

**AMENDMENT 1**  
**Phase 2 Contract Price Amendment**  
**Wastewater Treatment Facility Expansion Project**

This Amendment is entered into this \_\_\_\_ day of \_\_\_\_\_, 2024 (the “Effective Date”) between the City of Republic (“Owner”) and Burns & McDonnell Engineering Co., Inc., a Missouri company (“Design-Builder”), and is governed by the terms and conditions of the Progressive Design-Build Agreement for Water and Wastewater Projects - Wastewater Treatment Facility Expansion Project dated February 18, 2022 (“Agreement”), which is incorporated herein by reference. Owner and Design-Builder are referred to individually as a “Party” and collectively as the “Parties”.

1. Phase 2 Services to be performed:

- 1.1 The Phase 2 Services to be performed shall be as listed in Exhibit B – Scope of Services.

2. Phase 2 Contract Price:

- 2.1 Owner shall pay Design-Builder in accordance with Article 6 of the General Conditions of Contract the sum of Ninety Four Million Nine Hundred Forty Four Thousand Three Hundred Dollars (\$94,944,300.00) for the Phase 2 services, subject to adjustments made in accordance with the Agreement and the General Conditions of Contract. This cost includes \$2,550,000 of Owner Allowances.

3. Phase 2 Contract Time:

- 3.1 Substantial Completion of the entire Work, excluding the modifications of the Wastewater Holding Basins No. 1 and 2, shall be achieved no later than 965 calendar days after the Date of Commencement (“Scheduled Substantial Completion Date”).
- 3.2 The Phase 2 Contract Time and adjustments thereto shall be as governed by the Agreement and the General Conditions of Contract.

4. Other Changes:

- 4.1 Replace the third paragraph of Exhibit B-Phase 1 Scope of Services with the following:

The Phase 2 services will be prepared consistent with a targeted design Wastewater Treatment Plant blending capacity of 4 million gallons per day (MGD) nominal. It is assumed after completion of the separate WWTF Expansion project in addition to this Blending Project, the WWTF will have a nominal capacity of 5 MGD for average day conditions and targeted nominal capacity of 12 MGD for peak day conditions for a total targeted design nominal capacity of 16 MGD blending capacity for wet weather events.

4.2 Add the following Sections at the end of Article 4, paragraph 4.1 of the Progressive Design-Build Agreement.

.7 Design-Builder and Owner acknowledge and understand that Owner shall retain ownership of and title to any Hazardous Conditions at the Site. The parties agree that such Hazardous Conditions were not caused by and are not the responsibility of Design-Builder; and that Agreement or any documents or exhibits associated with the Agreement, do not attempt to nor do they actually transfer responsibility, liability, or ownership for Hazardous Conditions to Design-Builder. Under no circumstances shall Design-Builder assume ownership of or legal liability for such Hazardous Conditions under any law, rule, order, or regulation pertaining to Hazardous Conditions, or assume the status of generator, transporter, storer, treater, or disposal facility, or arranger of transport, storage, or disposal, for Hazardous Conditions.

.8 Design-Builder makes no representation, warranty, or guarantee, express or implied, that the environmental consulting services will result in a complete resolution for Owner of responsibilities and liabilities for contaminants, Hazardous Conditions, and their residuals associated with the site, or that the site will become completely free of all contaminants and Hazardous Conditions or fit for all uses. No warranty shall apply to Design-Builder's environmental consulting services performed under this Agreement. Design-Builder's services are based upon the limited scope authorized by Owner.

.9 If Design-Builder provides Owner with a written report in connection with the environmental consulting services performed, the report will present such findings and conclusions respecting the site as Design-Builder may reasonably make with the information gathered in accordance with the environmental consulting services. The report shall be based only upon Design-Builder's environmental consulting services. In preparing the report, Design-Builder may review and interpret certain information provided by third-parties, including government authorities, title companies, testing laboratories, and other entities. Design-Builder will not independently evaluate the accuracy or completeness of such information, and shall not be responsible for any errors or omissions contained in such information. Design-Builder's services will be performed solely for the benefit of Owner and not for the benefit of any other persons or entities. Nothing contained in the Agreement is intended to benefit anyone other than the parties hereto, nor to create a contractual relationship with, or a cause of action in favor of, a third-party. Design-Builder does not authorize any sharing of any information, report, or other deliverables, instruments of service or work product provided to Owner, with any third-party. If Owner shares with any third-party any information, report, or other deliverable, instrument of service, or work product as result of Design-Builder's environmental consulting services, Owner does so at its sole risk. Third-parties shall not rely on Design-Builder's environmental consulting services. Design-Builder assumes no liability for any decision or course of action by any third-party based on information and deliverables and environmental consulting services provided to Owner. Owner shall waive, release, and otherwise indemnify, defend, and hold harmless Design-

Builder from any injury, damage, liability, cost, or expense brought by any third-party that arises out or is related to such unauthorized disclosure or sharing of Design-Builder's deliverables, instruments of service, or work product with any third-party. Certification or verification by Design-Builder of test results or reports constitute a statement of the professional judgment of Design-Builder based on the facts and data known to Design-Builder. Certification, verification, or other confirmation are not guarantees or warranties concerning current or future considerations or performance of the facilities surveyed, or that Owner or others will be entitled to any innocent land Owner or purchaser defenses that may be available under applicable environmental laws including, without limitation, the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended.

.10 If expressly requested in writing by Owner for Design-Builder to sign waste manifests on Owner's behalf, Owner hereby appoints Design-Builder as its attorney in fact and limited agent, and expressly grants to Design-Builder authority to sign all manifests and other documents evidencing title to or control over Owner's Hazardous Substances.

- 4.3 MDNR requires certain provisions be added to the contract for the City to be eligible for ARPA and/or SRF funding. Add the following Sections at the end of Article 12 of the Progressive Design-Build Agreement.

12.3.19 Equal Employment Opportunity and Nondiscrimination in Employment: Pursuant to 41 CFR 60-4 and E.O. 11246, and as amendment, and consistent with all applicable federal, state, and municipal laws, Design-Builder will comply with Executive Order 11246 for bids, contracts, and subcontracts.

12.3.20 Contracting with Small and Minority Businesses, Women's Business Enterprises, and Labor Surplus Area Firms: Pursuant to 2 CFR 200.321; E.O. 11625 and 12138 and consistent with all applicable federal, state, and municipal laws, Design-Builder will take the following affirmative action steps in accordance with 2 CFR 200.321:

- a. Placing qualified small and minority businesses and women's business enterprises on solicitation lists;
- b. Assuring that small and minority businesses, and women's business enterprises are solicited whenever they are potential sources;
- c. Dividing total requirements, when economically feasible, into smaller tasks or quantities to permit maximum participation by small and minority businesses, and women's business enterprises;
- d. Establishing delivery schedules, where the requirement permits, which encourage participation by small and minority businesses, and women's business enterprises;
- e. Using the services and assistance, as appropriate, of such organizations as the Small Business Administration and the Minority Business Development Agency of the Department of Commerce;

The Design-Builder will complete the “Missouri State Revolving Fund Disadvantaged Business Enterprise (Minority and Women’s Business Enterprise) Utilization Worksheet”

12.3.21 Contract Work Hours and Safety Standards Act: Pursuant to Section 40 U.S.C. 327–330 and consistent with all applicable federal, state, and municipal laws, Design-Builder will comply with Sections 103 and 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 327–330) as supplemented by Department of Labor regulations (29 CFR part 5).

12.3.22 OSHA Training: Pursuant to Section 292.675, RSMo, and consistent with all applicable federal, state, and municipal laws, Design-Builder will provide a ten-hour Occupational Safety and Health Administration (OSHA) construction safety program for their on-site employees which includes a course in construction safety and health approved by OSHA or a similar program approved by the Missouri Department of Labor and Industrial Relations which is at least as stringent as an approved OSHA program. All employees are required to complete the program within sixty days of beginning work on such construction project.

12.3.23 Debarment and Suspension: Pursuant to Section 2 CFR 180; E.O. 12549 and consistent with all applicable federal, state, and municipal laws, Design-Builder will provide documentation necessary to confirm that the Design-Builder and subcontractors are not excluded or disqualified from doing business with the federal government.

12.3.24 Small Business Act: Pursuant to P.L. 100-590, and consistent with all applicable federal, state, and municipal laws, Design-Builder will take the following affirmative action steps in accordance with Section 129 of Public Law 100-590, Small Business Administration Reauthorization and Amendment Act of 1988:

- a. Placing Small Business in Rural Areas (SBRA) on solicitation lists;
- b. Ensuring that SBRAs are solicited whenever they are potential sources;
- c. Dividing total requirements, when economically feasible, into small tasks or quantities to permit maximum participation by SBRAs;
- d. Establishing delivery schedules, where the requirements of work will permit which would encourage participation by SBRAs; and
- e. Utilizing the services of the Small Business Administration and the Minority Business Development Agency of the U.S. Department of Commerce, as appropriate.

12.3.25 Central Contractor Registration: Pursuant to P.L. 109-282, and consistent with all applicable federal, state, and municipal laws, Design-Builder and its Subcontractors will register in the System for Award Management (SAM).

12.3.26 Privity of Contract: The Missouri Department of Natural Resources, its divisions, nor its employees are or will be a party to the contract at any tier.

12.3.27 Protests: Neither the U.S. Department of Treasury nor the Missouri Department

of Natural Resources will be involved in protest(s) and their resolution.

12.3.28 Domestic Products Procurement Law: Pursuant to 34.350 through 34.359 RSMo, and consistent with all applicable federal, state, and municipal laws, all manufactured goods or commodities used or supplied in the performance of any contract or subcontract awarded on this project shall be manufactured, assembled or produced in the United States, unless obtaining American-made products would increase the cost of the contract by more than ten percent (10%). Design-Builder will complete the “Domestic Products Procurement Act – §§34.350 - 34.359 RSMo Certification” form.

12.3.29 Anti-Lobbying Act: Pursuant to P.L. 101-121, and consistent with all applicable federal, state, and municipal laws, the Design-Builder and its Subcontractors will comply with the Anti-Lobbying Act, Section 319 of Public Law 101-121, and file an Anti-Lobbying Certification form, and the Disclosure of Lobbying Activities form, if required, to the next tier above.

12.3.30 False Claims Act: Pursuant to 31 USC 3729, and consistent with all applicable federal, state, and municipal laws, the Design-Builder will promptly refer to the State of Missouri or other appropriate Inspector General any credible evidence that a principal, employee, agent, contractor, sub-grantee, subcontractor or other person has submitted a false claim under the False Claims Act or has committed a criminal or civil violation of laws pertaining to fraud, conflict of interest, bribery, gratuity or similar misconduct involving federal funds.

12.3.31 Clean Air Act: Pursuant to 42 U.S.C. 7506(C), and consistent with all applicable federal, state, and municipal laws, the Design-Builder will comply with the Clean Air Act.

12.3.32 Clean Water Act: Pursuant to 33 U.S.C. 1368, and consistent with all applicable federal, state, and municipal laws, the Design-Builder will comply with the Clean Water Act.

12.3.33 Energy Efficiency Requirements: Pursuant to Energy Policy and Conservation Act (P.L.94-163, 89 Stat. 871), and consistent with all applicable federal, state, and municipal laws, the Design-Builder will comply with the mandatory standards and policies relating to energy efficiency which are contained in the State energy conservation plan issued in compliance with the Energy Policy and Conservation Act.

12.3.34 Recycled Materials: Pursuant with Section 6002 of the Resource Conservation and Recovery Act (RCRA) ), and consistent with all applicable federal, state, and municipal laws, preference shall be given to the procurement of specific products containing recycled materials identified in guidelines developed by the USEPA.

12.3.35 Historical and Archaeological: Pursuant to P.L. 93-291, If during the course of construction evidence of deposits of historical or archaeological interest is found, the Design-Builder shall cease operations affecting the find and shall notify the Owner who

shall notify the Missouri Department of Natural Resources and the Director, Division of State Parks, P.O. Box 176, Jefferson City, Missouri 65102-0176, Telephone (573) 751-2479. The Design-Builder shall halt any further disturbances of the deposits until notified by the Owner that they may proceed. The Owner will issue a notice to proceed only after the state official has surveyed the find and made a determination to the Missouri Department of Natural Resources and the Owner. Compensation to the Design-Builder, if any, for lost time or changes in construction to avoid the find, shall be considered a Differing Site Condition.

12.3.36 Prohibition on certain telecommunications and video surveillance services or equipment: Pursuant to 2 CFR 200.216, and consistent with all applicable federal, state, and municipal laws, Design-Builder will not procure or obtain, extend or renew a contract to procure or obtain, or enter into a contract (or extend or renew a contract) to procure or obtain equipment, services, or systems that uses covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system. As described in Public Law 115-232, section 889, covered telecommunications equipment is telecommunications equipment produced by Huawei Technologies Company or ZTE Corporation (or any subsidiary or affiliate of such entities).

For the purpose of public safety, security of government facilities, physical security surveillance of critical infrastructure, and other national security purposes, video surveillance and telecommunications equipment produced by Hytera Communications Corporation, Hangzhou Hikvision Digital Technology Company, or Dahua Technology Company (or any subsidiary or affiliate of such entities).

12.3.37 Anti-Discrimination Against Israel Act: Pursuant to 34.600 RSMo, and consistent with all applicable federal, state, and municipal laws, Design-Builder certifies that it is not currently engaged in and shall not, for the duration of the contract, engage in a boycott of goods or services from the State of Israel; companies doing business in or with Israel or authorized by, licensed by, or organized under the laws of the State of Israel; or persons or entities doing business in the State of Israel.

12.3.38 Access to Construction Site and Contract Records: The Design-Builder shall provide access to the project site and project records by, the Missouri State Auditor, the Missouri Department of Natural Resources, the USEPA, the Comptroller General of the United States, or any of their duly authorized representatives to any books, documents, papers, and records of the Design-Builder which are directly pertinent to that specific contract for the purpose of making audit, examination, excerpts, and transcriptions. Audit rights shall be in accordance with Article 8.6 of the Agreement. Any rates, multipliers or markups agreed to by the Owner and Design-Builder as part of the Agreement are only subject to audit to confirm that such rate, multiplier or markup has been charged in accordance with the Agreement, but the composition of such rate, multiplier or markup is not subject to audit. Any lump sum and or firm price agreed to by the Owner and Design-Builder as part of this Agreement is not subject to audit.

12.3.39 Payment Provisions: Pursuant to Section 8.260 and 8.960, RSMo, and consistent with all applicable federal, state, and municipal laws, the Owner shall make payment to the Design-Builder in accordance with §8.260 and §8.960 RSMo. Retainage can be no more than 5%.

12.3.40 State Revolving Fund: This project is being financed through the Missouri State Revolving Fund, by the Water and Wastewater Loan Revolving Fund and federal Capitalization Grants to Missouri.

12.3.41 Non-segregated Facilities: The Design-Builder will complete the U.S. Environmental Protection Agency Certification of Non-segregate Facilities.

5. The following Exhibits are incorporated herein by reference:

- 5.1 Exhibit “A” – Not Used
- 5.2 Exhibit “B” – Scope of Services
- 5.3 Exhibit “C” – Assumptions, Clarifications & Exclusions
- 5.4 Exhibit “C.1” – Greene County Missouri Annual Wage Order No. 30
- 5.5 Exhibit “C.2” – Wage Determination MO20230043 dated 2023.09.08
- 5.6 Exhibit “C.3” - Asbestos and Hazardous Materials Survey Report dated 2023.04.26
- 5.7 Exhibit “D” – Not Used
- 5.8 Exhibit “E” – Anticipated Lost Days to Inclement / Adverse Weather
- 5.9 Exhibit “F” – Not Used
- 5.10 Exhibit “G” – Allowances
- 5.11 Exhibit “H” – Permit and Easement Matrix
- 5.12 Exhibit “I” – Geotechnical Soils Report
- 5.13 Exhibit “I.1” – Pre-Pier Drilling Services Report dated 2023.10.23
- 5.14 Exhibit “J” – Schedule
- 5.15 Exhibit “K” – Pre-Final Design Documents
- 5.16 Exhibit “L” – CWSRF and ARPA Specification Inserts

**IN WITNESS WHEREOF**, the parties have executed this Amendment as of the date first above written.

**OWNER:**

**DESIGN-BUILDER:**

City of Republic  
*(Name of Owner)*

Burns & McDonnell Engineering Company, Inc.  
*(Name of Design-Builder)*

\_\_\_\_\_  
*(Signature)*

\_\_\_\_\_  
*(Signature)*

\_\_\_\_\_  
*(Printed Name)*

\_\_\_\_\_  
*(Printed Name)*

\_\_\_\_\_  
*(Title)*

\_\_\_\_\_  
*(Title)*

Date: \_\_\_\_\_

Date: \_\_\_\_\_

## EXHIBIT B - SCOPE OF SERVICES

The parties agree that the Design-Builder's Scope of Services for Final Design and Construction Services includes and is limited to the following:

### 2.1 Project Management:

- (1) Design-Builder will host monthly project update meetings and will provide meeting minutes with updated Action Item log.
- (2) Design-Builder will host a weekly on-site construction coordination meeting with Owner to document work completed the past week, planned work for the next week and key interfaces between Design-Builder and Owner.
- (3) Design-Builder will provide a monthly invoice that includes the following:
  - (a) AIA Payment application with approved schedule of values and based on percent complete.
- (4) Design-Builder will provide Grant and Loan Assistance for ARPA, General Revenue, and SRF funding sources.

### 2.2 Engineering Services:

- (1) Progress the design to Issued for Construction (IFC) and produce a deliverable for the Owner's review. The IFC drawings and specifications will include feedback from Owner's previous review of the Pre-Final documents.
- (2) Review and approve compliance submittals for equipment and materials to be incorporated into the Work. PDF versions of the final approved ("A" status) equipment submittals will be provided to Owner for Owner's information and records.
- (3) Provide engineering submittal management associated with submittals throughout the construction period.
- (4) Review third party test reports for equipment and materials to be incorporated into the project. Provide clarification and interpretation of the Issued for Construction design documents throughout the construction period. (Respond to Requests for Information [RFIs])
- (5) Revise Issued for Construction design documents as needed to support major changes in scope during construction.
- (6) Prepare a PDF set of Conformed As-Constructed design documents incorporating changes made to the Issued for Construction design documents during the construction process.
- (7) Complete Arc Flash Hazard Study for new electrical gear and provide labels and documentation for proper PPE selection.

### 2.3 Procurement:

- (1) Issuance and subsequent execution of supplier/vendor purchase orders.
- (2) Receive, review, and process supplier/vendor payment applications, in accordance with the terms of the purchase orders.
- (3) Perform supplier/vendor purchase order administration including the review and



- processing of RFIs, potential change order requests, change orders, etc.
- (4) Manage equipment and material deliveries as needed to facilitate the project schedule.
  - (5) Review equipment and materials delivered to the site for compliance with the IFC documents and approved submittals prior to being implemented to the Work.

#### **2.4 Construction Services:**

- (1) Facilitate site preconstruction conference.
- (2) Conduct weekly construction coordination meetings with subcontractors.
- (3) Receive, review, and process subcontractor payment applications.
- (4) Perform subcontract administration including the review and processing of RFIs, potential change order requests, change orders, etc.
- (5) Manage Subcontractors to construct installation of the Work in accordance with the Contract Documents.
- (6) Third party services, including surveying and materials testing. Surveying to include establishment of field control.
- (7) Review and compile American Iron and Steel (AIS) documentation.

#### **2.5 Commissioning & Start-up:**

- (1) Design-Builder will lead all commissioning, start-up and training activities as required in the IFC documents in collaboration with the Owner, key equipment suppliers and subcontractors.
- (2) Design-Builder will prepare an Operations and Maintenance (O&M) manual for the improvements. The O&M manual will include facility and equipment descriptions, design criteria, and process controls for the facility expansion and blending process.

## EXHIBIT C – ASSUMPTIONS, CLARIFICATIONS & EXCLUSIONS

### GENERAL / COMMERCIAL

1. The Scope of Services, Contract Time and Contract Price are based on Exhibit K – Pre-Final Design Documents.
2. The Contract Price and Contract Times are based on the following:
  - a. Contract executed and Limited Notice to Proceed issued on or before February 27, 2024. Limited Notice to Proceed shall authorize Design-Builder to proceed with Final Design as well as issuing Purchase Orders and Subcontracts to commit quoted pricing and begin the submittal process.
  - b. Final Notice to Proceed issued on or before July 1, 2024, authorizing Design-Builder to proceed with the complete scope of work.
  - c. It is anticipated that as unit processes (such as biological basins, MBR trains, pumps, digester conversion, dewatering, existing aeration basin conversion, etc.) are put into beneficial use, partial substantial completion will be given for the agreed upon scope of work.
  - d. Project Substantial completion will be achieved once all unit processes have achieved Substantial Completion.
  - e. The Work associated with converting the existing Aeration Basins to Wastewater Holding Basins 1 & 2 cannot begin until the 60-day Biological Process Performance Test has been completed for the MBR system.
3. The Contract Price and Contract Times are based on a standard 5-day week working 8 hours per day.
4. Taxes including sales, use, or special use on permanent equipment and materials are not included as a Tax Exemption Certificate has been provided by Owner to Design-Builder.
5. American Iron and Steel requirements are included. The Missouri Domestic Products Law is included. American Iron and Steel Certification forms will be provided for applicable products.
6. All BABA requirements are excluded and a BABA Waiver has been issued by the Missouri Department of Natural Resources for this project.
7. Labor rates for all craft labor are based upon Missouri Division of Labor Standards Wage and Hour Section, Annual Wage Order No. 30 for Greene County Missouri, dated March 10, 2023, and Davis-Bacon wage determination General Decision Number MO20230043 dated 09/08/2023, Building Construction Rates, attached herein. The higher of the wage and fringe combination between these wage determinations is included.
8. COVID-19. The uncertainty and potential disruptions to the labor force and supply chain caused by the global outbreak and spread of COVID-19 (“coronavirus”) may have an impact on this Project, the exact cost and duration of which Design-Builder can neither predict nor control. Government orders and restrictions may also delay or prevent performance as anticipated. Design-Builder will be granted with a period of relief in performance and appropriate cost relief where circumstances arise that are beyond Design-Builder’s control, including COVID-19 related events. To the extent applicable,

the doctrines of “commercial impracticability” or “frustration of purpose” under the Uniform Commercial Code may also excuse performance if delivery pursuant to our contract’s terms has been made “impracticable” by the occurrence of a contingency, the non-occurrence of which both parties assumed when the contract was made. At this time, it is impossible to foresee or to predict the full impact of COVID-19 around the world and, therefore, have not included price or schedule contingency specifically for COVID-19.

9. The Contract Times are based on current lead times provided by the equipment and material suppliers. If these lead times are impacted by the issuance of a notice to proceed to Design-Builder and/or supply chain issues, the Design-Builder may request an increase in the Contract Time and price.
10. Owner’s contingency or Owner’s other costs are not included in the Contract Price.
11. Owner’s allowances are included in the Contract Price.
12. Performance & Payment Bonds are included.
13. Builder’s Risk Insurance is included. The Builder’s Risk insurance premium is based on a moderate flood rating.
14. Spare parts are not included, unless called out in the Exhibit K – Pre-Final Design Documents.
15. Excludes charges for consumption fees for providing utility services (water, sewer, electricity). All consumption fees to be paid directly by Owner.
16. Owner will provide all water for construction and testing to Design-Builder at no cost.
17. Local Building Permit fees have not been included as it was assumed these fees would be waived by the Owner.
18. The contract price does not meet specific MBE/WBE participation goals. Design-Builder has made good faith efforts to garner MBE/WBE participation.

## **SITE CONSTRUCTION AND ACCESS**

1. Owner will provide adequate material staging, parking, and lay-down space for use during construction at the treatment plant site. Design-Builder has included cost for installing stone for the laydown area, as well as restoring the disturbed area at Project Completion.
2. We have assumed excess spoils from construction of the improvements may be hauled to the Owner’s site adjacent to the existing WWTP.
3. All fill required for the project will be obtained from the project site.
4. It is assumed that Design-Builder will not encounter any existing Hazards including, but not limited to, lead, asbestos, or contaminated soils, other than as identified in the Asbestos and Hazardous Materials Survey Report dated April 26, 2023, attached herein, as prepared by Burns & McDonnell. Mitigation/abatement of all existing hazardous substances other than those identified in the referenced report is not included.
5. Seeding of disturbed areas is included. Landscape plantings or sodding are not included.
6. It is assumed groundwater will not be encountered in any excavations. Design-Builder has included pumping for precipitation water.

7. No provisions for restoration due to flooding within the regulatory floodplain or floodway are included in the work. Any delays or site access limitations will be considered a force majeure event in accordance with the General Conditions.
8. Design-Bulder assumes the existing overhead power and fiber-optic along the west end of the existing plant site will be relocated around the perimeter of the MBR project site prior to mobilization.
9. Rock excavation is excluded.
10. Design-Builder has accounted for 1'-6" for over-excavation and structural fill replacement for all footings, foundations, and slabs on grade.

### **DRILLED SHAFTS**

1. Drilled shaft deep foundations are included for Digester No. 4 and the Grit and Fine Screening Building. A total of 1,449 vertical feet of 36" diameter shafts, with a 3'-0" rock socket and temporary casing are included. If additional shaft drilling is required, it shall be performed at a unit rate of \$355 per vertical foot. Drilled shaft construction and total length will be documented by the third party testing agency.
2. If the actual amount of concrete placed in the drilled shafts exceeds 20% of the calculated volume based on scheduled diameter, tip, and cut-off elevation, Design-Builder shall be reimbursed for the difference in cubic yardage at a rate of \$225 per cubic yard. Drilled shaft construction and concrete useage will be documented by the thrid party testing agency. This provision is intended to provde reimbursement to Design-Builder for filling subsurface/karst voids with concrete during shaft construction.

### **DEMOLITION**

1. It is assumed that all trees, fencing, etc. as indicated on the Drawings for removal by Owner will be removed prior to mobilization.
2. It is assumed that the contents of the old plant steel clarifier that will be demolished are non-hazardous and that the liquid and sludge will be pumped into the existing manhole immediately adjacent to the clarifier (west side). It is assumed that the sludge is capable of being fluidized and pumped. No hauling of sludge has been included for the demolition of the existing steel clarifier tank.
3. Decommissioning and demolition of the existing WWTP following the start-up of the new WWTP is excluded.

### **PROCESS MECHANICAL & EQUIPMENT**

1. Based on review of the bids received for the process equipment, Owner and Design-Builder have mutually agreed to using the following equipment manufacturers:
  - a. Slide Gates and Actuators – Golden Harvest / Auma
  - b. Membrane Bioreactor Equipment – Veolia
  - c. Fine Screens – Saveco
  - d. Grit System – Hydro International
  - e. Aeration and Digestion Blowers – Aerzen
  - f. Solids Conveyor – Spirac
  - g. Aeration and Digestion Diffusers – EDI, Inc.

- h. Large Bubble Mixing – EnviroMix
  - i. Solids Pumps (WAS and Digester Feed) – Netzsch
  - j. Centrifuge + Polymer System – Flottweg / UGSI
  - k. Scum Removal Tipping Trough – JMS
  - l. Scum Removal Chopper Pump – Vaughan
  - m. RAS Pumps – Sulzer
  - n. Influent Pumps – Flygt
2. Chemical Feed Pump and Tank (Grundfos / Snyder) Equipment will be factory painted.
  3. It is assumed that all existing gates, valves, pumps, etc. to remain are operational until the new plant is commissioned.

### **EXISTING DIGESTERS NO. 1, 2, AND 3 REHABILITATION**

1. Sludge haul-off and disposal is excluded.
2. Structural modifications and/or improvements to the existing tankage is excluded.
3. Coating of concrete tankage is excluded.
4. It is assumed that all valves in the existing Sludge Control Valve Vault are functional and will be utilized for Digester isolation.
5. Temporary pumping to drain tanks is excluded.

### **WASTEWATER HOLDING BASINS 1 AND 2**

1. Sludge and solids haul-off and disposal is excluded.
2. Structural modifications and/or improvements to the existing tankage is excluded.
3. Temporary pumping to drain tanks is excluded.

### **ADMINISTRATION BUILDING**

1. Office furnishings are excluded.
2. Laboratory steel casework shall be Kewaunee with Kemresin tops.
3. Laboratory equipment is excluded.
4. Range ovens, refrigerators, microwaves, and other break room or laboratory appliances are excluded, except for the following:
  - a. Steelco undercounter glassware washer is included.
5. Outlets, drains, etc. have been considered in the Contract Documents based on Owner-provided list of equipment and needs.

### **ELECTRICAL, INSTRUMENTATION, & CONTROLS**

1. Based on review of the bids received for the major electrical equipment, Owner and Design-Builder have mutually agreed to using the following equipment manufacturers:
  - a. Switchboards – Siemens
  - b. Transformers – Maddox
  - c. Generator and Switchgear – Kohler
2. Based on review of the bids received for the Instrumentation, Controls, and System Integration scope of work, Owner and Design Builder have mutually agreed to use R. E. Pedrotti Inc. for instrumentation, and system integration.
3. Excludes any new security devices or systems (cameras, card readers, etc.)
4. Excludes vendor/manufacturer services for maintenance, service, or start-up of the existing WWTP generator that will be relocated to the Dewatering Building.

5. It is assumed that the City will maintain existing AVEVA Software Support contract through project completion.
6. It is assumed that the City will maintain existing WIN911 Software Support contract through project completion.
7. First year costs for AVEVA software license additions and support is included. Year 2 and beyond are excluded.
8. Furnishing and installing of access control systems is excluded. Design-Builder will work with City IT personnel and rough-in to facilitate City furnished and installed access control systems.
9. Integration of the CIP3 and CIP7 lift stations into the new WWTP SCADA system is included. Integration of other collection system lift stations and drinking water wells into the plant SCADA system is excluded.
10. Hardware, software, and programming to mitigate issues with the existing network are not included.

**COMMISSIONING & START-UP**

1. Design-Builder has assumed that the Owner will provide plant operations following commissioning, start-up, and training. Design-Builder and the equipment manufacturers will be responsible for the start-up and commissioning of all new processes, with the understanding that the Owner shall assume plant operations following start-up, commissioning, training, and final check-out.
2. The Owner will be responsible for operating the plant within the guidelines established by the Operations and Maintenance Manual, with any modifications to the process or program confirmed to be acceptable by the MBR Equipment Supplier.
3. Sludge from the existing treatment plant operations will be used to seed the new process basin.
4. First fill of diesel for the two new diesel generators is included.
5. First fill and all required chemicals for start-up and plant operations are excluded.
6. First fill of process equipment lubricants is included. Change-out of lubricants following start-up and commissioning is excluded.
7. Start-up, commissioning, and performance testing will be performed at flow rates available at that time. It is assumed that commissioning and start-up will not be at full plant design capacity. A minimum of 2 MGD will be required to test out full range of flow and processes. Completion of the performance test will be a condition of Final Completion.
8. The following influent wastewater loadings are assumed for startup/performance testing:

Parameter, Units	Average	Maximum Month	Maximum Day
BOD <sub>5</sub> , mg/L	196	278	388
TSS, mg/L	167	256	381
Ammonia, mg/L	28	34	43
TKN, mg/L	40	50	62
TP, mg/L	4	6	8
pH, su	6.5 – 8.1		

9. The biological process will be tested to meet the following effluent wastewater quality

Permit Requirements:

Parameter, Units	30-Day Avg	7-Day Avg	Daily Max
pH, su	-	-	6.0-9.0
BOD <sub>5</sub> , mg/L	10	15	-
TSS, mg/L	15	20	-
Oil and Grease, mg/L	10	-	15
Total Nitrogen, mg/L	10	-	-
Ammonia-Nitrogen, mg/L (May -Sept)	1.0	-	8.0
Ammonia-Nitrogen, mg/L (Oct - Apr)	2.0	-	8.0
Total Phosphorus, mg/L	1.0	-	-
<i>E. coli</i> , #/100 mL	-	-	126

10. Biological Process Performance Test will be conducted with assistance from the MBR Equipment Supplier as further described in the Contract Documents.
- a. Period: The Design Builder and MBR Equipment Supplier shall assist the Owner with operation of the system continuously over a sixty (60) calendar day test period, and collect and summarize data to demonstrate that the system meets the effluent wastewater quality Permit Requirements.
  - b. Operation: One process/MBR train shall be operated according to the design parameters and additional trains shall be brought online as needed to not exceed the design criteria. MBR trains shall be operated as close to the maximum month, peak day, and peak hour flow as possible to simulate design conditions during the performance test. Trains not biologically tested will be mechanically tested only.
  - c. Completion: Completion of the Performance Test shall be defined as 60 continuous calendar days of operation without a major failure in the system and demonstration that the MBR System meets performance requirements of the Contract Documents. A major failure in the system is one that interrupts system operation for more than 12 hours.
  - d. Sampling: Owner shall collect and analyze samples as required by the MBR Equipment Supplier.

# Missouri

## Division of Labor Standards

### WAGE AND HOUR SECTION



MICHAEL L. PARSON, Governor

# Annual Wage Order No. 30

Section 039  
**GREENE COUNTY**

In accordance with Section 290.262 RSMo 2000, within thirty (30) days after a certified copy of this Annual Wage Order has been filed with the Secretary of State as indicated below, any person who may be affected by this Annual Wage Order may object by filing an objection in triplicate with the Labor and Industrial Relations Commission, P.O. Box 599, Jefferson City, MO 65102-0599. Such objections must set forth in writing the specific grounds of objection. Each objection shall certify that a copy has been furnished to the Division of Labor Standards, P.O. Box 449, Jefferson City, MO 65102-0449 pursuant to 8 CSR 20-5.010(1). A certified copy of the Annual Wage Order has been filed with the Secretary of State of Missouri.

Original Signed by

Todd Smith, Director  
Division of Labor Standards

Filed With Secretary of State: March 10, 2023

Last Date Objections May Be Filed: April 10, 2023

Prepared by Missouri Department of Labor and Industrial Relations



OCCUPATIONAL TITLE	**Prevailing Hourly Rate
Asbestos Worker	\$37.85
Boilermaker	\$30.37*
Bricklayer	\$50.67
<b>Carpenter</b>	<b>\$46.56</b>
Lather	
Linoleum Layer	
Millwright	
Pile Driver	
Cement Mason	\$37.40
Plasterer	
Communications Technician	\$32.23
Electrician (Inside Wireman)	\$48.27
Electrician Outside Lineman	\$30.37*
Lineman Operator	
Lineman - Tree Trimmer	
Groundman	
Groundman - Tree Trimmer	
Elevator Constructor	\$30.37*
Glazier	\$41.95
<b>Ironworker</b>	<b>\$64.78</b>
Laborer	\$41.25
General Laborer	
First Semi-Skilled	
Second Semi-Skilled	
Mason	\$30.37*
Marble Mason	
Marble Finisher	
Terrazzo Worker	
Terrazzo Finisher	
Tile Setter	
Tile Finisher	
Operating Engineer	\$44.50
Group I	
Group II	
Group III	
Group III-A	
Group IV	
Group V	
Painter	\$34.27
Plumber	\$50.63
Pipe Fitter	
Roofer	\$42.32
Sheet Metal Worker	\$48.72
Sprinkler Fitter	\$64.27
Truck Driver	\$30.37*
Truck Control Service Driver	
Group I	
Group II	
Group III	
Group IV	

\*The Division of Labor Standards received fewer than 1,000 reportable hours for this occupational title. The public works contracting minimum wage is established for this occupational title using data provided by Missouri Economic Research and Information Center.

\*\*The Prevailing Hourly Rate includes any applicable fringe benefit amounts for each occupational title as defined in RSMO Section 290.210.

Heavy Construction Rates for  
GREENE County

Section 039

OCCUPATIONAL TITLE	**Prevailing Hourly Rate
Carpenter	\$30.37*
Millwright	
Pile Driver	
Electrician (Outside Lineman)	\$30.37*
Lineman Operator	
Lineman - Tree Trimmer	
Groundman	
Groundman - Tree Trimmer	
Laborer	\$43.48
General Laborer	
Skilled Laborer	
Operating Engineer	\$50.64
Group I	
Group II	
Group III	
Group IV	
Truck Driver	\$48.71
Truck Control Service Driver	
Group I	
Group II	
Group III	
Group IV	

Use Heavy Construction Rates on Highway and Heavy construction in accordance with the classifications of construction work established in 8 CSR 30-3.040(3).

Use Building Construction Rates on Building construction in accordance with the classifications of construction work established in 8 CSR 30-3.040(2).

If a worker is performing work on a heavy construction project within an occupational title that is not listed on the Heavy Construction Rate Sheet, use the rate for that occupational title as shown on the Building Construction Rate Sheet.

\*The Division of Labor Standards received fewer than 1,000 reportable hours for this occupational title. Public works contracting minimum wage is established for this occupational title using data provided by Missouri Economic Research and Information Center.

\*\*The Prevailing Hourly Rate includes any applicable fringe benefit amounts for each occupational title.

# OVERTIME and HOLIDAYS

## OVERTIME

For all work performed on a Sunday or a holiday, not less than twice (2x) the prevailing hourly rate of wages for work of a similar character in the locality in which the work is performed or the public works contracting minimum wage, whichever is applicable, shall be paid to all workers employed by or on behalf of any public body engaged in the construction of public works, exclusive of maintenance work.

For all overtime work performed, not less than one and one-half (1½) the prevailing hourly rate of wages for work of a similar character in the locality in which the work is performed or the public works contracting minimum wage, whichever is applicable, shall be paid to all workers employed by or on behalf of any public body engaged in the construction of public works, exclusive of maintenance work or contractual obligation. For purposes of this subdivision, "**overtime work**" shall include work that exceeds ten hours in one day and work in excess of forty hours in one calendar week; and

A thirty-minute lunch period on each calendar day shall be allowed for each worker on a public works project, provided that such time shall not be considered as time worked.

## HOLIDAYS

January first;  
The last Monday in May;  
July fourth;  
The first Monday in September;  
November eleventh;  
The fourth Thursday in November; and  
December twenty-fifth;

If any holiday falls on a Sunday, the following Monday shall be considered a holiday.

"General Decision Number: MO20230043 09/08/2023

Superseded General Decision Number: MO20220043

State: Missouri

Construction Type: Building

County: Greene County in Missouri.

BUILDING CONSTRUCTION PROJECTS (does not include single family homes or apartments up to and including 4 stories).

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60).

If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022:	<ul style="list-style-type: none"><li>. Executive Order 14026 generally applies to the contract.</li><li>. The contractor must pay all covered workers at least \$16.20 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2023.</li></ul>
If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022:	<ul style="list-style-type: none"><li>. Executive Order 13658 generally applies to the contract.</li><li>. The contractor must pay all covered workers at least \$12.15 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2023.</li></ul>

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

Additional information on contractor requirements and worker protections under the Executive Orders is available at <http://www.dol.gov/whd/govcontracts>.

Modification Number	Publication Date
0	01/06/2023
1	01/20/2023

2 01/27/2023  
 3 03/24/2023  
 4 04/14/2023  
 5 09/08/2023

ASBE0063-002 11/01/2021

	Rates	Fringes
ASBESTOS WORKER/HEAT & FROST INSULATOR.....	\$ 28.47	13.00

BOIL0083-005 01/01/2021

	Rates	Fringes
BOILERMAKER.....	\$ 41.52	30.36

BRM0015-014 04/01/2022

	Rates	Fringes
BRICKLAYER.....	\$ 32.32	18.64

BRM0015-017 06/01/2022

	Rates	Fringes
TILE SETTER.....	\$ 24.90	14.27

\* CARP0017-004 05/01/2023

	Rates	Fringes
CARPENTER		
Acoustical Ceiling Installation.....	\$ 29.39	21.25
Drywall Hanging Only.....	\$ 29.39	21.25
Metal Stud Installation Only.....	\$ 29.39	21.25

\* ELEC0453-007 09/01/2023

	Rates	Fringes
ELECTRICIAN.....	\$ 30.60	17.91

ENGI0101-024 04/01/2020

	Rates	Fringes
POWER EQUIPMENT OPERATOR:		
Bobcat/Skid Loader.....	\$ 25.41	15.32
Crane.....	\$ 27.91	15.32
Forklift.....	\$ 26.12	15.32
Grader/Blade.....	\$ 27.91	15.32
Loader.....	\$ 26.12	15.32
Paver.....	\$ 27.91	15.32
Roller.....	\$ 25.41	15.32

IRON0010-006 04/01/2023

	Rates	Fringes
IRONWORKER, ORNAMENTAL,		

REINFORCING AND STRUCTURAL.....\$ 33.50 33.38

-----  
LAB00663-012 04/01/2023

Rates Fringes

LABORER

Brick & Cement/Concrete  
Mason Tender.....\$ 28.03 14.42  
Common or General; Asphalt  
Shoveler; Pipelayer.....\$ 25.30 14.42

-----  
PLAS0518-022 03/01/2023

Rates Fringes

CEMENT MASON/CONCRETE FINISHER...\$ 26.57 12.43

-----  
PLUM0178-002 11/01/2022

Rates Fringes

PIPEFITTER, Includes HVAC  
Pipe Installation.....\$ 35.75 15.32  
PLUMBER, Excludes HVAC Pipe  
Installation.....\$ 35.75 15.32

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ROOF0020-003 02/01/2022

Rates Fringes

ROOFER.....\$ 27.00 12.64

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SHEE0036-003 07/01/2022

Rates Fringes

SHEET METAL WORKER, Includes  
HVAC Duct and Unit  
Installation.....\$ 30.74 16.64

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\* SUM02010-042 06/14/2010

Rates Fringes

CARPENTER.....\$ 18.83 7.40  
OPERATOR: Backhoe/Excavator.....\$ 20.16 11.36  
OPERATOR: Hoist.....\$ 26.02 13.01  
PAINTER: Brush and Roller.....\$ 15.91 \*\* 8.15  
PAINTER: Spray.....\$ 17.78 0.00

-----  
WELDERS - Receive rate prescribed for craft performing  
operation to which welding is incidental.

=====

\*\* Workers in this classification may be entitled to a higher  
minimum wage under Executive Order 14026 (\$16.20) or 13658  
(\$12.15). Please see the Note at the top of the wage  
determination for more information.

Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at <https://www.dol.gov/agencies/whd/government-contracts>.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

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The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of ""identifiers"" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

#### Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than ""SU"" or ""UAVG"" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

#### Survey Rate Identifiers

Classifications listed under the ""SU"" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all

rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

#### Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

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#### WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- \* an existing published wage determination
- \* a survey underlying a wage determination
- \* a Wage and Hour Division letter setting forth a position on a wage determination matter
- \* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour National Office because National Office has responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations  
Wage and Hour Division  
U.S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator



(See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator  
U.S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board  
U.S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISIO"

# Asbestos and Hazardous Materials Survey Report



## City of Republic, Missouri

Mini-Storage & Basin  
901 NW Avenue  
Republic, MO 65738  
Project No. 143573

Survey Date: March 2, 2023  
Report Date: April 26, 2023

# **Asbestos and Hazardous Materials Survey Report**

prepared for

**City of Republic, Missouri  
Mini-Storage & Basin  
901 NW Avenue  
Republic, MO 65738**

**Project No. 143573**

**Survey Date: March 2, 2023  
Report Date: April 26, 2023**

prepared by

**Burns & McDonnell Engineering Company, Inc.  
Kansas City, Missouri**

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## CERTIFICATION

**City of Republic, Missouri  
Asbestos and Hazardous Materials Survey Report  
Project No. 143573**

### Certification

This report is not intended or represented to be suitable for reuse by the City of Republic, Missouri City of Republic, Missouri or others without specific verification or adaptation by the Consultant.

ERIC WENGER

Handwritten signature of Eric Wenger, CIH in cursive script.

---

Missouri Asbestos Inspector, Management Planner, Project Designer  
Missouri Lead Risk Assessor  
Certified Industrial Hygienist (CIH)

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## LIST OF ABBREVIATIONS

<b><u>Abbreviation</u></b>	<b><u>Term/Phrase/Name</u></b>
AA	Atomic Absorption Spectroscopic Analysis
ACM	Asbestos-Containing Material
AHERA	Asbestos Hazard Emergency Response Act
AIHA	American Industrial Hygiene Association
ASHARA	Asbestos School Hazard Abatement Reauthorization Act
ASTM	American Standards and Testing Methods
C&D	Construction and Demolition
CFR	Code of Federal Regulations
CIH	Certified Industrial Hygienist
CMU	Concrete Masonry Unit
EHS	Environmental Hazard Services Laboratory
EPA	U.S. Environmental Protection Agency
HEPA	High-efficiency particulate air (filter)
HUD	Housing and Urban Development
LBP	Lead-Based Paint
LCP	Lead-Containing Paint
LF	Linear Feet
MAP	Model Accreditation Program for Asbestos, published by EPA
MDNR	Missouri Department of Natural Resources
mg/cm <sup>2</sup>	Milligrams per centimeters squared
MSW	Municipal Solid Waste
NAD	No Asbestos Detected
NESHAP	National Emission Standards for Hazardous Air Pollutants
NIST	National Institute for Standards and Technology
NLLAP	National Lead Laboratory Accreditation Program
NRCA	National Roofing Contractors Association
NVLAP	National Voluntary Laboratory Accreditation Program
OSHA	Occupational Safety and Health Administration
PACM	Presumed Asbestos Containing Material
PCB	Polychlorinated biphenyl
PLM	Polarized Light Microscopy
ppm	Parts per million
RCRA	Resource Conservation and Recovery Act
TCLP	Toxic Characteristic Leaching Procedure
TEM	Transmission Electron Microscopy
TSI	Thermal System Insulation

## 1.0 INTRODUCTION

This report summarizes the results of a survey for asbestos-containing materials (ACM), lead-containing paint (LCP) and other miscellaneous regulated building materials at the vacant, mini-storage building and basin at 901 NW Avenue for the City of Republic, Missouri in preparation for planned demolition/renovation activities. The site is near, but does not include, the existing wastewater treatment plant. Other miscellaneous materials include mercury, polychlorinated bi-phenyl (PCB) compounds, containers of chemicals, etc. The survey was completed by Eric Wenger of Burns & McDonnell Engineering Company, Inc. (Burns & McDonnell) on March 2, 2023. In addition, Ari Leyva, Assistant Architect with Burns & McDonnell, provided on-site technical assistance during this survey.

