*

A. Standards, Specifications, Codes, Laws, and Regulations

1. Reference to standards, specifications, manuals, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard, specification, manual, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Agreement if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.

2. No provision of any such standard, specification, manual, or code, or any instruction of a Supplier, shall be effective to change the duties or responsibilities of Owner, Contractor, or Engineer, or any of their subcontractors, consultants, agents, or employees, from those set forth in the Contract Documents. No such provision or instruction shall be effective to assign to Owner, Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the Contract Documents.

3.03 *Reporting and Resolving Discrepancies*

A. *Reporting Discrepancies:*

1. *Contractor's Review of Contract Documents Before Starting Work*: Before undertaking each part of the Work, Contractor shall carefully study and compare the Contract Documents and check and verify pertinent figures therein and all applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy which Contractor discovers, or has actual knowledge of, and shall obtain a written interpretation or clarification from Engineer before proceeding with any Work affected thereby.

2. *Contractor's Review of Contract Documents During Performance of Work*: If, during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation , (b) any standard, specification, manual, or code, or (c) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 6.16.A) until an amendment or supplement to the Contract Documents has been issued by one of the methods indicated in Paragraph 3.04.

3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof.

B. *Resolving Discrepancies:*

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the Contract Documents shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between the provisions of the Contract Documents and:

   a. the provisions of any standard, specification, manual, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference in the Contract Documents); or

   b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 *Amending and Supplementing Contract Documents*

A. The Contract Documents may be amended to provide for additions, deletions, and revisions in the Work or to modify the terms and conditions thereof by either a Change Order or a Work Change Directive.

B. The requirements of the Contract Documents may be supplemented, and minor variations and deviations in the Work may be authorized, by one or more of the following ways:

1. A Field Order;

2. Engineer's approval of a Shop Drawing or Sample (subject to the provisions of Paragraph 6.17.D.3); or

3. Engineer's written interpretation or clarification.

3.05 *Reuse of Documents*

A. Contractor and any Subcontractor or Supplier shall not:

1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media editions; or

2. reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer.

B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein shall preclude Contractor from retaining copies of the Contract Documents for record purposes.

3.06 *Electronic Data*

A. Unless otherwise stated in the Supplementary Conditions, the data furnished by Owner or Engineer to Contractor, or by Contractor to Owner or Engineer, that may be relied upon are limited to the printed copies (also known as hard copies). Files in electronic media format of text, data, graphics, or other types are furnished only for the convenience of the receiving party. Any conclusion or information obtained or derived from such electronic files will be at the user's sole risk. If there is a discrepancy between the electronic files and the hard copies, the hard copies govern.

B. Because data stored in electronic media format can deteriorate or be modified inadvertently or otherwise without authorization of the data's creator, the party receiving electronic files agrees that it will perform acceptance tests or procedures within 60 days, after which the receiving party shall be deemed to have accepted the data thus transferred. Any errors detected within the 60-day acceptance period will be corrected by the transferring party.

C. When transferring documents in electronic media format, the transferring party makes no representations as to long term compatibility, usability, or readability of documents resulting from the use of software application packages, operating systems, or computer hardware differing from those used by the data's creator.

ARTICLE 4 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS; REFERENCE POINTS

4.01 *Availability of Lands*

A. Owner shall furnish the Site. Owner shall notify Contractor of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work. Owner will obtain in a timely manner and pay for easements for permanent structures or permanent changes in existing facilities. If Contractor and Owner are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the

Contract Price or Contract Times, or both, as a result of any delay in Owner's furnishing the Site or a part thereof, Contractor may make a Claim therefor as provided in Paragraph 10.05.

B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which the Work is to be performed and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.

C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

4.02 *Subsurface and Physical Conditions*

A. *Reports and Drawings:* The Supplementary Conditions identify:

1. those reports known to Owner of explorations and tests of subsurface conditions at or contiguous to the Site; and

2. those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities).

B. *Limited Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or

2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or

3. any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions, or information.

4.03 *Differing Subsurface or Physical Conditions*

A. *Notice:* If Contractor believes that any subsurface or physical condition that is uncovered or revealed either:

1. is of such a nature as to establish that any "technical data" on which Contractor is entitled to rely as provided in Paragraph 4.02 is materially inaccurate; or

2. is of such a nature as to require a change in the Contract Documents; or

3. differs materially from that shown or indicated in the Contract Documents; or

4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.16.A), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except as aforesaid) until receipt of written order to do so.

B. *Engineer's Review*: After receipt of written notice as required by Paragraph 4.03.A, Engineer will promptly review the pertinent condition, determine the necessity of Owner's obtaining additional exploration or tests with respect thereto, and advise Owner in writing (with a copy to Contractor) of Engineer's findings and conclusions.

C. *Possible Price and Times Adjustments:*

1. The Contract Price or the Contract Times, or both, will be equitably adjusted to the extent that the existence of such differing subsurface or physical condition causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

   a. such condition must meet any one or more of the categories described in Paragraph 4.03.A; and

   b. with respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraphs 9.07 and 11.03.

2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times if:

   a. Contractor knew of the existence of such conditions at the time Contractor made a final commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract; or

   b. the existence of such condition could reasonably have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such final commitment; or

   c. Contractor failed to give the written notice as required by Paragraph 4.03.A.

3. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, a Claim may be made therefor as provided in Paragraph 10.05. However, neither Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors shall be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.

4.04 *Underground Facilities*

A. *Shown or Indicated:* The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:

1. Owner and Engineer shall not be responsible for the accuracy or completeness of any such information or data provided by others; and

2. the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:

   a. reviewing and checking all such information and data;

   b. locating all Underground Facilities shown or indicated in the Contract Documents;

   c. coordination of the Work with the owners of such Underground Facilities, including Owner, during construction; and

   d. the safety and protection of all such Underground Facilities and repairing any damage thereto resulting from the Work.

B. *Not Shown or Indicated:*

1. If an Underground Facility is uncovered or revealed at or contiguous to the Site which was not shown or indicated, or not shown or indicated with reasonable accuracy in the Contract Documents, Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.16.A), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer. Engineer will promptly review the Underground Facility and determine the extent, if any, to which a change is required in the Contract Documents to reflect and document the consequences of the existence or location of the Underground Facility. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.

2. If Engineer concludes that a change in the Contract Documents is required, a Work Change Directive or a Change Order will be issued to reflect and document such consequences. An equitable adjustment shall be made in the Contract Price or Contract Times, or both, to the extent that they are attributable to the existence or location of any Underground Facility that was not shown or indicated or not shown or indicated with reasonable accuracy in the Contract Documents and that Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment in Contract Price or Contract Times, Owner or Contractor may make a Claim therefor as provided in Paragraph 10.05.

4.05 *Reference Points*

A. Owner shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the established reference points and property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall report to Engineer whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

4.06 *Hazardous Environmental Condition at Site*

A. *Reports and Drawings:* The Supplementary Conditions identify those reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at the Site.

B. *Limited Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor and safety precautions and programs incident thereto; or

2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or

3. any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions or information.

C. Contractor shall not be responsible for any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work. Contractor shall be responsible for a Hazardous Environmental Condition created with any materials brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible.

D. If Contractor encounters a Hazardous Environmental Condition or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, Contractor shall immediately: (i) secure or otherwise isolate such condition; (ii) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 6.16.A); and (iii) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to

permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 4.06.E.

E. Contractor shall not be required to resume Work in connection with such condition or in any affected area until after Owner has obtained any required permits related thereto and delivered written notice to Contractor: (i) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work; or (ii) specifying any special conditions under which such Work may be resumed safely. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, either party may make a Claim therefor as provided in Paragraph 10.05.

F. If after receipt of such written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of an adjustment in Contract Price or Contract Times as a result of deleting such portion of the Work, then either party may make a Claim therefor as provided in Paragraph 10.05. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 7.

G. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition: (i) was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be included within the scope of the Work, and (ii) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06.G shall obligate Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

H. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06.H shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

I. The provisions of Paragraphs 4.02, 4.03, and 4.04 do not apply to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 5 – BONDS AND INSURANCE

5.01 *Performance, Payment, and Other Bonds*

A. Contractor shall furnish performance and payment bonds, each in an amount at least equal to the Contract Price as security for the faithful performance and payment of all of Contractor's obligations under the Contract Documents. These bonds shall remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 13.07, whichever is later, except as provided otherwise by Laws or Regulations or by the Contract Documents. Contractor shall also furnish such other bonds as are required by the Contract Documents.

B. All bonds shall be in the form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in the list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. All bonds signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual's authority to bind the surety. The evidence of authority shall show that it is effective on the date the agent or attorney-in-fact signed each bond.

C. If the surety on any bond furnished by Contractor is declared bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the Project is located or it ceases to meet the requirements of Paragraph 5.01.B, Contractor shall promptly notify Owner and Engineer and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which shall comply with the requirements of Paragraphs 5.01.B and 5.02.

5.02 *Licensed Sureties and Insurers*

A. All bonds and insurance required by the Contract Documents to be purchased and maintained by Owner or Contractor shall be obtained from surety or insurance companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue bonds or insurance policies for the limits and coverages so required. Such surety and insurance companies shall also meet such additional requirements and qualifications as may be provided in the Supplementary Conditions.

5.03 *Certificates of Insurance*

A. Contractor shall deliver to Owner, with copies to each additional insured and loss payee identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Owner or any other additional insured) which Contractor is required to purchase and maintain.

B. Owner shall deliver to Contractor, with copies to each additional insured and loss payee identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Contractor or any other additional insured) which Owner is required to purchase and maintain.

C. Failure of Owner to demand such certificates or other evidence of Contractor's full compliance with these insurance requirements or failure of Owner to identify a deficiency in compliance from the evidence provided shall not be construed as a waiver of Contractor's obligation to maintain such insurance.

D. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor.

E. The insurance and insurance limits required herein shall not be deemed as a limitation on Contractor's liability under the indemnities granted to Owner in the Contract Documents.

5.04 *Contractor's Insurance*

A. Contractor shall purchase and maintain such insurance as is appropriate for the Work being performed and as will provide protection from claims set forth below which may arise out of or result from Contractor's performance of the Work and Contractor's other obligations under the Contract Documents, whether it is to be performed by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable:

1. claims under workers' compensation, disability benefits, and other similar employee benefit acts;

2. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees;

3. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees;

4. claims for damages insured by reasonably available personal injury liability coverage which are sustained:

   a. by any person as a result of an offense directly or indirectly related to the employment of such person by Contractor, or

   b. by any other person for any other reason;

5. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom; and

6. claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle.

B. The policies of insurance required by this Paragraph 5.04 shall:

1. with respect to insurance required by Paragraphs 5.04.A.3 through 5.04.A.6 inclusive, be written on an occurrence basis, include as additional insureds (subject to any customary exclusion regarding professional liability) Owner and Engineer, and any other individuals or entities identified in the Supplementary Conditions, all of whom shall be listed as additional insureds, and include coverage for the respective officers, directors, members, partners,

employees, agents, consultants, and subcontractors of each and any of all such additional insureds, and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby;

2. include at least the specific coverages and be written for not less than the limits of liability provided in the Supplementary Conditions or required by Laws or Regulations, whichever is greater;

3. include contractual liability insurance covering Contractor's indemnity obligations under Paragraphs 6.11 and 6.20;

4. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other additional insured identified in the Supplementary Conditions to whom a certificate of insurance has been issued (and the certificates of insurance furnished by the Contractor pursuant to Paragraph 5.03 will so provide);

5. remain in effect at least until final payment and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work in accordance with Paragraph 13.07; and

6. include completed operations coverage:

   a. Such insurance shall remain in effect for two years after final payment.

   b. Contractor shall furnish Owner and each other additional insured identified in the Supplementary Conditions, to whom a certificate of insurance has been issued, evidence satisfactory to Owner and any such additional insured of continuation of such insurance at final payment and one year thereafter.

5.05 *Owner's Liability Insurance*

A. In addition to the insurance required to be provided by Contractor under Paragraph 5.04, Owner, at Owner's option, may purchase and maintain at Owner's expense Owner's own liability insurance as will protect Owner against claims which may arise from operations under the Contract Documents.

5.06 *Property Insurance*

A. Unless otherwise provided in the Supplementary Conditions, Owner shall purchase and maintain property insurance upon the Work at the Site in the amount of the full replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). This insurance shall:

1. include the interests of Owner, Contractor, Subcontractors, and Engineer, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of

them, each of whom is deemed to have an insurable interest and shall be listed as a loss payee;

2. be written on a Builder's Risk "all-risk" policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, collapse, debris removal, demolition occasioned by enforcement of Laws and Regulations, water damage (other than that caused by flood), and such other perils or causes of loss as may be specifically required by the Supplementary Conditions.

3. include expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects);

4. cover materials and equipment stored at the Site or at another location that was agreed to in writing by Owner prior to being incorporated in the Work, provided that such materials and equipment have been included in an Application for Payment recommended by Engineer;

5. allow for partial utilization of the Work by Owner;

6. include testing and startup; and

7. be maintained in effect until final payment is made unless otherwise agreed to in writing by Owner, Contractor, and Engineer with 30 days written notice to each other loss payee to whom a certificate of insurance has been issued.

B. Owner shall purchase and maintain such equipment breakdown insurance or additional property insurance as may be required by the Supplementary Conditions or Laws and Regulations which will include the interests of Owner, Contractor, Subcontractors, and Engineer, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as a loss payee.

C. All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with this Paragraph 5.06 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other loss payee to whom a certificate of insurance has been issued and will contain waiver provisions in accordance with Paragraph 5.07.

D. Owner shall not be responsible for purchasing and maintaining any property insurance specified in this Paragraph 5.06 to protect the interests of Contractor, Subcontractors, or others in the Work to the extent of any deductible amounts that are identified in the Supplementary Conditions. The risk of loss within such identified deductible amount will be borne by Contractor, Subcontractors, or others suffering any such loss, and if any of them wishes property insurance coverage within the limits of such amounts, each may purchase and maintain it at the purchaser's own expense.

E. If Contractor requests in writing that other special insurance be included in the property insurance policies provided under this Paragraph 5.06, Owner shall, if possible, include such insurance, and the cost thereof will be charged to Contractor by appropriate Change Order. Prior to commencement of the Work at the Site, Owner shall in writing advise Contractor whether or not such other insurance has been procured by Owner.

5.07 *Waiver of Rights*

A. Owner and Contractor intend that all policies purchased in accordance with Paragraph 5.06 will protect Owner, Contractor, Subcontractors, and Engineer, and all other individuals or entities identified in the Supplementary Conditions as loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) in such policies and will provide primary coverage for all losses and damages caused by the perils or causes of loss covered thereby. All such policies shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any of the insureds or loss payees thereunder. Owner and Contractor waive all rights against each other and their respective officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them for all losses and damages caused by, arising out of or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Subcontractors and Engineer, and all other individuals or entities identified in the Supplementary Conditions as loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by Owner as trustee or otherwise payable under any policy so issued.

B. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them for:

1. loss due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other perils whether or not insured by Owner; and

2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by Owner during partial utilization pursuant to Paragraph 14.05, after Substantial Completion pursuant to Paragraph 14.04, or after final payment pursuant to Paragraph 14.07.

C. Any insurance policy maintained by Owner covering any loss, damage or consequential loss referred to in Paragraph 5.07.B shall contain provisions to the effect that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of recovery against Contractor, Subcontractors, or Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them.

5.08 *Receipt and Application of Insurance Proceeds*

A. Any insured loss under the policies of insurance required by Paragraph 5.06 will be adjusted with Owner and made payable to Owner as fiduciary for the loss payees, as their interests may appear, subject to the requirements of any applicable mortgage clause and of Paragraph 5.08.B. Owner shall deposit in a separate account any money so received and shall distribute it in accordance with such agreement as the parties in interest may reach. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the moneys so received applied on account thereof, and the Work and the cost thereof covered by an appropriate Change Order.

B. Owner as fiduciary shall have power to adjust and settle any loss with the insurers unless one of the parties in interest shall object in writing within 15 days after the occurrence of loss to Owner's exercise of this power. If such objection be made, Owner as fiduciary shall make settlement with the insurers in accordance with such agreement as the parties in interest may reach. If no such agreement among the parties in interest is reached, Owner as fiduciary shall adjust and settle the loss with the insurers and, if required in writing by any party in interest, Owner as fiduciary shall give bond for the proper performance of such duties.

5.09 *Acceptance of Bonds and Insurance; Option to Replace*

A. If either Owner or Contractor has any objection to the coverage afforded by or other provisions of the bonds or insurance required to be purchased and maintained by the other party in accordance with Article 5 on the basis of non-conformance with the Contract Documents, the objecting party shall so notify the other party in writing within 10 days after receipt of the certificates (or other evidence requested) required by Paragraph 2.01.B. Owner and Contractor shall each provide to the other such additional information in respect of insurance provided as the other may reasonably request. If either party does not purchase or maintain all of the bonds and insurance required of such party by the Contract Documents, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage. Without prejudice to any other right or remedy, the other party may elect to obtain equivalent bonds or insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and a Change Order shall be issued to adjust the Contract Price accordingly.

5.10 *Partial Utilization, Acknowledgment of Property Insurer*

A. If Owner finds it necessary to occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work as provided in Paragraph 14.05, no such use or occupancy shall commence before the insurers providing the property insurance pursuant to Paragraph 5.06 have acknowledged notice thereof and in writing effected any changes in coverage necessitated thereby. The insurers providing the property insurance shall consent by endorsement on the policy or policies, but the property insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy.

ARTICLE 6 – CONTRACTOR'S RESPONSIBILITIES

6.01 *Supervision and Superintendence*

A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction. Contractor shall not be responsible for the negligence of Owner or Engineer in the design or specification of a specific means, method, technique, sequence, or procedure of construction which is shown or indicated in and expressly required by the Contract Documents.

B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who shall not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.

6.02 *Labor; Working Hours*

A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the Site.

B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours. Contractor will not permit the performance of Work on a Saturday, Sunday, or any legal holiday without Owner's written consent (which will not be unreasonably withheld) given after prior written notice to Engineer.

6.03 *Services, Materials, and Equipment*

A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start-up, and completion of the Work.

B. All materials and equipment incorporated into the Work shall be as specified or, if not specified, shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications shall expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.

C. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

6.04 *Progress Schedule*

A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.07 as it may be adjusted from time to time as provided below.

1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.07) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times. Such adjustments will comply with any provisions of the General Requirements applicable thereto.

2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 12. Adjustments in Contract Times may only be made by a Change Order.

6.05 *Substitutes and "Or-Equals"*

A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or-equal" item or no substitution is permitted, other items of material or equipment or material or equipment of other Suppliers may be submitted to Engineer for review under the circumstances described below.

1. *"Or-Equal" Items:* If in Engineer's sole discretion an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, it may be considered by Engineer as an "or-equal" item, in which case review and approval of the proposed item may, in Engineer's sole discretion, be accomplished without compliance with some or all of the requirements for approval of proposed substitute items. For the purposes of this Paragraph 6.05.A.1, a proposed item of material or equipment will be considered functionally equal to an item so named if:

a. in the exercise of reasonable judgment Engineer determines that:

1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;

2) it will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole; and

3) it has a proven record of performance and availability of responsive service.

b. Contractor certifies that, if approved and incorporated into the Work:

1) there will be no increase in cost to the Owner or increase in Contract Times; and

2) it will conform substantially to the detailed requirements of the item named in the Contract Documents.

2. *Substitute Items:*

   a. If in Engineer's sole discretion an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item under Paragraph 6.05.A.1, it will be considered a proposed substitute item.

   b. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefor. Requests for review of proposed substitute items of material or equipment will not be accepted by Engineer from anyone other than Contractor.

   c. The requirements for review by Engineer will be as set forth in Paragraph 6.05.A.2.d, as supplemented by the General Requirements, and as Engineer may decide is appropriate under the circumstances.

   d. Contractor shall make written application to Engineer for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application:

      1) shall certify that the proposed substitute item will:

         a) perform adequately the functions and achieve the results called for by the general design,

         b) be similar in substance to that specified, and

         c) be suited to the same use as that specified;

      2) will state:

         a) the extent, if any, to which the use of the proposed substitute item will prejudice Contractor's achievement of Substantial Completion on time,

         b) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item, and

         c) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty;

      3) will identify:

         a) all variations of the proposed substitute item from that specified, and

         b) available engineering, sales, maintenance, repair, and replacement services; and

      4) shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including costs of redesign and claims of other contractors affected by any resulting change.

B. *Substitute Construction Methods or Procedures:* If a specific means, method, technique, sequence, or procedure of construction is expressly required by the Contract Documents, Contractor may furnish or utilize a substitute means, method, technique, sequence, or procedure of construction approved by Engineer. Contractor shall submit sufficient information to allow Engineer, in Engineer's sole discretion, to determine that the substitute proposed is equivalent to that expressly called for by the Contract Documents. The requirements for review by Engineer will be similar to those provided in Paragraph 6.05.A.2.

C. *Engineer's Evaluation:* Engineer will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to Paragraphs 6.05.A and 6.05.B. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No "or equal" or substitute will be ordered, installed or utilized until Engineer's review is complete, which will be evidenced by a Change Order in the case of a substitute and an approved Shop Drawing for an "or equal." Engineer will advise Contractor in writing of any negative determination.

D. *Special Guarantee:* Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.

E. *Engineer's Cost Reimbursement*: Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor pursuant to Paragraphs 6.05.A.2 and 6.05.B. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.

F. *Contractor's Expense*: Contractor shall provide all data in support of any proposed substitute or "or-equal" at Contractor's expense.

6.06 *Concerning Subcontractors, Suppliers, and Others*

A. Contractor shall not employ any Subcontractor, Supplier, or other individual or entity (including those acceptable to Owner as indicated in Paragraph 6.06.B), whether initially or as a replacement, against whom Owner may have reasonable objection. Contractor shall not be required to employ any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against whom Contractor has reasonable objection.

B. If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers, or other individuals or entities to be submitted to Owner in advance for acceptance by Owner by a specified date prior to the Effective Date of the Agreement, and if Contractor has submitted a list thereof in accordance with the Supplementary Conditions, Owner's acceptance (either in writing or by failing to make written objection thereto by the date indicated for acceptance or objection in the Bidding Documents or the Contract Documents) of any such Subcontractor, Supplier, or other individual or entity so identified may be revoked on the basis of reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity, and the Contract Price will be adjusted by the difference in the cost occasioned by such replacement, and an appropriate Change Order will be issued. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or

entity, whether initially or as a replacement, shall constitute a waiver of any right of Owner or Engineer to reject defective Work.

C. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts and omissions. Nothing in the Contract Documents:

1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier or other individual or entity; nor

2. shall create any obligation on the part of Owner or Engineer to pay or to see to the payment of any moneys due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.

D. Contractor shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work under a direct or indirect contract with Contractor.

E. Contractor shall require all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work to communicate with Engineer through Contractor.

F. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.

G. All Work performed for Contractor by a Subcontractor or Supplier will be pursuant to an appropriate agreement between Contractor and the Subcontractor or Supplier which specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer. Whenever any such agreement is with a Subcontractor or Supplier who is listed as a loss payee on the property insurance provided in Paragraph 5.06, the agreement between the Contractor and the Subcontractor or Supplier will contain provisions whereby the Subcontractor or Supplier waives all rights against Owner, Contractor, Engineer, and all other individuals or entities identified in the Supplementary Conditions to be listed as insureds or loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work. If the insurers on any such policies require separate waiver forms to be signed by any Subcontractor or Supplier, Contractor will obtain the same.

6.07 *Patent Fees and Royalties*

A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if, to the actual knowledge of Owner or Engineer, its

use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by Owner in the Contract Documents.

B. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, and its officers, directors, members, partners, employees, agents, consultants, and subcontractors from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device specified in the Contract Documents, but not identified as being subject to payment of any license fee or royalty to others required by patent rights or copyrights.

C. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

6.08 *Permits*

A. Unless otherwise provided in the Supplementary Conditions, Contractor shall obtain and pay for all construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of opening of Bids, or, if there are no Bids, on the Effective Date of the Agreement. Owner shall pay all charges of utility owners for connections for providing permanent service to the Work.

6.09 *Laws and Regulations*

A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.

B. If Contractor performs any Work knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work. However, it shall not be Contractor's responsibility to make certain that the Specifications and Drawings are in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.

C. Changes in Laws or Regulations not known at the time of opening of Bids (or, on the Effective Date of the Agreement if there were no Bids) having an effect on the cost or time of performance of the Work shall be the subject of an adjustment in Contract Price or Contract Times. If Owner

and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.

6.10 *Taxes*

A. Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

6.11 *Use of Site and Other Areas*

A. *Limitation on Use of Site and Other Areas:*

1. Contractor shall confine construction equipment, the storage of materials and equipment, and the operations of workers to the Site and other areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and other areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof, or of any adjacent land or areas resulting from the performance of the Work.

2. Should any claim be made by any such owner or occupant because of the performance of the Work, Contractor shall promptly settle with such other party by negotiation or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law.

3. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused by or based upon Contractor's performance of the Work.

B. *Removal of Debris During Performance of the Work:* During the progress of the Work Contractor shall keep the Site and other areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations.

C. *Cleaning:* Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.

D. *Loading Structures:* Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent property to stresses or pressures that will endanger it.

6.12 *Record Documents*

A. Contractor shall maintain in a safe place at the Site one record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, and written interpretations and clarifications in good order and annotated to show changes made during construction. These record documents together with all approved Samples and a counterpart of all approved Shop Drawings will be available to Engineer for reference. Upon completion of the Work, these record documents, Samples, and Shop Drawings will be delivered to Engineer for Owner.

6.13 *Safety and Protection*

A. Contractor shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:

1. all persons on the Site or who may be affected by the Work;

2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and

3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.

B. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify owners of adjacent property and of Underground Facilities and other utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property.

C. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. The Supplementary Conditions identify any Owner's safety programs that are applicable to the Work.

D. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.

E. All damage, injury, or loss to any property referred to in Paragraph 6.13.A.2 or 6.13.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts

any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).

F. Contractor's duties and responsibilities for safety and for protection of the Work shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 14.07.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

6.14 *Safety Representative*

A. Contractor shall designate a qualified and experienced safety representative at the Site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

6.15 *Hazard Communication Programs*

A. 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 the Site in accordance with Laws or Regulations.

6.16 *Emergencies*

A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent threatened damage, injury, or loss. Contractor shall give Engineer prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby or are required as a result thereof. If Engineer determines that a change in the Contract Documents is required because of the action taken by Contractor in response to such an emergency, a Work Change Directive or Change Order will be issued.

6.17 *Shop Drawings and Samples*

A. Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals (as required by Paragraph 2.07). Each submittal will be identified as Engineer may require.

1. *Shop Drawings:*

a. Submit number of copies specified in the General Requirements.

b. Data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide and to enable Engineer to review the information for the limited purposes required by Paragraph 6.17.D.

2. *Samples:*

a. Submit number of Samples specified in the Specifications.

b. Clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the submittal for the limited purposes required by Paragraph 6.17.D.

B. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.

C. *Submittal Procedures:*

1. Before submitting each Shop Drawing or Sample, Contractor shall have:

a. reviewed and coordinated each Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;

b. determined and verified all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;

c. determined and verified the suitability of all materials offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and

d. determined and verified all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.

2. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review and approval of that submittal.

3. With each submittal, Contractor shall give Engineer specific written notice of any variations that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be both a written communication separate from the Shop Drawings or Sample submittal; and, in addition, by a specific notation made on each Shop Drawing or Sample submitted to Engineer for review and approval of each such variation.

D. *Engineer's Review:*

1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. Engineer's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.

2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction (except where a particular means, method, technique, sequence, or procedure of construction is specifically and expressly called for by the

Contract Documents) or to safety precautions or programs incident thereto. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

3. Engineer's review and approval shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 6.17.C.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer's review and approval shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 6.17.C.1.

E. *Resubmittal Procedures:*

1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous submittals.

6.18 *Continuing the Work*

A. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, except as permitted by Paragraph 15.04 or as Owner and Contractor may otherwise agree in writing.

6.19 *Contractor's General Warranty and Guarantee*

A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer and its officers, directors, members, partners, employees, agents, consultants, and subcontractors shall be entitled to rely on representation of Contractor's warranty and guarantee.

B. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:

1. abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or

2. normal wear and tear under normal usage.

C. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:

1. observations by Engineer;

2. recommendation by Engineer or payment by Owner of any progress or final payment;

3. the issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;

4. use or occupancy of the Work or any part thereof by Owner;

5. any review and approval of a Shop Drawing or Sample submittal or the issuance of a notice of acceptability by Engineer;

6. any inspection, test, or approval by others; or

7. any correction of defective Work by Owner.

6.20 *Indemnification*

A. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable .

B. In any and all claims against Owner or Engineer or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 6.20.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.

C. The indemnification obligations of Contractor under Paragraph 6.20.A shall not extend to the liability of Engineer and Engineer's officers, directors, members, partners, employees, agents, consultants and subcontractors arising out of:

1. the preparation or approval of, or the failure to prepare or approve maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or

2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

6.21 *Delegation of Professional Design Services*

A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. Contractor shall not be required to provide professional services in violation of applicable law.

B. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of Contractor by the Contract Documents, Owner and Engineer will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to Engineer.

C. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications or approvals performed by such design professionals, provided Owner and Engineer have specified to Contractor all performance and design criteria that such services must satisfy.

D. Pursuant to this Paragraph 6.21, Engineer's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer's review and approval of Shop Drawings and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 6.17.D.1.

E. Contractor shall not be responsible for the adequacy of the performance or design criteria required by the Contract Documents.

ARTICLE 7 – OTHER WORK AT THE SITE

7.01 *Related Work at Site*

A. Owner may perform other work related to the Project at the Site with Owner's employees, or through other direct contracts therefor, or have other work performed by utility owners. If such other work is not noted in the Contract Documents, then:

1. written notice thereof will be given to Contractor prior to starting any such other work; and

2. if Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times that should be allowed as a result of such other work, a Claim may be made therefor as provided in Paragraph 10.05.

B. Contractor shall afford each other contractor who is a party to such a direct contract, each utility owner, and Owner, if Owner is performing other work with Owner's employees, proper and safe

access to the Site, provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work, and properly coordinate the Work with theirs. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected. The duties and responsibilities of Contractor under this Paragraph are for the benefit of such utility owners and other contractors to the extent that there are comparable provisions for the benefit of Contractor in said direct contracts between Owner and such utility owners and other contractors.

C. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 7, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

7.02 *Coordination*

A. If Owner intends to contract with others for the performance of other work on the Project at the Site, the following will be set forth in Supplementary Conditions:

1. the individual or entity who will have authority and responsibility for coordination of the activities among the various contractors will be identified;

2. the specific matters to be covered by such authority and responsibility will be itemized; and

3. the extent of such authority and responsibilities will be provided.

B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

7.03 *Legal Relationships*

A. Paragraphs 7.01.A and 7.02 are not applicable for utilities not under the control of Owner.

B. Each other direct contract of Owner under Paragraph 7.01.A shall provide that the other contractor is liable to Owner and Contractor for the reasonable direct delay and disruption costs incurred by Contractor as a result of the other contractor's wrongful actions or inactions.

C. Contractor shall be liable to Owner and any other contractor under direct contract to Owner for the reasonable direct delay and disruption costs incurred by such other contractor as a result of Contractor's wrongful action or inactions.

ARTICLE 8 – OWNER'S RESPONSIBILITIES

8.01 *Communications to Contractor*

A. Except as otherwise provided in these General Conditions, Owner shall issue all communications to Contractor through Engineer.

8.02 *Replacement of Engineer*

A. In case of termination of the employment of Engineer, Owner shall appoint an engineer to whom Contractor makes no reasonable objection, whose status under the Contract Documents shall be that of the former Engineer.

8.03 *Furnish Data*

A. Owner shall promptly furnish the data required of Owner under the Contract Documents.

8.04 *Pay When Due*

A. Owner shall make payments to Contractor when they are due as provided in Paragraphs 14.02.C and 14.07.C.

8.05 *Lands and Easements; Reports and Tests*

A. Owner's duties with respect to providing lands and easements and providing engineering surveys to establish reference points are set forth in Paragraphs 4.01 and 4.05. Paragraph 4.02 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of subsurface conditions and drawings of physical conditions relating to existing surface or subsurface structures at the Site.

8.06 *Insurance*

A. Owner's responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 5.

8.07 *Change Orders*

A. Owner is obligated to execute Change Orders as indicated in Paragraph 10.03.

8.08 *Inspections, Tests, and Approvals*

A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 13.03.B.

8.09 *Limitations on Owner's Responsibilities*

A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws

and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

8.10 *Undisclosed Hazardous Environmental Condition*

A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 4.06.

8.11 *Evidence of Financial Arrangements*

A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract Documents.

8.12 *Compliance with Safety Program*

A. While at the Site, Owner's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Owner has been informed pursuant to Paragraph 6.13.D.

ARTICLE 9 – ENGINEER'S STATUS DURING CONSTRUCTION

9.01 *Owner's Representative*

A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract Documents.

9.02 *Visits to Site*

A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.

B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 9.09. Particularly, but without limitation, during or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

9.03 *Project Representative*

A. If Owner and Engineer agree, Engineer will furnish a Resident Project Representative to assist Engineer in providing more extensive observation of the Work. The authority and responsibilities of any such Resident Project Representative and assistants will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in Paragraph 9.09. If Owner designates another representative or agent to represent Owner at the Site who is not Engineer's consultant, agent or employee, the responsibilities and authority and limitations thereon of such other individual or entity will be as provided in the Supplementary Conditions.

9.04 *Authorized Variations in Work*

A. Engineer may authorize minor variations in the Work from the requirements of the Contract Documents which do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. These may be accomplished by a Field Order and will be binding on Owner and also on Contractor, who shall perform the Work involved promptly. If Owner or Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, or both, and the parties are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.

9.05 *Rejecting Defective Work*

A. Engineer will have authority to reject Work which Engineer believes to be defective, or that Engineer believes will not produce a completed Project that conforms to the Contract Documents or that will prejudice the integrity of the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Engineer will also have authority to require special inspection or testing of the Work as provided in Paragraph 13.04, whether or not the Work is fabricated, installed, or completed.

9.06 *Shop Drawings, Change Orders and Payments*

A. In connection with Engineer's authority, and limitations thereof, as to Shop Drawings and Samples, see Paragraph 6.17.

B. In connection with Engineer's authority, and limitations thereof, as to design calculations and design drawings submitted in response to a delegation of professional design services, if any, see Paragraph 6.21.

C. In connection with Engineer's authority as to Change Orders, see Articles 10, 11, and 12.

D. In connection with Engineer's authority as to Applications for Payment, see Article 14.

9.07 *Determinations for Unit Price Work*

A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations

on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, subject to the provisions of Paragraph 10.05.

9.08 *Decisions on Requirements of Contract Documents and Acceptability of Work*

A. Engineer will be the initial interpreter of the requirements of the Contract Documents and judge of the acceptability of the Work thereunder. All matters in question and other matters between Owner and Contractor arising prior to the date final payment is due relating to the acceptability of the Work, and the interpretation of the requirements of the Contract Documents pertaining to the performance of the Work, will be referred initially to Engineer in writing within 30 days of the event giving rise to the question.

B. Engineer will, with reasonable promptness, render a written decision on the issue referred. If Owner or Contractor believes that any such decision entitles them to an adjustment in the Contract Price or Contract Times or both, a Claim may be made under Paragraph 10.05. The date of Engineer's decision shall be the date of the event giving rise to the issues referenced for the purposes of Paragraph 10.05.B.

C. Engineer's written decision on the issue referred will be final and binding on Owner and Contractor, subject to the provisions of Paragraph 10.05.

D. When functioning as interpreter and judge under this Paragraph 9.08, Engineer will not show partiality to Owner or Contractor and will not be liable in connection with any interpretation or decision rendered in good faith in such capacity.

9.09 *Limitations on Engineer's Authority and Responsibilities*

A. Neither Engineer's authority or responsibility under this Article 9 or under any other provision of the Contract Documents nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.

D. Engineer's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Paragraph 14.07.A will only be to determine generally that their content complies with the requirements of,

and in the case of certificates of inspections, tests, and approvals that the results certified indicate compliance with, the Contract Documents.

E. The limitations upon authority and responsibility set forth in this Paragraph 9.09 shall also apply to the Resident Project Representative, if any, and assistants, if any.

9.10 *Compliance with Safety Program*

A. While at the Site, Engineer's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Engineer has been informed pursuant to Paragraph 6.13.D.

ARTICLE 10 – CHANGES IN THE WORK; CLAIMS

10.01 *Authorized Changes in the Work*

A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work by a Change Order, or a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved which will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided).

B. If Owner and Contractor are unable to agree on entitlement to, or on the amount or extent, if any, of an adjustment in the Contract Price or Contract Times, or both, that should be allowed as a result of a Work Change Directive, a Claim may be made therefor as provided in Paragraph 10.05.

10.02 *Unauthorized Changes in the Work*

A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents as amended, modified, or supplemented as provided in Paragraph 3.04, except in the case of an emergency as provided in Paragraph 6.16 or in the case of uncovering Work as provided in Paragraph 13.04.D.

10.03 *Execution of Change Orders*

A. Owner and Contractor shall execute appropriate Change Orders recommended by Engineer covering:

1. changes in the Work which are: (i) ordered by Owner pursuant to Paragraph 10.01.A, (ii) required because of acceptance of defective Work under Paragraph 13.08.A or Owner's correction of defective Work under Paragraph 13.09, or (iii) agreed to by the parties;

2. changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive; and

3. changes in the Contract Price or Contract Times which embody the substance of any written decision rendered by Engineer pursuant to Paragraph 10.05; provided that, in lieu of

executing any such Change Order, an appeal may be taken from any such decision in accordance with the provisions of the Contract Documents and applicable Laws and Regulations, but during any such appeal, Contractor shall carry on the Work and adhere to the Progress Schedule as provided in Paragraph 6.18.A.

10.04 *Notification to Surety*

A. If the provisions of any bond require notice to be given to a surety of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times), the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

10.05 *Claims*

A. *Engineer's Decision Required*: All Claims, except those waived pursuant to Paragraph 14.09, shall be referred to the Engineer for decision. A decision by Engineer shall be required as a condition precedent to any exercise by Owner or Contractor of any rights or remedies either may otherwise have under the Contract Documents or by Laws and Regulations in respect of such Claims.

B. *Notice:* Written notice stating the general nature of each Claim shall be delivered by the claimant to Engineer and the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto. The responsibility to substantiate a Claim shall rest with the party making the Claim. Notice of the amount or extent of the Claim, with supporting data shall be delivered to the Engineer and the other party to the Contract within 60 days after the start of such event (unless Engineer allows additional time for claimant to submit additional or more accurate data in support of such Claim). A Claim for an adjustment in Contract Price shall be prepared in accordance with the provisions of Paragraph 12.01.B. A Claim for an adjustment in Contract Times shall be prepared in accordance with the provisions of Paragraph 12.02.B. Each Claim shall be accompanied by claimant's written statement that the adjustment claimed is the entire adjustment to which the claimant believes it is entitled as a result of said event. The opposing party shall submit any response to Engineer and the claimant within 30 days after receipt of the claimant's last submittal (unless Engineer allows additional time).

C. *Engineer's Action*: Engineer will review each Claim and, within 30 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any, take one of the following actions in writing:

1. deny the Claim in whole or in part;

2. approve the Claim; or

3. notify the parties that the Engineer is unable to resolve the Claim if, in the Engineer's sole discretion, it would be inappropriate for the Engineer to do so. For purposes of further resolution of the Claim, such notice shall be deemed a denial.

D. In the event that Engineer does not take action on a Claim within said 30 days, the Claim shall be deemed denied.

E. Engineer's written action under Paragraph 10.05.C or denial pursuant to Paragraphs 10.05.C.3 or 10.05.D will be final and binding upon Owner and Contractor, unless Owner or Contractor invoke the dispute resolution procedure set forth in Article 16 within 30 days of such action or denial.

F. No Claim for an adjustment in Contract Price or Contract Times will be valid if not submitted in accordance with this Paragraph 10.05.

ARTICLE 11 – COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

11.01 *Cost of the Work*

A. *Costs Included:* The term Cost of the Work means the sum of all costs, except those excluded in Paragraph 11.01.B, necessarily incurred and paid by Contractor in the proper performance of the Work. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, the costs to be reimbursed to Contractor will be only those additional or incremental costs required because of the change in the Work or because of the event giving rise to the Claim. Except as otherwise may be agreed to in writing by Owner, such costs shall be in amounts no higher than those prevailing in the locality of the Project, shall not include any of the costs itemized in Paragraph 11.01.B, and shall include only the following items:

1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by Owner.

2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates and refunds and returns from sale of surplus materials and equipment shall accrue to Owner, and Contractor shall make provisions so that they may be obtained.

3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, who will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 11.01.

4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.

5. Supplemental costs including the following:

    a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.

    b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.

    c. Rentals of all construction equipment and machinery, and the parts thereof whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.

    d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.

    e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.

    f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with Paragraph 5.06.D), provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's fee.

    g. The cost of utilities, fuel, and sanitary facilities at the Site.

    h. Minor expenses such as telegrams, long distance telephone calls, telephone service at the Site, express and courier services, and similar petty cash items in connection with the Work.

    i. The costs of premiums for all bonds and insurance Contractor is required by the Contract Documents to purchase and maintain.

B. *Costs Excluded:* The term Cost of the Work shall not include any of the following items:

1. Payroll costs and other compensation of Contractor's officers, executives, principals (of partnerships and sole proprietorships), general managers, safety managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expediters, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 11.01.A.1 or specifically covered by Paragraph 11.01.A.4, all of which are to be considered administrative costs covered by the Contractor's fee.

2. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.

3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.

4. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.

5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraphs 11.01.A.

C. *Contractor's Fee:* When all the Work is performed on the basis of cost-plus, Contractor's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, Contractor's fee shall be determined as set forth in Paragraph 12.01.C.

D. *Documentation:* Whenever the Cost of the Work for any purpose is to be determined pursuant to Paragraphs 11.01.A and 11.01.B, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to Engineer an itemized cost breakdown together with supporting data.

11.02 *Allowances*

A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.

B. *Cash Allowances:*

1. Contractor agrees that:

a. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and

b. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in

the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.

C. *Contingency Allowance:*

1. Contractor agrees that a contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.

D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

11.03 *Unit Price Work*

A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.

B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Determinations of the actual quantities and classifications of Unit Price Work performed by Contractor will be made by Engineer subject to the provisions of Paragraph 9.07.

C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.

D. Owner or Contractor may make a Claim for an adjustment in the Contract Price in accordance with Paragraph 10.05 if:

1. the quantity of any item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and

2. there is no corresponding adjustment with respect to any other item of Work; and

3. Contractor believes that Contractor is entitled to an increase in Contract Price as a result of having incurred additional expense or Owner believes that Owner is entitled to a decrease in Contract Price and the parties are unable to agree as to the amount of any such increase or decrease.

ARTICLE 12 – CHANGE OF CONTRACT PRICE; CHANGE OF CONTRACT TIMES

12.01 *Change of Contract Price*

A. The Contract Price may only be changed by a Change Order. Any Claim for an adjustment in the Contract Price shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05.

B. The value of any Work covered by a Change Order or of any Claim for an adjustment in the Contract Price will be determined as follows:

1. where the Work involved is covered by unit prices contained in the Contract Documents, by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 11.03); or

2. where the Work involved is not covered by unit prices contained in the Contract Documents, by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 12.01.C.2); or

3. where the Work involved is not covered by unit prices contained in the Contract Documents and agreement to a lump sum is not reached under Paragraph 12.01.B.2, on the basis of the Cost of the Work (determined as provided in Paragraph 11.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 12.01.C).

C. *Contractor's Fee:* The Contractor's fee for overhead and profit shall be determined as follows:

1. a mutually acceptable fixed fee; or

2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:

   a. for costs incurred under Paragraphs 11.01.A.1 and 11.01.A.2, the Contractor's fee shall be 15 percent;

   b. for costs incurred under Paragraph 11.01.A.3, the Contractor's fee shall be five percent;

   c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 12.01.C.2.a and 12.01.C.2.b is that the Subcontractor who actually performs the Work, at whatever tier, will be paid a fee of 15 percent of the costs incurred by such Subcontractor under Paragraphs 11.01.A.1 and 11.01.A.2 and that any higher tier Subcontractor and Contractor will each be paid a fee of five percent of the amount paid to the next lower tier Subcontractor;

   d. no fee shall be payable on the basis of costs itemized under Paragraphs 11.01.A.4, 11.01.A.5, and 11.01.B;

   e. the amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to five percent of such net decrease; and

   f. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with Paragraphs 12.01.C.2.a through 12.01.C.2.e, inclusive.

12.02 *Change of Contract Times*

A. The Contract Times may only be changed by a Change Order. Any Claim for an adjustment in the Contract Times shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05.

B. Any adjustment of the Contract Times covered by a Change Order or any Claim for an adjustment in the Contract Times will be determined in accordance with the provisions of this Article 12.

12.03 *Delays*

A. Where Contractor is prevented from completing any part of the Work within the Contract Times due to delay beyond the control of Contractor, the Contract Times will be extended in an amount equal to the time lost due to such delay if a Claim is made therefor as provided in Paragraph 12.02.A. Delays beyond the control of Contractor shall include, but not be limited to, acts or neglect by Owner, acts or neglect of utility owners or other contractors performing other work as contemplated by Article 7, fires, floods, epidemics, abnormal weather conditions, or acts of God.

B. If Owner, Engineer, or other contractors or utility owners performing other work for Owner as contemplated by Article 7, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times, or both. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.

C. If Contractor is delayed in the performance or progress of the Work by fire, flood, epidemic, abnormal weather conditions, acts of God, acts or failures to act of utility owners not under the control of Owner, or other causes not the fault of and beyond control of Owner and Contractor, then Contractor shall be entitled to an equitable adjustment in Contract Times, if such adjustment is essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays described in this Paragraph 12.03.C.

D. Owner, Engineer, and their officers, directors, members, partners, employees, agents, consultants, or subcontractors shall not be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.

E. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delays within the control of Contractor. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of Contractor.

ARTICLE 13 – TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

13.01 *Notice of Defects*

A. Prompt notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor. Defective Work may be rejected, corrected, or accepted as provided in this Article 13.

13.02 *Access to Work*

A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and governmental agencies with jurisdictional interests will have access to the Site and the Work at reasonable times for their observation, inspection, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's safety procedures and programs so that they may comply therewith as applicable.

13.03 *Tests and Inspections*

A. Contractor shall give Engineer timely notice of readiness of the Work for all required inspections, tests, or approvals and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.

B. Owner shall employ and pay for the services of an independent testing laboratory to perform all inspections, tests, or approvals required by the Contract Documents except:

1. for inspections, tests, or approvals covered by Paragraphs 13.03.C and 13.03.D below;

2. that costs incurred in connection with tests or inspections conducted pursuant to Paragraph 13.04.B shall be paid as provided in Paragraph 13.04.C; and

3. as otherwise specifically provided in the Contract Documents.

C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.

D. Contractor shall be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests, or approvals required for Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work; or acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work. Such inspections, tests, or approvals shall be performed by organizations acceptable to Owner and Engineer.

E. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation.

F. Uncovering Work as provided in Paragraph 13.03.E shall be at Contractor's expense unless Contractor has given Engineer timely notice of Contractor's intention to cover the same and Engineer has not acted with reasonable promptness in response to such notice.

13.04 *Uncovering Work*

A. If any Work is covered contrary to the written request of Engineer, it must, if requested by Engineer, be uncovered for Engineer's observation and replaced at Contractor's expense.

B. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, furnishing all necessary labor, material, and equipment.

C. If it is found that the uncovered Work is defective, Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 10.05.

D. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, Contractor may make a Claim therefor as provided in Paragraph 10.05.

13.05 *Owner May Stop the Work*

A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work shall not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

13.06 *Correction or Removal of Defective Work*

A. Promptly after receipt of written notice, Contractor shall correct all defective Work, whether or not fabricated, installed, or completed, or, if the Work has been rejected by Engineer, remove it from the Project and replace it with Work that is not defective. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers,

architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or removal (including but not limited to all costs of repair or replacement of work of others).

B. When correcting defective Work under the terms of this Paragraph 13.06 or Paragraph 13.07, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.

13.07 *Correction Period*

A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the terms of any applicable special guarantee required by the Contract Documents) or by any specific provision of the Contract Documents, any Work is found to be defective, or if the repair of any damages to the land or areas made available for Contractor's use by Owner or permitted by Laws and Regulations as contemplated in Paragraph 6.11.A is found to be defective, Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:

1. repair such defective land or areas; or

2. correct such defective Work; or

3. if the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, and

4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others or other land or areas resulting therefrom.

B. If Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others) will be paid by Contractor.

C. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.

D. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this Paragraph 13.07, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

E. Contractor's obligations under this Paragraph 13.07 are in addition to any other obligation or warranty. The provisions of this Paragraph 13.07 shall not be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

13.08 *Acceptance of Defective Work*

A. If, instead of requiring correction or removal and replacement of defective Work, Owner (and, prior to Engineer's recommendation of final payment, Engineer) prefers to accept it, Owner may do so. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness) and for the diminished value of the Work to the extent not otherwise paid by Contractor pursuant to this sentence. If any such acceptance occurs prior to Engineer's recommendation of final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work, and Owner shall be entitled to an appropriate decrease in the Contract Price, reflecting the diminished value of Work so accepted. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 10.05. If the acceptance occurs after such recommendation, an appropriate amount will be paid by Contractor to Owner.

13.09 *Owner May Correct Defective Work*

A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work, or to remove and replace rejected Work as required by Engineer in accordance with Paragraph 13.06.A, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, Owner may, after seven days written notice to Contractor, correct, or remedy any such deficiency.

B. In exercising the rights and remedies under this Paragraph 13.09, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, take possession of Contractor's tools, appliances, construction equipment and machinery at the Site, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this Paragraph.

C. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 13.09 will be charged against Contractor, and a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount of the adjustment, Owner may make a Claim therefor as provided in Paragraph 10.05. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.

D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 13.09.

ARTICLE 14 – PAYMENTS TO CONTRACTOR AND COMPLETION

14.01 *Schedule of Values*

A. The Schedule of Values established as provided in Paragraph 2.07.A will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments on account of Unit Price Work will be based on the number of units completed.

14.02 *Progress Payments*

A. *Applications for Payments:*

1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that Owner has received the materials and equipment free and clear of all Liens and evidence that the materials and equipment are covered by appropriate property insurance or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.

2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the Work have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment.

3. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

B. *Review of Applications:*

1. Engineer will, within 10 days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the Application to Owner or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.

2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's

review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:

a. the Work has progressed to the point indicated;

b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 9.07, and any other qualifications stated in the recommendation); and

c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.

3. By recommending any such payment Engineer will not thereby be deemed to have represented that:

a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract Documents; or

b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.

4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:

a. to supervise, direct, or control the Work, or

b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or

c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or

d. to make any examination to ascertain how or for what purposes Contractor has used the moneys paid on account of the Contract Price, or

e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.

5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 14.02.B.2. Engineer may also refuse to recommend any such payment or, because of subsequently discovered evidence or the results of subsequent inspections or tests, revise or revoke any such payment recommendation previously made, to such extent as may be necessary in Engineer's opinion to protect Owner from loss because:

a. the Work is defective, or completed Work has been damaged, requiring correction or replacement;

b. the Contract Price has been reduced by Change Orders;

c. Owner has been required to correct defective Work or complete Work in accordance with Paragraph 13.09; or

d. Engineer has actual knowledge of the occurrence of any of the events enumerated in Paragraph 15.02.A.

C. *Payment Becomes Due:*

1. Ten days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended will (subject to the provisions of Paragraph 14.02.D) become due, and when due will be paid by Owner to Contractor.

D. *Reduction in Payment:*

1. Owner may refuse to make payment of the full amount recommended by Engineer because:

a. claims have been made against Owner on account of Contractor's performance or furnishing of the Work;

b. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;

c. there are other items entitling Owner to a set-off against the amount recommended; or

d. Owner has actual knowledge of the occurrence of any of the events enumerated in Paragraphs 14.02.B.5.a through 14.02.B.5.c or Paragraph 15.02.A.

2. If Owner refuses to make payment of the full amount recommended by Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, when Contractor remedies the reasons for such action.

3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 14.02.C.1 and subject to interest as provided in the Agreement.

14.03 *Contractor's Warranty of Title*

A. Contractor warrants and guarantees that title to all Work, materials, and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to Owner no later than the time of payment free and clear of all Liens.

14.04 *Substantial Completion*

A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete (except for items specifically listed by Contractor as incomplete) and request that Engineer issue a certificate of Substantial Completion.

B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.

C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a tentative certificate of Substantial Completion which shall fix the date of Substantial Completion. There shall be attached to the certificate a tentative list of items to be completed or corrected before final payment. Owner shall have seven days after receipt of the tentative certificate during which to make written objection to Engineer as to any provisions of the certificate or attached list. If, after considering such objections, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the tentative certificate to Owner, notify Contractor in writing, stating the reasons therefor. If, after consideration of Owner's objections, Engineer considers the Work substantially complete, Engineer will, within said 14 days, execute and deliver to Owner and Contractor a definitive certificate of Substantial Completion (with a revised tentative list of items to be completed or corrected) reflecting such changes from the tentative certificate as Engineer believes justified after consideration of any objections from Owner.

D. At the time of delivery of the tentative certificate of Substantial Completion, Engineer will deliver to Owner and Contractor a written recommendation as to division of responsibilities pending final payment between Owner and Contractor with respect to security, operation, safety, and protection of the Work, maintenance, heat, utilities, insurance, and warranties and guarantees. Unless Owner and Contractor agree otherwise in writing and so inform Engineer in writing prior to Engineer's issuing the definitive certificate of Substantial Completion, Engineer's aforesaid recommendation will be binding on Owner and Contractor until final payment.

E. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the tentative list.

14.05 *Partial Utilization*

A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:

1. Owner at any time may request Contractor in writing to permit Owner to use or occupy any such part of the Work which Owner believes to be ready for its intended use and substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 14.04.A through D for that part of the Work.

2. Contractor at any time may notify Owner and Engineer in writing that Contractor considers any such part of the Work ready for its intended use and substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.

3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 14.04 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.

4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 5.10 regarding property insurance.

14.06 *Final Inspection*

A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

14.07 *Final Payment*

A. *Application for Payment:*

1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of inspection, marked-up record documents (as provided in Paragraph 6.12), and other documents, Contractor may make application for final payment following the procedure for progress payments.

2. The final Application for Payment shall be accompanied (except as previously delivered) by:

   a. all documentation called for in the Contract Documents, including but not limited to the evidence of insurance required by Paragraph 5.04.B.6;

   b. consent of the surety, if any, to final payment;

   c. a list of all Claims against Owner that Contractor believes are unsettled; and

d. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of or Liens filed in connection with the Work.

3. In lieu of the releases or waivers of Liens specified in Paragraph 14.07.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (i) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (ii) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien.

B. *Engineer's Review of Application and Acceptance:*

1. If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract Documents have been fulfilled, Engineer will, within ten days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of payment and present the Application for Payment to Owner for payment. At the same time Engineer will also give written notice to Owner and Contractor that the Work is acceptable subject to the provisions of Paragraph 14.09. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.

C. *Payment Becomes Due:*

1. Thirty days after the presentation to Owner of the Application for Payment and accompanying documentation, the amount recommended by Engineer, less any sum Owner is entitled to set off against Engineer's recommendation, including but not limited to liquidated damages, will become due and will be paid by Owner to Contractor.

14.08 *Final Completion Delayed*

A. If, through no fault of Contractor, final completion of the Work is significantly delayed, and if Engineer so confirms, Owner shall, upon receipt of Contractor's final Application for Payment (for Work fully completed and accepted) and recommendation of Engineer, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance to be held by Owner for Work not fully completed or corrected is less than the retainage stipulated in the Agreement, and if bonds have been furnished as required in Paragraph 5.01, the written consent of the surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by Contractor to Engineer with the Application for such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

14.09 *Waiver of Claims*

A. The making and acceptance of final payment will constitute:

1. a waiver of all Claims by Owner against Contractor, except Claims arising from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 14.06, from failure to comply with the Contract Documents or the terms of any special guarantees specified therein, or from Contractor's continuing obligations under the Contract Documents; and

2. a waiver of all Claims by Contractor against Owner other than those previously made in accordance with the requirements herein and expressly acknowledged by Owner in writing as still unsettled.

ARTICLE 15 – SUSPENSION OF WORK AND TERMINATION

15.01 *Owner May Suspend Work*

A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by notice in writing to Contractor and Engineer which will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be granted an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension if Contractor makes a Claim therefor as provided in Paragraph 10.05.

15.02 *Owner May Terminate for Cause*

A. The occurrence of any one or more of the following events will justify termination for cause:

1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule established under Paragraph 2.07 as adjusted from time to time pursuant to Paragraph 6.04);

2. Contractor's disregard of Laws or Regulations of any public body having jurisdiction;

3. Contractor's repeated disregard of the authority of Engineer; or

4. Contractor's violation in any substantial way of any provisions of the Contract Documents.

B. If one or more of the events identified in Paragraph 15.02.A occur, Owner may, after giving Contractor (and surety) seven days written notice of its intent to terminate the services of Contractor:

1. exclude Contractor from the Site, and take possession of the Work and of all Contractor's tools, appliances, construction equipment, and machinery at the Site, and use the same to the full extent they could be used by Contractor (without liability to Contractor for trespass or conversion);

2. incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere; and

3. complete the Work as Owner may deem expedient.

C. If Owner proceeds as provided in Paragraph 15.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Owner arising out of or relating to completing the Work, such excess will be paid to Contractor. If such claims, costs, losses, and damages exceed such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this Paragraph, Owner shall not be required to obtain the lowest price for the Work performed.

D. Notwithstanding Paragraphs 15.02.B and 15.02.C, Contractor's services will not be terminated if Contractor begins within seven days of receipt of notice of intent to terminate to correct its failure to perform and proceeds diligently to cure such failure within no more than 30 days of receipt of said notice.

E. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue. Any retention or payment of moneys due Contractor by Owner will not release Contractor from liability.

F. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 5.01.A, the termination procedures of that bond shall supersede the provisions of Paragraphs 15.02.B and 15.02.C.

15.03 *Owner May Terminate For Convenience*

A. Upon seven days written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):

1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;

2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses;

3. all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other

dispute resolution costs) incurred in settlement of terminated contracts with Subcontractors, Suppliers, and others; and

4. reasonable expenses directly attributable to termination.

B. Contractor shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

15.04 *Contractor May Stop Work or Terminate*

A. If, through no act or fault of Contractor, (i) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (ii) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (iii) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon seven days written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the Contract and recover from Owner payment on the same terms as provided in Paragraph 15.03.

B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, seven days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this Paragraph 15.04 are not intended to preclude Contractor from making a Claim under Paragraph 10.05 for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this Paragraph.

ARTICLE 16 – DISPUTE RESOLUTION

16.01 *Methods and Procedures*

A. Either Owner or Contractor may request mediation of any Claim submitted to Engineer for a decision under Paragraph 10.05 before such decision becomes final and binding. The mediation will be governed by the Construction Industry Mediation Rules of the American Arbitration Association in effect as of the Effective Date of the Agreement. The request for mediation shall be submitted in writing to the American Arbitration Association and the other party to the Contract. Timely submission of the request shall stay the effect of Paragraph 10.05.E.

B. Owner and Contractor shall participate in the mediation process in good faith. The process shall be concluded within 60 days of filing of the request. The date of termination of the mediation shall be determined by application of the mediation rules referenced above.

C. If the Claim is not resolved by mediation, Engineer's action under Paragraph 10.05.C or a denial pursuant to Paragraphs 10.05.C.3 or 10.05.D shall become final and binding 30 days after termination of the mediation unless, within that time period, Owner or Contractor:

1. elects in writing to invoke any dispute resolution process provided for in the Supplementary Conditions; or

2. agrees with the other party to submit the Claim to another dispute resolution process; or

3. gives written notice to the other party of the intent to submit the Claim to a court of competent jurisdiction.

ARTICLE 17 – MISCELLANEOUS

17.01 *Giving Notice*

A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if:

1. delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended; or

2. delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the giver of the notice.

17.02 *Computation of Times*

A. When any period of time is referred to in the Contract Documents by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

17.03 *Cumulative Remedies*

A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract Documents. The provisions of this Paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

17.04 *Survival of Obligations*

A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract Documents, as well as all continuing obligations indicated in the Contract Documents, will survive final payment, completion, and acceptance of the Work or termination or completion of the Contract or termination of the services of Contractor.

17.05 *Controlling Law*

A. This Contract is to be governed by the law of the state in which the Project is located.

17.06 *Headings*

A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

Section 00800

SUPPLEMENTARY CONDITIONS

SCOPE. These Supplementary Conditions amend or supplement the Standard General Conditions of the Construction Contract (C-700, 2007 Edition) and other provisions of the Contract Documents as indicated herein. All provisions which are not so amended or supplemented remain in full force and effect.

SC-1. DEFINITIONS AND TERMINOLOGY.

SC-1.01. DEFINED TERMS. The terms used in these Supplementary Conditions which are defined in the Standard General Conditions of the Construction Contract (C-700, 2007 Edition) have the meanings assigned to them in the General Conditions.

Amend the terms as follows:

3. Application for Payment: Strike out the word “Engineer” and insert the word “Owner” in its place.

9. Change Order: Strike out the words “recommended by Engineer”.

12. Contract Documents: In the first sentence, strike out the word “Engineer’s” and insert the word “Owner’s” in its place.

14. Contract Times: Strike out the words “as evidenced by Engineer’s written recommendation of final payment”.

15. Contractor: Delete the term “Contractor” and substitute therefore the terms “Contractor or Prime Contractor.”

17. Drawings: Add the following sentence to the definition: “Drawings may also be described as Plans.”

20. Field Order: Strike out the word “Engineer” and insert the word “Owner” in its place.

22. Hazardous Environmental Conditions: Delete the words “ or Radioactive Material” and substitute therefore the words “Radioactive Material or other pollutants or contaminants”.

44. Substantial Completion: Strike out the word “Engineer” and insert the word “Owner” in its place. Add the following to the first sentence: "and a Certificate of Substantial Completion has been completed."

51. Work Change Directive: In the first sentence strike out the words “and recommended by Engineer”.

Additional terms used in these Supplementary Conditions have the meanings indicted herein, which are applicable to both the singular and plural thereof.

Add the following new definitions to paragraph 1.01:

"52. Final Completion – The time when all work is complete, including all punch list items, and all documents required for occupancy of the facility are completed and submitted to the OWNER. These documents include, but are not limited to, Certificate of Occupancy, Letters of Approval from various regulatory agencies, inspection certificates, and all other items as required in paragraph 14.07."

"53. General Contractor – The person, firm, or corporation with whom OWNER has entered into an Agreement for a complete project, general trades, or complete project less a part of the project."

"54. Without exception – The term "without exception", when used in the Contract Documents following the name of a Supplier or a proprietary item of equipment, product, or material, shall mean that the sources of the product are limited to the listed Suppliers or products and that no like, equivalent, or "or-equal" item and no substitution will be considered."

"55. Written Notice – Notice to any party which is in writing and which shall be considered delivered and the service thereof completed once posted by certified or registered mail to the party to whom the notice is sent at its last given address or delivered in person to said party or its authorized representative on the work."

SC-102. TERMINOLOGY. Add the following paragraphs G, H, and I.

"G. Imperative Mood. These specifications are written to the BIDDER before the award of the Contract and to the CONTRACTOR after award of the Contract. The sentences that direct the CONTRACTOR to perform work are mostly written as commands. For example, a requirement to provide cold-weather protection would be expressed as, 'Provide cold-weather protection for concrete,' rather than 'The Contractor shall provide cold-weather protection for concrete.' In the imperative mood, the subject "the Bidder" or "the Contractor" is understood.

SC-2. PRELIMINARY MATTERS.

SC-2.02. Copies of Documents. Delete the second sentence of paragraph 2.02.A and insert the following new sentence in its place:

"Two (2) sets of contract drawings and specifications will be furnished the Contractor without charge. Additional sets will be furnished upon request at the cost of reproduction. The Contractor shall keep one (1) set of approved plans and specifications on the site of the work. This set shall be kept current by addition of all approved changes, addenda and amendments thereto. One set of as-built plans shall be returned to the Owner after the project is complete."

The plans and specifications are intended to be complementary; but should any discrepancy appear or any misunderstanding arise as to the import of anything

contained in either, the decision of the District shall be final and binding on the Contractor. The District may make any corrections of errors or omissions in the drawings and specifications when such corrections are necessary for the proper fulfillment of their intention as construed by the District.

All work or materials shown on the plans and not mentioned in the specifications or any work specified and not shown on the plans, shall be furnished, performed and done by the Contractor as if the same were both mentioned in the specifications and shown on the plans.

Should the Contractor in preparing its bid find anything necessary for the construction of the project that is not mentioned in the specifications or shown on the plans, or any discrepancy, it shall notify the District so that such items may be included. Should the Contractor fail to notify the District of such items, it will be assumed that its bid included everything necessary for the complete construction in the spirit and intent of the designs shown.

In case of discrepancy, figure dimensions shall govern over scale dimensions, large-scale details shall govern over small-scale drawings, plans shall govern over specifications, detailed technical specifications shall govern over general specifications, and the more restrictive specifications shall prevail."

SC-2.03. Commencement of Contract Times; Notice to Proceed. Delete the paragraph and insert in its place:

"A. The Contract Times will commence to run on the day indicated in the Notice to Proceed. The date for the Contract Times may be extended by mutual agreement between the OWNER and the CONTRACTOR."

SC-2.05. Before Starting Construction. Amend paragraphs 2.05.A and 2.05.B by striking out the word "Engineer" in all locations where it appears in the paragraphs and inserting the word "Owner" in its place.

SC-2.06. Preconstruction Conference. Delete paragraph 2.06.A in its entirety and insert the following new paragraph in its place:

If requested by Owner, within 20 days after the Contract Times start to run, but before any work at the Site is started, a conference attended by Contractor, Owner, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in paragraph 2.05.B, procedures for handling Shop Drawings and other submittals, processing Applications for Payment, and maintaining required records.

SC-2.07. Initial Acceptance of Schedules. Amend paragraph 2.07.A, including paragraphs 2.07.A.1, 2.07.A.2, and 2.07.A.3, by striking out the word "Engineer" in all locations where it appears in the paragraph and inserting the word "Owner" in its place.

SC-3. CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE.

SC-3.01. Intent. Amend paragraph 3.01.C by striking out the word “Engineer” and inserting the word “Owner” in its place.

SC-3.03. Reporting and Resolving Discrepancies. Amend paragraph 3.03.A by striking out the word “Engineer” and inserting the word “Owner” in its place.

SC-3.04. Amending and Supplementing Contract Documents. Amend paragraph 3.04.B by striking out the word “Engineer” and inserting the word “Owner” in its place.

SC-4. AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; REFERENCE POINTS.

SC-4.02. Subsurface and Physical Conditions. Add the following new paragraph**(s)** immediately after paragraph 4.02.B:

C. In the preparation of Drawings and Specifications, Engineer or Engineer’s Consultants relied upon the following reports of explorations and tests of subsurface conditions at the Site:

a. Report prepared by Consulting Services Incorporated of Cincinnati. This report shall be considered technical data upon which Contractor may rely on and shall be considered part of these project specifications.

Test holes have been made on the site of the Work. The locations of test holes are indicated on the Drawings.

SC-4.03. Differing Subsurface or Physical Conditions.

Replace paragraph 4.03.A with the following:

"A. Notice: If CONTRACTOR believes that any subsurface or physical condition at or contiguous to the Site that is uncovered or revealed either:

"1. Is of such nature as to require a change in the Contract Documents; or

"2. Differs materially from that shown or indicated in the Contract Documents; or

"3. Is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent on work of the character provided for in the Contract Documents;

"then CONTRACTOR shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any work in connection therewith (except in an emergency as required by paragraph 6.16.A), notify OWNER and ENGINEER in writing about such condition. CONTRACTOR shall not further disturb such condition or perform any work in connection therewith (except as aforesaid) until receipt of written order to do so."

Delete paragraph 4.03.B in its entirety and insert the following new paragraph in its place:

B. *Owner's Review*. After receipt of written notice as required by paragraph 4.03.A, Owner will promptly review the pertinent condition, determine the necessity if obtaining additional explorations or tests with respect thereto, and advise Contractor in writing of Owner's findings and conclusions.

SC-4.04. Underground Facilities.

Add the following immediately after paragraph 4.04.A.2.

"4.04.A.3 Location of Subsurface Utilities.

"a. The location of subsurface utilities is shown on the plans from information furnished by the utility owners.

"b. The CONTRACTOR shall, no later than 2 working days, excluding Saturdays, Sundays, and legal holidays, prior to construction in the area of the subsurface utility, notify the subsurface utility Owner in writing, by telephone, or in person. The marking or locating shall be coordinated to stay approximately 2 days ahead of the planned construction.

"c. The CONTRACTOR shall alert immediately the occupants of nearby premises as to any emergency that it may create or discover at or near such premises.

"d. The CONTRACTOR shall have full responsibility for coordination of the work with owners of such underground facilities during construction, for the safety and protection thereof as provided in paragraph 6.13 and repairing any damage thereto resulting from the work, the cost of all of which will be considered as having been included in the Contract Price.

"4.04.A.4 Where existing utilities and structures are indicated as being in the line of the proposed improvement, the CONTRACTOR shall expose them sufficiently in advance of the construction operations to permit adjustments in line or grade, if required, to eliminate interferences.

"4.04.A.5 Existing pipes or conduits crossing a trench, or otherwise exposed, shall be adequately braced and supported to prevent movement during construction.

"4.04.A.6 Broken Utility Services.

"a. Utility services broken or damaged shall be repaired at once to avoid inconvenience to customers and utility owners.

"b. Temporary arrangements, as approved by the ENGINEER, may be used until any damaged items can be permanently repaired.

"c. All items damaged or destroyed by construction and subsequently repaired must be properly maintained by the CONTRACTOR.

"d. CONTRACTOR must work 24 hours a day until service is restored to a damaged utility.

"4.04.A.7 Existing Utility Relocation.

"a. Where it is necessary to relocate an existing utility or structure, the work shall be done in such manner as is necessary to restore it to a condition equal to that of the original utility or structure.

"b. No such relocation shall be done until approval is received from the authority responsible for the utility or structure being changed."

Amend the first sentence of paragraph 4.04.B.1 by striking out the words “and Engineer”.

Amend the second sentence of paragraph 4.04.B.2 by striking out the word “Engineer” and inserting the word “Owner” in its place.

Amend the first sentence of paragraph 4.04.B.2 by striking out the word “Engineer” and inserting the word “Owner” in its place.

Add the following new paragraph immediately after paragraph 4.04.B:

Generally, service connections are not indicated on the Drawings. Contractor shall be responsible for discovery of existing underground installations, in advance of excavating or trenching, by contacting all local utilities and by prospecting.

SC-4.06 Hazardous Environmental Conditions at Site.

Delete paragraph 4.06.A. in it entirety and substitute the following paragraph therefore:

A. The following reports and drawings related to Hazardous Environmental Conditions identified at the Site are known to Owner: (None).

Amend paragraph 4.06.B by adding the words “that is created by, or” immediately after the words “a Hazardous Environmental Condition” in the fourth line.

Amend paragraph 4.06.G by deleting all words following the words “Hazardous Environmental Condition” in the seventh line and substituting therefore the following words: “was created by Owner or by anyone for whom Owner is responsible, other than Contractor and all persons, subcontractors and entities for which Contractor is responsible.”

SC-5. BONDS AND INSURANCE.

SC-5.02. Licensed Sureties and Insurers. Add the following new sentence at the end of paragraph 5.02.A:

The surety company shall be rated “A” by AM BEST.

SC-5.03. Certificates of Insurance. Add the following new sentence at the end of paragraph 5.03.A:

Contractor shall deliver to Owner properly completed certificates of insurance prior to the start of any Work at the Site, on the forms included in the Contract Documents.

SC-5.04. Contractor's Insurance.

Add the following new paragraphs immediately after paragraph 5.04.A.6:

7. Claims arising out of pollution and excluded from the Contractor's general liability and comprehensive automobile liability policies. This insurance shall be coordinated with the Contractor's general liability policy and shall provide bodily injury and property damage coverage similar to the Contractor's general liability policy. Coverage shall include contractual liability.

Add the following new paragraphs immediately after paragraph 5.04.B.6:

7. contain a cross liability or severability of interest clause or endorsement. Insurance covering the specified additional insureds shall be primary insurance, and all other insurance carried by the additional insureds shall be excess insurance;

8. with respect to workers' compensation and employers' liability, comprehensive automobile liability, commercial general liability, and umbrella liability insurance, and all other liability insurance specified herein to be provided by Contractor, Contractor shall require its insurance carriers to waive all rights of subrogation against Owner, Engineer, and their respective officers, directors, partners, employees, and agents.

Add the following new paragraphs immediately after paragraph 5.04.B:

C. The insurance required by paragraph 5.04 shall include coverage as necessary for the benefits provided under the United States Longshoremen's and Harbor Workers' Act and the Jones Act. This policy shall include an "all states" endorsement.

D. The limits of liability for the insurance required by paragraph 5.04 of the General Conditions shall provide coverage for not less than the following amounts but shall provide coverage in greater amounts where required by Laws and Regulations. This coverage may be primary or a combination of primary and umbrella excess liability.

1. Workers' Compensation, and related coverage under paragraphs 5.04.A.1 and 5.04.A.2 of the General Conditions:

a. State — Statutory

b. Applicable Federal (e.g., Longshoreman's) — Statutory

b. Employer's Liability $1,000,000 each occurrence

2. Commercial General Liability under paragraphs 5.04.A.3 through 5.04.A.6 of the General Conditions shall be occurrence type, written in comprehensive form, and shall protect Contractor, Owner, and Engineer as additional insureds, against claims arising from injuries, sickness, disease, or death of any person or damage to property arising out of performance of the Work. The policy shall also include a per project aggregate limit endorsement, personal injury liability coverage, contractual liability coverage for blasting, explosion, collapse of buildings, and damage to underground property.

a. General Aggregate $1,000,000

b. Products – Completed Operations Aggregate $1,000,000

c. Personal and Advertising Injury $1,000,000

d. Each Occurrence (Bodily Injury and Property Damage) $1,000,000

e. Property Damage liability insurance will provide Explosion, Collapse and Underground coverage's where applicable.

3. Automobile Liability under paragraph 5.04.A.6 of the General Conditions shall be occurrence type, written in comprehensive form, and shall protect Contractor, Owner, and Engineer as additional insureds, against all claims for injuries to members of the public and damage to property of others arising from the use of motor vehicles, either on or off the project site whether they are owned, nonowned, or hired. The liability limit shall be not less than:

a. Bodily Injury
   Each Person $1,000,000
   Each Accident $1,000,000

b. Property Damage
   Each Accident $1,000,000

c. Combined Single Limit $1,000,000

4. Umbrella Liability Insurance shall protect Contractor, Owner, and Engineer as additional insureds, against claims in excess of the limits provided under workers' compensation and employers' liability, comprehensive automobile liability, and commercial general liability policies. The umbrella policy shall follow the forms of the primary insurance, including the application of the primary limits. The liability limits shall be not less than:

Bodily injury and Property damage	$4,000,000 combined single limit for each occurrence $4,000,000 general aggregate

SC-5.05. Owner's Liability Insurance. Delete paragraph 5.05 in its entirety and insert the following new paragraph in its place:

5.05. *Owner's Liability Insurance*. This insurance shall be obtained by Contractor and issued in the name of Owner, and shall protect and defend Owner against claims arising as a result of the operations of Contractor or Contractor's Subcontractors. The liability limits shall be not less than:

a.	Bodily Injury	
	Each Occurrence	$1,000,000
	General Aggregate	$1,000,000
b.	Property Damage	
	Each Occurrence	$1,000,000
	General Aggregate	$1,000,000

SC-5.06. Property Insurance. Delete paragraph 5.06 in its entirety and insert the following new paragraphs in their place:

5.06. *Property Insurance*

A. Contractor shall purchase and maintain property insurance coverage upon the Work at the Site in the amount of the full replacement cost thereof. This insurance shall:

1. include the interests of Owner, Contractor, Subcontractors, Engineer, Engineer's Consultants, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as an additional insured;

2. be written on a Builder's Risk "all-risk" or open peril or special causes of loss policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, false work, and materials and equipment, and shall insure against at least the following perils or causes of loss: fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, collapse, debris removal, demolition occasioned by enforcement of Laws and Regulations, water damage, flood, damage caused by frost and freezing, and such other perils or causes of loss as may be specifically required by the Supplementary Conditions;

3. cover materials and equipment stored at the Site or at another location that was agreed to in writing by Owner prior to being incorporated in the Work,

provided that such materials and equipment have been included in an Application for Payment accepted by Owner;

4. include expenses incurred in the repair or replacement of any insured property (including, but not limited to, fees and charges of engineers and architects);

5. allow for partial utilization of the Work by Owner;

6. include testing and startup; and

7. be maintained in effect until final payment is made unless otherwise agreed to in writing by Owner, Contractor, and Engineer, with 30 days' written notice to each other additional insured to whom a certificate of insurance has been issued.

B. Contractor shall be responsible for any deductible or self-insured retention.

C. All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with paragraph 5.06 shall contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other additional insured to whom a certificate of insurance has been issued and will contain waiver provisions in accordance with paragraph 5.07.

D. If Owner requests in writing that other special insurance be included in the property insurance policies provided under paragraph 5.06, Contractor shall, if possible, include such insurance, and the cost thereof will be charged to Owner by appropriate Change Order or Written Amendment. Prior to commencement of the Work at the Site, Contractor shall in writing advise Owner whether or not Contractor has procured such other special insurance.

SC-6. CONTRACTOR'S RESPONSIBILITIES.

SC-6.02. Labor; Working Hours. Add the following new paragraphs immediately after paragraph 6.02.B:

C. No Work shall be done between 6:00 p.m. and 7:00 a.m. without permission of Owner. However, emergency work may be done without prior permission.

D. Night Work may be undertaken as a regular procedure with the permission of Owner; such permission, however, may be revoked at any time by Owner if Contractor fails to maintain adequate equipment and supervision for the proper prosecution and control of the Work at night.

SC-6.03. Services, Materials, and Equipment. Amend the second sentence of paragraph 6.03.B by striking out the word “Engineer” and inserting the word “Owner” in its place.

SC-6.04. Progress Schedule. Amend the first sentence of paragraph 6.04.A.1 by striking out the word “Engineer” and inserting the word “Owner” in its place.

SC-6.05. Substitutes and “Or-Equals’. Amend paragraph 6.05, including paragraphs 6.05.A, 6.05.A.1, 6.05.A.1.a, 6.05.A.1.b, 6.05.A.2, 6.05.A.2.a, 6.05.A.2.b, 6.05.A.2.c, 6.05.A.2.d, 6.05.B, 6.05.C, 6.05.D, and 6.05.E by striking out the words “Engineer” and “Engineer’s” in all locations where they appear in the paragraph and inserting the words “Owner” and “Owner’s”, respectively, in their place.

Add the following new paragraph after paragraph 6.05.A.2.d:

e. "If a proposed substitute item is accepted, all incidental costs associated with the use of the substitute including, but not limited to, redesign, claims of other Contractors, changes to electrical supply equipment, additional equipment or material required for the installation, etc., shall be at the expense of the Contractor proposing the substitute unless otherwise agreed to by the Owner."

SC-6.08. Permits. Add the following new paragraph immediately after paragraph 6.08.A:

B. Owner will obtain and pay for the following permits: Road & Highway Encroachment Permits, Kentucky Division of Water, and Stream Crossing Permits.

SC-6.09. Laws and Regulations. Add the following new paragraph immediately after paragraph 6.09.C:

D. Employment requirements shall be as specified herein and in the attachments at the end of the Supplementary Conditions.

SC-6.10. Taxes. Add the following new paragraph immediately after Paragraph 6.10.A of the General Conditions:

B. Portions of this project may be exempt from taxes. It is the Contractor’s responsibility to determine any applicable exemptions.

SC-6.12. Record Documents. Amend the second sentence of paragraph 6.12.A by striking out the word “Engineer” and inserting the word “Owner” in its place.

Amend the third sentence of paragraph 6.12.A by striking out the words “Engineer for”.

SC-6.16. Emergencies. Amend paragraph 6.16 by striking out the word “Engineer” in all locations where it appears in the paragraph and inserting the word “Owner” in its place.

Add the following new paragraph immediately after paragraph 6.16.A:

B. The Contractor understands and agrees that during the performance of the Contract, it shall maintain a presence within such proximity of the Work Site which will allow it to

respond to an emergency at the Work Site within one hour of receiving notice of an emergency, including emergencies occurring during non-working hours. The Contractor shall provide a list of emergency phone numbers for such purposes. If the Contractor does not have such a presence, it may satisfy this requirement by sub-contracting with a sub-contractor that does have such a presence, provided that any such sub-contractor must be approved by the Owner, in tits sole discretion, prior to the project pre-construction meeting.

SC-6.17. Shop Drawings and Samples. Amend paragraph 6.17, including paragraphs 6.17.A, 6.17.B, 6.17.C, 6.17.D, 6.17.D.1, 6.17.D.1.a, 6.17.D.1.b, 6.17.D.1.c, 6.17.D.1.d, 6.17.D.2, 6.17.D.3, 6.17.E.1, 6.17.E.2, 6.17.E.3, and 6.17.F.1 by striking out the words "Engineer" and "Engineer's" in all locations where they appear in the paragraph and inserting the words "Owner" and "Owner's", respectively, in their place.

SC-6.19. Contractor's General Warranty and Guarantee. Amend paragraph 6.19.C.1 by adding the words "or Owner" at the end of the paragraph.

Amend paragraph 6.19.C.2 by striking out the words "recommendation by Engineer or".

Amend paragraph 6.19.C.3 by striking out the words "by Engineer".

Amend paragraph 6.19.C.6 by striking out the word "Engineer" and inserting the word "Owner" in its place.

Delete paragraph 6.19.C.7 and substitute the following new paragraph therefore:

7. any correction of defective Work by Owner; or

Add the following new paragraph immediately after paragraph 6.19.C.7:

8. any expiration of a correction period.

SC-7. OTHER WORK.

SC-7.01. Related Work at Site. Amend paragraphs 7.01.B and 7.01.C by striking out the word "Engineer" in all locations where it appears in the paragraphs and inserting the word "Owner" in its place.

SC-8. OWNER'S RESPONSIBILITIES.

SC-8.01. Communications to Contractor. Amend paragraph A by striking out "through Engineer".

SC-8.02. Replacement of Engineer. Delete paragraph 8.02 in its entirety.

SC-9. ENGINEER'S STATUS DURING CONSTRUCTION.

SC-9.01. Owner's Representative. Delete paragraph 9.01 in its entirety.

SC-9.02. Visits to Site. Amend paragraphs 9.02.A and 9.02.B by striking out the words "Engineer" and "Engineer's" in all locations where they appear in the paragraph and inserting the words "Owner" and "Owners", respectively, in their place. Add following new paragraph:

B. Engineer may make visits to the Site as Owner deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, at the request and benefit of Owner, may determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will advise Owner of the progress of the Work and will endeavor to guard Owner against defective Work.

SC-9.04. Clarifications and Interpretations. Amend paragraph 9.04 by striking out the word "Engineer" in all locations where it appears in the paragraph and inserting the word "Owner" in its place.

SC-9.05. Authorizing Variations in Work. Amend paragraph 9.05 by striking out the word "Engineer" in all locations where it appears in the paragraph and inserting the word "Owner" in its place.

SC-9.06. Rejecting Defective Work. Amend paragraph 9.06 by striking out the word "Engineer" in all locations where it appears in the paragraph and inserting the word "Owner" in its place.

SC-9.07. Shop Drawings, Change Orders and Payments. Delete paragraph 9.07 in its entirety.

SC-9.08. Determinations for Unit Price Work. Delete paragraph 9.08 in its entirety.

SC-9.09. Decisions on Requirements of Contract Documents and Acceptability of Work. Delete paragraph 9.09 in its entirety.

SC-9.10. Limitations on Engineer's Authority and Responsibilities. Delete paragraph 9.10.D in its entirety.

SC-10. CHANGES IN THE WORK.

SC-10.03. Execution of Change Orders. Amend paragraph 10.03.A by striking out the words "recommended by Engineer".

Amend paragraph 10.03.A.3 by striking out the word "Engineer" and inserting the word "Owner" in its place.

SC-10.05. Claims and Disputes. Amend paragraph 10.05 by deleting paragraphs 10.05.A, 10.05.B, 10.05.B.1, 10.05.B.2, and 10.05.C in their entirety and inserting the following new paragraphs in their place:

A. *Notice*. Written notice stating the general nature of each Claim, dispute, or other matter shall be delivered by Contractor to Owner no later than 30 days after the start of the event giving rise thereto. Notice of the amount of extent of the Claim, dispute, or other matter with supporting data shall be delivered to Owner within 60 days after the start of such event, unless the Owner allows, in writing, additional time for Contractor to submit additional or more accurate data in support of such Claim, dispute, or other matter. A Claim for an adjustment in Contract Price shall be prepared in accordance with the provisions of paragraph 12.01.B. A Claim for an adjustment in Contract Time shall be prepared in accordance with the provisions of paragraph 12.02.B. Each Claim shall be accompanied by Contractor's written statement that the adjustment claimed is the entire adjustment to which Contractor believes it is entitled as a result of said event.

B. *Owner's Decisions*. Owner will render a formal decision in writing within 30 days after receipt of the last submittal of Contractor.

C. If Owner does not render a formal decision in writing within the time stated in paragraph 10.05.B, a decision denying the Claim in its entirety shall be deemed to have been issued 31 days after receipt of the last submittal of Contractor, unless Owner notifies Contractor in writing that a formal decision is pending and will be rendered within a specified number of days or by a specified date.

SC-11. COST OF THE WORK; CASH ALLOWANCES; UNIT PRICE WORK.

SC-11.01. Cost of the Work. Amend the second sentence of paragraph 11.01.A.3 by striking out the words "with the advice of Engineer".

Amend paragraph 11.01.D by striking out the word "Engineer" and inserting the word "Owner" in its place.

SC-11.02. Cash Allowances. Amend paragraph 11.02.A by striking out the words "and Engineer".

Amend paragraph 11.02.B by striking out the words "as recommended by Engineer".

SC-11.9. Unit Price Work. Add the following new paragraph immediately after paragraph 11.9.3.3

11.9.4. The unit price of an item of Unit Price Work shall be subject to reevaluation and adjustment by Change Order if the variation in the actual quantity of an item of Unit Price Work performed by Contractor differs by more than 25 percent from the estimated quantity of that item indicated in the Bid.

SC-12. CHANGE OF CONTRACT PRICE; CHANGE OF CONTRACT TIMES.

SC-12.01. Change of Contract Price. Delete paragraph 12.01.A in its entirety and insert the following new paragraph in its place:

A. The Contract Price may only be changed by a Change Order. Any Claim for an adjustment in the Contract Price shall be based on written notice submitted by Contractor to Owner in accordance with the provisions of paragraph 10.05.

SC-12.02. Change of Contract Times. Delete paragraph 12.02.A in its entirety and insert the following new paragraph in its place:

A. The Contract Times (or Milestones) may only be changed by a Change Order. Any Claim for an adjustment in the Contract Times (or Milestones) shall be based on written notice submitted by Contractor to owner in accordance with the provisions of paragraph 10.05.

SC-12.03. Delays. Insert the following new sentence following the first sentence of paragraph 12.03.A:

This extension shall be Contractor's sole and exclusive remedy for such delay.

Insert the following new paragraph 12.03.F immediately after paragraph 12.03.E:

F. In no event shall Owner be liable to Contractor, any Subcontractor, any Supplier, or any other person or organization, or to any surety for or employee or agent of any of them, for damages (including acceleration costs) arising out of or resulting from any delay.

SC-13. TESTS AND INSPECTIONS; CORRECTION, REMOVAL, OR ACCEPTANCE OF DEFECTIVE WORK.

SC-13.02. Access to Work. Add the following new paragraph immediately after paragraph 13.02.A:

B. Authorized representatives of the U.S. Environmental Protection Agency and the Kentucky Division of Water shall have access to the Work whenever it is in preparation or progress. Contractor shall provide proper facilities for such access and inspection.

SC-13.03. Tests and Inspections. Amend paragraph 13.03.A by striking out the word "Engineer" and inserting the word "Owner" in its place.

Amend paragraph 13.03.C by striking out the word "Engineer" and inserting the word "Owner" in its place.

Amend paragraph 13.03.E by striking out the word "Engineer" in both locations where it appears in the paragraph and inserting the word "Owner" in its place.

Amend paragraph 13.03.F by striking out the word "Engineer" in both locations where it appears in the paragraph and inserting the word "Owner" in its place.

SC-13.04. Uncovering Work. Amend paragraph 13.04.A by striking out the words "Engineer" and "Engineer's" in all locations where they appear in the paragraph and inserting the words "Owner" and "Owner's", respectively, in their place.

Delete paragraph 13.04.B in its entirety and insert the following new paragraph in its place:

B. If Owner considers it necessary or advisable that covered Work be observed by Engineer or Owner's representatives, or inspected or tested by others, Contractor, at Owner's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Owner may require, that portion of the Work in question, furnishing all necessary labor, material and equipment. If it is found that such Work is defective, Contractor shall pay all Claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and Owner shall be entitled to an appropriate decrease in the Contract Price. If, however, such Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times (or Milestones), or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, Contractor may make a Claim therefor as provided in paragraph 10.05.

SC-13.06. Correction or Removal of Defective Work. Amend paragraph 13.06.A by inserting the words "or Owner" following the word "Engineer".

SC-13.07. Correction Period. Add the following new paragraph after paragraph 13.07.E:

F. Nothing in Article 13 concerning the correction period shall establish a period of limitation with respect to any other obligation which Contractor has under the Contract Documents. The establishment of time periods relates only to the specific obligations of Contractor to correct the Work, and has no relationship to the time within which Contractor's obligations under the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish Contractor's liability with respect to Contractor's obligations other than to specifically correct the Work.

All machinery, piping, materials, equipment, fittings, and restoration of every kind furnished under this Contract by the Contractor shall be free from defects of manufacture and/or workmanship. The Contractor agrees to replace materials, workmanship, and restoration, which includes all roadway pavement work, shoulder and ditch restoration and repairs, which are found to be defective within twenty four (24) months after issuance of the "Certificate of Substantial Completion". In cases where such defects shall be caused by forces beyond the Contractor's control, as judged by the Owner, the replacements will not have to be made by the Contractor.

SC-13.08. Acceptance of Defective Work. Delete paragraph 13.08.A in its entirety and insert the following new paragraph in its place:

A. If, instead of requiring correction or removal and replacement of defective Work, Owner, prior to making final payment, prefers to accept it, Owner may do so. Contractor shall pay all Claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or

arbitration or other dispute resolution costs) attributable to Owner's evaluation of and determination to accept such defective Work and the diminished value of the Work to the extent not other wise paid by Contractor pursuant to this sentence. If any such acceptance occurs prior to Owner making final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work, and Owner shall be entitled to an appropriate decrease in the Contract Price, reflecting the diminished value of the Work so accepted. If the acceptance occurs after making final payment, an appropriate amount will be paid by Contractor to Owner.

SC-13.09. Owner May Correct Defective Work. Amend paragraph 13.09.A by striking out the word "Engineer" in all locations where it appears in the paragraph and inserting the word "Owner" in its place.

SC-14. PAYMENTS TO CONTRACTOR AND COMPLETION.

SC-14.01. Schedule of Values. Amend paragraph 14.01.A by striking out the word "Engineer" and inserting the word "Owner" in its place.

SC-14.02. Progress Payments. Amend paragraph 14.02.A by striking out the word "Engineer" and inserting the word "Owner" in its place.

Add the following new paragraphs immediately after paragraph 14.02.A.3:

4. Contractor's Applications for Payment shall be accompanied by the documentation specified herein.

5. Payments for stored materials and equipment shall be based only upon the actual cost to Contractor of the materials and equipment and shall not include any overhead or profit to Contractor. Partial payments will not be made for undelivered materials or equipment.

6. During the progress of the Work, each Application for Payment shall be accompanied by Contractor's updated schedule of operations, or progress report, with such shop drawings schedules, procurement schedules, value of material on hand included in application, and other data specified in Contract Documents or reasonably required by Owner.

Delete paragraphs 14.02.B and 14.02.C in their entirety and insert the following new paragraphs in their place:

B. *Review of Applications*

1. Owner will, within 10 days after receipt of each Application for Payment, either begin processing the Application for Payment to Contractor or return the Application to Contractor indicating in writing Owner's reasons for refusing payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.

2. Owner's review of Contractor's Application for Payment will consider whether the following have been achieved:

a. the Work has progressed to the point indicated;

b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, to the results of any subsequent tests called for in the Contract Documents, to a final determination of quantities and classifications for Unit Price Work under paragraph 9.08, and to any other qualifications as reasonably applied by Owner); and

c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as Owner or Engineer has observed the Work.

3. By processing and making such payment Owner will not thereby be deemed to have represented that:

a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work; or

b. that there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.

4. Neither Owner's review of Contractor's Work for the purposes of processing payments nor Owner's making any such payments, including final payment, will impose responsibility on Owner:

a. to supervise, direct, or control the Work, or

b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or

c. for Contractor's performance of the Work.

d. to make any examination to ascertain how or for what purposes Contractor has used the moneys paid on account of the Contract Price, or

e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.

5. Owner may refuse to process or make the whole or any part of any payment if, in Owner's opinion, the criteria referred to in paragraph 14.02.B.2 has not been met. Owner may also refuse to process or make any such payment or, because of subsequently discovered evidence or the results of subsequent inspections or tests, revise or revoke any such payment previously made, to such extent as may be necessary in Owner's opinion to protect Owner from loss because:

a. the Work is defective, or completed Work has been damaged, requiring correction or replacement;

b. the Contract Price has been reduced by Written Amendment or Change Orders;

c. Owner has been required to correct defective Work or complete Work in accordance with paragraph 13.09; or

d. Owner has actual knowledge of the occurrence of any of the events enumerated in paragraph 15.02.A.

Delete paragraphs 14.02.C in its entirety and insert the following new paragraphs in its place:

C. *Payment Becomes Due*

1. Twenty-five days after presentation of the Application for Payment to Owner, the amount recommended will (subject to the provisions of paragraph 14.02.D) become due, and when due will be paid by Owner to Contractor.

Amend paragraph 14.02.D.1 by striking out the words “recommended by Engineer” and inserting the words “requested by Contractor” in their place.

Delete paragraph 14.02.D.2 in its entirety and insert the following new paragraph in its place:

2. If Owner refuses to make payment of the full amount requested by Contractor, Owner must give Contractor immediate written notice stating the reasons for such action and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, when Contractor corrects to Owner’s satisfaction the reasons for such action.

SC-14.04. Substantial Completion. Delete paragraph 14.04.A in its entirety and insert the following new paragraph in its place:

A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner in writing that the entire Work is substantially complete (except for items specifically listed by Contractor as incomplete) and request that Owner issue a certificate of Substantial Completion.

B. Promptly thereafter, Owner and Contractor shall make an inspection of the Work to determine the status of completion. If Owner does not consider the Work substantially complete, Owner will notify Contractor in writing giving the reasons therefor.

C. If Owner considers the Work substantially complete, Owner will within 14 days after the inspection of the Work execute and deliver to Contractor a statement of Substantial Completion.

D. At the time of delivery of the certificate of Substantial Completion, Owner will deliver to Contractor a statement as to division of responsibilities pending final payment between Owner and Contractor with respect to security, operation, safety, and protection of the Work, maintenance, heat, utilities, insurance, and warranties and

guarantees. Unless Owner and Contractor subsequently agree otherwise in writing, Owner's aforesaid statement will be binding on Owner and Contractor until final payment.

Add the following new paragraphs following paragraph 14.04.A:

To be considered substantially complete, the following portions of the Work must be operational and ready for Owner's continuous use as intended: Water main is tested and placed into service, services are connected to the new main if applicable to the project, and rough restoration is complete.

Portions of the Work not essential to operation, which can be completed without interruption of the Owner's operation, may be completed after the Work is accepted as substantially complete, and may include the following items: final restoration such as seeding and sodding.

SC-14.05. Partial Utilization. Amend paragraph 14.05.A by striking out the word "Engineer".

SC-14.06. Final Inspection. Delete paragraph 14.06.A in its entirety and insert the following new paragraph in its place:

A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Owner and Contractor shall promptly make a final inspection of the Work. Owner will notify Contractor in writing of all particulars in which this inspection reveals that the Work is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

SC-14.07. Final Application for Payment. Amend paragraph 14.07.A.1 by striking out the word "Engineer" and inserting the word "Owner" in its place.

