Resolution 591-2014

Contract 324-2014

CONTRACT DOCUMENTS AND SPECIFICATIONS

FOR

Town Branch Wet Weather Storage Facility

Wastewater System Improvements
Division of Water Quality
Lexington Fayette Urban County Government

Remedial Measures Plan ID No.G2-TB-1

LFUCG Bid No.137-2014

Date: AUGUST 2014

Volume 1 of 2

PREPARED BY:

GRW Engineers, Inc
801 Corporate Drive
Lexington, KY 40503
(859) 223-3999

Edition: Conformance Set

TABLE OF CONTENTS

SECTION 00100 - ADVERTISEMENT FOR BIDS

1.01 INVITATION

Sealed proposals for the following work will be received by the Lexington-Fayette Urban County Government **until 2 PM local time, September 25, 2014** for furnishing all labor and/or materials and performing all work as set forth in the Contract Documents prepared by and for Lexington-Fayette Urban County Government, Division of Water Quality. Immediately following the scheduled closing time for reception of bids, all proposals which have been submitted in accordance with the above will be publicly opened and read aloud.

1.02 DESCRIPTION OF WORK

The project includes providing all construction supervision, labor, materials, tools, services, and testing necessary for the construction of the Town Branch Wet Weather Storage Facility, consisting of 22 MG of wastewater storage in a prestressed concrete tank, a 56 MGD wastewater pumping station, mechanical screening, slide gates, plug valves, swing check valves, ductile iron piping, grating, hatches, submersible pumps, variable frequency drives, electrical equipment, ventilation equipment, and other associated appurtenances.

1.03 OBTAINING PLANS, SPECIFICATIONS, AND BID DOCUMENTS

Plans, Specifications, and Contract Documents may be obtained from Lynn Imaging, 328 Old Vine Street, Lexington, KY 40507, (859) 255-1021 or (www.lynnimaging.com) and click on planroom for a non-refundable price of reproduction for each full set of plans and documents. Contract Documents may be examined at the following places:

LFUCG
Division of Central Purchasing
Third Floor, Room 338
Lexington, KY 40507
(859) 258-3320

LFUCG
Division of Water Quality
125 Lisle Industrial Avenue
Lexington, KY 40511
(859) 425-2400

Builders Exchange of KY, Inc.
2300 Meadow Drive
Louisville, KY 40205
Attn: Mary Beth Hewett
(502) 459-9800
Laura Willette
lwillette@bxkentucky.com
Mary Beth Hewett
mhewett@bxkentucky.com

McGraw-Hill Construction Dodge
www.construction.com/projectcenter/
dodge_document_ca@mcgraw-hill.com
Teresa Tolley
theresa_tolley@mcgraw-hill.com
Davina Jacobs
davina.jacobs@mhfi.com

1.04 METHOD OF RECEIVING BIDS

Bids will be received from Prime contracting firms on a lump sum basis. Bids shall be submitted in the manner and subject to the conditions as set forth and described in the Information Available to Bidders and Bid Form. Sealed bids shall be clearly marked on the outside of the envelope as follows: Company Name and Address, Bid Invitation Number, and the Project Name. Bids are to remain sealed until official Bid closure time.

1.05 METHOD OF AWARD

Determination of the successful bid will be based on the lowest responsive and responsible bidder whose qualifications indicate the award will be in the best interest of the OWNER and whose bid/proposal complies with all the prescribed requirements. No Notice of Award will be given until the OWNER has concluded such investigation as deemed necessary to establish the responsibility, qualifications and financial ability of Bidders to do the work in accordance with the Contract Documents to the satisfaction of the OWNER within the time prescribed. The OWNER reserves the right to reject the Bid of any Bidder who does not pass such investigation to the OWNER's satisfaction. In analyzing Bids, the OWNER may take into consideration alternate and unit prices, if requested by the Bid forms.

1.06 BID WITHDRAWAL

No bidder may withdraw his bid for a period of ninety (90) calendar days after the closing date for receipt of bids. Errors and omissions will not be cause for withdrawal of bid without forfeit of bid bond. Bids may be withdrawn in person prior to the closing date of receipt of bids.

1.07 BID SECURITY

All bids shall be accompanied by a bid bond of not less than five percent (5%) of the amount of the bid executed by a Surety Company authorized to do business in the Commonwealth of Kentucky and countersigned by a licensed Kentucky Resident Agent, representing the Surety Company. Certified Check or Bid Bond shall be payable to Lexington-Fayette Urban County Government.

1.08 SUBMISSION OF BIDS

Contractors shall submit their bids to the Lexington-Fayette Urban County Government, Division of Purchasing, Third Floor, 200 East Main Street, Lexington, Kentucky 40507. Bids shall be submitted in a sealed envelope not later than 2 P.M. p.m. (local time) September 25, 2014 Sealed proposals shall be marked clearly on the outside of the container "**Sealed Proposal for: Town Branch Wet Weather Storage Facility** to be opened at **2 p.m. Local Time, September 25, 2014**. Bids received after the scheduled closing time for receipt of bids will not be considered and will be returned unopened.

1.09 RIGHT TO REJECT

The Lexington-Fayette Urban County Government reserves the right to reject any and all bids and to waive all informalities and/or technicalities where the best interest of the Lexington-Fayette Urban County Government may be served.

1.10 NOTICE CONCERNING MWDBE GOAL

Notice of requirement for Affirmative Action to ensure Equal Employment Opportunities and Disadvantaged Business Enterprises (DBE), Minority-Owned Business Enterprises (MBE) and Woman-Owned Business Enterprises (WBE) Contract participation.

The Lexington-Fayette Urban County Government has set a goal that not less than ten percent (10%) of the total value of this Contract be subcontracted to MWDBEs. The goal for the utilization of MWDBEs as subcontractors is a recommended goal. Contractor(s) who fail to meet

such goal will be expected to provide written explanations to the Director of the Division of Purchasing of efforts they have made to accomplish the recommended goal, and the extent to which they are successful in accomplishing the recommended goal will be a consideration in the procurement process. Depending on the funding source, other MWDBE goals may apply.

For assistance in locating MWDBE Subcontractors contact:

Marilyn Clark, Division of Central Purchasing
Lexington-Fayette Urban County Government
200 East Main Street, 3rd Floor, Room 338
Lexington, Kentucky 40507
mclark@lexingtonky.gov

1.11 PRE-BID MEETING

A mandatory pre-bid meeting will be held at **10:00 a.m. local time, September 11, 2014** at the LFUCG Division of Water Quality, 125 Lisle Industrial Road, Lexington, KY 40511. A site visit will follow.

1.12 STATE REVOLVING LOAN REQUIREMENTS

This project may be partially or entirely funded by the Kentucky Infrastructure Revolving Loan Fund.

Bidders must comply with Title VI of the Civil Rights Act of 1964, the Anti-Kickback Act, and the Contract Work Hours 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.

Successful Bidder shall comply with 41 CFR 60-4, in regard to affirmative action, to insure equal opportunity to females and minorities and will apply the time tables and goal set forth in 40 CFR 60-4.

The procurement and performance of this contract are subject to the requirements of the Davis-Bacon Act.

Successful Bidder shall make positive efforts to use small, minority, women owned and disadvantaged businesses.

Attention of bidders is particularly called to the conditions of employment to be observed and minimum wage rates to be paid under the contract, Section 3, Segregated Facility, Section 109 and E.O. 11246 and Title VI. Minority bidders are encouraged to bid.

Successful Bidder is required to employ the six "Good Faith Efforts" as listed in EPA's Disadvantaged Business Enterprise Program when soliciting subcontractors and suppliers. Documentation of these efforts will be a required submittal prior to Contract Award. See Supplemental General Conditions for Clean Water State Revolving Fund (Section 00810, page 30) included in the Contract Documents.

The contract award will be made in writing to the lowest responsive and responsible bidder whose qualifications indicate the award will be in the best interest of the OWNER and whose bid/proposal complies with all the prescribed requirements. No Notice of Award will be given until the OWNER has concluded such investigation as deemed necessary to establish the

responsibility, qualifications and financial ability of Bidders to do the work in accordance with the Contract Documents to the satisfaction of the OWNER within the time prescribed. The OWNER reserves the right to reject the Bid of any Bidder who does not pass such investigation to the OWNER's satisfaction. In analyzing Bids, the OWNER may take into consideration alternate and unit prices, if requested by the Bid forms.

1.13 CONSENT DECREE REQUIREMENTS

The work to be provided through this Bid will assist the Lexington-Fayette Urban County Government (the "Owner") in successfully implementing the Agreement (Contract) and complying with any requirements which are related to the CONSENT DECREE entered in a case styled *United States & Commonwealth of Kentucky v. Lexington-Fayette Urban County Government,* United States District Court for the Eastern District of Kentucky, Civil Action No. 5:06-cv-386-KSF (the "CONSENT DECREE"). The services provided through this Bid are hereinafter referred to as the Agreement (Contract). The primary goal of the Agreement (Contract) is to provide the owner with the technical support and/or construction services necessary to successfully meet the obligations and deadlines of the CONSENT DECREE.

The Bidder shall familiarize itself with and shall at all times comply with the CONSENT DECREE, and all federal, state and local laws, ordinances, and regulations that in any manner affect the Agreement (Contract). Time is of the essence in the performance of Agreement (Contract). Bidder is aware that the Owner is subject to penalties for non-compliance with the CONSENT DECREE deadlines.

If delays result solely by reason of acts of the Bidder, the Bidder shall be held liable for any financial penalties incurred by the Owner as a result of the delay, including but not limited to those assessed pursuant to the CONSENT DECREE. In the event the parties cannot mutually agree upon the cause(s) associated with the delays in completing project deliverables, the Bidder must immediately notify the Owner in the event of such delay, and provide the Owner a written action plan within five (5) business days on how it will attempt to resolve the delay.

In the event that Bidder's delay or other nonperformance of its obligations hereunder results in the imposition of penalties against the Owner pursuant to the CONSENT DECREE, or the Owner otherwise suffers damage as a result of such delay or nonperformance, Bidder shall be solely liable to Owner for any and all such damages, including any costs and attorney's fees.

An electronic version of the CONSENT DECREE is available on the LFUCG web page for review or to print a copy at no charge.

END OF SECTION

SECTION 00300 – INFORMATION AVAILABLE TO BIDDERS

1.01 RECEIPT AND OPENING OF BIDS

The Lexington-Fayette Urban County Government (herein called the Owner) invites Bids from firms on the project described in the Advertisement for Bids. The Owner will receive Bids at the Division of Purchasing, at the time and in the manner set forth in the Advertisement for Bids, and the Bids will then be publicly opened and read aloud. The Owner may consider informal any Bid not prepared and submitted in accordance with the provisions hereof and may waive any informalities or reject any and all Bids. Any Bid may be withdrawn prior to the scheduled time for the opening of Bids or authorized postponement thereof. Any Bid received after the time and date specified shall not be considered. No Bidder may withdraw a Bid within ninety (90) days after the actual time and date of the Bid opening, but Owner may, in its sole discretion, release any Bid and return the Bid Security prior to that date.

The Lexington-Fayette Urban County Government assumes no responsibility for Bids that are not addressed and delivered as indicated above. Bids that are not delivered to the Division of Central Purchasing by the stated time and date will be rejected.

1.02 PREPARATION OF BID

Each Bid must be submitted on the prescribed Bid Form. All blank spaces for the Bid prices must be filled in, either in ink or typewritten, for both unit prices and extensions. Totals for each Bid item must be added to show the total amount of the Bid. Each Bid must be submitted in a sealed envelope bearing on the outside the name of the Bidder, the Bidder's address, the name of the project, the invitation number and time and date for which the Bid is submitted. Bids must be addressed to the Director of Purchasing, Lexington-Fayette Urban County Government, Third Floor, 200 East Main Street, Lexington, Kentucky 40507. If forwarded by mail, the sealed envelope containing the Bid must be enclosed in another envelope addressed as specified above.

1.03 SUBCONTRACTS

The Bidder is specifically advised that any person, firm, or other party to whom it is proposed to award a subcontract under this Contract must be acceptable to the Owner. All proposed subcontractors must be identified on Bid Form. Prior to the award of Contract, the Owner or the Owner's representative will advise the Contractor of the acceptance and approval thereof or of any action necessary to be taken. Should any Subcontractor be rejected by the Owner, the Contractor shall present a new name and/or firm to the Owner at no change in the Contract Price.

1.04 QUALIFICATIONS OF BIDDER

The Owner may make such investigations as the Owner deems necessary to determine the ability of the Bidder to perform the Work, and the Bidder shall furnish to the Owner all such information and data for this purpose as the Owner may request. The Owner reserves the right to reject any Bid if the evidence submitted by, or investigation of, such Bidder fails to satisfy the Owner that such Bidder is properly qualified to carry out the obligations of the Agreement (Contract) and to complete the Work contemplated therein. Conditional Bids will not be accepted.

In evaluating Bids, Owner shall consider the qualifications of the Bidders, whether or not the Bids comply with the prescribed requirements, and alternatives and unit or lump sum prices, as requested. Owner may consider maintenance requirements, performance data, and disruption or damage to private property. The contract, if awarded, will be awarded to the lowest, qualified, responsible Bidder based upon Owner's evaluation which indicates that the award will be in the best interest of Owner and the general public.

In the event there is any question as to the Bidder's qualifications and ability to complete the work, a final determination will be made in accordance with a fair evaluation by the Lexington-Fayette Urban County Government of the above listed elements.

A. If the Owner requires filling out a detailed financial statement, the Bidder may provide its current certified financial statement(s) for the required time interval.

B. Corporate firms are required to be registered and in good standing with the requirements and provisions of the Office of the Secretary of State, Commonwealth of Kentucky.

C. Good standing with Public Works Act - any Contractor and/or subcontractors in violation of any wage or work act provisions (KRS 337.510 to KRS 337.550) are prohibited by Statutory Act (KRS 337.990) from bidding on or working on any and all public works contracts, either in their name or in the name of any other company, firm or other entity in which he might be interested. No Bid from a prime contractor in violation of the Act can be considered, nor will any subcontractor in violation of the Act be approved and/or accepted. The responsibility for the qualifications of the subcontractor is solely that of the prime contractor.

D. Documents Required of Contractor - (1) A sworn statement signed by the President or owner of the Company regarding all current work in progress anywhere; (2) A document showing the percent of completion of each project and the total worth of each project; and (3) Documentation showing the percentage of the DBE employment levels on each project of the Bidder's current work force, and DBE participation levels for Subcontractors.

E. Optional Owner Requirements - The Owner, at its discretion, may require the Bidder/Contractor to provide: (1) A current detailed financial statement for a period including up to 3 prior years. (2) Financial security or insurance in amounts and kinds acceptable to the Owner to meet the financial responsibility requirements for the Contractor to indemnify the Owner. (3) Additional information and/or DBE work force data, as well as DBE participation data.

F. Each Bidder agrees to waive any claim it has or may have against the Owner, the Architect/Engineer, and their respective employees, arising out of or in connection with the administration, evaluation, or recommendation of any Bid.

1.05 BID SECURITY

A. Each Bid must be accompanied by a Bid bond prepared on a Form of Bid Bond and attached thereto, duly executed by the Bidder as principal and having as surety thereon a surety company approved by the Owner, in the amount of 5% of the Bid. Such Bid bond will be returned to the unsuccessful Bidder(s) only upon written request to the Director of Central Purchasing within seven (7) days of opening of Bids. Bid bond shall be made payable to the Lexington-Fayette Urban County Government. Bid security is not required for projects under $50,000.

B. Bonds shall be placed with an agent licensed in Kentucky with surety authorized to do business within the state. When the premium is paid for such coverage, the full commission payable shall be paid to such local agent who shall not divide such commission with any person other than a duly licensed resident local agent.

1.06 LIQUIDATED DAMAGES FOR FAILURE TO ENTER INTO CONTRACT

The successful Bidder, upon his failure or refusal to execute and deliver the Contract and bonds required within ten (10) days after he has received notice of the acceptance of his Bid, shall forfeit

to the Owner, as liquidated damages for such failure or refusal, the security deposited with his Bid.

1.07 TIME OF COMPLETION AND LIQUIDATED DAMAGES

Bidder must agree to commence work on or before a date to be specified in a written "Notice to Proceed" from the Owner and to fully complete the Project within the time as specified in the Contract Documents. Bidder must agree also to pay liquidated damages for each consecutive calendar day thereafter as specified in the Contract Documents.

1.08 EXAMINATION OF CONTRACT DOCUMENTS AND SITE

A. It is the responsibility of each Bidder before submitting a Bid, to (a) examine the Contract Documents thoroughly, (b) visit the site(s) to become familiar with local conditions that may affect cost, progress, performance or furnishing of the work, (c) consider Federal, State and Local laws and regulations that may affect cost, progress, performance or furnishing of the work, (d) study and carefully correlate Bidder's observations with the Contract Documents, and (e) notify Engineer of all conflicts, errors or discrepancies in the Contract Documents.

B. Bidders should examine the requirements of the General Conditions for information pertaining to subsurface conditions, underground structures, underground facilities, and availability of lands, easements, and rights-of-way. The completeness of data, presented in the Contract Documents, pertaining to subsurface conditions, underground structures, and underground facilities for the purposes of bidding or construction is not assured. The Bidder will, 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 the physical conditions (surface and subsurface) 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. On request in advance, Owner will provide access to the site to conduct such explorations and tests as each Bidder deems necessary for submission of a Bid. Bidder shall fill all holes, clean up and restore the site to its former condition upon completion of such explorations.

C. The submission of a Bid will constitute an incontrovertible representation by the Bidder that Bidder has complied with every requirement of this Article; that without exception the Bid is premised upon furnishing and performing the Work required by the Contract Documents and such means, methods, techniques, sequences or procedures of construction as may be indicated in or required by the Contract Documents; and that the Contract Documents are sufficient in scope and detail to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

1.09 ADDENDA AND INTERPRETATIONS

No interpretation of the meaning of the Contract Documents will be made to any Bidder orally. Every request for such interpretation should be in writing addressed to the Director of Central Purchasing, who in turn will have an addendum issued for the Lexington-Fayette Urban County Government, and to be given consideration must be received prior to the date fixed for the opening of Bids. Any and all such interpretations and any supplemental instructions will be in the form of written addenda to the specifications. Acknowledgement of the receipt of addenda must be included with all submitted Bids. Failure of any Bidder to receive any such addendum or interpretation shall not relieve such Bidder from any obligation under his Bid as submitted. All addenda so issued shall become part of the Contract Documents.

1.10 SECURITY FOR FAITHFUL PERFORMANCE

A. Simultaneously with the delivery of the executed Contracts, the Contractor shall furnish Performance, Payment, and Erosion and Sediment Control Bonds as security for the faithful performance of this Contract and for payment of all persons performing labor on the Project under this Contract and furnishing materials in connection with this Contract. The surety on such bond or bonds shall be a duly authorized surety company satisfactory to the Owner and authorized to do business in the Commonwealth of Kentucky.

B. The Contractor shall furnish the Warranty Bond upon completion of the Work, prior to the Owner's release of the final payment.

C. All bonds required by this Contract and laws of this State shall be placed with agents licensed in the State of Kentucky. When the premium is paid for such coverage's, the full commission shall be paid to such local agent who shall not divide such commission with any person other than a duly licensed resident local agent.

D. Contractor shall use standard Performance, Payment, Warranty, and Erosion and Sediment Control Bond forms such as documents provided with the Contract Documents or AIA form A312 (latest edition), for the Performance and Payment Bonds only.

E. The Performance Bond shall be in the amount of one hundred percent (100%) of the Agreement (Contract) amount. The Payment Bond shall be in the amount of one hundred percent (100%) of the Agreement (Contract) amount. The Warranty Bond shall be in the amount of five percent (5%) of the final construction cost amount (based on contractor's final pay request). The Erosion and Sediment Control Performance Bond shall be in the amount of the Erosion and Sediment Control lump sum price in the Bid Form.

1.11 POWER OF ATTORNEY

Attorney-in-fact who signs Bid bonds or Contract bonds must file with each bond a certified and effectively dated copy of their Power of Attorney.

1.12 TAXES AND WORKMEN'S COMPENSATION

The Contractor and subcontractor will be required to accept liability for payment of all payroll taxes, sales and use tax, and all other taxes or deductions required by local, state or federal law, such as social security measured by wages. Each shall carry Workmen's Compensation Insurance to the full amounts as required by Statutes and shall include the cost of all foregoing items in the Bid. The Contractor will not otherwise be reimbursed or compensated for such tax payments. The Contractor is urged to ascertain at his own risk his actual tax liability in connection with the execution or performance of this Contract.

1.13 LAWS AND REGULATIONS

The Bidder's attention is directed to the fact that all applicable state laws, municipal ordinances, and the rules and regulations of all authorities having jurisdiction over construction of the Project shall apply to the Contract throughout, and they will be deemed to be included in the Contract, the same as though herein written out in full.

1.14 EROSION AND SEDIMENT CONTROL AND PERMITS

The Contractor and Subcontractors performing Work on projects on behalf of the Owner shall also comply with all applicable federal, state, and local environmental regulations and all requirements and conditions set forth in specifications herein.

1.15 PREVAILING WAGE LAW AND MINIMUM HOURLY RATES

Federal or State wage rates and regulations, if required for this Project, will be as described in the Section 00820 herein.

1.16 AFFIRMATIVE ACTION PLAN

The successful Bidder must submit with their bid the following items to the Urban County Government:

A. Affirmative Action Plan of the firm
B. Current Work Force Analysis Form
C. Good Faith Effort Documentation to meet the MWDBE goals.
D. List of Disadvantaged Business Enterprise Subcontractors and the Dollar Value of each Subcontract

A Work Force Analysis on the prescribed form shall be submitted for each Contract. Failure to submit these items as required herein may result in disqualification of the Bidder from award of the Contract.

All submissions should be directed to:

Director, Division of Central Purchasing
Lexington-Fayette Urban County Government
200 East Main Street, Third Floor
Lexington, KY 40507

1.17 CONTRACT TIME

The number of calendar days within which the Work is to be substantially completed and ready for final payment (the Contract Time) is set forth in the Bid Form and the Agreement (Contract).

1.18 SUBSTITUTE OR "OR-EQUAL" ITEMS

The Contract, if awarded, will be on the basis of materials and equipment described in the Drawings or specified in the Specifications without consideration of possible substitute or "or-equal" items. Whenever it is indicated in the Drawings or specified in the Specifications that a substitute or "or-equal" item of material or equipment may be furnished or used by the Contractor if acceptable to the Engineer and Owner, application for such acceptance will not be considered by the Engineer and Owner until after the effective date of the Agreement (Contract). The procedure for submission of any such application by the Contractor and consideration by the Engineer and Owner is set forth in the General Conditions.

1.19 ALTERNATE BIDS

Bidders shall submit alternate Bids/proposals only if and when such alternate Bids/proposals have been specifically requested in an Advertisement for Bids. If alternate Bids/proposals are requested in an Advertisement for Bids, the form of submission of such alternate Bid and the conditions under which such alternate Bids will be considered for award of a contract will be established in the Advertisement.

Any Bidder who submits a Bid incorporating an alternate proposal when alternate Bids/proposals have not been requested in the Advertisement for Bids shall have his/her Bid rejected as non-responsive.

Any Bidder who submits a Bid incorporating two (2) or more prices for an item or groups of items (unless such method of pricing is requested in the Advertisement for Bids), or which imposes conditions for acceptance other than those established in the Advertisement for Bids, shall have their Bid rejected as non-responsive.

1.20 SIGNING OF AGREEMENT (CONTRACT)

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 (Contract) with all other written Contract Documents attached. Within ten days thereafter, Contractor shall sign and deliver the required number of counterparts of the Agreement (Contract) and attached documents to Owner with the required Bonds, Certificate of Insurance, and Power of Attorney. The Owner will deliver one fully signed counterpart to Contractor at such time as it has been signed by the Mayor.

1.21 ASSISTANCE TO BE OFFERED TO DISADVANTAGED BUSINESS ENTERPRISE (MWDBE) CONTRACTORS

A. Outreach for MWDBE(s)

The Lexington-Fayette Urban County Government (LFUCG) maintains a database of MWDBE contractors and organizations. When a LFUCG construction project is advertised for bidding, notices are sent to companies registered at https://lfucg.economicengine.com. The notices describe the project and indicate the deadline for submitting bids.

If you wish to be added to the LFUCG MWDBE contractor database, please contact:

Marilyn Clark, Division of Central Purchasing
Lexington-Fayette Urban County Government
200 East Main Street, Room 338
Lexington, Kentucky 40507
mclark@lexingtonky.gov

B. Bid Bond Assistance for MWDBE(s)

For those MWDBE contractors who wish to bid on LFUCG project, bid bond assistance is available. This bid bond assistance is in the form of a "Letter of Certification" which is accepted by the LFUCG's Division of Purchasing, in lieu of a bid bond. The "Letter of Certification" must be included in the bid package when it is submitted to the Division of Purchasing. The "Letter of Certification" will reference the specific project for which the bid is being submitted, and the time and date on which the bid is due. Bid bond assistance must be requested from the Lexington-Fayette Urban County Government's Division of Central Purchasing.

C. Eligibility for Bid Bond Assistance for MWDBE(s)

In order to be eligible for any Bid bonding assistance, a MWDBE construction company must be owned or controlled at the level of 51% or more by a member or members of a minority group or females. Prior to receiving assistance, a statement providing evidence of ownership and control of the company by a member or members of a minority group or females must be signed by the Owner or corporate officer and by an attorney or accountant submitted to:

Marilyn Clark, Division of Central Purchasing
Lexington-Fayette Urban County Government

200 East Main Street, Room 338
Lexington, Kentucky 40507
mclark@lexingtonky.gov

D. MWDBE Subcontractors

The LFUCG will, upon request, assist prime contractors in the procurement of eligible DBE subcontractors in an effort to achieve 10% minimum MWDBE goal.

For a list of eligible subcontractors, please contact:

Marilyn Clark, Division of Central Purchasing
Lexington-Fayette Urban County Government
200 East Main Street, Room 338
Lexington, Kentucky 40507
mclark@lexingtonky.gov

1.22 MWDBE PARTICIPATION GOALS

A. GENERAL

1. The LFUCG request all potential contractors to make a concerted effort to include Minority-Owned (MBE), Woman-Owned (WBE) and Disadvantaged (DBE) Business Enterprises as subcontractors or suppliers in their bids.

2. Toward that end, the LFUCG has established 10% of total procurement costs as a Goal for participation of Minority-Owned, Woman-Owned and Disadvantaged Businesses on this contract.

3. **It is therefore a request of each Bidder to include in its bid, the same goal (10%) for MWDBE participation and other requirements as outlined in this section.**

B. PROCEDURES

1. The successful bidder will be required to report to the LFUCG, the dollar amounts of all payments submitted to Minority-Owned or Woman-Owned subcontractors and suppliers for work done or materials purchased for this contract. (See Subcontractor Monthly Payment Report)

2. Replacement of a Minority-Owned or Woman-Owned subcontractor or supplier listed in the original submittal must be requested in writing and must be accompanied by documentation of Good Faith Efforts to replace the subcontractor / supplier with another MWDBE Firm; this is subject to approval by the LFUCG. (See LFUCG MWDBE Substitution Form)

3. For assistance in identifying qualified, certified businesses to solicit for potential contracting opportunities, bidders may contact:

   a. The Lexington-Fayette Urban County Government, Division of Central Purchasing (859-258-3320)

4. The LFUCG will make every effort to notify interested MWDBE subcontractors and suppliers of each Bid Package, including information on the scope of work, the pre-bid meeting time and location, the bid date, and all other pertinent information regarding the project.

C. DEFINITIONS

1. A Minority-Owned Business Enterprise (MBE) is defined as a business which is certified as being at least 51% owned and operated by persons of African American, Hispanic, Asian, Pacific Islander, American Indian or Alaskan Native Heritage.

2. A Woman-Owned Business Enterprise (WBE) is defined as a business which is certified as being at least 51% owned and operated by one or more Non-Minority Females.

3. A Disadvantaged Business (DBE) is defined as a business which is certified as being at least 51% owned and operated by a person(s) that are economically and socially disadvantaged.

4. Good Faith Efforts are efforts that, given all relevant circumstances, a bidder or proposer actively and aggressively seeking to meet the goals, can reasonably be expected to make. In evaluating good faith efforts made toward achieving the goals, whether the bidder or proposer has performed the efforts outlined in the Obligations of Bidder for Good Faith Efforts outlined in this document will be considered, along with any other relevant factors.

D. OBLIGATION OF BIDDER FOR GOOD FAITH EFFORTS

1. **The bidder shall make a Good Faith Effort to achieve the Participation Goal for MWDBE subcontractors/suppliers. The failure to meet the goal shall not necessarily be cause for disqualification of the bidder; however, bidders not meeting the goal are required to furnish with their bids written documentation of their Good Faith Efforts to do so.**

2. Award of Contract shall be conditioned upon satisfaction of the requirements set forth herein.

3. The Form of Proposal includes a section entitled "MWDBE Participation Form". The applicable information must be completed and submitted as outlined below.

4. **Failure to submit this information as requested may be cause for rejection of bid.**

E. DOCUMENTATION REQUIRED FOR GOOD FAITH EFFORTS

1. Bidders reaching the Goal are required to submit only the MWDBE Participation Form." The form must be fully completed including names and telephone number of participating MWDBE firm(s); type of work to be performed; estimated value of the contract and value expressed as a percentage of the total Lump Sum Bid Price. The form must be signed and dated, and is to be submitted with the bid.

2. Bidders not reaching the Goal must submit the "MWDBE Participation Form", the "Quote Summary Form" and a written statement documenting their Good Faith Effort to do so. If bid includes no MWDBE participation, bidder shall enter "None" on the subcontractor / supplier form). In addition, the bidder must submit written proof of their Good Faith Efforts to meet the Participation Goal:

   a. Advertised opportunities to participate in the contract in at least two (2) publications of general circulation media; trade and professional association publications; small and minority business or trade publications; and publications or trades targeting minority, women and disadvantaged businesses not less than fifteen (15) days prior to the deadline for submission of bids to allow MWDBE firms to participate.

   b. Included documentation of advertising in the above publications with the bidders good faith efforts package

   c. Attended LFUCG Central Purchasing Economic Inclusion Outreach event

d. Attended pre-bid meetings that were scheduled by LFUCG to inform MWDBEs of subcontracting opportunities

e. Sponsored Economic Inclusion event to provide networking opportunities for prime contractors and MWDBE firms

f. Requested a list of MWDBE subcontractors or suppliers from LFUCG Economic Engine and showed evidence of contacting the companies on the list(s).

g. Contacted organizations that work with MWDBE companies for assistance in finding certified MWBDE firms to work on this project. Those contacted and their responses should be a part of the bidder's good faith efforts documentation.

h. Sent written notices, by certified mail, email or facsimile, to qualified, certified MWDBEs soliciting their participation in the contract not less than seven (7) days prior to the deadline for submission of bids to allow them to participate effectively.

i. Followed up initial solicitations by contacting MWDBEs to determine their level of interest.

j. Provided the interested MWBDE firm with adequate and timely information about the plans, specifications, and requirements of the contract.

k. Selected portions of the work to be performed by MWDBE firms in order to increase the likelihood of meeting the contract goals. This includes, where appropriate, breaking out contract work items into economically feasible units to facilitate MWDBE participation, even when the prime contractor may otherwise perform these work items with its own workforce

l. Negotiated in good faith with interested MWDBE firms not rejecting them as unqualified without sound reasons based on a thorough investigation of their capabilities. Any rejection should be so noted in writing with a description as to why an agreement could not be reached.

m. Included documentation of quotations received from interested MWDBE firms which were not used due to uncompetitive pricing or were rejected as unacceptable and/or copies of responses from firms indicating that they would not be submitting a bid.

n. Bidder has to submit sound reasons why the quotations were considered unacceptable. The fact that the bidder has the ability and/or desire to perform the contract work with its own forces will not be considered a sound reason for rejecting a MWDBE quote. Nothing in this provision shall be construed to require the bidder to accept unreasonable quotes in order to satisfy MWDBE goals.

o. Made an effort to offer assistance to or refer interested MWDBE firms to obtain the necessary equipment, supplies, materials, insurance and/or bonding to satisfy the work requirements of the bid proposal

p. Made efforts to expand the search for MWBE firms beyond the usual geographic boundaries.

q. Other--any other evidence that the bidder submits which may show that the bidder has made reasonable good faith efforts to include MWDBE participation.

Failure to submit any of the documentation requested in this section may be cause for rejection of bid. Bidders may include any other documentation deemed relevant to this requirement. Documentation of Good Faith Efforts are to be submitted with the Bid, if the participation Goal is not met.

1.23 MINORITY BUSINESS ENTERPRISE PROGRAM

Marilyn Clark
Minority Business Enterprise Liaison
Division of Central Purchasing
Lexington-Fayette Urban County Government
200 East Main Street
Lexington, KY 40507
mclark@lexingtonky.gov
859-258-3323

OUR MISSION: The mission of the Minority Business Enterprise Program is to facilitate the full participation of minority and women owned businesses in the procurement process and to promote economic inclusion as a business imperative essential to the long term economic viability of Lexington-Fayette Urban County Government.

To that end the city council adopted and implemented resolution 167-91—Disadvantaged Business Enterprise (DBE) 10% Goal Plan in July of 1991. The resolution states in part (a full copy is available in Central Purchasing):

> *"A Resolution supporting adoption of the administrative plan for a ten percent (10%) Minimum goal for disadvantaged business enterprise participation in Lexington-Fayette Urban County Government construction and professional services contracts; Providing that as part of their bids on LFUCG construction contracts, general Contractors shall make a good faith effort to award at least ten percent (10%) of All subcontracts to disadvantaged business enterprises; providing that divisions of LFUCG shall make a good faith effort to award at least ten percent of their Professional services and other contracts to disadvantaged business enterprises..."*

A Disadvantaged Business Enterprise is defined as a business that has been certified as being at least 51% owned, operated and managed by a U.S. Citizen of the following groups:

- African-American
- Hispanic-American
- Asian/Pacific Islander
- Native American/Native Alaskan
- Non-Minority Female
- Economically and Socially Disadvantaged

We have compiled the list below to help you locate certified MBE, WBE and DBE certified businesses. Below is a listing of contacts for LFUCG Certified MWDBEs in Economic Engine (https://lfucg.economicengine.com)

Business	Contact	Email Address	Phone
LFUCG	Marilyn Clark	mclark@lexingtonky.gov	859-258-3323
Commerce Lexington – Minority Business Development	Tyrone Tyra	ttyra@commercelexington.com	859-226-1625
Tri-State Minority Supplier Diversity Council	Sonya Brown	sbrown@tsmsdc.com	502-625-0137
Small Business Development Council	Dee Dee Harbut, UK SBDC	dharbut@uky.edu	
	Shiree Mack	smack@uky.edu	
Community Ventures Corporation	James Coles	jcoles@cycky.org	859-231-0054
KY Department of Transportation	Melvin Bynes	Melvin.bynes@ky.gov	502-564-3601
	Shella Eagle	Shella.Eagle@ky.gov	502-564-3601
Ohio River Valley Women's Business Council (WBENC)	Rea Waldon	rwaldon@gcul.org	513-487-6534
Kentucky MWBE Certification Program	Yvette Smith, Kentucky Finance Cabinet	Yvette.Smith@ky.gov	502-564-8099
National Women Business Owner's Council (NWBOC)	Janet Harris-Lange	janet@nwboc.org	800-675-5066
Small Business Administration	Robert Coffey	robertcoffey@sba.gov	502-582-5971
La Voz de Kentucky	Andres Cruz	lavozdeky@yahoo.com	859-621-2106
The Key News Journal	Patrice Muhammad	paatricem@keynewsjournal.com	859-373-9428

1.24 LFUCG MWDBE PARTICIPATION FORM

LFUCG Bid/RFP/Quote Reference No._____

The MWDBE subcontractors listed have agreed to participate on this Bid/RFP/Quote. If any substitution is made or the total value of the Work is changed prior to or after the job is in progress, it is understood that those substitutions must be submitted to Central Purchasing for approval immediately.

MWDBE Company, Name, Address, Phone, Email	Work to be Performed	Total Dollar Value of the Work	% Value of Total Contract

The undersigned company representative submits the above list of MWDBE firms to be used in accomplishing the work contained in this Bid/RFP/Quote. Any misrepresentation may result in the termination of the Contract and/or be subject to applicable Federal and State laws concerning false statements and false claims.

Company **Company Representative**

Date **Title**

1.25 LFUCG MWDBE SUBSTITUTION FORM

LFUCG Bid/RFP/Quote Reference No._____

The substituted MWDBE subcontractors listed below have agreed to participate on this Bid/RFP/Quote. These substitutions were made prior to or after the job was in progress. These substitutions were made for reasons stated below and are now being submitted to Central Purchasing for approval. By the authorized signature of a representative of our company, we understand that this information will be entered into our file for this project.

SUBSTITUTED MWDBE Company Name, Address, Phone, Email	MWDBE Formally Contracted/ Name, Address, Phone, Email	Work to Be Performed	Reason for the Substitution	Total Dollar Value of the Work	% Value of Total Contract

The undersigned acknowledges that any misrepresentation may result in termination of the Contract and/or be subject to applicable Federal and State laws concerning false statements and false claims.

Company **Company Representative**

Date **Title**

1.26 MWDBE QUOTE SUMMARY FORM

LFUCG Bid/RFP/Quote Reference No._____

The undersigned acknowledges that the minority subcontractors listed on this form did submit a quote to participate on this project.

Company Name	Contact Person
Address/Phone/Email	Bid Package / Bid Date

MWDBE Company Address	Contact Person	Contact Information (work phone, Email, cell)	Date Contacted	Services to be performed	Method of Communication (email, phone meeting, ad, event, etc)	Total dollars ($) Do Not Leave Blank (Attach Documentation)	DBE * AA HA AS NA Female

*(DBE designation / AA=African American / HA= Hispanic American/AS = Asian American/Pacific Islander/ NA= Native American)

The undersigned acknowledges that all information is accurate. Any misrepresentation may result in termination of the Contract and/or be subject to applicable Federal and State laws concerning false statements and claims.

Company _____ **Company Representative** _____

Date _____ **Title** _____

1.27 LFUCG SUBCONTRACTOR MONTHLY PAYMENT REPORT

LFUCG Bid/RFP/Quote No._____

The LFUCG has a 10% goal plan adopted by city council to increase the participation of minority and women owned businesses in the procurement process. In order to measure that goal LFUCG will track spending with MWDBE vendors on a monthly basis. By the signature below of an authorized company representative, you certify that the information is correct, and that each of the representations set forth below is true. Any misrepresentation may result in termination of the contract and/or prosecution under applicable Federal and State laws concerning false statements and false claims. Please submit this form monthly to the Division of Central Purchasing/ 200 East Main Street / Room 338 / Lexington, KY 40507.

Total Contract Amount Awarded to Prime Contractor for this Project _____

Project Name/ Contract #	**Work Period/ From:** **To:**
Company Name:	**Address:**
Federal Tax ID:	**Contact Person:**

Subcontractor Vendor ID (name, address, phone, email	Description of Work	Total Subcontract Amount	% of Total Contract Awarded to Prime for this Project	Total Amount Paid for this Period	Purchase Order number for subcontractor work (please attach PO)	Scheduled Project Start Date	Scheduled Project End Date

By the signature below of an authorized company representative, you certify that the information is correct, and that each of the representations set forth below is true. Any misrepresentations may result in the termination of the Contract and/or prosecution under applicable Federal and State laws concerning false statements and false claims.

Company **Company Representative**

Date **Title**

1.28 LFUCG STATEMENT OF GOOD FAITH EFFORTS

LFUCG Bid/RFP/Quote No._____

By the signature below of an authorized company representative, we certify that we have utilized the following Good Faith Efforts to obtain the maximum participation by MWDBEs on the project and can supply the appropriate documentation.

_____ Advertised opportunities to participate in the contract in at least two (2) publications of general circulation media; trade and professional association publications; small and minority business or trade publications; and publications or trades targeting minority, women and disadvantaged businesses not less than fifteen (15) days prior to the deadline for submission of bids to allow MWDBE firms to participate.

_____ Included documentation of advertising in the above publications with the bidders good faith efforts package

_____ Attended LFUCG Central Purchasing Economic Inclusion Outreach event

_____ Attended pre-bid meetings that were scheduled by LFUCG to inform MWDBEs of subcontracting opportunities

_____ Sponsored Economic Inclusion event to provide networking opportunities for prime contractors and MWDBE firms

_____ Requested a list of MWDBE subcontractors or suppliers from LFUCG Economic Engine and showed evidence of contacting the companies on the list(s).

_____ Contacted organizations that work with MWDBE companies for assistance in finding certified MWBDE firms to work on this project. Those contacted and their responses should be a part of the bidder's good faith efforts documentation.

_____ Sent written notices, by certified mail, email or facsimile, to qualified, certified MWDBEs soliciting their participation in the contract not less than seven (7) days prior to the deadline for submission of bids to allow them to participate effectively.

_____ Followed up initial solicitations by contacting MWDBEs to determine their level of interest.

_____ Provided the interested MWBDE firm with adequate and timely information about the plans, specifications, and requirements of the contract.

_____ Selected portions of the work to be performed by MWDBE firms in order to increase the likelihood of meeting the contract goals. This includes, where appropriate, breaking out contract work items into economically feasible units to facilitate MWDBE participation, even when the prime contractor may otherwise perform these work items with its own workforce

_____ Negotiated in good faith with interested MWDBE firms not rejecting them as unqualified without sound reasons based on a thorough investigation of their capabilities. Any rejection should be so noted in writing with a description as to why an agreement could not be reached.

_____ Included documentation of quotations received from interested MWDBE firms which were not used due to uncompetitive pricing or were rejected as unacceptable and/or copies of responses from firms indicating that they would not be submitting a bid.

_____ Bidder has to submit sound reasons why the quotations were considered unacceptable. The fact that the bidder has the ability and/or desire to perform the contract work with its

own forces will not be considered a sound reason for rejecting a MWDBE quote. Nothing in this provision shall be construed to require the bidder to accept unreasonable quotes in order to satisfy MWDBE goals.

_____ Made an effort to offer assistance to or refer interested MWDBE firms to obtain the necessary equipment, supplies, materials, insurance and/or bonding to satisfy the work requirements of the bid proposal

_____ Made efforts to expand the search for MWBE firms beyond the usual geographic boundaries.

_____ Other - any other evidence that the bidder submits which may show that the bidder has made reasonable good faith efforts to include MWDBE participation.

Failure to submit any of the documentation requested in this section may be cause for rejection of bid. Bidders may include any other documentation deemed relevant to this requirement. Documentation of Good Faith Efforts are to be submitted with the Bid, if the participation Goal is not met.

The undersigned acknowledges that all information is accurate. Any misrepresentations may result in termination of the contract and/or be subject to applicable Federal and State laws concerning false statements and claims.

Company	**Company Representative**
Date	**Title**

1.29 OWNER PERMITS

Bidder shall refer to Section 00890 regarding permits that have been obtained by the Owner.

1.30 GEOTECHNICAL DATA

Bidder shall refer to Section 00320 regarding available geotechnical data for this Contract.

1.31 BUY AMERICAN PROVISION

This project is subject to Division G, Title IV of H.R. 3547 (Appropriations Act) passed by the United States Congress on January 17, 2014. This portion of the act requires that for the construction, alteration, maintenance, or repair of a public water system or treatment works, all of the iron and steel products used in the project be produced in the United States.

In this section, the term "iron and steel products" means the following products made primarily of iron or steel: lined or unlined pipes and fittings, manhole covers and other municipal castings, hydrants, tanks, flanges, pipe clamps and restraints, valves, structural steel, reinforced precast concrete, and construction materials.

This requirement shall not apply in any case or category of cases in which the Administrator of the Environmental Protection Agency finds that (1) applying the requirement would be inconsistent with the public interest; (2) iron and steel products are not produced in the United States in sufficient and reasonably available quantities and of a satisfactory quality; or (3) inclusion of iron and steel products produced in the United States will increase the cost of the overall project by more than *25* percent.

END OF SECTION

SECTION 00320 – GEOTECHNICAL DATA

PART 1 - GENERAL

1.01 SUBSURFACE DATA

A. All soundings, boring logs, or other data pertaining to the subsurface conditions as referred to in the Drawings and Specifications found hereinafter is believed to be reasonably correct. However, the Engineer does not guarantee the accuracy or adequacy of such information.

B. Bidders and prospective bidders are hereby warned and put on notice that the borings and soundings referred to above were made for design purposes only. They were not made for the purpose of informing bidders and prospective bidders as to subsurface conditions in the area of the work covered by these contracts and are not, in the opinion of the Engineer, sufficient or extensive enough to provide any accurate or reliable indication of subsurface conditions in the area covered by the work to be performed under these contracts other than at the location of the borings referred to. In bidding on this Contract, each bidder acknowledges that he has made whatever investigation of subsurface conditions he has deemed necessary for the purposes of bidding. The Contractor is urged to make such investigations as he deems necessary to ascertain the subsurface conditions to be encountered in the work.

END OF SECTION

Report of Geotechnical Exploration

for

Town Branch Wet Weather Storage Facility

Lexington, Kentucky

By

Consulting Services Incorporated of Kentucky (CSI)

Lexington, Kentucky

June 28, 2013

Prepared for

GRW Engineers, Inc.

Lexington, Kentucky

CSI Project Number 2443

Conformance Set

Consulting Services Incorporated

250 Gold Rush Road, Lexington, Kentucky 40503

June 28, 2013

GRW, Inc.
801 Corporate Drive
Lexington, Kentucky 40503

ATTN: Mr. Joe Henry, PE

Subject: **Report of Geotechnical Exploration**
Town Branch Wet Weather Storage (WWS) Facility
Lexington, Kentucky
CSI Project No. 2443

Dear Mr. Henry,

Consulting Services Incorporated of Kentucky (CSI) is pleased to present our Report of Geotechnical Exploration for the proposed Town Branch Wet Weather Storage (WWS) Facility in Lexington, Kentucky. We provided our services in general accordance with CSI Proposal Number 2443, dated April 22, 2013.

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 design, construction and performance of the proposed soil and rock supported portions of the project.

We appreciate the opportunity to provide our geotechnical services to you and the design team. Please do not hesitate to contact us for questions or comments about the information contained herein.

Sincerely,

Consulting Services Incorporated of Kentucky,

Daniel A Homm, EIT, SI
Staff Professional

STATE OF KENTUCKY
BRUCE L. HATCHER
14,527
LICENSED PROFESSIONAL ENGINEER
6-28-13

Bruce L. Hatcher, PE, SI
Chief Engineer
Licensed Kentucky 14,527

Office (859)309-6021 www.csikentucky.com Fax (888)792-3121

TABLE OF CONTENTS

Page

APPENDICES, FIGURES, PHOTOS AND TABLES

APPENDIX:

Site Location Plan
Boring and Sounding Location Plan
Geotechnical Boring Information Sheet
Boring Logs
Sounding Logs
Field Testing Procedures
Laboratory Testing Summary Sheet
Specific Laboratory Test Results
Laboratory Testing Procedures

LIST OF FIGURES:

LIST OF PICTURES:

LIST OF TABLES:

INTRODUCTION

1 SCOPE OF THE GEOTECHNICAL EXPLORATION

As we proposed, we conducted a geotechnical exploration which is summarized in the following report. Our services included a review of the project information provided, conducting a geotechnical exploration that utilized soil test borings, soundings (borings without sampling), and rock coring to obtain samples for modeling the soil/rock conditions at the subject site, an analysis of the data and information obtained, and providing recommendations for the soil and rock supported portions of the project site as listed in our proposal.

2 PROJECT INFORMATION

Project information was originally provided via e-mail correspondence with GRW Engineers, Inc. We were provided with the following documents for our review:

- Request for Proposal document from Lexington Fayette Urban County Government (LFUCG), dated March 22, 2013.

We understand that this project will consist of the construction of a large concrete storage facility (basin) for wastewater during high inflow events at the existing Town Branch WWTP in Lexington, Kentucky.