### 1.1 Inspector Credentials

This survey was conducted by Burns & McDonnell employee Mr. Eric Wenger, a Certified Industrial Hygienist (CIH), Missouri-licensed asbestos inspector and lead risk assessor. Asbestos inspector accreditation was assured by following the U.S. Environmental Protection Agency (EPA) Model Accreditation Program (MAP) for asbestos training, as required by the Asbestos School Hazard Abatement Reauthorization Act (ASHARA).

### 1.2 Locations Included in Survey

The inspection was limited to areas specified in the scope of work planned for demolition/renovation. The inspector identified, located, and sampled suspect homogenous material within locations included in this survey as described below.

1. Vacant mini-storage building interior and exterior (Mini-Storage) at 901 NW Ave, Republic, MO: Concrete masonry unit (CMU) wall construction, concrete slab-on-grade, metal-framed windows and doors, and damaged wooden roof covered with tar. Interior walls were a combination of CMU and wood. See drawings and photos in the Appendices of this report. The following describes areas included in the survey.
  - a. Roof and exterior of building: The roof is damaged and leaks water.
  - b. The interior has mud and building debris on the floors, making it difficult to see all the flooring. Assume all flooring is covered by floor tiles with yellow mastic on the concrete slab. Some flooring has a layer of carpet atop the floor tiles. There is an old electrical panel, an old lab drying oven, water heater, sump, window air-conditioning (A/C) unit, non-insulated metal water piping and pump motors, old bathroom, and miscellaneous debris, containers of liquids and old tires. The ceiling has fiberglass batt insulation above ceiling tiles, but most have fallen to the floor. Walking in the vacant building can present hazards to personnel including boards with nails, slippery floors, partly-fallen boards, and hazardous

materials.

2. Former clarifier basin north of Mini-Storage building (Basin):  
Round basin, about 83-feet in diameter, constructed of metal and with associated walkways, non-insulated metal piping, and concrete manhole.

Excluded areas:

- a. The currently operating main wastewater treatment plant (WWTP), process and administration buildings, were not included in this survey scope of work.
- b. Existing light fixtures were not opened for visual inspection.

### **1.3 Historical Records Review**

No previous reports of asbestos or lead inspections were provided to Burns & McDonnell prior to this survey, and it is assumed no previous sampling has been conducted.

### **1.4 Limitations of Survey**

The survey was limited to buildings and certain locations identified in Section 1.2 above. Professional judgment was used to determine survey methods, procedures, and report format, particularly regarding the location and number of collected samples, with procedures described in the following chapters. Although efforts were made to follow customary practices of environmental and/or industrial hygiene sciences to identify all suspect hazardous/regulated building materials, no guarantee or warranty is provided regarding the existence or absence of such materials, and a possibility remains for the presence of additional suspect materials that were inaccessible, including above ceilings, behind walls & mirrors, underground, within electrical panels, under debris/dirt on floors, etc. Therefore, prior to renovation or demolition activities, a contractor must first verify locations and amounts of materials identified in this report, then be alert to isolate any newly discovered, suspect regulated or hazardous materials and promptly communicate the discovery to the owner, manager, and/or general contractor as appropriate and seek further direction to properly protect occupants, workers and the public. Semi-destructive sampling methods were used, causing unavoidable blemishes or damage to facility structures and finishes. Findings in this report are based on conditions at the time of the survey and results rely on third-party laboratory analyses.

In addition, this survey was limited as follows:

1. This asbestos survey is considered a project design survey, following the EPA National Emission Standards for Hazardous Air Pollutants (NESHAP) prior to demolition or renovation, and the Occupational Safety and Health Administration (OSHA) directives to identify asbestos in the workplace vs. an Asbestos Hazard Emergency Response Act (AHERA) inspection, which would also require assessing friable asbestos among other aspects.



2. Lead and other hazardous materials were identified according to the OSHA directives to identify hazards, and this is not considered a detailed lead inspection according to requirements of EPA and Department of Housing and Urban Development (HUD) for child-occupied, target housing.
3. Additional suspect materials may be inaccessible and not discovered until building demolition.
4. Visual observations were used to identify possible mercury and PCBs – no samples collected or analyzed.

\* \* \* \* \*

## 2.0 ASBESTOS SURVEY PROCEDURES

The purpose of this asbestos survey was to identify whether ACM is present in the vacant main building, clarifier basin and associated piping, planned for demolition/renovation.

### 2.1 Asbestos Requirements

This survey was based on the EPA National Emissions Standards for Hazardous Air Pollutants (NESHAP) for asbestos in 40 CFR 61, Subpart M, combined with applicable portions of the Occupational Safety and Health Administration (OSHA) asbestos standard 29 CFR 1926.1101 (Construction), and 29 CFR 1910.1001 (General Industry). NESHAP requires the owner to “thoroughly inspect” for the presence of asbestos prior to demolition or renovation of a structure, installation, or building. OSHA requires building owners to determine the presence, location, and quantity of ACM at the work site, and for employers to protect workers from over-exposure to asbestos.

Other guidelines, including the ASTM E2356-18, *Standard Practice for Comprehensive Building Asbestos Surveys*, were reviewed and utilized as applicable and noted in this report, but were not followed as the basis of this survey.

An inspector can group suspect materials from similarly-constructed areas into homogeneous areas/materials if they are uniform in color, texture, and apparent date or known date of installation, as defined by ASTM.

NESHAP and OSHA consider materials to be ACM if they contain greater than one-percent (1%) asbestos, and NESHAP requires the inspector to categorize ACM as either:

- Friable (when dry, can be crumbled, pulverized, or reduced to powder by hand pressure);
- Category I non-friable (packings, gaskets, resilient floor covering, and asphalt roofing products), and EPA has a letter of interpretation to include mastics; or
- Category II non-friable (any other non-friable ACM).

ASTM defines non-suspect materials to include fiberglass, foam glass, rubber, glass, steel, concrete, porcelain, and wood. In addition, natural stone and bare metal were not considered suspect. Typically, an accredited inspector is not required to sample non-suspect materials, unless they are observed to have a suspect layer, mastic, or coating. Suspect materials are commonly grouped into one of three classifications:

- Thermal-system insulation (TSI);

- Surfacing materials, and;
- Miscellaneous materials.

According to OSHA, certain materials can be considered as ‘Presumed Asbestos Containing Material’ (PACM). These materials include TSI and surfacing materials found in buildings constructed prior to 1981. In addition, an accredited inspector can “assume” a suspect material is ACM even if no sampling or analysis are performed, but an inspector cannot assume a suspect material to be asbestos-free without sampling results. Assumed asbestos is typically limited to materials on live or energized systems, and suspect materials not safe or accessible for sampling.

OSHA states in an April 17, 1997 letter of interpretation that a material containing trace amounts of asbestos, i.e. less than 1%, are regulated as “unclassified” asbestos. Though not considered “ACM” by OSHA or EPA NESHAP definition, unclassified asbestos-work operations require that the employer follow OSHA asbestos requirements for engineering, work practice, and protective equipment controls to limit worker exposure.

## **2.2 State Asbestos Regulations**

Missouri administers the federal NESHAP program and regulates disposal of asbestos. Missouri does not regulate non-friable ACM, but recommends following federal asbestos guidelines, such as using an EPA-trained 40-hour asbestos supervisor for abatement, as required by OSHA to be onsite during removal of asbestos. Prior to demolition or renovation of a regulated building or structure, a Missouri-licensed asbestos inspector must complete an asbestos inspection. The Missouri Department of Natural Resources (MDNR) regulates demolition and renovation projects involving institutional, commercial, public, industrial, or residential structures, installations or buildings. The record of inspection must be kept within internal project files for the purpose of identifying asbestos and eliminating worker exposures. Depending on the type or category of the ACM identified from the inspection and the forces that will eventually act upon them during demolition or renovation, the materials may or may not be regulated by the MDNR. In order to determine the applicability of the MDNR’s asbestos requirements, the ACM must first be determined whether or not it meets the State’s definition of regulated asbestos-containing materials (RACM). RACM includes:

- Friable;
- Category I non-friable that have become or will become friable, or have been subject to sanding, grinding, cutting, burning, or abrading; and

- Category II non-friable that have a high probability of becoming, or have become, crumbled, pulverized or reduced to powder by the work practices used during the course of demolition or renovation.

If the asbestos inspection determines that 160 square feet, 260 linear feet, 35 cubic feet (threshold quantities) or more of RACM will be impacted by demolition or renovation activities, all of the RACM must be removed by a Missouri certified asbestos abatement contractor.

There are two types of notifications required by the MDNR in regard to demolition and renovation projects: asbestos abatement project notification (form MO 780-1226) and demolition and renovation project notification (form MO 780-1923). Asbestos abatement project notifications must be submitted to the MDNR Air Pollution Control Program at least 10 working days prior to the start of a regulated asbestos abatement project. A copy of the asbestos inspection report and laboratory analytical results must accompany the notification. A \$200 review fee is required for each notification. The second type of notification is demolition notification. Demolition/renovation notifications must be provided to the MDNR at least 10 working days prior to the demolition or renovation, along with a \$100 review fee.

Asbestos waste from regulated projects involving threshold quantities of RACM must be handled in strict accordance with the MDNR's requirements for asbestos waste disposal. Wastes from these projects must be transferred to an approved sanitary landfill or transfer station by registered asbestos abatement contractors, who are trained in the provisions for proper waste disposal. Non-friable asbestos can go to a construction/demolition (C&D) landfill if the landfill provides pre-approval. Friable asbestos must be disposed in a regulated landfill.

### **2.3 Asbestos Sampling Methods**

According to OSHA 29 CFR 1926.1101(K)(5)(B), which for bulk sampling refers to 40 CFR 763.86, and EPA MAP bulk sampling methods, the inspector(s) collected a sample(s) from each homogeneous area/material. An exception from the standard bulk sampling methods is use of 'convenience sampling' vs. 'randomly distributed' sampling, allowed under the EPA MAP in non-school buildings, particularly for TSI.

An effort was made to collect at least the minimum, required number of samples representing each suspect, homogeneous area/material. For suspect, non-friable homogeneous areas/materials, the accredited inspector determined the appropriate number of samples to characterize the material, as allowed under 40 CFR 763.86(d). Per ASTM E2356 6.4.6.3, a single sample may suffice for small, manufactured items such as heating, ventilation, and air-conditioning vibration dampeners, gaskets, and

friction products that appear to be of a consistent, manufactured product. Also, where it was not feasible to collect multiple samples and for non-regulated or non-suspect materials that were sampled for verification, one sample can be adequate, depending on the situation.

Sampling did not include 'live' systems such as cloth-like casing of electric wiring, which, if found, may be assumed positive; however, none of that type of wiring was observed during the survey.

Burns & McDonnell conducted the survey of suspect asbestos materials. At a minimum, amended water spray was used during sample collection to control dust and fiber release, with additional controls used by the inspector(s) if necessary, to limit fiber release. Wetted bulk samples were placed into individual, sealable containers, and retained by the inspector until delivered/shipped to the laboratory for analysis.

Samples were shipped/delivered for asbestos analysis to Environmental Hazards Services (EHS), located in Richmond, Virginia. This laboratory is accredited by the American Industrial Hygiene Association (AIHA) and is also certified for bulk asbestos analysis through the National Voluntary Laboratory Accreditation Program (NVLAP) under the National Institute for Standards & Technology (NIST) program, respective laboratory numbers #100420 and #101882-0.

Bulk samples were analyzed using polarized light microscopy (PLM) by EPA Method 600/R-93/116. The laboratory provided an approximate percentage of asbestos fibers in the sample and identified the crystal form of the asbestos. In some cases where collected samples had two or more layers (i.e. material with adhesive, or drywall and joint compound), the laboratory analyzed all layers. Federal regulations require that each layer of suspect material be analyzed separately for asbestos content. In addition, federal regulations state that if any sample from a homogeneous area contains asbestos, then the entire homogeneous area/material must be considered asbestos-containing, regardless of the results from the remaining samples from that area/material.

Under certain conditions, the EPA recommends subsequent confirmation analysis, in addition to PLM, using Transmission Electron Microscopy (TEM). TEM is recommended by the EPA for materials with trace levels of asbestos, up to 10%, and/or for non-friable organically bound materials that consist of fibers and other particulate matter embedded in a solid matrix of asphaltic, vinyl or other organic substances, such as floor tile. If used, the TEM method is typically the New York State ELAP Method #198.4. EPA states that if either TEM or PLM analysis provide results greater than 1% asbestos, then the material must be considered ACM.

For wallboard systems, EPA accepts a composite sample of sheetrock and joint compound and if the result is less than 1% asbestos it is not regulated. However, OSHA requires each layer to be analyzed and if either the joint compound or sheetrock is greater than 1% it is regulated by OSHA asbestos standard 29 CFR 1926.1101 for construction/demolition.

To comply with OSHA's asbestos regulation, a full-shift breathing-zone air sample was collected during the survey and analyzed by EHS Lab for fibers, along with a field blank, using phase-contrast microscopy.

\* \* \* \* \*

### 3.0 LEAD-PAINT SURVEY PROCEDURES

The purpose of the lead-paint survey was to identify whether lead is present in the paint coatings in areas that may be disturbed by anticipated renovation activities. In addition, coatings were also analyzed for cadmium (Cd) and chromium (Cr), which can be common hazards in paint coatings.

#### 3.1 Lead Paint and Metals Requirements

EPA and the Department of Housing and Urban Development (HUD) define a lead inspection as a surface-by-surface investigation to determine the presence of lead-based paint (LBP) in target (pre-1978) housing and child-occupied facilities. Since this facility is not target housing or child-occupied, the lead activity conducted on this project is not required to adhere to the EPA/HUD lead 'inspection' method but was modified and is better described as an 'assessment' or 'survey', conducted primarily to obtain information to pass along to employers to protect their workers from lead exposure.

OSHA regulates worker lead exposure under the lead-in-construction standard, 29 CFR 1926.62. If the lead disturbance is a result of on-staff maintenance work, then the OSHA lead-in-general industry standard would apply, per 29 CFR 1910.1025. When detectable lead and metal concentrations are found at a worksite, contractors and workers must be provided with a copy of the sample results so their employer can make proper decisions on engineering, work practice, and personal protective equipment (PPE) controls. When planning to disturb coatings and materials containing lead and/or other metals, the employer may be required by OSHA to develop a written lead compliance program for worker protection.

Laboratory analytical methods can detect trace levels of lead, so the following definitions are provided for consistency of terms:

- Lead-based Paint (LBP) is dried paint having a lead content exceeding 1 milligram per square centimeter ( $\text{mg}/\text{cm}^2$ ) by x-ray fluorescence analysis, or a lead concentration exceeding 0.5 percent (%), or 5,000 parts per million (ppm) by mass, using paint-chip collection and laboratory analysis as defined by ASTM, EPA, and HUD.
- Lead-containing Paint (LCP) is paint or other similar surface coating materials exceeding 0.06% by mass (which is approximately  $>600$  ppm total lead or  $\geq 0.7$   $\text{mg}/\text{cm}^2$ ) of dried paint film as defined by ASTM.

- The Consumer Product Safety Commission (CPSC), 16 CFR 1303, has set a limit for LCP in consumer products at 0.009% (90 ppm) by weight of dried paint film, as of August 14, 2009, reduced from previous limit set at 600 ppm.
- OSHA states that their 29 CFR 1926.62 lead-in-construction regulation was intended to apply to any detectable concentration of lead in paint, including trace lead levels, per a March 1, 1999 letter of interpretation.

The EPA's National Ambient Air Quality Standards (NAAQS 40 CFR 61.01) regulation includes lead. NAAQS requires certain controls to prevent lead contamination into the environment, including the directive to have 'no visible emissions' into the environment from a lead activity.

Other toxic metals such as cadmium and chromium may also be present in paint coatings and must be recognized and considered when protecting workers and the environment. OSHA has a cadmium standard (29 CFR 1926.1127) that must be followed when disturbing paint or other materials containing cadmium. Whereas no limits are established for concentrations of Cd or Cr in coatings, OSHA has established airborne, permissible exposure limits (PELs) for those metals to protect worker health. Using professional judgement to derive action levels for Cd and Cr in paint, one could compare the OSHA PEL for Pb to those for Cd and Cr. The Cd limit is 10 times lower, and the Cr limit is 10 times higher than Pb. This would provide a comparable action level for Cadmium in paint at 0.05%, and for Chromium in paint at 5%, assuming lead-based paint at 0.5%.

Waste disposal options for lead materials may vary based on state and local regulations. A determination of whether a material is hazardous waste due to lead, cadmium, or chromium and other metal content can be made by sending representative samples of waste streams to an accredited laboratory for toxicity characteristic leaching procedure (TCLP) analysis. The material is considered to be hazardous waste if the leachable content of the waste exceeds 5.0 ppm for lead, as well as exceeding applicable hazardous limits for other metals. TCLP testing was not included in the scope of this project.

In lieu of laboratory analysis, it is sometimes acceptable to employ "Use of Knowledge," which means analyzing the waste using existing information. A generally accepted approach is the "Rule of Twenty" which states that if a waste is 100% solid, as defined by the TCLP method, then the results of the total constituent analysis may be divided by twenty to convert the total results into the maximum leachable concentration. This factor is derived from the 20:1 liquid-to-solid ratio employed in the TCLP method and is a conservative estimate. Waste characterization was not included in the scope of this project.



### 3.2 State Lead Regulations

Follow OSHA lead regulations 29 CFR 1926.62 or 1910.1025 to protect workers from lead exposure, 29 CFR 1926.1127 for cadmium regulations, and 29 CFR 1926.55 for total chromium permissible exposure limits, assuming cadmium and total chromium may also be present in paint.

The Missouri Department of Natural Resources (MDNR) has requirements and guidance for disposal of lead waste, including the MDNR Fact Sheet titled “Managing Construction and Demolition Waste”. Lead paint residue, including lead paint chips, paint scrapings, contaminated blast residue, should be laboratory-tested for eight Resource Conservation and Recovery Act (RCRA) metals by TCLP by the Owner, or contractor, before disposal for hazardous waste determination. This fact sheet assumes that the lead waste originates in Missouri and, if found to be non-hazardous, is also disposed in Missouri.

If the leachable content [TCLP] exceeds the hazardous waste limits for any of the metals, the waste must be transported by a hazardous waste transporter to a hazardous waste landfill (which may be out of state) or, if allowed by MDNR, to a recycling company. If the lead material is not hazardous waste, it can be disposed in a Subtitle D, municipal solid waste landfill; however, the landfill must be notified of the lead content of the waste and has the opportunity to determine whether to accept the waste.

Demolition debris, includes blocks, bricks, metal and boards that have lead or other metal-based paint. MDNR states that demolition debris is unlikely to fail TCLP, but all solid wastes must receive an accurate hazardous waste determination when they are generated. If generator knowledge of the material is insufficient to make an accurate hazardous waste determination, then testing of the debris is needed. Demolition debris should not be chipped, shredded, milled, ground, mulched or similarly processed in a way that would increase their leachability before disposal. Landfill notification prior to disposal of materials with lead or other heavy metals is still necessary.

### 3.3 Paint Sampling Methods

Field sampling of paint coatings for laboratory analysis was used to provide information on concentrations of lead in paint to meet OSHA requirements for worker protection and to provide information to meet EPA NESHAP and/or waste disposal requirements during future demolition. Representative bulk paint-chip samples were collected and placed into containers for shipment to the laboratory for analysis. Hand tools, cleaned prior to each sample collection, were used to remove the paint-chips.

For this assessment, paint coatings were observed and grouped together by similar color, substrate, and painting history (if known). Then from each unique paint-substrate combination, approximately one

location was sampled. Approximate locations of samples were noted, and each sample number was logged onto a chain-of-custody (COC) form. Bulk paint-chip samples were sent to EHS in Richmond, Virginia and were analyzed for percent lead, cadmium, and total chromium by weight and/or ppm using Inductively-coupled Plasma (ICP) per NIOSH Method 7400. This laboratory is recognized under EPA's National Lead Laboratory Accreditation Program (NLLAP) and is accredited by AIHA.

\* \* \* \* \*

## **4.0 HAZARDOUS/ REGULATED MATERIALS INVENTORY**

The Burns & McDonnell inspector walked through the areas included in the survey and conducted visual observations to identify and catalogue other suspect, miscellaneous hazardous/regulated materials. No sampling occurred for these miscellaneous hazardous materials. The quantity and locations of visible materials were noted. Safety Data Sheets (SDS) were not provided, so certain assumptions were made regarding these materials. If SDSs become available in the future, they should be reviewed, and product knowledge applied. No analytical sampling was performed on any materials or units for purposes of determining hazardous characteristics or presence of hazardous constituents for disposal.

Miscellaneous materials, such as small quantity commercial container chemicals typically stored in a designated chemical cabinet or storage area, were not included in the inventory.

### **4.1 Mercury**

Efforts were made to visually identify and count mercury containing items in the areas included in the survey. Electrical lamps including fluorescent tubes, neon, compact fluorescent lamps, high-pressure sodium, mercury vapor, metal halide, and high-intensity discharge lamps may contain mercury at levels classifying tube disposal as hazardous waste according to the EPA. Also, mercury can be present in liquid form, such as in switches and thermostats.

### **4.2 PCBs**

Polychlorinated biphenyls (PCBs) are no longer commercially produced in the United States. However, PCBs are still present in products where PCBs have been used including electrical transformers, electrical lamp ballasts, hydraulic fluids, etc. The building was visually inspected for the potential presence of such materials. According to the EPA, suspect materials, including transformers and lighting ballasts, must be considered positive for PCBs unless the product is clearly marked with a label stating “NO PCBs” in the product. PCBs may also be present in suspect caulk, paints, and/or expansion joint fillers. No sampling was required for this project and no sampling occurred.

### **4.3 Miscellaneous Regulated Materials**

Other miscellaneous materials suspected to be hazardous, such as chemical containers that were not stored in a designated chemical cabinet or storage area, were included in the visual inventory.

\* \* \* \* \*

## 5.0 RESULTS

Results of the surveys are representative of conditions on the day of sampling. There is a possibility that other materials may be discovered during future activities or demolition.

Appendix A provides summary tables of results. Table 1 provides a summary of the location, amount, type, and NESHAP category of ACM found during this survey. Table 2 provides a listing of all suspect materials and homogenous areas that were sampled for asbestos. Table 3 provides a summary of all the paint sample results for lead, cadmium, and chromium. Table 4 provides a list of miscellaneous hazardous or regulated building materials (including mercury and PCBs) identified by visual observations.

Appendix B contains representative site photos. Appendix C provides drawings showing sample locations. Inspector credentials and all laboratory reports and chain-of-custody forms are in Appendix D.

### 5.1 Asbestos Results

Asbestos-containing materials (ACM) were identified in the following homogeneous materials (HM):

- HM #1: Intact black 'Bakelite' switches, about 12 switches in interior electrical wall panel, contain 30% chrysotile ACM, Category II, non-friable.
- HM #3: Damaged tan/gray caulk, hard/brittle, around the exterior metal-to-CMU perimeters of north window and west doors contains 3-4% chrysotile ACM, Category II, non-friable. There is about 10-linear feet and it may become friable when disturbed.
- HM #6: Damaged tan Floor tile (1'x1'), assumed to be on all interior floors (about 575 square feet) contains 2% chrysotile ACM, Category I, non-friable. Some of the floor tile is covered with a carpet and much is coated with dirt, mud, and debris. The yellow mastic on concrete, and yellow carpet mastic atop tile do not contain asbestos.
- HM #10: Intact white 'rope' packing/gasket around the door frame of the old lab oven in the northernmost room contains about 6-linear feet of Category I, non-friable ACM with 55% chrysotile in the non-woven main layer.
- HM #13: Damaged black caulk/sealant around the perimeter of the concrete manhole riser, located west of the basin. Category I, non-friable contains 12% chrysotile ACM and is about 6 linear feet.

The inspector's personal breathing-zone air sample result was 0.037 fibers per cubic centimeter of air (0.037 f/cc), within acceptable concentrations and below the OSHA 8-hour permissible exposure limit of 0.1 f/cc, providing a negative exposure assessment. Air sample was collected only during sampling of the asbestos materials and a half-face air-purifying respirator with P100 filters was worn during asbestos sampling. Air-sample duration was 50 minutes and no other potential asbestos exposure occurred during the shift.

## **5.2 Lead & Other Heavy Metals Paint Results**

All sampled paint contains lead. Most of the paint also contains some cadmium and/or chromium. All paint is in poor condition with some flaking and/or peeling.

## **5.3 Mercury Results**

Ceiling light fixtures were observed to have fluorescent tubes and are assumed to contain low-pressure mercury vapor.

- 8-mercury fluorescent tubes (8-feet each)

## **5.4 PCB Results**

Suspect PCBs were identified in ballasts, which should all be assumed to contain PCBs, unless each ballast is visually inspected, and a non-PCB label is present on each.

- 4-light ballasts in ceiling-mounted fluorescent fixtures are assumed to contain PCBs, unless visual inspection finds labels marked with 'No PCBs'.

## **5.5 Miscellaneous Regulated Materials Results**

Various containers of unknown chemicals are present, and some may contain oil, but Burns & McDonnell personnel did not inspect or identify contents or quantities in the containers. A window A/C unit is present that may contain freon. A water heater and used tires are present. Contents may be subject to regulation as hazardous wastes if they are listed in Subpart D of 40 CFR Part 261 if they exhibit any characteristics of hazardous waste as described in Subpart C of 40 CFR Part 261. An exterior water hydrant indicates the presence of underground water line.

\* \* \* \* \*

## 6.0 RECOMMENDATIONS

This survey has identified the presence of hazardous/regulated materials. Contractors and employers must identify, characterize, and profile potentially hazardous/ regulated materials prior to removal and handle and dispose/recycle materials in accordance with applicable local, state, and federal requirements.

Provide a copy of this report to contractors in bid documents and/or contractors planning to conduct renovation/demolition at the facility to review prior to starting work.

Retain a copy of this survey report for future reference and update by the building owner to inform and protect employees and building maintenance workers from inadvertently disturbing ACM and other regulated materials.

### 6.1 Asbestos Recommendations

- This survey identified the presence of ACM in and around the Mini-Storage Building and Basin.
- EPA/MDNR regulations required that regulated ACM, including equal or greater than 160 linear feet or 260 square feet of friable ACM and ACM likely to become friable when subjected to demolition work activities, must be properly abated/removed in accordance with all applicable local, state, and federal guidelines prior to renovation/demolition, including submittal of a 10-working day asbestos abatement notification to MDNR. Abatement options include removal, repair, encapsulation, encasement, and operations & maintenance of existing ACM, but removal of the ACM is the only permanent abatement option.
- Prior to demolition of the buildings or structural components, contractor must also submit a Notification of Demolition to MDNR at least 10-working days prior to work to comply with NESHAP regulations.
- Depending on removal methods, non-friable ACM removal may not be regulated by the State; however, it is recommended to have a Missouri-licensed asbestos abatement contractor remove all ACM and dispose of the material as asbestos waste prior to demolition. Although this recommendation exceeds EPA/MDNR requirements and adds abatement cost, it avoids potential asbestos exposure to construction workers, avoids inadvertent mis-handling or release to the environment, and may provide potential cost savings by not having to dispose of the entire building as asbestos-containing demolition waste.
- Do not disturb asbestos without having the required training, using appropriate and safe means, methods and personal protective equipment, and following EPA NESHAP regulations (40 CFR Part 61) and OSHA regulations 29 CFR 1910.1001/ 1926.1101 at a minimum.
- If any ACM is to remain in place in the building, the owner must implement an asbestos operations & maintenance (O&M) program to properly manage the remaining asbestos in good condition and limit employee asbestos exposure in accordance with OSHA 29 CFR 1910.1001 or 1926.1101.

- If additional suspect materials are identified, they need to be isolated and sampled for asbestos content by a Missouri-licensed asbestos inspector.

## 6.2 Lead & Metal Containing Paint Recommendations

- Inform contractor(s) that all paint contains lead and most also contains cadmium and/or chromium and they must handle and dispose according to federal, state, and local regulations to protect workers, public, and the environment.
- If removing or disturbing paint with lead and/or cadmium/chromium, follow safe work practices and lead and cadmium regulation in OSHA 29 CFR 1926.62 and 29 CFR 1926.1127.
- For paint with lead/metals in poor condition that is peeling, remove and collect loose paint chips and analyze a sample of the chips by TCLP and compare results to allowable hazardous waste limits for lead and other RCRA metals, including cadmium & chromium, to determine if the paint-chip waste is hazardous.
- Intact paint with lead/metals adhering to the substrate (good to fair condition) can remain in place during demolition/renovation. Some application of stabilizing paint (i.e., re-painting) may be helpful to keep paint coating on substrate in some locations. Building materials that are removed with intact lead/metals paint may be disposed of at a recycling facility or construction landfill, pending pre-approval by facility accepting the lead-containing waste.
- If renovation work will directly disturb paint with lead/metals such as but not limited to, scraping, sanding, blasting, welding, cutting, torching, etc., follow OSHA's lead regulations, 29 CFR 1926.62 for Construction and OSHA cadmium regulations, 29 CFR 1926.1127. Make an initial written determination in writing of employee exposure, based on intended means and methods of disturbing lead/cadmium/metal-containing paint. Prepare and follow a written lead & cadmium compliance plan when required by OSHA. Provide handwash facility and employee awareness training at a minimum. If there is reasonable possibility that employees may be exposed to lead or cadmium at or above the OSHA action level of 30 micrograms per cubic meter of air (30 ug/m<sup>3</sup>) for lead or 2.5 ug/m<sup>3</sup> for cadmium, certain actions need to be taken by the employer to protect workers from exposure.
- Prevent visible emissions of paint with lead/metals into the environment during demolition/renovation activities.
- Use wet methods and/or vacuums with high-efficiency particulate air (HEPA) filtration to clean up and control dust and debris containing paint with lead/metals.

## 6.3 Mercury Recommendations

- Remove and handle mercury-containing light tubes carefully, without breakage, and dispose as Universal Waste, with recycling a preferred option.
- Storage containers for mercury light tubes must be dated, labeled "Universal Waste" and the contents identified, then shipped to a reputable receiver/recycler within one year from

accumulation. Contractor should have a mercury spill kit with trained personnel available in the event that a light tube or vial breaks. Assume all fluorescent light tubes and metal-halide lamps throughout the buildings to be mercury containing.

#### **6.4 PCB Recommendations**

During removal of light fixtures, check the label on each lighting ballast. If the ballast was manufactured prior to 1979 and is not labeled as “non-PCB”, it should be segregated from the non-PCB electronic ballasts and sent to a reputable recycler for disposal as PCB-containing waste. According to the EPA, suspect materials, including lighting ballasts (unless they are electronic), must be considered positive for PCBs unless the product is clearly marked with a label stating, “NO PCBs”.

#### **6.5 Hazardous Materials Recommendations**

This survey has identified the presence of miscellaneous hazardous materials. All hazardous materials identified in this survey should be properly characterized and profiled prior to disposal or recycling in accordance with applicable local, state, and federal guidelines prior to demolition. Recommend reviewing any available SDS sheets for identified miscellaneous regulated materials.

\* \* \* \* \*



**APPENDIX A - TABLE 1 - SUMMARY OF ACM  
TABLE 2 - ASBESTOS BULK SAMPLES  
TABLE 3 - LEAD PAINT SAMPLES  
TABLE 4- MISCELLANEOUS HAZARDOUS MATERIALS**

**Table 1.**  
**Summary of Asbestos-Containing Material (ACM)**

**Vacant Mini-Storage Building and Basin**  
**901 NW Avenue**  
**City of Republic, Missouri**  
**Sampling Date: March 2, 2023**  
**(Contractor is to verify all locations and quantities.)**

Homogenous ACM Material Description	Location(s)	Sample Numbers	Estimated Amount	Condition	NESHAP Category	PLM Results
<u>Homogeneous Material #1:</u> Black 'Bakelite' electric gear switch	Electric panel on interior north wall in pump room	1A	About 7 large and 5 small switches/ connectors	Intact/Good	Category II, non-friable	30% Chrysotile
<u>Homogeneous Material #3:</u> Tan/Gray, hard window caulking around frames	Exterior north window and west exterior door frame	3A 3B 3C	10 Linear Feet	Damaged	Category II, non-friable with high probability of becoming crumbled during demolition	3-4% Chrysotile
<u>Homogeneous Material #6:</u> Tan Floor tile (1'x1') & yellow mastic on concrete (includes some areas covered with carpet (yellow carpet mastic))	Footprint floor of interior building	6A 6B 6C	575 Square Feet	Damaged	Category I, non-friable	2% Chrysotile (floor tile only) Yellow mastic does not contain asbestos. {Layer of dirt/ mud/ debris on floor.}
<u>Homogeneous Material #10:</u> White 'rope' packing/gasket	Around door frame of old oven sitting in North room	10A	6 Linear Feet	Intact/ Good	Category I, non-friable	55% Chrysotile (in non-woven main layer)
<u>Homogeneous Material #13:</u> Gray/ Black caulk/sealant	Around top perimeter of concrete manhole riser, located west of basin (iron-concrete seal)	13A	6 Linear Feet	Damaged	Category I, non-friable	12% Chrysotile

## Table 2. Asbestos Bulk Samples

Project Number/Name: Republic Missouri Wastewater (WW) Treatment Plant #143573 Client/Address: 901 NW Ave. City of Republic, MO

Sampling Date(s): Mar 2, 2023 Sampled by: Eric Wenger, CIH General Site Info/Activities/Building: Mini-storage Bldg & Basin.

Sample No.	Bldg. Name or No.	Floor No.	Room or Space	Homog. Material	Description of Material	Location of Sample	Results (PLM)	Estimated Quantity of ACM	NESHAP Category
1A	Mini-Storage	Ground	Pump Rm	1	Black 'Bakelite' electric gear switch	Switch from disconnected electric panel	30% Chrysotile Asbestos	12 Switches/ connectors in electrical panel	Category II, non-friable – {Assume panel switches are all ACM}
1B	Mini-Storage	Ground	Pump Rm	1	Black 'Bakelite' electric gear switch	240 V. switch	NAD		
2A	Mini-Storage	Ground	Ext. Windows	2	Gray, hard window glazing around glass panes	West exterior window facing hallway	NAD	NA	NA
2B	Mini-Storage	Ground	Ext. Windows	2	Gray, hard window glazing around glass panes	North exterior window of pump room	NAD	NA	NA
2C	Mini-Storage	Ground	Ext. Windows	2	Gray, hard window glazing around glass panes	Northern-most exterior window, facing lab	NAD	NA	NA
3A	Mini-Storage	Ground	Ext. Window	3	Tan/Gray, hard window caulking around frames	North, exterior window of pump room	3% Chrysotile Asbestos	10 LF	Category II, non-friable
3B	Mini-Storage	Ground	Ext. Window	3	Tan/Gray, hard window caulking around frames	North, exterior window	4% Chrysotile Asbestos		
3C	Mini-Storage	Ground	Ext. Window	3	Tan/Gray, hard door caulking around frame	West exterior door frame	3% Chrysotile Asbestos		
4A	Mini-Storage	Roof	Roof	4	Black, flexible bituminous layers & tar atop plywood	West side roof	NAD	NA	NA
4B	Mini-Storage	Roof	Roof	4	Black, flexible bituminous layers & tar atop plywood	West side roof	NAD	NA	NA

NAD= No asbestos detected. Samples collected per NESHAP, OSHA, and/or ASTM E2356 bulk asbestos sampling methods by Homogenous material. Estimated Quantity provided only for asbestos-containing materials (ACM) with additional field verification required. For Non-ACM, the quantity and Category are non-applicable (NA). Description of Material may include: Color; Texture; Miscellaneous (Misc); Thermal System Insulation (TSI); or Surfacing (Sur); and Condition: Good, Fair, or Poor.

## Table 2. Asbestos Bulk Samples

Project Number/Name: Republic Missouri Wastewater (WW) Treatment Plant #143573 Client/Address: 901 NW Ave, City of Republic, MO

Sampling Date(s): Mar 2, 2023 Sampled by: Eric Wenger, CIH General Site Info/Activities/Building: Mini-storage Bldg & Basin.

Sample No.	Bldg. Name or No.	Floor No.	Room or Space	Homog. Material	Description of Material	Location of Sample	Results (PLM)	Estimated Quantity of ACM	NESHAP Category
5A	Basin	Over-head	Pipe	5	Tan, troweled, cementitious patch on metal	Pipe/trough from basin clarifier to south, overhead	NAD	2.5 SF	NA
6A	Mini-Storage	Ground	Interior	6	Tan Floor tile (1'x1') & yellow mastic on concrete	Interior floor of northernmost room	2% Chrysotile Asb. (tile) (Mastic is NAD)	575 SF	Category I, non-friable (Tile only)
6B	Mini-Storage	Ground	Interior	6	Tan Floor tile (1'x1') & yellow mastic on concrete	Interior floor of southernmost room	2% Chrysotile Asb. (tile) (Mastic is NAD)		
6C	Mini-Storage	Ground	Interior	6	Tan Floor tile (1'x1') & yellow top and bottom mastic on concrete	Interior floor – under carpeting of southernmost room	2% Chrysotile Asb. (tile) (Mastics are NAD)		
7A	Mini-Storage	Ground	Exterior	7	Tan fiberglass insulation panel/board	Laying on ground –one sheet laying on north side	NAD	NA	NA
8A	Mini-Storage	Ground	North Rm	8	White ceiling tile (1'x1')	Ceiling – many have fallen to floor	NAD	NA	NA
8B	Mini-Storage	Ground	South Rm	8	White ceiling tile (1'x1')	Ceiling – many have fallen to floor	NAD	NA	NA
8C	Mini-Storage	Ground	Pump Rm	8	White ceiling tile (1'x1')	Ceiling – many have fallen to floor	NAD	NA	NA
9A	Mini-Storage	Ground	North Rm	9	Pink fiberglass panels & paper backing	Ceiling insulation- much has fallen to floor	NAD	NA	NA
9B	Mini-Storage	Ground	Pump Rm	9	Yellow fiberglass panels & paper & foil backing	Ceiling insulation- much has fallen to floor	NAD	NA	NA

NAD= No asbestos detected. Samples collected per NESHAP, OSHA, and/or ASTM E2356 bulk asbestos sampling methods by Homogenous material. Estimated Quantity provided only for asbestos-containing materials (ACM) with additional field verification required. For Non-ACM, the quantity and Category are non-applicable (NA). Description of Material may include: Color; Texture; Miscellaneous (Misc); Thermal System Insulation (TSI); or Surfacing (Sur); and Condition: Good, Fair, or Poor.

## Table 2. Asbestos Bulk Samples

Project Number/Name: Republic Missouri Wastewater (WW) Treatment Plant #143573 Client/Address: 901 NW Ave, City of Republic, MO

Sampling Date(s): Mar 2, 2023 Sampled by: Eric Wenger, CIH General Site Info/Activities/Building: Mini-storage Bldg & Basin.

Sample No.	Bldg. Name or No.	Floor No.	Room or Space	Homog. Material	Description of Material	Location of Sample	Results (PLM)	Estimated Quantity of ACM	NESHAP Category
<b>10A</b>	<b>Mini-Storage</b>	Ground	North Rm	10	White 'rope' packing/gasket	Around door frame of old oven sitting on floor	55% Chrysotile Asbestos in non-woven main layer	6 LF	Category I, non-friable
11A	Basin	Ground	Exterior Pipe	11	Black, rubber pipe gasket	2 Gaskets on pipe from basin, west of basin	NAD	NA	NA
12A	Basin	Ground	Exterior Pipe	12	Black tar wrap around exterior water pipe	Pipe from basin, west of basin	NAD	NA	NA
<b>13A</b>	<b>Basin</b>	<b>Ground</b>	<b>Exterior Manhole</b>	<b>13</b>	<b>Gray/ Black caulk/sealant</b>	<b>Around top perimeter of manhole (iron-concrete seal), west of basin</b>	<b>12% Chrysotile Asbestos</b>	<b>6 LF</b>	<b>Category I, non-friable</b>
14A	Basin Manhole	Ground	Exterior	14	Black tar/sealant on concrete	Around perimeter side of manhole riser, west of basin	NAD	NA	NA
15A	<b>Mini-Storage</b>	Ground	Interior	15	Tan, fiberglass-like boards	Boards laying on floor	NAD	NA	NA

NAD= No asbestos detected. Samples collected per NESHAP, OSHA, and/or ASTM E2356 bulk asbestos sampling methods by Homogenous material. Estimated Quantity provided only for asbestos-containing materials (ACM) with additional field verification required. For Non-ACM, the quantity and Category are non-applicable (NA). Description of Material may include: Color; Texture; Miscellaneous (Misc); Thermal System Insulation (TSI); or Surfacing (Sur); and Condition: Good, Fair, or Poor.

## Table 2. Asbestos Bulk Samples

### Listing of Homogenous Areas:

#### Mini-Storage Building and Basin Tank Wastewater Treatment Plant Republic, MO

**Bold indicates asbestos-containing material (ACM).**

- 1 = **Black 'Bakelite' electric gear switches) – Disconnected electrical panel (30% Chrysotile asbestos)**
- 2 = Gray, hard window glazing around exterior glass window panes (no asbestos)
- 3 = **Tan/Gray, hard window caulking around frames of exterior window and door (3-4% Chrysotile asbestos)**
- 4 = Black, flexible bituminous layers & tar atop plywood (no asbestos)
- 5 = Tan, troweled, cementitious patch on metal overhead trough (no asbestos)
- 6 = **Tan Floor tile (1'x1') on concrete (2% Chrysotile asbestos in tile) [yellow top and bottom mastic has no asbestos]**
- 7 = Tan fiberglass insulation panel laying outside (no asbestos)
- 8 = White ceiling tile (1'x1') (no asbestos)
- 9 = Yellow fiberglass panels & paper & foil backing (no asbestos)
- 10 = **White 'rope' packing/gasket (55% Chrysotile asbestos)**
- 11 = Black, rubber pipe gasket (no asbestos)
- 12 = Black tar wrap around exterior water pipe (no asbestos)
- 13 = **Gray/Black caulk/sealant on manhole cover (13% Chrysotile asbestos)**
- 14 = Black tar/sealant on concrete (no asbestos)
- 15 = Tan, fiberglass-like boards stored inside (no asbestos)

**Table 3.**

**Lead-Paint Bulk Samples**

Project Number/Name: Republic Missouri Wastewater (WW) Treatment Plant #143573 Client/Address: 901 NW Ave, City of Republic, MO  
 Sampling Date(s): Mar 2, 2023 Sampled by: Eric Wenger, CIH General Site Info/Activities/Building: Mini-storage Bldg & Basin.

Sample No.	Bldg. Name or No.	Floor No.	Room or Space	Component	Location of Sample	Color	Substrate	Paint Condition	Results (Parts per Million -ppm)
P1	Mini-Storage	Ground	Hall	Wall	West facing window in hallway near bathroom	Orange w/ Lime prime	CMU	Poor	Cd <0.99 Cr=50 Pb=230
P2	Mini-Storage	Ground	South	Wall	East lower wall of southernmost room	Gray w/ Lime prime	CMU	Poor	Cd<0.91 Cr=29 Pb=83
P3	Mini-Storage	Ground	South	Wall	South lower wall of southernmost room	Peach w/ Lime prime	CMU	Poor	Cd<0.96 Cr=51 Pb=170
P4	Mini-Storage	Ground	North	Wall	North wall of northernmost room	Pink w/ Lime prime	CMU	Poor	Cd<0.97 Cr=41 Pb=100
P5	Mini-Storage	Ground	South	Wall	South wall of western half of southernmost room	White w/ Lime prime	CMU	Poor	Cd=1.3 Cr=37 Pb=120
P6	Mini-Storage	Ground	Pump Rm	Pump motor & pedestal	Pump room – motor & pedestal	Dark Green w/ red prime	Metal	Poor	Cd=13 Cr=6,100 Pb=6,300
P7	Mini-Storage	Ground	Pump Rm	Pipe	Over and around pumps	Blue w/ Lime prime	Metal	Poor	Cd=3.3 Cr<12 Pb=62
P8	Mini-Storage	Ground	Exterior	Wall	Southern wall of southernmost room	Tan w/ Lime prime	CMU	Poor	Cd=5.3 Cr=11 Pb=71
P9	Mini-Storage	Roof	Exterior	Fascia	Exterior fascia board of westernmost exterior wall	Brown w/ Lime prime	Wood	Poor	Cd=7.6 Cr=9.0 Pb=20,000
P10	Basin	Ground	Exterior	Wall	Eastern facing exterior wall of basin tank	Lime w/ red prime	Steel	Poor	Cd=3.0 Cr=19 Pb=92
P11	Basin	Ground	Exterior	Pipe	Pipe connecting basin to exterior manhole on west side of basin	Lime	Steel	Poor	Cd=2.7 Cr=15 Pb=110

Cd= Cadmium; Cr= total Chromium; Pb= Lead. "<" = Not present = non-detect at less than laboratory reporting limit (see laboratory results).  
 ppm = parts per million (10,000 ppm = 1% Pb by weight). Any detectable lead is regulated by OSHA-See Report text.