Add the following new sentence immediately after the last sentence of paragraph 14.07.A.2.b.:

Consent of the surety, signed by an agent, must be accompanied by a certified copy of such agent's authority to act for the surety. The Contractor shall be responsible for providing all of the documents identified in this paragraph.

Delete paragraph 14.07.B in its entirety and insert the following new paragraph in its place:

B. *Review of Application and Acceptance*. If, on the basis of Owner's observation of the Work during construction and final inspection, and Owner's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Owner is satisfied that the Work has been completed and Contractor's other obligations under the Contract Documents have been fulfilled, Owner will process the final Application for Payment. Otherwise, Owner will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to process final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.

Amend paragraph 14.07.C by striking out the words “recommended by Engineer” and inserting the words “requested by Contractor” in their place.

SC-14.08. Final Completion Delayed. Delete paragraph 14.08.A in its entirety and insert the following new paragraph in its place:

A. If, through no fault of Contractor, final completion of the Work is significantly delayed, Owner shall, upon receipt of Contractor’s final Application for Payment, and without terminating the Agreement, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance to be held by Owner for Work not fully completed or corrected is less than the retainage stipulated in the Agreement, and if Bonds have been furnished as required in paragraph 5.01, the written consent of the surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by Contractor to Owner with the Application for such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

SC-15. SUSPENSION OF WORK AND TERMINATION.

SC-15.01. Owner May Suspend Work. Amend paragraph 15.01.A by striking out the words “and Engineer”.

SC-15.02. Owner May Terminate for Cause. Amend paragraph 15.02.B by deleting the fourth sentence of the paragraph, in its entirety, which begins: “Such Claims, costs, losses, and damages incurred…”.

SC-15.04. Contractor May Stop Work or Terminate. Delete paragraph 15.04.A and 15.04.B in their entirety and insert the following new paragraph in its place:

A. If, through no act or fault of Contractor, the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or Owner fails to act on any Application for Payment within 30 days after it is submitted, or Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon seven days written notice to Owner, and provided Owner does not remedy such suspension or failure within that time, terminate the Contract and recover from Owner payment on the same terms as provided in paragraph 15.03.

B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, seven days after written notice to Owner, stop the Work until payment is made of all such amounts dues Contractor, including interest thereon. The provisions of this paragraph 15.04 are not intended to preclude Contractor from making a Claim under paragraph 10.05 for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor’s stopping the Work as permitted by this Paragraph.

SC-16. DISPUTE RESOLUTION.

Delete Article 16 in its entirety and insert the following new article in its place:

ARTICLE 16 - DISPUTES.

Arbitration will not be acceptable as a means for settling claims, disputes, and other matters.

SC-17. MISCELLANEOUS.

SC-17.04. Survival of Obligations. Add the following new paragraph immediately after paragraph 17.04.A:

B. Contractor shall obtain from all Suppliers and manufacturers any and all warranties and guarantees of such Suppliers and manufacturers, whether or not specifically required by the Specifications, and shall assign such warranties and guarantees to Owner. With respect thereto, Contractor shall render reasonable assistance to Owner when requested, in order to enable Owner to enforce such warranties and guarantees. The assignment of any warranties or guarantees shall not affect the Correction Period or any other provisions of these Contract Documents.

End of Section

Section 01015

PROJECT REQUIREMENTS

1. GENERAL DESCRIPTION OF WORK. The Work to be performed under these Contract Documents is generally described as follows: Furnishing all plant, materials, equipment, supplies, labor and transportation, including fuel, power, water, (except any materials, equipment, utility, or service, if any, specified herein to be furnished by the District), and performing all work required in the scope of work in the Contract, in strict accordance with the specifications, schedules, and drawings, all of which are made a part hereof and including such detail drawings as may be furnished by the District from time to time during the prosecution of the work in explanation of said drawings.

2. COORDINATION. Contractor shall plan, schedule, and coordinate its operations in a manner which will facilitate the simultaneous progress of the work included under other contracts outside the scope of these Contract Documents if applicable.

3. MATERIALS TO BE FURNISHED BY OWNER. If the Owner is supplying some of the materials for this project (eg. air release valves, meter materials) it shall be indicated on the bid item unit price sheet and Measurement and Payment Section 1025. Items will be available at the Owner's storage yard unless other provisions have been made.

4. RESPONSIBILITY FOR MATERIALS AND EQUIPMENT.

4.01. Items Furnished by Owner. Contractor's responsibility for materials and equipment furnished by Owner shall begin at the point of delivery on acceptance by Contractor. Contractor shall carefully examine each shipment prior to acceptance and shall reject all defective items. Owner reserves the right, however, to accept items rejected by Contractor and to authorize their installation in the Work.

Defective materials and equipment discovered after installation and prior to final acceptance of the Work, where the defect is of a nature not detectable by visual examination and other appropriate field inspection methods, shall be replaced by Owner, together with such additional materials and supplies as may be necessary for their replacement. Contractor shall furnish all necessary tools, equipment, and appliances, and perform all necessary labor, for the removal and replacement of such defective items in a manner acceptable to Owner; adjustment to the Contract Price for the costs of the removal and replacement shall be made in accordance with Article 11 of the General Conditions.

All materials and equipment furnished by Owner which disappear or are damaged after their acceptance by Contractor shall be replaced by and at the expense of Contractor. Replacements shall conform to the original procurement specifications.

Contractor shall be responsible for all unloading, reloading, transporting to the site, storage if necessary, re-handling, and installation.

All items shall be unloaded promptly after arrival. All charges for demurrage due to negligence or delay by Contractor shall be paid by Contractor. Equipment and materials shall be handled by methods which will prevent damage.

Equipment and materials shall be protected from exposure to the elements. All equipment shall be stored in accordance with the General Equipment Stipulations.

Contractor shall accept the risk of any delay in delivery of equipment or materials furnished by Owner, and if the Work is delayed, Contractor shall have no claim for damages or contract adjustment other than an extension of time and the waiving of liquidated damages occasioned by the delay.

All equipment shall be arranged and installed as indicated on the Drawings, and in conformity with installation drawings and instructions furnished to Owner by the manufacturer of the equipment.

4.02. Items Furnished by Contractor. Contractor shall be fully responsible for all materials and equipment which it has furnished.

5. OFFSITE STORAGE. Offsite storage arrangement shall be approved by Owner for all materials and equipment not incorporated into the Work but included in Applications for Payment. Such offsite storage arrangement shall be presented in writing and shall afford adequate and satisfactory security and protection. Offsite storage facilities shall be accessible to Owner.

6. SUBSTITUTES AND "OR-EQUAL" ITEMS. Provisions for evaluation of substitutes and "or-equal" items of materials and equipment are covered in Paragraph 6.05 of the General Conditions. Requests for review of equivalency will not be accepted by Owner from anyone except Contractor, and such requests will not be considered until after the Contract has been awarded.

7. PREPARATION FOR SHIPMENT. All materials shall be suitably packaged to facilitate handling and protect against damage during transit and storage. Painted surfaces shall be protected against impact, abrasion, discoloration, and other damage. All painted surfaces which are damaged prior to acceptance of equipment shall be repainted to the satisfaction of Owner.

Each item, package, or bundle of material shall be tagged or marked as identified in the delivery schedule or on the Shop Drawings. Complete packing lists and bills of material shall be included with each shipment.

8. SALVAGE OF MATERIALS AND EQUIPMENT. Existing materials and equipment removed, and not reused as a part of the Work, shall become Contractor's property, except the following items which shall remain Owner's property: Fire Hydrants, temporary plugs, and any unused materials supplied by the Owner.

Contractor shall carefully remove, in a manner to prevent damage, all materials and equipment specified or indicated to be salvaged and reused or to remain the property of Owner. Contractor shall store and protect salvaged items specified or indicated to be reused in the Work.

Salvaged items not to be reused in the Work, but to remain Owner's property, shall be delivered by Contractor in good condition to Owner’s storage yard.

Any items damaged in removal, storage, or handling through carelessness or improper procedures shall be replaced by Contractor in kind or with new items.

Contractor may furnish and install new items instead of those specified or indicated to be salvaged and reused, in which case such removed items will become Contractor's property.

Existing materials and equipment removed by Contractor shall not be reused in the Work except where so specified or indicated.

9. EASEMENTS AND RIGHTS-OF-WAY. The easements and rights-of-way for the pipelines will be provided by Owner. Contractor shall confine its construction operations within the limits indicated on the Drawings. Contractor shall use due care in placing construction tools, equipment, excavated materials, and pipeline materials and supplies in order to avoid damage to property and interference with traffic.

9.01. On Private Property. Easements across private property are indicated on the Drawings. Contractor shall set stakes to mark the boundaries of construction easements across private property. The stakes shall be protected and maintained until completion of construction and cleanup.

Contractor shall not enter any private property outside the designated construction easement boundaries without written permission from the owner of the property.

Whenever the easement is occupied by crops which will be damaged by construction operations, Contractor shall notify the owner sufficiently in advance so that the crops may be removed before excavation or trenching is started. Contractor shall be responsible for all damage to crops outside the easement and shall make satisfactory settlement for the damage directly with the owner.

Where the line crosses fields which are leveled for irrigation or terraced, Contractor shall relevel irrigated fields and replace all terraces to their original or better condition, and to the satisfaction of the owner.

9.02. Work Within Highway and Railroad Rights-of-Way. Permits shall be obtained by Owner. All Work performed and all operations of Contractor, its employees, or Subcontractors within the limits of railroad and highway rights-of-way shall be in conformity with the requirements and be under the control (through Owner) of the railroad or highway authority owning, or having jurisdiction over and control of, the right-of-way in each case.

10. OPERATION OF EXISTING FACILITIES. The existing water transmission and distribution system must be kept in continuous operation throughout the construction period. No interruption will be permitted which adversely affects the degree of service provided. Provided permission is obtained from Owner in advance, portions of the existing facilities may be taken out of service for short periods corresponding with

periods of minimum service demands. This may facilitate work at night or weekends which is considered incidental to the project.

Contractor shall provide temporary facilities and make temporary modifications as necessary to keep the existing facilities in operation during the construction period.

11. NOTICES TO OWNERS AND AUTHORITIES. Contractor shall, as provided in the General Conditions, notify owners of adjacent property and utilities when prosecution of the Work may affect them.

When it is necessary to temporarily deny access to property, or when any utility service connection must be interrupted, Contractor shall give notices sufficiently in advance to enable the affected persons to provide for their needs. Notices shall conform to any applicable local ordinance and, whether delivered orally or in writing, shall include appropriate information concerning the interruption and instructions on how to limit inconvenience caused thereby.

Utilities and other concerned agencies shall be notified at least 24 hours prior to cutting or closing streets or other traffic areas or excavating near underground utilities or pole lines.

12. LINES AND GRADES. All Work shall be done to the lines, grades, and elevations indicated on the Drawings.

Basic horizontal and vertical control points will be established or designated by Owner to be used as datums for the Work. All additional survey, layout, and measurement work shall be performed by Contractor as a part of the Work.

Contractor shall provide an experienced instrument person, competent assistants, and such instruments, tools, stakes, and other materials required to complete the survey, layout, and measurement work. In addition, Contractor shall furnish, without charge, competent persons and such tools, stakes, and other materials as Owner may require in establishing or designating control points, or in checking survey, layout, and measurement work performed by Contractor.

Contractor shall keep Owner informed, a reasonable time in advance, of the times and places at which it wishes to do Work, so that horizontal and vertical control points may be established and any checking deemed necessary by Owner may be done with minimum inconvenience to Owner and minimum delay to Contractor.

Contractor shall remove and reconstruct work which is improperly located.

13. CONNECTIONS TO EXISTING FACILITIES. Unless otherwise specified or indicated, Contractor shall make all necessary connections to existing facilities, including structures, drain lines, and utilities such as water, sewer, gas, telephone, and electric. In each case, Contractor shall receive permission from Owner or the owning utility prior to undertaking connections. Contractor shall protect facilities against deleterious substances and damage.

Connections to existing facilities which are in service shall be thoroughly planned in advance, and all required equipment, materials, and labor shall be on hand at the time of undertaking the connections. Work shall proceed continuously (around the clock) if necessary to complete connections in the minimum time. Operation of valves or other appurtenances on existing utilities, when required, shall be by or under the direct supervision of the owning utility.

14. UNFAVORABLE CONSTRUCTION CONDITIONS. During unfavorable weather, wet ground, or other unsuitable construction conditions, Contractor shall confine its operations to work which will not be affected adversely by such conditions. No portion of the Work shall be constructed under conditions which would affect adversely the quality or efficiency thereof, unless special means or precautions are taken by Contractor to perform the Work in a proper and satisfactory manner.

15. CUTTING AND PATCHING. As provided in General Conditions, Contractor shall perform all cutting and patching required for the Work and as may be necessary in connection with uncovering Work for inspection or for the correction of defective Work.

Contractor shall perform all cutting and patching required for and in connection with the Work, including but not limited to the following:

Removal of improperly timed Work.
Removal of samples of installed materials for testing.
Alteration of existing facilities.
Installation of new Work in existing facilities.

Contractor shall provide all shoring, bracing, supports, and protective devices necessary to safeguard all Work and existing facilities during cutting and patching operations. Contractor shall not undertake any cutting or demolition which may affect the structural stability of the Work or existing facilities without Owner's concurrence.

Materials shall be cut and removed to the extent indicated on the Drawings or as required to complete the Work. Materials shall be removed in a careful manner, with no damage to adjacent facilities or materials. Materials which are not salvable shall be removed from the site by Contractor.

All Work and existing facilities affected by cutting operations shall be restored with new materials, or with salvaged materials acceptable to Owner, to obtain a finished installation with the strength, appearance, and functional capacity required. If necessary, entire surfaces shall be patched and refinished.

16. ASBESTOS REMOVAL. If, during the progress of the Work, suspected asbestos-containing products are identified, Contractor shall stop work in the affected area and engage an asbestos removal Subcontractor to verify the materials and, if necessary, encapsulate, enclose, or remove and dispose of all asbestos in accordance with current regulations of the Environmental Protection Agency and the U. S. Department of Labor - Occupational Safety and Health Administration, the state asbestos regulating agency, and any local government agency. Payment for such work will be made by Change Order.

16.01. Subcontractor's Qualifications. The Subcontractor for asbestos removal shall be regularly engaged in this type of activity and shall be familiar with the regulations which govern this work. The Subcontractor shall demonstrate to the satisfaction of Owner that it has successfully completed at least three asbestos removal projects, that it has the necessary staff and equipment to perform the work, and that it has an approved site for disposal of the asbestos. The Subcontractor shall carry insurance as specified in the Supplementary Conditions.

16.02. Removal Methods. The asbestos removal Subcontractor shall submit a work plan of its proposed removal procedure to Owner before beginning work and shall certify that the methods are in full compliance with the governing regulations. The work plan shall cover all aspects of the removal, including health and safety of employees and building occupants, hygiene facilities, employee certification, clearance criteria, transportation and disposal, enclosure techniques, and other techniques appropriate for the proposed work.

17. CLEANING UP. Contractor shall keep the premises free at all times from accumulations of waste materials and rubbish. Contractor shall provide adequate trash receptacles about the site and shall promptly empty the containers when filled.

Construction materials, such as concrete forms and scaffolding, shall be neatly stacked by Contractor when not in use. Contractor shall promptly remove splattered concrete, asphalt, oil, paint, corrosive liquids, and cleaning solutions from surfaces to prevent marring or other damage.

Volatile wastes shall be properly stored in covered metal containers and removed daily.

Wastes shall not be buried or burned on the site or disposed of into storm drains, sanitary sewers, streams, or waterways. All wastes shall be removed from the site and disposed of in a manner complying with local ordinances and anti-pollution laws.

Adequate cleanup will be a condition for processing of progress payment applications.

18. APPLICABLE CODES. References in the Contract Documents to local codes mean the following:

Kentucky Building Code
Kentucky Plumbing Code
National Electric Code
BOCA Mechanical Code

Other standard codes which apply to the Work are designated in the Specifications.

19. PRECONSTRUCTION CONFERENCE. Prior to the commencement of Work at the site, a pre-construction conference will be held at a mutually agreed time and place. The conference shall be attended by:

Contractor and its superintendent.
Principal Subcontractors.
Representatives of principal Suppliers and manufacturers as appropriate.
Representatives of Owner.

Government representatives as appropriate.
Others as requested by Contractor or Owner.

Unless previously submitted to Owner, Contractor shall bring to the conference a preliminary schedule for each of the following:

Progress.
Procurement.
Values for progress payment purposes.
Shop Drawings and other submittals.

The purpose of the conference is to designate responsible personnel and establish a working relationship. Matters requiring coordination will be discussed and procedures for handling such matters established. The agenda will include:

Contractor's preliminary schedules.
Transmittal, review, and distribution of Contractor's submittals.
Processing Applications for Payment.
Maintaining record documents.
Critical Work sequencing.
Field decisions and Change Orders.
Use of premises, office and storage areas, security, housekeeping, and Owner's needs.
Contractor's assignments for safety and first aid.

Owner will preside at the conference and will arrange for keeping the minutes and distributing the minutes to all persons in attendance.

20. PROGRESS MEETINGS. Contractor shall schedule and hold regular progress meetings at least monthly and at other times as requested by Owner or required by progress of the Work. Contractor, Owner, and all Subcontractors active on the site shall be represented at each meeting. Contractor may at its discretion request attendance by representatives of its Suppliers, manufacturers, and other Subcontractors.

Contractor shall preside at the meetings. Meeting minutes will be prepared and distributed by Contractor. The purpose of the meetings will be to review the progress of the Work, maintain coordination of efforts, discuss changes in scheduling, and resolve other problems which may develop.

End of Section

Section 01025

MEASUREMENT AND PAYMENT

1. SCOPE. This section covers methods of measurement and payment for items of Work under this Contract.

2. GENERAL. The total Contract Price shall cover all Work required by the Contract Documents. All costs in connection with the proper and successful completion of the Work, including furnishing all materials, equipment, supplies, and appurtenances; providing all construction plant, equipment, and tools; and performing all necessary labor and supervision to fully complete the Work, shall be included in the unit and lump sum prices bid. All Work not specifically set forth as a pay item in the Bid Form shall be considered a subsidiary obligation of Contractor and all costs in connection therewith shall be included in the prices bid. The Contractor shall be responsible for supplying all project materials, except for items supplied by the Owner as indicated in the Bid Item Descriptions below and on the bid form.

3. ESTIMATED QUANTITIES. All estimated quantities stipulated in the Bid Form or other Contract Documents are approximate and are to be used only (a) as a basis for estimating the probable cost of the Work and (b) for the purpose of comparing the bids submitted for the Work. The actual amounts of work done and materials furnished under unit price items may differ from the estimated quantities. The basis of payment for work and materials will be the actual amount of work done and materials furnished. Contractor agrees that it will make no claim for damages, anticipated profits, or otherwise on account of any difference between the amounts of work actually performed and materials actually furnished and the estimated amounts therefor.

4. EXCAVATION AND TRENCHING. Except where otherwise specified, the unit or lump sum price bid for each item of Work, which involves excavation, or trenching shall include all costs for such Work. No direct payment shall be made for excavation or trenching. All excavation and trenching shall be unclassified as to materials, which may be encountered; in addition, trenches shall be unclassified as to depth.

5. BID PRICES TO INCLUDE INCIDENTAL WORK. The bid prices will cover and include the cost and expense of all contingents, accessories and incidental work and material required to complete the improvement. This includes replacement of services, pavement, fences and any other objects which are affected in the process of construction on this work. It shall also include where necessary, watchmen, flagmen, barricades, red lights, all backfill material such as gravel, flowable fill and any temporary restoration, construction joints, finishing and curing concrete, dust control, maintenance of traffic, maintenance of existing sewage flow, provision for access to property, and many other incidents which occur on a normal construction job.

DESCRIPTION OF BID ITEMS

NOTE: Descriptions of each material can be found in Section 01600 Technical Provisions

6. PIPELINES. Pipelines which are to be paid for on a unit price basis shall be measured for payment on a horizontal plane after installation of the pipe. Where lines are laid to conform

to stationed profiles, payment shall be made on linear quantities based on the pipeline stationing as determined by surveys made after installation.

The measurement of the length of each line or run of pipe of each size will begin and end at:

a. The end of the pipe where connected to an existing pipe, fitting, or valve; or at the end of a dead-end run.

b. The center lines intersection of the run and branch on tees, crosses, or laterals where a branch line connecting therewith is constructed under this Contract. Where a branch fitting is installed under this Contract, and the branch or connecting line is to be constructed by others at some future date or under another contract, the pay measurement will include the entire laying length of the branch or branches of such fitting.

c. The measurement of each line of pipe of each size which is to be paid for on a unit price basis will be continuous through, and shall include the full laying lengths of, all fittings and valves installed between the ends of each line; except that the laying lengths of reducers and increasers will be divided equally between the connected pipe sizes. Connecting piping for fire hydrants will be paid under the unit price for fire hydrants.

6.01 CLASS 50 or 52 DUCTILE IRON PIPE (ALL SIZES). (Detail 103, 103a, 104, 104a, 110). Includes the specified pipe, polyethylene wrap, fittings, bends, tracing wire, excavation, labor, equipment, bedding, backfill disinfection, dechlorination, pressure testing, restoration of non-paved areas, etc. required to install the specified pipe at the location shown on the plans, or as directed, in accordance with the specifications and standard drawings complete and ready for use. Paid LINEAR FEET (LF).

6.02.A CLASS 50 or 52 DUCTILE IRON PIPE (ALL SIZES) – INTERNAL RESTRAINED JOINT. (Detail 103, 103a, 104, 104a, 110). Includes the specified pipe, polyethylene wrap, fittings, bends, tracing wire, excavation, labor, equipment, bedding, backfill, disinfection, dechlorination, pressure testing, restoration of non-paved areas, etc. required to install the specified pipe at the location shown on the plans, or as directed, in accordance with the specifications and standard drawings complete and ready for use. Paid LINEAR FEET (LF).

6.02.B CLASS 50 or 52 DUCTILE IRON PIPE (ALL SIZES) –RESTRAINED JOINT. (Detail 103, 103a, 104, 104a, 110). Includes the specified pipe, polyethylene wrap, fittings, bends, tracing wire, excavation, labor, equipment, bedding, backfill, disinfection, dechlorination, pressure testing, restoration of non-paved areas, etc. required to install the specified pipe at the location shown on the plans, or as directed, in accordance with the specifications and standard drawings complete and ready for use. Pipe gaskets shall develop a wedging action between pairs of high-strength stainless steel stainless steel elements spaced around the gasket (Field Lok®, Fast-Grip® or approved equal gaskets). The bend shall be restrained using mechanical joint restraint devices consisting of multiple gripping wedges incorporated into a follower gland compatible with all mechanical joints (Megalug Series 1100®, MJ Field Lok® or approved equal) Paid LINEAR FEET (LF).

6.03 C-900, C-909 Poly Vinyl Chloride (PVC) (ALL SIZES). (Detail 103, 103a, 104, 104a, 111). Includes the specified pipe, polyethylene wrap, fittings, bends, excavation, labor, equipment, bedding, backfill, disinfection, pressure testing, restoration of non-paved areas, tracing wire etc. required to install the specified pipe at the location shown on the plans, or as directed, in accordance with the specifications and standard drawings complete and ready for use. Paid LINEAR FEET (LF).

6.03B C-900, C-909 Poly Vinyl Chloride (PVC) (ALL SIZES) **– RESTRAINED JOINT**. (Detail 103, 103a, 104, 104a, 111). Includes the specified pipe, polyethylene wrap, fittings, bends, tracing wire, excavation, labor, equipment, bedding, backfill, disinfection, pressure testing, restoration of non-paved areas, etc. required to install the specified pipe at the location shown on the plans, or as directed, in accordance with the specifications and standard drawings complete and ready for use. Pipe push on joints shall be restrained using devices designed and approved by the AWWA for C900 or C909 PVC pipe (Megalug Series 1600®, Eagle Loc 900® or approved equal restraint systems). Transitional joints shall be restrained using mechanical joint restraint devices designed for PVC pipe and consisting of multiple gripping wedges incorporated into a follower gland compatible with all mechanical joints (Megalug Series 2000®, MJ Field Lok® PV Series or approved equal) Paid LINEAR FEET (LF).

6.04 CASING PIPE. Includes the casing pipe (K.D.O.T. or Railroad Spec.), labor, equipment, excavation, backfill, restoration, etc. required to install the casing pipe at the location shown on the plans, or as directed, in accordance with the specifications and standard drawings complete and ready for use. Paid LINEAR FEET (LF).

a. Crossings. Where tunneling is required in connection with railroad, highway, or primary road crossings, each crossing shall be measured for payment horizontally along the longitudinal center line of the enclosing conduit or pipe installed therein, from end to end of the enclosing conduit, or from end to end of the tunnel excavation where an enclosing conduit is not required. Each designated type of crossing shall include the following:

b. Crossings in Earth Backfill Tunnel. The unit price bid for each crossing in earth backfill tunnel shall include all costs in connection with excavation and backfilling, the excess cost of installing pipe in tunnel above the amount bid for the pipe laid in open trench, all skids, jointing materials, stabilized sand backfill, and all other work for and in connection with the crossing, not paid for separately. Separate payment shall not be made for tunnel liner or supports which may be needed for Contractor's convenience; all such items shall be considered a subsidiary obligation of Contractor.

c. Crossings in Conduit. The unit price bid for each crossing in pipe conduit or tunnel liner shall include all costs in connection with excavation and backfilling, pipe conduit or tunnel liner, the excess cost of installing pipe in pipe conduit or tunnel liner above the amount bid for the pipe laid in open trench, all skids, jointing materials, jacking pipe, jacking pits, sand backfill, end closures, and all other work for and in connection with the crossing, not paid for separately.

6.05 CLASS 250 DR 9 HDPE (HIGH DENSITY POLY-ETHYLENE) PIPE (2”). Includes the specified pipe, fittings, bends, excavation, labor, equipment, bedding, backfill, disinfection, pressure testing, restoration of non-paved areas, tracing wire etc. Contractor is required to install the specified pipe at the location shown on the plans, or as directed,

in accordance with the specifications and standard drawings complete and ready for use. Paid LINEAR FEET (LF).

6.06 PREFORMED PIPE INSULATION.
Includes all labor and material necessary to install preformed pipe insulation, wrapped with a double layer of polyvinyl tape on specified pipe. The preformed pipe insulation shall be Foam Glas (manufactured by Pittsburg Corning) or approved equal. Paid LINEAR FEET (LF).

Water Main Size	Insulation Thickness
4 inches to 8 inches	2 – ½ inches
10 inches to 16 inches	3 – ½ inches

7. Connections to Existing Water Mains. Connections to existing water mains will be paid for at the lump sum prices bid. Each lump sum price named for a connection shall include all costs incurred for making the connection over and above the price of the connecting piping in place. Each lump sum price shall include furnishing and installing the tapping sleeve and valve, fittings; all excavation, blocking and backfilling work; tapping of existing main; and all other costs not included under other bid items.

7.01 CONNECT TO EXISTING MAIN/TIE-IN (ALL SIZES). Includes all labor, equipment, excavation, specified pipe, fittings, sleeves, couplings, blocking, anchoring, polyethylene wrap, disinfection, pressure testing, backfill and restoration, and any pipe required to make the connection as shown on the plans, and in accordance with the specifications. Paid EACH (EA).

7.01B 2" TIE-IN W/ SADDLE & CURBSTOP. (Sta. 25+71 Blangey Road**).** Includes all labor, equipment, excavation, specified pipe, fittings, sleeves, couplings, blocking, anchoring, curbstop, saddle, valve box, disinfection, pressure testing, backfill and restoration, and any pipe required to make the connection as shown on the plans, and in accordance with the specifications. Paid EACH (EA).

7.02 TAPPING SLEEVE & VALVE (ALL SIZES) Includes the District approved tapping sleeve and valve, polyethylene wrap, labor, equipment, excavation, blocking, anchoring, disinfection, backfill, restoration, etc. to install the specified fitting at the locations shown on the plans in accordance with the specifications and standard drawing complete and ready for use. Paid EACH (EA) when complete.

8. Fire Hydrants. Fire hydrants will be paid for at the unit price bid. The unit price named for each fire hydrant installation shall include all costs incurred in furnishing and installing the fire hydrant; auxiliary gate valve, all connecting piping to the adjacent water main, accessories, and appurtenances, concrete blocking behind and under the fire hydrant, drainage facilities, yard restoration and all other costs not included under other bid items.

8.01 INSTALL FIRE HYDRANT ASSEMBLY. (Detail 109). Includes all labor, equipment, excavation, concrete blocking, 6" Ductile Iron Resilient Seated Gate Valve, Valve box, 6" Ductile Iron Anchor Coupling, 6" ductile iron leads (restrained) Fire Hydrant, extensions, granular drainage material, backfill and yard restoration to install fire hydrant complete and in accordance with the specifications and standard drawings. Paid EACH (EA).

8.02 INSTALL FUTURE FIRE HYDRANT VALVE. (Detail 109). Includes all labor, equipment, excavation, 6" Ductile Iron Resilient Seated Gate Valve, Valve box, Plug, backfill and yard restoration to install future fire hydrant assembly complete and in accordance with the specifications and standard drawings. Paid EACH (EA).

8.03 REMOVE FIRE HYDRANT. Includes all labor, equipment, excavation, backfill and yard restoration to remove an existing fire hydrant, cap hydrant lead if necessary and return to the Northern Kentucky Water District warehouse. Paid EACH (EA).

8.04 RELOCATE FIRE HYDRANT. Includes allowing for Northern Kentucky Water District's Inspector to inspect the existing fire hydrant prior to reuse, returning unusable fire hydrants to the Northern Kentucky Water District Warehouse and picking up a replacement hydrant for use. Includes the labor, equipment, excavation, bedding, backfill, testing, disinfection, and yard restoration to relocate existing fire hydrant to valve, pipe, and anchoring tee as indicated on plans and on standard drawings contained in the plans. The pipe, valve and anchoring tee shall be paid under separate bid items when required. The Contractor to supply and install all anchoring devices, fire hydrant extensions, 6" ductile iron leads (restrained), concrete blocking, yard restoration, granular drainage material, etc, needed to install the fire hydrant complete and ready for use as shown on the plans, and in accordance with the specifications and standard drawings. Paid EACH (EA).

8.05 ADJUST FIRE HYDRANT TO GRADE. Includes the labor, equipment, excavation, bedding, backfill, testing, disinfection, and yard restoration to adjust the existing fire hydrant using the fire hydrant manufacturer's extension kit for adjustments of 18" or less. Adjustments greater than 18" require anchoring couplings and vertical bends to adjust to grade. The Contractor will supply and install all anchor couplings, bends, fire hydrant extension, concrete blocking, yard restoration, granular drainage material, etc, needed to adjust the fire hydrant complete and ready for use as shown on the plans, and in accordance with the specifications and standard drawings. Paid EACH (EA).

9. Valves. Sectionalizing valves in water mains will be paid for at the unit price bid for each size. The unit price shall include all costs incurred in completing the sectionalizing valve installation over and above the amount paid for piping in place. The unit price shall include furnishing and installing the sectionalizing valve, valve box, and appurtenances; excavation and backfill not included under piping; and all other costs not included under other bid items.

No separate payment will be made for fire hydrant auxiliary gate valves or tapping valves.

9.01 DUCTILE IRON RESILIENT SEATED GATE VALVE (4", 6", 8", 12"). (Detail 105). Includes the specified valve, labor, equipment, excavation, polyethylene wrap, bedding, backfill, disinfection, pressure testing, restoration, etc. (contractor must supply mechanical joint restraints on restrained joint applications), required to install the specified valve at the location shown on the plans, or as directed, in accordance with the specifications and standard drawings complete and ready for use. All External Dome and Packing Bolts Shall be Stainless Steel. Paid EACH (EA).

9.02 BUTTERFLY VALVE (16" AND LARGER). Includes the labor, equipment, valve and appurtenances, material, excavation, polyethylene wrap, bedding, backfill, disinfection, pressure testing, restoration, etc. (contractor must supply mechanical joint

restraints on restrained joint applications), required to install the specified valve at the location shown on the plans, or as directed, in accordance with the specifications and standard drawings complete and ready for use. Paid EACH (EA).

9.03 DUCTILE IRON RESILIENT WEDGE GATE VALVE WITH BEVELED GEARING. Ductile iron body, non-rising stem, open left, 2" square operating nut, epoxy coated, mechanical joint, inlet and outlet connections, O-ring type packing, resilient wedge, 250 PSI working pressure, and conforming in all other ways to AWWA Standard C515 American Flow Control 2500 Resilient Wedge Gate Valve or approved equal. Valve body to be assembled with stainless steel bolts grade 304 or better. Accessory package (glands, gaskets and bolts) shall not be included. Includes the specified valve, labor, equipment, excavation, polyethylene wrap, bedding, backfill, disinfection, pressure testing, restoration, etc. (contractor must supply mechanical joint restraints on restrained joint applications), required to install the specified valve at the location shown on the plans, or as directed, in accordance with the specifications and standard drawings complete and ready for use. All External Dome and Packing Bolts Shall be Stainless Steel. Paid EACH (EA).

10. SERVICES

10.01 REPLACE and RECONNECT SERVICE LINE (3/4" THRU 2"). Includes the labor, equipment, excavation, bedding, backfill, and asphalt, concrete and yard restoration to install the service line at the locations shown on the plans or as directed, in accordance with the specifications and standard drawings, complete and ready for use. Lead service lines encountered by the excavation shall be replaced from the main to and including the meter vault and meter setting. All service line material will be supplied by NKWD. Paid EACH (EA).

10.02 REPLACE SERVICE LINE AND INSTALL WATER METER SETTING (3/4" THRU 2"). Includes the labor, equipment, excavation, bedding, backfill, and asphalt, concrete and yard restoration to install the service line, new meter vault and yoke setting at the locations shown on the plans or as directed, in accordance with the specifications and standard drawings, complete and ready for use. All service line material will be supplied by NKWD. Paid EACH (EA).

10.03 RECONNECT COPPER SERVICE (3/4" THRU 2"). Includes the labor, equipment, excavation, bedding, backfill and asphalt, concrete and yard restoration to reconnect the service line at the locations shown on the plans or as directed, in accordance with the specifications and standard drawings, complete and ready for use. Lead service lines encountered by the excavation shall be replaced from the main to and including the meter vault and meter setting. All service line material will be supplied by NKWD. Paid EACH (EA).

10.04 RELOCATE WATER METER SETTING. Includes the labor, equipment, excavation, bedding, backfill and asphalt, concrete and yard restoration to install a new meter vault and yoke setting to the location shown on the plans or as directed, in accordance with the specifications and standard drawings complete and ready for use. All service line material will be supplied by NKWD. Paid EACH (EA).

10.05 INSTALL WATER METER SETTING. Includes the labor, equipment, excavation, bedding, backfill, testing, disinfection and asphalt, concrete and yard restoration to

install a new meter vault and yoke setting to the location shown on the plans or as directed, in accordance with the specifications and standard drawings complete and ready for use. All service line material will be supplied by NKWD. Paid EACH (EA).

10.06 ADJUST EXISTING WATER VALVE BOX TO GRADE. Includes all labor, equipment, excavation, bedding, 2'x2'x4" concrete pad, backfill, testing, disinfection, and asphalt, concrete and yard restoration to install the valve box and valve toggle extensions (if required) and adjust the top of the box to finished grade complete and ready for use. Valve toggle extensions will be supplied by NKWD. Paid EACH (EA).

10.07 ADJUST WATER METER TO GRADE. Includes all labor, equipment, excavation, bedding, backfill, testing, disinfection, and asphalt, concrete and yard restoration to adjust the top of the box to finished grade complete and ready for use. Paid EACH (EA).

10.08 REMOVE EXISTING CURB STOP/METER CROCK. Includes the labor, equipment, excavation, backfill and asphalt, concrete or yard restoration to remove the existing curb stop or meter crock at the location shown on the plans or as directed, in accordance with the specifications and standard drawings. Paid EACH (EA).

10.09 INSTALL TEMPORARY WATER SERVICE. Includes the labor, equipment and materials for the installation and disinfection of temporary piping, flushing of temporary piping, removal of the existing meter and returning meter to the Owner, hooking up temporary water to meter setting, maintaining an uninterrupted water supply, repairs to any damaged or broken piping, installation of meter and removal of all piping and fittings upon completion of the work, Paid LUMP SUM (LS).

11. MISCELLANEOUS

11.01 CONCRETE ENCASEMENT. Includes the labor, equipment, excavation, backfill, concrete, restoration, etc. to construct the concrete encasement of the water main stream crossing as shown on the plans, and in accordance with the specifications and standard drawings. Paid LINEAR FEET (LF).

11.02 4" UNDERDRAIN. Includes the labor, equipment, excavation, bedding, materials, backfill, and restoration, etc. required to install the underdrain at the location shown on the plans in accordance with the specifications and standard drawings complete and ready for use. Paid EACH (EA).

11.03 PRESSURE REDUCING VALVE PIT. Includes the labor, equipment, excavation, concrete pit construction, materials, pipe work, electrical work, backfill, restoration, etc. required to install the specified pressure reducing valve pit at the location shown on the plans in accordance with the plans, specifications and standard drawings complete and ready for use. Paid EACH (EA).

11.04 PLUG AND BLOCK (ALL SIZES). This item shall include the specified plug, polyethylene wrap, labor, equipment, excavation, concrete, backfill and restoration required to install the plug and blocking at the location shown on the plans or as directed in accordance with the specifications. Paid EACH (EA).

11.05 AIR RELEASE VALVE. (Detail 106). This item shall include labor, equipment, excavation, polyethylene wrap, bedding, backfill, disinfection, pressure testing, restoration, etc. required to install the air release valve at the location shown on the plans or as directed in accordance with the specifications. All materials will be supplied by NKWD. Paid EACH (EA).

11.06 ANCHORING TEE AND BLOCK (ALL SIZES). Includes the specified anchoring tee, labor, equipment, excavation, polyethylene wrap, bedding, backfill, disinfection, pressure testing, restoration, etc. required to install the specified anchoring tee at the location shown on the plans, or as directed, in accordance with the specifications and standard drawings complete and ready for use. Paid EACH (EA).

11.06B INSTALL 2" BRASS COMPRESSION TEE. (Sta. 27+87 Blangey Road) Includes the labor, equipment, excavation, bedding, backfill, and asphalt, concrete and yard restoration to install a 2" brass compression tee at the location shown on the plans or as directed, in accordance with the specifications and standard drawings, complete and ready for use. The compression tee will be supplied by NKWD. Paid EACH (EA).

11.07 DUCTILE IRON TEE AND BLOCK (ALL SIZES). Includes the specified ductile iron tee, labor, equipment, excavation, polyethylene wrap, bedding, backfill, disinfection, pressure testing, restoration, etc. required to install the specified tee at the location shown on the plans, or as directed, in accordance with the specifications and standard drawings complete and ready for use. Paid EACH (EA).

11.08 DUCTILE IRON CROSS (ALL SIZES). Includes the specified ductile iron cross, labor, equipment, excavation, polyethylene wrap, bedding, backfill, disinfection, pressure testing, restoration, etc. required to install the specified ductile iron cross at the location shown on the plans, or as directed, in accordance with the specifications and standard drawings complete and ready for use. Paid EACH (EA).

11.09 REDUCER (ALL SIZES). Includes the reducer, labor, equipment, excavation, polyethylene wrap, bedding, backfill, disinfection, pressure testing, restoration, etc. required to install the specified reducer at the location shown on the plans, or as directed, in accordance with the specifications and standard drawings complete and ready for use. Paid EACH (EA).

11.10 FLUSHING DEVICE. (Detail 113) Includes the labor, equipment, excavation, polyethylene wrap, bedding, backfill, disinfection, pressure testing, restoration, etc. required to install the specified flushing device at the location shown on the plans in accordance with the specifications and standard drawings complete and ready for use. Flushing device materials will be supplied by NKWD. Paid EACH (EA).

11.11 TEST TAP. Includes the labor, equipment, excavation, polyethylene wrap, bedding, backfill, disinfection, pressure testing, restoration, etc. required to install the specified test tap at the location shown on the plans in accordance with the specifications and standard drawings complete and ready for use. Test Tap materials will be supplied by NKWD. Paid EACH (EA).

11.12 STORM SEWER CONNECTION. Includes all labor, equipment, excavation, bedding, backfill and materials required to make the connection to the existing

combination manhole as shown on the plans and in accordance with the specifications of K.T.C.and Sanitation District No. 1. Paid EACH (EA).

11.13 REMOVE EXISTING CATCH BASIN & RECONSTRUCT NEW DOUBLE CURB BOX INLET. Includes all labor, equipment, excavation, backfill and materials to remove an existing catch basin, dispose of existing catch basin in a proper manner in accordance will all applicable local, state, or federal regulations and installation of a Standard Double Curb Box Inlet as per the detail in the construction drawings. All work shall also be in accordance with the specifications of K.T.C. and Sanitation District No. 1. Paid EACH (EA)

11.14 REMOVE EXISTING STORM PIPE & CONSTRUCT HDPE STORM PIPE. Includes all labor, equipment, excavation, bedding, backfill and materials to remove the existing storm sewer pipe and install new HDPE storm pipe as per plan. All debris materials shall be disposed of in a proper manner and shall be as directed by all applicable local, state or federal regulations. Installation of new HDPE storm pipe shall be in accordance with the Storm Sewer Pipe Bedding – Flexible Pipe (Plastic) detail on the construction drawings. All work shall also be in accordance with the specifications of K.T.C. and Sanitation District No. 1. Paid LINEAR FOOT (LF)

11.15 SLEEVE OUT EXISTING TEE/CROSS/VALVE. Includes all labor, equipment, excavation, specified pipe, fittings, couplings, polyethylene wrap, bedding, backfill, disinfection, pressure testing, restoration, etc. required to remove the existing tee/cross/valve and install a straight pipe at the location shown on the plans or as directed in accordance with the specifications. Paid EACH (EA).

11.16 CORROSION TEST STATION. Includes the labor, equipment and materials required to place test stations, and electrodes, in accordance with specifications and details. Paid EACH (EA).

11.17 MAGNESIUM ANODES. Includes the labor, equipment and materials required to place mangnesium anodes and associated wiring, in accordance with specifications and details. Paid EACH (EA).

12. RESTORATION

12.01. Pavement Removal and Replacement. The unit prices per square yard for pavement removal and replacement shall be measured for (length x width) payment horizontally along the center line of the pipe, through manholes, and to the edge of the existing pavement; or, where the edge of the existing pavement is not clearly defined, to the edge of the pavement replacement. The unit prices bid for pavement removal and replacement shall include all costs in connection therewith, including cutting, removal, and disposal of old pavement; construction of new pavement; and all extra compaction effort required for backfill beneath pavement.

12.02 Miscellaneous Asphaltic Concrete Paving. Existing valve boxes shall be abandoned by removal or filling with concrete at the discretion of the District. This cost shall be incidental to any bid item associated with asphaltic concrete paving.

12.03. Sidewalk or Driveway Removal and Replacement. The unit prices per square yard bid for sidewalk or driveway removal and replacement shall include all costs involved in cutting and removing sidewalk or driveway, and all labor and materials required to replace the sidewalks.

Measurement for payment for sidewalk or driveway removal and replacement shall be on a square yard basis and shall include only the area actually removed and replaced, between joints, over the pipeline trench.

All costs involved in repairing or removal and replacement of existing sidewalk or driveway outside the specified pay limits, where damaged during the construction operations, shall be considered a subsidiary obligation of Contractor and shall be borne by Contractor.

12.04. MISCELLANEOUS CONCRETE. Concrete for encasement or blocking of pipe and fittings not included as parts of pipelines will be measured for payment as the actual volume of concrete placed within the limits as indicated or specified.

Concrete for total encasement shall be computed using the maximum allowable trench width (or pipe OD plus 24 inches where no maximum is specified), the minimum clear depth below the pipe, and the minimum cover over the pipe, less the volume occupied by the pipe itself.

Unless otherwise authorized by Owner, all additional concrete for encasement or blocking required outside the specified pay limits will be considered a subsidiary obligation of Contractor and no direct payment shall be made therefore.

All concrete which is required in connection with manholes or structures, pavement or sidewalk replacement, and other pay items shall be included in the lump sum or unit price bid for the pay item.

The unit price bid for miscellaneous concrete shall include concrete, reinforcing steel, forms, finishing, curing, and all other work or materials required to complete the concrete work.

Existing valve boxes shall be abandoned by removal or filling with concrete at the discretion of the District. This cost shall be incidental to any bid item associated with concrete paving or other concrete work.

12.05 ASPHALTIC CONCRETE MILLING AND PAVING. Includes the labor, equipment and materials required to perform any necessary milling, placing of asphalt to a depth of 1.5 inches in accordance with specifications and standard drawing #103A. Paid SQUARE YARD (SY).

12.06 ASPHALTIC CONCRETE. Includes the labor, equipment and materials required to perform any necessary removal and replacement of asphalt to a minimum depth of 8 inches or match existing depth (whichever is greater) and abandoning of valve boxes in accordance with specifications and standard drawing #103A. Paid SQUARE YARD (SY).

12.07 ASPHALTIC CONCRETE - DRIVEWAY. Includes the labor, equipment and materials required to perform any necessary removal and replacement of asphalt to a minimum depth of 6 inches or match existing depth (whichever is greater) in accordance with specifications and standard drawing #103A. Culvert repair or replacement shall be considered incidental to driveway restoration. Paid SQUARE YARD (SY).

12.08 ASPHALTIC CONCRETE. – WINTER CHARGE In effect when a sole asphalt plant is operating within a 50 mile radius of the project. Includes the labor, equipment and materials required to perform any necessary removal and replacement of asphalt to a minimum depth of 6 inches or match existing (whichever is greater) and abandoning of valve boxes in accordance with specifications and standard drawing #103A. Paid SQUARE YARD (SY).

12.09 CONCRETE PAVEMENT. Includes the labor, equipment and materials required to remove and replace a minimum of 8" KDOT class A Concrete or to match existing depth (whichever is greater), and abandoning of valve boxes in accordance with specifications and standard drawing #103A. Paid SQUARE YARD (SY).

12.10 CONCRETE DRIVEWAY. Includes the labor, equipment and materials required to remove and replace the driveway concrete to a minimum depth of 6 inches or match existing depth (whichever is greater). Culvert repair or replacement shall be considered incidental to driveway restoration. Paid SQUARE YARD (SY).

12.11 CONCRETE CURBING. Includes the labor, equipment and materials required to place KDOT class A Concrete to match existing in accordance with specifications and standard drawings. Paid LINEAR FEET (LF).

12.12 CONCRETE SIDEWALK. Includes the labor, equipment and materials required to remove and replace the sidewalk concrete to match existing depth. This item also includes any requirements to install sidewalk ramps per ADA standards. Paid SQUARE YARD (SY).

12.13 GRAVEL DRIVEWAY/PARKING AREA. Includes the labor, equipment and materials required to replace and grade gravel driveway to match existing depth. Paid SQUARE YARD (SY).

12.14 BEST MANAGEMENT PRACTICE. Includes the labor, equipment and materials required to conform and comply with the best management practices to control soil erosion as shown on the plans and specifications. Paid LUMP SUM (LS).

12.15 CLASS III CHANNEL LINING. Includes the labor, equipment, and materials to install new KYTC Class III channel lining (minimum of 2 feet think) at the locations specified on the plans. Paid SQUARE YARD (SY).

12.16 REMOVE TREE Includes the labor, equipment, and materials to remove and dispose of a tree as specified on the plans. Bid item includes stump removal, topsoil restoration, seeding and strawing. Note: Plans specify the removal of substantial trees necessary to install the water main. Smaller trees and brush not called out on the plans which need to be removed as part of the water main installation shall be considered incidental to the project. Paid EACH (EA).

End of Section

SECTION 01070

ABBREVIATIONS OF TERMS AND ORGANIZATIONS

1. LIST OF ABBREVIATIONS. Reference to standards and organizations in the Specifications shall be by the following abbreviated letter designations:

AA	Aluminum Association
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
ACPA	American Concrete Pipe Association
AFBMA	Antifriction Bearing Manufacturers Association
AGA	American Gas Association
AGMA	American Gear Manufacturers Association
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
ANSI	American National Standards Institute
APA	American Plywood Association
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASSE	American Society of Sanitary Engineers
ASTM	American Society for Testing and Materials
AWG	American Wire Gage
AWPA	American Wood-Preservers' Association
AWPB	American Wood Preservers Bureau
AWS	American Welding Society
AWWA	American Water Works Association
BHMA	Builders Hardware Manufacturers Association
CDA	Copper Development Association
CISPI	Cast Iron Soil Pipe Institute
CRSI	Concrete Reinforcing Steel Institute
CS	Commercial Standard (U.S. Department of Commerce)
DIPRA	Ductile Iron Pipe Research Association
EEI	Edison Electric Institute
EJCDC	Engineers' Joint Contract Documents Committee
EPA	Environmental Protection Agency
Fed Spec	Federal Specification
FHWA	Federal Highway Administration

FIA	Factory Insurance Association
FM	Factory Mutual
IEEE	Institute of Electrical and Electronics Engineers
IFI	Industrial Fasteners Institute
IRI	Industrial Risk Insurers
MIL	Military Specification
MSS	Manufacturers Standardization Society of Valve and Fitting Industry
NBS	National Bureau of Standards
NCSPA	National Corrugated Steel Pipe Association
NEC	National Electrical Code
NECA	National Electrical Contractors Association
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NIST	National Institute of Standards and Technology
NPC	National Plumbing Code
NPT	National Pipe Thread
NRMCA	National Ready Mixed Concrete Association
NSC	National Safety Council
NSF	National Sanitation Foundation
OSHA	Occupational Safety and Health Administration
PCA	Portland Cement Association
PCI	Prestressed Concrete Institute
PS	Product Standard
SAE	Society of Automotive Engineers
SI	Système International des Unitès (International System of Units)
SPFA	Steel Plate Fabricators Association
SSI	Scaffolding and Shoring Institute
SSPC	Steel Structures Painting Council
UL	Underwriters' Laboratories

End of Section

Section 01300

SUBMITTALS

1. PROGRESS SCHEDULE. After the preconstruction conference and before Work is started, Contractor shall submit to Owner for review a schedule of the proposed construction operations. Owner shall cooperate with Contractor in arrangements for continuity of service and operation of valves and other control facilities. The progress schedule shall indicate the sequence of the Work, the time of starting and completion of each part, and the time for making connections to existing piping, structures, or facilities.

2. PROGRESS REPORTS. A progress report shall be furnished to Owner with each Application for Payment. If the Work falls behind schedule, Contractor shall submit additional progress reports at such intervals as Owner may request.

Each progress report shall include sufficient narrative to describe current and anticipated delaying factors, their effect on the progress schedule, and proposed corrective actions. Any Work reported complete, but which is not readily apparent to Owner, must be substantiated with satisfactory evidence.

3. SURVEY DATA. All field books, notes, and other data developed by Contractor in performing surveys required as part of the Work shall be available to Owner for examination throughout the construction period. All such data shall be submitted to Owner with the other documentation required for final acceptance of the Work.

4. SHOP DRAWINGS AND ENGINEERING DATA.

4.01. General. Shop Drawings and engineering data (submittals) covering all equipment and fabricated and building materials which will become a permanent part of the Work under this Contract shall be submitted to Owner, at the Owner's address given in the Agreement. Submittals shall verify compliance with the Contract Documents, and shall include drawings and descriptive information in sufficient detail to show the kind, size, arrangement, and operation of component materials and devices; the external connections, anchorages, and supports required; performance characteristics; and dimensions needed for installation and correlation with other materials and equipment. When an item consists of components from several sources, Contractor shall submit a complete initial submittal including all components.

All submittals, regardless of origin, shall be stamped with the approval of Contractor and identified with the name and number of this Contract, Contractor's name, and references to applicable specification paragraphs and Contract Drawings. Each submittal shall indicate the intended use of the item in the Work. When catalog pages are submitted, applicable items shall be clearly identified and inapplicable data crossed out. The current revision, issue number, and date shall be indicated on all drawings and other descriptive data.

Contractor shall be solely responsible for the completeness of each submission. Contractor's stamp of approval is a representation to Owner that Contractor accepts sole responsibility for determining and verifying all quantities, dimensions, field construction

criteria, materials, catalog numbers, and similar data, and that Contractor has reviewed and coordinated each submittal with the requirements of the Work and the Contract Documents.

All deviations from the Contract Documents shall be identified as deviations on each submittal and shall be tabulated in Contractor's letter of transmittal. Such submittals shall, as pertinent to the deviation, indicate essential details of all changes proposed by Contractor.

One copy of each drawing and necessary data shall be submitted to Owner for its record. The Owner intends to use this for information only. If requested by Contractor, up to three additional copies may be submitted for review and approval by Owner. Owner will return marked copies (or one marked reproducible copy) to Contractor. Owner will not accept submittals from anyone but Contractor. Submittals shall be consecutively numbered in direct sequence of submittal and without division by subcontracts or trades.

4.02. Owner's Review of Submittals. Owner's review of submittals will cover only general conformity to the Drawings and Specifications, external connections, and dimensions which affect the layout. Owner's review does not indicate a thorough review of all dimensions, quantities, and details of the material, equipment, device, or item shown. Owner's review shall not relieve Contractor of Contractor's sole responsibility for errors, omissions, or deviations in the drawings and data, nor of Contractor's sole responsibility for compliance with the Contract Documents.

If Contractor requests a review and response, Owner's submittal review period shall be 14 consecutive calendar days in length and shall commence on the first calendar day immediately following the date of arrival of the submittal or resubmittal in Owner's office. The time required to mail the submittal or resubmittal back to Contractor shall not be considered a part of the submittal review period.

When the drawings and data are returned marked "NOT ACCEPTABLE" or "RETURNED FOR CORRECTION", the corrections shall be made as noted thereon and as instructed by Owner and corrected copies (or one corrected reproducible copy) resubmitted.

When the drawings and data are returned marked "EXCEPTIONS NOTED", "NO EXCEPTIONS NOTED", or "RECORD COPY", no additional copies need be furnished unless requested by Owner at time of review.

4.03. Resubmittal of Drawings and Data. Contractor shall accept full responsibility for the completeness of each resubmittal. Contractor shall verify that all corrected data and additional information previously requested by Owner are provided on the resubmittal.

When corrected copies are resubmitted, Contractor shall in writing direct specific attention to all revisions and shall list separately any revisions made other than those called for by Owner on previous submissions.

Requirements specified for initial submittals shall also apply to resubmittals. Resubmittals shall bear the number of the first submittal followed by a letter (A, B, etc.) to indicate the sequence of the resubmittal.

Re-submittals shall be made within 30 days of the date of the letter returning the material to be modified or corrected, unless within 14 days Contractor submits an acceptable request for an extension of the stipulated time period, listing the reasons the resubmittal cannot be completed within that time.

Any need for more than one resubmission, or any other delay in obtaining Owner's review of submittals, will not entitle Contractor to extension of the Contract Times unless delay of the Work is directly caused by a change in the Work authorized by a Change Order.

End of Section

Section 01400

QUALITY CONTROL

1. TESTING SERVICES. All tests to determine compliance with the Contract Documents shall be performed by an independent commercial testing firm acceptable to Owner. The testing firm's laboratory shall be staffed with experienced technicians, properly equipped and fully qualified to perform the tests in accordance with the specified standards.

Testing services provided by Owner are for the sole benefit of Owner; however, test results shall be available to Contractor. Testing necessary to satisfy Contractor's internal quality control procedures shall be the sole responsibility of Contractor.

1.01. Testing Services Furnished by Contractor. Unless otherwise specified, Contractor shall provide all testing services in connection with the following:

Concrete materials and mix designs.
Asphaltic concrete materials and mix designs.
Embedment, fill and backfill materials.
All other tests and engineering data required for Owner's review of materials and equipment proposed to be used in the Work.

Contractor shall obtain Owner's acceptance of the testing firm before having services performed, and shall pay all costs for these testing services.

1.02. Testing Services Furnished by Owner. Unless otherwise specified, Owner shall provide for tests made on the following materials and equipment:

Concrete.
Asphaltic concrete.
Moisture-density and relative density tests on embedment, fill, and backfill materials.
In-place field density tests on embedments, fills, and backfill.
Other materials and equipment at the discretion of Owner.

Testing, including sampling, will be performed by Owner or the testing firm's laboratory personnel, in the general manner indicated in the Specifications. Owner shall determine the exact time, location, and number of tests, including samples.

Arrangements for delivery of samples and test specimens to the testing firm's laboratory will be made by Owner. The testing firm's laboratory shall perform all laboratory tests within a reasonable time consistent with the specified standards and shall furnish a written report of each test.

Contractor shall furnish all sample materials and cooperate in the testing activities, including sampling. Contractor shall interrupt the Work when necessary to allow testing, including sampling, to be performed. Contractor shall have no claim for an increase in Contract Price or Contract Times due to such interruption. When testing activities,

including sampling, are performed in the field by Owner or the testing firm's laboratory personnel, Contractor shall furnish personnel and facilities to assist in the activities.

If testing shows workmanship and/or materials does not meet established requirements, the Contractor shall be responsible for all additional testing cost to ensure compliance.

1.03. Transmittal of Test Reports. Written reports of tests and engineering data furnished by Contractor for Owner's review of materials and equipment proposed to be used in the Work shall be submitted as specified for Shop Drawings.

End of Section

Section 01500

TEMPORARY FACILITIES

1. PRESENCE IN THE AREA. The Contractor understands and agrees that during the performance of the Contract, it shall maintain a presence within such proximity of the Work Site which will allow it to respond to an emergency at the Work Site within one hour of receiving notice of an emergency, including emergencies occurring during non-working hours. The Contractor shall provide a list of emergency phone numbers for such purposes. If the Contractor does not have such a presence, it may satisfy this requirement by sub-contracting with a sub-contractor that does have such a presence, provided that any such sub-contractor must be approved by the Owner, in its sole discretion, prior to the project pre-construction meeting.

2. WATER. Water in reasonable amounts required for and in connection with the Work to be performed will be furnished at existing fire hydrants by Owner without charge to Contractor. All water used in testing and disinfection of mains will be furnished by the Owner for the first test only. Contractor shall furnish necessary pipe, hose, nozzles, and tools and shall perform all necessary labor. Contractor shall make arrangements with Owner (who will fix the time, rate, and duration of each withdrawal from the distribution system) as to the amount of water required and the time when the water will be needed. Unnecessary waste of water will not be tolerated. Special hydrant wrenches shall be used for opening and closing fire hydrants. In no case shall pipe wrenches be used for this purpose.

3. POWER. Contractor shall provide all power for heating, lighting, operation of Contractor's plant or equipment, or for any other use by Contractor.

4. TELEPHONE SERVICE. Contractor shall make all necessary arrangements and pay all installation charges for telephone lines in its offices at the Site and shall provide all telephone instruments.

5. SANITARY FACILITIES. Contractor shall furnish temporary sanitary facilities at the Site, as provided herein, for the needs of all construction workers and others performing work or furnishing services on the Project.

Sanitary facilities shall be of reasonable capacity, properly maintained throughout the construction period, and obscured from public view to the greatest practical extent. If toilets of the chemically treated type are used, at least one toilet will be furnished for each 20 persons. Contractor shall enforce the use of such sanitary facilities by all personnel at the Site.

6. MAINTENANCE OF TRAFFIC. Contractor shall conduct his work to interfere as little as possible with public travel, whether vehicular or pedestrian. Whenever it is necessary to cross, obstruct, or close roads, driveways, and walks, whether public or private, Contractor shall provide and maintain suitable and safe bridges, detours, or other temporary expedients for the accommodation of public and private travel, and shall give reasonable notice to owners of private drives before interfering with them. Such maintenance of traffic will not be required when Contractor has obtained permission from the owner and tenant of

private property, or from the authority having jurisdiction over public property involved, to obstruct traffic at the designated point.

In making open cut street crossings, Contractor shall not block more than one-half of the street at a time. Whenever possible, Contractor shall widen the shoulder on the opposite side to facilitate traffic flow. Temporary surfacing shall be provided as necessary on shoulders.

The Contractor shall wherever necessary or as required by the Owner or the authority having jurisdiction provide, erect and maintain proper lights, signs, barricades, temporary guardrail, other traffic control devices, and furnish watchmen and flagmen as may be necessary to maintain safe traffic conditions in accordance with the Manual of Uniform Traffic Control Devices. Contractor shall use standard signage found in the latest edition of the Federal Highway Administration's "Standard Highway Signs and Markings" manual.

The Contractor shall be liable for and hold the Owner free and harmless from all damages occasioned in any way by its actions or neglect or those of its agents, employees, or workmen.

Work that requires the Contractor to shut down the road on weekends or at nights is considered an incidental to the project.

The Contractor at all times shall conduct the work in such manner as to cause as little interference as possible with private business or with private and public travel on the public highway. All damage (other than that resulting from normal wear and tear) to existing roads or pavements shall be repaired to withstand traffic in a safe condition.

Where the Contractor finds it necessary to remove excavated material to some other location, care should be taken not to overload trucks, which would in turn spill material out upon highways. Any such material spilled upon highways shall be immediately cleaned up from the location and properly disposed of per applicable regulation.

Where it is necessary and is agreeable with public and private property owners, excavated materials may be temporarily piled in the streets or roadways, however, one lane of traffic must be maintained at all times.

After excavated materials have been removed, all hard surface streets or roadways shall be thoroughly cleaned and left free of dirt, gravel and dust. Streets or roadways, which do not have hard surfaces, must be restored to their original condition at the expense of the Contractor. Streets and roadways shall be kept in a safe and passable condition at all times.

6.01. Temporary Bridges. Contractor shall construct substantial bridges at all points where it is necessary to maintain traffic across pipeline construction. Bridges in public streets, roads, and highways shall be acceptable to the authority having jurisdiction thereover. Bridges erected in private roads and driveways shall be adequate for the service to which they will be subjected. Bridges shall be provided with substantial guardrails and with suitably protected approaches. Footbridges shall be at least 4 feet wide, provided with handrails and uprights of dressed lumber. Bridges shall be maintained in place as long as the conditions of the Work require their use for safety of the public. When necessary for

the proper prosecution of the Work in the immediate vicinity of a bridge, the bridge may be relocated or temporarily removed for such period as Owner may permit.

6.02. Detours. Where required by the authority having jurisdiction thereover that traffic be maintained over any construction work in a public street, road, or highway, and the traffic cannot be maintained on the alignment of the original roadbed or pavement, Contractor shall, at its own expense, construct and maintain a detour around the construction work. Each detour shall include a bridge across the pipe trench and all necessary barricades, guardrails, approaches, lights, signals, signs, and other devices and precautions necessary for protection of the Work and safety of the public.

7. BARRICADES AND LIGHTS. All streets, roads, highways, and other public thoroughfares, which are closed to traffic, shall be protected by effective barricades on which shall be placed acceptable warning signs. Barricades shall be located at the nearest intersecting public highway or street on each side of the blocked section.

All open trenches and other excavations shall have suitable barricades, signs, and lights to provide adequate protection to the public. Obstructions, such as material piles and equipment, shall be provided with similar warning signs and lights.

All barricades and obstructions shall be illuminated with warning lights from sunset to sunrise. Material storage and conduct of the Work on or alongside public streets and highways shall cause the minimum obstruction and inconvenience to the traveling public.

All barricades, signs, lights, and other protective devices shall be installed and maintained in conformity with applicable statutory requirements and, where within railroad and highway rights-of-way, as required by the authority having jurisdiction thereover.

8. TRAFFIC CONTROL. In addition to the requirements of the maintenance of traffic and barricades and lights paragraphs in this section, traffic control shall be as set forth herein.

During periods of inclement weather, rush-hour traffic, or during periods of unusually heavy traffic, the Owner may require the Contractor to cease operations in order to adequately handle the traffic. The Owner reserves the right to require the suspension or delay of certain operations, or the expediting of other operations, at no additional cost to the Owner, to provide a proper sequence of operations which will promote the satisfactory movement of traffic. The Owner may require additional barricades, lights, or flagmen at any time or at any place necessary for proper protection of traffic, but approval by the Owner of the Contractor's method of operation shall not relieve the Contractor of his responsibility to protect traffic.

The use and duration of using heavy steel plates to convey traffic across open excavations shall be kept to a minimum. Steel plates shall be secured in an appropriate manner to prevent them from moving. The purpose of this requirement is to minimize the sound to the residents, institutions, commercial establishments, etc. The Owner reserves the right, at no additional cost to the Owner, to require the Contractor to complete certain operations and street re-paving so steel plates are not required.

The use of heavy steel plates during should be keep to a minimum. The Contractor shall place traffic cones behind the curb or other visible location to help identify the beginning and termination of the steel plates. Special precautions shall be taken by the Contractor if steel

plates are used during inclement weather. The Contractor shall be responsible for notifying the authority having jurisdiction over the roadway maintenance (snow removal) with the locations of the steel plates prior to each inclement weather event. The Contractor shall maintain the traffic cones and steel plates.

Contractor shall take extra precautions to provide and maintain emergency access on all streets and roads and to all residential, commercial, and other properties for police and fire departments and emergency medical service throughout the construction operations.

Contractor shall maintain the use of existing walks for pedestrians at all times. Additional requirements are specified in the temporary bridge subparagraph in this section.

9. TRAFFIC CONTROL PLAN. To obtain a permit to work within public rights-of-way, Contractor may be required to prepare and submit to the appropriate agencies, a traffic control plan in conformance with the requirements of the authority having jurisdiction thereover.

10. FENCES. All existing fences affected by the Work shall be maintained by Contractor until completion of the Work. Fences which interfere with construction operations shall not be relocated or dismantled until written permission is obtained from the owner of the fence, and the period the fence may be left relocated or dismantled has been agreed upon. A copy of all written permissions shall be submitted to Owner. Where fences must be maintained across the construction easement, adequate gates shall be installed. Gates shall be kept closed and locked at all times when not in use.

On completion of the Work across any tract of land, Contractor shall restore all fences to their original or to a better condition and to their original location.

11. PROTECTION OF PUBLIC AND PRIVATE PROPERTY, DAMAGE TO EXISTING PROPERTY. Contractor shall protect, shore, brace, support, and maintain all underground pipes, conduits, drains, and other underground construction uncovered or otherwise affected by his construction operations. All pavement, surfacing, driveways, curbs, walks, buildings, utility poles, guy wires, fences, and other surface structures affected by construction operations, together with all sod, shrubs, trees in yards, parkways, and medians shall be restored to their original or better condition, whether within or outside the easement. Unless otherwise specified, all replacements shall be made with new materials.

Sodded and landscaped areas on improved property (yards) shall be disturbed only to the extent required to permit construction. Such areas shall not be used as storage sites for construction supplies and, insofar as practicable, shall be kept free from stockpiles or excavated materials.

No trees shall be removed outside the permanent easement, except where authorized by Owner. Hand excavation shall be employed as necessary to prevent injury to trees. Trees left standing shall be adequately protected against damage from construction operations.

Contractor shall be responsible for all damage to streets, curbs/gutters, roads, sidewalks, shoulders, ditches, embankments, culverts, bridges, traffic loops and other public or private property, regardless of location or character, which may be caused by transporting equipment, materials, or workers to or from the Work or any part or site thereof, whether by him or his Subcontractors. Contractor shall make satisfactory and acceptable arrangements with the

owner of, or the agency or authority having jurisdiction over, the damaged property concerning its repair or replacement or payment of costs incurred in connection with the damage and shall furnish a written verification of all agreements.

Should the Contractor's operations damage any existing underground or aboveground utility, installation, structure, or other construction, Contractor shall immediately notify the authority owning or having jurisdiction over and control of the utility, installation, structure, or other construction, and make a report of such damage. A copy of the report shall be submitted to the Owner. The damaged item shall be repaired immediately by and at the expense of the Contractor unless otherwise specified or acceptable to the authority or owner having jurisdiction over, or to the Owner.

The utility, installation, structure, or other structures damaged by Contractor's operations shall be repaired, replaced, or otherwise restored in accordance with the local ordinances, standards, and requirements of the applicable authority or owner having jurisdiction thereover and shall be subject to acceptance by the Owner.
Special precaution shall be taken by the Contractor to avoid damage to existing overhead and underground utilities owned and operated by the Owner or other public or private utility companies.

With particular respect to existing underground utilities, all available information concerning their location has been shown on the drawings. While it is believed that the locations shown are reasonably correct, the Owner cannot guarantee the accuracy or adequacy of this information.

Before proceeding with the work, the Contractor shall confer with all public or private companies, agencies, property owners, or departments that own and operate utilities in the vicinity of the construction work. The purpose of this conference or conferences shall be to notify said companies, agencies or departments of the proposed construction schedule, verify the location of and possible interference with the existing utilities, fire protection systems, lawn irrigation systems, etc., that are shown on the plans, arrange for necessary suspensions of service, and make arrangements to locate and avoid interference with all other utilities (including house connections) that are not shown on the plans. The Owner has no objection to the Contractor arranging for said utility companies, agencies, or departments to locate and uncover their own utilities, however, insofar as the Owner is concerned, the Contractor shall bear entire responsibility for locating and avoiding or repairing damage to said existing utilities.

Where existing utilities or other underground structures are encountered, they shall not be displaced or molested unless necessary, and in such case they shall be replaced in as good or better condition than found as quickly as possible. All such utilities that are so damaged or molested shall be replaced at the Contractor's expense unless in the opinion of the Owner such damage was caused through no fault or action of the Contractor.

It is expected that the Contractor will be diligent in its efforts and use every possible means to locate existing utilities. Any claims for unavoidable damage based on improper or unknown locations will be thoroughly examined in the light of the Contractor's efforts to locate the said utilities or obstructions prior to beginning.

When construction is completed, the private property owner's facilities and grounds shall be restored to as good or better condition than found and as quickly as possible at the Contractor's expense.

All water mains and water service connections damaged by Contract's operations will be repaired by the Owner at the expense of the Contractor unless other arrangements are made. Customer irrigation piping damaged by Contractor's operations shall be repaired by and at the cost of the Contractor.

All fire hydrants and water control valves shall be kept free from obstruction and available for use at all times.

12. TREE AND PLANT PROTECTION. Tree and plant protection is of prime importance. Except where otherwise authorized, indicated, or specified, no trees or plants shall be removed. Activities near trees that are to be protected shall be kept to a minimum. Tree protection shall also include trimming, when necessary, to prevent damage by construction equipment.

Trees and plants to be removed shall be removed in such a manner as to avoid injury to surrounding trees and plants. Contractor shall be responsible for disposal of all trees and plants removed or damaged.

13. HAUL ROUTES. Contractor shall obtain and pay for all necessary permits from the applicable authority having jurisdiction thereover to allow use of public streets to transport equipment and material to and from the Site. At such time the Contractor shall request the agency having jurisdiction to establish the haul routes. A copy of the permit and designated haul routes shall be provided to the Owner prior to commencement of Work in that area.

14. PARKING. Contractor shall provide and maintain suitable parking areas for the use of all construction workers and others performing work or furnishing services in connection with the Project, as required to avoid any need for parking personal vehicles where they may interfere with public traffic, Owner's operations, or construction activities.

Contractor shall clean up all parking areas used and return them to their original state.

The location of the Contractor's parking areas shall be acceptable to Owner, and the owner and tenant of private property or to the authority having jurisdiction over public property upon which the parking area will be located.

15. RESIDENTIAL PARKING. Contractor shall provide appropriate areas for residents to park their vehicles during the construction operations adjacent to their properties, if required. This shall include making the appropriate areas available to the residents by not storing construction materials or equipment in these areas and providing signs and other notification methods acceptable to the Owner for instructing the residents on the location of the temporary parking and its intended use.

Additional requirements for notifying property owners and tenants of available temporary parking are covered in the project requirements section.

16. ACCESS ROADS. Contractor shall establish and maintain temporary access roads to various parts of the Site as required to complete the Project. Such roads shall be available for the use of all others performing work or furnishing services in connection with the Project.

17. NOISE CONTROL. Contractor shall take reasonable measures to avoid unnecessary noise. Such measures shall be appropriate for the normal ambient sound levels in the area during working hours. All construction machinery and vehicles shall be equipped with practical sound-muffling devices, and operated in a manner to cause the least noise consistent with efficient performance of the Work.

During construction activities on or adjacent to occupied buildings, and when appropriate, Contractor shall erect screens or barriers effective in reducing noise in the building and shall conduct his operations to avoid unnecessary noise which might interfere with the activities of building occupants.

18. DUST CONTROL. Contractor shall take reasonable measures to prevent unnecessary dust. Earth surfaces subject to dusting shall be kept moist with water or by application of a chemical dust suppressant. When practicable, dusty materials in piles or in transit shall be covered to prevent blowing dust.

Buildings or operating facilities, which may be affected adversely by dust, shall be adequately protected from dust. Existing or new machinery, motors, instrument panels, or similar equipment shall be protected by suitable dust screens. Proper ventilation shall be included with dust screens.

19. STORM WATER EROSION AND PREVENTION. The following is to be used as a guideline in conjunction with the plans for temporary drainage provisions, erosion control and pollution control as required by a Sanitation District #1 Permit and Kentucky Pollution Discharge Elimination System (KPDES). Reference “Kentucky Best Management Practices for Controlling Erosion, Sediment, and Pollutant Runoff from Construction Sites” and the “Northern Kentucky Sanitation District No. 1 Storm Water Permitting Guide”.

19.01. GRADING PERMIT, NOTICE of INTENT and NOTICE of TERMINATION. The owner will be responsible for acquiring a Grading Permit from Sanitation District #1 and filing a Notice of Intent/Notice of Termination with the KPDES. A Grading Permit is necessary when the square footage of the pervious and impervious areas are equal to or greater than one acre.

A. Projects less than one acre:
    - Best Management Practices that are shown on the plans and specifications are a minimum. Contractors are responsible for providing the minimum, and, if necessary will provide additional BMP’s to satisfy the situation and the regulating authority.

B. Projects greater than one acre:
    - Best Management Practices that are shown on the plans and specifications are a minimum. Contractors are responsible for providing the minimum, and, if necessary will provide additional BMP’s to satisfy the situation and the regulating authority.

- Sanitation District #1 must be contacted at least 72 hours prior to any construction activity. (Andy Amen @ 859-578-6880)
- Site stabilization shall begin within 14 days where construction activity has permanently ceased.
- Site stabilization shall begin within 21 days where construction activity has temporarily ceased.
- BMP'S shall be checked a minimum of every 7 days and within 24 hours after a 0.5" rainfall. Contractor shall keep a maintenance log book that records the date, weather event, reason for inspection and signature. The maintenance log book shall be turned over to the Owner at the end of the project.

19.02. TEMPORARY DRAINAGE PROVISIONS. Contractor shall provide for the drainage of storm water and such water as may be applied or discharged on the Site in performance of the Work. Drainage facilities shall be adequate to prevent damage to the Work, the Site, and adjacent property.

Existing drainage channels and conduits shall be cleaned, enlarged, or supplemented as necessary to carry all increased runoff attributable to Contractor's operations. Dikes shall be constructed as necessary to divert increased runoff from entering adjacent property (except in natural channels), to protect Owner's facilities and the Work, and to direct water to drainage channels or conduits. Ponding shall be provided as necessary to prevent downstream flooding.

19.03. EROSION CONTROL. Contractor shall prevent erosion of soil on the Site and adjacent property resulting from it's construction activities. Effective measures shall be initiated prior to the commencement of clearing, grading, excavation, or other operation that will disturb the natural protection.

Work shall be scheduled to expose areas subject to erosion for the shortest possible time, and natural vegetation shall be preserved to the greatest extent practicable. Temporary storage and construction buildings shall be located, and construction traffic routed, to minimize erosion. Temporary fast-growing vegetation or other suitable ground cover shall be provided as necessary to control runoff.

20. POLLUTION CONTROL. Contractor shall prevent the pollution of drains and watercourses by sanitary wastes, sediment, debris, and other substances resulting from construction activities. No sanitary wastes will be permitted to enter any drain or watercourse other than sanitary sewers. No sediment, debris, or other substance will be permitted to enter sanitary sewers, and reasonable measures shall be taken to prevent such materials from entering any drain or watercourse.

21. CUSTOMER NOTIFICATION. The Contractor after approval by the Owner's representative shall notify all affected Owner customers a minimum of 48 hours prior to interrupting water service. Notification shall be made by the Contractor using the Northern Kentucky Water District "Interruption of Service Notice". All Owner customers shall be notified prior to having their water turned-off to have ample time to draw water for use until service is restored. Under no circumstance shall a customer of the Owner be without water service overnight. If water service or existing water system cannot be interrupted during normal daytime hours due to water needs or high demands, the contractor may be required

to conduct the work at night or on the weekend. This work is considered an incidental to the project.

It is the Contractor's responsibility to post "No Parking" signs twenty-four (24) hours in advance of starting work in designated parking zones. Said signs shall be removed upon completion of work. Signs shall not be left posted over weekends or holidays.

22. UNSAFE CONDITIONS. The Owner reserves the right to take whatever action necessary to correct an unsafe condition created by the Contractor at the Contractor's expense.

23. SECURITY. CONTRACTOR shall be responsible for protection of the Site, and all the Work, materials, equipment, and existing facilities thereon, against vandals and other unauthorized persons.

No Claim shall be made against OWNER by reason of any act of an employee or trespasser, and CONTRACTOR shall make good all damage to OWNER's property resulting from CONTRACTOR's failure to provide security measures as specified.
Security measures shall be at least equal to those usually provided by OWNER to protect OWNER's existing facilities during normal operation, but shall also include such additional security fencing, barricades, lighting, and other measures as required to protect the Site.

24. STREAM CROSSINGS. The following is reprint of the requirements and conditions for blue line stream crossings which shall be followed:

SECTION 401 WATER QUALITY CERTIFICATION
CONDITIONS FOR NATIONWIDE PERMIT NO. 12
WITHIN THE COMMONWEALTH OF KENTUCKY

General Certification -Nationwide Permit #12 - Utility Line Backfill and Bedding

This General Certification is issued January 6, 2017, in conformity with the requirements of Section 401 of the Clean Water Act of 1977, as amended (33USC 1314), as well as Kentucky Statute KRS 224.16-070.

The Commonwealth of Kentucky hereby certifies under Section 401 of the Clean Water Act (CWA) that it has reasonable assurances that applicable water quality standards under Kentucky Administrative Regulations Title 401, Chapter 5, established pursuant to Sections 301, 302, 304, 306 and 307 of the CWA, will not be violated for the activity covered under 33 CFR Part 330 Appendix A(B) (12), namely utility line backfill and bedding provided that the following conditions are met:

1. This general Water Quality Certification is limited to the crossing of streams by utility lines. The length of a single utility crossing shall not exceed twice the width of the stream. This document does not authorize the installation of utility lines in a linear manner within the stream channel or below the top of the stream bank.

2. The provisions of 401 KAR 5:005 Section 8 are hereby incorporated into this General Water Quality Certification. Namely, "Sewer lines shall be located at least 50 feet away from a stream which appears as a blue line on a USGS 7 ½ minute topographic map except where the sewer alignment crosses the stream. The distance shall be measured from the top of the stream bank. The cabinet may allow construction within the 50' buffer if adequate methods are used to prevent soil from entering the stream.

   Gravity sewer lines and force mains that cross streams shall be constructed by methods that maintain normal stream flow and allow for a dry excavation. Water pumped from the excavation shall be contained and allowed to settle prior to re-entering the stream. Excavation equipment and vehicles shall operate outside of the flowing portion of the stream. Spoil material from the sewer line excavation shall not be allowed to enter the flowing portion of the stream." The provisions of this condition shall apply to all types of utility line stream crossings.

3. Removal of riparian vegetation in the utility line right-of-way shall be limited to that necessary for equipment access. Effective erosion and sedimentation control measures must be employed at all times during the project to prevent degradation of waters of the Commonwealth. Site regarding and reseeding will be accomplished within 14 days after disturbance.

4. Utility line construction projects through jurisdictional wetlands shall not result in conversion of the area to non-wetland status.

5. This General Certification shall not apply to those waters of the Commonwealth identified as Outstanding Resource Waters, Exceptional Waters or Cold Water Aquatic Habitat Waters, as designated by the Division of Water. An individual Water Quality Certification will be required for projects in these waters.

Non-compliance with the conditions of this general certification or violation of Kentucky state water quality standards may result in civil penalties.

This General Certification is issued January 6, 2017, (expires 5 years from this date) in conformity with the requirements of Section 401 of the Clean Water Act of 1977, as amended (33USC 1314), as well as Kentucky Statute KRS 224.16-070.

For additional information contact: Kentucky Division of Water, Water Quality Branch, 14 Reilly Road, Frankfort, Ky 40601 Phone (502)564-3410 Fax (502)564-4245

NATIONWIDE PERMIT CONDITIONS

GENERAL CONDITIONS: The Following general conditions must be followed in order for any authorization by a NWP to be valid:

1. **Navigation**. No activity may cause more than a minimal adverse effect on navigation.

2. Proper maintenance. Any structure of fill authorized shall be properly maintained, including maintenance to ensure public safety.

3. Erosion and siltation controls. Appropriate erosion and siltation controls must be used and maintained in effective operating condition during construction, and all exposed soil and other fills, as well as any work below the ordinary high water mark or high tide line, must be permanently stabilized at the earliest practicable date.

4. Aquatic life movements. No activity may substantially disrupt the movement of those species of aquatic life indigenous to the water body, including those species which normally migrate through the area, unless the activity s primary purpose is to impound water.

5. Equipment. Heavy equipment working in wetlands must be placed on mats, or other measures must be taken to minimize soil disturbance.

6. Regional and case-by-case conditions. The activity must comply with any regional conditions which may have been added by the Division Engineer (see 33 CFR 330.4(e)) and with any case specific conditions added by the Corps or by the state or tribe in its section 401 water quality certification.

7. Wild and Scenic rivers. No activity may occur in a component of the National Wild and Scenic River System; or in a river officially designed by Congress as a "study river" for possible inclusion in the system, while the river is in an official study status; unless the appropriate Federal agency, with direct management responsibility for such river, has determined in writing that the proposed activity will not adversely effect the Wild and Scenic River designation, or study status. Information on Wild and Scenic Rivers may be obtained from the appropriate Federal land management agency in the area (e.g., National Park Service, U.S. Forest Service, Bureau of Land Management, U.S. Fish and Wildlife Service.)

8. Tribal rights. No activity or its operation may impair reserved tribal rights, including, but not limited to, reserved water rights and treaty fishing and hunting rights.

9. Water quality certification. In certain states, an individual Section 401 water quality certification must be obtained or waived (see CFR 330.4(c)).

10. Endangered Species.

a. No activity is authorized under any NWP which is likely to jeopardize the continued existence of a threatened or endangered species or a species proposed for such designation, as identified under the Federal Endangered Species Act, or which is likely to destroy or adversely modify the critical habitat of such species. Non-federal permittees shall notify the District Engineer if any listed species or critical habitat might be affected or is in the vicinity of the project, and shall not begin work on the activity until notified by the District Engineer that the requirements of the Endangered Species Act have been satisfied and that the activity is authorized.

b. Authorization of an activity by a nationwide permit does not authorize the take of a threatened or endangered species as defined under the Federal Endangered Species Act. In the absence of separate authorization (e.g., an ESA Section 10 Permit, a Biological Opinion with incidental take provisions, etc.) from the U.S. Fish and Wildlife Service or the National Marine Fisheries Service, both lethal and non-lethal takes of protected species are in violation of the Endangered Species Act. Information on the location of threatened and

endangered species and their critical habitat can be obtained directly from the offices of the U.S. Fish and Wildlife Service and National Marine Fisheries Service or their world web pages at http://www.fws.gov

11. Historic properties. No activity which may affect historic properties listed, or eligible for listing, in the National Register of Historic Places in authorized, until the DE has complied with the provisions of 33 CFR Part 325, Appendix C. The prospective permittee must notify the District Engineer if the authorized activity may affect historic properties listed, determined to be eligible, or which the prospective permittee has reason to believe may be eligible for listing on the National Register of Historic Places, and shall not begin the activity until notified by the District Engineer that the requirements of the National Historic Preservation Act have been satisfied and that the activity is authorized. Information on the location and existence of historic resources can be obtained from the State Historic Preservation Office and the National Register of Historic Places (see 33 CFR 330.4(g)).

12. Compliance certification. Every permittee who has received a Nationwide permit verification from the Corps will submit a signed certification regarding the completed work and any required mitigation. The certification will be forwarded by the Corps with the authorization letter and will include: a.) A statement that the authorized work was done in accordance with the Corps authorization, including any general or specific conditions; b.) A statement that any required mitigation was completed in accordance with the permit conditions; c.) The signature of the permittee certifying the completion of the work and mitigation.

13. Multiple use of Nationwide permits. In any case where any NWP number 12 through 40 is combined with any other NWP number 12 through 40, as part of a single and complete project, the permittee must notify the District Engineer in accordance with paragraphs a, b, and c on the Notification General Condition number 13. Any NWP number 1 through 11 may be combined with any other NWP without notification to the Corps, unless notification is otherwise required by the terms of the NWPs. As provided at 33 CFR 330.6 © two or more different NWPs can be combined to authorize a single and complete project. However, the same NWP cannot be used more than once for a single and complete project.

SECTION 404 ONLY CONDITIONS:

In addition to the General Conditions, the following conditions apply only to activities that involve the discharge of dredged or fill material into waters of the U.S., and must be followed in order for authorization by the NWPs to be valid:

1. Water supply intakes. No discharge of dredged or fill material may occur in the proximity of a public water supply intake except where the discharge is for repair of the public water supply intake structures or adjacent bank stabilization.

2. Shellfish production. No discharge or dredged or fill material may occur in areas of concentrated shellfish production shellfish production, unless the discharge is directly related to a shellfish harvesting activity authorized by NWP 4.

3. Suitable material. No discharge of dredged or fill material may consist of unsuitable material (e.g., trash, debris, car bodies, asphalt, etc.,) and material discharged

must be free from toxic pollutants in toxic amounts (see Section 307 of the Clean Water Act).

4. Mitigation. Discharges of dredged or fill material into waters of the United States must be minimized or avoided to the maximum extent practicable at the project site (i.e., on-site), unless the District Engineer approves a compensation plan that the District Engineer determines is more beneficial to the environment than on-site minimization or avoidance measures.

5. Spawning areas. Discharge in spawning areas during spawning seasons must be avoided to the maximum extent practicable.

6. Obstruction of high flows. To the maximum extent practicable, discharges must not permanently restrict or impede the passage of normal or expected high flows or cause the relocation of the water (unless the primary purpose of the fill is to Impound waters).

7. Adverse effects from impoundments. If the discharge creates an impoundment of water, adverse effects on the aquatic system caused by the accelerated passage of water and /or the restriction of its flow shall be minimized to the maximum extent practicable.

8. Waterfowl breeding areas. Discharges into breeding areas for migratory waterfowl must be avoided to the maximum extent practicable.

9. Removal of temporary fills. Any temporary fills must be removed in their entirety and the affected areas returned to their preexisting elevation.

TERMS FOR NATIONWIDE PERMIT NO. 12

Utility Line Discharges. Discharges of dredged or fill material associated with excavation, backfill or bedding for utility lines, including outfall and intake structures, provided there is no change in pre-construction contours. A “utility line” is defined as any pipe or pipeline for the transportation of any gaseous, liquid, liquefiable, or slurry substance, for any purpose, and any cable, line, or wire for the transmission for any purpose of electrical energy, telephone and telegraph messages, and rapid and television communication. The term “utility line” does not include activities which drain water of the United States, such as drainage tile, however, it does apply to pipes conveying drainage from another area. This NWP authorizes mechanized landclearing necessary for the installation of utility lines, including overhead utility lines, provided the cleared area is kept to the minimum necessary and pre-construction contours are maintained. However, access roads, temporary or permanent, or foundations associated with overhead utility lines are not authorized by this NWP. Material resulting from trench excavation may be temporarily sidecast (up to three months) into waters of the United States, provided that the material is not placed in such a manner that it is dispersed by currents or other forces. The DE may extend the period of temporary side-casting not to exceed a total of 180 days, where appropriate. The area of waters of the United States that is disturbed must be limited to the minimum necessary to construct the utility line. In wetlands, the top 6” to 12” of the trench should generally be backfilled with topsoil from the trench. Excess material must be removed to upland areas

immediately upon completion of construction. Any exposed slopes and stream banks must be stabilized immediately upon completion of the utility line. (See 33 CFR Part 322).

Notification: The permittee must notify the district engineer in accordance with the "Notification" general condition, if any of the following criteria are met:

a. Mechanized land clearing in a forested wetland;
b. A Section 10 permit is required for the utility line;
c. The utility line in waters of the United States exceeds 500 feet; or,
d. The utility line is placed within a jurisdictional area (i.e., a water of the United States), and it runs parallel to a streambed that is within that jurisdictional area. (Sections 10 and 404)

End of Section

Section 01600

TECHNICAL PROVISIONS

1. WATER LINES

A. General

The Contractor shall furnish all labor, materials, and equipment to install the water lines and appurtenances as shown on the plans and specifications. Construction shall be in accordance with the District's Standard Specifications & Drawings for the Installation of Water Mains. The Contractor is responsible for obtaining a current copy of the Standards from the District which may be obtained from the website at www.nkywater.org or by contacting Denise Manning at (859) 426-2718.

The Contractor shall be responsible for videotaping the entire project prior to the start of construction. The video shall show driveway crossings, drainage ditches, problem areas, lay of the land, etc. One copy shall be forwarded to the District. Pictures of specific areas are recommended.

All private residents shall be notified no less than 48 hours and all businesses**,** industrial and commercial customers shall be notified no less that 1 week prior to the interruption of service. All shutdowns shall be coordinated with the affected residents, with priority given to any special needs customers such as hospitals, schools, and customers with special medical needs

The water lines shall be Class 50 or 52 Ductile Iron Pipe, C900 or C909 P.V.C. Pipe as specified on the Work Order.

The District will secure right-of-way permits as needed.

Unless otherwise specified all pipe fittings, valves, fire hydrants and accessories shall be rated for a minimum of 250 psi working pressure and material as specified herein or shown on the proposal. The pipe and accessories shall be new and unused. The interior of the pipe shall be thoroughly cleaned of foreign matter before being lowered into the trench and shall be kept clean during laying operations by plugging. The full length of each section of pipe shall rest upon the pipe bed with recessed excavation to accommodate bells and joints. Any pipe that has the grade or joint disturbed after laying, shall be taken up and re-laid.

Trench backfill shall be rough graded with ditch lines established and maintained within 500 feet for rural areas and 250 feet for urban areas for actual installation of main unless otherwise directed by the District. Individual roadways shall be completed (final grade established, preparation of the seed bed, and all concrete and asphalt restoration completed) prior to the start of additional roadways unless otherwise approved by the District. Temporary roadway and driveway access shall be maintained during construction.

Pipe shall not be laid in water or when trench or weather conditions are unsuitable for the work, except by permission from the District. When work is not in progress, open ends of pipe and fittings shall be plugged with a watertight plug. Any section of pipe found to be defective before and after laying shall be replaced with sound pipe without additional expense to the District. Fittings at bends in the pipe shall be firmly wedged with concrete block as indicated on the plans against the vertical face of the trench to prevent the fittings from being blown off the lines when under pressure.

SEWER MAIN SEPARATION. A 10' minimum lateral separation between water mains and sewers (defined as any sanitary/combined sewer, septic tank or subsoil treatment system) and sewer manholes, measured from the outside diameter to outside diameter, must be maintained. When a 10' separation is not practical then a variance may be obtained from DOW to maintain an 18" vertical and 18" lateral separation. No variances will be permitted for force mains.

SEWER MAIN CROSSING. Waterlines crossing under or over sewers lines (defined as any sanitary/combined sewer, septic tank or subsoil treatment system) must maintain a minimum vertical clearance of 18" and one full length of pipe shall be located so both joints are as far from the sewer as possible. Special Structural support for the water and sewer pipes may be required.

SEWER LATERALS. Sewer laterals (sewer lines that run between the sewer main and the house or other structure) are owned and maintained by the property owner. Since the sewer lateral is privately owned, locating these lines is very difficult. The Contractor is responsible for locating sewer laterals and shall use care when working near them. The Contractor shall be responsible for any and all damage to a sewer lateral in the area of their work. In the event of a sewer lateral is damaged, the contractor shall immediately notify Sanitation District #1and follow all of their procedures for repair and inspection of the repair.

ORGANIC CONTAMINATION. Mains installed within 200 feet of petroleum tanks and other areas of organic contamination must be ductile iron pipe.

REDUCTION OF LEAD IN DRINKING WATER ACT. All material supplied and installed by the contractor after January 4, 2014 shall meet the applicable requirements of the Reduction of Lead in Drinking Water Act.

B. **Hauling and Storage**

The Contractor shall notify the District when pipe will be received on the job so that proper arrangements may be made for inspecting the unloading and stringing, as well as inspecting and examining the pipe materials.

The Contractor shall be required to deliver all equipment and other materials and place same as and where required for installation. Care must be exercised in the handling of all materials and equipment. The Contractor will be held responsible for all breakage or damage to same caused by his workman, agents, or appliances for handling and moving. Pipes and other castings shall in no case be thrown or dropped from cars, trucks, or

wagons to the ground, but same shall be lowered gently and not allowed to roll against or strike other castings and unyielding objects violently. Pipe and other castings may be unloaded, yarded, and distributed at places that will not interfere with other building operations as the Contractor may elect.

Valves, castings, and other materials shall be yarded or housed in same convenient location by the Contractor. The cost of all hauling, handling, and storage shall be included in the bid prices for this project. The District takes no risk or responsibility for fire, flood, theft, or damage until after final acceptance of work.

2. **WATER MAIN PIPE**

A. **Ductile Iron Pipe**. Ductile iron pipe shall meet the requirements of ANSI A21.51 (AWWA C151)

1. Material. The chemical constituents shall meet the physical property recommendations of ASTM A536 to ensure that the iron is suitable for satisfactory drilling and cutting.

2. Minimum Thickness. Unless otherwise shown on the plans, the minimum thickness of the barrel of the pipe shall be Class 50. All pipe shall be clearly marked as to class by the manufacturer.

3. Coating and Lining. The pipe shall be coated outside with a bituminous coating in accordance with ANSI A 21.51 (AWWA C151) and lined inside with cement mortar and seal coated in accordance with ANSI A21.4 (AWWA- C104).

4. Fittings & Glands. Fittings and glands shall be ductile iron as specified in Section 3A, "Ductile Iron Fittings".

5. Polyethylene Encasement. Ductile Iron Pipe shall be encased with Polyethylene film conforming to ANSI A21.5 (AWWA C105)

6. Tracing Wire. All pipe shall be installed with a 12 gauge solid copper (P.V.C coated) tracing wire taped to the top of the pipe every 5'. Maximum tracing wire length shall be 500' without terminating in a curb stop box. Water main installations that stop short of the permanent fire hydrant tee, the tracing wire shall be terminated in a curb stop box. Splices in the tracing wire shall be kept to minimum and approved by the District. If splices are required, they shall be made with copper split bolt (Ilsco #IK-8 or approved equal) and taped with electrical tape. Should the new pipe be fitted to an existing pipe without a tracing wire, the tracing wire shall be terminated in a curb stop box at the point where the transition is made. Curb stop boxes shall not be located in pavement.

B. **Polyvinyl Chloride Pipe** (P.V.C.). P.V.C. Pipe shall meet the requirements of AWWA C900 and as specified in the Work Order.

1. Material. P.V.C. pipe shall be made from class 12454-A or class 1245-B virgin compounds as defined in ASTM D1784. All compounds shall qualify for a rating of 4000 psi for water at 73.4 degree F. per the requirements of PPI TR3.

2. Minimum Pressure Class. Unless otherwise shown, the minimum pressure class of 150 psi, D.R. 18 shall be used. All pipe shall be clearly marked as to class by the manufacturer.

3. Beveled Spigot. Beveled spigot ends must have a minimum bevel of 8 degrees to a maximum bevel of 15 degrees. The vertical face of the spigot end may not exceed 75% of pipe wall thickness and the horizontal length of the bevel shall not exceed 1.25 inches. Field beveled spigot end shall be made per manufacturers recommendation and as approved by the District. The degree of bevel shall be approved for the type of pipe being installed.

4. P.V.C. Tracing Wire. All P.V.C. pipe shall be installed with a 12 gauge solid copper (P.V.C coated) tracing wire taped to the top of the pipe every 5'. Maximum tracing wire length shall be 500' without terminating in a curb stop box. Water main installations that stop short of the permanent fire hydrant tee, the tracing wire shall be terminated in a curb stop box. Splices in the tracing wire shall be kept to minimum and approved by the District. If splices are required, they shall be made with copper split bolt (Ilsco #IK-8 or approved equal) and taped with electrical tape. Curb stop boxes shall not be located in pavement.