We understand that this project will be constructed in phases. Each phase is discussed separately below:

- **Phase 1** - In Phase 1, half of the WWS facility will be constructed. The footprint of Phase 1 will be approximately 300 feet (east-west direction) by 275 feet (north-south direction). Approximately 22 MG of storage will be provided in Phase 1. The construction of a pump station and controls building is also included in Phase 1.
- **Phase 2** - In Phase 2, another quarter of the WWS facility will be constructed. The footprint of Phase 2 will be approximately 150 feet (east-west direction) by 275 feet (north-south direction). Phase 2 will be located directly west of Phase 1, thus a common wall will be shared by both phases. Approximately 11 MG of storage will be provided in Phase 2
- **Phase 3** - In Phase 3, the final quarter of the WWS facility will be constructed. The footprint of Phase 3 will also be approximately 150 feet (east-west direction) by 275 feet (north-south direction). Phase 3 will be located directly west of Phase 2, thus a common wall will be shared by both phases. Approximately 11 MG of storage will be provided in Phase 3. At this time, the need for Phase 3 has not yet been finalized. Thus, Phase 3 may not be needed if remedial repairs to the existing sanitary sewer system produce less inflow and infiltration.

At present, we understand that the depth of the facility is expected to be roughly 38 feet. Also, it is expected that nearly half (roughly 20 feet) of the concrete structure will be below grade. Due to the size and weight of the structure, we expect that rock bearing foundations will be required. Although not provided, we expect a maximum foundation load of about 8,000 psf (pounds per square foot) for this size/type structure. Due to the heavy expected structure loads, we expect that rock bearing foundations (i.e. - spread foundations on rock, drilled piers, etc.) will be required for this project. However, we understand that the methane storage tank located on-site will be moved to another location. Based on the expected loads for the methane sphere, we expect that soil bearing foundations may be used for this small structure.

Since the project site is relatively level, we have assumed that the structure will be excavated directly to bedrock for the applicable footprint plus some margin (per phase). Due to the expected 20+ feet cut depths, we expect that the cut slopes in the overlying soil will be of significant concern for this project. Deep cuts along the north, south, and east sides could adversely impact the access road, the railroad ROW fence, or the stockyard property line fence (respectively). However, we do not expect that any free-standing retaining walls or new steep fill slopes will be required for this project.

The walls of the tanks will be subjected to lateral earth pressures (due to the backfill against them) below grade. Additionally, the facility walls will be subjected to hydrostatic pressures above grade during high inflow events when the water level rises above the ground line.

We understand that the bottom of the basin will be above the 100 year flood plain elevation in this area. Based on our discussions with the design team, we understand that a gravity perimeter drainage system has been selected for the proposed construction. Thus, uplift due to groundwater should not impact the proposed structure.

If any of the aforementioned information is in error or if the information changes during the course of the project, please contact our office so that we can re-evaluate the new information with respect to our findings and recommendations.

3 AREA/SITE INFORMATION

3A AREA TOPOGRAPHY/PHYSIOGRAPHY

The site is located in the Inner Blue Grass Region of the Blue Grass Physiographic Region of Kentucky. This area consists of gently rolling topography and rich, fertile soils. Published mapping reviewed indicates elevations in the site vicinity range from 950 feet to 1000 feet. Below is a figure of the location of the site with respect to the regional physiography.

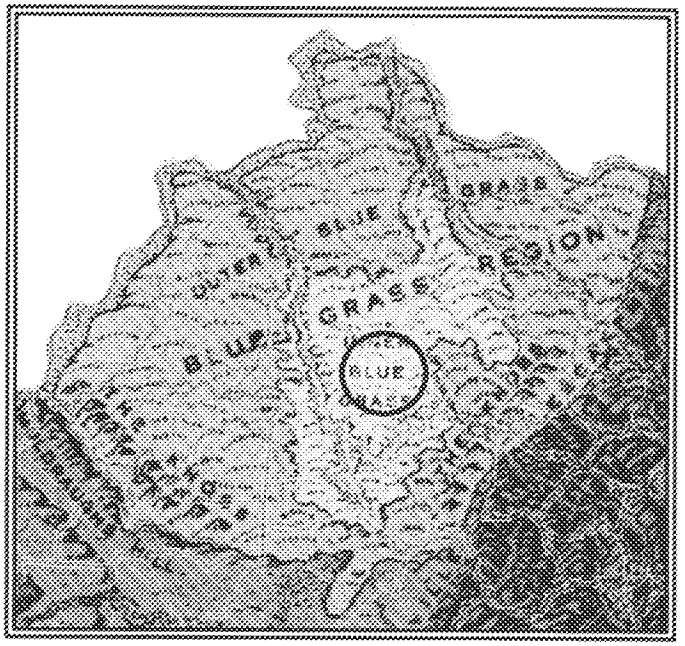


Figure 1. Kentucky Physiographic Map
(site vicinity shown in the circle)

3B SITE GEOLOGY

A review of the *USGS Geologic Map of the Lexington West Quadrangle, Kentucky* (dated 1967) indicates the project site is located in an area partially underlain by Alluvium (i.e. - water transported and deposited soils) along the Town Branch Creek. The Alluvium and the majority of the site are underlain by the Grier Limestone Member of the Lexington Limestone Formation. The Lexington Limestone Formation is part of the Middle an Ordovician aged rock deposits.

The Grier Limestone Member consists primarily of limestone. The limestone is described as very light gray to dark gray, rubbly, irregular medium and coarse grained, with dark gray shale partings in some beds. Below is a figure of the location of the site with respect to the area geology.

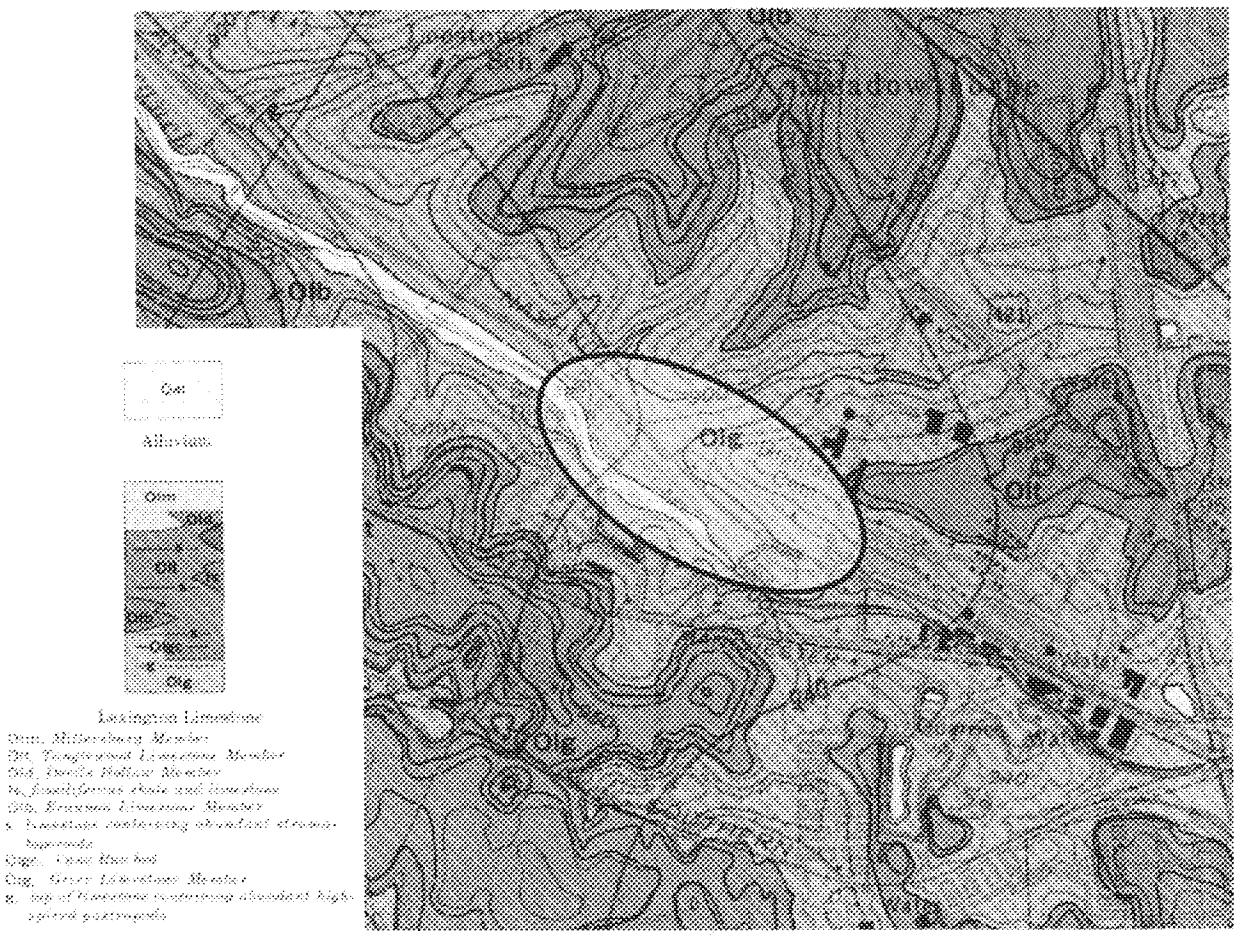


Figure 2. Site Geology USGS Lexington West Quadrangle, dated 1967
(site vicinity shown in the circle)

As with most of the geology of this portion of Kentucky, Karst (sinkholes, weathered bedrock, caverns, erratic bedrock, etc.) is associated with the site geology. Several closed depressions were mapped within 1 mile of the site. Since the site (and surrounding areas) have been regraded, obvious signs of sinkhole activity may have been filled or otherwise occluded. The *Fayette County Karst Areas* map published by the Kentucky Geological Survey (KGS) indicates that the project site is in an area of intense Karst development.

The Bryan Station Fault Zone is approximately 2 to 3 miles southeast of the project site. The geologic dip in the area of the project site is less than 1 percent to the northwest. The figure below indicates the likelihood of Karst occurrence.

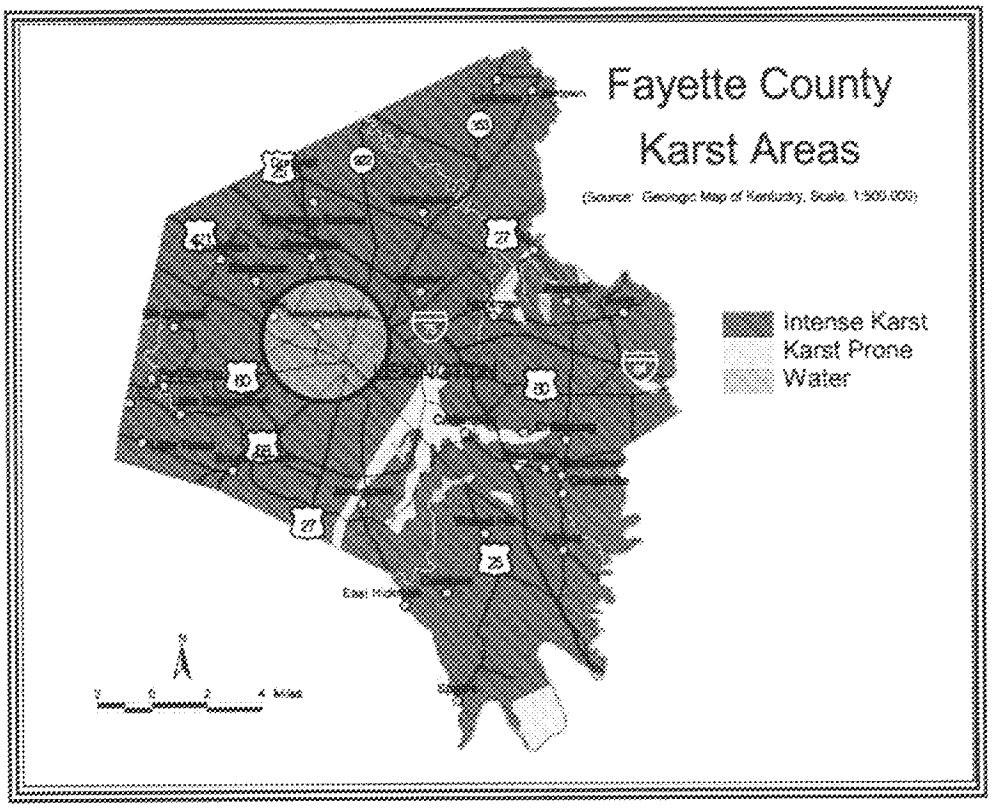


Figure 3. *Fayette County Karst Areas* Map, KGS
(site vicinity shown in circle)

3C PUBLISHED SITE SOIL CONDITIONS

According to the USDA Soil Survey of Fayette County (NRCS website), the soils underlying the site vicinity consist of the following series:

- Huntington silt loam (Hu).
- Made land, over silty materials (Md)
- Made land, over clayey materials (Me)
- Urban land-armour-maury complex (Ua)
- Bluegrass-Maury silt loams (uBlmB) on 2 to 6 percent slopes.
- Maury-Bluegrass silt loams (uMlmC) on 6 to 12 percent slopes.
- Depth to bedrock for this series is generally listed as greater than 80 inches.
- Depth to the water table for this series is generally greater than 80 inches.
- The soil series uBlmB is generally listed as being not limited, the soil series uMlmC is generally listed as being somewhat limited, the soil series Hu is generally listed as

being very limited and the soil series Md, Me, and Ua are generally listed as not rated for the construction of dwellings with basements. Particular issues affecting construction include flooding, slope, high shrink-swell potential, and depth to bedrock.

- The soil series Hu, uBlmB, uMlmC are generally listed as being very limited and the soil series Md, Me, and Ua are generally listed as not rated for the construction of paved streets and roads. Particular issues affecting construction include low soil strength, shrink-swell potential, depth to bedrock, and flooding.
- The soil series Hu, uBlmB, uMlmC are generally listed as being somewhat limited and the soil series Md, Me, and Ua are generally listed as not rated for the construction of shallow excavations. Particular issues affecting construction include flooding, high clay content, and unstable excavation sidewalls.

Below is the soils map from the USDA website.

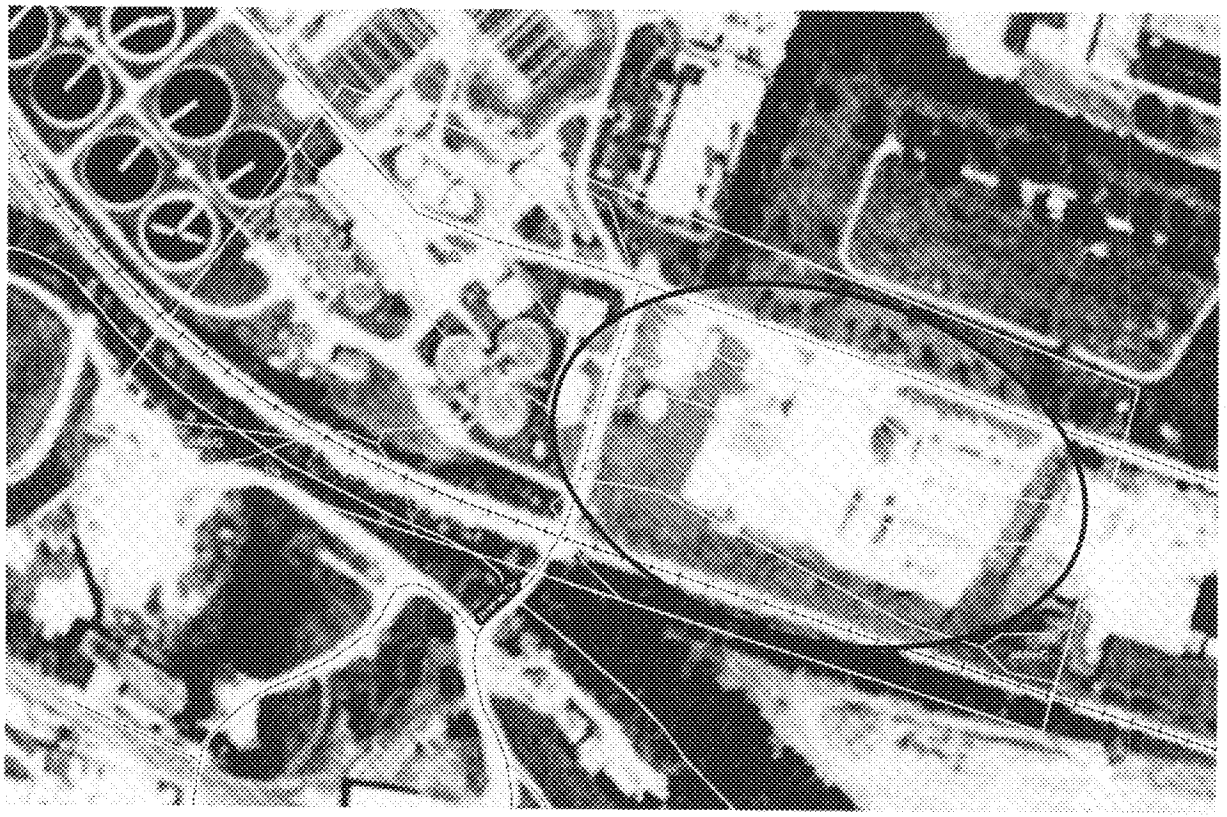


Figure 4. USDA Soil Survey Map of the Project Site

Due to the development of the site vicinity, the project site has been re-graded. Therefore, the soil survey information listed above may no longer be useful in this area since the site soils have been altered. It is likely that the surrounding area cut material may have been used

as fill material for the site. Thus, the soils described above may be on-site but not in their natural condition.

3D OTHER PUBLISHED SITE INFORMATION

We have reviewed several available aerial photographs, dated as far back as April 1993. In the April 1993 aerial photograph, it appears the site is in similar condition to the existing conditions during our field exploration and is covered with existing structures and pavement areas. There is an existing cemetery north of the project site. The area surrounding the project site is mostly comprised of businesses to the east and south. Specifically, there is a stockyard toward the east and the existing Town Branch Waste Water Treatment Plant (WWTP) toward the west. There are railroad tracks along the southern project boundary, generally running east to west. Between the April 1993 and April 2002 aerial photographs, it appears that some earthwork activities took place south of the railroad tracks and the project site. The remainder of the project site and surrounding areas appear to remain in similar condition during this time interval. Between the April 2002 and October 2011 aerial photographs, some small structures were constructed north and south of the project site. However, the project site and the majority of the surrounding areas appear to remain in similar condition. Please reference the aerial photographs below for further details.

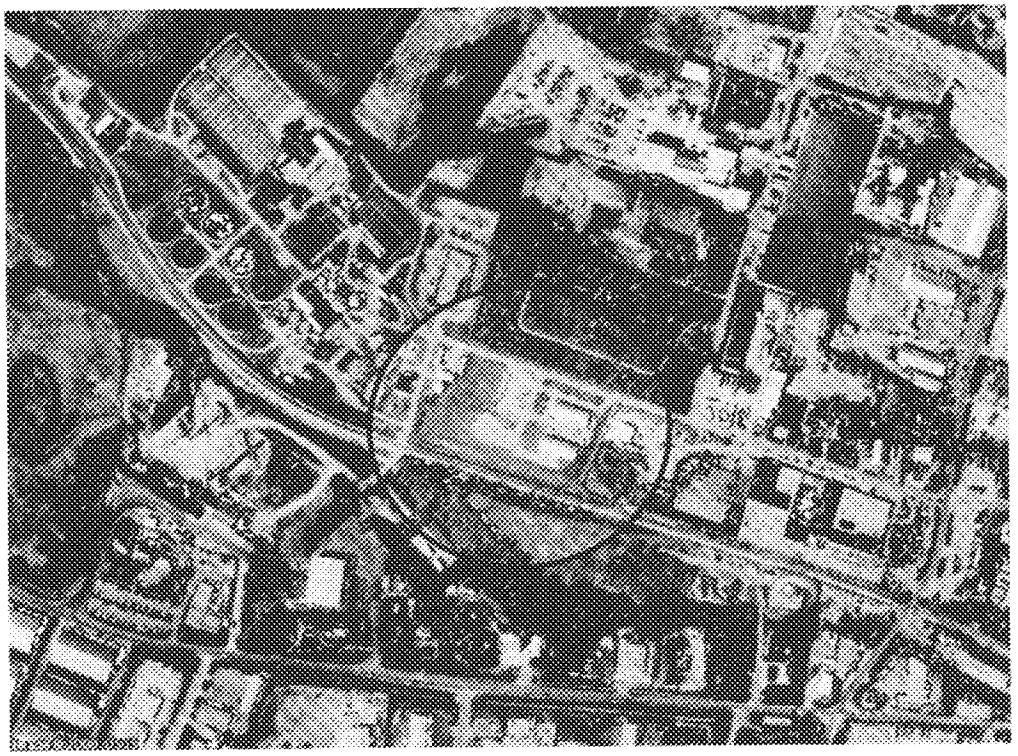


Figure 5. Aerial Photo dated April 18, 1993 (DIGITALGLOBE)

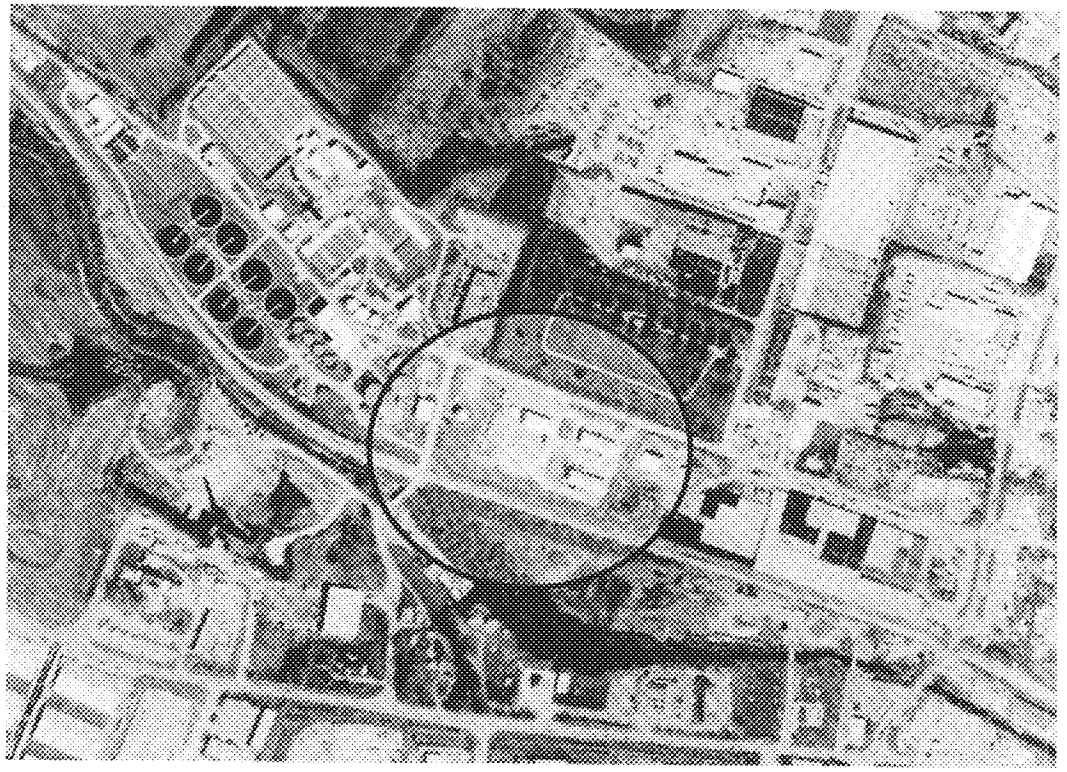


Figure 6. Aerial Photo dated April 1, 2002 (DIGITALGLOBE)

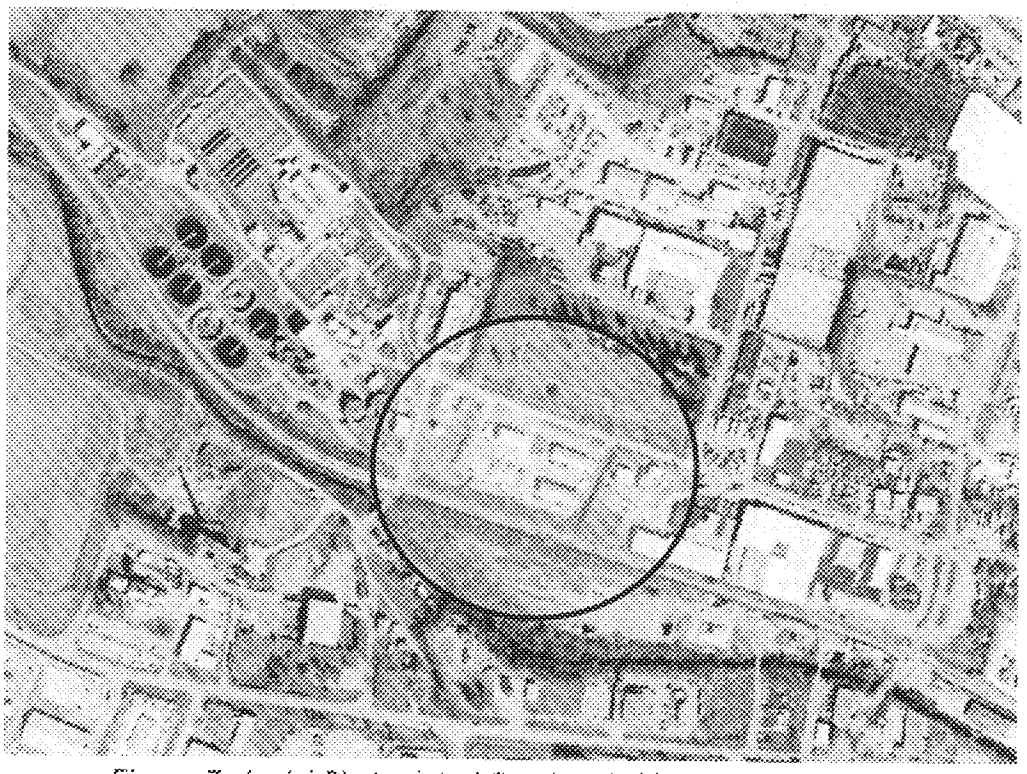


Figure 7. Aerial Photo dated October 4, 2011 (DIGITALGLOBE)

FINDINGS

4 SITE SURFACE OBSERVATIONS

An initial site visit was conducted on June 3, 2013 by Mr. Todd Helton, EIT and Mr. Daniel Homm, EIT (both of CSI), Mr. Joe Henry, PE of GRW Engineers, Inc., and LFUCG personnel. The project team discussed the proposed locations of the borings/soundings and offset the boring/sounding locations due to conflicts with either underground and overhead utilities.

A site visit was conducted on June 5 through 7 and June 10 through 13, 2013, by Mr. Homm. Mr. Homm performed a field reconnaissance, directed the drilling operations, and logged the recovered soil and rock samples.

The project site is located off of Lisle Industrial Avenue in Lexington, Kentucky adjacent to the Town Branch Waste Water Treatment Plant (WWTP). Specifically, the project area is located between the railroad right-of-way (to the south), an access road to the WWTP (to the north), the property line of the adjacent stockyard (to the east), and another access road to the WWTP (to the west). The project site is currently occupied by several buildings, several small structures, pavement areas, and some grassed areas. The majority of the project area is relatively level. However, the site slopes sharply downhill to the east (toward the stockyard property) and to the south (toward the railroad). There is heavy brush and small trees located in these steeply sloping sections along the eastern and southern edges of the project site. Additionally, the western third of the property slopes downward toward the western access road. The existing methane sphere is located along the western sloped edge of the property, adjacent to the western access road.

The proposed methane sphere storage location is approximately 600 northwest of the proposed location of the WWS tanks on the Town Branch Waste Water Treatment Plant (WWTP) property. The methane sphere storage location is a relatively level grassy area. There were no underground utilities marked in this area. However, several overhead utilities were located nearby.

There were several utilities parallel to the access roads off of Lisle Industrial Avenue and Jimmie Drive (including water, sewer, gas, and overhead utilities). Additionally, there are numerous public and private utilities within the project area. The photos below show the site conditions at the time of our site visit.

Photo 1: View from boring B-3 toward the west

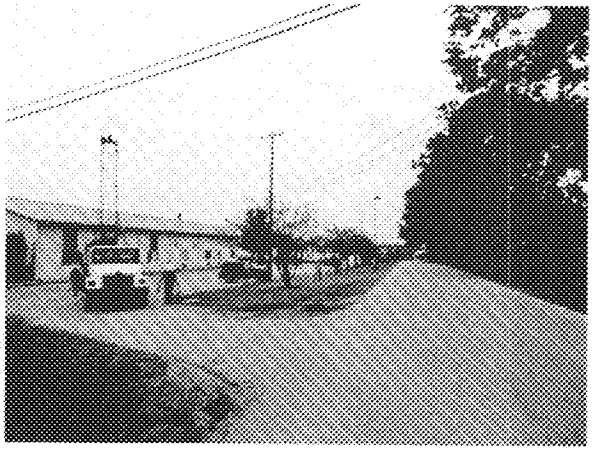


Photo 2: View from boring B-2 toward the west

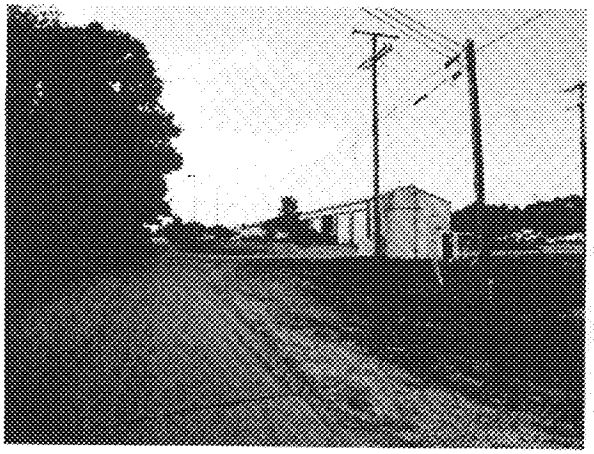


Photo 3: View from the intersection of the access roads toward the southeast

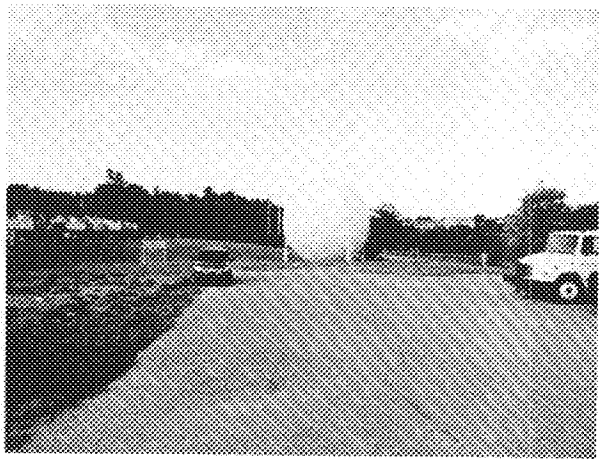


Photo 4: View from boring B-14 area toward the south

5 SUBSURFACE CONDITIONS

5A SOIL CONDITIONS

During our field exploration, we performed fourteen soil borings for the proposed WWS Facility (labeled B-1 through B-14), one boring in the proposed future methane sphere storage location (labeled B-15), and sixteen soundings (labeled S-1 through S-16) for the proposed WWS Facility. It should be noted that soundings are typically borings without sampling. However, we performed SPT (split spoon sampling) at soundings S-3 and S-6 at the request of Third Rock Consultants to recover soil samples for environmental sampling. The boring and

sounding locations were located as near as possible to the boring and sounding locations discussed with the design team during our on-site meeting on June 3, 2013. Please reference the Boring and Sounding Location Plans in the Appendix for the approximate boring and sounding locations.

In general, we encountered a topsoil/root zone or asphalt pavement and/or base stone, overlying previously placed (old) fill, overlying residual soils, overlying bedrock. We encountered auger refusal at all of our boring and sounding locations.

The topsoil/root zone had thicknesses ranging from approximately 1 to 5 inches. The asphalt pavement ranged in thickness from approximately 1 to 4 inches and the base stone ranged in thickness from 4 to 7 inches beneath the pavement sections. It should be noted that we encountered gravel pavement areas on-site that ranged in thickness from approximately 6 to 16 inches.

Beneath the surficial cover, we encountered previously placed fill at all fifteen of our boring locations. The previously placed fill generally consisted of mixed brown and gray clay with rock fragments, reinforced concrete fragments, brick fragments, asphalt fragments pieces of wood, fine roots, topsoil, and construction debris (i.e. - pieces of metal, wire, plastic, etc.). The largest diameter piece of wood encountered was approximately 12 inches in our recovered SPT samples. Therefore, other areas containing buried topsoil or deleterious materials are likely located on-site. We typically encountered a buried topsoil layer near the residual soil transition when encountered. It should be noted that due to the inclusion of topsoil in the old fill, the thicknesses of the buried topsoil layer was difficult to determine. At borings B-1, B-3, B-6, B-10, and B-10A and at soundings S-3 and S-10, we encountered shallow false refusals (determined by rock coring or offset borings/soundings) on hard unknown objects (likely large boulders or concrete fragments) in the old fill. Due to the large rock and concrete fragments in the previously placed fill, you should expect difficult excavating on-site. The thickness of the previously placed fill ranged from approximately 1½ to 24 feet. Based on the depths of existing fill on-site, we believe that the existing structures' footprints are underlain by existing old fill.

Beneath the previously placed fill, we typically encountered firm to stiff residual soils. It should be noted that samples were not recovered at borings B-1, B-3, B-6, and B-10A, since rock coring methods were used to advance the borings past hard unknown objects in the old fill. Please reference the Rock Conditions Section for more information. The residual soil horizon generally consisted of reddish brown to brown lean clay (CL) with varying amounts of sand and rock fragments. The residual soil horizon (where sampled) had thicknesses ranging from approximately 1½ to 9 feet.

The subsurface conditions encountered in each of our boring locations are shown on the Boring and Sounding Logs in the Appendix. It should be noted that our borings and soundings were drilled and sampled according to the procedures presented in the Appendix. The Boring

and Sounding Logs 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 the stratification lines shown on the Boring and Sounding Logs represent approximate transitions between material types. In-situ stratum changes could occur gradually or at slightly different depths.

The boring and sounding locations shown in the Appendix should be considered accurate only to the degree implied by the method used. Top of hole elevations were provided by the project surveyor.

5B ROCK CONDITIONS

Auger refusal is typically interpreted as top of bedrock. Due to the inclusion of large rock fragments and concrete fragments in the previously placed fill, some of the borings and soundings likely encountered false auger refusals. The borings' auger refusal elevations were all verified through rock coring operations. However, we cannot accurately determine if the soundings' auger refusal elevations were on bedrock or hard unknown objects within the old fill. If a suspect shallow auger refusal elevation was encountered, an offset sounding/boring was performed. At borings B-1, B-3, B-6, and B-10A, we performed rock-coring elevations at apparent top of bedrock. At these boring locations, the rock coring barrel penetrated a hard unknown object we had thought was bedrock (due to the auger refusal). After we penetrated the hard unknown object with the rock coring bit, we typically encountered additional fill (i.e. - soil and rock fragments). Since we were unable to advance the soil augers any further, we continued rock coring through the previously placed fill in order to advance the boring. Therefore, no additional soil samples were recovered at these boring locations after coring operations were begun. Thus, we do not know the exact old fill thickness or the residual soil thicknesses at these locations.

Auger refusal was encountered at all fifteen of our borings and at all sixteen of our soundings. The auger refusal depths ranged from 1.4 feet (boring B-10A) to 26.4 feet (boring B-4). Rock coring was performed at all of our boring locations. The amount of rock core collected varied dependent on the elevation where auger refusal was encountered and quality of recovered rock core. The lengths of rock coring ranged from 5 feet (boring B-15) to 33.6 feet (boring B-10A). The recovered rock cores typically consisted of gray limestone with dark gray shale partings and clay seams with recoveries ranging from 2 to 100 percent. The rock quality designation (RQD) for our recovered rock cores ranged from very poor to excellent engineering quality with RQD values ranging from of 0 to 92 percent. We encountered an approximately 5-inch open void in the bedrock at boring B-6 approximately 4 feet below the top of rock elevation and numerous clay seams in the top 5 feet of most of our borings. Core water loss was observed at borings

B-1, B-3, B-6, and B-7 B-8, and B-10A during rock coring operations. Please reference the applicable Boring Logs for further details.

The rock cores were boxed and transported to our laboratory for further examination by an engineer. The recovered rock core was generally consistent with the data presented on the Lexington West Geologic Quadrangle. The bedrock conditions encountered in our rock cores are shown on each Boring Log.

5C GROUNDWATER CONDITIONS

Groundwater was encountered at a depth of approximately 14.2 feet at boring B-13. We believe that the encountered ground water at boring B-13 is likely perched groundwater in the old fill near the residual soil horizon. Groundwater was not encountered at any of our fourteen boring or sixteen sounding locations upon the completion of soil augering. Final groundwater level readings were not taken upon the completion of rock coring since water was used to cool the rock coring bit at all of our boring locations. Denotations about groundwater levels shown on the Boring and Sounding Logs represent the conditions upon the completion of soil augering at the time of our exploration. The borings were immediately filled upon their completion due to safety concerns for personnel in the area. Please be aware that borings and soundings may experience some settlement over time, thus they should be monitored and backfilled to grade as necessary.

Although groundwater was not typically observed in our borings or soundings, groundwater could be encountered during construction. 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 (especially in old fill) or at/near the bedrock bedding planes, or at/near the soil/rock interface. Perched water sources are often not linked to the more continuous relatively stable groundwater table that typically occurs at much greater depths. Also, wet conditions and pockets of water are common at or near the existing/old structural features or underground utilities. Finally, water issues are also dependent upon recent rainfall activity, surface and subsurface drainage patterns in the area

6 LABORATORY TESTING

During the course of our work, we selected representative soil samples for laboratory testing. The tests include obtaining data for soil classification testing. Detailed descriptions of these tests and the results of our testing are included in the Appendix. Tests performed included:

- Natural moisture content tests
- Atterberg limits tests
- Percent fines analyses

- Unconfined compression test on soil
- Unconfined compression test on rock

GEOTECHNICAL DISCUSSION AND RECOMMENDATIONS

7 DISCUSSION-GEOTECHNICAL ISSUES

Based on our experience with similar projects and the conditions observed during our geotechnical exploration, we believe the site is suitable for the proposed construction. The primary geotechnical concerns are:

- Previous Site Improvements/Previously Developed Areas
- Construction in Heavily Developed/Razed Building Areas
- Site Clearing and Grubbing
- Previously Placed (Old) Fill
- Cut Slopes
- Shallow and Varying Depth to Rock
- Grade Selection
- Rock Removal
- Differing Bearing Conditions
- Karst

The following sections of this report discuss each issue. However, recommendations to address the issues are contained in later sections of the report.

7A PREVIOUS SITE IMPROVEMENTS/PREVIOUSLY DEVELOPED AREAS

The proposed construction is near several existing utilities along the railroad tracks, and Town Branch Drive (i.e. - water, gas, etc.). Additionally, there are numerous private utilities (i.e. - electric, gas, water, storm sewer, sanitary sewer, etc.) throughout the project site. The location of these utility lines must be verified prior to construction to determine if relocation of these utility lines will be necessary. Expect that previous construction may have left old fill or other deleterious material within the project boundaries. Your project budget should include a contingency for remediation and/or removal of any encountered buried deleterious material.

7B CONSTRUCTION IN HEAVILY DEVELOPED/RAZED BUILDING AREAS

There are several structures (i.e. - office buildings, storage sheds, garages, storage tanks, etc.) that will need to be demolished prior to the proposed construction. Past experience has shown that demolition or razing of existing structures fills the soil up with razed debris and utility connections. The razed debris, which includes the foundation/slab concrete, is not suitable for support of the new foundations. Thus, these materials should be undercut before rebuilding another structure. Utility connections/pipes are commonly within the debris when demolition occurs and should be disconnected and removed before rebuilding begins. Your project budget should contain a contingency for the removal and remediation of any encountered buried deleterious materials and/or underground structures/obstructions.

7C SITE CLEARING AND GRUBBING

Numerous small to large trees are located along the southern project boundary (parallel to the existing railroad tracks), most of which will likely need to be removed prior to construction. Expect that these trees will have extensive root systems that will leave significant voids in the subgrade when removed. These voids will need to be properly filled after the tree removal is performed if they are near the proposed final grades. Additionally, there are existing asphalt pavement areas on-site. The asphalt will likely have to be removed and wasted off-site. The base stone may be reused as structural fill, provided it meets the requirements specified in this report.

7D PREVIOUSLY PLACED (OLD) FILL

Previously placed fill was encountered at all of our boring locations. The previously placed fill generally consisted of brown and gray mixed clay with rock fragments, reinforced concrete fragments, brick fragments, asphalt fragments pieces of wood, fine roots, topsoil, and construction debris (i.e. - pieces of metal, wire, plastic, etc.). The largest diameter piece of wood encountered was approximately 12 inches in our recovered SPT samples. Therefore, other areas containing buried topsoil or deleterious materials are likely located on-site. It should be noted that five of our fifteen borings and at least two of our sixteen soundings encountered apparent false refusals on hard unknown objects (likely large boulders or concrete fragments) in the old fill. Therefore, due to the large rock fragments and concrete fragments in the previously placed fill, you should expect difficult excavating on-site. The thickness of previously placed fill ranged from approximately 1½ to 24 feet.

Old fill materials are often improperly compacted, commonly contain organics and debris, and are poor bearing materials. Due to the heavy expected loads, rock bearing foundations will likely be utilized for this project. Therefore, all of the old fill must be removed. The old fill may be reused provided that the deleterious materials and debris can by removed. Based on our borings, the amount of debris and deleterious materials contained in the old fill may

make it difficult or not economically feasible to reuse the old fill as new structural fill material.

7E CUT SLOPES

Due to the inconsistent nature of the old fill, we cannot accurately predict the stability of any soil excavation or slope. Therefore, steep/deep excavations will likely require shoring, bracing, over excavation, and/or other retention methods (i.e. - soil nails, helical piers, shotcrete, etc.) due to the high potential for collapse or unstable slopes. Thus, suitable retaining methods will have to be determined on-site as the excavations are performed dependent on the available space (restrictions due to roadways, etc.), encountered soil/rock conditions, and project grades.

7F SHALLOW AND VARYING DEPTH TO ROCK

As previously stated, our borings and soundings encountered auger refusal at depths ranging from approximately 3.3 feet to 26.4 feet. Therefore, shallow rock (and subsequent rock removal) will impact the project. Project foundations should be constructed to bear completely on rock in order to provide consistent bearing conditions for the entire structure. Due to the varying depth to rock and the expected project grades, rock excavation will be necessary. Thus, your budget should include rock removal for the project (based upon your final selected grades).

7G GRADE SELECTION

The site is gently sloping toward the west in the area of Phase I and II. Phase III is more steeply sloped downward toward the west. Based on the provided dimensions of the WWS Facility, we have assumed that of the on-site soils (fill and/or residual) will be removed. Based on the expected grades and tank dimensions, expect that rock will be encountered in the tank pad excavation and other deep excavations. Thus, grade selection will be very important for this project.

7H ROCK REMOVAL

Auger refusal (i.e. - bedrock) was encountered at depths as shallow as 3.3 feet in our borings and soundings. As such, rock removal will be required for foundation excavations, and for underground utility installations. You should expect that foundation excavations and deep excavations (such as sanitary sewer, storm sewer, water lines, etc.) will intersect the soil/rock interface. The rock encountered can have very hard zones (despite the low RQD values shown) and may be difficult to excavate.

7I DIFFERING BEARING CONDITIONS

Due to the heavy expected structure loads, rock bearing foundations will be required. Bearing project foundations on any combination of both soil and rock will likely result in unwanted differential settlement. Therefore, project foundations should be constructed to bear either completely on soil -OR- completely on rock in order to provide consistent bearing conditions for the structures. We expect that spread foundations bearing on bedrock will be utilized for the proposed Wet Weather Storage (WWS) tanks and that shallow spread foundations bearing on residual soils or new properly compacted soil fill will be utilized for the future methane sphere storage.

7J KARST

Karst topography with intense Karst risk is known to underlie the project site. Karst topography consists of limestone or dolomite that is weathered which results in sinkholes (i.e. - closed depressions), irregular top of rock profiles, pinnacled bedrock, slots or troughs in the bedrock, internal drainage systems, and open voids in either the bedrock itself or in the soil overburden (typically at the soil/rock interface). We encountered an approximately 5-inch open void in the bedrock at boring B-6 approximately 4 feet below the top of rock elevation and numerous clay seams in the top 5 feet of most of our rock cores. Additionally, soft/wet soils are commonly encountered at the soil/rock interface and in slots or troughs in the bedrock.

An in-depth Karst study was beyond the scope of this exploration. Procedures for construction in Karst areas are contained in later sections of the report. Regardless of methods used, they should be treated on a case-by-case basis and should involve a CSI geotechnical engineer.

Based on our knowledge of the area geology, sinkholes could be exposed during grading activities and foundation/underground utility construction. Detailed site proofrolling and foundation observations are frequently utilized in an attempt to locate incipient soil dropouts. Sinkholes must be evaluated and treated on an individual basis. Procedures for repairing sinkholes or other Karst features should be performed on a case-by-case basis and should involve a CSI geotechnical engineer.

8 SITE DRAINAGE

During construction, water should not be allowed to pond in excavations or undercutting will likely be required. Additionally, water ponded in excavations (especially those at or near the soil-rock interface) can activate latent Karst features. During the life of the project, slope the subgrade and other site features so that surface water flows away from the site structures. Diversion ditches should be used to keep surface water from accumulating at or near site structures.

For excavations during construction, most free water from the subsurface conditions could likely be removed via sump pumps and open channel flow (ditches) at or near the source of seepage. We expect that pockets of perched water will be encountered during excavations in the old fill due to the large particle sizes and poor compaction. Therefore, you should expect that perched water will "bleed" out of voids in the old fill. The perched water can "bleed" out over a few hours to several days. Therefore, the project budget and schedule should include contingencies to remove excess perched water. If normal dewatering measures prove insufficient, CSI should be retained to provide recommendations on the issue.

As previously mentioned, wet conditions are possible in excavations on-site during site construction. Daylighting wet zones for drainage or the use of french/rock drains may be prudent or cost effective methods of de-watering wet areas of the site. Pumping with long-flexible hoses day-lighted hundreds of feet away or other types of sumping could also be utilized if necessary. CSI should be retained to observe all excavations in locations of springs or other water-bearing features.

9 FOUNDATIONS

Based on our understanding of this project, we expect that spread foundations bearing on bedrock will be utilized for the proposed Wet Weather Storage (WWS) tanks. However, we expect that shallow spread foundations bearing on residual soils or new properly compacted soil fill and will be utilized for the future methane sphere storage. The foundation bearing conditions should be the same for the entire structure (i.e. - soil bearing - OR - rock bearing) in order to reduce the risk of differential settlement caused by differing bearing conditions. If there are any changes in the project criteria, CSI should be allowed to review the recommendations to determine if any modifications are required.

9A SHALLOW FOUNDATIONS ON ROCK

As previously stated, due to the heavy expected structure loads, rock bearing foundations will be required for the WWS tank. For foundations bearing completely on bedrock (either directly or indirectly), foundations may be sized using a maximum allowable bearing pressure of 10,000 pounds per square foot (**10 ksf**). Any existing soil or weathered rock should be excavated until competent rock is exposed in the bottom of the foundation excavation. We interpret competent rock by observing the teeth of the backhoe or trackhoe being dragged vertically across the top of exposed rock. We encountered an approximately 5-inch open void in the bedrock at boring B-6 approximately 4 feet below the top of rock elevation and numerous clay seams in the top 5 feet of most of our borings. Based on this information, we expect that undercutting of rock in probable Karst features will be necessary.

Upon approval by a CSI geotechnical engineer, the excavation should be backfilled using DGA (dense graded aggregate) from the prepared subgrade elevation due to site conditions. After

the subgrade has been approved to receive new DGA fill, the fill may commence with the following procedures and guidelines recommended:

- Place DGA fill in maximum 8-inch thick loose lifts.
- Fill lifts should be densified using vibratory compaction methods
- Fill lifts should be densified to at least 95 percent of the DGA's maximum dry density (ASTM D 698).
- Density testing should be performed as a means to verify percent compaction and moisture content of the DGA as it is being placed and compacted.
- Retain a representative of CSI to observe and document fill placement and compaction operations.

A detailed settlement analysis was beyond the scope of this exploration. However, based on the expected structural loads and foundations bearing on competent bedrock, we expect both total settlements and differential settlements should not exceed ¼ inch.

Additional design considerations for spread foundations bearing on bedrock are outlined as follows:

- Foundations bearing on bedrock are not subject to a minimum frost embedment depth.

9B SHALLOW FOUNDATIONS ON ROCK - CONSTRUCTION NOTES

For foundations constructed on top of competent bedrock, we also recommend the following procedures.