## Table 4. Miscellaneous Hazardous/Regulated Materials

**Vacant Mini-Storage Building and Basin  
901 NW Avenue  
City of Republic, Missouri  
Sampling Date: March 2, 2023  
(Contractor is to verify all locations and quantities.)**

Material Description	Location(s)	Estimated Amount	Visual Results	Comments
Ballasts in fluorescent light fixtures	Interior of vacant mini-storage bldg.	4 fixtures	Present on ceilings	During renovation, check each ballast for potential PCB-containing label; and if potential PCB ballasts are found handle as Universal Waste
Mercury in 8-foot, fluorescent Light tubes	Interior of vacant mini-storage bldg.	8 tubes	Tubes may be 'low-mercury' but they still contain mercury	Handle as Universal Waste; Appropriate recycling recommended
Window A/C Unit	Exterior window, NW room, mini-storage	1 unit	Ozone-depleting Freon likely to be present	Dispose per Federal /Missouri Regulations
Water hydrant	Exterior north of mini-storage bldg.	1 hand-operated	Water line present	Utility locates prior to demolition
Rubber tires	Interior west room of mini-storage bldg.	3 old tires	Tires on floor	Dispose per Federal /Missouri Regulations
Water heater	Interior mid room of mini-storage bldg.	1	Non-functional	Dispose per Federal /Missouri Regulations
55-gallon drum	Interior west room of mini-storage bldg.	Partial filled	On floor	May contain used oil – not certain. Dispose per Federal /Missouri Regulations
Jugs of liquids	Interior, mostly in west room of mini-storage bldg.	16 jugs, mostly empty	On shelves & floor	Dispose per Federal /Missouri Regulations
Container of liquid	Interior west room of mini-storage bldg.	1 gallon of liquid	Contents not certain	May contain oil. Dispose per Federal /Missouri Regulations

*PCB – polychlorinated biphenyl  
ppm – parts per million. No sampling occurred, only visual observations.*



**APPENDIX B - PHOTOS**



Photograph D-1: Mini-Storage Bldg, pump Rm: Sample 1A black 'Bakelite' electrical switches (about 7 large and 5 small) 30% chrysotile asbestos-containing material (ACM), Category II, non-friable, intact. Orange wall paint contains lead (all paint contains lead).



Photograph D-2: Mini-Storage Bldg. Exterior window of pump room, north side: Sample 3B (similar to 3A & 3C) of Tan/gray window caulking (metal frame to CMU/concrete ext. wall) contains damaged 3-4% chrysotile ACM, Category II, non-friable, damaged. Lime paint on CMU walls contains lead.



Photograph D-3: Mini-Storage Bldg. Exterior west door to pump room: Sample 3C of Tan/gray door caulking (metal frame to CMU/concrete ext. wall) contains damaged 3-4% chrysotile ACM, Category II, non-friable, damaged. Lime prime paint on frame and CMU walls contains lead.



Photograph D-4:  
Roof of Mini-Storage building has tar on wood – no ACM. Lime paint on metal contains lead.



Photograph D-5: Mini-Storage Bldg. Northernmost room; Sample 6A (similar to 6B & 6C) tan floor tile contains 2% ACM, Category I, non-friable, damaged – assume ACM floor tile on all interior flooring. Yellow mastic does not contain any ACM. Floor covered in dirt, mud, carpeting, and debris. While paint on east CMU wall contains lead.



Photograph D-6: Mini-Storage Bldg, Northernmost Rm/lab, white 'rope' packing/gasket around door of old drying oven sitting on floor, contains 55% chrysotile ACM, Category I, non-friable, intact. Pink fiberglass and white ceiling tiles, mostly on floor, do not contain any asbestos.



Photograph D-7: Gray/black caulk/sealant (iron to concrete) around top perimeter of manhole riser, west of basin, contains 12% chrysotile ACM, Category I, non-friable in damaged condition. Note that black tar on side of concrete riser and black tar/wrap on nearby pipes do not contain any asbestos.



Photograph D-8: Exterior wall of former basin, Sample P10 showing lime paint with red prime contains lead. (Note that all sampled paint contains lead and most also contain cadmium and/or chromium).

## **APPENDIX C - FIGURES**

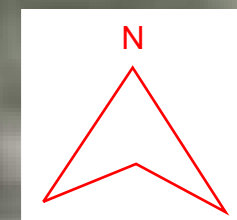


**CITY OF REPUBLIC, MO  
MINI STORAGE BUILDING**

FIGURE 1: PAINT SAMPLE  
LOCATIONS FOR LEAD,  
CADMIUM, AND CHROMIUM

03/02/23

KEY;  INDICATES  
ALL PAINT CONTAINS  
LEAD





P11

P10

N West Ave

N West Ave

N West Ave

N West Ave

905

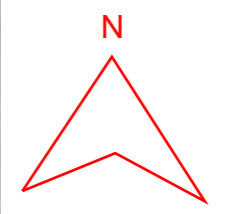
0 16.38 ft

Measure distance x

Click on the map to add to your path

Total distance: 16.38 ft (4.99 m)

Layers



### CITY OF REPUBLIC, MO MINI STORAGE BUILDING

FIGURE 2: PAINT SAMPLE  
LOCATIONS FOR LEAD,  
CADMIUM, AND CHROMIUM

03/02/23

KEY;  INDICATES  
ALL PAINT CONTAINS  
LEAD







**CITY OF REPUBLIC, MO  
MINI STORAGE BUILDING**

**FIGURE 3: SAMPLE LOCATIONS  
FOR ABESTOS CONTAINING  
MATERIAL (ACM)**

03/02/23

KEY;  INDICATES  
ACM PRESENT

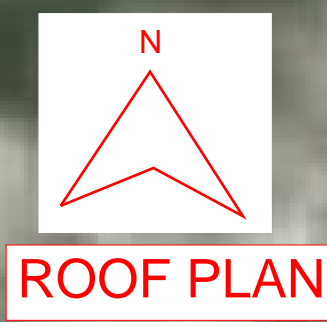


**CITY OF REPUBLIC, MO  
MINI STORAGE BUILDING**

FIGURE 4: SAMPLE LOCATIONS  
FOR ABESTOS CONTAINING  
MATERIAL (ACM)

03/02/23

NO ACM PRESENT





13A (SEALANT AROUND MANHOLE LID)

12A

14A

11A

5A

0 16.38 ft

905

N West Ave

N West Ave

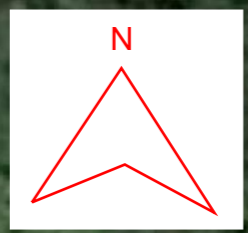
N West Ave

N West Ave

Measure distance x

Click on the map to add to your path

Total distance: 16.38 ft (4.99 m)



### CITY OF REPUBLIC, MO MINI STORAGE BUILDING

FIGURE 5: SAMPLE  
LOCATIONS FOR ABESTOS  
CONTAINING MATERIAL  
(ACM)

03/02/23

KEY;  INDICATES  
ACM PRESENT



**APPENDIX D – CREDENTIALS & LAB DATA**

**STATE OF MISSOURI**  
**DEPARTMENT OF HEALTH AND SENIOR SERVICES**

**LEAD OCCUPATION LICENSE REGISTRATION**

Issued to:

**Eric N. Wenger**

The person, firm or corporation whose name appears on this certificate has fulfilled the requirements for licensure as set forth in the Missouri Revised Statutes 701.300-701.338, as long as not suspended or revoked, and is hereby authorized to engage in the activity listed below.

**Lead Risk Assessor**  
Category of License

Issuance Date: **7/11/2022**  
Expiration Date: **7/11/2024**  
License Number: **080311-300001861**



*Paula F. Nickelson*

Paula F. Nickelson  
Acting Director  
Department of Health and Senior Services

CERTIFICATION NUMBER:

**701111722MOIR4257**

THIS CERTIFIES

**Eric N Wenger**

HAS COMPLETED THE CERTIFICATION

REQUIREMENTS FOR

**Inspector**



APPROVED: **12/01/2022**

EXPIRES: **12/01/2023**

TRAINING DATE: **11/17/2022**

A handwritten signature in black ink that reads "Stephen M. Hill". The signature is written in a cursive style.

Director of Air Pollution Control Program



Environmental Hazards Services, L.L.C.  
 7469 Whitepine Rd  
 Richmond, VA 23237  
 Telephone: 800.347.4010

## Asbestos Bulk Analysis Report

Report Number: 23-03-00714

Client: Burns & McDonnell Engineering  
 9400 Ward Pkwy.  
 Kansas City, MO 64114

Received Date: 03/06/2023  
 Analyzed Date: 03/06/2023  
 Reported Date: 03/07/2023

Project/Test Address: 143574; Republic, MO - WTP

Client Number:  
 26-3514

Fax Number:  
 816-822-3494

# Laboratory Results

Lab Sample Number	Client Sample Number	Layer Type	Lab Gross Description	Asbestos	Other Materials
23-03-00714-001	1A		Dark Brown to Black Brittle; Homogeneous	30% Chrysotile	70% Non-Fibrous
				Total Asbestos: 30%	
23-03-00714-002	1B		Black Brittle; Homogeneous	NAD	15% Cellulose 85% Non-Fibrous
23-03-00714-003	2A		Pale Gray Brittle; Homogeneous	NAD	2% Talc 98% Non-Fibrous
23-03-00714-004	2B		Pale Gray Brittle; Homogeneous	NAD	2% Talc 98% Non-Fibrous
23-03-00714-005	2C		Pale Gray Brittle; Homogeneous	NAD	3% Talc 97% Non-Fibrous

# Environmental Hazards Services, L.L.C

Client Number: 26-3514

Report Number: 23-03-00714

Project/Test Address: 143574; Republic, MO - WTP

Lab Sample Number	Client Sample Number	Layer Type	Lab Gross Description	Asbestos	Other Materials
23-03-00714-006	3A		Pale Tan to Pale Gray Brittle; Homogeneous	3% Chrysotile	97% Non-Fibrous
				Total Asbestos: 3%	
23-03-00714-007	3B		Pale Tan to Pale Gray Brittle; Homogeneous	4% Chrysotile	96% Non-Fibrous
				Total Asbestos: 4%	
23-03-00714-008	3C		Pale Tan to Pale Gray Brittle; Homogeneous	3% Chrysotile	97% Non-Fibrous
				Total Asbestos: 3%	
23-03-00714-009	4A		Black Brittle; Black Fibrous; Inhomogeneous	NAD	18% Cellulose 3% Fibrous Glass 3% Synthetic 4% Hair 72% Non-Fibrous
23-03-00714-010	4B		Black Brittle; Black Fibrous; Inhomogeneous	NAD	18% Cellulose 3% Fibrous Glass 3% Synthetic 4% Hair 72% Non-Fibrous
23-03-00714-011	5A		Pale Pink to Pale Tan Brittle; Homogeneous	NAD	3% Cellulose 3% Talc 94% Non-Fibrous
23-03-00714-012A	6A	Flooring	Pale Beige/Tan Granular; Homogeneous	2% Chrysotile	98% Non-Fibrous
				Total Asbestos: 2%	



# Environmental Hazards Services, L.L.C

Client Number: 26-3514

Report Number: 23-03-00714

Project/Test Address: 143574; Republic, MO - WTP

Lab Sample Number	Client Sample Number	Layer Type	Lab Gross Description	Asbestos	Other Materials
23-03-00714-012B	6A	Mastic	Pale Yellow Adhesive; Homogeneous	NAD	4% Cellulose 96% Non-Fibrous
23-03-00714-013A	6B	Flooring	Pale Beige/Tan Granular; Homogeneous	2% Chrysotile  Total Asbestos: 2%	98% Non-Fibrous
23-03-00714-013B	6B	Mastic	Pale Yellow Adhesive; Homogeneous	NAD	3% Cellulose 1% Synthetic 96% Non-Fibrous
23-03-00714-014A	6C	Other *	Yellow to Dark Gray Adhesive; Homogeneous	NAD	3% Cellulose 3% Synthetic 94% Non-Fibrous
* Mastic Atop Flooring					
23-03-00714-014B	6C	Flooring	Pale Beige/Tan Granular; Homogeneous	2% Chrysotile  Total Asbestos: 2%	98% Non-Fibrous
23-03-00714-014C	6C	Other *	Pale Yellow Adhesive; Homogeneous	NAD	3% Cellulose 97% Non-Fibrous
* Mastic Beneath Flooring					
23-03-00714-015	7A		Off-White to Pale Gray Brittle; White Fibrous; Inhomogeneous	NAD	35% Fibrous Glass 65% Non-Fibrous
23-03-00714-016	8A		Tan Fibrous; White Brittle; Inhomogeneous	NAD	95% Cellulose 5% Non-Fibrous

# Environmental Hazards Services, L.L.C

Client Number: 26-3514  
 Project/Test Address: 143574; Republic, MO - WTP

Report Number: 23-03-00714

Lab Sample Number	Client Sample Number	Layer Type	Lab Gross Description	Asbestos	Other Materials
23-03-00714-017	8B		Tan Fibrous; White Brittle; Inhomogeneous	NAD	92% Cellulose 8% Non-Fibrous
23-03-00714-018	8C		Brown Fibrous; White Brittle; Inhomogeneous	NAD	95% Cellulose 5% Non-Fibrous
23-03-00714-019	9A		Pale Pink/Tan Fibrous; Black Pliable to Brittle; Inhomogeneous	NAD	15% Cellulose 70% Fibrous Glass 15% Non-Fibrous
23-03-00714-020	9B		Off-White to Pale Yellow/Tan Fibrous; Amber Adhesive; Inhomogeneous	NAD	12% Cellulose 80% Fibrous Glass 8% Non-Fibrous
23-03-00714-021	10A		Off-White/Pale Beige Fibrous; Inhomogeneous	55% Chrysotile	30% Cellulose 15% Non-Fibrous
				Total Asbestos: 55%	
Chrysotile present in non-woven off-white fibrous (main) layer.					
23-03-00714-022	11A		Black Pliable to Brittle; Homogeneous	NAD	1% Cellulose 99% Non-Fibrous
23-03-00714-023	12A		Dark Rust Orange to Dark Gray Brittle; Inhomogeneous	NAD	100% Non-Fibrous
23-03-00714-024	13A		Black to Gray Brittle; Homogeneous	12% Chrysotile	88% Non-Fibrous
				Total Asbestos: 12%	

# Environmental Hazards Services, L.L.C

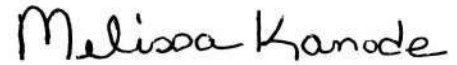
Client Number: 26-3514  
Project/Test Address: 143574; Republic, MO - WTP

Report Number: 23-03-00714

Lab Sample Number	Client Sample Number	Layer Type	Lab Gross Description	Asbestos	Other Materials
23-03-00714-025	14A		Black Pliable to Brittle; Inhomogeneous	NAD	1% Cellulose 99% Non-Fibrous
23-03-00714-026	15A		Pale Gray-Green Brittle; Homogeneous	NAD	30% Fibrous Glass 25% Synthetic 45% Non-Fibrous

QC Sample: 53-M22020-4  
QC Blank: SRM 1866 Fiberglass  
Reporting Limit: 1% Asbestos  
Method: EPA Method 600/R-93/116, EPA Method 600/M4-82-020  
Analyst: Mark Case

Reviewed By Authorized Signatory:



*Melissa Kanode*  
QA/QC Clerk

These results are based on a comparative visual estimate. The condition of the samples analyzed was acceptable upon receipt per laboratory protocol unless otherwise noted on this report. Each distinct component in an inhomogeneous sample was analyzed separately and reported as a composite. Results represent the analysis of samples submitted by the client. Sample location, description, area, volume, etc., was provided by the client. This report cannot be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government. This report shall not be reproduced except in full, without the written consent of the Environmental Hazards Service, L.L.C. California Certification #2319 NY ELAP #11714 NVLAP #101882-0 VELAP 460172. All information concerning sampling location, date, and time can be found on Chain-of-Custody. Environmental Hazards Services, L.L.C. does not perform any sample collection.

Environmental Hazards Services, L.L.C. recommends reanalysis by point count (for more accurate quantification) or Transmission Electron Microscopy (TEM), (for enhanced detection capabilities) for materials regulated by EPA NESHAP (National Emission Standards for Hazardous Air Pollutants) and found to contain less than ten percent (<10%) asbestos by polarized light microscopy (PLM). Both services are available for an additional fee.

400 Point Count Analysis, where noted, performed per EPA Method 600/R-93/116 with a Reporting Limit of 0.25%.

\* All California samples analyzed by Polarized Light Microscopy, EPA Method 600/M4-82-020, Dec. 1982.

LEGEND: NAD = no asbestos detected



**Request for Analysis and Chain of Custody Record**

<b>Company:</b> Burns & McDonnell Engineering		<b>EHS</b>		<b>Laboratory:</b>		<b>Project No. &amp; Task:</b> 143574	
9400 Ward Pkwy, Kansas City, MO 64114		7469 White Pine Road		Richmond, VA 23237		Client/Location: Republic, MO -WTP	
Ph: (816) 333-9400		Richmond, VA 23237		P.O.:		Sample Date: 3/2/2023	
Contact: Eric Wenger, CIH Email: ewenger@burnsmcd.com		Phone: 800-347-4010		Sample Date: 3/2/2023			
Sample ID	Location & Description	Sample Matrix*	Analyte	Sampling/ Analytical Method	Notes		
1A	Electrical switch 'Bakelite'	Bulk	Asbestos	PLM			
1B	Electrical switch 'Bakelite'	Bulk	Asbestos	PLM			
2A	Gray window glazing	Bulk	Asbestos	PLM			
2B	Gray window glazing	Bulk	Asbestos	PLM			
2C	Gray window glazing	Bulk	Asbestos	PLM			
3A	Gray window caulk	Bulk	Asbestos	PLM			
3B	Gray window caulk	Bulk	Asbestos	PLM			
3C	Gray window caulk	Bulk	Asbestos	PLM			
4A	Bituminous roofing	Bulk	Asbestos	PLM			
4B	Bituminous roofing	Bulk	Asbestos	PLM			
5A	Tan cementitious patching	Bulk	Asbestos	PLM			
Special Instructions: Normal TAT.							
Relinquished By (Signature): <i>Eric Wenger</i>		Date/Time: 3/3/23		Received By (Signature): <i>Eric Wenger</i>		Date/Time: 03/06/23 10:28AM	
Relinquished By (Signature): <i>Eric Wenger</i>		Date/Time: 3/3/23		Received By (Signature): <i>Eric Wenger</i>		Date/Time: 03/06/23 10:28AM	
Lab Reference No.:		Sample Condition:		Lab Comments:			

\* Sample Matrix = Air, Bulk, or Wipe.

23-03-00714  
  
 Due Date: 03/13/2023 (Monday)  
 EL MM-1

*MSR*  
*26 PM*



Request for Analysis and Chain of Custody Record

0714  
Page 2 of 3

<b>Company:</b> Burns & McDonnell Engineering		<b>EHS</b>		<b>Laboratory:</b>		<b>Project No. &amp; Task:</b> 143574	
9400 Ward Pkwy, Kansas City, MO 64114		7469 White Pine Road		Richmond, VA 23237		Client/Location: Republic, MO -WTP	
Ph: (816) 333-9400		Richmond, VA 23237		P.O.:		Sample Date: 3/2/2023	
Contact: Eric Wenger, CIH Email: ewenger@burnsmcd.com		Phone: 800-347-4010		Sample Date: 3/2/2023			
Sample ID	Location & Description	Sample Matrix*	Analyte	Sampling/ Analytical Method	Notes		
6A	Tan floor tile & yellow mastic	Bulk	Asbestos	PLM			
6B	Tan floor tile & yellow mastic	Bulk	Asbestos	PLM			
6C	Tan floor tile, yellow top and bottom mastic	Bulk	Asbestos	PLM			
7A	Tan fiberglass panel	Bulk	Asbestos	PLM			
8A	Ceiling tile	Bulk	Asbestos	PLM			
8B	Ceiling tile	Bulk	Asbestos	PLM			
8C	Ceiling tile	Bulk	Asbestos	PLM			
9A	Pink fiberglass & paper	Bulk	Asbestos	PLM			
9B	Yellow fiberglass, paper & foil	Bulk	Asbestos	PLM			
10A	White packing – rope gasket	Bulk	Asbestos	PLM			
Special Instructions: Normal TAT.							
Relinquished By (Signature): <i>Eric Wenger</i>		Date/Time: 3/3/23		Received By (Signature): <i>A. Waldren</i>		Date/Time: 03/06/23 10:28am	
Relinquished By (Signature):		Date/Time:		Received By (Signature):		Date/Time:	
Lab Reference No.:		Sample Condition:		Lab Comments:			

\* Sample Matrix = Air, Bulk, or Wipe.



**Request for Analysis and Chain of Custody Record**

0714  
Page 3 of 3

<b>Company:</b> Burns & McDonnell Engineering		<b>EHS</b>		<b>Laboratory:</b>		<b>Project No. &amp; Task:</b> 143574	
9400 Ward Pkwy, Kansas City, MO 64114		7469 White Pine Road		Richmond, VA 23237		Client/Location: Republic, MO -WTP	
Ph: (816) 333-9400		Richmond, VA 23237		P.O.:		Sample Date: 3/2/2023	
Contact: Eric Wenger, CIH Email: ewenger@burnsmcd.com		Phone: 800-347-4010		Sample Date: 3/2/2023			
Sample ID	Location & Description	Sample Matrix*	Analyte	Sampling/ Analytical Method	Notes		
11A	Black rubber gasket	Bulk	Asbestos	PLM			
12A	Black tar wrap	Bulk	Asbestos	PLM			
13A	Black caulk sealant	Bulk	Asbestos	PLM			
14A	Black tar sealant	Bulk	Asbestos	PLM			
15A	Tan fiberglass-like board	Bulk	Asbestos	PLM			
-							
-							
-							
-							
Special Instructions: Normal TAT.							
Relinquished By (Signature): <i>Eric Wenger</i>		Date/Time: 3/3/23 15:40		Received By (Signature): <i>D. Walker</i>		Date/Time: 03/06/23 10:28 AM	
Relinquished By (Signature):		Date/Time:		Received By (Signature):		Date/Time:	
Lab Reference No.		Sample Condition:		Lab Comments:			

\* Sample Matrix = Air, Bulk, or Wipe.



EHS  
Laboratories

Environmental Hazards Services, L.L.C.  
7469 Whitepine Rd  
Richmond, VA 23237  
Telephone: 800.347.4010

# Fiber Count Analysis Report

Client: Burns & McDonnell Engineering  
9400 Ward Pkwy.  
Kansas City, MO 64114

Report Number: 23-03-00727  
Received Date: 03/06/2023  
Analyzed Date: 03/06/2023  
Reported Date: 03/06/2023

Project/Test Address: 143574; Republic, MO - WTP

Client Number:  
26-3514

## Laboratory Results

Fax Number:  
816-822-3494

Lab Sample Number	Client Sample Number	Volume Liters (L)	Fibers/Fields	Fibers/mm <sup>2</sup>	Fibers/CC	Narrative ID
23-03-00727-001	030223-1	100	7.5 / 100	9.6	0.037	
23-03-00727-002	030223-2	0.000	0.0 / 100	<7.6	---	

Method: NIOSH 7400, Issue 3, 14 June 2019  
Analyst: Makayla Haggard

Reviewed By Authorized Signatory:

Tasha Eddy  
QA/QC Clerk

Intralaboratory Sr for fiber count ranges 5-20, >20-50, and >50-100 respectively are 0.301, 0.303, 0.282.

Individual Analyst Sr for fiber count ranges 5-20, >20-50, and >50-100 respectively are 0.301, 0.303, 0.282.

New York State requires a minimum sample volume of 1000L for PCM clearance samples.

NOTE: The condition of the samples analyzed was acceptable upon receipt per laboratory protocol unless otherwise noted on this report. Results represent the analysis of samples submitted by the client. Sample location, description, area, volume, etc., was provided by the client. Results listed above in Fibers/CC are based on air volume supplied by the client. The submission of blank samples is required by sampling methodologies. EHS sample results are blank corrected, per NIOSH 7400, when the client submits blank samples. If the report does not contain the result for a field blank, it is because the client did not include a field blank with their samples. This report shall not be reproduced except in full, without the written consent of the Environmental Hazards Services, L.L.C.


Method Level of Detection: 7.64 fibers/mm<sup>2</sup>.

AIHA LAP, LLC (100420)

LEGEND L = liters fibers/mm<sup>2</sup> = fibers per square millimeter  
fibers/cc = fibers per cubic centimeter



**Request for Analysis and Chain of Custody Record**

<b>Company:</b> Burns & McDonnell Engineering		<b>Laboratory:</b> EHS		<b>Project No. &amp; Task:</b> 143574	
9400 Ward Pkwy, Kansas City, MO 64114		7469 White Pine Road Richmond, VA 23237		Client/Location: Republic, MO -WTP	
Ph: (816) 333-9400		Richmond, VA 23237		P.O.:	
Contact: Eric Wenger, CIH Email: ewenger@burnsmcd.com		Phone: 800-347-4010		Sample Date: 3/2/2023	
Sample ID	Location & Description	Sample Matrix*	Analyte	Sampling/ Analytical Method	Notes
030223-1	PBZ-Eric Wenger- Asbestos Inspection NEA-STEL	Air	Asbestos Fibers	PCM	100 Liters (50 minutes)
030223-2	Field Blank	Air	Asbestos Fibers	PCM	0 Liters (0 minutes)
<p style="text-align: center;">23-03-00727</p>  <p style="text-align: center;">Due Date: 03/13/2023 (Monday) EL MM-L</p>					
Special Instructions: Normal TAT					
Relinquished By (Signature): <i>Eric Wenger</i>		Date/Time: 3/3/23 15:40		Sampler (Signature): Eric Wenger	
Relinquished By (Signature): <i>Eric Wenger</i>		Date/Time: 3/3/23 15:40		Received By (Signature): <i>Eric Wenger</i>	
Lab Reference No.:		Sample Condition:		Lab Comments:	

\* Sample Matrix = Air, Bulk, or Wipe.





Environmental Hazards Services, L.L.C.  
 7469 Whitepine Rd  
 Richmond, VA 23237  
 Telephone: 800.347.4010

Paint  
 Metals  
 Analysis Report

Client: Burns & McDonnell Engineering  
 9400 Ward Pkwy.  
 Kansas City, MO 64114

Report Number: 23-03-00723

Received Date: 03/06/2023

Reported Date: 03/09/2023

Project/Test Address: 143574; Republic, MO - WTP

Client Number:  
 26-3514

# Laboratory Results

Fax Number:  
 816-822-3494

Lab Sample Number	Client Sample Number	Analyzed Date:	Analyte:	Concentration ppm (mg/kg)	Narrative ID
23-03-00723-001	P1	03/08/2023	Cadmium (Cd)	<0.99	
			Chromium (Cr)	50	
			Lead (Pb)	230	
23-03-00723-002	P2	03/08/2023	Cadmium (Cd)	<0.91	
			Chromium (Cr)	29	
			Lead (Pb)	83	
23-03-00723-003	P3	03/08/2023	Cadmium (Cd)	<0.96	
			Chromium (Cr)	51	
			Lead (Pb)	170	
23-03-00723-004	P4	03/08/2023	Cadmium (Cd)	<0.97	
			Chromium (Cr)	41	
			Lead (Pb)	100	
23-03-00723-005	P5	03/08/2023	Cadmium (Cd)	1.3	
			Chromium (Cr)	37	
			Lead (Pb)	120	
23-03-00723-006	P6	03/08/2023	Cadmium (Cd)	13	

# Environmental Hazards Services, L.L.C

Client Number: 26-3514

Report Number: 23-03-00723

Project/Test Address: 143574; Republic, MO - WTP

Lab Sample Number	Client Sample Number	Analyzed Date:	Analyte:	Concentration ppm (mg/kg)	Narrative ID
			Chromium (Cr)	6100	
			Lead (Pb)	6300	
23-03-00723-007	P7	03/08/2023	Cadmium (Cd)	3.3	
			Chromium (Cr)	<12	
			Lead (Pb)	62	
23-03-00723-008	P8	03/08/2023	Cadmium (Cd)	5.3	
			Chromium (Cr)	11	
			Lead (Pb)	71	
23-03-00723-009	P9	03/08/2023	Cadmium (Cd)	7.6	
			Chromium (Cr)	9.0	
			Lead (Pb)	20000	
23-03-00723-010	P10	03/08/2023	Cadmium (Cd)	3.0	
			Chromium (Cr)	19	
			Lead (Pb)	92	
23-03-00723-011	P11	03/08/2023	Cadmium (Cd)	2.7	
			Chromium (Cr)	15	
			Lead (Pb)	110	

# Environmental Hazards Services, L.L.C

Client Number: 26-3514

Report Number: 23-03-00723

Project/Test Address: 143574; Republic, MO - WTP

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Lab Sample Number	Client Sample Number	Analyzed Date:	Analyte:	Concentration ppm (mg/kg)	Narrative ID
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---

Analyst: Carlos Gonzalez

Method: Mercury (Hg): EPA SW846 7471B  
All other metals: EPA SW846 3050B/6010D

Reviewed By Authorized Signatory:



---

Tasha Eaddy

QA/QC Clerk

Sample Results denoted with a "less than" (<) sign contains less than the reporting limit for each particular metal, based on a 50mL volume. The reporting limit is 0.10 ug for Mercury, 0.5ug for Cadmium and Beryllium, 1ug for Arsenic and Thallium and 2.5ug for all other metals. To convert metals concentration (ppm) to % by weight, divide the above concentration by 10,000.

The condition of the samples analyzed was acceptable upon receipt per laboratory protocol unless otherwise noted on this report. Results represent the analysis of samples submitted by the client. Unless otherwise noted, samples are reported without a dry weight correction. Sample location, description, area, volume, etc., was provided by the client. If the report does not contain the result for a field blank, it is due to the fact that the client did not include a field blank with their samples. These sample results do not reflect blank correction. This report shall not be reproduced except in full, without the written consent of Environmental Hazards Services, L.L.C. NY ELAP #11714.

---

LEGEND

ug = microgram

ppm = parts per million


mL = milliliter

mg/kg = milligrams per kilogram

---



**Request for Analysis and Chain of Custody Record**

<b>Company:</b> Burns & McDonnell Engineering		<b>Laboratory:</b> EHS		<b>Project No. &amp; Task:</b> 143574	
9400 Ward Pkwy, Kansas City, MO 64114		7469 White Pine Road Richmond, VA 23237		Client/Location: Republic, MO -WTP	
Ph: (816) 333-9400		Richmond, VA 23237		P.O.:	
Contact: Eric Wenger, CIH Email: ewenger@burnsmcd.com		Phone: 800-347-4010		Sample Date: 3/2/2023	
Sample ID	Location & Description	Sample Matrix*	Analyte	Sampling/ Analytical Method	Notes
P1	Orange w/ lime prime paint	Bulk	Pb, Cd, Cr	NIOSH 7300	<p style="text-align: center;">23-03-00723</p>  <p style="text-align: center;">Due Date: 03/13/2023 (Monday) EL</p> <p style="text-align: right;">MM-L</p>
P2	Gray w/ lime prime paint	Bulk	Pb, Cd, Cr	NIOSH 7300	
P3	Peach w/ lime prime paint	Bulk	Pb, Cd, Cr	NIOSH 7300	
P4	Pink w/ lime prime paint	Bulk	Pb, Cd, Cr	NIOSH 7300	
P5	White w/ lime prime paint	Bulk	Pb, Cd, Cr	NIOSH 7300	
P6	Dark green w/ red prime paint	Bulk	Pb, Cd, Cr	NIOSH 7300	
P7	Blue w/ lime prime paint	Bulk	Pb, Cd, Cr	NIOSH 7300	
P8	Tan w/ lime prime paint	Bulk	Pb, Cd, Cr	NIOSH 7300	
P9	Brown w/ lime paint	Bulk	Pb, Cd, Cr	NIOSH 7300	
P10	Lime w/ red prime	Bulk	Pb, Cd, Cr	NIOSH 7300	
P11	Lime paint	Bulk	Pb, Cd, Cr	NIOSH 7300	
Special Instructions: Normal TAT					
Relinquished By (Signature): <i>Eric Wenger</i>		Date/Time: 3/3/23 15:40		Received By (Signature): <i>Eric Wenger</i>	
Relinquished By (Signature): <i>Eric Wenger</i>		Date/Time: 3/3/23 15:40		Received By (Signature): <i>Eric Wenger</i>	
Lab Reference No.:		Sample Condition:		Lab Comments:	

\* Sample Matrix = Air, Bulk, or Wipe.



CREATE AMAZING.

Burns & McDonnell World Headquarters  
9400 Ward Parkway  
Kansas City, MO 64114  
O 816-333-9400  
F 816-333-3690  
[www.burnsmcd.com](http://www.burnsmcd.com)

**EXHIBIT E – ANTICIPATED LOST DAYS TO INCLEMENT / ADVERSE WEATHER**

The chart below provides the days per month that the Design-Builder anticipates will be lost due to inclement / adverse weather. The days shown in this Exhibit B shall not accumulate month-to-month, but are to be used for determining only the anticipated adverse weather in a given month. Adverse Weather shall be as defined in Article 6 of the Agreement.

<b>Anticipated Lost Days per Month</b>	
<b>Month</b>	<b>Anticipated Lost Days</b>
January	2
February	2
March	1
April	2
May	3
June	3
July	2
August	2
September	2
October	2
November	1
December	1

## EXHIBIT G – ALLOWANCES

The parties have agreed to establish the following Allowance Items and Allowance Values. Allowance items are elements of work that are identified to potentially occur, but it cannot be determined if they will occur or the magnitude of the occurrence, so they are not included in the Design-Builder's current Scope of Work. The Allowance Value is the value which the parties have agreed to establish for an Allowance Item in accordance with Article 7.7 of the Agreement.

If Allowances are utilized, the Design-Builder shall be compensated for its costs and the Design-Builder's markup. Design-Builder's markup shall be as established in Article 7.3 of the Agreement. Design-Builder and Owner shall agree to the compensation method prior to work being performed. It is noted that use of an Allowance may also require a schedule adjustment in certain situations.

1. Fatty Clay and/or Other Unsuitable Subgrade Bearing Material - Over-Excavation and Replacement Fill, \$157,000: This Allowance Item is established to fund the over-excavation and replacement of unsuitable fatty clays and/or other unsuitable existing bearing materials beyond the limits identified in the Contract Documents, with acceptable fill material at locations to include, but not limited to, new structure foundations, slabs, pads, paving, pipe trenches, ductbanks, etc. as recommended by the third-party testing services firm.
2. Rock Excavation and/or Karst encountered, \$120,000: This Allowance Item is established to fund the excavation of rock and/or karst if encountered at excavations, including any over-excavation and material replacement associated with rock and/or karst. The geotechnical explorations did not indicate that rock and/or karst would be encountered at the planned design elevations, however there is the potential to encounter these items. If encountered, the third-party services testing firm will be engaged to provide recommendations on limits of excavation/removal and any replacement material required. Rock excavation shall be performed at a unit rate of \$345/CY.
3. Final Site Development and Improvements, \$50,000: This Allowance Item is established to fund the construction of additional miscellaneous site improvements at the direction of the City. Site improvements could include but are not limited to additional sidewalks, paving, gravel storage pads, etc. beyond that identified in the Contract Documents.
4. Unforeseen Conditions, \$35,000: This Allowance Item is established to fund differing site conditions that may be encountered through execution of the work. Examples of these items include, but are not limited to, the presence of unmarked utilities or existing utilities that were not previously identified in the Contract Documents, actual existing tie-in locations differ from what is shown on the Contract Documents, unforeseen underground obstructions that have not been previously identified, additional work at tie-in locations due to poor quality of existing piping, inoperable/malfunctioning existing valves, slide gates, etc.
5. Drilled Shaft Concrete Overage (Karst Voids), \$25,000: This Allowance Item is

established to fund the furnishing and placement of additional ready-mix concrete for the drilled shaft construction. If the actual amount of concrete placed in the drilled shafts exceeds 20% of the calculated volume based on scheduled diameter, tip, and cut-off elevation, Design-Builder shall be reimbursed for the difference in cubic yardage at a rate of \$225 per cubic yard. Drilled shaft construction and concrete useage will be documented by the thrid party testing agency.

6. Additional Drilled Shaft Length, \$42,000: This Allowance Item is established to fund additional drilled shaft length if needed. 1,449 vertical feet of drilled shaft deep foundations are included in the base Contract. If additional shaft drilling is required, it shall be performed at a unit rate of \$355 per vertical foot. Drilled shaft construction and total length will be confirmed and documented by the thrid party testing agency via daily drilling logs.
7. Extended Service / Plant Operations Assistance, \$90,000: This Allowance Item is established to fund additional operational support from Design-Builder, including extending general conditions, for the new wastewater treatment plant following the 60-day MBR system commissioning and performance testing period.
8. Existing Wastewater Treatment Plant Decommissioning Assistance, \$150,000: This Allowance Item is established to fund Design-Builder assistance to the City with the decommissioning of the existing wastewater treatment plant, including extending general conditions. Activities could include but are not limited to assistance with the draining and wash down of basins, demolition and removal of process equipment and piping, or other activities as requested by the City.
9. SRF Funding Delays and Associated Escalation Expense, \$396,000: This Allowance Item is established to fund escalation costs associated with procurement and subcontractor contracts due to delays in the City finalizing funding resources that allow Design-Builder to issue purchase orders and subcontracts to lock in 3<sup>rd</sup> party proposal pricing.
10. Electrical Equipment Delays (MVSWGR, Generators, Transformers, \$150,000: This Allowance Item is established to fund schedule delays, including extending general conditions, should delays with the delivery of critical electrical equipment delay the project.
11. Administration Building Furnishings and Laboratory Equipment, \$185,000: This Allowance Item is established to fund the supply and installation of the Administration Building office furnishings and appliances, including but not limited to desks, tables, chairs, magnetic glass boards, TV's, shelving, window shades, refrigerators, ranges/ovens, microwaves, etc. This Allowance Item is also established to fund the supply of laboratory equipment including but limited to air incubator, solids oven, standing refrigerator, undercounter refrigerator, DI system and storage tank, stools, glassware, etc.
12. Startup and Commissioning Operational Chemical Supply, \$20,000: This Allowance Item is established to fund the supply of all process related chemicals, including first fill and all



chemicals necessary for the start-up, commissioning, and subsequent performance testing of the new plant.

13. Additional Equipment Maintenance at Turnover, \$50,000: This Allowance Item is established to fund the supply and replacement of process equipment lubricants following start-up, commissioning, and performance testing, prior to final turnover to the City. Process lubricants include but are not limited to greasing and oil.
14. SCADA Software, Hardware, and/or Licensing Changes, \$35,000: This Allowance Item is established to fund upgrades to the existing City WWTP SCADA license packages, and/or additional SCADA software or hardware upgrades. This allowance item is intended to fund upgrades beyond the 1-year AVEVA license included in the base price for the new WWTP.
15. Additional 1-year AVEVA Software License, \$25,000: This Allowance Item is established to fund 1 additional year of AVEVA software licensing and support. Desing-Builder's proposal included 1-year. This allowance funds a second year.
16. IT System Upgrades, \$20,000: This Allowance Item is established to fund IT upgrades at the discretion of the City, including but not limited to upgraded firewall/s, Wi-Fi at the Administration Building, etc.
17. City-wide SCADA Improvements, \$1,000,000: This Allowance Item is established to fund City-wide SCADA improvements and system integration with the City's collection system lift stations and water wells, into the new WWTP SCADA system to provide a single City-wide controls system. This allowance excludes the preliminary field work and system study to develop an overall solution. That work shall be handled as a separate task order.

**EXHIBIT H – PERMIT & EASEMENT MATRIX**

The project is anticipated to require the permits listed in Table 1 and the Easements listed in Table 2.

**Table 1: Anticipated Permits Required**

<b>Anticipated Permit</b>	<b>Administering Agency</b>	<b>Assumed Agency Review Timeline</b>	<b>Party Responsible for Obtaining Permit</b>
Nationwide Permit/State Water Quality Certification (Section 404/401 Permit – Wetlands Permit)	USACE/MDNR	60 days	BMcD
Floodplain Development Permit	Greene County	30-60 days	BMcD
NPDES General Stormwater Permit	MDNR	Permit issued after NOI is submitted electronically	BMcD (SWPPP has been drafted)

**Table 2: Anticipated Easements Required**

<b>Parcel ID/Address</b>	<b>Approximate Size (SF)</b>	<b>Type</b>	<b>Party Responsible for Obtaining Easements</b>

All work is within City of Republic owned property and no easements are required.

**EXHIBIT I – GEOTECHNICAL SOILS REPORT**



# Geotechnical Engineering Report

---

**Republic Wastewater Treatment Plant Improvements**

**Revision No. 1**

**Republic, Missouri**

August 19, 2022

Terracon Project No. B5205029/B5215111

**Prepared for:**

Burns & McDonnell Engineering Co.

Kansas City, Missouri

**Prepared by:**

Terracon Consultants, Inc.

Springfield, Missouri



August 19, 2022

Burns & McDonnell Engineering Co.  
9400 Ward Parkway  
Kansas City, Missouri 64114



Attn: Ms. Allison White, P.E.  
P: (314) 328 5431  
E: alwhite@burnsmcd.com

Re: Geotechnical Engineering Report  
Republic Wastewater Treatment Plant Improvements  
Revision No. 1  
408 N. West Ave. – Northwest of Wade Street Intersection  
Republic, Missouri  
Terracon Project No. B5205029/B5215111

Dear Ms. White:

We have completed a subsurface exploration and geotechnical engineering exploration for the referenced project. This study was performed in general accordance with Burns & McDonnell Engineering Co. (BMcD) Work Authorization TRCN366G, dated September 18, 2020 and Amendment to Work Authorization TRCN366G, dated January 21, 2021. This report presents the findings of the subsurface exploration and provides geotechnical recommendations concerning earthwork and the design and construction of foundations and floor slabs, and pavements for the proposed project.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report or if we may be of further service, please contact us.

Sincerely,  
**Terracon Consultants, Inc.**

A handwritten signature in blue ink that reads "David A. Williams".

David A. Williams, P.E.  
Project Engineer

A handwritten signature in black ink that reads "Kole C. Berg".

Kole C. Berg, P.E.  
Principal/Senior Consultant  
Missouri: PE-2002016417



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**Note:** This report was originally delivered in a web-based format. For more interactive features, please view your project online at [client.terracon.com](http://client.terracon.com).

## FIGURES

### GEOMODEL

### 10-POINT SYSTEM EVALUATION TABLE

## ATTACHMENTS

### EXPLORATION AND TESTING PROCEDURES

### SITE LOCATION, BORING LOCATION AND EXPLORATION PLANS

### GEOLOGIC MAP

### EXPLORATION RESULTS

### ROCK CORE PHOTOGRAPHS

### SUPPORTING INFORMATION

**Note:** Refer to each individual Attachment for a listing of contents.

## **REPORT SUMMARY**

A geotechnical exploration has been performed for the proposed Republic Wastewater Treatment Plant Improvements located at 408 N. West Ave. in Republic, Missouri. In 2020, twelve (12) borings, designated B-1 through B-8, B-2A, B-4A, B-5A, and B-7A, were performed to depths of approximately 25½ to 64½ feet below the existing ground surface. In 2022, twelve (12) borings, designated B-11 through B-22, were performed to depths of approximately 18½ to 50 feet below the existing ground surface. The following geotechnical considerations were identified:

- A previous geotechnical investigation (Geotechnical Engineering Report, Republic Wastewater Treatment Plant Improvements, dated December 18, 2020, Terracon Project No. B5205029) was performed near the additional planned improvements. Information from the previous geotechnical investigation has been incorporated into this Geotechnical Engineering Report.
- The subject site is located within karst prone bedrock material. During the 2020 field exploration of Boring B-5, a sudden loss of drilling fluid and limited drilling resistance were noted from depths of approximately 25 to 32 feet below the ground surface. These conditions are associated with the presence of voids and soft clay seams in the underlying limestone and are an indication of karst activity.
- Demolition of the existing buildings should include removal of all above-grade and below-grade elements including floor slabs, foundation walls, and footings. All existing utilities should also be properly abandoned and/or relocated. This should include removal of all poorly compacted trench backfill extending into the proposed building area. Excavations created by demolition and removal of existing features should be backfilled with engineered fill that is placed and compacted as recommended in this report.
- Existing undocumented fill was encountered to depths ranging from approximately 2 to 10 feet in Boring B-1, B-3 through B-7, B-4A, B-5A, B-11, B-16, B-20, and B-21. Foundations for the proposed building should not bear on or above the undocumented fill materials. Any existing fill should be removed and replaced (or improved) so foundations and floor slabs for the building bear on suitable native soils or on properly placed and compacted engineered fill extending to the suitable native soils.
- Provided the owner is willing to accept the risks associated with supporting pavements over the existing fill materials in exchange for reduced construction costs, portions of the existing fill could be left in place for support new pavements. At least 12 inches of new engineered fill should be placed directly below the pavements with this option.

## Geotechnical Engineering Report

Republic Wastewater Treatment Plant Improvements ■ Republic, Missouri  
August 19, 2022 ■ Terracon Project No. B5205029/B5215111



- Soils with liquid limits over 45 percent were encountered in the soil exploration program and are prone to volume change with variations in moisture content. The fat clay (CH) soils encountered in the soil exploration program (both as undocumented fill materials and native soils) are high in plasticity and prone to volume change with variations in moisture content. For this reason, we recommend a 24-inch thick Low Volume Change (LVC) zone be maintained or constructed beneath grade-supported floor slabs.
- Some relatively high moisture content soils were encountered in the upper levels of some of the borings, and these soils may be exposed in excavations and cuts. These soils may become unstable when disturbed. During periods of dry weather, these soils may be stable upon initial exposure; however, these soils, if exposed, may become relatively soft and unstable under construction traffic. We recommend that the owner budget for the possibility that overexcavation and/or subgrade stabilization may be required and contractors be prepared to handle potentially unstable and/or soft conditions.
- Based on our borings and seismic refraction survey, the International Building Code (IBC) seismic site class for this site is C.

The professional opinions and recommendations presented in this report are based on evaluation of data developed by testing discrete samples obtained from widely-spaced borings. Site subsurface conditions have been inferred from available data, but actual subsurface conditions will only be revealed by excavation. So that variations in subsurface conditions which may affect the design can be addressed as they are encountered, we recommend that Terracon be retained to observe excavations and perform tests during the site preparation, earthwork and foundation construction phases of the project.

This executive summary should not be separated from or used apart from this report. This report presents fully developed recommendations and opinions based on our understanding of the project at the time the report was prepared. The report limitations are described in the **General Comments** section of this report.