5. Transition between D.I.P. and P.V.C. pipe shall be made with some type of ductile iron fitting.

6. P.V.C. Pipe Shipping, Handling & Storage. The front end of all pipe delivered by truck shall be covered for protection against exhaust fumes. P.V.C. pipe shall be protected from exposure to sunlight according to manufacturer's recommendations. Pipe will not be accepted for installation if discoloration is evident due to sunlight or other exposure. Pipe shall be stored in such a manner to prevent beaming the pipe.

7. Fittings & Glands. Fittings and glands shall be ductile iron as specified in Section 3A, "Ductile Iron Fittings". Ductile Iron Fittings shall be encased with Polyethylene film conforming to ANSI A21.5 (AWWA C105)

C. **Pipe Joints**

1. Push on and Mechanical. Push-on and mechanical joints including accessories shall conform to ANSI A21.11 (AWWA-C111). Bolts shall be high strength COR-10 tee head with hex nuts. The maximum deflection at push-on joints and/or mechanical joints shall be 5 degrees or as recommended by the Manufacturer. Spigot bell and joints shall conform to current AWWA Standards.

2. Flanged. Flanged joints shall meet the requirements of ANSI A21.15 (AWWA C115) or ANSI B16.1

    a. *Gaskets* - All flanged joints shall be furnished with 1/16 inch thick full face red rubber.

b. *Bolts* - Bolts shall have American Standard heavy unfinished hexagonal head and nut dimensions all a specified in ANSI B18.2. For bolts of 1-3/4 inches in diameter and larger, bolt studs with a nut on each end are recommended. Material for bolts and nuts shall conform to ASTM A307, Grade B.

3. Internal Restrained. If an internal restrained joint system is required on the plans, all pipes, bends, tees, etc. shall be restrained push-on joint pipe and fittings utilizing ductile iron components. Restrained joint pipe shall be ductile iron manufactured in accordance with the requirements of ANSI/AWWA C151/A21.51. Push-on joints for pipe shall be in accordance with ANSI/AWWA C111/A21.11 "Rubber-Gasket Joints for Ductile-Iron Pipe and Fittings." Pipe thickness shall be designed in accordance with ANSI/AWWA C150/A21.50 "Thickness Design of Ductile-Iron Pressure Pipe," and shall be based on laying conditions and internal pressures as stated in the project plans and specifications. All restrained joint pipe and fittings shall be boltless, flexible and capable of deflection after installation. Restrained joint pipe and fittings shall be U.S. Pipe's TR FLEX restrained joint system, American's Flex-Ring or pre-approved equal. Restraint of field cut pipe shall be provided with U.S. Pipe's TR FLEX GRIPPER® Ring, TR FLEX Pipe field weldments or pre-approved equal. Method of restraining and laying schedule shall be approved by the District prior to the start of the project. Manufacturer installation instructions shall be followed. Restrained joints shall be capable of withstanding a maximum joint pressure of 250 psi. unless otherwise noted.

   Mechanical joints with retainer gland and Field Lok® gaskets are not acceptable unless otherwise specified (note: exception for valves).

4. Restrained. If a restrained joint system is required on the plans, all pipes, bends, tees, etc. shall be restrained with an approved system.

   a. The Field Lok®, Field Lok 350®, Fast-Grip®, or approved equal pipe gaskets shall develop a wedging action between pairs of high-strength stainless steel elements spaced around the gasket and shall meet the material requirements of ANSI/AWWA C111/A21.11. Restrained joints shall be capable of withstanding a maximum joint pressure of 250 psi. unless otherwise noted.

   b. The Megalug Series 1100®, MJ Field Lok® or approved equal restraint devices shall consist of multiple gripping wedges incorporated into a follower gland meeting the applicable requirements of ANSI/AWWA C110/A21.10. Gland body, wedges and wedge actuating components shall be cast from 65-45-12 ductile iron. The restraining system shall be rated in accordance with the performance requirements of ANSI/AWWA C111/A21.11 Rubber Gasket Joints for Ductile Iron Pressure Pipe and Fittings. Restrained joints shall be capable of withstanding a maximum joint pressure of 250 psi. unless otherwise noted.

5. Bonded Joints. Ductile Iron Joints and pipe fittings joints shall have approved type bonded joints. All joints shall be electrically bonded to provide electrical continuity across all joints of pipe: all fittings and specials, except where "insulated" flange joints are required or ordered.

a. On pipe sizes up to and including 16-inch in diameter, one (1) “set” of bonding connectors shall be installed at the top of each pipe/fitting. On pipe sizes 24-inch and larger, two (2) “sets” of bonding connectors shall be installed, one (1) set each at twelve (12) inches clockwise and counterclockwise from the top of each pipe/fitting joint.

3. FITTINGS

A. **Ductile Iron Fittings**. Ductile Iron Compact Fittings and accessories shall conform to AWWA C153 and Full Body Fittings - and accessories to AWWA C110. Bolts and nuts shall be high strength, corrosion resistant alloy, such as "Cor-Ten" or approved equal.

1. Working Pressures. All fittings and accessories shall be Ductile Iron, rated for a minimum of 250 psi working pressure or as specified herein. The fittings and accessories shall be new and unused. (NOTE: Certain areas of the District’s service area require materials used, to be of a higher working pressure than 200 psi.)

2. Coating and Lining. The fittings shall be coated outside with a bituminous coating in accordance with ANSI A21.10 (AWWA C110) and lined inside with cement mortar and seal coated in accordance with ANSI A21.4 (AWWA C104).

3. Fittings and Glands. All pipe fittings shall be mechanical joint fittings unless specified elsewhere. Mechanical joints shall conform to AWWA C111.

4. Polyethylene Encasement. Ductile Iron Fittings shall be encased with polyethylene film conforming to ANSI A21.5 (AWWA C105)

B. **Joints**

1. Mechanical. Mechanical joints including accessories shall conform to ANSI A21.11 (AWWA C111). Glands shall be ductile iron. Bolts shall be high strength COR-10 tee head with hex nuts.

4. POLYETHYLENE WRAP

All ductile iron pipe, fittings, valves, and fire hydrant leads shall be polyethylene wrapped, installed according to the current edition of AWWA C105. Ductile iron fittings, valves, and fire hydrant leads used in the installation of P.V.C. pipe shall be included.

A. **Material**. Polyethylene wrap shall be 8-mil thickness low-density film or 4-mil thickness high-density cross-laminated polyethylene tube or polyethylene encasement per AWWA C105 and shall be blue or white in color. V-Bio® Enhanced polywrap is acceptable.

B. **Color.** Standard polyethylene wrap shall be blue in color. The wrap may be white if using V-Bio® Enhanced polywrap.

C. **Installation.** The contractor shall cut the roll in tubes 2 feet longer than a standard length of pipe. Each tube shall be slipped over the length of pipe, centering to allow a one foot

overlap on each adjacent pipe section. After the lap is made, slack in the tubing shall be taken up for a snug fit and the overlay shall be secured with polyethylene tape.

Pipe shall not be wrapped and stored on site for any period of time, but wrapped and immediately placed in the trench, fittings shall be wrapped prior to installing blocking or pads. (see Standard Drawing #104) Polyvinyl chloride pipe requires no wrap. Odd shaped appurtenances such as valves, tees, fittings, and other ferrous metal pipeline appurtenances shall be wrapped by using a flat sheet of polyethylene. Wrapping shall be done by placing the sheet under the appliances and bringing the edges together, folding twice, and taping down.

5. **FIRE HYDRANTS**

A. **Description**. The Contractor shall provide all labor, materials, tools, and equipment required to furnish and install in good workmanlike manner all fire hydrants complete and ready for service where shown on the plans or where directed by the District and as specified herein.

B. **Fire Hydrants.** Fire hydrants shall conform to AWWA C502. Hydrants shall conform to the Standards of the Northern Kentucky Water District and as shown on the plans. All fire hydrants shall have auxiliary valves for isolating water flow to the hydrant. All fire hydrants and auxiliary valves shall be positively locked to the water main by restrained joints, hydrant adapters, or other approved method. Hydrants shall be designed to 200 psi working pressure and shall be shop tested to 300 psi hydrostatic pressure with the main valve both open and closed. The barrel shall have a breakable safety section and/or base bolts just above the ground line.

Hydrants shall have a main valve opening of 5 1/4 inches, a 6 inch mechanical joint inlet to be suitable for setting in a trench 3' 6" deep minimum, and shall be the traffic style hydrant so that the main valve remains closed when the barrel is broken off. Hydrants shall have a dry top and shall be self draining, when the main valve is closed. Self draining hydrants shall drain to dry wells provided exclusively for that purpose. Hydrant drains shall not be connected to storm or sanitary sewers. Hydrants located generally in the Covington System and other areas determined by the District (flood zones) shall have all drain holes plugged prior to installation. Hydrants shall be rotatable in a minimum of eight (8) position in 360 degrees. All hydrants shall have two (2)- two and one half (2 1/2) inch hose nozzles and one (1) steamer or pumper connection threaded to conform to Northern Kentucky Water District Standards: steamer nozzle shall be National Standard Thread and 2 1/2" outlets shall be Northern Kentucky Water District Standard Thread (Old Cincinnati Thread). The operating nut and the nuts of the nozzle caps shall be square in shape, measuring one (1) inch from side to side. Hydrant body shall be painted yellow for areas designed for 150 psi working pressure and red for areas in excess of 150 psi.

All hydrants shall be right hand open, clockwise, except in certain areas of Campbell Co. as specified in Standard Drawings and shall have a direction arrow of operation cast into the dome of the hydrant. Installation per Standard Drawing #109.

C. **Installation**. The installation of fire hydrants shall be in conformance with "Mains

Installation" section, paragraph "Setting Hydrants".

D. **Polyethylene Encasement.** Fire hydrant tee, anchoring pipe and part of the fire hydrant shoe shall be encased with Polyethylene film conforming to ANSI A21.5 (AWWA C105). (See Standard Drawing #109)

6. VALVES

A. **Description.** The Contractor shall provide all labor, materials, tools, and equipment required to furnish and install in good workmanlike manner all valves and accessories complete and ready for service where shown on the plans or where directed by the District and as specified herein.

B. **Gate Valves.** Gate valves shall conform to AWWA C509 or C515 and shall be ductile body, resilient wedge, non-rising stem with rubber "O" ring packing seals. All external dome and packing bolts shall be stainless steel. The valves shall open by turning counter-clockwise. All valves shall have openings through the body of the same circular area as that of the pipe to which they are attached. Valves shall have mechanical joint ends unless otherwise shown on the plans or directed by the District. All valves shall be designed for a working pressure of 250 pounds per square inch (PSI) unless otherwise noted on the plans or in the "Supplemental Specifications". An extension stem shall be furnished if required, to bring the operating nut within 3-1/2 feet of finished grade. Extension stems shall be securely fastened to the valve stem. The Contractor shall make all valves tight under their working pressures after they have been placed and before the main is placed in operation.

C. **Tapping Sleeves and Valves.** Tapping sleeves and valves shall be designed for a working pressure of 250 psi. The tapping sleeve together with the tapping valve shall be tested at 250 psi for visible leakage and pressure drop before the main is tapped. Tapping sleeve and valve used in high pressure areas shall be tested at 350 psi.

1. Tapping Sleeves. Tapping sleeves shall be two piece with mechanical joint type ends, and be so designed as to assure uniform gasket pressure and permit centering of the sleeve on the pipe.

2. Tapping Valves. Tapping valves shall have a flange on one end for bolting to the tapping sleeve and a mechanical joint type end connection on the outlet with slotted standard flange or other adapters for connection to the tapping machine. All external dome, flange and packing bolts shall be stainless steel. The valves shall open by turning counterclockwise. Tapping valves shall conform to AWWA C509.

D. **Valve Boxes.** All valves shall be provided with valve boxes. Valve boxes shall be of standard, adjustable, heavy duty cast iron extension type, two piece, 5 1/4 inch shaft, screw type, and of such length as necessary to extend from valve to finished grade, Tyler #562-S, Tyler #564-S or approved equal. Valve box cover shall be stamped "Water". Tops shall be set at final established grade.

E. **Butterfly Valves.** Unless otherwise specified valves 16 inches and larger shall be

butterfly valves rated at 250 psi working pressure and conform to the applicable portions of AWWA Standard C504, latest edition.

1. Body. The valves shall be AWWA Class 250B designed for tight shut-off against a differential pressure of 250 psi. Valve bodies shall be constructed of ductile iron. Two trunnions for shaft bearing shall be integral with the valve body. The valves and appurtenances shall be suitable for buried service.

2. Ends. Valves shall have mechanical joint ends and shall be furnished with high strength COR-10 tee head with hex nuts, ductile iron glands, and rubber gaskets for each mechanical joint end.

3. Discs. Valve discs of cast steel, fabricated steel, or cast bronze are not acceptable.

4. Seats. Seats bonded on the discs are not acceptable.

5. Shaft Seals. If stuffing boxes are utilized for shaft seals they shall be constructed of cast iron, ASTM A126. Gland assemblies shall be of cast bronze, ASTM B132. The packing gland shall be housed in a solid walled cast iron, ASTM A48, Class 40 one piece structure or equal.

6. Operators. The valve operating mechanism shall be for counterclockwise opening. There shall be no external moving parts on valve or operator except the operator input shaft. Input shaft is to be operated by a 2 inch square operating nut. Maximum required input force on the operator shaft to open and close the valve shall be 40 pounds. The total number of turns applied to the operating nut required to completely open the valve from a completely closed position shall not be less than twice the normal valve diameter. An extension stem shall be furnished to bring the operating nut within 3 1/2 feet of the finished grade. Extension stems shall be securely fastened to the valve stem.

F. **Air Release and Vacuum Valves.** Air release valves shall be constructed at high points in the water line as indicated on the plans. These valves shall permit the air in the pipeline to escape as the pipeline fills and allows the air to re-enter as the line empties. The air relief vent of automatic air release valves, where practical, may be extended to a distance of at least 1 foot above the grade and installed with a screened, downward facing elbow. Manually operated air release valves shall include a camlock-type coupling and waste valve. These valves shall be APCO Air Release Valves Model #200-A or approved equal, 250 psi working pressure. 8" and smaller water mains, tap size and piping shall be ¾", 12" water main - 1", & 16" and larger water main - 2". Temporary taps of suitable size may be required at certain points on the water main for the release of air for filling and/or flushing purposes. Temporary taps will be removed and plugged after use. Refer to Standard Drawing #106 for reference. Materials for air release valves will be supplied by the District.

7. STEEL CASING PIPE

Casing pipe shall be steel pipe with a minimum yield strength of 35,000 psi with a

minimum wall thickness as listed below:

Nominal Diameter Casing Pipe	Normal Wall Thickness	Nominal Diameter Casing Pipe	Normal Wall Thickness
Under 14’	0.251”	26”	0.438”
14” & 16”	0.282”	28” & 30”	0.469”
18”	0.313”	32”	0.501”
20”	0.344”	34” & 36”	0.532”
22”	0.375”	38”, 40”, & 42”	0.563”
24”	0.407”	48”	0.626”

The inside diameter of the casing pipe shall be at least four (4) inches greater than the outside diameter of the carrier pipe joints. Steel casing sections shall be connected by welding, conforming to AWWA C206.

Adequate manufactured pipe spacers shall be installed to ensure that the carrier pipe is adequately supported in the center of the casing pipe throughout it’s length, particularly at the ends. There shall not be any metallic contact between the casing and carrier pipe. Manufactured pipe spacers shall be installed per manufacture’s installation requirements. Casings shall have both ends sealed up in such a way as to prevent the entrance of foreign material. See Standard Drawing #114 for installation details.

8. **PIPE, VALVE, HYDRANT PRESSURE REGULATOR PIT AND METER SETTING INSTALLATION**

A. **Pipe Laying.** Pipe shall be laid with bell ends facing in the direction of laying, unless otherwise directed by the District. After placing a length of pipe in the trench the spigot end shall be centered in the bell and the pipe forced home. All pipe shall be laid with ends abutting and true to line and grade. Deflection of pipe joints in excess of the manufacturer's recommendations will not be permitted. A watertight pipe plug or bulkhead shall be provided and used to prevent the entrance of foreign material whenever pipe laying operations are not in progress.

B. **Pipe Cutting.** The cutting of pipe for installing valves, fittings, or hydrants shall be done in a neat and workmanlike manner without damage to the pipe or lining. The end shall be smooth and at right angles to the axis of the pipe. Flame cutting of metal pipe by means of an oxyacetylene torch shall not be permitted. All pipe cutting shall be at the Contractor's expense.

C. **Push-On Joints.** The surfaces with which the rubber gasket comes in contact shall be thoroughly cleaned just prior to assembly. The gasket shall then be inserted into the groove in the bell. Before starting joint assembly, a liberal coating of special lubricant shall be applied to the spigot end. (Special lubricant shall be suitable for use in potable water) With the spigot end centered in the bell, the spigot end is pushed home. Insertion of spigot into PCV type pipe bell should be inserted until the reference mark is flush with

the end of the bell. Over insertion of the pipe is not recommended per the manufacturer.

D. **Mechanical Joints.** Mechanical joints for pipe require that the spigot be centrally located in the bell. The surfaces with which the rubber gasket comes in contact shall be thoroughly cleaned just prior to assembly. The clean surfaces shall be brushed with a special lubricant just prior to slipping the gasket over the spigot end and into the bell. (Special lubricant shall be suitable for use in potable water) The lubricant shall also be brushed over the gasket prior to installation to remove the loose dirt and lubricate the gasket as it is forced into its retaining space. P.V.C. pipe spigot ends shall be field cut smooth and at right angles to the axis of the pipe for installation in mechanical joint fittings. Bolt torque shall be per the manufacturer's recommendations.

E. **Setting Valves.** Valves shall be set on a firm solid concrete block foundation so that no load will be transferred to the connecting pipe. Valves in water mains shall, where possible, be located on the street property lines extended, unless otherwise shown on the plans. A valve box shall be provided for every valve. The valve box shall not transmit shock or stress to the valve and shall be centered and plumb over the operating nut of the valve. The box cover shall be set flush with the surface of the finished pavement unless otherwise shown. All valves boxes with the exception of isolating valves for fire hydrants that are located in non-paved areas shall have a minimum of 2' by 2' by 4" concrete pad as shown in Standard Drawing No. 105, unless a smaller pad is approved by the District.

F. **Setting Hydrants.** Hydrants shall be located as shown on the plans or as directed by the District. The location shall provide complete accessibility and minimize the possibility of damage from vehicles or injury to pedestrians. All hydrants shall stand plumb with the pumper nozzle facing the curb. Hydrant shall be set to the established grade, with the traffic flange within 4" above final grade in accordance to Standard Drawing No. 109. Each hydrant shall be controlled by an independent gate valve with valve box. All valves used for hydrant control shall be anchored to the branch tee.

G. **Thrust Blocking.** All bends over five (5) degrees, plugs, caps, and tees shall be securely blocked against movement with concrete thrust blocks placed against undisturbed earth in accordance with Standard Drawing No. 104. All thrust blocks shall be inspected and approved by the District prior to backfilling. Water mains shall have concrete thrust block at all pipe intersections and changes of direction to resist forces acting on the pipeline. All concrete thrust blocks shall be poured in such a manner that the bolts can be replaced without disturbing the blocking.

All caps or plugs used in mains to undergo hydrostatic test shall be properly installed and blocked in advance of testing mains. All caps or plug installations shall be approved by the District representative before the main is subjected to the pressure test.

1. Concrete Blocking. Concrete blocking shall be K.D.O.T. Class A concrete as specified in Section "Concrete". Blocking shall be placed between undisturbed ground and the fitting to be anchored. The area of bearing on the fitting and on the ground in each instance shall be that shown herein. The blocking shall, unless otherwise shown, be so placed that the pipe and fitting joints will be accessible for repair.

2. Tie Rods. If shown or specified, movement shall be prevented by attaching suitable metal rods, clamps or restrained fittings. Steel tie rods or clamps, where permitted, shall be of adequate strength to prevent movement. Steel tie rods or clamps shall be painted with three coats of approved bituminous paint or coal tar enamel. A minimum of 3/4" welded eyebolts @ a 90 degree bend and 3/4" threaded rods may only be used with the approval of the District for temporary restraint only. Duc-Lucs are prohibited for use.

3. Restrained Fittings. Restrained fittings, where permitted, shall be subject to the approval of the District.

H. **Meter Setting Installation**

The Contractor shall furnish all labor, equipment, excavation, backfill, testing, disinfection, and restoration to install the pipe at the locations shown on the plans or as directed, in accordance with the District's Standard Specifications & Drawings, complete and ready for use. No additional payment will be made for rock excavation or for bedding required in rock excavation. It will be the Contractors responsibility to remove and reset the service at his own expense if he fails to notify and receive the approval from the District. Contractors work shall be warranted for a period of one year of the date of activation of each service (meter set date).

1. Inspection & Notification. The Contractor shall notify all affected District customers prior to interrupting water service. The Contractor shall make 48 hours notification. Routine service inspection and final inspections will be made by the District upon request by the Contractor and in a timely manner. The Contractor shall provide the District 24 hours notification for inspection by the District. It is the Contractors responsibility to post "No Parking" signs and safety devices.

2. Materials. The District shall furnish to the Contractor the materials necessary to install the meter setting and water service lines. This shall include: Lid & ring, meter vault, piping, yoke bar, double yoke bar, angle valve, yoke ell, couplings, corporation, tapping saddle, extension ring.

   The Contractor shall be responsible for pickup of materials at the District's designated location. The Contractor will be responsible to the District for materials lost, stolen, or damaged while in his possession. The Contractor shall return all unused materials, which includes scrap copper and fittings to the District. Salvaged materials are the property of the District and shall be returned to the District. The materials necessary to do restoration will not be provided under this contract item but shall be obtained from a pre-approved source.

3. Installation of Service Lines. The Contractor shall be familiar with copper piping, fittings and connections, and have available equipment to work with said materials. No sweat type fittings shall be permitted. Service line shall be installed as shown on the plans or as directed by the District. The Contractor shall excavate whatever material encountered. The service lines shall be installed using boring and jacking or open cut (as specified on the plans) at the depth required to clear existing and proposed sewers,

but in no case shall the line be installed with less than 36 inches cover from final grade. The trench width shall be as excavated to a maximum of 2 feet. The line shall be laid on firm soil. In rock, sufficient extra depth shall be excavated and refilled with acceptable compacted soil or bedding sand to provide a cushion for the elimination of the possibility of crushing or perforating the pipe. Connections shall be made using normal practices for water line installation and in accordance with the standards in the plans or contained herein.

a. *Water Service Taps* – The Contractor shall maintain a minimum of 36" cover over any tap. Tapping Saddles shall not be used with ductile iron or cast iron pipe. The corporation installed into the main shall have no more than 4 threads showing between the top of the water and the bottom of the corporation unless a tapping saddle is used.

b. *Service Lines* - The Contractor shall maintain a constant cover of 36"over any water line. Methods of pushing or jacking under the existing street must avoid bending or kinking the pipe. No open cuts of the pavement will be permitted unless pre-approved by the District. All copper shall be cut using a copper-tubing cutter. All connections shall be flared connections. No oil base or other contaminating materials will be used in lubricants, caulking and sealers. The Contractor shall be responsible for making all joints watertight.

c. *Meter Vaults* - All meter vaults shall be located inside existing right-of-ways or water main easements of record or as directed by the District. Typically the meter vault shall sit 5' behind the back edge of curb or edge of pavement. The Contractor shall contact the customer and determine a suitable location of the setting within the above guidelines. It is the Contractors responsibility to notify the District's Inspector if these conditions cannot be met. The District's Inspector will inspect any questionable meter setting location prior to the Contractor installing.

Meter vaults shall be set to allow the meter cover to be level with the back edge of the existing curb or the back edge of paving along roadways without curbs. It is the Contractor's responsibility to ensure that the meter vault does not settle due to poor compaction or any other reason within the Contractor's control. The Contractor at no additional expense to the District shall adjust any meter vault that sinks below grade due to poor workmanship by the Contractor to grade.

9. **TRENCH BACKFILL**

All trench backfill shall be free from cinders, refuse, organic material, boulders, rocks or other material which in the opinion of the District is unsuitable. No backfill shall be made with frozen material. Lime sand shall not be used for any backfill.

A. **Backfill in Non-Pavement Areas.** Trench backfill in areas not directly beneath or near pavements and driveways shall be as specified in this section unless the local authority having jurisdiction or the District stipulates additional requirements.

1. Trench Bottom Preparation. The pipe shall be bedded on sand to achieve full pipe barrel support. In any event not less than 3" of sand bedding shall be used.

2. Backfill to 12" Over Pipe Barrel. All trench excavations shall be backfilled immediately after pipe is laid with the exception of thrust blocks. Compacted sand or bankrun material shall be used to backfill the trench from the bottom of the pipe barrel to the 12" over the pipe barrel. Backfill material shall be free from cinders, refuse, organic material, boulders, top soil, frozen material, material with a high void content, rocks **1 1/2"** or larger measured in any direction, sharp stones and crushed rocks larger than **3/4"**, or other materials which in the opinion of the District is unsuitable. No flushing of backfill shall be permitted to achieve compaction. Clay bulkheads shall be installed as specified in Section B-5 of Trench Backfill.

3. Remaining Trench Backfill. From 12" above the pipe barrel to the surface, excavated trench material may be used as backfill material or as required by local or county authorities. No material shall be used for backfill that contains frozen earth, vegetable or organic material, debris, rocks **8"** or larger measured in any direction, or earth with an exceptionally high void content.

4. Compaction. All backfill shall be placed in uniform loose layers, not to exceed 12" layers, and each layer shall be compacted to a density not less than 95 percent of the standard Proctor maximum dry density (ASTM D698) unless additional requirements are required by the local authority having jurisdiction. The backfill shall be compacted in such a manner and with appropriate equipment so that there is no pipe damage, pipe misalignment or damage to joints. No flushing of backfill shall be permitted to achieve compaction.

B. **Backfill Beneath Driveways.** Trench backfill beneath and within five (5) feet of driveways shall be as specified in this section.

1. Trench Bottom Preparation. The pipe shall be bedded on sand to achieve full pipe barrel support. In any event not less than 3" of sand bedding shall be used.

2. Backfill to 12" Over Pipe Barrel. All trench excavations shall be backfilled immediately after pipe is laid with the exception of thrust blocks. Compacted sand or bankrun material shall be used to backfill the trench from the bottom of the pipe barrel to the 12" over the pipe barrel. Backfill material shall be free from cinders, refuse, organic material, boulders, top soil, frozen material, material with a high void content, rocks **1 1/2"** or larger measured in any direction, sharp stones and crushed rocks larger than **3/4"**, or other materials which in the opinion of the District is unsuitable. No flushing of backfill shall be permitted to achieve compaction. Clay bulkheads shall be installed as specified in Section B-5 of Trench Backfill.

3. Granular Backfill. When backfilling under pavements, driveways, or as directed by the District, granular material as specified shall be used in place of the excavated material. The granular backfill shall be placed from 12 inches from the top of pipe to 6 inches below pavement subgrade level in uniform 6 inch loose layers and each layer shall be compacted to a density not less than 95 percent of the standard Proctor maximum dry

density (ASTM D698). The backfill shall be compacted in such a manner and with appropriate equipment so that there is no pipe damage, pipe misalignment or damage to joints. No flushing of backfill shall be permitted to achieve compaction.

4. Trench Backfill to Subgrade. The top 6 inches of the trench backfill, immediately below pavement subgrade level, shall be crushed limestone or dense grade aggregate compacted in the same manner and to the same density at the granular backfill.

5. Remaining Trench Backfill to Final Grade. From subgrade to final grade, asphalt, concrete or other paving/surface shall be placed to match the existing pavement/surface conditions.

6. Bulkheads. When a granular bedding is provided in rock or when granular backfill is required, the Contractor shall place bulkheads of clay soil across the trench at 100 foot intervals to resist the movement of groundwater through the granular material. Such bulkheads shall be carefully compacted and shall extend approximately 3 feet in a direction parallel to the pipe and shall extend from the bottom of the trench to a point 4" below final grade level.

7. Surface Conditions. The trench surface shall be periodically attended to during the course of the contract. The trench surface shall be maintained in a safe condition and shall not interfere with natural drainage.

C. **Backfill Beneath Pavement**. Trench backfill beneath roadway pavements, or as directed by the District shall include flowable fill as specified in this section.

1. Backfill to 12 Inches Over pipe Barrel. The pipe shall be bedded on sand so that the pipe barrel has full and continuous support. All trench excavations shall be backfilled immediately after pipe is laid. Compacted sand or bankrun shall be used to backfill the trench from the bottom of the pipe barrel to 12 inches above the top of the pipe barrel. The sand or bankrun shall be placed in uniform 6 inch loose layers and each layer compacted to a density not less than 95 percent of the standard Proctor maximum dry density (ASTM D698) in such a manner and with appropriate equipment so that there is no pipe damage, pipe misalignment or damage to joints so as to eliminate the possibility of settlement, pipe misalignment, or damage to joints. The sand or bankrun shall be free from cinders, refuse, organic material, boulders, rocks, or other material which in the opinion of the District is unsuitable. No backfill shall be made with frozen material.

2. Trench Backfill to Subgrade. From 12 inches above the pipe barrel to subgrade, **"Low Strength Mortar Backfill Material"** (Flowable Fill, K-Crete) shall be used as backfill material. The Low Strength Mortar Mix shall meet the current Ky. Dept. of Highways's "Standard Specifications for Road & Bridge Construction". The Low Strength Mortar Mix shall have sufficient drying time (per manufacturer's recommendation) before the final layer of backfill is applied.

3. Remaining Trench Backfill to Final Grade. From subgrade to final grade, asphalt, concrete or other paving/surface shall be placed to match the existing

pavement/surface conditions. All joints shall be properly seal with an approved material.

4. Testing of Trench Backfill. Testing of backfill shall be at the request of the District and to the specifications of the District and at the cost of the Contractor.

10. TEMPORARY STREET & ROADWAY RESTORATION

A. **Traffic-Bound Base Course.** For all trenches where replacing streets and/or driveways is required, the Contractor shall maintain at his own expense a traffic- bound course of a minimum of 6" traffic-bound gravel and 4" of temporary hot asphalt or cold patch asphalt when hot mix is not available in a safe and passable condition until the trenches are ready for final resurfacing. The traffic-bound base course shall be compacted to a density not less than 95 percent of the standard Proctor maximum dry density (ASTM D698).

B. **Maintenance of Temporary Street Restoration** Temporary street restoration areas shall be maintained in a safe condition at all times. There shall be no loose materials, depressions, drop-offs or any other deficiencies in the temporary pavement. If said deficiencies exist they shall be immediately corrected by the Contractor.

11. FINAL RESTORATION OF STREET & ROADWAYS

A. **Scope.** This section covers the restoration of concrete and asphaltic concrete pavement, driveways, sidewalks and other surface construction removed or damaged during the progress of the work.

B. **General.** Except as otherwise specified, indicated on the drawings, or covered with other surface treatments, all pavement, driveways, curbs/gutters, and sidewalks which are removed or damaged during the progress of the work shall be restored to its original or better condition by the Contractor. All restoration work shall be subject to acceptance by the property owner, agency having jurisdiction thereof, and the District. Unless otherwise specified, all material used for restoration work shall be new.

At least five days in advance of pavement and curbs/gutter replacement, the Contractor shall notify the District and the authority having jurisdiction thereof of the proposed work. All street work shall be subject to acceptance by the authority having jurisdiction thereof.

Crushed limestone, bituminous materials or other materials used in the resurfacing of streets, shall meet the current requirements of the Standard Specifications of the Kentucky Department of Highways.

Sub-grades shall be thoroughly compacted to at least 95 percent of maximum density at optimum moisture content as determined by ASTM D698. In addition, the stability of sub-grades shall be such that when materials for construction are deposited on the sub-grade no rutting or displacement of the subgrade by material hauling vehicles will occur.

Governing Standards. Except as otherwise specified or indicated, materials, equipment, details, and construction methods shall comply with the applicable provisions of the local,

county and state ordinances and regulations. Requirements for surface restoration and materials specified herein are the minimum requirements for compliance with the Contract Documents. If requirements of the authority having jurisdiction over surface restoration are greater than those presented herein, Contractor shall comply with those requirements at no additional cost to the District.

Weather Limitations. Minimum temperature under which asphaltic concrete pavements may be constructed shall be as stipulated in the governing standards.

If weather conditions do not permit replacement of permanent surfacing, a temporary cold mix asphaltic concrete surfacing shall be provided and maintained in a smooth and driveable condition. Cold mix material shall be replaced with the specified hot mix asphaltic concrete when weather conditions permit. No materials shall be placed when the underlying surface is muddy, frozen, or has frost or water thereon.

Equipment and facilities for measuring, mixing, heating, transporting, spreading, compacting, and other operations shall be in accordance with the applicable requirements of the governing standards. Improved or modernized equipment which will produce results equal in quality to those which would result from the specified equipment will be considered for use. All equipment and facilities shall be acceptable to the District.

C. **Materials**. The sources of materials shall be submitted for review by the District. Except as modified herein, materials shall conform to the requirements of the Kentucky Department of Transportation standards.

Contractor shall submit to District for approval documentation certifying materials to be used for surface restoration are in compliance with the requirements herein.

D. **Asphaltic Concrete Pavement.** Except as modified herein, existing asphaltic concrete pavement which is removed or damaged during the progress of the work shall be replaced with new pavement to match, as closely as possible, the adjacent existing pavement.

Asphaltic concrete pavements shall be constructed as specified, and in accordance with the Kentucky Department of Transportation standards.

Finished surfaces shall match existing surfaces as appropriate.

Bituminous mixtures shall be spread and finished by hand methods only where machine methods are impractical as determined by the District. Hand placed mixtures shall not be cast or otherwise manipulated in such manner that segregation occurs.

Each lift of the base course shall be uniformly compacted to a density of not less than 94 percent as determined by ASTM D2950. The surface course shall be uniformly compacted to a density of not less than 96 percent as determined by ASTM D2950.

Where asphaltic concrete pavement is to be replaced, the subgrade shall be prepared as herein before specified and this subgrade shall comprise the base courase upon which the

concrete sub-slab and/or bituminous pavement shall be laid.

Where no concrete sub-slab is required, the subgrade or base shall be thoroughly cleaned and broomed and a prime coat of medium tar (RC-3) shall be uniformly applied at a rate of 0.20 to 0.25 gallons per square yard. Where Portland cement concrete sub-slab is required the prime shall be applied at the rate of approximately .05 gallons per square yard. The prime shall be applied by a pressure distributor or other approved pressure spray method.

When the prime coat has become tacky but not dry and hard, a bituminous surfacing consisting of class "I" asphaltic concrete shall be placed, spread, finished and compacted in accordance with the current Standard Specifications of the Kentucky Department of Highways. Compacted thickness of asphaltic concrete pavement shall be as directed or as shown on the plans. All asphaltic concrete joints shall be properly seal with an approved material in accordance with the current Standard Specifications of the Kentucky Department of Highways (hot-poured elastic joint sealer).

E. **Concrete Pavement.** Existing concrete pavements which are removed or damaged during the progress of the work shall be replaced to match, as closely as possible, the adjacent existing concrete pavement. Concrete, materials, and workmanship shall conform to the applicable requirements of the concrete section.

Where concrete pavement is to be replaced or is required under bituminous pavement replacement, it shall conform to the existing pavement and/or the District's instructions , (not less than 6' (six inches) thick) and accomplished with K.D.O.T. Class "A" concrete. Concrete curbs shall conform to existing concrete curbs. All joints shall be properly sealed with an approved material.

If concrete is removed to within 2 feet or less of an existing construction joint, the additional pavement to the joint shall be removed and replaced with new concrete.

F. **Aggregate Base Course.** Aggregate base course shall be used as a base, where required by the governing regulations. The base course shall be constructed in accordance with the governing standards. Mixing of the base course shall be by the central plant method or the road mix method.

G. **Protection.** The Contractor shall protect all adjacent concrete and masonry so that no damage will occur as the result of subsequent construction operations. All damage or discoloration shall be repaired to the satisfaction of the District.

Special care shall be taken to prevent bituminous materials from spraying or splashing. Adjacent construction shall be protected by covering with suitable fabric or paper.

H. **Miscellaneous Repair Work.** All existing items and construction, whether or not indicated by the drawings but which are removed or damaged as a result of construction operations under this contract, whether within or outside of public right-of-way, shall be repaired or replaced unless otherwise required by the drawings.

Repair or replacement shall be with material similar to those existing and shall, in each case, restore the item to its original or better condition as acceptable to the District and the District thereof.

Mailboxes repaired or replaced as part of the project shall be installed at a height of 41 to 42 inches measured from the pavement surface to the bottom of the box. The front face of the mailbox shall be 6 to 8 inches behind the edge of the pavement.

I. **Untreated Surface.** Where the existing surface is untreated gravel or stone, the Contractor shall replace the surfacing that is disturbed or removed with crushed limestone to at least the thickness of the existing pavement. The crushed limestone shall be placed and compacted in the same manner as traffic-bound base course. Prior to the final acceptance, the Contractor shall fill all depressions with compacted crushed limestone, and shall thoroughly compact and grade to match existing surface.

12. **CLEAN UP**

After a section of main is tested and accepted, the ground surface shall be cleaned of all surplus material including stone, broken pipe, construction material, and all other debris, to the satisfaction of the District.

13. **STORAGE AND DISPOSAL OF EXCAVATED MATERIAL**

Where the Contractor finds it necessary to remove excavated material to some other location, care should be taken not to overload trucks, which would in turn spill material out upon highways. Any such material spilled upon highways shall be immediately cleaned up from the location and disposed of.

Where it is necessary and is agreeable with public and private property owners, excavated materials may be temporarily piled in the streets or roadways, however, one lane of traffic must be maintained at all times. By no means will the Contractor be permitted to store excavated materials in streets or roadways over night.

All excavated material and all construction materials used in prosecution of the work shall be deposited so as not to endanger the Work, create unnecessary annoyance to the public, or interfere with natural drainage courses. During the progress of the work, all material piles shall be kept trimmed up and maintained in a neat, workmanlike manner.

After excavated materials have been removed, all hard surface streets or roadways shall be thoroughly cleaned and left free of dirt and dust. Streets or roadways which do not have hard surfaces must be restored to their original condition at the expense of the Contractor.

Disposal of excess excavated material from trench excavations or site restoration shall be disposed from the site at the Contractor's expense. Broken concrete and other debris resulting from pavement or sidewalk removal, excavated rock in excess of the amount permitted to be installed in trench backfill, debris encountered in excavation work, and other similar waste materials shall be disposed from the site at the Contractor's expense.

The Contractor shall be responsible for procurement of its own dump sites, and maintaining that site at its own expense.

Confirm and comply with all applicable environmental, labor, health and safety, and all other Laws and Regulations related to demolition, removal, hauling, disposal and all other handling of unsalvageable equipment, supplies, waste, debris and other material.

14. TRENCH MAINTENANCE

The Contractor shall be responsible for the condition of the trenches for a period of two years from the date of the "Certificate of Substantial Completion" issuance.

15. RESTORATION, GRADING AND SEEDING

The Contractor shall provide all labor, materials, tools, and equipment required to grade, fertilize, seed, and mulch in good, workmanlike manner the areas where shown on the plans or where directed by the District and as specified herein.

A. Materials

1. Topsoil. Topsoil shall not contain more than 40% clay in that portion passing a No.10 sieve and shall contain not less than 5% or more than 20% organic matter as determined by loss on ignition of samples oven dried to constant weight at 212 degrees Fahrenheit.

2. Fertilizer. Fertilizer shall be lawn or turf grade 12-12-12.

3. Seed

   a. *Urban Areas* - All areas to be seeded which are considered to be urban in character, and any area in front of a residence, business or commercial, shall be seeded with the following mixture: (% are by weight)
      40% Fine Lawn Turf-Type Fescue
      40% Creeping Red Fescue (Festuca rubra)
      20% Annual Ryegrass (Lolium multiflorm)

   b. *Right-of-way and Easements* - All areas in right-of way or in easements adjacent to right-of-away other than urban areas, shall be seeded with the following mixture: (% are by weight)
      30% Fine Lawn Turf-Type Fescue
      50% Kentucky 31 Fescue (Festuca arundinaces Var. Ky.31.)
      20% Annual Ryegrass (Lolium multiflorum)

   c. *All Other Areas* - All other areas shall be seeded with the following mixture: (% are by weight)
      90% Perennial Ryegrass (Lolium perenne)
      10% Alsike Clover (Trifolium hybridum)

4. Mulch. Mulch shall be straw reasonably free of weed seed and any foreign materials which may affect plant growth. Other materials may be used if approved by the District.

5. Asphalt Emulsion. Emulsion shall be nontoxic to plants and shall conform to AASHTO M140 or AASHTO M208.

B. **Installation**

1. Preparation of Seed Bed

   a. *Topsoil* - If suitable topsoil is available as part of the excavated material it shall be removed, stored and used to backfill the top 4 inches of the excavation. All grass, weeds, roots, sticks, stones, and other debris are to be removed and the topsoil carefully brought to the finish grade by **hand raking.**

   b. *Non-topsoil* - If there is no suitable topsoil available on any part of the work or if there is a deficiency of suitable topsoil, the trench backfill, except in urban areas shall be used as a seed bed. After the backfill has been given a reasonable time to settle, it shall be graded off to the finish grade and harrowed to a depth of 3 inches. All grass, weeds, roots, sticks, stones, and other debris are to be removed and the soil carefully brought to the finish grade by **hand raking.**

   c. *Urban Areas* - If there is no topsoil available on any part of the work or is there is a deficiency of suitable topsoil, the Contractor shall furnish 4 inches of topsoil to be used as a seed bed in all urban areas and any area in front of a residence.

2. Fertilizing. Fertilizing shall be uniformly applied to all areas to be seeded at the rate of 1 pound per 100 square feet in topsoil or 2 pounds per 100 square feet in non-topsoil. The fertilizer shall be thoroughly disked, harrowed or raked into the soil to a depth of not less than 2 inches. Immediately before sowing the seed, the Contractor shall rework the surface until it is a fine, pulverized, smooth seed bed, varying not more than 1 inch in 10 feet.

3. Seeding. Immediately after the preparation and fertilization of the seed bed the District shall inspect and approve the site prior to seeding. The seed shall be thoroughly mixed and then evenly sown over the prepared areas at the rate of 3 pounds per 1000 square feet for urban, right-of-way and easement areas and a rate of 2 pounds per 1000 square feet for all other areas. Seed shall be sown dry or hydraulically. After sowing, the area shall be raked, dragged, or otherwise treated to cover the seed to a depth of approximately 1/4 inch.

4. Mulching. Within 48 hours after any given area is seeded, mulching material shall be evenly placed over all seeded areas at the rate of approximately 2 tons per acre, when seeding is performed between the dates of March 15 and October 15, and at the approximate rate of 3 tons per acre when seeding is performed between the dates of October 15 and March 15 of the succeeding year.

a. *Emulsion* - Mulching materials shall be kept in place with asphalt emulsion applied at a minimum rate of 60 gallons per ton of mulch or by methods as approved or may be otherwise required to prevent displacement of material. Mulching which is displaced shall be replaced at once but only after the seeding or other work which preceded the mulching and which work was damaged as a result of displacement of mulching material has been acceptably repaired.

5. Maintenance. All seeded areas shall be carefully maintained and tended by the Contractor, watering as necessary to secure a good turf. Settled areas shall be filled, graded, and re-seeded. Seeded areas shall be free of weeds and other debris. The Contractor shall be responsible for the condition of the seeded areas for a period of 1 year from the date of "Final Certificate" issuance.

C. **Payment**. Seeding is not a pay item and all cost related thereto shall be included in the unit price of the applicable bid item.

16. DISINFECTION AND LEAKAGE TEST

A. **Scope**. This section covers the disinfection of the new water mains, fittings, temporary services and associated appurtenances. The Contractor shall provide all labor, materials, tools, equipment, and incidentals required to test the mains for watertightness and disinfect the mains as directed by the District and as specified herein. Gauges for the test shall be furnished by the Contractor.

B. **Test Section**. After the main has been installed and backfilled all newly installed pipe or any valved section thereof shall be considered a test section.

C. **Witness.** All tests performed for each test section shall be witnessed and approved by the District before acceptance. In the event the Contractor performs any test without witness by the District, the Contractor will be required to test the section again in conformance with this specification at no cost to the District.

D. **General.** All disinfection work shall conform to the requirements of the latest revision of ANSI/AWWA C651 and the requirements of the Kentucky Division of Water. If any State requirements conflict with the provisions of this section, the State requirements shall govern.

Water required for flushing and disinfection work will be provided as stipulated in the temporary facilities.

When it is necessary to interrupt service to water customers, each customer affected shall be notified in advance of the proposed service interruption and its probable duration in accordance with the project requirements.

E. **Disinfection Procedure.**. During construction or after the installation of the pipe and fittings is complete, an approved disinfection method, according to governing standards, shall be used. The disinfection solution shall be allowed to stand in the main and associated

appurtenances for a period of at least twenty-four (24) hours.

During disinfection, all valves, hydrants, and service line connections shall be operated to ensure that all appurtenances are disinfected. Valves shall be manipulated in such a manner that the strong disinfection solution in the main from flowing back into the supply line. Check valves shall be used if required.

All non-disinfected fittings used for tie-ins or repairs shall be cleaned and swabbed with a liquid sodium hypochlorite disinfecting solution prior to installation.

F. **Final Flushing**. Upon completion of chlorination but before sampling and bacteriological testing, Contractor shall remove all heavily chlorinated water from the main and temporary services by flushing with potable water at the maximum velocity which can be developed under the direction and control of the District.

The Contractor shall properly neutralize and dispose of the chlorinated water and flushing water in accordance with all applicable regulations. Contractor shall obtain all special waste disposal permits necessary.

G. **Disposal of Heavily Chlorinated Water.** Disposal of chlorinated water will be in accordance with 401 KAR5:031. Coliform samples must be taken at connection points to existing mains, 1 mile intervals along new mains, and at all dead ends. Contractor shall apply a de-chlorinating agent to the water to be wasted to neutralize thoroughly the chlorine residual remaining in the water. (See the following table for neutralizing chemicals.) Federal, state, and local regulatory agencies should be contacted to determine special provisions for disposal of heavily chlorinated water.

Chlorine residual of water being disposed of shall be de-chlorinated by treating with one of the chemicals listed in the following table:

Pounds of Chemicals Required to De-chlorinate Various Residual Chlorine Concentrations in 100,000 Gallons of Water*

Residual Chlorine Concentration *mg/L*	Sulfur Dioxide (SO_2)	Sodium Bisulfate (NaHSO3)	Sodium Sulfite (Na_2SO_3)	Sodium Thiosulfate ($Na_2S_2O_3@5H_2O$)
1	0.8	1.2	1.4	1.2
2	1.7	2.5	2.9	2.4
10	8.3	12.5	14.6	12.0
50	41.7	62.6	73.0	60.0

* Except for residual chlorine concentration, all amounts are in pounds.

The Contractor shall provide all necessary materials, equipment and labor for applying the de-chlorinating chemical in a manner such that proper mixing and contact time of the

chemical and the heavily chlorinated water is obtained for complete removal of chlorine being flushed. The Contractor shall periodically test the flush water to verify that the chlorine residual is zero.

H. **Chlorine Residual Tests.** Upon completion of final flushing, the District will perform chlorine residual tests to ensure the chlorine residual in the main and temporary services is not higher than that generally prevailing in the remainder of the water distribution system and is acceptable to the District.

I. **Bacteriological Tests.** Sampling and testing of water in the main and temporary services will be performed by the District after final flushing. A standard plate count will be made by the District for each sample.

J. **Redisinfection.** Should the bacteriological tests indicate the presence of coliform organisms at any sampling point, the main and temporary services shall be re-flushed, re-sampled, and re-tested. If check samples show the presence of coliform organisms, the main and temporary services shall be re-chlorinated at no additional cost to the District until results acceptable to the District are obtained.

Re-disinfection shall be completed by the continuous feed or by the slug method. Unless otherwise permitted, the chlorination agent shall be injected into the main and temporary services at the supply end through a corporation cock installed in the top of the pipe. All materials, equipment and labor necessary for the re-disinfection shall be supplied by Contractor at no additional cost to the District.

K. **Hydrostatic Testing.** Hydrostatic Testing will be in accordance with AWWA C600. The water main being tested shall have all air expelled by additional flushing or installation of taps on high points in the line. The pressure of the water main shall be gradually increased to obtain a minimum pressure of 100 psi over the design pressure (250 psi minimum) at the lowest elevation point of the water main or as directed by the District. The test will be for a two (2) hour duration and will not vary by more than 5 psi. All tests performed for each test section shall be witnessed and approved by a representative of the District, in the event any test is performed without a representative of the District, the Contractor shall be required to test the section again. Leakage is defined as the amount of water used to maintain the test pressure.

17. APPLICABLE SPECIFICATIONS & STANDARDS

The following current specifications and standards form a part of these Specifications:

A. **American Water Works Association** (AWWA) Standards
B. **Northern Kentucky Water District** Standard Specifications & Drawing for the Installation of Water Mains current edition located at www.nkywater.org
C. "Manual of Accident Prevention in Construction" published by the **Associated General contractors of America**
D. **Kentucky Occupational Safety and Health Administration's** "Kentucky Occupational Safety and Health Standards for General Industry" current edition.
E. **American National Standards Institute** (ANSI)

F. **American Society for Testing & Materials** (ASTM)
G. **Kentucky Division of Water Quality**
H. **"Recommended Standards for Water Works"** current edition

End of Section

Geotechnical Report

NKY Water District - Blangey Road Water Main

Prepared for

Cardinal Engineering
1 Moock Road #1
Wilder, Kentucky 41071

July 7, 2023

Project No. CN230010

July 7, 2023

Mr. Kevin Hanson
Cardinal Engineering
1 Moock Road #1
Wilder, Kentucky 41071

Subject: Geotechnical Report for
NKY Water District - Blangey Road Water Main
Highland Heights, Kentucky
CSI Project No. CN230010

Dear Mr. Hanson,

Consulting Services Incorporated of Cincinnati (CSI) is pleased to present our geotechnical report for the NKY Water District - Blangey Road Water Main project in Highland Heights, Kentucky. We provided our services in general accordance the CSI Proposal 8227, dated December 12, 2022.

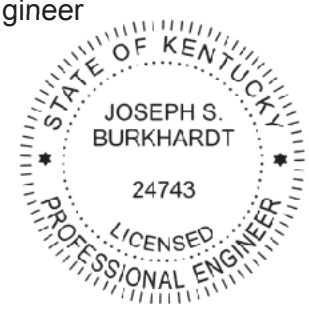
Our report represents information provided to us, readily available published data relevant to the site and site area, our observations and subsurface conditions encountered and our opinion of primary geotechnical conditions (discussion and recommendations) affecting site work and foundation design for the project.

Again, we greatly appreciate the opportunity to provide our services and look forward to working with you and the project team on this (and hopefully) more projects in the future. Please do not hesitate to contact us for questions or comments about the information contained herein.

Cordially,

Graham Duncan, EIT
Staff Engineer

Joseph S. Burkhardt, P.E.
Principal Geotechnical Engineer



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Appendix A

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INTRODUCTION

1 SCOPE OF THE GEOTECHNICAL EXPLORATION

As proposed, CSI conducted a geotechnical exploration for the proposed 8” water main extension along Blangey Road in Highland Heights, Kentucky. Our services included a review of the project information provided, conducting a subsurface exploration that utilized soil borings to obtain samples for modeling the soil conditions along the proposed route, an analysis of data and information obtained, evaluation of bearing conditions for the water line and recommendations for backfill of the pipe.

2 SITE AND PROJECT INFORMATION

The project will include the installation of a new 8” water main along Blangey Road in Highland Heights, Kentucky. As part of this report, CSI has reviewed a plan set titled ‘Subdistrict HB Water main Extension Project’ dated 1-11-23. CSI’s understanding of the project is outlined in the tables below.

Table 1: Site Information

Item	Description
Site Location	The site is located along Blangey Road in Highland Heights, Kentucky from the intersection of the last fire hydrant on Blangey Road (approximately 700 feet west of Mary Ingles Highway) to the end of county maintenance.
Length of Improvement	The water line will be approximately 2,700 feet in length
Surrounding Area	The surrounding area is characterized by sparse residential developments in all directions
Existing Conditions	Existing road way is asphalt paved and is 15 foot wide edge to edge. The roadway is present along an unnamed tributary of the Ohio River. In general, the alignment is located within a valley that appears to be a flood plain of the Ohio River. Steep slopes are present along the creek bed to the south and east of the roadway.

Table 2: Project Information

Item	Description
Site Layout	See Boring Location Plan
Proposed Structure(s)	An approximately 2,700 foot long 8 inch of new water main and intermittent fire hydrants.
Water Main Construction	Based on our understanding, the water main will be constructed within the road right-of-ways at a depth of about 5 feet below grade. The water main will be installed along both sides of the roadway and will cross back and forth across the roadway 5 times, near stations 3+00, 6+00, 11+00, 18+00, and 22+00. Provided plans indicate that the alignment will cross the several tributaries near stations 2+00, 13+00, and 25+00, which will be encased in concrete. Additionally, a jack and bore crossing is proposed to cross existing driveway(s) present near station 26+00.

3 AREA/SITE INFORMATION

3A AREA TOPOGRAPHY / PHYSIOGRAPHY

The site is located within the Outer Blue Grass Region of northern Kentucky. This area is characterized by Ordovician dolomites, limestones and calcareous shales, thin pre-Wisconsinan drift, loamy soils and low to moderately high relief. Published mapping reviewed indicates the elevations in the site vicinity range from about 480 feet near the begging of the alignment to about 600 feet near the end of the roadway. Below is a figure of the location of the site with respect to the regional physiography.

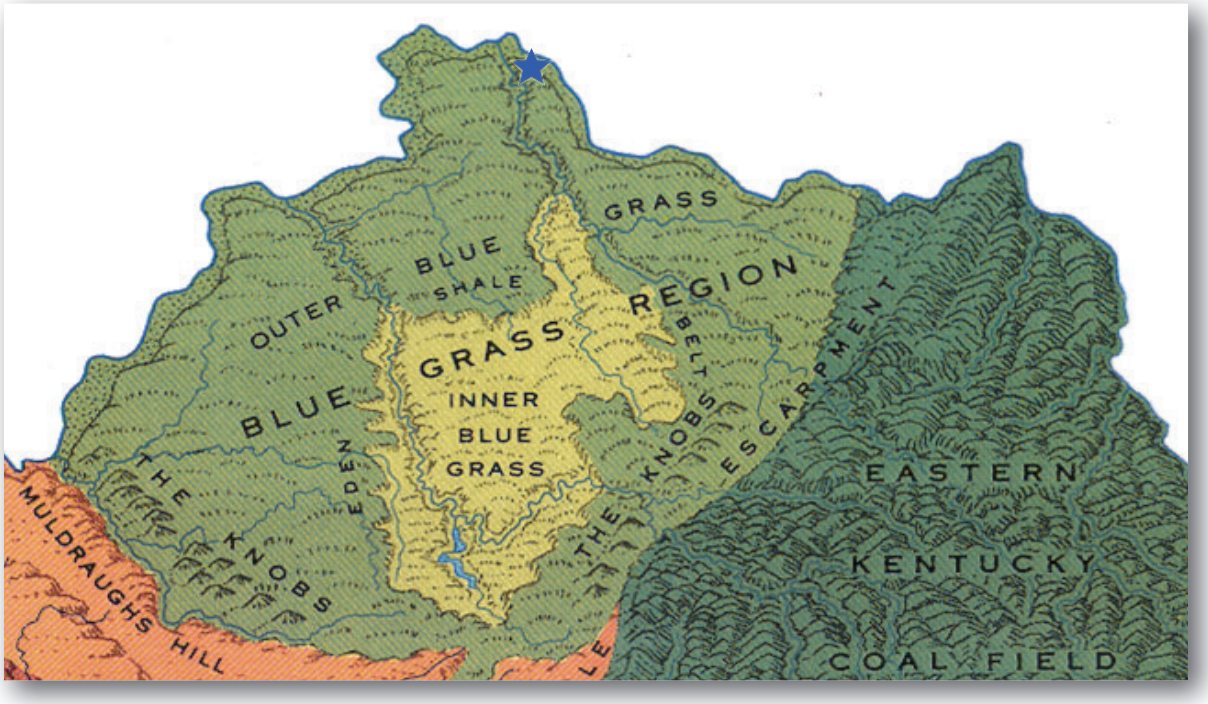


Figure 1 - Kentucky Physiographic Map (site vicinity shown with star)

3B SITE GEOLOGY

Review of the *Kentucky Geologic Map Service* shown in **Figure 2** below indicates the the majority of the alignment is underlain by Quaternary age alluvial deposits (Qal) with the southern portions of the alignment being underlain by Ordovician age deposits belonging to the Kope (Ok) Formation. In general, the alluvial deposits are comprised of clay with varying amounts of silt, sand, and gravel. The Kope formation is comprised of interbedded limestone and shale with shale accounting for up to 80 percent of the total formation.

Figure 2: Site Geologic Mapping. Approximate Alignment Highlighted.

FINDINGS

4 SUBSURFACE CONDITIONS

CSI performed a total of three (3) soil test borings to explore the subsurface conditions along the alignment at approximate 900 foot intervals. In general, our borings encountered fill material, alluvial and residual. Borings for this project were numbered sequentially across eight separate project sites. Specific borings for the Blangey Road Project site are labeled as boring numbers B-20 through B-22.

4A STRATA INFORMATION

The subsurface conditions encountered at the test boring locations are shown in the Test Boring Log in the Appendix. These records represent our interpretation of the subsurface conditions based on the field logs, visual examination of field samples by an engineer, and tests of the

samples collected. The letters in parentheses following the soil descriptions are the soil classifications in general accordance with the Unified Soil Classification System (USCS). It should be noted that dashed stratification lines shown on the soil boring log represent approximate transitions between material types. In-situ stratum changes could occur gradually or at slightly different depths. Boring elevations were determined by Cardinal Engineering and supplied to CSI.

ASPHALT/TOPSOIL

Topsoil was encountered at the ground surface each boring location and was noted to be between 3 and 4 inches.

PREVIOUSLY PLACED FILL

Previously placed fill material (or possible fill) was encountered in boring B-20 to a depth of about 12 feet below grade. The previously placed fill was described to be brown to brown and gray mottled lean clay with varying amounts of rock fragments, sand, silt, and roots. Standard Penetration Testing (SPT) N-Values ranged from 5 to 20 blows per foot (bpf) indicated a firm to very stiff consistency. Laboratory testing of a representative sample indicate a Liquid Limit (LL) of 44 percent and Plasticity Index of 24 percent. Natural moisture contents ranged from 16.6 to 24.4 percent.

ALLUVIUM

Alluvial soils were encountered in boring B-20 underlying the fill material to a depth of about 12 feet below grade. The alluvial soils encountered were described as a brown silt with fine grained sand. An SPT N-Value of 8 bpf was recorded within the alluvial soil indicating a firm consistency. A natural moisture content of 22.7 percent was recorded within the alluvial soils.

RESIDUUM

Residual soil deposits were encountered underlying the topsoil in borings B-21 and B-22 and were described to be brown, lean to fat clay with varying amounts of silt and rock fragments. SPT N-Values ranged from 2 to more than 50 bpf indicated a soft to hard consistency. Laboratory testing of a representative sample indicate a Liquid Limit (LL) of 42 percent and Plasticity Index of 18 percent. Natural moisture contents ranged from 18.9 to 27.0 percent.

WEATHERED SHALE/LIMESTONE BEDROCK

Auger refusal or weathered shale bedrock was not encountered within any of our boring locations. For details of subsurface conditions encountered at a particular boring location please refer to the boring logs contained in Appendix A. It should be noted that our borings were drilled and sampled according to the procedures presented in the appendix. The boring locations shown in the appendix should be considered accurate only to the degree implied by the method used.

4B GROUNDWATER CONDITIONS

Groundwater was not encountered in any measurable quantities at our boring locations. In the Northern Kentucky area, water conditions that usually affect construction and performance of projects consist of trapped/perched water zones which occur in variable areas in the soil mass that may be present at the soil/bedrock interface and/or due to sand layers and seams throughout the soil. Perched water sources are often not linked to the more continuous relatively stable ground water table that typically occurs at greater depths. Site excavation activities or ground disturbance can expose these features and the resulting seepage can vary greatly. Groundwater issues are also dependent upon recent rainfall activity and surface and subsurface drainage patterns in the area that may change depending on climatic conditions.

5 LABORATORY TESTING

Laboratory tests were performed on selected recovered samples from the borings to provide recommendations for earthwork and to determine index properties of the soils. Details for the test methods and results are shown in the Appendix. Tests performed included:

- 13 Moisture Content Tests
- 2 Grain Size Analyses (-200 Sieve)
- 3 Atterberg Limits Tests

GEOTECHNICAL DISCUSSION AND RECOMMENDATIONS

6 DISCUSSION—GEOTECHNICAL ISSUES

Based on our experience with similar projects and the conditions observed during our subsurface exploration, we believe the site is suitable for the proposed construction, provided the recommendations outlined in this report are followed. The primary geotechnical concerns are:

- **SOFT TO MARGINALLY SOFT SOILS**
- **PREVIOUSLY PLACED FILL MATERIAL**

6A SOFT TO MARGINALLY SOFT SOILS

Soft to marginally soft soil were encountered in Borings B-20 and B-22 at depths as great as 8.5 feet below grade. Additionally, the majority of the alignment is located within areas which are shown to be underlain by alluvial soils which are prone to be soft/loose and saturated. Due to the nature of the deposition, alluvial soils are often soft, wet, and poorly consolidated. As such, they often make poor bearing materials and undercuts to competent soils should be anticipated within these areas. It is anticipated that the bearing materials at the proposed invert depths will primarily encounter firm alluvial or residual soils, however, some undercutting may be required. Additionally, within areas where alluvial soils are encountered, particularly along the existing creek

and where granular soils are encountered, ground water infiltration should be anticipated within excavations. In most cases, the groundwater should be able to be removed from excavations using pumps.

6B PREVIOUSLY PLACED FILL MATERIAL

Previously placed fill or possible fill material was encountered in boring B-20 to a depth of about 12 feet below grade. Old fill materials are often improperly compacted, commonly contain organics and debris, and are generally poor bearing materials. Based upon consistency of the fill encountered within our boring it should provide suitable support conditions. If widespread fill material is encountered during installation, it is possible that soft and/or lose areas of fill may be encountered which will require undercuts to provide suitable bearing support.

7 WATER PIPE SUPPORT

With regards to pipe support, firm or better alluvial or residual soils are expected along a majority of the proposed alignment. Fill/Possible Fill material was encountered at B-20 to a depth of about 12 feet. In general, the fill appears to be suitable to support the pipe; however, a distinct drop in strength was noted from a depth of about 8 to 12 feet. Where fill is encountered, some undercutting may be necessary depending upon the consistency. Based upon subsurface information, a majority of the soils along the alignment should provide adequate support, however some undercutting should be expected.If soft soils are encountered, they should be undercut to the stiff or better materials and replaced with suitable fill material. Additionally, restrained joints and or thrust blocks may be required depending upon the field conditions. If questionable soils are encountered, CSI should be notified to evaluate and provide necessary recommendations.

8 THRUST RESTRAINT

Where changes in the direction of flow occur and/or where the water main cross sectional area changes, thrust forces will be generated in the direction of water flow. In some cases the thrust forces generated can be greater than the lateral resistance of the natural soils and/or backfill placed within utility trenches. To prevent separation and/or damage to the water main at these horizontal or vertical bends/joints, thrust block restraints (or restrained joints where thrust blocks are not applicable) will be required. Review of the provided plans indicate that thrust block are planned at several location along the proposed alignment. Based upon the conditions encountered, the thrust blocks appear to be suitable for the proposed alignment. Thrust blocks should bear on the undisturbed stiff or better residual soils and can be designed using the soil parameters shown in the table below. For design of restrained joints, a frictional coefficient between pipe and soil of 0.3 should be used. Additionally, reinforced concrete encasement may also be used in place of restrained joints.

Table 3: Thrust Block Soil Parameters

Soil Group	Passive Earth Pressure Coefficient	Unit Weight (pcf)	Cohesion (psf)	Friction Angle (φ)
Residual Clay	Kp = 2.4	110	0	φ = 24
Fill/Alluvial	Kp = 2.2	105	0	φ = 22

9 EARTHWORK

We do not anticipate any structural fill to occur along the alignment with the exception of backfill of the trenches. The following recommendations are for backfill operations around open cut trenches for the alignment.

9A EXCAVATIONS

Normal earth excavation equipment should be suitable for excavations associated with the overburden soils. For below-grade excavations, the fill material as well as alluvialsoils should be classified as OSHA Type C soils with a minimum slope excavation of 1.5H:1V. For excavations within the residual soils, the soil should be classified as an OSHA Type B soil with a minimum slope excavation of 1H:1V. If soil types other than what has been mentioned above are encountered, CSI should be contacted to evaluate for stability.

9B TRENCH BACKFILL OPERATIONS

These materials are placed in more confined areas than mass earthwork materials or pavement materials. The following are general recommendations for backfill areas:

- Fill lift thicknesses will vary dependent on compaction equipment available and material types, but in no case should exceed 8 inches for clay and 12 inches for granular soils;
- For crushed stone/aggregate backfills in trenches and when using smaller compaction equipment the lift thickness should be based on the type of aggregate and equipment. For well-graded granular soils such as Dense Grade Aggregate, a thickness of 4 to 6 inches is typically required. If open-graded stone is used, the lift thickness may be able to be increased. This should be evaluated by the geotechnical engineer;
- Place cohesive fill (clay) in maximum 8-inch thick loose lifts. Granular soils may be placed in maximum 12 inch loose lifts provided properly sized equipment is used in the compaction process;
- Fill lifts should be compacted to at least 98 percent of the soil's maximum dry density (ASTM D 698) in areas beneath pavements and 92 percent in grassed areas.
- Maintain the moisture content of compacted fill between minus 2 and plus 2 percent of optimum moisture;

- Maximum particle size of the soil should be limited to half the lift thickness.;
- Density testing should be performed as a means to verify percent compaction and moisture content of the material as it is being placed and compacted;
- Density testing should be performed at a rate of at least 3 tests per lift; CSI should be retained to provide additional recommendations for backfill;

9C TUNNELING METHODS (TRENCHLESS)

Provided plans indicate that the water main will utilize a jack and bore crossing to go under an existing driveway near station 26+00. This method of installation is viable where stable ground is present above groundwater, over short lengths of about 400 to 500 feet, and where highly accurate alignment is not required.

For the Jack and Bore installation, a launching and receiving pit would be required at each end of the section. To accommodate equipment, we would anticipate the pit would extend about 5 feet below the planned bottom of the pipe invert with temporary shoring installed around the sidewalls. Based on our borings, we anticipate that the soils will consist of clay with varying amounts of silt and rock fragments and be stable enough for this type of installation; however, we recommend to consult with a speciality contractor for specific recommendations on the installation.

The temporary support walls for the Jack and Bore pits will be subjected to lateral earth pressures from the surrounding soil. The retained zone should be considered as an imaginary line drawn upward at a 45 degree angle from the top of the retaining wall footings. The values given in the tables below assume the backfill zone is level, drained, the zone of backfill conforms to the minimum zone size given above, and no surcharge is placed on the backfill.

Table 4: Equivalent Fluid Density (EFD) and Earth Pressure Coefficient

Condition	On-Site Soils (2)	
	Coefficients	EFD (Drained) (pcf)
Active	Ka = 0.42	46
Passive	Kp = 2.37	260
At-Rest	Ko = 0.59	65

(1) On-site soil having a unit weight of 110 pcf and friction angle of 24 degrees.
(2) Assumes a level backfill above retained zones and no surcharge loading

9D GENERAL NOTES

- For all earthwork operations, positive surface drainage is prudent to keep water from ponding on the surface and to assist in maintaining surface stability;
- The surface should be sealed prior to expected wet weather. This can usually be accomplished with rubber-tired construction equipment or a steel-drum roller;
- If any soil placement problems occur, CSI should be retained to provide additional recommendations, as needed.

10 SITE DRAINAGE

During construction, water should not be allowed to pond in excavations or undercutting will likely be required. During the life of the project, slope the subgrade and other site features so that surface water flows away from the site structures.

For excavations during construction, most free water from the subsurface conditions could likely be removed via sump pumps at or near the source of seepage. However, if normal dewatering measures prove insufficient, CSI should be retained to provide recommendations on the issue.

11 CREEK CROSSING

Provided plans indicate that the proposed water main will cross three unnamed tributaries utilizing a below grade crossing. Within the creek, plans indicate that the within the limits of the creek, the excavation below the bedrock-soil interface will be backfilled with concrete to match the existing creek bed configuration. While our boring locations did not encounter bedrock, bedrock is visible in several areas within the existing tributaries at higher elevations near the end of the alignment (in the area of boring B-21). Based upon our experience in the area and observations made within the tributaries, we expect bedrock to be present at or near the creek bottoms. In the event that bedrock is not encountered within the excavation, we recommend that the base of the excavation be extended to bedrock (or to a sufficient depth to prevent scour of the bearing soils) and backfilled with concrete.

12 NOTES ON THE REPORT AND RECOMMENDATIONS

We recommend that this complete report be provided to the various design team members, the contractors and the project Owner. Potential contractors should be informed of this report in the "Instructions to Bidders" section of the bid documents. A geotechnical exploration, such as the one we performed, used three borings to attempt to model the subsurface conditions at the site. Because no exploration contains complete data or a complete model, there is always a possibility that conditions between borings will be different from those at specific boring locations. Thus, it is possible that some subsurface conditions will not be as anticipated by the project team or contractor. If this report is included or referenced in the actual contract documents, it shall be explicitly understood that this report is for informational purposes only. CSI shall not be responsible for the opinions of, or conclusions drawn by others.

It has been our experience that the construction process often disturbs soil conditions and this process, no matter how much experience we use to anticipate construction methodology, is not completely predictable. Therefore, changes or modifications to our recommendations are likely needed due to these possible variances. Experienced CSI geotechnical personnel should be used to observe and document the construction procedures and the conditions encountered. Unanticipated conditions and inadequate procedures should be reported to the design team along with timely recommendations to solve the problems created. We recommend that the Owner retain CSI to provide this service based upon our familiarity with the project, the subsurface conditions and the intent of our recommendations.

This report is based on the supplied project information, the subsurface conditions observed at the time of the report, and our experience with similar conditions. As such, it cannot be applied to other project sites, types, or combinations thereof. If the Project Information section in this report contains incorrect information or if additional information is available, you should convey the correct or additional information to us and retain us to review our recommendations. Our recommendations may then require modification.

No section or portion of this report (including Appendix information) can be used as a stand alone article to make distinct changes or assumptions. The entire report and Appendix should be used together as one resource. We wish to remind you that our exploration services include storing the soil samples collected and making them available for inspection for 30 days. The soil samples are then discarded unless you request otherwise. Please inform us if you wish to keep any of the obtained samples.

While this report deals with samples of subsurface materials and some comments on water conditions at the site, no assessment of site environmental conditions or the presence of contaminants were performed.

We wish to remind you that our exploration services include storing the soil samples collected and making them available for inspection for 30 days. The samples are then discarded unless you request otherwise. Please inform us if you wish to keep any of the obtained samples.

APPENDIX A

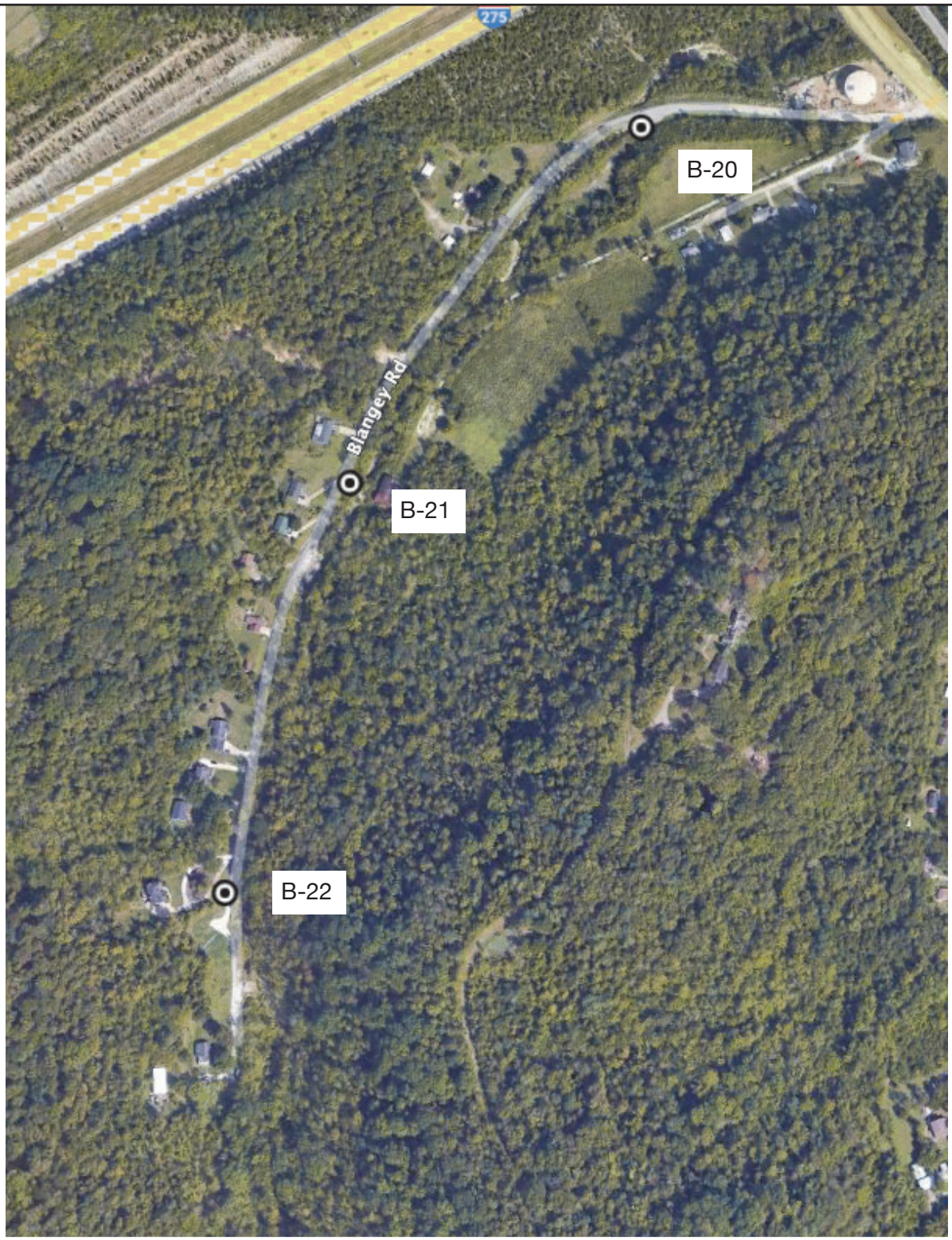
SITE LOCATION PLAN
GEOTECHNICAL BORING INFORMATION SHEET
GENERAL BORING PROFILE
TEST BORING LOGS
FIELD TESTING PROCEDURES
LIQUID AND PLASTIC LIMITS REPORT
SUMMARY OF LABORATORY RESULTS
LABORATORY TESTING PROCEDURES

N

ADAPTED FROM TOPOGRAPHIC MAPPING
FOR ILLUSTRATION PURPOSES

CSI Cincinnati, LLC
11785 Highway Drive
Cincinnati, Ohio 45241
513.252.2059 Office | 888.792.3121 Fax
www.csiohio.com

TITLE: SITE LOCATION PLAN		PROJECT NO: CN230010	DRAWN BY: GD
PROJECT:	BLANGEY ROAD NEW WATER MAIN HIGHLAND HEIGHTS, KY	DATE: 7/7/23	CHECKED BY: JB
		NOT TO SCALE	DRAWING NO 1 OF 2



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FOR ILLUSTRATION PURPOSES

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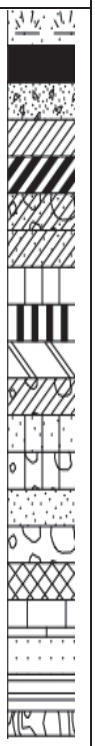
11785 Highway Drive
Cincinnati, Ohio 45241
513.252.2059 Office | 888.792.3121 Fax
www.csiohio.com

TITLE: BORING LOCATION PLAN		PROJECT NO: CN230010	DRAWN BY: GD
PROJECT:	BLANGEY ROAD NEW WATER MAIN HIGHLAND HEIGHTS, KY	DATE: 7/7/23	CHECKED BY: JB
		NOT TO SCALE	DRAWING NO 2 OF 2

Consulting Services Incorporated
LEXINGTON | LOUISVILLE | CINCINNATI

Geotechnical Boring Information Sheet

Sample Type Symbols	
Splitspoon (SPT)	
Shelby Tube	
Grab	
Rock Core	
Auger Cuttings	

Surface Symbols	
Topsoil	
Asphalt	
Concrete	
Lean Clay	
Fat Clay	
Glacial Till	
Sandy Clay	
Silt	
Elastic Silt	
Lean Clay to Fat Clay	
Gravelly Clay	
Sandy Silt	
Gravelly Silt	
Sand	
Gravel	
Fill	
Limestone	
Sandstone	
Shale/Siltstone	
Weathered Rock	

Samples Strength Descriptors	
Cohesive Soils:	**N**
Very Soft	0-1
Soft	2-4
Firm	5-8
Stiff	9-15
Very Stiff	16-30
Hard	31+
Non-cohesive Soils:	
Very Loose	0-4
Loose	5-10
Firm	11-20
Very Firm	21-30
Dense	30-50
Very Dense	51+

Definitions

SPT-"Splitspoon" or standard penetration test. Blow counts are number of drops required for a 140 lb hammer dropping 30 inches to drive the sampler 6 inches.

N-value is the addition of the last two intervals of the 18-inch sample.

Shelby tubes are often called "undisturbed samples". They are directly pushed into the ground, twisted, allowed to rest for a small period of time and then pulled out of the ground. Tops and bottoms are cleaned and then sealed.

Sample classification is done in general accordance with ASTM D2487 and 2488 using the Unified Soil Classification System (USCS) as a general guide.

Soil moisture descriptions are based on the recovered sample observations. The descriptors are dry, slightly moist, moist, very moist and wet. These are typically based on relative estimates of the moisture condition of a visual estimation of the soils optimum moisture content (EOMC). Dry is almost in a "dusty" condition usually 6 or more percent below EOMC. Slightly moist is from about 6 to 2 percent below EOMC at a point at which the soil color does not readily change with the addition of water. Moist is usually 2 percent below to 2 percent above EOMC and the point at which the soil will tend to begin forming "balls" under some pressure in the hand. Very moist is usually from about 2 percent to 6 percent above EOMC and also the point at which it's often considered "muddy". Wet soil is usually 6 or more percent above EOMC and often contains free water or the soil is in a saturated state.

Silt or Clay is defined at material finer than a standard #200 US sieve (<0.075mm) Sand is defined as material between the size of #200 sieve up to #4 sieve. Gravel is from #4 size sieve material to 3". Cobbles are from 3" to 12". Boulders are over 12".

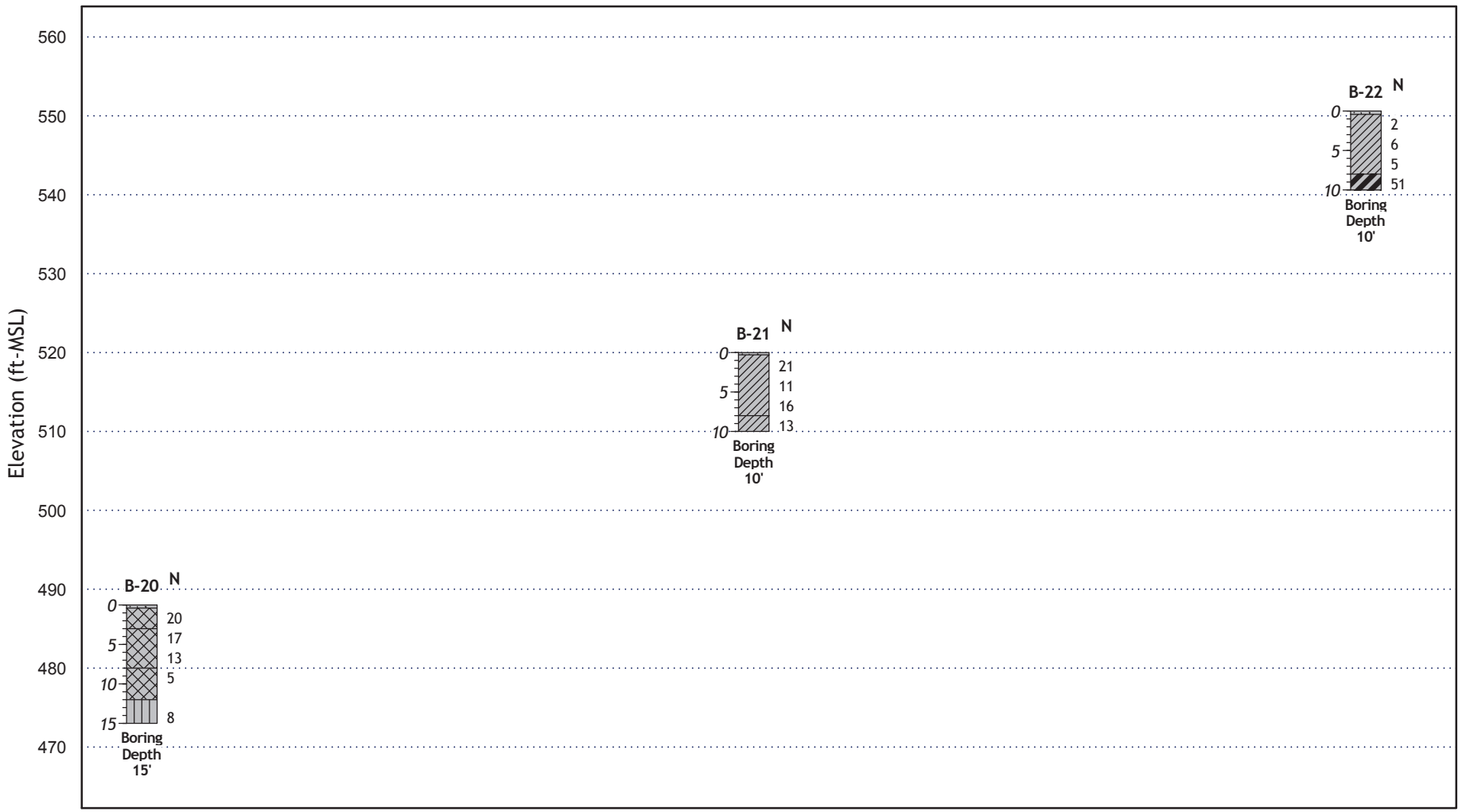
Rock hardness is classified as follows:

Very Soft:	Easily broken by hand pressure
Soft:	Ends can be broken by hand pressure; easily broken with hammer
Medium:	Ends easily broken with hammer; middle requires moderate blow
Hard:	Ends require moderate hammer blow; middle requires several blows
Very Hard:	Many blows with a hammer required to break core

Rock Quality Designation (RQD) is defined as total combined length of 4" or longer pieces of core divided by the total core run length; defined in percentage.

Water or cave-in observed in borings is at completion of drilling each boring unless otherwise noted.

Strata lengths shown on borings represents a rough estimate. Transition may be more abrupt or gradual. Soil borings are representative of that estimated location at that time and are based on recovered samples. Conditions may be different between borings and between sample intervals. Boring information is not to be considered stand alone but should be taken in context with comments and information in the geotechnical report and the means by which the borings are logged, sampled and drilled.



SOIL TYPES

(Shown in Graphic Log)

- Fill
- Asphalt
- Topsoil
- Gravel
- Sand
- Silt
- Lean Clay
- Fat Clay
- Silty Sand
- Clayey Sand
- Sandy Silt
- Clayey Silt
- Sandy Clay
- Silty Clay
- Limestone
- Sandstone
- Siltstone
- Shale

CSI of Cincinnati
11785 Highway Drive
Cincinnati, OH 45241
Phone: 513.252.2059
Fax: 888.792.3121

Northern Kentucky Water
CN230010

BORING PROFILE

Fig. 1

CSI of Cincinnati
11785 Highway Drive
Cincinnati, OH 45241
Phone: 513.252.2059
Fax: 888.792.3121

TEST BORING LOG

CLIENT: Cardinal Engineering
PROJECT NAME: Northern Kentucky Water
PROJECT LOCATION: Alexandria, KY

BORING #: B-20
JOB #: CN230010
LOGGED BY: CG
APPROVED BY: GD

DRILLING and SAMPLING INFORMATION

Date Started	2/27/23	Contractor	CSI
Date Completed	3/1/23	Boring Size	4 in.
Drill Rig	B-57 Mobile	Boring Method	SFA
Weather	Cloudy, 40s-50s	Hammer Type	Automatic

SOIL CLASSIFICATION

SURFACE ELEVATION: 488.0

Elev. (ft)	Depth Scale	Water Level	Sample No.	Sample Type	Sample Graphics	Recovery (in)	Standard Penetration Test Blows per 6" [*N-Value*] *blows/foot*	Qu-tsf Unconfined (Pocket Pen.) Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plasticity Index (PI)	Percent Passing #200 Sieve	Remarks
													TOPSOIL - 4 INCHES
486	2		1	SS		7	3-5-15 [*20*]		18.3				FILL: Brown and gray mottled LEAN CLAY (CL) with trace roots and trace rock fragments - moist, very stiff
484	4		2	SS		6	7-10-7 [*17*]		16.6				FILL: Brown and gray LEAN CLAY (CL) with sand, silt, and rock fragments - moist, stiff to very stiff
482	6		3	SS		7	14-7-6 [*13*]		20.4				
480	8		4	SS		18	3-2-3 [*5*]		24.4	44	24	88	POSSIBLE FILL: Gray LEAN CLAY (CL) with trace silt, roots, and rock fragments - moist, firm
478	10												
476	12												Brown SILT (ML) with fine grained sand [Alluvium] - wet, firm
474	14		5	SS		18	3-4-4 [*8*]		22.7			97	
472	16												Boring terminated at 15.0 feet End boring
470	18												

Depth to Groundwater
- Noted on Drilling Tools _____ ft.
- At Completion _____ ft.
- After _____ hours _____ ft.
- Cave Depth _____ ft.

Sample Type
- SPT- Standard Penetration Test
- SS- Split Spoon
- ST- Shelby Tube
- RC- Rock Core
- CU- Auger Cuttings

Boring Method
- HSA- Hollow Stem Augers
- CFA- Continuous Flight Augers
- MD- Mud Drilling

CSI of Cincinnati
11785 Highway Drive
Cincinnati, OH 45241
Phone: 513.252.2059
Fax: 888.792.3121

TEST BORING LOG

CLIENT: Cardinal Engineering
PROJECT NAME: Northern Kentucky Water
PROJECT LOCATION: Alexandria, KY

BORING #: B-21
JOB #: CN230010
LOGGED BY: CG
APPROVED BY: GD

DRILLING and SAMPLING INFORMATION

Date Started	2/27/23	Contractor	CSI
Date Completed	3/1/23	Boring Size	4 in.
Drill Rig	B-57 Mobile	Boring Method	SFA
Weather	Cloudy, 40s-50s	Hammer Type	Automatic

SOIL CLASSIFICATION

SURFACE ELEVATION: 520.0

TOPSOIL - 3 INCHES

Brown LEAN CLAY (CL) with trace rock fragments, and roots [Residuum] - moist, stiff to very stiff

Brown and gray LEAN CLAY (CL) with some rock fragments and trace silt [Residuum] - dry, stiff

Boring terminated at 10.0 feet

No refusal

TEST DATA

Elev. (ft)	Depth Scale	Sample No.	Sample Type	Recovery (in)	Standard Penetration Test Blows per 6" [*N-Value*] *blows/foot*	Qu-tsf Unconfined (Pocket Pen.) Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plasticity Index (PI)	Percent Passing #200 Sieve	Remarks
518	2	1	SS	12	4-7-14 [*21*]		22.7				
516	4	2	SS	12	5-6-5 [*11*]		22.0				
514	6	3	SS	10	3-8-8 [*16*]		20.0				
512	8	4	SS	11	5-5-8 [*13*]		16.7				
510	10										
508	12										
506	14										

Depth to Groundwater
- Noted on Drilling Tools _____ ft.
- At Completion _____ ft.
- After _____ hours _____ ft.
- Cave Depth _____ ft.

Sample Type
- SPT- Standard Penetration Test
- SS- Split Spoon
- ST- Shelby Tube
- RC- Rock Core
- CU- Auger Cuttings

Boring Method
- HSA- Hollow Stem Augers
- CFA- Continuous Flight Augers
- MD- Mud Drilling

CSI of Cincinnati
11785 Highway Drive
Cincinnati, OH 45241
Phone: 513.252.2059
Fax: 888.792.3121

TEST BORING LOG

CLIENT: Cardinal Engineering
PROJECT NAME: Northern Kentucky Water
PROJECT LOCATION: Alexandria, KY

BORING #: B-22
JOB #: CN230010
LOGGED BY: CG
APPROVED BY: GD

DRILLING and SAMPLING INFORMATION

Date Started	2/27/23	Contractor	CSI
Date Completed	3/1/23	Boring Size	4 in.
Drill Rig	B-57 Mobile	Boring Method	SFA
Weather	Cloudy, 40s-50s	Hammer Type	Automatic

SOIL CLASSIFICATION

SURFACE ELEVATION: 550.6

TOPSOIL - 4 INCHES

Brown LEAN CLAY (CL) with trace silt and rock fragments [Residuum] - moist, soft to firm

Brown and gray FAT CLAY (CH) with little silt and trace rock fragments [Residuum] - moist, hard

Boring terminated at 10.0 feet

No refusal

TEST DATA

Sample No.	Sample Type	Sample Graphics	Recovery (in)	Standard Penetration Test Blows per 6" [*N-Value*] *blows/foot*	Qu-tsf Unconfined (Pocket Pen.) Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plasticity Index (PI)	Percent Passing #200 Sieve	Remarks
1	SS		12	2-1-1 [2]		27.8				
2	SS		14	2-3-3 [6]		26.4				
3	SS		7	2-2-3 [5]		14.1	42	18	81	
4	SS		14	3-21-30 [51]		21.5				

Depth to Groundwater
- Noted on Drilling Tools _____ ft.
- At Completion _____ ft.
- After _____ hours _____ ft.
- Cave Depth _____ ft.

Sample Type
- SPT- Standard Penetration Test
- SS- Split Spoon
- ST- Shelby Tube
- RC- Rock Core
- CU- Auger Cuttings

Boring Method
- HSA- Hollow Stem Augers
- CFA- Continuous Flight Augers
- MD- Mud Drilling

FIELD TESTING PROCEDURES

Field Operations: The general field procedures employed by CSI are summarized in ASTM D 420 which is entitled "Investigating and Sampling Soils and Rocks for Engineering Purposes." This recommended practice lists recognized methods for determining soil and rock distribution and ground water conditions. These methods include geophysical and in situ methods as well as borings.

Borings are drilled to obtain subsurface samples using one of several alternate techniques depending upon the subsurface conditions. These techniques are:

a. Continuous 2-1/2 or 3-1/4 inch I.D. hollow stem augers;

b. Wash borings using roller cone or drag bits (mud or water);

c. Continuous flight augers (ASTM D 1425).

These drilling methods are not capable of penetrating through material designated as "refusal materials." Refusal, thus indicated, may result from hard cemented soil, soft weathered rock, coarse gravel or boulders, thin rock seams, or the upper surface of sound continuous rock. Core drilling procedures are required to determine the character and continuity of refusal materials.

The subsurface conditions encountered during drilling are reported on a field test boring record by the chief driller. The record contains information concerning the boring method, samples attempted and recovered, indications of the presence of various materials such as coarse gravel, cobbles, etc., and observations between samples. Therefore, these boring records contain both factual and interpretive information. The field boring records are on file in our office.

The soil and rock samples plus the field boring records are reviewed by a geotechnical engineer. The engineer classifies the soils in general accordance with the procedures outlined in ASTM D 2488 and prepares the final boring records which are the basis for all evaluations and recommendations.

The final boring records represent our interpretation of the contents of the field records based on the results of the engineering examinations and tests of the field samples. These records depict subsurface conditions at the specific locations and at the particular time when drilled. Soil conditions at other locations may differ from conditions occurring at these boring locations. Also, the passage of time may result in a change in the subsurface soil and ground water conditions at these boring locations. The lines designating the interface between soil or refusal materials on the records and on profiles represent approximate boundaries. The transition between materials may be gradual. The final boring records are included with this report.

The detailed data collection methods using during this study are discussed on the following pages.

Soil Test Borings: Soil test borings were made at the site at locations shown on the attached Boring Plan. Soil sampling and penetration testing were performed in accordance with ASTM D 1586.

The borings were made by mechanically twisting a hollow stem steel auger into the soil. At regular intervals, the drilling tools were removed and soil samples obtained with a standard 1.4 inch I.D., 2 inch O.D., split tube sampler. The sampler was first seated 6 inches to penetrate any loose cuttings, then driven an additional foot with blows of a 140-pound hammer falling 30 inches. The number of hammer blows required to drive the sampler the final foot was recorded and is designated the "penetration resistance". The penetration resistance, when properly evaluated, is an index to the soil strength and foundation supporting capability.

Representative portions of the soil samples, thus obtained, were placed in glass jars and transported to the laboratory. In the laboratory, the samples were examined to verify the driller's field classifications. Test Boring Records are attached which graphically show the soil descriptions and penetration resistances.

Core Drilling: Refusal materials are materials that cannot be penetrated with the soil drilling methods employed. Refusal, thus indicated, may result from hard cemented soil, soft weathered rock, coarse gravel or boulders, thin rock seams or the upper surface of sound continuous rock. Core drilling procedures are required to determine the character and continuity of refusal materials.

Prior to coring, casing is set in the drilled hole through the overburden soils, if necessary, to keep the hole from caving. Refusal materials are then cored according to ASTM D 2113 using a diamond-studded bit fastened to the

end of a hollow double tube core barrel. This device is rotated at high speeds, and the cuttings are brought to the surface by circulating water. Core samples of the material penetrated are protected and retained in the swivel-mounted inner tube. Upon completion of each drill run, the core barrel is brought to the surface, the core recovered is measured, the samples are removed and the core is placed in boxes for storage.

The core samples are returned to our laboratory where the refusal material is identified and the percent core recovery and rock quality designation is determined by a soils engineer or geologist. The percent core recovery is the ratio of the sample length obtained to the depth drilled, expressed as a percent. The rock quality designation (RQD) is obtained by summing up the length of core recovered, including only the pieces of core which are four inches or longer, and dividing by the total length drilled. The percent core recovery and RQD are related to soundness and continuity of the refusal material. Refusal material descriptions, recoveries, and RQDs are shown on the "Test Boring Records".

Hand Auger Borings and Dynamic Cone Penetration Testing: Hand auger borings are performed manually by CSI field personnel. This consists of manually twisting hand auger tools into the subsurface and extracting “grab” or baggie samples at intervals determined by the project engineer. At the sample intervals, dynamic cone penetration (DCP) testing is performed. This testing involves the manual raising and dropping of a 20 pound hammer, 18 inches. This “driver” head drives a solid-1¾ inch diameter cone into the ground. DCP “counts” are the number of drops it takes for the hammer to drive three 1¾ inch increments, recorded as X-Y-Z values.

Test Pits: Test pits are excavated by the equipment available, often a backhoe or trackhoe. The dimensions of the test pits are based on the equipment used and the power capacity of the equipment. Samples are taken from the spoils of typical buckets of the excavator and sealed in jars or “Ziplock” baggies. Dynamic Cone Penetration or hand probe testing is often performed in the upper few feet as OSHA standards allow. Refusal is deemed as the lack of advancement of the equipment with reasonable to full machine effort.

Water Level Readings: Water table readings are normally taken in conjunction with borings and are recorded on the "Test Boring Records". These readings indicate the approximate location of the hydrostatic water table at the time of our field investigation. Where impervious soils are encountered (clayey soils) the amount of water seepage into the boring is small, and it is generally not possible to establish the location of the hydrostatic water table through water level readings. The ground water table may also be dependent upon the amount of precipitation at the site during a particular period of time. Fluctuations in the water table should be expected with variations in precipitation, surface run-off, evaporation and other factors.

The time of boring water level reported on the boring records is determined by field crews as the drilling tools are advanced. The time of boring water level is detected by changes in the drilling rate, soil samples obtained, etc. Additional water table readings are generally obtained at least 24 hours after the borings are completed. The time lag of at least 24 hours is used to permit stabilization of the ground water table which has been disrupted by the drilling operations. The readings are taken by dropping a weighted line down the boring or using an electrical probe to detect the water level surface.