- Loose soil, mud, debris, and excess water should be removed from the bearing surface immediately prior to concrete placement.
- Foundation bearing surfaces should be benched (as much as practical) to provide nearly-level bearing surfaces.
- A CSI geotechnical engineer should observe all foundation excavations and provide recommendations for treatment of any unsuitable conditions encountered.

9C SHALLOW SPREAD FOUNDATIONS ON SOIL - METHANE SPHERE

Shallow spread footings may be sized using a maximum allowable bearing pressure of 2,000 pounds per square foot (psf). The foundations should be kept as high as possible (minimum frost embedment depth) to reduce the risk of encountering bedrock. No grading information was provided to us for this structure; however, if rock is encountered within 2 feet of the

bottom of foundation (BOF) elevation, we recommend that the rock be undercut at least 2 feet below bottom of footing and the excavation backfilled with compacted soil up to the design BOF elevation to provide a "cushion".

A detailed settlement analysis was beyond the scope of this exploration. However, based on the estimated structure loads, the anticipated behavior of soil types encountered during field activities, and our experience with similar projects, we expect that total settlements will not exceed 1 inch, and that differential settlements will not exceed 1/2 inch.

Settlement estimates are based, in part, upon the assumption that site preparation is performed in accordance with our recommendations and with good quality control of the earthwork. Proper remediation of unsuitable old fill and proper placement and compaction of new fill is particularly important in keeping settlements within tolerable limits.

Additional design considerations for project foundations are outlined as follows:

- Design all footings with a minimum 24 inches width.
- All exterior footing bottoms should bear at least 24 inches below finished exterior grading (KBC Table 1805.2.1 for Fayette County).
- Interior footings (those not exposed to freezing) may be placed at nominal depths or 18 inches deep, whichever is deeper;

9D SHALLOW FOUNDATIONS ON SOIL - METHANE SPHERE CONSTRUCTION NOTES

Any soils can lose strength if they become wet, so we recommend the foundation subgrades be protected from exposure to water. For foundations construction, we also recommend the following procedures.

- For soils that will remain exposed overnight or for an extended period of time, place a "lean" concrete mud-mat over the bearing areas. The concrete should be at least 4 inches thick. Flowable fill concrete or low-strength concrete is suitable for this cover, as conditions allow.
- Disturbed soil should be removed prior to foundation concrete placement.
- Foundation bearing conditions should be benched level.
- Areas loosened by excavation operations should be recompacted prior to reinforcing steel placement.
- Loose soil, debris, and excess surface water should be removed from the bearing surface prior to concrete placement.

- Retain a CSI geotechnical engineer to observe all foundation excavations and provide recommendations for treatment of any unsuitable conditions encountered.
- The foundation bearing conditions should be checked by means of portable dynamic cone penetration (DCP) testing at the direction of a CSI geotechnical engineer.

10 SEISMIC SITE CLASSIFICATION

The latest edition of the Kentucky Building Code (KBC) was reviewed to determine the Site Seismic Classification. Based on our review of geologic data, our experience, subsurface conditions encountered, and the use of rock bearing foundations for the proposed WWS tank, we recommend a Seismic **SITE CLASS "B"** for foundation design purposes. If soil bearing foundations are utilized for the methane sphere, we recommend a Seismic **SITE CLASS "C"** for foundation design purposes.

A detailed geotechnical earthquake engineering analysis was not performed since it was beyond the scope of our authorized work. However, based on a review of published literature and our experience with similar subsurface conditions, we believe the potential for slope instability, liquefaction, and surface rupture due to faulting or lateral spreading resulting from earthquake motions is low. However, this potential could be elevated during wet periods of the year unless adequate drainage is provided.

11 BELOW GRADE WALLS/STRUCTURES

The project consists of several wet weather storage tanks for the existing water treatment plant. At present, we understand that the depth of the facility is expected to be roughly 38 feet. Also, it is expected that nearly half (roughly 20 feet) of the concrete structure will be below grade. Thus, the walls of the storage tanks will be subjected to lateral earth pressures due to the backfill behind it. Below-grade walls should be designed to provide sufficient drainage at the rear of the walls to relieve hydrostatic pressure.

- We recommend the walls be backfilled using a compacted, open-graded, granular material such as No. 57 stone. The granular material should be clean and free draining.
- A geotextile material (i.e. - filter fabric) must be used as a separator between the granular backfill material and the surrounding soils to prevent soil piping.
- To utilize the following granular material earth pressure values, the granular material must occupy a minimum backfill zone of 2 feet between the face of the wall and the soil backfill or bedrock.
- The No. 57 stone backfill zone should be drained using a perforated pipe placed near the base of the foundation. The perforated pipe should be placed at the lowest

elevation where water would accumulate. The perforated pipe should be directed through a solid pipe to daylight or to the storm sewer system.

The following table presents granular backfill, earth pressure design parameters for Equivalent Hydrostatic Pressures (EHP) and Earth Pressure coefficients. The values given assume the backfill surface is nearly level, the granular backfill is drained, the zone of backfill conforms to the minimum zone detailed above, and no surcharge is placed on the backfill. A unit weight of 100 pcf (pounds per cubic foot) was used for the backfill stone

TABLE 1. Granular Material
Equivalent Hydrostatic Pressures (EHP)
and Earth Pressure Coefficients

Condition	EHP (pcf)	Coefficients
Active	30	$K_a = 0.30$
At Rest	50	$K_o = 0.50$
Passive	300*	$K_p = 3.0$*

*Unfactored

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, uses widely spaced 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.

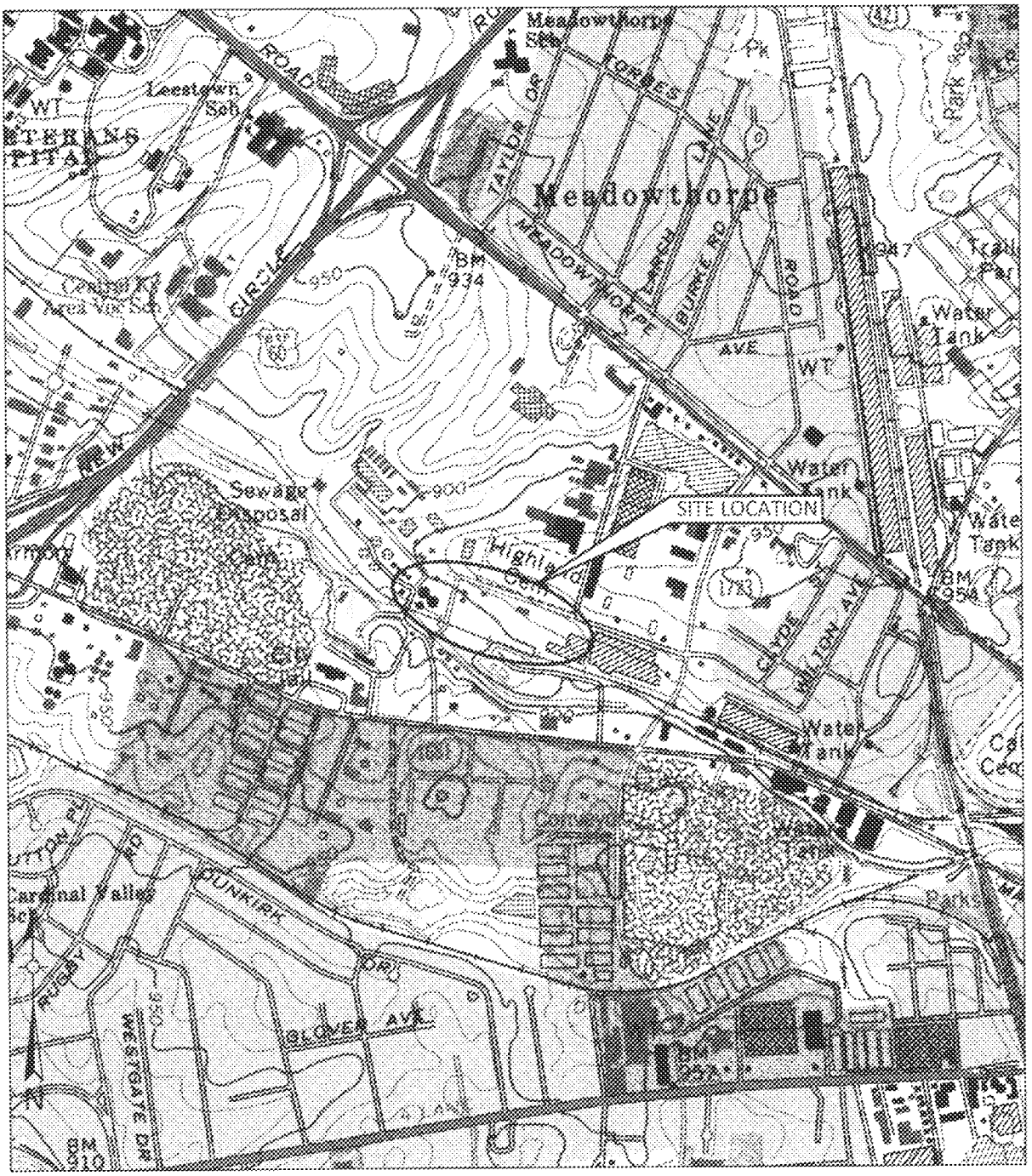
No section or portion of this report (including Appendix information) can be used as a stand alone article to make distinct changes or assumptions. The entire report and Appendix should be used together as one resource. We wish to remind you that our exploration services include storing the soil samples collected and making them available for inspection for 30 days. The soil samples are then discarded unless you request otherwise. We typically keep rock cores until the project is completed. Then, we dispose of the rock core samples. 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 soil samples are then discarded unless you request otherwise. Please inform us if you wish to keep any of the obtained samples.

APPENDIX

Site Location Plan
Boring and Sounding Location Plans
Geotechnical Boring Information Sheet
Boring Logs
Sounding Logs
Field Testing Procedures
Laboratory Testing Summary Sheet
Specific Laboratory Test Results
Laboratory Testing Procedures

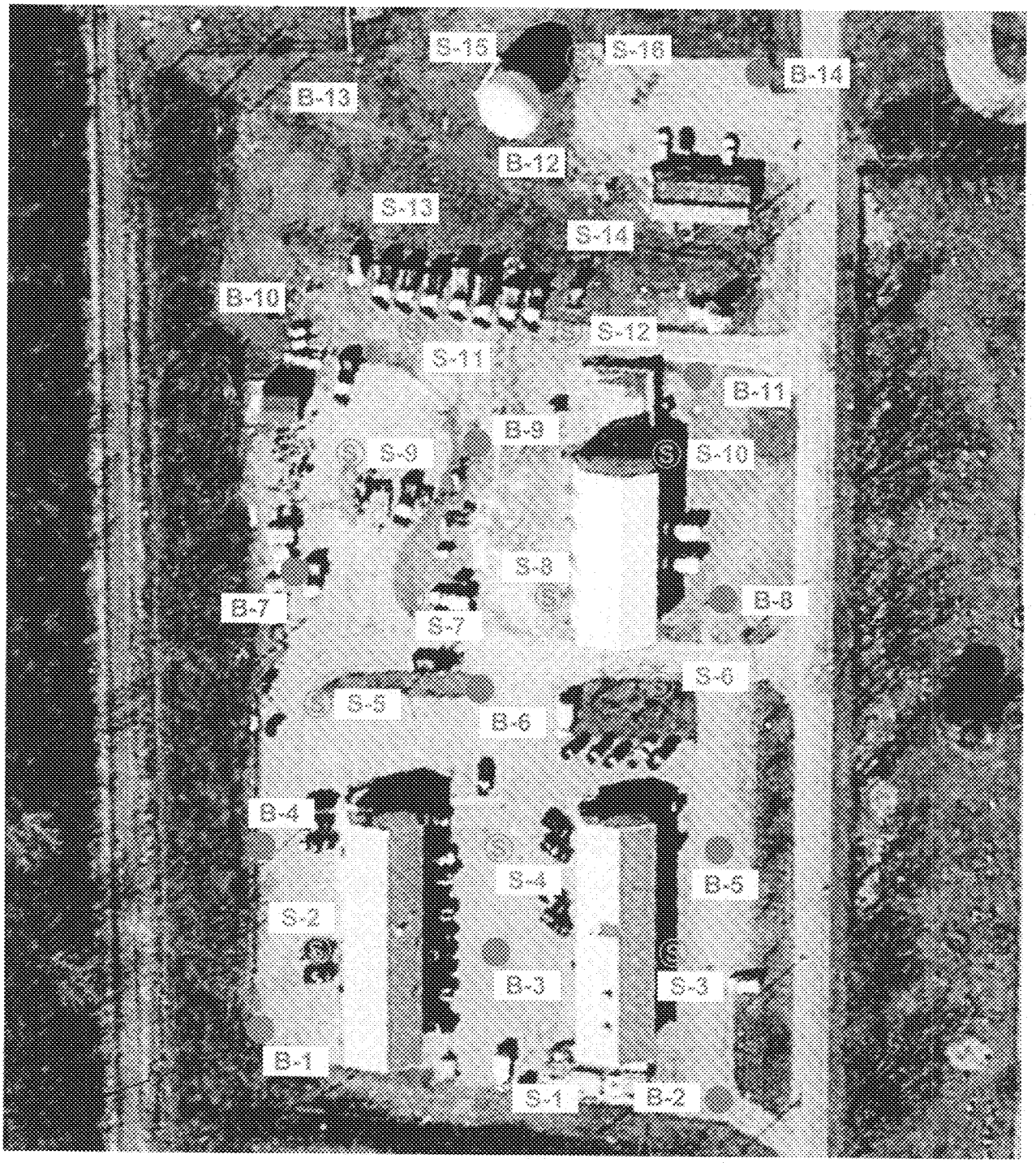


Site Location Plan adapted from USGS Lexington West Topographic Quadrangle map dated 1965 (revised 1998), with further adaptation by CSI personnel.

FOR ILLUSTRATION PURPOSES ONLY

Consulting Services Incorporated of Kentucky
250 Gold Rush Road
Lexington, Kentucky 40503
859.309.6021 Office|888.792.3121 Fax
www.csikentucky.com

TITLE: SITE LOCATION PLAN	Project No.: 7443	Drawn By: JAC
PROJECT: TOWN BRANCH WWS LEXINGTON, KENTUCKY	Date: June 28, 2013	Checked By: JTH
	Scale: Not To Scale	Drawing No.: 1 of 1



Boring and Sounding Location Plan adapted from Aerial Photography dated October 4, 2011, with further adaptation by CSI personnel.

Top of hole elevations were provided by the project surveyor

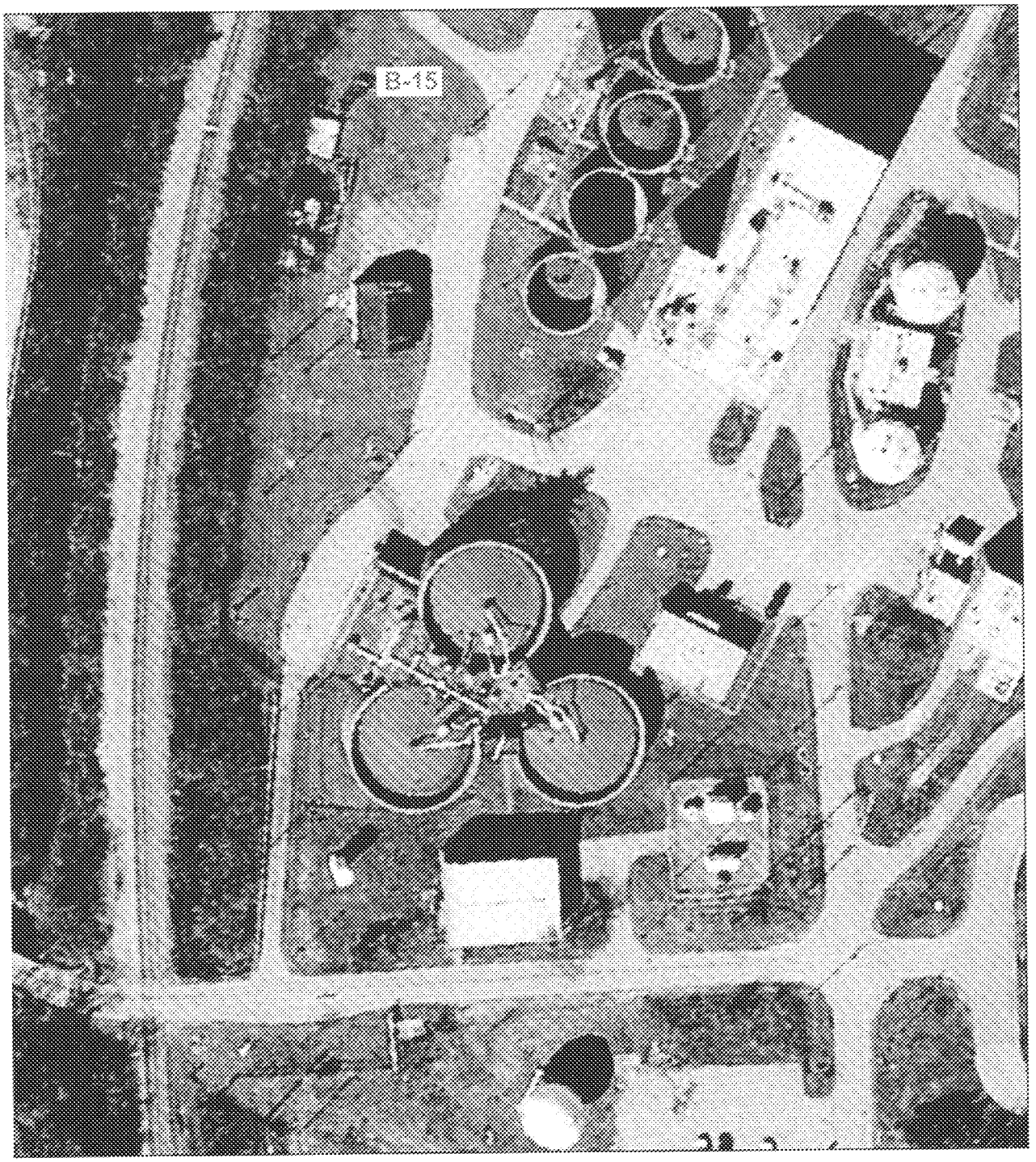
LEGEND
B-XX BORING LOCATIONS
S-YY SOUNDING LOCATIONS

FOR ILLUSTRATION PURPOSES ONLY

Consulting Services Incorporated of Kentucky
250 Gold Rush Road
Lexington, Kentucky 40503
859.309.6021 Office|888.792.3121 Fax
www.csikentucky.com

TITLE: BORING AND SOUNDING LOCATION PLAN	Project No: 2443	Drawn By: JAC
PROJECT: TOWN BRANCH WWS LEXINGTON, KENTUCKY	Date: June 26, 2013	Checked By: DH
	Scale: Not To Scale	Drawing No. 1 of 2

Conformance Set



Boring and Sounding Location Plan adapted from Aerial Photography dated October 4, 2011, with further adaptation by CSI personnel.

Top of hole elevations were provided by the project surveyor.

FOR ILLUSTRATION PURPOSES ONLY

LEGEND

B-XXX BORING LOCATIONS

Consulting Services Incorporated of Kentucky
250 Gold Rush Road
Lexington, Kentucky 40503
859.309.6021 Office|866 792.3121 Fax
www.csikentucky.com

TITLE: BORING LOCATION PLAN	Project No: 2443	Drawn By: JAC
PROJECT: TOWN BRANCH WWS LEXINGTON, KENTUCKY	Date: June 28, 2013	Checked By: DH
	Scale: Not To Scale	Drawing No: 2 of 2

Consulting Services Incorporated
250 Gold Rush Road, Lexington, Kentucky 40503

Geotechnical Boring Information Sheet

Sample Type Symbols	
Splitspoon (SPT)	
Dynamic Cone Penetrometer (DCP)	
Shelby Tube	
Grab	
Bulk	
Rock Core	

Surface Symbols	
Topsoil	
Asphalt	
Concrete	
Lean Clay	
Fat Clay	
Sandy Clay	
Silt	
Elastic Silt	
Lean Clay to Fat Clay	
Gravelly Clay	
Sandy Silt	
Gravelly Silt	
Sand	
Gravel	
Fill	
Void	
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.

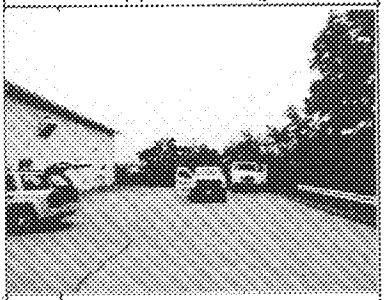
Strata lengths shown on borings represents a rough estimate. Transition may be more abrupt or gradual. Soil borings are representative of that estimated location at that time and are based on recovered samples. Conditions may be different between borings and between sample intervals. Boring information 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.

Consulting Services Inc. of Kentucky — Boring Log

250 Gold Rush Road | Lexington, Kentucky 40503 | 859.309.6921 tel | 888.792.3121 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: 2443
BORING NUMBER: B-1
LOCATION: Lexington, Kentucky
WEATHER: Cloudy, 60's
DRILL RIG TYPE: Mobile B-34
DRILLER: Geo-Drill
DATE DRILLED: 06-07-2013
DRILLING METHOD: 3 1/4" ID HSA
CSI FIELD REP: D. Homm
CLIENT: GRW Engineers, Inc.

TOP OF GROUND ELEVATION: 920.4

ELEV (feet)	DEPTH (feet)	Strata Description	SOIL TYPE	SAMPLES	SPT Blow Counts	Recovery (in)	RQD (%)	Notes
920.4	0	GRAVEL - 16 inches						Dry upon completion of soil augering
		FILL - sampled as STIFF to VERY STIFF to FIRM, brown clay, with rock fragments, with black oxide nodules, with roots, moist			3-6-6	10		
915.4	5				11-10-9	3		
					9-9-9	5		Photo of Approx. Boring Location
					6-3-3	5		
910.4	10							
					4-6-7	1		
905.4	15	Auger Refusal at 15.6 feet Begin Coring at 15.6 feet			50/0.1	0		
					Run No.	Recovery (%)	RQD (%)	No core water return
					1 (15.6'-25.6')	2	0	Cored through a hard object at 15.6 feet, then encountered additional fill
900.4	20	FILL - no sample recovered						
895.4	25	FILL - no sample recovered			2 (25.6'-35.6')	38	18	
890.4	30	LIMESTONE - gray, with fossils, with clay seams, with shale partings						
885.4	35	LIMESTONE - gray, with fossils, with clay seams, with shale partings			3 (35.6'-40.6')	98	65	

Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location. Top of hole elevations were provided by the project surveyor.

Consulting Services Inc. of Kentucky — Boring Log

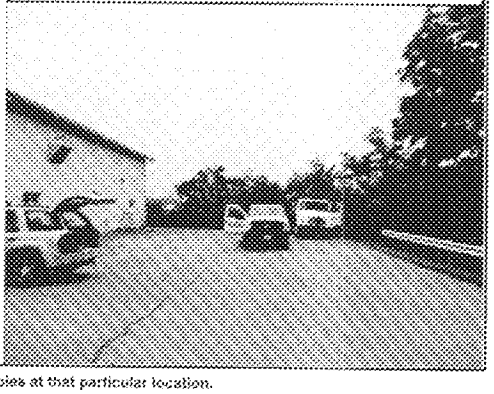
250 Gold Rush Road | Lexington, Kentucky 40503 | 859.368.8021 tel | 866.782.3121 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: 2443
BORING NUMBER: B-1
LOCATION: Lexington, Kentucky
WEATHER: Cloudy, 60's
DRILL RIG TYPE: Mobile B-34
DRILLER: Geo-Drill
DATE DRILLED: 06-07-2013
DRILLING METHOD: 3 1/4" ID HSA
CSI FIELD REP: D. Hamm
CLIENT: GRW Engineers, Inc.

TOP OF GROUND ELEVATION: 920.4

ELEV. (feet)	DEPTH (feet)	WATER LEVEL	Strata Description	SOIL TYPE	SAMPLES	SPT Blow Counts	Recovery (in)	RQD (%)	Notes
880.4	40		LIMESTONE - gray, with fossils, with clay seams, with shale partings						
			Coring Terminated at 40.6 feet						
875.4	45								
870.4	50								
865.4	55								
860.4	60								
855.4	65								
850.4	70								
845.4	75								

Photo of Approx. Boring Location



Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location. Top of hole elevations were provided by the project surveyor.

Consulting Services Inc. of Kentucky — Boring Log

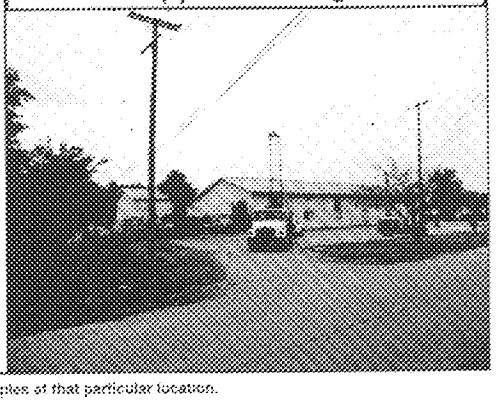
250 Gold Rush Road | Lexington, Kentucky 40503 | 859.309.6021 tel | 888.782.3121 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: 2443
BORING NUMBER: B-2
LOCATION: Lexington, Kentucky
WEATHER: Sunny, 80's
DRILL RIG TYPE: Mobile B-34
DRILLER: Geo-Drill
DATE DRILLED: 06-05-2013
DRILLING METHOD: 4" OD SFA
CSI FIELD REP: D. Hornm
CLIENT: GRW Engineers, Inc.

TOP OF GROUND ELEVATION: 922.3

ELEV (Feet)	DEPTH (Feet)	WATER LEVEL	Strata Description	SOIL TYPE	SAMPLE TYPE	SPT Blow Counts	Recovery (in)	RQD (%)	Notes
922.3	0		ASPHALT - 2-1/2 inches BASE STONE - 6 inches FILL - sampled as VERY STIFF, brown clay, with rock fragments, moist			11-6-9	8		Dry upon completion of soil augering
						9-13-7	3		
917.3	5		FILL - sampled as FIRM, dark gray clay, with rock fragments, with brick fragments, with pieces of wood, with roots, with topsoil, moist			6-4-4	5		
						11-5-2	6		
912.3	10		FILL - sampled as FIRM, reddish brown and dark brown clay, with rock fragments, moist						
			Auger Refusal at 12.1 feet Begin Coring at 12.1 feet			Run No.	Recovery (%)	RQD (%)	No core water loss
						1 (12.1'-20.0')	98	86	
907.3	15		LIMESTONE - medium gray, with fossils, with clay seams from 12.1 to 14.1 feet						
902.3	20		LIMESTONE - medium gray, with fossils			2 (20.0'-30.0')	95	76	
897.3	25								Qu = 1681 ksf
892.3	30		Coring Terminated at 30.0 feet						
887.3	35								

Photo of Approx. Boring Location



Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples of that particular location.
Top of hole elevations were provided by the project surveyor.

Conformance Set

Consulting Services Inc. of Kentucky — Boring Log

290 Gold Rush Road | Lexington, Kentucky 40503 | 859.368.6021 tel | 859.792.3121 fax

PROJECT: Town Branch WWS | PROJECT NUMBER: 2443 | BORING NUMBER: B-3

LOCATION: Lexington, Kentucky | WEATHER: Cloudy/Rain, 70's | DRILL RIG TYPE: Mobile B-34

DRILLER: Geo-Drill | DATE DRILLED: 06-06-2013 | DRILLING METHOD: 3 1/4" ID HSA

CSI FIELD REP: D. Hamm | CLIENT: GRW Engineers, Inc.

TOP OF GROUND ELEVATION: 922.1

ELEV (feet)	DEPTH (feet)	Water Level	Strata Description	SOIL TYPE	SAMPLES	SPT Blow Counts	Recovery (in)	RQD (%)	Notes
922.1	0		ASPHALT - 3 inches BASE STONE - 7 inches FILL - sampled as VERY STIFF to STIFF, brown clay, with rock fragments, with roots, with asphalt fragments, moist			2-50/0.2	6		Dry upon completion of soil augering
917.1	5					4-9-10	2		
						4-7-9	4		
912.1	10					7-4-9	9		
						4-50/0.2	3		
907.1	15		Auger Refusal at 14.7 feet Begin Coring at 14.7 feet FILL - no sample recovered			Run No. 1 (14.7'-24.7')	Recovery (%) 36	RQD (%) 11	No core water return Cored through a hard object at 14.7 feet, then encountered additional fill
902.1	20		LIMESTONE - bluish gray, with fossils, with clay seams						
897.1	25		LIMESTONE - gray to dark gray, with fossils, with calcite, with few clay seams, with shale partings			2 (24.7'-34.7')	98	83	
892.1	30								
887.1	35		Coring Terminated at 34.7 feet						

Photo of Approx. Boring Location

Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location. Top of hole elevations were provided by the project surveyor.

Consulting Services Inc. of Kentucky — Boring Log

250 Gold Rush Road | Lexington, Kentucky 40503 | 859.309.6021 tel | 888.792.3121 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: 2443
BORING NUMBER: B-4
LOCATION: Lexington, Kentucky
WEATHER: Cloudy, 70's
DRILL RIG TYPE: Mobile B-34
DRILLER: Geo-Drill
DATE DRILLED: 06-07-2013
DRILLING METHOD: 3 1/4" ID HSA
CSI FIELD REP: D. Homm
CLIENT: GRW Engineers, Inc.

TOP OF GROUND ELEVATION: 921.7

ELEV. (feet)	DEPTH (feet)	Strata Description	SOIL TYPE	SAMPLES	SPT Blow Counts	Recovery (in)	ROD (%)	Notes
921.7	0	ASPHALT - 3-1/2 inches BASE STONE - 7 inches FILL - sampled as HARD to VERY STIFF, brown clay, with rock fragments, with asphalt fragments, with reinforcing steel bar pieces, moist			9-23-24	10		Dry upon completion of soil augering
916.7	6				11-8-14	9		
					50/0.2	1		
911.7	10				4-3-4	1		
906.7	15	FILL - sampled as FIRM to HARD to FIRM to STIFF, dark gray clay, with topsoil, with pieces of wood, with concrete fragments, with pieces of metal, with brick fragments, with glass, with pieces of plastic, with asphalt			3-2-2	4		
901.7	20				3-20-25	6		Photo of Approx. Boring Location
					3-2-3	2		
896.7	25	LEAN CLAY (CL) - STIFF, brown, with black oxide nodules, moist			3-4-6	18		
		Auger Refusal at 26.4 feet Begin Coring at 26.4 feet			Run No.	Recovery (%)	ROD (%)	No core water loss
891.7	30	LIMESTONE - light gray, with clay seams, with fossils			1 (26.4'-36.4')	63	27	Qu = 1,392 ksf
886.7	35							
		LIMESTONE - light gray, with shale partings			2 (36.4'-41.4')	100	70	

Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location. Top of hole elevations were provided by the project surveyor.

Conformance Set

Consulting Services Inc. of Kentucky — Boring Log

250 Gold Rush Road | Lexington, Kentucky 40503 | 859.309.6821 tel | 859.792.3121 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: 2443
BORING NUMBER: B-4
LOCATION: Lexington, Kentucky
WEATHER: Cloudy, 70's
DRILL RIG TYPE: Mobile B-34
DRILLER: Geo-Drill
DATE DRILLED: 06-07-2013
DRILLING METHOD: 3 1/4" ID HSA
CSI FIELD REP: D. Hamm
CLIENT: GRW Engineers, Inc

TOP OF GROUND ELEVATION: 921.7

ELEV. (feet)	DEPTH (feet)	Water Level	Strata Description	SOIL TYPE	SAMPLES	SPT Blow Counts	Recovery (in)	RQD (%)	Notes
861.7	40		LIMESTONE - light gray, with shale partings						
			Coring Terminated at 41.4 feet						
876.7	45								
871.7	50								
866.7	55								
861.7	60								
856.7	65								
851.7	70								
846.7	75								

Photo of Approx. Boring Location

Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location. Top of hole elevations were provided by the project surveyor.

Consulting Services Inc. of Kentucky — Boring Log

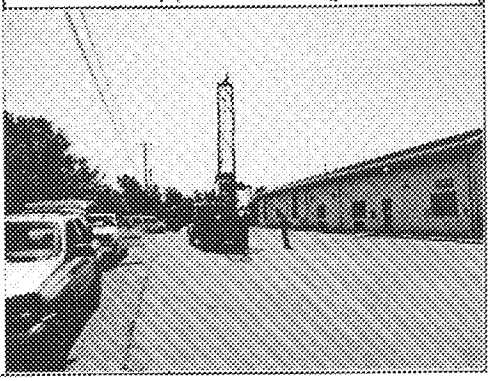
250 Gold Rush Road | Lexington, Kentucky 40503 | 859.309.6021 tel | 859.792.3121 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: 2443
BORING NUMBER: B-5
LOCATION: Lexington, Kentucky
WEATHER: Sunny, 80's
DRILL RIG TYPE: Mobile B-34
DRILLER: Geo-Drill
DATE DRILLED: 06-05-2013
DRILLING METHOD: 3 1/4" ID HSA
CSI FIELD REP: D. Homm
CLIENT: GRW Engineers, Inc.

TOP OF GROUND ELEVATION: 922.0

ELEV. (feet)	DEPTH (feet)	Water Level	Strata Description	SOIL TYPE	SAMPLES	SPT Blow Counts	Recovery (in)	RQD (%)	Notes
922	0		ASPHALT - 4 inches						Dry upon completion of soil augering
			BASE STONE - 6 inches						
			FILL - sampled as STIFF, dark brown clay, with rock fragments, with asphalt fragments, moist			9-50/0.4	6		
			Boulder from 2.4 feet to 4.0 feet			6-7-7	16		
917	5		FILL - sampled as STIFF to VERY STIFF, dark brown clay, with rock fragments, with asphalt fragments, with pieces of glass, with pieces of wood, with roots, moist			6-7-10	10		
						3-4-8	15		
						2-6-7	8		
912	10		LEAN CLAY (CL) - STIFF, reddish brown, with black oxide nodules, with rock fragments, with chert fragments, moist						
						3-3-8	2		
907	15		Auger Refusal at 16.4 feet Begin Coring at 16.4 feet			Run No	Recovery (%)	RQD (%)	No core water loss
			LIMESTONE - bluish gray, with clay seams in upper 2 feet, with calcite, with fossils			1 (16.4'-20.0')	88	47	
902	20					2 (20.0'-30.0')	100	78	
			LIMESTONE - bluish gray, with calcite seams, with fossils						
897	25								
892	30		Coring Terminated at 30.0 feet						
887	35								

Photo of Approx. Boring Location



Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location.
Top of hole elevations were provided by the project surveyor.

Consulting Services Inc. of Kentucky — Boring Log

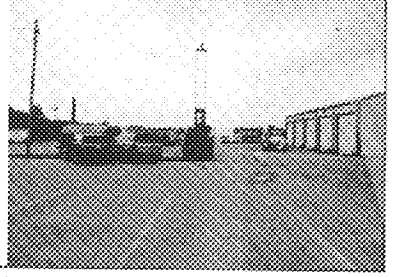
255 Gold Rush Road | Lexington, Kentucky 40503 | 859.309.6021 tel | 888.782.3121 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: 2443
BORING NUMBER: B-6
LOCATION: Lexington, Kentucky
WEATHER: Cloudy, 70's
DRILL RIG TYPE: Mobile B-34
DRILLER: Geo-Drill
DATE DRILLED: 06-06-2013
DRILLING METHOD: 3 1/4" ID HSA
CSI FIELD REP: D. Honum
CLIENT: GRW Engineers, Inc.

TOP OF GROUND ELEVATION: 921.3

B.E.V. (feet)	DEPTH (feet)	Water Level	Strata Description	SOIL TYPE	SAMPLES	SPT Blow Counts	Recovery (in)	RQD (%)	Notes
921.3	0		TOPSOIL - 2 inches			6-6-6	18		Dry upon completion of soil augering
			FILL - sampled as STIFF to VERY STIFF, dark brown clay, with rock fragments, with coal fragments, with pieces of wood, with roots, moist			13-11-12	12		
916.3	5		FILL - sampled as STIFF to HARD, brown clay, with rock fragments, moist			7-6-6	8		
						20-17-19	8		
						15-50/0.1	2		
911.3	10		Auger Refusal at 9.6 feet Begin Coring at 9.6 feet			Run No.	Recovery (%)	RQD (%)	No core water return
						1 (9.6'-19.6')	22	5	Cored through a hard object at 9.6 feet, then encountered additional fill
			FILL - no sample recovered						
906.3	15								
901.3	20		LIMESTONE - dark gray, with clay seams, with fossils			2 (19.6'-29.6')	81	43	
			LIMESTONE - dark gray, with clay seams, with fossils						
			Open void from 23.4 to 23.8 feet						
896.3	25		LIMESTONE - dark gray, with clay seams, with fossils						
891.3	30		LIMESTONE - medium to dark gray, with clay seams			3 (29.6'-34.6')	93	76	
886.3	35		Coring Terminated at 34.6 feet						

Photo of Approx. Boring Location



Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location. Top of hole elevations were provided by the project surveyor.

Consulting Services Inc. of Kentucky — Boring Log

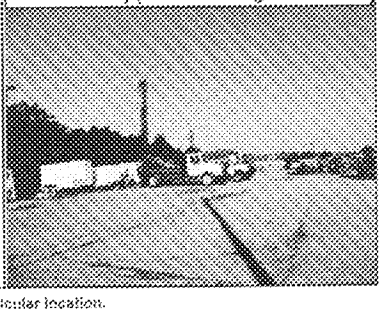
250 Gold Rush Road | Lexington, Kentucky 40503 | 859.309.8021 tel | 888.792.3121 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: 2443
BORING NUMBER: B-7
LOCATION: Lexington, Kentucky
WEATHER: Sunny, 70's
DRILL RIG TYPE: Mobile B-80
DRILLER: Geo-Drill
DATE DRILLED: 06-11-2013
DRILLING METHOD: 4" OD SFA
CSI FIELD REP: D. Homm
CLIENT: GRW Engineers, Inc.

TOP OF GROUND ELEVATION: 919.7

ELEV (feet)	DEPTH (feet)	Strata Description	SOIL TYPE	SPT Blow Counts	Recovery (in)	RQD (%)	Notes
919.7	0	ASPHALT - 1 inches BASE STONE- 4 inches FILL - sampled as HARD to FIRM, brown and dark brown clay, with rock fragments, with topsoil, with roots, with pieces of wire, moist		3-4-50/0.1	12		Dry upon completion of soil augering
				50/0.2	2		
914.7	5	Encountered tree branch approximately 12 inch diameter at 7 feet		22-14-20	14		
				10-22-50/0.2	11		
909.7	10						
				3-3-4	15		
904.7	15	FILL - sampled as FIRM to STIFF clay dark gray and brown, with roots, with topsoil, with pieces of metal, with pieces of wire, moist		3-3-4	18		
899.7	20			4-5-5	18		
		LEAN CLAY (CL) - STIFF, reddish brown clay, with black oxide nodules, moist		5-7-8	18		
894.7	25	Weathered rock Auger Refusal at 25.7 feet Begin Coring at 25.7 feet		Run No.	Recovery (%)	RQD (%)	No core water return
		LIMESTONE - dark gray, with fossils, with shale partings, with clay seams in top 3 feet		1 (25.7'-35.7')	96	52	
889.7	30						
884.7	35	Coring Terminated at 35.7 feet					

Photo of Approx. Boring Location



Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location. Top of hole elevations were provided by the project surveyor.

Consulting Services Inc. of Kentucky — Boring Log

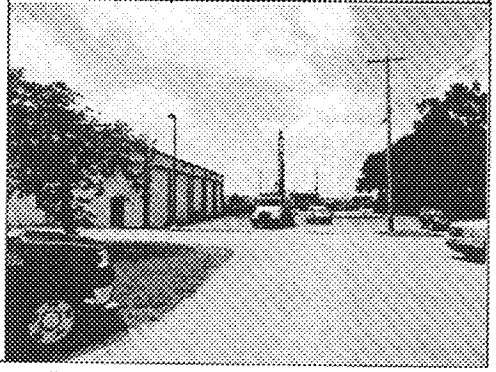
250 Gold Rush Road | Lexington, Kentucky 40503 | 859.309.6021 tel | 888.782.3121 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: 2443
BORING NUMBER: B-8
LOCATION: Lexington, Kentucky
WEATHER: Sunny, 80's
DRILL RIG TYPE: Mobile B-80
DRILLER: Geo-Drill
DATE DRILLED: 06-11-2013
DRILLING METHOD: 4" OD SFA
CSI FIELD REP: D. Homm
CLIENT: GRW Engineers, Inc.

TOP OF GROUND ELEVATION: 919.4

ELEV. (feet)	DEPTH (feet)	Strata Description	SOIL TYPE	SAMPLES	SPT Blow Counts	Recovery (in)	RQD (%)	Notes
919.4	0	GRAVEL - 8 inches						
		FILL - sampled as VERY STIFF to STIFF, brown and dark gray clay, with rock fragments, with brick fragments, with pieces of wood, moist			11-50/0.1	2		Dry upon completion of soil augering
					8-50/.04	1		
914.4	5				12-17-9	2		
					6-5-6	16		
		LEAN CLAY (CL) - STIFF, reddish brown, with black oxide nodules, moist				20		Qu = 3,328 psf
909.4	10							
		Weathered rock			50/0.1	1		
904.4	15	Auger Refusal at 14.5 feet Begin Coring at 14.5 feet			Run No.	Recovery (%)	RQD (%)	Core water loss at 15.4 feet
		LIMESTONE - gray, with fossils, with clay seams in top 3 feet			1 (14.5'-20.0')	66	36	
899.4	20	LIMESTONE - bluish gray, with fossils, with shale partings, with clay seams			2 (20.0'-30.0')	100	72	Qu = 1,380 ksf
894.4	25							
889.4	30	Coring Terminated at 30.0 feet						
884.4	35							

Photo of Approx. Boring Location



Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location.
Top of hole elevations were provided by the project surveyor.

Consulting Services Inc. of Kentucky — Boring Log

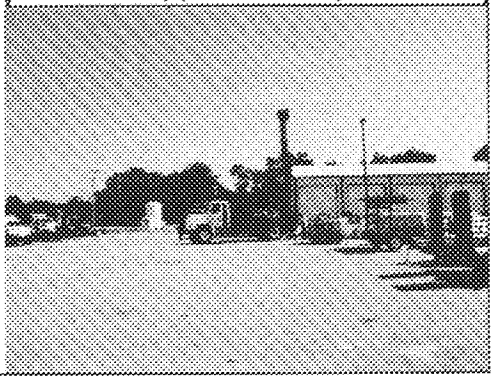
250 Gold Rush Road | Lexington, Kentucky 40503 | 859.309.6021 tel | 888.782.3121 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: 2443
BORING NUMBER: B-9
LOCATION: Lexington, Kentucky
WEATHER: Sunny, 80's
DRILL RIG TYPE: Mobile B-80
DRILLER: Geo-Drill
DATE DRILLED: 06-11-2013
DRILLING METHOD: 4" OD SFA
CSI FIELD REP: D. Hornm
CLIENT: GRW Engineers, Inc

TOP OF GROUND ELEVATION: 919.3

ELEV (feet)	DEPTH (feet)	Water Level	Strata Description	SOIL TYPE	SAMPLES	SPT Blow Counts	Recovery (in)	RQD (%)	Notes
919.3	0		GRAVEL - 6 inches						Dry upon completion of soil augering
			FILL - sampled as VERY STIFF to FIRM to STIFF to HARD, brown and black clay, with rock fragments, with pieces of wood, with topsoil,moist			6-10-11	6		
						3-3-5	5		
914.3	5					10-50/0.4	3		
						2-4-50/0.1	2		
909.3	10					5-6-7	6		
						4-10-36	3		
904.3	15		LEAN CLAY (CL) - reddish brown, with black oxide nodules, with rock fragments, moist			Shelby Tube	19		No Suitable Sample
899.3	20		Auger Refusal at 22.2 feet Begin Coring at 22.2 feet			Run No	Recovery (%)	RQD (%)	No core water loss
894.3	25		LIMESTONE - gray, with fossils, with shale partings, with clay seams in top 5 feet			1 (22.2'-32.2')	97	76	Qu = 1,535 ksf
889.3	30		Coring Terminated at 32.2 feet						
884.3	35								

Photo of Approx. Boring Location



Please note, Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location.
Top of hole elevations were provided by the project surveyor

Consulting Services Inc. of Kentucky — Boring Log

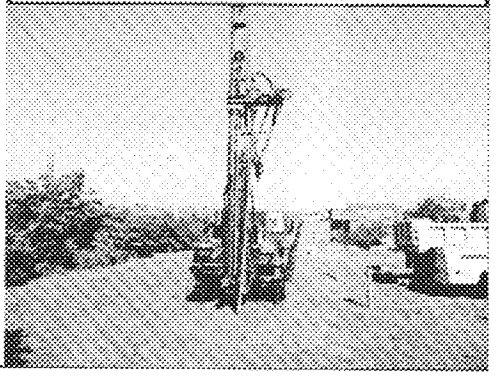
350 Gold Rush Road | Lexington, Kentucky 40503 | 859.309.6821 tel | 888.792.3121 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: 2443
BORING NUMBER: B-10
LOCATION: Lexington, Kentucky
WEATHER: Sunny, 90's
DRILL RIG TYPE: Mobile B-80
DRILLER: Geo-Drill
DATE DRILLED: 06-12-2013
DRILLING METHOD: 4" OD SFA
CSI FIELD REP: D. Homm
CLIENT: GRW Engineers, Inc

TOP OF GROUND ELEVATION: 915.9

ELEV (feet)	DEPTH (feet)	Water Level	Strata Description	SOIL TYPE	SAMPLES	SPT Blow Counts	Recovery (in)	RQD (%)	Notes
915.9	0		TOPSOIL - 3 inches FILL - sampled as HARD reddish brown clay, with rock fragments, with reinforced concrete fragments, with boulders, moist			6-36-25 25-50/0.3	10 5		Dry upon completion of soil augering Offset boring B-10A 10 feet toward the west
910.9	5		Auger Refusal at 5.0 feet						
905.9	10								
900.9	15								
895.9	20								
890.9	25								
885.9	30								
880.9	35								

Photo of Approx. Boring Location



Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location. Top of hole elevations were provided by the project surveyor.

Consulting Services Inc. of Kentucky — Boring Log

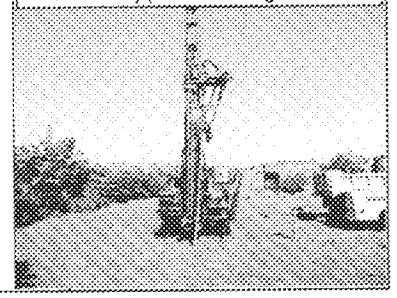
250 Gold Rush Road | Lexington, Kentucky 40503 | 859.309.6031 tel | 888.792.3121 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: 2443
BORING NUMBER: B-10A
LOCATION: Lexington, Kentucky
WEATHER: Sunny, 90's
DRILL RIG TYPE: Mobile B-80
DRILLER: Geo-Drill
DATE DRILLED: 06-12-2013
DRILLING METHOD: 4" OD SFA
CSI FIELD REP: D. Homm
CLIENT: GRW Engineers, Inc.