**Geotechnical Engineering Report**  
**Republic Wastewater Treatment Plant Improvements**  
**408 N. West Ave. – Northwest of Wade Street Intersection**  
**Republic, Missouri**  
**Terracon Project No. B5205029/B5215111**  
**August 19, 2022**

## INTRODUCTION

This report presents the results of our subsurface exploration and geotechnical engineering services performed for the proposed Republic Wastewater Treatment Plant Improvements to be located at 408 N. West Ave. – Northwest of Wade Street Intersection in Republic, Missouri. In 2020, twelve (12) borings, designated B-1 through B-8, B-2A, B-4A, B-5A, and B-7A, were performed to depths of approximately 25½ to 64½ feet below the existing ground surface. In 2022, twelve (12) borings, designated B-11 through B-22, were performed to depths of approximately 18½ to 50 feet below the existing ground surface. The purpose of these services is to provide information and geotechnical engineering recommendations relative to:

- Subsurface soil (and rock) conditions
- Groundwater conditions
- Site preparation and earthwork
- Excavation considerations
- Dewatering considerations
- Demolition considerations
- Foundation design and construction
- Floor slab design and construction
- Seismic site class
- Lateral earth pressures
- Pavement design and construction

Maps showing the site and boring locations are shown in the **Site Location**, **Boring Location** and **Exploration Plan** sections, respectively. The results of the laboratory testing performed on soil samples obtained from the site during the field exploration are included on the boring logs and/or as separate pages in the **Exploration Results** section.

The **General Comments** section provides an understanding of the report limitations.

## SITE CONDITIONS

The following description of site conditions is derived from our site visit in association with the field exploration and our review of publicly available geologic and topographic maps.

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Item	Description
<b>Parcel Information</b>	<p>The project is located at 408 N. West Ave. – Northwest of Wade Street Intersection in Republic, Missouri.</p> <p>The approximate coordinates of the site are: Lat.: 37.1426° N Long.: 93.2659° W (See <b>Site Location</b>)</p>
<b>Existing Improvements</b>	Existing wastewater treatment facility
<b>Current Ground Cover</b>	Bare ground, native grasses, and asphalt pavements (access roads)
<b>Existing Topography</b>	A site topographic plan was not provided. Current grades at the site are relatively flat with drainage to towards Dry Branch Creek near the middle of the site.

## PROJECT DESCRIPTION

Our initial understanding of the project along with associated recommendations were provided in our previous geotechnical investigation (Geotechnical Engineering Report, Republic Wastewater Treatment Plant Improvements, dated December 18, 2020, Terracon Project No. B5205029) and was discussed in the current project planning stage. A period of collaboration has transpired since the previous geotechnical investigation was completed, and our final understanding of the project is as follows:

Item	Description
<b>Project Description</b>	Improvements to the existing Wastewater Treatment Facility
<b>Grading/Slopes</b>	<p>Terracon assumes up to 25 feet of cut and 5 feet of fill may be required to develop final grades.</p> <p>Terracon understands final slope angles no steeper than 3H:1V (Horizontal:Vertical) are planned.</p>
<b>Below-Grade Areas</b>	Some structures are anticipated to have walls extending 22 feet below grade.
<b>Pavements</b>	<p>New pavements will be constructed. We assume both rigid (concrete) , flexible (asphalt) pavement, and gravel access road sections should be considered.</p> <p>Anticipated traffic information for the following categories (vehicles per day) should be provided by the client:</p> <ul style="list-style-type: none"><li>■ Autos/light trucks</li><li>■ Light delivery and trash collection vehicles</li><li>■ Tractor-trailer trucks</li></ul> <p>The pavement design period is 20 years.</p>

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<p><b>Proposed Structures</b></p>	<p><b>Blending:</b> Transfer Pump Station Valve Vault – 20’ Square – Reinforced Mat Foundation Filter Splitter Structure – 17’x12’ – Reinforced Mat Foundation Filter Building – 70’x50’ – Wall Footing with Slab-on-Grade Disinfection Building – 70’x25’ – Reinforced Mat Foundation on Perimeter Grade Beam</p> <p><b>Membrane Bioreactor (MBR):</b> Influent Pump Station Vault – 22’ Square – Reinforced Mat Foundation Grit Removal and Fine Screening Building – 70’x45’ – Reinforced Mat Foundation Chemical Feed Building – 50’x35’ – Reinforced Mat Foundation on Perimeter Grade Beam Process Splitter – 30’x12’ – Reinforced Mat Foundation Process Basins – 200’x160’ – Reinforced Mat Foundation MBR Basin – 80’x40’ – Reinforced Mat Foundation MBR Building – 80’x40’ – Reinforced Mat Foundation Digester 4 – 86’ diameter – Reinforced Mat Foundation Dewatering Building – 80’x40’ – Wall Footing with Slab-on-Grade Administration Building – 125’x65’ – Wall Footing with Slab-on-Grade Electrical Building – 75’x25’ – Wall Footing with Slab-on-Grade Miscellaneous Structure for Various Equipment – Reinforced Mat Foundation</p>
<p><b>Foundation and Slab Bearing Elevations</b></p>	<p>Transfer Pump Station – 1239 feet Influent Pump Station – 1232 feet Process Basins – 1262 feet MBR Basin – 1260 feet MBR Building – 1259 feet Digester 4 – 1248 feet</p> <p>Slab bearing elevations of remaining structures listed in Proposed Structures are planned to be within 1 to 2 feet of existing ground surface</p>

<p><b>Maximum Loads</b> (Provided by B&amp;M)</p>	<p><b>Blending:</b> Transfer Pump Station – 2.5 ksf bearing Filter Splitter Structure – 2.0 ksf bearing Filter Building – 6.5 klf strip Disinfection Building – 4.0 klf strip <b>Membrane Bioreactor (MBR):</b> Influent Pump Station Vault – 3.0 ksf bearing Grit Removal and Fine Screening Building – 3.5 ksf bearing Chemical Feed Building – 2.5 klf strip Process Splitter – 1.5 ksf bearing Process Basins – 2.5 ksf bearing MBR Basin – 2.0 ksf bearing MBR Building – 3.0 ksf bearing Digester 4 – 2.0 ksf bearing Dewatering Building – 80'x40' – 6.0 klf strip Administration Building – 125'x65' – 4.0 klf strip Electrical Building – 75'x25' – 4.0 klf strip Miscellaneous Structure for Various Equipment – &lt;1.0 ksf bearing</p>
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## **GEOLOGIC SETTING**

The project site is located in the Springfield Plateau subsection of the Ozark Highlands Physiographic Province of Missouri. This province is characterized by gently rolling to nearly level upland areas dissected by stream and river valleys, underlain primarily by carbonate rocks (limestone and dolomite).

The project site is mapped as being underlain by the limestone and dolomite of the Osagean Series carbonate rocks, dated to the Early Mississippian Geologic Period. The Osagean series in southwestern Missouri consists of the Keokuk Limestone, Burlington Limestone, Elsey Formation, Reeds Spring Formation, and Pierson Limestone, and is up to 400 feet in thickness. Due to a lack of exposed bedrock at the surface of the site, the mapped geology cannot be verified.

The Osagean Series carbonate rocks are known to form a widespread karst terrain, a landform characterized by closed depressions, sinkholes, cave entrances, sinking streams, and a highly irregular “pinnacled” bedrock/soil interface. The karst landform is the consequence of the presence of soluble bedrock.

Specifically, the project site is mapped as being underlain by the Osagean Series, see [Geologic Map](#).

## **REVIEW OF AVAILABLE RECORDS**

The following records were reviewed:

- Google Earth, Historical Aerial Photographs;
- USGS Earth Explorer, Historical Aerial Photographs, <https://earthexplorer.usgs.gov/>;
- USGS Topoview, Historical Topographic Maps, <https://ngmdb.usgs.gov/topoview/>;
- Greene County, MO, GIS Data Viewer, <https://greenecountymo.gov/>;
- City of Springfield, MO, GIS Data Viewer, <https://www.springfieldmo.gov/>;
- Missouri State University, Digital Library, <http://digitalcollections.missouristate.edu/>;
- Missouri Department of Natural Resources, GeoStrat, <http://dnr.no.gov/geostrat/>;

Several karst features and potential karst features were identified during our document review and review of previous Terracon projects on adjacent properties. Based on our review of the above resources, a documented sinkhole is present in the southeastern portion of the property see **Geologic Map**.

Our review of records included reviewing aerial photographs from 1936, 1959, 1964, 1968, 1970, 1978, 1979, 1990, 1997, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2013, 2015, 2017, 2019, and 2020. Additionally, our records review included reviewing USGS 7.5-minute quadrangle historical topographic maps from 1936, 1960, 1968, 1971, 1976.

Historical aerial photographs and historical topographic maps dating as far back to 1936 indicate that the subject site remained undeveloped prior to 1959, when sewage disposal structures appear directly south of project site. Documentation indicates that the site was underwent changes where parts of the site was zoned as a land fill prior to 1968. Additions to the existing wastewater treatment plan can be seen through the years up until the 2003 aerial photograph, where no changes are observed through the latest aerial photograph reviewed by Terracon in 2022.

## **SITE RECONAISSANCE**

On October 6, 2020, Joshua Elson, R.G., of Terracon visited the property to observe surface conditions for potential karst activity. At the time of the site visit, the ground surface was predominately maintained lawn around the existing wastewater treatment plant structures. No areas of subsidence or depressions were observed at the time of the site visit. Additionally, on June 21, 2022, Ripken Dodson, E.I., of Terracon visited the property to observe surface conditions for potential karst activity. At the time of the site visit, the ground surface in the area of the proposed treatment plant addition was bare, partially graded, exposed soil. No areas of subsidence or depressions were observed at the time of the visit.

## GEOPHYSICAL RESULTS

### Karst Conditions

The subject site is located within karst prone bedrock material. During the exploration of Boring B-5, a sudden loss of drilling fluid and limited drilling resistance were noted from depths of approximately 25 to 32 feet below the ground surface. These conditions are associated with the presence of voids and soft clay seams in the underlying limestone and are an indication of karst activity.

Karst development in this area occurs from the dissolution of the native limestone bedrock material. Over time, groundwater can transport the surrounding soil into bedrock voids causing visible surface features such as circular depressions or areas of drainage. However, some sinkholes may not be readily visible from the surface because they are plugged or capped with a thin layer of rock. Maintaining and managing adequate storm water drainage is important within karst prone areas, as described in the **Grading and Drainage** section. The image below, provided by MDNR, depicts the development of sinkholes over time.

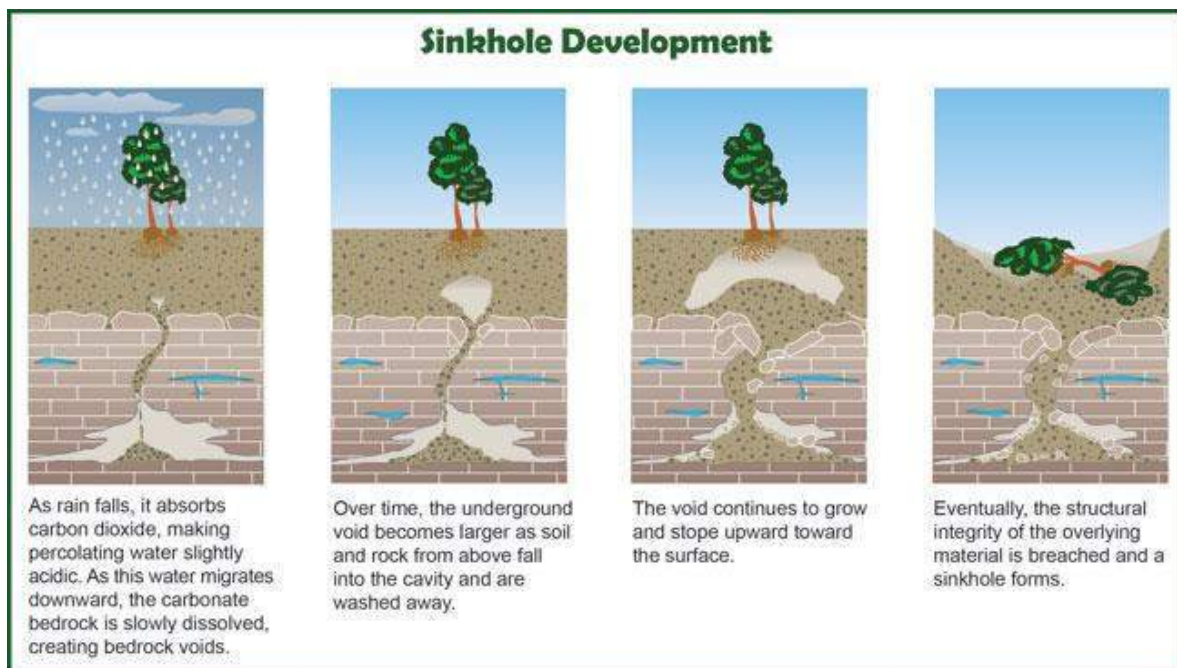


Image courtesy of MDNR

Though no evidence of sinkholes was noted during the 2020 and 2022 site reconnaissance visits, the development of karst features on the site is a possibility over time. The current state of the practice in geotechnical engineering does not allow for the accurate prediction of when or where sinkholes or karst-related subsidence could occur. The owner is advised that construction on this

property or essentially any other site within this area, carries with it some risk that future sinkholes may develop.

## MASW Interpretations

Terracon performed Multi-Channel Analysis of Surface Waves (MASW) seismic surveys was to identify potential karst-related features to direct the subsequent geotechnical exploration. The locations of our MASW survey lines are shown on the **Geophysical Site Plan**, and a description of the MASW method is provided in the **Exploration and Testing Procedures** section of this report.

The velocity at which the surface waves propagate is related to the shear modulus of the material through which it passes; therefore, allowing us to constrain the location(s) of potentially weak, soft, or saturated subsurface conditions consistent with the presence of karst-related features. The 2D images provided on the **MASW Profiles** present the shear wave velocity, respectively, as a function of distance in the horizontal direction and depth. It should be noted that the seismic velocity characteristics of soils and rocks can be similar; thus, the transition between material types may be gradual. The occurrence of the different soil types, and their consistencies and densities encountered in the borings are consistent with the range of shear wave values shown in the table below.

Site Class	Soil Profile	Shear Wave Velocity (ft/s)
A	Hard rock	$V_s > 5,000$
B	Medium hard rock	$3,000 < V_s \leq 5,000$
BC	Soft Rock	$2,100 < V_s \leq 3,000$
C	Very dense sand or hard clay	$1,450 < V_s \leq 2,100$
CD	Dense sand or very stiff clay	$1,000 < V_s \leq 1,450$
D	Medium dense sand or stiff clay	$700 < V_s \leq 1,000$
DE	Loose sand or medium stiff clay	$500 < V_s \leq 700$
E	Very loose sand or soft clay	$V_s \leq 500$

Based on the MASW shear wave data we identify three layers as a part of our subsurface profile:

- **Residual soils:** from the surface to depths of about 20 to 50 feet below site grade (bsg)
- **Fractured bedrock:** from about 30 to 100 feet bsg
- **Hard bedrock:** from about 80 to 100 feet bsg

Shear wave velocities within the residual soils are characterized by shear wave velocities from less than 600 ft/s to about 1,200 ft/s consistent with the presence of soils characterized as soft to stiff. Areas of locally higher shear wave velocities relative to the surrounding materials were observed and are consistent with the presence of harder materials within the residual soil layer.

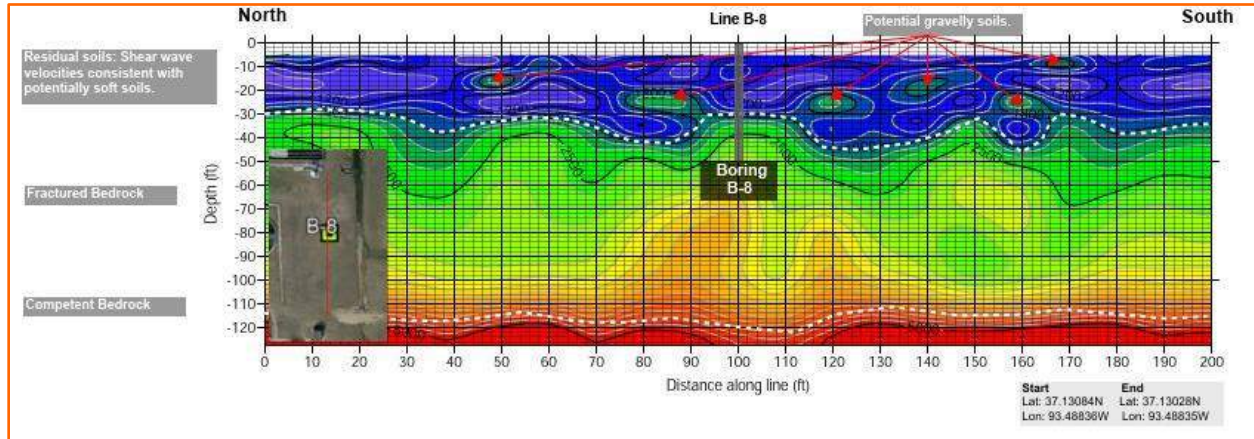
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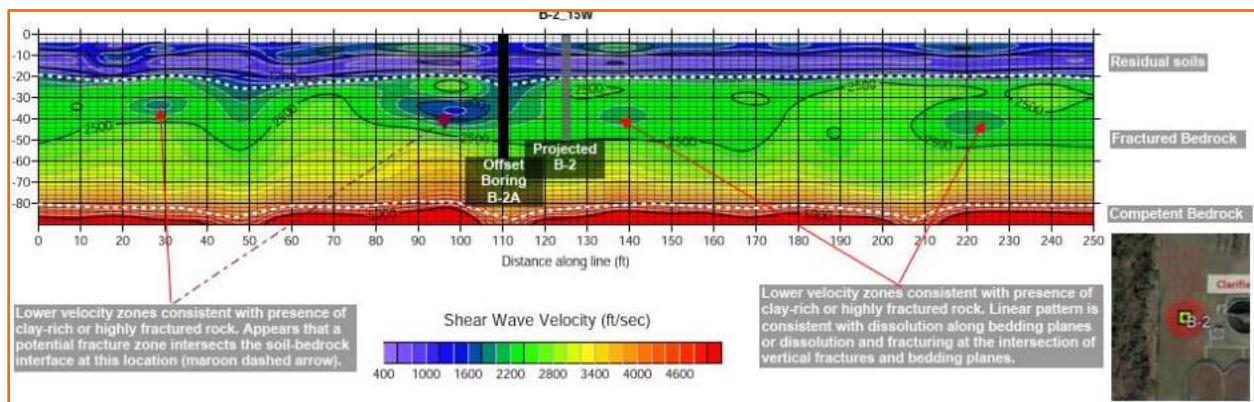


Thus, we anticipate that excavations within the residual soil layer may encounter cobbles and boulders (e.g., Line B-8 in figure below).



**MASW Profile at Boring B-8** – areas with shear wave velocities greater than surrounding soils in the residual soil layer are consistent with the presence of high gravel content soils, cobbles or boulders.

Local low velocity zones (LVZs) are observed at a depth of about 40 to 50 feet within the highly to moderately weathered bedrock unit. The shear wave velocities and distribution of the LVZs are consistent with the presence of highly fractured bedrock potentially at locations where subvertical fractures intersect a weathered bedding plane. Some of these LVZs appear to extend up to the residual soil-fractured bedrock interface. It is possible that these fracture zones serve as fluid conduits and have higher clay contents than the surrounding rock mass, which would contribute to the observed lower velocities. It is important to note that the velocities of the LVZs vary from about 1,200 to 2,200 ft/s consistent with the presence of materials characterized as “very dense soil and soft rock”; therefore, our initial interpretation of the LVZs did not characterize these locations as voids. Four (4) additional borings were advanced at locations where LVZ anomalies were observed (e.g., offset Boring B-2A shown in the figure below). Our observations from these borings are consistent with our interpretation of the MASW data.





**MASW Profile at Boring B-2 15W** – an additional boring was offset approximately 15 feet south of boring B-2 to explore one of the LVZs located at a depth of about 30 to 40 feet and extending up to the residual soil-fractured bedrock interface.

The results of the geophysical and subsequent geotechnical exploration are consistent with some karst-related features such as variable bedrock surface topography and highly weathered fractures and bedding planes. The results are not consistent with the presence of voids, caves, etc. at locations of the proposed structures; however, construction on this property or other sites within this area, carries with it some risk that future sinkholes may develop.

A description of the subsurface materials, their occurrence across the site, and how their impact of constructability and design are presented in the following sections.

## GEOTECHNICAL CHARACTERIZATION

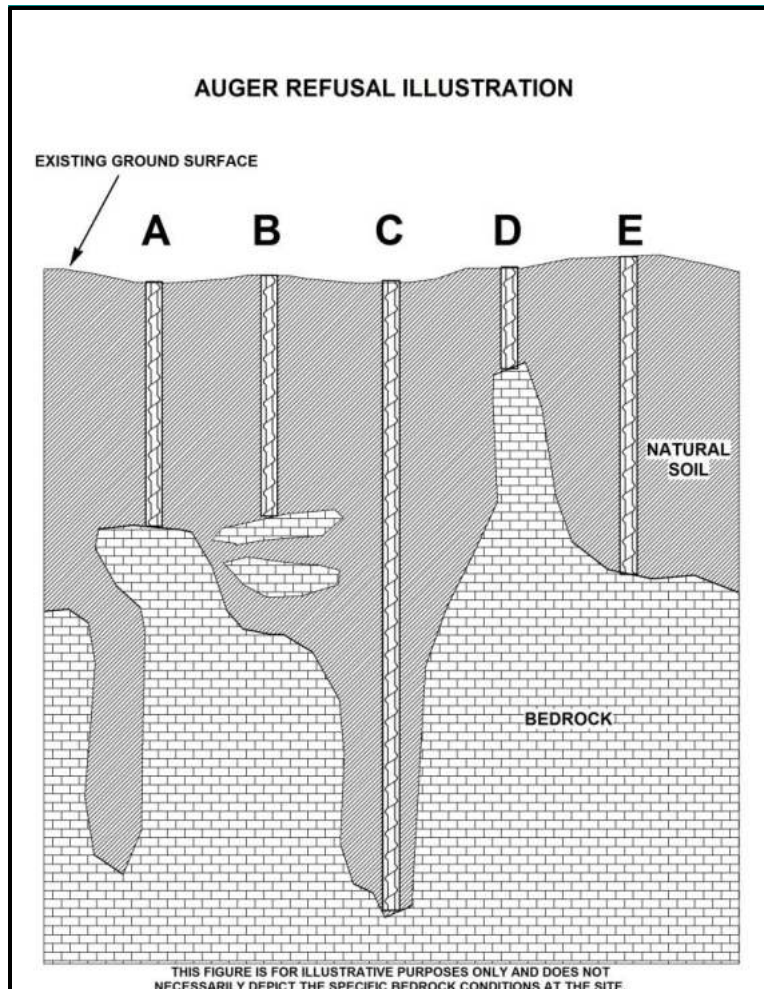
We have developed a general characterization of the subsurface conditions based upon the subsurface exploration, laboratory data, geologic setting and our understanding of the project. This characterization, termed GeoModel, forms the basis of our geotechnical evaluation. Conditions encountered at each boring location are indicated on the individual logs. The individual logs can be found in the **Exploration Results** section and the GeoModel can be found in the **Figures** section of this report.

As part of our analyses, we identified the following model layers within the subsurface profile. For a more detailed view of the model layer depths at each boring location, refer to the GeoModel.

Model Layer	Layer Name	General Description
1	Surficial Materials	Topsoil and exposed fill materials or residual soils
2	Fill	Lean to fat clay (CL or CH) with varying amounts of gravel and sand or clayey gravel with varying amounts of clay and sand
3	Residual Soils	Lean to fat clay (CL or CH) with varying amounts of gravel and sand or gravelly soils with varying amounts of clay and sand
4	Limestone	Highly to slightly weathered

Auger refusal is defined as the depth below the ground surface at which a boring can no longer be advanced with the soil drilling technique being used. Auger refusal is subjective and is based upon the type of drilling equipment used, the types of augers used, and the effort exerted by the driller. Auger refusal can occur on the upper surface of discontinuous bedrock (A), slabs of unweathered rock suspended in the residual soil matrix or "floaters" (B), in widened joints that may extend well below the surrounding bedrock surface (C), on rock "pinnacles" (D) rising above

the surrounding bedrock surface, or on the upper surface of continuous bedrock (E). These possible auger refusal conditions are illustrated in the figure below. Linear interpolation of apparent bedrock elevations based upon the boring data is often used but can misrepresent actual rock removal quantities where anomalies exist, such as pinnacled rock, where rock could be shallower than that encountered in the borings. Additional borings, auger probes, test pits, or geophysical testing could be performed to obtain more specific bedrock information.



### Groundwater Conditions

The boreholes were observed while drilling and after completion for the presence and level of groundwater. In addition, delayed water levels were also obtained in some borings. The water levels observed in the boreholes are shown on the boring logs in [Exploration Results](#), and are summarized below.

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Boring Number	Approximate Depth to Groundwater while Drilling (feet) <sup>1</sup>	Approximate Depth to Groundwater after 24 hours (feet) <sup>1</sup>
B-2	16	12
B-8	22½	19
B-2A	14	19
B-4A	Not Encountered	21
B-7A	35	Not Encountered
B-11	35	Not Observed
B-12	22	Not Observed
B-14	20½	Not Observed
B-15	19½	Not Observed
B-17	16½	Not Observed
B-18	23	Not Observed
B-19	20	Not Observed
B-20	18½	Not Observed
B-22	23	Not Observed

1. Below ground surface

Groundwater level fluctuations occur due to seasonal variations in the amount of rainfall, runoff and other factors not evident at the time the borings were performed. Therefore, groundwater levels during construction or at other times in the life of the structure may be different than the levels indicated on the boring logs. The possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project.

## GEOTECHNICAL OVERVIEW

### General

We recommend that the exposed subgrade be thoroughly evaluated after stripping of any topsoil and at the base of all cut areas, and prior to the start of any fill operations. We recommend that the Geotechnical Engineer be retained to evaluate the bearing material for the foundations and subgrade soils. Subsurface conditions, as identified by the field and laboratory testing programs, have been reviewed and evaluated with respect to the proposed project plans known to us at this time.

### Anticipated Foundations

Due to the variable depth to bedrock across the site and the variance in the anticipated bearing elevation of each structure, we recommend that each structure be evaluated individually to

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determine the most appropriate foundation system. Based on the anticipated bearing elevations, the anticipated maximum loads and the data that we have gathered in our exploration, we have provided a summary of the anticipated foundation system for each structure in the following table.

Planned Structure	Anticipated Maximum Load	Preliminary Bearing Elevation (feet)	Recommended Foundation Type	Recommended Bearing Material
<b>Blending:</b>				
Transfer Pump Station	2.5 ksf	1239	Mat Foundation and/or Drilled Shafts	Residual Clay or Competent Limestone at about elevation 1208½
Filter Splitter Structure	2.0 ksf	At Grade	Mat Foundation	Residual Clay and/or Engineered Fill
Filter Building	6.5 klf	At Grade	Strip Footings	Residual Clay and/or Engineered Fill
Disinfection Building	4.0 klf	At Grade	Strip Footings	Residual Clay and/or Engineered Fill
<b>Membrane Bioreactor (MBR):</b>				
Influent Pump Station Vault	3.0 ksf	1232	Mat Foundation	Residual Clay and/or Engineered Fill
Grit Removal and Fine Screening Building	3.5 ksf	At Grade	Mat Foundation bearing on ground improvement or Drilled Shafts	Competent Limestone at about elevation 1248
Chemical Feed Building	2.5 klf	At Grade	Mat Foundation on Grade Beam	Residual Clay and/or Engineered Fill
Process Splitter	1.5 ksf	At Grade	Mat Foundation	Residual Clay and/or Engineered Fill
Process Basins	2.5 ksf	1262	Mat Foundation	Residual Clay and/or Engineered Fill
MBR Basin	2.0 ksf	1260	Mat Foundation	Residual Clay and/or Engineered Fill
MBR Building	3.0 ksf	1259	Mat Foundation	Residual Clay and/or Engineered Fill
Digester 4	2.0 ksf	1253	Drilled Shafts	Competent Limestone at about elevation 1235
Dewatering Building	6.0 klf	At Grade	Strip Footings	Residual Clay and/or Engineered Fill
Administration Building	4.0 klf	At Grade	Strip Footings	Residual Clay and/or Engineered Fill
Electrical Building	4.0 klf	At Grade	Strip Footings	Residual Clay and/or Engineered Fill

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Planned Structure	Anticipated Maximum Load	Preliminary Bearing Elevation (feet)	Recommended Foundation Type	Recommended Bearing Material
Miscellaneous Structure for Various Equipment	<1.0 ksf	At Grade	Strip Footings	Residual Clay and/or Engineered Fill

During the exploration of Boring B-5, a sudden loss of drilling fluid and limited drilling resistance were noted at a depth of approximately 25 to 32 feet below the ground surface. These conditions are associated with the presence of voids and soft clay seams in the underlying limestone. The extent and nature of the void cannot be determined without further investigation. With the presence of this void, Terracon recommends the mat foundation of Digester 4 be supported on drilled shaft foundations that bear beyond this depth into the competent limestone below the void and clay seam.

### Demolition

Demolition of the existing structures should include removal of all above-grade and below-grade elements including floor slabs, foundation walls, and footings. Attention should be given to removing all loose or poorly compacted existing fill materials that are often located adjacent to existing and former foundation walls. All existing utilities should also be properly abandoned and/or relocated. This should include removal of all poorly compacted trench backfill extending into the proposed structure areas. In addition, care should be taken by contractors to protect all existing improvements to remain, such as pavements and utilities. Excavations created by demolition and removal of existing features should be backfilled with engineered fill that is placed and compacted as recommended in this report.

### Existing Undocumented Fill

Existing undocumented fill was encountered to depths ranging from approximately 2 to 10 feet in Boring B-1, B-3 through B-7, B-4A, B-5A, B-11, B-16, B-20, and B-21. The fill could extend deeper in areas not explored. Existing undocumented fill should be observed, tested, and approved by Terracon. If indications of fill are found during the excavations, then the material should be treated as fill and the recommendations noted below should be considered. While the N-values obtained in the undocumented fill materials were generally equal to or higher than the existing native soils, no documentation or records regarding the placement of this fill were provided for our review. If records of the fill placement are available, Terracon should be provided with these documents to better assess the suitability of the existing fill.

Due to the clayey gravels at the subject site, differentiating between native materials and man placed fill in soil boring samples is difficult and, in many cases, impractical without documentation. The designation of possible fill has been given to materials that are suspected of being fill but no

definite indications of fill were noted in the sampling process. These materials should be carefully observed and inspected during excavations for indications of fill by a representative of Terracon. If indications of fill are found during the excavations, then the material should be treated as fill and the recommendations noted below should be considered.

Existing undocumented fill may contain soft or loose soil or other unsuitable materials; these conditions may not be disclosed by the widely-spaced, relatively small-diameter borings. If these conditions are present and are not discovered and addressed during construction, then larger than normal settlement resulting in cracking, differential movement, or other damage could occur in foundations, floor slabs, pavements, and utility lines supported on or above the existing fill. Typically, larger than normal settlement of floor slabs results in reflective cracking of overlying rigid floor coverings (if any), unlevel floors, and “bumps” at locations of differential movement.

Foundations and floor slabs for the new structures should not bear on or above the existing undocumented fill materials. The existing fill should be removed and replaced so that the foundations and floor slabs for the new structures bear on suitable native soils or on properly placed and compacted engineered fill extending to suitable native soils. If the fill is completely removed and replaced, it should be removed within the proposed structure footprint and extend at least 5 feet outside the building perimeter.

Provided the owner is willing to accept the risks associated with supporting pavements over the existing fill materials in exchange for reduced construction costs, portions of the existing fill could be left in place. To reduce the risk of adverse performance from higher settlement and to provide more consistent support for pavements, some portion of the existing fill should be removed and the exposed existing fill materials should be observed and tested during construction. Where unsuitable conditions are observed, the materials should be improved by scarification and recompaction or be removed and replaced with engineered fill. At least 12 inches of new engineered fill should be placed directly below the pavement sections with this option. However, even with the recommended subgrade preparation and construction testing, there is a risk to the owner that unsuitable material within or buried by the fill will not be discovered. If the owner is not willing to accept the risks of supporting pavements over existing fill materials, the existing fill should be completely removed and replaced.

Portions of the existing fill may be suitable for removal and reuse as an engineered fill material. If this material is used as an engineered fill material, it should be first evaluated by the materials testing firm to determine if it meets the requirements listed in **Material Requirements**. If the material will be used as fill it should be placed as described in **Compaction Requirements**.

## **Swell Potential**

High plastic clays with liquid limits over 45 were noted in the Atterberg limits tests performed on selected samples. These materials are prone to volume change with seasonal fluctuations in moisture, which may lead to excessive shrinking and swelling of floor slabs and lightly-loaded structures. We recommend a low volume change (LVC) zone be constructed beneath the at-grade floor slab. Using an LVC zone as recommended in this report may not eliminate all future subgrade volume change and resultant floor slab movements. However, the procedures outlined herein should help to reduce the potential for subgrade volume change. Existing soils can be left in place and compacted if they are tested during construction and meet LVC material requirements. Details regarding this LVC zone are provided in the **Floor Slab** section.

This report provides recommendations to help mitigate the effects of soil shrinkage and expansion. However, even if these procedures are followed, some movement and cracking in the structure could occur. The severity of cracking and other (cosmetic) damage such as uneven floor slabs will likely increase if any modification of the site results in excessive wetting or drying of the expansive soils. Eliminating the risk of movement and distress may not be feasible, but it may be possible to further reduce the risk of movement if more extensive measures are used during construction. We would be pleased to discuss other construction alternatives with you upon request.

## **Dewatering**

Groundwater was encountered within the anticipated excavation depths at the site. The contractor should be prepared to dewater excavations for foundations and utilities that extend below the groundwater table, especially utility crossings within Dry Branch Creek. If seepage is encountered in excavations during construction, the contractor is responsible for designing, implementing, and maintaining appropriate dewatering methods to control seepage and facilitate construction. In our experience, dewatering of excavations in clay soils can typically be accomplished using sump pits and pumps. However, if seepage occurs within gravel layers or karst features are encountered excavations, a more extensive dewatering system may be required.

## **Soft Subgrade Potential**

The subgrade soils may become unstable when disturbed. During periods of dry weather, these soils may be stable upon initial exposure, however, these soils could become relatively soft and unstable under construction traffic. Further, depending upon site conditions during construction, overexcavation or stabilization of the subgrade and/or base of overexcavations may be needed to achieve a suitable working surface. Accordingly, we recommend that the owner budget for the possibility that overexcavation and/or subgrade stabilization may be required, and contractors should be prepared to handle potentially unstable and/or soft conditions.

## **EARTHWORK**

Earthwork is anticipated to include clearing and grubbing, excavations, and fill placement.

### **Site Preparation**

Prior to placing fill, existing vegetation and root mat should be removed. Complete stripping of the topsoil should be performed in the proposed building and parking/driveway areas.

The subgrade should be proofrolled with an adequately loaded vehicle such as a fully-loaded, tandem-axle dump truck. The proofrolling should be observed by the Geotechnical Engineer. Areas excessively deflecting under the proofroll should be delineated and subsequently addressed by the Geotechnical Engineer. Such areas should either be removed or modified by following the recommendations in the **Subgrade Stabilization** section. Excessively wet or dry material should either be removed, or moisture conditioned and recompacted.

### **Subgrade Stabilization**

Methods of subgrade improvement, as described below, could include scarification, moisture conditioning, and recompaction, and removal of unstable materials and replacement with granular fill (with or without geosynthetics). The appropriate method of improvement, if required, would be dependent on factors such as schedule, weather, the size of the area to be stabilized, and the nature of the instability. More detailed recommendations can be provided during construction as the need for subgrade stabilization occurs. Performing site grading operations during warm seasons and dry periods would help to reduce the amount of subgrade stabilization required.

If the exposed subgrade is unstable during proofrolling operations, it could be stabilized using one of the methods outlined below.

- **Scarification and Compaction** – It may be feasible to scarify, dry, and compact the exposed soils. The success of this procedure would depend primarily upon favorable weather and sufficient time to dry the soils. Stable subgrades likely would not be achievable if the thickness of the unstable soil is greater than about 1 foot, if the unstable soil is at or near groundwater levels, or if construction is performed during a period of wet or cool weather when drying is difficult.
- **Crushed Stone** – The use of crushed stone or gravel, such as MoDOT Type 5 or an approved alternate gradation of crushed limestone aggregate, is the most common procedure to improve subgrade stability. Typical undercut depths would be expected to range from about 6 to 30 inches below finished subgrade elevation with this procedure. The use of high modulus geogrid, equivalent to TENSAR BX-1100, could also be considered after underground work such as utility construction is completed. Prior to placing the geotextile or geogrid, we



recommend that all below-grade construction, such as utility line installation, be completed to avoid damaging the geosynthetic. Equipment should not be operated above the geosynthetic until one full lift of crushed stone fill is placed above it. The maximum particle size of granular material placed over the geotextile or geogrid should meet the manufacturer’s specifications, and generally should not exceed 1½ inches.

Further evaluation of the need and recommendations for subgrade stabilization can be provided during construction as the geotechnical conditions are exposed.

### Fill Material Types

Materials used for fill should meet the following material property requirements:

Fill Type <sup>1</sup>	USCS Classification	Acceptable Location for Placement
Low Volume Change (LVC) material	GM <sup>2</sup> or CL (LL<45 and PI<23)	All locations and elevations, except where free-draining material is required
On-site soils	CH or CL (native clay soils and existing fill soils; LL>45 and PI>23)	Pavement areas and at depths greater than 24 inches below building finished grade  Existing undocumented fill should be observed, tested and approved by Terracon. Organics, rock/rubble fragments larger than 3 inches, debris, or other unsuitable materials should be removed prior to re-use of the existing undocumented fill in engineered fill sections.
Well-Graded Granular	GW <sup>3</sup>	Where free-draining material is required

1. Engineered fill should consist of approved materials that are free of organic matter and debris. Frozen material should not be used, and fill should not be placed on a frozen subgrade.
2. MoDOT Type 5 or an approved alternate gradation of crushed limestone aggregate
3. Granular materials with less than 5 percent fines (material passing the #200 sieve), such as ASTM C33 Size No. 57 aggregate or similar from Section 1009 from MoDOT Standard Specifications.

Low volume change (LVC) material placed below the building floor slabs can consist of well-graded crushed stone aggregate (e.g., MoDOT Type 5). Lean clay soils with a liquid limit less than 45 and plasticity index less than 23 could also be used as LVC material, but these soils would be susceptible to softening and disturbance if they become wetted by surface water and precipitation. Soils that meet the LVC criteria were encountered in the borings, but were not encountered in an easily identifiable, discrete layer. Therefore, the use of imported LVC materials should be expected. If a granular leveling course (such as crushed stone aggregate) is used immediately below the floor slabs, this material can be considered part of the LVC zone.

## Fill Compaction Requirements

Fill should meet the following compaction requirements.

Item	Description
<b>Fill Lift Thickness<sup>1</sup></b>	9 inches in loose thickness when large, self-propelled compaction equipment is used 4 inches when small, hand-guided equipment (plate or “jumping jack” compactor) is used
<b>Compaction Requirements<sup>2</sup></b>	At least 95 percent of the material’s maximum standard Proctor dry density <sup>3</sup>
<b>Water Content Range</b>	Low plasticity cohesive: -2 percent to +2 percent of optimum <sup>3</sup> High plasticity cohesive: 0 to +4 percent of optimum <sup>3</sup> Granular: Workable moisture levels <sup>4</sup>

1. Reduced lift thicknesses of 4 to 6 inches are recommended in confined areas (e.g., utility trenches, foundation excavations, and foundation backfill) and when hand-operated compaction equipment is used.
2. We recommend that engineered fill be tested for moisture content and compaction during placement. If the results of the in-place density tests indicate the specified moisture or compaction limits have not been met, the area represented by the test should be reworked and retested as required until the specified moisture and compaction requirements are achieved. As stated within ASTM D 698, this procedure is intended for soils with 30 percent or less material larger than ¾ inch. Accordingly, we recommend full time proofroll observation be performed instead of moisture density testing for materials containing more than 30 percent aggregate retained on the ¾-inch sieve.
3. As determined by the standard Proctor test (ASTM D 698)
4. Specifically, moisture levels should be maintained low enough to allow for satisfactory compaction to be achieved without the cohesionless fill material pumping when proofrolled.

## Utility Trench and Duct Bank Backfill

All trench excavations and excavations for concrete duct banks should be made with sufficient working space to permit construction including backfill placement and compaction. If utility trenches and duct banks are backfilled with relatively clean granular material, they should be capped with at least 18 inches of clay fill to reduce the infiltration and conveyance of surface water through the trench backfill.

Utility trenches are common sources of water infiltration and migration. All utility trenches that penetrate beneath structures should be effectively sealed to restrict water intrusion and flow through the trenches that could migrate below the structure. We recommend constructing an effective “trench plug” that extends at least 5 feet out from the face of the structure exterior. The plug material should consist of clay compacted as recommended in **Earthwork**. The clay fill should be placed to completely surround the utility line and be compacted in accordance with

recommendations in this report. Alternatively, flowable fill could be used to construct the trench plug.

## **Grading and Drainage**

During construction, grades should be developed to direct surface water flow away from or around the site. Exposed subgrades should be sloped to provide positive drainage so that saturation of subgrades is avoided. Surface water should not be permitted to accumulate on the site. Final surrounding grades should promote rapid surface drainage away from the structures. Accumulation of water adjacent to the structure could contribute to significant moisture increases in the subgrade soils and subsequent softening/settlement or expansion/heave.

After construction of the structures and pavements have been completed, we recommend verifying final grades to document that effective drainage has been achieved. Grades around the structures should also be periodically inspected and adjusted as necessary, as part of the structure's maintenance program.

## **Earthwork and Excavation Considerations**

Terracon should be retained during the construction phase of the project to observe earthwork and to perform necessary tests and observations during subgrade preparation, proofrolling, placement and compaction of controlled compacted fills, backfilling of excavations into completed subgrades, and just prior to construction of foundations, slabs, and pavements.

Care should be taken to avoid disturbance of prepared subgrades. Unstable subgrade conditions can develop during general construction operations, particularly if the soils are wetted and/or subjected to repetitive construction traffic. If unstable subgrade conditions develop, stabilization measures will need to be employed. Construction traffic over the completed subgrade should be avoided to the extent practical. If the subgrade becomes frozen, desiccated, saturated, or disturbed, the affected materials should be removed or these materials should be scarified, moisture conditioned, and compacted prior to slab construction.

The OSHA Occupational Safety and Health Standards-Excavations classify soils into three basic types (Type A, B, or C). Depending upon the soil type, OSHA requirements for excavation slopes range from  $\frac{3}{4}$  H to 1V (horizontal to vertical) for Type A soils, 1H to 1V for Type B soils, and 1½H to 1V for Type C soils. OSHA allows up to vertical excavations in stable rock masses. OSHA dictates that any excavation extending to a depth of more than 20 feet shall be designed by a registered professional engineer. Based upon the subsurface conditions encountered at the boring locations, the overlying soils classify as Type C soil according to OSHA regulations. OSHA recommends a maximum slope inclination of 1½ horizontal to 1 vertical for excavation in these soils. In addition, whenever a lower strength material underlies a higher strength material, the lower strength material must be utilized for trench design.

In lieu of trench slopes as defined by OSHA, trench shoring or a shield (trench boxes) may be utilized to reduce overall excavation widths. The contractor or the specialty subcontractor should be responsible for the design of the temporary shoring. These designs should be performed in accordance with applicable regulatory requirements.

Care should be taken during excavation to protect the structural integrity of any existing structures, pavements, or adjacent underground utilities that are to remain in-place. The settlement tolerances of adjacent structures or improvements should be considered when determining the excavation methods. Depending upon factors such as the depth of excavation, the location of the existing improvements, groundwater and soils conditions, temporary sheeting, shoring, and underpinning may be required. Particular caution should be exercised if excavations are performed near existing utility lines. Existing backfill for utility lines is often poorly compacted and the limits of the old excavation form a ready failure surface. The OSHA trench safety guidelines for adequate side slopes based on soil types may not apply in these situations. Existing underground utilities should be shored and braced as required to maintain their integrity and appropriately designed trench boxes or sheeting and bracing should be used to provide for worker safety.

All vehicles, equipment and soil piles should be kept a sufficient lateral distance from the crest of the trench slope to maintain safe working conditions. Vehicles, equipment and soil piles located adjacent to trenches could significantly influence the stability of the slopes as outlined by the OSHA regulations. A more detailed stability analysis would be required for these conditions. Additionally, vibrations from heavy traffic, or similar sources can influence slope stability. The exposed slope faces should be protected from the elements. Surface water should be diverted away from all excavations. The length of open trench should be held to a minimum. Trench excavation, pipe laying, and backfilling should be completed as quickly as possible to minimize the amount of time that excavations are left open.

### **Construction Observation and Testing**

The earthwork efforts should be observed and tested by a representative of the Geotechnical Engineer. Observation and testing should include documentation of removal of vegetation and topsoil, proofrolling, and mitigation of areas delineated by the proofroll to require mitigation.

In areas of foundation excavations, the bearing subgrade should be evaluated by the Geotechnical Engineer. If unacceptable conditions are encountered, the Geotechnical Engineer should be contacted to recommend mitigation options.

## **SHALLOW FOUNDATIONS**

The following section provides design parameters for shallow spread footing foundations and reinforced concrete mat foundations.

## Spread Footing Foundation Design Parameters

The following design parameters are applicable for design of shallow strip footing foundations for the proposed Filter, Disinfection, Electrical, Dewatering and Administration Buildings, and other ancillary structures for various equipment planned.

Description	Value
<b>Maximum net allowable bearing pressure</b> <sup>1,2,3</sup>	<b><u>Bearing on residual clay and/or engineered fill</u></b> 2,000 psf
<b>Minimum embedment below finished grade for frost protection</b> <sup>4</sup>	30 inches
<b>Minimum footing widths</b>	Isolated footings: 30 inches Continuous footings: 16 inches
<b>Estimated total settlement</b> <sup>5</sup>	1 inch or less
<b>Estimated differential settlement</b> <sup>5</sup>	1/2 to 2/3 of the total settlement over a horizontal distance of 50 feet

1. The recommended net allowable bearing pressure is the pressure in excess of the minimum surrounding overburden pressure at the footing base elevation. This pressure assumes that any soft soils or other unsuitable materials, including existing undocumented fill, if encountered, will be undercut and replaced with engineered fill.
2. The allowable bearing pressure can be increased by 1/3 for transient loading conditions.
3. A factor of safety of 3 has been applied to this value.
4. This embedment depth is recommended for footings beneath unheated areas to provide frost protection and to reduce the effects of seasonal moisture variations in the foundation bearing soils.
5. The foundation settlement will depend upon the variations within the subsurface soil profile, the structural loading conditions, the embedment depth of the footings, the thickness of engineered fill below the footings, and the quality of the earthwork operations and footing construction.