Occasionally the borings will cave-in, preventing water level readings from being obtained or trapping drilling water above the caved-in zone. The cave-in depth is also measured and recorded on the boring records.

Summary of Laboratory Results

Borehole	Depth	Sample Type	Liquid Limit	Plastic Limit	Plasticity Index	Classification	Water Content (%)	Unconfined Compressive Strength (tsf)	Dry Density (pcf)	Wet Density (pcf)	Max. Dry Density (pcf)	Opt. Water Content (%)	CBR	Swell (%)	RQD	Percent Recovery	Percent Finer (No. 200)
B-20	1.0	SS					18.3										
B-20	3.5	SS					16.6										
B-20	6.0	SS					20.4										
B-20	8.5	SS	44	20	24	LEAN CLAY(CL)	24.4										88
B-20	13.5	SS					22.7										97
B-21	1.0	SS					22.7										
B-21	3.5	SS					22.0										
B-21	6.0	SS					20.0										
B-21	8.5	SS					16.7										
B-22	1.0	SS					27.8										
B-22	3.5	SS					26.4										
B-22	6.0	SS	42	24	18	LEAN CLAY with SAND(CL)	14.1										81
B-22	8.5	SS					21.5										

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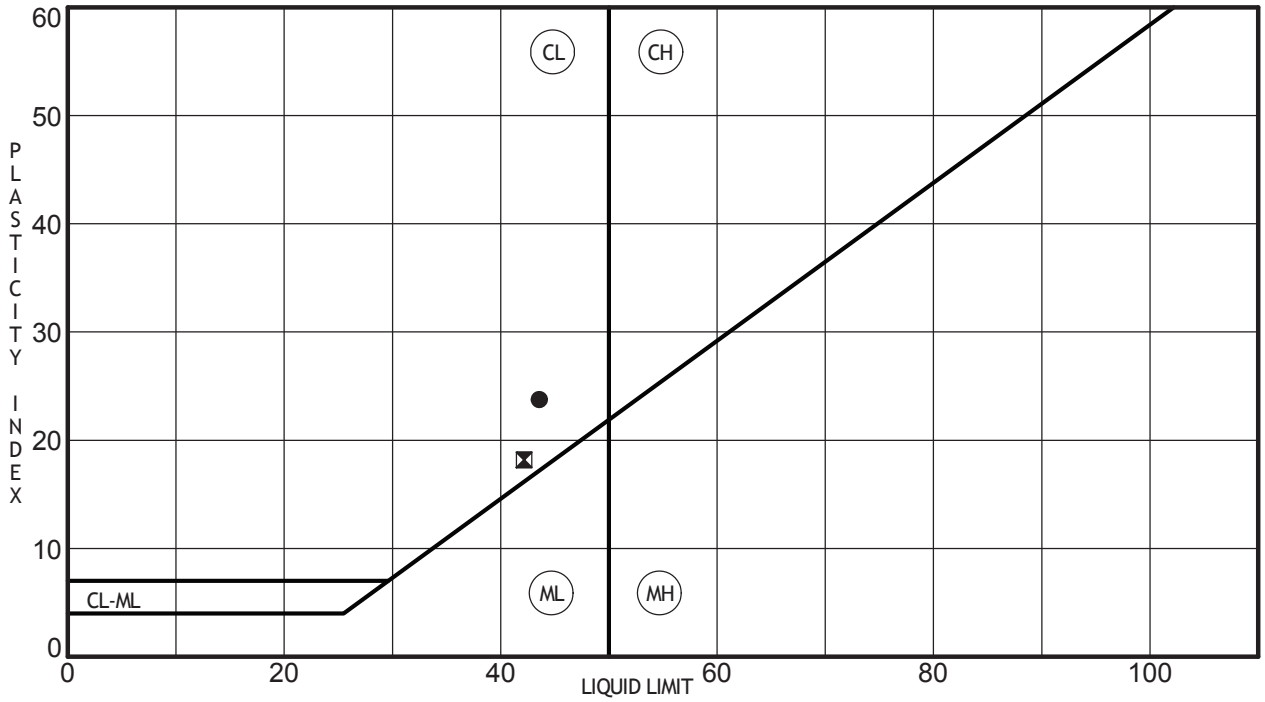
SS - Split Spoon Sample
GRAB - Bulk Grab Sample

PROJECT INFORMATION

Client: Cardinal Engineering
Project Name: Northern Kentucky Water
Project Number: CN230010
Project Location: Alexandria, KY

Liquid and Plastic Limits Test Report



	Boring	Depth (ft)	LL	PL	PI	Water Content	% < #40	% < #200	USCS	Description
●	B-20	8.5	44	20	24	24.4		88		LEAN CLAY(CL)
⊠	B-22	6.0	42	24	18	14.1		81		LEAN CLAY with SAND(CL)

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PROJECT INFORMATION

Client: Cardinal Engineering
Project Name: Northern Kentucky Water
Project Number: CN230010
Project Location: Alexandria, KY

LABORATORY TESTING PROCEDURES

Soil Classification: Soil classifications provide a general guide to the engineering properties of various soil types and enable the engineer to apply past experience to current problems. In our investigations, samples obtained during drilling operations are examined in our laboratory and visually classified by an engineer. The soils are classified according to consistency (based on number of blows from standard penetration tests), color and texture. These classification descriptions are included on our "Test Boring Records."

The classification system discussed above is primarily qualitative and for detailed soil classification two laboratory tests are necessary: grain size tests and plasticity tests. Using these test results the soil can be classified according to the AASHTO or Unified Classification Systems (ASTM D 2487). Each of these classification systems and the in-place physical soil properties provides an index for estimating the soil's behavior. The soil classification and physical properties obtained are presented in this report.

Rock Classification: Rock classifications provide a general guide to the engineering properties of various rock types and enable the engineer to apply past experience to current situations. In our explorations, rock core samples obtained during drilling operations are examined in our laboratory and visually classified by an engineer. The rock cores are classified according to relative hardness and RQD (see Guide to Rock Classification Terminology), color, and texture. These classification descriptions are included on our Test Boring Records.

Atterberg Limits: Portions of the samples are taken for Atterberg Limits testing to determine the plasticity characteristics of the soil. The plasticity index (PI) is the range of moisture content over which the soil deforms as a plastic material. It is bracketed by the liquid limit (LL) and the plastic limit (PL). The liquid limit is the moisture content at which the soil becomes sufficiently "wet" to flow as a heavy viscous fluid. The plastic limit is the lowest moisture content at which the soil is sufficiently plastic to be manually rolled into tiny threads. The liquid limit and plastic limit are determined in accordance with ASTM D 4318.

Moisture Content: The Moisture Content is determined according to ASTM D 2216.

Percent Finer Than 200 Sieve: Selected samples of soils are washed through a number 200 sieve to determine the percentage of material less than 0.074 mm in diameter.

Rock Strength Tests: To obtain strength data for rock materials encountered, unconfined compression tests are performed on selected samples. In the unconfined compression test, a cylindrical portion of the rock core is subjected to increasing axial load until it fails. The pressure required to produce failure is recorded, corrected for the length to diameter ratio of the core and reported.

Compaction Tests: Compaction tests are run on representative soil samples to determine the dry density obtained by a uniform compactive effort at varying moisture contents. The results of the test are used to determine the moisture content and unit weight desired in the field for similar soils. Proper field compaction is necessary to decrease future settlements, increase the shear strength of the soil and decrease the permeability of the soil.

The two most commonly used compaction tests are the Standard Proctor test and the Modified Proctor test. They are performed in accordance with ASTM D 698 and D 1557, respectively. Generally, the Standard Proctor compaction test is run on samples from building or parking areas where small compaction equipment is anticipated. The Modified compaction test is generally performed for heavy structures, highways, and other areas where large compaction equipment is expected. In both tests a representative soil sample is placed in a mold and compacted with a compaction hammer. Both tests have three alternate methods.

Test	Method	Hammer Wt./Fall	Mold Diam.	Run on Material Finer Than	No. of Layers	No. of Blows/ Layer
Standard	A	5.5 lb./12"	4"	No. 4 sieve	3	25
D 698	B	5.5 lb./12"	4"	3/8" sieve	3	25
	C	5.5 lb./12"	6"	3/4" sieve	3	56

Test	Method	Hammer Wt./Fall	Mold Diam.	Run on Material Finer Than	No. of Layers	No. of Blows/ Layer
Modified	A	10 lb./18"	4"	No. 4 sieve	5	25
D 1557	B	10 lb./18"	4"	3/8" sieve	5	25
	C	10 lb./18"	6"	3/4" sieve	5	56

The moisture content and unit weight of each compacted sample is determined. Usually 4 to 5 such tests are run at different moisture contents. Test results are presented in the form of a dry unit weight versus moisture content curve. The compaction method used and any deviations from the recommended procedures are noted in this report.

Laboratory California Bearing Ratio Tests: The California Bearing Ratio, generally abbreviated to CBR, is a punching shear test and is a comparative measure of the shearing resistance of a soil. It provides data that is a semi-empirical index of the strength and deflection characteristics of a soil. The CBR is used with empirical curves to design pavement structures.

A laboratory CBR test is performed according to ASTM D 1883. The results of the compaction tests are utilized in compacting the test sample to the desired density and moisture content for the laboratory California Bearing Ratio test. A representative sample is compacted to a specified density at a specified moisture content. The test is performed on a 6-inch diameter, 4.58-inch-thick disc of compacted soil that is confined in a cylindrical steel mold. The sample is compacted in accordance with Method C of ASTM D 698 or D 1557.

CBR tests may be run on the compacted samples in either soaked or unsoaked conditions. During testing, a piston approximately 2 inches in diameter is forced into the soil sample at the rate of 0.05 inch per minute to a depth of 0.5 inch to determine the resistance to penetration. The CBR is the percentage of the load it takes to penetrate the soil to a 0.1 inch depth compared to the load it takes to penetrate a standard crushed stone to the same depth. Test results are typically shown graphically.

Geotechnical Report

NKY Water District - Enzweiler Road Water Main

Prepared for

Cardinal Engineering
1 Moock Road #1
Wilder, Kentucky 41071

June 28, 2023

Project No. CN230010

June 28, 2023

Mr. Kevin Hanson
Cardinal Engineering
1 Moock Road #1
Wilder, Kentucky 41071

Subject: Geotechnical Report for
NKY Water District - Enzweiler Road Water Main
Alexandria, Kentucky
CSI Project No. CN230010

Dear Mr. Hanson,

Consulting Services Incorporated of Cincinnati (CSI) is pleased to present our geotechnical report for the NKY Water District - Enzweiler Road Water Main project in Alexandria, Kentucky. We provided our services in general accordance the CSI Proposal 8227, dated December 12, 2022.

Our report represents information provided to us, readily available published data relevant to the site and site area, our observations and subsurface conditions encountered and our opinion of primary geotechnical conditions (discussion and recommendations) affecting site work and foundation design for the project.

Again, we greatly appreciate the opportunity to provide our services and look forward to working with you and the project team on this (and hopefully) more projects in the future. Please do not hesitate to contact us for questions or comments about the information contained herein.

Cordially,

Graham Duncan, EIT
Staff Engineer

Joseph S. Burkhardt, P.E.
Principal Geotechnical Engineer

STATE OF KENTUCKY
JOSEPH S. BURKHARDT
24743
LICENSED PROFESSIONAL ENGINEER

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APPENDICES, FIGURES, PHOTOS, AND TABLES

Appendix A

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INTRODUCTION

1 SCOPE OF THE GEOTECHNICAL EXPLORATION

As proposed, CSI conducted a geotechnical exploration for the proposed 8” water main extension along Enzweiler Road in Alexandria, Kentucky. Our services included a review of the project information provided, conducting a subsurface exploration that utilized soil borings to obtain samples for modeling the soil conditions along the proposed route, an analysis of data and information obtained, evaluation of bearing conditions for the water line and recommendations for backfill of the pipe.

2 SITE AND PROJECT INFORMATION

The project will include the installation of a new 8” water main along Enzweiler Road in Alexandria, Kentucky. As part of this report, CSI has reviewed a plan set titled ‘Subdistrict HB Water Main Extension Project’ dated 1-11-23. CSI’s understanding of the project is outlined in the tables below.

Table 1: Site Information

Item	Description
Site Location	The site is located along Enzweiler Road from the intersection of Enzweiler Road and AA Highway to the end of county maintenance near 335 Enzweiler Road.
Length of Improvement	The water line will be approximately 1,200 feet in length
Surrounding Area	The surrounding area is characterized by sparse residential developments to the north, south, and east and light industrial and commercial developments to the west.
Existing Conditions	Existing roadway (Enzweiler Road) is asphalt paved and is 18 foot wide edge to edge. In addition, the AA Highway is present on the south portion of the project where the water line will tie in. A relatively heavily wooded slope is present along the east edge of the roadway.
Existing Utilities	Two gas mains are present along the west of Enzweiler Road and several underground utilities present along AA Road immediately south of the site.

Table 2: Project Information

Item	Description
Site Layout	See Boring Location Plan
Proposed Structure(s)	An approximately 1,200 foot long 8 inch of new water main and intermittent fire hydrants.
Water Main Construction	Based on our understanding the water main will be constructed within the road right-of-ways at a depth of about 5 feet below grade. The water main will connect to an existing water main on the south side of AA Highway and it is our understanding that jack and bore installation will be utilized to cross AA Highway. The majority of the alignment will be installed along the western portion of the roadway and will cross Enzweiler Road to the east portion of the road near the end of the alignment.

3 AREA/SITE INFORMATION

3A AREA TOPOGRAPHY / PHYSIOGRAPHY

The site is located within the Outer Blue Grass Region of northern Kentucky. This area is characterized by Ordovician dolomites, limestones and calcareous shales, thin pre-Wisconsinan drift, loamy soils and low to moderately high relief. Published mapping reviewed indicates the elevations in the site vicinity range from about 810 feet near 335 Enzweiler Road. Below is a figure of the location of the site with respect to the regional physiography.

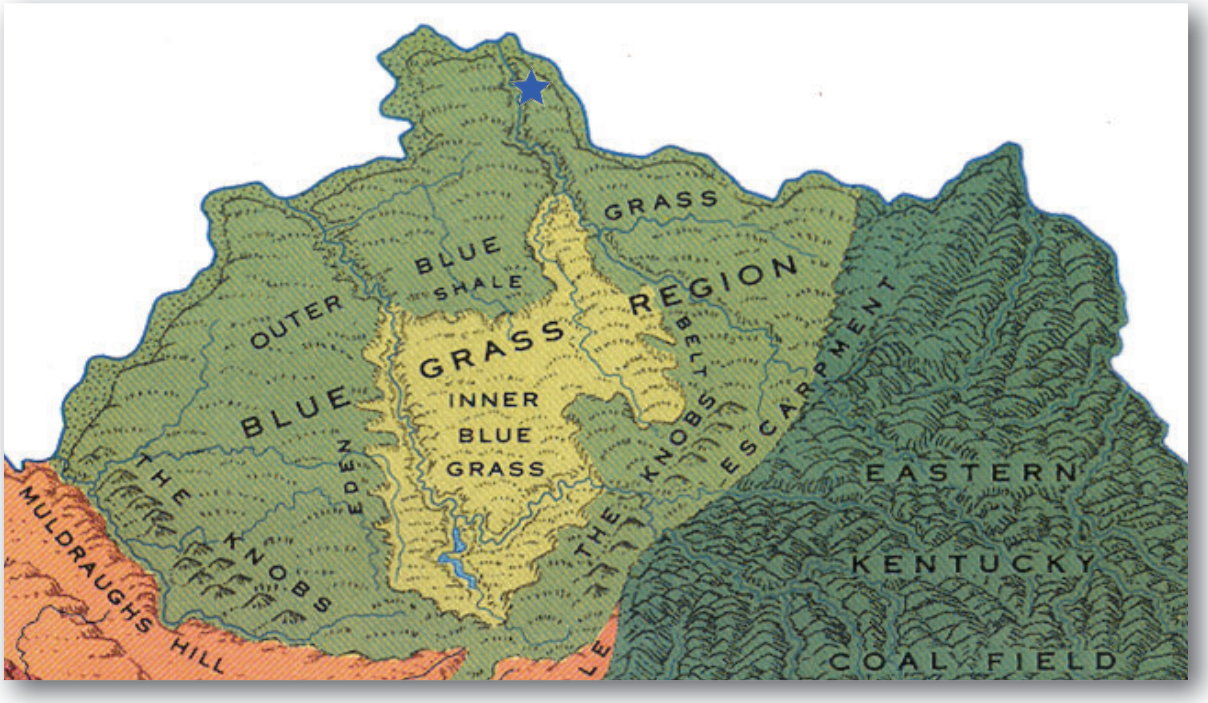

Figure 1 - Kentucky Physiographic Map (site vicinity shown with star)

3B SITE GEOLOGY

Review of the *Kentucky Geologic Map Service* shown in **Figure 2** below indicates the the majority of the alignment is underlain by Ordovician age deposits belonging to the Fairview (Of). In general, this formation is comprised of interbedded limestone and shale with about 45 to 65 percent being limestone.

FINDINGS

5 SUBSURFACE CONDITIONS

CSI performed a total of three (3) soil test borings to explore the subsurface conditions along the alignment at approximate 400 foot intervals. In general our borings encountered residual soils and shale bedrock. Boring for this project were numbered sequentially across eight separate project sites. Specific borings for the Enzweiler Road Project site are labeled as boring numbers B-1 through B-3.

5A STRATA INFORMATION

The subsurface conditions encountered at the test boring locations are shown in the Test Boring Log in the Appendix. These records represent our interpretation of the subsurface conditions based on the field logs, visual examination of field samples by an engineer, and tests of the samples collected. The letters in parentheses following the soil descriptions are the soil classifications in general accordance with the Unified Soil Classification System (USCS). It should be noted that dashed stratification lines shown on the soil boring log represent approximate transitions between material types. In-situ stratum changes could occur gradually or at slightly different depths. Boring elevations were determined by Cardinal Engineering and supplied to CSI.

ASPHALT/TOPSOIL

Topsoil was encountered at the ground surface in the area of boring B-1 and B-3 and was noted to be 5 and 6 inches, respectively. Asphalt was encountered at the ground surface in boring B-2 and was noted to be 3 inches thick.

RESIDUUM

Residual soils were encountered underlying the surficial cover in each boring location. The residuum was described to be brown to brown and gray lean to fat clay with varying amounts of black oxide nodules, rock fragments, and silt. SPT N-Values ranged from 4 to more than 50 bpf indicating a soft to hard consistency. Laboratory testing of a representative sample indicates a LL of 47 to 71 percent and a PI of 26 to 43 percent. Natural moisture contents ranged from 12.4 to 32.2 percent.

WEATHERED SHALE/LIMESTONE BEDROCK

Weathered shale bedrock samples were recovered from borings B-2 and B-3 at depths of about 8 feet below grade. The shale samples recovered were described to be brown highly weathered shale with varying amounts of limestone rock fragments. Auger refusal on what has been assumed to be competent limestone was encountered in boring B-1 at a depth of about 2.6 feet below grade.

For details of subsurface conditions encountered at a particular boring location please refer to the boring logs contained in Appendix A. It should be noted that our borings were drilled and sampled according to the procedures presented in the appendix. The boring locations shown in the appendix should be considered accurate only to the degree implied by the method used.

5B GROUNDWATER CONDITIONS

Groundwater was not encountered in any measurable quantities at our boring locations. In the Northern Kentucky area, water conditions that usually affect construction and performance of projects consist of trapped/perched water zones which occur in variable areas in the soil mass that may be present at the soil/bedrock interface and/or due to sand layers and seams throughout

the soil. Perched water sources are often not linked to the more continuous relatively stable ground water table that typically occurs at greater depths. Site excavation activities or ground disturbance can expose these features and the resulting seepage can vary greatly. Groundwater issues are also dependent upon recent rainfall activity and surface and subsurface drainage patterns in the area that may change depending on climatic conditions.

6 LABORATORY TESTING

Laboratory tests were performed on selected recovered samples from the borings to provide recommendations for earthwork and to determine index properties of the soils. Details for the test methods and results are shown in the Appendix. Tests performed included:

- 6 Moisture Content Tests
- 2 Grain Size Analyses (-200 Sieve)
- 2 Atterberg Limits Tests

GEOTECHNICAL DISCUSSION AND RECOMMENDATIONS

7 DISCUSSION—GEOTECHNICAL ISSUES

Based on our experience with similar projects and the conditions observed during our subsurface exploration, we believe the site is suitable for the proposed construction, provided the recommendations outlined in this report are followed. The primary geotechnical concerns are:

- **SOFT SOILS**
- **SHALLOW BEDROCK EXCAVATION**

7A SOFT SOILS

Soft soils with blow counts of 4 were encountered within boring B-3 at depths between about 1-3 and 5.5-8 feet below grade. Laboratory testing indicates that the samples recovered at these locations had moisture contents of 23.2 and 32.2 percent, respectively. Based upon the moisture content of the soils encountered, it appears that they are relatively saturated and have lost strength due to the excessive water content. As such, they often make poor bearing materials and undercuts to competent soils should be anticipated within these areas.

7B BEDROCK EXCAVATION

Within boring B-1, auger refusal on what has been assumed to be bedrock was encountered at a depth of about 2.6 feet. It is anticipated that average water line installation depths will be about 5 feet below existing grades. Thus, it is anticipated that excavations may extend 2 or more feet into bedrock for the water line. In addition to the water line, the Jack and Bore pits will require additional excavation in order install the water line. The bedrock in the area is a mixture of

interbedded limestone and shale and while the shale is often very soft and soil-like, but the limestone (although in thin beds) can be very hard and difficult to remove. Our borings, as well as site geology, suggest that the bedrock present is comprised of about 50 to 60 percent limestone, with the remainder being shale. A large trackhoe will likely be required; however, the use of ripping equipment or a hoe-ram may be necessary if competent limestone is encountered during excavation. In addition, the jack and bore contractor should anticipate installation of the pipe through the limestone/shale bedrock.

8 WATER PIPE SUPPORT

With regards to pipe support, residual clay or shale/limestone bedrock bearing conditions are expected. Based upon subsurface information, these soils should provide adequate support, with the exception of soft soils present in the area of B-3. Based upon the borings, soft soils may be present to depths of up to 8 feet below grade in this area and undercuts of about 3 feet should be expected. Undercuts should extend to the stiff or better residual soils or bedrock and replaced with suitable fill material. If questionable soils are encountered, CSI should be notified to evaluate and provide necessary recommendations.

9 THRUST RESTRAINT

Where changes in the direction of flow occur and/or where the water main cross sectional area changes, thrust forces will be generated in the direction of water flow. In some cases the thrust forces generated can be greater than the lateral resistance of the natural soils and/or backfill placed within utility trenches. To prevent separation and/or damage to the water main at these horizontal or vertical bends/joints, thrust block restraints (or restrained joints where thrust blocks are not applicable) will be required. Review of the provided plans indicate that thrust block are planned at several location along the proposed alignment. Based upon the conditions encountered, the thrust blocks appear to be suitable for the proposed alignment. Thrust blocks should bear on the undisturbed stiff or better residual soils or alluvial soils and can be designed using the soil parameters shown in the table below. For design of restrained joints, a frictional coefficient between pipe and soil of 0.3 should be used. Additionally, reinforced concrete encasement may also be used in place of restrained joints.

Table 3: Thrust Block Soil Parameters

Soil Group	Passive Earth Pressure Coefficient	Unit Weight (pcf)	Cohesion (psf)	Friction Angle (φ)
Residual Clay	Kp = 2.5	115	100	φ = 25

10 EARTHWORK

We do not anticipate any structural fill to occur on the site with the exception of backfill of the trenches. The following recommendations are for backfill operations around open cut trenches for the alignment.

10A EXCAVATIONS

Normal earth excavation equipment should be suitable for excavations associated with the overburden soils. The weathered shale encountered on site should be able to be excavated with conventional equipment, however for the competent limestone layers encountered, ripping equipment or the use of a hoe-ram will most likely be necessary.

For below-grade excavations, the residual material should be classified as an OSHA Type A soil with a minimum slope excavation of 0.75H:1V. If soil types other than what has been mentioned above are encountered, CSI should be contacted to evaluate for stability.

Based on our understanding of the project, a trenchless installation method will be required to cross AA Highway. Installation of the proposed alignment along Enzweiler Road will utilize typical open trench installation.

10B TRENCH BACKFILL OPERATIONS

These materials are placed in more confined areas than mass earthwork materials or pavement materials. The following are general recommendations for backfill areas:

- Fill lift thicknesses will vary dependent on compaction equipment available and material types, but in no case should exceed 8 inches for clay and 12 inches for granular soils;
- For crushed stone/aggregate backfills in trenches and when using smaller compaction equipment the lift thickness should be based on the type of aggregate and equipment. For well-graded granular soils such as Dense Grade Aggregate, a thickness of 4 to 6 inches is typically required. If open-graded stone is used, the lift thickness may be able to be increased. This should be evaluated by the geotechnical engineer;
- Place cohesive fill (clay) in maximum 8-inch thick loose lifts. Granular soils may be placed in maximum 12 inch loose lifts provided properly sized equipment is used in the compaction process;
- Fill lifts should be compacted to at least 98 percent of the soil's maximum dry density (ASTM D 698) in areas beneath pavements and 92 percent in grassed areas.
- Maintain the moisture content of compacted fill between minus 2 and plus 2 percent of optimum moisture;
- Maximum particle size of the soil should be limited to half the lift thickness.;

- Density testing should be performed as a means to verify percent compaction and moisture content of the material as it is being placed and compacted;

- Density testing should be performed at a rate of at least 3 tests per lift; CSI should be retained to provide additional recommendations for backfill;

10C TUNNELING METHODS (TRENCHLESS)

Due to the water line crossing the AA Highway, open trench excavations will not be possible. As indicated on the drawings, Jack and Bore will be performed with the Push Pit being on Enzweiler Road (north side of AA Highway) and the Receiving Pit on the south side of the AA Highway. This distance is about 80 feet. Given the depth of bedrock in this area (B-1), we anticipate the jack and boring will be performed entirely within limestone and shale bedrock.

To accommodate equipment, we would anticipate the pit would extend about 5 feet below the planned bottom of the pipe invert with temporary shoring installed as necessary around the sidewalls. In the push pit side, located on Enzweiler Road, about 8 to 10 feet of shale/limestone would have to be excavated. While our scope did not include borings on the south side of AA Highway, we anticipate similar conditions and bedrock depths. We recommend that an experienced specialty contractor be contacted to evaluate the conditions and further discuss.

The temporary support walls for the Jack and Bore pits will be subjected to lateral earth pressures from the surrounding soil. The retained zone should be considered as an imaginary line drawn upward at a 45 degree angle from the top of the retaining wall footings. The values given in the tables below assume the backfill zone is level, drained, the zone of backfill conforms to the minimum zone size given above, and no surcharge is placed on the backfill.

Table 4: Equivalent Fluid Density (EFD) and Earth Pressure Coefficient

Condition	On-Site Soils (2)	
	Coefficients	EFD (Drained) (pcf)
Active	Ka = 0.39	50
Passive	Kp = 2.56	320
At-Rest	Ko = 0.56	70

(1) On-site soil having a unit weight of 125 pcf and friction angle of 26 degrees.
(2) Assumes a level backfill above retained zones and no surcharge loading

10D GENERAL NOTES

- For all earthwork operations, positive surface drainage is prudent to keep water from ponding on the surface and to assist in maintaining surface stability;

- The surface should be sealed prior to expected wet weather. This can usually be accomplished with rubber-tired construction equipment or a steel-drum roller;
- If any soil placement problems occur, CSI should be retained to provide additional recommendations, as needed.

11 SITE DRAINAGE

During construction, water should not be allowed to pond in excavations or undercutting will likely be required. During the life of the project, slope the subgrade and other site features so that surface water flows away from the site structures.

For excavations during construction, most free water from the subsurface conditions could likely be removed via sump pumps and open channel flow (if possible) at or near the source of seepage. However, if normal dewatering measures prove insufficient, CSI should be retained to provide recommendations on the issue.

13 NOTES ON THE REPORT AND RECOMMENDATIONS

We recommend that this complete report be provided to the various design team members, the contractors and the project Owner. Potential contractors should be informed of this report in the "Instructions to Bidders" section of the bid documents. A geotechnical exploration, such as the one we performed, used three borings to attempt to model the subsurface conditions at the site. Because no exploration contains complete data or a complete model, there is always a possibility that conditions between borings will be different from those at specific boring locations. Thus, it is possible that some subsurface conditions will not be as anticipated by the project team or contractor. If this report is included or referenced in the actual contract documents, it shall be explicitly understood that this report is for informational purposes only. CSI shall not be responsible for the opinions of, or conclusions drawn by others.

It has been our experience that the construction process often disturbs soil conditions and this process, no matter how much experience we use to anticipate construction methodology, is not completely predictable. Therefore, changes or modifications to our recommendations are likely needed due to these possible variances. Experienced CSI geotechnical personnel should be used to observe and document the construction procedures and the conditions encountered. Unanticipated conditions and inadequate procedures should be reported to the design team along with timely recommendations to solve the problems created. We recommend that the Owner retain CSI to provide this service based upon our familiarity with the project, the subsurface conditions and the intent of our recommendations.

This report is based on the supplied project information, the subsurface conditions observed at the time of the report, and our experience with similar conditions. As such, it cannot be applied to other project sites, types, or combinations thereof. If the Project Information section in this report contains incorrect information or if additional information is available, you should convey

the correct or additional information to us and retain us to review our recommendations. Our recommendations may then require modification.

No section or portion of this report (including Appendix information) can be used as a stand alone article to make distinct changes or assumptions. The entire report and Appendix should be used together as one resource. We wish to remind you that our exploration services include storing the soil samples collected and making them available for inspection for 30 days. The soil samples are then discarded unless you request otherwise. Please inform us if you wish to keep any of the obtained samples.

While this report deals with samples of subsurface materials and some comments on water conditions at the site, no assessment of site environmental conditions or the presence of contaminants were performed.

We wish to remind you that our exploration services include storing the soil samples collected and making them available for inspection for 30 days. The samples are then discarded unless you request otherwise. Please inform us if you wish to keep any of the obtained sample.

APPENDIX A

SITE LOCATION PLAN
GEOTECHNICAL BORING INFORMATION SHEET
GENERAL BORING PROFILE
TEST BORING LOGS
FIELD TESTING PROCEDURES
LIQUID AND PLASTIC LIMITS REPORT
SUMMARY OF LABORATORY RESULTS
LABORATORY TESTING PROCEDURES

N

ADAPTED FROM TOPOGRAPHIC MAPPING
FOR ILLUSTRATION PURPOSES

CSI Cincinnati, LLC
11785 Highway Drive
Cincinnati, Ohio 45241
513.252.2059 Office | 888.792.3121 Fax
www.csiohio.com

TITLE: SITE LOCATION PLAN		PROJECT NO. CN230010	DRAWN BY: GD
PROJECT:	ENZWEILER ROAD NEW WATER MAIN ALEXANDRIA, KY	DATE: 5/14/23	CHECKED BY: JB
		NOT TO SCALE	DRAWING NO 1 OF 2

N

FOR ILLUSTRATION PURPOSES

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Cincinnati, Ohio 45241
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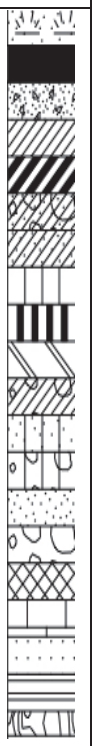
www.csiohio.com

TITLE: BORING LOCATION PLAN		PROJECT NO. CN230010	DRAWN BY: GD
PROJECT:	POPLAR THICKET ROAD NEW WATER MAIN ALEXANDRIA, KY	DATE: 5/14/23	CHECKED BY: JB
		NOT TO SCALE	DRAWING NO 2 OF 2

Consulting Services Incorporated
LEXINGTON | LOUISVILLE | CINCINNATI

Geotechnical Boring Information Sheet

Sample Type Symbols	
Splitspoon (SPT)	
Shelby Tube	
Grab	
Rock Core	
Auger Cuttings	

Surface Symbols	
Topsoil	
Asphalt	
Concrete	
Lean Clay	
Fat Clay	
Glacial Till	
Sandy Clay	
Silt	
Elastic Silt	
Lean Clay to Fat Clay	
Gravelly Clay	
Sandy Silt	
Gravelly Silt	
Sand	
Gravel	
Fill	
Limestone	
Sandstone	
Shale/Siltstone	
Weathered Rock	

Samples Strength Descriptors	
Cohesive Soils:	**N**
Very Soft	0-1
Soft	2-4
Firm	5-8
Stiff	9-15
Very Stiff	16-30
Hard	31+
Non-cohesive Soils:	
Very Loose	0-4
Loose	5-10
Firm	11-20
Very Firm	21-30
Dense	30-50
Very Dense	51+

Definitions

SPT-"Splitspoon" or standard penetration test. Blow counts are number of drops required for a 140 lb hammer dropping 30 inches to drive the sampler 6 inches.

N-value is the addition of the last two intervals of the 18-inch sample.

Shelby tubes are often called "undisturbed samples". They are directly pushed into the ground, twisted, allowed to rest for a small period of time and then pulled out of the ground. Tops and bottoms are cleaned and then sealed.

Sample classification is done in general accordance with ASTM D2487 and 2488 using the Unified Soil Classification System (USCS) as a general guide.

Soil moisture descriptions are based on the recovered sample observations. The descriptors are dry, slightly moist, moist, very moist and wet. These are typically based on relative estimates of the moisture condition of a visual estimation of the soils optimum moisture content (EOMC). Dry is almost in a "dusty" condition usually 6 or more percent below EOMC. Slightly moist is from about 6 to 2 percent below EOMC at a point at which the soil color does not readily change with the addition of water. Moist is usually 2 percent below to 2 percent above EOMC and the point at which the soil will tend to begin forming "balls" under some pressure in the hand. Very moist is usually from about 2 percent to 6 percent above EOMC and also the point at which it's often considered "muddy". Wet soil is usually 6 or more percent above EOMC and often contains free water or the soil is in a saturated state.

Silt or Clay is defined at material finer than a standard #200 US sieve (<0.075mm) Sand is defined as material between the size of #200 sieve up to #4 sieve. Gravel is from #4 size sieve material to 3". Cobbles are from 3" to 12". Boulders are over 12".

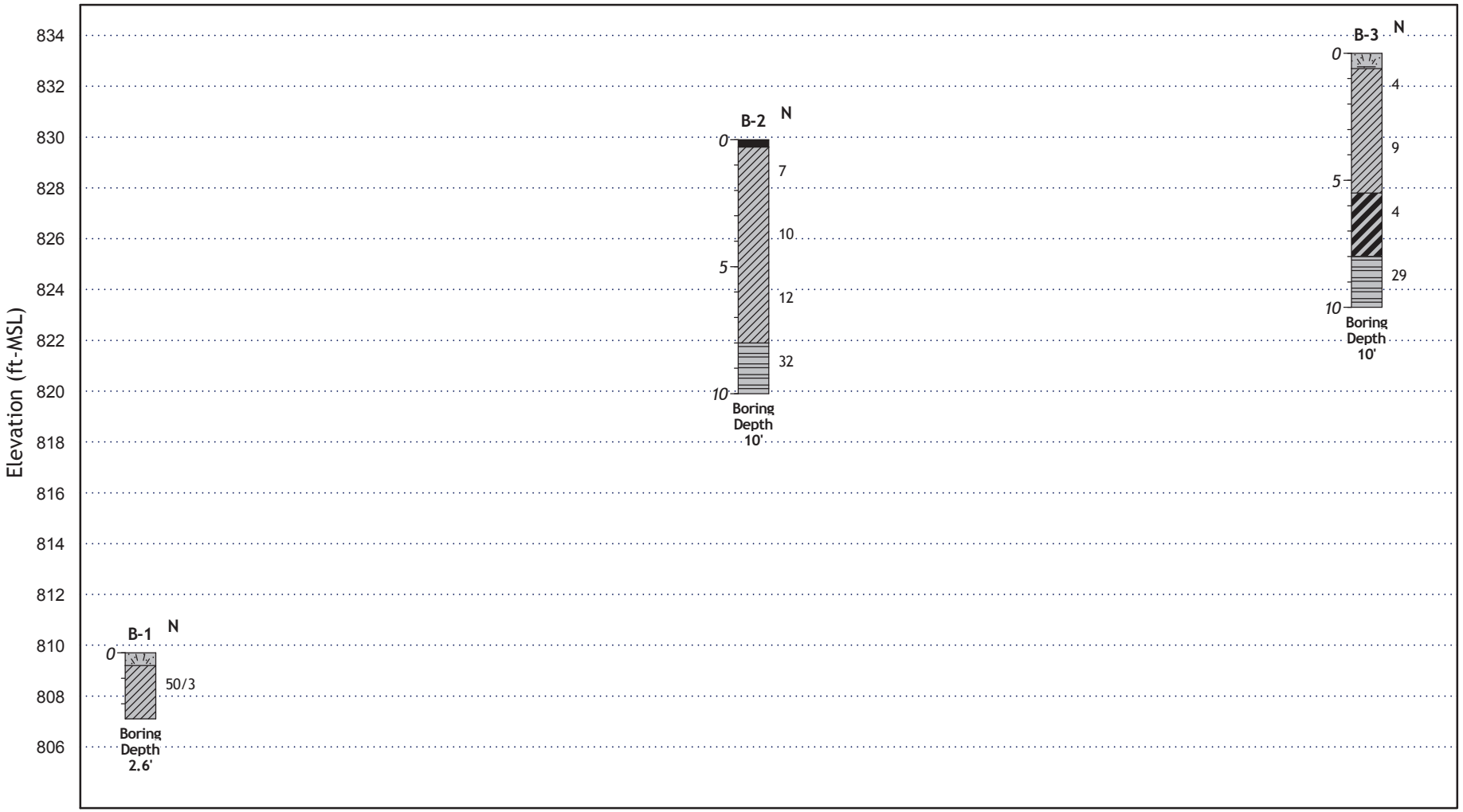
Rock hardness is classified as follows:

Very Soft:	Easily broken by hand pressure
Soft:	Ends can be broken by hand pressure; easily broken with hammer
Medium:	Ends easily broken with hammer; middle requires moderate blow
Hard:	Ends require moderate hammer blow; middle requires several blows
Very Hard:	Many blows with a hammer required to break core

Rock Quality Designation (RQD) is defined as total combined length of 4" or longer pieces of core divided by the total core run length; defined in percentage.

Water or cave-in observed in borings is at completion of drilling each boring unless otherwise noted.

Strata lengths shown on borings represents a rough estimate. Transition may be more abrupt or gradual. Soil borings are representative of that estimated location at that time and are based on recovered samples. Conditions may be different between borings and between sample intervals. Boring information is not to be considered stand alone but should be taken in context with comments and information in the geotechnical report and the means by which the borings are logged, sampled and drilled.



SOIL TYPES

(Shown in Graphic Log)

- Fill
- Asphalt
- Topsoil
- Gravel
- Sand
- Silt
- Lean Clay
- Fat Clay
- Silty Sand
- Clayey Sand
- Sandy Silt
- Clayey Silt
- Sandy Clay
- Silty Clay
- Limestone
- Sandstone
- Siltstone
- Shale

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11785 Highway Drive
Cincinnati, OH 45241
Phone: 513.252.2059
Fax: 888.792.3121

Northern Kentucky
Water
CN230010

BORING PROFILE

Fig. 1

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11785 Highway Drive
Cincinnati, OH 45241
Phone: 513.252.2059
Fax: 888.792.3121

TEST BORING LOG

CLIENT: Cardinal Engineering
PROJECT NAME: Northern Kentucky Water
PROJECT LOCATION: Alexandria, KY

BORING #: B-1
JOB #: CN230010
LOGGED BY: CG
APPROVED BY: GD

DRILLING and SAMPLING INFORMATION

Date Started	2/27/23	Contractor	CSI
Date Completed	3/1/23	Boring Size	4 in.
Drill Rig	B-57 Mobile	Boring Method	SFA
Weather	Cloudy, 40s-50s	Hammer Type	Automatic

SOIL CLASSIFICATION

SURFACE ELEVATION: 809.7

TOPSOIL - 5 INCHES

Brown LEAN CLAY (CL) with rock fragments, trace silt, and black oxide nodules [Residuum] - moist, hard

Auger Refusal at 2.6'

End Boring

TEST DATA

Elev. (ft)	Depth Scale	Water Level	Sample No.	Sample Type	Sample Graphics	Recovery (in)	Standard Penetration Test Blows per 6" [*N-Value*] *blows/foot*	Qu-tsf Unconfined (Pocket Pen.) Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plasticity Index (PI)	Percent Passing #200 Sieve	Remarks
808	2		1	SS		3	50/3-- [*50/3*]		20.0				
806	4												
804	6												
802	8												
800	10												
798	12												
796	14												

Depth to Groundwater
- Noted on Drilling Tools _____ ft.
- At Completion _____ ft.
- After _____ hours _____ ft.
- Cave Depth _____ ft.

Sample Type
- SPT- Standard Penetration Test
- SS- Split Spoon
- ST- Shelby Tube
- RC- Rock Core
- CU- Auger Cuttings

Boring Method
- HSA- Hollow Stem Augers
- CFA- Continuous Flight Augers
- MD- Mud Drilling

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11785 Highway Drive
Cincinnati, OH 45241
Phone: 513.252.2059
Fax: 888.792.3121

TEST BORING LOG

CLIENT: Cardinal Engineering
PROJECT NAME: Northern Kentucky Water
PROJECT LOCATION: Alexandria, KY

BORING #: B-2
JOB #: CN230010
LOGGED BY: CG
APPROVED BY: GD

DRILLING and SAMPLING INFORMATION

Date Started	2/27/23	Contractor	CSI
Date Completed	3/1/23	Boring Size	4 in.
Drill Rig	B-57 Mobile	Boring Method	SFA
Weather	Cloudy, 40s-50s	Hammer Type	Automatic

SOIL CLASSIFICATION

SURFACE ELEVATION: 829.9

ASPHALT - 3 INCHES

Brown and gray LEAN CLAY (CL) with trace roots, silt, and black oxide nodules [Residuum] - moist, firm to stiff

Brown highly weathered SHALE with trace rock fragments - dry, soft

Boring terminated at 10.0 feet

No refusal

TEST DATA

Elev. (ft)	Depth Scale	Sample No.	Sample Type	Sample Graphics	Recovery (in)	Standard Penetration Test Blows per 6" [*N-Value*] *blows/foot*	Qu-tsf Unconfined (Pocket Pen.) Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plasticity Index (PI)	Percent Passing #200 Sieve	Remarks
828	2	1	SS		13	3-3-4 [7]		25.0				
826	4	2	SS		8	3-4-6 [10]		12.4	47	26	65	
824	6	3	SS		15	4-4-8 [12]						
822	8	4	SS		16	5-10-22 [32]						
820	10											
818	12											
816	14											

Depth to Groundwater
- Noted on Drilling Tools _____ ft.
- At Completion _____ ft.
- After _____ hours _____ ft.
- Cave Depth _____ ft.

Sample Type
- SPT- Standard Penetration Test
- SS- Split Spoon
- ST- Shelby Tube
- RC- Rock Core
- CU- Auger Cuttings

Boring Method
- HSA- Hollow Stem Augers
- CFA- Continuous Flight Augers
- MD- Mud Drilling

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Fax: 888.792.3121

TEST BORING LOG

CLIENT: Cardinal Engineering
PROJECT NAME: Northern Kentucky Water
PROJECT LOCATION: Alexandria, KY

BORING #: B-3
JOB #: CN230010
LOGGED BY: CG
APPROVED BY: GD

DRILLING and SAMPLING INFORMATION

Date Started	2/27/23	Contractor	CSI
Date Completed	3/1/23	Boring Size	4 in.
Drill Rig	B-57 Mobile	Boring Method	SFA
Weather	Cloudy, 40s-50s	Hammer Type	Automatic

SOIL CLASSIFICATION

SURFACE ELEVATION: 833.3

Elev. (ft)	Depth Scale	Water Level	Soil Classification	Sample No.	Sample Type	Sample Graphics	Recovery (in)	Standard Penetration Test Blows per 6" [*N-Value*] *blows/foot*	Qu-tsf Unconfined (Pocket Pen.) Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plasticity Index (PI)	Percent Passing #200 Sieve	Remarks
832	2		TOPSOIL - 6 INCHES Brown and gray mottled LEAN CLAY (CL) with some silt, trace roots, and black oxide nodules [Residuum] - moist, soft to stiff	1	SS		18	2-1-3 [*4*]		23.2				
830	4			2	SS		14	4-4-5 [*9*]		21.2				
828	6		Brown and gray mottled FAT CLAY (CH) with some silt, trace roots, and black oxide nodules [Residuum] - moist, soft	3	SS		15	2-1-3 [*4*]		32.2	71	43	98	
826	8		Brown highly weathered SHALE with trace rock fragments - dry, soft	4	SS		14	4-10-19 [*29*]						
824	10		Boring terminated at 10.0 feet No refusal											
822	12													
820	14													

Depth to Groundwater
- Noted on Drilling Tools _____ ft.
- At Completion _____ ft.
- After _____ hours _____ ft.
- Cave Depth _____ ft.

Sample Type
- SPT- Standard Penetration Test
- SS- Split Spoon
- ST- Shelby Tube
- RC- Rock Core
- CU- Auger Cuttings

Boring Method
- HSA- Hollow Stem Augers
- CFA- Continuous Flight Augers
- MD- Mud Drilling

FIELD TESTING PROCEDURES

Field Operations: The general field procedures employed by CSI are summarized in ASTM D 420 which is entitled "Investigating and Sampling Soils and Rocks for Engineering Purposes." This recommended practice lists recognized methods for determining soil and rock distribution and ground water conditions. These methods include geophysical and in situ methods as well as borings.

Borings are drilled to obtain subsurface samples using one of several alternate techniques depending upon the subsurface conditions. These techniques are:

a. Continuous 2-1/2 or 3-1/4 inch I.D. hollow stem augers;

b. Wash borings using roller cone or drag bits (mud or water);

c. Continuous flight augers (ASTM D 1425).

These drilling methods are not capable of penetrating through material designated as "refusal materials." Refusal, thus indicated, may result from hard cemented soil, soft weathered rock, coarse gravel or boulders, thin rock seams, or the upper surface of sound continuous rock. Core drilling procedures are required to determine the character and continuity of refusal materials.

The subsurface conditions encountered during drilling are reported on a field test boring record by the chief driller. The record contains information concerning the boring method, samples attempted and recovered, indications of the presence of various materials such as coarse gravel, cobbles, etc., and observations between samples. Therefore, these boring records contain both factual and interpretive information. The field boring records are on file in our office.

The soil and rock samples plus the field boring records are reviewed by a geotechnical engineer. The engineer classifies the soils in general accordance with the procedures outlined in ASTM D 2488 and prepares the final boring records which are the basis for all evaluations and recommendations.

The final boring records represent our interpretation of the contents of the field records based on the results of the engineering examinations and tests of the field samples. These records depict subsurface conditions at the specific locations and at the particular time when drilled. Soil conditions at other locations may differ from conditions occurring at these boring locations. Also, the passage of time may result in a change in the subsurface soil and ground water conditions at these boring locations. The lines designating the interface between soil or refusal materials on the records and on profiles represent approximate boundaries. The transition between materials may be gradual. The final boring records are included with this report.

The detailed data collection methods using during this study are discussed on the following pages.

Soil Test Borings: Soil test borings were made at the site at locations shown on the attached Boring Plan. Soil sampling and penetration testing were performed in accordance with ASTM D 1586.

The borings were made by mechanically twisting a hollow stem steel auger into the soil. At regular intervals, the drilling tools were removed and soil samples obtained with a standard 1.4 inch I.D., 2 inch O.D., split tube sampler. The sampler was first seated 6 inches to penetrate any loose cuttings, then driven an additional foot with blows of a 140-pound hammer falling 30 inches. The number of hammer blows required to drive the sampler the final foot was recorded and is designated the "penetration resistance". The penetration resistance, when properly evaluated, is an index to the soil strength and foundation supporting capability.

Representative portions of the soil samples, thus obtained, were placed in glass jars and transported to the laboratory. In the laboratory, the samples were examined to verify the driller's field classifications. Test Boring Records are attached which graphically show the soil descriptions and penetration resistances.

Core Drilling: Refusal materials are materials that cannot be penetrated with the soil drilling methods employed. Refusal, thus indicated, may result from hard cemented soil, soft weathered rock, coarse gravel or boulders, thin rock seams or the upper surface of sound continuous rock. Core drilling procedures are required to determine the character and continuity of refusal materials.

Prior to coring, casing is set in the drilled hole through the overburden soils, if necessary, to keep the hole from caving. Refusal materials are then cored according to ASTM D 2113 using a diamond-studded bit fastened to the

end of a hollow double tube core barrel. This device is rotated at high speeds, and the cuttings are brought to the surface by circulating water. Core samples of the material penetrated are protected and retained in the swivel-mounted inner tube. Upon completion of each drill run, the core barrel is brought to the surface, the core recovered is measured, the samples are removed and the core is placed in boxes for storage.

The core samples are returned to our laboratory where the refusal material is identified and the percent core recovery and rock quality designation is determined by a soils engineer or geologist. The percent core recovery is the ratio of the sample length obtained to the depth drilled, expressed as a percent. The rock quality designation (RQD) is obtained by summing up the length of core recovered, including only the pieces of core which are four inches or longer, and dividing by the total length drilled. The percent core recovery and RQD are related to soundness and continuity of the refusal material. Refusal material descriptions, recoveries, and RQDs are shown on the "Test Boring Records".

Hand Auger Borings and Dynamic Cone Penetration Testing: Hand auger borings are performed manually by CSI field personnel. This consists of manually twisting hand auger tools into the subsurface and extracting “grab” or baggie samples at intervals determined by the project engineer. At the sample intervals, dynamic cone penetration (DCP) testing is performed. This testing involves the manual raising and dropping of a 20 pound hammer, 18 inches. This “driver” head drives a solid-1¾ inch diameter cone into the ground. DCP “counts” are the number of drops it takes for the hammer to drive three 1¾ inch increments, recorded as X-Y-Z values.

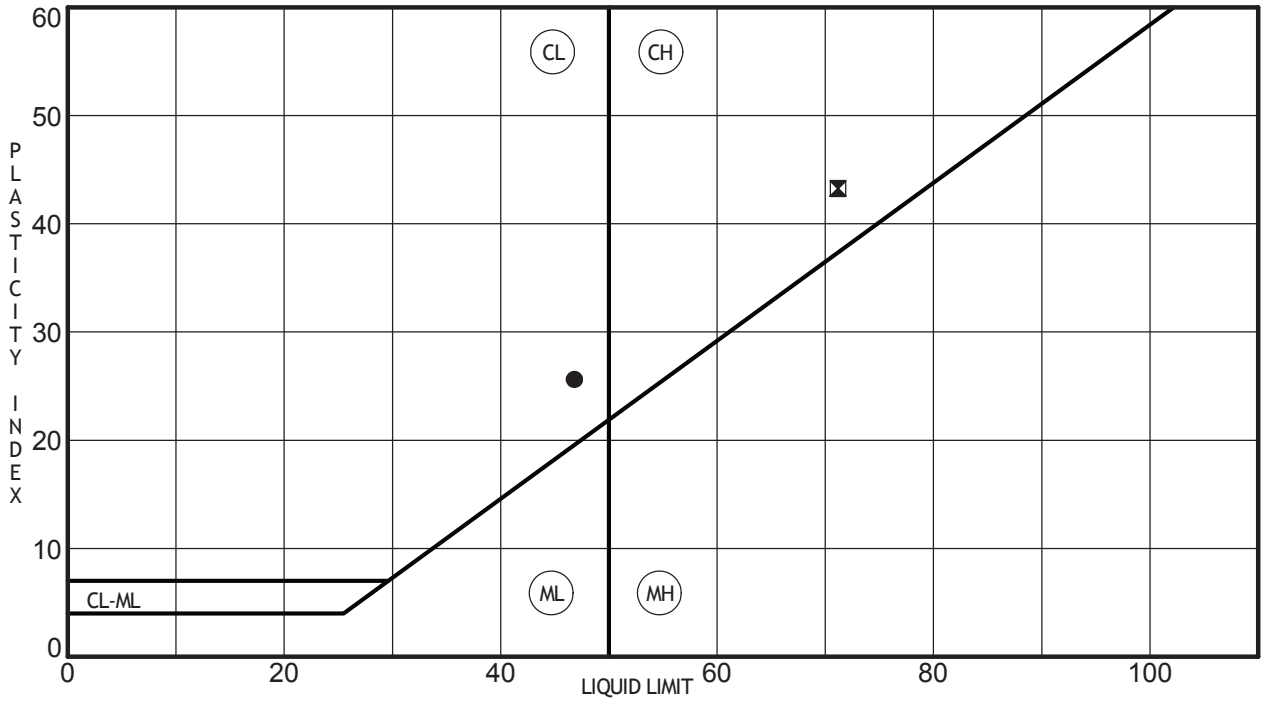
Test Pits: Test pits are excavated by the equipment available, often a backhoe or trackhoe. The dimensions of the test pits are based on the equipment used and the power capacity of the equipment. Samples are taken from the spoils of typical buckets of the excavator and sealed in jars or “Ziplock” baggies. Dynamic Cone Penetration or hand probe testing is often performed in the upper few feet as OSHA standards allow. Refusal is deemed as the lack of advancement of the equipment with reasonable to full machine effort.

Water Level Readings: Water table readings are normally taken in conjunction with borings and are recorded on the "Test Boring Records". These readings indicate the approximate location of the hydrostatic water table at the time of our field investigation. Where impervious soils are encountered (clayey soils) the amount of water seepage into the boring is small, and it is generally not possible to establish the location of the hydrostatic water table through water level readings. The ground water table may also be dependent upon the amount of precipitation at the site during a particular period of time. Fluctuations in the water table should be expected with variations in precipitation, surface run-off, evaporation and other factors.

The time of boring water level reported on the boring records is determined by field crews as the drilling tools are advanced. The time of boring water level is detected by changes in the drilling rate, soil samples obtained, etc. Additional water table readings are generally obtained at least 24 hours after the borings are completed. The time lag of at least 24 hours is used to permit stabilization of the ground water table which has been disrupted by the drilling operations. The readings are taken by dropping a weighted line down the boring or using an electrical probe to detect the water level surface.

Occasionally the borings will cave-in, preventing water level readings from being obtained or trapping drilling water above the caved-in zone. The cave-in depth is also measured and recorded on the boring records.

Liquid and Plastic Limits Test Report



	Boring	Depth (ft)	LL	PL	PI	Water Content	% < #40	% < #200	USCS	Description
●	B-2	3.5	47	21	26	12.4		65		SANDY LEAN CLAY(CL)
⊠	B-3	6.0	71	28	43	32.2		98		FAT CLAY(CH)

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Cincinnati, OH 45241
Phone: 513.252.2059
Fax: 888.792.3121

PROJECT INFORMATION

Client: Cardinal Engineering
Project Name: Northern Kentucky Water
Project Number: CN230010
Project Location: Alexandria, KY

Summary of Laboratory Results

Borehole	Depth	Sample Type	Liquid Limit	Plastic Limit	Plasticity Index	Classification	Water Content (%)	Unconfined Compressive Strength (tsf)	Dry Density (pcf)	Wet Density (pcf)	Max. Dry Density (pcf)	Opt. Water Content (%)	CBR	Swell (%)	RQD	Percent Recovery	Percent Finer (No. 200)
B-1	1.0	SS					20.0										
B-2	1.0	SS					25.0										
B-2	3.5	SS	47	21	26	SANDY LEAN CLAY(CL)	12.4										65
B-3	1.0	SS					23.2										
B-3	3.5	SS					21.2										
B-3	6.0	SS	71	28	43	FAT CLAY(CH)	32.2										98

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Fax: 888.792.3121

SS - Split Spoon Sample
GRAB - Bulk Grab Sample

PROJECT INFORMATION

Client: Cardinal Engineering
Project Name: Northern Kentucky Water
Project Number: CN230010
Project Location: Alexandria, KY

LABORATORY TESTING PROCEDURES

Soil Classification: Soil classifications provide a general guide to the engineering properties of various soil types and enable the engineer to apply past experience to current problems. In our investigations, samples obtained during drilling operations are examined in our laboratory and visually classified by an engineer. The soils are classified according to consistency (based on number of blows from standard penetration tests), color and texture. These classification descriptions are included on our "Test Boring Records."

The classification system discussed above is primarily qualitative and for detailed soil classification two laboratory tests are necessary: grain size tests and plasticity tests. Using these test results the soil can be classified according to the AASHTO or Unified Classification Systems (ASTM D 2487). Each of these classification systems and the in-place physical soil properties provides an index for estimating the soil's behavior. The soil classification and physical properties obtained are presented in this report.

Rock Classification: Rock classifications provide a general guide to the engineering properties of various rock types and enable the engineer to apply past experience to current situations. In our explorations, rock core samples obtained during drilling operations are examined in our laboratory and visually classified by an engineer. The rock cores are classified according to relative hardness and RQD (see Guide to Rock Classification Terminology), color, and texture. These classification descriptions are included on our Test Boring Records.

Atterberg Limits: Portions of the samples are taken for Atterberg Limits testing to determine the plasticity characteristics of the soil. The plasticity index (PI) is the range of moisture content over which the soil deforms as a plastic material. It is bracketed by the liquid limit (LL) and the plastic limit (PL). The liquid limit is the moisture content at which the soil becomes sufficiently "wet" to flow as a heavy viscous fluid. The plastic limit is the lowest moisture content at which the soil is sufficiently plastic to be manually rolled into tiny threads. The liquid limit and plastic limit are determined in accordance with ASTM D 4318.

Moisture Content: The Moisture Content is determined according to ASTM D 2216.

Percent Finer Than 200 Sieve: Selected samples of soils are washed through a number 200 sieve to determine the percentage of material less than 0.074 mm in diameter.

Rock Strength Tests: To obtain strength data for rock materials encountered, unconfined compression tests are performed on selected samples. In the unconfined compression test, a cylindrical portion of the rock core is subjected to increasing axial load until it fails. The pressure required to produce failure is recorded, corrected for the length to diameter ratio of the core and reported.

Compaction Tests: Compaction tests are run on representative soil samples to determine the dry density obtained by a uniform compactive effort at varying moisture contents. The results of the test are used to determine the moisture content and unit weight desired in the field for similar soils. Proper field compaction is necessary to decrease future settlements, increase the shear strength of the soil and decrease the permeability of the soil.

The two most commonly used compaction tests are the Standard Proctor test and the Modified Proctor test. They are performed in accordance with ASTM D 698 and D 1557, respectively. Generally, the Standard Proctor compaction test is run on samples from building or parking areas where small compaction equipment is anticipated. The Modified compaction test is generally performed for heavy structures, highways, and other areas where large compaction equipment is expected. In both tests a representative soil sample is placed in a mold and compacted with a compaction hammer. Both tests have three alternate methods.

Test	Method	Hammer Wt./Fall	Mold Diam.	Run on Material Finer Than	No. of Layers	No. of Blows/ Layer
Standard	A	5.5 lb./12"	4"	No. 4 sieve	3	25
D 698	B	5.5 lb./12"	4"	3/8" sieve	3	25
	C	5.5 lb./12"	6"	3/4" sieve	3	56

Test	Method	Hammer Wt./Fall	Mold Diam.	Run on Material Finer Than	No. of Layers	No. of Blows/ Layer
Modified	A	10 lb./18"	4"	No. 4 sieve	5	25
D 1557	B	10 lb./18"	4"	3/8" sieve	5	25
	C	10 lb./18"	6"	3/4" sieve	5	56

The moisture content and unit weight of each compacted sample is determined. Usually 4 to 5 such tests are run at different moisture contents. Test results are presented in the form of a dry unit weight versus moisture content curve. The compaction method used and any deviations from the recommended procedures are noted in this report.

Laboratory California Bearing Ratio Tests: The California Bearing Ratio, generally abbreviated to CBR, is a punching shear test and is a comparative measure of the shearing resistance of a soil. It provides data that is a semi-empirical index of the strength and deflection characteristics of a soil. The CBR is used with empirical curves to design pavement structures.

A laboratory CBR test is performed according to ASTM D 1883. The results of the compaction tests are utilized in compacting the test sample to the desired density and moisture content for the laboratory California Bearing Ratio test. A representative sample is compacted to a specified density at a specified moisture content. The test is performed on a 6-inch diameter, 4.58-inch-thick disc of compacted soil that is confined in a cylindrical steel mold. The sample is compacted in accordance with Method C of ASTM D 698 or D 1557.

CBR tests may be run on the compacted samples in either soaked or unsoaked conditions. During testing, a piston approximately 2 inches in diameter is forced into the soil sample at the rate of 0.05 inch per minute to a depth of 0.5 inch to determine the resistance to penetration. The CBR is the percentage of the load it takes to penetrate the soil to a 0.1 inch depth compared to the load it takes to penetrate a standard crushed stone to the same depth. Test results are typically shown graphically.

Geotechnical Report

NKY Water District - Gunkel Road Water Main

Prepared for

Cardinal Engineering
1 Moock Road #1
Wilder, Kentucky 41071

July 7, 2023

Project No. CN230010

July 7, 2023

Mr. Kevin Hanson
Cardinal Engineering
1 Moock Road #1
Wilder, Kentucky 41071

Subject: Geotechnical Report for
NKY Water District - Gunkel Road Water Main
Melbourne, Kentucky
CSI Project No. CN230010

Dear Mr. Hanson,

Consulting Services Incorporated of Cincinnati (CSI) is pleased to present our geotechnical report for the NKY Water District - Gunkel Road Water Main project in Melbourne, Kentucky. We provided our services in general accordance the CSI Proposal 8227, dated December 12, 2022.

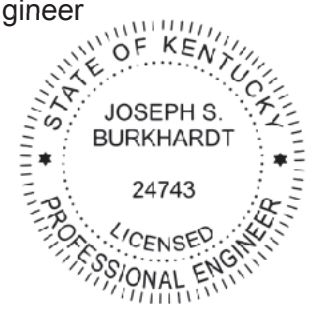
Our report represents information provided to us, readily available published data relevant to the site and site area, our observations and subsurface conditions encountered and our opinion of primary geotechnical conditions (discussion and recommendations) affecting site work and foundation design for the project.

Again, we greatly appreciate the opportunity to provide our services and look forward to working with you and the project team on this (and hopefully) more projects in the future. Please do not hesitate to contact us for questions or comments about the information contained herein.

Cordially,

Graham Duncan, EIT
Staff Engineer

Joseph S. Burkhardt, P.E.
Principal Geotechnical Engineer



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APPENDICES, FIGURES, PHOTOS, AND TABLES

Appendix A

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INTRODUCTION

1 SCOPE OF THE GEOTECHNICAL EXPLORATION

As proposed, CSI conducted a geotechnical exploration for the proposed 8” water main extension along Gunkel Road in Melbourne, Kentucky. Our services included a review of the project information provided, conducting a subsurface exploration that utilized soil borings to obtain samples for modeling the soil conditions along the proposed route, an analysis of data and information obtained, evaluation of bearing conditions for the water line and recommendations for backfill of the pipe.

2 SITE AND PROJECT INFORMATION

The project will include the installation of a new 8” water main along Gunkel Road in Melbourne, Kentucky. As part of this report, CSI has reviewed a plan set titled ‘Subdistrict HB Water main Extension Project’ dated 1-11-23. CSI’s understanding of the project is outlined in the tables below.

Table 1: Site Information

Item	Description
Site Location	The site is located along Gunkel Road in Melbourne, Kentucky from the intersection of Gunkel Road and Mystic Rose Road to the end of county maintenance
Length of Improvement	The water line will be approximately 2,700 feet in length
Surrounding Area	The surrounding area is characterized by sparse residential developments in all directions
Existing Conditions	Existing road way is asphalt paved and is 12 foot wide edge to edge. The roadway is present within a valley with relatively steep and wooded slopes present to the east and west of the road. An unnamed creek/tributary is present along the south and eastern side of the roadway.

Table 2: Project Information

Item	Description
Site Layout	See Boring Location Plan
Proposed Structure(s)	An approximately 2,700 foot long 8 inch of new water main and intermittent fire hydrants.
Water Main Construction	Based on our understanding, the water main will be constructed within the road right-of-ways at a depth of about 5 feet below grade. The water main will be installed along the northern and west sides of the road. Additionally, provided plans indicate that the alignment will cross two unnamed creeks near stations 0+50 and 20+00 which will be encased in concrete.

3 AREA/SITE INFORMATION

3A AREA TOPOGRAPHY / PHYSIOGRAPHY

The site is located within the Outer Blue Grass Region of northern Kentucky. This area is characterized by Ordovician dolomites, limestones and calcareous shales, thin pre-Wisconsinan drift, loamy soils and low to moderately high relief. Published mapping reviewed indicates the elevations in the site vicinity range from about 650 feet within near the intersection of Gunkel Road and Mystic Rose Road to about 806 feet near the end of the roadway. Below is a figure of the location of the site with respect to the regional physiography.

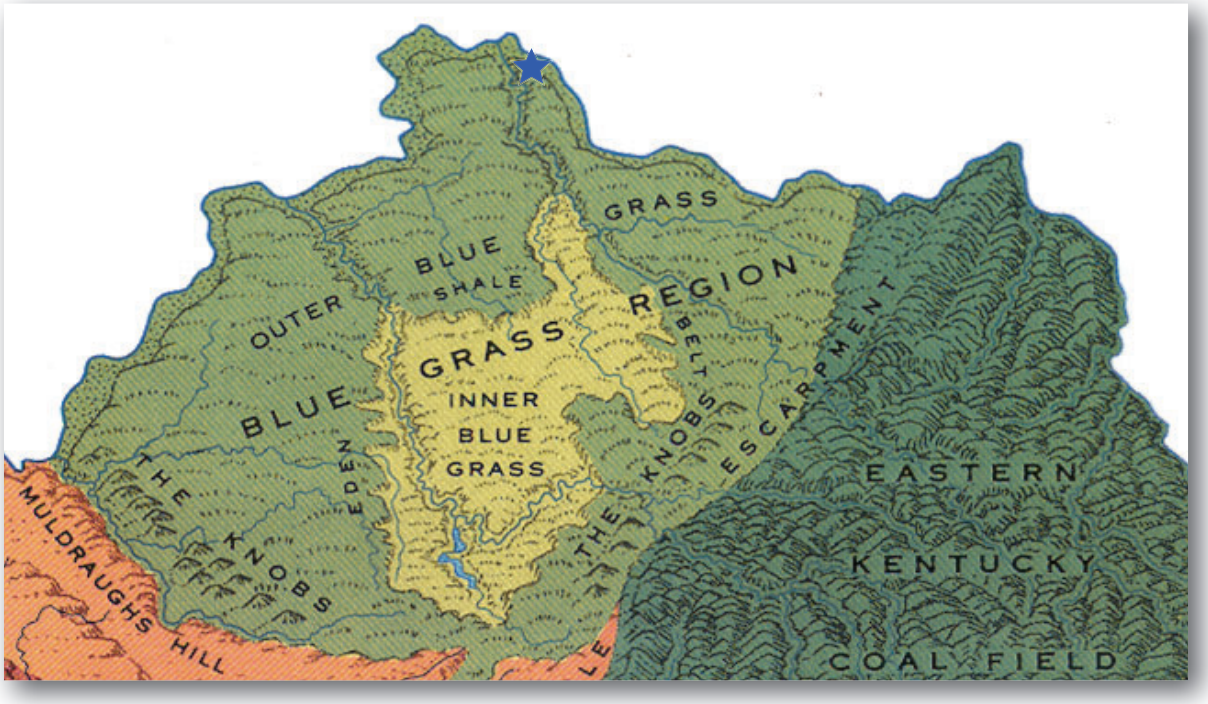


Figure 1 - Kentucky Physiographic Map (site vicinity shown with star)

3B SITE GEOLOGY

Review of the *Kentucky Geologic Map Service* shown in **Figure 2** below indicates the the majority of the alignment is underlain by Ordovician age deposits belonging to the Kope (Ok) and Fairview (Of) Formations. In general, each of these formations are comprised of interbedded limestone and shale and differ mainly in the ratio of limestone to shale. The Kope formation is comprised of about 80 percent shale with the Fairview being comprised of about 45 to 65 percent limestone.

Figure 2: Site Geologic Mapping. Approximate Alignment Highlighted.

FINDINGS

4 SUBSURFACE CONDITIONS

CSI performed a total of three (3) soil test borings to explore the subsurface conditions along the alignment at approximate 900 foot intervals. In general, our borings encountered residual soils and shale bedrock. Boring for this project were numbered sequentially across eight

separate project sites. Specific borings for the Gunkel Road Project site are labeled as boring numbers B-17 through B-19.

4A STRATA INFORMATION

The subsurface conditions encountered at the test boring locations are shown in the Test Boring Log in the Appendix. These records represent our interpretation of the subsurface conditions based on the field logs, visual examination of field samples by an engineer, and tests of the samples collected. The letters in parentheses following the soil descriptions are the soil classifications in general accordance with the Unified Soil Classification System (USCS). It should be noted that dashed stratification lines shown on the soil boring log represent approximate transitions between material types. In-situ stratum changes could occur gradually or at slightly different depths. Boring elevations were determined by Cardinal Engineering and supplied to CSI.

ASPHALT/TOPSOIL

Topsoil was encountered at the ground surface in boring B-17 and was noted to be 2 inches thick. Asphalt was encountered at the ground surface within borings B-18 and B-19 to depths of 3 inches below grade.

RESIDUUM

Residual soil deposits were encountered in each boring location and were described to be brownlean clay with varying amounts of silt, rock fragments, black oxide nodules, and roots. SPT N-Values ranged from 8 to more than 50 bpf indicating a firm to hard consistency, which generally increased with depth. Laboratory testing of a representative sample indicate Liquid Limits (LL) of 41 and 47 percent and Plasticity Indices of 16 and 22 percent. Natural moisture contents ranged from 18.9 to 27.0 percent.

WEATHERED SHALE/LIMESTONE BEDROCK

Weathered shale bedrock samples were recovered in boring B-18 starting at a depth of about 3 feet below grade. The samples recovered were described to be brown highly weathered shale with varying amounts of limestone rock fragments. Auger refusal on what has been assumed to be competent limestone was encountered in borings B-17 and B-19 at depths of 7.5 and 8.5 feet below grade, respectively.

For details of subsurface conditions encountered at a particular boring location please refer to the boring logs contained in Appendix A. It should be noted that our borings were drilled and sampled according to the procedures presented in the appendix. The boring locations shown in the appendix should be considered accurate only to the degree implied by the method used.

4B GROUNDWATER CONDITIONS

Groundwater was not encountered in any measurable quantities at our boring locations. In the Northern Kentucky area, water conditions that usually affect construction and performance of projects consist of trapped/perched water zones which occur in variable areas in the soil mass that may be present at the soil/bedrock interface and/or due to sand layers and seams throughout the soil. Perched water sources are often not linked to the more continuous relatively stable ground water table that typically occurs at greater depths. Site excavation activities or ground disturbance can expose these features and the resulting seepage can vary greatly. Groundwater issues are also dependent upon recent rainfall activity and surface and subsurface drainage patterns in the area that may change depending on climatic conditions.

5 LABORATORY TESTING

Laboratory tests were performed on selected recovered samples from the borings to provide recommendations for earthwork and to determine index properties of the soils. Details for the test methods and results are shown in the Appendix. Tests performed included:

- 6 Moisture Content Tests
- 2 Grain Size Analyses (-200 Sieve)
- 2 Atterberg Limits Tests

GEOTECHNICAL DISCUSSION AND RECOMMENDATIONS

6 DISCUSSION—GEOTECHNICAL ISSUES

Based on our experience with similar projects and the conditions observed during our subsurface exploration, we believe the site is suitable for the proposed construction, provided the recommendations outlined in this report are followed. The primary geotechnical concerns are:

- **SOFT ALLUVIAL SOILS**
- **BEDROCK EXCAVATION**

6A SOFT ALLUVIAL SOILS & GROUNDWATER INFILTRATION

While no alluvial soils were encountered within our borings, the proposed alignment will cross two unnamed creeks. It is anticipated that the bearing materials at the proposed invert depths will consist of stiff residual soils or shale bedrock, however, it is possible that soft alluvial soils may be present at bearing elevations. Due to the nature of the deposition, alluvial soils are often soft, wet, and poorly consolidated. As such, they often make poor bearing materials and undercuts to competent soils should be anticipated within these areas. Additionally, within areas where alluvial soils are encountered, particularly along the existing creek and where granular soils are

encountered, ground water infiltration should be anticipated within excavations. In most cases, the groundwater should be able to be removed from excavations using pumps or trench drains.

6B BEDROCK EXCAVATION

Within our borings, bedrock was encountered at depths as shallow as about 3 feet below grade. It is anticipated that average water line installation depths will be about 5 feet below existing grades. Thus, it is anticipated that portions of the excavations may extend 2 or more feet into bedrock. The bedrock in the area is a mixture of interbedded limestone and shale and while the shale is often very soft and soil-like, the limestone (although in thin beds) can be very hard and difficult to remove. Our borings, as well as site geology, suggest that the bedrock present is comprised of about 50 to 80 percent shale, with the remainder being limestone. The use of ripping equipment or a hoe-ram may be necessary if competent limestone is encountered during excavation.

7 WATER PIPE SUPPORT

With regards to pipe support, weathered shale/limestone bedrock or stiff residual soils are expected along the majority of the proposed alignment. Based upon subsurface information, these soils should provide adequate support. An exception may be in the creek crossings, where some additional undercutting may be necessary if alluvial soils are encountered.

If soft soils are encountered, they should be undercut to the stiff or better materials and replaced with suitable fill material. Additionally, restrained joints and or thrust blocks may be required depending upon unexpected field conditions. If questionable soils are encountered, CSI should be notified to evaluate and provide necessary recommendations. The figure below outlines expected soil conditions along the proposed alignment.

8 THRUST RESTRAINT

Where changes in the direction of flow occur and/or where the water main cross sectional area changes, thrust forces will be generated in the direction of water flow. In some cases the thrust forces generated can be greater than the lateral resistance of the natural soils and/or backfill placed within utility trenches. To prevent separation and/or damage to the water main at these horizontal or vertical bends/joints, thrust block restraints (or restrained joints where thrust blocks are not applicable) will be required. Review of the provided plans indicate that thrust block are planned at several location along the proposed alignment. Based upon the conditions encountered, the thrust blocks appear to be suitable for the proposed alignment. Thrust blocks should bear on the undisturbed stiff or better residual soils and can be designed using the soil parameters shown in the table below. For design of restrained joints, a frictional coefficient between pipe and soil of 0.3 should be used. Additionally, reinforced concrete encasement may also be used in place of restrained joints.

Table 3: Thrust Block Soil Parameters

Soil Group	Passive Earth Pressure Coefficient	Unit Weight (pcf)	Cohesion (psf)	Friction Angle (φ)
Residual Clay	Kp = 2.5	115	100	φ = 25
Alluvial/ Lacustrine	Kp = 2.2	105	0	φ = 22

9 EARTHWORK

We do not anticipate any structural fill to occur on the site with the exception of backfill of the trenches. The following recommendations are for backfill operations around open cut trenches for the alignment.

9A EXCAVATIONS

Normal earth excavation equipment should be suitable for excavations associated with the overburden soils. The weathered shale encountered on site should be able to be excavated with conventional equipment, however for the competent limestone layers encountered, ripping equipment or the use of a hoe-ram will most likely be necessary.

For below-grade excavations, the fill material as well as alluvial/lacustrine soils should be classified as OSHA Type C soils with a minimum slope excavation of 1.5H:1V. For excavations within the residual soils, the soil should be classified as an OSHA Type A soil with a minimum slope excavation of 0.75H:1V. T If soil types other than what has been mentioned above are encountered, CSI should be contacted to evaluate for stability.

9B TRENCH BACKFILL OPERATIONS

These materials are placed in more confined areas than mass earthwork materials or pavement materials. The following are general recommendations for backfill areas:

- Fill lift thicknesses will vary dependent on compaction equipment available and material types, but in no case should exceed 8 inches for clay and 12 inches for granular soils;
- For crushed stone/aggregate backfills in trenches and when using smaller compaction equipment the lift thickness should be based on the type of aggregate and equipment. For well-graded granular soils such as Dense Grade Aggregate, a thickness of 4 to 6 inches is typically required. If open-graded stone is used, the lift thickness may be able to be increased. This should be evaluated by the geotechnical engineer;
- Place cohesive fill (clay) in maximum 8-inch thick loose lifts. Granular soils may be placed in maximum 12 inch loose lifts provided properly sized equipment is used in the compaction process;

- Fill lifts should be compacted to at least 98 percent of the soil's maximum dry density (ASTM D 698) in areas beneath pavements and 92 percent in grassed areas.
- Maintain the moisture content of compacted fill between minus 2 and plus 2 percent of optimum moisture;
- Maximum particle size of the soil should be limited to half the lift thickness.;
- Density testing should be performed as a means to verify percent compaction and moisture content of the material as it is being placed and compacted;
- Density testing should be performed at a rate of at least 3 tests per lift; CSI should be retained to provide additional recommendations for backfill;

9C GENERAL NOTES

- For all earthwork operations, positive surface drainage is prudent to keep water from ponding on the surface and to assist in maintaining surface stability;
- The surface should be sealed prior to expected wet weather. This can usually be accomplished with rubber-tired construction equipment or a steel-drum roller;
- If any soil placement problems occur, CSI should be retained to provide additional recommendations, as needed.

10 SITE DRAINAGE

During construction, water should not be allowed to pond in excavations and fill areas or undercutting will likely be required. During the life of the project, slope the subgrade and other site features so that surface water flows away from the site structures.

For excavations during construction, most free water from the subsurface conditions could likely be removed via sump pumps and open channel flow (if possible) at or near the source of seepage. However, if normal dewatering measures prove insufficient, CSI should be retained to provide recommendations on the issue.

11 CREEK CROSSING

Provided plans indicate that the proposed water main will cross two unnamed creeks utilizing a below grade crossing. Within the creek, plans indicate that the within the limits of the creek, the excavation below the bedrock-soil interface will be backfilled with concrete to match the existing creek bed configuration. While no borings were performed within either creek, boring B-17 was located near the first creek crossing location. Within boring B-17 auger refusal on what has been assumed to be competent limestone was encountered at a depth of about 7.5 feet. Based upon our experience in the area and the borings performed in the areas adjacent to the creek, we expect bedrock to be present at or near the creek bottoms. In the event that bedrock is not

encountered within the excavation, we recommend that the base of the excavation be extended to bedrock (or to a sufficient depth to prevent scour of the bearing soils) and backfilled with concrete.

12 NOTES ON THE REPORT AND RECOMMENDATIONS

We recommend that this complete report be provided to the various design team members, the contractors and the project Owner. Potential contractors should be informed of this report in the "Instructions to Bidders" section of the bid documents. A geotechnical exploration, such as the one we performed, used one boring to attempt to model the subsurface conditions at the site. Because no exploration contains complete data or a complete model, there is always a possibility that conditions between borings will be different from those at specific boring locations. Thus, it is possible that some subsurface conditions will not be as anticipated by the project team or contractor. If this report is included or referenced in the actual contract documents, it shall be explicitly understood that this report is for informational purposes only. CSI shall not be responsible for the opinions of, or conclusions drawn by others.

It has been our experience that the construction process often disturbs soil conditions and this process, no matter how much experience we use to anticipate construction methodology, is not completely predictable. Therefore, changes or modifications to our recommendations are likely needed due to these possible variances. Experienced CSI geotechnical personnel should be used to observe and document the construction procedures and the conditions encountered. Unanticipated conditions and inadequate procedures should be reported to the design team along with timely recommendations to solve the problems created. We recommend that the Owner retain CSI to provide this service based upon our familiarity with the project, the subsurface conditions and the intent of our recommendations.

This report is based on the supplied project information, the subsurface conditions observed at the time of the report, and our experience with similar conditions. As such, it cannot be applied to other project sites, types, or combinations thereof. If the Project Information section in this report contains incorrect information or if additional information is available, you should convey the correct or additional information to us and retain us to review our recommendations. Our recommendations may then require modification.

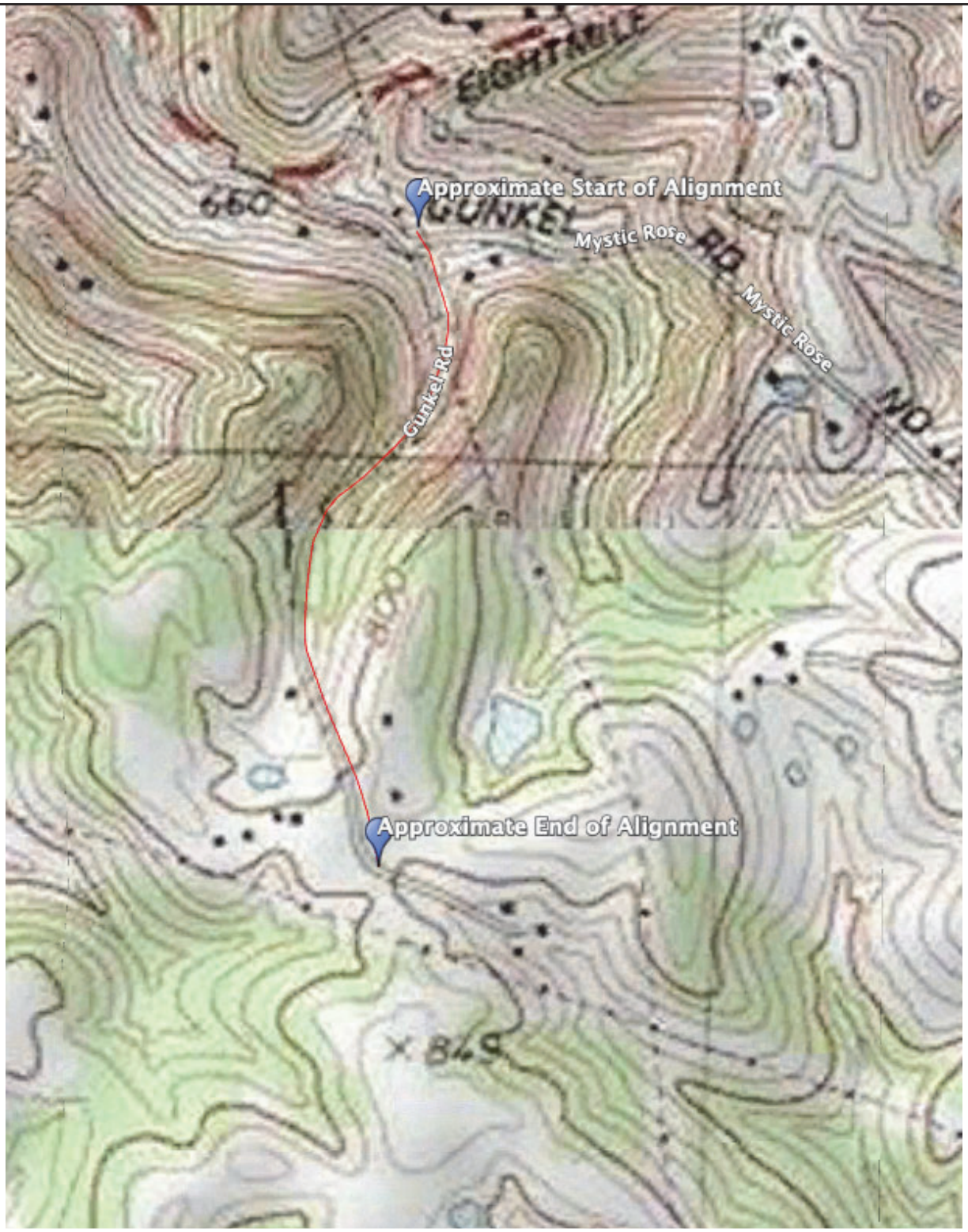
No section or portion of this report (including Appendix information) can be used as a stand alone article to make distinct changes or assumptions. The entire report and Appendix should be used together as one resource. We wish to remind you that our exploration services include storing the soil samples collected and making them available for inspection for 30 days. The soil samples are then discarded unless you request otherwise. Please inform us if you wish to keep any of the obtained samples.

While this report deals with samples of subsurface materials and some comments on water conditions at the site, no assessment of site environmental conditions or the presence of contaminants were performed.

We wish to remind you that our exploration services include storing the soil samples collected and making them available for inspection for 30 days. The samples are then discarded unless you request otherwise. Please inform us if you wish to keep any of the obtained samples.

APPENDIX A

SITE LOCATION PLAN
GEOTECHNICAL BORING INFORMATION SHEET
GENERAL BORING PROFILE
TEST BORING LOGS
FIELD TESTING PROCEDURES
LIQUID AND PLASTIC LIMITS REPORT
SUMMARY OF LABORATORY RESULTS
LABORATORY TESTING PROCEDURES



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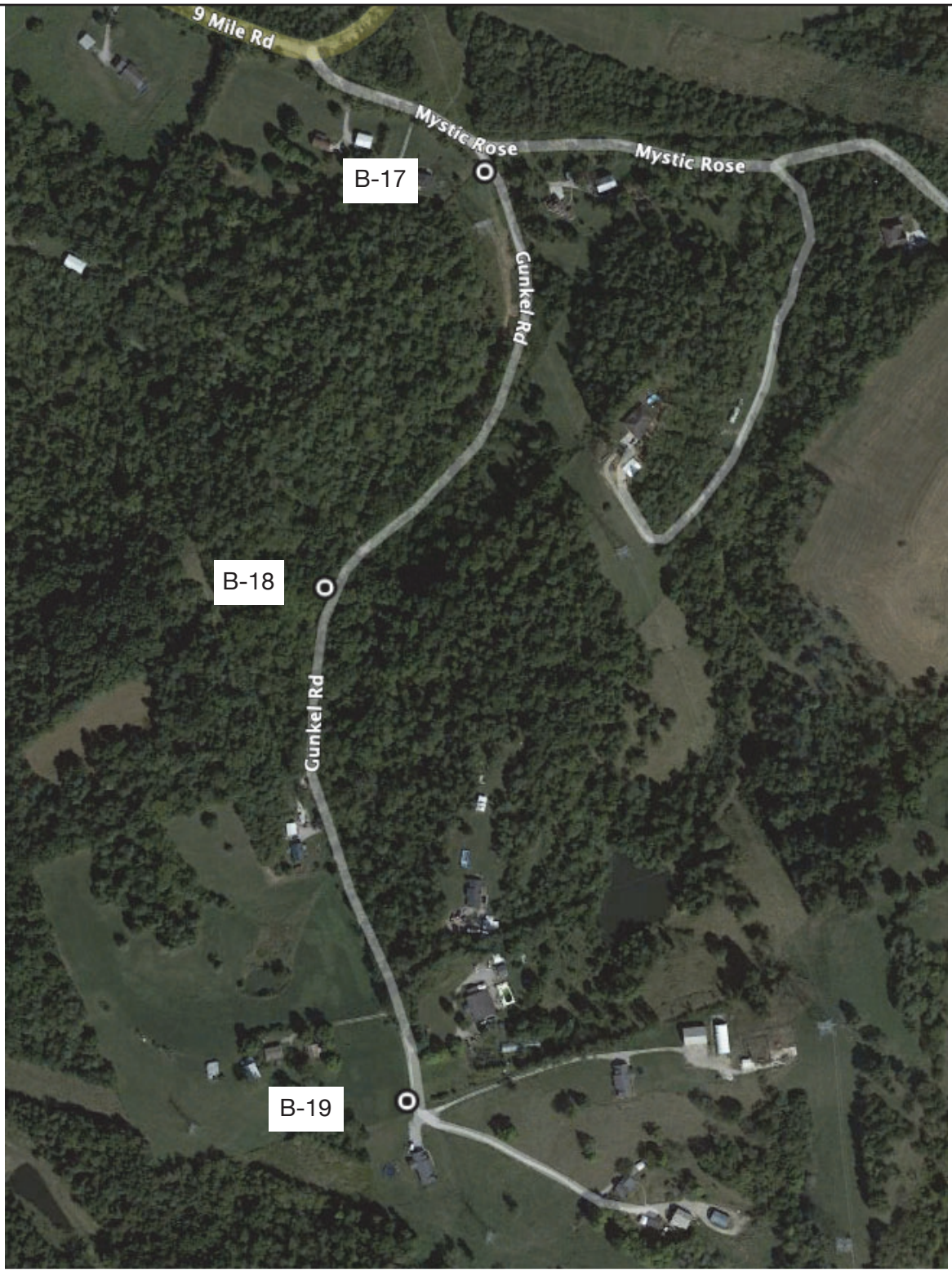
ADAPTED FROM TOPOGRAPHIC MAPPING
FOR ILLUSTRATION PURPOSES

CSI Cincinnati, LLC
11785 Highway Drive
Cincinnati, Ohio 45241
513.252.2059 Office | 888.792.3121 Fax
www.csiohio.com

TITLE: SITE LOCATION PLAN		PROJECT NO: CN230112	DRAWN BY: GD
PROJECT:	GUNKEL ROAD NEW WATER MAIN MELBOURNE, KY	DATE: 6/20/23	CHECKED BY: JB
		NOT TO SCALE	DRAWING NO 1 OF 2



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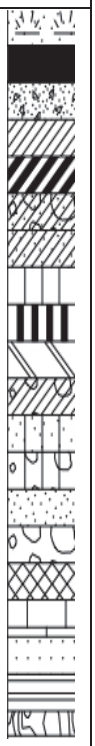
11785 Highway Drive
Cincinnati, Ohio 45241
513.252.2059 Office | 888.792.3121 Fax
www.csiohio.com

TITLE: BORING LOCATION PLAN		PROJECT NO: CN230112	DRAWN BY: GD
PROJECT:	GUNKEL ROAD NEW WATER MAIN MELBOURNE, KY	DATE: 6/20/23	CHECKED BY: JB
		NOT TO SCALE	DRAWING NO 2 OF 2

Consulting Services Incorporated
LEXINGTON | LOUISVILLE | CINCINNATI

Geotechnical Boring Information Sheet

Sample Type Symbols	
Splitspoon (SPT)	
Shelby Tube	
Grab	
Rock Core	
Auger Cuttings	

Surface Symbols	
Topsoil	
Asphalt	
Concrete	
Lean Clay	
Fat Clay	
Glacial Till	
Sandy Clay	
Silt	
Elastic Silt	
Lean Clay to Fat Clay	
Gravelly Clay	
Sandy Silt	
Gravelly Silt	
Sand	
Gravel	
Fill	
Limestone	
Sandstone	
Shale/Siltstone	
Weathered Rock	

Samples Strength Descriptors	
Cohesive Soils:	**N**
Very Soft	0-1
Soft	2-4
Firm	5-8
Stiff	9-15
Very Stiff	16-30
Hard	31+
Non-cohesive Soils:	
Very Loose	0-4
Loose	5-10
Firm	11-20
Very Firm	21-30
Dense	30-50
Very Dense	51+

Definitions

SPT-"Splitspoon" or standard penetration test. Blow counts are number of drops required for a 140 lb hammer dropping 30 inches to drive the sampler 6 inches.

N-value is the addition of the last two intervals of the 18-inch sample.

Shelby tubes are often called "undisturbed samples". They are directly pushed into the ground, twisted, allowed to rest for a small period of time and then pulled out of the ground. Tops and bottoms are cleaned and then sealed.

Sample classification is done in general accordance with ASTM D2487 and 2488 using the Unified Soil Classification System (USCS) as a general guide.

Soil moisture descriptions are based on the recovered sample observations. The descriptors are dry, slightly moist, moist, very moist and wet. These are typically based on relative estimates of the moisture condition of a visual estimation of the soils optimum moisture content (EOMC). Dry is almost in a "dusty" condition usually 6 or more percent below EOMC. Slightly moist is from about 6 to 2 percent below EOMC at a point at which the soil color does not readily change with the addition of water. Moist is usually 2 percent below to 2 percent above EOMC and the point at which the soil will tend to begin forming "balls" under some pressure in the hand. Very moist is usually from about 2 percent to 6 percent above EOMC and also the point at which it's often considered "muddy". Wet soil is usually 6 or more percent above EOMC and often contains free water or the soil is in a saturated state.

Silt or Clay is defined at material finer than a standard #200 US sieve (<0.075mm) Sand is defined as material between the size of #200 sieve up to #4 sieve. Gravel is from #4 size sieve material to 3". Cobbles are from 3" to 12". Boulders are over 12".

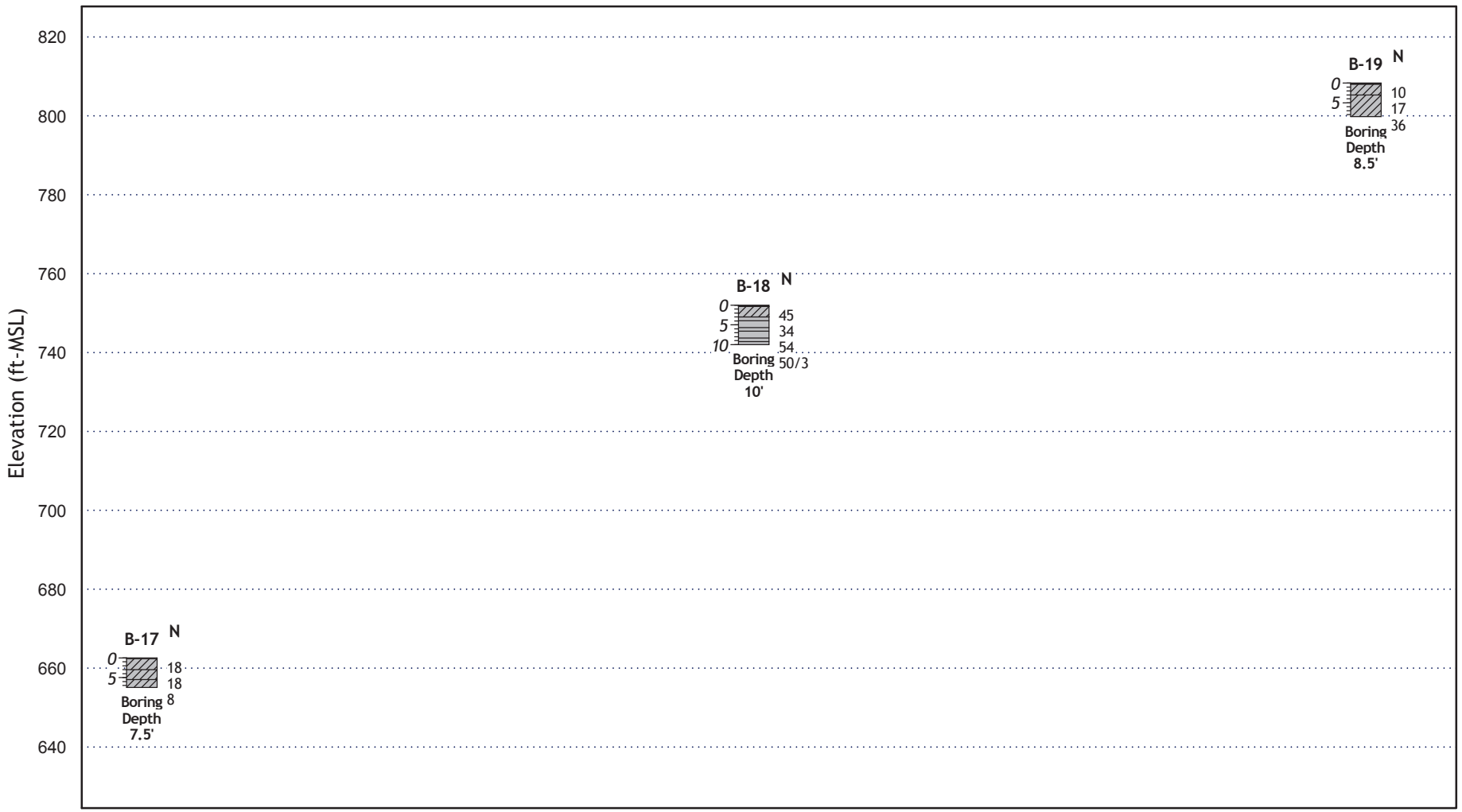
Rock hardness is classified as follows:

Very Soft:	Easily broken by hand pressure
Soft:	Ends can be broken by hand pressure; easily broken with hammer
Medium:	Ends easily broken with hammer; middle requires moderate blow
Hard:	Ends require moderate hammer blow; middle requires several blows
Very Hard:	Many blows with a hammer required to break core

Rock Quality Designation (RQD) is defined as total combined length of 4" or longer pieces of core divided by the total core run length; defined in percentage.

Water or cave-in observed in borings is at completion of drilling each boring unless otherwise noted.