TOP OF GROUND ELEVATION: 915.9

ELEV. (feet)	DEPTH (feet)	Strata Description	SOIL TYPE	SPT Blow Counts	Recovery (in)	RQD (%)	Notes
915.9	0	FILL - sampled as brown clay, with rock fragments, with concrete fragments (sampled at B-10)					Dry upon completion of soil augering
		Auger Refusal at 1.4 feet Begin Coring at 1.4 feet		Run No.	Recovery (%)	RQD (%)	No core water return
				1 (1.4'-10.0')	18	0	Cored through a hard object at 1.4 feet, then encountered additional fill
910.9	5	FILL - no sample recovered					
905.9	10	FILL - no sample recovered		2 (10.0'-20.0')	21	0	
900.9	15						
895.9	20			3 (20.0'-30.0')	52	40	
890.9	25	LIMESTONE - light gray with fossils, with dark gray shale partings, with calcite, with clay seams					
885.9	30			4 (30.0'-35.0')	98	92	
880.9	35	Coring Terminated at 35.0 feet					

Photo of Approx. Boring Location



Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location.
Offset from B-10 by 10 feet

Consulting Services Inc. of Kentucky — Boring Log

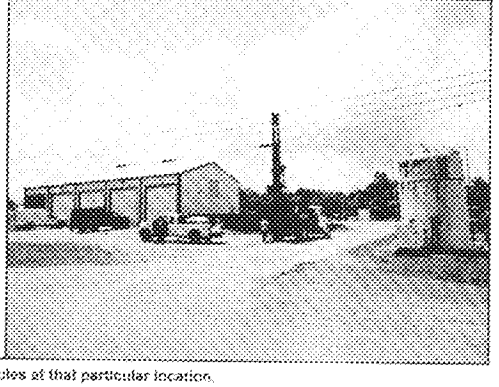
280 Gold Rush Road | Lexington, Kentucky 40503 | 859.309.6021 tel | 888.792.3121 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: 2443
BORING NUMBER: B-11
LOCATION: Lexington, Kentucky
WEATHER: Cloudy, 70's
DRILL RIG TYPE: Mobile B-60
DRILLER: Geo-Drill
DATE DRILLED: 06-10-2013
DRILLING METHOD: 4" OD SFA
CSI FIELD REP: D. Hamm
CLIENT: GRW Engineers, Inc.

TOP OF GROUND ELEVATION: 917.2

ELEV (feet)	DEPTH (feet)	Water Level	Strata Description	SOIL TYPE	SAMPLES	SPT Blow Counts	Recovery (in)	RQD (%)	Notes
917.2	0		GRAVEL - 10 inches						Dry upon completion of soil augering
			FILL - sampled as VERY STIFF, brown clay, with rock fragments, with asphalt fragments, moist			9-10-17	7		
912.2	5		FILL - sampled as VERY STIFF, brown and dark gray clay, with rock fragments, with asphalt fragments, with pieces of wood, moist			5-15-9	10		
			LEAN CLAY (CL) - STIFF, reddish brown, with black oxide nodules, with rock fragments, moist			6-7-7	18		
907.2	10					6-11-50/0.4	13		
			Weathered rock			Run No	Recovery (%)	RQD (%)	No core water loss
			Auger Refusal at 11.0 feet Begin Coring at 11.0 feet						
902.2	15		LIMESTONE - light to dark gray, with clay seams in top 2-1/2 feet			1 (11.0'-21.0')	96	83	
897.2	20								
			LIMESTONE - bluish gray, with calcite with dark gray shale partings			2 (21.0'-31.0')	98	75	
892.2	25								No water return at 25.0 feet
887.2	30								
			Coring Terminated at 31.0 feet						
882.2	35								

Photo of Approx. Boring Location



Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location.
Top of hole elevations were provided by the project surveyor

Conformance Set

Consulting Services Inc. of Kentucky — Boring Log

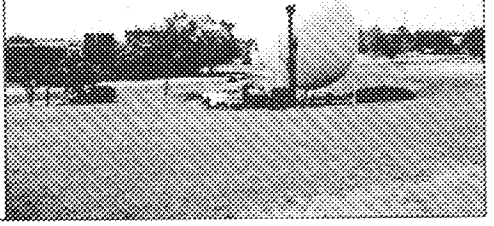
250 Gold Rush Road | Lexington, Kentucky 40503 | 859.309.6021 tel | 888.792.3121 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: 2443
BORING NUMBER: B-12
LOCATION: Lexington, Kentucky
WEATHER: Sunny, 90's
DRILL RIG TYPE: Mobile B-80
DRILLER: Geo-Drill
DATE DRILLED: 06-12-2013
DRILLING METHOD: 4" OD SFA
CSI FIELD REP: D. Homm
CLIENT: GRW Engineers, Inc.

TOP OF GROUND ELEVATION: 902.4

ELEV. (feet)	DEPTH (feet)	Water Level	Strata Description	SOIL TYPE	SAMPLES	SPT Blow Counts	Recovery (in)	RQD (%)	Notes
902.4	0		TOPSOIL - 4 inches			3-7-7	8		Dry upon completion of soil augering
			FILL - sampled as STIFF, brown clay, with rock fragments, moist			50/0.4	3		
			LEAN CLAY (CL) - FIRM, brown, with silt, with sand, moist			1-3-4	18		
897.4	5					Shelby Tube	15		No Suitable Sample
			Auger Refusal at 7.3 feet Begin Coring at 7.3 feet			Run No.	Recovery (%)	RQD (%)	No core water loss
892.4	10		LIMESTONE - gray, with fossils, with shale partings, with clay seams			2 (10.0'-20.0') 1 (7.3'-10.0')	95 94	80 16	
887.4	15								
882.4	20		LIMESTONE - dark gray, with fossils, with shale partings			3 (20.0'-30.0')	99	84	
877.4	25								
872.4	30		Coring Terminated at 30.0 feet						
867.4	35								

Photo of Approx. Boring Location



Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location.
Top of hole elevations were provided by the project surveyor.

Conformance Set

Consulting Services Inc. of Kentucky — Boring Log

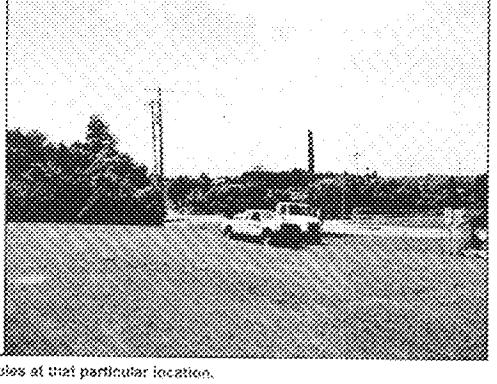
350 Gold Rush Road | Lexington, Kentucky 40503 | 859.309.6021 tel | 888.732.3121 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: 2443
BORING NUMBER: B-13
LOCATION: Lexington, Kentucky
WEATHER: Sunny, 90's
DRILL RIG TYPE: Mobile B-80
DRILLER: Geo-Drill
DATE DRILLED: 06-12-2013
DRILLING METHOD: 4" OD SFA
CSI FIELD REP: D. Honun
CLIENT: GRW Engineers, Inc.

TOP OF GROUND ELEVATION: 907.1

ELEV. (feet)	DEPTH (feet)	Water Level	Strata Description	SOIL TYPE	SAMPLES	SPT Blow Counts	Recovery (in)	RQD (%)	Notes
907.1	0		TOPSOIL - 5 inches			2-27-18	8		
			FILL - sampled as HARD to VERY STIFF to SOFT, reddish brown clay, with rock fragments, with fine roots, with topsoil, with pieces of wood, with pieces of plastic, with pieces of glass, with brick fragments, with asphalt fragments, moist			10-18-12	14		
902.1	5		Encountered boulders from 3 to 5 feet			5-6-10	18		
						5-7-12	18		
897.1	10					2-6-4	15		
						2-2-1	18		
892.1	15	▽	LEAN CLAY (CL) - STIFF, light brown, with sand, with silt, wet			3-4-8	18		Encountered water at 14.2 feet
			Weathered rock			Run No.	Recovery (%)	RQD (%)	No core water loss
			Auger Refusal at 16.7 feet						Qu = 684 ksf
			Begin Coring at 16.7 feet			1 (16.7'-20.0')	97	49	
887.1	20					2 (20.0'-30.0')	99	77	
882.1	25		LIMESTONE - bluish gray, with shale partings, with fossils, with clay seams						
877.1	30		Coring Terminated at 30.0 feet						
872.1	35								

Photo of Approx. Boring Location



Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location. Top of hole elevations were provided by the project surveyor.

Consulting Services Inc. of Kentucky — Boring Log

250 Gold Rush Road | Lexington, Kentucky 40503 | 859.309.6021 tel | 888.792.3121 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: 2443
BORING NUMBER: B-14
LOCATION: Lexington, Kentucky
WEATHER: Sunny, 80's
DRILL RIG TYPE: Mobile B-80
DRILLER: Geo-Drill
DATE DRILLED: 06-12-2013
DRILLING METHOD: 4" OD SFA
CSI FIELD REP: D. Homm
CLIENT: GRW Engineers, Inc.

TOP OF GROUND ELEVATION: 912.3

ELEV (feet)	DEPTH (feet)	Visible Water	Strata Description	SOIL TYPE	GRAPHICS	SPT Blow Counts	Recovery (in)	RQD (%)	Notes
912.3	0		TOPSOIL - 1 inch			7-8-6	6		Dry upon completion of soil augering
			FILL - sampled as VERY STIFF, brown and dark gray clay, with rock fragments, with asphalt fragments, moist			50/0.4	1		
						6-8-11	15		
907.3	5		LEAN CLAY (CL) - VERY STIFF, reddish brown, with black oxide nodules, with chert fragments, moist				14		Qu = 1,489 psf
			Weathered rock			Run No	Recovery (%)	RQD (%)	No core water loss
			Auger Refusal at 7.1 feet Begin Coring at 7.1 feet						
902.3	10		LIMESTONE - dark gray, with fossils, with clay seams			1 (7.1'-10.0') 2 (10.0'-20.0')	97 99	57 84	
897.3	15								Qu = 684 ksf
			LIMESTONE - gray, with fossils, with shale partings						
892.3	20					3 (20.0'-30.0')	100	79	
887.3	25								
882.3	30		Coring Terminated at 30.0 feet						
877.3	35								

Photo of Approx. Boring Location

Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples of that particular location.
Top of hole elevations were provided by the project surveyor.

Consulting Services Inc. of Kentucky — Boring Log

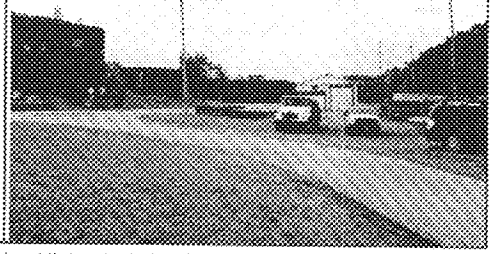
250 Gold Rush Road | Lexington, Kentucky 40503 | 859.388.5021 tel | 888.792.3121 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: 2443
BORING NUMBER: B-15
LOCATION: Lexington, Kentucky
WEATHER: Cloudy, 70's
DRILL RIG TYPE: Mobile B-34
DRILLER: Geo-Drill
DATE DRILLED: 06-13-2013
DRILLING METHOD: 4" OD SFA
CSI FIELD REP: D. Hamm
CLIENT: GRW Engineers, Inc.

TOP OF GROUND ELEVATION: 889.4

ELEV. (feet)	DEPTH (feet)	Visible Water	Strata Description	SOIL TYPE	SAMPLE No.	SPT Blow Counts	Recovery (in)	RQD (%)	Notes
889.4	0		TOPSOIL - 1 inch			12-13-12	16		Dry upon completion of soil augering
			FILL - sampled as VERY STIFF, brown clay, with rock fragments, with roots, moist			12-50/0.4	6		Offset boring B-15A 5 feet toward the east due to shallow refusal
884.4	5		LEAN CLAY (CL) - VERY STIFF, dark brown, with black oxide nodules, with rock fragments, moist						
			Weathered rock						
			Auger Refusal at 3.3 feet						
879.4	10								
874.4	15								
869.4	20								
864.4	25								
859.4	30								
854.4	35								

Photo of Approx. Boring Location



Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location.
*Top of hole elevations were provided by the project surveyor.

Consulting Services Inc. of Kentucky — Boring Log

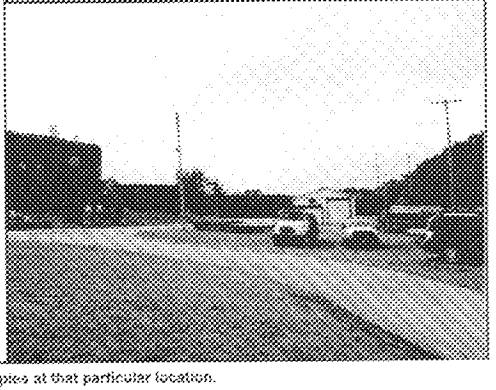
350 Gold Rush Road | Lexington, Kentucky 40503 | 859.309.6021 tel | 888.792.3121 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: 2443
BORING NUMBER: B-15A
LOCATION: Lexington, Kentucky
WEATHER: Cloudy, 70's
DRILL RIG TYPE: Mobile B-34
DRILLER: Geo-Drill
DATE DRILLED: 06-13-2013
DRILLING METHOD: 4" OD SFA
CSI FIELD REP: D. Hamm
CLIENT: GRW Engineers, Inc.

TOP OF GROUND ELEVATION: 889.4

ELEV. (feet)	DEPTH (feet)	Strata Description	SOIL TYPE	SAMP. TYP	SPT Blow Counts	Recovery (in)	ROD (%)	Notes
889.4	0	Sounding - no samples taken						Offset due to shallow auger refusal at boring B-15
		Auger Refusal at 3.3 feet Begin Coring at 3.3 feet			Run No.	Recovery (%)	ROD (%)	No core water loss
884.4	5	LIMESTONE - light gray, with shale partings, with clay seams			1 (3.3'-8.3')	95	42	
		Coring Terminated at 8.3 feet						
879.4	10							
874.4	15							
869.4	20							
864.4	25							
859.4	30							
854.4	35							

Photo of Approx. Boring Location



Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location.
Top of hole elevations were provided by the project surveyor.

Consulting Services Inc. of Kentucky

Boring Log

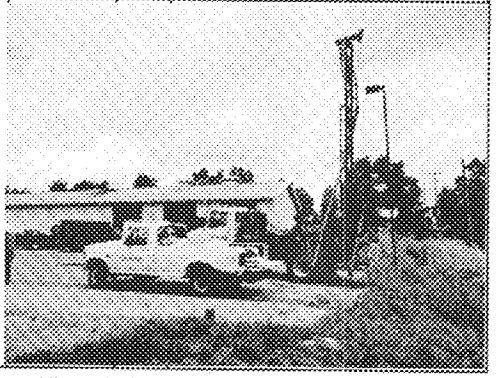
250 Gold Rush Road | Lexington, Kentucky 40503 | 859.309.6021 tel | 888.792.3121 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: 2443
BORING NUMBER: S-1
LOCATION: Lexington, Kentucky
WEATHER: Sunny, 80's
DRILL RIG TYPE: Mobile B-34
DRILLER: Geo-Drill
DATE DRILLED: 06-07-2013
DRILLING METHOD: 3 1/4" ID HSA
CSI FIELD REP: D. Homm
CLIENT: GRW Engineers, Inc.

TOP OF GROUND ELEVATION: 921.6

ELEV (feet)	DEPTH (feet)	Water Level	Strata Description	SOIL TYPE	SAMPLES	SPT Blow Counts	Recovery (in)	RQD (%)	Notes
921.6	0		Sounding - no recovered sample						Dry upon completion of soil augering
916.6	5								
911.6	10								
906.6	15								
901.6	20		Auger Refusal at 18.3 feet						
896.6	25								
891.6	30								
886.6	35								

Photo of Approx. Boring Location



Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location. Top of hole elevations were provided by the project surveyor.

Conformance Set

Consulting Services Inc. of Kentucky

Boring Log

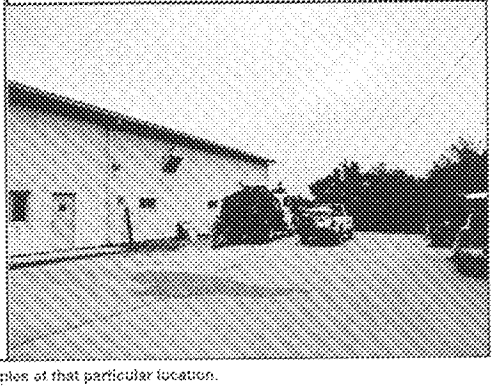
260 Gold Rush Road | Lexington, Kentucky 40503 | 859.308.6021 tel | 888.792.3121 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: 2443
BORING NUMBER: S-2
LOCATION: Lexington, Kentucky
WEATHER: Sunny, 80's
DRILL RIG TYPE: Mobile B-34
DRILLER: Geo-Drill
DATE DRILLED: 06-07-2013
DRILLING METHOD: 3 1/4" ID HSA
CSI FIELD REP: D. Hamm
CLIENT: GRW Engineers, Inc.

TOP OF GROUND ELEVATION: 921.8

ELEV. (feet)	DEPTH (feet)	GRAPHIC LOG	Strata Description	SOIL TYPE	SAMPLE ID	SPT Blow Counts	Recovery (in)	RQD (%)	Notes
921.8	0		Sounding - no recovered sample						Dry upon completion of soil augering
916.8	5								
911.8	10								
906.8	15								
901.8	20								
896.8	25								
891.8	30		Auger Refusal at 28.3 feet						
886.8	35								

Photo of Approx. Boring Location



Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples of that particular location.
Top of hole elevations were provided by the project surveyor.

Conformance Set

Consulting Services Inc. of Kentucky — Boring Log

250 Gold Rush Road | Lexington, Kentucky 40503 | 859.309.8021 tel | 859.782.3131 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: 2443
BORING NUMBER: S-3
LOCATION: Lexington, Kentucky
WEATHER: Sunny, 80's
DRILL RIG TYPE: Mobile B-34
DRILLER: Geo-Drill
DATE DRILLED: 06-05-2013
DRILLING METHOD: 4" OD SFA
CSI FIELD REP: D. Homm
CLIENT: GRW Engineers, Inc.

TOP OF GROUND ELEVATION: 922.3

ELEV (feet)	DEPTH (feet)	Water Level	Strata Description	SOIL TYPE	SAMPLES	SPT Blow Counts	Recovery (in)	RQD (%)	Notes
922.3	0		ASPHALT - 3 inches BASE STONE - 5 inches Sounding - no recovered samples						Dry upon completion of soil augering
917.3	5		Auger Refusal at 4.0 feet						Performed offset sounding S-3 10 feet toward the east
912.3	10								
907.3	15								
902.3	20								
897.3	25								
892.3	30								
887.3	35								

Photo of Approx. Boring Location

Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location. Top of hole elevations were provided by the project surveyor.

Consulting Services Inc. of Kentucky — Boring Log

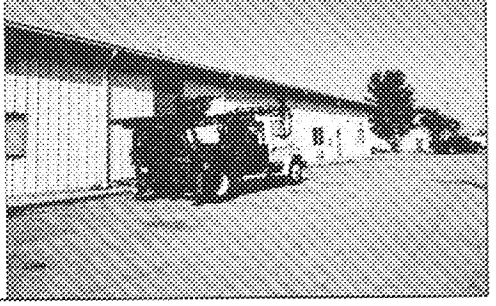
250 Gold Rush Road | Lexington, Kentucky 40503 | 859.309.6021 tel | 888.792.3121 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: 2443
BORING NUMBER: S-3A
LOCATION: Lexington, Kentucky
WEATHER: Sunny, 60's
DRILL RIG TYPE: Mobile B-34
DRILLER: Geo-Drill
DATE DRILLED: 06-05-2013
DRILLING METHOD: 4" OD SFA
CSI FIELD REP: D. Hamm
CLIENT: GRW Engineers, Inc.

TOP OF GROUND ELEVATION: 922.3

ELEV. (feet)	DEPTH (feet)	Visible Water	Strata Description	SOIL TYPE	SAMPLES	SPT Blow Counts	Recovery (in)	RQD (%)	Notes
922.3	0		ASPHALT - 3 inches						Dry upon completion of soil augering
			BASE STONE - 4 inches						
			FILL - sampled as HARD, brown clay, with rock fragmenis, with black oxide nodules, moist			6-15-21	10		
						9-50/0.4	8		Sampling performed at the request of Third Rock Consultants
917.3	5								
			LEAN CLAY (CL) - STIFF, reddish brown, with black oxide nodules, with rock fragments, moist						
912.3	10					4-7-7	16		
			LEAN CLAY (CL) - FIRM, light brown, with black oxide nodules, with rock fragmenis			3-3-3	6		
						4-50/0.4	6		
907.3	15		Weathered rock						
			Auger Refusal at 14.3 feet						
902.3	20								
897.3	25								
892.3	30								
887.3	35								

Photo of Approx. Boring Location



Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location. Top of hole elevations were provided by the project surveyor.

Conformance Set

Consulting Services Inc. of Kentucky — Boring Log

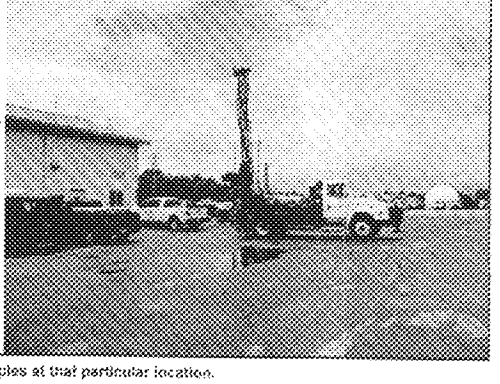
358 Gold Rush Road | Lexington, Kentucky 40503 | 859.309.6921 tel | 859.782.3121 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: 2443
BORING NUMBER: S-4
LOCATION: Lexington, Kentucky
WEATHER: Sunny, 80's
DRILL RIG TYPE: Mobile B-34
DRILLER: Geo-Drill
DATE DRILLED: 06-07-2013
DRILLING METHOD: 3 1/4" ID HSA
CSI FIELD REP: D. Homm
CLIENT: GRW Engineers, Inc

TOP OF GROUND ELEVATION: 921.9

ELEV. (feet)	DEPTH (feet)	Water Level	Strata Description	SOIL TYPE	SAMPLES	SPT Blow Counts	Recovery (in)	ROD (%)	Notes
921.9	0		ASPHALT - 4-1/2 inches BASE STONE - 5 inches Sounding - no recovered sample						Dry upon completion of soil augering
916.9	5								
911.9	10								
906.9	15								
901.9	20		Auger Refusal at 21.8 feet						
896.9	25								
891.9	30								
886.9	35								

Photo of Approx. Boring Location



Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location.
Top of hole elevations were provided by the project surveyor.

Consulting Services Inc. of Kentucky

Boring Log

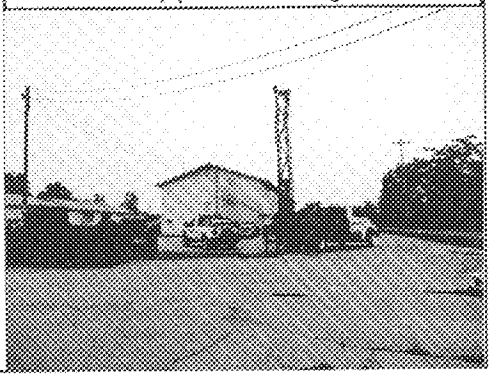
250 Gold Rush Road | Lexington, Kentucky 40503 | 859.309.6021 tel | 859.792.3121 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: 2443
BORING NUMBER: S-5
LOCATION: Lexington, Kentucky
WEATHER: Sunny, 80's
DRILL RIG TYPE: Mobile B-34
DRILLER: Geo-Drill
DATE DRILLED: 06-07-2013
DRILLING METHOD: 3 1/4" ID HSA
CSI FIELD REP: D. Homm
CLIENT: GRW Engineers, Inc.

TOP OF GROUND ELEVATION: 920.6

ELEV (feet)	DEPTH (feet)	WATER LEVEL	Strata Description	SOIL TYPE	USCS	SPT Blow Counts	Recovery (in)	RQD (%)	Notes
920.6	0		ASPHALT - 1 inch BASE STONE - 4 inches Sounding - no recovered sample						Dry upon completion of soil augering
915.6	5								
910.6	10								
905.6	15								
900.6	20								
895.6	25		Auger Refusal at 26.3 feet						
890.6	30								
885.6	35								

Photo of Approx. Boring Location



Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location.
Top of hole elevations were provided by the project surveyor.

Conformance Set

Consulting Services Inc. of Kentucky — Boring Log

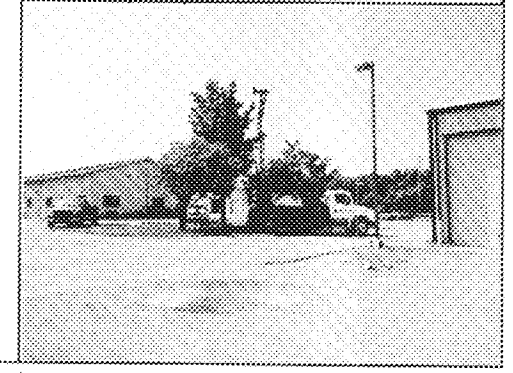
280 Gold Rush Road | Lexington, Kentucky 40503 | 859.368.8021 tel | 888.792.3121 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: 3443
BORING NUMBER: S-6
LOCATION: Lexington, Kentucky
WEATHER: Sunny, 80's
DRILL RIG TYPE: Mobile B-34
DRILLER: Geo-Drill
DATE DRILLED: 06-07-2013
DRILLING METHOD: 3 1/4" ID HSA
CSI FIELD REP: D. Homm
CLIENT: GRW Engineers, Inc.

TOP OF GROUND ELEVATION: 920.9

ELEV. (feet)	DEPTH (feet)	Water Level	Strata Description	SOIL TYPE	SAMPLES	SPT Blow Counts	Recovery (in)	RQD (%)	Notes
920.9	0		TOPSOIL - 1 inch			50/0.4	4		Dry upon completion of soil augering
			FILL - sampled as VERY STIFF to FIRM, light brown clay, with rock fragments, with roots, moist			6-9-12	3		
						4-4-4	4		Sampling performed at the request of Third Rock Consultants
915.9	5					3-2-5	5		
			FILL - sampled as FIRM to VERY STIFF, dark brown clay, with black oxide nodules, with rock fragments, with petroleum odor, moist			6-11-12	10		
						50/0.3	0		
910.9	10		FILL - topsoil			6-6-8	13		
			LEAN CLAY (CL) - STIFF, reddish brown, with black oxide nodules			4-6-6	14		
905.9	15		Auger Refusal at 13.8 feet						
900.9	20								
895.9	25								
890.9	30								
885.9	35								

Photo of Approx. Boring Location



Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location. Top of hole elevations were provided by the project surveyor.

Consulting Services Inc. of Kentucky

Boring Log

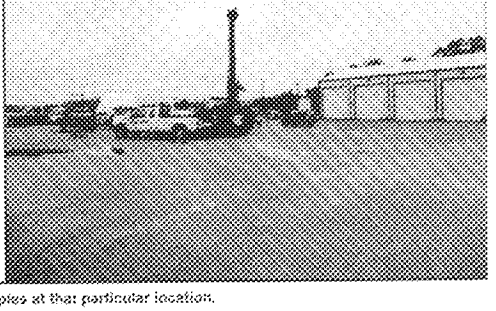
250 Gold Rush Road | Lexington, Kentucky 40503 | 859.309.9021 tel | 888.792.3121 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: 2443
BORING NUMBER: S-7
LOCATION: Lexington, Kentucky
WEATHER: Cloudy/Rain, 60's
DRILL RIG TYPE: Mobile B-60
DRILLER: Geo-Drill
DATE DRILLED: 06-10-2013
DRILLING METHOD: 4" OD SFA
CSI FIELD REP: D. Homm
CLIENT: GRW Engineers, Inc

TOP OF GROUND ELEVATION: 919.9

ELEV (feet)	DEPTH (feet)	Water Level	Strata Description	SOIL TYPE	GRAPHICS	SPT Blow Counts	Recovery (in)	RQD (%)	Notes
919.9	0		Sounding - no recovered sample						Dry upon completion of soil augering
914.9	5								
909.9	10								
904.9	15								
899.9	20								
			Weathered rock						
894.9	25		Auger Refusal at 23.9						
889.9	30								
884.9	35								

Photo of Approx. Boring Location



Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location.
Top of hole elevations were provided by the project surveyor.

Conformance Set

Consulting Services Inc. of Kentucky — Boring Log

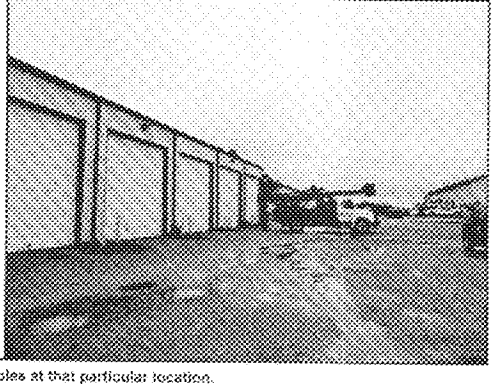
280 Gold Rush Road | Lexington, Kentucky 40503 | 859.309.6921 tel | 888.782.3121 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: 2443
BORING NUMBER: S-8
LOCATION: Lexington, Kentucky
WEATHER: Cloudy/Rain, 60's
DRILL RIG TYPE: Mobile B-80
DRILLER: Geo-Drill
DATE DRILLED: 06-10-2013
DRILLING METHOD: 4" OD SFA
CSI FIELD REP: D. Homm
CLIENT: GRW Engineers, Inc.

TOP OF GROUND ELEVATION: 920.2

ELEV (feet)	DEPTH (feet)	WELL LOGS	Strata Description	SOIL TYPE	SAMPLES	SPT Blow Counts	Recovery (in)	RQD (%)	Notes
920.2	0		Sounding - no recovered sample						Dry upon completion of soil augering
915.2	5								
910.2	10								
905.2	15								
			Weathered rock						
			Auger Refusal at 18.5						
900.2	20								
895.2	25								
890.2	30								
885.2	35								

Photo of Approx. Boring Location



Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location.
Top of hole elevations were provided by the project surveyor.

Consulting Services Inc. of Kentucky

Boring Log

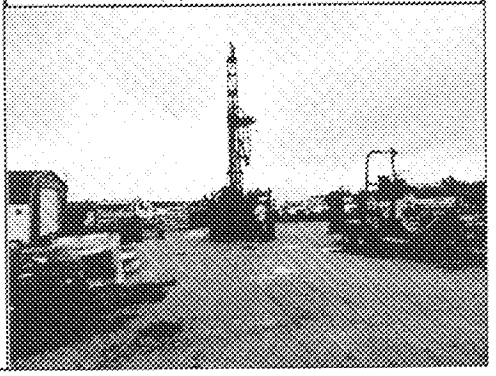
250 Gold Rush Road | Lexington, Kentucky 40503 | 859.309.6021 tel | 859.792.3121 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: 2443
BORING NUMBER: S-9
LOCATION: Lexington, Kentucky
WEATHER: Cloudy/Rain
DRILL RIG TYPE: Mobile B-80
DRILLER: Geo-Drill
DATE DRILLED: 06-10-2013
DRILLING METHOD: 4" OD SFA
CSI FIELD REP: D. Homm
CLIENT: GRW Engineers, Inc.

TOP OF GROUND ELEVATION: 919.8

ELEV (feet)	DEPTH (feet)	Water Level	Strata Description	SOIL TYPE	SAMPLES	SPT Blow Counts	Recovery (in)	RQD (%)	Notes
919.8	0		Sounding - no recovered sample						Dry upon completion of soil augering
914.8	5								
909.8	10								
904.8	15								
899.8	20								
894.8	25		Weathered rock Auger Refusal at 26.5 feet						
889.8	30								
884.8	35								

Photo of Approx. Boring Location



Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location. Top of hole elevations were provided by the project surveyor.

Conformance Set

Consulting Services Inc. of Kentucky — Boring Log

250 Gold Rush Road | Lexington, Kentucky 40503 | 859.368.8021 tel | 888.782.3121 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: 2443
BORING NUMBER: S-10
LOCATION: Lexington, Kentucky
WEATHER: Cloudy/Rain, 60's
DRILL RIG TYPE: Mobile B-80
DRILLER: Geo-Drill
DATE DRILLED: 06-10-2013
DRILLING METHOD: 4" OD SFA
CSI FIELD REP: D. Homm
CLIENT: GRW Engineers, Inc.

TOP OF GROUND ELEVATION: 918.9

ELEV (feet)	DEPTH (feet)	Water Level	Strata Description	SOIL TYPE	SAMPLE TYPE	SPT Blow Counts	Recovery (in)	ROD (%)	Notes
918.9	0		Sounding - no recovered sample						Dry upon completion of soil augering
			Auger Refusal at 2.6 feet						Performed offset sounding S-10A 5 feet toward the east
913.9	5								
908.9	10								
903.9	15								
898.9	20								
893.9	25								
888.9	30								
883.9	35								

Photo of Approx. Boring Location

Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location. Top of hole elevations were provided by the project surveyor.

Consulting Services Inc. of Kentucky

Boring Log

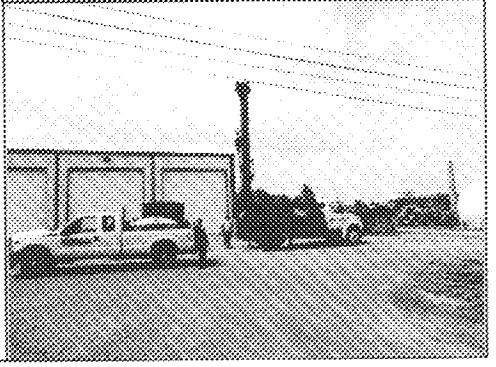
250 Gold Rush Road | Lexington, Kentucky 40503 | 859.309.6021 tel | 888.792.3121 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: 2443
BORING NUMBER: S-10A
LOCATION: Lexington, Kentucky
WEATHER: Cloudy/Rain, 60's
DRILL RIG TYPE: Mobile B-80
DRILLER: Geo-Drill
DATE DRILLED: 06-10-2013
DRILLING METHOD: 4" OD SFA
CSI FIELD REP: D. Hamm
CLIENT: GRW Engineers, Inc.

TOP OF GROUND ELEVATION: 917.9

ELEV (feet)	DEPTH (feet)	Water Level	Strata Description	SOIL TYPE	SAMPLES	SPT Blow Counts	Recovery (in)	RQD (%)	Notes
917.9	0		Sounding - no recovered sample						Dry upon completion of soil augering
912.9	5								
907.9	10								
			Weathered rock						
			Auger Refusal at 12.8 feet						
902.9	15								
897.9	20								
892.9	25								
887.9	30								
882.9	35								

Photo of Approx. Boring Location



Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location. Top of hole elevations were provided by the project surveyor.

Consulting Services Inc. of Kentucky — Boring Log

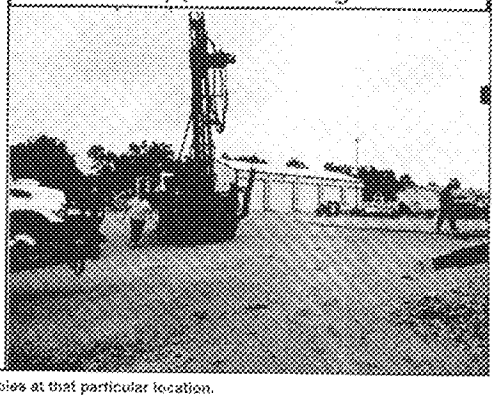
350 Gold Rush Road | Lexington, Kentucky 40503 | 859.309.6021 tel | 859.782.3131 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: 2443
BORING NUMBER: S-11
LOCATION: Lexington, Kentucky
WEATHER: Cloudy/Rain, 60's
DRILL RIG TYPE: Mobile B-80
DRILLER: Geo-Drill
DATE DRILLED: 06-10-2013
DRILLING METHOD: 4" OD SFA
CSI FIELD REP: D. Homm
CLIENT: GRW Engineers, Inc.

TOP OF GROUND ELEVATION: 917.9

ELEV. (msl)	DEPTH (feet)	Water Level	Strata Description	SOIL TYPE	SAMPLES	SPT Blow Counts	Recovery (in)	RQD (%)	Notes
917.9	0		Sounding - no recovered sample						Dry upon completion of soil augering
912.9	5								
907.9	10								
902.9	15								
897.9	20								
			Weathered rock						
892.9	25		Auger Refusal at 24.5 feet						
887.9	30								
882.9	35								

Photo of Approx. Boring Location



Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location. Top of hole elevations were provided by the project surveyor.

Conformance Set

Consulting Services Inc. of Kentucky — Boring Log

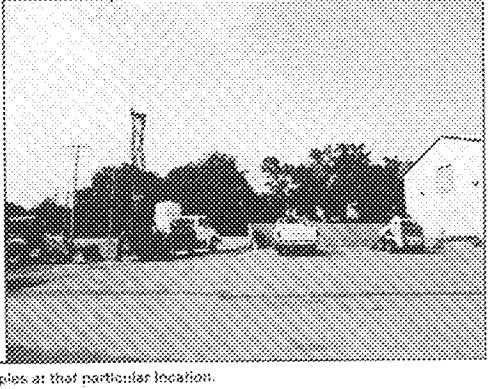
250 Gold Rush Road | Lexington, Kentucky 40503 | 859.309.6021 tel | 888.792.3121 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: 2443
BORING NUMBER: S-12
LOCATION: Lexington, Kentucky
WEATHER: Cloudy, 80's
DRILL RIG TYPE: Mobile B-34
DRILLER: Geo-Drill
DATE DRILLED: 06-06-2013
DRILLING METHOD: 4" OD SFA
CSI FIELD REP: D. Hamm
CLIENT: GRW Engineers, Inc

TOP OF GROUND ELEVATION: 917.4

ELEV (feet)	DEPTH (feet)	WATER LEVEL	Strata Description	SOIL TYPE	SAMPLES	SPT Blow Counts	Recovery (in)	RQD (%)	Notes
917.4	0		Sounding - no recovered sample						Dry upon completion of soil augering
912.4	5								
907.4	10								
902.4	15		Auger Refusal at 15.1 feet						
897.4	20								
892.4	25								
887.4	30								
882.4	35								

Photo of Approx. Boring Location



Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location.
Top of hole elevations were provided by the project surveyor.

Consulting Services Inc. of Kentucky

Boring Log

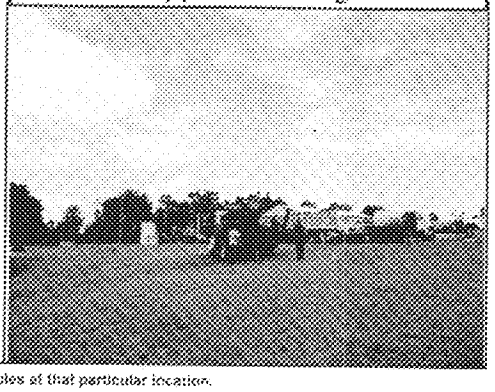
250 Gold Rush Road | Lexington, Kentucky 40503 | 859.309.6021 tel | 859.782.3123 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: 2443
BORING NUMBER: S-13
LOCATION: Lexington, Kentucky
WEATHER: Cloudy/Rain, 60's
DRILL RIG TYPE: Mobile B-80
DRILLER: Geo-Drill
DATE DRILLED: 06-10-2013
DRILLING METHOD: 4" OD SFA
CSI FIELD REP: D. Homm
CLIENT: GRW Engineers, Inc.

TOP OF GROUND ELEVATION: 912.9

ELEV (feet)	DEPTH (feet)	Water Level	Strata Description	SOIL TYPE	SAMPLES	SPT Blow Counts	Recovery (in)	RQD (%)	Notes
912.9	0		Sounding - no recovered sample						Dry upon completion of soil augering
907.9	5								
902.9	10								
897.9	15								
892.9	20								
			Weathered rock						
			Auger Refusal at 22.4 feet						
887.9	25								
882.9	30								
877.9	35								

Photo of Approx. Boring Location



Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location. Top of hole elevations were provided by the project surveyor.

Consulting Services Inc. of Kentucky — Boring Log

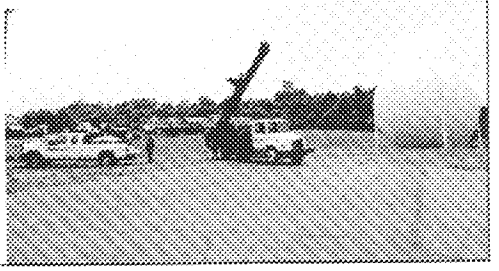
250 Gold Rush Road | Lexington, Kentucky 40503 | 859.309.6021 tel | 859.792.3121 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: 2443
BORING NUMBER: S-14
LOCATION: Lexington, Kentucky
WEATHER: Cloudy/Rain, 60's
DRILL RIG TYPE: Mobile B-80
DRILLER: Geo-Drill
DATE DRILLED: 06-10-2013
DRILLING METHOD: 4" OD SFA
CSI FIELD REP: D. Homm
CLIENT: GRW Engineers, Inc.

TOP OF GROUND ELEVATION: 911.8

ELEV. (feet)	DEPTH (feet)	Water Level	Strata Description	SOIL TYPE	SAMPLES	SPT Blow Counts	Recovery (in)	RQD (%)	Notes
911.8	0		Sounding - no recovered sample						Dry upon completion of soil augering
906.8	5								
901.8	10		Weathered rock Auger Refusal at 9.5 feet						
896.8	15								
891.8	20								
886.8	25								
881.8	30								
876.8	35								

Photo of Approx. Boring Location



Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location.
Top of hole elevations were provided by the project surveyor.

Consulting Services Inc. of Kentucky — Boring Log

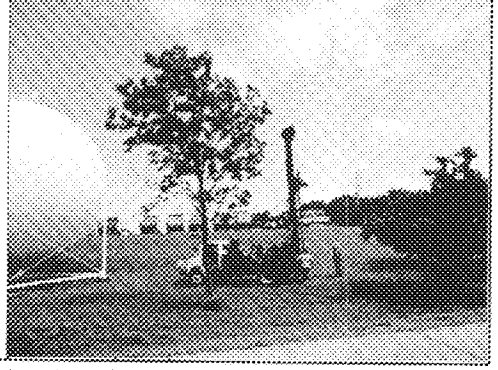
280 Gold Rush Road | Lexington, Kentucky 40503 | 859.309.8021 tel | 888.782.3121 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: 2443
BORING NUMBER: S-15
LOCATION: Lexington, Kentucky
WEATHER: Cloudy/Rain, 60's
DRILL RIG TYPE: Mobile B-80
DRILLER: Geo-Drill
DATE DRILLED: 06-10-2013
DRILLING METHOD: 4" OD SFA
CSI FIELD REP: D. Hamm
CLIENT: GRW Engineers, Inc.

TOP OF GROUND ELEVATION: 901.9

ELEV (feet)	DEPTH (feet)	Water Level	Strata Description	SOIL TYPE	SAMPLES	SPT Blow Counts	Recovery (in)	RQD (%)	Notes
901.9	0		Sounding - no recovered sample						Dry upon completion of soil augering
896.9	5								
891.9	10		Weathered rock						
			Auger refusal at 10.8 feet						
886.9	15								
881.9	20								
876.9	25								
871.9	30								
866.9	35								

Photo of Approx. Boring Location



Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples of that particular location. Top of hole elevations were provided by the project surveyor.

Conformance Set

Consulting Services Inc. of Kentucky

Boring Log

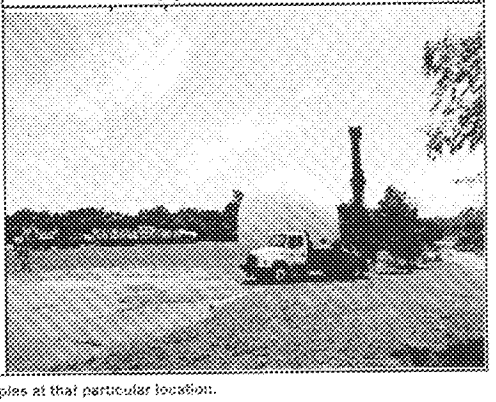
250 Gold Rush Road | Lexington, Kentucky 40503 | 859.309.6021 tel | 888.792.3121 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: 2443
BORING NUMBER: S-16
LOCATION: Lexington, Kentucky
WEATHER: Cloudy/Rain, 60's
DRILL RIG TYPE: Mobile B-80
DRILLER: Geo-Drill
DATE DRILLED: 06-10-2013
DRILLING METHOD: 4" OD SFA
CSI FIELD REP: D. Hamm
CLIENT: GRW Engineers, Inc.

TOP OF GROUND ELEVATION: 910.2

ELEV. (feet)	DEPTH (feet)	GRAPHIC LOG	Strata Description	SOIL TYPE	SAMPLES	SPT Blow Counts	Recovery (in)	RQD (%)	Notes
910.2	0		Sounding - no recovered sample						Dry upon completion of soil augering
905.2	5								
900.2	10								
895.2	15								
			Weathered rock						
			Auger Refusal at 17.9 feet						
890.2	20								
885.2	25								
880.2	30								
875.2	35								

Photo of Approx. Boring Location



Please note, Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location. Top of hole elevations were provided by the project surveyor.

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.