## Mat Foundation Design Parameters

Based on the conditions encountered at the borings, we understand the foundations for Filter Splitter Structure, Influent and Transfer Pump Station, Chemical Feed Building, Process Splitter and Basins, and MBR Building and Basins will be supported on mat foundations. The mat foundations at these locations can bear on medium stiff to stiff residual clay or engineered fill at the planned depth.

Description	Value
<b>Maximum net allowable bearing pressure</b> <sup>1,2,3</sup>	2,000 psf
<b>Modulus of subgrade reaction (for design of mat foundations)</b> <sup>4</sup>	100 pounds per square inch per inch of deflection (psi/in or pci)
<b>Estimated total settlement</b> <sup>5</sup>	¾ inch within 3 months after full load is applied

## Geotechnical Engineering Report

Republic Wastewater Treatment Plant Improvements ■ Republic, Missouri

August 19, 2022 ■ Terracon Project No. B5205029/B5215111



Description	Value
<b>Estimated differential settlement</b> <sup>5</sup>	½ inch over a horizontal distance of 10 feet
<ol style="list-style-type: none"><li>1. The recommended net allowable bearing pressure is the pressure in excess of the minimum surrounding overburden pressure at the footing base elevation.</li><li>2. The allowable bearing pressure can be increased by 1/3 for transient loading conditions.</li><li>3. A factor of safety of 3 has been applied to these values.</li><li>4. The recommended modulus value is based on a 12-inch square plate. The modulus value used in design should be adjusted based on the actual size of the floor slab according to the Naval Facilities Engineering Design Manual 7.2, Page 7.2-155, Table 4 equation: <math>K_b = K_v \left(\frac{b+1}{2b}\right)^2</math> where <math>K_v</math> is the modulus value based on a 12-inch square plate, <math>b</math> is the width of the slab and <math>K_b</math> is the design modulus value.</li><li>5. The foundation settlement will depend upon the variations within the structural loading conditions, the quality of the lean concrete placed, and foundation construction.</li></ol>	

Foundations that will be subjected to lateral loads should be embedded sufficiently to resist these loads. Horizontal loads acting on foundations cast directly against undisturbed soils or backfilled with engineered fill may be resisted by a combination of passive pressure on the sides of the footing and sliding friction at the base of the foundation. An ultimate coefficient of sliding friction of 0.3 may be assigned to the base of the foundations bearing on residual clay or engineered fill. Passive resistance may be calculated using an equivalent fluid unit weight of 290 pounds per cubic foot (pcf) for cohesive backfill and 360 pcf for granular backfill. Appropriate safety factors should be applied to the ultimate friction and equivalent fluid unit weight values provided.

### Ground Improvement Utilizing Aggregate Piers/Stone Columns

The Grit Removal and Fine Screen Building may be supported on a mat foundation designed to the above recommendations if underlying soil modifications utilizing rammed/vibratory aggregate piers/columns are utilized to support the anticipated loads at this site. The use of this type of soil modification can also increase the allowable bearing capacity of the existing soil. The ground improvement system can often be designed for a specified bearing capacity. Maximum obtainable bearing capacities are site-specific and may vary between 3,000 psf to 8,000 psf.

There are two main systems of this type of soil modification, one using a ramming action to compact the soil and one utilizing a vibrating system. These systems typically consist of 18- to 30-inch diameter drilled holes that are filled in lifts of well-graded aggregate that is densified by either ramming or vibration to form very stiff, high-density aggregate piers/columns. The compacted aggregate piers/columns produce high lateral stresses within the surrounding soil matrix, thereby stiffening the reinforced composite soil/aggregate mass. This results in significant strengthening and stiffening of the foundation bearing layer to support footings within the required settlement tolerances.

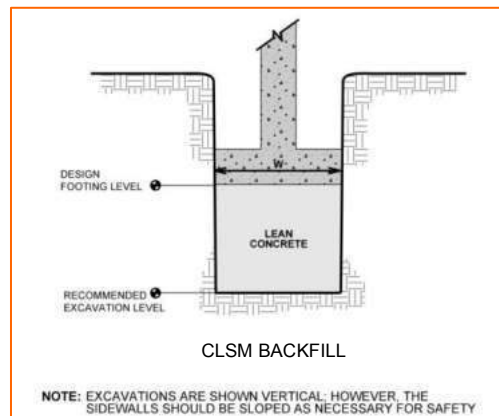
Aggregate pier foundation elements are a design-build system that are designed and installed by a specialty foundation contractor. Therefore, the subsurface exploration information contained in this report should be provided to the foundation contractors for detailed analysis and design and

cost information. The foundation contractor selected for doing the installation should be contact prior to the start of excavations, as these elements are often installed from the existing ground surface. The client should be prepared with a desired targeted bearing capacity to discuss with the foundation contractor. The allowable net bearing capacity following installation of aggregate piers will be provided by the designer.

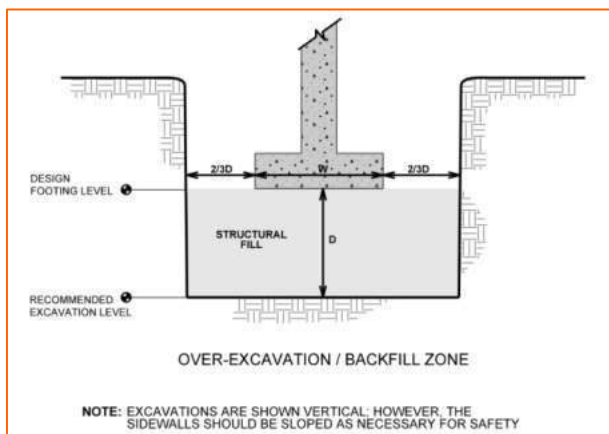
### **Shallow Foundation Construction Considerations**

As noted in **Earthwork**, the footing excavations should be observed and tested by a representative Geotechnical Engineer. The base of all foundation excavations should be free of water and loose soil, prior to placing concrete. Concrete should be placed soon after excavating to reduce bearing soil disturbance. Care should be taken to prevent wetting or drying of the bearing materials during construction. Excessively wet or dry material or any loose/disturbed material in the bottom of the footing excavations should be removed/reconditioned before foundation concrete is placed. Placement of a lean concrete or controlled low-strength material (CLSM) mud mat over the bearing soils should be considered if the excavations must remain open for an extended period of time.

If unsuitable bearing soils are encountered at the base of the planned footing excavation, the excavation should be extended deeper to suitable soils, and the footings could bear directly on these soils at the lower level or on lean concrete backfill placed in the excavations. This is illustrated on the sketch below.



Over-excavation for structural fill placement below spread footing foundations should be conducted as shown below. The over-excavation should be backfilled up to the footing base elevation with suitable fill materials, as recommended in the **Earthwork** section.



## DEEP FOUNDATIONS

Subsurface voids, and soft, compressible clay seams were encountered in the vicinity of the proposed Transfer Pump Station and Digester 4. Drilled shaft foundations bearing below these voids and clay seams can be considered to support these structures. Additionally, if a mat foundation underlain by ground improvement of the proposed Grit Removal and Fine Screen Building is not a suitable option, drilled shafts bearing within competent limestone can be considered.

### Drilled Shaft Foundation Design Parameters

Based on the conditions encountered at our boring locations, drilled shaft foundations at the proposed Transfer Pump Station, Digester 4, Grit Removal and Fine Screen Building should bear within competent limestone. Competent limestone was encountered at the approximate elevations shown in the following table.

Structure	Approximate Elevation of Competent Limestone (feet) <sup>1,2</sup>	Allowable End Bearing Pressure (Limestone), (ksf) <sup>3</sup>	Allowable Skin Friction Uplift (Limestone) (ksf) <sup>3,4</sup>
Transfer Pump Station	1208½	60	8
Digester 4	1235	60	8
Grit Removal and Fine Screen Building	1248	60	8

1. The structural engineer should refer to the appended boring logs and exploration plan to evaluate the drilled shaft capacities based on the structural loading, shaft diameter, and embedment depth. The contract documents should include provisions to adjust the drilled shaft bearing elevations based on the rock conditions encountered and Terracon’s field observations during construction, rather than setting a strict tip elevation for each shaft.
2. Drilled shafts should extend a minimum of 6 inches into competent limestone.



- 
3. A factor of safety of 2 has been applied to these values.
  4. Skin friction should be ignored in the overburden soils.
- 

Drilled shafts for this project should have a minimum diameter of 3 feet. Provided the drilled shafts are designed and constructed in accordance with recommendations presented in this report, we estimate total settlement of the drilled shafts would be ¼ inch or less. Differential settlement between adjacent columns would be less than half the total settlement. These settlement estimates do not include elastic compression of the drilled shaft under axial loading. Settlement estimates for drilled shafts are dependent on the shaft diameter, and these settlement estimates are valid for shaft diameters ranging from 3 to 5 feet. Terracon should be notified if larger-diameter shafts are planned.

### **Drilled Shaft Foundation Construction Considerations**

The base of all drilled shaft excavations should be free of water and loose material prior to placement of concrete. Core samples of the bedrock were obtained in B-4 and B-4A at the Transfer Pump Station and B-5 and B-5A at Digester 4, and these boreholes extended about 10 feet into the bedrock. We recommend foundation inspection holes be performed at each drilled shaft location. Each inspection hole should extend to a depth of 10 feet or twice the diameter of the rock socket below the bottom of the shaft, whichever is greater, to evaluate the bearing material below the shaft and integrity of the rock socket.

Drilled shaft excavations should be observed by a Terracon representative to evaluate that suitable bearing materials have been reached and that the excavations have been cleaned sufficiently prior to placement of concrete. If the shaft bottom cannot be visually inspected and probed/sounded from ground surface, other methods (such as a downhole camera) could be used to inspect the shaft bottom.

Conventional excavating and drilling equipment should be able to penetrate the soil. Coring may be required to advance the shaft excavations through weathered limestone and 6 inches into competent limestone.

While removing the casing from a shaft excavation during concrete placement, the concrete inside the casing should be maintained at a sufficient level to prevent intrusion of overburden materials into the excavation and resist any earth pressures outside the casing during the entire casing removal procedure. We recommend the concrete mixture for drilled shafts be designed to have a slump in the range of 5 to 7 inches to facilitate casing removal and reduce the possibility of concrete arching.

## **SEISMIC CONSIDERATIONS**

Terracon conducted a seismic refraction survey for the purpose of providing information relative to the Seismic Site Class per International Building Code (IBC) 2018 using the average shear-wave velocity in the top 100 feet of the subsurface profile.

A seismic refraction system consisting of one SeismicSource DAQLink III seismographs and 24 geophones was utilized to derive subsurface seismic velocity information. Linear arrays of 24 geophones were placed as indicated on the figure below and the following type of seismic data was recorded:

- *Refraction microtremors* produced by ambient seismic noise are recorded. The data was then processed using a wavefield-transformation data-processing technique and an interactive Rayleigh-wave dispersion-modeling tool. The refraction microtremor exploits aspects of spectral analysis of surface waves (SASW) and multi-channel analysis of surface waves (MASW) to derive a shear wave (s-wave) profile and an average shear-wave velocity along the array for a corresponding depth.

The IBC requires structural design to be in accordance with the appropriate site class definition for soil profile type. Based upon the Site Class Definitions in ASCE 7-22, Chapter 20, Table 20.2-1, and the **average shear wave velocity of 2,300 ft/s** derived from our seismic survey data, as indicated in the **Shear-Wave Velocity** appendix, Terracon recommends a Class BC seismic site classification for design.

The average shear-wave velocity analysis and recommendations presented in this report are based upon the data obtained from the seismic refraction system performed at the indicated location and on the indicated date. This analysis does not reflect variations that may occur across the site, or variations that may occur throughout the year, such as groundwater fluctuations. The refraction microtremor method is an approximate method, and one of many methods that can be used to determine shear-wave velocities.

Description	Value
<b>2018 International Building Code Site Class (IBC) <sup>1</sup></b>	BC
<b>Site Latitude</b>	37.1305° N
<b>Site Longitude</b>	93.4884° W
<b>Risk Category</b>	III
<b>S<sub>DS</sub> Spectral Acceleration for a Short Period <sup>2</sup></b>	0.18 g
<b>S<sub>D1</sub> Spectral Acceleration for a 1-Second Period <sup>2</sup></b>	0.085 g
<b>F<sub>a</sub> Site Coefficient – Table 1613.3.3(1)</b>	1.3
<b>F<sub>v</sub> Site Coefficient – Table 1613.3.3(2)</b>	1.5

1. Seismic site classification in general accordance with ASCE 7-22, *Minimum Design Loads for Buildings and Other Structures*.
2. These values were obtained using online seismic design maps and tools provided by the USGS (<http://earthquake.usgs.gov/hazards/designmaps/>).

## FLOOR SLABS

Grade-supported floor slabs should be supported on a minimum of 24 inches of low volume change (LVC) material. LVC fill should be placed and compacted as recommended in section **Earthwork**.

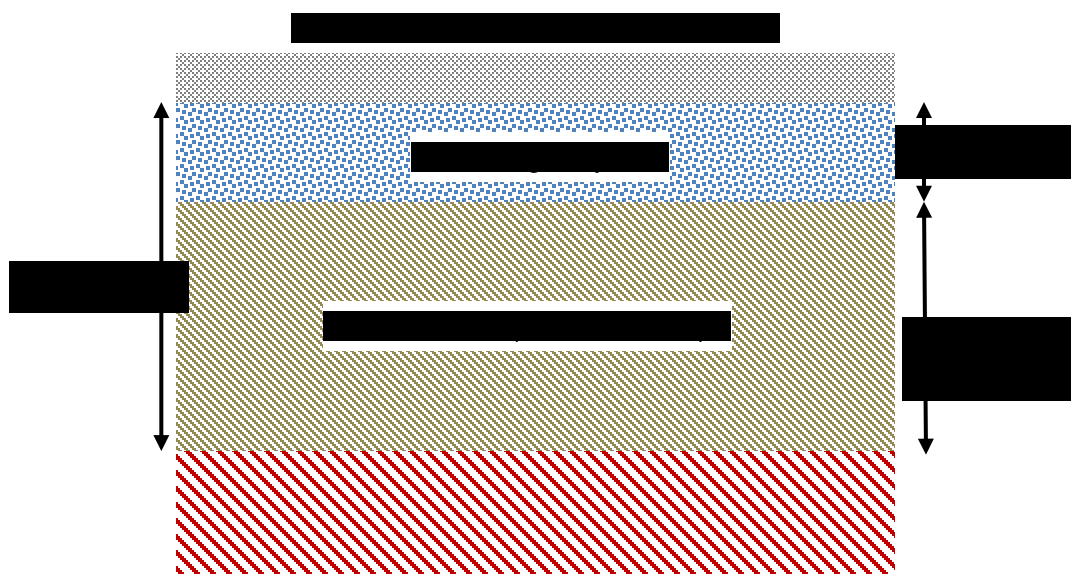


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### Floor Slab Design Parameters

Item	Description
<b>Floor slab support</b> <sup>1, 2</sup>	A minimum 24-inch thick low volume change (LVC) material
<b>Modulus of subgrade reaction</b>	100 pounds per square inch per inch (psi/in) for point loading conditions
<b>Granular course beneath slab</b> <sup>3, 4, 5</sup>	Minimum 4 inches
<b>Capillary break layer thickness</b> <sup>4, 5</sup>	Minimum 4 inches

1. The recommended modulus value is based on a 12-inch square plate. The modulus value used in design should be adjusted based on the actual size of the floor slab according to the Naval Facilities Engineering Design Manual 7.2, Page 7.2-155, Table 4 equation:  $K_b = K_v \left(\frac{b+1}{2b}\right)^2$  where  $K_v$  is the modulus value based on a 12-inch square plate,  $b$  is the width of the slab and  $K_b$  is the design modulus value.
2. Well graded crushed stone (e.g., MoDOT Type 5 aggregate) or open-graded crushed stone (e.g., ASTM C33, Size No. 57 aggregate) can be used as the leveling course.
3. These granular materials may be considered part of the LVC zone.

Joints should be constructed in slabs at regular intervals as recommended by the American Concrete Institute (ACI) to help control the location of cracks. Joints or any cracks in the slab that develop should be sealed with a waterproof, non-extruding compressible compound.

Typically, some increase in the slab subgrade moisture content will occur because of gradual accumulation of capillary moisture, which would otherwise evaporate if the slab had not been constructed. The use of a vapor retarder should be considered beneath concrete slabs-on-grade that will be covered with moisture sensitive or impervious coverings, or when the slab will support equipment sensitive to moisture. When conditions warrant the use of a vapor retarder, the slab designer should refer to ACI 302 and/or ACI 360 for procedures and cautions regarding the use and placement of a vapor retarder.

### **Floor Slab Construction Considerations**

If LVC materials consist of clay, the subgrade should be maintained in a relatively moist condition until the slab is constructed. If the subgrade becomes desiccated prior to construction of the slab, the affected material should be removed or the materials should be scarified, moistened, and compacted. Upon completion of grading operations in the construction area, care should be taken to maintain the recommended subgrade moisture content and density prior to construction of the slab. A 4-inch thick CLSM mud-mat could be utilized to protect the subgrade during construction.

On most project sites, the site grading is generally accomplished early in the construction phase. However, as construction proceeds, the subgrade may be disturbed due to utility excavations, construction traffic, desiccation, rainfall etc. As a result, the slab subgrade soils may not be suitable for placement of the granular course and/or concrete at the time of building construction, and corrective action may be required.

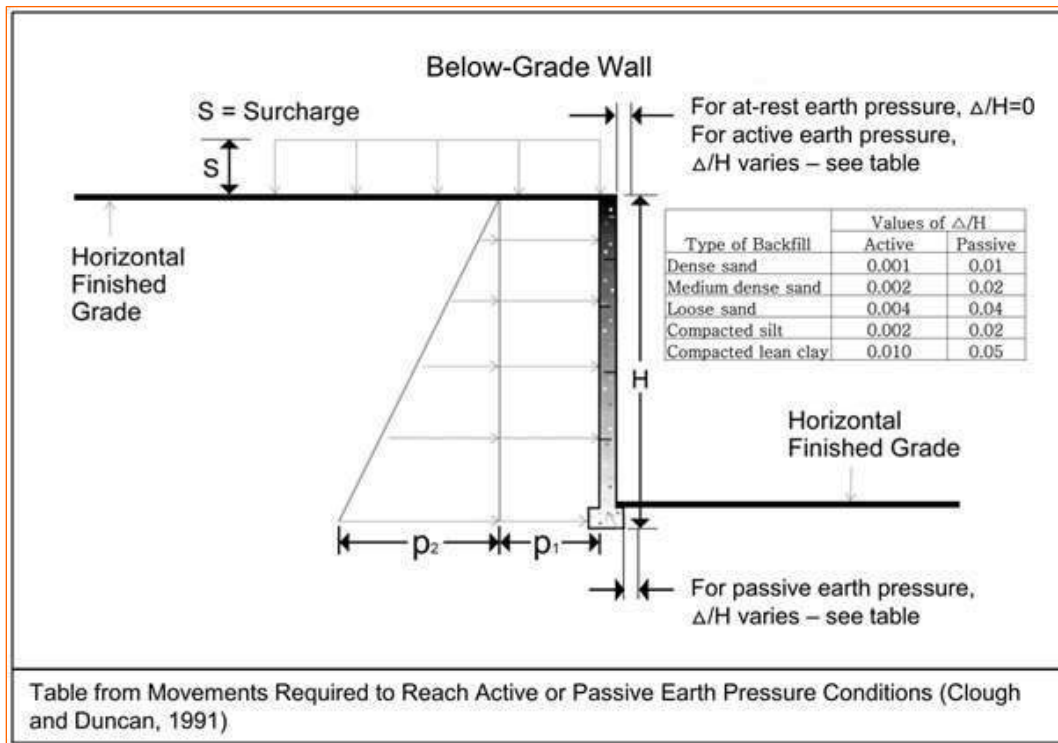
Terracon should evaluate the condition of the slab subgrades immediately prior to placement of the granular leveling course and construction of the slabs. Particular attention should be paid to areas containing backfilled trenches and high traffic areas that were previously disturbed during construction. Where unsuitable conditions are located within the slab subgrade soils, the subgrade should be improved by removing and replacing the affected material with properly compacted fill.

## **LATERAL EARTH PRESSURES**

### **Lateral Earth Pressure Design Parameters**

Structures with unbalanced backfill levels on opposite sides should be designed for earth pressures at least equal to values indicated in the following table. Earth pressures will be influenced by structural design of the walls, conditions of wall restraint, methods of construction and/or compaction and the strength of the materials being restrained. Two wall restraint conditions

are shown in the diagram below. Active earth pressure is commonly used for design of free-standing cantilever retaining walls and assumes wall movement. The “at-rest” condition assumes no wall movement and is commonly used for walls that are restrained at the top. The recommended design lateral earth pressures do not include a factor of safety and do not provide for possible hydrostatic pressure on the walls (unless stated).



Lateral Earth Pressure Design Parameters				
Earth Pressure Condition <sup>1</sup>	Coefficient for Backfill Type <sup>2</sup>	Surcharge Pressure <sup>3, 4, 5</sup> $p_1$ (psf)	Effective Fluid Pressures (psf) <sup>2, 4, 5</sup>	
			Drained <sup>6</sup>	Undrained <sup>6</sup>
Active ( $K_a$ )	Granular - 0.31	(0.31)S	(40)H	(80)H
	Fine Grained - 0.41	(0.41)S	(50)H	(85)H
At-Rest ( $K_o$ )	Granular - 0.47	0.47)S	(55)H	(90)H
	Fine Grained - 0.58	(0.58)S	(70)H	(95)H
Passive ( $K_p$ )	Granular - 3.25	---	(390)H	(250)H
	Fine Grained - 2.46	---	(295)H	(205)H

1. For active earth pressure, wall must rotate about base, with top lateral movements 0.002 H to 0.004 H, where H is wall height. For passive earth pressure, wall must move horizontally to mobilize resistance.
2. Uniform, horizontal backfill, compacted to at least 95% of the ASTM D 698 maximum dry density, rendering a maximum unit weight of 120 pcf
3. Uniform surcharge, where S is surcharge pressure
4. Loading from heavy compaction equipment is not included.

## Geotechnical Engineering Report

Republic Wastewater Treatment Plant Improvements ■ Republic, Missouri

August 19, 2022 ■ Terracon Project No. B5205029/B5215111



Lateral Earth Pressure Design Parameters				
Earth Pressure Condition <sup>1</sup>	Coefficient for Backfill Type <sup>2</sup>	Surcharge Pressure <sup>3, 4, 5</sup> $p_1$ (psf)	Effective Fluid Pressures (psf) <sup>2, 4, 5</sup>	
			Drained <sup>6</sup>	Undrained <sup>6</sup>

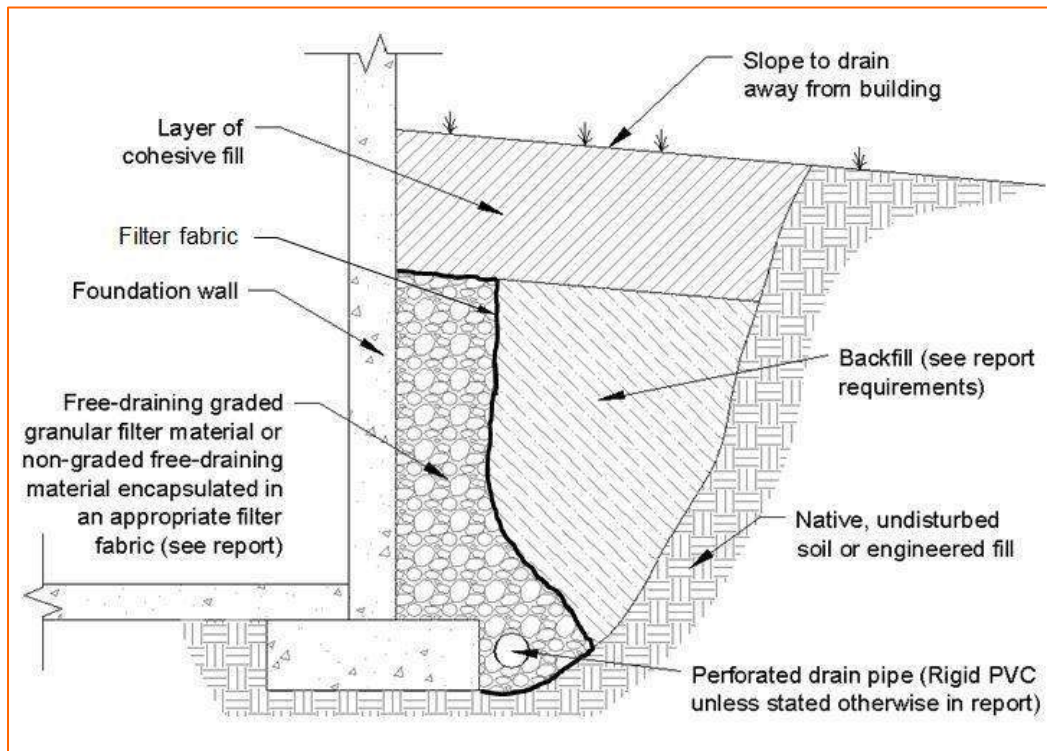
5. No safety factor is included in these values.

6. To achieve “Drained” conditions, follow guidelines in **Subsurface Drainage for Below-Grade Walls** below. “Undrained” conditions are recommended when drainage behind walls is not incorporated into the design.

Backfill placed against structures should consist of granular soils or low plasticity cohesive soils. For the granular values to be valid, the granular backfill must extend out and up from the base of the wall at an angle of at least 45 degrees from vertical for the active and at-rest cases and 60 degrees from the vertical for the passive case.

### Subsurface Drainage for Below-Grade Walls

A perforated rigid plastic drain line installed behind the base of walls and extends below adjacent grade is recommended to prevent hydrostatic loading on the walls. The invert of a drain line around a below-grade building area or exterior retaining wall should be placed near foundation bearing level. The drain line should be sloped to provide positive gravity drainage to daylight or to a sump pit and pump. The drain line should be surrounded by clean, free-draining granular material having less than 5% passing the No. 200 sieve. The free-draining aggregate should be encapsulated in a filter fabric. The granular fill should extend to within 2 feet of final grade, where it should be capped with compacted cohesive fill to reduce infiltration of surface water into the drain system.



As an alternative to free-draining granular fill, a prefabricated drainage structure may be used. A prefabricated drainage structure is a plastic drainage core or mesh which is covered with filter fabric to prevent soil intrusion, and is fastened to the wall prior to placing backfill.

## PAVEMENTS

Pavement subgrades are expected to consist of on-site native clay soils. The pavement subgrades should be proofrolled as recommended in **Earthwork**. If soft or otherwise unsuitable areas are observed, additional over-excavation and replacement will be needed.

Grading and paving are commonly performed by separate contractors and there is often a time lapse between the end of grading operations and the commencement of paving. Subgrades prepared early in the construction process may become disturbed by construction traffic. Non-uniform subgrades often result in poor pavement performance and local failures relatively soon after pavements are constructed. Depending on the paving equipment used by the contractor, measures may be required to improve subgrade strength to greater depths for support of heavily loaded concrete/asphalt trucks.

We recommend the moisture content and density of the subgrade be evaluated and the pavement subgrades be proofrolled (using a loaded tandem-axle dump truck with a minimum gross weight of 20 tons or similarly loaded rubber-tire equipment) within two days prior to commencement of

actual paving operations. Areas not in compliance with the required ranges of moisture or density should be scarified, moisture conditioned, and compacted. Particular attention should be paid to high traffic areas that were rutted and disturbed earlier and to areas where backfilled trenches are located. Areas where unsuitable conditions are located should be repaired by removing and replacing the materials with properly compacted fills. The subgrade should be in its finished form at the time of the final review.

**Opinions of Minimum Pavement Thickness**

Pavement thickness depends upon many factors including but not limited to:

- applied wheel/axle loads and number of repetitions
- subgrade and pavement material characteristics
- climate conditions
- site and pavement drainage

Specific information regarding anticipated vehicle types, axle loads, and traffic volumes was not provided at the time of this report. The “Light Duty” pavement section considers 4-tire, 2-axle personal vehicle traffic (cars, vans, pickups and SUVs) only. The “Medium Duty” pavement section considers personal vehicle traffic along with a maximum of ten trucks per week, consisting of panel delivery trucks, trash collection trucks, or legally loaded semi-tractor trailers (53-foot trailers). Our recommendations for asphaltic cement concrete (ACC) pavement and Portland cement concrete (PCC) pavement sections are outlined in the following table.

Pavement Type	Light Duty	Medium Duty
<b>Gravel Access Roads</b>	8 inches aggregate (MoDOT Type 5 or similar)	12 inches aggregate (MoDOT Type 5 or similar)
<b>ACC</b>	2 inches ACC surface 4 inches ACC base 6 inches aggregate base (MoDOT Type 5 or similar)	2 inches ACC surface 6 inches ACC base 6 inches aggregate base (MoDOT Type 5 or similar)
<b>PCC</b>	5 inches PCC 4 inches open graded rock (ASTM C33 Size No. 57 aggregate or similar from Section 1009 from MoDOT Standard Specifications)	7 inches PCC 4 inches open graded rock (ASTM C33 Size No. 57 aggregate or similar from Section 1009 from MoDOT Standard Specifications)

PCC pavements will perform better than ACC in areas where short radii turning and braking are expected (i.e., entrance/exit aprons) due to better resistance to rutting and shoving. In addition, PCC pavement will perform better in areas subject to heavy static loads (i.e., dumpster pads).



Construction traffic on the pavements was not considered in developing our opinions of minimum pavement thickness. If the pavements will be subject to construction equipment/vehicles, the pavement sections should be revised to consider the additional loading.

Pavements and subgrades will be subject to freeze-thaw cycles and seasonal fluctuations in moisture content. Pavement thickness design methods are intended to provide adequate thickness of structural materials over a particular subgrade such that wheel loads are reduced to a level that the subgrade can support. The subgrade support parameters for pavement thickness design do not account for shrink/swell movements of a subgrade constructed of expansive clay soils. Therefore, the pavement may be adequate from a structural standpoint, yet still experience cracking and deformation due to shrink/swell related movement of the subgrade.

The pavement sections provided above consider that the subgrade soils will not experience significant increases in moisture content. Paved areas should be sloped to provide rapid drainage of surface water and to drain water away from the pavement edges. Pavements should be designed so water does not accumulate on or adjacent to the pavement, since this could saturate and soften the subgrade soils and subsequently accelerate pavement deterioration.

Periodic maintenance of the pavements will be required. Cracks should be sealed, and areas exhibiting distress should be repaired promptly to help prevent further deterioration. Even with periodic maintenance, some movement and related cracking may still occur and repairs may be required.

## CORROSIVITY

The table below lists the results of laboratory soluble sulfate, sulfides, soluble chloride, Red-Ox, total salts, electrical resistivity, and pH testing. The values may be used to estimate potential corrosive characteristics of the on-site soils with respect to contact with the various underground materials which will be used for project construction.

Corrosivity Test Results Summary									
Boring	Sample Depth (feet)	Soil Description	Soluble Sulfate (mg/kg)	Soluble Chloride (mg/kg)	Sulfides (mg/kg)	Red-Ox (mV)	Total Salts (mg/kg)	Electrical Resistivity (Ω-cm)	pH
B-2A	6 to 8	Lean Clay (CL)	20	35	ND <sup>1</sup>	+693	101	6,499	6.69
B-4A	13 to 15	Lean Clay (CL)	86	45	ND <sup>1</sup>	+690	493	3,395	7.09
B-11	0 to 5	Lean Clay (CL)	103	<17	0.099	Not Tested	163	1,432	6.82

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Corrosivity Test Results Summary									
Boring	Sample Depth (feet)	Soil Description	Soluble Sulfate (mg/kg)	Soluble Chloride (mg/kg)	Sulfides (mg/kg)	Red-Ox (mV)	Total Salts (mg/kg)	Electrical Resistivity (Ω-cm)	pH
B-14	5 to 10	Fat Clay (CH)	22	25	0.083	Not Tested	55	2,470	6.21

1. ND = Not Detected

The 10-point system evaluation of corrosive potential for ductile iron pipe is used to determine the corrosivity of the soil samples and is included in **Figures**. The evaluation procedure is based on five tests on a sample of soil. Each test result is assigned a point value according to its contributions to corrosivity. The points for all five areas are totaled and if the sum is 10 or more, the soil is considered corrosive to ductile iron pipe, in which case corrosion protective measures will be required. Based on the sum of averaged points for all five areas, the soils tested do not exceed the 10-point system, so the site soils would not be considered corrosive environment to buried ductile iron pipe.

In our experience, alkali-silica reactivity (ASR) in concrete aggregates is uncommon in Southwest Missouri; however, it is a possibility that ASR could occur in concrete in the project area under the certain circumstances. We recommend the contractor and concrete supplier consider the potential impacts of ASR in the concrete mix design.

Results of soluble sulfate testing indicate samples of the on-site soils tested possess negligible sulfate concentrations when classified in accordance with Table 19.3.1.1 of ACI 318 and indicate that ASTM Type I/II portland cement should be suitable for concrete on and below grade for the length of the project. Concrete should be designed in accordance with the provisions of ACI 318. For specific recommendations regarding soil corrosivity, we recommend a corrosion specialist be consulted.

## GENERAL COMMENTS

Our analysis and opinions are based upon our understanding of the project, the geotechnical conditions in the area, and the data obtained from our site exploration. Natural variations may occur between exploration point locations or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. Terracon should be retained as the Geotechnical Engineer, where noted in this report, to provide observation and testing services during pertinent construction phases. If variations appear, we can provide further evaluation and supplemental recommendations. If variations are noted in the absence of our observation and testing services on-site, we should be immediately notified so that we can provide evaluation and supplemental recommendations.

## Geotechnical Engineering Report

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Support of floor slabs and pavements over existing fill is discussed in this report. However, even with the recommended construction testing, there is a risk that unsuitable materials within or buried by the fill will not be discovered. This risk cannot be eliminated without removing the fill, but it can be reduced by thorough exploration and testing.

Our Scope of Services does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

Our services and any correspondence or collaboration through this system are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third-party beneficiaries intended. Any third-party access to services or correspondence is solely for information purposes to support the services provided by Terracon to our client. Reliance upon the services and any work product is limited to our client, and is not intended for third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

Site characteristics as provided are for design purposes and not to estimate excavation costs. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that could significantly impact excavation costs. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety, cost estimating, excavation support, and dewatering requirements/design are the responsibility of others. If changes in the nature, design, or location of the project are planned, our conclusions and recommendations shall not be considered valid unless we review the changes and either verify or modify our conclusions in writing.

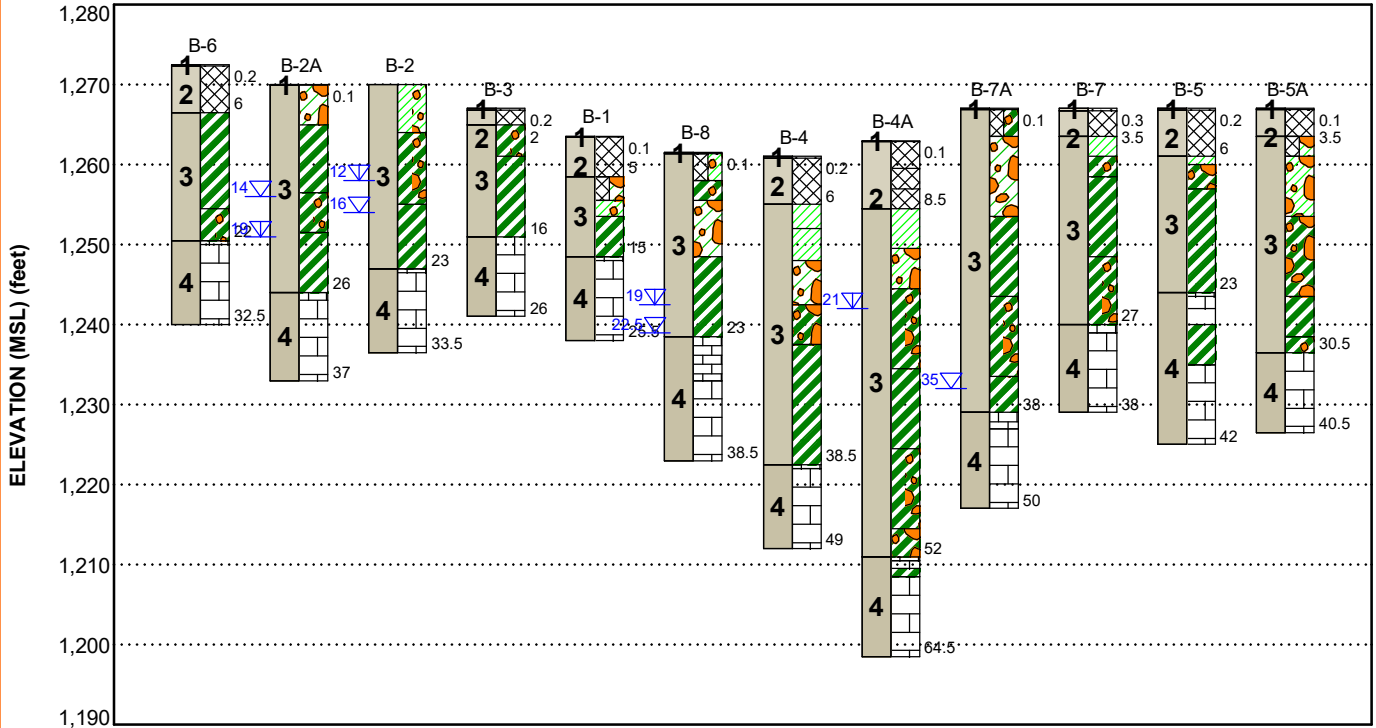
## FIGURES

### Contents:

GeoModels (2020 & 2022)

**GEOMODEL**

Republic WWTP ■ Republic, Missouri  
Terracon Project No. B5205029



This is not a cross section. This is intended to display the Geotechnical Model only. See individual logs for more detailed conditions.

Model Layer	Layer Name	General Description
1	Surficial Materials	Topsoil and exposed fill materials or residual soils
2	Fill	Lean to fat clay (CL or CH) with varying amounts of gravel and sand or clayey gravel with varying amounts of clay and sand
3	Residual Soils	Lean to fat clay (CL or CH) with varying amounts of gravel and sand or gravelly soils with varying amounts of clay and sand
4	Limestone	Highly to slightly weathered

**LEGEND**

- Topsoil
- Lean Clay with Gravel
- Limestone
- Gravelly Fat Clay
- Fill
- Fat Clay
- Fat Clay with Gravel
- Clayey Gravel
- Highly Weathered Limestone
- Lean Clay
- Gravelly Lean Clay

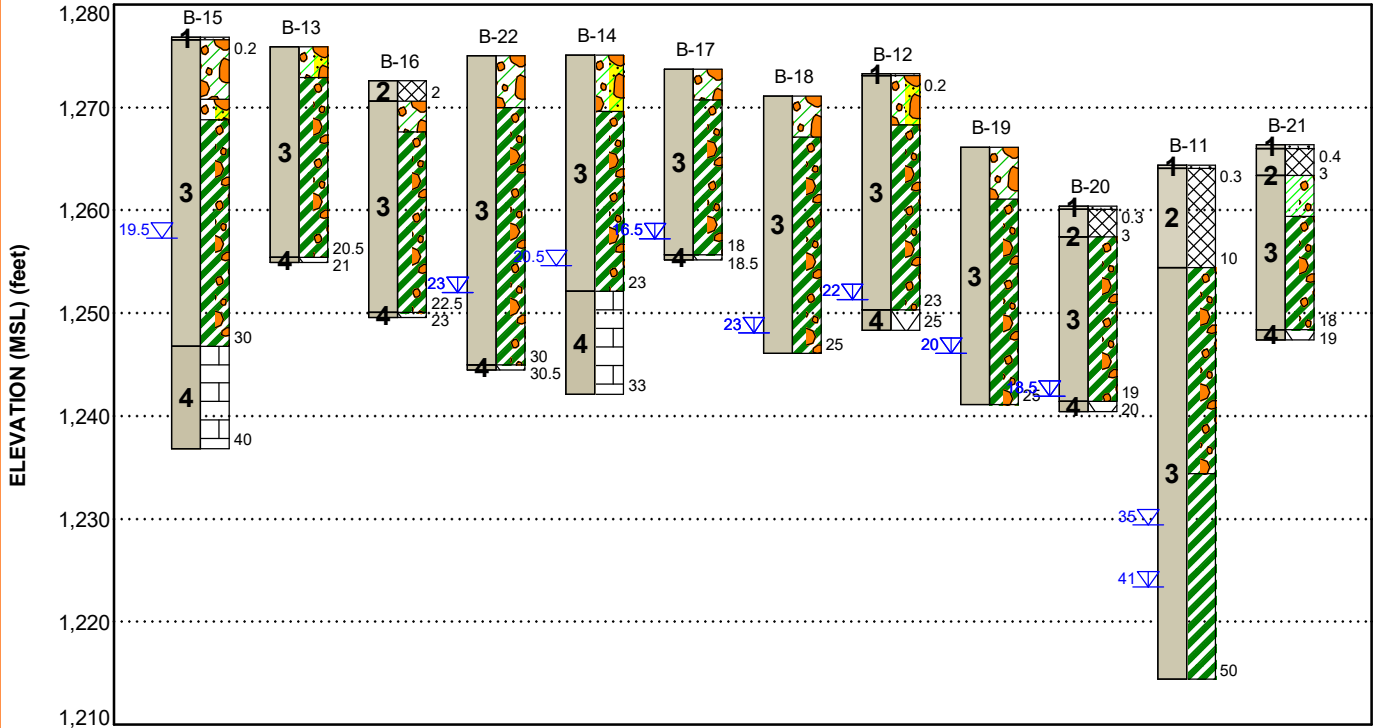
- First Water Observation
- Second Water Observation

Groundwater levels are temporal. The levels shown are representative of the date and time of our exploration. Significant changes are possible over time. Water levels shown are as measured during and/or after drilling. In some cases, boring advancement methods mask the presence/absence of groundwater. See individual logs for details.

**NOTES:**  
Layering shown on this figure has been developed by the geotechnical engineer for purposes of modeling the subsurface conditions as required for the subsequent geotechnical engineering for this project.  
Numbers adjacent to soil column indicate depth below ground surface.

**GEOMODEL**

Republic, MO WWTP Expansion - Additional Borings ■ Republic, MO  
Terracon Project No. B5215111



This is not a cross section. This is intended to display the Geotechnical Model only. See individual logs for more detailed conditions.

Model Layer	Layer Name	General Description
1	Surficial Materials	Topsoil and exposed fill materials or residual soils
2	Fill	Lean to fat clay (CL or CH) with varying amounts of gravel and sand or clayey gravel with varying amounts of clay and sand
3	Residual Soils	Lean to fat clay (CL or CH) with varying amounts of gravel and sand or gravelly soils with varying amounts of clay and sand
4	Limestone	Highly to slightly weathered

**LEGEND**

- Topsoil
- Fat Clay
- Limestone
- Lean Clay with Gravel
- Fill
- Clayey Gravel with Sand
- Clayey Gravel
- Fat Clay with Gravel
- Weathered Rock
- Poorly-graded Gravel with Clay and Sand

- First Water Observation
- Second Water Observation

Groundwater levels are temporal. The levels shown are representative of the date and time of our exploration. Significant changes are possible over time. Water levels shown are as measured during and/or after drilling. In some cases, boring advancement methods mask the presence/absence of groundwater. See individual logs for details.

**NOTES:**

Layering shown on this figure has been developed by the geotechnical engineer for purposes of modeling the subsurface conditions as required for the subsequent geotechnical engineering for this project. Numbers adjacent to soil column indicate depth below ground surface.

## SOIL TEST EVALUATION

### Ductile Iron Pipe Research Association (DIPRA)

	Range	Points
Resistivity (ohm/cm)  (Based on single probe at pipe depth or water saturated Miller soil box)	< 1500	10
	≥1500-1800	8
	>1800-2100	5
	>2100-2500	2
	>2500-3000	1
	> 3000	0
pH	0.0-2.0	5
	2.0-4.0	3
	4.0-6.5	0
	6.5-8.5	0*
	> 8.5	3
Redox	> 100 mV	0
	50-100 mV	3.5
	0-50 mV	4
	Negative mV	5
Sulfides	Positive	3.5
	Trace	2
	Negative	0
Moisture	Poor drainage, continuously wet	2
	Fair drainage, generally moist	1
	Good drainage, generally dry	0

\* If sulfides are present and low or negative redox results are obtained, 3 points shall be given to this range.

### **Interpretation**

Corrosive conditions to ductile iron pipe if ten (10) points or more.

## ATTACHMENTS



## EXPLORATION AND TESTING PROCEDURES

### Geophysical Field Exploration

Terracon performed Multi-Channel Analysis of Surface Waves (MASW) seismic surveys at the locations shown on the **Geophysical Site Plan**. A Geometrics Geode seismograph and a land-streamer consisting of a linear array of twenty-four, 4.5Hz geophones was used to collect multi-channel analysis of surface waves (MASW) data to measure the shear wave velocity of the subsurface materials.

MASW was performed by collecting surface waves created by a seismic source consisting of a Propelled Energy Generator (PEG) equipped with an 80lb weight dropped and accelerated from a height of about 17 inches onto a steel impact plate. The data was processed using dispersion analysis software that extracts the fundamental-mode dispersion curves. Using a roll-along setup and subsets of geophones, many 1D profiles are created along an array and then combined to yield a 2D profile. These 2D profiles were examined for locations indicating abrupt changes in shear wave velocities, which may indicate subsurface voids, sinkholes, or abrupt material changes.