Strata lengths shown on borings represents a rough estimate. Transition may be more abrupt or gradual. Soil borings are representative of that estimated location at that time and are based on recovered samples. Conditions may be different between borings and between sample intervals. Boring information is not to be considered stand alone but should be taken in context with comments and information in the geotechnical report and the means by which the borings are logged, sampled and drilled.



SOIL TYPES

(Shown in Graphic Log)

- Fill
- Asphalt
- Topsoil
- Gravel
- Sand
- Silt
- Lean Clay
- Fat Clay
- Silty Sand
- Clayey Sand
- Sandy Silt
- Clayey Silt
- Sandy Clay
- Silty Clay
- Limestone
- Sandstone
- Siltstone
- Shale

CSI of Cincinnati
11785 Highway Drive
Cincinnati, OH 45241
Phone: 513.252.2059
Fax: 888.792.3121

Northern Kentucky
Water
CN230010

BORING PROFILE

Fig. 1

CSI STRATIGRAPHY (GINT 7) CN230010 - NORTHERN KENTUCKY WATER.GPJ GINT STD US LAB.GDT 7/7/23

CSI of Cincinnati
11785 Highway Drive
Cincinnati, OH 45241
Phone: 513.252.2059
Fax: 888.792.3121

TEST BORING LOG

CLIENT: Cardinal Engineering
PROJECT NAME: Northern Kentucky Water
PROJECT LOCATION: Alexandria, KY

BORING #: B-17
JOB #: CN230010
LOGGED BY: CG
APPROVED BY: GD

DRILLING and SAMPLING INFORMATION

Date Started	2/27/23	Contractor	CSI
Date Completed	3/1/23	Boring Size	4 in.
Drill Rig	B-57 Mobile	Boring Method	SFA
Weather	Cloudy, 40s-50s	Hammer Type	Automatic

SOIL CLASSIFICATION

SURFACE ELEVATION: 662.6

Elev. (ft)	Depth Scale	Water Level	Soil Classification	Sample No.	Sample Type	Sample Graphics	Recovery (in)	Standard Penetration Test Blows per 6" [*N-Value*] *blows/foot*	Qu-tsf Unconfined (Pocket Pen.) Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plasticity Index (PI)	Percent Passing #200 Sieve	Remarks
662	0		TOPSOIL - 2 INCHES											
			Brown LEAN CLAY (CL) with rock fragments, little silt, and trace roots [Residuum] - moist, very stiff	1	SS		10	2-11-7 [*18*]		25.5				
660	2													
			Brown LEAN CLAY (CL) with little silt, and trace rock fragments [Residuum] - moist, very stiff	2	SS		16	4-7-11 [*18*]		27.0	41	16	85	
658	4													
			Gray brown LEAN CLAY (CL) with little rock fragments and trace silt [Residuum] - moist, firm	3	SS		7	3-4-4 [*8*]						
656	6													
			Auger refusal at 7.5 feet											
654	8		End boring											
652	10													
650	12													
648	14													

TEST DATA

Depth to Groundwater
- Noted on Drilling Tools _____ ft.
- At Completion _____ ft.
- After _____ hours _____ ft.
- Cave Depth _____ ft.

Sample Type
- SPT- Standard Penetration Test
- SS- Split Spoon
- ST- Shelby Tube
- RC- Rock Core
- CU- Auger Cuttings

Boring Method
- HSA- Hollow Stem Augers
- CFA- Continuous Flight Augers
- MD- Mud Drilling

CSI of Cincinnati
11785 Highway Drive
Cincinnati, OH 45241
Phone: 513.252.2059
Fax: 888.792.3121

TEST BORING LOG

CLIENT: Cardinal Engineering
PROJECT NAME: Northern Kentucky Water
PROJECT LOCATION: Alexandria, KY

BORING #: B-18
JOB #: CN230010
LOGGED BY: CG
APPROVED BY: GD

DRILLING and SAMPLING INFORMATION

Date Started	2/27/23	Contractor	CSI
Date Completed	3/1/23	Boring Size	4 in.
Drill Rig	B-57 Mobile	Boring Method	SFA
Weather	Cloudy, 40s-50s	Hammer Type	Automatic

SOIL CLASSIFICATION

SURFACE ELEVATION: 752.0

ASPHALT - 3 INCHES

Brown LEAN CLAY (CL) with trace black oxide nodules, rock fragments, and roots [Residuum] - dry , hard

Brown highly weathered SHALE with rock fragments - dry, soft

Boring terminated at 10.0 feet

No refusal

Elev. (ft)	Depth Scale	Sample No.	Sample Type	Sample Graphics	Recovery (in)	Standard Penetration Test Blows per 6" [*N-Value*] *blows/foot*	Qu-tsf Unconfined (Pocket Pen.) Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plasticity Index (PI)	Percent Passing #200 Sieve	Remarks
750	2	1	SS		5	6-14-31 [*45*]		18.9				
748	4	2	SS		14	10-13-21 [*34*]						
746	6	3	SS		13	13-23-31 [*54*]						
744	8	4	SS		6	32-50/3- [*50/3*]						
742	10											
740	12											
738	14											

Depth to Groundwater
- Noted on Drilling Tools _____ ft.
- At Completion _____ ft.
- After _____ hours _____ ft.
- Cave Depth _____ ft.

Sample Type
- SPT- Standard Penetration Test
- SS- Split Spoon
- ST- Shelby Tube
- RC- Rock Core
- CU- Auger Cuttings

Boring Method
- HSA- Hollow Stem Augers
- CFA- Continuous Flight Augers
- MD- Mud Drilling

CSI of Cincinnati
11785 Highway Drive
Cincinnati, OH 45241
Phone: 513.252.2059
Fax: 888.792.3121

TEST BORING LOG

CLIENT: Cardinal Engineering
PROJECT NAME: Northern Kentucky Water
PROJECT LOCATION: Alexandria, KY

BORING #: B-19
JOB #: CN230010
LOGGED BY: CG
APPROVED BY: GD

DRILLING and SAMPLING INFORMATION

Date Started	2/27/23	Contractor	CSI
Date Completed	3/1/23	Boring Size	4 in.
Drill Rig	B-57 Mobile	Boring Method	SFA
Weather	Cloudy, 40s-50s	Hammer Type	Automatic

SOIL CLASSIFICATION

SURFACE ELEVATION: 808.3

ASPHALT - 3 INCHES

Brown LEAN CLAY (CL) with black oxide nodules and roots [Residuum] - moist, stiff

Brown LEAN CLAY (CL) with trace black oxide nodules, silt, and rock fragments [Residuum] - dry, very stiff to hard

Auger refusal at 8.5 feet

End boring

TEST DATA

Elev. (ft)	Depth Scale	Water Level	Sample No.	Sample Type	Sample Graphics	Recovery (in)	Standard Penetration Test Blows per 6" [*N-Value*] *blows/foot*	Qu-tsf Unconfined (Pocket Pen.) Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plasticity Index (PI)	Percent Passing #200 Sieve	Remarks
808													
	2		1	SS		12	3-4-6 [*10*]		25.2				
806													
	4		2	SS		17	3-6-11 [*17*]		21.6				
804													
	6		3	SS		10	8-15-21 [*36*]		19.2	47	22	98	
802													
	8												
800													
	10												
798													
	12												
796													
	14												
794													

Depth to Groundwater
- Noted on Drilling Tools _____ ft.
- At Completion _____ ft.
- After _____ hours _____ ft.
- Cave Depth _____ ft.

Sample Type
- SPT- Standard Penetration Test
- SS- Split Spoon
- ST- Shelby Tube
- RC- Rock Core
- CU- Auger Cuttings

Boring Method
- HSA- Hollow Stem Augers
- CFA- Continuous Flight Augers
- MD- Mud Drilling

FIELD TESTING PROCEDURES

Field Operations: The general field procedures employed by CSI are summarized in ASTM D 420 which is entitled "Investigating and Sampling Soils and Rocks for Engineering Purposes." This recommended practice lists recognized methods for determining soil and rock distribution and ground water conditions. These methods include geophysical and in situ methods as well as borings.

Borings are drilled to obtain subsurface samples using one of several alternate techniques depending upon the subsurface conditions. These techniques are:

a. Continuous 2-1/2 or 3-1/4 inch I.D. hollow stem augers;

b. Wash borings using roller cone or drag bits (mud or water);

c. Continuous flight augers (ASTM D 1425).

These drilling methods are not capable of penetrating through material designated as "refusal materials." Refusal, thus indicated, may result from hard cemented soil, soft weathered rock, coarse gravel or boulders, thin rock seams, or the upper surface of sound continuous rock. Core drilling procedures are required to determine the character and continuity of refusal materials.

The subsurface conditions encountered during drilling are reported on a field test boring record by the chief driller. The record contains information concerning the boring method, samples attempted and recovered, indications of the presence of various materials such as coarse gravel, cobbles, etc., and observations between samples. Therefore, these boring records contain both factual and interpretive information. The field boring records are on file in our office.

The soil and rock samples plus the field boring records are reviewed by a geotechnical engineer. The engineer classifies the soils in general accordance with the procedures outlined in ASTM D 2488 and prepares the final boring records which are the basis for all evaluations and recommendations.

The final boring records represent our interpretation of the contents of the field records based on the results of the engineering examinations and tests of the field samples. These records depict subsurface conditions at the specific locations and at the particular time when drilled. Soil conditions at other locations may differ from conditions occurring at these boring locations. Also, the passage of time may result in a change in the subsurface soil and ground water conditions at these boring locations. The lines designating the interface between soil or refusal materials on the records and on profiles represent approximate boundaries. The transition between materials may be gradual. The final boring records are included with this report.

The detailed data collection methods using during this study are discussed on the following pages.

Soil Test Borings: Soil test borings were made at the site at locations shown on the attached Boring Plan. Soil sampling and penetration testing were performed in accordance with ASTM D 1586.

The borings were made by mechanically twisting a hollow stem steel auger into the soil. At regular intervals, the drilling tools were removed and soil samples obtained with a standard 1.4 inch I.D., 2 inch O.D., split tube sampler. The sampler was first seated 6 inches to penetrate any loose cuttings, then driven an additional foot with blows of a 140-pound hammer falling 30 inches. The number of hammer blows required to drive the sampler the final foot was recorded and is designated the "penetration resistance". The penetration resistance, when properly evaluated, is an index to the soil strength and foundation supporting capability.

Representative portions of the soil samples, thus obtained, were placed in glass jars and transported to the laboratory. In the laboratory, the samples were examined to verify the driller's field classifications. Test Boring Records are attached which graphically show the soil descriptions and penetration resistances.

Core Drilling: Refusal materials are materials that cannot be penetrated with the soil drilling methods employed. Refusal, thus indicated, may result from hard cemented soil, soft weathered rock, coarse gravel or boulders, thin rock seams or the upper surface of sound continuous rock. Core drilling procedures are required to determine the character and continuity of refusal materials.

Prior to coring, casing is set in the drilled hole through the overburden soils, if necessary, to keep the hole from caving. Refusal materials are then cored according to ASTM D 2113 using a diamond-studded bit fastened to the

end of a hollow double tube core barrel. This device is rotated at high speeds, and the cuttings are brought to the surface by circulating water. Core samples of the material penetrated are protected and retained in the swivel-mounted inner tube. Upon completion of each drill run, the core barrel is brought to the surface, the core recovered is measured, the samples are removed and the core is placed in boxes for storage.

The core samples are returned to our laboratory where the refusal material is identified and the percent core recovery and rock quality designation is determined by a soils engineer or geologist. The percent core recovery is the ratio of the sample length obtained to the depth drilled, expressed as a percent. The rock quality designation (RQD) is obtained by summing up the length of core recovered, including only the pieces of core which are four inches or longer, and dividing by the total length drilled. The percent core recovery and RQD are related to soundness and continuity of the refusal material. Refusal material descriptions, recoveries, and RQDs are shown on the "Test Boring Records".

Hand Auger Borings and Dynamic Cone Penetration Testing: Hand auger borings are performed manually by CSI field personnel. This consists of manually twisting hand auger tools into the subsurface and extracting “grab” or baggie samples at intervals determined by the project engineer. At the sample intervals, dynamic cone penetration (DCP) testing is performed. This testing involves the manual raising and dropping of a 20 pound hammer, 18 inches. This “driver” head drives a solid-1¾ inch diameter cone into the ground. DCP “counts” are the number of drops it takes for the hammer to drive three 1¾ inch increments, recorded as X-Y-Z values.

Test Pits: Test pits are excavated by the equipment available, often a backhoe or trackhoe. The dimensions of the test pits are based on the equipment used and the power capacity of the equipment. Samples are taken from the spoils of typical buckets of the excavator and sealed in jars or “Ziplock” baggies. Dynamic Cone Penetration or hand probe testing is often performed in the upper few feet as OSHA standards allow. Refusal is deemed as the lack of advancement of the equipment with reasonable to full machine effort.

Water Level Readings: Water table readings are normally taken in conjunction with borings and are recorded on the "Test Boring Records". These readings indicate the approximate location of the hydrostatic water table at the time of our field investigation. Where impervious soils are encountered (clayey soils) the amount of water seepage into the boring is small, and it is generally not possible to establish the location of the hydrostatic water table through water level readings. The ground water table may also be dependent upon the amount of precipitation at the site during a particular period of time. Fluctuations in the water table should be expected with variations in precipitation, surface run-off, evaporation and other factors.

The time of boring water level reported on the boring records is determined by field crews as the drilling tools are advanced. The time of boring water level is detected by changes in the drilling rate, soil samples obtained, etc. Additional water table readings are generally obtained at least 24 hours after the borings are completed. The time lag of at least 24 hours is used to permit stabilization of the ground water table which has been disrupted by the drilling operations. The readings are taken by dropping a weighted line down the boring or using an electrical probe to detect the water level surface.

Occasionally the borings will cave-in, preventing water level readings from being obtained or trapping drilling water above the caved-in zone. The cave-in depth is also measured and recorded on the boring records.

Summary of Laboratory Results

Borehole	Depth	Sample Type	Liquid Limit	Plastic Limit	Plasticity Index	Classification	Water Content (%)	Unconfined Compressive Strength (tsf)	Dry Density (pcf)	Wet Density (pcf)	Max. Dry Density (pcf)	Opt. Water Content (%)	CBR	Swell (%)	RQD	Percent Recovery	Percent Finer (No. 200)
B-17	1.0	SS					25.5										
B-17	3.5	SS	41	25	16	LEAN CLAY with SAND(CL)	27.0										85
B-18	1.0	SS					18.9										
B-19	1.0	SS					25.2										
B-19	3.5	SS					21.6										
B-19	6.0	SS	47	25	22	LEAN CLAY(CL)	19.2										98

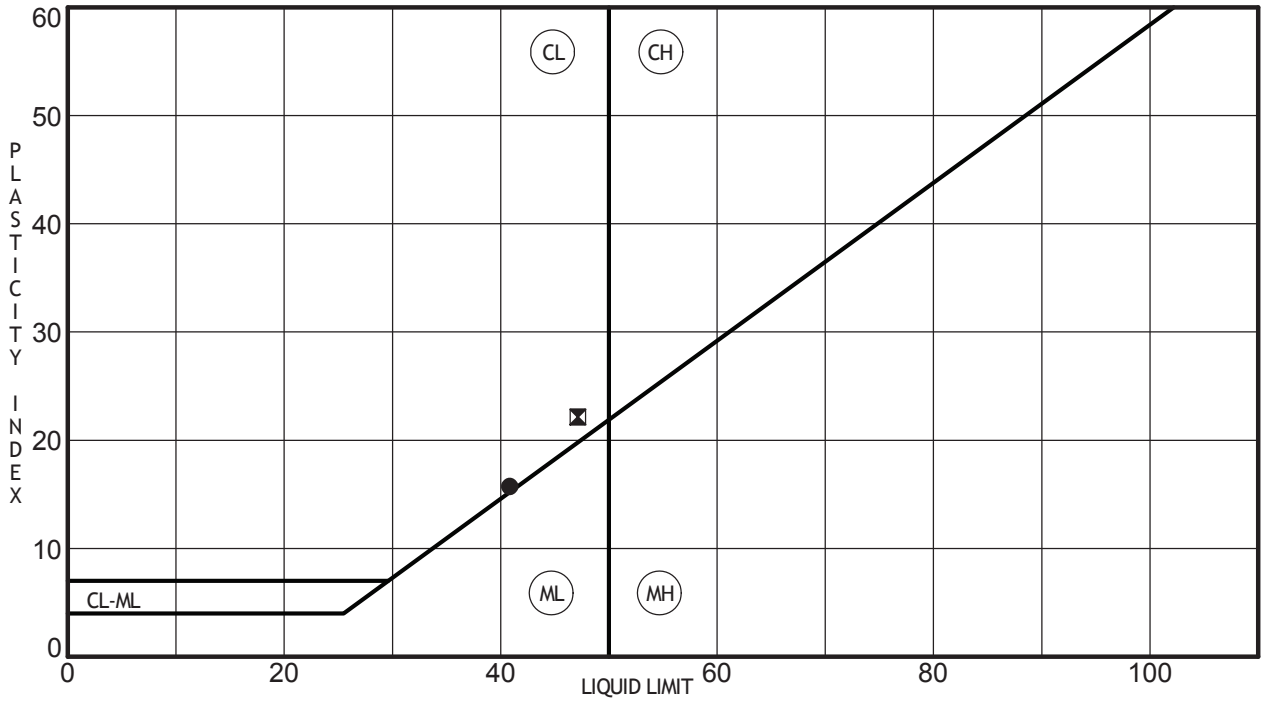
CSI of Cincinnati
11785 Highway Drive
Cincinnati, OH 45241
Phone: 513.252.2059
Fax: 888.792.3121

SS - Split Spoon Sample
GRAB - Bulk Grab Sample

PROJECT INFORMATION

Client: Cardinal Engineering
Project Name: Northern Kentucky Water
Project Number: CN230010
Project Location: Alexandria, KY

Liquid and Plastic Limits Test Report



	Boring	Depth (ft)	LL	PL	PI	Water Content	% < #40	% < #200	USCS	Description
●	B-17	3.5	41	25	16	27.0		85		LEAN CLAY with SAND(CL)
⊠	B-19	6.0	47	25	22	19.2		98		LEAN CLAY(CL)

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11785 Highway Drive
Cincinnati, OH 45241
Phone: 513.252.2059
Fax: 888.792.3121

PROJECT INFORMATION

Client: Cardinal Engineering
Project Name: Northern Kentucky Water
Project Number: CN230010
Project Location: Alexandria, KY

LABORATORY TESTING PROCEDURES

Soil Classification: Soil classifications provide a general guide to the engineering properties of various soil types and enable the engineer to apply past experience to current problems. In our investigations, samples obtained during drilling operations are examined in our laboratory and visually classified by an engineer. The soils are classified according to consistency (based on number of blows from standard penetration tests), color and texture. These classification descriptions are included on our "Test Boring Records."

The classification system discussed above is primarily qualitative and for detailed soil classification two laboratory tests are necessary: grain size tests and plasticity tests. Using these test results the soil can be classified according to the AASHTO or Unified Classification Systems (ASTM D 2487). Each of these classification systems and the in-place physical soil properties provides an index for estimating the soil's behavior. The soil classification and physical properties obtained are presented in this report.

Rock Classification: Rock classifications provide a general guide to the engineering properties of various rock types and enable the engineer to apply past experience to current situations. In our explorations, rock core samples obtained during drilling operations are examined in our laboratory and visually classified by an engineer. The rock cores are classified according to relative hardness and RQD (see Guide to Rock Classification Terminology), color, and texture. These classification descriptions are included on our Test Boring Records.

Atterberg Limits: Portions of the samples are taken for Atterberg Limits testing to determine the plasticity characteristics of the soil. The plasticity index (PI) is the range of moisture content over which the soil deforms as a plastic material. It is bracketed by the liquid limit (LL) and the plastic limit (PL). The liquid limit is the moisture content at which the soil becomes sufficiently "wet" to flow as a heavy viscous fluid. The plastic limit is the lowest moisture content at which the soil is sufficiently plastic to be manually rolled into tiny threads. The liquid limit and plastic limit are determined in accordance with ASTM D 4318.

Moisture Content: The Moisture Content is determined according to ASTM D 2216.

Percent Finer Than 200 Sieve: Selected samples of soils are washed through a number 200 sieve to determine the percentage of material less than 0.074 mm in diameter.

Rock Strength Tests: To obtain strength data for rock materials encountered, unconfined compression tests are performed on selected samples. In the unconfined compression test, a cylindrical portion of the rock core is subjected to increasing axial load until it fails. The pressure required to produce failure is recorded, corrected for the length to diameter ratio of the core and reported.

Compaction Tests: Compaction tests are run on representative soil samples to determine the dry density obtained by a uniform compactive effort at varying moisture contents. The results of the test are used to determine the moisture content and unit weight desired in the field for similar soils. Proper field compaction is necessary to decrease future settlements, increase the shear strength of the soil and decrease the permeability of the soil.

The two most commonly used compaction tests are the Standard Proctor test and the Modified Proctor test. They are performed in accordance with ASTM D 698 and D 1557, respectively. Generally, the Standard Proctor compaction test is run on samples from building or parking areas where small compaction equipment is anticipated. The Modified compaction test is generally performed for heavy structures, highways, and other areas where large compaction equipment is expected. In both tests a representative soil sample is placed in a mold and compacted with a compaction hammer. Both tests have three alternate methods.

Test	Method	Hammer Wt./Fall	Mold Diam.	Run on Material Finer Than	No. of Layers	No. of Blows/ Layer
Standard	A	5.5 lb./12"	4"	No. 4 sieve	3	25
D 698	B	5.5 lb./12"	4"	3/8" sieve	3	25
	C	5.5 lb./12"	6"	3/4" sieve	3	56

Test	Method	Hammer Wt./Fall	Mold Diam.	Run on Material Finer Than	No. of Layers	No. of Blows/ Layer
Modified	A	10 lb./18"	4"	No. 4 sieve	5	25
D 1557	B	10 lb./18"	4"	3/8" sieve	5	25
	C	10 lb./18"	6"	3/4" sieve	5	56

The moisture content and unit weight of each compacted sample is determined. Usually 4 to 5 such tests are run at different moisture contents. Test results are presented in the form of a dry unit weight versus moisture content curve. The compaction method used and any deviations from the recommended procedures are noted in this report.

Laboratory California Bearing Ratio Tests: The California Bearing Ratio, generally abbreviated to CBR, is a punching shear test and is a comparative measure of the shearing resistance of a soil. It provides data that is a semi-empirical index of the strength and deflection characteristics of a soil. The CBR is used with empirical curves to design pavement structures.

A laboratory CBR test is performed according to ASTM D 1883. The results of the compaction tests are utilized in compacting the test sample to the desired density and moisture content for the laboratory California Bearing Ratio test. A representative sample is compacted to a specified density at a specified moisture content. The test is performed on a 6-inch diameter, 4.58-inch-thick disc of compacted soil that is confined in a cylindrical steel mold. The sample is compacted in accordance with Method C of ASTM D 698 or D 1557.

CBR tests may be run on the compacted samples in either soaked or unsoaked conditions. During testing, a piston approximately 2 inches in diameter is forced into the soil sample at the rate of 0.05 inch per minute to a depth of 0.5 inch to determine the resistance to penetration. The CBR is the percentage of the load it takes to penetrate the soil to a 0.1 inch depth compared to the load it takes to penetrate a standard crushed stone to the same depth. Test results are typically shown graphically.

Geotechnical Report

NKY Water District - Oneonta Road Water Main

Prepared for

Cardinal Engineering
1 Moock Road #1
Wilder, Kentucky 41071

August 1, 2023

Project No. CN230010

August 1, 2023

Mr. Kevin Hanson
Cardinal Engineering
1 Moock Road #1
Wilder, Kentucky 41071

Subject: Geotechnical Report for
NKY Water District - Oneonta Road Water Main
California, Kentucky
CSI Project No. CN230130

Dear Mr. Hanson,

Consulting Services Incorporated of Cincinnati (CSI) is pleased to present our geotechnical report for the NKY Water District - Oneonta Road Water Main project in California, Kentucky. We provided our services in general accordance with the CSI Proposal 8227, dated December 12, 2022 and the CSI Proposal 8419, dated April 3, 2023.

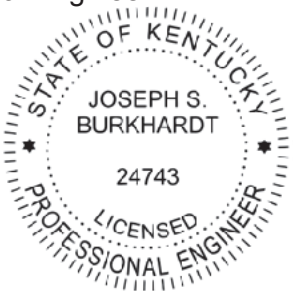
Our report represents information provided to us, readily available published data relevant to the site and site area, our observations and subsurface conditions encountered and our opinion of primary geotechnical conditions (discussion and recommendations) affecting site work and foundation design for the project.

Again, we greatly appreciate the opportunity to provide our services and look forward to working with you and the project team on this (and hopefully) more projects in the future. Please do not hesitate to contact us for questions or comments about the information contained herein.

Cordially,

Graham Duncan, EIT
Staff Engineer

Joseph S. Burkhardt, P.E.
Principal Geotechnical Engineer



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APPENDICES, FIGURES, PHOTOS, AND TABLES

Appendix A

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INTRODUCTION

1 SCOPE OF THE GEOTECHNICAL EXPLORATION

As proposed, CSI conducted a geotechnical exploration for the proposed 8” water main extension along Oneonta Road in California, Kentucky. Our services included a review of the project information provided, conducting a subsurface exploration that utilized soil borings to obtain samples for modeling the soil conditions along the proposed route, an analysis of data and information obtained, evaluation of bearing conditions for the water line and recommendations for backfill of the pipe.

2 SITE AND PROJECT INFORMATION

The project will include the installation of a new 8” water main along Oneonta Road in California, Kentucky. As part of this report, CSI has reviewed a plan set titled ‘Subdistrict HB Water main Extension Project’ dated 1-11-23. CSI’s understanding of the project is outlined in the tables below.

Table 1: Site Information

Item	Description
Site Location	The site is located along Oneonta Road in California, Kentucky from the intersection of Washington Trace Road and Oneonta Road to the Intersection of Oneonta Road and Mary Ingles Highway.
Length of Improvement	The water line will be approximately 7,800 feet in length
Surrounding Area	The surrounding area is characterized by sparse residential developments in all directions
Existing Conditions	Existing roadway is asphalt paved and is 15 foot wide edge to edge. Twelve Mile Creek is present immediately south of the roadway along the majority of the alignment and is located within the 100 year flood plain of the creek. Additionally, what appear to be a soil nail slope repair was noted near 5812 Oneonta Road.

Table 2: Project Information

Item	Description
Site Layout	See Boring Location Plan
Proposed Structure(s)	An approximately 7,800 foot long 8 inch of new water main and intermittent fire hydrants.
Water Main Construction	Based on our understanding the water main will be constructed within the road right-of-ways at a depth of about 5 feet below grade. The water main will be installed along north side of the roadway along the entire alignment. Additionally, the alignment will cross a tributary of Twelve Mile Creek using a concrete encased creek crossing near station 4+00.

3 AREA/SITE INFORMATION

3A AREA TOPOGRAPHY / PHYSIOGRAPHY

The site is located within the Outer Blue Grass Region of northern Kentucky. This area is characterized by Ordovician dolomites, limestones and calcareous shales, thin pre-Wisconsinan drift, loamy soils and low to moderately high relief. Published mapping reviewed indicates the elevations in the site vicinity range from about 480 feet near the intersection of Oneonta Road and Washington Trace Road to about 530 feet near the intersection of Oneonta Road and Mary Ingles Highway. Below is a figure of the location of the site with respect to the regional physiography.

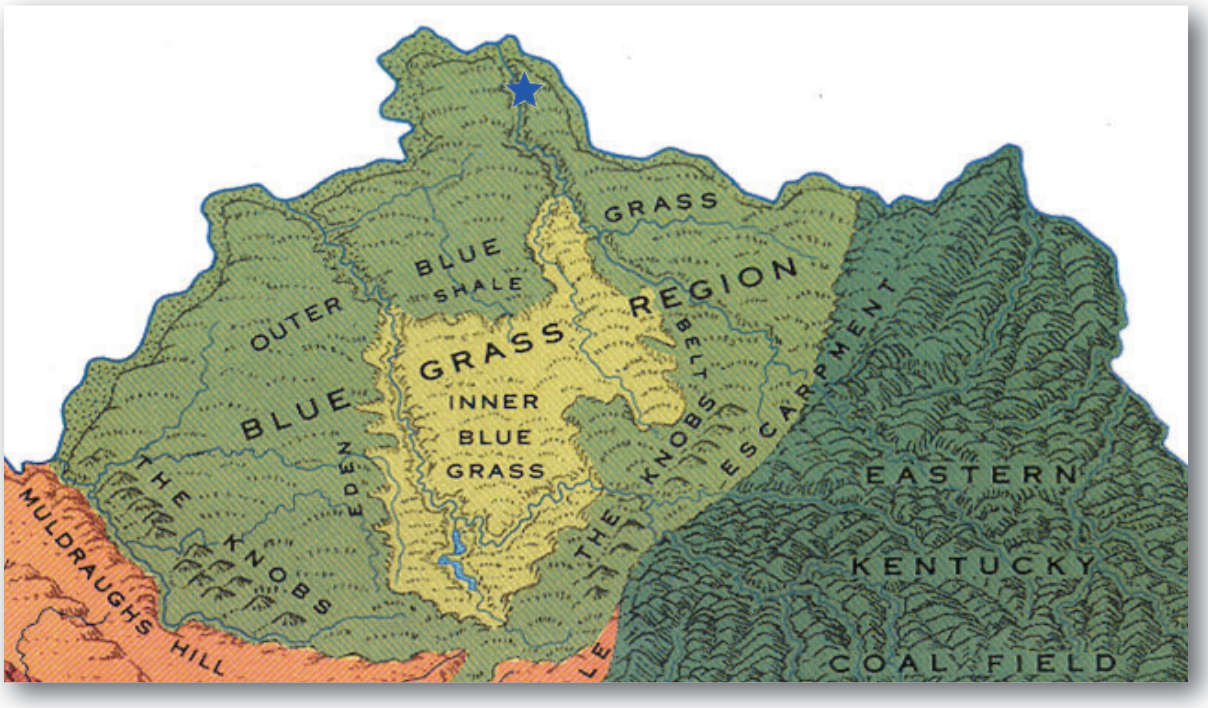

Figure 1 - Kentucky Physiographic Map (site vicinity shown with star)

3B SITE GEOLOGY

Review of the *Kentucky Geologic Map Service* shown in **Figure 2** below indicates the the majority of the alignment is underlain by Quaternary age alluvial deposits (Qal & Qwla) which consist of mixed layers of clay, silt, gravel, and sand. At higher elevations along the alignment Ordovician age deposits belonging to the Point Pleasant Tongue of Clays Ferry (Ocp) and Kope Formations are present. In general, each of these formations are comprised of interbedded limestone and shale and differ mainly in the ratio of limestone to shale. The Kope formation is comprised of about 80 percent shale while the Point Pleasant Tongue of Clays Ferry formation being comprised of about 45 to 65 percent limestone.

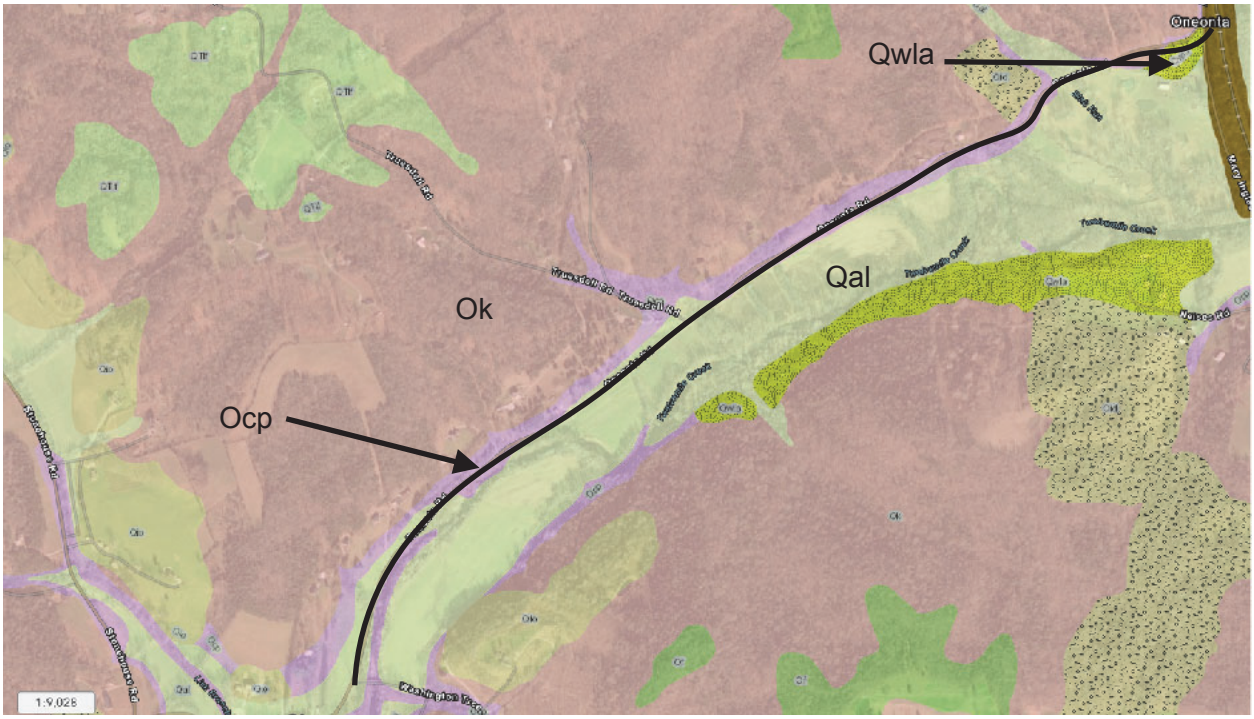

Figure 2 - Site Geologic Mapping (Approximate Alignment Highlighted)

FINDINGS

4 SUBSURFACE CONDITIONS

CSI performed a total of nine (9) soil test borings to explore the subsurface conditions along the alignment at approximate 1,000 foot intervals. In general, our borings encountered alluvial,andresidual soils with shale bedrock. Some isolated possible fill material was encountered within one boring. Borings for this project were numbered sequentially across eight separate project sites. Specific borings for the Oneonta Road Project site are labeled as boring numbers B-11 through B-13 as well as supplemental borings SB-1 through SB-6

4A STRATA INFORMATION

The subsurface conditions encountered at the test boring locations are shown in the Test Boring Log in the Appendix. These records represent our interpretation of the subsurface conditions based on the field logs, visual examination of field samples by an engineer, and tests of the samples collected. The letters in parentheses following the soil descriptions are the soil classifications in general accordance with the Unified Soil Classification System (USCS). It should be noted that dashed stratification lines shown on the soil boring log represent approximate transitions between material types. In-situ stratum changes could occur gradually or at slightly different depths. Boring elevations were determined by Cardinal Engineering and supplied to CSI.

TOPSOIL

Topsoil was encountered at the ground surface within each boring location, with thicknesses ranging from 1 to 4 inches.

ALLUVIUM

Alluvial soil deposits were encountered in boring B-11, B-12, SB-2, SB-3, SB-4 to depths of up to 10 or more feet below grade. The alluvial soils were described to be brown lean clay with trace to little silt, sand, and black oxide nodules. Standard Penetration Testing (SPT) N-Values ranged from 5 to 9 blows per foot (bpf) indicated a firm to stiff consistency, which increased with depth. Laboratory testing of a representative samples indicates Liquid Limits (LL) of 35 and 43 percent and Plasticity Indices (PI) of 16 and 26 percent, respectively. Natural moisture contents ranged from 20.2 to 26.3 percent.

PREVIOUSLY PLACED FILL MATERIAL

Possible previously placed fill material was encountered in boring SB-3 to a depth of about 3.5 feet below grade. The fill material was described to be brown lean clay with trace roots and black oxide nodules. SPT N-Values in the fill material were recorded to be 10 bpf, indicating a stiff consistency.

RESIDUUM

Residual soil deposits were encountered underlying the alluvium or topsoil in each of our boring locations except B-11. The residuum was generally described to be brown lean to fat clay with varying amounts of silt, rock fragments, and black oxide nodules. Standard Penetration Testing (SPT) N-Values ranged from 6 to more than 50 bpf indicated a firm to hard consistency, which generally increased with depth. Natural moisture contents ranged from 17.0 to 34.0 percent. Laboratory testing of a representative samples indicates Liquid Limits (LL) ranging from 43 to 54 percent and Plasticity Indices (PI) between 23 and 34 percent.

WEATHERED SHALE/LIMESTONE BEDROCK

Weathered shale bedrock samples were recovered from borings B-11, B-13, and SB-4 at depths of about 8 feet within each boring. Auger refusal in what has been assumed to be competent limestone within borings B-5 and B-6 at depths of about 3.2 and 3 feet, respectively. For details of subsurface conditions encountered at a particular boring location please refer to the boring logs contained in Appendix A. It should be noted that our borings were drilled and sampled according to the procedures presented in the appendix. The boring locations shown in the appendix should be considered accurate only to the degree implied by the method used.

4B GROUNDWATER CONDITIONS

Groundwater was not encountered in any measurable quantities within any of our boring locations. In the Northern Kentucky area, water conditions that usually affect construction and

performance of projects consist of trapped/perched water zones which occur in variable areas in the soil mass that may be present at the soil/bedrock interface and/or due to sand layers and seams throughout the soil. Perched water sources are often not linked to the more continuous relatively stable ground water table that typically occurs at greater depths. Site excavation activities or ground disturbance can expose these features and the resulting seepage can vary greatly. Groundwater issues are also dependent upon recent rainfall activity and surface and subsurface drainage patterns in the area that may change depending on climatic conditions.

5 LABORATORY TESTING

Laboratory tests were performed on selected recovered samples from the borings to provide recommendations for earthwork and to determine index properties of the soils. Details for the test methods and results are shown in the Appendix. Tests performed included:

- 23 Moisture Content Tests
- 5 Grain Size Analyses (-200 Sieve)
- 5 Atterberg Limits Tests

GEOTECHNICAL DISCUSSION AND RECOMMENDATIONS

6 DISCUSSION—GEOTECHNICAL ISSUES

Based on our experience with similar projects and the conditions observed during our subsurface exploration, we believe the site is suitable for the proposed construction, provided the recommendations outlined in this report are followed. The primary geotechnical concerns are:

- **MARGINALLY SOFT ALLUVIAL SOILS**
- **SHALLOW BEDROCK**
- **EXISTING ROADWAY REPAIRS**

6A MARGINALLY SOFT ALLUVIAL SOILS

Marginally soft soils were encountered in borings B-14 and B-15 at a depth as great as 3.5 feet below grade. Additionally, geologic mapping as well as our borings indicate that alluvial soil deposits are present along the majority of the alignment. Due to the deposition environment, alluvial soils such as these are often soft and make poor bearing materials. While it is anticipated that the alignment will extend through the softest materials present within the upper 3 feet, marginally soft soils are may still be present at bearing elevations and may require undercuts to competent soils.

6B SHALLOW BEDROCK

Within borings SB-5 and SB-6, auger refusal on what has been assumed to be bedrock was encountered at depths of about 3 feet below grade. It is anticipated that average water line installation depths will be about 5 feet below existing grades. Thus, it is anticipated that excavations may extend 2 or more feet into bedrock for some portions of the water line. The bedrock in the area is a mixture of interbedded limestone and shale and while the shale is often very soft and soil-like, but the limestone (although in thin beds) can be very hard and difficult to remove. Our borings, as well as site geology, suggest that the bedrock present is comprised of about 20 to 60 percent limestone, with the remainder being shale. A large trackhoe will likely be required; however, the use of ripping equipment or a hoe-ram may be necessary if competent limestone is encountered during excavation.

6C EXISTING ROADWAY REPAIRS

As mentioned above, an existing roadway repair utilizing soil nails is present along the south side of the roadway near the address 5812 Oneonta Road. Soil Nail repairs utilize a steel ‘nail’ or tendon which has been grouted in place below grade to reinforce a soil mass. The steel nail is typically installed at a downward angle from the reinforced face, however the angle, length, and depth of the soil nails installed is unknown. Excavations in the area of the soil nail wall may encounter or damage installed soil nails. To prevent damages to the existing soil nails, the soil nail design should be reviewed with respect to the water line location and rerouting of the water line around the improvements may be required.

7 WATER PIPE SUPPORT

With regards to pipe support, three different bearing conditions are anticipated along the proposed alignment. Along the majority of the alignment alluvial soil conditions should be expected with residual soils or bedrock conditions expected in areas of higher elevation. If soft soils are encountered, they should be undercut to the firm or better materials and replaced with suitable fill material. Additionally, restrained joints and or thrust blocks may be required depending upon the field conditions. If questionable soils are encountered, CSI should be notified to evaluate and provide necessary recommendations.

8 THRUST RESTRAINT

Where changes in the direction of flow occur and/or where the water main cross sectional area changes, thrust forces will be generated in the direction of water flow. In some cases the thrust forces generated can be greater than the lateral resistance of the natural soils and/or backfill placed within utility trenches. To prevent separation and/or damage to the water main at these horizontal or vertical bends/joints, thrust block restraints (or restrained joints where thrust blocks are not applicable) will be required. Review of the provided plans indicate that thrust block are planned at several location along the proposed alignment. Based upon the conditions encountered, the thrust blocks appear to be suitable for the proposed alignment. Thrust blocks should bear on the undisturbed stiff or better residual soils or alluvial soils and can be designed

using the soil parameters shown in the table below. For design of restrained joints, a frictional coefficient between pipe and soil of 0.3 should be used. Additionally, reinforced concrete encasement may also be used in place of restrained joints.

Table 3: Thrust Block Soil Parameters

Soil Group	Passive Earth Pressure Coefficient	Unit Weight (pcf)	Cohesion (psf)	Friction Angle (φ)
Residual Clay	Kp = 2.5	115	100	φ = 25
Alluvial	Kp = 2.2	105	0	φ = 22

9 EARTHWORK

We do not anticipate any structural fill to occur on the site with the exception of backfill of the trenches. The following recommendations are for backfill operations around open cut trenches for the alignment.

9A EXCAVATIONS

Normal earth excavation equipment should be suitable for excavations associated with the overburden soils. The weathered shale encountered on site should be able to be excavated with conventional equipment, however for the competent limestone layers encountered, ripping equipment or the use of a hoe-ram will most likely be necessary.

For below-grade excavations, the residual soils should be classified as OSHA Type B soils with a minimum slope excavation of 1H:1V. If soil types other than what has been mentioned above are encountered, CSI should be contacted to evaluate for stability.

9B TRENCH BACKFILL OPERATIONS

These materials are placed in more confined areas than mass earthwork materials or pavement materials. The following are general recommendations for backfill areas:

- Fill lift thicknesses will vary dependent on compaction equipment available and material types, but in no case should exceed 8 inches for clay and 12 inches for granular soils;
- For crushed stone/aggregate backfills in trenches and when using smaller compaction equipment the lift thickness should be based on the type of aggregate and equipment. For well-graded granular soils such as Dense Grade Aggregate, a thickness of 4 to 6 inches is typically required. If open-graded stone is used, the lift thickness may be able to be increased. This should be evaluated by the geotechnical engineer;

- Place cohesive fill (clay) in maximum 8-inch thick loose lifts. Granular soils may be placed in maximum 12 inch loose lifts provided properly sized equipment is used in the compaction process;
- Fill lifts should be compacted to at least 98 percent of the soil's maximum dry density (ASTM D 698) in areas beneath pavements and 92 percent in grassed areas.
- Maintain the moisture content of compacted fill between minus 2 and plus 2 percent of optimum moisture;
- Maximum particle size of the soil should be limited to half the lift thickness.;
- Density testing should be performed as a means to verify percent compaction and moisture content of the material as it is being placed and compacted;
- Density testing should be performed at a rate of at least 3 tests per lift; CSI should be retained to provide additional recommendations for backfill;

9C GENERAL NOTES

- For all earthwork operations, positive surface drainage is prudent to keep water from ponding on the surface and to assist in maintaining surface stability;
- The surface should be sealed prior to expected wet weather. This can usually be accomplished with rubber-tired construction equipment or a steel-drum roller;
- If any soil placement problems occur, CSI should be retained to provide additional recommendations, as needed.

10 SITE DRAINAGE

During construction, water should not be allowed to pond in excavations and fill areas or undercutting will likely be required. During the life of the project, slope the subgrade and other site features so that surface water flows away from the site structures.

For excavations during construction, most free water from the subsurface conditions could likely be removed via sump pumps and open channel flow (if possible) at or near the source of seepage. However, if normal dewatering measures prove insufficient, CSI should be retained to provide recommendations on the issue.

11 CREEK/TRIBUTARY CROSSING

Provided plans indicate that the proposed water main will cross an unnamed tributary to Twelvemile Creek near Station 4+00. Within the tributary, plans indicate that the excavation below the bedrock-soil interface will be backfilled with concrete to match the existing creek bed configuration. While no borings were performed near the tributary, conditions are expected to be

similar to borings B-11 and B-12 with alluvial and residual soils present to depths of 8 or more feet below grade. Based upon the borings performed in the area of the proposed crossing bedrock may be present at depths greater than the proposed invert elevations. In the event that bedrock is not encountered within the excavation, we recommend that the base of the excavation be extended to bedrock (or to a sufficient depth to prevent scour of the bearing soils) and backfilled with concrete. Given that bedrock may not be present at the installation depth, a scour analysis should be performed to determine an appropriate installation depth in the event bedrock is not encountered.

12 NOTES ON THE REPORT AND RECOMMENDATIONS

We recommend that this complete report be provided to the various design team members, the contractors and the project Owner. Potential contractors should be informed of this report in the "Instructions to Bidders" section of the bid documents. A geotechnical exploration, such as the one we performed, used three borings to attempt to model the subsurface conditions at the site. Because no exploration contains complete data or a complete model, there is always a possibility that conditions between borings will be different from those at specific boring locations. Thus, it is possible that some subsurface conditions will not be as anticipated by the project team or contractor. If this report is included or referenced in the actual contract documents, it shall be explicitly understood that this report is for informational purposes only. CSI shall not be responsible for the opinions of, or conclusions drawn by others.

It has been our experience that the construction process often disturbs soil conditions and this process, no matter how much experience we use to anticipate construction methodology, is not completely predictable. Therefore, changes or modifications to our recommendations are likely needed due to these possible variances. Experienced CSI geotechnical personnel should be used to observe and document the construction procedures and the conditions encountered. Unanticipated conditions and inadequate procedures should be reported to the design team along with timely recommendations to solve the problems created. We recommend that the Owner retain CSI to provide this service based upon our familiarity with the project, the subsurface conditions and the intent of our recommendations.

This report is based on the supplied project information, the subsurface conditions observed at the time of the report, and our experience with similar conditions. As such, it cannot be applied to other project sites, types, or combinations thereof. If the Project Information section in this report contains incorrect information or if additional information is available, you should convey the correct or additional information to us and retain us to review our recommendations. Our recommendations may then require modification.

No section or portion of this report (including Appendix information) can be used as a stand alone article to make distinct changes or assumptions. The entire report and Appendix should be used together as one resource. We wish to remind you that our exploration services include storing the soil samples collected and making them available for inspection for 30 days. The soil

samples are then discarded unless you request otherwise. Please inform us if you wish to keep any of the obtained samples.

While this report deals with samples of subsurface materials and some comments on water conditions at the site, no assessment of site environmental conditions or the presence of contaminants were performed.

We wish to remind you that our exploration services include storing the soil samples collected and making them available for inspection for 30 days. The samples are then discarded unless you request otherwise. Please inform us if you wish to keep any of the obtained samples.

APPENDIX A

SITE LOCATION PLAN
GEOTECHNICAL BORING INFORMATION SHEET
GENERAL BORING PROFILE
TEST BORING LOGS
FIELD TESTING PROCEDURES
LIQUID AND PLASTIC LIMITS REPORT
SUMMARY OF LABORATORY RESULTS
LABORATORY TESTING PROCEDURES

N

ADAPTED FROM TOPOGRAPHIC MAPPING
FOR ILLUSTRATION PURPOSES

CSI Cincinnati, LLC
11785 Highway Drive
Cincinnati, Ohio 45241
513.252.2059 Office | 888.792.3121 Fax
www.csiohio.com

TITLE: SITE LOCATION PLAN		PROJECT NO: CN230010	DRAWN BY: GD
PROJECT: ONEONTA ROAD WATER MAIN CALIFORNIA, KY		DATE: 7/31/23	CHECKED BY: JB
		NOT TO SCALE	DRAWING NO 1 OF 2

N

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TITLE: BORING LOCATION PLAN		PROJECT NO: CN230010	DRAWN BY: GD
PROJECT: ONEONTA ROAD WATER MAIN CALIFORNIA, KY		DATE: 7/31/23	CHECKED BY: JB
		NOT TO SCALE	DRAWING NO 2 OF 2

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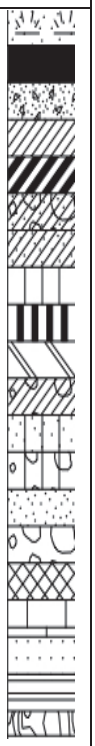
Geotechnical Boring Information Sheet

Sample Type Symbols

Splitspoon (SPT)
Shelby Tube
Grab
Rock Core
Auger Cuttings

Surface Symbols



Topsoil
Asphalt
Concrete
Lean Clay
Fat Clay
Glacial Till
Sandy Clay
Silt
Elastic Silt
Lean Clay to Fat Clay
Gravelly Clay
Sandy Silt
Gravelly Silt
Sand
Gravel
Fill
Limestone
Sandstone
Shale/Siltstone
Weathered Rock

Samples Strength Descriptors

Cohesive Soils:	**N**
Very Soft	0-1
Soft	2-4
Firm	5-8
Stiff	9-15
Very Stiff	16-30
Hard	31+
Non-cohesive Soils:	
Very Loose	0-4
Loose	5-10
Firm	11-20
Very Firm	21-30
Dense	30-50
Very Dense	51+

Definitions

SPT-"Splitspoon" or standard penetration test. Blow counts are number of drops required for a 140 lb hammer dropping 30 inches to drive the sampler 6 inches.

N-value is the addition of the last two intervals of the 18-inch sample.

Shelby tubes are often called "undisturbed samples". They are directly pushed into the ground, twisted, allowed to rest for a small period of time and then pulled out of the ground. Tops and bottoms are cleaned and then sealed.

Sample classification is done in general accordance with ASTM D2487 and 2488 using the Unified Soil Classification System (USCS) as a general guide.

Soil moisture descriptions are based on the recovered sample observations. The descriptors are dry, slightly moist, moist, very moist and wet. These are typically based on relative estimates of the moisture condition of a visual estimation of the soils optimum moisture content (EOMC). Dry is almost in a "dusty" condition usually 6 or more percent below EOMC. Slightly moist is from about 6 to 2 percent below EOMC at a point at which the soil color does not readily change with the addition of water. Moist is usually 2 percent below to 2 percent above EOMC and the point at which the soil will tend to begin forming "balls" under some pressure in the hand. Very moist is usually from about 2 percent to 6 percent above EOMC and also the point at which it's often considered "muddy". Wet soil is usually 6 or more percent above EOMC and often contains free water or the soil is in a saturated state.

Silt or Clay is defined at material finer than a standard #200 US sieve (<0.075mm) Sand is defined as material between the size of #200 sieve up to #4 sieve. Gravel is from #4 size sieve material to 3". Cobbles are from 3" to 12". Boulders are over 12".

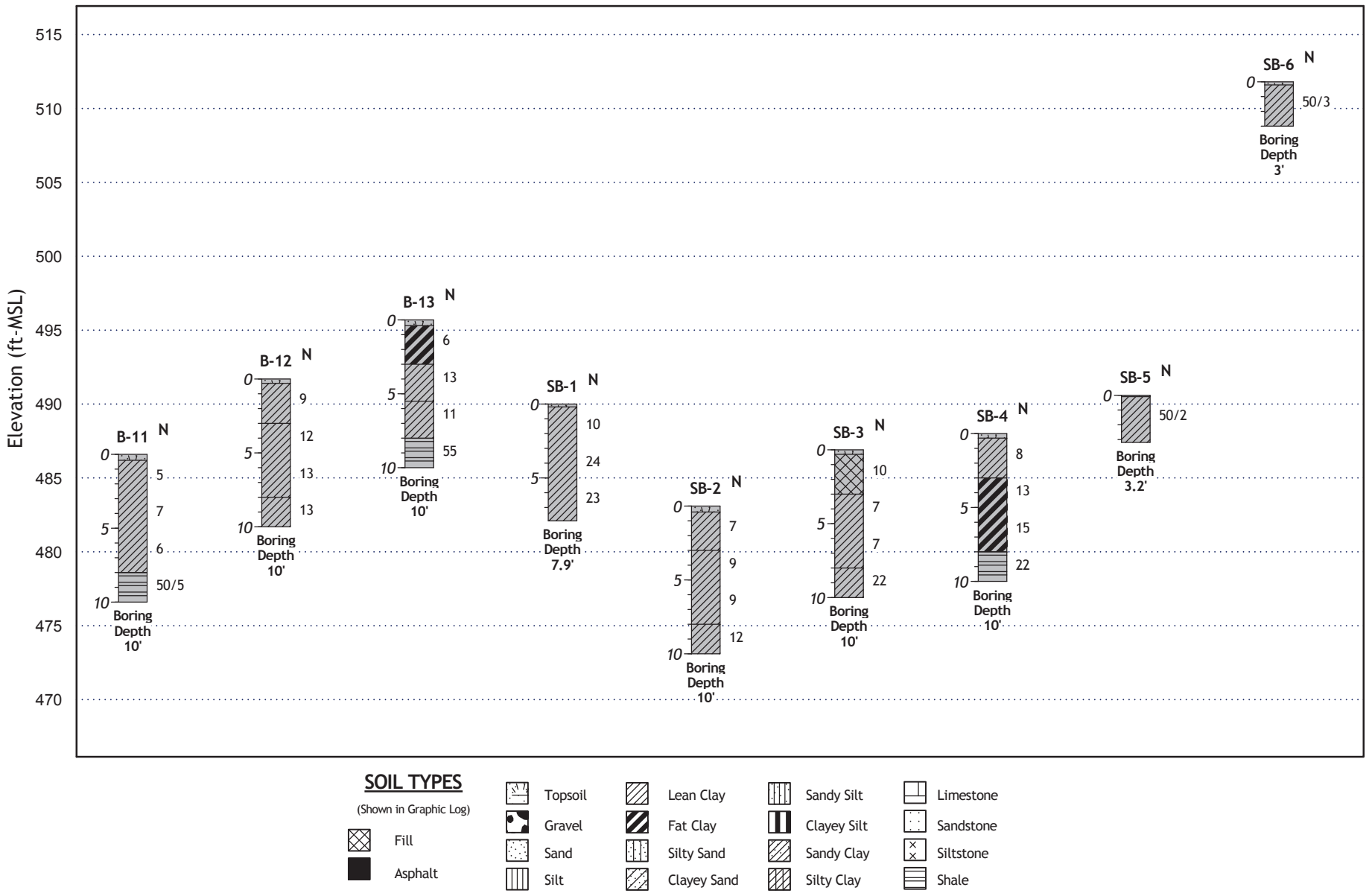
Rock hardness is classified as follows:

Very Soft:	Easily broken by hand pressure
Soft:	Ends can be broken by hand pressure; easily broken with hammer
Medium:	Ends easily broken with hammer; middle requires moderate blow
Hard:	Ends require moderate hammer blow; middle requires several blows
Very Hard:	Many blows with a hammer required to break core

Rock Quality Designation (RQD) is defined as total combined length of 4" or longer pieces of core divided by the total core run length; defined in percentage.

Water or cave-in observed in borings is at completion of drilling each boring unless otherwise noted.

Strata lengths shown on borings represents a rough estimate. Transition may be more abrupt or gradual. Soil borings are representative of that estimated location at that time and are based on recovered samples. Conditions may be different between borings and between sample intervals. Boring information is not to be considered stand alone but should be taken in context with comments and information in the geotechnical report and the means by which the borings are logged, sampled and drilled.



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11785 Highway Drive
Cincinnati, OH 45241
Phone: 513.252.2059
Fax: 888.792.3121

Oneonta Road Water Main
CN230131

BORING PROFILE

Fig. 1

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Cincinnati, OH 45241
Phone: 513.252.2059
Fax: 888.792.3121

TEST BORING LOG

CLIENT: Cardinal Engineering
PROJECT NAME: Oneonta Road Water Main
PROJECT LOCATION: California, KY

BORING #: B-11
JOB #: CN230131
LOGGED BY: CG
APPROVED BY: GD

DRILLING and SAMPLING INFORMATION

Date Started	2/27/23	Contractor	CSI
Date Completed	3/1/23	Boring Size	4 in.
Drill Rig	B-57 Mobile	Boring Method	SFA
Weather	Cloudy, 40s-50s	Hammer Type	Automatic

SOIL CLASSIFICATION

SURFACE ELEVATION: 486.6

TOPSOIL - 4 INCHES

Brown LEAN CLAY (CL) with little silt and trace sand [Alluvium] - moist, firm

Gray highly weathered SHALE with rock fragments, moist, soft

Boring terminated at 10.0 feet

No refusal

TEST DATA

Sample No.	Sample Type	Sample Graphics	Recovery (in)	Standard Penetration Test Blows per 6" [*N-Value*] *blows/foot*	Qu-tsf Unconfined (Pocket Pen.) Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plasticity Index (PI)	Percent Passing #200 Sieve	Remarks
1	SS		8	6-3-2 [5]		24.1				
2	SS		18	3-3-4 [7]		21.9	35	16	95	
3	SS		18	2-2-4 [6]		22.1				
4	SS		8	8-50/5- [50/5]						

Depth to Groundwater
- Noted on Drilling Tools _____ ft.
- At Completion _____ ft.
- After _____ hours _____ ft.
- Cave Depth _____ ft.

Sample Type
- SPT- Standard Penetration Test
- SS- Split Spoon
- ST- Shelby Tube
- RC- Rock Core
- CU- Auger Cuttings

Boring Method
- HSA- Hollow Stem Augers
- CFA- Continuous Flight Augers
- MD- Mud Drilling

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Fax: 888.792.3121

TEST BORING LOG

CLIENT: Cardinal Engineering
PROJECT NAME: Oneonta Road Water Main
PROJECT LOCATION: California, KY

BORING #: B-12
JOB #: CN230131
LOGGED BY: CG
APPROVED BY: GD

DRILLING and SAMPLING INFORMATION

Date Started	2/27/23	Contractor	CSI
Date Completed	3/1/23	Boring Size	4 in.
Drill Rig	B-57 Mobile	Boring Method	SFA
Weather	Cloudy, 40s-50s	Hammer Type	Automatic

SURFACE ELEVATION: 491.7

Elev. (ft)	Depth Scale	Water Level	SOIL CLASSIFICATION	Sample No.	Sample Type	Sample Graphics	Recovery (in)	Standard Penetration Test Blows per 6" [*N-Value*] *blows/foot*	Qu-tsf Unconfined (Pocket Pen.) Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plasticity Index (PI)	Percent Passing #200 Sieve	Remarks
			TOPSOIL - 3 INCHES											
490	2		Brown LEAN CLAY (CL) with little silt, trace rock fragments, and sand [Alluvium] - moist, stiff	1	SS		9	2-4-5 [*9*]		23.2				
488	4		Dark brown and gray LEAN CLAY (CL) with trace silt [Residuum] - moist , stiff	2	SS		18	3-5-7 [*12*]		23.5				
486	6			3	SS		18	3-6-7 [*13*]		23.5				
484	8		Brown LEAN CLAY (CL) with little silt and trace black oxide nodules [Residuum] - moist, stiff	4	SS		18	4-6-7 [*13*]		21.6				
482	10		Boring terminated at 10.0 feet No Refusal											
480	12													
478	14													

Depth to Groundwater
- Noted on Drilling Tools _____ ft.
- At Completion _____ ft.
- After _____ hours _____ ft.
- Cave Depth _____ ft.

Sample Type
- SPT- Standard Penetration Test
- SS- Split Spoon
- ST- Shelby Tube
- RC- Rock Core
- CU- Auger Cuttings

Boring Method
- HSA- Hollow Stem Augers
- CFA- Continuous Flight Augers
- MD- Mud Drilling

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Fax: 888.792.3121

TEST BORING LOG

CLIENT: Cardinal Engineering
PROJECT NAME: Oneonta Road Water Main
PROJECT LOCATION: California, KY

BORING #: B-13
JOB #: CN230131
LOGGED BY: CG
APPROVED BY: GD

DRILLING and SAMPLING INFORMATION

Date Started	2/27/23	Contractor	CSI
Date Completed	3/1/23	Boring Size	4 in.
Drill Rig	B-57 Mobile	Boring Method	SFA
Weather	Cloudy, 40s-50s	Hammer Type	Automatic

SOIL CLASSIFICATION

SURFACE ELEVATION: 495.7

Elev. (ft)	Depth Scale	Water Level	Soil Classification	Sample No.	Sample Type	Sample Graphics	Recovery (in)	Standard Penetration Test Blows per 6" [*N-Value*] *blows/foot*	Qu-tsf Unconfined (Pocket Pen.) Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plasticity Index (PI)	Percent Passing #200 Sieve	Remarks
494	2		TOPSOIL - 4 INCHES Brown and gray mottled FAT CLAY (CH) with trace silt, rock fragments, and roots [Residuum] - moist, firm	1	SS		6	3-3-3 [*6*]		23.1				
492	4		Brown and LEAN CLAY (CL) with trace silt and rock fragments [Residuum] - moist, stiff	2	SS		9	3-5-8 [*13*]		14.8				
490	6		Brown and gray LEAN CLAY (CL) with trace rock fragments [Residuum] - dry, stiff	3	SS		15	2-5-6 [*11*]		16.7	43	23	97	
488	8		Brown and gray highly weathered SHALE with trace rock fragments - moist, soft	4	SS		10	28-11-44 [*55*]						
486	10		Boring terminated at 10.0 feet No refusal											
484	12													
482	14													

Depth to Groundwater
- Noted on Drilling Tools _____ ft.
- At Completion _____ ft.
- After _____ hours _____ ft.
- Cave Depth _____ ft.

Sample Type
- SPT- Standard Penetration Test
- SS- Split Spoon
- ST- Shelby Tube
- RC- Rock Core
- CU- Auger Cuttings

Boring Method
- HSA- Hollow Stem Augers
- CFA- Continuous Flight Augers
- MD- Mud Drilling

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TEST BORING LOG

CLIENT: Cardinal Engineering
PROJECT NAME: Oneonta Road Water Main
PROJECT LOCATION: California, KY

BORING #: SB-1
JOB #: CN230131
LOGGED BY: CG
APPROVED BY: GD

DRILLING and SAMPLING INFORMATION

Date Started	7/6/23	Contractor	CSI
Date Completed	7/6/23	Boring Size	4 in.
Drill Rig	B-57 Mobile	Boring Method	SFA
Weather	Partly Cloudy, 80s	Hammer Type	Automatic

SOIL CLASSIFICATION

SURFACE ELEVATION: 490.0

TOPSOIL - 2 INCHES

Brown LEAN to CLAY (CL) with limestone rock fragments and trace black oxide nodules [Residuum] - moist, stiff to very stiff

Auger refusal at 7.9'

End boring

TEST DATA

Elev. (ft)	Depth Scale	Water Level	Sample No.	Sample Type	Sample Graphics	Recovery (in)	Standard Penetration Test Blows per 6" [*N-Value*] *blows/foot*	Qu-tsf Unconfined (Pocket Pen.) Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plasticity Index (PI)	Percent Passing #200 Sieve	Remarks
488	2		1	SS		18	5-5-5 [*10*]		17.9				
486	4		2	SS		18	2-6-18 [*24*]						
484	6		3	SS		12	9-13-10 [*23*]		19.1	43	24	96	
482	8												
480	10												
478	12												
476	14												

Depth to Groundwater
- Noted on Drilling Tools _____ ft.
- At Completion _____ ft.
- After _____ hours _____ ft.
- Cave Depth _____ ft.

Sample Type
- SPT- Standard Penetration Test
- SS- Split Spoon
- ST- Shelby Tube
- RC- Rock Core
- CU- Auger Cuttings

Boring Method
- HSA- Hollow Stem Augers
- CFA- Continuous Flight Augers
- MD- Mud Drilling

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TEST BORING LOG

CLIENT: Cardinal Engineering
PROJECT NAME: Oneonta Road Water Main
PROJECT LOCATION: California, KY

BORING #: SB-2
JOB #: CN230131
LOGGED BY: CG
APPROVED BY: GD

DRILLING and SAMPLING INFORMATION

Date Started	7/6/23	Contractor	CSI
Date Completed	7/6/23	Boring Size	4 in.
Drill Rig	B-57 Mobile	Boring Method	SFA
Weather	Partly Cloudy, 80s	Hammer Type	Automatic

Elev. (ft)	Depth Scale	Water Level	SOIL CLASSIFICATION / SURFACE ELEVATION: 483.1	Sample No.	Sample Type	Sample Graphics	Recovery (in)	Standard Penetration Test Blows per 6" [*N-Value*] *blows/foot*	Qu-tsf Unconfined (Pocket Pen.) Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plasticity Index (PI)	Percent Passing #200 Sieve	Remarks
			TOPSOIL - 4 INCHES											
482	2		Dark gray and brown LEAN CLAY (CL) with trace silt and sand [Alluvium] - moist, firm	1	SS		18	2-3-4 [7]		26.3				
480	4		Brown and gray mottled LEAN CLAY (CL) with trace roots, silt, sand, and black oxide nodules [Alluvium] - moist, stiff	2	SS		18	3-4-5 [9]		21.6				
478	6			3	SS		18	3-4-5 [9]		21.4				
476	8		Brown LEAN to CLAY (CL) with trace black oxide nodules, silt, and sand [Residuum] - moist, stiff	4	SS		8.5	4-6-6 [12]						
474	10		Boring terminated at 10'											
472	12		No refusal											
470	14													

TEST DATA

Depth to Groundwater
- Noted on Drilling Tools _____ ft.
- At Completion _____ ft.
- After _____ hours _____ ft.
- Cave Depth _____ ft.

Sample Type
- SPT- Standard Penetration Test
- SS- Split Spoon
- ST- Shelby Tube
- RC- Rock Core
- CU- Auger Cuttings

Boring Method
- HSA- Hollow Stem Augers
- CFA- Continuous Flight Augers
- MD- Mud Drilling

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Phone: 513.252.2059
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TEST BORING LOG

CLIENT: Cardinal Engineering
PROJECT NAME: Oneonta Road Water Main
PROJECT LOCATION: California, KY

BORING #: SB-3
JOB #: CN230131
LOGGED BY: CG
APPROVED BY: GD

DRILLING and SAMPLING INFORMATION

Date Started	7/6/23	Contractor	CSI
Date Completed	7/6/23	Boring Size	4 in.
Drill Rig	B-57 Mobile	Boring Method	SFA
Weather	Partly Cloudy, 80s	Hammer Type	Automatic

SOIL CLASSIFICATION

SURFACE ELEVATION: 486.9

TOPSOIL - 3 INCHES

POSSIBLE FILL: Brown LEAN CLAY (CL) with trace roots and black oxide nodules - dry, stiff

Brown LEAN CLAY (CL) with trace silt and black oxide nodules [Alluvium] - moist, firm

Brown LEAN CLAY (CL) with limestone rock fragments [Residuum] - moist, very stiff

Boring terminated at 10'

No refusal

TEST DATA

Sample No.	Sample Type	Recovery (in)	Standard Penetration Test Blows per 6" [*N-Value*] *blows/foot*	Qu-tsf Unconfined (Pocket Pen.) Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plasticity Index (PI)	Percent Passing #200 Sieve	Remarks
1	SS	12	4-5-5 [*10*]						
2	SS	5	2-3-4 [*7*]		22.2	43	26	95	
3	SS	18	3-3-4 [*7*]		23.4				
4	SS	18	3-7-15 [*22*]		23.5				

Depth to Groundwater
- Noted on Drilling Tools _____ ft.
- At Completion _____ ft.
- After _____ hours _____ ft.
- Cave Depth _____ ft.

Sample Type
- SPT- Standard Penetration Test
- SS- Split Spoon
- ST- Shelby Tube
- RC- Rock Core
- CU- Auger Cuttings

Boring Method
- HSA- Hollow Stem Augers
- CFA- Continuous Flight Augers
- MD- Mud Drilling

CSI of Cincinnati
11785 Highway Drive
Cincinnati, OH 45241
Phone: 513.252.2059
Fax: 888.792.3121

TEST BORING LOG

CLIENT: Cardinal Engineering
PROJECT NAME: Oneonta Road Water Main
PROJECT LOCATION: California, KY

BORING #: SB-4
JOB #: CN230131
LOGGED BY: CG
APPROVED BY: GD

DRILLING and SAMPLING INFORMATION

Date Started	7/6/23	Contractor	CSI
Date Completed	7/6/23	Boring Size	4 in.
Drill Rig	B-57 Mobile	Boring Method	SFA
Weather	Partly Cloudy, 80s	Hammer Type	Automatic

SOIL CLASSIFICATION

SURFACE ELEVATION: 488.0

TOPSOIL - 3 INCHES

Dark brown LEAN CLAY (CL) with trace rock fragments and trace silt [Alluvium] - dry, firm

Brown and gray FAT CLAY (CH) with trace rock fragments and silt [Residuum] - slightly moist, stiff

Gray hihgly weathered SHALE with limestone fragments - dry, soft

Boring terminated at 10'

No refusal

TEST DATA

Elev. (ft)	Depth Scale	Water Level	Sample No.	Sample Type	Sample Graphics	Recovery (in)	Standard Penetration Test Blows per 6" [*N-Value*] *blows/foot*	Qu-tsf Unconfined (Pocket Pen.) Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plasticity Index (PI)	Percent Passing #200 Sieve	Remarks
486	2		1	SS		7	3-4-4 [*8*]		20.2				
484	4		2	SS		18	3-5-8 [*13*]		19.3	54	34	92	
482	6		3	SS		16	5-7-8 [*15*]						
480	8		4	SS		18	4-9-13 [*22*]		17.2				
478	10												
476	12												
474	14												

Depth to Groundwater
- Noted on Drilling Tools _____ ft.
- At Completion _____ ft.
- After _____ hours _____ ft.
- Cave Depth _____ ft.

Sample Type
- SPT- Standard Penetration Test
- SS- Split Spoon
- ST- Shelby Tube
- RC- Rock Core
- CU- Auger Cuttings

Boring Method
- HSA- Hollow Stem Augers
- CFA- Continuous Flight Augers
- MD- Mud Drilling

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11785 Highway Drive
Cincinnati, OH 45241
Phone: 513.252.2059
Fax: 888.792.3121

TEST BORING LOG

CLIENT: Cardinal Engineering
PROJECT NAME: Oneonta Road Water Main
PROJECT LOCATION: California, KY

BORING #: SB-5
JOB #: CN230131
LOGGED BY: CG
APPROVED BY: GD

DRILLING and SAMPLING INFORMATION

Date Started	7/6/23	Contractor	CSI
Date Completed	7/6/23	Boring Size	4 in.
Drill Rig	B-57 Mobile	Boring Method	SFA
Weather	Partly Cloudy, 80s	Hammer Type	Automatic

Elev. (ft)	Depth Scale	Water Level	SOIL CLASSIFICATION / SURFACE ELEVATION: 490.6	Sample No.	Sample Type	Sample Graphics	Recovery (in)	Standard Penetration Test Blows per 6" [*N-Value*] *blows/foot*	Qu-tsf Unconfined (Pocket Pen.) Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plasticity Index (PI)	Percent Passing #200 Sieve	Remarks
490			TOPSOIL - 1 INCH											
	2		Dark brown and gray mottled LEAN CLAY (CL) with rock fragments [Residuum] - dry, hard	1	SS		3	50/2-- [*50/2*]		24.4				
488														
	4		Auger refusal at 3.2'											
486			End boring											
	6													
484														
	8													
482														
	10													
480														
	12													
478														
	14													
476														

Depth to Groundwater
- Noted on Drilling Tools _____ ft.
- At Completion _____ ft.
- After _____ hours _____ ft.
- Cave Depth _____ ft.

Sample Type
- SPT- Standard Penetration Test
- SS- Split Spoon
- ST- Shelby Tube
- RC- Rock Core
- CU- Auger Cuttings

Boring Method
- HSA- Hollow Stem Augers
- CFA- Continuous Flight Augers
- MD- Mud Drilling

CSI of Cincinnati
11785 Highway Drive
Cincinnati, OH 45241
Phone: 513.252.2059
Fax: 888.792.3121

TEST BORING LOG

CLIENT: Cardinal Engineering
PROJECT NAME: Oneonta Road Water Main
PROJECT LOCATION: California, KY

BORING #: SB-6
JOB #: CN230131
LOGGED BY: CG
APPROVED BY: GD

DRILLING and SAMPLING INFORMATION

Date Started	7/6/23	Contractor	CSI
Date Completed	7/6/23	Boring Size	4 in.
Drill Rig	B-57 Mobile	Boring Method	SFA
Weather	Partly Cloudy, 80s	Hammer Type	Automatic

Elev. (ft)	Depth Scale	Water Level	SOIL CLASSIFICATION / SURFACE ELEVATION: 511.8	Sample No.	Sample Type	Sample Graphics	Recovery (in)	Standard Penetration Test Blows per 6" [*N-Value*] *blows/foot*	Qu-tsf Unconfined (Pocket Pen.) Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plasticity Index (PI)	Percent Passing #200 Sieve	Remarks
510	2		TOPSOIL - 2 INCHES Brown LEAN CLAY (CL) with rock fragments and trace black oxide nodules [Residuum] - dry, hard	1	SS		6	8-3-50/3 [*50/3*]		26.4				
508	4		Auger refusal at 3' End boring											
506	6													
504	8													
502	10													
500	12													
498	14													

Depth to Groundwater
- Noted on Drilling Tools _____ ft.
- At Completion _____ ft.
- After _____ hours _____ ft.
- Cave Depth _____ ft.

Sample Type
- SPT- Standard Penetration Test
- SS- Split Spoon
- ST- Shelby Tube
- RC- Rock Core
- CU- Auger Cuttings

Boring Method
- HSA- Hollow Stem Augers
- CFA- Continuous Flight Augers
- MD- Mud Drilling

FIELD TESTING PROCEDURES

Field Operations: The general field procedures employed by CSI are summarized in ASTM D 420 which is entitled "Investigating and Sampling Soils and Rocks for Engineering Purposes." This recommended practice lists recognized methods for determining soil and rock distribution and ground water conditions. These methods include geophysical and in situ methods as well as borings.

Borings are drilled to obtain subsurface samples using one of several alternate techniques depending upon the subsurface conditions. These techniques are:

a. Continuous 2-1/2 or 3-1/4 inch I.D. hollow stem augers;

b. Wash borings using roller cone or drag bits (mud or water);

c. Continuous flight augers (ASTM D 1425).

These drilling methods are not capable of penetrating through material designated as "refusal materials." Refusal, thus indicated, may result from hard cemented soil, soft weathered rock, coarse gravel or boulders, thin rock seams, or the upper surface of sound continuous rock. Core drilling procedures are required to determine the character and continuity of refusal materials.

The subsurface conditions encountered during drilling are reported on a field test boring record by the chief driller. The record contains information concerning the boring method, samples attempted and recovered, indications of the presence of various materials such as coarse gravel, cobbles, etc., and observations between samples. Therefore, these boring records contain both factual and interpretive information. The field boring records are on file in our office.

The soil and rock samples plus the field boring records are reviewed by a geotechnical engineer. The engineer classifies the soils in general accordance with the procedures outlined in ASTM D 2488 and prepares the final boring records which are the basis for all evaluations and recommendations.

The final boring records represent our interpretation of the contents of the field records based on the results of the engineering examinations and tests of the field samples. These records depict subsurface conditions at the specific locations and at the particular time when drilled. Soil conditions at other locations may differ from conditions occurring at these boring locations. Also, the passage of time may result in a change in the subsurface soil and ground water conditions at these boring locations. The lines designating the interface between soil or refusal materials on the records and on profiles represent approximate boundaries. The transition between materials may be gradual. The final boring records are included with this report.

The detailed data collection methods using during this study are discussed on the following pages.

Soil Test Borings: Soil test borings were made at the site at locations shown on the attached Boring Plan. Soil sampling and penetration testing were performed in accordance with ASTM D 1586.

The borings were made by mechanically twisting a hollow stem steel auger into the soil. At regular intervals, the drilling tools were removed and soil samples obtained with a standard 1.4 inch I.D., 2 inch O.D., split tube sampler. The sampler was first seated 6 inches to penetrate any loose cuttings, then driven an additional foot with blows of a 140-pound hammer falling 30 inches. The number of hammer blows required to drive the sampler the final foot was recorded and is designated the "penetration resistance". The penetration resistance, when properly evaluated, is an index to the soil strength and foundation supporting capability.

Representative portions of the soil samples, thus obtained, were placed in glass jars and transported to the laboratory. In the laboratory, the samples were examined to verify the driller's field classifications. Test Boring Records are attached which graphically show the soil descriptions and penetration resistances.

Core Drilling: Refusal materials are materials that cannot be penetrated with the soil drilling methods employed. Refusal, thus indicated, may result from hard cemented soil, soft weathered rock, coarse gravel or boulders, thin rock seams or the upper surface of sound continuous rock. Core drilling procedures are required to determine the character and continuity of refusal materials.

Prior to coring, casing is set in the drilled hole through the overburden soils, if necessary, to keep the hole from caving. Refusal materials are then cored according to ASTM D 2113 using a diamond-studded bit fastened to the

end of a hollow double tube core barrel. This device is rotated at high speeds, and the cuttings are brought to the surface by circulating water. Core samples of the material penetrated are protected and retained in the swivel-mounted inner tube. Upon completion of each drill run, the core barrel is brought to the surface, the core recovered is measured, the samples are removed and the core is placed in boxes for storage.

The core samples are returned to our laboratory where the refusal material is identified and the percent core recovery and rock quality designation is determined by a soils engineer or geologist. The percent core recovery is the ratio of the sample length obtained to the depth drilled, expressed as a percent. The rock quality designation (RQD) is obtained by summing up the length of core recovered, including only the pieces of core which are four inches or longer, and dividing by the total length drilled. The percent core recovery and RQD are related to soundness and continuity of the refusal material. Refusal material descriptions, recoveries, and RQDs are shown on the "Test Boring Records".

Hand Auger Borings and Dynamic Cone Penetration Testing: Hand auger borings are performed manually by CSI field personnel. This consists of manually twisting hand auger tools into the subsurface and extracting “grab” or baggie samples at intervals determined by the project engineer. At the sample intervals, dynamic cone penetration (DCP) testing is performed. This testing involves the manual raising and dropping of a 20 pound hammer, 18 inches. This “driver” head drives a solid-1¾ inch diameter cone into the ground. DCP “counts” are the number of drops it takes for the hammer to drive three 1¾ inch increments, recorded as X-Y-Z values.

Test Pits: Test pits are excavated by the equipment available, often a backhoe or trackhoe. The dimensions of the test pits are based on the equipment used and the power capacity of the equipment. Samples are taken from the spoils of typical buckets of the excavator and sealed in jars or “Ziplock” baggies. Dynamic Cone Penetration or hand probe testing is often performed in the upper few feet as OSHA standards allow. Refusal is deemed as the lack of advancement of the equipment with reasonable to full machine effort.

Water Level Readings: Water table readings are normally taken in conjunction with borings and are recorded on the "Test Boring Records". These readings indicate the approximate location of the hydrostatic water table at the time of our field investigation. Where impervious soils are encountered (clayey soils) the amount of water seepage into the boring is small, and it is generally not possible to establish the location of the hydrostatic water table through water level readings. The ground water table may also be dependent upon the amount of precipitation at the site during a particular period of time. Fluctuations in the water table should be expected with variations in precipitation, surface run-off, evaporation and other factors.

The time of boring water level reported on the boring records is determined by field crews as the drilling tools are advanced. The time of boring water level is detected by changes in the drilling rate, soil samples obtained, etc. Additional water table readings are generally obtained at least 24 hours after the borings are completed. The time lag of at least 24 hours is used to permit stabilization of the ground water table which has been disrupted by the drilling operations. The readings are taken by dropping a weighted line down the boring or using an electrical probe to detect the water level surface.

Occasionally the borings will cave-in, preventing water level readings from being obtained or trapping drilling water above the caved-in zone. The cave-in depth is also measured and recorded on the boring records.

Summary of Laboratory Results

Borehole	Depth	Sample Type	Liquid Limit	Plastic Limit	Plasticity Index	Classification	Water Content (%)	Unconfined Compressive Strength (tsf)	Dry Density (pcf)	Wet Density (pcf)	Max. Dry Density (pcf)	Opt. Water Content (%)	CBR	Swell (%)	RQD	Percent Recovery	Percent Finer (No. 200)
B-11	1.0	SS					24.1										
B-11	3.5	SS	35	19	16	LEAN CLAY(CL)	21.9										95
B-11	6.0	SS					22.1										
B-12	1.0	SS					23.2										
B-12	3.5	SS					23.5										
B-12	6.0	SS					23.5										
B-12	8.5	SS					21.6										
B-13	1.0	SS					23.1										
B-13	3.5	SS					14.8										
B-13	6.0	SS	43	20	23	LEAN CLAY(CL)	16.7										97
SB-1	1.0	SS					17.9										
SB-1	6.0	SS	43	19	24	LEAN CLAY(CL)	19.1										96
SB-2	1.0	SS					26.3										
SB-2	3.5	SS					21.6										
SB-2	6.0	SS					21.4										
SB-3	3.5	SS	43	17	26	LEAN CLAY(CL)	22.2										95
SB-3	6.0	SS					23.4										
SB-3	8.5	SS					23.5										
SB-4	1.0	SS					20.2										
SB-4	3.5	SS	54	20	34	FAT CLAY(CH)	19.3										92
SB-4	8.5	SS					17.2										
SB-5	1.0	SS					24.4										
SB-6	1.0	SS					26.4										

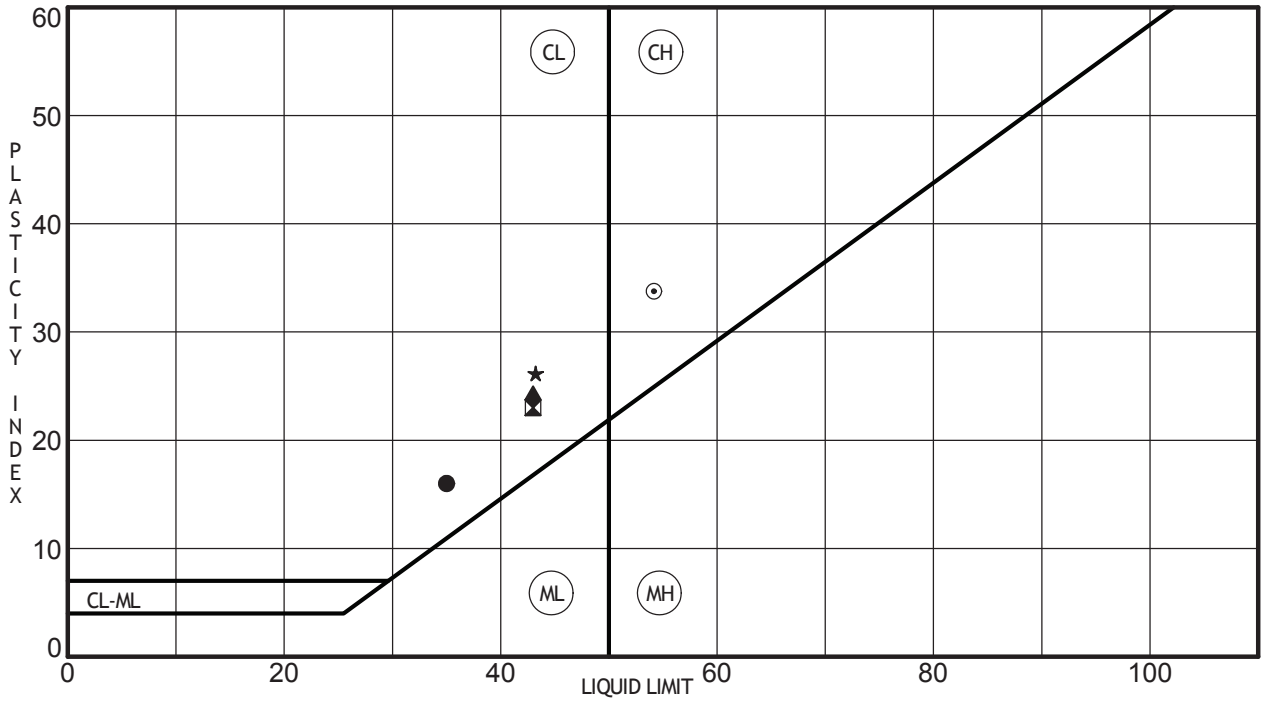
CSI of Cincinnati
11785 Highway Drive
Cincinnati, OH 45241
Phone: 513.252.2059
Fax: 888.792.3121

SS - Split Spoon Sample
GRAB - Bulk Grab Sample

PROJECT INFORMATION

Client: Cardinal Engineering
Project Name: Oneonta Road Water Main
Project Number: CN230131
Project Location: California, KY

Liquid and Plastic Limits Test Report



	Boring	Depth (ft)	LL	PL	PI	Water Content	% < #40	% < #200	USCS	Description
●	B-11	3.5	35	19	16	21.9		95		LEAN CLAY(CL)
⊠	B-13	6.0	43	20	23	16.7		97		LEAN CLAY(CL)
▲	SB-1	6.0	43	19	24	19.1		96		LEAN CLAY(CL)
★	SB-3	3.5	43	17	26	22.2		95		LEAN CLAY(CL)
⊙	SB-4	3.5	54	20	34	19.3		92		FAT CLAY(CH)

CSI of Cincinnati
11785 Highway Drive
Cincinnati, OH 45241
Phone: 513.252.2059
Fax: 888.792.3121

PROJECT INFORMATION

Client: Cardinal Engineering
Project Name: Oneonta Road Water Main
Project Number: CN230131
Project Location: California, KY

LABORATORY TESTING PROCEDURES

Soil Classification: Soil classifications provide a general guide to the engineering properties of various soil types and enable the engineer to apply past experience to current problems. In our investigations, samples obtained during drilling operations are examined in our laboratory and visually classified by an engineer. The soils are classified according to consistency (based on number of blows from standard penetration tests), color and texture. These classification descriptions are included on our "Test Boring Records."

The classification system discussed above is primarily qualitative and for detailed soil classification two laboratory tests are necessary: grain size tests and plasticity tests. Using these test results the soil can be classified according to the AASHTO or Unified Classification Systems (ASTM D 2487). Each of these classification systems and the in-place physical soil properties provides an index for estimating the soil's behavior. The soil classification and physical properties obtained are presented in this report.

Rock Classification: Rock classifications provide a general guide to the engineering properties of various rock types and enable the engineer to apply past experience to current situations. In our explorations, rock core samples obtained during drilling operations are examined in our laboratory and visually classified by an engineer. The rock cores are classified according to relative hardness and RQD (see Guide to Rock Classification Terminology), color, and texture. These classification descriptions are included on our Test Boring Records.

Atterberg Limits: Portions of the samples are taken for Atterberg Limits testing to determine the plasticity characteristics of the soil. The plasticity index (PI) is the range of moisture content over which the soil deforms as a plastic material. It is bracketed by the liquid limit (LL) and the plastic limit (PL). The liquid limit is the moisture content at which the soil becomes sufficiently "wet" to flow as a heavy viscous fluid. The plastic limit is the lowest moisture content at which the soil is sufficiently plastic to be manually rolled into tiny threads. The liquid limit and plastic limit are determined in accordance with ASTM D 4318.

Moisture Content: The Moisture Content is determined according to ASTM D 2216.

Percent Finer Than 200 Sieve: Selected samples of soils are washed through a number 200 sieve to determine the percentage of material less than 0.074 mm in diameter.

Rock Strength Tests: To obtain strength data for rock materials encountered, unconfined compression tests are performed on selected samples. In the unconfined compression test, a cylindrical portion of the rock core is subjected to increasing axial load until it fails. The pressure required to produce failure is recorded, corrected for the length to diameter ratio of the core and reported.

Compaction Tests: Compaction tests are run on representative soil samples to determine the dry density obtained by a uniform compactive effort at varying moisture contents. The results of the test are used to determine the moisture content and unit weight desired in the field for similar soils. Proper field compaction is necessary to decrease future settlements, increase the shear strength of the soil and decrease the permeability of the soil.

The two most commonly used compaction tests are the Standard Proctor test and the Modified Proctor test. They are performed in accordance with ASTM D 698 and D 1557, respectively. Generally, the Standard Proctor compaction test is run on samples from building or parking areas where small compaction equipment is anticipated. The Modified compaction test is generally performed for heavy structures, highways, and other areas where large compaction equipment is expected. In both tests a representative soil sample is placed in a mold and compacted with a compaction hammer. Both tests have three alternate methods.

Test	Method	Hammer Wt./Fall	Mold Diam.	Run on Material Finer Than	No. of Layers	No. of Blows/ Layer
Standard	A	5.5 lb./12"	4"	No. 4 sieve	3	25
D 698	B	5.5 lb./12"	4"	3/8" sieve	3	25
	C	5.5 lb./12"	6"	3/4" sieve	3	56

Test	Method	Hammer Wt./Fall	Mold Diam.	Run on Material Finer Than	No. of Layers	No. of Blows/ Layer
Modified	A	10 lb./18"	4"	No. 4 sieve	5	25
D 1557	B	10 lb./18"	4"	3/8" sieve	5	25
	C	10 lb./18"	6"	3/4" sieve	5	56

The moisture content and unit weight of each compacted sample is determined. Usually 4 to 5 such tests are run at different moisture contents. Test results are presented in the form of a dry unit weight versus moisture content curve. The compaction method used and any deviations from the recommended procedures are noted in this report.

Laboratory California Bearing Ratio Tests: The California Bearing Ratio, generally abbreviated to CBR, is a punching shear test and is a comparative measure of the shearing resistance of a soil. It provides data that is a semi-empirical index of the strength and deflection characteristics of a soil. The CBR is used with empirical curves to design pavement structures.

A laboratory CBR test is performed according to ASTM D 1883. The results of the compaction tests are utilized in compacting the test sample to the desired density and moisture content for the laboratory California Bearing Ratio test. A representative sample is compacted to a specified density at a specified moisture content. The test is performed on a 6-inch diameter, 4.58-inch-thick disc of compacted soil that is confined in a cylindrical steel mold. The sample is compacted in accordance with Method C of ASTM D 698 or D 1557.

CBR tests may be run on the compacted samples in either soaked or unsoaked conditions. During testing, a piston approximately 2 inches in diameter is forced into the soil sample at the rate of 0.05 inch per minute to a depth of 0.5 inch to determine the resistance to penetration. The CBR is the percentage of the load it takes to penetrate the soil to a 0.1 inch depth compared to the load it takes to penetrate a standard crushed stone to the same depth. Test results are typically shown graphically.

Geotechnical Report

NKY Water District -
Upper Lick Branch Road Water Main

Prepared for

Cardinal Engineering
1 Moock Road #1
Wilder, Kentucky 41071

July 21, 2023

Project No. CN230010

July 21, 2023

Mr. Kevin Hanson
Cardinal Engineering
1 Moock Road #1
Wilder, Kentucky 41071

Subject: Geotechnical Report for
NKY Water District - Upper Lick Branch Road Water Main
Alexandria, Kentucky
CSI Project No. CN230010

Dear Mr. Hanson,

Consulting Services Incorporated of Cincinnati (CSI) is pleased to present our geotechnical report for the NKY Water District - Upper Lick Branch Road Water Main project in Alexandria, Kentucky. We provided our services in general accordance the CSI Proposal 8227, dated December 12, 2022.

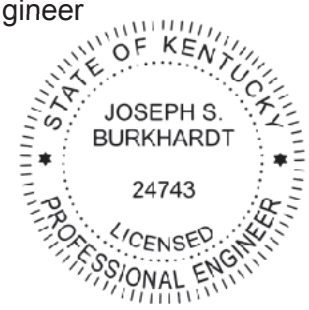
Our report represents information provided to us, readily available published data relevant to the site and site area, our observations and subsurface conditions encountered and our opinion of primary geotechnical conditions (discussion and recommendations) affecting site work and foundation design for the project.

Again, we greatly appreciate the opportunity to provide our services and look forward to working with you and the project team on this (and hopefully) more projects in the future. Please do not hesitate to contact us for questions or comments about the information contained herein.

Cordially,

Graham Duncan, EIT
Staff Engineer

Joseph S. Burkhardt, P.E.
Principal Geotechnical Engineer



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APPENDICES, FIGURES, PHOTOS, AND TABLES

Appendix A

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INTRODUCTION

1 SCOPE OF THE GEOTECHNICAL EXPLORATION

As proposed, CSI conducted a geotechnical exploration for the proposed 8” water main extension along Upper Lick Branch Road in Alexandria, Kentucky. Our services included a review of the project information provided, conducting a subsurface exploration that utilized soil borings to obtain samples for modeling the soil conditions along the proposed route, an analysis of data and information obtained, evaluation of bearing conditions for the water line and recommendations for backfill of the pipe.

2 SITE AND PROJECT INFORMATION

The project will include the installation of a new 8” water main along Upper Lick Branch Road in Alexandria, Kentucky. As part of this report, CSI has reviewed a plan set titled ‘Subdistrict HB Water main Extension Project’ dated 1-11-23. CSI’s understanding of the project is outlined in the tables below.

Table 1: Site Information

Item	Description
Site Location	The site is located along Upper Lick Branch Road in Alexandria, Kentucky from the intersection of Upper Lick Branch and Grandview Road to 2421 Upper Lick Branch Road.
Length of Improvement	The water line will be approximately 3,500 feet in length
Surrounding Area	The surrounding area is characterized by sparse residential developments in all directions
Existing Conditions	Existing roadway is asphalt paved and is 16 foot wide edge to edge. Lick Branch stream is present along the south side of the roadway with some portions of the alignment being located within the 100 year flood plain of the creek.

Table 2: Project Information

Item	Description
Site Layout	See Boring Location Plan
Proposed Structure(s)	An approximately 3,500 foot long 8 inch of new water main and intermittent fire hydrants.
Water Main Construction	Based on our understanding the water main will be constructed within the road right-of-ways at a depth of about 5 feet below grade. The water main will be installed along both sides of the road and will cross the roadway several times near stations 4+00, 6+00, 12+00, 13+00, and 23+00.

3 AREA/SITE INFORMATION

3A AREA TOPOGRAPHY / PHYSIOGRAPHY

The site is located within the Outer Blue Grass Region of northern Kentucky. This area is characterized by Ordovician dolomites, limestones and calcareous shales, thin pre-Wisconsinan drift, loamy soils and low to moderately high relief. Published mapping reviewed indicates the elevations in the site vicinity range from about 790 feet near the intersection of Upper Lick Branch Road and Grandview Road to about 650 feet near the end of the alignment. Below is a figure of the location of the site with respect to the regional physiography.

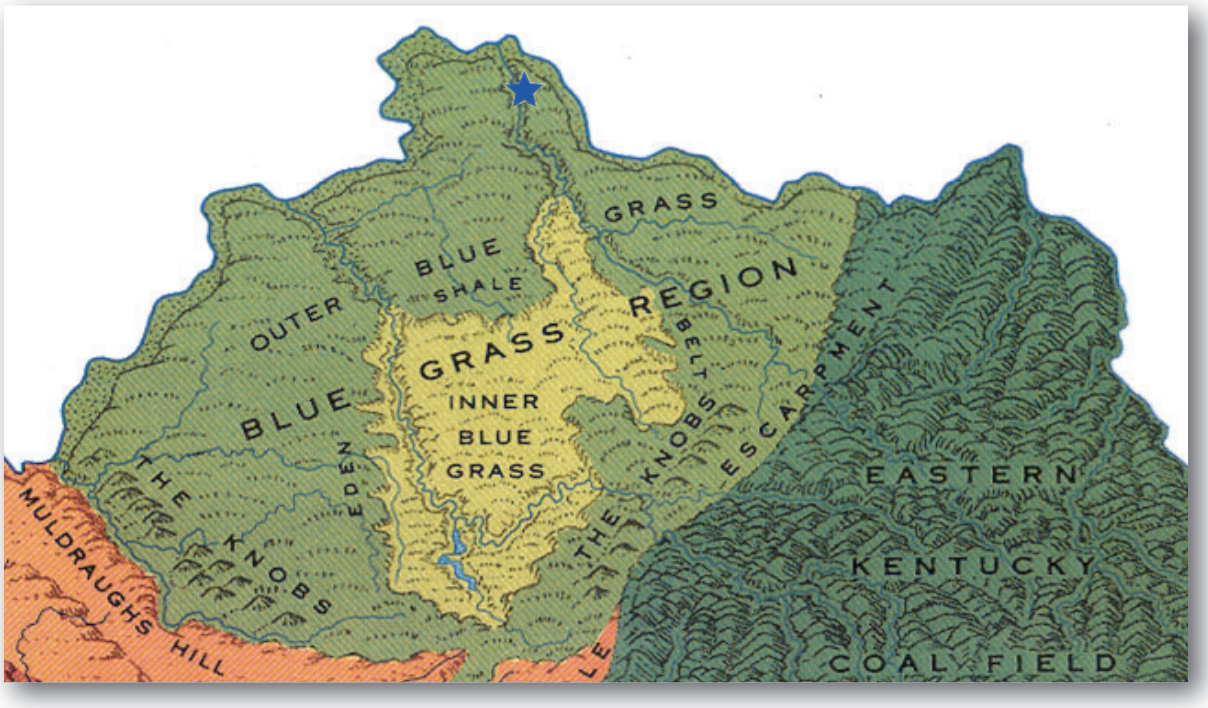


Figure 1 - Kentucky Physiographic Map (site vicinity shown with star)

3B SITE GEOLOGY

Review of the *Kentucky Geologic Map Service* shown in **Figure 2** below indicates the the majority of the alignment is underlain by Ordovician age deposits belonging to the Kope (Ok) formation and with a small area of the Fairview (Of) formation present near the the intersection of Upper Lick Branch Road and Grandview Road. In general, each of these formations are comprised of interbedded limestone and shale and differ mainly in the ratio of limestone to shale. The Kope formation is comprised of about 80 percent shale while the Fairview being comprised of about 45 to 65 percent limestone.