AMRL
Consulting Services Incorporated
2360 Custer Court Road, Lexington, Kentucky 40509

LABORATORY TESTING SUMMARY SHEET

Town Branch WWS Facility - Lexington, Kentucky
CSI PROJECT NUMBER - 2443

Boring No.	Depth (feet)	Sample Type*	USCS Classification	Natural Moisture Content %	% Finer No. 200	Atterberg Limits Information LL	PL	PI	Unit Weight (pcf	Rock Unconfined (ksf)	Soil Unconfined (psf)
B-2	25.0-26.0	CORE								1,681	
B-4	24.0-25.5	SS		26.2							
	33.0-33.5	CORE								1,392	
B-5	7.0-8.5	SS	CL	24.9	77.3	46	22	24			
	8.5-10.0	SS		23.0							
	14.0-15.5	SS		18.4							
B-7	22.5-24.0	SS		24.3							
B-8	7.0-8.5	SS		23.2							
	8.5-10.5	UD									3,328
	14.0-14.1	SS		23.7							
	21.0-21.5	CORE								1,380	
B-9	23.0-25.0	CORE								1,535	
B-11	6.5-8.0	SS	CL	24.9	71.8	42	21	21			
	9.0-10.4	SS		28.9							
B-12	5.5-6.7	SS	CL	26.0	75.2	37	22	15			
B-13	14.0-15.5	SS		33.2							
	18.0-20.0	CORE								684	

* SS = splitspoon sample, UD = undisturbed (Shelby tube) sample, BULK = bulk sample, GRAB = grab sample, CORE = rock core sample

Consulting Services Incorporated
[illegible] Lexington, Kentucky 40511

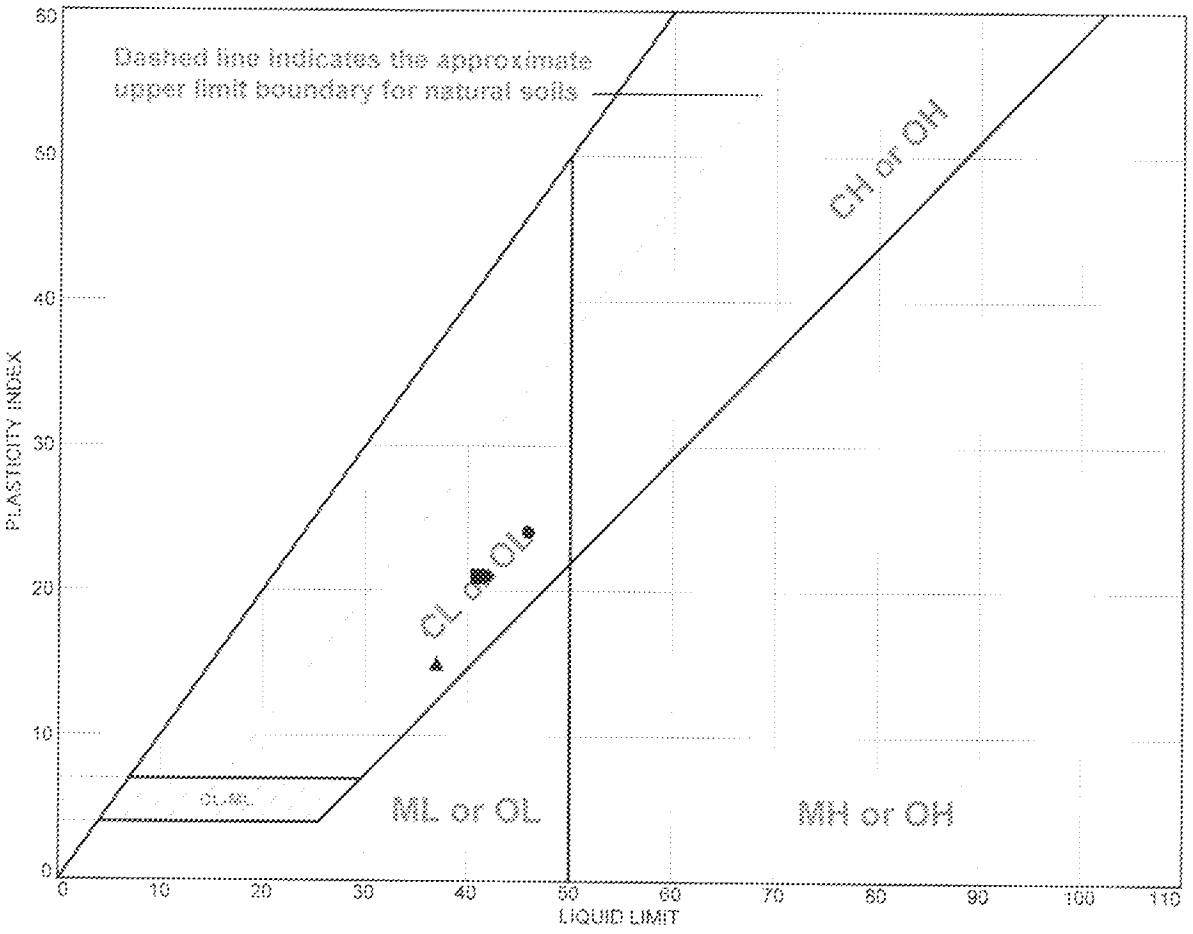
LABORATORY TESTING SUMMARY SHEET

Town Branch WWS Facility - Lexington, Kentucky
CSI PROJECT NUMBER - 2443

Boring No.	Depth (feet)	Sample Type*	USCS Classification	Natural Moisture Content %	% Finer No. 200	Atterberg Limits Information LL	PL	PI	Unit Weight (pcf	Rock Unconfined (ksf)	Soil Unconfined (psf)
B-14	4.0-5.5	SS	CL	23.2	66.7	41	20	21			
	5.5-6.8	UD									1,489
	15.0-17.0	CORE								684	
B-15	1.5-2.4	SS		24.0							

* SS = splitspoon sample, UD = undisturbed (Shelby tube) sample, BULK = bulk sample, GRAB = grab sample, CORE = rock core sample

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	reddish brown LEAN CLAY	46	22	24		77.3	CL
■	reddish brown LEAN CLAY	41	20	21		66.7	CL
▲	brown LEAN CLAY	37	22	15		75.2	CL
◆	reddish brown LEAN CLAY	42	21	21		71.8	CL

Project No. 2443 **Client:** GRW, Inc

Project: Town Branch WWS Facility - Lexington, Kentucky

Remarks:

●**Source of Sample:** Borings **Depth:** 7.0-8.5 **Sample Number:** B-5
■**Source of Sample:** Borings **Depth:** 4.0-5.5 **Sample Number:** B-14
▲**Source of Sample:** Borings **Depth:** 4.0-5.5 **Sample Number:** B-12
◆**Source of Sample:** Borings **Depth:** 6.5-8.0 **Sample Number:** B-11

CSI of Kentucky

Lexington, KY

Figure

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 D 698	A	5.5 lb./12"	4"	No. 4 sieve	3	25
	B	5.5 lb./12"	4"	3/8" sieve	3	25
	C	5.5 lb./12"	6"	3/4" sieve	3	56

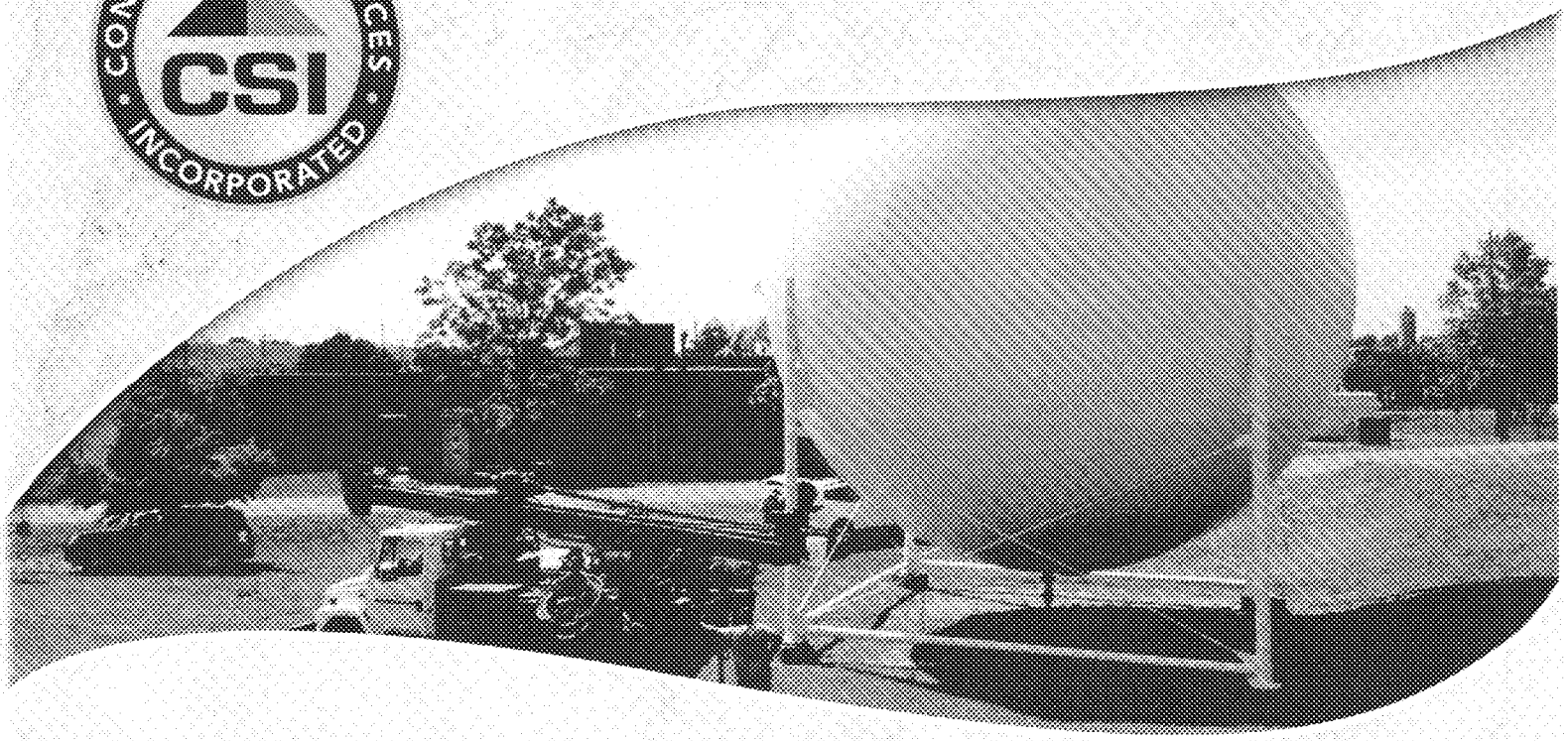
Test	Method	Hammer Wt./Fall	Mold Diam.	Run on Material Finer Than	No. of Layers	No. of Blows/ Layer
Modified D 1557	A	10 lb./18"	4"	No. 4 sieve	5	25
	B	10 lb./18"	4"	3/8" sieve	5	25
	C	10 lb./18"	6"	3/4" sieve	5	56

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.



Revised Geotechnical Report

for

Town Branch Wet Weather Storage (WWS) Facility

Lexington, Kentucky

Job Number LX132443

July 24, 2014

Prepared for

GRW

Lexington, Kentucky

csikentucky.com | csiohio.com

858 Contract Street, Lexington, Kentucky 40505 | 7098 Distribution Drive, Louisville, Kentucky 40258

11162 Luschek Avenue, Cincinnati, Ohio 45241

Conformance Set

Consulting Services Incorporated
Lexington 859.309.6021 | Cincinnati 513.252.2059 | Louisville 502.532.8269
Geotechnical & Materials Engineering | IBC Special Inspection | Material Testing

July 24, 2014

GRW, Inc.
801 Corporate Drive
Lexington, Kentucky 40503

ATTN: Mr. Joe Henry, PE

Subject: **Revised Report of Geotechnical Exploration**
Town Branch Wet Weather Storage (WWS) Facility
Lexington, Kentucky
CSI Project No. LX132443

Dear Mr. Henry,

Consulting Services Incorporated of Kentucky (CSI) is pleased to present our Revised Report of Geotechnical Exploration for the proposed Town Branch Wet Weather Storage (WWS) Facility in Lexington, Kentucky. As you are aware, we provided our original geotechnical report (dated June 28, 2013) for the proposed Wet Weather Storage Facility. Since that time, the selected storage tank system (and other project information) has been changed. As a result, changes to our previously provided recommendations are required to accommodate the new design. Please note that we provided our services in general accordance with CSI Proposal Number 2443, dated April 22, 2013.

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 design, construction and performance of the proposed earth or rock supported portions of the project.

We appreciate the opportunity to provide our geotechnical services to you and the design team. Please do not hesitate to contact us for questions or comments about the information contained herein.

Cordially,

J. Todd Helton, EIT, SI
Staff Professional

Bruce L. Hatcher, PE
Chief Engineer
Licensed KY 14,527

STATE OF KENTUCKY
BRUCE L. HATCHER
14,527
LICENSED PROFESSIONAL ENGINEER
7-24-14

Conformance Set

TABLE OF CONTENTS

Page

APPENDICES, FIGURES, PHOTOS AND TABLES

APPENDICES:

Site Location Plan
Boring and Sounding Location Plan
Geotechnical Boring Information Sheet
Boring Logs
Sounding Logs
Field Testing Procedures
Laboratory Testing Summary Sheet
Specific Laboratory Test Results
Laboratory Testing Procedures

LIST OF FIGURES:

LIST OF PICTURES:

LIST OF TABLES:

INTRODUCTION

1 SCOPE OF THE GEOTECHNICAL EXPLORATION

As we proposed, we conducted a geotechnical exploration which is summarized in the following report. Our services included a review of the project information provided, conducting a geotechnical exploration that utilized soil test borings, soundings (borings without sampling), and rock coring to obtain samples for modeling the soil/rock conditions at the subject site, an analysis of the data and information obtained, and providing recommendations for the soil and rock supported portions of the project site as listed in our proposal.

2 PROVIDED INFORMATION

Project information was originally provided via e-mail correspondence with GRW Engineers, Inc. We were provided with the following documents for our review:

- Request for Proposal document from Lexington Fayette Urban County Government (LFUCG), dated March 22, 2013.
- A drawing entitled, " Exhibit 1 - Wet Weather Storage Preliminary Layout Plan", dated May, 2014 depicting the new storage tank layout.

Previous Design Information

Originally, this project was to consist of the construction of a large, rectangular, concrete storage facility (basin) for wastewater during high inflow events at the existing Town Branch WWTP in Lexington, Kentucky.

Additionally, the project was to be constructed in three phases. In Phase 1, half of the WWS facility was to be constructed. The footprint of Phase 1 was approximately 300 feet by 275 feet (approximately 22 MG of storage). The construction of a pump station and controls building was also included in Phase 1. In Phase 2, another quarter of the WWS facility was to be constructed. The footprint of Phase 2 was approximately 150 feet by 275 feet. In Phase 3, the final quarter of the WWS facility was to be constructed. The footprint of Phase 3 will also be approximately 150 feet by 275 feet.

Previously, the depth of the facility was expected to be roughly 38 feet. Also, it was expected that nearly half (roughly 20 feet) of the concrete structure would be below grade. As a result, it was assumed that the structure would be excavated to rock and the bottom of the tank would bear directly on bedrock. Additionally, the old fill encountered on-site was expected to be removed as a result of the anticipated undercut to bedrock.

Current Design Information

As of the date of this report, it is our understanding that the current tank design consists of a 22 MG CROM prestressed water tank (with an out-to-out diameter of approximately 265 feet) to be constructed in the first phase. Additionally, the total height of the tank (including the

tank top) will be roughly 80 feet. A second 22MG CROM tank (of equal footprint) would be constructed during the second phase of construction. We understand that the CROM tank will consist of a steel shell diaphragm with prestressed wiring, encased in shotcrete. The bottom of the tanks will be constructed as a concrete slab (of varying thickness) with the thickness of the slab increasing toward the wall of the tank.

We understand that the CROM tank floor will be supported by drilled shaft foundations end bearing on bedrock. The anticipated load expected to be exerted by the tank is approximately 4,000 pounds per square foot. At this time, we understand that the intended design diameter of the proposed drilled shafts is 48 inches. We understand that the drilled shaft embedment depth may be increased (beyond the typical 2-feet rock socket) in order to increase the axial capacity of each drilled shaft. As requested, we have included the anticipated increase in the axial capacity of drilled shafts due to the increased embedment into rock. These calculations have been included in the *Foundations* Section of this report

If any of the aforementioned information is in error or if the information changes during the course of the project, please contact our office so that we can re-evaluate the new information with respect to our findings and recommendations.

3 AREA/SITE INFORMATION

3A AREA TOPOGRAPHY/PHYSIOGRAPHY

The site is located in the Inner Blue Grass Region of the Blue Grass Physiographic Region of Kentucky. This area consists of gently rolling topography and rich, fertile soils. Published mapping reviewed indicates elevations in the site vicinity range from 950 feet to 1000 feet. Below is a figure of the location of the site with respect to the regional physiography.

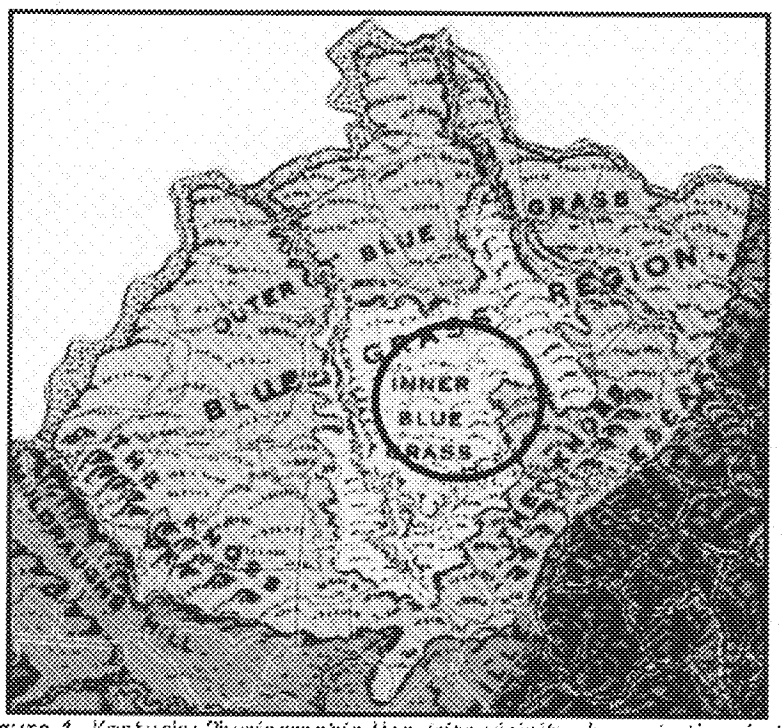


Figure 1. Kentucky Physiographic Map (site vicinity shown in the circle)

3B SITE GEOLOGY

A review of the *USGS Geologic Map of the Lexington West Quadrangle, Kentucky* (dated 1967) indicates the project site is located in an area partially underlain by Alluvium (i.e. – water transported and deposited soils) along the Town Branch Creek. The Alluvium and the majority of the site are underlain by the Grier Limestone Member of the Lexington Limestone Formation. The Lexington Limestone Formation is part of the Middle an Ordovician aged rock deposits.

The Grier Limestone Member consists primarily of limestone. The limestone is described as very light gray to dark gray, rubbly, irregular medium and coarse grained, with dark gray shale partings in some beds. Below is a figure of the location of the site with respect to the area geology.

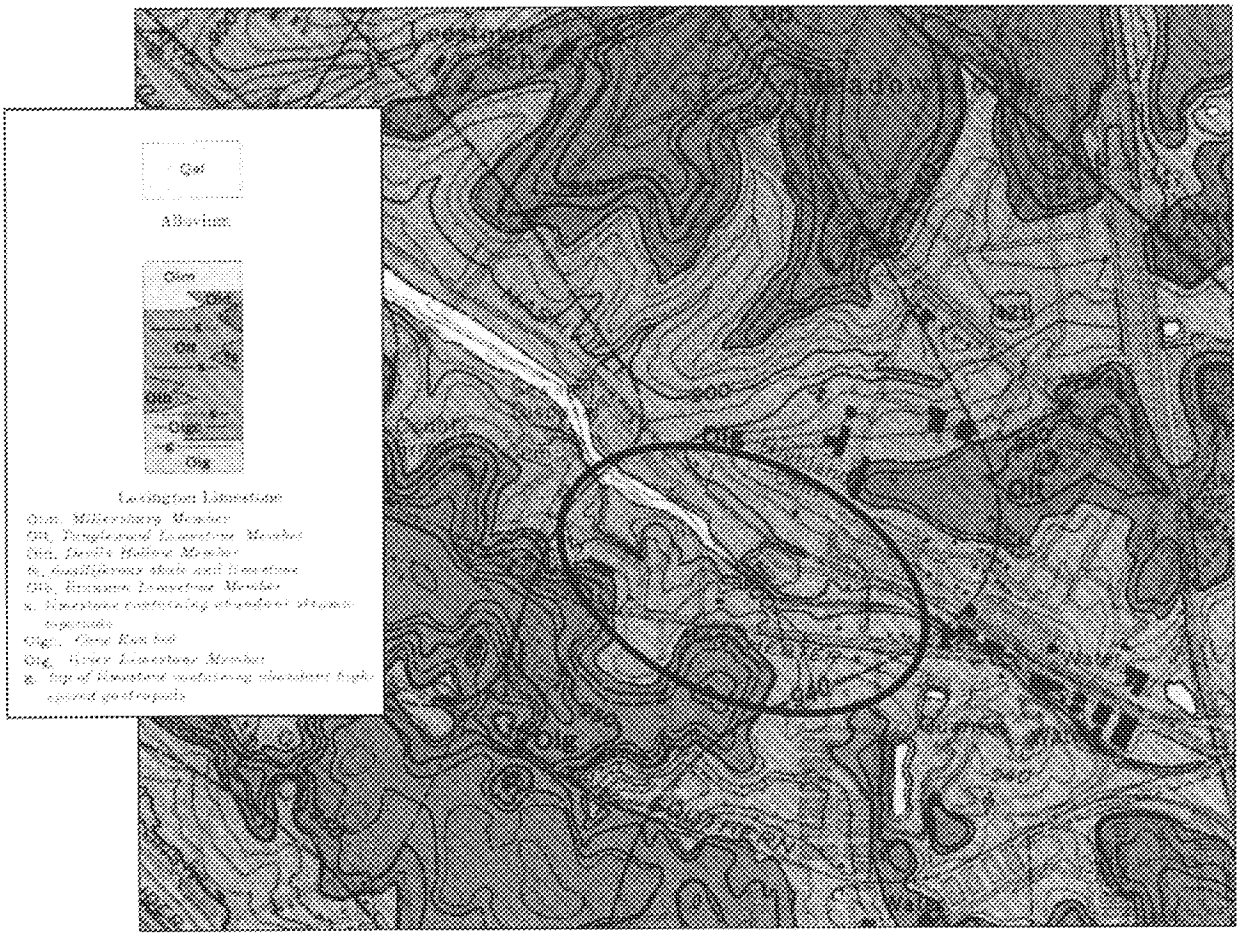


Figure 2. Site Geology USGS Lexington West Quadrangle, dated 1967
(site vicinity shown in the circle)

As with most of the geology of this portion of Kentucky, Karst (sinkholes, weathered bedrock, caverns, erratic bedrock, etc.) is associated with the site geology. Several closed depressions were mapped within 1 mile of the site. Since the site (and surrounding areas) have been regraded, obvious signs of sinkhole activity may have been filled or otherwise occluded. The

Fayette County Karst Areas map published by the Kentucky Geological Survey (KGS) indicates that the project site is in an area of intense Karst development.

The Bryan Station Fault Zone is approximately 2 to 3 miles southeast of the project site. The geologic dip in the area of the project site is less than 1 percent to the northwest. The figure below indicates the likelihood of Karst occurrence.

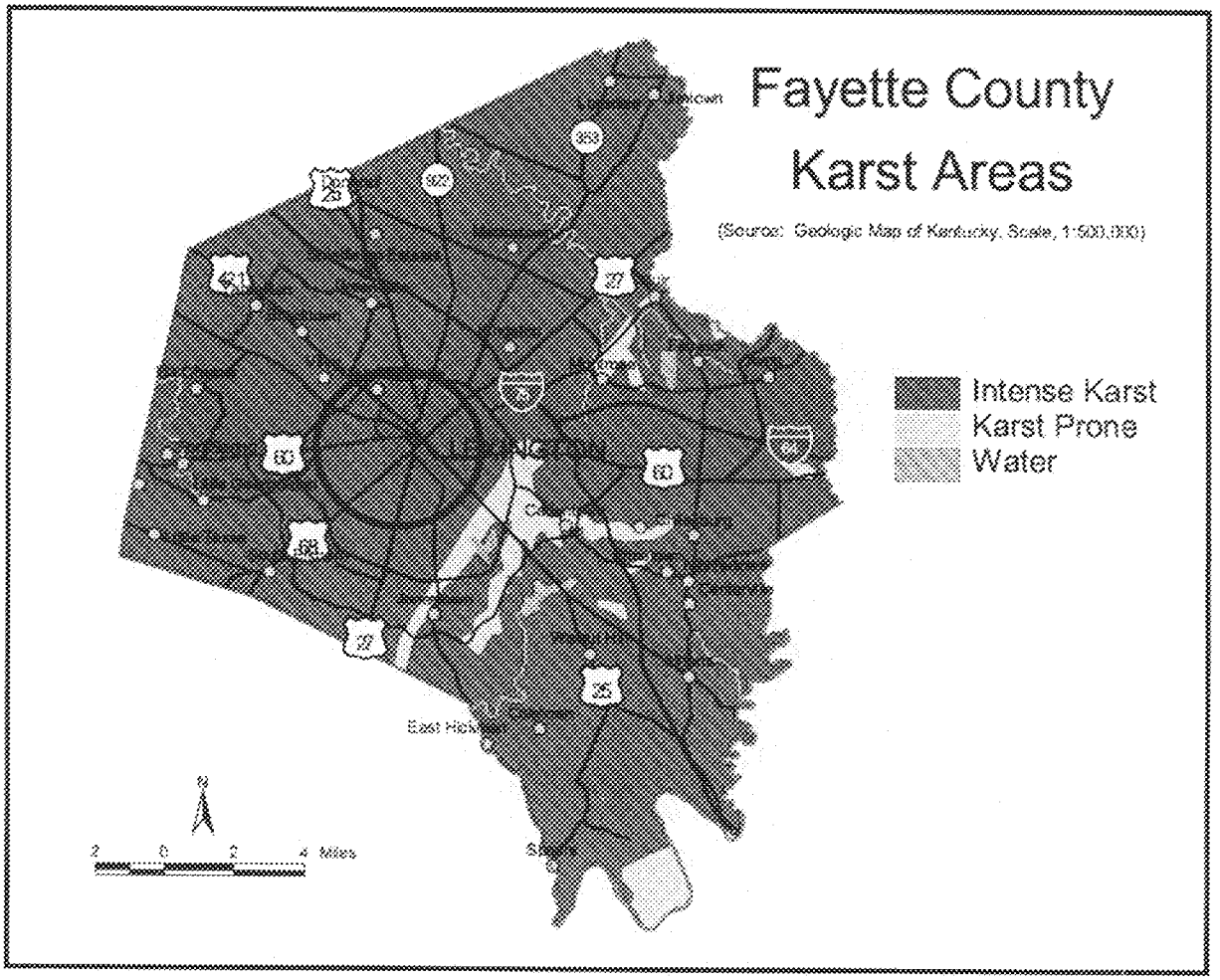


Figure 3. Fayette County Karst Areas Map, KGS (site vicinity shown in circle)

3C PUBLISHED SITE SOIL CONDITIONS

According to the USDA Soil Survey of Fayette County (NRCS website), the soils underlying the site vicinity consist of the following series:

- Huntington silt loam (Hu).
- Made land, over silty materials (Md)
- Made land, over clayey materials (Me)
- Urban land-armour-maury complex (Ua)

- Bluegrass-Maury silt loams (uBlmB) on 2 to 6 percent slopes.
- Maury-Bluegrass silt loams (uMlmC) on 6 to 12 percent slopes.
- Depth to bedrock for this series is generally listed as greater than 80 inches.
- Depth to the water table for this series is generally greater than 80 inches.
- The soil series uBlmB is generally listed as being not limited, the soil series uMlmC is generally listed as being somewhat limited, the soil series Hu is generally listed as being very limited and the soil series Md, Me, and Ua are generally listed as not rated for the construction of dwellings with basements. Particular issues affecting construction include flooding, slope, high shrink-swell potential, and depth to bedrock.
- The soil series Hu, uBlmB, uMlmC are generally listed as being very limited and the soil series Md, Me, and Ua are generally listed as not rated for the construction of paved streets and roads. Particular issues affecting construction include low soil strength, shrink-swell potential, depth to bedrock, and flooding.
- The soil series Hu, uBlmB, uMlmC are generally listed as being somewhat limited and the soil series Md, Me, and Ua are generally listed as not rated for the construction of shallow excavations. Particular issues affecting construction include flooding, high clay content, and unstable excavation sidewalls.

Below is the soils map from the USDA website.

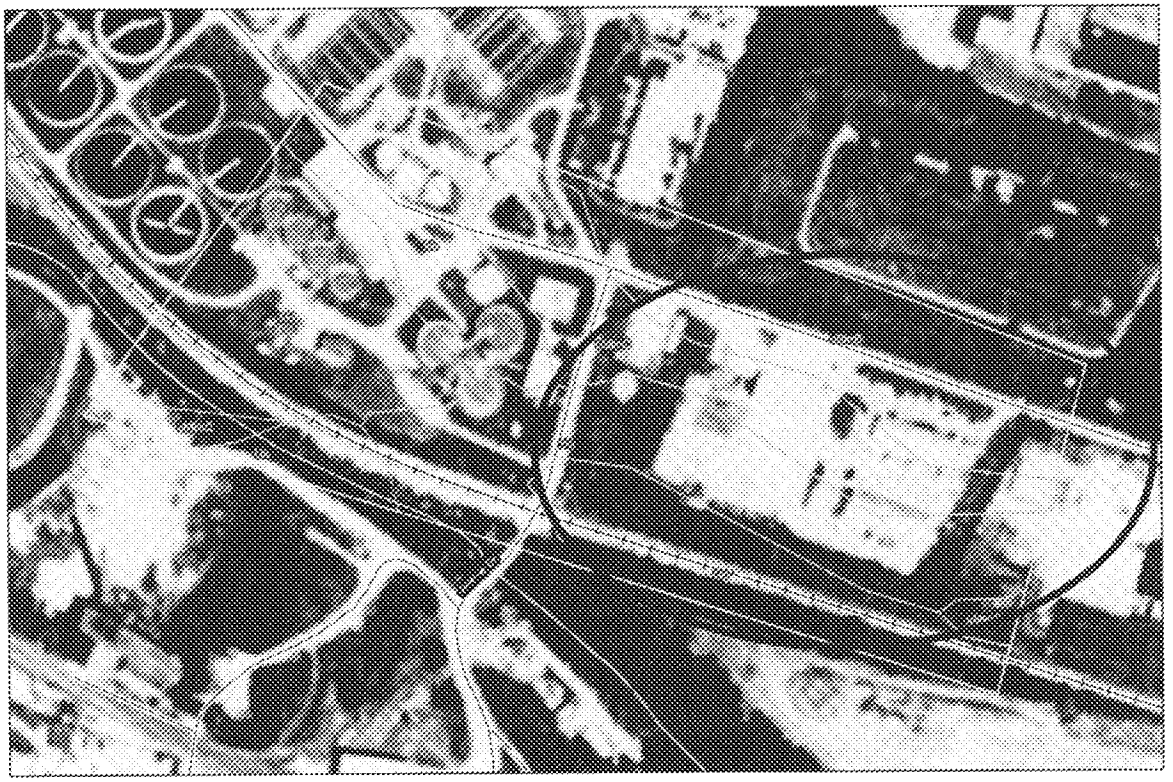


Figure 4. USDA Soil Survey Map of Project Site

Due to the development of the site vicinity, the project site has been re-graded. Therefore, the soil survey information listed above may no longer be useful in this area since the site soils have been altered. It is likely that the surrounding area cut material may have been used as fill material for the site. Thus, the soils described above may be on-site but not in their natural condition.

3D OTHER PUBLISHED SITE INFORMATION

We have reviewed several available aerial photographs, dated as far back as April 1993. In the April 1993 aerial photograph, it appears the site is in similar condition to the existing conditions during our field exploration and is covered with existing structures and pavement areas. There is an existing cemetery north of the project site. The area surrounding the project site is mostly comprised of businesses to the east and south. Specifically, there is a stockyard toward the east and the existing Town Branch Waste Water Treatment Plant (WWTP) toward the west. There are railroad tracks along the southern project boundary, generally running east to west. Between the April 1993 and April 2002 aerial photographs, it appears that some earthwork activities took place south of the railroad tracks and the project site. The remainder of the project site and surrounding areas appear to remain in similar condition during this time interval. Between the April 2002 and October 2011 aerial photographs, some small structures were constructed north and south of the project site. However, the project site and the majority of the surrounding areas appear to remain in similar condition. Please reference the aerial photographs below for further details.

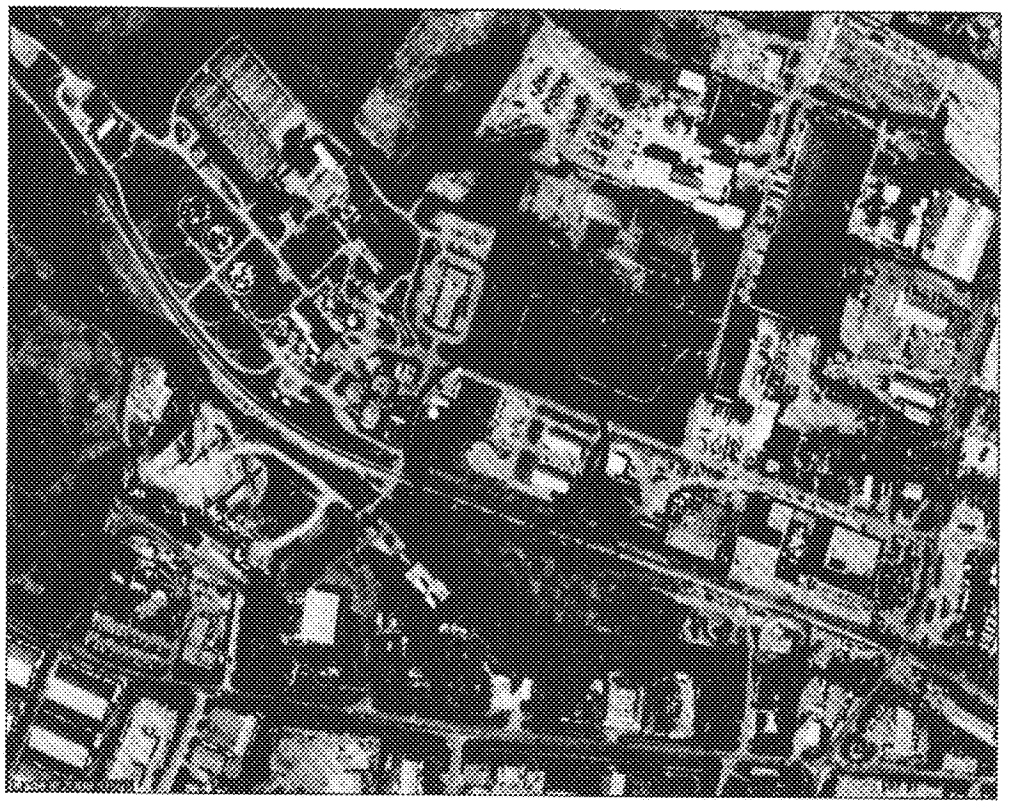


Figure 5. Aerial Photo dated April 18, 1993 (DIGITALGLOBE)

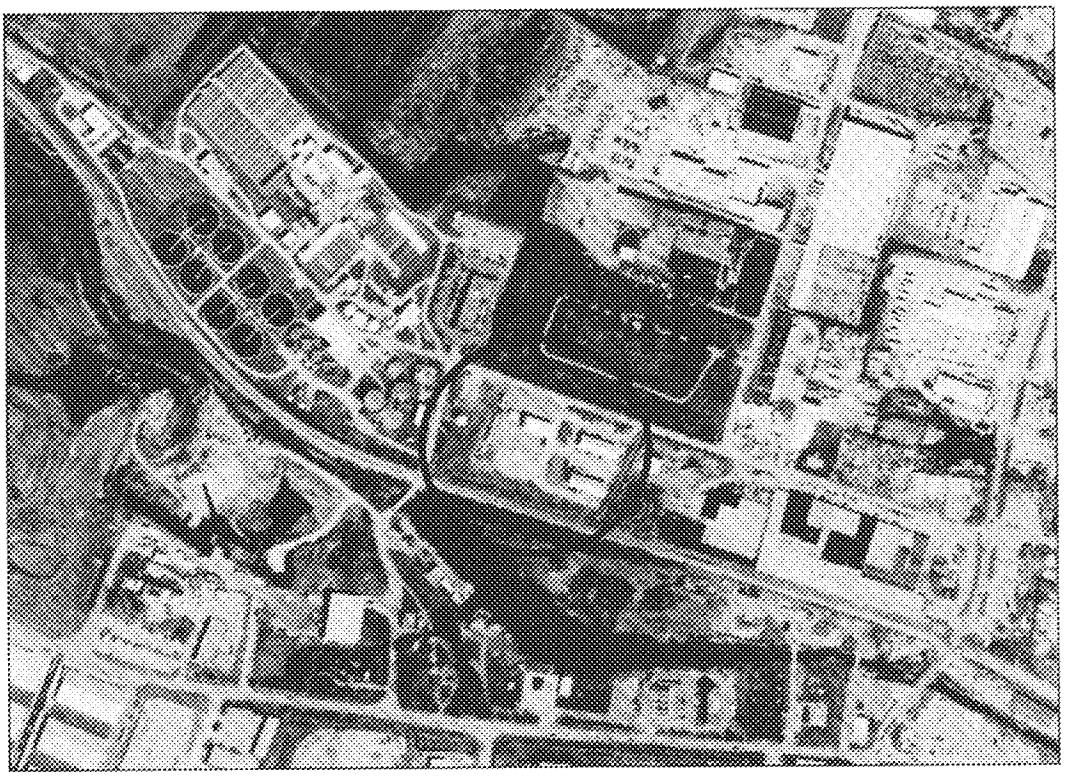


Figure 6. Aerial Photo dated April 1, 2002 (DIGITALGLOBE)

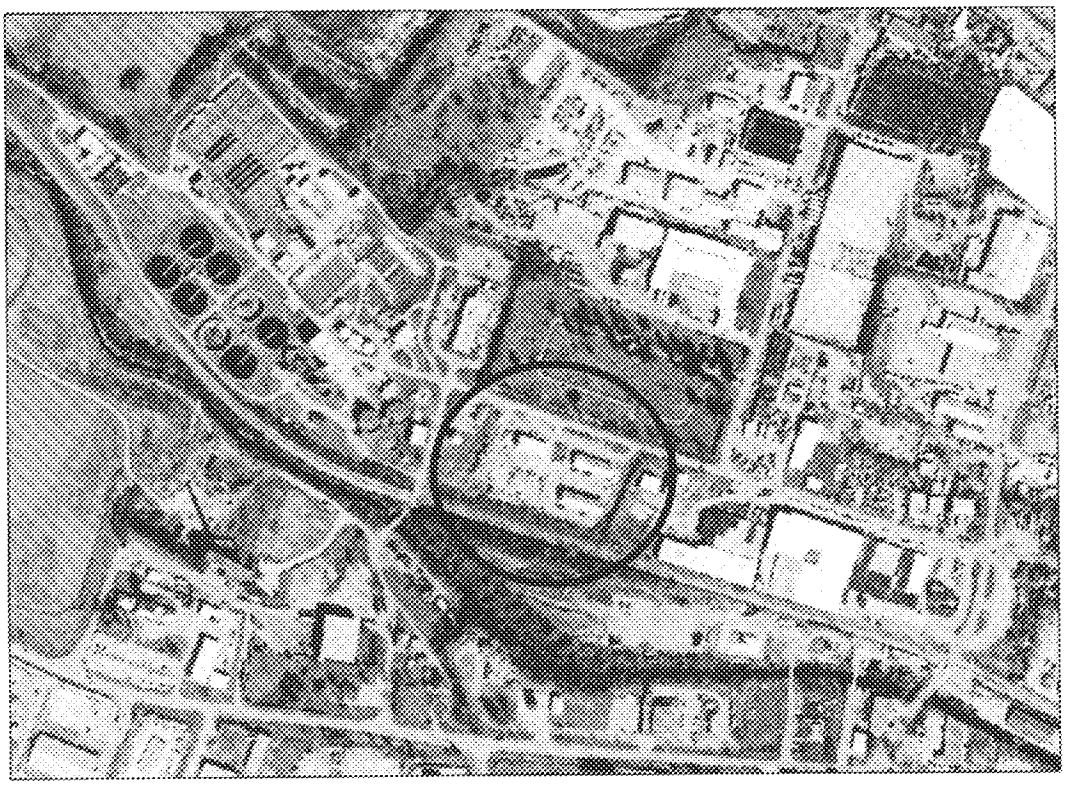


Figure 7. Aerial Photo dated October 4, 2011 (DIGITALGLOBE)

FINDINGS

4 SITE SURFACE OBSERVATIONS

An initial site visit was conducted on June 3, 2013 by Mr. Todd Helton, EIT and Mr. Daniel Homm, EIT (both of CSI), Mr. Joe Henry, PE of GRW Engineers, Inc., and LFUCG personnel. The project team discussed the proposed locations of the borings/soundings and offset the boring/sounding locations due to conflicts with either underground and overhead utilities.

A site visit was conducted on June 5 through 7 and June 10 through 13, 2013, by Mr. Homm. Mr. Homm performed a field reconnaissance, directed the drilling operations, and logged the recovered soil and rock samples.

The project site is located off of Lisle Industrial Avenue in Lexington, Kentucky adjacent to the Town Branch Waste Water Treatment Plant (WWTP). Specifically, the project area is located between the railroad right-of-way (to the south), an access road to the WWTP (to the north), the property line of the adjacent stockyard (to the east), and another access road to the WWTP (to the west). The project site is currently occupied by several buildings, several small structures, pavement areas, and some grassed areas. The majority of the project area is relatively level. However, the site slopes sharply downhill to the east (toward the stockyard property) and to the south (toward the railroad). There is heavy brush and small trees located in these steeply sloping sections along the eastern and southern edges of the project site. Additionally, the western third of the property slopes downward toward the western access road. The existing methane sphere is located along the western sloped edge of the property, adjacent to the western access road.

The proposed methane sphere storage location is approximately 600 northwest of the proposed location of the WWS tanks on the Town Branch Waste Water Treatment Plant (WWTP) property. The methane sphere storage location is a relatively level grassy area. There were no underground utilities marked in this area. However, several overhead utilities were located nearby.

There were several utilities parallel to the access roads off of Lisle Industrial Avenue and Jimmie Drive (including water, sewer, gas, and overhead utilities). Additionally, there are numerous public and private utilities within the project area. The photos below show the site conditions at the time of our site visit.

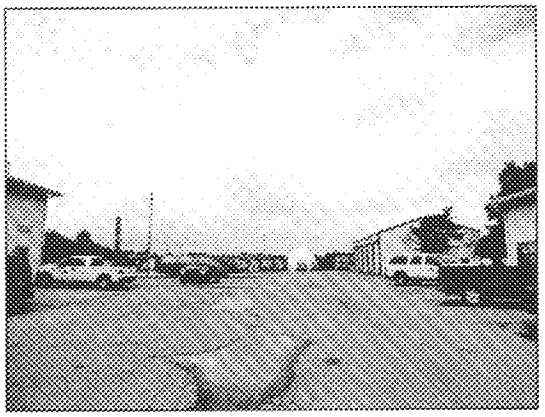


Photo 1: View from boring B-3 toward the west

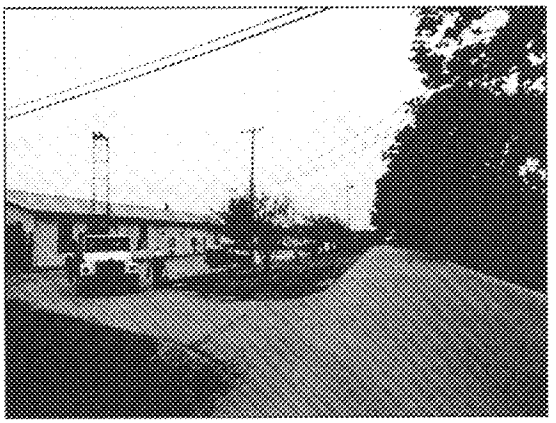


Photo 2: View from boring B-2 toward the west

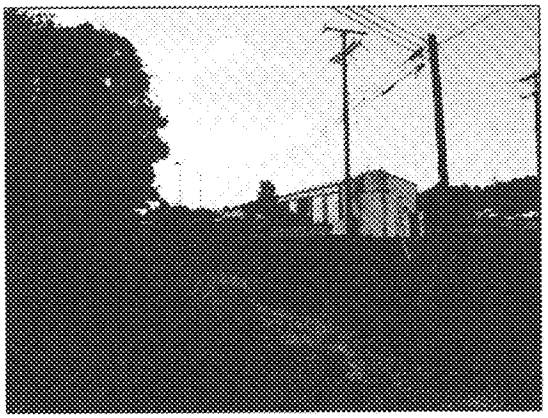


Photo 3: View from the intersection of the access roads toward the southeast

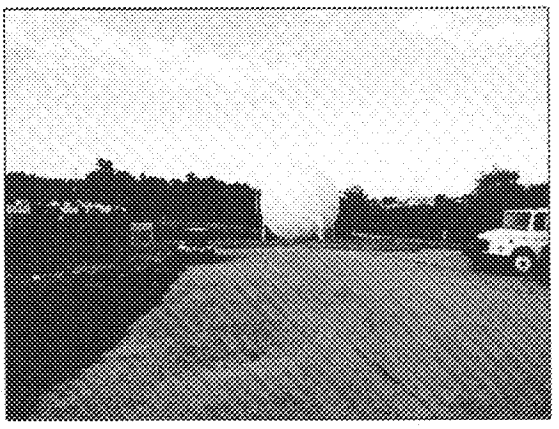


Photo 4: View from boring B-14 area toward the south

5 SUBSURFACE CONDITIONS

During our field exploration, we performed fourteen soil borings for the proposed WWS Facility (labeled B-1 through B-14), one boring in the proposed future methane sphere storage location (labeled B-15), and sixteen soundings (labeled S-1 through S-16) for the proposed WWS Facility. It should be noted that soundings are typically borings without sampling. However, we performed SPT (split spoon sampling) at soundings S-3 and S-6 at the request of Third Rock Consultants to recover soil samples for environmental sampling. The boring and sounding locations were located as near as possible to the boring and sounding locations discussed with the design team during our on-site meeting on June 3, 2013. Please reference the Boring and Sounding Location Plans in the Appendix for the approximate boring and sounding locations.

5A SOIL CONDITIONS

In general, we encountered a topsoil/root zone or asphalt pavement and/or base stone, overlying previously placed (old) fill, overlying residual soils, overlying bedrock. We encountered auger refusal at all of our boring and sounding locations.

The topsoil/root zone had thicknesses ranging from approximately 1 to 5 inches. The asphalt pavement ranged in thickness from approximately 1 to 4 inches and the base stone ranged in thickness from 4 to 7 inches beneath the pavement sections. It should be noted that we encountered gravel pavement areas on-site that ranged in thickness from approximately 6 to 16 inches.

Beneath the surficial cover, we encountered previously placed fill at all fifteen of our boring locations. The previously placed fill generally consisted of mixed brown and gray clay with rock fragments, reinforced concrete fragments, brick fragments, asphalt fragments pieces of wood, fine roots, topsoil, and construction debris (i.e. - pieces of metal, wire, plastic, etc.). The largest diameter piece of wood encountered was approximately 12 inches in our recovered SPT samples. Therefore, other areas containing buried topsoil or deleterious materials are likely located on-site. We typically encountered a buried topsoil layer near the residual soil transition when encountered. It should be noted that due to the inclusion of topsoil in the old fill, the thicknesses of the buried topsoil layer was difficult to determine. At borings B-1, B-3, B-6, B-10, and B-10A and at soundings S-3 and S-10, we encountered shallow false refusals (determined by rock coring or offset borings/soundings) on hard unknown objects (likely large boulders or concrete fragments) in the old fill. Due to the large rock and concrete fragments in the previously placed fill, you should expect difficult excavating on-site. The thickness of the previously placed fill ranged from approximately 1½ to 24 feet. Based on the depths of existing fill on-site, we believe that the existing structures' footprints are underlain by existing old fill.

Beneath the previously placed fill, we typically encountered firm to stiff residual soils. It should be noted that samples were not recovered at borings B-1, B-3, B-6, and B-10A, since rock coring methods were used to advance the borings past hard unknown objects in the old fill. Please reference the Rock Conditions Section for more information. The residual soil horizon generally consisted of reddish brown to brown lean clay (CL) with varying amounts of sand and rock fragments. The residual soil horizon (where sampled) had thicknesses ranging from approximately 1½ to 9 feet.

The subsurface conditions encountered in each of our boring locations are shown on the Boring and Sounding Logs in the Appendix. It should be noted that our borings and soundings were drilled and sampled according to the procedures presented in the Appendix. The Boring and Sounding Logs 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 the stratification lines shown on the Boring and Sounding Logs represent approximate transitions between material types. In-situ stratum changes could occur gradually or at slightly different depths.

The boring and sounding locations shown in the Appendix should be considered accurate only to the degree implied by the method used. Top of hole elevations were provided by the project surveyor.

5B GROUNDWATER CONDITIONS

Groundwater was encountered at a depth of approximately 14.2 feet at boring B-13. We believe that the encountered ground water at boring B-13 is likely perched groundwater in the old fill near the residual soil horizon. Groundwater was not encountered at any of our fourteen boring or sixteen sounding locations upon the completion of soil augering. Final groundwater level readings were not taken upon the completion of rock coring since water was used to cool the rock coring bit at all of our boring locations. Denotations about groundwater levels shown on the Boring and Sounding Logs represent the conditions upon the completion of soil augering at the time of our exploration. The borings were immediately filled upon their completion due to safety concerns for personnel in the area. Please be aware that borings and soundings may experience some settlement over time, thus they should be monitored and backfilled to grade as necessary.

Although groundwater was not typically observed in our borings or soundings, groundwater could be encountered during construction. 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 (especially in old fill) or at/near the bedrock bedding planes, or at/near the soil/rock interface. Perched water sources are often not linked to the more continuous relatively stable groundwater table that typically occurs at much greater depths. Also, wet conditions and pockets of water are common at or near the existing/old structural features or underground utilities. Finally, water issues are also dependent upon recent rainfall activity, surface and subsurface drainage patterns in the area.

5C ROCK CONDITIONS

Auger refusal is typically interpreted as top of bedrock. Due to the inclusion of large rock fragments and concrete fragments in the previously placed fill, some of the borings and soundings likely encountered false auger refusals. The borings' auger refusal elevations were all verified through rock coring operations. However, we cannot accurately determine if the soundings' auger refusal elevations were on bedrock or hard unknown objects within the old fill. If a suspect shallow auger refusal elevation was encountered, an offset sounding/boring was performed. At borings B-1, B-3, B-6, and B-10A, we performed rock-coring elevations at apparent top of bedrock. At these boring locations, the rock coring barrel penetrated a hard unknown object we had thought was bedrock (due to the auger refusal). After we penetrated the hard unknown object with the rock coring bit, we typically encountered additional fill (i.e. - soil and rock fragments). Since we were unable to advance the soil augers any further, we continued rock coring through the previously placed fill in order to advance the boring. Therefore, no additional soil samples were recovered at these boring locations after coring operations were begun. Thus, we do not know the exact old fill thickness or the residual soil thicknesses at these locations.

Auger refusal was encountered at all fifteen of our borings and at all sixteen of our soundings. The auger refusal depths ranged from 1.4 feet (boring B-10A) to 26.4 feet (boring B-4). Rock coring was performed at all of our boring locations. The amount of rock core collected varied dependent on the elevation where auger refusal was encountered and quality of recovered rock core. The lengths of rock coring ranged from 5 feet (boring B-15) to 33.6 feet (boring B-10A).