### Geotechnical Field Exploration

Number of Borings <sup>1</sup>	Boring Depth (feet) <sup>2, 3</sup>	Planned Location
B-1	25½	Near electrical building, bower pad (formerly planned Anoxic basin)
B-2 and B-2A	33½ and 37	Generator building (formerly planned Clarifier 4)
B-3	25	Disinfection building (formerly planned Chemical feed building)
B-4 and B-4A	49.2 and 64.3	Transfer pump station
B-5 and B-5A	42 and 40½	Digester 4
B-6	32.3	General location (formerly planned Aeration basin)
B-7 and B-7A	38 and 50	General location (formerly planned Admin/dewatering building)
B-8	38.5	General location
B-11	50	Influent pump station
B-12	25	Grit removal and fine screen building

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Number of Borings <sup>1</sup>	Boring Depth (feet) <sup>2, 3</sup>	Planned Location
B-13	21	Process splitter
B-14	33½	Process basin
B-15	40	Process basin
B-16	23	Membrane bioreactor building and tank
B-17	18½	Chemical feed building
B-18	25	Electrical building
B-19	25	Administration building
B-20	20	Filter building and filter splitter structure
B-21	19	Dewatering building
B-22	30½	Process basin

1. Boring designation B-9 and B-10 were not utilized as part of the 2020 and 2022 geotechnical field exploration

2. Below ground surface

3. Borings B-13, B-16, B-17, B-20 encountered auger refusal on a possible cobble, boulder, or bedrock prior to their planned termination depth. All other borings extended to their planned depths.

**Boring Layout and Elevations:** The boring layout was performed by Terracon. Coordinates were obtained with a handheld GPS unit (estimated horizontal accuracy of about ±20 feet). Approximate elevations for the 2020 borings were obtained by surveyor's level and rod and are rounded to the nearest ½-foot. Elevations for the 2020 borings are referenced to a temporary benchmark indicated on the **Boring Location and Exploration Plan**. Surface elevations for the 2022 borings were surveyed by Allgeier, Martin and Associates, Inc.

**Subsurface Exploration Procedures:** The borings were advanced with ATV-mounted rotary drill rigs using continuous flight, solid-stem augers. Samples were obtained from the borings as noted in **Exploration Results**. The thin-walled tube sampling was performed with a thin-walled, seamless steel tube with a sharp cutting edge that was pushed hydraulically into the soil to obtain a relatively undisturbed sample. The split-barrel sampling procedure was performed using a standard 2-inch outer diameter, split-barrel sampling spoon that was driven into the ground by a 140-pound automatic hammer falling a distance of 30 inches. The automatic hammer used in our 2020 and 2022 field explorations had hammer efficiencies of 92.5 and 82%, respectively. The number of blows required to advance the sampling spoon the last 12 inches of a normal 18-inch penetration was recorded as the Standard Penetration Test (SPT) resistance value. The SPT resistance values, also referred to as N-values, are indicated on the boring logs at their respective test depths. Water levels were observed and recorded during drilling and sampling and after 24 hours when practical. For safety purposes, all borings were backfilled with bentonite chips and grout after their completion.

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Auger refusal materials were explored with rock coring procedures at select location. An NQ2 rock core barrel was utilized to perform the rock cores at all borings except Boring B-13, B-16, B-17, and B-20. Water was used as a drilling fluid for cooling the rock bit and the spent water was discharged on site. Due to the use of water for rock coring, groundwater observations may have been affected and may not accurately portray the actual groundwater elevation at these locations.

The sampling depths, penetration distances, and other sampling information were recorded on the field boring logs. The samples were placed in appropriate containers and taken to our soil laboratory for testing and classification by a Geotechnical Engineer. Our exploration team prepared field boring logs as part of the drilling operations. These field logs included visual classifications of the materials encountered during drilling and our interpretation of the subsurface conditions between samples. Final boring logs were prepared from the field logs. The final boring logs represent the Geotechnical Engineer's interpretation of the field logs and include modifications based on observations and tests of the samples in our laboratory.

### Laboratory Testing

Classification of the soil samples was performed in general accordance with the Unified Soil Classification System (USCS) based on the material's texture and plasticity. The project engineer reviewed the field data and assigned laboratory tests to better understand the engineering properties of the various soil and rock strata.

- Water (Moisture) Content of Soil and Rock by Mass
- Liquid Limit, Plastic Limit, and Plasticity Index of Soils
- Particle-Size Analysis of Soils
- Dry Unit Weight of Soils
- Unconfined Compressive Strength of Cohesive Soil
- Unconfined Compressive Strength of Rock
- Chemical Analysis: pH, Sulfates, Sulfide, Chloride, Electrical Resistivity, Total Salts, Redox Potential

Boring log rock classification was determined using the Description of Rock Properties and locally accepted practices for engineering purposes. Petrographic analysis may reveal other rock types. Rock core samples typically provide an improved specimen for this classification.

## **SITE LOCATION AND EXPLORATION PLANS**

### **Contents:**

Site Location Plan  
Boring Location Plan  
Exploration Plan  
Geologic Map

**BORING LOCATION PLAN**

Republic Wastewater Treatment Plant Improvements ■ Republic, Missouri  
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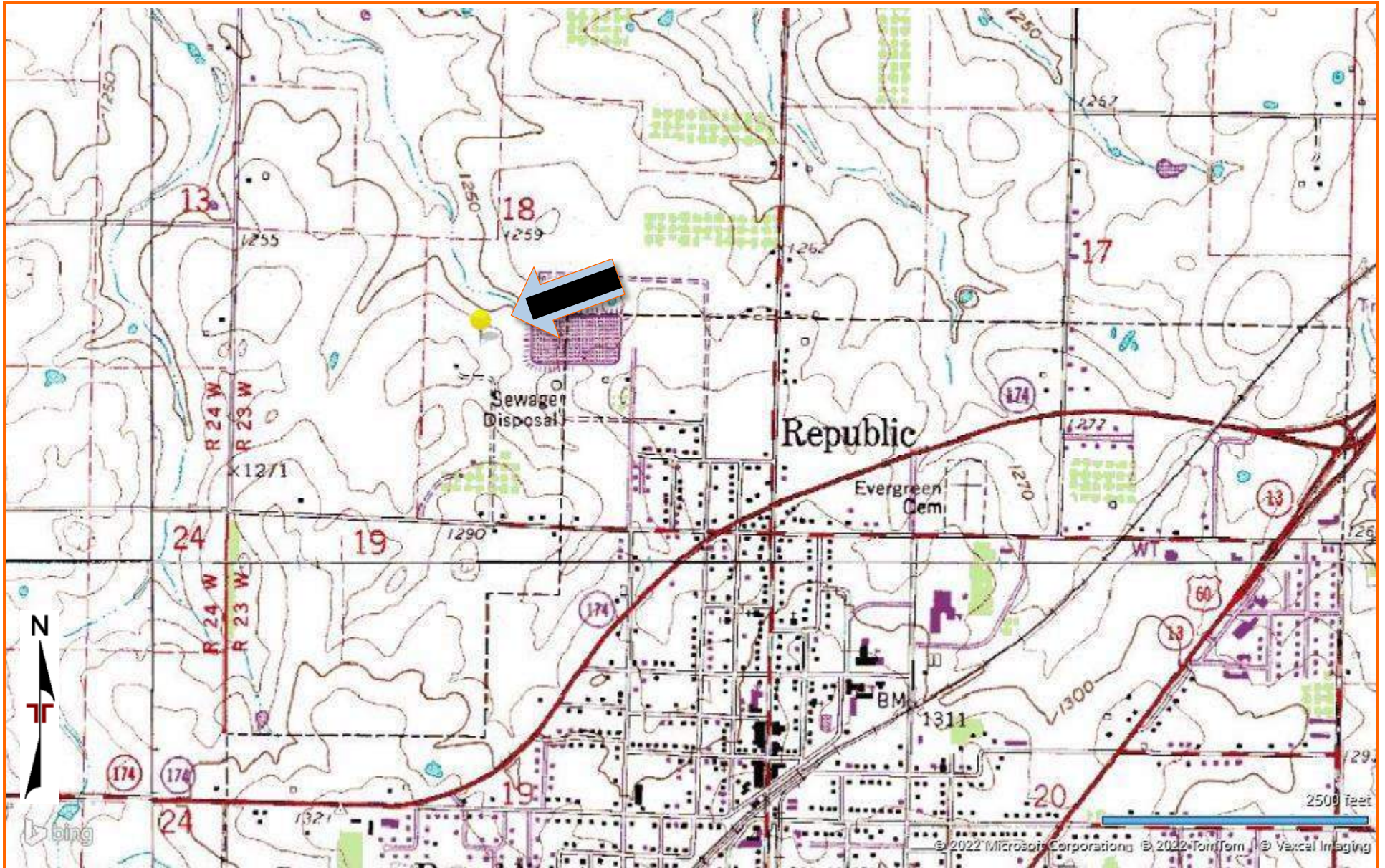


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY MICROSOFT BING MAPS

**GEOPHYSICAL SITE PLAN**

Republic Wastewater Treatment Plant Improvements ■ Republic, Missouri  
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DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY MICROSOFT BING MAPS

## BORING LOCATION PLAN

Republic Wastewater Treatment Plant Improvements ■ Republic, Missouri  
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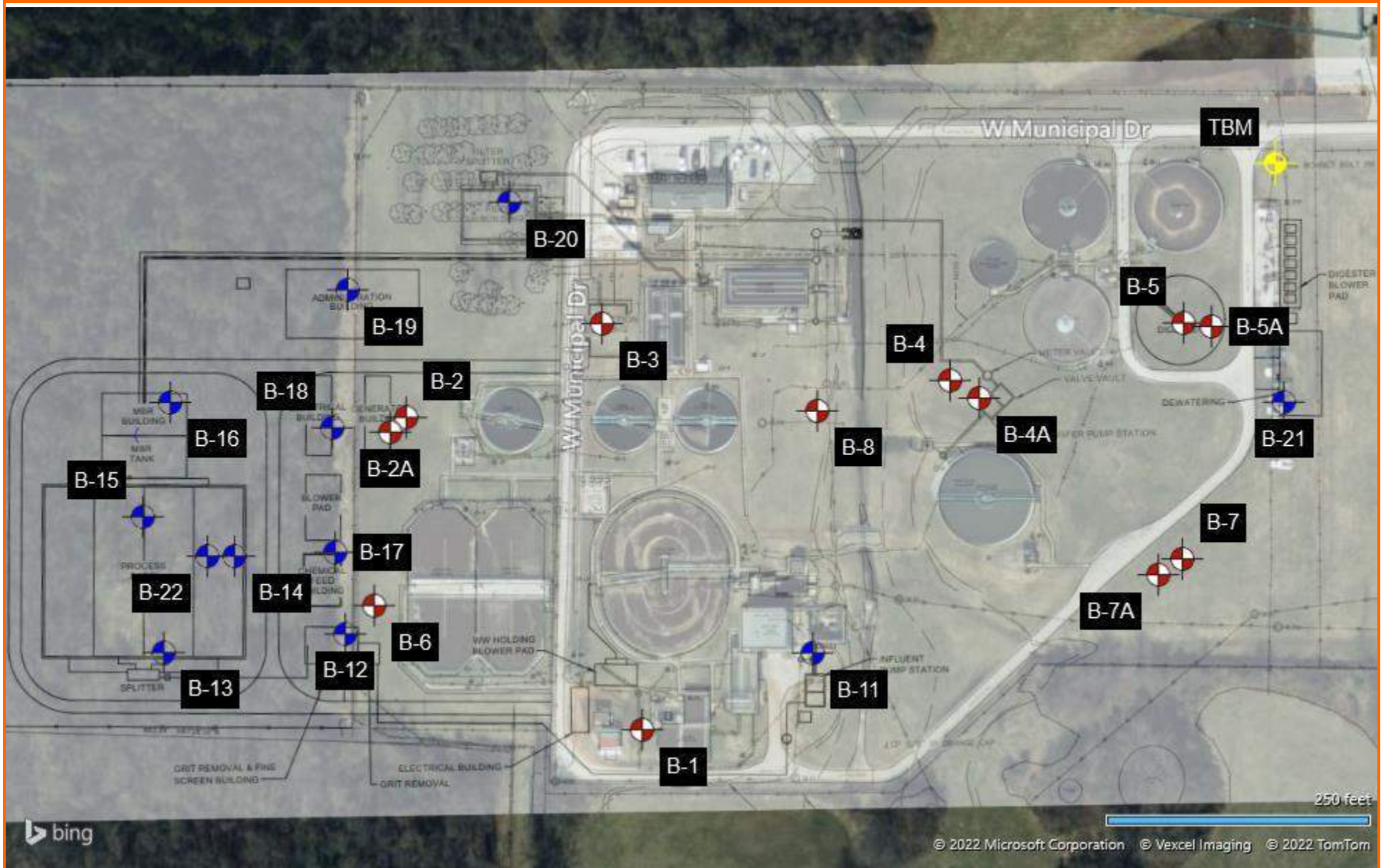


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MAP PROVIDED BY MICROSOFT BING MAPS

**GEOLOGIC MAP**

Republic Wastewater Treatment Plant Improvements ■ Republic, Missouri  
August 19, 2022 ■ Terracon Project No. B5205029/B5215111



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MAP PROVIDED BY MICROSOFT BING MAPS



**GEOLOGIC MAP**

Republic Wastewater Treatment Plant Improvements ■ Republic, Missouri  
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DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY MICROSOFT BING MAPS

## **EXPLORATION RESULTS**

### **Contents:**

Boring Logs (2020 & 2022)

Atterberg Limits (2020 & 2022)

Grain Size Distribution (2020 & 2022)

Moisture Density Relationships (2020)

Chemical Testing Results (2020 & 2022)

Unconfined Compressive Strength – Rock (2020 & 2022)

Rock Core Photographs (2020 & 2022)

MASW Profiles (2020 & 2022)

Shear Wave Velocity Profile

# BORING LOG NO. B-1

**PROJECT: Republic WWTP**

**CLIENT: Burns & McDonnell Engineering Co.  
Kansas City, Missouri**

**SITE: N. West Ave. NW of Wade St. Intersection  
Republic, Missouri**

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL\_KF B5205029 REPUBLIC WASTEWAT.GPJ TERRACON\_DATATEMPLATE.GDT 7/25/22

MODEL LAYER	GRAPHIC LOG	LOCATION See <a href="#">Exploration Plan</a> Latitude: 37.1297° Longitude: -93.4889° Approximate Surface Elev.: 1263.5 (Ft.) +/-	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	REC%	RQD%	LABORATORY HP (psf)	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS		Strength (psi)
														LL-PL-PI		
		DEPTH ELEVATION (Ft.)														
1		0.1 <b>TOPSOIL</b> 1263.4+/-														
2		<b>FILL - LEAN CLAY WITH SAND (CL)</b> , trace gravel, red and brown 1258.5+/-														
		5.0														
		8.0 <b>CLAYEY GRAVEL (GC)</b> , red, (Possible Fill) 1255.5+/-														
3		10.0 <b>LEAN CLAY WITH GRAVEL (CL)</b> , stiff 1253.5+/-														
		15.0 <b>FAT CLAY (CH)</b> , trace gravel, red, stiff 1248.5+/-														
		15.5 <b>HIGHLY WEATHERED LIMESTONE</b> , gray 1248+/-														
4		<b>LIMESTONE</b> , gray, coarse-grained, sound, thick bedding, slightly weathered, strong rock 1238+/-														
		25.5 <b>Boring Terminated at 25.5 Feet</b> 1238+/-														
								100	100							7,160
								100	100							9,700
								100	100							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:  
4.25" center flight augers to refusal followed with NQ2 core barrel

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:  
Boring backfilled with bentonite grout upon completion

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were measured in the field using an engineer's level and grade rod.

**WATER LEVEL OBSERVATIONS**

Not observed while drilling  
Not observed after 24 hours



Boring Started: 10-22-2020

Boring Completed: 10-22-2020

Drill Rig: CME 750X

Driller: DH

Project No.: B5205029

# BORING LOG NO. B-2

**PROJECT:** Republic WWTP

**CLIENT:** Burns & McDonnell Engineering Co.  
Kansas City, Missouri

**SITE:** N. West Ave. NW of Wade St. Intersection  
Republic, Missouri

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL\_KF B5205029 REPUBLIC WASTEWAT.GPJ TERRACON\_DATATEMPLATE.GDT 7/25/22

MODEL LAYER	GRAPHIC LOG	LOCATION See <a href="#">Exploration Plan</a>  Latitude: 37.1305° Longitude: -93.4897°  Approximate Surface Elev.: 1270 (Ft.) +/- DEPTH ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	REC%	RQD%	LABORATORY HP (psf)	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS		Strength (psi)		
														LL-PL-PI				
3		<b>LEAN CLAY WITH GRAVEL (CL)</b> , with sand, red and brown, very stiff to hard	4			4	50			1.75 (HP)		10.8						
			5			8	5-8-12 N=20			3.0 (HP)		24.8						
			10			12	8-6-5 N=11			3.0 (HP)		37.1			75-41-34			
			15			6	6-14-11 N=25			0.75 (HP)		34.3						
			15			24					0.75 (HP)	840	54.7	40				
4		<b>HIGHLY WEATHERED LIMESTONE</b> , gray <b>LIMESTONE</b> , gray, coarse-grained, sound, thick bedding, slightly weathered, strong rock	23.0															
			23.5															
			33.5															
		<b>Boring Terminated at 33.5 Feet</b>																

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:  
4.25" center flight augers to refusal followed with NQ2 core barrel

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:  
Boring backfilled with bentonite grout upon completion

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were measured in the field using an engineer's level and grade rod.

**WATER LEVEL OBSERVATIONS**

- While drilling
- After 24 hours



Boring Started: 10-23-2020

Boring Completed: 10-23-2020

Drill Rig: CME 750X

Driller: DH

Project No.: B5205029

# BORING LOG NO. B-3

**PROJECT:** Republic WWTP

**CLIENT:** Burns & McDonnell Engineering Co.  
Kansas City, Missouri

**SITE:** N. West Ave. NW of Wade St. Intersection  
Republic, Missouri

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL\_KF B5205029 REPUBLIC WASTEWAT.GPJ TERRACON\_DATATEMPLATE.GDT 7/25/22

MODEL LAYER	GRAPHIC LOG	LOCATION See <a href="#">Exploration Plan</a> Latitude: 37.1308° Longitude: -93.4891° Approximate Surface Elev.: 1267 (Ft.) +/-	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	REC%	RQD%	LABORATORY HP (psf)	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	Strength (psi)
2	0.2 2.0	<b>TOPSOIL</b> <b>FILL - CLAYEY GRAVEL (GC),</b> red	0.2 2.0			10	9-13-12 N=25			4.5 (HP)		31.2			
		<b>FAT CLAY WITH GRAVEL (CH),</b> dark brown, hard	6.0			6	19-18-8 N=26			2.5 (HP)		15.9			
		<b>FAT CLAY (CH),</b> trace gravel and sand, red, stiff	16.0			8	9-19-13 N=32			2.25 (HP)		35.0			
			16.0			4				2.0 (HP)		41.3			
			16.0			16	3-5-9 N=14			0.75 (HP)		57.9			
4	26.0	<b>LIMESTONE,</b> gray, coarse-grained, sound, thick bedding, slightly weathered, strong rock	26.0					100	96						9,460
			26.0					100	97						5,570
		<b>Boring Terminated at 26 Feet</b>						100	100						

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

**Advancement Method:**  
4.25" center flight augers to refusal followed with NQ2 core barrel

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

**Abandonment Method:**  
Boring backfilled with bentonite grout upon completion

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were measured in the field using an engineer's level and grade rod.

**WATER LEVEL OBSERVATIONS**

Not observed while drilling  
Not observed after 24 hours



Boring Started: 10-28-2020

Boring Completed: 10-28-2020

Drill Rig: CME 750X

Driller: DH

Project No.: B5205029

# BORING LOG NO. B-4

**PROJECT:** Republic WWTP

**CLIENT:** Burns & McDonnell Engineering Co.  
Kansas City, Missouri

**SITE:** N. West Ave. NW of Wade St. Intersection  
Republic, Missouri

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL\_KF B5205029 REPUBLIC WASTEWAT.GPJ TERRACON\_DATATEMPLATE.GDT 7/25/22

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 37.1306° Longitude: -93.4879° Approximate Surface Elev.: 1261 (Ft.) +/- DEPTH ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	REC%	RQD%	LABORATORY HP (psf)	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS		Strength (psi)
														LL-PL-PI		
1		<b>TOPSOIL</b> 0.2 / 260.8+/-														
2		<b>FILL - CLAYEY GRAVEL (GC)</b> , red														
			5			5	10-12-12 N=24			4.0 (HP)		15.2				
			5			4	10-13-20 N=33			4.75 (HP)		14.4				
		<b>LEAN CLAY (CL)</b> , trace gravel, dark brown, hard	6.0			13	4-3-4 N=7			1.25 (HP)		22.9				
		<b>LEAN CLAY (CL)</b> , trace gravel, brownish red, stiff	9.0			14	4-6-7 N=13			3.0 (HP)		21.0			41-21-20	
		<b>CLAYEY GRAVEL (GC)</b> , red, medium dense	13.0			6	10-13-15 N=28			2.0 (HP)		20.0				
		<b>GRAVELLY FAT CLAY (CH)</b> , red	18.5			8	19-18-12 N=30			N/A		22.1				
3		<b>FAT CLAY (CH)</b> , trace gravel, red	23.5			18	0-1-2 N=3			1.0 (HP)		57.6				
			25			18	3-2-7 N=9			0.25 (HP)		71.1				
			30			18	4-3-5 N=8			N/A		41.3				
			35			18	0-2-3 N=5			N/A		69.9				
		<b>HIGHLY WEATHERED LIMESTONE</b> , gray	38.5			0	50/0"	100	88	N/A						
		<b>LIMESTONE</b> , gray, coarse-grained, sound, thick bedding, slightly weathered, strong rock	39.0					100	92							5,860
4			45					100	95							7,130
		<b>Boring Terminated at 49 Feet</b>	49.0													

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

**Advancement Method:**  
4.25" center flight augers to refusal followed with NQ2 core barrel

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

**Abandonment Method:**  
Boring backfilled with bentonite grout upon completion

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were measured in the field using an engineer's level and grade rod.

**WATER LEVEL OBSERVATIONS**

Not observed while drilling  
Not observed after 24 hours



Boring Started: 10-21-2020

Boring Completed: 10-21-2020

Drill Rig: CME 750X

Driller: DH

Project No.: B5205029

# BORING LOG NO. B-5

**PROJECT:** Republic WWTP

**CLIENT:** Burns & McDonnell Engineering Co.  
Kansas City, Missouri

**SITE:** N. West Ave. NW of Wade St. Intersection  
Republic, Missouri

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL\_KF B5205029 REPUBLIC WASTEWAT.GPJ TERRACON\_DATATEMPLATE.GDT 7/26/22

MODEL LAYER	GRAPHIC LOG	LOCATION See <a href="#">Exploration Plan</a>  Latitude: 37.1308° Longitude: -93.4872°  Approximate Surface Elev.: 1267 (Ft.) +/-  DEPTH ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	REC%	RQD%	LABORATORY HP (psf)	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS		Strength (psi)	
														LL-PL-PI			
1		<b>TOPSOIL</b> 0.2 / 1266.8+/-															
2		<b>FILL - FAT CLAY WITH GRAVEL (CH)</b> , red 6.0 / 1261+/-			6		8-12-6 N=18			3.0 (HP)		25.2					
		<b>LEAN CLAY (CL)</b> , trace gravel, brown, stiff 7.0 / 1260+/-	5		5		7-6-5 N=11			4.5 (HP)		21.9					
		<b>GRAVELLY FAT CLAY (CH)</b> , red, very stiff 10.0 / 1257+/-			9		6-12-12 N=24			2.0 (HP)		15.3			33-15-18		
		<b>FAT CLAY (CH)</b> , trace gravel, red, stiff			6		10-12-7 N=19			2.0 (HP)		25.8					
3			15		20						360	54.3	41				
					8		10-6-3 N=9			1.25 (HP)		30.7					
		<b>HIGHLY WEATHERED LIMESTONE</b> , gray 23.0 / 1244+/-			0		50/0"	100	44	N/A							
		<b>LIMESTONE</b> , gray 23.5 / 1243.5+/-	25					0	0								
		<b>LIMESTONE</b> , gray, coarse-grained, sound, thick bedding, slightly weathered, strong rock 27.0 / 1240+/-															
		<b>VOID</b>															
4		<b>CLAY SEAM</b> 32.0 / 1235+/-						65	53								7,300
		<b>LIMESTONE</b> , gray, coarse-grained, sound, thick bedding, slightly weathered, strong rock 42.0 / 1225+/-	35					100	92								
		<b>Boring Terminated at 42 Feet</b>	40					100	100								8,380

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

**Advancement Method:**  
4.25" center flight augers to refusal followed with NQ2 core barrel

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

**Abandonment Method:**  
Boring backfilled with bentonite grout upon completion

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were measured in the field using an engineer's level and grade rod.

**WATER LEVEL OBSERVATIONS**

Not observed while drilling  
Not observed after 24 hours



Boring Started: 10-20-2020

Boring Completed: 10-20-2020

Drill Rig: CME 750X

Driller: DH

Project No.: B5205029

# BORING LOG NO. B-6

**PROJECT:** Republic WWTP

**CLIENT:** Burns & McDonnell Engineering Co.  
Kansas City, Missouri

**SITE:** N. West Ave. NW of Wade St. Intersection  
Republic, Missouri

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL\_KF B5205029 REPUBLIC WASTEWAT.GPJ TERRACON\_DATATEMPLATE.GDT 7/25/22

MODEL LAYER	GRAPHIC LOG	LOCATION See <a href="#">Exploration Plan</a> Latitude: 37.1300° Longitude: -93.4898° Approximate Surface Elev.: 1272.5 (Ft.) +/-	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	REC%	RQD%	LABORATORY HP (psf)	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS		
														LL-PL-PI	Strength (psi)	
1		<b>TOPSOIL</b> ELEVATION (Ft.) 1272.3+/-	0.2													
2		<b>FILL - FAT CLAY WITH GRAVEL (CH)</b> , red	0.2 - 6.0													
			5		X	8	11-17-5 N=22			4.5 (HP)		15.8				
					X	10	8-13-16 N=29			4.5 (HP)		22.3				
			6.0													
		<b>FAT CLAY (CH)</b> , trace gravel, red, stiff	6.0 - 18.0													
			10		X	18	4-4-5 N=9			2.5 (HP)		45.2				
					X	18	5-5-6 N=11			3.25 (HP)		51.0				
3		<b>FAT CLAY WITH GRAVEL (CH)</b> , red, stiff	18.0 - 22.0													
			15			20					760	41.6	52			
			20		X	14	4-4-5 N=9			1.0 (HP)		38.4				
			22.0													
		<b>HIGHLY WEATHERED LIMESTONE</b> , gray	22.0 - 22.5													
		<b>LIMESTONE</b> , gray, coarse-grained, sound, thick bedding, slightly weathered, strong rock	22.5 - 32.5													
4			25					100	100							7,640
			30					100	100							
			32.5					100	74							8,380
<b>Boring Terminated at 32.5 Feet</b>																

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

**Advancement Method:**  
4.25" center flight augers to refusal followed with NQ2 core barrel

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

**Abandonment Method:**  
Boring backfilled with bentonite grout upon completion

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were measured in the field using an engineer's level and grade rod.

**WATER LEVEL OBSERVATIONS**

Not observed while drilling  
Not observed after 24 hours



Boring Started: 10-23-2020

Boring Completed: 10-23-2020

Drill Rig: CME 750X

Driller: DH

Project No.: B5205029



# BORING LOG NO. B-7

**PROJECT: Republic WWTP**

**CLIENT: Burns & McDonnell Engineering Co.  
Kansas City, Missouri**

**SITE: N. West Ave. NW of Wade St. Intersection  
Republic, Missouri**

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL\_KF B5205029 REPUBLIC WASTEWAT.GPJ TERRACON\_DATATEMPLATE.GDT 7/25/22

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 37.1302° Longitude: -93.4872° Approximate Surface Elev.: 1267 (Ft.) +/- DEPTH ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	REC%	RQD%	LABORATORY HP (psf)	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	Strength (psi)
1	[Cross-hatch pattern]	<b>TOPSOIL</b> 1266.7+/-	0.3												
2	[Diagonal lines]	<b>FILL - FAT CLAY WITH GRAVEL (CH)</b> , red 1263.5+/-	3.5			8	6-4-10 N=14			4.5 (HP)		17.5		45-22-23	
	[Diagonal lines]	<b>LEAN CLAY (CL)</b> , trace gravel, brown, very stiff 1261+/-	6.0			7	4-10-8 N=18			2.0 (HP)		20.6			
	[Diagonal lines]	<b>FAT CLAY WITH GRAVEL (CH)</b> , red, hard 1258.5+/-	8.5			11	9-6-24 N=30			2.25 (HP)		23.5			
	[Diagonal lines]	<b>FAT CLAY (CH)</b> , trace gravel, red, stiff 1248.5+/-	18.5			16	5-5-5 N=10			2.25 (HP)		47.4		97-44-53	
3	[Diagonal lines]	<b>FAT CLAY WITH GRAVEL (CH)</b> , red, medium stiff to stiff 1240+/-	27.0			15	3-5-9 N=14			2.0 (HP)		46.8			
	[Diagonal lines]	<b>FAT CLAY WITH GRAVEL (CH)</b> , red, medium stiff to stiff 1239+/-	28.0			9	5-4-5 N=9			2.75 (HP)		46.7			
	[Diagonal lines]	<b>HIGHLY WEATHERED LIMESTONE</b> , gray 1229+/-	38.0			8	3-3-4 N=7			0.5 (HP)		21.9			
4	[Brick pattern]	<b>LIMESTONE</b> , gray, coarse-grained, sound, thick bedding, slightly weathered, strong rock						100	80						10,120
								100	95						
								100	100						8,020
		<b>Boring Terminated at 38 Feet</b>													

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:  
4.25" center flight augers to refusal followed with NQ2 core barrel

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:  
Boring backfilled with bentonite grout upon completion

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were measured in the field using an engineer's level and grade rod.

**WATER LEVEL OBSERVATIONS**

Not observed while drilling  
Not observed after 24 hours



Boring Started: 10-19-2020

Boring Completed: 10-20-2020

Drill Rig: CME 750X

Driller: DH

Project No.: B5205029

# BORING LOG NO. B-8

**PROJECT:** Republic WWTP

**CLIENT:** Burns & McDonnell Engineering Co.  
Kansas City, Missouri

**SITE:** N. West Ave. NW of Wade St. Intersection  
Republic, Missouri

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL\_KF B5205029 REPUBLIC WASTEWAT.GPJ TERRACON\_DATATEMPLATE.GDT 7/25/22

MODEL LAYER	GRAPHIC LOG	LOCATION See <a href="#">Exploration Plan</a> Latitude: 37.1305° Longitude: -93.4884° Approximate Surface Elev.: 1261.5 (Ft.) +/-	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	REC%	RQD%	LABORATORY HP (psf)	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	Strength (psi)
		DEPTH ELEVATION (Ft.)													
	0.1	<b>TOPSOIL</b> 1261.4+/-													
	3.5	<b>LEAN CLAY WITH GRAVEL (CL)</b> , brown, stiff, (Possible Fill) 1258+/-		X		0	12-16-19 N=35			1.0 (HP)		26.9			
	6.0	<b>FAT CLAY WITH GRAVEL (CH)</b> , red, very stiff to hard 1255.5+/-	5	X		6	4-6-12 N=18			4.0 (HP)		20.8			
	13.0	<b>CLAYEY GRAVEL (GC)</b> , red, medium dense to dense 1248.5+/-	10	X		8	22-32-10 N=42			12.25 (HP)		20.5			
	23.0	<b>FAT CLAY (CH)</b> , trace gravel, red, medium stiff to stiff 1238.5+/-	15			2	9-10-7 N=17			1.25 (HP)		24.2			
	28.5	<b>HIGHLY WEATHERED LIMESTONE</b> , gray, with occasional clay seams 1233+/-	20	▽		20				N/A	1920	46.2	44		
	38.5	<b>LIMESTONE</b> , gray, coarse-grained, sound, thick bedding, slightly weathered, strong rock 1223+/-	25	▽		12	2-3-4 N=7			1.0 (HP)		47.4			
		<b>HIGHLY WEATHERED LIMESTONE</b> , gray, with occasional clay seams 1233+/-	30			10	2-20-9 N=29			N/A		47.8			
		<b>LIMESTONE</b> , gray, coarse-grained, sound, thick bedding, slightly weathered, strong rock 1223+/-	35			0	50/0"	100	95	N/A					8,130
		<b>Boring Terminated at 38.5 Feet</b>	38.5					100	97						8,280

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:  
4.25" center flight augers to refusal followed with NQ2 core barrel

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:  
Boring backfilled with bentonite grout upon completion

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were measured in the field using an engineer's level and grade rod.

**WATER LEVEL OBSERVATIONS**

- ▽ While drilling
- ▽ After 24 hours



Boring Started: 10-21-2020

Boring Completed: 10-22-2020

Drill Rig: CME 750X

Driller: DH

Project No.: B5205029

# BORING LOG NO. B-2A

**PROJECT:** Republic WWTP

**CLIENT:** Burns & McDonnell Engineering Co.  
Kansas City, Missouri

**SITE:** N. West Ave. NW of Wade St. Intersection  
Republic, Missouri

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL\_KF B5205029 REPUBLIC WASTEWAT.GPJ TERRACON\_DATATEMPLATE.GDT 7/25/22

MODEL LAYER	GRAPHIC LOG	LOCATION See <a href="#">Exploration Plan</a> Latitude: 37.1305° Longitude: -93.4897° Approximate Surface Elev.: 1270 (Ft.) +/-	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	REC%	ROD%	LABORATORY HP (psf)	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS		
														LL-PL-PI	Strength (psi)	
		DEPTH ELEVATION (Ft.)														
		0.1 <b>TOPSOIL</b> 1269.9+/-														
		<b>CLAYEY GRAVEL (GC)</b> , brown, very stiff to hard								3.0 (HP)		16.6				
		5.0 <b>FAT CLAY (CH)</b> , trace gravel, red, stiff 1265+/-								N/A		18.4				
										N/A	1560	48.6	44			
										3.25 (HP)		36.9				
		13.5 <b>FAT CLAY WITH GRAVEL (CH)</b> , red, very stiff 1256.5+/-								1.75 (HP)		34.3				
		18.5 <b>FAT CLAY (CH)</b> , trace gravel, red, soft 1251.5+/-								N/A		70.1			89-37-52	
										N/A	120	79.3	29			
		26.0 <b>HIGHLY WEATHERED LIMESTONE</b> , gray, with occasional clay seams 1244+/-														
		27.0 <b>LIMESTONE</b> , gray, coarse-grained, sound, thick bedding, slightly weathered, strong rock 1243+/-							100	83						8,750
									100	100						
									100	96						7,320
		<b>Boring Terminated at 37 Feet</b>														

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:  
4.25" center flight augers to refusal followed with NQ2 core barrel

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

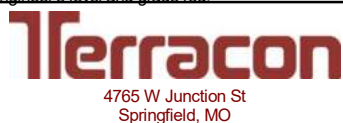
Abandonment Method:  
Boring backfilled with bentonite grout upon completion

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were measured in the field using an engineer's level and grade rod.

**WATER LEVEL OBSERVATIONS**

- ▽ While drilling
- ▽ After 24 hours



Boring Started: 10-30-2020

Boring Completed: 10-30-2020

Drill Rig: CME 750X

Driller: DH

Project No.: B5205029

# BORING LOG NO. B-4A

**PROJECT:** Republic WWTP

**CLIENT:** Burns & McDonnell Engineering Co.  
Kansas City, Missouri

**SITE:** N. West Ave. NW of Wade St. Intersection  
Republic, Missouri

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL\_KF B5205029 REPUBLIC WASTEWAT.GPJ TERRACON\_DATATEMPLATE.GDT 7/25/22

MODEL LAYER	GRAPHIC LOG	LOCATION See <a href="#">Exploration Plan</a>  Latitude: 37.1306° Longitude: -93.4878°  Approximate Surface Elev.: 1263 (Ft.) +/-	DEPTH (Ft.)	ELEVATION (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	REC%	RQD%	LABORATORY HP (psf)	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS		Strength (psi)
															LL-PL-PI		
2		0.1 <b>TOPSOIL</b> 1262.9+/-															
		3.5 <b>FILL - FAT CLAY WITH GRAVEL (CH)</b> , red and brown 1259.5+/-			X	6	4-4-4 N=8				1.0 (HP)		22.2				
		6.0 <b>FILL - FAT CLAY WITH GRAVEL (CH)</b> , red 1257+/-			X	6	5-10-11 N=21				1.75 (HP)		18.2				
		8.5 <b>FILL - GRAVELLY FAT CLAY (CH)</b> , red 1254.5+/-			X	6	8-6-3 N=9				N/A		20.0				
		13.5 <b>LEAN CLAY (CL)</b> , trace gravel, dark brown, medium stiff 1249.5+/-			X	10	4-4-4 N=8				1.5 (HP)		21.9			39-20-19	
		18.5 <b>GRAVELLY LEAN CLAY (CL)</b> , brown, medium stiff 1244.5+/-					20				N/A	1900	24.3	64			
		20.0 <b>FAT CLAY WITH GRAVEL (CH)</b> , red, medium stiff 1244.5+/-			X	18	2-3-3 N=6				0.75 (HP)		22.4				
		25.0 <b>FAT CLAY WITH GRAVEL (CH)</b> , red, medium stiff 1244.5+/-			X	18	3-3-2 N=5				1.0 (HP)		28.2			48-21-27	
		28.5 <b>FAT CLAY (CH)</b> , trace gravel, red brown, stiff to very stiff 1234.5+/-			X	12	3-6-7 N=13				1.25 (HP)		25.5				
		38.5 <b>FAT CLAY WITH GRAVEL (CH)</b> , red, stiff 1224.5+/-			X	10	7-7-7 N=14				1.0 (HP)		24.4				
3		48.5 <b>GRAVELLY FAT CLAY (CH)</b> , red, stiff 1214.5+/-			X	11	5-6-6 N=12			2.5 (HP)		27.2					
		52.0 <b>GRAVELLY FAT CLAY (CH)</b> , red, stiff 1211+/-			X	10	11-7-7 N=14			N/A		33.7					
		Red below 33.5 feet			X	13	13-14-9 N=23			0.5 (HP)		24.7					

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:  
4.25" center flight augers to refusal followed with NQ2 core barrel

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:  
Boring backfilled with bentonite grout upon completion

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were measured in the field using an engineer's level and grade rod.

**WATER LEVEL OBSERVATIONS**

Not observed while drilling  
After 24 hours



Boring Started: 10-30-2020

Boring Completed: 10-30-2020

Drill Rig: CME 750X

Driller: DH

Project No.: B5205029

# BORING LOG NO. B-4A

**PROJECT: Republic WWTP**

**CLIENT: Burns & McDonnell Engineering Co.  
Kansas City, Missouri**

**SITE: N. West Ave. NW of Wade St. Intersection  
Republic, Missouri**

MODEL LAYER	GRAPHIC LOG	LOCATION See <a href="#">Exploration Plan</a> Latitude: 37.1306° Longitude: -93.4878°  Approximate Surface Elev.: 1263 (Ft.) +/-	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	REC%	RQD%	LABORATORY HP (psf)	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS		Strength (psi)	
														LL-PL-PI			
4	52.5	<p><b>HIGHLY WEATHERED LIMESTONE</b>, gray, -with occasional clay seams</p> <p><b>LIMESTONE</b>, gray, coarse-grained, sound, thick bedding, slightly weathered, strong rock</p> <p><b>CLAY SEAM</b></p> <p><b>LIMESTONE</b>, gray, coarse-grained, sound, thick bedding, slightly weathered, strong rock</p> <p><i>Boring Terminated at 64.5 Feet</i></p>	55					79	31								
	53.5		60					100	63								11,170
	54.5		64.5					100	100								6,900

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:  
4.25" center flight augers to refusal followed with NQ2 core barrel

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

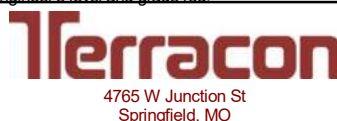
Abandonment Method:  
Boring backfilled with bentonite grout upon completion

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were measured in the field using an engineer's level and grade rod.

**WATER LEVEL OBSERVATIONS**

Not observed while drilling  
After 24 hours



Boring Started: 10-30-2020

Boring Completed: 10-30-2020

Drill Rig: CME 750X

Driller: DH

Project No.: B5205029

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL\_KF B5205029 REPUBLIC WASTEWAT.GPJ TERRACON\_DATATEMPLATE.GDT 7/25/22

# BORING LOG NO. B-5A

**PROJECT:** Republic WWTP

**CLIENT:** Burns & McDonnell Engineering Co.  
Kansas City, Missouri

**SITE:** N. West Ave. NW of Wade St. Intersection  
Republic, Missouri

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL\_KF B5205029 REPUBLIC WASTEWAT.GPJ TERRACON\_DATATEMPLATE.GDT 7/25/22

MODEL LAYER	GRAPHIC LOG	LOCATION See <a href="#">Exploration Plan</a>  Latitude: 37.1308° Longitude: -93.4871°  Approximate Surface Elev.: 1267 (Ft.) +/-  DEPTH ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	REC%	ROD%	LABORATORY HP (psf)	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS		Strength (psi)	
														LL-PL-PI			
2		0.1 <b>TOPSOIL</b> 1266.9+/-															
		3.5 <b>FILL - FAT CLAY WITH GRAVEL (CL)</b> , brown 1263.5+/-			X	6		12-7-4 N=11					26.7				
3		6.0 <b>GRAVELLY LEAN CLAY (CL)</b> , brown, stiff to very stiff, (Possible Fill) 1261+/-	5		X	10		6-11-10 N=21				20.8					
		12.0 <b>GRAVELLY LEAN CLAY (CL)</b> , red and brown, stiff to very stiff			X	12		10-7-6 N=13				16.8					
		15.0 <b>GRAVELLY FAT CLAY (CH)</b> , red, medium stiff to stiff				X	15		9-14-13 N=27				25.4		45-19-26		
		18.0 <b>GRAVELLY FAT CLAY (CH)</b> , red, medium stiff to stiff					18					390	60.2	43			
		23.5 <b>FAT CLAY (CH)</b> , trace gravel, red				X	8		5-3-5 N=8				32.9				
4		28.5 <b>FAT CLAY (CH)</b> , trace gravel, red	25		X	18		0-1-1 N=2				73.8					
		30.5 <b>FAT CLAY WITH GRAVEL (CH)</b> , red, soft to medium stiff	30		X	10		18-5-3 N=8				73.3					
		40.5 <b>LIMESTONE</b> , gray, coarse-grained, sound, thick bedding, slightly weathered, strong rock	35						100	97						8,330	
		40.5 <b>Boring Terminated at 40.5 Feet</b>	40					100	97						6,500		

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:  
4.25" center flight augers to refusal followed with NQ2 core barrel

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:  
Boring backfilled with bentonite grout upon completion

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were measured in the field using an engineer's level and grade rod.

**WATER LEVEL OBSERVATIONS**

Not observed while drilling  
Not observed after 24 hours



Boring Started: 11-02-2020

Boring Completed: 11-02-2020

Drill Rig: CME 750X

Driller: DH

Project No.: B5205029

# BORING LOG NO. B-7A

**PROJECT:** Republic WWTP

**CLIENT:** Burns & McDonnell Engineering Co.  
Kansas City, Missouri

**SITE:** N. West Ave. NW of Wade St. Intersection  
Republic, Missouri

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL\_KF B5205029 REPUBLIC WASTEWAT.GPJ TERRACON\_DATATEMPLATE.GDT 7/25/22

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 37.1301° Longitude: -93.4872° Approximate Surface Elev.: 1267 (Ft.) +/-	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	REC%	ROD%	LABORATORY HP (psf)	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS		Strength (psi)	
														LL-PL-PI			
			0.1														
		<b>TOPSOIL</b>	1266.9+/-														
		<b>FAT CLAY WITH GRAVEL (CH)</b> , red, medium stiff, (Possible Fill)	1263.5+/-			8	3-4-3 N=7					33.2					
		<b>CLAYEY GRAVEL (GC)</b> , red, very stiff to hard				0	8-14-9 N=23										
						10	14-19-13 N=32					19.5					
						10	22-19-16 N=35					17.8					
			13.5			14	3-3-3 N=6					53.9					
		<b>FAT CLAY (CH)</b> , trace gravel, red, medium stiff to very stiff	1253.5+/-														
						12	2-10-11 N=21					48.5					
			23.5			10	8-9-7 N=16					37.1					
		<b>FAT CLAY WITH GRAVEL (CH)</b> , red, very stiff	1243.5+/-														
						13	8-11-9 N=20					58.3					
			33.5			18	6-2-2 N=4					41.4					
		<b>FAT CLAY (CH)</b> , trace gravel, red, soft	1233.5+/-														
			38.0			6	28-50/1"					47.3					
		<b>HIGHLY WEATHERED LIMESTONE</b> , gray, -with occasional clay seams	1229+/-														
		<b>LIMESTONE</b> , gray, coarse-grained, sound, thick bedding, slightly weathered, strong rock	1227+/-					100	84								6,920
								100	75								3,390
			50.0					100	100								
		<b>Boring Terminated at 50 Feet</b>															

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:  
4.25" center flight augers to refusal followed with NQ2 core barrel

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

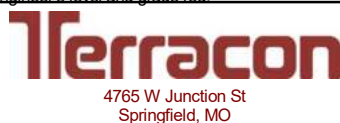
Abandonment Method:  
Boring backfilled with bentonite grout upon completion

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were measured in the field using an engineer's level and grade rod.