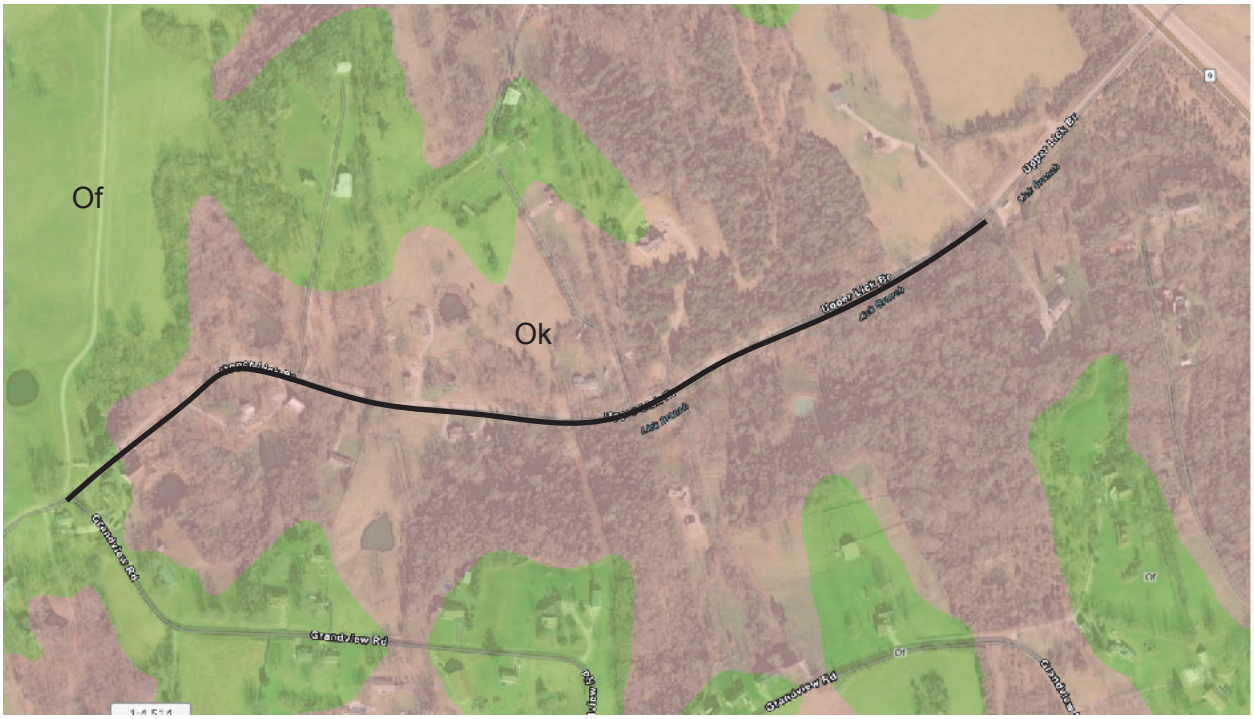


Figure 2: Site Geologic Mapping. Approximate Alignment Highlighted.

FINDINGS

4 SUBSURFACE CONDITIONS

CSI performed a total of three (3) soil test borings to explore the subsurface conditions along the alignment at approximate 1,000 foot intervals. In general our borings encountered residual soils and shale bedrock. Some isolated lacustrine deposits were encountered at one of the locations. Borings for this project were numbered sequentially across eight separate project sites. Specific borings for the Upper Lick Branch Project site are labeled as boring numbers B-14 through B-16.

4A STRATA INFORMATION

The subsurface conditions encountered at the test boring locations are shown in the Test Boring Log in the Appendix. These records represent our interpretation of the subsurface conditions based on the field logs, visual examination of field samples by an engineer, and tests of the samples collected. The letters in parentheses following the soil descriptions are the soil classifications in general accordance with the Unified Soil Classification System (USCS). It should be noted that dashed stratification lines shown on the soil boring log represent approximate transitions between material types. In-situ stratum changes could occur gradually or at slightly different depths. Boring elevations were determined by Cardinal Engineering and supplied to CSI.

TOPSOIL

Topsoil was encountered at the ground surface within each boring location to ranging from 4 to 8 inches.

LACUSTRINE

Lacustrine soil deposits were encountered in boring B-14 to termination depths of 10 feet below grade. The lacustrine soils were described to be brown and gray mottled fat clay with trace silt and rock fragments. Standard Penetration Testing (SPT) N-Values ranged from 3 to 12 blows per foot (bpf) indicated a soft to stiff consistency, which increased with depth. Laboratory testing of a representative sample indicates a LL of 60 percent and a PI of 36 percent. Natural moisture contents ranged from 28.2 to 32.7 percent.

RESIDUUM

Residual soil deposits were encountered underlying underlying the topsoil in each of our boring locations. The residuum was generally described to be brown to brown and gray mottle lean to fat clay with varying amounts of silt, rock fragments, and black oxide nodules. Standard Penetration Testing (SPT) N-Values ranged from 3 to 18 blows per foot (bpf) indicated a soft to very stiff consistency, which generally increased with depth. Several of the near surface soils samples recovered (within boring B-15) were noted to have a moisture content greater than 30 percent and appeared to relatively saturated and soft when compared to the underlying soils. Natural moisture contents ranged from 17.0 to 34.0 percent.

WEATHERED SHALE/LIMESTONE BEDROCK

Weathered shale bedrock samples were recovered from borings B-15 and B-16 at depths of about 8 and 3 feet below grade, respectively. Auger refusal was encountered within boring B-16 on what has been assumed to be competent limestone at a depth of about 5.2 feet below grade. For details of subsurface conditions encountered at a particular boring location please refer to the boring logs contained in Appendix A. It should be noted that our borings were drilled and sampled according to the procedures presented in the appendix. The boring locations shown in the appendix should be considered accurate only to the degree implied by the method used.

4B GROUNDWATER CONDITIONS

Groundwater was noted on drilling tools within boring B-15 at depth of about 8 feet below grade at the soil-bedrock interface. Upon completion of the borings, groundwater was remeasured however was not encountered in any measurable quantities. In the Northern Kentucky area, water conditions that usually affect construction and performance of projects consist of trapped/perched water zones which occur in variable areas in the soil mass that may be present at the soil/bedrock interface and/or due to sand layers and seams throughout the soil. Perched water sources are often not linked to the more continuous relatively stable ground water table that typically occurs at greater depths. Site excavation activities or ground disturbance can expose

these features and the resulting seepage can vary greatly. Groundwater issues are also dependent upon recent rainfall activity and surface and subsurface drainage patterns in the area that may change depending on climatic conditions.

5 LABORATORY TESTING

Laboratory tests were performed on selected recovered samples from the borings to provide recommendations for earthwork and to determine index properties of the soils. Details for the test methods and results are shown in the Appendix. Tests performed included:

- 7 Moisture Content Tests
- 1 Grain Size Analyses (-200 Sieve)
- 1 Atterberg Limits Tests

GEOTECHNICAL DISCUSSION AND RECOMMENDATIONS

6 DISCUSSION—GEOTECHNICAL ISSUES

Based on our experience with similar projects and the conditions observed during our subsurface exploration, we believe the site is suitable for the proposed construction, provided the recommendations outlined in this report are followed. The primary geotechnical concerns are:

- **SOFT TO MARGINALLY SOFT SOILS**
- **GROUNDWATER INFILTRATION**
- **BEDROCK EXCAVATION**

6A SOFT TO MARGINALLY SOFT SOILS

Soft to marginally soft soil were encountered in borings B-14 and B-15 at a depth as great as 8.5 feet below grade. The samples recovered in these areas were noted to be relatively soft and saturated when compared to the underlying soils. While it is anticipated that the alignment will extend through the softest materials present within the upper 3 feet, marginally soft soils are still expected to be present at bearing elevations. Soft soils such as this often make poor bearing materials and undercuts to competent soils should be anticipated where encountered.

6B GROUNDWATER INFILTRATION

Groundwater was encountered on drilling tools within boring B-15 at the soil-bedrock interface at a depth of about 8.5 feet which is common to encounter in Northern Kentucky. Where excavations extend beyond the soil-bedrock interface and groundwater intrusion may be encountered. Additionally, groundwater should be expected in the event alluvial or granular soils are

encountered, particularly near the existing creek. In most cases, the groundwater should be able to be removed from excavations using pumps or trench drains.

6C BEDROCK EXCAVATION

Within our borings, bedrock was encountered at depths as shallow as about 3 feet below grade. Plans show that average water line installation depths will be about 4 to 5 feet below existing grades. Thus, it is anticipated that excavations may extend 1 to 2 feet into bedrock. The bedrock in the area is a mixture of interbedded limestone and shale and while the shale is often very soft and soil-like, but the limestone (although in thin beds) can be very hard and difficult to remove. Our borings, as well as site geology, suggest that the bedrock present is comprised of about 50 to 80 percent shale, with the remainder being limestone. The use of ripping equipment or a hoe-ram may be necessary if competent limestone is encountered during excavation.

7 WATER PIPE SUPPORT

With regards to pipe support, three different bearing conditions are anticipated along the proposed alignment. Along the initial portion of the alignment (near Grandview Rd), lacustrine soils are anticipated. Bearing conditions along the remainder of the alignment are expected to consist of weathered shale/limestone bedrock or firm residual soils. Although not encountered in the borings, alluvial soils may be encountered within portions of the alignment present in the flood plain portion of the Lick Branch Stream. If soft soils are encountered, they should be undercut to the firm or better materials and replaced with suitable fill material. Additionally, restrained joints and or thrust blocks may be required depending upon the field conditions. If questionable soils are encountered, CSI should be notified to evaluate and provide necessary recommendations.

8 THRUST RESTRAINT

Where changes in the direction of flow occur and/or where the water main cross sectional area changes, thrust forces will be generated in the direction of water flow. In some cases the thrust forces generated can be greater than the lateral resistance of the natural soils and/or backfill placed within utility trenches. To prevent separation and/or damage to the water main at these horizontal or vertical bends/joints, thrust block restraints (or restrained joints where thrust blocks are not applicable) will be required. Review of the provided plans indicate that thrust block are planned at several location along the proposed alignment. Based upon the conditions encountered, the thrust blocks appear to be suitable for the proposed alignment. Thrust blocks should bear on the undisturbed stiff or better residual soils or alluvial soils and can be designed using the soil parameters shown in the table below. For design of restrained joints, a frictional coefficient between pipe and soil of 0.3 should be used. Additionally, reinforced concrete encasement may also be used in place of restrained joints.

Table 3: Thrust Block Soil Parameters

Soil Group	Passive Earth Pressure Coefficient	Unit Weight (pcf)	Cohesion (psf)	Friction Angle (φ)
Residual Clay	Kp = 2.5	115	100	φ = 25
Lacustrine	Kp = 2.2	105	0	φ = 22

9 EARTHWORK

We do not anticipate any structural fill to occur on the site with the exception of backfill of the trenches. The following recommendations are for backfill operations around open cut trenches for the alignment.

9A EXCAVATIONS

Normal earth excavation equipment should be suitable for excavations associated with the overburden soils. The weathered shale encountered on site should be able to be excavated with conventional equipment, however for the competent limestone layers encountered, ripping equipment or the use of a hoe-ram will most likely be necessary.

For below-grade excavations, the residual soils should be classified as OSHA Type B soils with a minimum slope excavation of 1H:1V. If soil types other than what has been mentioned above are encountered, CSI should be contacted to evaluate for stability.

9B TRENCH BACKFILL OPERATIONS

These materials are placed in more confined areas than mass earthwork materials or pavement materials. The following are general recommendations for backfill areas:

- Fill lift thicknesses will vary dependent on compaction equipment available and material types, but in no case should exceed 8 inches for clay and 12 inches for granular soils;
- For crushed stone/aggregate backfills in trenches and when using smaller compaction equipment the lift thickness should be based on the type of aggregate and equipment. For well-graded granular soils such as Dense Grade Aggregate, a thickness of 4 to 6 inches is typically required. If open-graded stone is used, the lift thickness may be able to be increased. This should be evaluated by the geotechnical engineer;
- Place cohesive fill (clay) in maximum 8-inch thick loose lifts. Granular soils may be placed in maximum 12 inch loose lifts provided properly sized equipment is used in the compaction process;
- Fill lifts should be compacted to at least 98 percent of the soil's maximum dry density (ASTM D 698) in areas beneath pavements and 92 percent in grassed areas.
- Maintain the moisture content of compacted fill between minus 2 and plus 2 percent of optimum moisture;
- Maximum particle size of the soil should be limited to half the lift thickness.;
- Density testing should be performed as a means to verify percent compaction and moisture content of the material as it is being placed and compacted;

- Density testing should be performed at a rate of at least 3 tests per lift; CSI should be retained to provide additional recommendations for backfill;

9C GENERAL NOTES

- For all earthwork operations, positive surface drainage is prudent to keep water from ponding on the surface and to assist in maintaining surface stability;
- The surface should be sealed prior to expected wet weather. This can usually be accomplished with rubber-tired construction equipment or a steel-drum roller;
- If any soil placement problems occur, CSI should be retained to provide additional recommendations, as needed.

10 SITE DRAINAGE

During construction, water should not be allowed to pond in excavations and fill areas or undercutting will likely be required. During the life of the project, slope the subgrade and other site features so that surface water flows away from the site structures.

For excavations during construction, most free water from the subsurface conditions could likely be removed via sump pumps and open channel flow (if possible) at or near the source of seepage. However, if normal dewatering measures prove insufficient, CSI should be retained to provide recommendations on the issue.

11 NOTES ON THE REPORT AND RECOMMENDATIONS

We recommend that this complete report be provided to the various design team members, the contractors and the project Owner. Potential contractors should be informed of this report in the "Instructions to Bidders" section of the bid documents. A geotechnical exploration, such as the one we performed, used three borings to attempt to model the subsurface conditions at the site. Because no exploration contains complete data or a complete model, there is always a possibility that conditions between borings will be different from those at specific boring locations. Thus, it is possible that some subsurface conditions will not be as anticipated by the project team or contractor. If this report is included or referenced in the actual contract documents, it shall be explicitly understood that this report is for informational purposes only. CSI shall not be responsible for the opinions of, or conclusions drawn by others.

It has been our experience that the construction process often disturbs soil conditions and this process, no matter how much experience we use to anticipate construction methodology, is not completely predictable. Therefore, changes or modifications to our recommendations are likely needed due to these possible variances. Experienced CSI geotechnical personnel should be used to observe and document the construction procedures and the conditions encountered. Unanticipated conditions and inadequate procedures should be reported to the design team along with timely recommendations to solve the problems created. We recommend that the

Owner retain CSI to provide this service based upon our familiarity with the project, the subsurface conditions and the intent of our recommendations.

This report is based on the supplied project information, the subsurface conditions observed at the time of the report, and our experience with similar conditions. As such, it cannot be applied to other project sites, types, or combinations thereof. If the Project Information section in this report contains incorrect information or if additional information is available, you should convey the correct or additional information to us and retain us to review our recommendations. Our recommendations may then require modification.

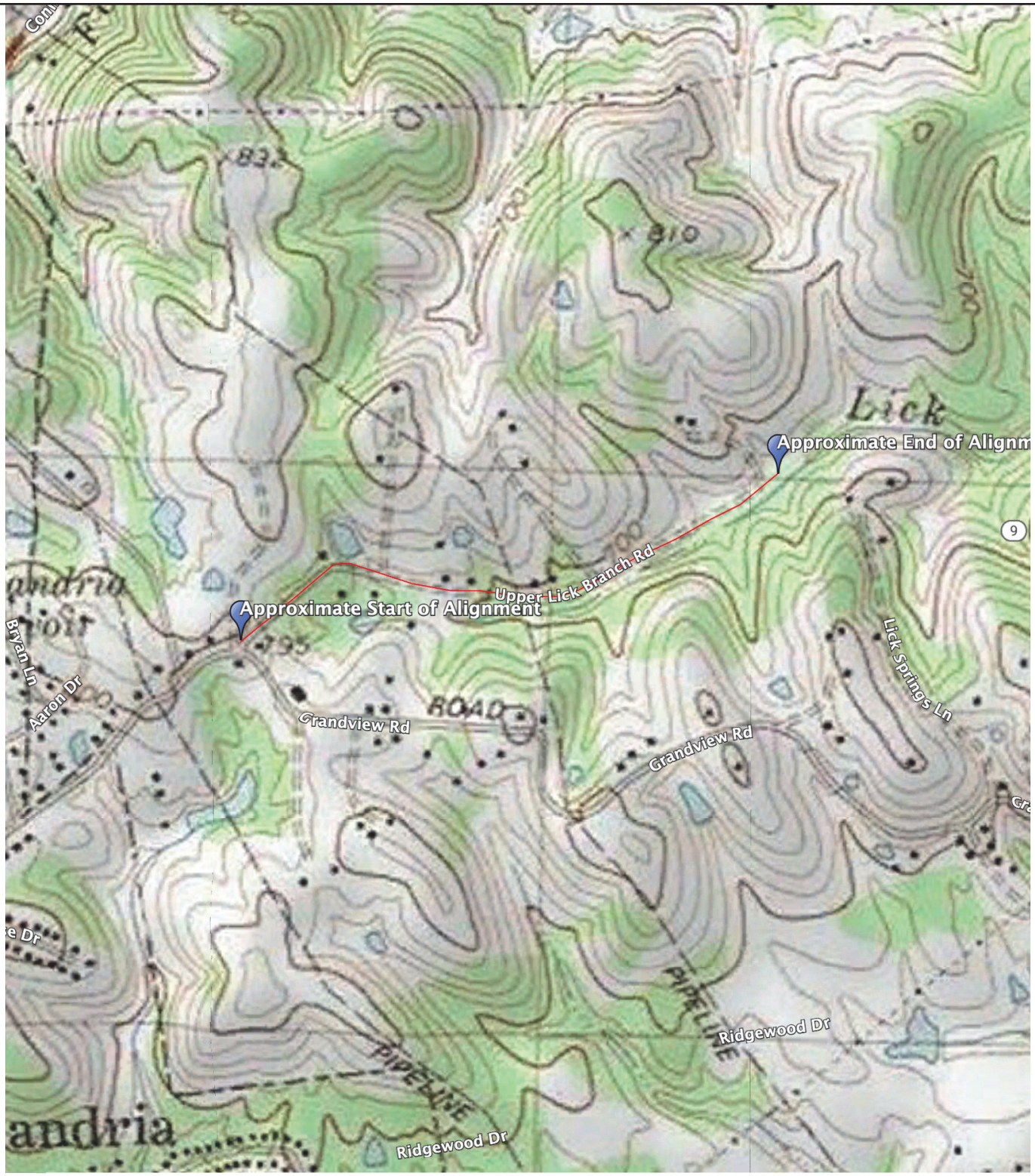
No section or portion of this report (including Appendix information) can be used as a stand alone article to make distinct changes or assumptions. The entire report and Appendix should be used together as one resource. We wish to remind you that our exploration services include storing the soil samples collected and making them available for inspection for 30 days. The soil samples are then discarded unless you request otherwise. Please inform us if you wish to keep any of the obtained samples.

While this report deals with samples of subsurface materials and some comments on water conditions at the site, no assessment of site environmental conditions or the presence of contaminants were performed.

We wish to remind you that our exploration services include storing the soil samples collected and making them available for inspection for 30 days. The samples are then discarded unless you request otherwise. Please inform us if you wish to keep any of the obtained samples.

APPENDIX A

SITE LOCATION PLAN
GEOTECHNICAL BORING INFORMATION SHEET
GENERAL BORING PROFILE
TEST BORING LOGS
FIELD TESTING PROCEDURES
LIQUID AND PLASTIC LIMITS REPORT
SUMMARY OF LABORATORY RESULTS
LABORATORY TESTING PROCEDURES



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ADAPTED FROM TOPOGRAPHIC MAPPING
FOR ILLUSTRATION PURPOSES

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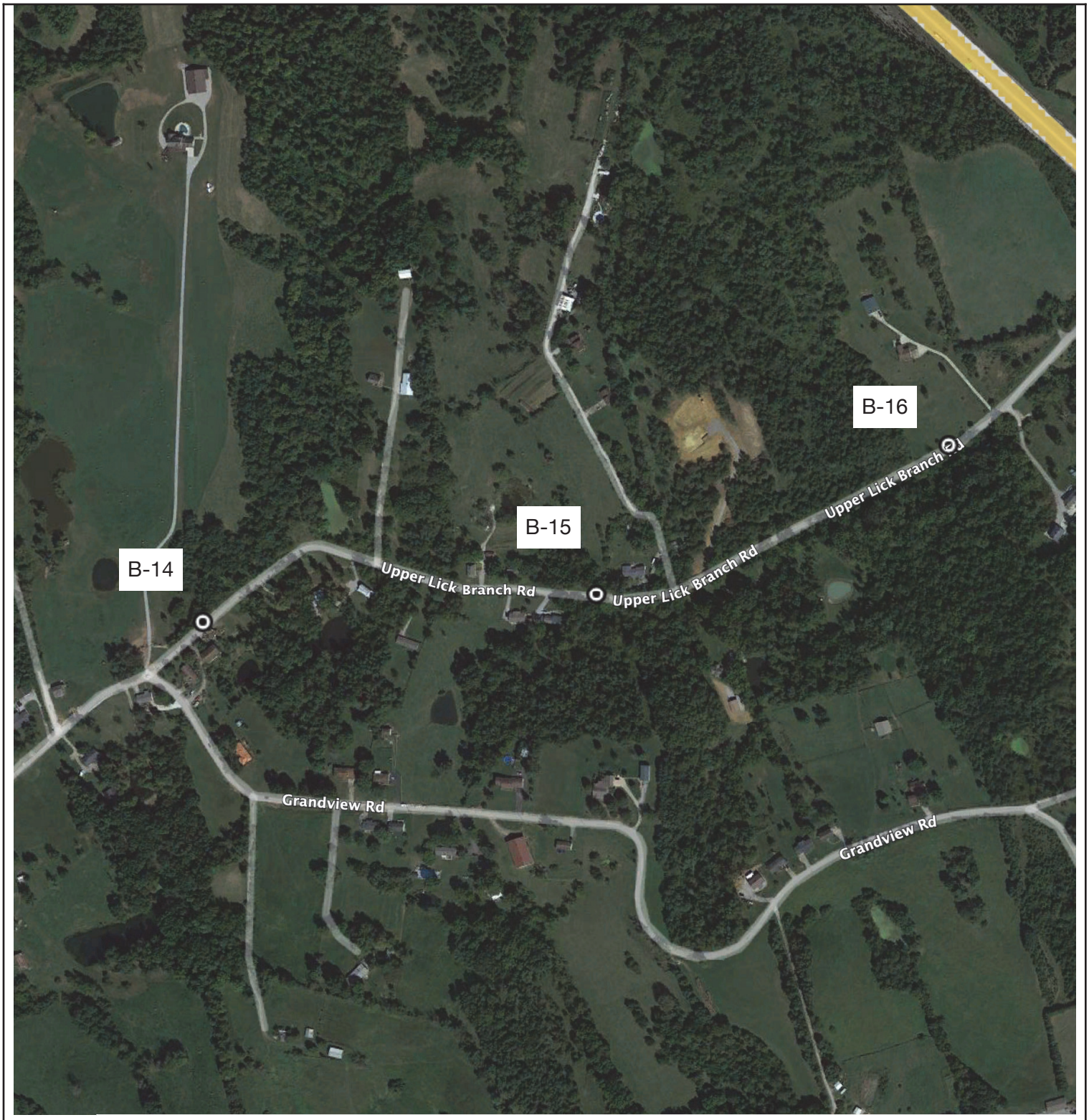
Cincinnati, Ohio 45241
513.252.2059 Office | 888.792.3121 Fax
www.csiohio.com

TITLE:	SITE LOCATION PLAN	PROJECT NO: CN230010	DRAWN BY: GD
PROJECT:	UPPER LICK BRANCH ROAD WATER MAIN ALEXANDRIA, KY	DATE: 7/18/23	CHECKED BY: JB
		NOT TO SCALE	DRAWING NO 1 OF 2



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TITLE:	BORING LOCATION PLAN	PROJECT NO: CN230010	DRAWN BY: GD
PROJECT:	UPPER LICK BRANCH ROAD WATER MAIN ALEXANDRIA, KY	DATE: 7/18/23	CHECKED BY: JB
		NOT TO SCALE	DRAWING NO 2 OF 2

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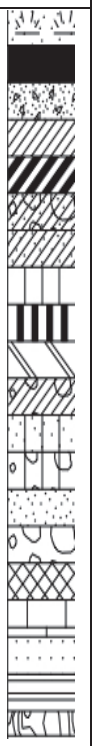
Geotechnical Boring Information Sheet

Sample Type Symbols

Splitspoon (SPT)
Shelby Tube
Grab
Rock Core
Auger Cuttings

Surface Symbols



Topsoil
Asphalt
Concrete
Lean Clay
Fat Clay
Glacial Till
Sandy Clay
Silt
Elastic Silt
Lean Clay to Fat Clay
Gravelly Clay
Sandy Silt
Gravelly Silt
Sand
Gravel
Fill
Limestone
Sandstone
Shale/Siltstone
Weathered Rock

Samples Strength Descriptors

Cohesive Soils:	**N**
Very Soft	0-1
Soft	2-4
Firm	5-8
Stiff	9-15
Very Stiff	16-30
Hard	31+
Non-cohesive Soils:	
Very Loose	0-4
Loose	5-10
Firm	11-20
Very Firm	21-30
Dense	30-50
Very Dense	51+

Definitions

SPT-"Splitspoon" or standard penetration test. Blow counts are number of drops required for a 140 lb hammer dropping 30 inches to drive the sampler 6 inches.

N-value is the addition of the last two intervals of the 18-inch sample.

Shelby tubes are often called "undisturbed samples". They are directly pushed into the ground, twisted, allowed to rest for a small period of time and then pulled out of the ground. Tops and bottoms are cleaned and then sealed.

Sample classification is done in general accordance with ASTM D2487 and 2488 using the Unified Soil Classification System (USCS) as a general guide.

Soil moisture descriptions are based on the recovered sample observations. The descriptors are dry, slightly moist, moist, very moist and wet. These are typically based on relative estimates of the moisture condition of a visual estimation of the soils optimum moisture content (EOMC). Dry is almost in a "dusty" condition usually 6 or more percent below EOMC. Slightly moist is from about 6 to 2 percent below EOMC at a point at which the soil color does not readily change with the addition of water. Moist is usually 2 percent below to 2 percent above EOMC and the point at which the soil will tend to begin forming "balls" under some pressure in the hand. Very moist is usually from about 2 percent to 6 percent above EOMC and also the point at which it's often considered "muddy". Wet soil is usually 6 or more percent above EOMC and often contains free water or the soil is in a saturated state.

Silt or Clay is defined at material finer than a standard #200 US sieve (<0.075mm) Sand is defined as material between the size of #200 sieve up to #4 sieve. Gravel is from #4 size sieve material to 3". Cobbles are from 3" to 12". Boulders are over 12".

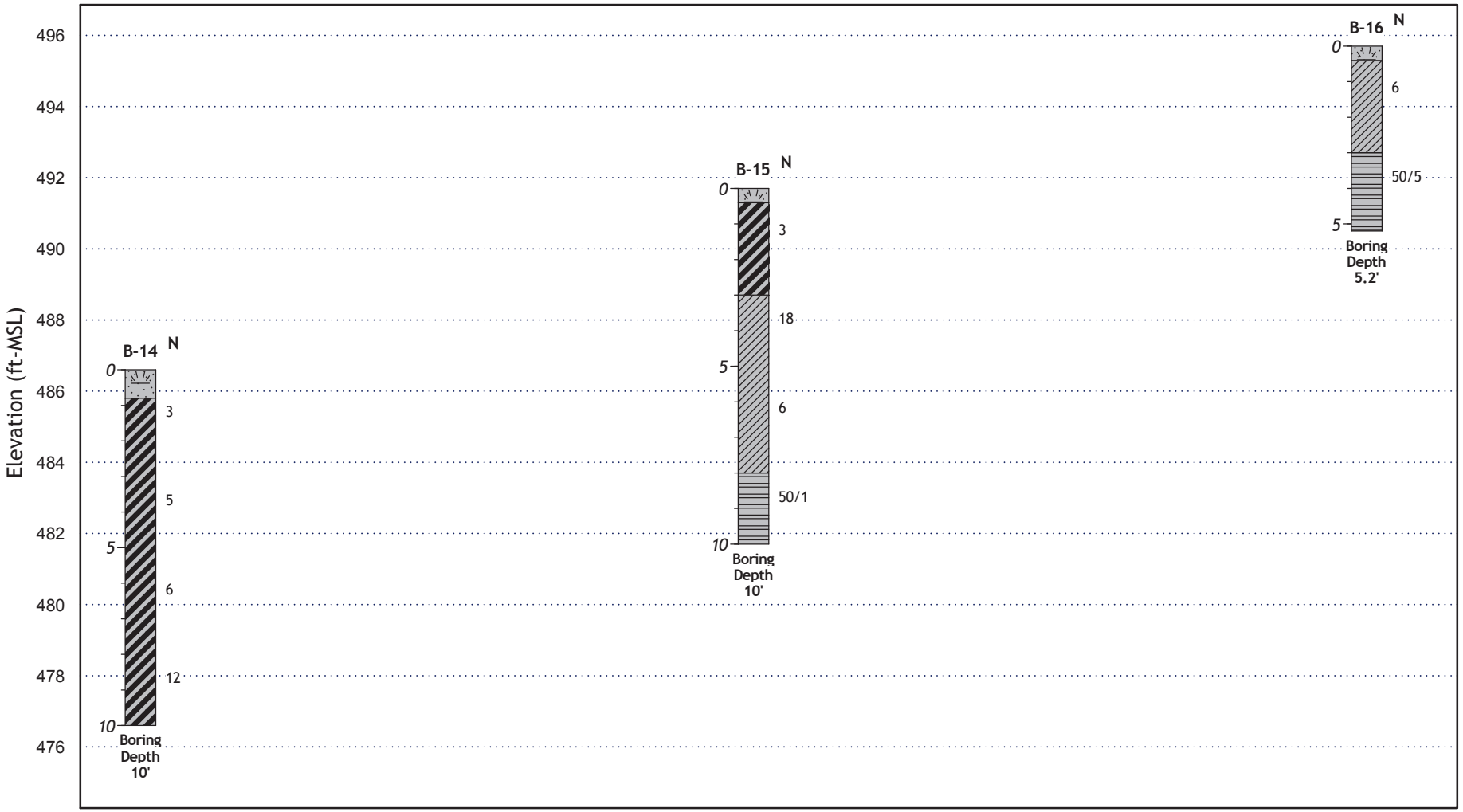
Rock hardness is classified as follows:

Very Soft:	Easily broken by hand pressure
Soft:	Ends can be broken by hand pressure; easily broken with hammer
Medium:	Ends easily broken with hammer; middle requires moderate blow
Hard:	Ends require moderate hammer blow; middle requires several blows
Very Hard:	Many blows with a hammer required to break core

Rock Quality Designation (RQD) is defined as total combined length of 4" or longer pieces of core divided by the total core run length; defined in percentage.

Water or cave-in observed in borings is at completion of drilling each boring unless otherwise noted.

Strata lengths shown on borings represents a rough estimate. Transition may be more abrupt or gradual. Soil borings are representative of that estimated location at that time and are based on recovered samples. Conditions may be different between borings and between sample intervals. Boring information is not to be considered stand alone but should be taken in context with comments and information in the geotechnical report and the means by which the borings are logged, sampled and drilled.



SOIL TYPES

(Shown in Graphic Log)

- Fill
- Asphalt
- Topsoil
- Gravel
- Sand
- Silt
- Lean Clay
- Fat Clay
- Silty Sand
- Clayey Sand
- Sandy Silt
- Clayey Silt
- Sandy Clay
- Silty Clay
- Limestone
- Sandstone
- Siltstone
- Shale

CSI of Cincinnati
11785 Highway Drive
Cincinnati, OH 45241
Phone: 513.252.2059
Fax: 888.792.3121

Northern Kentucky Water
CN230010

BORING PROFILE

Fig. 1

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11785 Highway Drive
Cincinnati, OH 45241
Phone: 513.252.2059
Fax: 888.792.3121

TEST BORING LOG

CLIENT: Cardinal Engineering
PROJECT NAME: Northern Kentucky Water
PROJECT LOCATION: Alexandria, KY

BORING #: B-14
JOB #: CN230010
LOGGED BY: CG
APPROVED BY: GD

DRILLING and SAMPLING INFORMATION

Date Started	2/27/23	Contractor	CSI
Date Completed	3/1/23	Boring Size	4 in.
Drill Rig	B-57 Mobile	Boring Method	SFA
Weather	Cloudy, 40s-50s	Hammer Type	Automatic

SOIL CLASSIFICATION

SURFACE ELEVATION: 486.6

TOPSOIL - 8 INCHES

Brown and gray varved FAT CLAY (CH) with trace silt and rock fragments [Lacustrine] - moist, soft to stiff

Boring terminated at 10.0 feet

No refusal

TEST DATA

Sample No.	Sample Type	Sample Graphics	Recovery (in)	Standard Penetration Test Blows per 6" [*N-Value*] *blows/foot*	Qu-tsf Unconfined (Pocket Pen.) Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plasticity Index (PI)	Percent Passing #200 Sieve	Remarks
1	SS		18	2-1-2 [*3*]		31.4				
2	SS		6	2-2-3 [*5*]		32.7				
3	SS		18	3-2-4 [*6*]		32.0				
4	SS		18	4-6-6 [*12*]		28.2	60	36	100	

Depth to Groundwater
- Noted on Drilling Tools _____ ft.
- At Completion _____ ft.
- After _____ hours _____ ft.
- Cave Depth _____ ft.

Sample Type
- SPT- Standard Penetration Test
- SS- Split Spoon
- ST- Shelby Tube
- RC- Rock Core
- CU- Auger Cuttings

Boring Method
- HSA- Hollow Stem Augers
- CFA- Continuous Flight Augers
- MD- Mud Drilling

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11785 Highway Drive
Cincinnati, OH 45241
Phone: 513.252.2059
Fax: 888.792.3121

TEST BORING LOG

CLIENT: Cardinal Engineering
PROJECT NAME: Northern Kentucky Water
PROJECT LOCATION: Alexandria, KY

BORING #: B-15
JOB #: CN230010
LOGGED BY: CG
APPROVED BY: GD

DRILLING and SAMPLING INFORMATION

Date Started	2/27/23	Contractor	CSI
Date Completed	3/1/23	Boring Size	4 in.
Drill Rig	B-57 Mobile	Boring Method	SFA
Weather	Cloudy, 40s-50s	Hammer Type	Automatic

SOIL CLASSIFICATION

SURFACE ELEVATION: 491.7

TOPSOIL - 4 INCHES

Brown FAT CLAY (CH) with some silt, black oxide nodules, and trace roots [Residuum] - very moist, soft

Brown and gray LEAN CLAY (CL) with trace roots and fossil fragments [Residuum] - dry, firm to very stiff

Gray highly weathered SHALE - dry, soft

Boring terminated at 10.0 feet

No refusal

Sample No.	Sample Type	Recovery (in)	Standard Penetration Test Blows per 6" [*N-Value*] *blows/foot*	Moisture Content %
1	SS	18	2-1-2 [*3*]	34.0
2	SS	10	8-12-6 [*18*]	
3	SS	2	WOH-2-4 [*6*]	17.0
4	SS	4	29-50/1- [*50/1*]	

Qu-tsf Unconfined (Pocket Pen.) Compressive Strength
Liquid Limit (LL)
Plasticity Index (PI)
Percent Passing #200 Sieve
Remarks

Depth to Groundwater
- Noted on Drilling Tools 8.0 ft.
- At Completion _____ ft.
- After _____ hours _____ ft.
- Cave Depth _____ ft.

Sample Type
- SPT- Standard Penetration Test
- SS- Split Spoon
- ST- Shelby Tube
- RC- Rock Core
- CU- Auger Cuttings

Boring Method
- HSA- Hollow Stem Augers
- CFA- Continuous Flight Augers
- MD- Mud Drilling

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11785 Highway Drive
Cincinnati, OH 45241
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Fax: 888.792.3121

TEST BORING LOG

CLIENT: Cardinal Engineering
PROJECT NAME: Northern Kentucky Water
PROJECT LOCATION: Alexandria, KY

BORING #: B-16
JOB #: CN230010
LOGGED BY: CG
APPROVED BY: GD

DRILLING and SAMPLING INFORMATION

Date Started	2/27/23	Contractor	CSI
Date Completed	3/1/23	Boring Size	4 in.
Drill Rig	B-57 Mobile	Boring Method	SFA
Weather	Cloudy, 40s-50s	Hammer Type	Automatic

SOIL CLASSIFICATION

SURFACE ELEVATION: 495.7

TOPSOIL - 4 INCHES

Brown and gray LEAN CLAY (CL) with rock fragments and some silt [Residuum] - slightly moist, firm

Gray highly weathered SHALE - dry, soft

Auger refusal at 5.2 feet

End boring

TEST DATA

Elev. (ft)	Depth Scale	Sample No.	Sample Type	Sample Graphics	Recovery (in)	Standard Penetration Test Blows per 6" [*N-Value*] *blows/foot*	Qu-tsf Unconfined (Pocket Pen.) Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plasticity Index (PI)	Percent Passing #200 Sieve	Remarks
494	2	1	SS		7	8-3-3 [*6*]		20.7				
492	4	2	SS		14	8-19-50/5 [*50/5*]						
490	6											
488	8											
486	10											
484	12											
482	14											

Depth to Groundwater
- Noted on Drilling Tools _____ ft.
- At Completion _____ ft.
- After _____ hours _____ ft.
- Cave Depth _____ ft.

Sample Type
- SPT- Standard Penetration Test
- SS- Split Spoon
- ST- Shelby Tube
- RC- Rock Core
- CU- Auger Cuttings

Boring Method
- HSA- Hollow Stem Augers
- CFA- Continuous Flight Augers
- MD- Mud Drilling

FIELD TESTING PROCEDURES

Field Operations: The general field procedures employed by CSI are summarized in ASTM D 420 which is entitled "Investigating and Sampling Soils and Rocks for Engineering Purposes." This recommended practice lists recognized methods for determining soil and rock distribution and ground water conditions. These methods include geophysical and in situ methods as well as borings.

Borings are drilled to obtain subsurface samples using one of several alternate techniques depending upon the subsurface conditions. These techniques are:

a. Continuous 2-1/2 or 3-1/4 inch I.D. hollow stem augers;

b. Wash borings using roller cone or drag bits (mud or water);

c. Continuous flight augers (ASTM D 1425).

These drilling methods are not capable of penetrating through material designated as "refusal materials." Refusal, thus indicated, may result from hard cemented soil, soft weathered rock, coarse gravel or boulders, thin rock seams, or the upper surface of sound continuous rock. Core drilling procedures are required to determine the character and continuity of refusal materials.

The subsurface conditions encountered during drilling are reported on a field test boring record by the chief driller. The record contains information concerning the boring method, samples attempted and recovered, indications of the presence of various materials such as coarse gravel, cobbles, etc., and observations between samples. Therefore, these boring records contain both factual and interpretive information. The field boring records are on file in our office.

The soil and rock samples plus the field boring records are reviewed by a geotechnical engineer. The engineer classifies the soils in general accordance with the procedures outlined in ASTM D 2488 and prepares the final boring records which are the basis for all evaluations and recommendations.

The final boring records represent our interpretation of the contents of the field records based on the results of the engineering examinations and tests of the field samples. These records depict subsurface conditions at the specific locations and at the particular time when drilled. Soil conditions at other locations may differ from conditions occurring at these boring locations. Also, the passage of time may result in a change in the subsurface soil and ground water conditions at these boring locations. The lines designating the interface between soil or refusal materials on the records and on profiles represent approximate boundaries. The transition between materials may be gradual. The final boring records are included with this report.

The detailed data collection methods using during this study are discussed on the following pages.

Soil Test Borings: Soil test borings were made at the site at locations shown on the attached Boring Plan. Soil sampling and penetration testing were performed in accordance with ASTM D 1586.

The borings were made by mechanically twisting a hollow stem steel auger into the soil. At regular intervals, the drilling tools were removed and soil samples obtained with a standard 1.4 inch I.D., 2 inch O.D., split tube sampler. The sampler was first seated 6 inches to penetrate any loose cuttings, then driven an additional foot with blows of a 140-pound hammer falling 30 inches. The number of hammer blows required to drive the sampler the final foot was recorded and is designated the "penetration resistance". The penetration resistance, when properly evaluated, is an index to the soil strength and foundation supporting capability.

Representative portions of the soil samples, thus obtained, were placed in glass jars and transported to the laboratory. In the laboratory, the samples were examined to verify the driller's field classifications. Test Boring Records are attached which graphically show the soil descriptions and penetration resistances.

Core Drilling: Refusal materials are materials that cannot be penetrated with the soil drilling methods employed. Refusal, thus indicated, may result from hard cemented soil, soft weathered rock, coarse gravel or boulders, thin rock seams or the upper surface of sound continuous rock. Core drilling procedures are required to determine the character and continuity of refusal materials.

Prior to coring, casing is set in the drilled hole through the overburden soils, if necessary, to keep the hole from caving. Refusal materials are then cored according to ASTM D 2113 using a diamond-studded bit fastened to the

end of a hollow double tube core barrel. This device is rotated at high speeds, and the cuttings are brought to the surface by circulating water. Core samples of the material penetrated are protected and retained in the swivel-mounted inner tube. Upon completion of each drill run, the core barrel is brought to the surface, the core recovered is measured, the samples are removed and the core is placed in boxes for storage.

The core samples are returned to our laboratory where the refusal material is identified and the percent core recovery and rock quality designation is determined by a soils engineer or geologist. The percent core recovery is the ratio of the sample length obtained to the depth drilled, expressed as a percent. The rock quality designation (RQD) is obtained by summing up the length of core recovered, including only the pieces of core which are four inches or longer, and dividing by the total length drilled. The percent core recovery and RQD are related to soundness and continuity of the refusal material. Refusal material descriptions, recoveries, and RQDs are shown on the "Test Boring Records".

Hand Auger Borings and Dynamic Cone Penetration Testing: Hand auger borings are performed manually by CSI field personnel. This consists of manually twisting hand auger tools into the subsurface and extracting “grab” or baggie samples at intervals determined by the project engineer. At the sample intervals, dynamic cone penetration (DCP) testing is performed. This testing involves the manual raising and dropping of a 20 pound hammer, 18 inches. This “driver” head drives a solid-1¾ inch diameter cone into the ground. DCP “counts” are the number of drops it takes for the hammer to drive three 1¾ inch increments, recorded as X-Y-Z values.

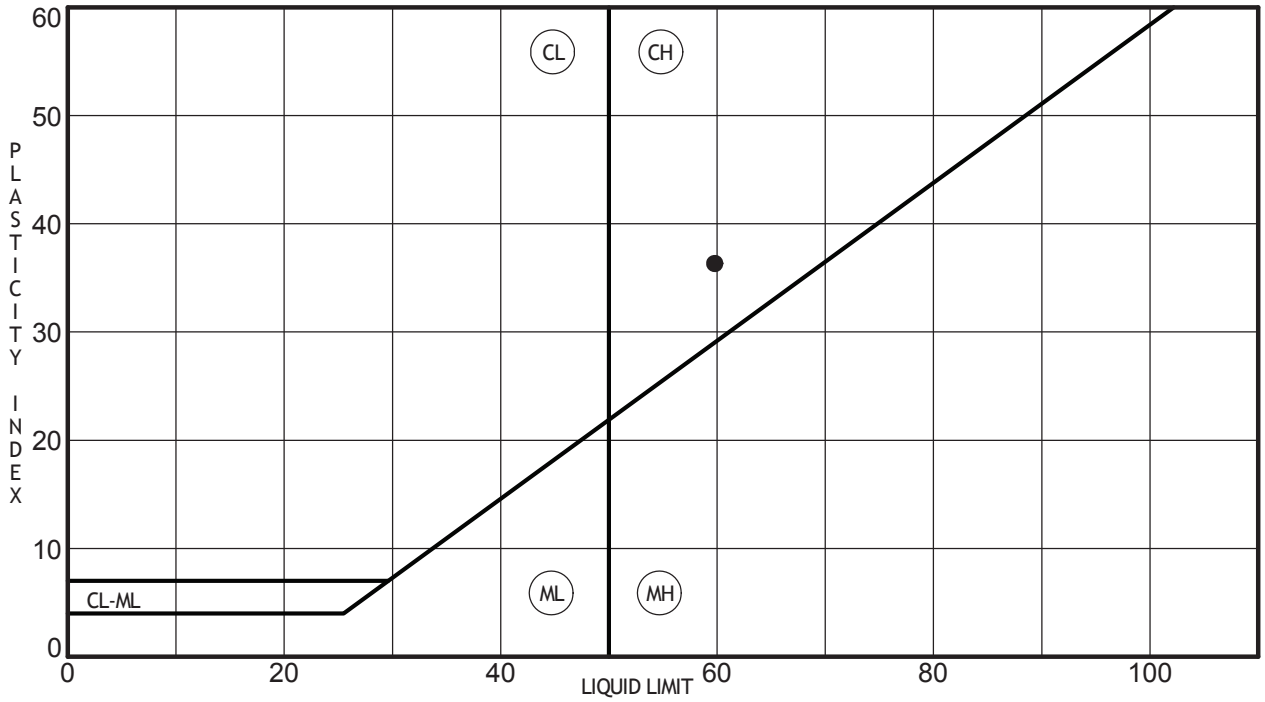
Test Pits: Test pits are excavated by the equipment available, often a backhoe or trackhoe. The dimensions of the test pits are based on the equipment used and the power capacity of the equipment. Samples are taken from the spoils of typical buckets of the excavator and sealed in jars or “Ziplock” baggies. Dynamic Cone Penetration or hand probe testing is often performed in the upper few feet as OSHA standards allow. Refusal is deemed as the lack of advancement of the equipment with reasonable to full machine effort.

Water Level Readings: Water table readings are normally taken in conjunction with borings and are recorded on the "Test Boring Records". These readings indicate the approximate location of the hydrostatic water table at the time of our field investigation. Where impervious soils are encountered (clayey soils) the amount of water seepage into the boring is small, and it is generally not possible to establish the location of the hydrostatic water table through water level readings. The ground water table may also be dependent upon the amount of precipitation at the site during a particular period of time. Fluctuations in the water table should be expected with variations in precipitation, surface run-off, evaporation and other factors.

The time of boring water level reported on the boring records is determined by field crews as the drilling tools are advanced. The time of boring water level is detected by changes in the drilling rate, soil samples obtained, etc. Additional water table readings are generally obtained at least 24 hours after the borings are completed. The time lag of at least 24 hours is used to permit stabilization of the ground water table which has been disrupted by the drilling operations. The readings are taken by dropping a weighted line down the boring or using an electrical probe to detect the water level surface.

Occasionally the borings will cave-in, preventing water level readings from being obtained or trapping drilling water above the caved-in zone. The cave-in depth is also measured and recorded on the boring records.

Liquid and Plastic Limits Test Report



	Boring	Depth (ft)	LL	PL	PI	Water Content	% < #40	% < #200	USCS	Description
●	**B-14**	**8.5**	**60**	**23**	**37**	**28.2**		**100**		**FAT CLAY(CH)**

CSI of Cincinnati
11785 Highway Drive
Cincinnati, OH 45241
Phone: 513.252.2059
Fax: 888.792.3121

PROJECT INFORMATION

Client: Cardinal Engineering
Project Name: Northern Kentucky Water
Project Number: CN230010
Project Location: Alexandria, KY

Summary of Laboratory Results

Borehole	Depth	Sample Type	Liquid Limit	Plastic Limit	Plasticity Index	Classification	Water Content (%)	Unconfined Compressive Strength (tsf)	Dry Density (pcf)	Wet Density (pcf)	Max. Dry Density (pcf)	Opt. Water Content (%)	CBR	Swell (%)	RQD	Percent Recovery	Percent Finer (No. 200)
B-14	1.0	SS					31.4										
B-14	3.5	SS					32.7										
B-14	6.0	SS					32.0										
B-14	8.5	SS	60	23	37	FAT CLAY(CH)	28.2										100
B-15	1.0	SS					34.0										
B-15	6.0	SS					17.0										
B-16	1.0	SS					20.7										

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Fax: 888.792.3121

SS - Split Spoon Sample
GRAB - Bulk Grab Sample

PROJECT INFORMATION

Client: Cardinal Engineering
Project Name: Northern Kentucky Water
Project Number: CN230010
Project Location: Alexandria, KY

LABORATORY TESTING PROCEDURES

Soil Classification: Soil classifications provide a general guide to the engineering properties of various soil types and enable the engineer to apply past experience to current problems. In our investigations, samples obtained during drilling operations are examined in our laboratory and visually classified by an engineer. The soils are classified according to consistency (based on number of blows from standard penetration tests), color and texture. These classification descriptions are included on our "Test Boring Records."

The classification system discussed above is primarily qualitative and for detailed soil classification two laboratory tests are necessary: grain size tests and plasticity tests. Using these test results the soil can be classified according to the AASHTO or Unified Classification Systems (ASTM D 2487). Each of these classification systems and the in-place physical soil properties provides an index for estimating the soil's behavior. The soil classification and physical properties obtained are presented in this report.

Rock Classification: Rock classifications provide a general guide to the engineering properties of various rock types and enable the engineer to apply past experience to current situations. In our explorations, rock core samples obtained during drilling operations are examined in our laboratory and visually classified by an engineer. The rock cores are classified according to relative hardness and RQD (see Guide to Rock Classification Terminology), color, and texture. These classification descriptions are included on our Test Boring Records.

Atterberg Limits: Portions of the samples are taken for Atterberg Limits testing to determine the plasticity characteristics of the soil. The plasticity index (PI) is the range of moisture content over which the soil deforms as a plastic material. It is bracketed by the liquid limit (LL) and the plastic limit (PL). The liquid limit is the moisture content at which the soil becomes sufficiently "wet" to flow as a heavy viscous fluid. The plastic limit is the lowest moisture content at which the soil is sufficiently plastic to be manually rolled into tiny threads. The liquid limit and plastic limit are determined in accordance with ASTM D 4318.

Moisture Content: The Moisture Content is determined according to ASTM D 2216.

Percent Finer Than 200 Sieve: Selected samples of soils are washed through a number 200 sieve to determine the percentage of material less than 0.074 mm in diameter.

Rock Strength Tests: To obtain strength data for rock materials encountered, unconfined compression tests are performed on selected samples. In the unconfined compression test, a cylindrical portion of the rock core is subjected to increasing axial load until it fails. The pressure required to produce failure is recorded, corrected for the length to diameter ratio of the core and reported.

Compaction Tests: Compaction tests are run on representative soil samples to determine the dry density obtained by a uniform compactive effort at varying moisture contents. The results of the test are used to determine the moisture content and unit weight desired in the field for similar soils. Proper field compaction is necessary to decrease future settlements, increase the shear strength of the soil and decrease the permeability of the soil.

The two most commonly used compaction tests are the Standard Proctor test and the Modified Proctor test. They are performed in accordance with ASTM D 698 and D 1557, respectively. Generally, the Standard Proctor compaction test is run on samples from building or parking areas where small compaction equipment is anticipated. The Modified compaction test is generally performed for heavy structures, highways, and other areas where large compaction equipment is expected. In both tests a representative soil sample is placed in a mold and compacted with a compaction hammer. Both tests have three alternate methods.

Test	Method	Hammer Wt./Fall	Mold Diam.	Run on Material Finer Than	No. of Layers	No. of Blows/ Layer
Standard	A	5.5 lb./12"	4"	No. 4 sieve	3	25
D 698	B	5.5 lb./12"	4"	3/8" sieve	3	25
	C	5.5 lb./12"	6"	3/4" sieve	3	56

Test	Method	Hammer Wt./Fall	Mold Diam.	Run on Material Finer Than	No. of Layers	No. of Blows/ Layer
Modified	A	10 lb./18"	4"	No. 4 sieve	5	25
D 1557	B	10 lb./18"	4"	3/8" sieve	5	25
	C	10 lb./18"	6"	3/4" sieve	5	56

The moisture content and unit weight of each compacted sample is determined. Usually 4 to 5 such tests are run at different moisture contents. Test results are presented in the form of a dry unit weight versus moisture content curve. The compaction method used and any deviations from the recommended procedures are noted in this report.

Laboratory California Bearing Ratio Tests: The California Bearing Ratio, generally abbreviated to CBR, is a punching shear test and is a comparative measure of the shearing resistance of a soil. It provides data that is a semi-empirical index of the strength and deflection characteristics of a soil. The CBR is used with empirical curves to design pavement structures.

A laboratory CBR test is performed according to ASTM D 1883. The results of the compaction tests are utilized in compacting the test sample to the desired density and moisture content for the laboratory California Bearing Ratio test. A representative sample is compacted to a specified density at a specified moisture content. The test is performed on a 6-inch diameter, 4.58-inch-thick disc of compacted soil that is confined in a cylindrical steel mold. The sample is compacted in accordance with Method C of ASTM D 698 or D 1557.

CBR tests may be run on the compacted samples in either soaked or unsoaked conditions. During testing, a piston approximately 2 inches in diameter is forced into the soil sample at the rate of 0.05 inch per minute to a depth of 0.5 inch to determine the resistance to penetration. The CBR is the percentage of the load it takes to penetrate the soil to a 0.1 inch depth compared to the load it takes to penetrate a standard crushed stone to the same depth. Test results are typically shown graphically.

Geotechnical Report

NKY Water District -
Poplar Thicket Road Water Main

Prepared for

Cardinal Engineering
1 Moock Road #1
Wilder, Kentucky 41071

June 22, 2023

Project No. CN230010

June 22, 2023

Mr. Kevin Hanson
Cardinal Engineering
1 Moock Road #1
Wilder, Kentucky 41071

Subject: Geotechnical Report for
NKY Water District - Poplar Thicket Road Water Main
Alexandria, Kentucky
CSI Project No. CN230010

Dear Mr. Hanson,

Consulting Services Incorporated of Cincinnati (CSI) is pleased to present our geotechnical report for the NKY Water District - Poplar Thicket Road Water Main project in Alexandria, Kentucky. We provided our services in general accordance the CSI Proposal 8227, dated December 12, 2022.

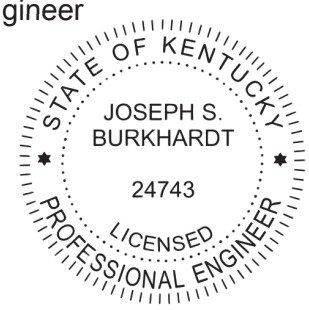
Our report represents information provided to us, readily available published data relevant to the site and site area, our observations and subsurface conditions encountered and our opinion of primary geotechnical conditions (discussion and recommendations) affecting site work and foundation design for the project.

Again, we greatly appreciate the opportunity to provide our services and look forward to working with you and the project team on this (and hopefully) more projects in the future. Please do not hesitate to contact us for questions or comments about the information contained herein.

Cordially,

Graham Duncan, EIT
Staff Engineer

Joseph S. Burkhardt, P.E.
Principal Geotechnical Engineer



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APPENDICES, FIGURES, PHOTOS, AND TABLES

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INTRODUCTION

1 SCOPE OF THE GEOTECHNICAL EXPLORATION

As proposed, CSI conducted a geotechnical exploration for the proposed 8” water main extension along Poplar Thicket Road in Alexandria, Kentucky. Our services included a review of the project information provided, conducting a subsurface exploration that utilized soil borings to obtain samples for modeling the soil conditions along the proposed route, an analysis of data and information obtained, evaluation of bearing conditions for the water line and recommendations for backfill of the pipe.

2 SITE AND PROJECT INFORMATION

The project will include the installation of a new 8” water main along Poplar Thicket Road in Alexandria, Kentucky. As part of this report, CSI has reviewed a plan set titled ‘Subdistrict HB Water main Extension Project’ dated 1-11-23. CSI’s understanding of the project is outlined in the tables below.

Table 1: Site Information

Item	Description
Site Location	The site is located along Poplar Thicket Road in Alexandria, Kentucky from the intersection of Poplar Thicket Road and Licking Pike to 446 Poplar Thicket Road.
Length of Improvement	The water line will be approximately 5,300 feet in length
Surrounding Area	The surrounding area is characterized by sparse residential developments in all directions
Existing Conditions	Existing road way is asphalt paved and is 13 foot wide edge to edge. A small creek tributary and bridge crossing is present near the intersection of Poplar Thicket and Licking Pike. Slopes are relatively steep in areas near the existing creek with steep/hillside terrain also present from about Station 6+00 to 30+00.

Table 2: Project Information

Item	Description
Site Layout	See Boring Location Plan
Proposed Structure(s)	An approximately 5,300 foot long 8 inch of new water main and intermittent fire hydrants.
Water Main Construction	Based on our understanding the water main will be constructed within the road right-of-ways at a depth of about 5 feet below grade. The water main will be installed along the northern side of the road along the initial portion of the alignment, and will cross to the southern side of the roadway near the address 646 Poplar Thickett Road. Provided plans indicate that the alignment will cross under Scaffold Creek and be encased in concrete.

3 AREA/SITE INFORMATION

3A AREA TOPOGRAPHY / PHYSIOGRAPHY

The site is located within the Outer Blue Grass Region of northern Kentucky. This area is characterized by Ordovician dolomites, limestones and calcareous shales, thin pre-Wisconsinan drift, loamy soils and low to moderately high relief. Published mapping reviewed indicates the elevations in the site vicinity range from about 540 feet within the tributary near Licking Pike to about 800 feet near 446 Poplar Thicket Road. Below is a figure of the location of the site with respect to the regional physiography.

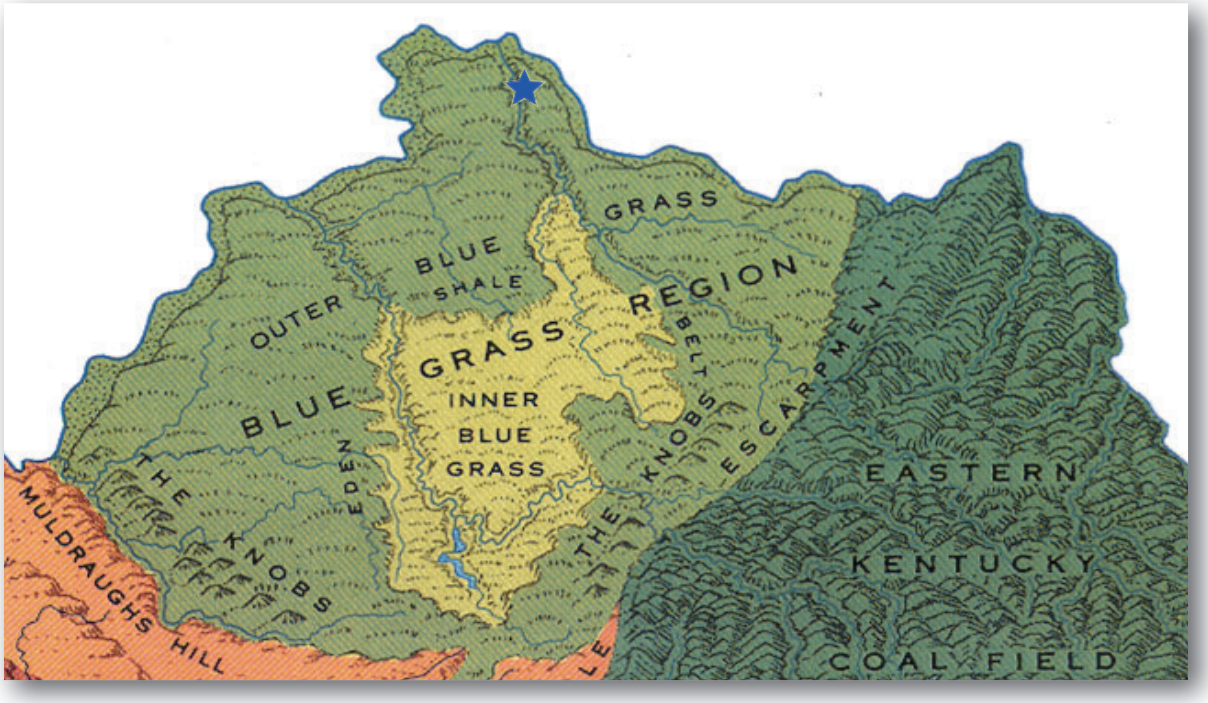


Figure 1 - Kentucky Physiographic Map (site vicinity shown with star)

3B SITE GEOLOGY

Review of the *Kentucky Geologic Map Service* shown in **Figure 2** below indicates the the majority of the alignment is underlain by Ordovician age deposits belonging to the Kope (Ok) and Fairview (Of) Formations with a thin band of the Point Pleasant Tongue of Clays Ferry (Ocp) present along the banks of Scaffold Creek. In general, each of these formations are comprised of interbedded limestone and shale and differ mainly in the ratio of limestone to shale. The Kope formation is comprised of about 80 percent shale with the Fairview and Point Pleasant Tongue of Clays Ferry each being comprised of about 45 to 65 percent limestone. Alluvial (Qal) deposits comprised of clay with varying amounts of silt, sand, and gravel are present in the along the creek. Near the end of the proposed alignment at 446 Poplar Thicket Road, Lacustrine/Fluvial (QTlf) soils associated with ancestral Licking River system are present and are typically comprised of varying layers and mixtures of clay, silt, gravel, and sand.

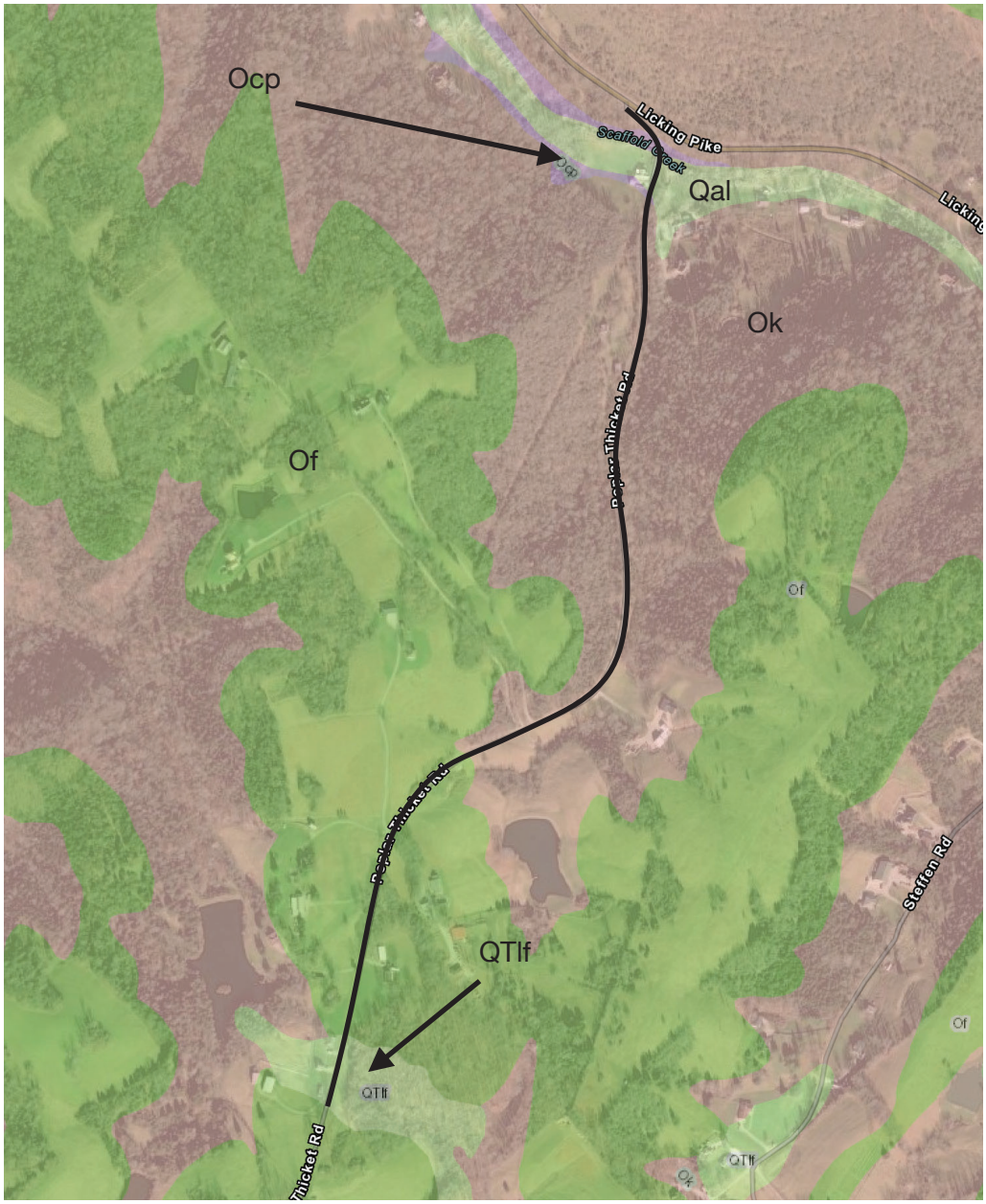


Figure 2: Site Geologic Mapping. Approximate Alignment Highlighted.

FINDINGS

5 SUBSURFACE CONDITIONS

CSI performed a total of five (5) soil test borings to explore the subsurface conditions along the alignment at approximate 1,000 foot intervals. In general our borings encountered residual soils and shale bedrock. Some isolated alluvial and lacustrine deposits were encountered at one of the locations. Boring for this project were numbered sequentially across eight separate project

sites. Specific borings for the Poplar Thicket Project site are labeled as boring numbers B-6 through B-10.

5A STRATA INFORMATION

The subsurface conditions encountered at the test boring locations are shown in the Test Boring Log in the Appendix. These records represent our interpretation of the subsurface conditions based on the field logs, visual examination of field samples by an engineer, and tests of the samples collected. The letters in parentheses following the soil descriptions are the soil classifications in general accordance with the Unified Soil Classification System (USCS). It should be noted that dashed stratification lines shown on the soil boring log represent approximate transitions between material types. In-situ stratum changes could occur gradually or at slightly different depths. Boring elevations were determined by Cardinal Engineering and supplied to CSI.

ASPHALT/TOPSOIL

Asphalt was encountered at the ground surface within boring B-6 to a depth of 3 inches. Topsoil was encountered the ground surface in the remaining boring locations and was measured to be about 3 to 4 inches thick.

PREVIOUSLY PLACED FILL

Previously placed fill was encountered within boring B-6 and B-7 to depths of about 3 feet below grade. The fill within boring B-6 was described to be gray gravel with sand and asphalt fragments. Within boring B-7 the fill was described to be brown lean call with trace asphalt fragments and roots. Standard Penetration Testing (SPT) N-Values were reported at 10 and 8 blows per foot (bpf) indicating a firm to stiff consistency. Laboratory testing of the sample recovered from Boring B-7 of 24.5 percent.

RESIDUUM

Residual soil deposits were encountered underlying underlying the fill material in boring B-6 and B-7 and underlying the surficial cover within borings B-8. And B-9. The residuum was described to be brown to brown and gray lean to fat clay with varying amounts of black oxide nodules, rock fragments, and silt. SPT N-Values ranged from 8 to more than 50 bpf indicating a firm to hard consistency, which generally increased with depth. Laboratory testing of a representative sample indicates a LL of 50 percent and a PI of 23 percent. Natural moisture contents ranged from 16.6 to 22.7 percent.

ALLUVIUM

Alluvial or water deposited soils were encountered in boring B-10 underlying the topsoil to a depth of about 5.5 feet below grade. The alluvium was described primarily to be brown to brown and gray fat clay with trace silt and roots. Standard Penetration (SPT) N-Values for the alluvial

soils were reported at 6 and 10 bpf, indicating a firm to stiff consistency. Laboratory testing of a the samples recovered indicated moisture contents of 24.9 and 28.3 percent.

LACUSTRINE

Lacustrine soil deposits were encountered underlying the alluvial soils within borings B-10 at a depth of 5.5 feet below grade. The lacustrine soils were generally described to be brown varved fat clay. SPT N-Values ranged from 7 to 9 bpf indicating a firm to stiff consistency. Laboratory testing of a representative sample indicates a Liquid Limit of 64 percent and a PI of 35 percent. Natural moisture contents were reported at 25.6 and 30.9 percent.

WEATHERED SHALE/LIMESTONE BEDROCK

Weathered shale bedrock samples were recovered from borings B-7, B-8, and B-9 at depths of about 5.5 feet below grade within each boring. The shale samples recovered were described to be light brown to gray highly weathered shale with varying amounts of limestone rock fragments. Auger refusal was not encountered at any boring locations.

For details of subsurface conditions encountered at a particular boring location please refer to the boring logs contained in Appendix A. It should be noted that our borings were drilled and sampled according to the procedures presented in the appendix. The boring locations shown in the appendix should be considered accurate only to the degree implied by the method used.

5B GROUNDWATER CONDITIONS

Groundwater was not encountered in any measurable quantities at our boring locations. In the Northern Kentucky area, water conditions that usually affect construction and performance of projects consist of trapped/perched water zones which occur in variable areas in the soil mass that may be present at the soil/bedrock interface and/or due to sand layers and seams throughout the soil. Perched water sources are often not linked to the more continuous relatively stable ground water table that typically occurs at greater depths. Site excavation activities or ground disturbance can expose these features and the resulting seepage can vary greatly. Groundwater issues are also dependent upon recent rainfall activity and surface and subsurface drainage patterns in the area that may change depending on climatic conditions.

6 LABORATORY TESTING

Laboratory tests were performed on selected recovered samples from the borings to provide recommendations for earthwork and to determine index properties of the soils. Details for the test methods and results are shown in the Appendix. Tests performed included:

- 11 Moisture Content Tests
- 2 Grain Size Analyses (-200 Sieve)
- 2 Atterberg Limits Tests

GEOTECHNICAL DISCUSSION AND RECOMMENDATIONS

7 DISCUSSION—GEOTECHNICAL ISSUES

Based on our experience with similar projects and the conditions observed during our subsurface exploration, we believe the site is suitable for the proposed construction, provided the recommendations outlined in this report are followed. The primary geotechnical concerns are:

- **SLOPE STABILITY**
- **SOFT ALLUVIAL SOILS**
- **GROUNDWATER INFILTRATION**
- **BEDROCK EXCAVATION**

7A SLOPE STABILITY

Based on our understanding, the proposed water main will be located within the right of way of Poplar Thicket Road and will be installed along the upslope side of the road, where possible. While no signs of major instability were observed along the alignment, the Kope Formation is present within portions of the site and some areas of creep were observed in sporadic areas along the slope. The Kope Formation is historically associated with slope instability in the Greater Cincinnati and Northern Kentucky area. Although slope movement cannot be completely eliminated, proper construction procedures are key to slope stability throughout the life of the pipeline. Section 8 below contains recommendations for proper pipe support related to both bearing conditions and potential lateral movement.

7B SOFT ALLUVIAL SOILS & GROUNDWATER INFILTRATION

Alluvial soils were encountered within an apparent ancient lakebed deposit in the area of B-10 and are also anticipated in low lying areas along banks and flood zone of the existing creek present near the intersection of Licking Pike and Poplar Thicket Road. Due to the nature of the deposition, alluvial soils are often soft, wet, and poorly consolidated. As such, they often make poor bearing materials and undercuts to competent soils should be anticipated within these areas. Additionally, within areas where alluvial soils are encountered, particularly along the existing creek and where granular soils are encountered, ground water infiltration should be anticipated within excavations. In most cases, the groundwater should be able to be removed from excavations using pumps or trench drains.

7C BEDROCK EXCAVATION

Within our borings, bedrock was encountered at depths as shallow as about 3 feet below grade. It is anticipated that average water line installation depths will be about 5 feet below existing grades. Thus, it is anticipated that excavations may extend 2 or more feet into bedrock. The bedrock in the

area is a mixture of interbedded limestone and shale and while the shale is often very soft and soil-like, but the limestone (although in thin beds) can be very hard and difficult to remove. Our borings, as well as site geology, suggest that the bedrock present is comprised of about 50 to 80 percent shale, with the remainder being limestone. The use of ripping equipment or a hoe-ram may be necessary if competent limestone is encountered during excavation.

8 WATER PIPE SUPPORT

With regards to pipe support, three different bearing conditions are anticipated along the proposed alignment. Along the majority of the alignment, weathered shale/limestone bedrock or stiff residual soils are expected. Within portions of the alignment that are in low lying areas along the creek, as well as a small section near the end of the alignment, alluvial and/or lacustrine soils are anticipated. Based upon subsurface information, these soils should provide adequate support. An exception may be in the creek crossing, where some additional undercutting may be necessary. Portions of the alignment which are located along slopes (Stations 6+00 to 30+00) should bear within the weathered shale bedrock a minimum of 12 inches in order to provide support for lateral movement of the overburden soils.

If soft soils are encountered, they should be undercut to the stiff or better materials and replaced with suitable fill material. Additionally, restrained joints and or thrust blocks may be required depending upon the field conditions. If questionable soils are encountered, CSI should be notified to evaluate and provide necessary recommendations. The figure below outlines expected soil conditions along the proposed alignment.

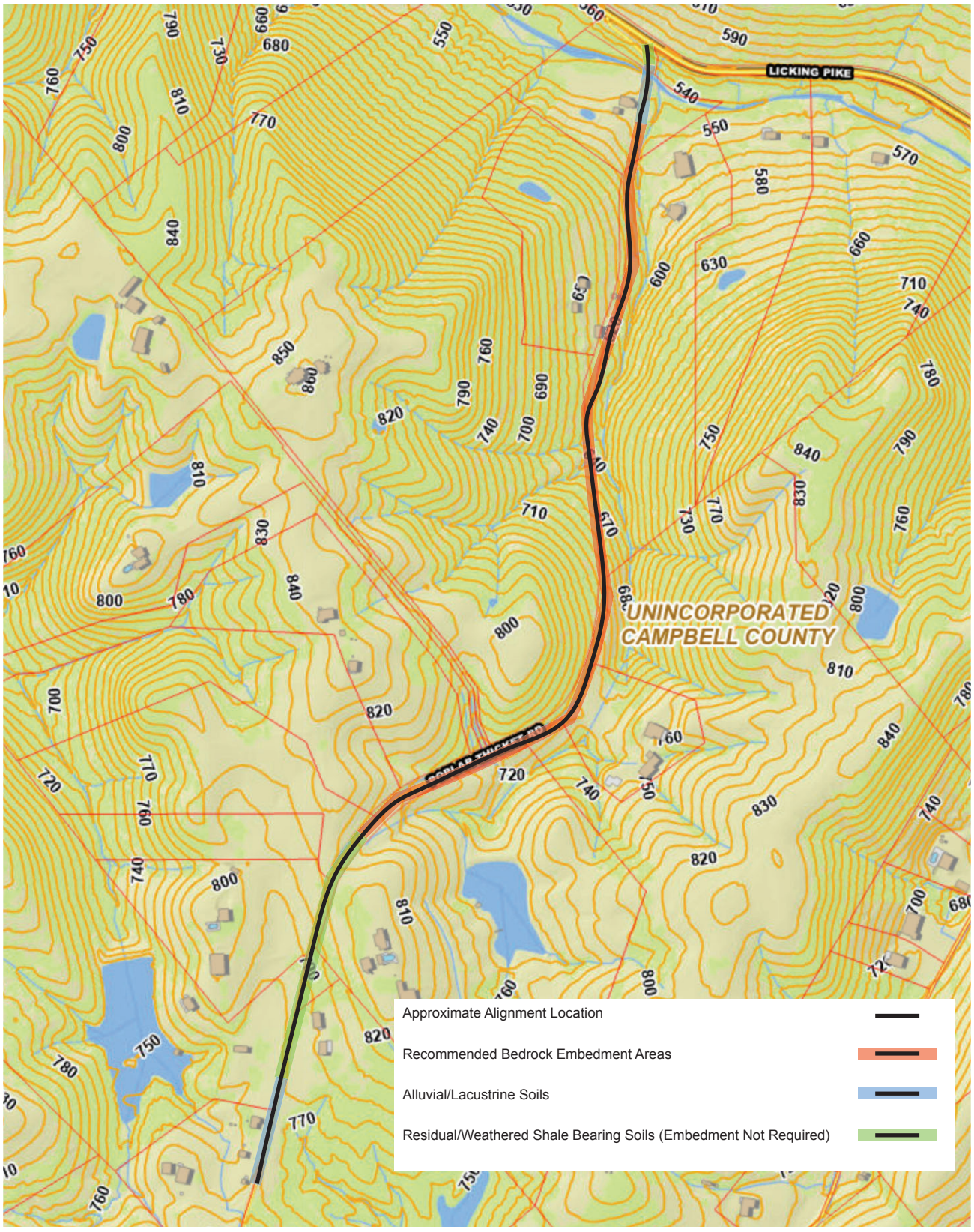


Figure 3: Alignment Bearing Conditions

9 THRUST RESTRAINT

Where changes in the direction of flow occur and/or where the water main cross sectional area changes, thrust forces will be generated in the direction of water flow. In some cases the thrust forces generated can be greater than the lateral resistance of the natural soils and/or backfill placed within utility trenches. To prevent separation and/or damage to the water main at these horizontal or vertical bends/joints, thrust block restraints (or restrained joints where thrust blocks are not applicable) will be required. Review of the provided plans indicate that thrust block are planned at several location along the proposed alignment. Based upon the conditions encountered, the thrust blocks appear to be suitable for the proposed alignment. Thrust blocks should bear on the undisturbed stiff or better residual soils or alluvial soils and can be designed using the soil parameters shown in the table below. For design of restrained joints, a frictional coefficient between pipe and soil of 0.3 should be used. Additionally, reinforced concrete encasement may also be used in place of restrained joints.

Table 3: Thrust Block Soil Parameters

Soil Group	Passive Earth Pressure Coefficient	Unit Weight (pcf)	Cohesion (psf)	Friction Angle (φ)
Residual Clay	Kp = 2.5	115	100	φ = 25
Alluvial/ Lacustrine	Kp = 2.2	105	0	φ = 22

10 EARTHWORK

We do not anticipate any structural fill to occur on the site with the exception of backfill of the trenches. The following recommendations are for backfill operations around open cut trenches for the alignment.

10A EXCAVATIONS

Normal earth excavation equipment should be suitable for excavations associated with the overburden soils. The weathered shale encountered on site should be able to be excavated with conventional equipment, however for the competent limestone layers encountered, ripping equipment or the use of a hoe-ram will most likely be necessary.

For below-grade excavations, the fill material as well as alluvial/lacustrine soils should be classified as OSHA Type C soils with a minimum slope excavation of 1.5H:1V. For excavations within the residual soils, the soil should be classified as an OSHA Type A soil with a minimum slope excavation of 0.75H:1V. T If soil types other than what has been mentioned above are encountered, CSI should be contacted to evaluate for stability.

10B TRENCH BACKFILL OPERATIONS

These materials are placed in more confined areas than mass earthwork materials or pavement materials. The following are general recommendations for backfill areas:

- Fill lift thicknesses will vary dependent on compaction equipment available and material types, but in no case should exceed 8 inches for clay and 12 inches for granular soils;
- For crushed stone/aggregate backfills in trenches and when using smaller compaction equipment the lift thickness should be based on the type of aggregate and equipment. For well-graded granular soils such as Dense Grade Aggregate, a thickness of 4 to 6 inches is typically required. If open-graded stone is used, the lift thickness may be able to be increased. This should be evaluated by the geotechnical engineer;
- Place cohesive fill (clay) in maximum 8-inch thick loose lifts. Granular soils may be placed in maximum 12 inch loose lifts provided properly sized equipment is used in the compaction process;
- Fill lifts should be compacted to at least 98 percent of the soil's maximum dry density (ASTM D 698) in areas beneath pavements and 92 percent in grassed areas.
- Maintain the moisture content of compacted fill between minus 2 and plus 2 percent of optimum moisture;
- Maximum particle size of the soil should be limited to half the lift thickness.;
- Density testing should be performed as a means to verify percent compaction and moisture content of the material as it is being placed and compacted;
- Density testing should be performed at a rate of at least 3 tests per lift; CSI should be retained to provide additional recommendations for backfill;

10C GENERAL NOTES

- For all earthwork operations, positive surface drainage is prudent to keep water from ponding on the surface and to assist in maintaining surface stability;
- The surface should be sealed prior to expected wet weather. This can usually be accomplished with rubber-tired construction equipment or a steel-drum roller;
- If any soil placement problems occur, CSI should be retained to provide additional recommendations, as needed.

11 SITE DRAINAGE

During construction, water should not be allowed to pond in excavations and fill areas or undercutting will likely be required. During the life of the project, slope the subgrade and other site features so that surface water flows away from the site structures.

For excavations during construction, most free water from the subsurface conditions could likely be removed via sump pumps and open channel flow (if possible) at or near the source of seepage. However, if normal dewatering measures prove insufficient, CSI should be retained to provide recommendations on the issue.

12 CREEK CROSSING

Provided plans indicate that the proposed water main will cross the existing Scaffold Creek utilizing a below grade crossing. Within the creek, plans indicate that the within the limits of the creek, the excavation below the bedrock-soil interface will be backfilled with concrete to match the existing creek bed configuration. While no borings were performed within the creek, borings B-6 and B-7 were performed near the creek. Within boring B-6 bedrock was not encountered but very stiff residual soils were noted at depths of about 8 feet which is commonly encountered directly above the bedrock surface. Within boring B-7 bedrock was encountered at depths of about 5.5 feet below grade. Based upon our experience in the area and the borings performed in the areas adjacent to the creek, we expect bedrock to be present at elevations of about 828 to 830 feet (near the creek bottom). In the event that bedrock is not encountered within the excavation, we recommend that the base of the excavation be extended to bedrock (or to a sufficient depth to prevent scour of the bearing soils) and backfilled with concrete.

13 NOTES ON THE REPORT AND RECOMMENDATIONS

We recommend that this complete report be provided to the various design team members, the contractors and the project Owner. Potential contractors should be informed of this report in the "Instructions to Bidders" section of the bid documents. A geotechnical exploration, such as the one we performed, used one boring to attempt to model the subsurface conditions at the site. Because no exploration contains complete data or a complete model, there is always a possibility that conditions between borings will be different from those at specific boring locations. Thus, it is possible that some subsurface conditions will not be as anticipated by the project team or contractor. If this report is included or referenced in the actual contract documents, it shall be explicitly understood that this report is for informational purposes only. CSI shall not be responsible for the opinions of, or conclusions drawn by others.

It has been our experience that the construction process often disturbs soil conditions and this process, no matter how much experience we use to anticipate construction methodology, is not completely predictable. Therefore, changes or modifications to our recommendations are likely needed due to these possible variances. Experienced CSI geotechnical personnel should be used to observe and document the construction procedures and the conditions encountered. Unanticipated conditions and inadequate procedures should be reported to the design team

along with timely recommendations to solve the problems created. We recommend that the Owner retain CSI to provide this service based upon our familiarity with the project, the subsurface conditions and the intent of our recommendations.

This report is based on the supplied project information, the subsurface conditions observed at the time of the report, and our experience with similar conditions. As such, it cannot be applied to other project sites, types, or combinations thereof. If the Project Information section in this report contains incorrect information or if additional information is available, you should convey the correct or additional information to us and retain us to review our recommendations. Our recommendations may then require modification.

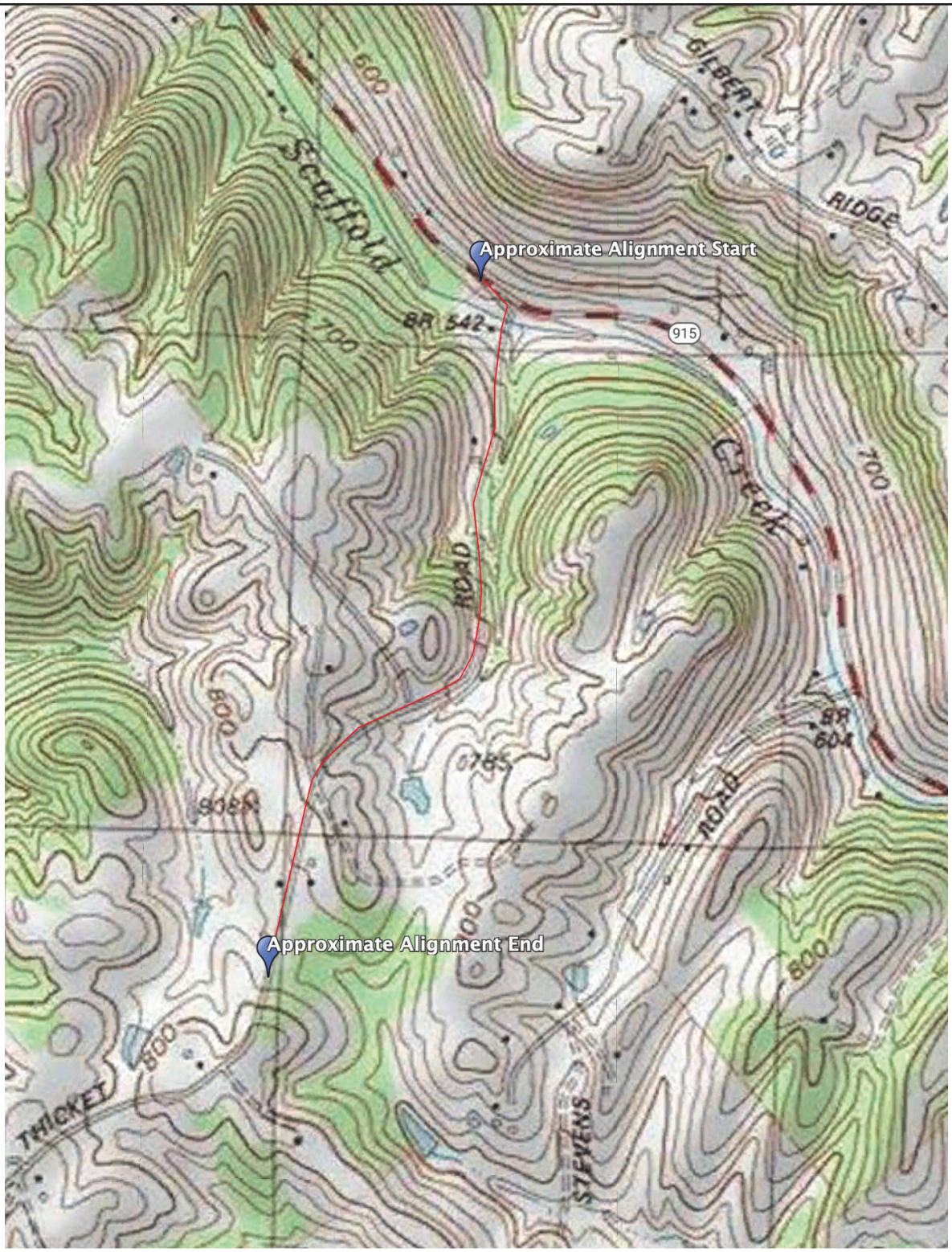
No section or portion of this report (including Appendix information) can be used as a stand alone article to make distinct changes or assumptions. The entire report and Appendix should be used together as one resource. We wish to remind you that our exploration services include storing the soil samples collected and making them available for inspection for 30 days. The soil samples are then discarded unless you request otherwise. Please inform us if you wish to keep any of the obtained samples.

While this report deals with samples of subsurface materials and some comments on water conditions at the site, no assessment of site environmental conditions or the presence of contaminants were performed.

We wish to remind you that our exploration services include storing the soil samples collected and making them available for inspection for 30 days. The samples are then discarded unless you request otherwise. Please inform us if you wish to keep any of the obtained samples.

APPENDIX A

SITE LOCATION PLAN
GEOTECHNICAL BORING INFORMATION SHEET
GENERAL BORING PROFILE
TEST BORING LOGS
FIELD TESTING PROCEDURES
LIQUID AND PLASTIC LIMITS REPORT
SUMMARY OF LABORATORY RESULTS
LABORATORY TESTING PROCEDURES



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ADAPTED FROM TOPOGRAPHIC MAPPING
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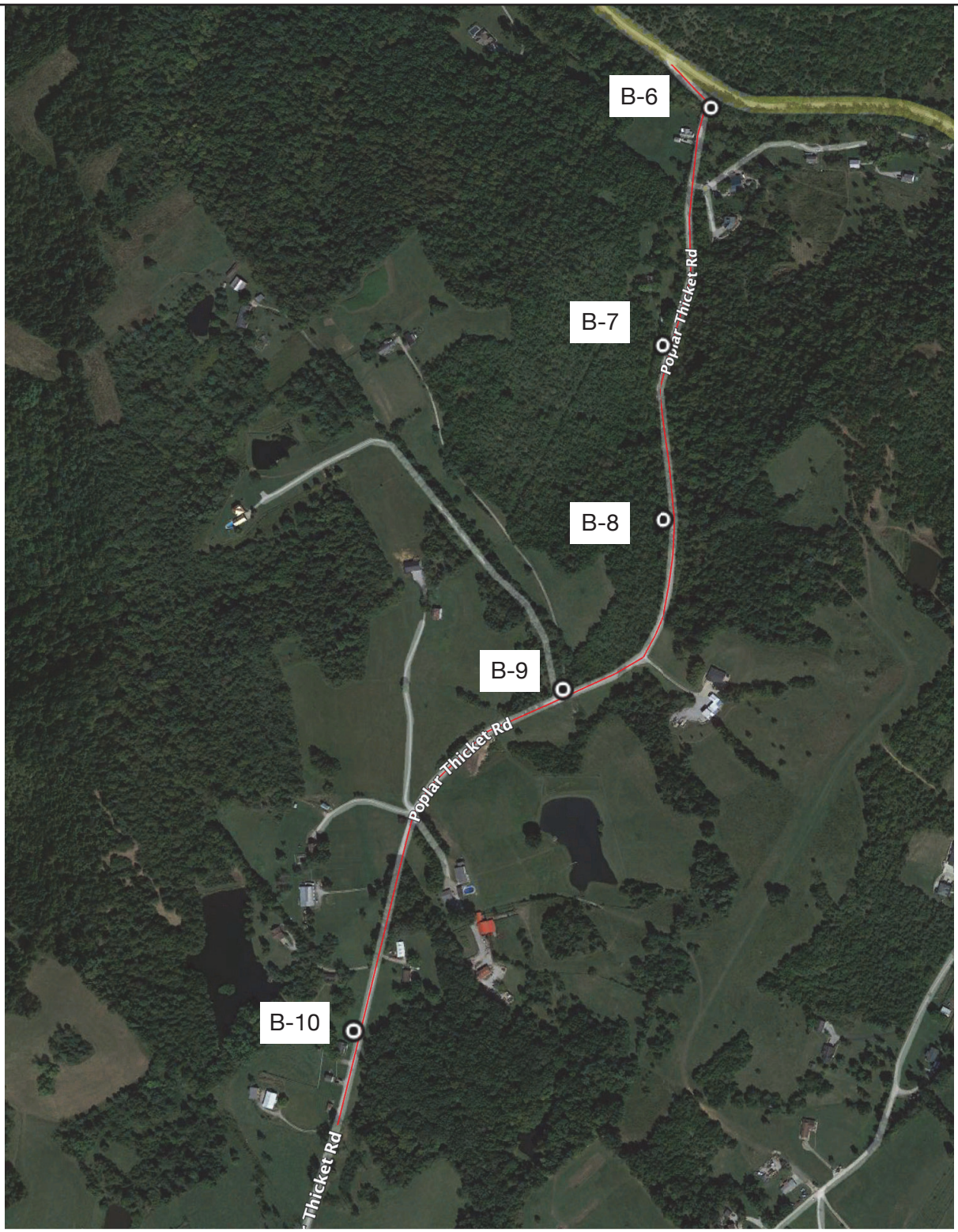
TITLE:	SITE LOCATION PLAN	PROJECT NO. CN230010	DRAWN BY: GD
PROJECT:	POPLAR THICKET ROAD NEW WATER MAIN ALEXANDRIA, KY	DATE: 5/14/23	CHECKED BY: JB
		NOT TO SCALE	DRAWING NO 1 OF 2



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TITLE:	BORING LOCATION PLAN	PROJECT NO. CN230010	DRAWN BY: GD
PROJECT:	POPLAR THICKET ROAD NEW WATER MAIN ALEXANDRIA, KY	DATE: 5/14/23	CHECKED BY: JB
		NOT TO SCALE	DRAWING NO 2 OF 2

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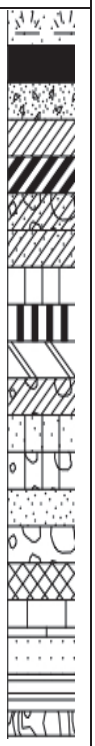
Geotechnical Boring Information Sheet

Sample Type Symbols

Splitspoon (SPT)
Shelby Tube
Grab
Rock Core
Auger Cuttings

Surface Symbols



Topsoil
Asphalt
Concrete
Lean Clay
Fat Clay
Glacial Till
Sandy Clay
Silt
Elastic Silt
Lean Clay to Fat Clay
Gravelly Clay
Sandy Silt
Gravelly Silt
Sand
Gravel
Fill
Limestone
Sandstone
Shale/Siltstone
Weathered Rock

Samples Strength Descriptors

Cohesive Soils:	**N**
Very Soft	0-1
Soft	2-4
Firm	5-8
Stiff	9-15
Very Stiff	16-30
Hard	31+
Non-cohesive Soils:	
Very Loose	0-4
Loose	5-10
Firm	11-20
Very Firm	21-30
Dense	30-50
Very Dense	51+

Definitions

SPT-"Splitspoon" or standard penetration test. Blow counts are number of drops required for a 140 lb hammer dropping 30 inches to drive the sampler 6 inches.

N-value is the addition of the last two intervals of the 18-inch sample.

Shelby tubes are often called "undisturbed samples". They are directly pushed into the ground, twisted, allowed to rest for a small period of time and then pulled out of the ground. Tops and bottoms are cleaned and then sealed.

Sample classification is done in general accordance with ASTM D2487 and 2488 using the Unified Soil Classification System (USCS) as a general guide.

Soil moisture descriptions are based on the recovered sample observations. The descriptors are dry, slightly moist, moist, very moist and wet. These are typically based on relative estimates of the moisture condition of a visual estimation of the soils optimum moisture content (EOMC). Dry is almost in a "dusty" condition usually 6 or more percent below EOMC. Slightly moist is from about 6 to 2 percent below EOMC at a point at which the soil color does not readily change with the addition of water. Moist is usually 2 percent below to 2 percent above EOMC and the point at which the soil will tend to begin forming "balls" under some pressure in the hand. Very moist is usually from about 2 percent to 6 percent above EOMC and also the point at which it's often considered "muddy". Wet soil is usually 6 or more percent above EOMC and often contains free water or the soil is in a saturated state.

Silt or Clay is defined at material finer than a standard #200 US sieve (<0.075mm) Sand is defined as material between the size of #200 sieve up to #4 sieve. Gravel is from #4 size sieve material to 3". Cobbles are from 3" to 12". Boulders are over 12".