The recovered rock cores typically consisted of gray limestone with dark gray shale partings and clay seams with recoveries ranging from 2 to 100 percent. The rock quality designation (RQD) for our recovered rock cores ranged from very poor to excellent engineering quality with RQD values ranging from of 0 to 92 percent. We encountered an approximately 5-inch open void in the bedrock at boring B-6 approximately 4 feet below the top of rock elevation and numerous clay seams in the top 5 feet of most of our borings. Core water loss was observed at borings B-1, B-3, B-6, and B-7 B-8, and B-10A during rock coring operations. Please reference the applicable Boring Logs for further details.

The rock cores were boxed and transported to our laboratory for further examination by an engineer. The recovered rock core was generally consistent with the data presented on the Lexington West Geologic Quadrangle. The bedrock conditions encountered in our rock cores are shown on each Boring Log.

6 LABORATORY TESTING

During the course of our work, we selected representative soil samples for laboratory testing. The tests include obtaining data for soil classification testing. Detailed descriptions of these tests and the results of our testing are included in the Appendix. Tests performed included:

- Natural moisture content tests
- Atterberg limits tests
- Percent fines analyses
- Unconfined compression test on soil
- Unconfined compression test on rock

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 can be adapted for the proposed development. The primary geotechnical concerns are:

- Previous Site Improvements/Previously Developed Areas
- Construction in Heavily Developed/Razed Building Areas
- Site Clearing and Grubbing
- Previously Placed (Old) Fill
- Differing Bearing Conditions
- Karst

The following sections discuss each issue. However, recommendations to address the issues are contained in later sections of the report.

7A PREVIOUS SITE IMPROVEMENTS/PREVIOUSLY DEVELOPED AREAS

The proposed construction is near several existing utilities along the railroad tracks, and Town Branch Drive (i.e. - water, gas, etc.). Additionally, there are numerous private utilities (i.e. - electric, gas, water, storm sewer, sanitary sewer, etc.) throughout the project site. The location of these utility lines must be verified prior to construction to determine if relocation of these utility lines will be necessary. Expect that previous construction may have left old fill or other deleterious material within the project boundaries. Your project budget should include a contingency for remediation and/or removal of any encountered buried deleterious material.

7B CONSTRUCTION IN HEAVILY DEVELOPED/RAZED BUILDING AREAS

There are several structures (i.e. - office buildings, storage sheds, garages, storage tanks, etc.) that will need to be demolished prior to the proposed construction. Past experience has shown that demolition or razing of existing structures fills the soil up with razed debris and utility connections. The razed debris, which includes the foundation/slab concrete, is not suitable for support of the new structures. Thus, these materials should be removed before rebuilding another structure. Utility connections/pipes are commonly within the debris when demolition occurs and should be disconnected and removed before rebuilding begins. Your project budget should contain a contingency for the removal and remediation of any encountered buried deleterious materials and/or underground structures/obstructions.

7C SITE CLEARING AND GRUBBING

Numerous small to large trees are located along the southern project boundary (parallel to the existing railroad tracks), some of which may need to be removed prior to construction. Expect that these trees will have extensive root systems that will leave significant voids in the subgrade when removed. These voids will need to be properly filled after the tree removal is performed if they are near the proposed final grades. Additionally, there are existing asphalt pavement areas on-site. The asphalt will likely have to be removed and wasted off-site. The base stone may be reused as structural fill, provided it meets the requirements specified in this report.

7D PREVIOUSLY PLACED (OLD) FILL

Previously placed fill was encountered at all of our boring locations. The previously placed fill generally consisted of brown and gray mixed clay with rock fragments, reinforced concrete fragments, brick fragments, asphalt fragments pieces of wood, fine roots, topsoil, and construction debris (i.e. - pieces of metal, wire, plastic, etc.). The largest diameter piece of wood encountered was approximately 12 inches in our recovered SPT samples. Therefore, other areas containing buried topsoil or deleterious materials are likely located on-site. It should be noted that five of our fifteen borings and at least two of our sixteen soundings encountered apparent false refusals on hard unknown objects (likely large boulders or concrete fragments) in the old fill. Therefore, due to the large rock fragments and concrete fragments in the previously placed fill, you should expect difficult excavating on-site. The thickness of previously placed fill ranged from approximately 1½ to 24 feet.

Old fill materials are often improperly compacted, commonly contain organics and debris, and are poor bearing materials. Due to the heavy expected loads, we understand that drilled shaft foundation bearing on rock will likely be utilized for the proposed tanks for this project. Also, shallow spread foundations bearing on rock may be utilized for the additional structures (where possible). Therefore, we expect that much of this old fill will be left in-place and the drilled shafts will be installed through the old fill. Any removed old fill may be reused provided that the deleterious materials and debris can be removed. Based on our borings, the amount of debris and deleterious materials contained in the old fill may make it difficult or not economically feasible to reuse the old fill as new structural fill material.

7E DIFFERING BEARING CONDITIONS

Due to the heavy expected structure loads, rock bearing foundations will be required. Bearing project foundations on any combination of both soil and rock will likely result in unwanted differential settlement. Therefore, project foundations should be constructed to bear either completely on soil -OR- completely on rock in order to provide consistent bearing conditions for the structures. We expect that drilled shaft foundation bearing on rock will be utilized for the Wet Weather Storage (WWS) Tanks, while shallow spread foundations bearing on bedrock may be utilized for the additional structures. Also, shallow spread foundations bearing on residual soils or new properly compacted soil fill may be utilized for the future methane sphere storage (if the methane sphere is to be relocated and reused).

7F KARST

Karst topography with intense Karst risk is known to underlie the project site. Karst topography consists of limestone or dolomite that is weathered which results in sinkholes (i.e. - closed depressions), irregular top of rock profiles, pinnacled bedrock, slots or troughs in the bedrock, internal drainage systems, and open voids in either the bedrock itself or in the soil overburden (typically at the soil/rock interface). We encountered an approximately 5-inch open void in the bedrock at boring B-6 approximately 4 feet below the top of rock elevation and numerous clay seams in the top 5 feet of most of our rock cores. Additionally, soft/wet soils are commonly encountered at the soil/rock interface and in slots or troughs in the bedrock.

An in-depth Karst study was beyond the scope of this exploration. Procedures for construction in Karst areas are contained in later sections of the report. Regardless of methods used, they should be treated on a case-by-case basis and should involve a CSI geotechnical engineer.

Based on our knowledge of the area geology, sinkholes could be exposed during grading activities and foundation/underground utility construction. Detailed site proofrolling and foundation observations are frequently utilized in an attempt to locate incipient soil dropouts. Sinkholes must be evaluated and treated on an individual basis. Procedures for repairing sinkholes or other Karst features should be performed on a case-by-case basis and should involve a CSI geotechnical engineer.

8 SITE DRAINAGE

During construction, water should not be allowed to pond in excavations or undercutting will likely be required. Additionally, water ponded in excavations (especially those at or near the soil-rock interface) can activate latent Karst features. During the life of the project, slope the subgrade and other site features so that surface water flows away from the site structures. Diversion ditches should be used to keep surface water from accumulating at or near site structures.

For excavations during construction, most free water from the subsurface conditions could likely be removed via sump pumps and open channel flow (ditches) at or near the source of seepage. We expect that pockets of perched water will be encountered during excavations in the old fill due to the large particle sizes and poor compaction. Therefore, you should expect that perched water will "bleed" out of voids in the old fill. The perched water can "bleed" out over a few hours to several days. Therefore, the project budget and schedule should include contingencies to remove excess perched water. If normal dewatering measures prove insufficient, CSI should be retained to provide recommendations on the issue.

As previously mentioned, wet conditions are possible in excavations on-site during site construction. Daylighting wet zones for drainage or the use of french/rock drains may be prudent or cost effective methods of de-watering wet areas of the site. Pumping with long-flexible hoses day-lighted hundreds of feet away or other types of sumping could also be utilized if necessary. CSI should be retained to observe all excavations in locations of springs or other water-bearing features.

9 FOUNDATIONS

We understand that the WWS Tanks will be constructed as CROM tanks which will be supported by drilled shafts foundations. To avoid differential settlement occurring between the CROM tanks and the additional structures (i.e. - the Diversion Structures, the Pump Station, and/or the Flow Control Vault), we recommend that these structures also be constructed with rock bearing foundations (either drilled shafts or shallow spread foundations). In the event that the selected grades and rock depths allow for shallow spread foundations for these additional structures, we have also included recommendations for shallow spread foundations bearing on rock in this report. If there are any changes in the project criteria, CSI should be allowed to review the recommendations to determine if any modifications are required.

9A DRILLED SHAFT FOUNDATIONS

As previously stated, we understand that the proposed CROM Tanks and possibly the Diversion Structures, the Pump Station, and the Flow Control Vault will be supported by drilled shaft foundations bearing on rock. We understand that the CROM Tank floors will be directly supported by the drilled shafts (with no grade beams or separate structural floor slab). We expect that the other proposed structures may include grade beams and structural floor slabs in their design (if needed).

Due to the conditions encountered at our boring locations, we expect that there are special conditions associated with this site that will greatly impact the budget for the drilled shaft installation. Typically, drilled shaft installation starts with advancing an earth auger down until something hard is encountered. This can be either something large (i.e. - boulders, concrete, etc.) in the old fill -OR- bedrock. Based on our drilling data and the trackhoe excavations by others (not presented in this report), we expect that the drilled shafts will likely refuse on hard objects in the old fill. A rock auger can typically be used to penetrate most hard objects; however, the cost per foot will be significantly more once the rock auger is used (commonly 3 to 5 times the earth auger price). Additionally, a rock core barrel may be required to penetrate the hard object or to keep the drilled shaft plumb. Since clean soil may be encountered beneath the encountered hard object, the rock auger or core barrel should then be replaced with a soil auger when material is encountered which can be penetrated with a soil auger. A rock auger will eventually have to be used at the bedrock surface to create a 2 foot deep rock socket. Ideally, the drilled shaft contractor needs to change drill bits according to the material encountered and be paid accordingly.

We would expect that the drilled shaft holes will be ragged in the old fill material. Based on our experience in eastern Kentucky with mine spoil sites, a 40 percent concrete overage is common (based on actual versus theoretical concrete volumes). The loss of concrete in the hole will be more in areas where the holes penetrate old fill that contains rock or concrete fragments. Thus, the installed cost of the drilled shaft concrete will be more than a normal project (i.e. - drilled shafts in residual soil).

Based on the trackhoe excavations by others, we expect that concrete rubble with significant amounts of reinforcing steel is contained within the old fill at select locations. It may be more economical to remove these select areas in mass, then backfill with compacted soil or DGA (dense graded aggregate) to the existing grade to allow the drilled shafts to be more easily installed. Backfilling with No. 57 crushed stone is <u>not</u> advisable since the rock fragments would slough into the drilled hole.

Depending upon the encountered conditions (i.e. - void in bedrock or large void zone in old fill), you may have to sacrifice a steel casing in the drilled shaft. Typically, the steel casings are removed as the drilled shaft concrete is poured. However, sacrificing the casing may be your only option in some instances.

Due to the special conditions associated with this site, we recommend that the project budget include numerous unit rate prices for these special cases mentioned above. These would include (but not be limited to): sacrificing steel casings (per foot per each diameter of drilled shaft used), mass excavation and backfilling select areas, down-hole time to cut steel objects (would include downtime for drill rig), etc. As a result, the total cost of the foundation system will not be known until all of the drilled shafts have been installed. Additionally, you will be setting a precedence for the Phase 2 tank if drilled shafts are used for the Phase 1 tank. Based on our drilling results, we expect that Phase 2 will include a higher concentration of concrete rubble. Thus, the cost of the drilled shafts for Phase 2 will likely be more than that for Phase 1.

Based on the conditions encountered in our rock cores, the reviewed data and our experience with other projects in the area, we expect that limestone with interbedded shale and shale partings, and open voids may be encountered beneath the drilled shaft foundations. As such, your construction budget should include a large contingency for the likelihood of extensive rock removal and/or having to sacrifice the steel casings (due to open voids in the bedrock). The following recommendations have been included for the design and construction of drilled shaft foundations.

Design Considerations for Rock-Bearing Foundations

The drilled shafts may be sized for an allowable end-bearing pressure of **60,000 pounds per square foot (60 ksf)** for drilled shafts bearing on competent rock. This allowable bearing pressure is based on the assumption that the bearing material for each drilled shaft will be observed, evaluated, and approved by a CSI geotechnical engineer. The bottoms of the drilled shafts will have to be inspected. Thus, a down-hole inspection will be required. Test holes will need to be drilled at each drilled shaft location to a depth of twice the diameter of the shaft or a minimum of 5 feet. The drilled shafts should bear at least 2 feet into rock (rock socket), bearing on competent rock for end-bearing performance under gravity loading conditions. We recommend a minimum drilled shaft diameter of 30 inches be used in the design to allow down-hole inspection of the bedrock. Based on information provided by GRW personnel, we understand that the drilled shaft diameter selected for the tank foundations is 48-inches. Thus, the following table shows the increase in the axial capacity of the drilled piers due to the increased embedment depth (below the 2 foot rock socket) for drilled piers with a diameter of 48 inches.

Table 1. Drilled Shaft Design Allowable Axial Capacity (48-inch Diameter)

Depth Below Rock Socket (ft)	Allowable Unit Side Shear (ksf)	Allowable Unit End Bearing Capacity (ksf)	Allowable Side Shear (kips)	Allowable End Bearing Capacity (kips)	Total Allowable Axial Capacity (kips)
0	5.0	60	0	754	754
1.0	5.0	60	63	754	817
2.0	5.0	60	126	754	880
3.0	5.0	60	188	754	942
4.0	5.0	60	251	754	1005
5.0	5.0	60	314	754	1068
6.0	5.0	60	377	754	1131
7.0	5.0	60	440	754	1194
8.0	5.0	60	503	754	1257
9.0	5.0	60	565	754	1319
10.0	5.0	60	628	754	1382
11.0	5.0	60	691	754	1445

Please note: Allowable parameters are based on a Factor of Safety of 3.0

The following table shows our estimated design parameters for drilled shafts.

Table 2. Estimated Design Parameters for Drilled Shafts

Soil Parameters	Value
Moist Unit Weight of Soil (pcf)	125
Cohesion of Soil (psf)	2,000
Internal Angle of Friction of Soil	25°
Adhesion Friction Factor (concrete to soil)	0.30
Adhesion Friction Angle (concrete to soil)	18°
Rock Parameters	**Value**
Unit Weight of Rock (pcf)	155
Cohesion of Rock (psf)	0
Internal Angle of Friction of Rock	45°
Adhesion Friction Factor (concrete to rock)	0.70
Adhesion Friction Angle (concrete to rock)	35°

Additional design considerations for drilled shaft foundations are as follows:

- Neglect the upper 2 feet of the bedrock (rock socket) for all resistance calculations.
- **The steel casings may have to be left in-place because of the open voids, thus all skin friction will be lost.**

A detailed settlement analysis was beyond the scope of this exploration. However, based on the assumed structural loads and drilled shafts bearing on sound rock, we expect both total settlements and differential settlements will not exceed ¼ inch.

Rock Excavation

The amount of rock excavation in drilled shafts can have a major impact on the final cost of installed foundations. Based on our sampling, the bedrock in the area of the proposed Town Branch WWS Tank and the associated structures may contain mud seams and/or open voids. Thus, the amount of rock excavation required for the proposed drilled shaft foundations could be extensive and should be taken into consideration in the construction budget. Additionally, the cost associated with sacrificing the steel casing should be included as a contingency in the construction budget.

CSI's experience indicates general drilled shaft construction and delineation of "rock" in the excavation is greatly facilitated if suitable drilling equipment is used. The use of a drill capable of producing at least 500,000 inch-pounds of torque and 35,000 pounds of downward force is recommended. Additionally, CSI recommends that rock be defined as material which cannot be penetrated by a heavy duty earth auger with hardened teeth at a rate in excess of 3 inches per minute.

9B DRILLED SHAFT FOUNDATIONS-CONSTRUCTION NOTES

- Provide a minimum drilled shaft diameter of 30 inches to reasonably enter the drilled shaft excavation for cleaning, bottom preparation and inspection. Again, we understand that the design drilled shaft diameter for this project is 48-inches.
- Clean the foundation bearing area so it is nearly level or suitably benched and is free of ponded water or loose material.
- Install a temporary protective steel casing to prevent sidewall collapse, prevent excessive mud and water intrusion, and to allow workers to safely enter, clean and inspect the drilled shaft. This steel casing may have to be left in-place because of open voids.
- Make provisions for groundwater removal from the drilled shaft excavation. Groundwater flow may require the use of special procedures to achieve a satisfactory foundation installation. Concrete placement may require the use of a tremie pipe or concrete pumping equipment.
- Clean the socket "face" prior to concrete placements. Cleaning will require hand cleaning or washing if mud smear forms on the face of the rock. A geotechnical engineer should approve the rock socket surface prior to concrete placement.
- Retain a CSI geotechnical engineer to observe the bottom of the drilled shaft after the bottom of the hole is leveled, cleaned of any mud or extraneous material, and dewatered.
- The protective steel casing may be extracted (provided no voids are encountered) as the concrete is placed provided a sufficient head of concrete is maintained inside the steel casing to prevent soil or water intrusion into the newly placed concrete .
- Specify concrete slumps ranging from 4 to 7 inches for the drilled shaft construction. These slumps are recommended to fill irregularities along the sides and bottom of the drilled hole, displace water as it is placed, and permit placement of reinforcing steel cages into the fluid concrete.
- Direct the concrete placement into the drilled hole through a centering chute to reduce side flow or segregation.

9C DRILLED SHAFT FOUNDATIONS-INSTALLATION MONITORING

It is recommended that the drilled shaft construction be observed by a CSI geotechnical engineer. The observation should address the following items:

- Top location within tolerances
- Correct plan dimensions
- Plumbness within tolerances
- Materials excavated agree with borings
- Statement of bottom soundness and cleanliness

- Construction procedure

Drilled shafts with diameters of 30 inches or greater are large enough to allow a down-hole inspection of the bearing conditions. A CSI representative should check the bottom of the drilled shaft to observe that competent rock has been encountered. Soundness checks will be performed at the bottom of the drilled shaft using a rock hammer and probe rod. Again, probe holes will be required for each drilled shaft location. Significant deviations from the specified or anticipated conditions should be reported to the owner's representative and to the foundation designer.

9D SHALLOW FOUNDATIONS ON ROCK

As previously stated, to avoid differential settlement occurring between the CROM tanks and the additional structures (i.e. - the Diversion Structures, the Pump Station, and/or the Flow Control Vault), we recommend that these structures also be constructed with rock bearing foundations (either drilled shafts or shallow spread foundations).

For spread foundations bearing completely on bedrock (either directly or indirectly), foundations may be sized using a maximum allowable bearing pressure of 10,000 pounds per square foot (10 ksf). Any existing soil or weathered rock should be excavated until competent rock is exposed in the bottom of the foundation excavation. We interpret competent rock by observing the teeth of the backhoe or trackhoe being dragged vertically across the top of exposed rock. We encountered an approximately 5-inch open void in the bedrock at boring B-6 approximately 4 feet below the top of rock elevation and numerous clay seams in the top 5 feet of most of our borings. Based on this information, we expect that undercutting of rock in probable Karst features (i.e. - slots, troughs, etc.) will be necessary.

Upon approval by a CSI geotechnical engineer, the excavation should be backfilled using DGA (dense graded aggregate) from the prepared subgrade elevation due to site conditions. After the subgrade has been approved to receive new DGA fill, the fill may commence with the following procedures and guidelines recommended:

- Place DGA fill in maximum 8-inch thick loose lifts.
- Fill lifts should be densified using vibratory compaction methods
- Fill lifts should be densified to at least 95 percent of the DGA's maximum dry density (ASTM D 698).
- Density testing should be performed as a means to verify percent compaction and moisture content of the DGA as it is being placed and compacted.
- Retain a representative of CSI to observe and document fill placement and compaction operations.

Since the footing excavations for these additional structures will likely create relatively small, confined excavations, it may be advantageous to backfill these footing excavations with flowable fill (minimum compressive strength of 300 psi) or lean concrete (minimum compressive strength of 1,500 psi) up to the design bottom-of-footing elevation.

A detailed settlement analysis was beyond the scope of this exploration. However, based on the expected structural loads and foundations bearing on competent bedrock, we expect both total settlements and differential settlements should not exceed ¼ inch.

Additional design considerations for spread foundations bearing on bedrock are outlined as follows:

- Foundations bearing on bedrock are not subject to a minimum frost embedment depth.

9E SHALLOW FOUNDATIONS ON ROCK - CONSTRUCTION NOTES

For foundations constructed on top of competent bedrock, we also recommend the following procedures.

- Loose soil, mud, debris, and excess water should be removed from the bearing surface immediately prior to concrete placement.
- Foundation bearing surfaces should be benched (as much as practical) to provide nearly-level bearing surfaces.
- A CSI geotechnical engineer should observe all foundation excavations and provide recommendations for treatment of any unsuitable conditions encountered.

9F SHALLOW SPREAD FOUNDATIONS ON SOIL - METHANE SPHERE

We understand that the methane sphere is to be relocated during construction. At this time, the new location of the methane sphere is not certain. We advanced boring B-15 at the anticipated new location of the methane sphere (at the time of our original geotechnical exploration). Thus, the following recommendations should be considered general recommendations for the relocated methane sphere. Any location other than the location explored previously may require additional evaluation prior to construction.

Shallow spread footings may be sized using a maximum allowable bearing pressure of 2,000 pounds per square foot (psf). The foundations should be kept as high as possible (minimum frost embedment depth) to reduce the risk of encountering bedrock. No grading information was provided to us for this structure; however, if rock is encountered within 2 feet of the bottom of foundation (BOF) elevation, we recommend that the rock be undercut at least 2 feet below bottom of footing and the excavation backfilled with compacted soil up to the design BOF elevation to provide a "cushion". Please note that the methane sphere footings must not bear on old fill.

A detailed settlement analysis was beyond the scope of this exploration. However, based on the estimated structure loads, the anticipated behavior of soil types encountered during field activities, and our experience with similar projects, we expect that total settlements will not exceed 1 inch, and that differential settlements will not exceed 1/2 inch.

Settlement estimates are based, in part, upon the assumption that site preparation is performed in accordance with our recommendations and with good quality control of the

earthwork. Proper remediation of unsuitable old fill and proper placement and compaction of new fill is particularly important in keeping settlements within tolerable limits.

Additional design considerations for project foundations are outlined as follows:

- Design all footings with a minimum 24 inches width.
- All exterior footing bottoms should bear at least 24 inches below finished exterior grading (KBC Table 1805.2.1 for Fayette County).

9G SHALLOW FOUNDATIONS ON SOIL - METHANE SPHERE CONSTRUCTION NOTES

Any soils can lose strength if they become wet, so we recommend the foundation subgrades be protected from exposure to water. For foundations construction, we also recommend the following procedures.

- For soils that will remain exposed overnight or for an extended period of time, place a "lean" concrete mudmat over the bearing areas. The concrete should be at least 4 inches thick. Flowable fill concrete or low-strength concrete is suitable for this cover, as conditions allow.
- Disturbed soil should be removed prior to foundation concrete placement.
- Foundation bearing conditions should be benched level.
- Areas loosened by excavation operations should be recompacted prior to reinforcing steel placement.
- Loose soil, debris, and excess surface water should be removed from the bearing surface prior to concrete placement.
- Retain a CSI geotechnical engineer to observe all foundation excavations and provide recommendations for treatment of any unsuitable conditions encountered.
- The foundation bearing conditions should be checked by means of portable dynamic cone penetration (DCP) testing at the direction of a CSI geotechnical engineer.

10 SEISMIC SITE CLASSIFICATION

The latest edition of the Kentucky Building Code (KBC) was reviewed to determine the Site Seismic Classification. Based on our review of geologic data, our experience, subsurface conditions encountered, and the use of rock bearing foundations for the proposed WWS tanks and associated structures (i.e. - the Diversion Structures, the Pump Station, and/or the Flow Control Vault) we recommend a Seismic **SITE CLASS "B"** for foundation design purposes. If soil bearing foundations are utilized for the methane sphere, we recommend a Seismic **SITE CLASS "C"** for foundation design purposes.

A detailed geotechnical earthquake engineering analysis was not performed since it was beyond the scope of our authorized work. However, based on a review of published literature and our experience with similar subsurface conditions, we believe the potential for slope instability, liquefaction, and surface rupture due to faulting or lateral spreading resulting

from earthquake motions is low. However, this potential could be elevated during wet periods of the year unless adequate drainage is provided.

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, uses widely spaced 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.

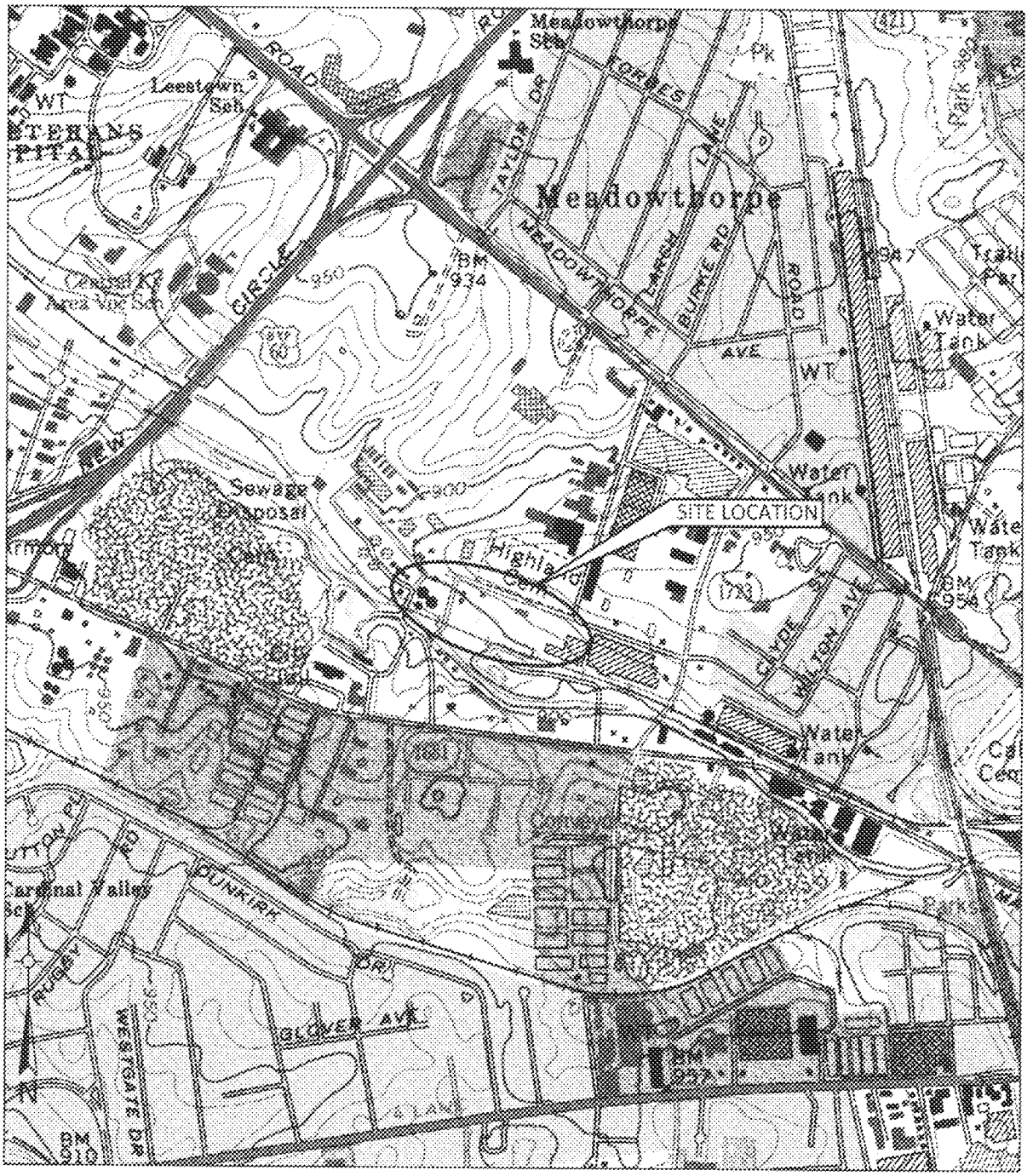
No section or portion of this report (including Appendix information) can be used as a stand alone article to make distinct changes or assumptions. The entire report and Appendix should be used together as one resource. We wish to remind you that our exploration services include storing the soil samples collected and making them available for inspection for 30 days. The rock cores will be retained until foundation installation is complete. The soil and rock core 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

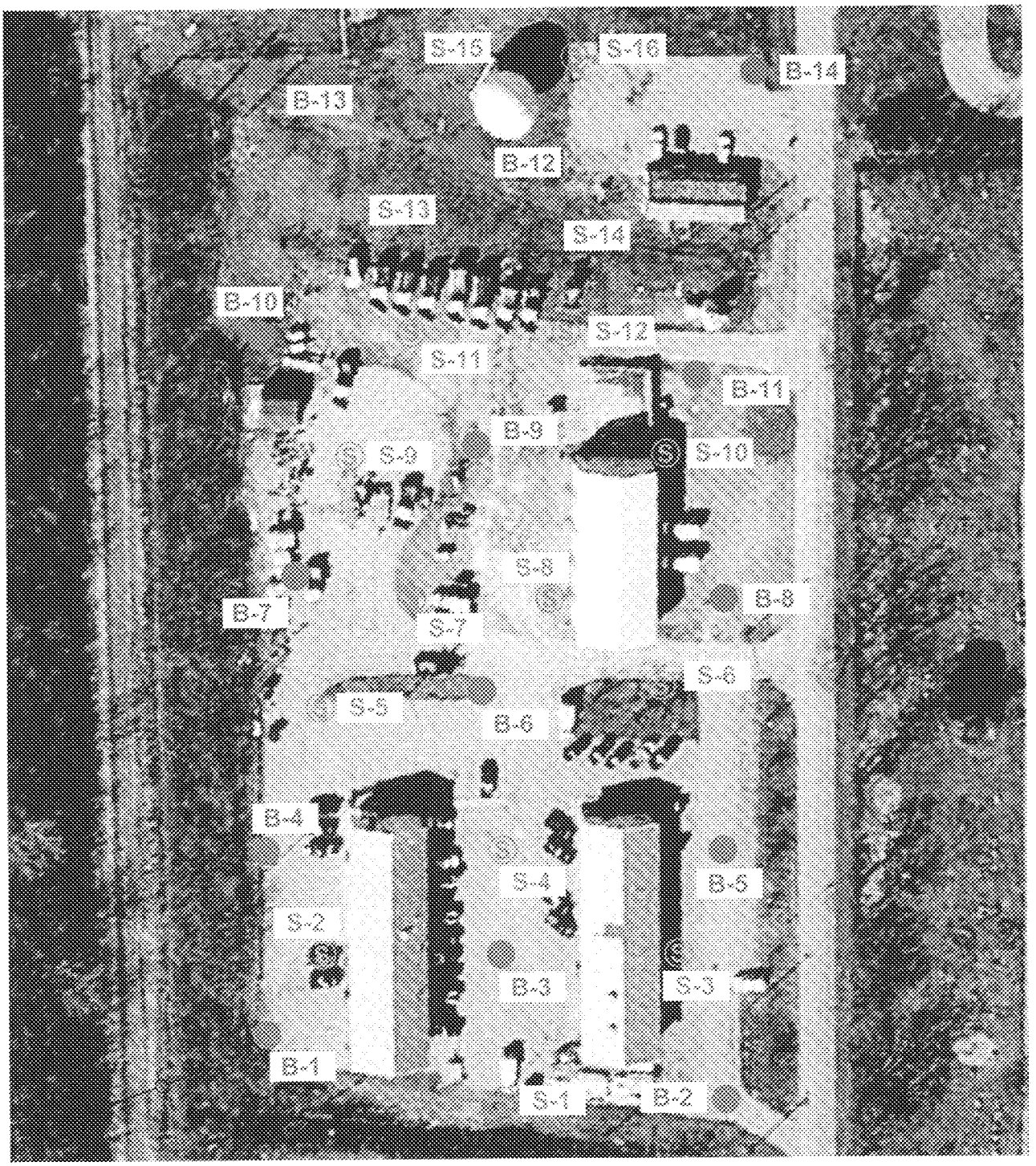
Site Location Plan
Boring Location Plan
Key to Symbols and Descriptions
Test Boring Records
Rock Core Records
Field Testing Procedures
Summary of Lab Testing Table(s) and Lab Testing Sheets
Laboratory Testing Procedures



Site Location Plan adapted from USGS Lexington West Topographic Quadrangle map dated 1965 (revised 1993), with further adaptation by CSI personnel

FOR ILLUSTRATION PURPOSES ONLY

Consulting Services Incorporated of Kentucky 858 Contract Street Lexington, Kentucky 40505 859.309.6021 Office/888.792.3121 Fax www.csikentucky.com	TITLE: SITE LOCATION PLAN	Project No: IX132443	Drawn By: JAC
	PROJECT: TOWN BRANCH WWS LEXINGTON, KENTUCKY	Date: July 24, 2014	Checked By: JTH
		Scale: Not To Scale	Drawing No: 1 of 1



Boring and Sounding Location Plan adapted from Aerial Photography dated October 4, 2011, with further adaptation by CSI personnel

Top of hole elevations were provided by the project surveyor.

FOR ILLUSTRATION PURPOSES ONLY

LEGEND

B-XX BORING LOCATIONS

S-XX SOUNDING LOCATIONS

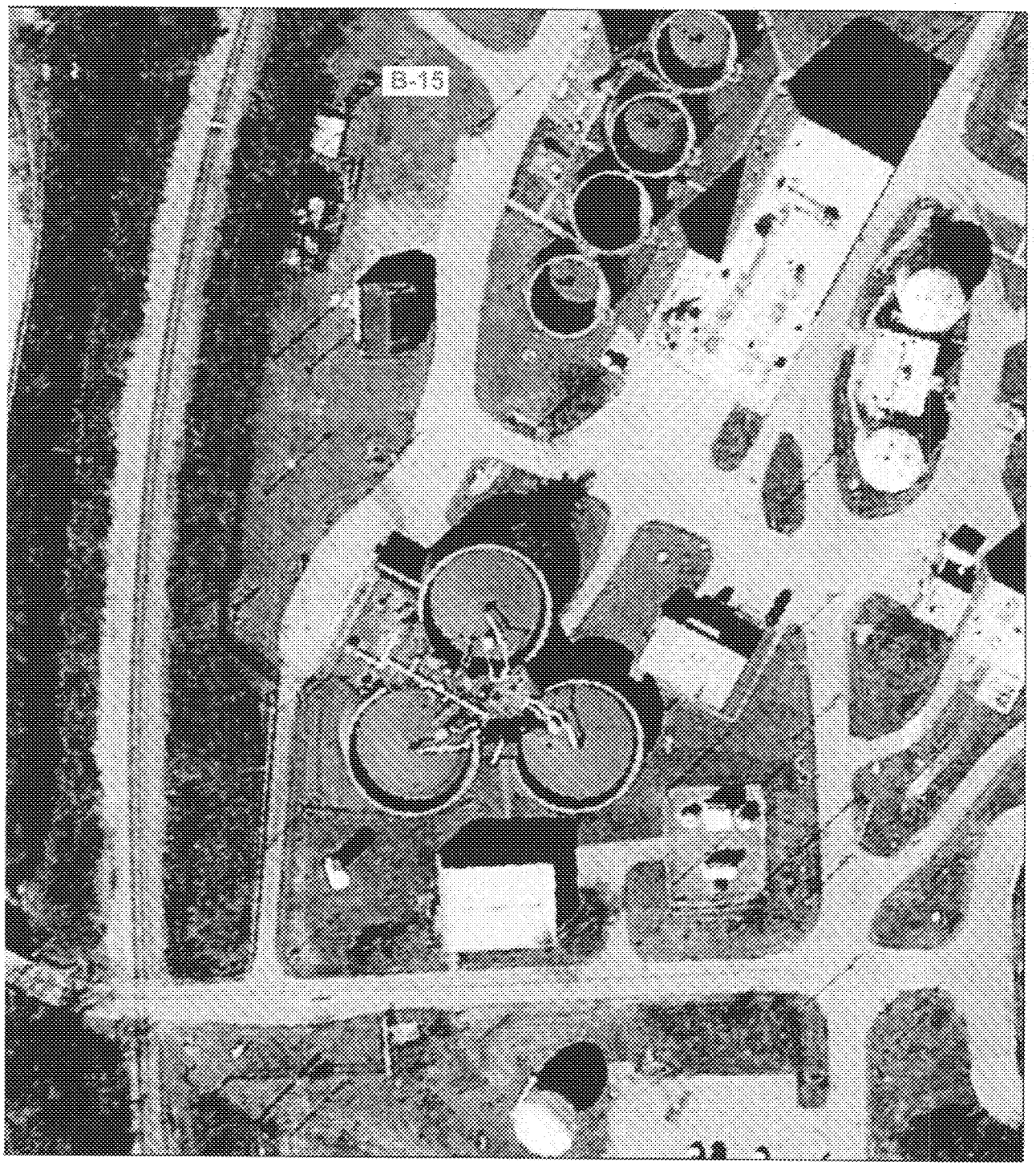
Consulting Services Incorporated of Kentucky
856 Contract Street
Lexington, Kentucky 40505
859.309.6021 Office|888.792.3121 Fax
www.csikentucky.com

TITLE: BORING AND SOUNDING LOCATION PLAN

PROJECT: TOWN BRANCH WWS
LEXINGTON, KENTUCKY

Project No.	Drawn By:
LX132443	JAC
Date: July 24, 2014	Checked By: JTH
Scale: Not To Scale	Drawing No: 1 of 2

Conformance Set



Boring and Sounding Location Plan adapted from Aerial Photography dated October 4, 2011, with further adaptation by CSI personnel.

Top of hole elevations were provided by the project surveyor.

FOR ILLUSTRATION PURPOSES ONLY

LEGEND

B-XXX BORING LOCATIONS

Consulting Services Incorporated of Kentucky
858 Contract Street
Lexington, Kentucky 40505
859.309.6021 Office|888.792.3121 Fax
www.csikentucky.com

TITLE: BORING LOCATION PLAN	Project No: LX132443	Drawn By: JAC
PROJECT: TOWN BRANCH WWS LEXINGTON, KENTUCKY	Date: July 24, 2014	Checked By: JTH
	Scale: Not To Scale	Drawing No: 2 of 2

Consulting Services Incorporated
LEXINGTON | LOUISVILLE | CINCINNATI

Geotechnical Boring Information Sheet

Sample Type Symbols	
Splitspoon (SPT)	
Dynamic Cone Penetrometer (DCP)	
Shelby Tube	
Grab	
Bulk	
Rock Core	

Surface Symbols	
Topsoil	
Asphalt	
Concrete	
Lean Clay	
Fat Clay	
Sandy Clay	
Silt	
Elastic Silt	
Lean Clay to Fat Clay	
Gravelly Clay	
Sandy Silt	
Gravelly Silt	
Sand	
Gravel	
Fill	
Void	
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.

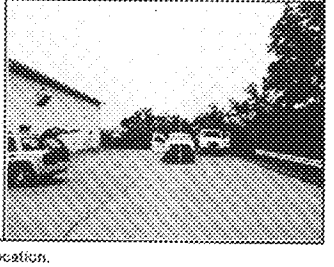
Strata lengths shown on borings represents a rough estimate. Transition may be more abrupt or gradual. Soil borings are representative of that estimated location at that time and are based on recovered samples. Conditions may be different between borings and between sample intervals. Boring information 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.

Consulting Services Inc. of Kentucky — Boring Log

858 Contract Street | Lexington, Kentucky 40505 | 859.309.6021 tel | 888.792.3121 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: LX132443
BORING NUMBER: B-1
LOCATION: Lexington, Kentucky
WEATHER: Cloudy, 60's
DRILL RIG TYPE: Mobile B-34
DRILLER: Geo-Drill
DATE DRILLED: 06-07-2013
DRILLING METHOD: 3 1/4" ID HSA
CSI FIELD REP: D. Homm
CLIENT: GRW Engineers, Inc.

TOP OF GROUND ELEVATION: 920.4

ELEV. (feet)	DEPTH (feet)	Water Level	Strata Description	SOIL TYPE	SAMPLES	SPT Blow Counts	Recovery (in)	RQD (%)	Notes
920.4	0		GRAVEL - 16 inches						Dry upon completion of soil augering
			FILL - sampled as STIFF to VERY STIFF to FIRM, brown clay, with rock fragments, with black oxide nodules, with roots, moist			3-6-6	10		
915.4	5					11-10-9	3		
						8-9-6	5		
910.4	10					8-3-3	6		
905.4	15					4-6-7	1		
			Auger Refusal at 15.6 feet Begin Coring at 15.6 feet			50/0.1	0		No core water return
						Run No.	Recovery (%)	RQD (%)	
						1 (15.6'-25.6')	2	0	Cored through a hard object at 15.6 feet, then encountered additional fill
900.4	20		FILL - no sample recovered						
895.4	25		FILL - no sample recovered			2 (25.6'-35.6')	36	16	
890.4	30		LIMESTONE - gray, with fossils, with clay seams, with shale partings						Photo of Approx. Boring Location
885.4	35		LIMESTONE - gray, with fossils, with clay seams, with shale partings			3 (35.6'-40.6')	98	66	

Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location. Top of hole elevations were provided by the project surveyor.

Conformance Set

Consulting Services Inc. of Kentucky — Boring Log

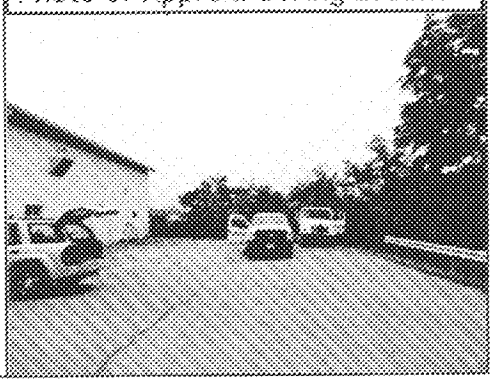
858 Contract Street | Lexington, Kentucky 40505 | 859.309.6621 tel | 859.780.3121 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: LK132443
BORING NUMBER: B-1
LOCATION: Lexington, Kentucky
WEATHER: Cloudy, 60's
DRILL RIG TYPE: Mobile B-34
DRILLER: Geo-Drill
DATE DRILLED: 06-07-2013
DRILLING METHOD: 3 1/4" ID HSA
CSI FIELD REP: D. Homm
CLIENT: GRW Engineers, Inc.

TOP OF GROUND ELEVATION: 920.4

ELEV (feet)	DEPTH (feet)	WATER LEVEL	Strata Description	SOIL TYPE	SAMPLES	SPT Blow Counts	Recovery (in)	RQD (%)	Notes
880.4	40		LIMESTONE - gray, with fossils, with clay seams, with shale partings						
			Coring Terminated at 40.6 feet						
875.4	45								
870.4	50								
865.4	55								
860.4	60								
855.4	65								
850.4	70								
845.4	75								

Photo of Approx. Boring Location



Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location.
Top of hole elevations were provided by the project surveyor.

Consulting Services Inc. of Kentucky — Boring Log

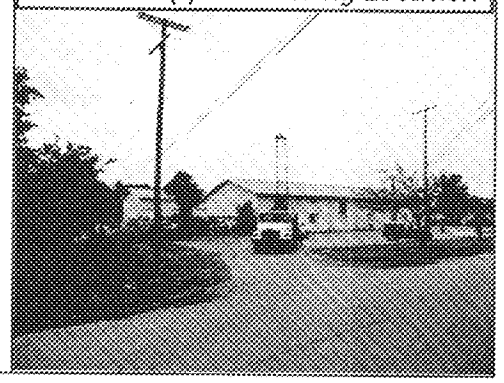
858 Contract Street | Lexington, Kentucky 40505 | 859.309.8021 tel | 888.783.3121 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: LX132443
BORING NUMBER: B-2
LOCATION: Lexington, Kentucky
WEATHER: Sunny, 80's
DRILL RIG TYPE: Mobile B-34
DRILLER: Geo-Drill
DATE DRILLED: 06-05-2013
DRILLING METHOD: 4" OD SFA
CSI FIELD REP: D. Hamm
CLIENT: GRW Engineers, Inc.

TOP OF GROUND ELEVATION: 922.3

ELEV (feet)	DEPTH (feet)	Water Level	Strata Description	SOIL TYPE	SAMPLES	SPT Blow Counts	Recovery (in)	RQD (%)	Notes
922.3	0		ASPHALT - 2-1/2 inches						Dry upon completion of soil augering
			BASE STONE - 6 inches						
			FILL - sampled as VERY STIFF, brown clay, with rock fragments, moist			11-8-9	8		
917.3	5					9-13-7	3		
			FILL - sampled as FIRM, dark gray clay, with rock fragments, with brick fragments, with pieces of wood, with roots, with topsoil, moist			6-4-4	5		
912.3	10		FILL - sampled as FIRM, reddish brown and dark brown clay, with rock fragments, moist			11-5-2	6		
			Auger Refusal at 12.1 feet Begin Coring at 12.1 feet			Run No.	Recovery (%)	RQD (%)	No core water loss
907.3	15					1 (12.1'-20.0')	98	86	
			LIMESTONE - medium gray, with fossils, with clay seams from 12.1 to 14.1 feet						
902.3	20		LIMESTONE - medium gray, with fossils			2 (20.0'-30.0')	95	78	
897.3	25								Qu = 1681 ksf
892.3	30		Coring Terminated at 30.0 feet						
887.3	35								

Photo of Approx. Boring Location



Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location. Top of hole elevations were provided by the project surveyor.

Consulting Services Inc. of Kentucky — Boring Log

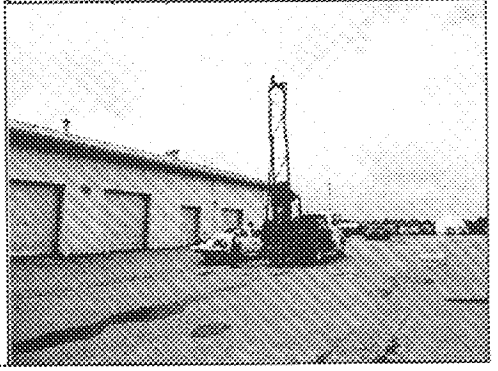
859 Contract Street | Lexington, Kentucky 40505 | 859.309.6021 tel | 888.782.3121 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: LX132443
BORING NUMBER: B-3
LOCATION: Lexington, Kentucky
WEATHER: Cloudy/Rain, 70's
DRILL RIG TYPE: Mobile B-34
DRILLER: Geo-Drill
DATE DRILLED: 06-06-2013
DRILLING METHOD: 3 1/4" ID HSA
CSI FIELD REP: D. Homm
CLIENT: GRW Engineers, Inc.

TOP OF GROUND ELEVATION: 922.1

ELEV. (ft±)	DEPTH (ft)	WATER LEVEL	Strata Description	SOIL TYPE	SAMPLE TYPE	SPT Blow Counts	Recovery (in)	RQD (%)	Notes
922.1	0		ASPHALT - 3 inches BASE STONE - 7 inches FILL - sampled as VERY STIFF to STIFF, brown clay, with rock fragments, with roots, with asphalt fragments, moist			2-50/0.2	6		Dry upon completion of soil augering
917.1	5					4-9-10	2		
						4-7-9	4		
912.1	10					7-4-9	9		
						4-50/0.2	3		
907.1	15		Auger Refusal at 14.7 feet Begin Coring at 14.7 feet FILL - no sample recovered			Run No.	Recovery (%)	RQD (%)	No core water return
						1 (14.7'-24.7')	36	11	Cored through a hard object at 14.7 feet, then encountered additional fill
902.1	20		LIMESTONE - bluish gray, with fossils, with clay seams						
897.1	25		LIMESTONE - gray to dark gray, with fossils, with calcite, with few clay seams, with shale partings			2 (24.7'-34.7')	98	83	
892.1	30								
887.1	35		Coring Terminated at 34.7 feet						

Photo of Approx. Boring Location



Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location.
Top of hole elevations were provided by the project surveyor.