**WATER LEVEL OBSERVATIONS**

While drilling  
Not observed after 24 hours



Boring Started: 11-02-2020	Boring Completed: 11-02-2020
Drill Rig: CME 750X	Driller: DH
Project No.: B5205029	

# BORING LOG NO. B-11

**PROJECT:** Republic, MO WWTP Expansion - Additional Borings

**CLIENT:** Burns & McDonnell Engineering Company Inc  
Kansas City, MO

**SITE:** Near 408 N. West Ave.  
Republic, MO

MODEL LAYER	GRAPHIC LOG	LOCATION See <a href="#">Exploration Plan</a> Latitude: 37.1299° Longitude: -93.4884° Approximate Surface Elev.: 1264.4 (Ft.) +/-	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (%)	FIELD TEST RESULTS	REC (%)	RQD (%)	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS		Strength (psi)
												DEPTH ELEVATION (Ft.)	LL-PL-PI	
1	TOPSOIL		0.3											
2	FILL - GRAVELLY LEAN CLAY (CL), brown		10.0											
			5			8	5-5-4 N=9			1.5 (HP)	15.5			
			5			4	2-3-4 N=7			0.5 (HP)	23.0			
			5			10	4-8-7 N=15			1.5 (HP)	35.2			
			10			8	16-10-6 N=16			3.0 (HP)	20.1			
	FAT CLAY WITH GRAVEL (CH), red, medium stiff to very stiff		15			18	1-3-5 N=8			2.0 (HP)	25.4	52-16-36		
			20			14	13-16-11 N=27			1.0 (HP)	23.4			
			25			13	7-15-12 N=27			2.5 (HP)	30.4			
			30			18	8-4-7 N=11			1.0 (HP)	50.6			
	FAT CLAY (CH), red and tan, very soft to stiff		35			15	7-11-5 N=16			0.5 (HP)	66.8			
			40			9	7-5-6 N=11			N/A	111.2			
			45			8	1-0-0 N=0			0.5 (HP)	48.1			
			50			2	0-1-2 N=3			3.5 (HP)	22.4			
<b>Boring Terminated at 50 Feet</b>			50											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:  
4.25" center flight augers

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:  
Boring backfilled with bentonite chips/grout upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

**WATER LEVEL OBSERVATIONS**

- ▽ While drilling
- ▽ At completion of drilling



Boring Started: 06-24-2022

Boring Completed: 06-24-2022

Drill Rig: CME 750X

Driller: DH

Project No.: B5215111

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL\_B5215111 REPUBLIC, MO WWTP.GPJ TERRACON\_DATATEMPLATE.GDT 7/26/22



# BORING LOG NO. B-12

**PROJECT:** Republic, MO WWTP Expansion -  
Additional Borings

**CLIENT:** Burns & McDonnell Engineering Company Inc  
Kansas City, MO

**SITE:** Near 408 N. West Ave.  
Republic, MO

MODEL LAYER	GRAPHIC LOG	LOCATION See <a href="#">Exploration Plan</a> Latitude: 37.1300° Longitude: -93.4899° Approximate Surface Elev.: 1273.3 (Ft.) +/-	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (%)	FIELD TEST RESULTS	REC (%)	RQD (%)	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS		Strength (psi)
												DEPTH ELEVATION (Ft.)	LL-PL-PI	
			0.2											
	<b>TOPSOIL</b>		1273.1+/-											
	<b>CLAYEY GRAVEL WITH SAND (GC),</b> brown, medium dense		5.0							N/A	16.0			
	<b>FAT CLAY WITH GRAVEL (CH),</b> red, medium stiff to very stiff		1268.3+/-							3.5 (HP)	24.1			
										2.5 (HP)	49.1			
										2.5 (HP)	49.7			
										0.5 (HP)	47.0			
										0.5 (HP)	67.8			
			23.0	▽										
	<b>WEATHERED LIMESTONE</b>		1250.3+/-											
			25.0							N/A	25.1			
	<b>Boring Terminated at 25 Feet</b>													

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:  
4.25" center flight augers

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:  
Boring backfilled with bentonite chips/grout upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

**WATER LEVEL OBSERVATIONS**

- ▽ While sampling
- ▽ At completion of drilling



4765 W Junction St  
Springfield, MO

Boring Started: 06-21-2022

Boring Completed: 06-21-2022

Drill Rig: CME 750X

Driller: DH

Project No.: B5215111

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL\_B5215111 REPUBLIC, MO WWTP.GPJ TERRACON\_DATATEMPLATE.GDT 7/26/22

# BORING LOG NO. B-13

**PROJECT:** Republic, MO WWTP Expansion -  
Additional Borings

**CLIENT:** Burns & McDonnell Engineering Company Inc  
Kansas City, MO

**SITE:** Near 408 N. West Ave.  
Republic, MO

MODEL LAYER	GRAPHIC LOG	LOCATION See <a href="#">Exploration Plan</a> Latitude: 37.1299° Longitude: -93.4905°  Approximate Surface Elev.: 1275.9 (Ft.) +/- DEPTH ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (%)	FIELD TEST RESULTS	REC (%)	RQD (%)	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS		Strength (psi)
												LL-PL-PI		
3			3.0		X	3	5-12-12 N=24			N/A	9.2			
			5		X	8	6-20-9 N=29			2.0 (HP)	30.2			
			10		X	6	9-14-7 N=21			2.5 (HP)	38.7			
			15		X	10	7-7-7 N=14			3.5 (HP)	36.6			
			20		X	13	2-20-9 N=29			2.5 (HP)	49.6			
			20.5		X	9	3-5-10 N=15			2.0 (HP)	54.5			
4	21.0	1255.4+/- 1254.9+/-	<b>WEATHERED LIMESTONE</b> <b>Auger Refusal at 21 Feet</b>											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:  
4.25" center flight augers

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Auger refusal on possible cobbles, boulder, or bedrock.

Abandonment Method:  
Boring backfilled with bentonite chips/grout upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

**WATER LEVEL OBSERVATIONS**

Groundwater not encountered



Boring Started: 06-22-2022

Boring Completed: 06-22-2022

Drill Rig: CME 750X

Driller: DH

Project No.: B5215111



THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL\_B5215111 REPUBLIC, MO WWTP.GPJ TERRACON\_DATATEMPLATE.GDT 7/26/22

# BORING LOG NO. B-14

**PROJECT:** Republic, MO WWTP Expansion - Additional Borings

**CLIENT:** Burns & McDonnell Engineering Company Inc  
Kansas City, MO

**SITE:** Near 408 N. West Ave.  
Republic, MO

MODEL LAYER	GRAPHIC LOG	LOCATION See <a href="#">Exploration Plan</a> Latitude: 37.1302° Longitude: -93.4902°  Approximate Surface Elev.: 1275.1 (Ft.) +/- DEPTH ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (%)	FIELD TEST RESULTS	REC (%)	RQD (%)	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS	
												LL-PL-PI	Strength (psi)
3			5.5	1269.6+/-	X	10	6-8-11 N=19			1.0 (HP)	20.1		
			7	22-16-5 N=21			0.5 (HP)	18.1					
			12	20-21-14 N=35	X		3.5 (HP)	49.2					
			18	8-7-9 N=16	X		1.5 (HP)	57.7					
			8	3-5-5 N=10	X		1.0 (HP)	48.3					
			12	5-7-7 N=14	X		1.5 (HP)	52.3					
4			23.0	1252.1+/-	▽								
			60			100	95					3710	
			30	1242.1+/-		57		95	78				12510
<b>Boring Terminated at 33 Feet</b>													

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:  
4.25" center flight augers with NQ2 core barrel

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:  
Boring backfilled with bentonite chips/grout upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

**WATER LEVEL OBSERVATIONS**

▽ While drilling



Boring Started: 06-22-2022

Boring Completed: 06-22-2022

Drill Rig: CME 750X

Driller: DH

Project No.: B5215111

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL\_B5215111 REPUBLIC, MO WWTP.GPJ TERRACON\_DATATEMPLATE.GDT 7/26/22

# BORING LOG NO. B-15

**PROJECT:** Republic, MO WWTP Expansion - Additional Borings

**CLIENT:** Burns & McDonnell Engineering Company Inc  
Kansas City, MO

**SITE:** Near 408 N. West Ave.  
Republic, MO

MODEL LAYER	GRAPHIC LOG	LOCATION See <a href="#">Exploration Plan</a> Latitude: 37.1303° Longitude: -93.4905°  Approximate Surface Elev.: 1276.8 (Ft.) +/-	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (%)	FIELD TEST RESULTS	REC (%)	RQD (%)	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS		Strength (psi)
												LL-PL-PI		
		DEPTH ELEVATION (Ft.)												
	0.2	<b>TOPSOIL</b>	1276.6+/-											
		<b>CLAYEY GRAVEL (GC)</b> , brown, medium dense to dense		X	10		6-6-6 N=12			2.5 (HP)	19.0			
	6.0		1270.8+/-							2.0 (HP)	22.3			
		<b>POORLY GRADED GRAVEL WITH CLAY AND SAND (GP-GC)</b> , brown, medium dense		X	11		12-10-8 N=18			1.0 (HP)	16.2	36-15-21		
	8.0	<b>FAT CLAY WITH GRAVEL (CH)</b> , red, very soft to stiff	1268.8+/-							2.5 (HP)	43.2			
				X	12		10-6-6 N=12							
	15									1.0 (HP)	35.8			
				X	12		3-2-3 N=5							
	20			▽	10		2-2-3 N=5			0.5 (HP)	58.7			
										0.5 (HP)	63.2			
	25				18		2-1-1 N=2							
	30	<b>LIMESTONE</b> , grey, slightly fractured, slightly weathered	1246.8+/-											
					60			100	87					11280
	35				60			100	92					9730
	40	<b>Boring Terminated at 40 Feet</b>	1236.8+/-											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:  
4.25" center flight augers with NQ2 core barrel

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:  
Boring backfilled with bentonite chips/grout upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

**WATER LEVEL OBSERVATIONS**

▽ While sampling



Boring Started: 06-22-2022

Boring Completed: 06-22-2022

Drill Rig: CME 750X

Driller: DH

Project No.: B5215111

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL\_B5215111 REPUBLIC, MO WWTP.GPJ TERRACON\_DATATEMPLATE.GDT 7/26/22

# BORING LOG NO. B-16

**PROJECT:** Republic, MO WWTP Expansion -  
Additional Borings

**CLIENT:** Burns & McDonnell Engineering Company Inc  
Kansas City, MO

**SITE:** Near 408 N. West Ave.  
Republic, MO

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL\_B5215111 REPUBLIC, MO WWTP.GPJ TERRACON\_DATATEMPLATE.GDT 7/26/22

MODEL LAYER	GRAPHIC LOG	LOCATION See <a href="#">Exploration Plan</a> Latitude: 37.1306° Longitude: -93.4905° Approximate Surface Elev.: 1272.6 (Ft.) +/- DEPTH ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (%)	FIELD TEST RESULTS	REC (%)	RQD (%)	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS		Strength (psi)
												LL-PL-PI		
2		<b>FILL - GRAVELLY LEAN CLAY (CL)</b> 1270.6+/-	2.0		7		4-7-11 N=18			1.0 (HP)	20.5			
		<b>CLAYEY GRAVEL (GC)</b> , brown, medium dense 1267.6+/-	5.0		10		18-18-8 N=26			3.0 (HP)	35.3			
		<b>FAT CLAY WITH GRAVEL (CH)</b> , red, stiff to hard			10		7-6-7 N=13			2.5 (HP)	38.2	77-27-50		
					17		8-9-33 N=42			2.5 (HP)	50.1			
					18		7-11-7 N=18			2.5 (HP)	52.0			
					18		10-6-8 N=14			2.0 (HP)	53.0			
3														
4		<b>WEATHERED LIMESTONE</b> Auger Refusal at 23 Feet 1250.1+/- 1249.6+/-	22.5 23.0											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:  
4.25" center flight augers

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:  
Auger refusal on possible cobbles, boulder, or bedrock.

Abandonment Method:  
Boring backfilled with bentonite chips/grout upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

**WATER LEVEL OBSERVATIONS**

Groundwater not encountered



4765 W Junction St  
Springfield, MO

Boring Started: 06-22-2022

Boring Completed: 06-22-2022

Drill Rig: CME 750X

Driller: DH

Project No.: B5215111

# BORING LOG NO. B-17

**PROJECT:** Republic, MO WWTP Expansion - Additional Borings

**CLIENT:** Burns & McDonnell Engineering Company Inc  
Kansas City, MO

**SITE:** Near 408 N. West Ave.  
Republic, MO

MODEL LAYER	GRAPHIC LOG	LOCATION See <a href="#">Exploration Plan</a> Latitude: 37.1302° Longitude: -93.4899° Approximate Surface Elev.: 1273.7 (Ft.) +/- DEPTH ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY ( )	FIELD TEST RESULTS	REC (%)	RQD (%)	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS		Strength (psi)
												LL-PL-PI		
3			3.0	1270.7+/-	X	12	7-13-7 N=20			1.0 (HP)	19.3			
			5		X	13	5-5-6 N=11			2.5 (HP)	41.6			
			10		X	18	4-6-6 N=12			2.0 (HP)	48.0			
			15		X	18	6-16-15 N=31			3.5 (HP)	47.4			
			18.0	1255.7+/-	X	7	4-3-5 N=8			1.0 (HP)	69.1			
4		18.5	1255.2+/-	▽										
		<p><b>WEATHERED LIMESTONE</b> <i>Auger Refusal at 18.5 Feet</i></p>												

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:  
4.25" center flight augers

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Auger refusal on possible cobbles, boulder, or bedrock.

Abandonment Method:  
Boring backfilled with bentonite chips/grout upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

**WATER LEVEL OBSERVATIONS**

- ▽ While drilling
- ▽ At completion of drilling



Boring Started: 06-21-2022

Boring Completed: 06-21-2022

Drill Rig: CME 750X

Driller: DH

Project No.: B5215111

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL\_B5215111 REPUBLIC, MO WWTP.GPJ TERRACON\_DATATEMPLATE.GDT 7/26/22

# BORING LOG NO. B-18

**PROJECT:** Republic, MO WWTP Expansion - Additional Borings

**CLIENT:** Burns & McDonnell Engineering Company Inc  
Kansas City, MO

**SITE:** Near 408 N. West Ave.  
Republic, MO

MODEL LAYER	GRAPHIC LOG	LOCATION See <a href="#">Exploration Plan</a> Latitude: 37.1305° Longitude: -93.4899° Approximate Surface Elev.: 1271.1 (Ft.) +/- DEPTH ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (%)	FIELD TEST RESULTS	REC (%)	RQD (%)	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS		Strength (psi)
												LL-PL-PI		
3		<b>CLAYEY GRAVEL (GC)</b> , brown, dense  <b>FAT CLAY WITH GRAVEL (CH)</b> , red, medium stiff to very stiff	4.0	1267.1+/-	X	12	8-14-20 N=34			2.5 (HP)	18.3	29-19-10		
			5	1267.1+/-	X	16	6-6-11 N=17			2.5 (HP)	36.3			
			5	1267.1+/-	X	5	9-16-8 N=24			3.0 (HP)	19.1			
			10	1267.1+/-	X	12	5-10-7 N=17			2.5 (HP)	46.8			
			15	1267.1+/-	X	14	7-8-5 N=13			4.0 (HP)	49.8			
			20	1267.1+/-	X	9	3-2-3 N=5			1.5 (HP)	58.0			
			25	1246.1+/-	X	18	3-3-3 N=6			0.5 (HP)	57.5			
		<b>Boring Terminated at 25 Feet</b>	25	▽										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:  
4.25" center flight augers

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:  
Boring backfilled with bentonite chips/grout upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

**WATER LEVEL OBSERVATIONS**

- ▽ While sampling
- ▽ At completion of drilling



Boring Started: 06-21-2022

Boring Completed: 06-21-2022

Drill Rig: CME 750X

Driller: DH

Project No.: B5215111

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL\_B5215111 REPUBLIC, MO WWTP.GPJ TERRACON\_DATATEMPLATE.GDT 7/26/22

# BORING LOG NO. B-19

**PROJECT:** Republic, MO WWTP Expansion - Additional Borings

**CLIENT:** Burns & McDonnell Engineering Company Inc  
Kansas City, MO

**SITE:** Near 408 N. West Ave.  
Republic, MO

MODEL LAYER	GRAPHIC LOG	LOCATION See <a href="#">Exploration Plan</a> Latitude: 37.1309° Longitude: -93.4899° Approximate Surface Elev.: 1266.1 (Ft.) +/- DEPTH ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (%)	FIELD TEST RESULTS	REC (%)	RQD (%)	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS		Strength (psi)
												LL-PL-PI		
3		1261.1+/-	5	1261.1+/-	X	12	20-28-22 N=50			N/A	19.6			
					X	16	7-11-9 N=20			2.5 (HP)	37.2			
					X	9	12-6-9 N=15			2.5 (HP)	41.7			
					X	10	6-12-9 N=21			3.0 (HP)	47.5			
					X	5	3-4-5 N=9			1.0 (HP)	45.8			
					▽	7	4-5-3 N=8			N/A				
					X	16	1-0-8 N=8			1.0 (HP)	88.1			
		1241.1+/-	25	<b>Boring Terminated at 25 Feet</b>										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:  
4.25" center flight augers

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:  
Boring backfilled with bentonite chips/grout upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

**WATER LEVEL OBSERVATIONS**

- ▽ While drilling
- ▽ At completion of drilling



Boring Started: 06-21-2022

Boring Completed: 06-21-2022

Drill Rig: CME 750X

Driller: DH

Project No.: B5215111

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL\_B5215111 REPUBLIC, MO WWTP.GPJ TERRACON\_DATATEMPLATE.GDT 7/26/22



# BORING LOG NO. B-20

**PROJECT:** Republic, MO WWTP Expansion - Additional Borings

**CLIENT:** Burns & McDonnell Engineering Company Inc  
Kansas City, MO

**SITE:** Near 408 N. West Ave.  
Republic, MO

MODEL LAYER	GRAPHIC LOG	LOCATION See <a href="#">Exploration Plan</a> Latitude: 37.1311° Longitude: -93.4894° Approximate Surface Elev.: 1260.4 (Ft.) +/-	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (%)	FIELD TEST RESULTS	REC (%)	RQD (%)	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS		Strength (psi)
												DEPTH ELEVATION (Ft.)	LL-PL-PI	
1	TOPSOIL	0.3 / 1260.1+/-												
2	FILL - GRAVELLY LEAN CLAY (CL)	3.0 / 1257.4+/-				6	9-12-10 N=22			N/A	18.8			
3	FAT CLAY WITH GRAVEL (CH), red, very soft to very stiff		5			8	9-15-13 N=28			3.5 (HP)	26.2			
						8	8-10-10 N=20			1.5 (HP)	28.2			
						4	6-6-5 N=11			1.5 (HP)	27.7			
						9	2-1-0 N=1			N/A	71.3			
4	WEATHERED LIMESTONE	19.0 / 1241.4+/- 20.0 / 1240.4+/-	20	▽		15	5-5-50/4"			N/A	55.3			
		<b>Auger Refusal at 20 Feet</b>												

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:  
4.25" center flight augers

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Auger refusal on possible cobbles, boulder, or bedrock.

Abandonment Method:  
Boring backfilled with bentonite chips/grout upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

**WATER LEVEL OBSERVATIONS**

- ▽ While drilling
- ▽ At completion of drilling



4765 W Junction St  
Springfield, MO

Boring Started: 06-24-2022

Boring Completed: 06-24-2022

Drill Rig: CME 750X

Driller: DH

Project No.: B5215111

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL\_B5215111 REPUBLIC, MO WWTP.GPJ TERRACON\_DATATEMPLATE.GDT 7/26/22

# BORING LOG NO. B-21

**PROJECT:** Republic, MO WWTP Expansion - Additional Borings

**CLIENT:** Burns & McDonnell Engineering Company Inc  
Kansas City, MO

**SITE:** Near 408 N. West Ave.  
Republic, MO

MODEL LAYER	GRAPHIC LOG	LOCATION See <a href="#">Exploration Plan</a> Latitude: 37.1306° Longitude: -93.4868° Approximate Surface Elev.: 1266.4 (Ft.) +/-	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (%)	FIELD TEST RESULTS	REC (%)	RQD (%)	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS		Strength (psi)
												DEPTH ELEVATION (Ft.)	LL-PL-PI	
1	TOPSOIL		0.4											
2	FILL - GRAVELLY LEAN CLAY (CL)		3.0			10	4-4-2 N=6			1.5 (HP)	26.5			
	LEAN CLAY WITH GRAVEL (CL)		5.0			15	9-14-5 N=19			1.5 (HP)	20.9	41-18-23		
	FAT CLAY WITH GRAVEL (CH), red, stiff to very stiff		7.0			10	4-5-5 N=10			3.5 (HP)	48.6			
3			10.0			8	7-7-8 N=15			2.0 (HP)	50.4			
			15.0			18	3-4-9 N=13			1.5 (HP)	52.7			
4	WEATHERED LIMESTONE		18.0			3	50/4"			N/A	16.3			
Boring Terminated at 19 Feet														

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:  
4.25" center flight augers

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:  
Auger refusal on possible cobbles, boulder, or bedrock.

Abandonment Method:  
Boring backfilled with bentonite chips/grout upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

**WATER LEVEL OBSERVATIONS**

Groundwater not encountered



Boring Started: 06-24-2022

Boring Completed: 06-24-2022

Drill Rig: CME 750X

Driller: DH

Project No.: B5215111

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL\_B5215111 REPUBLIC, MO WWTP.GPJ TERRACON\_DATATEMPLATE.GDT 7/26/22

# BORING LOG NO. B-22

**PROJECT:** Republic, MO WWTP Expansion - Additional Borings

**CLIENT:** Burns & McDonnell Engineering Company Inc  
Kansas City, MO

**SITE:** Near 408 N. West Ave.  
Republic, MO

MODEL LAYER	GRAPHIC LOG	LOCATION See <a href="#">Exploration Plan</a> Latitude: 37.1302° Longitude: -93.4903° Approximate Surface Elev.: 1275.0 (Ft.) +/- DEPTH ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (%)	FIELD TEST RESULTS	REC (%)	RQD (%)	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS		Strength (psi)
												LL-PL-PI		
3			5		9		6-18-18 N=36			2.0 (HP)	29.3			
			5		7		15-19-20 N=39			N/A	18.0			
			10		12		21-29-9 N=38			2.5 (HP)	35.6			
			15		18		5-8-7 N=15			3.0 (HP)	47.1			
			20		15		2-3-4 N=7			1.5 (HP)	53.7			
			25		18	▽	4-3-3 N=6			1.5 (HP)	64.7			
			30		18		0-0-0 N=0			N/A	92.8			
			30.5		18		0-0-50 N=50			N/A	88.3			
		<b>WEATHERED LIMESTONE</b> <i>Boring Terminated at 30.5 Feet</i>												

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:  
4.25" center flight augers

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Auger refusal on possible cobbles, boulder, or bedrock.

Abandonment Method:  
Boring backfilled with bentonite chips/grout upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

**WATER LEVEL OBSERVATIONS**

- ▽ While drilling
- ▽ At completion of drilling



Boring Started: 06-24-2022

Boring Completed: 06-24-2022

Drill Rig: CME 750X

Driller: DH

Project No.: B5215111

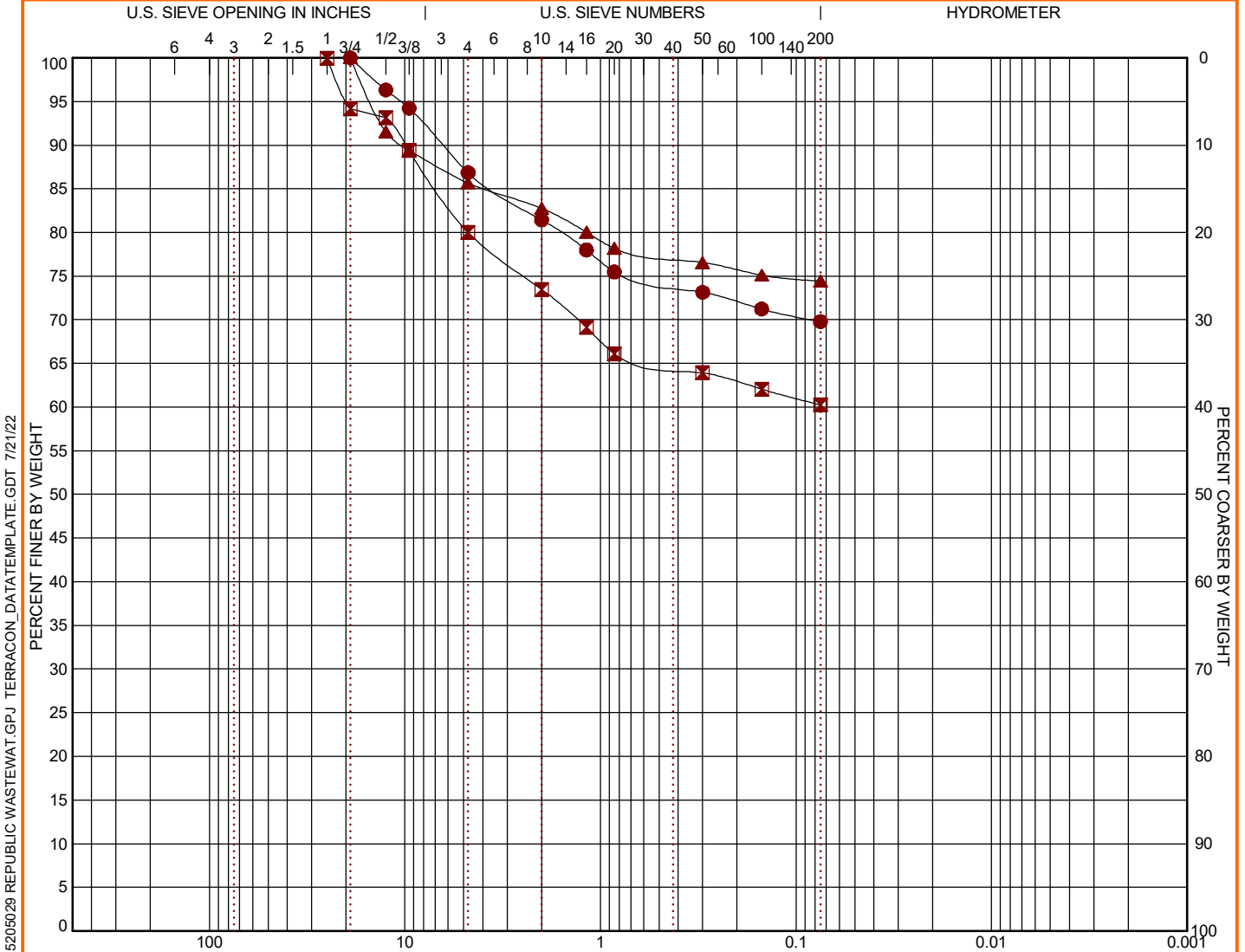
THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL\_B5215111 REPUBLIC, MO WWTP.GPJ TERRACON\_DATATEMPLATE.GDT 7/26/22





# GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS 1 KF B5205029 REPUBLIC WASTEWAT.GPJ TERRACON\_DATATEMPLATE.GDT 7/21/22

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BORING ID	DEPTH	% COBBLES	% GRAVEL	% SAND	% SILT	% FINES	% CLAY	USCS
● B-1	1 - 2.5	0.0	13.1	17.1		69.8		
☒ B-2	3.5 - 5		19.9	19.8		60.3		
▲ B-3	8 - 9	0.0	14.4	11.2		74.4		

GRAIN SIZE			
	●	☒	▲
D <sub>60</sub>			
D <sub>30</sub>			
D <sub>10</sub>			
COEFFICIENTS			
	●	☒	▲
C <sub>c</sub>			
C <sub>u</sub>			

●		☒		▲	
Sieve	% Finer	Sieve	% Finer	Sieve	% Finer
3/4"	100.0	1"	99.94	3/4"	100.0
1/2"	96.32	3/4"	94.13	1/2"	91.51
3/8"	94.22	1/2"	93.17	3/8"	89.37
#4	86.85	3/8"	89.4	#4	85.65
#8	81.44	#4	80.02	#8	82.76
#16	77.99	#8	73.48	#16	80.03
#30	75.48	#16	69.12	#30	78.17
#100	73.14	#30	66.11	#100	76.56
#200	71.23	#100	63.9	#200	75.11
	69.79	#200	62.06		74.43
			60.26		

SOIL DESCRIPTION	
●	
☒	
▲	
REMARKS	
●	
☒	
▲	

PROJECT: Republic WWTP

SITE: N. West Ave. NW of Wade St. Intersection  
Republic, Missouri

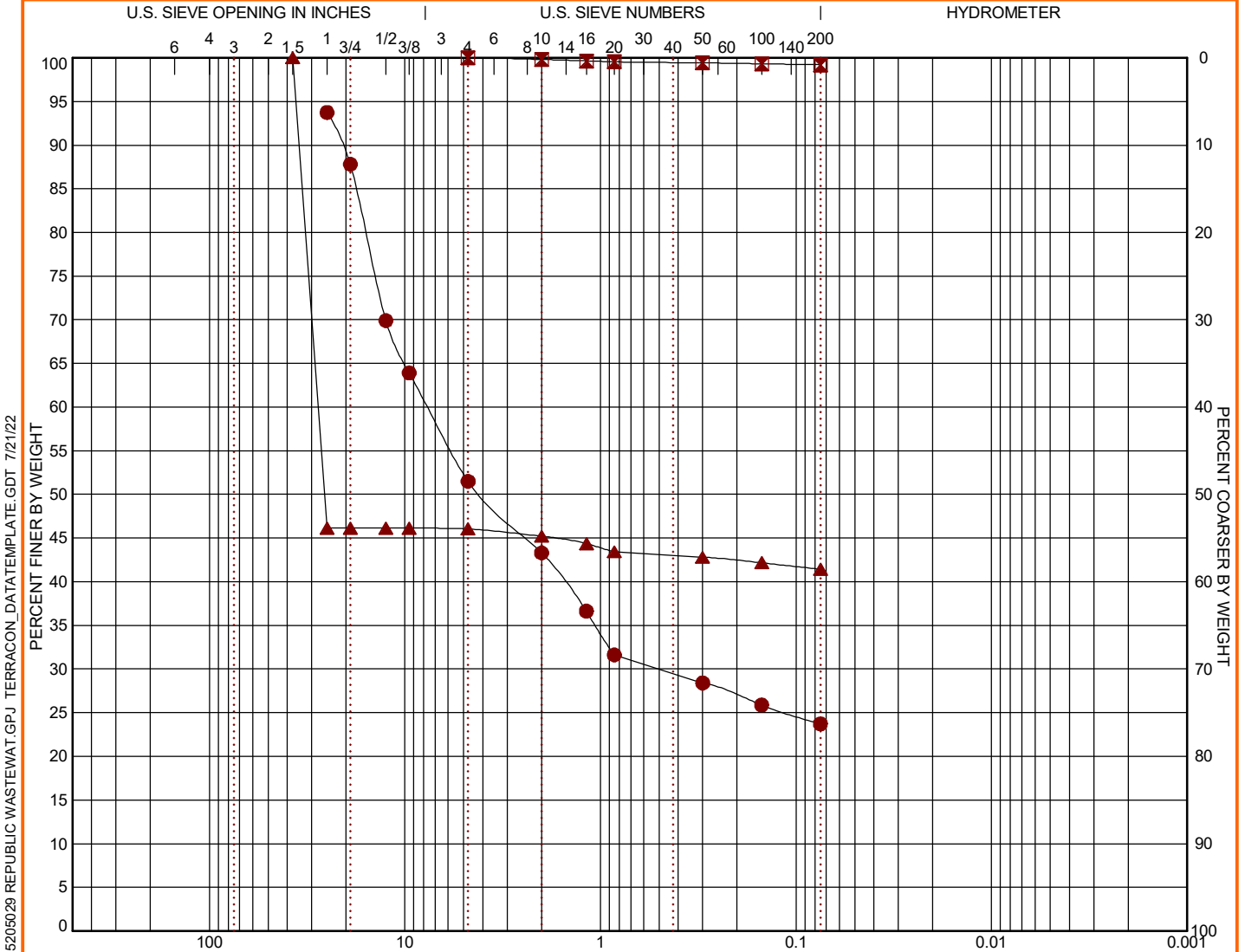


PROJECT NUMBER: B5205029

CLIENT: Burns & McDonnell Engineering Co.  
Kansas City, Missouri

# GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BORING ID	DEPTH	% COBBLES	% GRAVEL	% SAND	% SILT	% FINES	% CLAY	USCS
B-4	18.5 - 20		42.2	27.8		23.7		
B-6	8.5 - 10	0.0	0.0	0.8		99.2		
B-8	8.5 - 10	0.0	54.0	4.6		41.4		

GRAIN SIZE			
	●	☒	▲
D <sub>60</sub>	7.636		27.748
D <sub>30</sub>	0.504		
D <sub>10</sub>			

COEFFICIENTS			
	●	☒	▲
C <sub>c</sub>			
C <sub>u</sub>			

●		☒		▲	
Sieve	% Finer	Sieve	% Finer	Sieve	% Finer
1"	93.74	#4	100.0	1"	46.15
3/4"	87.81	#8	99.81	3/4"	46.15
1/2"	69.9	#16	99.64	1/2"	46.15
3/8"	63.91	#30	99.55	3/8"	46.15
#4	51.5	#100	99.42	#4	46.05
#8	43.3	#200	99.31	#8	45.21
#16	36.63		99.2	#16	44.37
#30	31.62			#30	43.43
#100	28.4			#100	42.8
#200	25.88			#200	42.17
	23.72				41.44
					100.0

SOIL DESCRIPTION	
●	
☒	
▲	

REMARKS	
●	
☒	
▲	

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS 1 KF B5205029 REPUBLIC WASTEWAT.GPJ TERRACON\_DATATEMPLATE.GDT 7/21/22

PROJECT: Republic WWTP

SITE: N. West Ave. NW of Wade St. Intersection  
Republic, Missouri

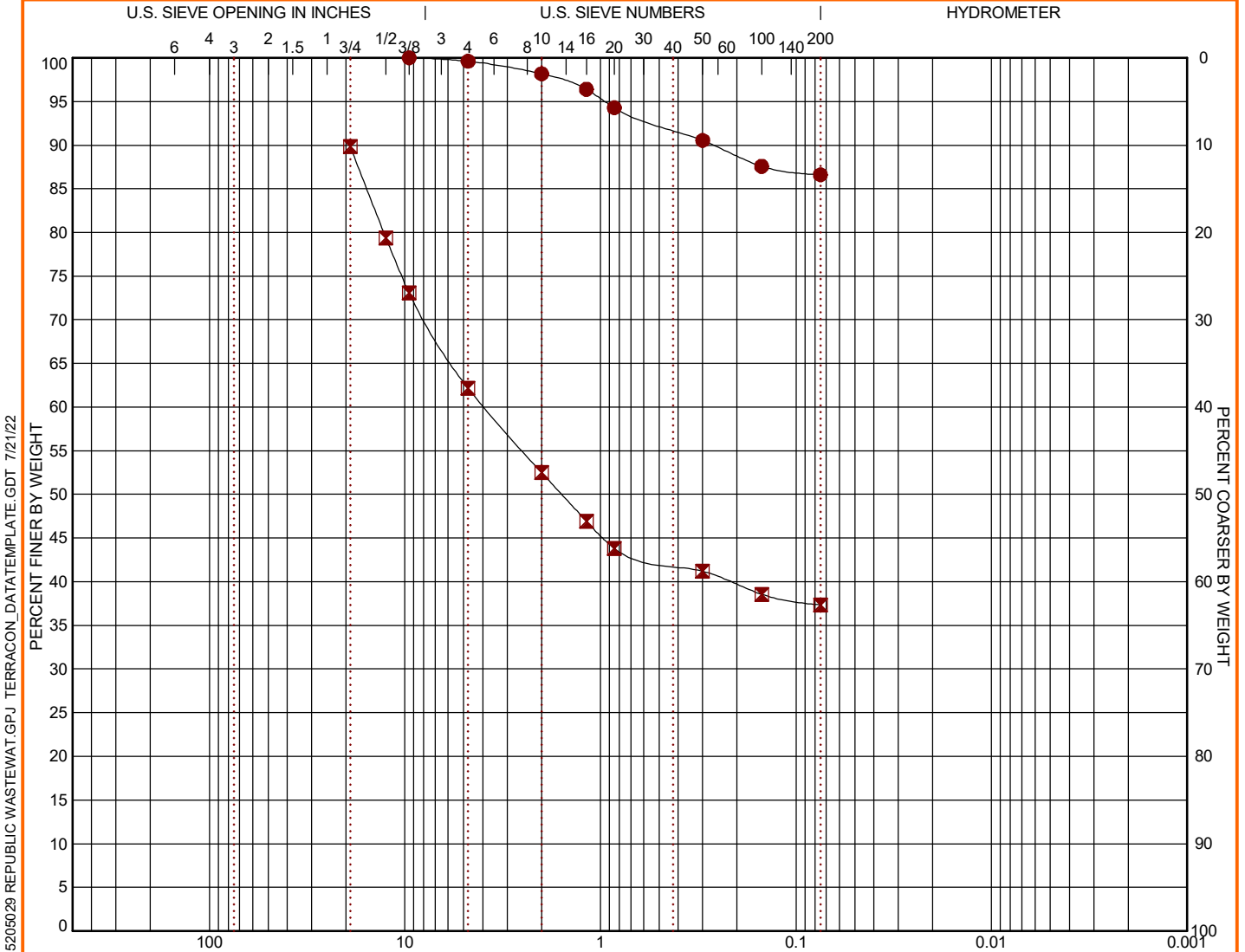


PROJECT NUMBER: B5205029

CLIENT: Burns & McDonnell Engineering Co.  
Kansas City, Missouri

# GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY			
	coarse	fine	coarse	medium	fine				

BORING ID	DEPTH	% COBBLES	% GRAVEL	% SAND	% SILT	% FINES	% CLAY	USCS
● B-4A	13 - 15	0.0	0.4	13.0		86.6		
☒ B-5A	6 - 7.5		27.6	24.8		37.3		

GRAIN SIZE			
	●	☒	
<b>D<sub>60</sub></b>		3.91	
<b>D<sub>30</sub></b>			
<b>D<sub>10</sub></b>			
COEFFICIENTS			
	●	☒	
<b>C<sub>c</sub></b>			
<b>C<sub>u</sub></b>			

●		☒			
Sieve	% Finer	Sieve	% Finer	Sieve	% Finer
#4	99.61	3/4"	89.81		
#8	98.17	1/2"	79.39		
#16	96.4	3/8"	73.07		
#30	94.28	#4	62.18		
#100	90.54	#8	52.49		
#200	87.57	#16	46.93		
	86.61	#30	43.81		
	100.0	#100	41.2		
		#200	38.56		
			37.33		

SOIL DESCRIPTION	
●	
☒	
REMARKS	
●	
☒	

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS 1 KF B5205029 REPUBLIC WASTEWAT.GPJ TERRACON\_DATATEMPLATE.GDT 7/21/22

PROJECT: Republic WWTP

SITE: N. West Ave. NW of Wade St. Intersection  
Republic, Missouri



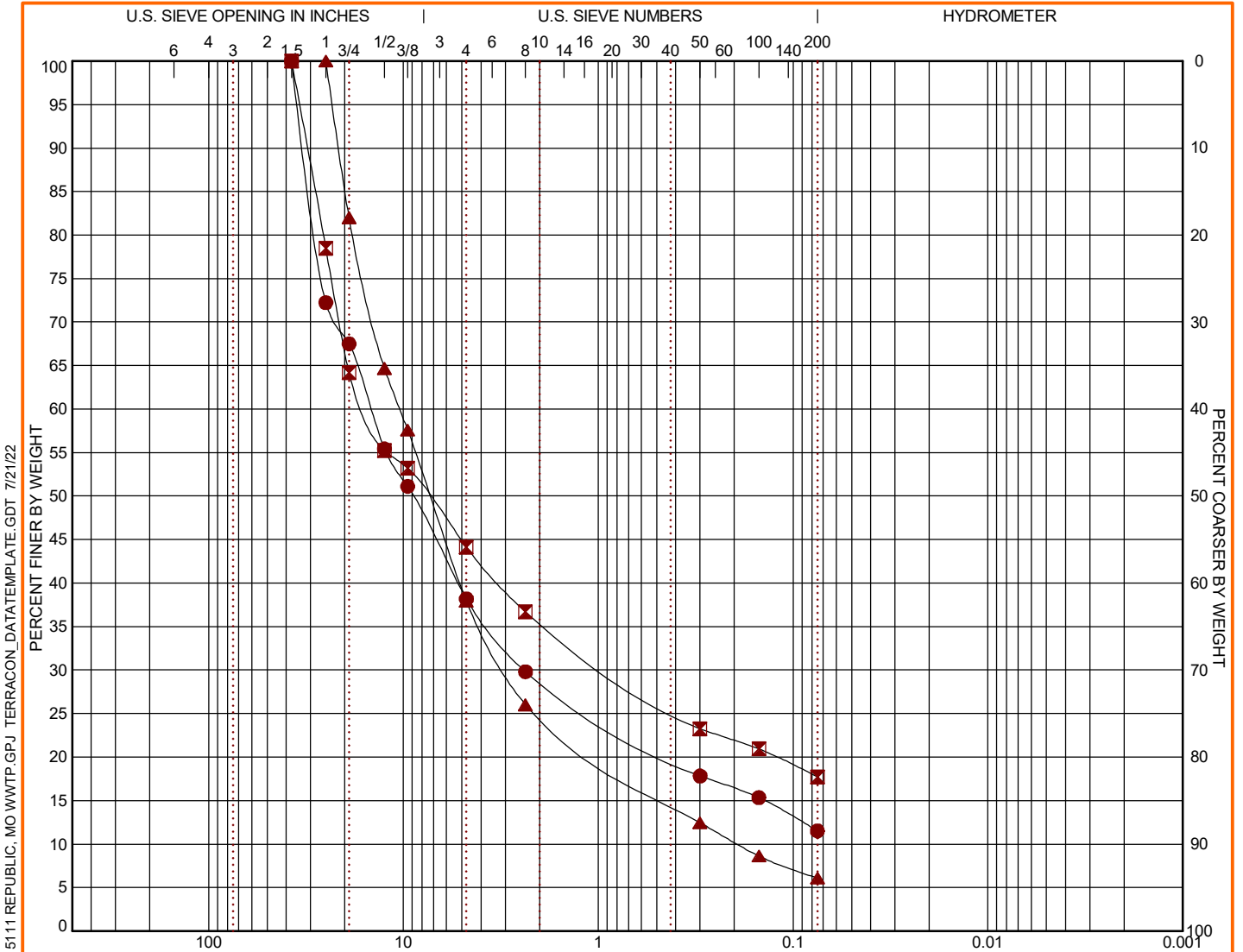
PROJECT NUMBER: B5205029

CLIENT: Burns & McDonnell Engineering Co.  
Kansas City, Missouri



# GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BORING ID	DEPTH	% COBBLES	% GRAVEL	% SAND	% SILT	% FINES	% CLAY	USCS
● B-12	1 - 2.5	0.0	61.8	26.7		11.5		
☒ B-14	3.5 - 5	0.0	55.8	26.4		17.7		
▲ B-15	6 - 7.5	0.0	62.1	31.8		6.1		GP-GC

GRAIN SIZE			
	●	☒	▲
D <sub>60</sub>	14.651	15.605	10.43
D <sub>30</sub>	2.398	0.844	2.982
D <sub>10</sub>			0.192
COEFFICIENTS			
	●	☒	▲
C <sub>c</sub>	6.88		4.43
C <sub>u</sub>	256.63		54.21

●		☒		▲	
Sieve	% Finer	Sieve	% Finer	Sieve	% Finer
1 1/2"	100.0	1 1/2"	100.0	1"	100.0
1"	72.23	1"	78.45	3/4"	82.02
3/4"	67.5	3/4"	64.22	1/2"	64.67
1/2"	55.42	1/2"	55.25	3/8"	57.59
3/8"	51.12	3/8"	53.21	#4	37.91
#4	38.19	#4	44.15	#8	26.02
#8	29.81	#8	36.69	#100	12.44
#100	17.82	#100	23.27	#200	8.63
#200	15.34	#200	20.94		6.1
	11.51		17.72		

SOIL DESCRIPTION	
●	
☒	
▲	POORLY GRADED GRAVEL with CLAY and SAND (GP-GC)
REMARKS	
●	
☒	
▲	

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS 1 B5215111 REPUBLIC, MO WWTP, GP-J TERRACON\_DATATEMPLATE.GDT 7/21/22

PROJECT: Republic, MO WWTP Expansion - Additional Borings

SITE: Near 408 N. West Ave. Republic, MO



4765 W Junction St  
Springfield, MO

PROJECT NUMBER: B5215111

CLIENT: Burns & McDonnell Engineering Company Inc  
Kansas City, MO

# LABORATORY COMPACTION CHARACTERISTICS OF SOIL REPORT



Report Number: B5205029.0001

Service Date: 10/26/20

Report Date: 10/28/20

4765 W Junction St  
Springfield, MO 65802-1013  
417-864-5100

## Client

Burns & McDonnell CAS LLC  
Attn: Jeff Barnard  
9400 Ward Parkway  
Kansas City, MO 64114

## Project

Republic Wastewater Treatment Plant Additions  
N. West Ave. NW of Wade St. Intersection  
Republic, MO

Project Number: B5205029

## Material Information

Source of Material: Bulk Sample B-1

Proposed Use:

## Sample Information

Sample Date: 10/28/20

Sampled By:

Sample Location: B-1 1 to 5 Feet

Sample Description: Brown Gravelly Clay

## Laboratory Test Data

Test Procedure: ASTM D698

Test Method: Method C

Sample Preparation: Wet

Rammer Type: Manual

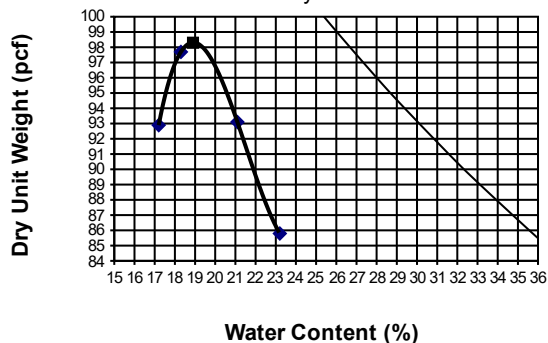
Maximum Dry Unit Weight (pcf): 98.3

Optimum Water Content (%): 18.9

	Result	Specifications
Liquid Limit:	46	
Plastic Limit:	21	
Plasticity Index:	25	
In-Place Moisture (%):		
Passing 3/4" (%):	8.7	

USCS: CL

Zero Air Voids Curve for Assumed Specific Gravity 2.70



## Comments:

Services: Proctor values

Terracon Rep.: Austin Payne

Reported To:

Contractor:

Report Distribution:

(1) Burns & McDonnell CAS LLC, JeffBarnard

Reviewed By: \_\_\_\_\_

Joshua Elson  
Senior Staff Geologist

Test Methods: ASTM D698

The tests were performed in general accordance with applicable ASTM, AASHTO, or DOT test methods. This report is exclusively for the use of the client indicated above and shall not be reproduced except in full without the written consent of our company. Test results transmitted herein are only applicable to the actual samples tested at the location(s) referenced and are not necessarily indicative of the properties of other apparently similar or identical materials.