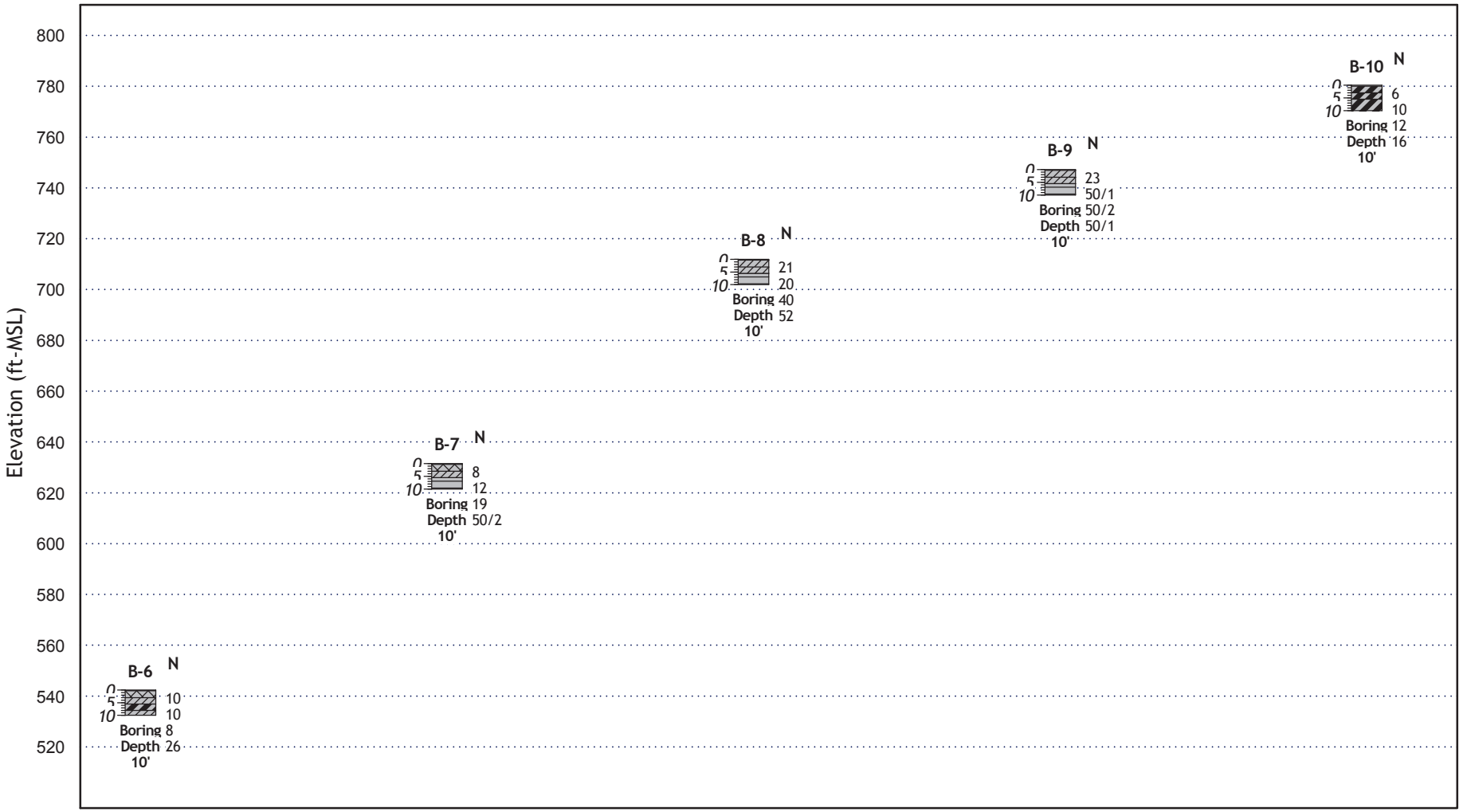
Rock hardness is classified as follows:

Very Soft:	Easily broken by hand pressure
Soft:	Ends can be broken by hand pressure; easily broken with hammer
Medium:	Ends easily broken with hammer; middle requires moderate blow
Hard:	Ends require moderate hammer blow; middle requires several blows
Very Hard:	Many blows with a hammer required to break core

Rock Quality Designation (RQD) is defined as total combined length of 4" or longer pieces of core divided by the total core run length; defined in percentage.

Water or cave-in observed in borings is at completion of drilling each boring unless otherwise noted.

Strata lengths shown on borings represents a rough estimate. Transition may be more abrupt or gradual. Soil borings are representative of that estimated location at that time and are based on recovered samples. Conditions may be different between borings and between sample intervals. Boring information is not to be considered stand alone but should be taken in context with comments and information in the geotechnical report and the means by which the borings are logged, sampled and drilled.



SOIL TYPES

(Shown in Graphic Log)

- Fill
- Asphalt
- Topsoil
- Gravel
- Sand
- Silt
- Lean Clay
- Fat Clay
- Silty Sand
- Clayey Sand
- Sandy Silt
- Clayey Silt
- Sandy Clay
- Silty Clay
- Limestone
- Sandstone
- Siltstone
- Shale

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Northern Kentucky
Water
CN230010

BORING PROFILE

Fig. 1

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Fax: 888.792.3121

TEST BORING LOG

CLIENT: Cardinal Engineering
PROJECT NAME: Northern Kentucky Water
PROJECT LOCATION: Alexandria, KY

BORING #: B-6
JOB #: CN230010
LOGGED BY: CG
APPROVED BY: GD

DRILLING and SAMPLING INFORMATION

Date Started	2/27/23	Contractor	CSI
Date Completed	3/1/23	Boring Size	4 in.
Drill Rig	B-57 Mobile	Boring Method	SFA
Weather	Cloudy, 40s-50s	Hammer Type	Automatic

SOIL CLASSIFICATION

SURFACE ELEVATION: 542.4

Elev. (ft)	Depth Scale	Water Level	Soil Classification	Sample No.	Sample Type	Sample Graphics	Recovery (in)	Standard Penetration Test Blows per 6" [*N-Value*] *blows/foot*	Qu-tsf Unconfined (Pocket Pen.) Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plasticity Index (PI)	Percent Passing #200 Sieve	Remarks
542			ASPHALT- 3 INCHES											
			FILL : Gravel with sand and asphalt - dry, stiff	1	SS		6	5-7-3 [*10*]						
540	2													
			Brown LEAN CLAY (CL) with trace silt, and trace roots [Residuum] - moist, stiff	2	SS		9	3-4-6 [*10*]		16.6				
538	4													
			Brown and gray FAT CLAY (CH) with trace sand, trace roots and trace black oxide nodules [Residuum] - moist, firm	3	SS		10	3-4-4 [*8*]		22.7	50	23	92	
536	6													
			Brown LEAN CLAY (CL) with rock fragments and trace silt [Residuum] - moist, very stiff	4	SS		10	8-5-21 [*26*]		16.9				
534	8													
			Boring terminated at 10.0 feet No refusal											
532	10													
530	12													
528	14													

Depth to Groundwater
- Noted on Drilling Tools _____ ft.
- At Completion _____ ft.
- After _____ hours _____ ft.
- Cave Depth _____ ft.

Sample Type
- SPT- Standard Penetration Test
- SS- Split Spoon
- ST- Shelby Tube
- RC- Rock Core
- CU- Auger Cuttings

Boring Method
- HSA- Hollow Stem Augers
- CFA- Continuous Flight Augers
- MD- Mud Drilling

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TEST BORING LOG

CLIENT: Cardinal Engineering
PROJECT NAME: Northern Kentucky Water
PROJECT LOCATION: Alexandria, KY

BORING #: B-7
JOB #: CN230010
LOGGED BY: CG
APPROVED BY: GD

DRILLING and SAMPLING INFORMATION

Date Started	2/27/23	Contractor	CSI
Date Completed	3/1/23	Boring Size	4 in.
Drill Rig	B-57 Mobile	Boring Method	SFA
Weather	Cloudy, 40s-50s	Hammer Type	Automatic

SOIL CLASSIFICATION

SURFACE ELEVATION: 631.5

TOPSOIL - 3 INCHES

Possible FILL: Brown LEAN to FAT CLAY (CL/CH) with roots and trace asphalt - moist, firm

Brown LEAN CLAY (CL) with little black oxide nodules and trace silt [Residuum] - dry, stiff

Brown and gray highly weathered SHALE with rock fragments - dry, soft

Boring terminated at 10.0 feet

No refusal

TEST DATA

Elev. (ft)	Depth Scale	Sample No.	Sample Type	Recovery (in)	Standard Penetration Test Blows per 6" [*N-Value*] *blows/foot*	Moisture Content %
630	2	1	SS	3	2-4-4 [*8*]	24.5
628	4	2	SS	16	3-5-7 [*12*]	18.3
626	6	3	SS	14	3-8-11 [*19*]	
624	8					
622	10	4	SS	2	50/2-- [*50/2*]	
620	12					
618	14					

Qu-tsf Unconfined (Pocket Pen.) Compressive Strength
Liquid Limit (LL)
Plasticity Index (PI)
Percent Passing #200 Sieve
Remarks

Depth to Groundwater
- Noted on Drilling Tools _____ ft.
- At Completion _____ ft.
- After _____ hours _____ ft.
- Cave Depth _____ ft.

Sample Type
- SPT- Standard Penetration Test
- SS- Split Spoon
- ST- Shelby Tube
- RC- Rock Core
- CU- Auger Cuttings

Boring Method
- HSA- Hollow Stem Augers
- CFA- Continuous Flight Augers
- MD- Mud Drilling

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Fax: 888.792.3121

TEST BORING LOG

CLIENT: Cardinal Engineering
PROJECT NAME: Northern Kentucky Water
PROJECT LOCATION: Alexandria, KY

BORING #: B-8
JOB #: CN230010
LOGGED BY: CG
APPROVED BY: GD

DRILLING and SAMPLING INFORMATION

Date Started	2/27/23	Contractor	CSI
Date Completed	3/1/23	Boring Size	4 in.
Drill Rig	B-57 Mobile	Boring Method	SFA
Weather	Cloudy, 40s-50s	Hammer Type	Automatic

SOIL CLASSIFICATION

SURFACE ELEVATION: 711.9

TOPSOIL - 3 INCHES

Brown and gray LEAN CLAY (CL) with rock fragments [Residuum] - dry, very stiff

Brown LEAN CLAY (CL) with silt and trace rock fragments [Residuum] - moist, very stiff

Brown highly weathered SHALE with trace silt - dry, soft

Boring terminated at 10.0 feet

No refusal

TEST DATA

Sample No.	Sample Type	Recovery (in)	Standard Penetration Test Blows per 6" [*N-Value*] *blows/foot*	Moisture Content %
1	SS	12	5-8-13 [*21*]	18.8
2	SS	13	5-8-12 [*20*]	
3	SS	18	5-11-29 [*40*]	
4	SS	16	13-17-35 [*52*]	

Depth to Groundwater
- Noted on Drilling Tools _____ ft.
- At Completion _____ ft.
- After _____ hours _____ ft.
- Cave Depth _____ ft.

Sample Type
- SPT- Standard Penetration Test
- SS- Split Spoon
- ST- Shelby Tube
- RC- Rock Core
- CU- Auger Cuttings

Boring Method
- HSA- Hollow Stem Augers
- CFA- Continuous Flight Augers
- MD- Mud Drilling

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Fax: 888.792.3121

TEST BORING LOG

CLIENT: Cardinal Engineering
PROJECT NAME: Northern Kentucky Water
PROJECT LOCATION: Alexandria, KY

BORING #: B-9
JOB #: CN230010
LOGGED BY: CG
APPROVED BY: GD

DRILLING and SAMPLING INFORMATION

Date Started	2/27/23	Contractor	CSI
Date Completed	3/1/23	Boring Size	4 in.
Drill Rig	B-57 Mobile	Boring Method	SFA
Weather	Cloudy, 40s-50s	Hammer Type	Automatic

SOIL CLASSIFICATION

SURFACE ELEVATION: 747.2

TOPSOIL - 3 INCHES

Brown and gray mottled LEAN CLAY (CL) with rock fragments and trace silt [Residuum] - slighty moist, very stiff

Brown and gray LEAN CLAY (CL) with rock fragments and trace black oxide nodules [Residuum] - moist, hard

Brown and gray highly weathered SHALE with trace rock fragments and trace silt - dry, soft

Boring terminated at 10.0 feet

No refusal

TEST DATA

Elev. (ft)	Depth Scale	Water Level	Sample No.	Sample Type	Sample Graphics	Recovery (in)	Standard Penetration Test Blows per 6" [*N-Value*] *blows/foot*	Qu-tsf Unconfined (Pocket Pen.) Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plasticity Index (PI)	Percent Passing #200 Sieve	Remarks
746	2		1	SS		9	3-8-15 [*23*]		20.8				
744	4		2	SS		8	5-10-50/1 [*50/1*]						
742	6		3	SS		6	8-50/2- [*50/2*]						
740	8		4	SS		1	50/1-- [*50/1*]						
738	10												
736	12												
734	14												

Depth to Groundwater
- Noted on Drilling Tools _____ ft.
- At Completion _____ ft.
- After _____ hours _____ ft.
- Cave Depth _____ ft.

Sample Type
- SPT- Standard Penetration Test
- SS- Split Spoon
- ST- Shelby Tube
- RC- Rock Core
- CU- Auger Cuttings

Boring Method
- HSA- Hollow Stem Augers
- CFA- Continuous Flight Augers
- MD- Mud Drilling

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TEST BORING LOG

CLIENT: Cardinal Engineering
PROJECT NAME: Northern Kentucky Water
PROJECT LOCATION: Alexandria, KY

BORING #: B-10
JOB #: CN230010
LOGGED BY: CG
APPROVED BY: GD

DRILLING and SAMPLING INFORMATION

Date Started	2/27/23	Contractor	CSI
Date Completed	3/1/23	Boring Size	4 in.
Drill Rig	B-57 Mobile	Boring Method	SFA
Weather	Cloudy, 40s-50s	Hammer Type	Automatic

SURFACE ELEVATION: 780.4

Elev. (ft)	Depth Scale	Water Level	SOIL CLASSIFICATION	Sample No.	Sample Type	Sample Graphics	Recovery (in)	Standard Penetration Test Blows per 6" [*N-Value*] *blows/foot*	Qu-tsf Unconfined (Pocket Pen.) Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plasticity Index (PI)	Percent Passing #200 Sieve	Remarks
780			TOPSOIL - 4 INCHES											
			Brown and gray mottled FAT CLAY (CH) with trace roots and trace silt [Alluvium] - moist, firm	1	SS		18	2-2-4 [*6*]		28.3				
778	2													
			Brown FAT CLAY (CH) with trace roots and trace silt [Alluvium] - moist, stiff	2	SS		16	3-4-6 [*10*]		24.9				
776	4													
			Brown FAT CLAY (CH) with some silt and trace rock fragments [Lacustrine] - moist, stiff	3	SS		12	3-5-7 [*12*]		25.6				
774	6													
	8			4	SS		18	3-5-11 [*16*]		30.9	64	35	100	
772														
770	10		Boring terminated at 10.0 feet No refusal											
768	12													
766	14													

Depth to Groundwater
- Noted on Drilling Tools _____ ft.
- At Completion _____ ft.
- After _____ hours _____ ft.
- Cave Depth _____ ft.

Sample Type
- SPT- Standard Penetration Test
- SS- Split Spoon
- ST- Shelby Tube
- RC- Rock Core
- CU- Auger Cuttings

Boring Method
- HSA- Hollow Stem Augers
- CFA- Continuous Flight Augers
- MD- Mud Drilling

FIELD TESTING PROCEDURES

Field Operations: The general field procedures employed by CSI are summarized in ASTM D 420 which is entitled "Investigating and Sampling Soils and Rocks for Engineering Purposes." This recommended practice lists recognized methods for determining soil and rock distribution and ground water conditions. These methods include geophysical and in situ methods as well as borings.

Borings are drilled to obtain subsurface samples using one of several alternate techniques depending upon the subsurface conditions. These techniques are:

a. Continuous 2-1/2 or 3-1/4 inch I.D. hollow stem augers;

b. Wash borings using roller cone or drag bits (mud or water);

c. Continuous flight augers (ASTM D 1425).

These drilling methods are not capable of penetrating through material designated as "refusal materials." Refusal, thus indicated, may result from hard cemented soil, soft weathered rock, coarse gravel or boulders, thin rock seams, or the upper surface of sound continuous rock. Core drilling procedures are required to determine the character and continuity of refusal materials.

The subsurface conditions encountered during drilling are reported on a field test boring record by the chief driller. The record contains information concerning the boring method, samples attempted and recovered, indications of the presence of various materials such as coarse gravel, cobbles, etc., and observations between samples. Therefore, these boring records contain both factual and interpretive information. The field boring records are on file in our office.

The soil and rock samples plus the field boring records are reviewed by a geotechnical engineer. The engineer classifies the soils in general accordance with the procedures outlined in ASTM D 2488 and prepares the final boring records which are the basis for all evaluations and recommendations.

The final boring records represent our interpretation of the contents of the field records based on the results of the engineering examinations and tests of the field samples. These records depict subsurface conditions at the specific locations and at the particular time when drilled. Soil conditions at other locations may differ from conditions occurring at these boring locations. Also, the passage of time may result in a change in the subsurface soil and ground water conditions at these boring locations. The lines designating the interface between soil or refusal materials on the records and on profiles represent approximate boundaries. The transition between materials may be gradual. The final boring records are included with this report.

The detailed data collection methods using during this study are discussed on the following pages.

Soil Test Borings: Soil test borings were made at the site at locations shown on the attached Boring Plan. Soil sampling and penetration testing were performed in accordance with ASTM D 1586.

The borings were made by mechanically twisting a hollow stem steel auger into the soil. At regular intervals, the drilling tools were removed and soil samples obtained with a standard 1.4 inch I.D., 2 inch O.D., split tube sampler. The sampler was first seated 6 inches to penetrate any loose cuttings, then driven an additional foot with blows of a 140-pound hammer falling 30 inches. The number of hammer blows required to drive the sampler the final foot was recorded and is designated the "penetration resistance". The penetration resistance, when properly evaluated, is an index to the soil strength and foundation supporting capability.

Representative portions of the soil samples, thus obtained, were placed in glass jars and transported to the laboratory. In the laboratory, the samples were examined to verify the driller's field classifications. Test Boring Records are attached which graphically show the soil descriptions and penetration resistances.

Core Drilling: Refusal materials are materials that cannot be penetrated with the soil drilling methods employed. Refusal, thus indicated, may result from hard cemented soil, soft weathered rock, coarse gravel or boulders, thin rock seams or the upper surface of sound continuous rock. Core drilling procedures are required to determine the character and continuity of refusal materials.

Prior to coring, casing is set in the drilled hole through the overburden soils, if necessary, to keep the hole from caving. Refusal materials are then cored according to ASTM D 2113 using a diamond-studded bit fastened to the

end of a hollow double tube core barrel. This device is rotated at high speeds, and the cuttings are brought to the surface by circulating water. Core samples of the material penetrated are protected and retained in the swivel-mounted inner tube. Upon completion of each drill run, the core barrel is brought to the surface, the core recovered is measured, the samples are removed and the core is placed in boxes for storage.

The core samples are returned to our laboratory where the refusal material is identified and the percent core recovery and rock quality designation is determined by a soils engineer or geologist. The percent core recovery is the ratio of the sample length obtained to the depth drilled, expressed as a percent. The rock quality designation (RQD) is obtained by summing up the length of core recovered, including only the pieces of core which are four inches or longer, and dividing by the total length drilled. The percent core recovery and RQD are related to soundness and continuity of the refusal material. Refusal material descriptions, recoveries, and RQDs are shown on the "Test Boring Records".

Hand Auger Borings and Dynamic Cone Penetration Testing: Hand auger borings are performed manually by CSI field personnel. This consists of manually twisting hand auger tools into the subsurface and extracting “grab” or baggie samples at intervals determined by the project engineer. At the sample intervals, dynamic cone penetration (DCP) testing is performed. This testing involves the manual raising and dropping of a 20 pound hammer, 18 inches. This “driver” head drives a solid-1¾ inch diameter cone into the ground. DCP “counts” are the number of drops it takes for the hammer to drive three 1¾ inch increments, recorded as X-Y-Z values.

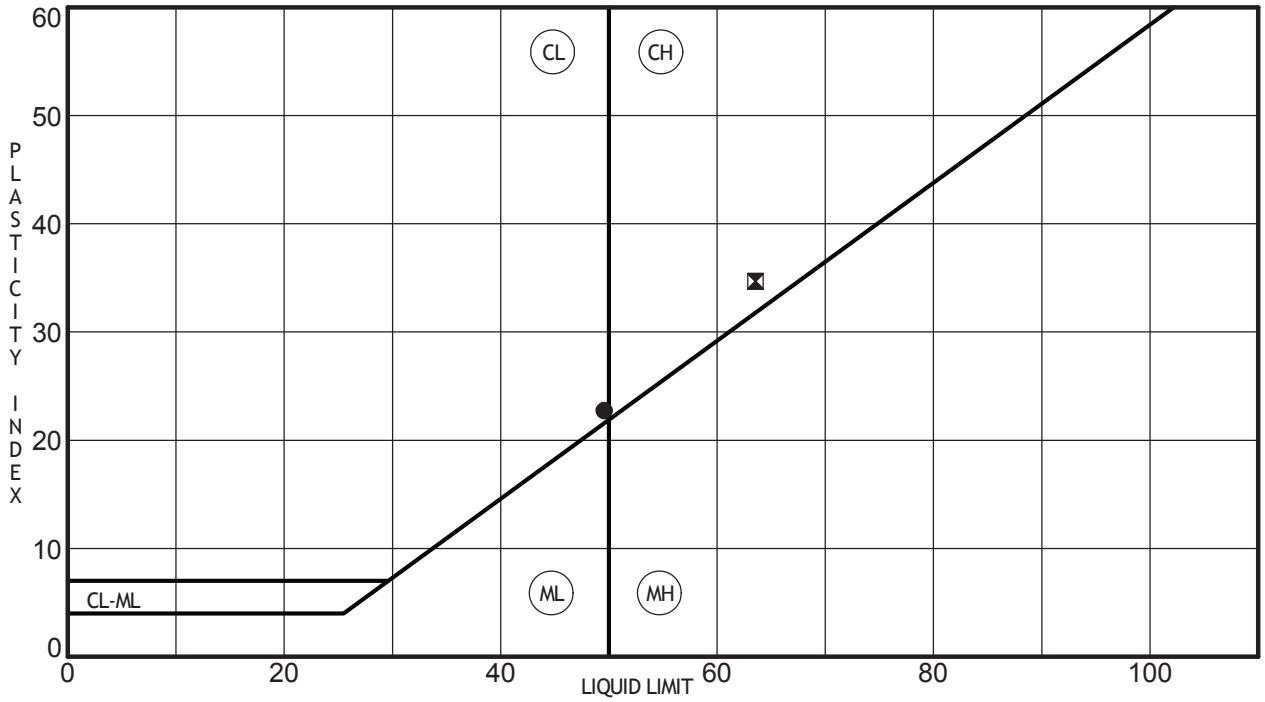
Test Pits: Test pits are excavated by the equipment available, often a backhoe or trackhoe. The dimensions of the test pits are based on the equipment used and the power capacity of the equipment. Samples are taken from the spoils of typical buckets of the excavator and sealed in jars or “Ziplock” baggies. Dynamic Cone Penetration or hand probe testing is often performed in the upper few feet as OSHA standards allow. Refusal is deemed as the lack of advancement of the equipment with reasonable to full machine effort.

Water Level Readings: Water table readings are normally taken in conjunction with borings and are recorded on the "Test Boring Records". These readings indicate the approximate location of the hydrostatic water table at the time of our field investigation. Where impervious soils are encountered (clayey soils) the amount of water seepage into the boring is small, and it is generally not possible to establish the location of the hydrostatic water table through water level readings. The ground water table may also be dependent upon the amount of precipitation at the site during a particular period of time. Fluctuations in the water table should be expected with variations in precipitation, surface run-off, evaporation and other factors.

The time of boring water level reported on the boring records is determined by field crews as the drilling tools are advanced. The time of boring water level is detected by changes in the drilling rate, soil samples obtained, etc. Additional water table readings are generally obtained at least 24 hours after the borings are completed. The time lag of at least 24 hours is used to permit stabilization of the ground water table which has been disrupted by the drilling operations. The readings are taken by dropping a weighted line down the boring or using an electrical probe to detect the water level surface.

Occasionally the borings will cave-in, preventing water level readings from being obtained or trapping drilling water above the caved-in zone. The cave-in depth is also measured and recorded on the boring records.

Liquid and Plastic Limits Test Report



	Boring	Depth (ft)	LL	PL	PI	Water Content	% < #40	% < #200	USCS	Description
●	B-6	6.0	50	27	23	22.7		92		FAT CLAY(CH)
⊠	B-10	8.5	64	29	35	30.9		100		FAT CLAY(CH)

CSI of Cincinnati
11785 Highway Drive
Cincinnati, OH 45241
Phone: 513.252.2059
Fax: 888.792.3121

PROJECT INFORMATION

Client: Cardinal Engineering
Project Name: Northern Kentucky Water
Project Number: CN230010
Project Location: Alexandria, KY

LABORATORY TESTING PROCEDURES

Soil Classification: Soil classifications provide a general guide to the engineering properties of various soil types and enable the engineer to apply past experience to current problems. In our investigations, samples obtained during drilling operations are examined in our laboratory and visually classified by an engineer. The soils are classified according to consistency (based on number of blows from standard penetration tests), color and texture. These classification descriptions are included on our "Test Boring Records."

The classification system discussed above is primarily qualitative and for detailed soil classification two laboratory tests are necessary: grain size tests and plasticity tests. Using these test results the soil can be classified according to the AASHTO or Unified Classification Systems (ASTM D 2487). Each of these classification systems and the in-place physical soil properties provides an index for estimating the soil's behavior. The soil classification and physical properties obtained are presented in this report.

Rock Classification: Rock classifications provide a general guide to the engineering properties of various rock types and enable the engineer to apply past experience to current situations. In our explorations, rock core samples obtained during drilling operations are examined in our laboratory and visually classified by an engineer. The rock cores are classified according to relative hardness and RQD (see Guide to Rock Classification Terminology), color, and texture. These classification descriptions are included on our Test Boring Records.

Atterberg Limits: Portions of the samples are taken for Atterberg Limits testing to determine the plasticity characteristics of the soil. The plasticity index (PI) is the range of moisture content over which the soil deforms as a plastic material. It is bracketed by the liquid limit (LL) and the plastic limit (PL). The liquid limit is the moisture content at which the soil becomes sufficiently "wet" to flow as a heavy viscous fluid. The plastic limit is the lowest moisture content at which the soil is sufficiently plastic to be manually rolled into tiny threads. The liquid limit and plastic limit are determined in accordance with ASTM D 4318.

Moisture Content: The Moisture Content is determined according to ASTM D 2216.

Percent Finer Than 200 Sieve: Selected samples of soils are washed through a number 200 sieve to determine the percentage of material less than 0.074 mm in diameter.

Rock Strength Tests: To obtain strength data for rock materials encountered, unconfined compression tests are performed on selected samples. In the unconfined compression test, a cylindrical portion of the rock core is subjected to increasing axial load until it fails. The pressure required to produce failure is recorded, corrected for the length to diameter ratio of the core and reported.

Compaction Tests: Compaction tests are run on representative soil samples to determine the dry density obtained by a uniform compactive effort at varying moisture contents. The results of the test are used to determine the moisture content and unit weight desired in the field for similar soils. Proper field compaction is necessary to decrease future settlements, increase the shear strength of the soil and decrease the permeability of the soil.

The two most commonly used compaction tests are the Standard Proctor test and the Modified Proctor test. They are performed in accordance with ASTM D 698 and D 1557, respectively. Generally, the Standard Proctor compaction test is run on samples from building or parking areas where small compaction equipment is anticipated. The Modified compaction test is generally performed for heavy structures, highways, and other areas where large compaction equipment is expected. In both tests a representative soil sample is placed in a mold and compacted with a compaction hammer. Both tests have three alternate methods.

Test	Method	Hammer Wt./Fall	Mold Diam.	Run on Material Finer Than	No. of Layers	No. of Blows/ Layer
Standard	A	5.5 lb./12"	4"	No. 4 sieve	3	25
D 698	B	5.5 lb./12"	4"	3/8" sieve	3	25
	C	5.5 lb./12"	6"	3/4" sieve	3	56

Test	Method	Hammer Wt./Fall	Mold Diam.	Run on Material Finer Than	No. of Layers	No. of Blows/ Layer
Modified	A	10 lb./18"	4"	No. 4 sieve	5	25
D 1557	B	10 lb./18"	4"	3/8" sieve	5	25
	C	10 lb./18"	6"	3/4" sieve	5	56

The moisture content and unit weight of each compacted sample is determined. Usually 4 to 5 such tests are run at different moisture contents. Test results are presented in the form of a dry unit weight versus moisture content curve. The compaction method used and any deviations from the recommended procedures are noted in this report.

Laboratory California Bearing Ratio Tests: The California Bearing Ratio, generally abbreviated to CBR, is a punching shear test and is a comparative measure of the shearing resistance of a soil. It provides data that is a semi-empirical index of the strength and deflection characteristics of a soil. The CBR is used with empirical curves to design pavement structures.

A laboratory CBR test is performed according to ASTM D 1883. The results of the compaction tests are utilized in compacting the test sample to the desired density and moisture content for the laboratory California Bearing Ratio test. A representative sample is compacted to a specified density at a specified moisture content. The test is performed on a 6-inch diameter, 4.58-inch-thick disc of compacted soil that is confined in a cylindrical steel mold. The sample is compacted in accordance with Method C of ASTM D 698 or D 1557.

CBR tests may be run on the compacted samples in either soaked or unsoaked conditions. During testing, a piston approximately 2 inches in diameter is forced into the soil sample at the rate of 0.05 inch per minute to a depth of 0.5 inch to determine the resistance to penetration. The CBR is the percentage of the load it takes to penetrate the soil to a 0.1 inch depth compared to the load it takes to penetrate a standard crushed stone to the same depth. Test results are typically shown graphically.

Geotechnical Report

NKY Water District -
Pond Creek Road Water Main

Prepared for

Cardinal Engineering
1 Moock Road #1
Wilder, Kentucky 41071

June 28, 2023

Project No. CN230010

June 28, 2023

Mr. Kevin Hanson
Cardinal Engineering
1 Moock Road #1
Wilder, Kentucky 41071

Subject: Geotechnical Report for
NKY Water District - Pond Creek Road Water Main
Alexandria, Kentucky
CSI Project No. CN230010

Dear Mr. Hanson,

Consulting Services Incorporated of Cincinnati (CSI) is pleased to present our geotechnical report for the NKY Water District - Pond Creek Road Water Main project in Alexandria, Kentucky. We provided our services in general accordance the CSI Proposal 8227, dated December 12, 2022.

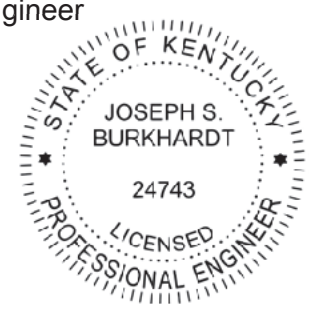
Our report represents information provided to us, readily available published data relevant to the site and site area, our observations and subsurface conditions encountered and our opinion of primary geotechnical conditions (discussion and recommendations) affecting site work and foundation design for the project.

Again, we greatly appreciate the opportunity to provide our services and look forward to working with you and the project team on this (and hopefully) more projects in the future. Please do not hesitate to contact us for questions or comments about the information contained herein.

Cordially,

Graham Duncan, EIT
Staff Engineer

Joseph S. Burkhardt, P.E.
Principal Geotechnical Engineer



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INTRODUCTION

1 SCOPE OF THE GEOTECHNICAL EXPLORATION

As proposed, CSI conducted a geotechnical exploration for the proposed 8” water main extension along Pond Creek Road in Alexandria, Kentucky. Our services included a review of the project information provided, conducting a subsurface exploration that utilized soil borings to obtain samples for modeling the soil conditions along the proposed route, an analysis of data and information obtained, evaluation of bearing conditions for the water line and recommendations for backfill of the pipe.

2 SITE AND PROJECT INFORMATION

The project will include the installation of a new 8” water main along Pond Creek Road in Alexandria, Kentucky. As part of this report, CSI has reviewed a plan set titled ‘Subdistrict HB Water main Extension Project’ dated 1-11-23. CSI’s understanding of the project is outlined in the tables below.

Table 1: Site Information

Item	Description
Site Location	The site is located along Pond Creek Road in Alexandria, Kentucky from the intersection of Pond Creek Road and Visalia Road to 10365 Pond Creek Road.
Length of Improvement	The water line will be approximately 1,600 feet in length
Surrounding Area	The surrounding area is characterized by sparse residential developments in all directions. The Licking River is located about 1,000 feet to the southwest of Pond Creek Road
Existing Conditions	Existing road way is asphalt paved and is 20 foot wide edge to edge. A small creek tributary is present near the intersection of Pond Creek Road and Visalia Road. The stream crosses under Pond Creek Road via an approximately 24 inch diameter HDPE pipe with an invert of 513.32 feet.

Table 2: Project Information

Item	Description
Site Layout	See Boring Location Plan
Proposed Structure(s)	An approximately 1,600 foot long 8 inch of new water main and intermittent fire hydrants.
Water Main Construction	Based on our understanding the water main will be constructed within the road right-of-ways at a depth of about 5 feet below grade. The water main will be installed along the northern side of the road along the initial portion of the alignment, and will cross to the southern side of the roadway near the address 10529 Pond Creek Road. Provided plans indicate that a jack and bore crossing will be utilized to cross Pond Creek Road

3 AREA/SITE INFORMATION

3A AREA TOPOGRAPHY / PHYSIOGRAPHY

The site is located within the Outer Blue Grass Region of northern Kentucky. This area is characterized by Ordovician dolomites, limestones and calcareous shales, thin pre-Wisconsinan drift, loamy soils and low to moderately high relief. Published mapping reviewed indicates the elevations in the site vicinity range from about 500 feet near the intersection of Pond Creek Road and Visalia Road to about 520 feet near the end of the alignment at 10365 Pond Creek Road. Below is a figure of the location of the site with respect to the regional physiography.

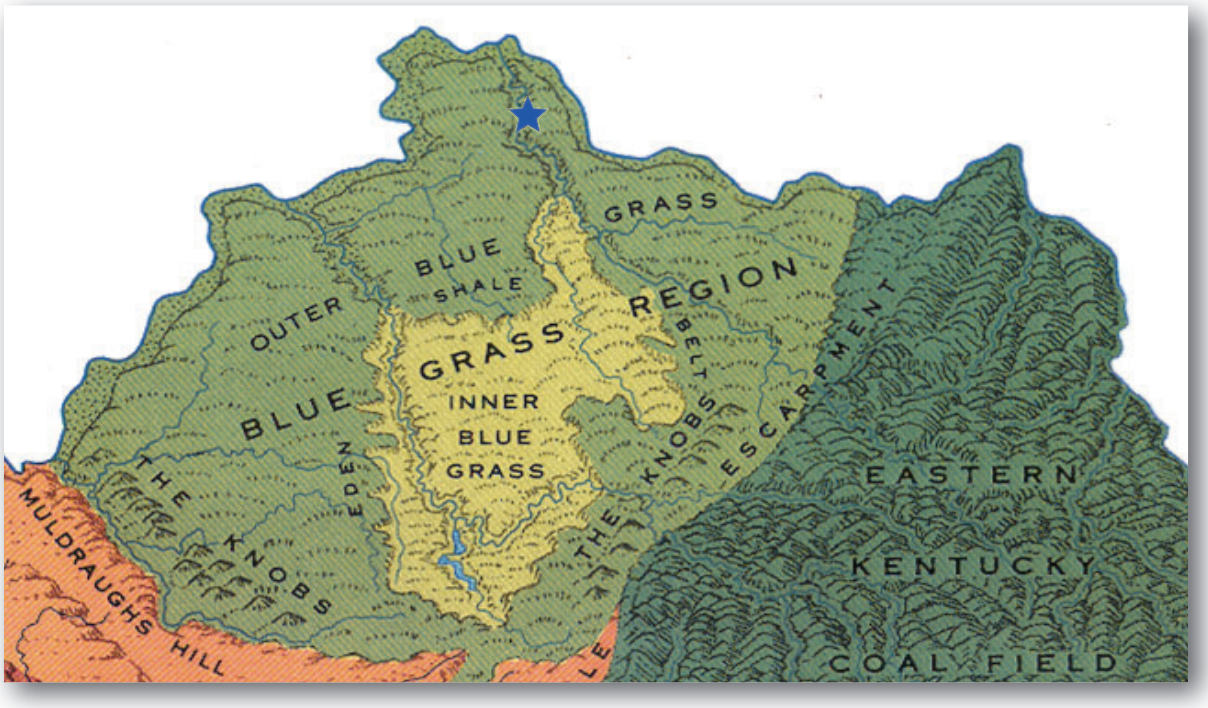


Figure 1 - Kentucky Physiographic Map (site vicinity shown with star)

3B SITE GEOLOGY

Review of the *Kentucky Geologic Map Service* shown in **Figure 2** below indicates the the majority of the alignment is located within an area underlain by terrace deposits which are generally comprised of silty clay with varying amounts of sand and gravel. Sand and gravel lenses are present and can be up to 15 feet thick. At higher elevations along the western portion of the alignment the Point Pleasant Tongue of Clays Ferry (Ocp) formation is present In general, the Point Pleasant Tonge of Clays Ferry Formation is comprised of interbedded layers of shale and limestone with limestone accounting for 45 to 65 percent of the formation.

Figure 2: Site Geologic Mapping. Approximate Alignment Highlighted.

FINDINGS

5 SUBSURFACE CONDITIONS

CSI performed a total of two (2) soil test borings to explore the subsurface conditions along the alignment at approximate 800 foot intervals. In general our borings encountered residual soils and shale bedrock. Boring for this project were numbered sequentially across eight separate project sites. Specific borings for the Pond Creek Project site are labeled as boring numbers B-4 through B-5.

5A STRATA INFORMATION

The subsurface conditions encountered at the test boring locations are shown in the Test Boring Log in the Appendix. These records represent our interpretation of the subsurface conditions based on the field logs, visual examination of field samples by an engineer, and tests of the samples collected. The letters in parentheses following the soil descriptions are the soil classifications in general accordance with the Unified Soil Classification System (USCS). It should be noted that dashed stratification lines shown on the soil boring log represent approximate transitions between material types. In-situ stratum changes could occur gradually or at slightly different depths. Boring elevations were determined by Cardinal Engineering and supplied to CSI.

TOPSOIL

Topsoil was encountered at the ground surface in each boring location and was measured to be about 3 inches thick.

ALLUVIUM

Alluvial or water deposited soils associated with the Licking River were encountered in each boring to a depth of 5.5 to 8 feet below grade. The alluvium was described primarily to be brown to brown and gray fat clay with trace silt, black oxide nodules, and sand. Standard Penetration (SPT) N-Values for the alluvial soils were reported at 3 to 50 or more blows per foot (bpf), indicating a soft to hard consistency. Laboratory testing of a representative sample indicates a Liquid Limit (LL) of 47 percent with Plasticity Index (PI) of 28 percent. Natural moisture contents ranged from 22.7 to 25.7 percent.

RESIDUUM

Residual soil deposits were encountered underlying the alluvial soils in each boring. The residuum was described to gray and brown lean clay with trace rock fragments, silt, and black oxide nodules. SPT N-Values ranged from 13 to 47 bpf indicating a stiff to hard consistency. Laboratory testing of a representative sample indicates a LL of 32 percent and a PI of 17 percent. Natural moisture contents within the residual samples were recorded from 17.4 and 19.0 percent.

WEATHERED SHALE/LIMESTONE BEDROCK

Bedrock samples and/or auger refusal was not encountered at any boring locations. For details of subsurface conditions encountered at a particular boring location please refer to the boring logs contained in Appendix A. It should be noted that our borings were drilled and sampled according to the procedures presented in the appendix. The boring locations shown in the appendix should be considered accurate only to the degree implied by the method used.

5B GROUNDWATER CONDITIONS

Groundwater was not encountered in any measurable quantities at our boring locations. In the Northern Kentucky area, water conditions that usually affect construction and performance of projects consist of trapped/perched water zones which occur in variable areas in the soil mass that may be present at the soil/bedrock interface and/or due to sand layers and seams throughout the soil. Perched water sources are often not linked to the more continuous relatively stable ground water table that typically occurs at greater depths. Site excavation activities or ground disturbance can expose these features and the resulting seepage can vary greatly. Groundwater issues are also dependent upon recent rainfall activity and surface and subsurface drainage patterns in the area that may change depending on climatic conditions.

6 LABORATORY TESTING

Laboratory tests were performed on selected recovered samples from the borings to provide recommendations for earthwork and to determine index properties of the soils. Details for the test methods and results are shown in the Appendix. Tests performed included:

- 8 Moisture Content Tests
- 2 Grain Size Analyses (-200 Sieve)
- 2 Atterberg Limits Tests

GEOTECHNICAL DISCUSSION AND RECOMMENDATIONS

7 DISCUSSION—GEOTECHNICAL ISSUES

Based on our experience with similar projects and the conditions observed during our subsurface exploration, we believe the site is suitable for the proposed construction, provided the recommendations outlined in this report are followed. The primary geotechnical concerns are related to the soft alluvial soils and possible groundwater infiltration

Alluvial soils were encountered in each boring which coincides with the alluvial terrace deposits shown on geologic mapping. Due to the nature of the deposition, alluvial soils are often soft, wet, and poorly consolidated. As such, they often make poor bearing materials and undercuts to competent soils should be anticipated within these areas. Additionally, groundwater intrusion

should be anticipated particularly where lenses of granular soils are encountered. In most cases, the groundwater should be able to be removed from excavations using pumps or trench drains.

8 WATER PIPE SUPPORT

With regards to pipe support, alluvial soils are anticipated at bearing elevations. Based upon subsurface information, these soils should provide adequate support, however areas of soft soil which will require undercutting should be anticipated. It is expected that any required undercuts would be limited to less than 3 feet as stiff or better residual soils are present at depths of about 8 feet below grade.

If soft soils are encountered, they should be undercut to the stiff or better materials and replaced with suitable fill material. If questionable soils are encountered, CSI should be notified to evaluate and provide necessary recommendations.

9 THRUST RESTRAINT

Where changes in the direction of flow occur and/or where the water main cross sectional area changes, thrust forces will be generated in the direction of water flow. In some cases the thrust forces generated can be greater than the lateral resistance of the natural soils and/or backfill placed within utility trenches. To prevent separation and/or damage to the water main at these horizontal or vertical bends/joints, thrust block restraints (or restrained joints where thrust blocks are not applicable) will be required. Review of the provided plans indicate that thrust block are planned at several location along the proposed alignment. Based upon the conditions encountered, the thrust blocks appear to be suitable for the proposed alignment. Thrust blocks should bear on the undisturbed stiff or better residual soils or stiff/firm or better alluvial soils and can be designed using the soil parameters shown in the table below. For design of restrained joints, a frictional coefficient between pipe and soil of 0.3 should be used. Additionally, reinforced concrete encasement may also be used in place of restrained joints.

Table 3: Thrust Block Soil Parameters

Soil Group	Passive Earth Pressure Coefficient	Unit Weight (pcf)	Cohesion (psf)	Friction Angle (φ)
Residual Clay	Kp = 2.5	115	100	φ = 25
Alluvial/ Lacustrine	Kp = 2.2	105	0	φ = 22

10 EARTHWORK

We do not anticipate any structural fill to occur on the site with the exception of backfill of the trenches. The following recommendations are for backfill operations around open cut trenches for the alignment.

10A EXCAVATIONS

Normal earth excavation equipment should be suitable for excavations associated with the overburden soils. The weathered shale encountered on site should be able to be excavated with conventional equipment, however for the competent limestone layers encountered, ripping equipment or the use of a hoe-ram will most likely be necessary.

For below-grade excavations, alluvial soils should be classified as OSHA Type C soils with a minimum slope excavation of 1.5H:1V. For excavations within the residual soils, the soil should be classified as an OSHA Type A soil with a minimum slope excavation of 0.75H:1V. If soil types other than what has been mentioned above are encountered, CSI should be contacted to evaluate for stability.

10B TRENCH BACKFILL OPERATIONS

These materials are placed in more confined areas than mass earthwork materials or pavement materials. The following are general recommendations for backfill areas:

- Fill lift thicknesses will vary dependent on compaction equipment available and material types, but in no case should exceed 8 inches for clay and 12 inches for granular soils;
- For crushed stone/aggregate backfills in trenches and when using smaller compaction equipment the lift thickness should be based on the type of aggregate and equipment. For well-graded granular soils such as Dense Grade Aggregate, a thickness of 4 to 6 inches is typically required. If open-graded stone is used, the lift thickness may be able to be increased. This should be evaluated by the geotechnical engineer;
- Place cohesive fill (clay) in maximum 8-inch thick loose lifts. Granular soils may be placed in maximum 12 inch loose lifts provided properly sized equipment is used in the compaction process;
- Fill lifts should be compacted to at least 98 percent of the soil's maximum dry density (ASTM D 698) in areas beneath pavements and 92 percent in grassed areas.
- Maintain the moisture content of compacted fill between minus 2 and plus 2 percent of optimum moisture;
- Maximum particle size of the soil should be limited to half the lift thickness.;
- Density testing should be performed as a means to verify percent compaction and moisture content of the material as it is being placed and compacted;
- Density testing should be performed at a rate of at least 3 tests per lift; CSI should be retained to provide additional recommendations for backfill;

10C TUNNELING METHODS (TRENCHLESS)

Provided plans indicate that the water main crossing Pond Creek Road will utilize Jack and Bore to cross over to the south side of Pond Creek Road at about Station 13+20. This method of installation is viable where stable ground is present above groundwater, over short lengths of about 400 to 500 feet, and where highly accurate alignment is not required.

For the Jack and Bore installation, a launching and receiving pit would be required at each end of the section. To accommodate equipment, we would anticipate the pit would extend about 5 feet below the planned bottom of the pipe invert with temporary shoring installed around the sidewalls. Based on our borings, we anticipate that the soils will consist of clay with varying amounts of sand and black oxide nodules and be stable enough for this type of installation; however, we recommend to consult with a speciality contractor for specific recommendations on the installation.

The temporary support walls for the Jack and Bore pits will be subjected to lateral earth pressures from the surrounding soil. The retained zone should be considered as an imaginary line drawn upward at a 45 degree angle from the top of the retaining wall footings. The values given in the tables below assume the backfill zone is level, drained, the zone of backfill conforms to the minimum zone size given above, and no surcharge is placed on the backfill.

Table 4: Equivalent Fluid Density (EFD) and Earth Pressure Coefficient

Condition	On-Site Soils (2)	
	Coefficients	EFD (Drained) (pcf)
Active	Ka = 0.39	50
Passive	Kp = 2.56	320
At-Rest	Ko = 0.56	70

(1) On-site soil having a unit weight of 125 pcf and friction angle of 26 degrees.
(2) Assumes a level backfill above retained zones and no surcharge loading

10D GENERAL NOTES

- For all earthwork operations, positive surface drainage is prudent to keep water from ponding on the surface and to assist in maintaining surface stability;
- The surface should be sealed prior to expected wet weather. This can usually be accomplished with rubber-tired construction equipment or a steel-drum roller;
- If any soil placement problems occur, CSI should be retained to provide additional recommendations, as needed.

11 SITE DRAINAGE

During construction, water should not be allowed to pond in excavations or undercutting will likely be required. During the life of the project, slope the subgrade and other site features so that surface water flows away from the site structures.

For excavations during construction, most free water from the subsurface conditions could likely be removed via sump pumps and open channel flow (if possible) at or near the source of seepage. However, if normal dewatering measures prove insufficient, CSI should be retained to provide recommendations on the issue.

12 NOTES ON THE REPORT AND RECOMMENDATIONS

We recommend that this complete report be provided to the various design team members, the contractors and the project Owner. Potential contractors should be informed of this report in the "Instructions to Bidders" section of the bid documents. A geotechnical exploration, such as the one we performed, used two borings to attempt to model the subsurface conditions at the site. Because no exploration contains complete data or a complete model, there is always a possibility that conditions between borings will be different from those at specific boring locations. Thus, it is possible that some subsurface conditions will not be as anticipated by the project team or contractor. If this report is included or referenced in the actual contract documents, it shall be explicitly understood that this report is for informational purposes only. CSI shall not be responsible for the opinions of, or conclusions drawn by others.

It has been our experience that the construction process often disturbs soil conditions and this process, no matter how much experience we use to anticipate construction methodology, is not completely predictable. Therefore, changes or modifications to our recommendations are likely needed due to these possible variances. Experienced CSI geotechnical personnel should be used to observe and document the construction procedures and the conditions encountered. Unanticipated conditions and inadequate procedures should be reported to the design team along with timely recommendations to solve the problems created. We recommend that the Owner retain CSI to provide this service based upon our familiarity with the project, the subsurface conditions and the intent of our recommendations.

This report is based on the supplied project information, the subsurface conditions observed at the time of the report, and our experience with similar conditions. As such, it cannot be applied to other project sites, types, or combinations thereof. If the Project Information section in this report contains incorrect information or if additional information is available, you should convey the correct or additional information to us and retain us to review our recommendations. Our recommendations may then require modification.

No section or portion of this report (including Appendix information) can be used as a stand alone article to make distinct changes or assumptions. The entire report and Appendix should be used together as one resource. We wish to remind you that our exploration services include storing the soil samples collected and making them available for inspection for 30 days. The soil

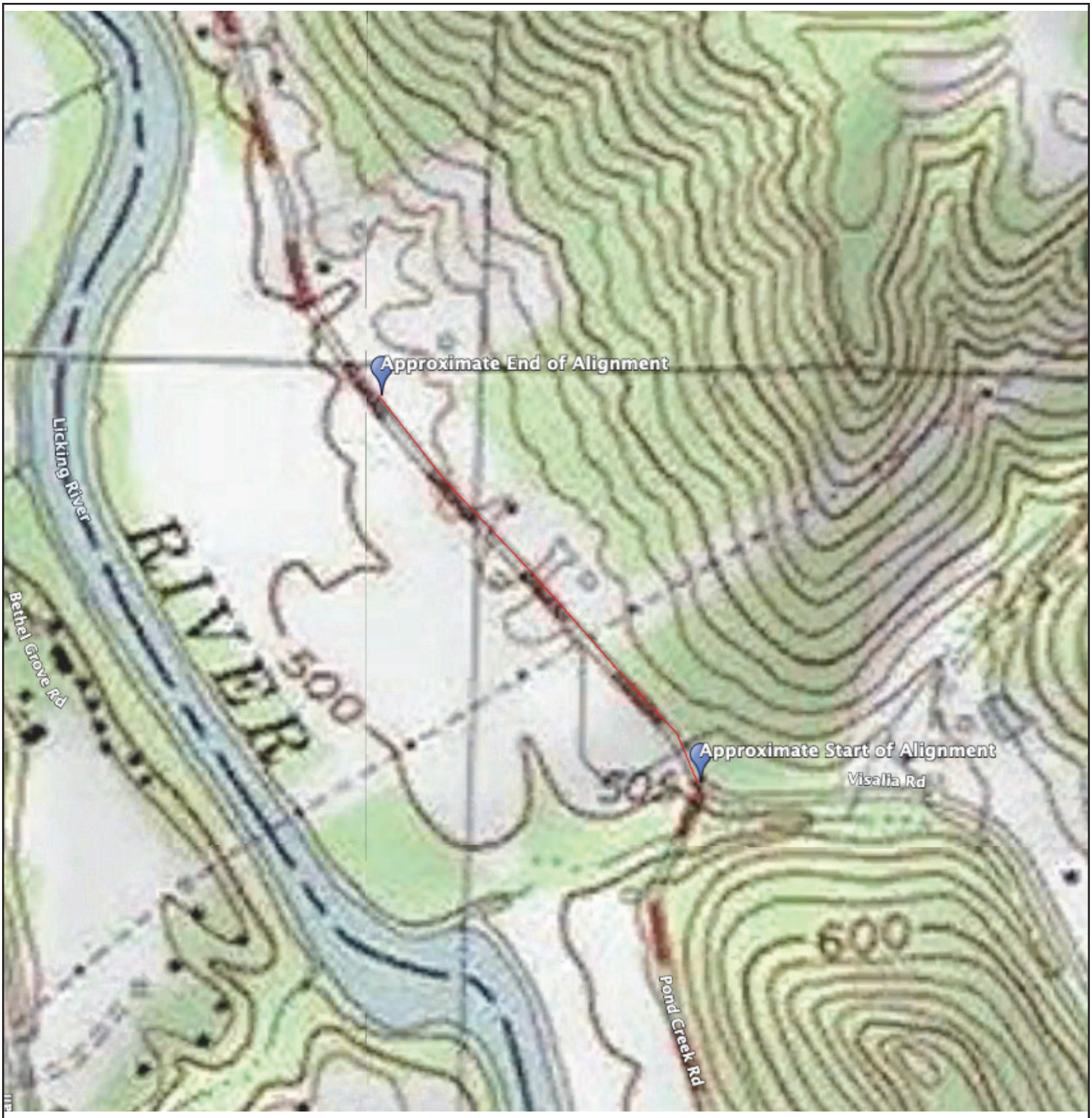
samples are then discarded unless you request otherwise. Please inform us if you wish to keep any of the obtained samples.

While this report deals with samples of subsurface materials and some comments on water conditions at the site, no assessment of site environmental conditions or the presence of contaminants were performed.

We wish to remind you that our exploration services include storing the soil samples collected and making them available for inspection for 30 days. The samples are then discarded unless you request otherwise. Please inform us if you wish to keep any of the obtained samples.

APPENDIX A

SITE LOCATION PLAN
GEOTECHNICAL BORING INFORMATION SHEET
GENERAL BORING PROFILE
TEST BORING LOGS
FIELD TESTING PROCEDURES
LIQUID AND PLASTIC LIMITS REPORT
SUMMARY OF LABORATORY RESULTS
LABORATORY TESTING PROCEDURES



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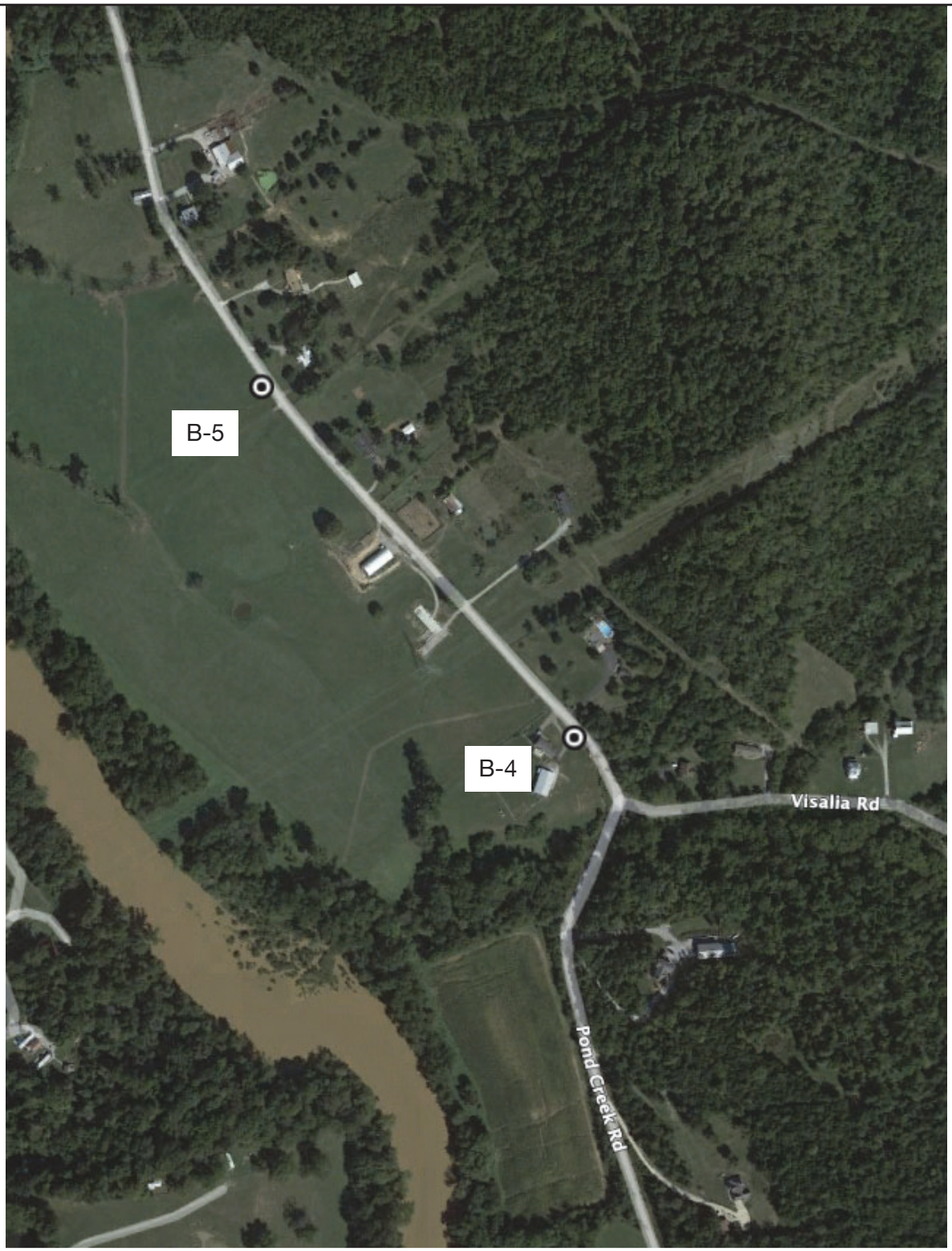
ADAPTED FROM TOPOGRAPHIC MAPPING
FOR ILLUSTRATION PURPOSES

CSI Cincinnati, LLC
11785 Highway Drive
Cincinnati, Ohio 45241
513.252.2059 Office | 888.792.3121 Fax
www.csiohio.com

TITLE: SITE LOCATION PLAN		PROJECT NO: CN230010	DRAWN BY: GD
PROJECT:	POND CREEK ROAD NEW WATER MAIN ALEXANDRIA, KY	DATE: 6/14/23	CHECKED BY: JB
		NOT TO SCALE	DRAWING NO 1 OF 2



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CSI Cincinnati, LLC
11785 Highway Drive
Cincinnati, Ohio 45241
513.252.2059 Office | 888.792.3121 Fax
www.csiohio.com

TITLE: BORING LOCATION PLAN		PROJECT NO: CN230010	DRAWN BY: GD
PROJECT:	POND CREEK ROAD NEW WATER MAIN ALEXANDRIA, KY	DATE: 6/14/23	CHECKED BY: JB
		NOT TO SCALE	DRAWING NO 2 OF 2

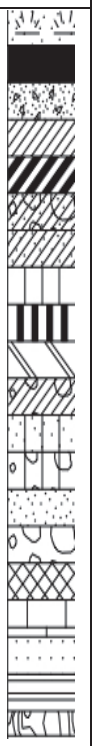
Consulting Services Incorporated
LEXINGTON | LOUISVILLE | CINCINNATI

Geotechnical Boring Information Sheet

Sample Type Symbols

Splitspoon (SPT)
Shelby Tube
Grab
Rock Core
Auger Cuttings

Surface Symbols



Topsoil
Asphalt
Concrete
Lean Clay
Fat Clay
Glacial Till
Sandy Clay
Silt
Elastic Silt
Lean Clay to Fat Clay
Gravelly Clay
Sandy Silt
Gravelly Silt
Sand
Gravel
Fill
Limestone
Sandstone
Shale/Siltstone
Weathered Rock

Samples Strength Descriptors

Cohesive Soils:	**N**
Very Soft	0-1
Soft	2-4
Firm	5-8
Stiff	9-15
Very Stiff	16-30
Hard	31+
Non-cohesive Soils:	
Very Loose	0-4
Loose	5-10
Firm	11-20
Very Firm	21-30
Dense	30-50
Very Dense	51+

Definitions

SPT-"Splitspoon" or standard penetration test. Blow counts are number of drops required for a 140 lb hammer dropping 30 inches to drive the sampler 6 inches.

N-value is the addition of the last two intervals of the 18-inch sample.

Shelby tubes are often called "undisturbed samples". They are directly pushed into the ground, twisted, allowed to rest for a small period of time and then pulled out of the ground. Tops and bottoms are cleaned and then sealed.

Sample classification is done in general accordance with ASTM D2487 and 2488 using the Unified Soil Classification System (USCS) as a general guide.

Soil moisture descriptions are based on the recovered sample observations. The descriptors are dry, slightly moist, moist, very moist and wet. These are typically based on relative estimates of the moisture condition of a visual estimation of the soils optimum moisture content (EOMC). Dry is almost in a "dusty" condition usually 6 or more percent below EOMC. Slightly moist is from about 6 to 2 percent below EOMC at a point at which the soil color does not readily change with the addition of water. Moist is usually 2 percent below to 2 percent above EOMC and the point at which the soil will tend to begin forming "balls" under some pressure in the hand. Very moist is usually from about 2 percent to 6 percent above EOMC and also the point at which it's often considered "muddy". Wet soil is usually 6 or more percent above EOMC and often contains free water or the soil is in a saturated state.

Silt or Clay is defined at material finer than a standard #200 US sieve (<0.075mm) Sand is defined as material between the size of #200 sieve up to #4 sieve. Gravel is from #4 size sieve material to 3". Cobbles are from 3" to 12". Boulders are over 12".

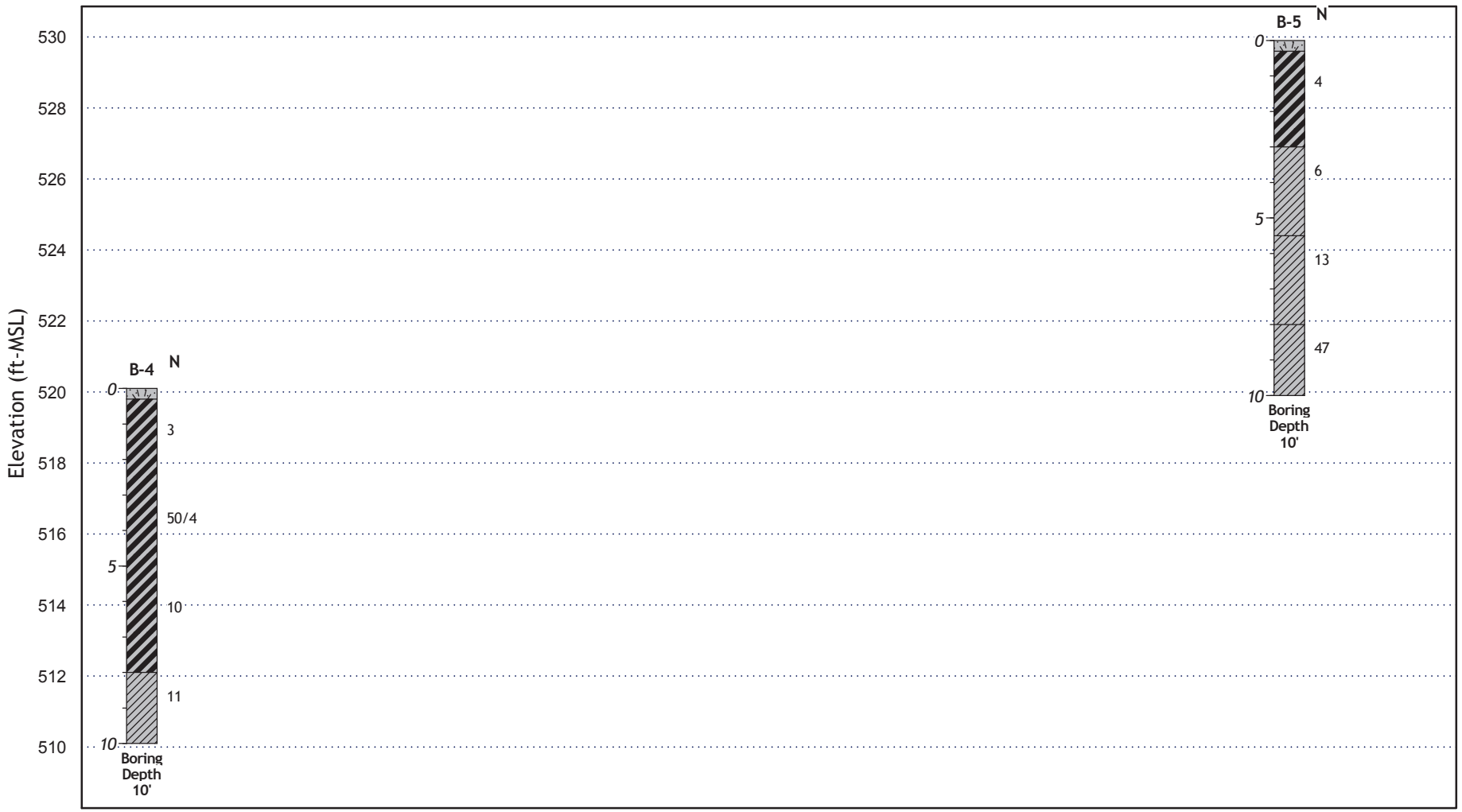
Rock hardness is classified as follows:

Very Soft:	Easily broken by hand pressure
Soft:	Ends can be broken by hand pressure; easily broken with hammer
Medium:	Ends easily broken with hammer; middle requires moderate blow
Hard:	Ends require moderate hammer blow; middle requires several blows
Very Hard:	Many blows with a hammer required to break core

Rock Quality Designation (RQD) is defined as total combined length of 4" or longer pieces of core divided by the total core run length; defined in percentage.

Water or cave-in observed in borings is at completion of drilling each boring unless otherwise noted.

Strata lengths shown on borings represents a rough estimate. Transition may be more abrupt or gradual. Soil borings are representative of that estimated location at that time and are based on recovered samples. Conditions may be different between borings and between sample intervals. Boring information is not to be considered stand alone but should be taken in context with comments and information in the geotechnical report and the means by which the borings are logged, sampled and drilled.



SOIL TYPES

(Shown in Graphic Log)

- Fill
- Asphalt
- Topsoil
- Gravel
- Sand
- Silt
- Lean Clay
- Fat Clay
- Silty Sand
- Clayey Sand
- Sandy Silt
- Clayey Silt
- Sandy Clay
- Silty Clay
- Limestone
- Sandstone
- Siltstone
- Shale

CSI of Cincinnati
11785 Highway Drive
Cincinnati, OH 45241
Phone: 513.252.2059
Fax: 888.792.3121

Northern Kentucky Water
CN230010

BORING PROFILE

Fig. 1

CSI of Cincinnati
11785 Highway Drive
Cincinnati, OH 45241
Phone: 513.252.2059
Fax: 888.792.3121

TEST BORING LOG

CLIENT: Cardinal Engineering
PROJECT NAME: Northern Kentucky Water
PROJECT LOCATION: Alexandria, KY

BORING #: B-4
JOB #: CN230010
LOGGED BY: CG
APPROVED BY: GD

DRILLING and SAMPLING INFORMATION

Date Started	2/27/23	Contractor	CSI
Date Completed	3/1/23	Boring Size	4 in.
Drill Rig	B-57 Mobile	Boring Method	SFA
Weather	Cloudy, 40s-50s	Hammer Type	Automatic

SOIL CLASSIFICATION

SURFACE ELEVATION: 520.1

TOPSOIL - 3 INCHES

Brown and gray mottled FAT CLAY (CH) with little silt, trace roots, sand, and black oxide nodules [Alluvium] - moist, soft to hard

Brown and gray LEAN CLAY (CL) with little silt, trace black oxide nodules, and roots [Residuum] - moist, stiff

Boring terminated at 10.0 feet

No refusal

TEST DATA

Sample No.	Sample Type	Recovery (in)	Standard Penetration Test Blows per 6" [*N-Value*] *blows/foot*	Qu-tsf Unconfined (Pocket Pen.) Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plasticity Index (PI)	Percent Passing #200 Sieve	Remarks
1	SS	16	2-1-2 [*3*]		22.7				
2	SS	4	50/4-- [*50/4*]		22.7				
3	SS	18	4-4-6 [*10*]		19.2				
4	SS	18	3-4-7 [*11*]		19.0	32	17	95	

Depth to Groundwater
- Noted on Drilling Tools _____ ft.
- At Completion _____ ft.
- After _____ hours _____ ft.
- Cave Depth _____ ft.

Sample Type
- SPT- Standard Penetration Test
- SS- Split Spoon
- ST- Shelby Tube
- RC- Rock Core
- CU- Auger Cuttings

Boring Method
- HSA- Hollow Stem Augers
- CFA- Continuous Flight Augers
- MD- Mud Drilling

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Cincinnati, OH 45241
Phone: 513.252.2059
Fax: 888.792.3121

TEST BORING LOG

CLIENT: Cardinal Engineering
PROJECT NAME: Northern Kentucky Water
PROJECT LOCATION: Alexandria, KY

BORING #: B-5
JOB #: CN230010
LOGGED BY: CG
APPROVED BY: GD

DRILLING and SAMPLING INFORMATION

Date Started	2/27/23	Contractor	CSI
Date Completed	3/1/23	Boring Size	4 in.
Drill Rig	B-57 Mobile	Boring Method	SFA
Weather	Cloudy, 40s-50s	Hammer Type	Automatic

SOIL CLASSIFICATION

SURFACE ELEVATION: 529.9

Elev. (ft)	Depth Scale	Water Level	Soil Classification	Sample No.	Sample Type	Sample Graphics	Recovery (in)	Standard Penetration Test Blows per 6" [*N-Value*] *blows/foot*	Qu-tsf Unconfined (Pocket Pen.) Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plasticity Index (PI)	Percent Passing #200 Sieve	Remarks
			TOPSOIL - 3 INCHES											
528	2		Brown FAT CLAY (CH) with some silt and trace roots [Alluvium] - moist, soft	1	SS		4	2-1-3 [*4*]		22.8				
526	4		Brown and gray LEAN CLAY (CL) with trace black oxide nodules and silt [Alluvium] - moist, firm	2	SS		18	2-2-4 [*6*]		25.7	47	28	91	
524	6		Brown and gray mottled LEAN CLAY (CL) with trace black oxide nodules and rock fragments [Residuum] - moist, stiff	3	SS		18	2-6-7 [*13*]		17.1				
522	8		Brown and gray LEAN CLAY (CL) with little rock fragments and trace silt [Residuum] - moist, hard	4	SS		18	9-16-31 [*47*]		17.4				
520	10		Boring terminated at 10.0 feet No refusal											
518	12													
516	14													

Depth to Groundwater
- Noted on Drilling Tools _____ ft.
- At Completion _____ ft.
- After _____ hours _____ ft.
- Cave Depth _____ ft.

Sample Type
- SPT- Standard Penetration Test
- SS- Split Spoon
- ST- Shelby Tube
- RC- Rock Core
- CU- Auger Cuttings

Boring Method
- HSA- Hollow Stem Augers
- CFA- Continuous Flight Augers
- MD- Mud Drilling

FIELD TESTING PROCEDURES

Field Operations: The general field procedures employed by CSI are summarized in ASTM D 420 which is entitled "Investigating and Sampling Soils and Rocks for Engineering Purposes." This recommended practice lists recognized methods for determining soil and rock distribution and ground water conditions. These methods include geophysical and in situ methods as well as borings.

Borings are drilled to obtain subsurface samples using one of several alternate techniques depending upon the subsurface conditions. These techniques are:

a. Continuous 2-1/2 or 3-1/4 inch I.D. hollow stem augers;

b. Wash borings using roller cone or drag bits (mud or water);

c. Continuous flight augers (ASTM D 1425).

These drilling methods are not capable of penetrating through material designated as "refusal materials." Refusal, thus indicated, may result from hard cemented soil, soft weathered rock, coarse gravel or boulders, thin rock seams, or the upper surface of sound continuous rock. Core drilling procedures are required to determine the character and continuity of refusal materials.

The subsurface conditions encountered during drilling are reported on a field test boring record by the chief driller. The record contains information concerning the boring method, samples attempted and recovered, indications of the presence of various materials such as coarse gravel, cobbles, etc., and observations between samples. Therefore, these boring records contain both factual and interpretive information. The field boring records are on file in our office.

The soil and rock samples plus the field boring records are reviewed by a geotechnical engineer. The engineer classifies the soils in general accordance with the procedures outlined in ASTM D 2488 and prepares the final boring records which are the basis for all evaluations and recommendations.

The final boring records represent our interpretation of the contents of the field records based on the results of the engineering examinations and tests of the field samples. These records depict subsurface conditions at the specific locations and at the particular time when drilled. Soil conditions at other locations may differ from conditions occurring at these boring locations. Also, the passage of time may result in a change in the subsurface soil and ground water conditions at these boring locations. The lines designating the interface between soil or refusal materials on the records and on profiles represent approximate boundaries. The transition between materials may be gradual. The final boring records are included with this report.

The detailed data collection methods using during this study are discussed on the following pages.

Soil Test Borings: Soil test borings were made at the site at locations shown on the attached Boring Plan. Soil sampling and penetration testing were performed in accordance with ASTM D 1586.

The borings were made by mechanically twisting a hollow stem steel auger into the soil. At regular intervals, the drilling tools were removed and soil samples obtained with a standard 1.4 inch I.D., 2 inch O.D., split tube sampler. The sampler was first seated 6 inches to penetrate any loose cuttings, then driven an additional foot with blows of a 140-pound hammer falling 30 inches. The number of hammer blows required to drive the sampler the final foot was recorded and is designated the "penetration resistance". The penetration resistance, when properly evaluated, is an index to the soil strength and foundation supporting capability.

Representative portions of the soil samples, thus obtained, were placed in glass jars and transported to the laboratory. In the laboratory, the samples were examined to verify the driller's field classifications. Test Boring Records are attached which graphically show the soil descriptions and penetration resistances.

Core Drilling: Refusal materials are materials that cannot be penetrated with the soil drilling methods employed. Refusal, thus indicated, may result from hard cemented soil, soft weathered rock, coarse gravel or boulders, thin rock seams or the upper surface of sound continuous rock. Core drilling procedures are required to determine the character and continuity of refusal materials.

Prior to coring, casing is set in the drilled hole through the overburden soils, if necessary, to keep the hole from caving. Refusal materials are then cored according to ASTM D 2113 using a diamond-studded bit fastened to the

end of a hollow double tube core barrel. This device is rotated at high speeds, and the cuttings are brought to the surface by circulating water. Core samples of the material penetrated are protected and retained in the swivel-mounted inner tube. Upon completion of each drill run, the core barrel is brought to the surface, the core recovered is measured, the samples are removed and the core is placed in boxes for storage.

The core samples are returned to our laboratory where the refusal material is identified and the percent core recovery and rock quality designation is determined by a soils engineer or geologist. The percent core recovery is the ratio of the sample length obtained to the depth drilled, expressed as a percent. The rock quality designation (RQD) is obtained by summing up the length of core recovered, including only the pieces of core which are four inches or longer, and dividing by the total length drilled. The percent core recovery and RQD are related to soundness and continuity of the refusal material. Refusal material descriptions, recoveries, and RQDs are shown on the "Test Boring Records".

Hand Auger Borings and Dynamic Cone Penetration Testing: Hand auger borings are performed manually by CSI field personnel. This consists of manually twisting hand auger tools into the subsurface and extracting “grab” or baggie samples at intervals determined by the project engineer. At the sample intervals, dynamic cone penetration (DCP) testing is performed. This testing involves the manual raising and dropping of a 20 pound hammer, 18 inches. This “driver” head drives a solid-1¾ inch diameter cone into the ground. DCP “counts” are the number of drops it takes for the hammer to drive three 1¾ inch increments, recorded as X-Y-Z values.

Test Pits: Test pits are excavated by the equipment available, often a backhoe or trackhoe. The dimensions of the test pits are based on the equipment used and the power capacity of the equipment. Samples are taken from the spoils of typical buckets of the excavator and sealed in jars or “Ziplock” baggies. Dynamic Cone Penetration or hand probe testing is often performed in the upper few feet as OSHA standards allow. Refusal is deemed as the lack of advancement of the equipment with reasonable to full machine effort.

Water Level Readings: Water table readings are normally taken in conjunction with borings and are recorded on the "Test Boring Records". These readings indicate the approximate location of the hydrostatic water table at the time of our field investigation. Where impervious soils are encountered (clayey soils) the amount of water seepage into the boring is small, and it is generally not possible to establish the location of the hydrostatic water table through water level readings. The ground water table may also be dependent upon the amount of precipitation at the site during a particular period of time. Fluctuations in the water table should be expected with variations in precipitation, surface run-off, evaporation and other factors.

The time of boring water level reported on the boring records is determined by field crews as the drilling tools are advanced. The time of boring water level is detected by changes in the drilling rate, soil samples obtained, etc. Additional water table readings are generally obtained at least 24 hours after the borings are completed. The time lag of at least 24 hours is used to permit stabilization of the ground water table which has been disrupted by the drilling operations. The readings are taken by dropping a weighted line down the boring or using an electrical probe to detect the water level surface.

Occasionally the borings will cave-in, preventing water level readings from being obtained or trapping drilling water above the caved-in zone. The cave-in depth is also measured and recorded on the boring records.

Summary of Laboratory Results

Borehole	Depth	Sample Type	Liquid Limit	Plastic Limit	Plasticity Index	Classification	Water Content (%)	Unconfined Compressive Strength (tsf)	Dry Density (pcf)	Wet Density (pcf)	Max. Dry Density (pcf)	Opt. Water Content (%)	CBR	Swell (%)	RQD	Percent Recovery	Percent Finer (No. 200)
B-4	1.0	SS					22.7										
B-4	3.5	SS					22.7										
B-4	6.0	SS					19.2										
B-4	8.5	SS	32	15	17	LEAN CLAY(CL)	19.0										95
B-5	1.0	SS					22.8										
B-5	3.5	SS	47	20	27	LEAN CLAY(CL)	25.7										91
B-5	6.0	SS					17.1										
B-5	8.5	SS					17.4										

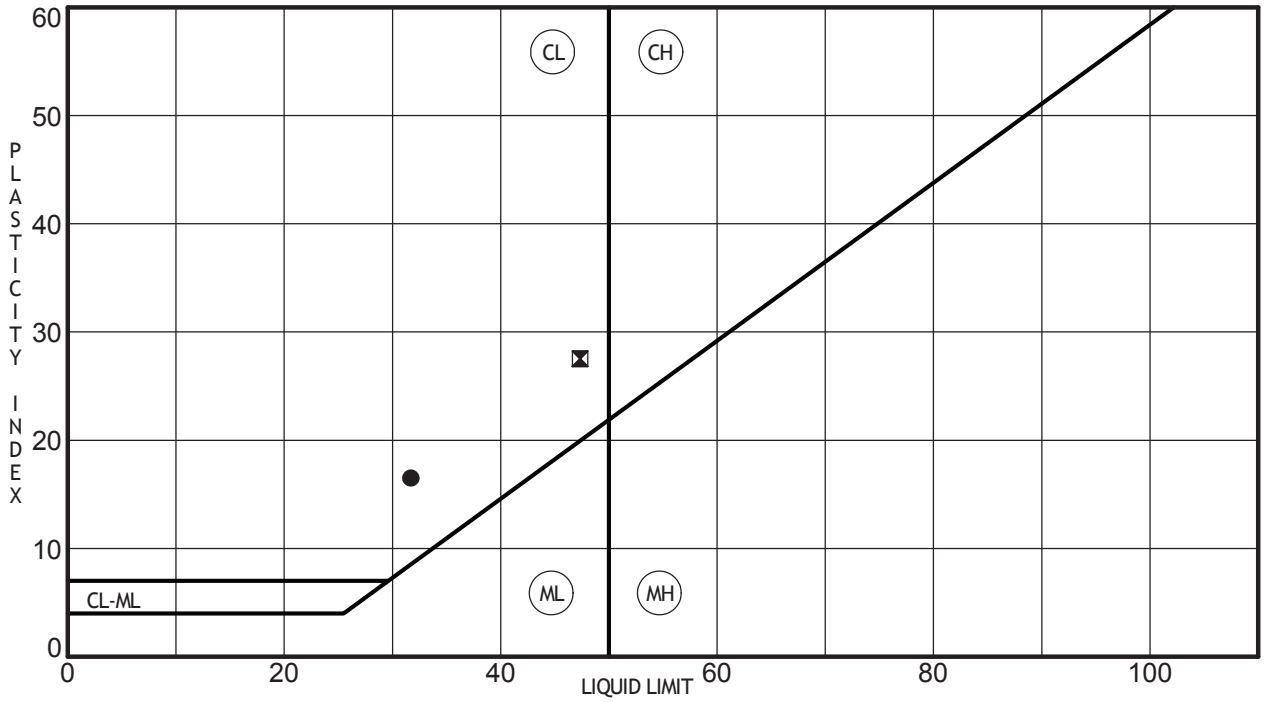
CSI of Cincinnati
11785 Highway Drive
Cincinnati, OH 45241
Phone: 513.252.2059
Fax: 888.792.3121

SS - Split Spoon Sample
GRAB - Bulk Grab Sample

PROJECT INFORMATION

Client: Cardinal Engineering
Project Name: Northern Kentucky Water
Project Number: CN230010
Project Location: Alexandria, KY

Liquid and Plastic Limits Test Report



	Boring	Depth (ft)	LL	PL	PI	Water Content	% < #40	% < #200	USCS	Description
●	B-4	8.5	32	15	17	19.0		95		LEAN CLAY(CL)
⊠	B-5	3.5	47	20	27	25.7		91		LEAN CLAY(CL)

CSI of Cincinnati
11785 Highway Drive
Cincinnati, OH 45241
Phone: 513.252.2059
Fax: 888.792.3121

PROJECT INFORMATION

Client: Cardinal Engineering
Project Name: Northern Kentucky Water
Project Number: CN230010
Project Location: Alexandria, KY

LABORATORY TESTING PROCEDURES

Soil Classification: Soil classifications provide a general guide to the engineering properties of various soil types and enable the engineer to apply past experience to current problems. In our investigations, samples obtained during drilling operations are examined in our laboratory and visually classified by an engineer. The soils are classified according to consistency (based on number of blows from standard penetration tests), color and texture. These classification descriptions are included on our "Test Boring Records."

The classification system discussed above is primarily qualitative and for detailed soil classification two laboratory tests are necessary: grain size tests and plasticity tests. Using these test results the soil can be classified according to the AASHTO or Unified Classification Systems (ASTM D 2487). Each of these classification systems and the in-place physical soil properties provides an index for estimating the soil's behavior. The soil classification and physical properties obtained are presented in this report.

Rock Classification: Rock classifications provide a general guide to the engineering properties of various rock types and enable the engineer to apply past experience to current situations. In our explorations, rock core samples obtained during drilling operations are examined in our laboratory and visually classified by an engineer. The rock cores are classified according to relative hardness and RQD (see Guide to Rock Classification Terminology), color, and texture. These classification descriptions are included on our Test Boring Records.

Atterberg Limits: Portions of the samples are taken for Atterberg Limits testing to determine the plasticity characteristics of the soil. The plasticity index (PI) is the range of moisture content over which the soil deforms as a plastic material. It is bracketed by the liquid limit (LL) and the plastic limit (PL). The liquid limit is the moisture content at which the soil becomes sufficiently "wet" to flow as a heavy viscous fluid. The plastic limit is the lowest moisture content at which the soil is sufficiently plastic to be manually rolled into tiny threads. The liquid limit and plastic limit are determined in accordance with ASTM D 4318.

Moisture Content: The Moisture Content is determined according to ASTM D 2216.

Percent Finer Than 200 Sieve: Selected samples of soils are washed through a number 200 sieve to determine the percentage of material less than 0.074 mm in diameter.

Rock Strength Tests: To obtain strength data for rock materials encountered, unconfined compression tests are performed on selected samples. In the unconfined compression test, a cylindrical portion of the rock core is subjected to increasing axial load until it fails. The pressure required to produce failure is recorded, corrected for the length to diameter ratio of the core and reported.

Compaction Tests: Compaction tests are run on representative soil samples to determine the dry density obtained by a uniform compactive effort at varying moisture contents. The results of the test are used to determine the moisture content and unit weight desired in the field for similar soils. Proper field compaction is necessary to decrease future settlements, increase the shear strength of the soil and decrease the permeability of the soil.

The two most commonly used compaction tests are the Standard Proctor test and the Modified Proctor test. They are performed in accordance with ASTM D 698 and D 1557, respectively. Generally, the Standard Proctor compaction test is run on samples from building or parking areas where small compaction equipment is anticipated. The Modified compaction test is generally performed for heavy structures, highways, and other areas where large compaction equipment is expected. In both tests a representative soil sample is placed in a mold and compacted with a compaction hammer. Both tests have three alternate methods.

Test	Method	Hammer Wt./Fall	Mold Diam.	Run on Material Finer Than	No. of Layers	No. of Blows/ Layer
Standard	A	5.5 lb./12"	4"	No. 4 sieve	3	25
D 698	B	5.5 lb./12"	4"	3/8" sieve	3	25
	C	5.5 lb./12"	6"	3/4" sieve	3	56

Test	Method	Hammer Wt./Fall	Mold Diam.	Run on Material Finer Than	No. of Layers	No. of Blows/ Layer
Modified	A	10 lb./18"	4"	No. 4 sieve	5	25
D 1557	B	10 lb./18"	4"	3/8" sieve	5	25
	C	10 lb./18"	6"	3/4" sieve	5	56

The moisture content and unit weight of each compacted sample is determined. Usually 4 to 5 such tests are run at different moisture contents. Test results are presented in the form of a dry unit weight versus moisture content curve. The compaction method used and any deviations from the recommended procedures are noted in this report.

Laboratory California Bearing Ratio Tests: The California Bearing Ratio, generally abbreviated to CBR, is a punching shear test and is a comparative measure of the shearing resistance of a soil. It provides data that is a semi-empirical index of the strength and deflection characteristics of a soil. The CBR is used with empirical curves to design pavement structures.

A laboratory CBR test is performed according to ASTM D 1883. The results of the compaction tests are utilized in compacting the test sample to the desired density and moisture content for the laboratory California Bearing Ratio test. A representative sample is compacted to a specified density at a specified moisture content. The test is performed on a 6-inch diameter, 4.58-inch-thick disc of compacted soil that is confined in a cylindrical steel mold. The sample is compacted in accordance with Method C of ASTM D 698 or D 1557.

CBR tests may be run on the compacted samples in either soaked or unsoaked conditions. During testing, a piston approximately 2 inches in diameter is forced into the soil sample at the rate of 0.05 inch per minute to a depth of 0.5 inch to determine the resistance to penetration. The CBR is the percentage of the load it takes to penetrate the soil to a 0.1 inch depth compared to the load it takes to penetrate a standard crushed stone to the same depth. Test results are typically shown graphically.

Geotechnical Report

NKY Water District -
Rifle Range Road Water Main

Prepared for

Cardinal Engineering
1 Moock Road #1
Wilder, Kentucky 41071

August 18, 2023

Project No. CN230010

August 18, 2023

Mr. Kevin Hanson
Cardinal Engineering
1 Moock Road #1
Wilder, Kentucky 41071

Subject: Geotechnical Report for
NKY Water District - Rifle Range Road Water Main
Alexandria, Kentucky
CSI Project No. CN230130

Dear Mr. Hanson,

Consulting Services Incorporated of Cincinnati (CSI) is pleased to present our geotechnical report for the NKY Water District - Rifle Range Road Water Main project in Alexandria, Kentucky. We provided our services in general accordance with the CSI Proposal 8420, dated April 3, 2023.

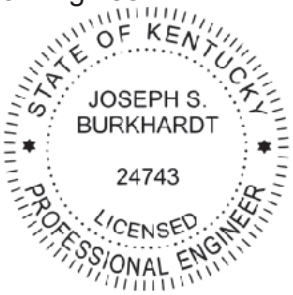
Our report represents information provided to us, readily available published data relevant to the site and site area, our observations and subsurface conditions encountered and our opinion of primary geotechnical conditions (discussion and recommendations) affecting site work and foundation design for the project.

Again, we greatly appreciate the opportunity to provide our services and look forward to working with you and the project team on this (and hopefully) more projects in the future. Please do not hesitate to contact us for questions or comments about the information contained herein.

Cordially,

Graham Duncan, EIT
Staff Engineer

Joseph S. Burkhardt, P.E.
Principal Geotechnical Engineer



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APPENDICES, FIGURES, PHOTOS, AND TABLES

Appendix A

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INTRODUCTION

1 SCOPE OF THE GEOTECHNICAL EXPLORATION

As proposed, CSI conducted a geotechnical exploration for the proposed 8” water main extension along Rifle Range Road in Alexandria, Kentucky. Our services included a review of the project information provided, conducting a subsurface exploration that utilized soil borings to obtain samples for modeling the soil conditions along the proposed route, an analysis of data and information obtained, evaluation of bearing conditions for the water line and recommendations for backfill of the pipe.

2 SITE AND PROJECT INFORMATION

The project will include the installation of a new 8” water main along Rifle Range Road in Alexandria, Kentucky. At the time of this report, plans are not available for the proposed water main alignment. CSI’s understanding of the project is outlined in the tables below.

Table 1: Site Information

Item	Description
Site Location	The site is located along Rifle Range Road in Alexandria, Kentucky from the existing fire hydrant located near 539 Rifle Range Road to the end of Rifle Range Road.
Length of Improvement	The water line will be approximately 10,000 feet in length
Surrounding Area	The surrounding area is characterized by sparse residential developments in all directions
Existing Conditions	Existing roadway is asphalt paved and is about 14 foot wide edge to edge. The Licking River is present approximately 500 feet to the west of the roadway along the majority of the alignment with several portions of the alignment being located within the 100 year flood plain of the creek.

Table 2: Project Information

Item	Description
Site Layout	See Boring Location Plan
Proposed Structure(s)	An approximately 10,000 foot long 8 inch of new water main and intermittent fire hydrants.
Water Main Construction	Based on our understanding the water main will be constructed within the road right-of-ways at a depth of about 5 feet below grade. At this time, plans for the proposed alignment route are not available, however review of existing topographic indicate that several tributaries to the licking river are present along the proposed alignment and will require creek crossings. Additionally, it has been assumed that the alignment will cross the roadway in several locations to avoid floodplains where possible.

3 AREA/SITE INFORMATION

3A AREA TOPOGRAPHY / PHYSIOGRAPHY

The site is located within the Outer Blue Grass Region of northern Kentucky. This area is characterized by Ordovician dolomites, limestones and calcareous shales, thin pre-Wisconsinan drift, loamy soils and low to moderately high relief. Published mapping reviewed indicates the elevations in the site vicinity range from about 580 feet near 207 Rifle Range Road a to about 480 feet within a swale near 499 Rifle Range Road. Below is a figure of the location of the site with respect to the regional physiography.

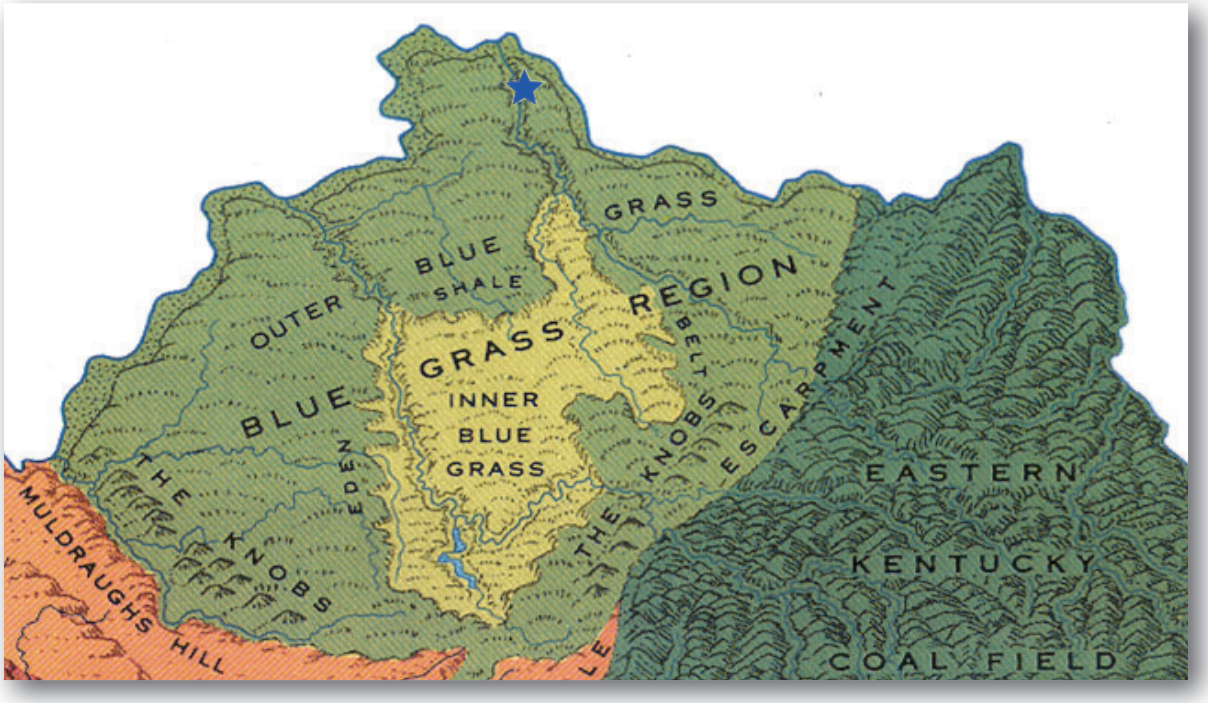


Figure 1 - Kentucky Physiographic Map (site vicinity shown with star)

3B SITE GEOLOGY

Review of the *Kentucky Geologic Map Service* shown in **Figure 2** below indicates the the majority of the alignment is underlain by Ordovician age deposits belonging to the Kope (Ok) and Point Pleasant Tongue of Clays Ferry (Ocp) Formations. These formations are both comprised of interbedded limestone and shale and differ mainly in the ratio of limestone to shale. The Kope formation is comprised of about 80 percent shale while the Point Pleasant Tongue of Clays Ferry formation being comprised of about 45 to 65 percent limestone. At lower elevations, particularly to the north and west of the road way Quaternary age alluvial deposits (Qt & Qal) which consist of mixed layers of clay, silt, gravel, and sand.

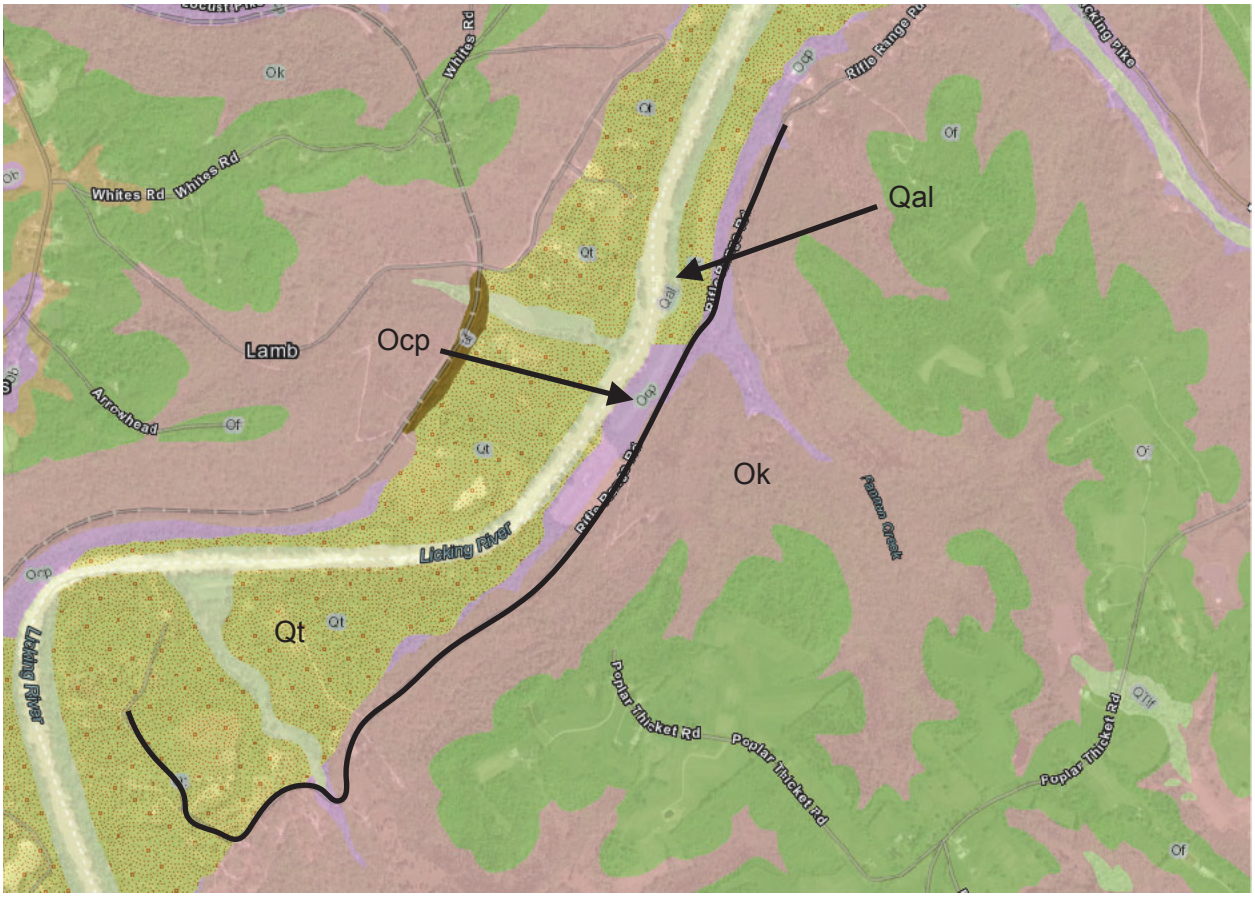


Figure 2 - Site Geologic Mapping (Approximate Alignment Highlighted)

FINDINGS

4 SUBSURFACE CONDITIONS

CSI performed a total of eleven (11) soil test borings to explore the subsurface conditions along the alignment at approximate 1,000 foot intervals. In general, our borings encountered residual soils overlying bedrock. Some isolated areas of alluvial and fill material were also encountered.