Consulting Services Inc. of Kentucky — Boring Log

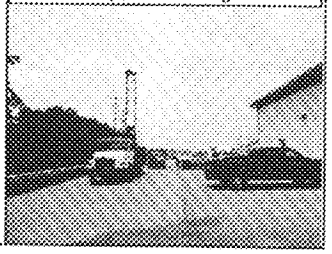
868 Contract Street | Lexington, Kentucky 40505 | 859.309.6021 tel | 859.792.3121 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: LX132443
BORING NUMBER: B-4
LOCATION: Lexington, Kentucky
WEATHER: Cloudy, 70's
DRILL RIG TYPE: Mobile B-34
DRILLER: Geo-Drill
DATE DRILLED: 06-07-2013
DRILLING METHOD: 3 1/4" ID HSA
CSI FIELD REP: D. Homm
CLIENT: GRW Engineers, Inc.

TOP OF GROUND ELEVATION: 921.7

ELEV. (feet)	DEPTH (feet)	Water Level	Strata Description	SOIL TYPE	SAMPLES	SPT Blow Counts	Recovery (%)	RQD (%)	Notes
921.7	0		ASPHALT - 3-1/2 inches BASE STONE - 7 inches FILL - sampled as HARD to VERY STIFF, brown clay, with rock fragments, with asphalt fragments, with reinforcing steel bar pieces, moist			9-23-24	10		Dry upon completion of soil augering
916.7	5					11-8-14	9		
						50/0.2	1		
911.7	10								
						4-3-4	1		
906.7	15		FILL - sampled as FIRM to HARD to FIRM to STIFF, dark gray clay, with topsoil, with pieces of wood, with concrete fragments, with pieces of metal, with brick fragments, with glass, with pieces of plastic, with asphalt			3-2-2	4		
901.7	20					3-20-26	6		
						3-2-3	2		
896.7	25					3-4-6	18		
			LEAN CLAY (CL) - STIFF, brown, with black oxide nodules, moist						
			Auger Refusal at 26.4 feet Begin Coring at 26.4 feet			Run No.	Recovery (%)	RQD (%)	No core water loss
						1 (26.4'-36.4')	63	27	Qu = 1,392 ksf
891.7	30		LIMESTONE - light gray, with clay seams, with fossils						
886.7	35		LIMESTONE - light gray, with shale partings			2 (36.4'-41.4')	100	70	

Photo of Approx. Boring Location



Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location.
Top of hole elevations were provided by the project surveyor.

Consulting Services Inc. of Kentucky — Boring Log

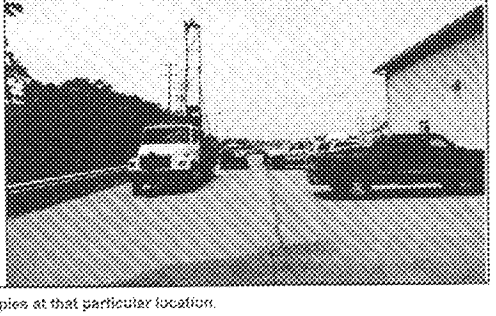
858 Contract Street | Lexington, Kentucky 40505 | 859.309.6021 tel | 888.782.3121 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: LX132443
BORING NUMBER: B-4
LOCATION: Lexington, Kentucky
WEATHER: Cloudy, 70's
DRILL RIG TYPE: Mobile B-34
DRILLER: Geo-Drill
DATE DRILLED: 06-07-2013
DRILLING METHOD: 3 1/4" ID HSA
CSI FIELD REP: D. Homm
CLIENT: GRW Engineers, Inc.

TOP OF GROUND ELEVATION: 921.7

ELEV (MSL)	DEPTH (ft)	GRAPHIC LOG	Strata Description	SOIL TYPE	SAMPLES	SPT Blow Counts	Recovery (in)	RQD (%)	Notes
881.7	40		LIMESTONE - light gray, with shale partings						
			Coring Terminated at 41.4 feet						
876.7	45								
871.7	50								
866.7	55								
861.7	60								
856.7	65								
851.7	70								
846.7	75								

Photo of Approx. Boring Location



Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location.
Top of hole elevations were provided by the project surveyor.

Consulting Services Inc. of Kentucky — Boring Log

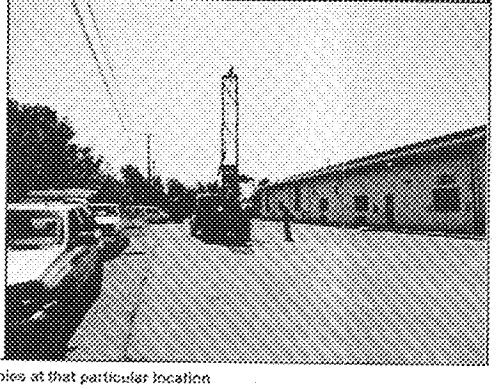
888 Contract Street | Lexington, Kentucky 40505 | 859.309.6021 tel | 859.792.3121 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: LX132443
BORING NUMBER: B-5
LOCATION: Lexington, Kentucky
WEATHER: Sunny, 60's
DRILL RIG TYPE: Mobile B-34
DRILLER: Geo-Drill
DATE DRILLED: 06-05-2013
DRILLING METHOD: 3 1/4" ID HSA
CSI FIELD REP: D. Hamm
CLIENT: GRW Engineers, Inc

TOP OF GROUND ELEVATION: 922.0

ELEV (feet)	DEPTH (feet)	Strata Description	SOIL TYPE	SAMPLES	SPT Blow Counts	Recovery (in)	RQD (%)	Notes
922	0	ASPHALT - 4 inches BASE STONE - 6 inches FILL - sampled as STIFF, dark brown clay, with rock fragments, with asphalt fragments, moist Boulder from 2.4 feet to 4.0 feet			9-60/0.4	6		Dry upon completion of soil augering
917	5	FILL - sampled as STIFF to VERY STIFF, dark brown clay, with rock fragments, with asphalt fragments, with pieces of glass, with pieces of wood, with roots, moist			6-7-7 5-7-10 3-4-8 3-6-7	16 10 15 8		
912	10	LEAN CLAY (CL) - STIFF, reddish brown, with black oxide nodules, with rock fragments, with chert fragments, moist						
907	15				3-3-6	2		
		Auger Refusal at 16.4 feet Begin Coring at 16.4 feet			Run No.	Recovery (%)	RQD (%)	No core water loss
902	20	LIMESTONE - bluish gray, with clay seams in upper 2 feet, with calcite, with fossils			1 (16.4'-20.0') 2 (20.0'-30.0')	88 100	47 76	
897	25	LIMESTONE - bluish gray, with calcite seams, with fossils						
892	30	Coring Terminated at 30.0 feet						
887	35							

Photo of Approx. Boring Location



Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location. Top of hole elevations were provided by the project surveyor.

Consulting Services Inc. of Kentucky — Boring Log

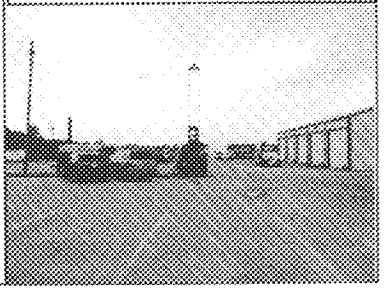
858 Contract Street | Lexington, Kentucky 40505 | 859.309.6021 tel | 888.792.3121 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: LX132443
BORING NUMBER: B-6
LOCATION: Lexington, Kentucky
WEATHER: Cloudy, 70's
DRILL RIG TYPE: Mobile B-34
DRILLER: Geo-Drill
DATE DRILLED: 06-06-2013
DRILLING METHOD: 3 1/4" ID HSA
CSI FIELD REP: D. Hamm
CLIENT: GRW Engineers, Inc.

TOP OF GROUND ELEVATION: 921.3

ELEV. (feet)	DEPTH (Feet)	Water Level	Strata Description	SOIL TYPE	SAMPLES	SPT Blow Counts	Recovery (in)	RQD (%)	Notes
921.3	0		TOPSOIL - 2 inches			6-6-5	18		Dry upon completion of soil augering
			FILL - sampled as STIFF to VERY STIFF, dark brown clay, with rock fragments, with coal fragments, with pieces of wood, with rocks, moist			13-11-12	12		
916.3	5		FILL - sampled as STIFF to HARD, brown clay, with rock fragments, moist			7-8-5	8		
						20-17-19	8		
						16-50/0.1	2		
911.3	10		Auger Refusal at 9.6 feet Begin Coring at 9.6 feet			Run No.	Recovery (%)	RQD (%)	No core water return
						1 (9.6'-19.6')	22	5	Cored through a hard object at 9.6 feet, then encountered additional fill
			FILL - no sample recovered						
906.3	15								
901.3	20		LIMESTONE - dark gray, with clay seams, with fossils			2 (19.6'-29.6')	81	43	
			LIMESTONE - dark gray, with clay seams, with fossils						
			Open void from 23.4 to 23.6 feet						
896.3	25		LIMESTONE - dark gray, with clay seams, with fossils						
891.3	30		LIMESTONE - medium to dark gray, with clay seams			3 (29.6'-34.6')	93	75	
886.3	35		Coring Terminated at 34.6 feet						

Photo of Approx. Boring Location



Please note, Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location.
Top of hole elevations were provided by the project surveyor.

Conformance Set

Consulting Services Inc. of Kentucky — Boring Log

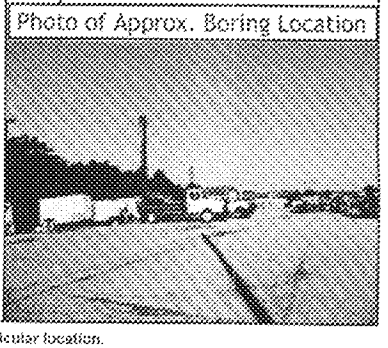
558 Codrell Street | Lexington, Kentucky 40505 | 859.368.6021 tel | 888.792.3121 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: LX132443
BORING NUMBER: B-7
LOCATION: Lexington, Kentucky
WEATHER: Sunny, 70's
DRILL RIG TYPE: Mobile B-80
DRILLER: Geo-Drill
DATE DRILLED: 06-11-2013
DRILLING METHOD: 4" OD SFA
CSI FIELD REP: D. Hamm
CLIENT: GRW Engineers, Inc.

TOP OF GROUND ELEVATION: 919.7

ELEV (feet)	DEPTH (feet)	Water Level	Strata Description	SOIL TYPE	SAMPLE NO.	SPT Blow Counts	Recovery (in)	RQD (%)	Notes
919.7	0		ASPHALT - 1 inches						Dry upon completion of soil augering
			BASE STONE- 4 inches						
			FILL - sampled as HARD to FIRM, brown and dark brown clay, with rock fragments, with topsoil, with roots, with pieces of wire, moist			3-4-50/0.1	12		
914.7	5					50/0.2	2		
			Encountered tree branch approximately 12 inch diameter at 7 feet			22-14-20	14		
909.7	10					10-22-50/0.2	11		
904.7	15					3-3-4	15		
			FILL - sampled as FIRM to STIFF clay, dark gray and brown, with roots, with topsoil, with pieces of metal, with pieces of wire, moist			3-3-4	18		
899.7	20					4-5-5	18		
			LEAN CLAY (CL) - STIFF, reddish brown clay, with black oxide nodules, moist			5-7-8	16		
894.7	25		Weathered rock			Run No.	Recovery (%)	RQD (%)	No core water return
			Auger Refusal at 25.7 feet Begin Coring at 25.7 feet						
889.7	30		LIMESTONE - dark gray, with fossils, with shale partings, with clay seams in top 3 feet			1 (25.7'-35.7')	95	52	
884.7	35		Coring Terminated at 35.7 feet						

Photo of Approx. Boring Location



Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location. Top of hole elevations were provided by the project surveyor.

Conformance Set

Consulting Services Inc. of Kentucky — Boring Log

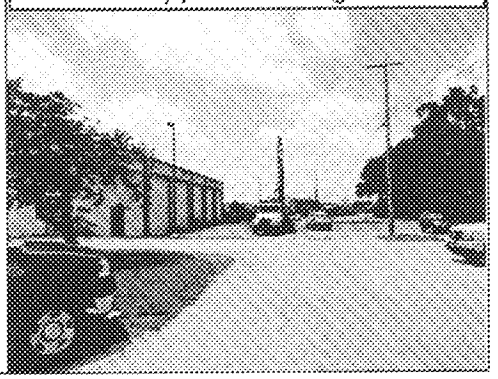
856 Corporate Street | Lexington, Kentucky 40505 | 859.309.5021 tel | 888.782.3121 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: LX132443
BORING NUMBER: B-8
LOCATION: Lexington, Kentucky
WEATHER: Sunny, 80's
DRILL RIG TYPE: Mobile B-80
DRILLER: Geo-Drill
DATE DRILLED: 06-11-2013
DRILLING METHOD: 4" OD SFA
CSI FIELD REP: D. Hamm
CLIENT: GRW Engineers, Inc.

TOP OF GROUND ELEVATION: 919.4

ELEV. (feet)	DEPTH (feet)	WATER LEVEL	Strata Description	SOIL TYPE	SAMPLES	SPT Blow Counts	Recovery (in)	RQD (%)	Notes
919.4	0		GRAVEL - 8 inches						Dry upon completion of soil augering
			FILL - sampled as VERY STIFF to STIFF, brown and dark gray clay, with rock fragments, with brick fragments, with pieces of wood, moist			11-50/0.1	2		
						8-50/.04	1		
914.4	5					12-17-9	2		
						5-5-5	15		
			LEAN CLAY (CL) - STIFF, reddish brown, with black oxide nodules, moist				20		Qu = 3,328 psf
909.4	10								
						50/0.1	1		
904.4	15		Weathered rock			Run No.	Recovery (%)	RQD (%)	Core water loss at 15.4 feet
			Auger Refusal at 14.5 feet Begin Coring at 14.5 feet			1 (14.5'-20.0')	80	36	
			LIMESTONE - gray, with fossils, with clay seams in top 3 feet						
899.4	20		LIMESTONE - bluish gray, with fossils, with shale partings, with clay seams			2 (20.0'-30.0')	100	72	Qu = 1,380 ksf
894.4	25								
889.4	30		Coring Terminated at 30.0 feet						
884.4	35								

Photo of Approx. Boring Location



Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location.
Top of hole elevations were provided by the project surveyor.

Conformance Set

Consulting Services Inc. of Kentucky — Boring Log

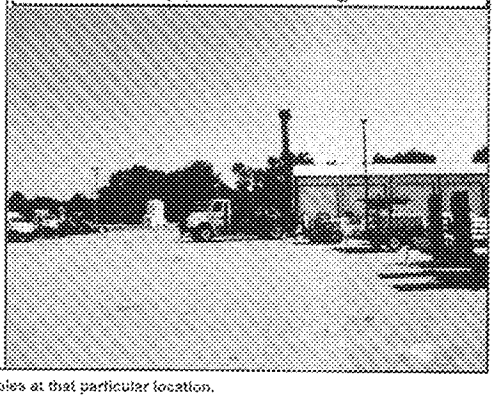
888 Contract Street | Lexington, Kentucky 40508 | 859.309.8021 tel | 866.792.3121 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: LX132443
BORING NUMBER: B-9
LOCATION: Lexington, Kentucky
WEATHER: Sunny, 80's
DRILL RIG TYPE: Mobile B-80
DRILLER: Geo-Drill
DATE DRILLED: 06-11-2013
DRILLING METHOD: 4" OD SFA
CSI FIELD REP: D. Homm
CLIENT: GRW Engineers, Inc.

TOP OF GROUND ELEVATION: 919.3

ELEV. (feet)	DEPTH (feet)	WATER LEVEL	Strata Description	SOIL TYPE	SAMPLES	SPT Blow Counts	Recovery (in)	RQD (%)	Notes
919.3	0		GRAVEL - 6 inches						Dry upon completion of soil augering
			FILL - sampled as VERY STIFF to FIRM to STIFF to HARD, brown and black clay, with rock fragments, with pieces of wood, with topsoil, moist			6-10-11	8		
914.3	5					3-3-5	5		
						10-50/0.4	3		
909.3	10					2-4-50/0.1	2		
						5-6-7	6		
						4-10-36	3		
904.3	15								
			LEAN CLAY (CL) - reddish brown, with black oxide nodules, with rock fragments, moist			Shelby Tube	19		No Suitable Sample
899.3	20								
			Auger Refusal at 22.2 feet Begin Coring at 22.2 feet			Run No.	Recovery (%)	RQD (%)	No core water loss
894.3	25					1 (22.2'-32.2')	97	76	Qu = 1,535 ksf
			LIMESTONE - gray, with fossils, with shale partings, with clay seams in top 5 feet						
889.3	30								
			Coring Terminated at 32.2 feet						
884.3	35								

Photo of Approx. Boring Location



Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location. Top of hole elevations were provided by the project surveyor.

Consulting Services Inc. of Kentucky

Boring Log

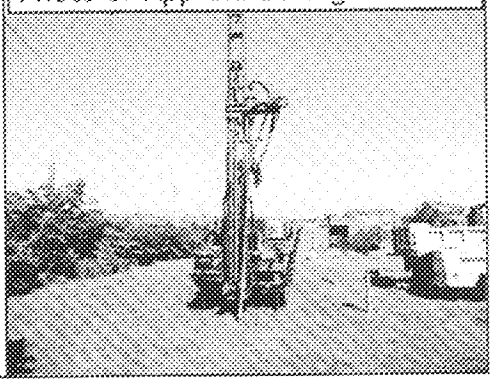
859 Contract Street | Lexington, Kentucky 40505 | 859.309.6021 tel | 888.782.3121 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: LX132443
BORING NUMBER: B-10
LOCATION: Lexington, Kentucky
WEATHER: Sunny, 90's
DRILL RIG TYPE: Mobile B-80
DRILLER: Geo-Drill
DATE DRILLED: 06-12-2013
DRILLING METHOD: 4" OD SFA
CSI FIELD REP: B. Horrm
CLIENT: GRW Engineers, Inc.

TOP OF GROUND ELEVATION: 915.9

ELEV. (feet)	DEPTH (feet)	Water Level	Strata Description	SOIL TYPE	SAMPLES	SPT Blow Counts	Recovery (in)	RQD (%)	Notes
915.9	0		TOPSOIL - 3 inches FILL - sampled as HARD reddish brown clay, with rock fragments, with reinforced concrete fragments, with boulders, moist			6-35-25 25-50/0.3	10 5		Dry upon completion of soil augering Offset boring B-10A 10 feet toward the west
910.9	5		Auger Refusal at 5.0 feet						
905.9	10								
900.9	15								
895.9	20								
890.9	25								
885.9	30								
880.9	35								

Photo of Approx. Boring Location



Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location.
Top of hole elevations were provided by the project surveyor.

Consulting Services Inc. of Kentucky — Boring Log

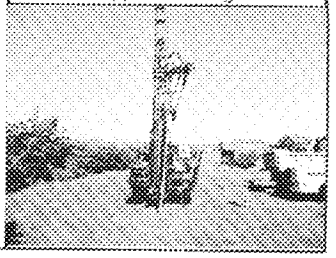
858 Corvant Street | Lexington, Kentucky 40505 | 859.309.6321 tel | 888.792.3121 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: LX132443
BORING NUMBER: B-10A
LOCATION: Lexington, Kentucky
WEATHER: Sunny, 90's
DRILL RIG TYPE: Mobile B-80
DRILLER: Geo-Drill
DATE DRILLED: 06-12-2013
DRILLING METHOD: 4" OD SFA
CSI FIELD REP: D. Homm
CLIENT: GRW Engineers, Inc.

TOP OF GROUND ELEVATION: 915.9

ELEV (feet)	DEPTH (feet)	Water Level	Strata Description	SOIL TYPE	SAMPLES	SPT Blow Counts	Recovery (in)	RQD (%)	Notes
915.9	0		FILL - sampled as brown clay, with rock fragments, with concrete fragments (sampled at B-10)						Dry upon completion of soil augering
						Run No.	Recovery (%)	RQD (%)	No core water return
			Auger Refusal at 1.4 feet Begin Coring at 1.4 feet			1 (1.4'-10.0')	16	0	Cored through a hard object at 1.4 feet, then encountered additional fill
910.9	5		FILL - no sample recovered						
905.9	10		FILL - no sample recovered			2 (10.0'-20.0')	21	0	
900.9	15								
895.9	20					3 (20.0'-30.0')	52	40	
890.9	25		LIMESTONE - light gray with fossils, with dark gray shale partings, with calcite, with clay seams						
885.9	30					4 (30.0'-35.0')	98	92	
880.9	35		Coring Terminated at 35.0 feet						

Photo of Approx. Boring Location



Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location.
Offset from B-10 by 10 feet

Consulting Services Inc. of Kentucky — Boring Log

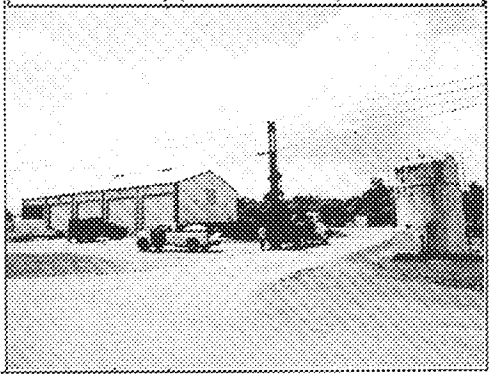
868 Contract Street | Lexington, Kentucky 40508 | 859.309.8021 tel | 888.792.3121 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: LX132443
BORING NUMBER: B-11
LOCATION: Lexington, Kentucky
WEATHER: Cloudy, 70's
DRILL RIG TYPE: Mobile B-60
DRILLER: Geo-Drill
DATE DRILLED: 06-10-2013
DRILLING METHOD: 4" OD SFA
CSI FIELD REP: D. Hamm
CLIENT: GRW Engineers, Inc.

TOP OF GROUND ELEVATION: 917.2

ELEV. (feet)	DEPTH (feet)	WATER LEVEL	Strata Description	SOIL TYPE	SAMPLES	SPT Blow Counts	Recovery (in)	RQD (%)	Notes
917.2	0		GRAVEL - 10 inches						Dry upon completion of soil augering
			FILL - sampled as VERY STIFF, brown clay, with rock fragments, with asphalt fragments, moist			9-10-17	7		
912.2	5		FILL - sampled as VERY STIFF, brown and dark gray clay, with rock fragments, with asphalt fragments, with pieces of wood, moist			5-15-9	10		
			LEAN CLAY (CL) - STIFF, reddish brown, with black oxide nodules, with rock fragments, moist			6-7-7	18		
907.2	10		Weathered rock			5-11-50/0.4	13		
			Auger Refusal at 11.0 feet Begin Coring at 11.0 feet			Run No.	Recovery (%)	RQD (%)	No core water loss
902.2	15		LIMESTONE - light to dark gray, with clay seams in top 2-1/2 feet			1 (11.0'-21.0')	98	83	
897.2	20								
			LIMESTONE - bluish gray, with calcite, with dark gray shale partings			2 (21.0'-31.0')	96	76	
892.2	25								No water return at 25.0 feet
887.2	30								
			Coring Terminated at 31.0 feet						
882.2	35								

Photo of Approx. Boring Location



Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location.
Top of hole elevations were provided by the project surveyor.

Consulting Services Inc. of Kentucky — Boring Log

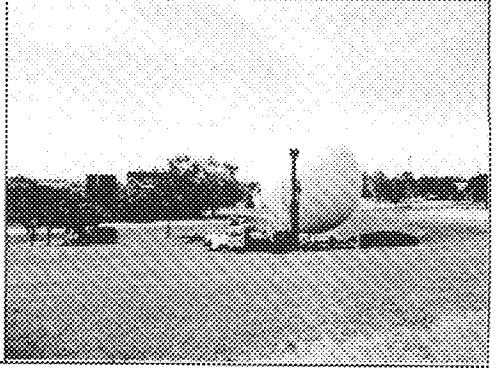
898 Corporate Street | Lexington, Kentucky 40509 | 859.309.6021 tel | 859.792.3121 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: LX132443
BORING NUMBER: B-12
LOCATION: Lexington, Kentucky
WEATHER: Sunny, 90's
DRILL RIG TYPE: Mobile B-80
DRILLER: Geo-Drill
DATE DRILLED: 06-12-2013
DRILLING METHOD: 4" OD SFA
CSI FIELD REP: D. Hornm
CLIENT: GRW Engineers, Inc.

TOP OF GROUND ELEVATION: 902.4

ELEV (feet)	DEPTH (feet)	WATER LOSS	Strata Description	SOIL TYPE	SAMPLES	SPT Blow Counts	Recovery (in)	RQD (%)	Notes
902.4	0		TOPSOIL - 4 inches			3-7-7	8		Dry upon completion of soil augering
			FILL - sampled as STIFF, brown clay, with rock fragments, moist			50/0.4	3		
			LEAN CLAY (CL) - FIRM, brown, with silt, with sand, moist			1-3-4	18		
897.4	5					Shelby Tube	15		No Suitable Sample
			Auger Refusal at 7.3 feet Begin Coring at 7.3 feet			Run No.	Recovery (%)	RQD (%)	No core water loss
892.4	10		LIMESTONE - gray, with fossils, with shale partings, with clay seams			2 (10.0'-20.0') 1 (7.3'-10.0')	95 94	80 16	
887.4	15								
882.4	20		LIMESTONE - dark gray, with fossils, with shale partings			3 (20.0'-30.0')	99	84	
877.4	25								
872.4	30		Coring Terminated at 30.0 feet						
867.4	35								

Photo of Approx. Boring Location



Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location. Top of hole elevations were provided by the project surveyor.

Consulting Services Inc. of Kentucky — Boring Log

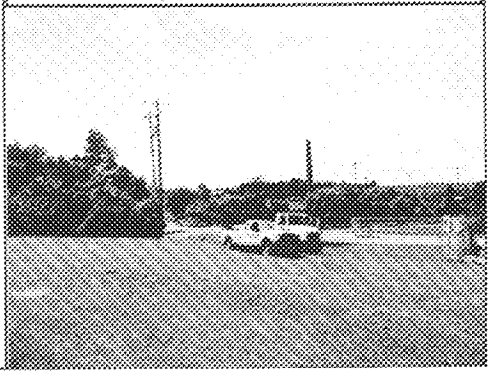
858 Contract Street | Lexington, Kentucky 40505 | 859.309.6021 tel | 888.792.3121 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: LX132443
BORING NUMBER: B-13
LOCATION: Lexington, Kentucky
WEATHER: Sunny, 90's
DRILL RIG TYPE: Mobile B-80
DRILLER: Geo-Drill
DATE DRILLED: 06-12-2013
DRILLING METHOD: 4" OD SFA
CSI FIELD REP: D. Homm
CLIENT: GRW Engineers, Inc.

TOP OF GROUND ELEVATION: 907.1

ELEV (feet)	DEPTH (feet)	WATER LEVEL	Strata Description	SOIL TYPE	SAMPLES	SPT Blow Counts	Recovery (in)	RQD (%)	Notes
907.1	0		TOPSOIL - 5 inches			2-27-18	6		
			FILL - sampled as HARD to VERY STIFF to SOFT, reddish brown clay, with rock fragments, with fine roots, with topsoil, with pieces of wood, with pieces of plastic, with pieces of glass, with brick fragments, with asphalt fragments, moist			10-16-12	14		
902.1	5		Encountered boulders from 3 to 5 feet			5-6-10	18		
						5-7-12	18		
897.1	10					2-6-4	15		
						2-2-1	16		
892.1	15	▽	LEAN CLAY (CL) - STIFF, light brown, with sand, with silt, wet			3-4-8	18		Encountered water at 14.2 feet
			Weathered rock			Run No.	Recovery (%)	RQD (%)	No core water loss
			Auger Refusal at 16.7 feet						Qu = 684 ksf
			Begin Coring at 16.7 feet			1 (16.7'-20.0')	97	49	
887.1	20					2 (20.0'-30.0')	99	77	
			LIMESTONE - bluish gray, with shale partings, with fossils, with clay seams						
882.1	25								
877.1	30		Coring Terminated at 30.0 feet						
872.1	35								

Photo of Approx. Boring Location



Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location.
Top of hole elevations were provided by the project surveyor

Consulting Services Inc. of Kentucky — Boring Log

858 Corporate Street | Lexington, Kentucky 40505 | 859.309.8921 tel | 888.782.3121 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: LX132443
BORING NUMBER: B-14
LOCATION: Lexington, Kentucky
WEATHER: Sunny, 80's
DRILL RIG TYPE: Mobile B-80
DRILLER: Geo-Drill
DATE DRILLED: 06-12-2013
DRILLING METHOD: 4" OD SFA
OSI FIELD REP: D. Homm
CLIENT: GRW Engineers, Inc.

TOP OF GROUND ELEVATION: 912.3

ELEV (feet)	DEPTH (feet)	Water Level	Strata Description	SOIL TYPE	SAMPLES	SPT Blow Counts	Recovery (in)	RQD (%)	Notes
912.3	0		TOPSOIL - 1 inch			7-6-8	6		Dry upon completion of soil augering
			FILL - sampled as VERY STIFF, brown and dark gray clay, with rock fragments, with asphalt fragments, moist			50/0.4	1		
907.3	5		LEAN CLAY (CL) - VERY STIFF, reddish brown, with black oxide nodules, with chert fragments, moist			6-8-11	15		
							14		Qu = 1,489 psf
			Weathered rock			Run No.	Recovery (%)	RQD (%)	No core water loss
			Auger Refusal at 7.1 feet Begin Coring at 7.1 feet						
902.3	10		LIMESTONE - dark gray, with fossils, with clay seams			1 (7.1'-10.0') 2 (10.0'-20.0')	97 99	57 84	
897.3	15								Qu = 684 ksf
			LIMESTONE - gray, with fossils, with shale partings						
892.3	20					3 (20.0'-30.0')	100	79	
887.3	25								
882.3	30		Coring Terminated at 30.0 feet						
877.3	35								

Photo of Approx. Boring Location

Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location. Top of hole elevations were provided by the project surveyor.

Conformance Set

Consulting Services Inc. of Kentucky — Boring Log

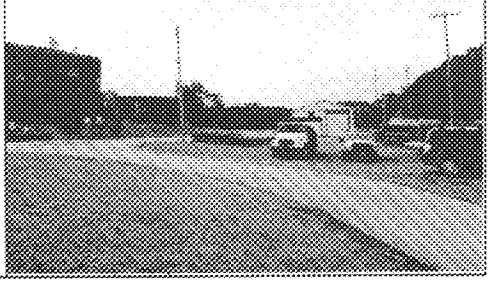
859 Corporate Street | Lexington, Kentucky 40508 | 859.368.5021 tel | 888.782.3121 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: LX132443
BORING NUMBER: B-15
LOCATION: Lexington, Kentucky
WEATHER: Cloudy, 70's
DRILL RIG TYPE: Mobile B-34
DRILLER: Geo-Drill
DATE DRILLED: 06-13-2013
DRILLING METHOD: 4" OD SFA
CSI FIELD REP: D. Homm
CLIENT: GRW Engineers, Inc.

TOP OF GROUND ELEVATION: 889.4

ELEV. (feet)	DEPTH (feet)	Water Level	Strata Description	SOIL TYPE	SAMPLES	SPT Blow Counts	Recovery (in)	RQD (%)	Notes
889.4	0		TOPSOIL - 1 inch			12-13-12	16		Dry upon completion of soil augering
			FILL - sampled as VERY STIFF, brown clay, with rock fragments, with roots, moist			12-50/0.4	6		Offset borine B-15A 5 feet toward the east due to shallow refusal
884.4	5		LEAN CLAY (CL) - VERY STIFF, dark brown, wtih black oxide nodules, with rock fragments, moist						
			Weathered rock						
			Auger Refusal at 3.3 feet						
879.4	10								
874.4	15								
869.4	20								
864.4	25								
859.4	30								
854.4	35								

Photo of Approx. Boring Location



Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location. Top of hole elevations were provided by the project surveyor.

Consulting Services Inc. of Kentucky — Boring Log

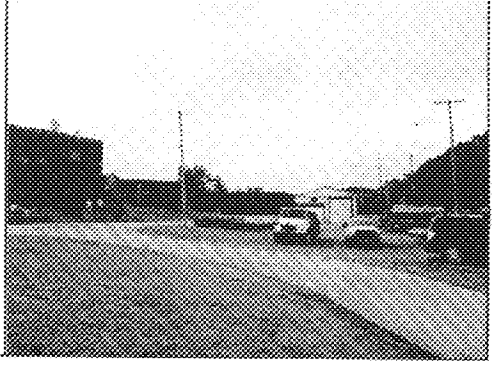
858 Corporate Street | Lexington, Kentucky 40505 | 859.309.8021 tel | 888.782.3121 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: LX132443
BORING NUMBER: B-15A
LOCATION: Lexington, Kentucky
WEATHER: Cloudy, 70's
DRILL RIG TYPE: Mobile B-34
DRILLER: Geo-Drill
DATE DRILLED: 06-13-2013
DRILLING METHOD: 4" OD SFA
CSI FIELD REP: D. Honnn
CLIENT: GRW Engineers, Inc.

TOP OF GROUND ELEVATION: 889.4

ELEV. (feet)	DEPTH (feet)	Water Level	Strata Description	SOIL TYPE	SAMPLES	SPT Blow Counts	Recovery (in)	RQD (%)	Notes
889.4	0		Sounding - no samples taken						Offset due to shallow auger refusal at boring B-15
			Auger Refusal at 3.3 feet Begin Coring at 3.3 feet			Run No.	Recovery (%)	RQD (%)	No core water loss
884.4	5		LIMESTONE - light gray, with shale partings, with clay seams			1 (3.3'-8.3')	95	42	
			Coring Terminated at 8.3 feet						
879.4	10								
874.4	15								
869.4	20								
864.4	25								
859.4	30								
854.4	35								

Photo of Approx. Boring Location



Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location. Top of hole elevations were provided by the project surveyor.

Consulting Services Inc. of Kentucky — Boring Log

856 Contract Street | Lexington, Kentucky 40505 | 859.309.6021 tel | 859.792.3121 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: LX132443
BORING NUMBER: S-1
LOCATION: Lexington, Kentucky
WEATHER: Sunny, 80's
DRILL RIG TYPE: Mobile B-34
DRILLER: Geo-Drill
DATE DRILLED: 06-07-2013
DRILLING METHOD: 3 1/4" ID HSA
CSI FIELD REP: D. Homm
CLIENT: GRW Engineers, Inc

TOP OF GROUND ELEVATION: 921.6

ELEV (feet)	DEPTH (feet)	Graphic Log	Strata Description	SOIL TYPE	SAMPLES	SPT Blow Counts	Recovery (in)	RQD (%)	Notes
921.6	0		Sounding - no recovered sample						Dry upon completion of soil augering
916.6	5								
911.6	10								
906.6	15								
			Auger Refusal at 18.3 feet						
901.6	20								
896.6	25								
891.6	30								
886.6	35								

Photo of Approx. Sounding Location

Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location.
Top of hole elevations were provided by the project surveyor.

Conformance Set

Consulting Services Inc. of Kentucky — Boring Log

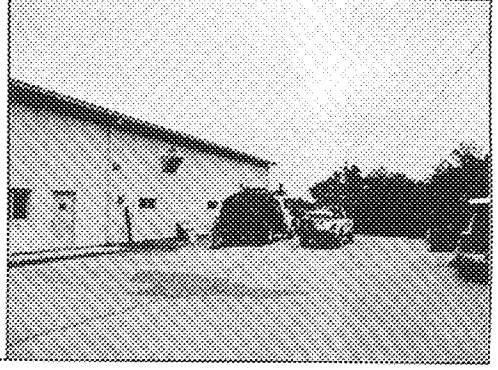
868 Contract Street | Lexington, Kentucky 40505 | 859.309.6021 tel | 888.792.3121 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: LX132443
BORING NUMBER: S-2
LOCATION: Lexington, Kentucky
WEATHER: Sunny, 80's
DRILL RIG TYPE: Mobile B-34
DRILLER: Geo-Drill
DATE DRILLED: 06-07-2013
DRILLING METHOD: 3 1/4" ID HSA
CSI FIELD REP: D. Homm
CLIENT: GRW Engineers, Inc.

TOP OF GROUND ELEVATION: 921.8

ELEV (feet)	DEPTH (feet)	Water Level	Strata Description	SOIL TYPE	SAMPLES	SPT Blow Counts	Recovery (in)	RQD (%)	Notes
921.8	0		Sounding - no recovered sample						Dry upon completion of soil augering
916.8	5								
911.8	10								
906.8	15								
901.8	20								
896.8	25								
891.8	30		Auger Refusal at 28.3 feet						
886.8	35								

Photo of Approx. Sounding Location



Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples of that particular location. Top of hole elevations were provided by the project surveyor.

Consulting Services Inc. of Kentucky — Boring Log

856 Corporate Street | Lexington, Kentucky 40505 | 859.309.6021 tel | 866.742.3121 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: LX132443
BORING NUMBER: S-3
LOCATION: Lexington, Kentucky
WEATHER: Sunny, 80's
DRILL RIG TYPE: Mobile B-34
DRILLER: Geo-Drill
DATE DRILLED: 06-05-2013
DRILLING METHOD: 4" OD SFA
CSI FIELD REP: D. Hamm
CLIENT: GRW Engineers, Inc.

TOP OF GROUND ELEVATION: 922.3

ELEV. (feet)	DEPTH (feet)	Water Level	Strata Description	SOIL TYPE	SAMPLES	SPT Blow Counts	Recovery (in)	RQD (%)	Notes
922.3	0		ASPHALT - 3 inches BASE STONE - 5 inches Sounding - no recovered samples						Dry upon completion of soil augering
917.3	5		Auger Refusal at 4.0 feet						Performed offset sounding S-3 10 feet toward the east
912.3	10								
907.3	15								
902.3	20								
897.3	25								
892.3	30								
887.3	35								

Photo of Approx. Sounding Location

Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location. Top of hole elevations were provided by the project surveyor.

Consulting Services Inc. of Kentucky — Boring Log

859 Contract Street | Lexington, Kentucky 40508 | 859.368.6021 tel | 888.792.3121 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: LX132443
BORING NUMBER: S-3A
LOCATION: Lexington, Kentucky
WEATHER: Sunny, 80's
DRILL RIG TYPE: Mobile B-34
DRILLER: Geo-Drill
DATE DRILLED: 06-05-2013
DRILLING METHOD: 4" OD SFA
CSI FIELD REP: D. Homm
CLIENT: GRW Engineers, Inc.

TOP OF GROUND ELEVATION: 922.3

ELEV. (feet)	DEPTH (feet)	Water Level	Strata Description	SOIL TYPE	SAMPLES	SPT Blow Counts	Recovery (in)	RQD (%)	Notes
922.3	0		ASPHALT - 3 inches						Dry upon completion of soil augering
			BASE STONE - 4 inches						
			FILL - sampled as HARD, brown clay, with rock fragments, with black oxide nodules, moist			9-15-21	10		
						9-50/0.4	8		Sampling performed at the request of Third Rock Consultants
917.3	5								
			LEAN CLAY (CL) - STIFF, reddish brown, with black oxide nodules, with rock fragments, moist						
912.3	10					4-7-7	16		
			LEAN CLAY (CL) - FIRM, light brown, with black oxide nodules, with rock fragments			3-3-5	0		
						4-50/0.4	6		
907.3	15		Weathered rock						
			Auger Refusal at 14.3 feet						
902.3	20								
897.3	25								
892.3	30								
887.3	35								

Photo of Approx. Sounding Location

Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location. Top of hole elevations were provided by the project surveyor.

Consulting Services Inc. of Kentucky — Boring Log

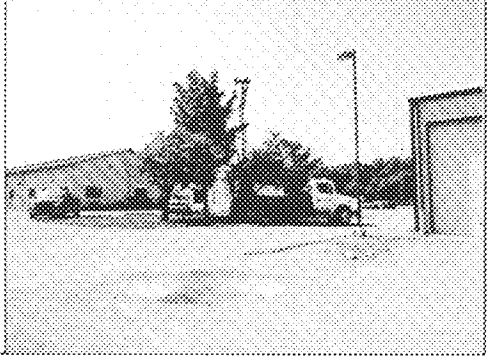
838 Contract Street | Lexington, Kentucky 40505 | 859.309.6021 tel | 866.792.3121 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: LX132443
BORING NUMBER: S-6
LOCATION: Lexington, Kentucky
WEATHER: Sunny, 80's
DRILL RIG TYPE: Mobile B-34
DRILLER: Geo-Drill
DATE DRILLED: 06-07-2013
DRILLING METHOD: 3 1/4" ID HSA
CSI FIELD REP: D. Hamm
CLIENT: GRW Engineers, Inc.

TOP OF GROUND ELEVATION: 920.9

ELEV. (feet)	DEPTH (feet)	Strata Description	SOIL TYPE	% RQD / REC	SPT Blow Counts	Recovery (in)	POD (%)	Notes
920.9	0	TOPSOIL - 1 inch			50/0.4	4		Dry upon completion of soil augering
		FILL - sampled as VERY STIFF to FIRM, light brown clay, with rock fragments, with roots, moist			6-9-12	3		
					4-4-4	4		Sampling performed at the request of Third Rock Consultants
915.9	5				3-2-5	5		
		FILL - sampled as FIRM to VERY STIFF, dark brown clay, with black oxide nodules, with rock fragments, with petroleum odor, moist			6-11-12	10		
					50/0.3	0		
					6-6-8	13		
910.9	10	FILL - topsoil						
		LEAN CLAY (CL) - STIFF, reddish brown, with black oxide nodules			4-6-8	14		
		Auger Refusal at 13.8 feet						
905.9	15							
900.9	20							
895.9	25							
890.9	30							
885.9	35							

Photo of Approx. Sounding Location



Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location. Top of hole elevations were provided by the project surveyor.

Consulting Services Inc. of Kentucky — Boring Log

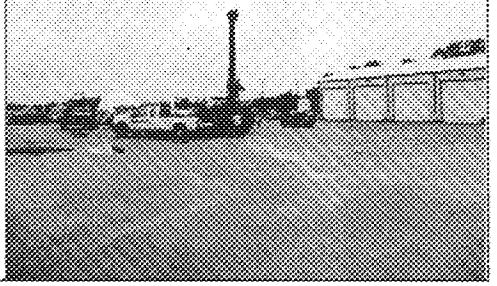
858 Contract Street | Lexington, Kentucky 40505 | 859.309.6021 tel | 859.792.3131 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: LX132443
BORING NUMBER: S-7
LOCATION: Lexington, Kentucky
WEATHER: Cloudy/Rain, 60's
DRILL RIG TYPE: Mobile B-60
DRILLER: Geo-Drill
DATE DRILLED: 06-10-2013
DRILLING METHOD: 4" OD SFA
CSI FIELD REP: D. Homm
CLIENT: GRW Engineers, Inc

TOP OF GROUND ELEVATION: 919.9

ELEV. (feet)	DEPTH (feet)	WATER LEVEL	Strata Description	SOIL TYPE	SAMPLES	SPT Blow Counts	Recovery (in)	RQD (%)	Notes
919.9	0		Sounding - no recovered sample						Dry upon completion of soil augering
914.9	5								
909.9	10								
904.9	15								
899.9	20								
			Weathered rock						
894.9	25		Auger Refusal at 23.9						
889.9	30								
884.9	35								

Photo of Approx. Sounding Location



Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location.
Top of hole elevations were provided by the project surveyor

Consulting Services Inc. of Kentucky — Boring Log

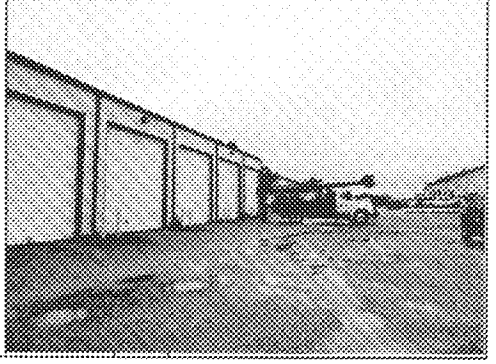
858 Centract Street | Lexington, Kentucky 40505 | 859.309.6621 tel | 859.792.3121 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: LX132443
BORING NUMBER: S-8
LOCATION: Lexington, Kentucky
WEATHER: Cloudy/Rain, 60's
DRILL RIG TYPE: Mobile B-80
DRILLER: Geo-Drill
DATE DRILLED: 06-10-2013
DRILLING METHOD: 4" OD SFA
CSI FIELD REP: D. Homm
CLIENT: GRW Engineers, Inc.

TOP OF GROUND ELEVATION: 920.2

ELEV (feet)	DEPTH (feet)	WATER LEVEL	Strata Description	SOIL TYPE	SAMPLES	SPT Blow Counts	Recovery (in)	RQD (%)	Notes
920.2	0		Sounding - no recovered sample						Dry upon completion of soil augering
915.2	5								
910.2	10								
905.2	15								
			Weathered rock						
			Auger Refusal at 18.5						
900.2	20								
895.2	25								
890.2	30								
885.2	35								

Photo of Approx. Sounding Location



Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location. Top of hole elevations were provided by the project surveyor.

Conformance Set

Consulting Services Inc. of Kentucky — Boring Log

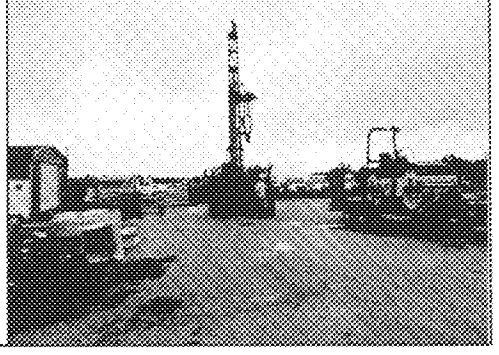
858 Contract Street | Lexington, Kentucky 40508 | 859.309.6021 tel | 859.792.3121 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: LX132443
BORING NUMBER: S-9
LOCATION: Lexington, Kentucky
WEATHER: Cloudy/Rain
DRILL RIG TYPE: Mobile B-60
DRILLER: Geo-Drill
DATE DRILLED: 06-10-2013
DRILLING METHOD: 4" OD SFA
CSI FIELD REP: D. Homm
CLIENT: GRW Engineers, Inc.

TOP OF GROUND ELEVATION: 919.8

ELEV (feet)	DEPTH (feet)	WATER LEVEL	Strata Description	SOIL TYPE	SAMPLES	SPT Blow Counts	Recovery (in)	ROD (%)	Notes
919.8	0		Sounding - no recovered sample						Dry upon completion of soil augering
914.8	5								
909.8	10								
904.8	15								
899.8	20								
894.8	26		Weathered rock Auger Refusal at 26.5 feet						
889.8	30								
884.8	35								

Photo of Approx. Sounding Location



Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location. Top of hole elevations were provided by the project surveyor.

Conformance Set

Consulting Services Inc. of Kentucky

Boring Log

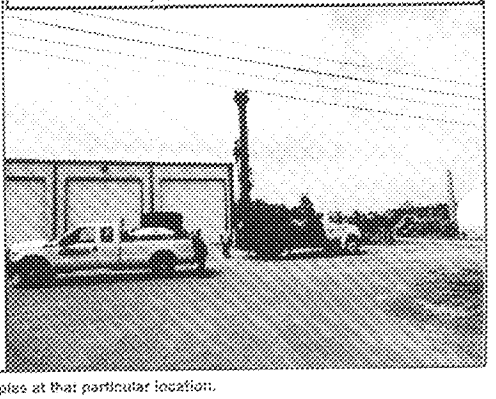
858 Contract Street | Lexington, Kentucky 40505 | 859.309.6021 tel | 859.293.3121 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: LX132443
BORING NUMBER: S-10
LOCATION: Lexington, Kentucky
WEATHER: Cloudy/Rain, 60's
DRILL RIG TYPE: Mobile B-80
DRILLER: Geo-Drill
DATE DRILLED: 06-10-2013
DRILLING METHOD: 4" OD SFA
CSI FIELD REP: D. Homm
CLIENT: GRW Engineers, Inc.

TOP OF GROUND ELEVATION: 918.9

ELEV (feet)	DEPTH (feet)	GRAPHIC LOG	Strata Description	SOIL TYPE	SAMPLES	SPT Blow Counts	Recovery (in)	RQD (%)	Notes
918.9	0		Sounding - no recovered sample						Dry upon completion of soil augering
			Auger Refusal at 2.6 feet						Performed offset sounding S-10A 5 feet toward the east
913.9	5								
908.9	10								
903.9	15								
898.9	20								
893.9	25								
888.9	30								
883.9	35								

Photo of Approx. Sounding Location



Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location.
Top of hole elevations were provided by the project surveyor.