4A STRATA INFORMATION

The subsurface conditions encountered at the test boring locations are shown in the Test Boring Log in the Appendix. These records represent our interpretation of the subsurface conditions based on the field logs, visual examination of field samples by an engineer, and tests of the samples collected. The letters in parentheses following the soil descriptions are the soil classifications in general accordance with the Unified Soil Classification System (USCS). It should be noted that dashed stratification lines shown on the soil boring log represent approximate transitions between material types. In-situ stratum changes could occur gradually

or at slightly different depths. Boring elevations were determined by Cardinal Engineering and supplied to CSI.

TOPSOIL

Asphalt was encountered at the ground surface within each boring location and was noted to be between 3 and 4 inches thick.

RESIDUUM

Residual soils were encountered in each boring except for boring B-11. In general, the residual soils were noted to be brown lean to fat clay with varying amounts of silt, rock fragments, and black oxide nodules. Standard Penetration Testing (SPT) N-Values ranged from 5 to 52 blows per foot (bpf) indicated a firm to stiff consistency, which increased with depth. Laboratory testing of a representative samples indicates Liquid Limits (LL) ranging from 43 to 52 percent and Plasticity Indices (PI) between 22 and 26 percent. Natural moisture contents ranged from 15.8 to 24.7 percent.

ALLUVIUM

Alluvial soil deposits were encountered in boring B-11 to the termination depth of 10 feet. The alluvial soils were encountered were noted in two layers. The upper layer of alluvial soils were noted to be brown to light brown lean clay with little to some silt, trace sand, and black oxide nodules. The lower alluvial soils were encountered at a depth of about 8 feet and were described to be brown fine grained sand with clay, trace black oxide nodules, and rock fragments. SPT N-Values within the cohesive soils were noted to be 5 to 9 bpf, indicating a firm to very stiff consistency. Within the non-cohesive soils an SPT N-value of 9 bpf was noted, indicating a loose relative density.

PREVIOUSLY PLACED FILL

Previously placed fill was encountered in borings B-3 and B-9 to depths of 3 and 5.5 feet below grade, respectively. The fill material within boring B-3 was described to be gray lean clay with roots, rock fragments, and trace sand. Within boring B-9, the material was noted to be to be brown to gray fine grained sand with rock fragments, asphalt fragments and silt. SPT N-Values ranged from 6 to 23 blows per foot (bpf) indicated a firm to stiff consistency, which increased with depth. Laboratory testing of a representative samples indicates Liquid Limits (LL) of 35 and 43 percent and Plasticity Indices (PI) of 16 and 26 percent, respectively. Natural moisture contents ranged from 20.2 to 26.3 percent.

WEATHERED SHALE/LIMESTONE BEDROCK

Weathered shale bedrock samples were recovered from borings B-1, B-3, B-7, and B-8 at depths of about 8 feet within each boring. Auger refusal on what has been assumed to be competent limestone was encountered within borings B-1, B-2, B-3, B-4, and B-9 at depths

ranging from 8.4 to 8.9 feet. For details of subsurface conditions encountered at a particular boring location please refer to the boring logs contained in Appendix A. It should be noted that our borings were drilled and sampled according to the procedures presented in the appendix. The boring locations shown in the appendix should be considered accurate only to the degree implied by the method used.

4B GROUNDWATER CONDITIONS

Groundwater was not encountered in any measurable quantities within any of our boring locations. In the Northern Kentucky area, water conditions that usually affect construction and performance of projects consist of trapped/perched water zones which occur in variable areas in the soil mass that may be present at the soil/bedrock interface and/or due to sand layers and seams throughout the soil. Perched water sources are often not linked to the more continuous relatively stable ground water table that typically occurs at greater depths. Site excavation activities or ground disturbance can expose these features and the resulting seepage can vary greatly. Groundwater issues are also dependent upon recent rainfall activity and surface and subsurface drainage patterns in the area that may change depending on climatic conditions.

5 LABORATORY TESTING

Laboratory tests were performed on selected recovered samples from the borings to provide recommendations for earthwork and to determine index properties of the soils. Details for the test methods and results are shown in the Appendix. Tests performed included:

- 27 Moisture Content Tests
- 3 Grain Size Analyses (-200 Sieve)
- 3 Atterberg Limits Tests

GEOTECHNICAL DISCUSSION AND RECOMMENDATIONS

6 DISCUSSION—GEOTECHNICAL ISSUES

Based on our experience with similar projects and the conditions observed during our subsurface exploration, we believe the site is suitable for the proposed construction, provided the recommendations outlined in this report are followed. The primary geotechnical concerns are:

- **MARGINALLY SOFT ALLUVIAL SOILS**
- **SHALLOW BEDROCK**
- **PREVIOUSLY PLACED FILL**

6A MARGINALLY SOFT ALLUVIAL SOILS

Marginally soft alluvial soils were encountered in borings B-11 to depths of about 3.5 feet below grade. Additionally, geologic mapping as well as our borings indicate that alluvial soil deposits are present at lower elevations along or near the entire alignment. Due to the deposition environment, alluvial soils such as these are often soft and make poor bearing materials. While it is anticipated that the alignment will extend through the softest materials present within the upper 3 feet, marginally soft soils are may still be present at bearing elevations and may require undercuts to competent soils.

6B SHALLOW BEDROCK

Auger refusal on what has been assumed to be competent limestone was encountered in several borings at depths of about 8 to 9 feet below grade. While it is anticipated that typical alignment installation depths will not encounter bedrock, it is possible that shallow bedrock is encountered in some areas along the alignment, particularly at higher elevations. The bedrock in the area is a mixture of interbedded limestone and shale and while the shale is often very soft and soil-like, but the limestone (although in thin beds) can be very hard and difficult to remove. A large trackhoe will likely be required; however, the use of ripping equipment or a hoe-ram may be necessary if competent limestone is encountered during excavation.

6C PREVIOUSLY PLACED FILL MATERIAL

Previously placed fill or possible fill material was encountered in borings B-3 and B-9 to a maximum depth of about 5.5 feet below grade. Old fill materials are often improperly compacted, commonly contain organics and debris, and are generally poor bearing materials. Based upon consistency of the fill encountered within our boring it should provide suitable support conditions. If widespread fill material is encountered during installation, it is possible that soft and/or lose areas of fill may be encountered which will require undercuts to provide suitable bearing support.

7 WATER PIPE SUPPORT

With regards to pipe support, three different bearing conditions are anticipated along the proposed alignment. Along the majority of the alignment residual soil conditions should be expected with isolated areas of fill, as well as alluvial soils present at lower elevations. If soft soils are encountered, they should be undercut to the firm or better materials and replaced with suitable fill material. Additionally, restrained joints and or thrust blocks may be required depending upon the field conditions. If questionable soils are encountered, CSI should be notified to evaluate and provide necessary recommendations.

8 THRUST RESTRAINT

Where changes in the direction of flow occur and/or where the water main cross sectional area changes, thrust forces will be generated in the direction of water flow. In some cases the thrust forces generated can be greater than the lateral resistance of the natural soils and/or backfill

placed within utility trenches. To prevent separation and/or damage to the water main at these horizontal or vertical bends/joints, thrust block restraints (or restrained joints where thrust blocks are not applicable) will be required. Review of the provided plans indicate that thrust block are planned at several location along the proposed alignment. Based upon the conditions encountered, the thrust blocks appear to be suitable for the proposed alignment. Thrust blocks should bear on the undisturbed stiff or better residual soils or alluvial soils and can be designed using the soil parameters shown in the table below. For design of restrained joints, a frictional coefficient between pipe and soil of 0.3 should be used. Additionally, reinforced concrete encasement may also be used in place of restrained joints.

Table 3: Thrust Block Soil Parameters

Soil Group	Passive Earth Pressure Coefficient	Unit Weight (pcf)	Cohesion (psf)	Friction Angle (φ)
Residual Clay	Kp = 2.5	115	100	φ = 25
Alluvial/Fill	Kp = 2.2	105	0	φ = 22

9 EARTHWORK

We do not anticipate any structural fill to occur on the site with the exception of backfill of the trenches. The following recommendations are for backfill operations around open cut trenches for the alignment.

9A EXCAVATIONS

Normal earth excavation equipment should be suitable for excavations associated with the overburden soils. The weathered shale encountered on site should be able to be excavated with conventional equipment, however for the competent limestone layers encountered, ripping equipment or the use of a hoe-ram will most likely be necessary.

For below-grade excavations, the residual soils should be classified as OSHA Type B soils with a minimum slope excavation of 1H:1V. Previously placed fill and alluvial soils should be classified as OHSA Type C soils with a minimum slope excavation of 1.5H:1V. If soil types other than what has been mentioned above are encountered, CSI should be contacted to evaluate for stability.

9B TRENCH BACKFILL OPERATIONS

These materials are placed in more confined areas than mass earthwork materials or pavement materials. The following are general recommendations for backfill areas:

- Fill lift thicknesses will vary dependent on compaction equipment available and material types, but in no case should exceed 8 inches for clay and 12 inches for granular soils;

- For crushed stone/aggregate backfills in trenches and when using smaller compaction equipment the lift thickness should be based on the type of aggregate and equipment. For well-graded granular soils such as Dense Grade Aggregate, a thickness of 4 to 6 inches is typically required. If open-graded stone is used, the lift thickness may be able to be increased. This should be evaluated by the geotechnical engineer;
- Place cohesive fill (clay) in maximum 8-inch thick loose lifts. Granular soils may be placed in maximum 12 inch loose lifts provided properly sized equipment is used in the compaction process;
- Fill lifts should be compacted to at least 98 percent of the soil's maximum dry density (ASTM D 698) in areas beneath pavements and 92 percent in grassed areas.
- Maintain the moisture content of compacted fill between minus 2 and plus 2 percent of optimum moisture;
- Maximum particle size of the soil should be limited to half the lift thickness.;
- Density testing should be performed as a means to verify percent compaction and moisture content of the material as it is being placed and compacted;
- Density testing should be performed at a rate of at least 3 tests per lift; CSI should be retained to provide additional recommendations for backfill;

9C GENERAL NOTES

- For all earthwork operations, positive surface drainage is prudent to keep water from ponding on the surface and to assist in maintaining surface stability;
- The surface should be sealed prior to expected wet weather. This can usually be accomplished with rubber-tired construction equipment or a steel-drum roller;
- If any soil placement problems occur, CSI should be retained to provide additional recommendations, as needed.

10 SITE DRAINAGE

During construction, water should not be allowed to pond in excavations and fill areas or undercutting will likely be required. During the life of the project, slope the subgrade and other site features so that surface water flows away from the site structures.

For excavations during construction, most free water from the subsurface conditions could likely be removed via sump pumps and open channel flow (if possible) at or near the source of seepage. However, if normal dewatering measures prove insufficient, CSI should be retained to provide recommendations on the issue.

11 CREEK/TRIBUTARY CROSSING

As mentioned above, plans are not currently available for the proposed alignment, however review of available topographic mapping indicates that there are several small creeks/tributaries of the Licking River which will likely require below grade creek crossings. Within the tributary, plans indicate that the excavation below the bedrock-soil interface will be backfilled with concrete to match the existing creek bed configuration. While no borings were performed near the tributaries, conditions across the majority alignment were relatively consistent with residual soils present to depths of 8 or more feet below grade. Based upon the borings performed in the area of the proposed crossing bedrock may be present at depths greater than the proposed invert elevations. In the event that bedrock is not encountered within the excavation, we recommend that the base of the excavation be extended to bedrock (or to a sufficient depth to prevent scour of the bearing soils) and backfilled with concrete. Given that bedrock may not be present at the installation depth, a scour analysis should be performed to determine an appropriate installation depth in the event bedrock is not encountered.

12 NOTES ON THE REPORT AND RECOMMENDATIONS

We recommend that this complete report be provided to the various design team members, the contractors and the project Owner. Potential contractors should be informed of this report in the "Instructions to Bidders" section of the bid documents. A geotechnical exploration, such as the one we performed, used three borings to attempt to model the subsurface conditions at the site. Because no exploration contains complete data or a complete model, there is always a possibility that conditions between borings will be different from those at specific boring locations. Thus, it is possible that some subsurface conditions will not be as anticipated by the project team or contractor. If this report is included or referenced in the actual contract documents, it shall be explicitly understood that this report is for informational purposes only. CSI shall not be responsible for the opinions of, or conclusions drawn by others.

It has been our experience that the construction process often disturbs soil conditions and this process, no matter how much experience we use to anticipate construction methodology, is not completely predictable. Therefore, changes or modifications to our recommendations are likely needed due to these possible variances. Experienced CSI geotechnical personnel should be used to observe and document the construction procedures and the conditions encountered. Unanticipated conditions and inadequate procedures should be reported to the design team along with timely recommendations to solve the problems created. We recommend that the Owner retain CSI to provide this service based upon our familiarity with the project, the subsurface conditions and the intent of our recommendations.

This report is based on the supplied project information, the subsurface conditions observed at the time of the report, and our experience with similar conditions. As such, it cannot be applied to other project sites, types, or combinations thereof. If the Project Information section in this report contains incorrect information or if additional information is available, you should convey

the correct or additional information to us and retain us to review our recommendations. Our recommendations may then require modification.

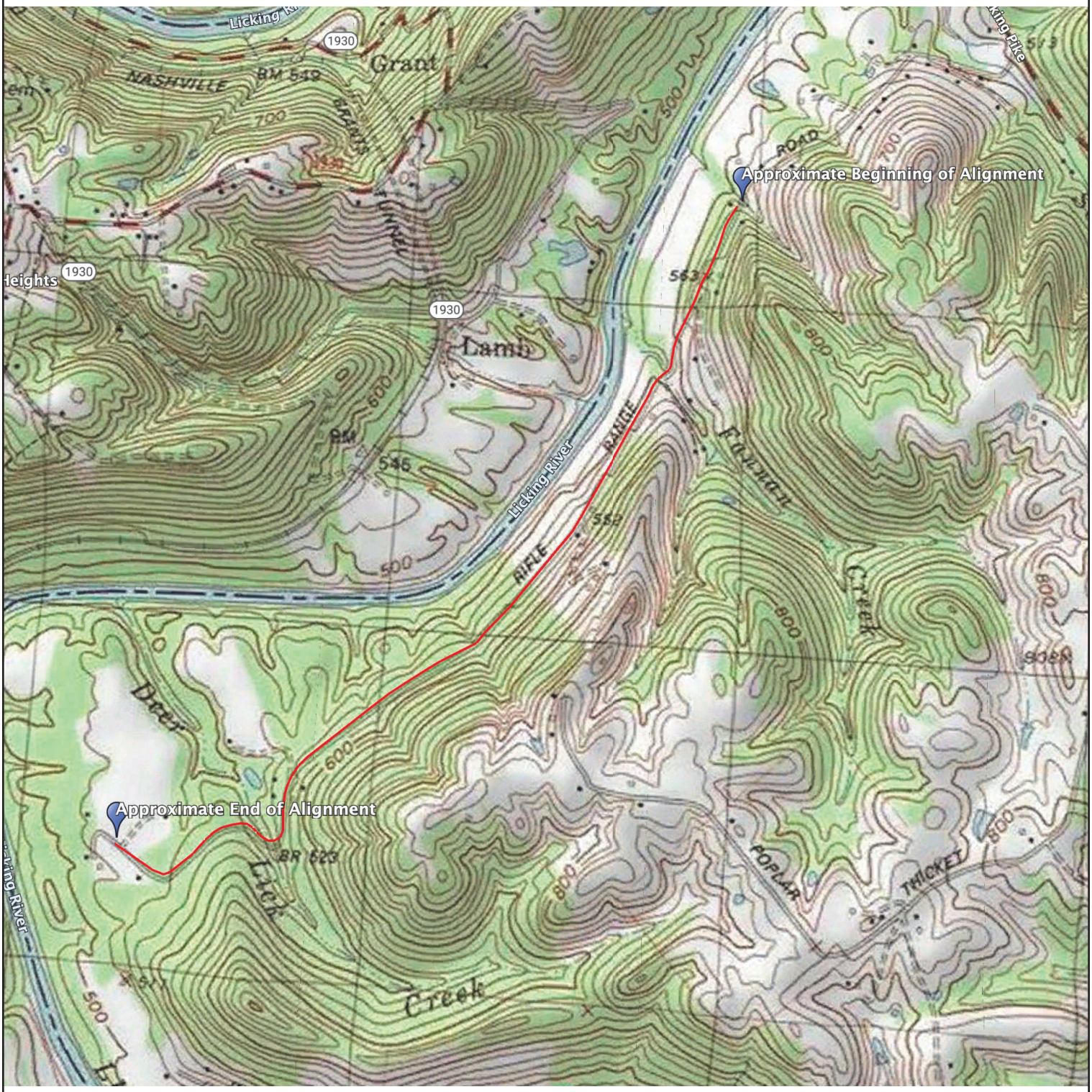
No section or portion of this report (including Appendix information) can be used as a stand alone article to make distinct changes or assumptions. The entire report and Appendix should be used together as one resource. We wish to remind you that our exploration services include storing the soil samples collected and making them available for inspection for 30 days. The soil samples are then discarded unless you request otherwise. Please inform us if you wish to keep any of the obtained samples.

While this report deals with samples of subsurface materials and some comments on water conditions at the site, no assessment of site environmental conditions or the presence of contaminants were performed.

We wish to remind you that our exploration services include storing the soil samples collected and making them available for inspection for 30 days. The samples are then discarded unless you request otherwise. Please inform us if you wish to keep any of the obtained samples.

APPENDIX A

SITE LOCATION PLAN
GEOTECHNICAL BORING INFORMATION SHEET
GENERAL BORING PROFILE
TEST BORING LOGS
FIELD TESTING PROCEDURES
LIQUID AND PLASTIC LIMITS REPORT
SUMMARY OF LABORATORY RESULTS
LABORATORY TESTING PROCEDURES



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ADAPTED FROM TOPOGRAPHIC MAPPING
FOR ILLUSTRATION PURPOSES

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Cincinnati, Ohio 45241
513.252.2059 Office | 888.792.3121 Fax
www.csiohio.com

TITLE: SITE LOCATION PLAN		PROJECT NO: CN230130	DRAWN BY: GD
PROJECT:	RIFLE RANGE ROAD WATER MAIN ALEXANDRIA, KY	DATE: 8/14/23	CHECKED BY: JB
		NOT TO SCALE	DRAWING NO 1 OF 2

FOR ILLUSTRATION PURPOSES

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Cincinnati, Ohio 45241
513.252.2059 Office | 888.792.3121 Fax
www.csiohio.com

TITLE:	BORING LOCATION PLAN	PROJECT NO: CN230130	DRAWN BY: GD
PROJECT:	RIFLE RANGE ROAD WATER MAIN ALEXANDRIA, KY	DATE: 8/14/23	CHECKED BY: JB
		NOT TO SCALE	DRAWING NO 2 OF 2

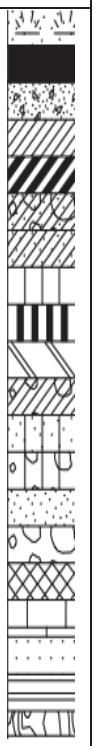
Consulting Services Incorporated
LEXINGTON | LOUISVILLE | CINCINNATI

Geotechnical Boring Information Sheet

Sample Type Symbols

Splitspoon (SPT)
Shelby Tube
Grab
Rock Core
Auger Cuttings

Surface Symbols



Topsoil
Asphalt
Concrete
Lean Clay
Fat Clay
Glacial Till
Sandy Clay
Silt
Elastic Silt
Lean Clay to Fat Clay
Gravelly Clay
Sandy Silt
Gravelly Silt
Sand
Gravel
Fill
Limestone
Sandstone
Shale/Siltstone
Weathered Rock

Samples Strength Descriptors

Cohesive Soils:	**N**
Very Soft	0-1
Soft	2-4
Firm	5-8
Stiff	9-15
Very Stiff	16-30
Hard	31+
Non-cohesive Soils:	
Very Loose	0-4
Loose	5-10
Firm	11-20
Very Firm	21-30
Dense	30-50
Very Dense	51+

Definitions

SPT-"Splitspoon" or standard penetration test. Blow counts are number of drops required for a 140 lb hammer dropping 30 inches to drive the sampler 6 inches.

N-value is the addition of the last two intervals of the 18-inch sample.

Shelby tubes are often called "undisturbed samples". They are directly pushed into the ground, twisted, allowed to rest for a small period of time and then pulled out of the ground. Tops and bottoms are cleaned and then sealed.

Sample classification is done in general accordance with ASTM D2487 and 2488 using the Unified Soil Classification System (USCS) as a general guide.

Soil moisture descriptions are based on the recovered sample observations. The descriptors are dry, slightly moist, moist, very moist and wet. These are typically based on relative estimates of the moisture condition of a visual estimation of the soils optimum moisture content (EOMC). Dry is almost in a "dusty" condition usually 6 or more percent below EOMC. Slightly moist is from about 6 to 2 percent below EOMC at a point at which the soil color does not readily change with the addition of water. Moist is usually 2 percent below to 2 percent above EOMC and the point at which the soil will tend to begin forming "balls" under some pressure in the hand. Very moist is usually from about 2 percent to 6 percent above EOMC and also the point at which it's often considered "muddy". Wet soil is usually 6 or more percent above EOMC and often contains free water or the soil is in a saturated state.

Silt or Clay is defined at material finer than a standard #200 US sieve (<0.075mm) Sand is defined as material between the size of #200 sieve up to #4 sieve. Gravel is from #4 size sieve material to 3". Cobbles are from 3" to 12". Boulders are over 12".

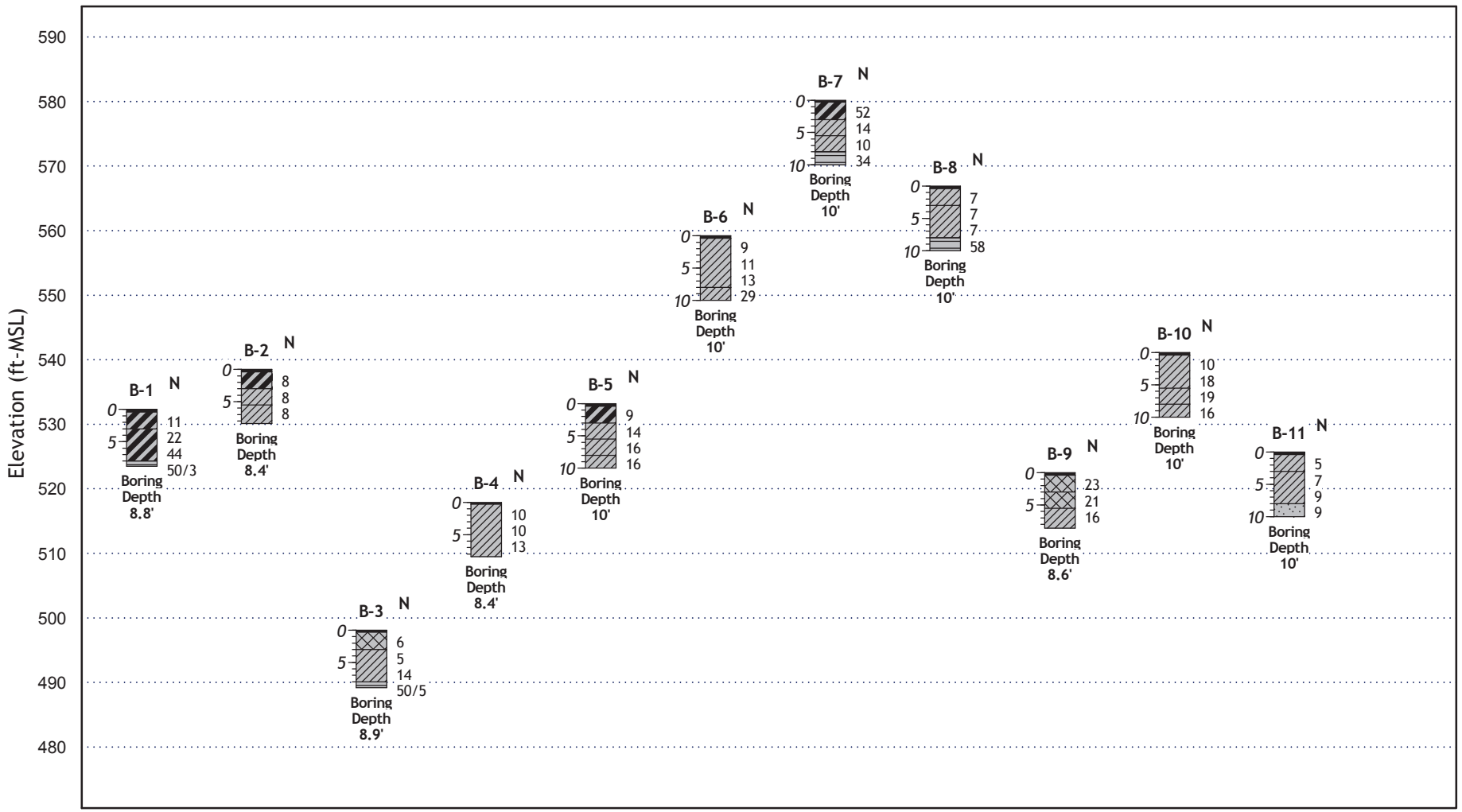
Rock hardness is classified as follows:

Very Soft:	Easily broken by hand pressure
Soft:	Ends can be broken by hand pressure; easily broken with hammer
Medium:	Ends easily broken with hammer; middle requires moderate blow
Hard:	Ends require moderate hammer blow; middle requires several blows
Very Hard:	Many blows with a hammer required to break core

Rock Quality Designation (RQD) is defined as total combined length of 4" or longer pieces of core divided by the total core run length; defined in percentage.

Water or cave-in observed in borings is at completion of drilling each boring unless otherwise noted.

Strata lengths shown on borings represents a rough estimate. Transition may be more abrupt or gradual. Soil borings are representative of that estimated location at that time and are based on recovered samples. Conditions may be different between borings and between sample intervals. Boring information is not to be considered stand alone but should be taken in context with comments and information in the geotechnical report and the means by which the borings are logged, sampled and drilled.



SOIL TYPES

(Shown in Graphic Log)

- Fill
- Asphalt
- Topsoil
- Gravel
- Sand
- Silt
- Lean Clay
- Fat Clay
- Silty Sand
- Clayey Sand
- Sandy Silt
- Clayey Silt
- Sandy Clay
- Silty Clay
- Limestone
- Sandstone
- Siltstone
- Shale

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11785 Highway Drive
Cincinnati, OH 45241
Phone: 513.252.2059
Fax: 888.792.3121

Rifle Range Road
CN230130

BORING PROFILE

Fig. 1

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Phone: 513.252.2059
Fax: 888.792.3121

TEST BORING LOG

CLIENT: Cardinal Engineering
PROJECT NAME: Rifle Range Road
PROJECT LOCATION: Alexandria, KY

BORING #: B-1
JOB #: CN230130
LOGGED BY: CG
APPROVED BY: GD

DRILLING and SAMPLING INFORMATION

Date Started	6/22/23	Contractor	CSI
Date Completed	6/22/23	Boring Size	4 in.
Drill Rig	B-57 Mobile	Boring Method	SFA
Weather	Cloudy, 70s	Hammer Type	Automatic

SOIL CLASSIFICATION

Elev. (ft)	Depth Scale	Water Level	SURFACE ELEVATION: 532.3	Sample No.	Sample Type	Sample Graphics	Recovery (in)	Standard Penetration Test Blows per 6" [*N-Value*] *blows/foot*	Qu-tsf Unconfined (Pocket Pen.) Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plasticity Index (PI)	Percent Passing #200 Sieve	Remarks
532			ASPHALT - 4 INCHES											
			Light brown varved FAT CLAY (CH) with trace black oxide nodules [Residuum] - moist, stiff	1	SS		14	3-5-6 [*11*]		19.8				
530	2													
			Brown FAT CLAY (CH) with rock fragments and trace silt [Residuum] - moist, very stiff to hard	2	SS		16	6-10-12 [*22*]		16.8				
528	4													
				3	SS		12	6-18-26 [*44*]		15.8	52	26	98	
526	6													
	8		Gray highly weathered SHALE - dry, soft	4	SS		3	50/3-- [*50/3*]						
524			Auger refusal at 8.8'											
			End boring											
522	10													
520	12													
518	14													

TEST DATA

Depth to Groundwater
- Noted on Drilling Tools _____ ft.
- At Completion _____ ft.
- After _____ hours _____ ft.
- Cave Depth _____ ft.

Sample Type
- SPT- Standard Penetration Test
- SS- Split Spoon
- ST- Shelby Tube
- RC- Rock Core
- CU- Auger Cuttings

Boring Method
- HSA- Hollow Stem Augers
- CFA- Continuous Flight Augers
- MD- Mud Drilling

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Cincinnati, OH 45241
Phone: 513.252.2059
Fax: 888.792.3121

TEST BORING LOG

CLIENT: Cardinal Engineering
PROJECT NAME: Rifle Range Road
PROJECT LOCATION: Alexandria, KY

BORING #: B-2
JOB #: CN230130
LOGGED BY: CG
APPROVED BY: GD

DRILLING and SAMPLING INFORMATION

Date Started	6/22/23	Contractor	CSI
Date Completed	6/22/23	Boring Size	4 in.
Drill Rig	B-57 Mobile	Boring Method	SFA
Weather	Cloudy, 70s	Hammer Type	Automatic

Elev. (ft)	Depth Scale	Water Level	SOIL CLASSIFICATION SURFACE ELEVATION: 538.5	Sample No.	Sample Type	Sample Graphics	Recovery (in)	Standard Penetration Test Blows per 6" [*N-Value*] *blows/foot*	Qu-tsf Unconfined (Pocket Pen.) Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plasticity Index (PI)	Percent Passing #200 Sieve	Remarks
538			ASPHALT - 4 INCHES											
	2		Brown FAT CLAY (CH) with black oxide nodules and trace rock fragments [Residuum] - moist, firm	1	SS		9	2-3-5 [*8*]		22.7				
536														
	4		Dark brown LEAN CLAY (CL) with black oxide nodules, rock fragments, and trace sand [Residuum] - moist, firm	2	SS		12	3-3-5 [*8*]						
534														
	6		Dark brown LEAN CLAY (CL) with black oxide nodules and trace rock fragments [Residuum] - moist, firm	3	SS		8	3-4-4 [*8*]		17.6				
532														
	8		Auger refusal at 8.4'											
530			End boring											
	10													
528														
	12													
526														
	14													
524														

Depth to Groundwater
- Noted on Drilling Tools _____ ft.
- At Completion _____ ft.
- After _____ hours _____ ft.
- Cave Depth _____ ft.

Sample Type
- SPT- Standard Penetration Test
- SS- Split Spoon
- ST- Shelby Tube
- RC- Rock Core
- CU- Auger Cuttings

Boring Method
- HSA- Hollow Stem Augers
- CFA- Continuous Flight Augers
- MD- Mud Drilling

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Cincinnati, OH 45241
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Fax: 888.792.3121

TEST BORING LOG

CLIENT: Cardinal Engineering
PROJECT NAME: Rifle Range Road
PROJECT LOCATION: Alexandria, KY

BORING #: B-3
JOB #: CN230130
LOGGED BY: CG
APPROVED BY: GD

DRILLING and SAMPLING INFORMATION

Date Started	6/22/23	Contractor	CSI
Date Completed	6/22/23	Boring Size	4 in.
Drill Rig	B-57 Mobile	Boring Method	SFA
Weather	Cloudy, 70s	Hammer Type	Automatic

SOIL CLASSIFICATION

SURFACE ELEVATION: 498.1

Elev. (ft)	Depth Scale	Water Level	Soil Description	Sample No.	Sample Type	Sample Graphics	Recovery (in)	Standard Penetration Test Blows per 6" [*N-Value*] *blows/foot*	Qu-tsf Unconfined (Pocket Pen.) Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plasticity Index (PI)	Percent Passing #200 Sieve	Remarks
498			ASPHALT - 3 INCHES											
			FILL: Gray LEAN CLAY (CL) with roots, rock fragments, and trace sand - moist, firm	1	SS		9	2-3-3 [*6*]		26.7				
496	2													
			Light brown LEAN CLAY (CL) with trace silt and rock fragments [Residuum] - moist, firm to stiff	2	SS		18	2-2-3 [*5*]		16.2				
494	4													
				3	SS		6	2-4-10 [*14*]						
492	6													
490	8		Light brown highly weathered thinly laminated SHALE with trace silt - moist, soft	4	SS		1	50/5-- [*50/5*]						
			Auger refusal at 8.9'											
488	10		End boring											
486	12													
484	14													

Depth to Groundwater

Noted on Drilling Tools	_____ ft.	
At Completion	_____ ft.	
After _____ hours	_____ ft.	
Cave Depth	_____ ft.	

Sample Type
SPT- Standard Penetration Test
SS- Split Spoon
ST- Shelby Tube
RC- Rock Core
CU- Auger Cuttings

Boring Method
HSA- Hollow Stem Augers
CFA- Continuous Flight Augers
MD- Mud Drilling

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TEST BORING LOG

CLIENT: Cardinal Engineering
PROJECT NAME: Rifle Range Road
PROJECT LOCATION: Alexandria, KY

BORING #: B-4
JOB #: CN230130
LOGGED BY: CG
APPROVED BY: GD

DRILLING and SAMPLING INFORMATION

Date Started	6/22/23	Contractor	CSI
Date Completed	6/22/23	Boring Size	4 in.
Drill Rig	B-57 Mobile	Boring Method	SFA
Weather	Cloudy, 70s	Hammer Type	Automatic

Elev. (ft)	Depth Scale	Water Level	SOIL CLASSIFICATION / SURFACE ELEVATION: 517.9	Sample No.	Sample Type	Sample Graphics	Recovery (in)	Standard Penetration Test Blows per 6" [*N-Value*] *blows/foot*	Qu-tsf Unconfined (Pocket Pen.) Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plasticity Index (PI)	Percent Passing #200 Sieve	Remarks
			ASPHALT - 3 INCHES											
516	2		Brown LEAN CLAY (CL) with trace to littlesilt and trace rock fragments [Residuum] - moist, stiff	1	SS		6	4-5-5 [*10*]						
514	4			2	SS		10	4-6-4 [*10*]		17.8	45	22	98	
512	6			3	SS		11	3-6-7 [*13*]		17.4				
510	8		Auger refusal at 8.4'											
			End boring											
508	10													
506	12													
504	14													

Depth to Groundwater
- Noted on Drilling Tools _____ ft.
- At Completion _____ ft.
- After _____ hours _____ ft.
- Cave Depth _____ ft.

Sample Type
- SPT- Standard Penetration Test
- SS- Split Spoon
- ST- Shelby Tube
- RC- Rock Core
- CU- Auger Cuttings

Boring Method
- HSA- Hollow Stem Augers
- CFA- Continuous Flight Augers
- MD- Mud Drilling

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Cincinnati, OH 45241
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Fax: 888.792.3121

TEST BORING LOG

CLIENT: Cardinal Engineering
PROJECT NAME: Rifle Range Road
PROJECT LOCATION: Alexandria, KY

BORING #: B-5
JOB #: CN230130
LOGGED BY: CG
APPROVED BY: GD

DRILLING and SAMPLING INFORMATION

Date Started	6/22/23	Contractor	CSI
Date Completed	6/22/23	Boring Size	4 in.
Drill Rig	B-57 Mobile	Boring Method	SFA
Weather	Cloudy, 70s	Hammer Type	Automatic

Elev. (ft)	Depth Scale	Water Level	SOIL CLASSIFICATION SURFACE ELEVATION: 533.2	Sample No.	Sample Type	Sample Graphics	Recovery (in)	Standard Penetration Test Blows per 6" [*N-Value*] *blows/foot*	Qu-tsf Unconfined (Pocket Pen.) Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plasticity Index (PI)	Percent Passing #200 Sieve	Remarks
			ASPHALT - 4 INCHES											
532	2		Brown FAT CLAY (CH) with little silt and trace black oxide nodules [Residuum] - moist, stiff	1	SS		13	2-3-6 [*9*]		20.8				
530	4		Brown LEAN CLAY (CL) with black oxide nodules, silt, and trace rock fragments [Residuum] - moist, stiff	2	SS		16	4-7-7 [*14*]						
528	6		Dark brown LEAN CLAY (CL) with trace silt [Residuum] - moist, very stiff	3	SS		14	4-9-7 [*16*]		21.9				
526	8		Brown LEAN CLAY (CL) with little silt and trace rock fragments [Residuum] - moist, very stiff	4	SS		14	4-7-9 [*16*]		17.6				
524	10		Boring terminated at 10'											
522			No refusal											
520	12													
	14													

Depth to Groundwater
- Noted on Drilling Tools _____ ft.
- At Completion _____ ft.
- After _____ hours _____ ft.
- Cave Depth _____ ft.

Sample Type
- SPT- Standard Penetration Test
- SS- Split Spoon
- ST- Shelby Tube
- RC- Rock Core
- CU- Auger Cuttings

Boring Method
- HSA- Hollow Stem Augers
- CFA- Continuous Flight Augers
- MD- Mud Drilling

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Fax: 888.792.3121

TEST BORING LOG

CLIENT: Cardinal Engineering
PROJECT NAME: Rifle Range Road
PROJECT LOCATION: Alexandria, KY

BORING #: B-6
JOB #: CN230130
LOGGED BY: CG
APPROVED BY: GD

DRILLING and SAMPLING INFORMATION

Date Started	6/22/23	Contractor	CSI
Date Completed	6/22/23	Boring Size	4 in.
Drill Rig	B-57 Mobile	Boring Method	SFA
Weather	Cloudy, 70s	Hammer Type	Automatic

SOIL CLASSIFICATION

SURFACE ELEVATION: 559.2

ASPHALT - 4 INCHES

Dark brown LEAN CLAY (CL) with trace roots, rock fragments and black oxide nodules [Residuum] - moist, stiff

Brown LEAN CLAY (CL) with silt, black oxide nodules, and trace rock fragments [Residuum] - moist, very stiff

Boring terminated at 10'

No refusal

TEST DATA

Sample No.	Sample Type	Recovery (in)	Standard Penetration Test Blows per 6" [*N-Value*] *blows/foot*	Moisture Content %
1	SS	16	3-4-5 [*9*]	24.7
2	SS	18	4-5-6 [*11*]	24.4
3	SS	18	4-6-7 [*13*]	
4	SS	10	4-5-24 [*29*]	18.8

Depth to Groundwater
- Noted on Drilling Tools _____ ft.
- At Completion _____ ft.
- After _____ hours _____ ft.
- Cave Depth _____ ft.

Sample Type
SPT- Standard Penetration Test
SS- Split Spoon
ST- Shelby Tube
RC- Rock Core
CU- Auger Cuttings

Boring Method
HSA- Hollow Stem Augers
CFA- Continuous Flight Augers
MD- Mud Drilling

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Fax: 888.792.3121

TEST BORING LOG

CLIENT: Cardinal Engineering
PROJECT NAME: Rifle Range Road
PROJECT LOCATION: Alexandria, KY

BORING #: B-7
JOB #: CN230130
LOGGED BY: CG
APPROVED BY: GD

DRILLING and SAMPLING INFORMATION

Date Started	6/22/23	Contractor	CSI
Date Completed	6/22/23	Boring Size	4 in.
Drill Rig	B-57 Mobile	Boring Method	SFA
Weather	Cloudy, 70s	Hammer Type	Automatic

SOIL CLASSIFICATION

SURFACE ELEVATION: 580.2

Elev. (ft)	Depth Scale	Water Level	Soil Classification	Sample No.	Sample Type	Sample Graphics	Recovery (in)	Standard Penetration Test Blows per 6" [*N-Value*] *blows/foot*	Qu-tsf Unconfined (Pocket Pen.) Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plasticity Index (PI)	Percent Passing #200 Sieve	Remarks
580			ASPHALT - 3 INCHES											
			Brown FAT CLAY (CH) with trace black oxide nodules, silt, and roots [Residuum] - moist, hard	1	SS		6	2-3-49 [*52*]		23.5				
578	2													
			Brown LEAN CLAY (CL) with little silt and trace rock fragments [Residuum] - moist, stiff	2	SS		11	12-7-7 [*14*]		18.4				
576	4													
			Brown to gray LEAN CLAY (CL) with little silt and trace rock fragments [Residuum] - moist, stiff	3	SS		16	5-4-6 [*10*]		18.6				
574	6													
572	8		Olive brown highly weathered and thinly laminated SHALE with trace limestone fragments - dry, soft	4	SS		17	10-14-20 [*34*]						
570	10		Boring terminated at 10'											
			No refusal											
568	12													
566	14													

TEST DATA

Depth to Groundwater

Noted on Drilling Tools	_____ ft.	
At Completion	_____ ft.	
After _____ hours	_____ ft.	
Cave Depth	_____ ft.	

Sample Type
SPT- Standard Penetration Test
SS- Split Spoon
ST- Shelby Tube
RC- Rock Core
CU- Auger Cuttings

Boring Method
HSA- Hollow Stem Augers
CFA- Continuous Flight Augers
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11785 Highway Drive
Cincinnati, OH 45241
Phone: 513.252.2059
Fax: 888.792.3121

TEST BORING LOG

CLIENT: Cardinal Engineering
PROJECT NAME: Rifle Range Road
PROJECT LOCATION: Alexandria, KY

BORING #: B-8
JOB #: CN230130
LOGGED BY: CG
APPROVED BY: GD

DRILLING and SAMPLING INFORMATION

Date Started	6/22/23	Contractor	CSI
Date Completed	6/22/23	Boring Size	4 in.
Drill Rig	B-57 Mobile	Boring Method	SFA
Weather	Cloudy, 70s	Hammer Type	Automatic

Elev. (ft)	Depth Scale	Water Level	SOIL CLASSIFICATION / SURFACE ELEVATION: 566.9	Sample No.	Sample Type	Sample Graphics	Recovery (in)	Standard Penetration Test Blows per 6" [*N-Value*] *blows/foot*	Qu-tsf Unconfined (Pocket Pen.) Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plasticity Index (PI)	Percent Passing #200 Sieve	Remarks
566	0		ASPHALT - 4 INCHES											
			Brown LEAN CLAY (CL) with trace rock fragments, black oxide nodules, and silt [Residuum] - moist, firm	1	SS		13	3-3-4 [7]						
564	2													
			Brown to gray FAT CLAY (CH) with little rock fragments, trace black oxide nodules, and silt [Residuum] - moist, firm	2	SS		12	3-3-4 [7]		20.8				
562	4													
				3	SS		12	3-3-4 [7]		24.3				
560	6													
			Gray highly weathered and thinly laminated SHALE with limestone fragments - dry, soft	4	SS		14	12-26-32 [58]		11.4				
558	8													
			Boring terminated at 10' No refusal											
556	10													
554	12													
552	14													

TEST DATA

Depth to Groundwater
- Noted on Drilling Tools _____ ft.
- At Completion _____ ft.
- After _____ hours _____ ft.
- Cave Depth _____ ft.

Sample Type
- SPT- Standard Penetration Test
- SS- Split Spoon
- ST- Shelby Tube
- RC- Rock Core
- CU- Auger Cuttings

Boring Method
- HSA- Hollow Stem Augers
- CFA- Continuous Flight Augers
- MD- Mud Drilling

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Cincinnati, OH 45241
Phone: 513.252.2059
Fax: 888.792.3121

TEST BORING LOG

CLIENT: Cardinal Engineering
PROJECT NAME: Rifle Range Road
PROJECT LOCATION: Alexandria, KY

BORING #: B-9
JOB #: CN230130
LOGGED BY: CG
APPROVED BY: GD

DRILLING and SAMPLING INFORMATION

Date Started	6/22/23	Contractor	CSI
Date Completed	6/22/23	Boring Size	4 in.
Drill Rig	B-57 Mobile	Boring Method	SFA
Weather	Cloudy, 70s	Hammer Type	Automatic

Elev. (ft)	Depth Scale	Water Level	SOIL CLASSIFICATION / SURFACE ELEVATION: 522.5	Sample No.	Sample Type	Sample Graphics	Recovery (in)	Standard Penetration Test Blows per 6" [*N-Value*] *blows/foot*	Qu-tsf Unconfined (Pocket Pen.) Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plasticity Index (PI)	Percent Passing #200 Sieve	Remarks
522			ASPHALT - 4 INCHES											
			FILL: Light Brown fine grained SAND (SP) with gravel and asphalt - moist, very firm	1	SS		5	9-13-10 [*23*]						
520	2													
			FILL: Gray fine grained SAND (SP) with rock fragments and silt - dry, very firm	2	SS		8	7-9-12 [*21*]		12.1				
518	4													
			Brown LEAN CLAY (CL) with rock fragments and trace silt [Residuum] - moist, very stiff	3	SS		16	5-9-7 [*16*]		19.5				
516	6													
514	8		Auger refusal at 8.6'											
			End boring											
512	10													
510	12													
508	14													

Depth to Groundwater
- Noted on Drilling Tools _____ ft.
- At Completion _____ ft.
- After _____ hours _____ ft.
- Cave Depth _____ ft.

Sample Type
- SPT- Standard Penetration Test
- SS- Split Spoon
- ST- Shelby Tube
- RC- Rock Core
- CU- Auger Cuttings

Boring Method
- HSA- Hollow Stem Augers
- CFA- Continuous Flight Augers
- MD- Mud Drilling

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Phone: 513.252.2059
Fax: 888.792.3121

TEST BORING LOG

CLIENT: Cardinal Engineering
PROJECT NAME: Rifle Range Road
PROJECT LOCATION: Alexandria, KY

BORING #: B-10
JOB #: CN230130
LOGGED BY: CG
APPROVED BY: GD

DRILLING and SAMPLING INFORMATION

Date Started	6/22/23	Contractor	CSI
Date Completed	6/22/23	Boring Size	4 in.
Drill Rig	B-57 Mobile	Boring Method	SFA
Weather	Cloudy, 70s	Hammer Type	Automatic

SOIL CLASSIFICATION

SURFACE ELEVATION: 541.1

Elev. (ft)	Depth Scale	Water Level	Soil Classification	Sample No.	Sample Type	Sample Graphics	Recovery (in)	Standard Penetration Test Blows per 6" [*N-Value*] *blows/foot*	Qu-tsf Unconfined (Pocket Pen.) Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plasticity Index (PI)	Percent Passing #200 Sieve	Remarks
540	0		ASPHALT - 4 INCHES											
			Brown LEAN CLAY (CL) with trace roots, trace silt, trace sand, and trace black oxide nodules [Residuum] - moist, stiff to very stiff	1	SS		9	3-5-5 [*10*]						
538	2													
				2	SS		12	5-8-10 [*18*]		16.5	43	22	89	
536	4													
			Light brown LEAN CLAY (CL) with silt and trace black oxide nodules [Residuum] - moist, very stiff	3	SS		17	5-9-10 [*19*]						
534	6													
			Reddish brown LEAN CLAY (CL) with trace black oxide nodules and trace silt [Residuum] - moist, very stiff	4	SS		18	4-6-10 [*16*]		21.2				
532	8													
			Boring terminated at 10'											
530	10		No refusal											
	12													
528														
	14													

Depth to Groundwater

Noted on Drilling Tools	_____ ft.	
At Completion	_____ ft.	
After _____ hours	_____ ft.	
Cave Depth	_____ ft.	

Sample Type
SPT- Standard Penetration Test
SS- Split Spoon
ST- Shelby Tube
RC- Rock Core
CU- Auger Cuttings

Boring Method
HSA- Hollow Stem Augers
CFA- Continuous Flight Augers
MD- Mud Drilling

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TEST BORING LOG

CLIENT: Cardinal Engineering
PROJECT NAME: Rifle Range Road
PROJECT LOCATION: Alexandria, KY

BORING #: B-11
JOB #: CN230130
LOGGED BY: CG
APPROVED BY: GD

DRILLING and SAMPLING INFORMATION

Date Started	6/22/23	Contractor	CSI
Date Completed	6/22/23	Boring Size	4 in.
Drill Rig	B-57 Mobile	Boring Method	SFA
Weather	Cloudy, 70s	Hammer Type	Automatic

Elev. (ft)	Depth Scale	Water Level	SOIL CLASSIFICATION / SURFACE ELEVATION: 525.7	Sample No.	Sample Type	Sample Graphics	Recovery (in)	Standard Penetration Test Blows per 6" [*N-Value*] *blows/foot*	Qu-tsf Unconfined (Pocket Pen.) Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plasticity Index (PI)	Percent Passing #200 Sieve	Remarks
			ASPHALT - 4 INCHES											
524	2		Brown LEAN CLAY (CL) with little silt, trace sand and trace black oxide nodules [Alluvium] - moist, firm	1	SS		18	2-2-3 [5]						
522	4		Light brown to brown LEAN CLAY (CL) with little to some silt, little sand, and trace black oxide nodules [Alluvium] - moist, firm	2	SS		12	2-3-4 [7]		15.9				
520	6			3	SS		16	2-4-5 [9]		18.7				
518	8		Brown fine grained SAND (SP) with clay, trace black oxide nodules and rock fragments [Alluvium] - moist, stiff	4	SS		18	2-5-4 [9]						
516	10		Boring terminated at 10'											
514	12		No refusal											
512	14													

Depth to Groundwater
- Noted on Drilling Tools _____ ft.
- At Completion _____ ft.
- After _____ hours _____ ft.
- Cave Depth _____ ft.

Sample Type
- SPT- Standard Penetration Test
- SS- Split Spoon
- ST- Shelby Tube
- RC- Rock Core
- CU- Auger Cuttings

Boring Method
- HSA- Hollow Stem Augers
- CFA- Continuous Flight Augers
- MD- Mud Drilling

FIELD TESTING PROCEDURES

Field Operations: The general field procedures employed by CSI are summarized in ASTM D 420 which is entitled "Investigating and Sampling Soils and Rocks for Engineering Purposes." This recommended practice lists recognized methods for determining soil and rock distribution and ground water conditions. These methods include geophysical and in situ methods as well as borings.

Borings are drilled to obtain subsurface samples using one of several alternate techniques depending upon the subsurface conditions. These techniques are:

a. Continuous 2-1/2 or 3-1/4 inch I.D. hollow stem augers;

b. Wash borings using roller cone or drag bits (mud or water);

c. Continuous flight augers (ASTM D 1425).

These drilling methods are not capable of penetrating through material designated as "refusal materials." Refusal, thus indicated, may result from hard cemented soil, soft weathered rock, coarse gravel or boulders, thin rock seams, or the upper surface of sound continuous rock. Core drilling procedures are required to determine the character and continuity of refusal materials.

The subsurface conditions encountered during drilling are reported on a field test boring record by the chief driller. The record contains information concerning the boring method, samples attempted and recovered, indications of the presence of various materials such as coarse gravel, cobbles, etc., and observations between samples. Therefore, these boring records contain both factual and interpretive information. The field boring records are on file in our office.

The soil and rock samples plus the field boring records are reviewed by a geotechnical engineer. The engineer classifies the soils in general accordance with the procedures outlined in ASTM D 2488 and prepares the final boring records which are the basis for all evaluations and recommendations.

The final boring records represent our interpretation of the contents of the field records based on the results of the engineering examinations and tests of the field samples. These records depict subsurface conditions at the specific locations and at the particular time when drilled. Soil conditions at other locations may differ from conditions occurring at these boring locations. Also, the passage of time may result in a change in the subsurface soil and ground water conditions at these boring locations. The lines designating the interface between soil or refusal materials on the records and on profiles represent approximate boundaries. The transition between materials may be gradual. The final boring records are included with this report.

The detailed data collection methods using during this study are discussed on the following pages.

Soil Test Borings: Soil test borings were made at the site at locations shown on the attached Boring Plan. Soil sampling and penetration testing were performed in accordance with ASTM D 1586.

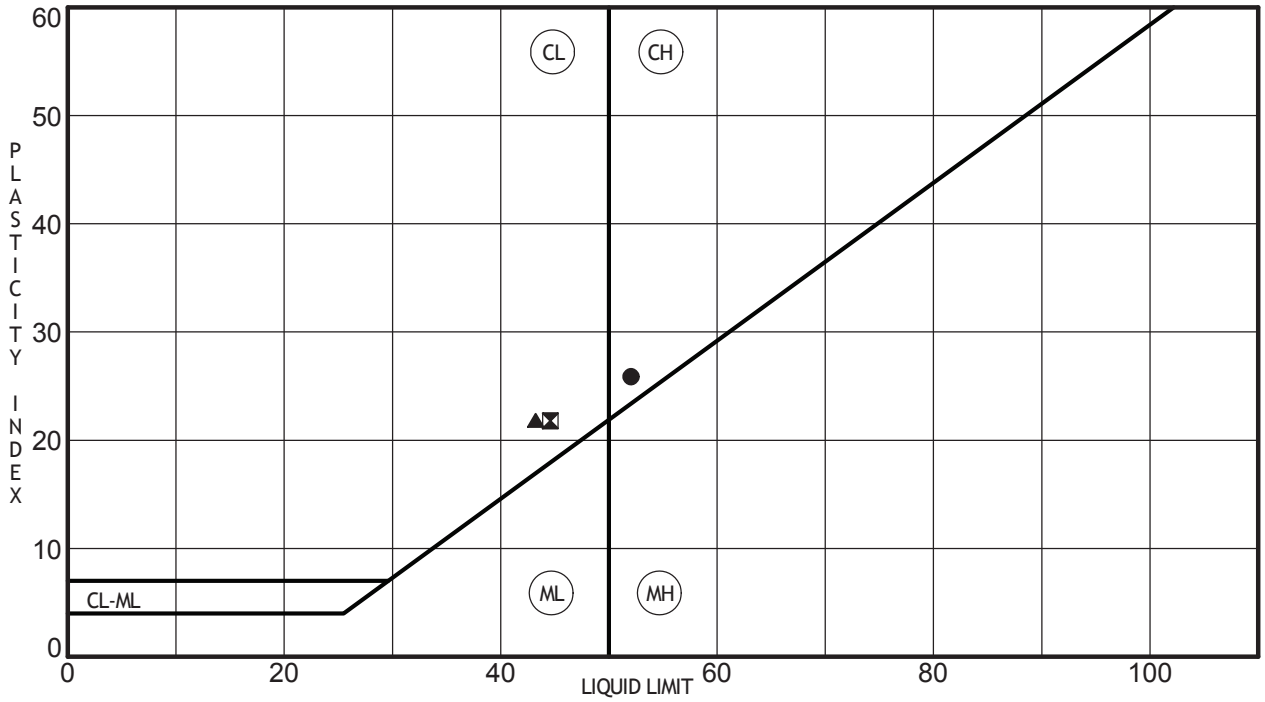
The borings were made by mechanically twisting a hollow stem steel auger into the soil. At regular intervals, the drilling tools were removed and soil samples obtained with a standard 1.4 inch I.D., 2 inch O.D., split tube sampler. The sampler was first seated 6 inches to penetrate any loose cuttings, then driven an additional foot with blows of a 140-pound hammer falling 30 inches. The number of hammer blows required to drive the sampler the final foot was recorded and is designated the "penetration resistance". The penetration resistance, when properly evaluated, is an index to the soil strength and foundation supporting capability.

Representative portions of the soil samples, thus obtained, were placed in glass jars and transported to the laboratory. In the laboratory, the samples were examined to verify the driller's field classifications. Test Boring Records are attached which graphically show the soil descriptions and penetration resistances.

Core Drilling: Refusal materials are materials that cannot be penetrated with the soil drilling methods employed. Refusal, thus indicated, may result from hard cemented soil, soft weathered rock, coarse gravel or boulders, thin rock seams or the upper surface of sound continuous rock. Core drilling procedures are required to determine the character and continuity of refusal materials.

Prior to coring, casing is set in the drilled hole through the overburden soils, if necessary, to keep the hole from caving. Refusal materials are then cored according to ASTM D 2113 using a diamond-studded bit fastened to the

Liquid and Plastic Limits Test Report



	Boring	Depth (ft)	LL	PL	PI	Water Content	% < #40	% < #200	USCS	Description
●	B-1	6.0	52	26	26	15.8		98		FAT CLAY(CH)
⊠	B-4	3.5	45	23	22	17.8		98		LEAN CLAY(CL)
▲	B-10	3.5	43	21	22	16.5		89		LEAN CLAY(CL)

CSI of Cincinnati
11785 Highway Drive
Cincinnati, OH 45241
Phone: 513.252.2059
Fax: 888.792.3121

PROJECT INFORMATION

Client: Cardinal Engineering
Project Name: Rifle Range Road
Project Number: CN230130
Project Location: Alexandria, KY

Summary of Laboratory Results

Borehole	Depth	Sample Type	Liquid Limit	Plastic Limit	Plasticity Index	Classification	Water Content (%)	Unconfined Compressive Strength (tsf)	Dry Density (pcf)	Wet Density (pcf)	Max. Dry Density (pcf)	Opt. Water Content (%)	CBR	Swell (%)	RQD	Percent Recovery	Percent Finer (No. 200)
B-1	1.0	SS					19.8										
B-1	3.5	SS					16.8										
B-1	6.0	SS	52	26	26	FAT CLAY(CH)	15.8										98
B-2	1.0	SS					22.7										
B-2	6.0	SS					17.6										
B-3	1.0	SS					26.7										
B-3	3.5	SS					16.2										
B-4	3.5	SS	45	23	22	LEAN CLAY(CL)	17.8										98
B-4	6.0	SS					17.4										
B-5	1.0	SS					20.8										
B-5	6.0	SS					21.9										
B-5	8.5	SS					17.6										
B-6	1.0	SS					24.7										
B-6	3.5	SS					24.4										
B-6	8.5	SS					18.8										
B-7	1.0	SS					23.5										
B-7	3.5	SS					18.4										
B-7	6.0	SS					18.6										
B-8	3.5	SS					20.8										
B-8	6.0	SS					24.3										
B-8	8.5	SS					11.4										
B-9	3.5	SS					12.1										
B-9	6.0	SS					19.5										
B-10	3.5	SS	43	21	22	LEAN CLAY(CL)	16.5										89
B-10	8.5	SS					21.2										
B-11	3.5	SS					15.9										

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SS - Split Spoon Sample
GRAB - Bulk Grab Sample

PROJECT INFORMATION

Client: Cardinal Engineering
Project Name: Rifle Range Road
Project Number: CN230130
Project Location: Alexandria, KY

Summary of Laboratory Results

Borehole	Depth	Sample Type	Liquid Limit	Plastic Limit	Plasticity Index	Classification	Water Content (%)	Unconfined Compressive Strength (tsf)	Dry Density (pcf)	Wet Density (pcf)	Max. Dry Density (pcf)	Opt. Water Content (%)	CBR	Swell (%)	RQD	Percent Recovery	Percent Finer (No. 200)
B-11	6.0	SS					18.7										

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SS - Split Spoon Sample
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PROJECT INFORMATION

Client: Cardinal Engineering
Project Name: Rifle Range Road
Project Number: CN230130
Project Location: Alexandria, KY

end of a hollow double tube core barrel. This device is rotated at high speeds, and the cuttings are brought to the surface by circulating water. Core samples of the material penetrated are protected and retained in the swivel-mounted inner tube. Upon completion of each drill run, the core barrel is brought to the surface, the core recovered is measured, the samples are removed and the core is placed in boxes for storage.

The core samples are returned to our laboratory where the refusal material is identified and the percent core recovery and rock quality designation is determined by a soils engineer or geologist. The percent core recovery is the ratio of the sample length obtained to the depth drilled, expressed as a percent. The rock quality designation (RQD) is obtained by summing up the length of core recovered, including only the pieces of core which are four inches or longer, and dividing by the total length drilled. The percent core recovery and RQD are related to soundness and continuity of the refusal material. Refusal material descriptions, recoveries, and RQDs are shown on the "Test Boring Records".

Hand Auger Borings and Dynamic Cone Penetration Testing: Hand auger borings are performed manually by CSI field personnel. This consists of manually twisting hand auger tools into the subsurface and extracting “grab” or baggie samples at intervals determined by the project engineer. At the sample intervals, dynamic cone penetration (DCP) testing is performed. This testing involves the manual raising and dropping of a 20 pound hammer, 18 inches. This “driver” head drives a solid-1¾ inch diameter cone into the ground. DCP “counts” are the number of drops it takes for the hammer to drive three 1¾ inch increments, recorded as X-Y-Z values.

Test Pits: Test pits are excavated by the equipment available, often a backhoe or trackhoe. The dimensions of the test pits are based on the equipment used and the power capacity of the equipment. Samples are taken from the spoils of typical buckets of the excavator and sealed in jars or “Ziplock” baggies. Dynamic Cone Penetration or hand probe testing is often performed in the upper few feet as OSHA standards allow. Refusal is deemed as the lack of advancement of the equipment with reasonable to full machine effort.

Water Level Readings: Water table readings are normally taken in conjunction with borings and are recorded on the "Test Boring Records". These readings indicate the approximate location of the hydrostatic water table at the time of our field investigation. Where impervious soils are encountered (clayey soils) the amount of water seepage into the boring is small, and it is generally not possible to establish the location of the hydrostatic water table through water level readings. The ground water table may also be dependent upon the amount of precipitation at the site during a particular period of time. Fluctuations in the water table should be expected with variations in precipitation, surface run-off, evaporation and other factors.

The time of boring water level reported on the boring records is determined by field crews as the drilling tools are advanced. The time of boring water level is detected by changes in the drilling rate, soil samples obtained, etc. Additional water table readings are generally obtained at least 24 hours after the borings are completed. The time lag of at least 24 hours is used to permit stabilization of the ground water table which has been disrupted by the drilling operations. The readings are taken by dropping a weighted line down the boring or using an electrical probe to detect the water level surface.

Occasionally the borings will cave-in, preventing water level readings from being obtained or trapping drilling water above the caved-in zone. The cave-in depth is also measured and recorded on the boring records.

LABORATORY TESTING PROCEDURES

Soil Classification: Soil classifications provide a general guide to the engineering properties of various soil types and enable the engineer to apply past experience to current problems. In our investigations, samples obtained during drilling operations are examined in our laboratory and visually classified by an engineer. The soils are classified according to consistency (based on number of blows from standard penetration tests), color and texture. These classification descriptions are included on our "Test Boring Records."

The classification system discussed above is primarily qualitative and for detailed soil classification two laboratory tests are necessary: grain size tests and plasticity tests. Using these test results the soil can be classified according to the AASHTO or Unified Classification Systems (ASTM D 2487). Each of these classification systems and the in-place physical soil properties provides an index for estimating the soil's behavior. The soil classification and physical properties obtained are presented in this report.

Rock Classification: Rock classifications provide a general guide to the engineering properties of various rock types and enable the engineer to apply past experience to current situations. In our explorations, rock core samples obtained during drilling operations are examined in our laboratory and visually classified by an engineer. The rock cores are classified according to relative hardness and RQD (see Guide to Rock Classification Terminology), color, and texture. These classification descriptions are included on our Test Boring Records.

Atterberg Limits: Portions of the samples are taken for Atterberg Limits testing to determine the plasticity characteristics of the soil. The plasticity index (PI) is the range of moisture content over which the soil deforms as a plastic material. It is bracketed by the liquid limit (LL) and the plastic limit (PL). The liquid limit is the moisture content at which the soil becomes sufficiently "wet" to flow as a heavy viscous fluid. The plastic limit is the lowest moisture content at which the soil is sufficiently plastic to be manually rolled into tiny threads. The liquid limit and plastic limit are determined in accordance with ASTM D 4318.

Moisture Content: The Moisture Content is determined according to ASTM D 2216.

Percent Finer Than 200 Sieve: Selected samples of soils are washed through a number 200 sieve to determine the percentage of material less than 0.074 mm in diameter.

Rock Strength Tests: To obtain strength data for rock materials encountered, unconfined compression tests are performed on selected samples. In the unconfined compression test, a cylindrical portion of the rock core is subjected to increasing axial load until it fails. The pressure required to produce failure is recorded, corrected for the length to diameter ratio of the core and reported.

Compaction Tests: Compaction tests are run on representative soil samples to determine the dry density obtained by a uniform compactive effort at varying moisture contents. The results of the test are used to determine the moisture content and unit weight desired in the field for similar soils. Proper field compaction is necessary to decrease future settlements, increase the shear strength of the soil and decrease the permeability of the soil.

The two most commonly used compaction tests are the Standard Proctor test and the Modified Proctor test. They are performed in accordance with ASTM D 698 and D 1557, respectively. Generally, the Standard Proctor compaction test is run on samples from building or parking areas where small compaction equipment is anticipated. The Modified compaction test is generally performed for heavy structures, highways, and other areas where large compaction equipment is expected. In both tests a representative soil sample is placed in a mold and compacted with a compaction hammer. Both tests have three alternate methods.

Test	Method	Hammer Wt./Fall	Mold Diam.	Run on Material Finer Than	No. of Layers	No. of Blows/ Layer
Standard	A	5.5 lb./12"	4"	No. 4 sieve	3	25
D 698	B	5.5 lb./12"	4"	3/8" sieve	3	25
	C	5.5 lb./12"	6"	3/4" sieve	3	56

Test	Method	Hammer Wt./Fall	Mold Diam.	Run on Material Finer Than	No. of Layers	No. of Blows/ Layer
Modified	A	10 lb./18"	4"	No. 4 sieve	5	25
D 1557	B	10 lb./18"	4"	3/8" sieve	5	25
	C	10 lb./18"	6"	3/4" sieve	5	56

The moisture content and unit weight of each compacted sample is determined. Usually 4 to 5 such tests are run at different moisture contents. Test results are presented in the form of a dry unit weight versus moisture content curve. The compaction method used and any deviations from the recommended procedures are noted in this report.

Laboratory California Bearing Ratio Tests: The California Bearing Ratio, generally abbreviated to CBR, is a punching shear test and is a comparative measure of the shearing resistance of a soil. It provides data that is a semi-empirical index of the strength and deflection characteristics of a soil. The CBR is used with empirical curves to design pavement structures.

A laboratory CBR test is performed according to ASTM D 1883. The results of the compaction tests are utilized in compacting the test sample to the desired density and moisture content for the laboratory California Bearing Ratio test. A representative sample is compacted to a specified density at a specified moisture content. The test is performed on a 6-inch diameter, 4.58-inch-thick disc of compacted soil that is confined in a cylindrical steel mold. The sample is compacted in accordance with Method C of ASTM D 698 or D 1557.

CBR tests may be run on the compacted samples in either soaked or unsoaked conditions. During testing, a piston approximately 2 inches in diameter is forced into the soil sample at the rate of 0.05 inch per minute to a depth of 0.5 inch to determine the resistance to penetration. The CBR is the percentage of the load it takes to penetrate the soil to a 0.1 inch depth compared to the load it takes to penetrate a standard crushed stone to the same depth. Test results are typically shown graphically.

Andy Beshear
GOVERNOR

ENERGY AND ENVIRONMENT CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
300 Sower Boulevard
Frankfort, Kentucky 40601
Phone: (502) 564-2150
Fax: 502-564-4245

Rebecca W. Goodman
SECRETARY

Anthony R. Hatton
COMMISSIONER

July 20, 2024

Kyle Ryan, P.E.
Northern KY Water District
2835 Crescent Springs Rd
Erlanger, KY 41018

RE: Sub-District HB Water Main Extension
Campbell County, KY
Northern KY Water District
AI #: 2485, APE20240008
PWSID #: 0590220-24-008

Dear Mr. Kyle Ryan:

We have reviewed the plans and specifications for the above referenced project. The plans include the construction of approximately 216 linear feet of 2-inch HDPE water main, 29,237 linear feet of 8-in DI water main and 5,644 linear feet of 8-inch PVC water main. This is to advise that plans and specifications for the above referenced project are APPROVED with respect to sanitary features of design, as of this date with the requirements contained in the attached construction permit.

If you have any questions concerning this project, please contact Terry Humphries at 502-782-6983 or terry.humphries@ky.gov.

Sincerely,

Terry Humphries, P.E.
Supervisor, Engineering Section
Water Infrastructure Branch
Division of Water

TH:CF
Enclosures
c: Cardinal Engineering Corp
Campbell County Health Department
Division of Plumbing

Distribution-Major Construction

Northern KY Water District

Facility Requirements

Activity ID No.:APE20240008

PORT0000000307 (Sub-District HB Water Main Extension) 216 linear feet of 2-inch HDPE water main, 29237 linear feet of 8-in DI water main, and 5644 linear feet of 8-inch PVC water main:

Narrative Requirements:

Condition No.	Condition
T-1	Construction of this project shall not result in the water system's inability to supply consistent water service in compliance with 401 KAR 8:010 through 8:600. [401 KAR 8:100 Section 5]
T-2	The public water system shall not implement a change to the approved plans without the prior written approval of the cabinet. [401 KAR 8:100 Section 4(3)]
T-3	A proposed change to the approved plans affecting sanitary features of design shall be submitted to the cabinet for approval in accordance with Section 2 of this administrative regulation. [401 KAR 8:100 Section 4(2)]
T-4	During construction, a set of approved plans and specifications shall be available at the job site. Construction shall be performed in accordance with the approved plans and specifications. [401 KAR 8:100 Section 3(1)]
T-5	Unless construction begins within two (2) years from the date of approval of the final plans and specifications, the approval shall expire. [401 KAR 8:100 Section 3(3)]
T-6	Upon completion of construction, a professional engineer shall certify in writing that the project has been completed in accordance with the approved plans and specifications. [401 KAR 8:100 Section 4(1)]
T-7	The system shall be designed to maintain a minimum pressure of 20 psi at ground level at all points in the distribution system under all conditions of flow. [Recommended Standards for Water Works 8.2.1, Drinking Water General Design Criteria IV.1.a]
T-8	Water lines should be hydraulically capable of a flow velocity of 2.5 ft/s while maintaining a pressure of at least 20 psi. [Drinking Water General Design Criteria IV.1.b]
T-9	The normal working pressure in the distribution system at the service connection shall not be less than 30 psi under peak demand flow conditions. Peak demand is defined as the maximum customer water usage rate, expressed in gallons per minute (gpm), in the pressure zone of interest during a 24 hour (diurnal) time period. [Drinking Water General Design Criteria IV.1.d]
T-10	When static pressure exceeds 150 psi, pressure reducing devices shall be provided on mains or as part of the meter setting on individual service lines in the distribution system. [Drinking Water General Design Criteria IV.1.c]
T-11	The minimum size of water main in the distribution system where fire protection is not to be provided should be a minimum of three (3) inch diameter. Any departure from minimum requirements shall be justified by hydraulic analysis and future water use, and can be considered only in special circumstances. [Recommended Standards for Water Works 8.2.2, Drinking Water General Design Criteria IV.2.b]

PORT0000000307 (Sub-District HB Water Main Extension) 216 linear feet of 2-inch HDPE water main, 29237 linear feet of 8-in DI water main, and 5644 linear feet of 8-inch PVC water main:

Narrative Requirements:

Condition No.	Condition
T-12	Water mains not designed to carry fire-flows shall not have fire hydrants connected to them. [Recommended Standards for Water Works 8.4.1.b]
T-13	Flushing devices should be sized to provide flows which will give a velocity of at least 2.5 feet per second in the water main being flushed. [Recommended Standards for Water Works 8.2.4.b, Recommended Standards for Water Works 8.4.1.b]
T-14	No flushing device shall be directly connected to any sewer. [Recommended Standards for Water Works 8.2.4.b, Recommended Standards for Water Works 8.4.1.b]
T-15	Pipe shall be constructed to a depth providing a minimum cover of 30 inches to top of pipe. [Drinking Water General Design Criteria IV.3.a]
T-16	Water mains shall be covered with sufficient earth or other insulation to prevent freezing. [Recommended Standards for Water Works 8.7]
T-17	A continuous and uniform bedding shall be provided in the trench for all buried pipe. Backfill material shall be tamped in layers around the pipe and to a sufficient height above the pipe to adequately support and protect the pipe. Stones found in the trench shall be removed for a depth of at least six inches below the bottom of the pipe. [Recommended Standards for Water Works 8.7]
T-18	Water line installation shall incorporate the provisions of the AWWA standards and/or manufacturer's recommended installation procedures. [Recommended Standards for Water Works 8.7]
T-19	All materials used for the rehabilitation of water mains shall meet ANSI/NSF standards. [Recommended Standards for Water Works 8.1]
T-20	Packing and jointing materials used in the joints of pipe shall meet the standards of AWWA and the reviewing authority. [Recommended Standards for Water Works 8.1]
T-21	All tees, bends, plugs and hydrants shall be provided with reaction blocking, tie rods or joints designed to prevent movement. [Recommended Standards for Water Works 8.7]
T-22	All materials including pipe, fittings, valves and fire hydrants shall conform to the latest standards issued by the ASTM, AWWA and ANSI/NSF, where such standards exist, and be acceptable to the Division of Water. [Recommended Standards for Water Works 8.1]
T-23	Water mains which have been used previously for conveying potable water may be reused provided they meet the above standards and have been restored practically to their original condition. [Recommended Standards for Water Works 8.1]

PORT0000000307 (Sub-District HB Water Main Extension) 216 linear feet of 2-inch HDPE water main, 29237 linear feet of 8-in DI water main, and 5644 linear feet of 8-inch PVC water main:

Narrative Requirements:

Condition No.	Condition
T-24	Manufacturer approved transition joints shall be used between dissimilar piping materials. [Recommended Standards for Water Works 8.1]
T-25	The minimum size of water main which provides for fire protection and serving fire hydrants shall be six?inch diameter. [Recommended Standards for Water Works 8.2, Drinking Water General Design Criteria IV.2.a]
T-26	Pipes and pipe fittings containing more than 8% lead shall not be used. All products shall comply with ANSI/NSF standards. [Recommended Standards for Water Works 8.1]
T-27	Gaskets containing lead shall not be used. Repairs to lead?joint pipe shall be made using alternative methods. [Recommended Standards for Water Works 8.1]
T-28	Pipe materials shall be selected to protect against both internal and external pipe corrosion. [Recommended Standards for Water Works 8.1]
T-29	Dead end mains shall be equipped with a means to provide adequate flushing. [Recommended Standards for Water Works 8.2]
T-30	The hydrant lead shall be a minimum of six inches in diameter. Auxiliary valves shall be installed on all hydrant leads. [Recommended Standards for Water Works 8.4.3]
T-31	A sufficient number of valves shall be provided on water mains to minimize inconvenience and sanitary hazards during repairs. [Recommended Standards for Water Works 8.3]
T-32	Wherever possible, chambers, pits or manholes containing valves, blow?offs, meters, or other such appurtenances to a distribution system, shall not be located in areas subject to flooding or in areas of high groundwater. Such chambers or pits should drain to the ground surface, or to absorption pits underground. The chambers, pits and manholes shall not connect directly to any storm drain or sanitary sewer. Blow?offs shall not connect directly to any storm drain or sanitary sewer. [Recommended Standards for Water Works 8.6]
T-33	At high points in water mains where air can accumulate provisions shall be made to remove the air by means of air relief valves. [Recommended Standards for Water Works 8.5.1]
T-34	Automatic air relief valves shall not be used in situations where flooding of the manhole or chamber may occur. [Recommended Standards for Water Works 8.5.1]

PORT0000000307 (Sub-District HB Water Main Extension) 216 linear feet of 2-inch HDPE water main, 29237 linear feet of 8-in DI water main, and 5644 linear feet of 8-inch PVC water main:

Narrative Requirements:

Condition No.	Condition
T-35	The open end of an air relief pipe from automatic valves shall be extended to at least one foot above grade and provided with a screened, downward?facing elbow. [Recommended Standards for Water Works 8.5.2.c]
T-36	Discharge piping from air relief valves shall not connect directly to any storm drain, storm sewer, or sanitary sewer. [Recommended Standards for Water Works 8.5.2.d]
T-37	Water pipe shall be constructed with a lateral separation of 10 feet or more from any gravity sanitary or combined sewer measured edge to edge where practical. If not practical a variance may be requested to allow the water pipe to be installed closer to the gravity sanitary or combined sewer provided the water pipe is laid in a separate trench or undisturbed shelf located on one side of the sewer with the bottom of the pipe at least 18 inches above the top of the gravity sanitary or combined sewer pipe. [Drinking Water General Design Criteria IV.3.b]
T-38	Water lines crossing sanitary, combined or storm sewers shall be laid to provide a minimum vertical distance of 18 inches between the outside of the water main and the outside of the sanitary, combined or storm sewer with preference to the water main located above the sanitary, combined or storm sewer. [Drinking Water General Design Criteria IV.3.c]
T-39	At crossings, one full length of water pipe shall be located so both joints will be as far from the sewer as possible. [Recommended Standards for Water Works 8.8.3.b]
T-40	There shall be no connection between the distribution system and any pipes, pumps, hydrants, or tanks whereby unsafe water or other contaminating materials may be discharged or drawn into the system. [Recommended Standards for Water Works 8.10.1]
T-41	Water utilities shall have a cross connection program conforming to 401 KAR 8. [Recommended Standards for Water Works 8.10.1]
T-42	Installed pipe shall be pressure tested and leakage tested in accordance with the appropriate AWWA Standards. [Recommended Standards for Water Works 8.7.6]
T-43	New, cleaned and repaired water mains shall be disinfected in accordance with AWWA Standard C651. The specifications shall include detailed procedures for the adequate flushing, disinfection, and microbiological testing of all water mains. In an emergency or unusual situation, the disinfection procedure shall be discussed with the Division of Water. [Recommended Standards for Water Works 8.7.7]
T-44	A minimum cover of five feet shall be provided over pipe crossing underwater. [Recommended Standards for Water Works 8.9.2]

PORT0000000307 (Sub-District HB Water Main Extension) 216 linear feet of 2-inch HDPE water main, 29237 linear feet of 8-in DI water main, and 5644 linear feet of 8-inch PVC water main:

Narrative Requirements:

Condition No.	Condition
T-45	Valves shall be provided at both ends of water crossings so that the section can be isolated for testing or repair; the valves shall be easily accessible, and not subject to flooding for pipes crossing underwater. [Recommended Standards for Water Works 8.9.2.b]
T-46	Permanent taps or other provisions to allow insertion of a small meter to determine leakage and obtain water samples on each side of the valve closest to the supply source for pipes crossing. [Recommended Standards for Water Works 8.9.2.c]

Columbia Gas Transmission, LLC

ENCROACHMENT AGREEMENT

Northern Kentucky Water District
2835 Crescent Springs Road
Erlanger, KY 41018

May 10, 2024

Re: Install a Water Main
Campbell County, KY

TC Energy's Pipeline Integrity Group Engineer has completed a review of proposal for the above referenced project (the "**Project**"). The results of the review are contained in the Engineering Guidelines dated **May 10, 2024** (the "**Guidelines**"), which are attached hereto and incorporated hereinas Exhibit A. **Northern Kentucky Water District** (hereinafter the "**Applicant**") and its contractors will be held responsible to adhere to the terms herewith provided by which **Columbia Gas Transmission, LLC** (hereinafter "**Columbia Gas Transmission**" or **"Company"**) issues this Encroachment Agreement (the "**Agreement**").

1. **Term: This Agreement shall remain in effect for so long as Columbia Gas Transmission, or its successors and assigns, continues to own or operate the Columbia Gas Transmission's property and/or facilities and the Columbia Gas Transmission's property and/or facilities are impacted by the encroachment. Any construction activity permitted under this Agreement must be completed within One Year (365 Days) from May 10, 2024.**

2. All work must comply with the Guidelines and **Applicant's** design plans and drawings which have been approved and stamped "Reviewed and Approved as Noted by TC Energy Engineering Pipeline Integrity Group Engineer" and which are attached hereto and incorporated herein as Exhibit B (the "**Approved Plans**"). Any changes to the design, description, and/or construction within the Approved Plans must be approved in writing, and in advance of any construction, by TC Energy's Pipeline Integrity Group Engineer. Such approval, if given, shall be deemed to be subject to all the terms and conditions hereof. Upon separate written request, subsequent to installation of the facility, **Applicant** will provide **Columbia Gas Transmission** with an as-built drawing related to the encroachment(s) on the property. If **Applicant** terminates the work before completion, it shall comply with all Guidelines and Approved Plans to place the **Columbia Gas Transmission** property and/or existing facilities into as good of condition as they were prior to the **Applicant's** work.

3. **Applicant's** work and encroachment upon **Columbia Gas Transmission's** property and/or facilities shall be performed in accordance with all applicable laws, rules and regulations. **Applicant** agrees to maintain all facilities installed pursuant to the Project in good condition at all times, and that such maintenance shall conform to all applicable laws, rules and regulations.

4. Prior to commencement of **Applicant's** construction and/or installation activities, **Applicant** shall provide **Columbia Gas Transmission** with a schedule of its proposed activities. **Columbia Gas Transmission** must have a representative on site at all times when work is being performed over/near its facilities and/or within its property, right-of-way, or easement.

5. Except for emergency situations, notice of at least seventy-two (72) hours in advance of any work or maintenance must be provided. **Applicant** must contact **Columbia Gas Transmission's** Operations representative: **Jonathan Caldwell, at (859) 644-4256.** *Please note that voice messages do not constitute 72-hour notice. Person to person contact must be made.*

6. Compliance with these terms and those contained in the Guidelines does not suggest or imply that **Applicant**, its contractors, consultants or any other associated party is relieved of any responsibility or liability in the event **Columbia Gas Transmission's** property and/or facilities are damaged in any way before, during or after the construction of the encroachment. **Columbia Gas Transmission** does not waive any rights that it may have against any third parties who cause any damage or injury to **Columbia Gas Transmission**, its affiliates, parent and subsidiary companies, and **Columbia Gas Transmission** will hold all parties responsible for damages, claims, or costs incurred for any issues arising from **Applicant's** activities.

7. The rights and consent granted by this Agreement may not be assigned without **Columbia Gas Transmission's** prior written consent. The responsibilities and obligations of **Applicant** pursuant to this Agreement shall extend to its successors and assigns.

8. All rights granted hereunder shall be subject and subordinate to the paramount rights granted to **Columbia Gas Transmission** to occupy and use all or any portion or portions of its property, right-of-way, or easement in its operations, and the operations conducted by **Applicant** will be performed at no direct cost or expense to **Columbia Gas Transmission**.

9. Please be advised that **Columbia Gas Transmission** is now and will continue to utilize the property, right-of-way, or easement and in doing so, may at any time, or from time to time, enter upon said land, place and transport machinery and equipment thereon, excavate trenches and ditches thereon, and operate and maintain **Columbia Gas Transmission's** land and facilities. **Columbia Gas Transmission**'s facilities will not be removed from service, nor will the placement of such facilities be adjusted because of **Applicant's** Project or facilities.

10. **Applicant**, on behalf of itself and any other person or entity claiming by or through **Applicant**, hereby waives, releases, discharges and agrees to save, defend, hold harmless and indemnify **Columbia Gas Transmission**, its affiliates, parent and subsidiary companies, and each of their respective successors, assigns, affiliates, owners, members, officers, directors, shareholders, employees, agents, contractors and subcontractors, and any other individuals or entities claiming by or through any of them (collectively, the "**Releasees**"), from and against all claims, causes of action, suits, debts, expenses, damages, interest, costs and demands whatsoever, against the **Releasees**, which arise out of, are connected with, or relate in any way to **Applicant's** encroachment or activities as contemplated herein.

11. **Applicant** shall secure all necessary permits from all governmental agencies having jurisdiction thereof for the Project or construction, installation, maintenance and operation of **Applicant's** facilities and shall comply with all applicable laws, rules and regulations at all times hereafter. **Columbia Gas Transmission's** consent hereby granted is subject to the existing easement rights and/or leasehold interests of **Columbia Gas Transmission** at the above referenced location. **Columbia Gas Transmission** cannot, and does not, by execution of this Agreement, grant a right-of-way or other land use rights to **Applicant** but executes this Agreement solely to signify that insofar as **Columbia Gas Transmission's** interests are concerned and insofar as such is required under applicable law, **Columbia Gas Transmission** consents to the **Applicant's** proposed Project, provided such Project is completed and maintained in accordance with the provisions of this Agreement and all applicable laws, rules and regulations. Therefore, **Applicant** agrees to secure any other rights-of-way, easements and/or permits from any parties holding interests in the real property concerned and which are necessary for **Applicant's** Project or the construction, installation, operation and maintenance of **Applicant's** facilities. Nothing herein contained shall be construed as impairing any rights or privileges or obligations of the Company under its easement and/or leasehold rights, including the construction of additional facilities and appurtenances from time to time (if allowed for therein).

12. Prior to any construction activities near **Columbia Gas Transmission's** property and/or facilities, **Applicant** must provide all contractors a copy of this Agreement, including the Guidelines dated **May 10, 2024** and the Approved Plans, and all contactors must maintain copies in their possession to confirm that they are aware of the conditions, requirements and obligations for the encroachment pursuant to this Agreement.

13. **Applicant** acknowledges and agrees that, in the interest of public safety and pipeline security, construction activities at or near **Columbia Gas Transmission's** property and/or facilities must be closely monitored, and specific procedures followed. FAILURE TO FOLLOW THIS AGREEMENT MAY RESULT IN PERSONAL INJURY, LOSS OF LIFE OR SERIOUS PROPERTY DAMAGE. Applicant's construction, installation, maintenance and operation of Applicant's facilities and Project shall comply with industry standards and applicable law to prevent damage to **Columbia Gas Transmission's** property and/or facilities and to prevent safety issues, including, but not limited to, impairment of support, access to, stability, integrity or protection of **Columbia Gas Transmission's** property and/or facilities.

14. **Columbia Gas Transmission requires that Applicant and/or each of Applicant's contractors / subcontractors on this project submit State One Call tickets (call 811) in accordance with the applicable One Call system's advance notification requirements for each different phase of the Project that involves earth disturbance (grading, excavating, trenching, digging, etc.).**

The Company looks forward to working with you to minimize impact resulting from this Project and also provide for the safety of the general public and the integrity of Company's facilities. Should you have any further questions regarding this Agreement please contact Company at **1.800.562.8931.**

No work is permitted under the terms of this Encroachment Agreement until the Encroachment Agreement has been countersigned, dated and a copy returned to: us_crossings@tcenergy.com.

Columbia Gas Transmission, LLC:

By:	Nancy Babcock
Name:	Nancy Babcock
Title:	and As Authorized Signatory
Date:	May 10, 2024

By:	Rachel Thomas
Name:	Rachel Thomas
Title:	Manager, US Land and As Authorized Signatory
Date:	May 10, 2024

COUNTERSIGNED AND AGREED TO:

Northern Kentucky Water District

By:	Amy Stoffer
Name:	Amy Stoffer
Title:	VP Engineering, Production & Water Quality
Date:	May 23, 2024

The signature below is to be secured on site prior to construction activity within the Company's property, right-of-way, or easement to confirm presence of Company.

Columbia Gas Transmission, LLC Representative: _____
Printed Name: _____

Date: _____

cc: Land Representative w/att
Field Tech(s) w/att
File - WF#202305120050

EXHIBIT "A"

DATE: 05/10/2024

Workflow: 202305120050

The crossing application submitted by Steve Broering was received on 05/12/2023. Northern Kentucky Water District plans to install a water main crossing TC Energy pipeline in Campbell County, KY. The plans dated 03/30/2023 & 01/11/2023 have been reviewed. By comparison to our operating maps and records, it is evident that TC Energy has facilities located within the limits of, and impacted by, the proposed construction.

Please Note: Involvement status relates solely to facilities owned and/or operated by TC Energy.

Work within TC Energy's right-of-way will be performed in accordance with TC Energy procedures to protect the safety of TC Energy's facilities. The following guidelines, although not inclusive, are provided to accommodate your request and protect our pipelines and facilities.

Section 1: General Requirements for Construction within TC Energy Right-of-Way (ROW).

1. Follow all applicable federal and state safety requirements at all times.

2. Before any field work or construction begins in the vicinity of TC Energy pipeline facilities the location and elevation of the pipeline shall be confirmed. Begin with a call to 811 or appropriate state "One Call" notification number. Request both the approximate location and depth of the pipeline to be determined in any area of proposed construction. The area of proposed construction shall be marked with white paint, flags, or otherwise as required by state law.

3. When conducting construction activities in or around TC Energy pipeline facilities or rights-of-way, a TC Energy on-site Company Representative shall be present unless otherwise permitted by TC Energy. A TC Energy Representative will review the location of pipeline facilities prior to starting work.

4. Notice of at least seventy-two (72) hours in advance of construction must be provided. The permittee must contact the following TC ENERGY field representatives:

   Name: Jonathan Caldwell Cell: 859-644-4256

5. Use of vibratory equipment larger than walk-behind units shall not be permitted within twenty-five (25) feet of the pipeline or related facility.

6. The Permittee shall mark any excavation area with white paint, flags, or as required by applicable state law within TC Energy right-of-way.

EXHIBIT "A"

7. The following items, but not limited to, are not permitted within the ROW; valves, curb boxes, manholes, sprinkler heads, splice boxes, service risers, energized equipment, poles, towers, guy wires, mechanical supports, ground rods, anchors, signs, bollards, and similar structures.

8. Before excavation can begin near a TC Energy right-of-way, the excavation area must be located and marked according to the appropriate state one call regulation. Safe digging is no accident. Know what's below. Call 811 before you dig. TC Energy or its representative shall locate the pipeline and determine the approximate depth of cover before the Permittee can begin excavation.

9. TC Energy shall have a Company representative present during all excavation activities. The Company representative shall have full authority to stop the work if it is determined that the work is being performed in an unsafe manner relative to TC Energy facilities or personnel.

10. Should it be necessary for a TC Energy employee/representative to enter the excavation to inspect its pipeline(s), the excavation at the crossing shall be sloped, permitted safe with trench boxes, or shored in accordance with the requirements of the Occupational Safety and Health Administration.

11. No equipment shall work directly over the pipeline unless TC Energy grants specific written permission.

12. When excavating within a TC Energy right-of-way in the presence of a loaded pipeline, the Permittee's excavation equipment shall have a plate welded or attached over the teeth of the excavator bucket.

13. No side cutters shall be used during any excavation within a TC Energy ROW.

14. No part of powered equipment shall come within two (2) feet of TC Energy's pipelines, or according to applicable State or Federal requirements.

15. No bucket, any attachment or load may be swung over TC Energy's pipeline(s) where there is less than two (2) feet of cover.

16. TC Energy requires the pipeline to be pothole located prior to excavation within fifteen (15) feet. Afterwards potholing techniques are to be used when digging within two (2) feet of the outer edge of the pipeline unless requirements that are more stringent are set forth by the applicable state's One Call system. Within this "tolerance zone" only hand excavation, air cutting, vacuum excavation or other TC Energy approved techniques are permitted.

EXHIBIT "A"

17. No excavation shall be made on land adjacent to the pipeline that shall in any way impair, withdraw lateral support, cause subsidence, create the accumulation of water, or cause damage to the pipeline or right-of-way.

18. The Permittee shall ensure all excavation work complies with OSHA's excavation standards outlined in 29 CFR 1926 and correct any noncompliant excavation site before work within TC Energy right-of-way continues.

19. At any location where the pipeline is exposed, the Permittee shall provide TC Energy the opportunity to inspect the pipeline condition, install cathodic protection equipment, repair any pipe coating imperfections, and/or install underground warning materials.

20. No TC Energy buried pipeline shall be left exposed for any duration of time, unless otherwise permitted by TC Energy.

21. Backfill and compaction shall be performed to the satisfaction and in the presence of a Company representative. At least 6 inches of fine, loose earth or other permitted backfill material with no sharp gravel, rock, hard clods, vegetation, or other debris shall be added on all sides of any pipeline, and remaining backfill shall be placed so as not to disturb this padding material or damage the pipeline and its coating. Backfill over the pipe shall be compacted by hand until eighteen (18) inches of cover is achieved.

22. Disturbed ground shall be compacted to at least the same degree of compaction as surrounding areas.

23. The Permittee shall restore the site to its original condition unless otherwise permitted by TC Energy.

24. There shall be no work or spoil storage on the TC Energy right-of-way, nor shall there be any unauthorized equipment crossing(s) on the TC Energy right-of-way.

25. The permittee may be crossing one or more of TC Energy's transmission pipeline(s). These pipeline(s) may be coated with a material to protect them from corrosion. The coating may contain asbestos. If the excavation results in exposing TC Energy's pipeline(s) and there is any damage to the coating, you will be responsible for all costs, including any disposal costs, associated with the coating repair. If necessary, you will also be required, to halt all work activity while the coating material is being analyzed. The coating repair, including the removal of the original material, will be performed by TC Energy personnel or a qualified third-party contractor selected by TC Energy. All work will be done in accordance with TC Energy's current engineering and environmental standards. During the excavation work, Permittee agrees to cooperate with TC Energy to ensure all federal, state and local environmental and safety regulations are followed.

EXHIBIT "A"

26. Warning tape shall be placed over the pipe whenever a utility is being installed or replaced. A minimum six (6) inch wide tape that follows A.P.W.A. Uniform Color Code shall be placed directly above the buried utility, where possible. The tape will be buried at least one (1) foot below the surface of the ground. A second warning tape shall be placed and at least one (1) foot directly above the utility.

27. The utility shall cross the TC Energy right-of-way as near to ninety (90) degrees as possible, but no less than forty-five (45) degrees.

28. Utilities shall not be installed longitudinally within the right-of-way.

29. The utility shall maintain the same depth of cover across the entire width of the TC Energy ROW if crossing above the TC Energy pipeline.

30. The utility shall maintain elevation across the entire width of the TC Energy ROW if crossing below the TC Energy pipeline.

31. The utility shall not change direction within the TC Energy ROW.

32. Underground utility crossings shall be marked with proper signage at the edge of the TC Energy right-of-way boundaries. Signage shall be according to the A.P.W.A. Uniform Color Code and comply with the authorities having jurisdiction at the edge of each ROW boundary. Exceptions may include agricultural land or open waters.

33. Utilities crossings below the TC Energy pipeline with greater than three (3) feet of clearance may not require additional encasement. TC Energy will review the proposed installation and make the final determination.

34. Utilities shall cross the pipeline with a minimum vertical clearance of two (2) feet for open cut.

35. Non metallic utilities shall be installed with tracer wire for the full width of the TC Energy right-of-way.

36. At locations where tracer wire is installed, tracer wire shall be raised to the ground surface and connected to a test station for monitoring.

37. Metallic utilities shall be coated with a non-conductive coating for the entire width of the TC Energy right-of-way.

38. Metallic utilities shall cross the pipeline with a minimum vertical clearance of two (2) feet for open cut.

EXHIBIT "A"

39. Corrosion protection (CP) materials including but not limited to bonds, test leads, test stations, magnesium anode current drains, and permanent reference electrodes shall be installed at the expense of the Permittee. Corrosion materials will be determined by TC Energy upon review of the installation or at the time of construction.
    CP material requirements may include:
    i. Installation of test leads on both the TC Energy pipeline and the Permittee's crossing structure.
    ii. Installation of a permanent Copper-Copper Sulfate (CuCuSO4) reference electrode between the TC Energy pipeline and the Permittee's crossing structure.

40. Permittee shall be responsible for the corrosion protection of its facilities against TC Energy's cathodic protection system. Permittee shall be responsible for installation of facilities on its structures. TC Energy shall provide personnel, at the expense of Permittee, for installation of facilities on TC Energy's pipelines.

41. The permittee will be responsible to work with TC Energy to perform cooperative interference testing of the existing and newly installed corrosion protection systems. Any interference found will be mitigated by the permittee.

Respectfully Submitted,

Benjamin Acheampong
Integrity Engineer
USGO Integrity Engineering Services
benjamin_acheampong@tcenergy.com
mobile: 708-476-4600 **desk:** 832-320-6132

700 Louisiana St. Suite 15108A
Houston, TX 77002
USA

TCEnergy.com