Consulting Services Inc. of Kentucky

Boring Log

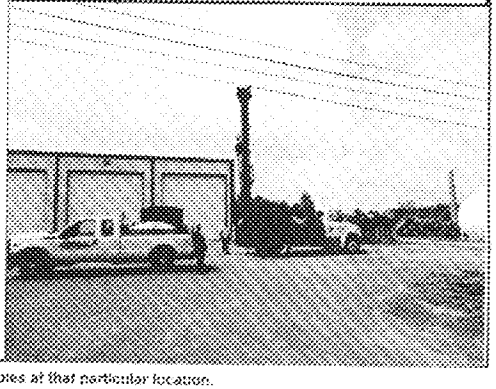
863 Corporate Street | Lexington, Kentucky 40505 | 859.309.6021 tel | 888.792.3121 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: LX132443
BORING NUMBER: S-10A
LOCATION: Lexington, Kentucky
WEATHER: Cloudy/Rain, 60's
DRILL RIG TYPE: Mobile B-80
DRILLER: Geo-Drill
DATE DRILLED: 06-10-2013
DRILLING METHOD: 4" OD SFA
CSI FIELD REP: D. Homm
CLIENT: GRW Engineers, Inc.

TOP OF GROUND ELEVATION: 917.9

ELEV. (feet)	DEPTH (feet)	Strata Description	SOIL TYPE	SAMPLES	SPT Blow Counts	Recovery (in)	ROD (%)	Notes
917.9	0	Sounding - no recovered sample						Dry upon completion of soil augering
912.9	5							
907.9	10							
		Weathered rock						
		Auger Refusal at 12.8 feet						
902.9	15							
897.9	20							
892.9	25							
887.9	30							
882.9	35							

Photo of Approx. Sounding Location



Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location. Top of hole elevations were provided by the project surveyor.

Conformance Set

Consulting Services Inc. of Kentucky

Boring Log

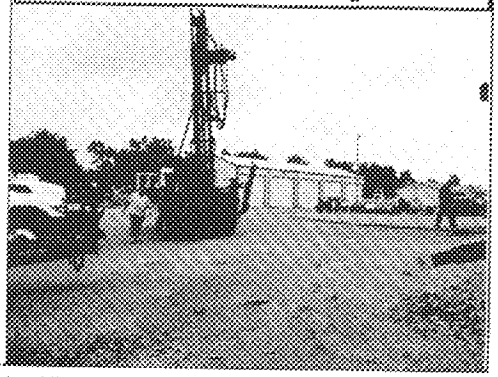
1551 Contract Street | Lexington, Kentucky 40505 | 859.309.9021 tel | 859.792.3121 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: LX132443
BORING NUMBER: S-11
LOCATION: Lexington, Kentucky
WEATHER: Cloudy/Rain, 60's
DRILL RIG TYPE: Mobile B-80
DRILLER: Geo-Drill
DATE DRILLED: 06-10-2013
DRILLING METHOD: 4" OD SFA
CSI FIELD REP: D. Homm
CLIENT: GRW Engineers, Inc.

TOP OF GROUND ELEVATION: 917.9

ELEV. (feet)	DEPTH (feet)	CASING (type)	Strata Description	SOIL TYPE	SAMPLES	SPT Blow Counts	Recovery (in)	RQD (%)	Notes
917.9	0		Sounding - no recovered sample						Dry upon completion of soil augering
912.9	5								
907.9	10								
902.9	15								
897.9	20								
			Weathered rock						
892.9	25		Auger Refusal at 24.5 feet						
887.9	30								
882.9	35								

Photo of Approx. Sounding Location



Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location.
Top of hole elevations were provided by the project surveyor.

Consulting Services Inc. of Kentucky

Boring Log

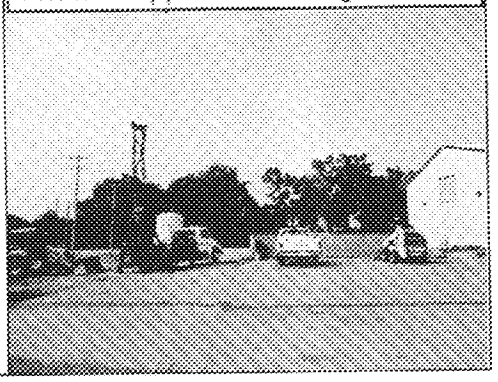
856 Corporate Street | Lexington, Kentucky 40505 | 859.309.6921 tel | 888.793.3121 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: LX132443
BORING NUMBER: S-12
LOCATION: Lexington, Kentucky
WEATHER: Cloudy, 80's
DRILL RIG TYPE: Mobile B-34
DRILLER: Geo-Drill
DATE DRILLED: 06-06-2013
DRILLING METHOD: 4" OD SFA
CSI FIELD REP: D. Hamm
CLIENT: GRW Engineers, Inc.

TOP OF GROUND ELEVATION: 917.4

ELEV (feet)	DEPTH (feet)	Water Level	Strata Description	SOIL TYPE	SAMPLES	SPT Blow Counts	Recovery (in)	RQD (%)	Notes
917.4	0		Sounding - no recovered sample						Dry upon completion of soil augering
912.4	5								
907.4	10								
902.4	15		Auger Refusal at 15.1 feet						
897.4	20								
892.4	25								
887.4	30								
882.4	35								

Photo of Approx. Sounding Location



Please note: Boring log is for information only. Soil borings only show conditions observed at specific recovered samples at that particular location.
Top of hole elevations were provided by the project surveyor.

Conformance Set

Consulting Services Inc. of Kentucky — Boring Log

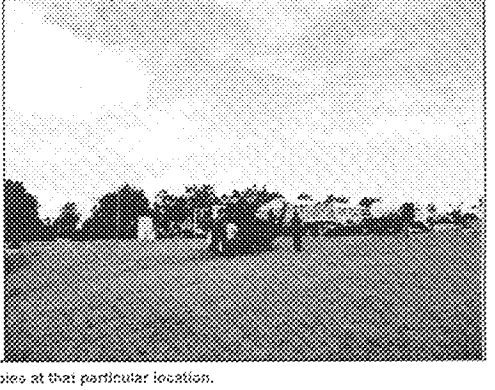
858 Contract Street | Lexington, Kentucky 40505 | 859.309.6021 tel | 859.792.3121 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: LX132443
BORING NUMBER: S-13
LOCATION: Lexington, Kentucky
WEATHER: Cloudy/Rain, 60's
DRILL RIG TYPE: Mobile B-80
DRILLER: Geo-Drill
DATE DRILLED: 06-10-2013
DRILLING METHOD: 4" OD SFA
CSI FIELD REP.: D. Homm
CLIENT: GRW Engineers, Inc.

TOP OF GROUND ELEVATION: 912.9

ELEV (feet)	DEPTH (feet)	CASING BLOWS	Strata Description	SOIL TYPE	SAMPLE TYPE	SPT Blow Counts	Recovery (in)	RQD (%)	Notes
912.9	0		Sounding - no recovered sample						Dry upon completion of soil augering
907.9	5								
902.9	10								
897.9	15								
892.9	20								
			Weathered rock						
			Auger Refusal at 22.4 feet						
887.9	25								
882.9	30								
877.9	35								

Photo of Approx. Sounding Location



Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location.
Top of hole elevations were provided by the project surveyor.

Conformance Set

Consulting Services Inc. of Kentucky — Boring Log

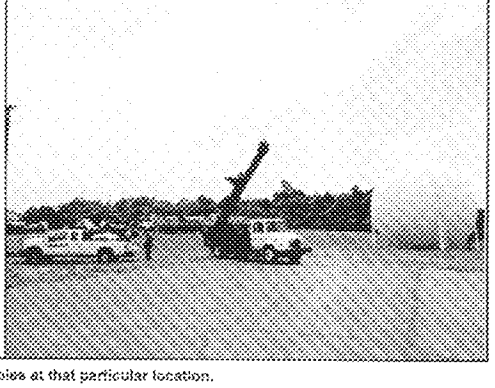
858 Contract Street | Lexington, Kentucky 40505 | 859.305.6021 tel | 888.792.3121 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: LX132443
BORING NUMBER: S-14
LOCATION: Lexington, Kentucky
WEATHER: Cloudy/Rain, 60's
DRILL RIG TYPE: Mobile B-80
DRILLER: Geo-Drill
DATE DRILLED: 06-10-2013
DRILLING METHOD: 4" OD SFA
CSI FIELD REP: D. Homm
CLIENT: GRW Engineers, Inc.

TOP OF GROUND ELEVATION: 911.8

ELEV (feet)	DEPTH (feet)	WATER LEVEL	Strata Description	SOIL TYPE	SAMPLES	SPT Blow Counts	Recovery (in)	RQD (%)	Notes
911.8	0		Sounding - no recovered sample						Dry upon completion of soil augering
906.8	5								
901.8	10		Weathered rock Auger Refusal at 9.5 feet						
896.8	15								
891.8	20								
886.8	25								
881.8	30								
876.8	35								

Photo of Approx. Sounding Location



Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location. Top of hole elevations were provided by the project surveyor.

Consulting Services Inc. of Kentucky — Boring Log

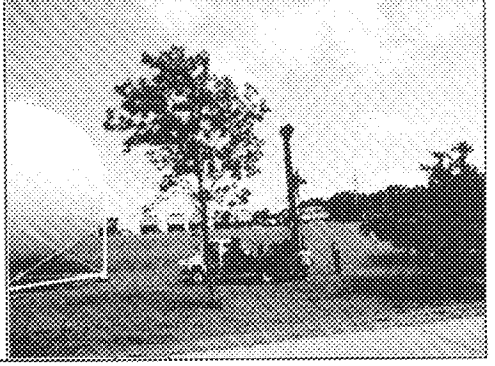
358 Contract Street | Lexington, Kentucky 40505 | 859.368.6021 tel | 888.792.3121 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: LX132443
BORING NUMBER: S-15
LOCATION: Lexington, Kentucky
WEATHER: Cloudy/Rain, 60's
DRILL RIG TYPE: Mobile B-80
DRILLER: Geo-Drill
DATE DRILLED: 06-10-2013
DRILLING METHOD: 4" OD SFA
CSI FIELD REP.: D. Hornm
CLIENT: GRW Engineers, Inc.

TOP OF GROUND ELEVATION: 901.9

ELEV. (feet)	DEPTH (feet)	Water Level	Strata Description	SOIL TYPE	SAMPLES	SPT Blow Counts	Recovery (in)	RQD (%)	Notes
901.9	0		Sounding - no recovered sample						Dry upon completion of soil augering
896.9	5								
891.9	10		Weathered rock Auger refusal at 10.8 feet						
886.9	15								
881.9	20								
876.9	25								
871.9	30								
866.9	35								

Photo of Approx. Sounding Location



Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location. Top of hole elevations were provided by the project surveyor.

Consulting Services Inc. of Kentucky — Boring Log

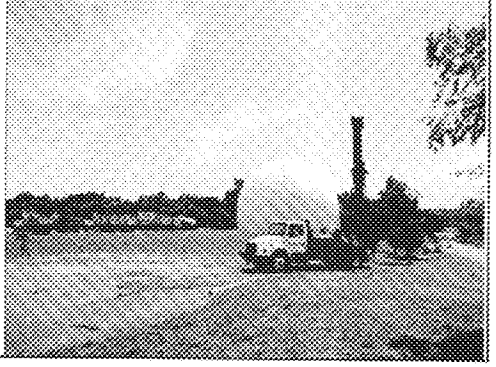
858 Contract Street | Lexington, Kentucky 40505 | 859.309.6023 tel | 859.792.3121 fax

PROJECT: Town Branch WWS
PROJECT NUMBER: LX132443
BORING NUMBER: S-18
LOCATION: Lexington, Kentucky
WEATHER: Cloudy/Rain, 60's
DRILL RIG TYPE: Mobile B-80
DRILLER: Geo-Drill
DATE DRILLED: 06-10-2013
DRILLING METHOD: 4" OD SFA
CSI FIELD REP: D. Homm
CLIENT: GRW Engineers, Inc.

TOP OF GROUND ELEVATION: 910.2

ELEV (feet)	DEPTH (feet)	Water Level	Strata Description	SOIL TYPE	SAMPLES	SPT Blow Counts	Recovery (in)	RQD (%)	Notes
910.2	0		Sounding - no recovered sample						Dry upon completion of soil augering
905.2	5								
900.2	10								
895.2	15								
			Weathered rock						
890.2	20		Auger Refusal at 17.9 feet						
885.2	25								
880.2	30								
875.2	35								

Photo of Approx. Sounding Location



Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location.
Top of hole elevations were provided by the project surveyor.

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.

Consulting Services Incorporated
LEXINGTON | LOUISVILLE | CINCINNATI

LABORATORY TESTING SUMMARY SHEET

Town Branch WWS Facility - Lexington, Kentucky
CSI PROJECT NUMBER - LX132443

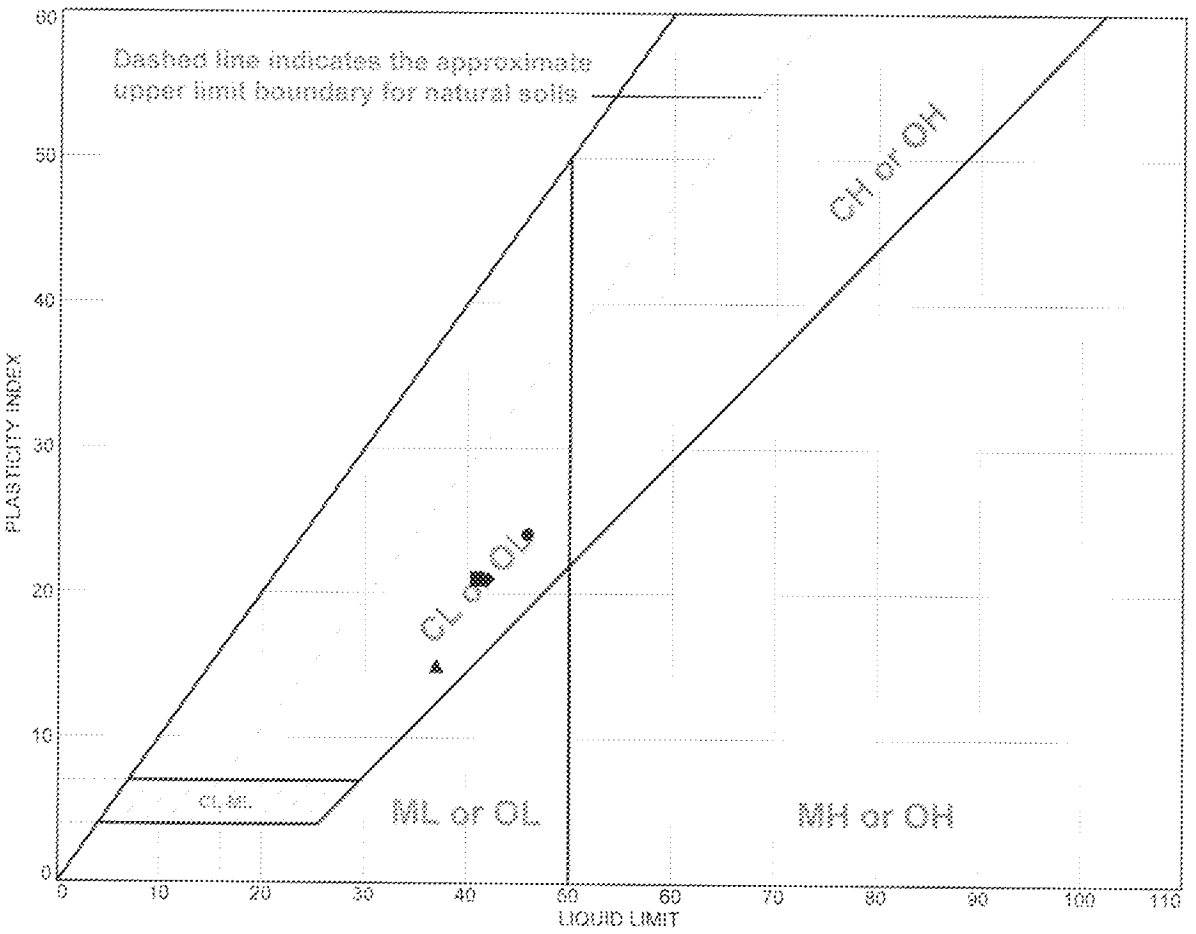
Boring No.	Depth (feet)	Sample Type*	USCS Classification	Natural Moisture Content %	% Finer No. 200	Atterberg Limits Information LL	PL	PI	CBR (Percent at 0.1")	Max. DD (pcf)	OMC (%)	Qu (psf)	Rock Qu (ksf)
B-2	25.0-26.0	CORE											1,681
B-4	24.0-25.5	SS		26.2									
	33.0-33.5	CORE											1,392
B-5	7.0-8.5	SS	CL	24.9	77.3	46	22	24					
	8.5-10.0	SS		23.0									
	14.0-15.5	SS		18.4									
B-7	22.5-24.0	SS		24.3									
B-8	7.0-8.5	SS		23.2									
	8.5-10.0	UD										3,328	
	14.0-14.1	SS		23.7									
	21.0-21.5	CORE											1,380
B-9	23.0-25.0	CORE											1,535
B-11	6.5-8.0	SS	CL	24.9	71.8	42	21	21					
	9.0-10.4	SS		28.9									
B-12	5.5-6.7	SS	CL	26.0	75.2	37	22	15					
B-13	14.0-15.5	SS		33.2									
	18.0-20.0	CORE											684
B-14	4.0-5.5	SS		23.2									
	5.5-6.8	UD										1,489	
	15.0-17.0	CORE											684
B-15	1.5-2.4	SS		24.0									

* SS = splitspoon sample, UD = undisturbed (Shelby tube) sample, BULK = bulk sample, GRAB = grab sample, CORE = rock core sample

www.csikentucky.com
Office - Lexington (859)309-6021 - Louisville (502)532-8269 - Cincinnati (513)252-2059
Fax (888)792-3121

Conformance Set

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	reddish brown LEAN CLAY	46	22	24		77.3	CL
■	reddish brown LEAN CLAY	41	20	21		66.7	CL
▲	brown LEAN CLAY	37	22	15		75.2	CL
◆	reddish brown LEAN CLAY	42	21	21		71.8	CL

Project No. 2443 **Client:** GRW, Inc.

Project: Town Branch WWS Facility - Lexington, Kentucky

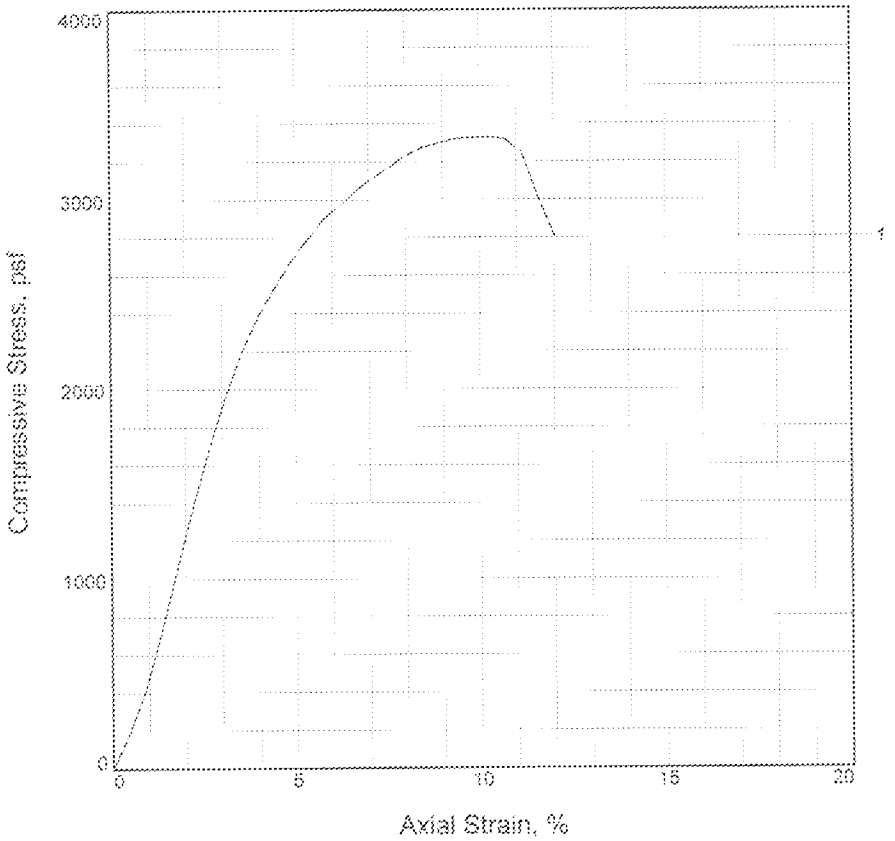
Remarks:

●**Source of Sample:** Borings **Depth:** 7.0-8.5 **Sample Number:** B-5
■**Source of Sample:** Borings **Depth:** 4.0-5.5 **Sample Number:** B-14
▲**Source of Sample:** Borings **Depth:** 4.0-5.5 **Sample Number:** B-12
◆**Source of Sample:** Borings **Depth:** 6.5-8.0 **Sample Number:** B-11

Consulting Services Incorporated
LEXINGTON | LOUISVILLE | CINCINNATI

Figure

UNCONFINED COMPRESSION TEST



Sample No.	1
Unconfined strength, psf	3327.6
Undrained shear strength, psf	1663.8
Failure strain, %	10.3
Strain rate, in./min.	N/A
Water content, %	23.8
Wet density, pcf	128.8
Dry density, pcf	104.1
Saturation, %	103.6
Void ratio	0.6191
Specimen diameter, in.	2.85
Specimen height, in.	5.61
Height/diameter ratio	1.97

Description:

LL =	**PL =**	**PI =**	**Assumed GS=** 2.7	**Type:**

Project No.: 2443
Date Sampled:
Remarks:

Client: GRW, Inc.

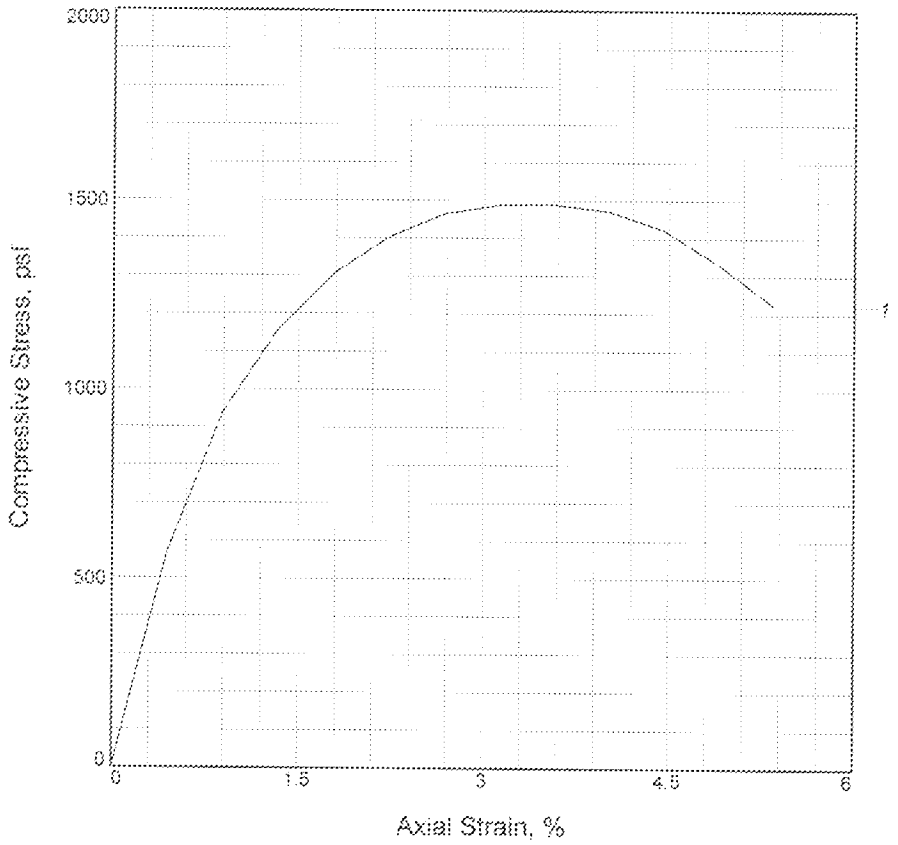
Project: Town Branch WWS Facility - Lexington, Kentucky

Source of Sample: Borings **Depth:** 8.5-10.5
Sample Number: B-8

Consulting Services Incorporated
LEXINGTON | LOUISVILLE | CINCINNATI

Figure _____

UNCONFINED COMPRESSION TEST



Sample No.	1
Unconfined strength, psf	1489.4
Undrained shear strength, psf	744.7
Failure strain, %	3.6
Strain rate, in./min.	N/A
Water content, %	30.6
Wet density, pcf	121.4
Dry density, pcf	92.9
Saturation, %	101.6
Void ratio	0.8138
Specimen diameter, in.	2.86
Specimen height, in.	5.61
Height/diameter ratio	1.96

Description:

LL = 41	**PL =** 20	**PI =** 21	**Assumed GS=** 2.7	**Type:**

Project No.: 2443
Date Sampled:
Remarks:

Client: GRW, Inc.

Project: Town Branch WWS Facility - Lexington, Kentucky

Source of Sample: Borings **Depth:** 4.0-5.5
Sample Number: B-14

Figure _____

Consulting Services Incorporated
LEXINGTON | LOUISVILLE | CINCINNATI

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 D 698	A	5.5 lb./12"	4"	No. 4 sieve	3	25
	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 D 1557	A	10 lb./18"	4"	No. 4 sieve	5	25
	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.

VECTOR ENGINEERS, INC

Cane Run and Griffin Gate Soundings, Lexington, KY

Sounding Location	Sounding (Bore)	Elevation (ft.)	Refusal Depth (ft.)	Refusal Elevation (ft.)	Sounding Notes
Lower Cane Run	201	932.33	8.2	924.13	
	202	927.59	6.7	920.89	
	203	923.00	4.2	918.80	
	204	918.15	7.6	910.55	
	205	921.19	3.3	917.89	
	206	919.42	3.5	915.92	

Notes:
1) Soundings were performed at staked locations in the field.
2) Sounding elevations were copied from survey stakes. Refusal elevations were then derived using our refusal depths encountered.

SECTION 00321 – ENVIRONMENTAL DATA

PART 1 - GENERAL

1.01 ENVIRONMENTAL DATA

A. The environmental report is attached to this specification.

B. In bidding on this Contract, each bidder acknowledges that he is aware of the environmental subsurface conditions existing on the site necessary for the purposes of bidding.

END OF SECTION

THIRDROCK
WWW.THIRDROCKCONSULTANTS.COM

TECHNICAL MEMORANDUM

To: Joe Henry, PE
GRW Engineers, Inc.

From: Gerry Fister, PG

Re: Town Branch WWS Soil Testing Results

Date: August 2, 2013

Introduction
Lexington Fayette Urban County Government (LFUCG) currently operates their Sanitary Sewers Operations (SSO) department at a parcel of land on the Town Branch Waste Water Treatment Plant campus located at 301 Lisle Industrial Avenue in Lexington, Kentucky. LFUCG intends to develop a wet weather storage facility to manage peak flow influent to the facility. The facility will consist of a large tank requiring the majority of the overburden (soil and fill) to be removed from the site.

Background
Initial screening of this site determined that the former land use of the wet weather storage site consisted of an automotive salvage yard. The site was filled to current grade around 1980. Based on interviews with Town Branch personnel, the site was filled with material associated with the WWTP plant expansion. The current use of the site as the sanitary sewer operations included the operation of petroleum underground storage tanks (USTs). The USTs have been removed and a No Further Action letter was provided by the Kentucky Division of Waste Management Underground Storage Branch dated 3/27/2013. However, the closure sampling conducted during the removal of the USTs in June 2008 exhibited elevated levels of polynuclear aromatic hydrocarbons (PAH) on the east wall of the pit excavation.

During the initial screening, two samples were collected to evaluate the possible impact to the soils below the fill from the automotive salvage yard. Samples were analyzed for the presence of metals, PCBs and PAHs. Results were compared to the EPA screening levels and determined to be elevated for arsenic and chromium above residential land use levels. PCB and PAH concentrations were not detected below the fill placed on the site around 1980 (*Environmental Site Assessment of SSO and SRO Sites*, 11/27/2012, Third Rock Consultants, LLC).

June 2013 Sampling
Samples were collected in coordination with the geotechnical drilling conducted by CSI (6/5/2013 – 6/13/2013). The objective was to determine the range of chromium and arsenic in the original sub-fill surface soils and to evaluate the fill in the vicinity of the former UST pit. Results indicate that the arsenic and chromium concentrations in the original surface soils are consistent with the initial screening results.

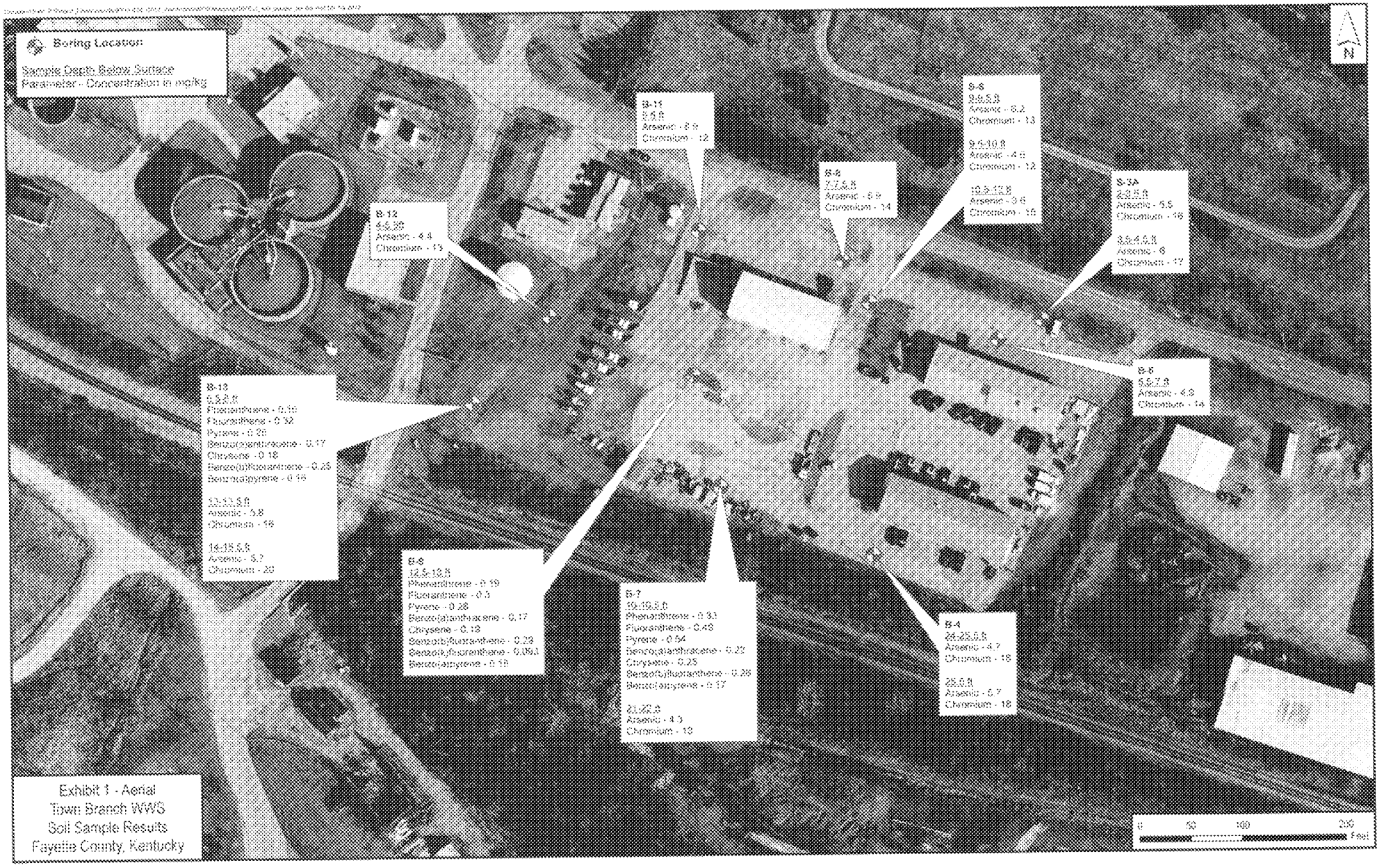
Although above the EPA screening levels for arsenic and chromium, concentrations are within the range of ambient background concentrations for Central Kentucky (As = 22.7 mg/Kg and Cr = 40 mg/Kg). Based on these findings, the soil below the fill will not require management.

PAH compounds were detected in samples from the fill in each of the three samples analyzed for these parameters. Concentrations of PAH compounds in the fill are above the unrestricted off-site use levels allowed by the UST regulations and above the residential land use EPA screening levels but within limits for industrial land use. The PAH limits that are exceeded are for benzo(a)anthracene 0.15 mg/KG and 0.30 mg/Kg for the sum of all other benzo PAH compounds.

Sample locations and associated contaminant concentrations are shown on the attached exhibit. Laboratory reports are available upon request.

Use of Fill Limitations

Because samples of the fill material located at the WWS site exhibit concentrations of PAHs above the unrestricted off-site use levels and above the EPA screening levels for residential use, this material will require management. The fill material is not suitable for disposal at a site that could potentially be used as residential land in the future. If this material is moved off-site for disposal, the disposal site will require a permanent deed covenant restricting future use and a management plan. The use of the nearby Old Frankfort Pike landfill may be a suitable disposal site with authorization form the Kentucky Division of Waste Management. In addition to restricted use and management requirements, the fill material appears to contain substantial amounts of debris.



Conformance Set

SECTION 00410 – BID FORM

Town Branch Wet Weather Storage Facility
Remedial Measures Plan ID No. G2-TB-1

Division of Water Quality
Lexington-Fayette Urban County Government

LFUCG Bid No. 137-2014

1.01 GENERAL

Place: Lexington, Kentucky Date: 10/2/14

The following Bid Form shall be followed exactly in submitting a Bid for this Work.

This Bid Form Submitted by Judy Construction Company

103 S. Church St. Cynthiana, KY 41031
(Name and Address of Bidder)

(Hereinafter called "Bidder"), organized and existing under the laws of the State of Kentucky, doing

business as a corporation
"a corporation," "a partnership", or an "individual" as applicable

To: Lexington-Fayette Urban County Government
(Hereinafter called "Owner"
Office of the Director of Central Purchasing
200 East Main Street, Room 338
Lexington, KY 40507

The Bidder, in compliance with your Advertisement for Bids for the Town Branch Wet Weather Storage Facility; Lexington, Kentucky, having examined the Contract Documents including the Plans and Specifications with related documents, having examined the site for proposed Work, and being familiar with all of the conditions and any and all addendums surrounding the construction of the proposed Project, including the availability of materials and labor, hereby proposes to furnish all labor, materials, and supplies, and to construct the Project in accordance with the Contract Documents, within the time set forth therein, and at the lump sum stated hereinafter. These prices are to cover all expenses incurred in performing the Work required under the Contract Documents, of which this Bid is a part.

The Bidder hereby agrees to commence Work under this Contract on a date to be specified in a written "Notice to Proceed" of the Owner and to substantially complete the Project within **five hundred eighty three (583) consecutive calendar days.** Bidder further agrees to pay liquidated damages, the sum of One Thousand Dollars and no cents ($1,000.00) for each consecutive day thereafter.

The Bidder hereby acknowledges receipt of the following addenda:

Addendum No. 1	Date 9/10/14	Addendum No. 5	Date 9/25/14
Addendum No. 2	Date 9/15/14	Addendum No. 6	Date 9/29/14
Addendum No. 3	Date 9/16/14	Addendum No. ____	Date ____
Addendum No. 4	Date 9/22/14	Addendum No. ____	Date ____

insert above the number and the date of any Addendum issued and received. If none has been issued and received, the word "NONE" should be inserted.

1.02 LEGAL STATUS OF BIDDER

Bidder Judy Construction Company

Date October 2, 2014

*A. A corporation duly organized and doing business under the laws of the State of Kentucky, for whom Steve Judy, bearing the official title of President, whose signature is affixed to this Bid is duly authorized to execute contracts.

~~*B. A Partnership each of the members of which with addresses are [illegible] general partners as such.~~

~~*C. An individual, whose signature is affixed to this Bid. (Print name)~~

* The Bidder shall fill out the appropriate form and strike out the other two.

1.03 BIDDERS AFFIDAVIT

Comes the Affiant, Steve Judy, and after being first duly sworn, states under penalty of perjury as follows:

A. His/her name is Steve Judy and he/she is the individual submitting the Bid or is the authorized representative of Judy Construction Company, the entity submitting the Bid (hereinafter referred to as "Bidder").

B. Bidder will pay all taxes and fees, which are owed to the Lexington-Fayette Urban County Government at the time the Bid is submitted, prior to award of the Agreement and will maintain a "current" status in regard to those taxes and fees during the life of the Agreement.

C. Bidder will obtain a Lexington-Fayette Urban County Government business license, if applicable, prior to award of the Agreement.

D. Bidder has authorized the Division of Central Purchasing to verify the above-mentioned information with the Division of Revenue and to disclose to the Urban County Council that taxes and/or fees are delinquent or that a business license has not been obtained.

E. Bidder has not knowingly violated any provision of the campaign finance laws of the Commonwealth of Kentucky within the past five (5) years and the award of an Agreement to the Bidder will not violate any provision of the campaign finance laws of the Commonwealth.

F. Bidder has not knowingly violated any provision of Chapter 26 of the Lexington-Fayette Urban County Government Code of Ordinances, known as the "Ethics Act."

G. Bidder acknowledges that "knowingly" for purposes of this Affidavit means, with respect to conduct or to circumstances described by a statute or ordinance defining an offense, that a person is aware or should have been aware that his conduct is of that nature or that the circumstance exists.

Further, Affiant sayeth naught.

Affiant Signature Steve Judy, President

STATE OF Kentucky

COUNTY OF Harrison

The foregoing instrument was subscribed, sworn to and acknowledged before me by

Steve Judy on this the 2nd day of October 2014.

My Commission expires: 1/6/15

NOTARY PUBLIC, STATE AT LARGE Linda L. Jones

1.04 BID SCHEDULE

The Bidder agrees to perform all the Work described in the Specifications and shown on the Plans for the following proposed lump sum prices, if applicable, which shall include the furnishing of all labor, materials, supplies, equipment and/or vehicle usage, services, all items of cost, overhead, taxes (federal, state, local), and profit for the Contractor and any Subcontractor involved, within the time set forth herein.

If a discrepancy between the unit price and the item total exists, the unit price prevails except:

> If the unit price is illegible, omitted, or the same as the item total, item total prevails and the unit price is the quotient of the item total and the quantity.

If the unit price and the item total are illegible or are omitted, the bid may be determined nonresponsive. If a lump sum total price is illegible or is omitted, the bid may be determined nonresponsive.

For a lump sum based bid, the item total is the bid amount the Owner uses for bid comparison.

For a unit price based bid, the sum of the item totals is the bid amount the Owner uses for bid comparison.

The LFUCG's decision on the bid amount is final.

All specified cash allowances are included in the price(s) set forth below and have been computed in accordance with Paragraph 11.02.B of the General Conditions.

Bidder acknowledges that estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids, and final payment for all Unit Price items will be based on actual quantities of Unit Price work, determined as provided in the Contract Documents.

Note: The quantities for the Unit Price items are unpredictable and the Engineer has inserted certain quantities in the proposal to be used solely for the purpose of comparison of Bids. The Bidder shall not be entitled to any adjustment in the contract Unit Price bid items as a result of changes in any of these items from zero to any quantity. The Bidder shall make no claims for anticipated profits, or loss of profits, or for other damages as a result of changes in the quantities purchased.

BID SCHEDULE				
Bid Item Description	Approximate Quantities	Unit	Unit Bid Price	Total Price
Item 1 – Base Bid - For General Construction of Town Branch Wet Weather Storage Facility – Lump Sum	1	LS	15,805,906	15,805,906
Item 2 – System Programming Service Allowance Lump Sum	1	LS	$ 120,000.00	$ 120,000.00
Item 3 – Mechanical Screen – Equipment Allowance Only Lump Sum	1	LS	$ 307,400.00	$ 307,400.00
Item 4 – Allowance Railroad Repair – Lump Sum	1	LS	$ 25,000.00	$25,000.00
Item 5 – Allowance Project Documentation Photography Lump Sum	1	LS	$30,000.00	$30,000.00
Item 6a – Unit Price Pavement Construction Bituminous Asphalt Surface Dollars Per Ton (TN)	1,205	TN	88.00	106,040
Item 6b – Unit Price Pavement Construction Bituminous Asphalt Base Dollars Per Ton (TN)	512	TN	78.00	39,936
Item 6c – Unit Price Pavement Construction Dense Graded Aggregate (DGA) Dollars Per Ton (TN)	966	TN	28.50	27,531
Item 7 – Unit Price Pavement Restoration Pavement Milling and Texturing Dollars Per Ton (TN)	303	TN	19.00	5,757
Item 8 – Unit Price Pavement Restoration Subgrade Undercutting Dollars Per Cubic Yard (CY)	120	CY	31.50	3,780
Item 9 – Unit Price Over-Excavation of Earthen/Rock/ Rubble/Debris and Replacement with Compacted Earthen/Rock Materials Under Structures with drilled shafts Dollars Per Cubic Yard (CY)	3,000	CY	37.00	111,000
Item 10 – Unit Price Construct Drilled Shaft Through Overburden Dollars Per Vertical Linear Foot (VLF)	5,000	VLF	250.00	1,250,000

Bid Item Description	Approximate Quantities	Unit	Unit Bid Price	Total Price
Item 11 – Unit Price Construct Drilled Shaft Through Rock Socket Removal Dollars Per Vertical Linear Foot (VLF)	1,650	VLF	518.00	958,300
Item 12 – Unit Price Delay Time – Drilled Shaft Equipment and Crew Dollars Per Hour (Hours)	50	HRS	787.00	39,350
Item 13 – Unit Price Lower Cane Run Force Main Tie-in Lump Sum	1	LS	258,000	258,000
Item 14[ADDS] – Allowance *Temporary Power Relocation* *Lump Sum*	*1*	*LS*	*$20,000*	20,000
			Total Bid Price	19,108,000

TOTAL BID PRICE for the Town Branch Wet Weather Storage Facility shall be provided and summed from Items 1 through 11 *14[ADDS]* in words and figures.

NINETEEN MILLION ONE HUNDRED EIGHT THOUSAND DOLLARS ($ 19,108,000).
(words) (figures)

Alternate Equipment Information	
Equipment Item	**Base Bid Equipment Manufacturer**
1. Pumps	ABS Flygt Ebara
2. Check Valves	APCO Valvematic Golden Anderson
3. Plug Valves	DeZurik Pratt *Golden Anderson*[ADD#2]
4. Slide Gates	H. Fontaine Whipps Golden Harvest
5. Air Release Valves	ARI
6. Mechanical Screen	Westech ROMAG
7. Valve and Gate Actuators	Limitorque
8. Level Transmitters	Ohmart Vega
9. SCADA PLC's	Allen Bradley ControlLogix
10. Motor Control Center and Power House	Allen Bradley Schneider (Square D) ~~Eaton (Cutler Hammer)~~
11. 18 Pulse VFD's	Allen Bradley Schneider (Square D) ~~Eaton (Cutler Hammer)~~
12. Generator Set	Kohler Caterpillar Cummins/Onan MTU *Generac*[ADD#2]
13. Gas Detection System	Sierra Monitor Corporation
14. Prestressed Concrete Tank Manufacturer[ADD#1]	*The Crom Corporation*[ADD#1] *Precon Corporation*[ADD#1]

Notes: 1. Where more than one Base Bid equipment manufacturer is listed above, the Bidder has the option of including any of the listed manufacturers in the Base Bid. The bidder must indicate the Base Bid equipment included in the Bid by circling the selected manufacturer at the time of the submission of the Bid. The design has been completed using the first listed Base Bid equipment manufacturer. Should the Bidder list the second, third, or fourth Base Bid equipment, the Bidder, at no additional cost to the Owner, shall make any changes to structure, piping controls, electrical, instrumentation, architectural, mechanical, etc. that may be necessary to accommodate this equipment.

The Contract Documents state that blasting is not permitted. However, LFUCG has made the determination that blasting is an acceptable method for rock removal on this project. All blasting must comply with Federal, State, and Local Regulations and National Codes on the purchase, transportation, storage, and use of explosive material. Codes include, but are not limited to the following:

1. Storage, security, and accountability: Bureau of Alcohol, Tobacco, and Firearms (BATF): 27 CFR Part 181.
2. Shipment: DOT, 49 CFR Parts 171-179, 390-397.
3. Safety and Health: OSHA 29 CFR Part 1926, Subpart U.
4. Transportation and Storage: NFPA 495, Chapters 3 through 6.
5. Kentucky Department of Mines and Minerals code for explosive disintegration of rock.

The Contractor must complete the following before explosives are brought to site:

1. Obtain all required permits from authorities having jurisdiction, with copies to Owner.
2. Obtain Blasting and Liability insurance in accordance with Kentucky Department of Highway requirements. A copy of the Declaration of Insurance shall be provided to the Owner.
3. Complete preblast survey with signed copy to Owner.

Preblast survey shall be completed to document the existing conditions of structures or utilities within 500 feet of the blast or that could be at risk from blasting damage. Such documentation is to be of such quality to determine whether blasting operations damaged structures. Preblast survey shall utilize video, still images and report forms to document each structure. Video with audible description of observations shall be used to observe general conditions of each structure and to note specific damage that exists to structure prior to blasting. Still images shall be utilized to supplement video as needed to document specific conditions of each structure. Report form shall document date of survey, and who was present during survey. Forms shall also be utilized to supplement video as to the conditions of structures. Existing damage such as cracked foundations, brick facade, and etc. shall have reference object such as a scale in image or video. Audio commentary of cracked foundations, brick facades, etc. shall denote width of cracks. The Contractor shall submit three copies of video, still images, and pdf copies of report forms on CD's.

Respectfully Submitted,

FIRM: Judy Construction Company

ADDRESS: 103 S. Church St.

CITY/STATE/ZIP: Cynthiana, KY 41031

DATE: 10/27/14

BY: _____ Steve Judy
(must be original signature)

TITLE: President

PHONE: 859-234-6900 FAX: 859-234-3480
(area code, number & extension)

EMAIL ADDRESS: sjudy@judyconstructionco.com

OFFICIAL ADDRESS AND PHONE:

103 S. Church St.

Cynthiana, KY 41031

859-234-6900 (Seal if Bid is by Corporation)

By signing this form you agree to all of the terms and associated forms.

1.05 STATEMENT OF BIDDER'S QUALIFICATIONS

The following statement of the Bidder's qualifications is required to be filled in, executed, and submitted with the Bid:

A. Name of Bidder: Judy Construction Company

B. Permanent Place of Business: 103 S. Church St, Cynthiana, KY 41031

C. When Organized: 4/9/74

D. Where Incorporated: Kentucky

E. Financial Condition:

If specifically requested by the Owner, the apparent low Bidder is required to submit its latest three (3) years audited financial statements to the Owner's Division of Central Purchasing within seven (7) calendar days following the Bid opening.

F. In the event the Agreement is awarded to the undersigned, Performance, Payment, Erosion and Sediment Control, and Warranty bonds will be furnished by:

Continental Casualty Company (Surety)

Signed: Paula J Teague (Representative of Surety)

Paula J. Teague, Atty-in-Fact

G. The following is a list of similar projects performed by the Bidder: (Attach separate sheet if necessary).

NAME	LOCATION	CONTRACT SUM
See attachment A		

H. The Bidder has now under contract and bonded the following projects:

NAME	LOCATION	CONTRACT SUM
See attachment B		

I. List Key Bidder Personnel who will work on this Project.

NAME	POSITION DESCRIPTION	NO. OF YEARS WITH BIDDER
See attachment C		

J. MWDBE Participation on current bonded projects under contract:

SUBCONTRACTORS (LIST)	PROJECT (SPECIFIC TYPE)	MWDBE	% of WORK
See attachment B			

(USE ADDITIONAL SHEETS IF NECESSARY)

K. We acknowledge that, if we are the apparent low Bidder, we may be required to submit to the Owner within seven (7) calendar days following the Bid Opening, a sworn statement regarding all office management and field management personnel. Additionally, if requested by the Owner, we will within seven (7) days following the request submit audited financial statements and loss history for insurance claims for the three (3) most recent years (or a lesser period if stipulated by the Owner)