# LABORATORY COMPACTION CHARACTERISTICS OF SOIL REPORT



Report Number: B5205029.0002

Service Date: 10/26/20

Report Date: 10/28/20

4765 W Junction St  
Springfield, MO 65802-1013  
417-864-5100

## Client

Burns & McDonnell CAS LLC  
Attn: Jeff Barnard  
9400 Ward Parkway  
Kansas City, MO 64114

## Project

Republic Wastewater Treatment Plant Additions  
N. West Ave. NW of Wade St. Intersection  
Republic, MO

Project Number: B5205029

## Material Information

Source of Material: Bulk Sample B-2

Proposed Use:

## Sample Information

Sample Date: 10/23/20 Sample Time: 800

Sampled By: Joshua Elson

Sample Location: Boring B-2 - 1 to 5 Feet

Sample Description: Brown Gravelly Clay

## Laboratory Test Data

Test Procedure: ASTM D698

Test Method: Method C

Sample Preparation: Wet

Rammer Type: Manual

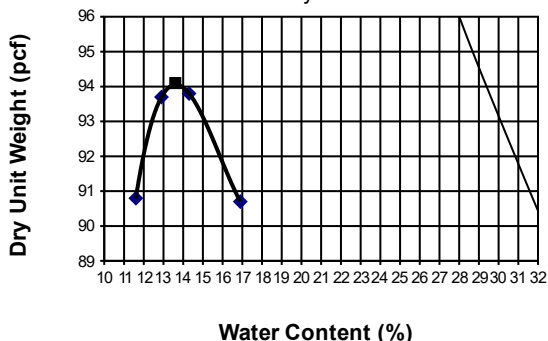
Maximum Dry Unit Weight (pcf): 94.1

Optimum Water Content (%): 13.6

	Result	Specifications
Liquid Limit:	36	
Plastic Limit:	23	
Plasticity Index:	13	
In-Place Moisture (%):		
Passing 3/4" (%):	10.7	

USCS: CL

Zero Air Voids Curve for Assumed Specific Gravity 2.70



## Comments:

Services: Proctor values

Terracon Rep.: Austin Payne

Reported To:

Contractor:

Report Distribution:

(1) Burns & McDonnell CAS LLC, JeffBarnard

Reviewed By: \_\_\_\_\_

Joshua Elson  
Senior Staff Geologist

Test Methods: ASTM D698

The tests were performed in general accordance with applicable ASTM, AASHTO, or DOT test methods. This report is exclusively for the use of the client indicated above and shall not be reproduced except in full without the written consent of our company. Test results transmitted herein are only applicable to the actual samples tested at the location(s) referenced and are not necessarily indicative of the properties of other apparently similar or identical materials.

# LABORATORY COMPACTION CHARACTERISTICS OF SOIL REPORT



Report Number: B5205029.0003

Service Date: 10/26/20

Report Date: 10/28/20

4765 W Junction St  
Springfield, MO 65802-1013  
417-864-5100

## Client

Burns & McDonnell CAS LLC  
Attn: Jeff Barnard  
9400 Ward Parkway  
Kansas City, MO 64114

## Project

Republic Wastewater Treatment Plant Additions  
N. West Ave. NW of Wade St. Intersection  
Republic, MO

Project Number: B5205029

## Material Information

Source of Material: Bulk Sample B-5

Proposed Use:

## Sample Information

Sample Date: 10/23/20 Sample Time: 800

Sampled By: Joshua Elson

Sample Location: Boring B-5 - 3 to 5 Feet

Sample Description: Brown Gravelly Clay

## Laboratory Test Data

Test Procedure: ASTM D698

Test Method: Method C

Sample Preparation: Wet

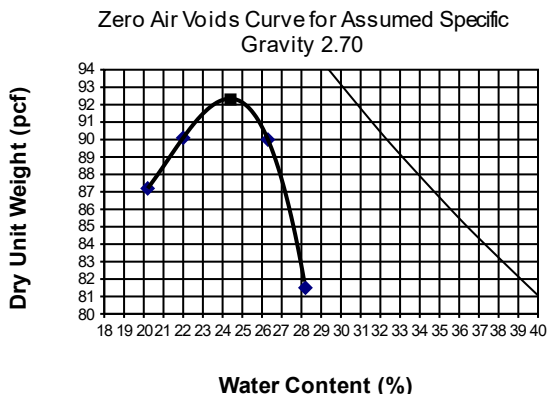
Rammer Type: Manual

Maximum Dry Unit Weight (pcf): 92.3

Optimum Water Content (%): 24.4

	Result	Specifications
Liquid Limit:	52	
Plastic Limit:	25	
Plasticity Index:	27	
In-Place Moisture (%):		
Passing 3/4" (%):	13.9	

USCS: CH



## Comments:

Services: Proctor values

Terracon Rep.: Austin Payne

Reported To:

Contractor:

Report Distribution:

(1) Burns & McDonnell CAS LLC, JeffBarnard

Reviewed By: \_\_\_\_\_

Joshua Elson  
Senior Staff Geologist

Test Methods: ASTM D698

The tests were performed in general accordance with applicable ASTM, AASHTO, or DOT test methods. This report is exclusively for the use of the client indicated above and shall not be reproduced except in full without the written consent of our company. Test results transmitted herein are only applicable to the actual samples tested at the location(s) referenced and are not necessarily indicative of the properties of other apparently similar or identical materials.

**Client**

Burns & McDonnell CAS LLC

**Project**

Republic Wastewater Treatment Plant Additions

**Sample Submitted By:** Terracon (B5)

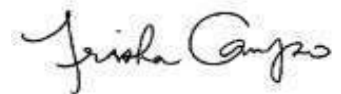
**Date Received:** 12/2/2020

**Lab No.:** 20-1250

**Results of Corrosion Analysis**

<b>Sample Number</b>	--	--
<b>Sample Location</b>	B-2A	B-4A
<b>Sample Depth (ft.)</b>	6.0-8.0	13.0-15.0
pH Analysis, ASTM G 51	6.69	7.09
Water Soluble Sulfate (SO <sub>4</sub> ), ASTM C 1580 (mg/kg)	20	86
Sulfides, AWWA 4500-S D, (mg/kg)	Nil	Nil
Chlorides, ASTM D 512, (mg/kg)	35	45
Red-Ox, ASTM G 200, (mV)	+693	+690
Total Salts, AWWA 2540, (mg/kg)	101	493
Resistivity (Saturated), ASTM G 57, (ohm-cm)	6499	3395

**Analyzed By:**



Trisha Campo  
Chemist



MMET LABORATORY


MMET, Inc • 316 N Airport Rd • Strafford, MO 65757  
tel: 417-736-6016 • fax: 417-736-6018 • toll: 877-581-MMET  
Email [mmet@mmetinc.com](mailto:mmet@mmetinc.com) Est. 1997

LABORATORY REPORT

Report Number:	M261105	Report Date:	7/20/2022
Lab Number:	221506		
Customer: Terracon		Project Manager:	David A. Williams, PE Project Eng.
4765 W. Junction Street		Project Name:	Republic WWTP
Springfield, MO 65802		Project Location:	B5215111
Phone 417-864-5100		Sample Matrix:	Soil
Fax 417-864-0871		Sampled By:	Drill Crew
Cell 417-773-2500	<a href="mailto:Ripken.Dodson@terracon.com">Ripken.Dodson@terracon.com</a>	Sample ID:	B-11 (Cumulative)
Email <a href="mailto:Joshua.Elson@terracon.com">Joshua.Elson@terracon.com</a>	<a href="mailto:Nic.Arens@terracon.com">Nic.Arens@terracon.com</a>	Date Sampled:	
Purchase Order No.	<a href="mailto:David.Williams@terracon.com">David.Williams@terracon.com</a>	Date Received:	6/29/2022

Paramter	Method	Results	Units	Date of Analysis	Analyst
Sulfate	AASHTO T290-91	103	mg/Kg	7/20/2022	WAM
Sulfide	SM 4500-S D	0.099	mg/Kg	7/20/2022	WAM
Chloride	AASHTO T291	< 17	mg/Kg	7/20/2022	WAM
pH 1:2	EPA 9045C / AASHTO T289-91	6.82	SU	7/20/2022	WAM
Electrical Conductivity 1:2	SM 2510	327	µS	7/20/2022	WAM
TDS		163	ppm	7/20/2022	WAM
Salt		0.17	ppt	7/20/2022	WAM
Minimum Lab Soil Resistivity	AASHTO T288-91	1,432	Ω cm	7/20/2022	WAM

Report Approved by:



Wayne A. Middleton, Pres., Lab Dir.



MMET LABORATORY

MMET, Inc • 316 N Airport Rd • Strafford, MO 65757  
tel: 417-736-6016 • fax: 417-736-6018 • toll: 877-581-MMET  
Email [mmet@mmetinc.com](mailto:mmet@mmetinc.com) Est. 1997

LABORATORY REPORT

Report Number: M261105	Report Date: 7/20/2022
Lab Number: 221507	
Customer: Terracon 4765 W. Junction Street Springfield, MO 65802	Project Manager: David A. Williams, PE Project Eng. Project Name: Republic WWTP Project Location: B5215111 Sample Matrix: Soil Sampled By: Drill Crew Sample ID: B-14 (5-10') Date Sampled: Date Received: 6/29/2022
Phone 417-864-5100 Fax 417-864-0871 Cell 417-773-2500 Email <a href="mailto:Joshua.Elson@terracon.com">Joshua.Elson@terracon.com</a> Purchase Order No.	<a href="mailto:Ripken.Dodson@terracon.com">Ripken.Dodson@terracon.com</a> <a href="mailto:Nic.Arens@terracon.com">Nic.Arens@terracon.com</a> <a href="mailto:David.Williams@terracon.com">David.Williams@terracon.com</a>

Paramter	Method	Results	Units	Date of Analysis	Analyst
Sulfate	AASHTO T290-91	22	mg/Kg	7/20/2022	WAM
Sulfide	SM 4500-S D	0.083	mg/Kg	7/20/2022	WAM
Chloride	AASHTO T291	25	mg/Kg	7/20/2022	WAM
pH 1:2	EPA 9045C / AASHTO T289-91	6.21	SU	7/20/2022	WAM
Electrical Conductivity 1:2	SM 2510	111	µS	7/20/2022	WAM
TDS		55	ppm	7/20/2022	WAM
Salt		0.06	ppt	7/20/2022	WAM
Minimum Lab Soil Resistivity	AASHTO T288-91	2,470	Ω cm	7/20/2022	WAM

Report Approved by:

Wayne A. Middleton, Pres., Lab Dir.

**Unconfined Compressive Strength  
of Intact Rock Core Specimens**

Project Name: Republic WWTP

Project No.: B5205029/B5215111

Client: Burns & McDonnell Engineering Co.

Date: 7/25/2022

Tested By: KSH

Reviewed By: JDE



Boring	Depth (feet)	Recovery (%)	RQD (%)	Strength (psi)	Type of Rock
B-1	16.5	100	100	7,160	Limestone
B-1	23.0	100	100	9,700	Limestone
B-2	24.0	100	100	7,940	Limestone
B-2	30.5	100	88	7,080	Limestone
B-3	17.0	100	96	9,460	Limestone
B-3	23.0	100	97	5,570	Limestone
B-4	41.5	100	92	5,860	Limestone
B-4	47.6	100	95	7,130	Limestone
B-5	32.0	65	53	7,300	Limestone
B-5	36.0	100	92	8,390	Limestone
B-6	25.5	100	100	7,640	Limestone
B-6	31.8	100	74	8,380	Limestone
B-7	29.0	100	80	10,120	Limestone
B-7	35.2	100	100	8,020	Limestone



**Unconfined Compressive Strength  
of Intact Rock Core Specimens**

Project Name: Republic WWTP

Project No.: B5205029/B5215111

Client: Burns & McDonnell Engineering Co.

Test Date: 7/25/2022

Tested by: KSH

Reviewed By: JDE



**Laboratory Data Sheet**

<b>Boring</b>	<b>Depth (feet)</b>	<b>Recovery (%)</b>	<b>RQD (%)</b>	<b>Strength (psi)</b>	<b>Type of Rock</b>
B-8	29.0	100	95	<b>8,130</b>	Limestone
B-8	37.0	100	97	<b>8,280</b>	Limestone
B-2A	28.5	100	83	<b>8,750</b>	Limestone
B-2A	33.5	100	96	<b>7,320</b>	Limestone
B-4A	57.0	100	63	<b>11,170</b>	Limestone
B-4A	63.2	100	100	<b>6,900</b>	Limestone
B-5A	33.0	100	97	<b>8,330</b>	Limestone
B-5A	40.5	100	97	<b>6,500</b>	Limestone
B-7A	41.3	100	84	<b>6,920</b>	Limestone
B-7A	46.5	100	75	<b>3,390</b>	Limestone

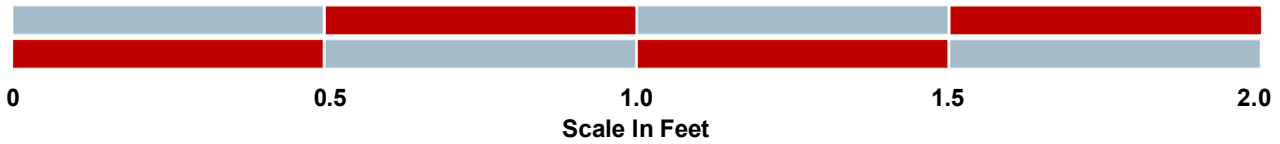


**ROCK CORE PHOTOGRAPHS**

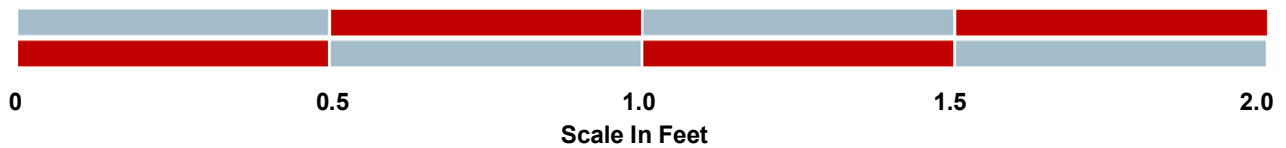
Republic Wastewater Treatment Plant Improvements ■ Republic, Missouri  
Terracon Project No. B5205029/B52151111



**Boring B-1**  
Depth: 15.5' to 25.5'



**Boring B-2**  
Depth: 23.5' to 33.5'

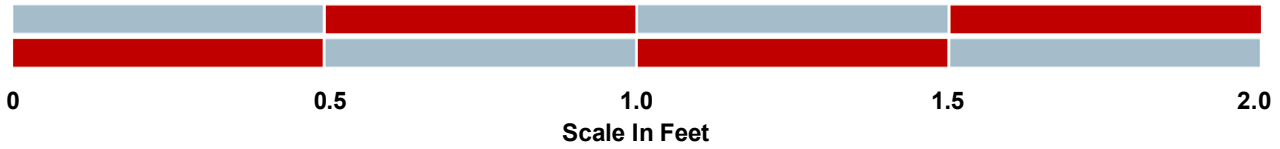


**ROCK CORE PHOTOGRAPHS**

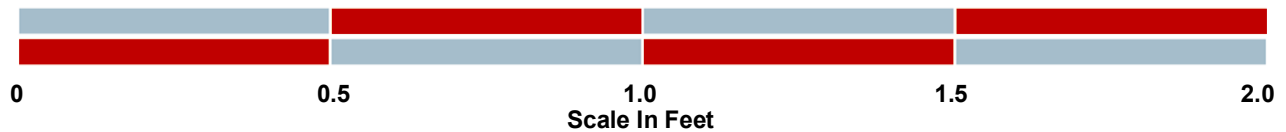
Republic Wastewater Treatment Plant Improvements ■ Republic, Missouri  
Terracon Project No. B5205029/B52151111



**Boring B-2A**  
Depth: 27.0' to 37.0'



**Boring B-3**  
Depth: 15.8' to 25.8'

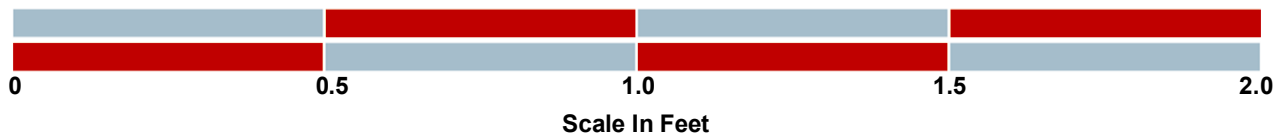


**ROCK CORE PHOTOGRAPHS**

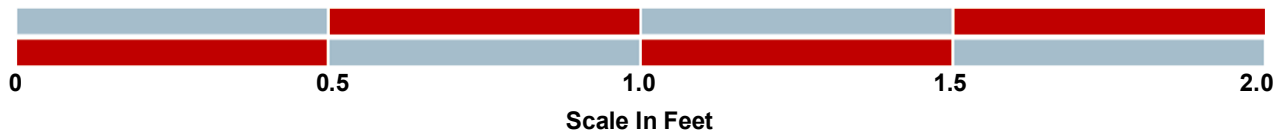
Republic Wastewater Treatment Plant Improvements ■ Republic, Missouri  
Terracon Project No. B5205029/B52151111



**Boring B-4**  
Depth: 39.2' to 49.2'



**Boring B-4A**  
Depth: 52.0' to 62.0'

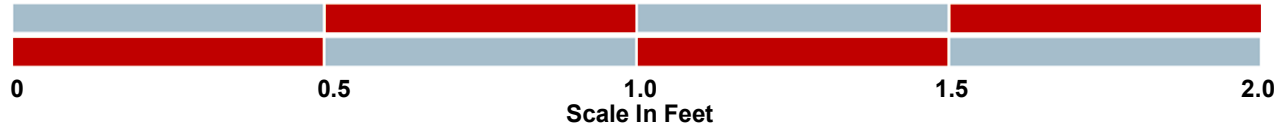


ROCK CORE PHOTOGRAPHS

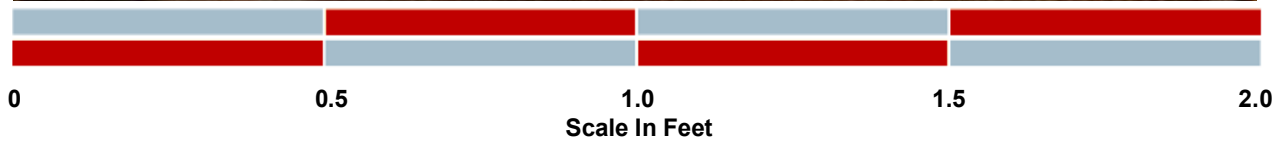
Republic Wastewater Treatment Plant Improvements ■ Republic, Missouri  
Terracon Project No. B5205029/B52151111



**Boring B-4A**  
Depth: 62.0' to 64.3'



**Boring B-5**  
Depth: 23.5' to 33.5'

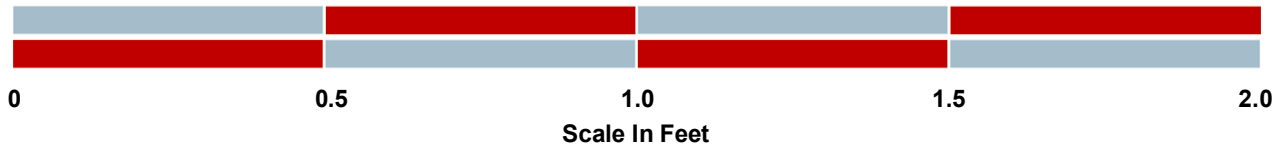


**ROCK CORE PHOTOGRAPHS**

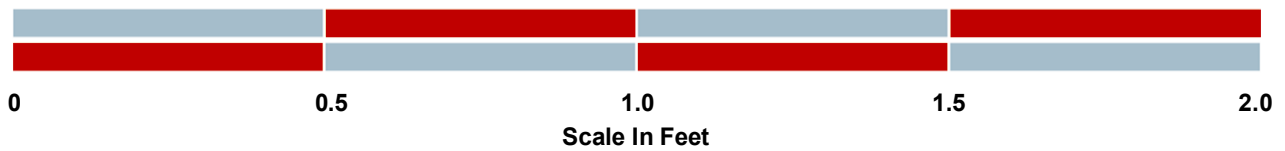
Republic Wastewater Treatment Plant Improvements ■ Republic, Missouri  
Terracon Project No. B5205029/B52151111



**Boring B-5**  
Depth: 33.5' to 42.0'



**Boring B-5A**  
Depth: 30.5' to 40.5'



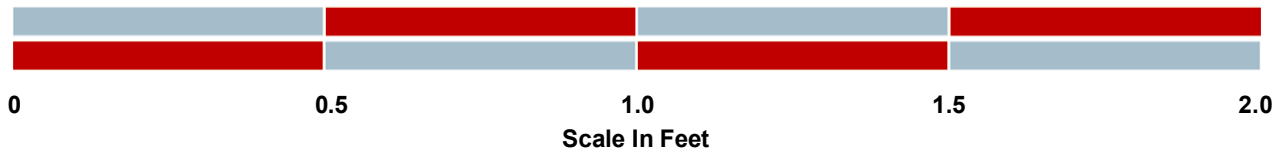
Responsive ■ Resourceful ■ Reliable

**ROCK CORE PHOTOGRAPHS**

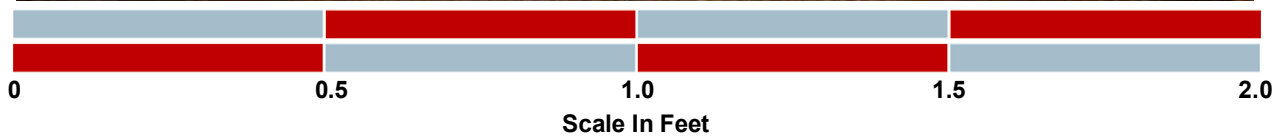
Republic Wastewater Treatment Plant Improvements ■ Republic, Missouri  
Terracon Project No. B5205029/B52151111



**Boring B-6**  
Depth: 22.3' to 32.3'



**Boring B-7**  
Depth: 28.0' to 38.0'



Responsive ■ Resourceful ■ Reliable

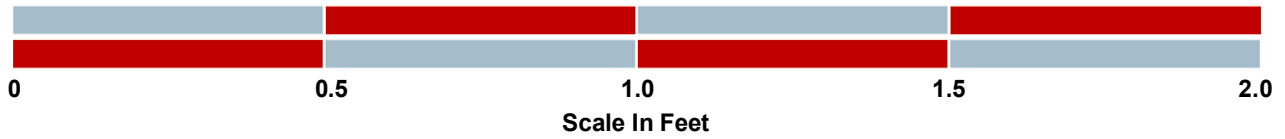


**ROCK CORE PHOTOGRAPHS**

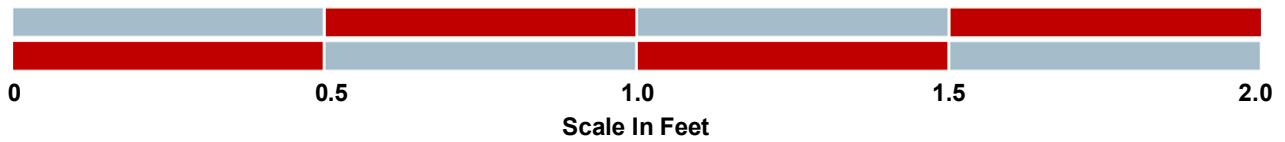
Republic Wastewater Treatment Plant Improvements ■ Republic, Missouri  
Terracon Project No. B5205029/B52151111



**Boring B-7A**  
Depth: 40.0' to 50.0'



**Boring B-8**  
Depth: 28.5' to 38.5'



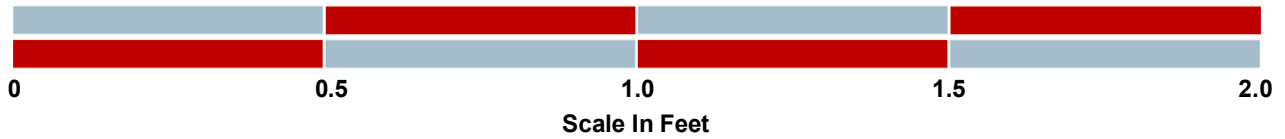
Responsive ■ Resourceful ■ Reliable

ROCK CORE PHOTOGRAPHS

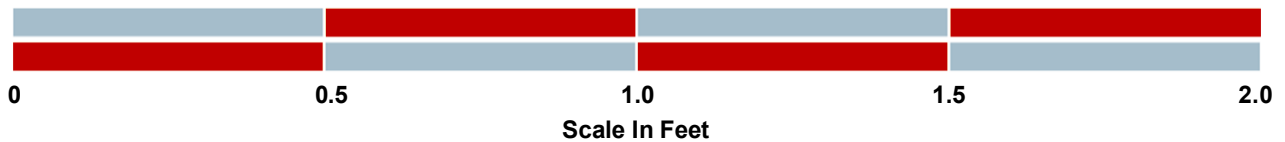
Republic Wastewater Treatment Plant Improvements ■ Republic, Missouri  
Terracon Project No. B5205029/B52151111



**Boring B-14**  
Depth: 23.0' to 33.0'



**Boring B-15**  
Depth: 30.0' to 40.0'



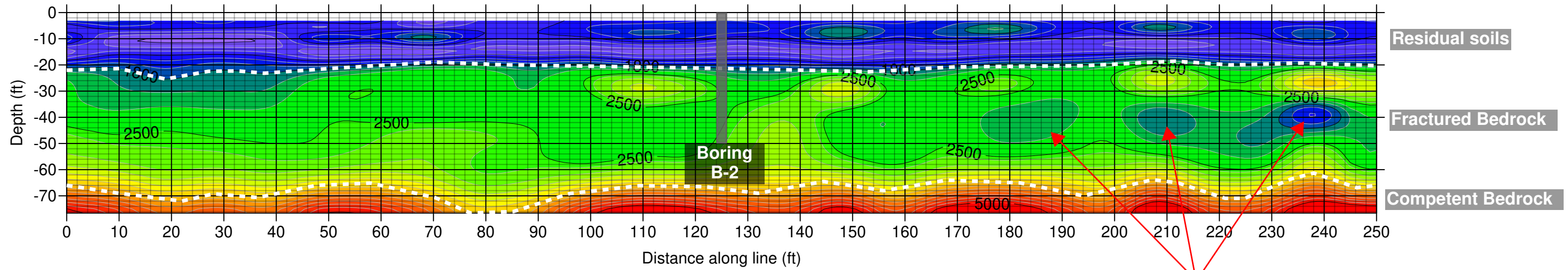
South

North

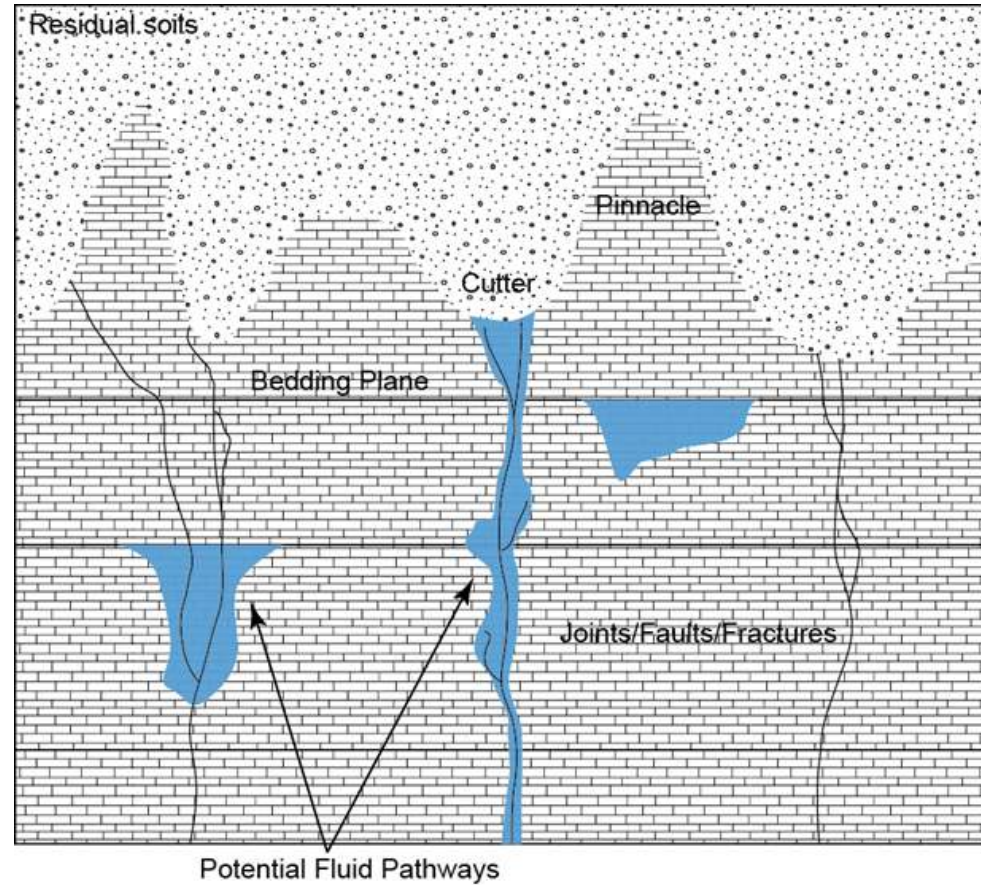
Line B-2\_C

**Start**  
 Lat: 37.13022 N  
 Lon: 93.78971 W

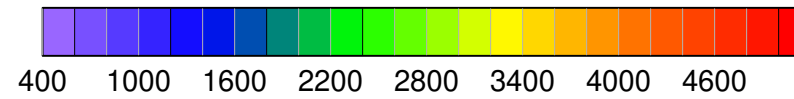
**End**  
 Lat: 37.13087 N  
 Lon: 93.48954 W




Lower velocity zones consistent with presence of clay-rich or highly fractured rock. Linear pattern is consistent with dissolution along bedding planes or dissolution and fracturing at the intersection of vertical fractures and bedding planes.



Shear Wave Velocity (ft/sec)



Soil Profile	Shear Wave Velocity (ft/s)
Hard rock	$V_s > 5,000$
Rock	$2,500 < V_s \leq 5,000$
Very dense soil and soft rock	$1,200 < V_s \leq 2,500$
Stiff soil	$600 < V_s \leq 1,200$
Soft soil	$V_s < 600$

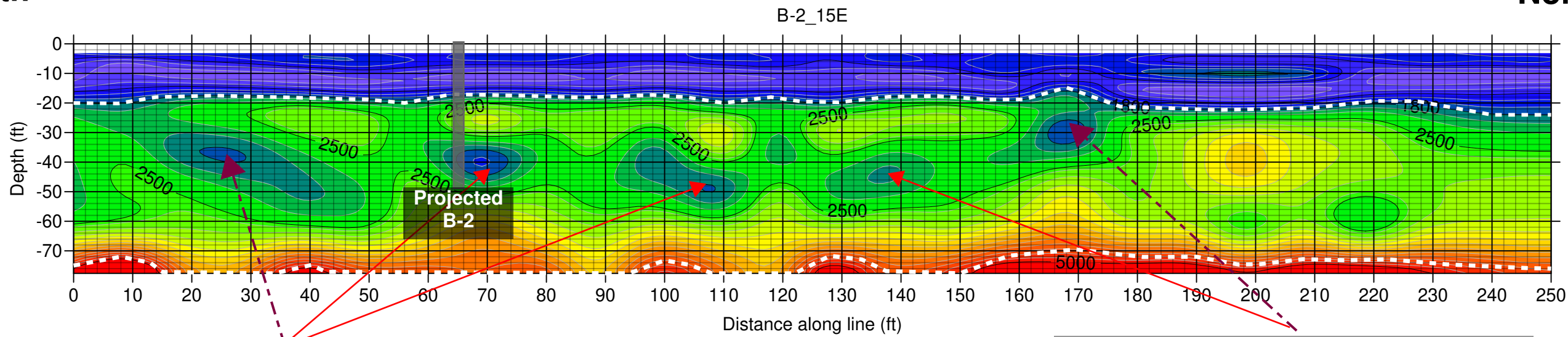
Legend	Notes	MASW Profile - Line B-2_C
	1. Profile Scales: Horizontal 1" = 20' Vertical 1" = 40'	Project: City of Republic WWTF Client: Burns & McDonald Location: Republic, MO Project No.: B5205029 Date: October 8, 2020 

South

North

**Start**  
 Lat: 37.13048 N  
 Lon: 93.48958 W

**End**  
 Lat: 37.13118 N  
 Lon: 93.48953 W

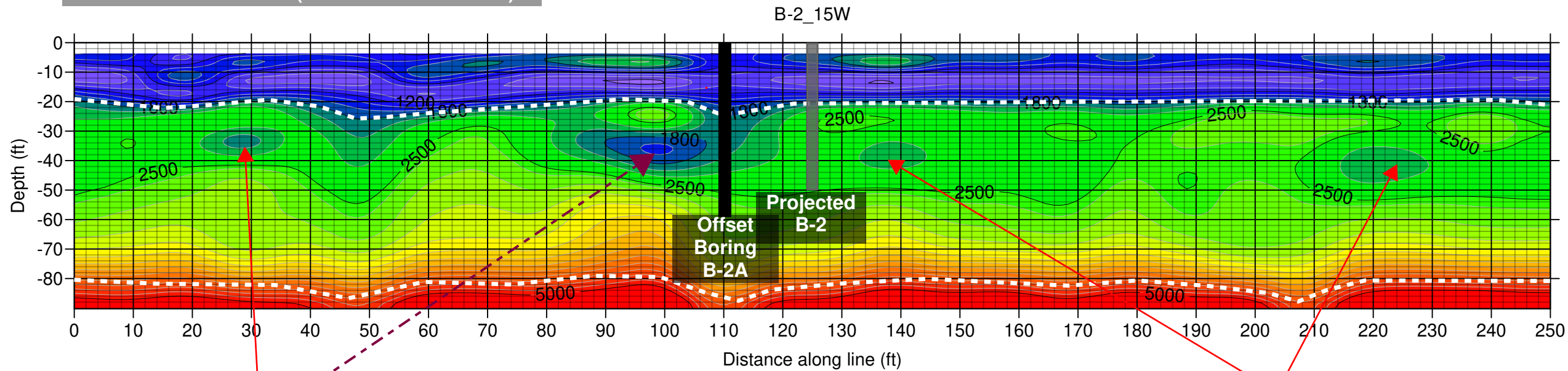


Lower velocity zones consistent with presence of clay-rich or highly fractured rock. Appears that a potential fracture zone intersects the soil-bedrock interface at this location (maroon dashed arrow).

Lower velocity zones consistent with presence of clay-rich or highly fractured rock. Appears that a potential fracture zone intersects the soil-bedrock interface at this location (maroon dashed arrow).

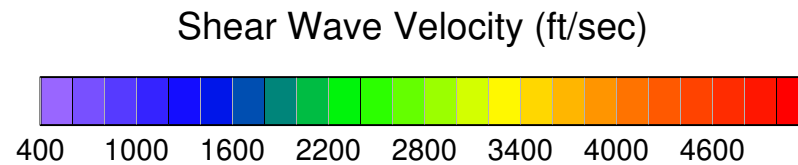
**Start**  
 Lat: 37.13024 N  
 Lon: 93.48969 W

**End**  
 Lat: 37.13090 N  
 Lon: 93.48963 W



Lower velocity zones consistent with presence of clay-rich or highly fractured rock. Appears that a potential fracture zone intersects the soil-bedrock interface at this location (maroon dashed arrow).

Lower velocity zones consistent with presence of clay-rich or highly fractured rock. Linear pattern is consistent with dissolution along bedding planes or dissolution and fracturing at the intersection of vertical fractures and bedding planes.



Soil Profile	Shear Wave Velocity (ft/s)
Hard rock	$V_s > 5,000$
Rock	$2,500 < V_s \leq 5,000$
Very dense soil and soft rock	$1,200 < V_s \leq 2,500$
Stiff soil	$600 < V_s \leq 1,200$
Soft soil	$V_s < 600$

Legend

Notes

1. Profile Scales: Horizontal 1" = 20'  
 Vertical 1" = 40'

MASW Profiles - B-2\_15E & B-2\_15W

Project: City of Republic WWTF  
 Client: Burns & McDonald  
 Location: Republic, MO  
 Project No.: B5205029  
 Date: October 8, 2020

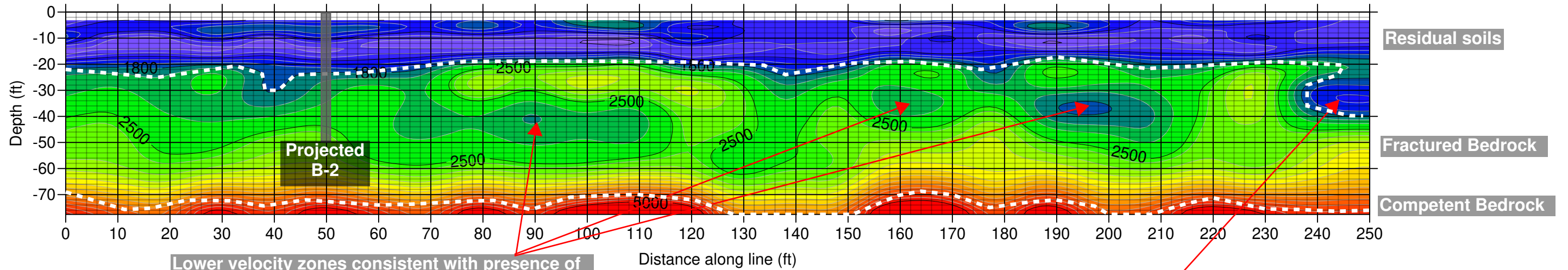


South

North

Line B-2\_30E

**Start**  
 Lat: 37.13050 N  
 Lon: 93.48954 W  
**End**  
 Lat: 37.13118 N  
 Lon: 93.48947 W

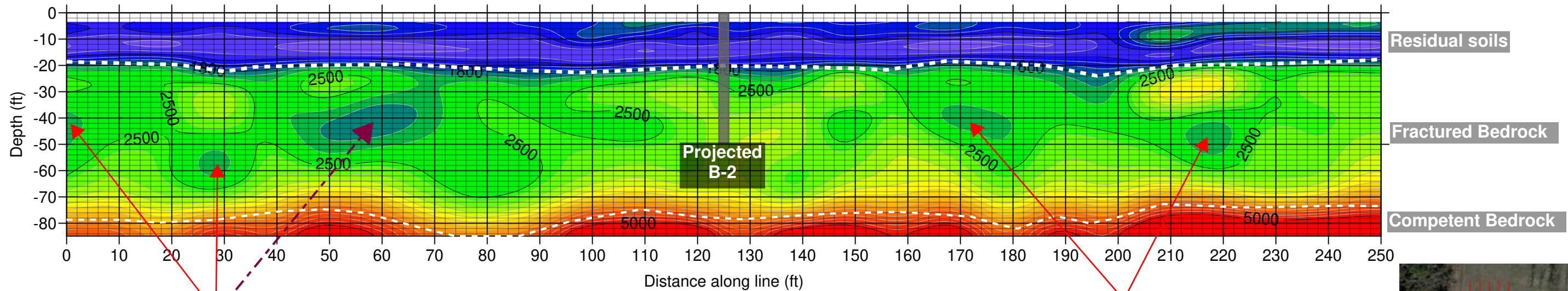


Lower velocity zones consistent with presence of clay-rich or highly fractured rock. Linear pattern is consistent with dissolution along bedding planes or dissolution and fracturing at the intersection of vertical fractures and bedding planes.

Apparent change in relief of about 10 feet for the soil-bedrock interface at the north end of the line.

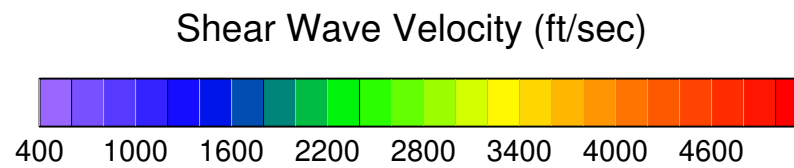
Line B-2\_30W

**Start**  
 Lat: 37.13020 N  
 Lon: 93.48975 W  
**End**  
 Lat: 37.13090 N  
 Lon: 93.48975 W



Lower velocity zones consistent with presence of clay-rich or highly fractured rock. Appears that a potential fracture zone intersects the soil-bedrock interface at this location (maroon dashed arrow).

Lower velocity zones consistent with presence of clay-rich or highly fractured rock. Linear pattern is consistent with dissolution along bedding planes or dissolution and fracturing at the intersection of vertical fractures and bedding planes.



Soil Profile	Shear Wave Velocity (ft/s)
Hard rock	$V_s > 5,000$
Rock	$2,500 < V_s \leq 5,000$
Very dense soil and soft rock	$1,200 < V_s \leq 2,500$
Stiff soil	$600 < V_s \leq 1,200$
Soft soil	$V_s < 600$

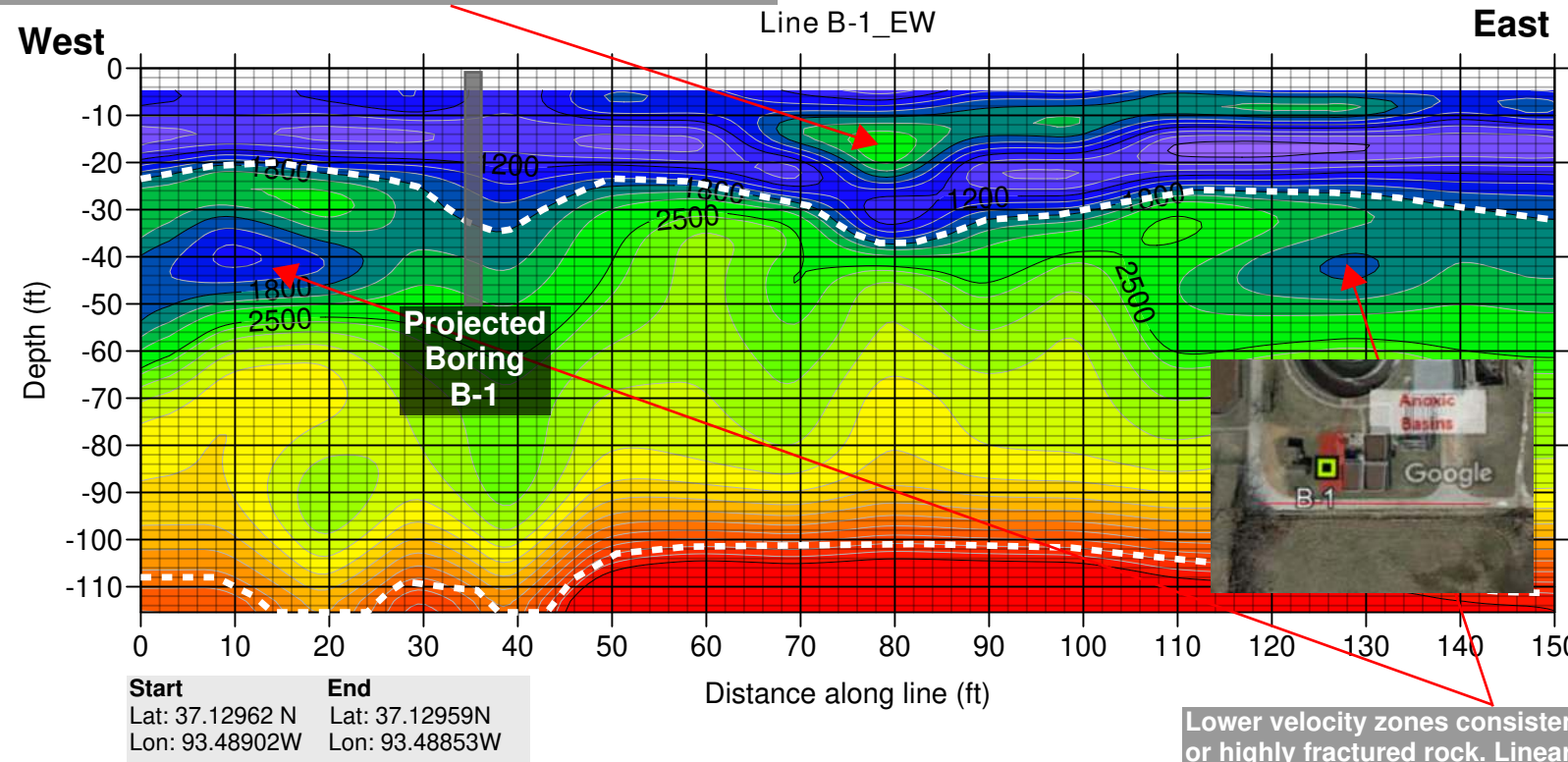
Legend

Notes
1. Profile Scales: Horizontal 1" = 20' Vertical 1" = 40'

MASW Profile - Line B-2_30E & B-2_30W
Project: City of Republic WWTF Client: Burns & McDonald Location: Republic, MO Project No.: B5205029 Date: October 8, 2020



Potentially a large boulder (weathered caprock) over stiff soil.



**Start**  
Lat: 37.12962 N  
Lon: 93.48902W

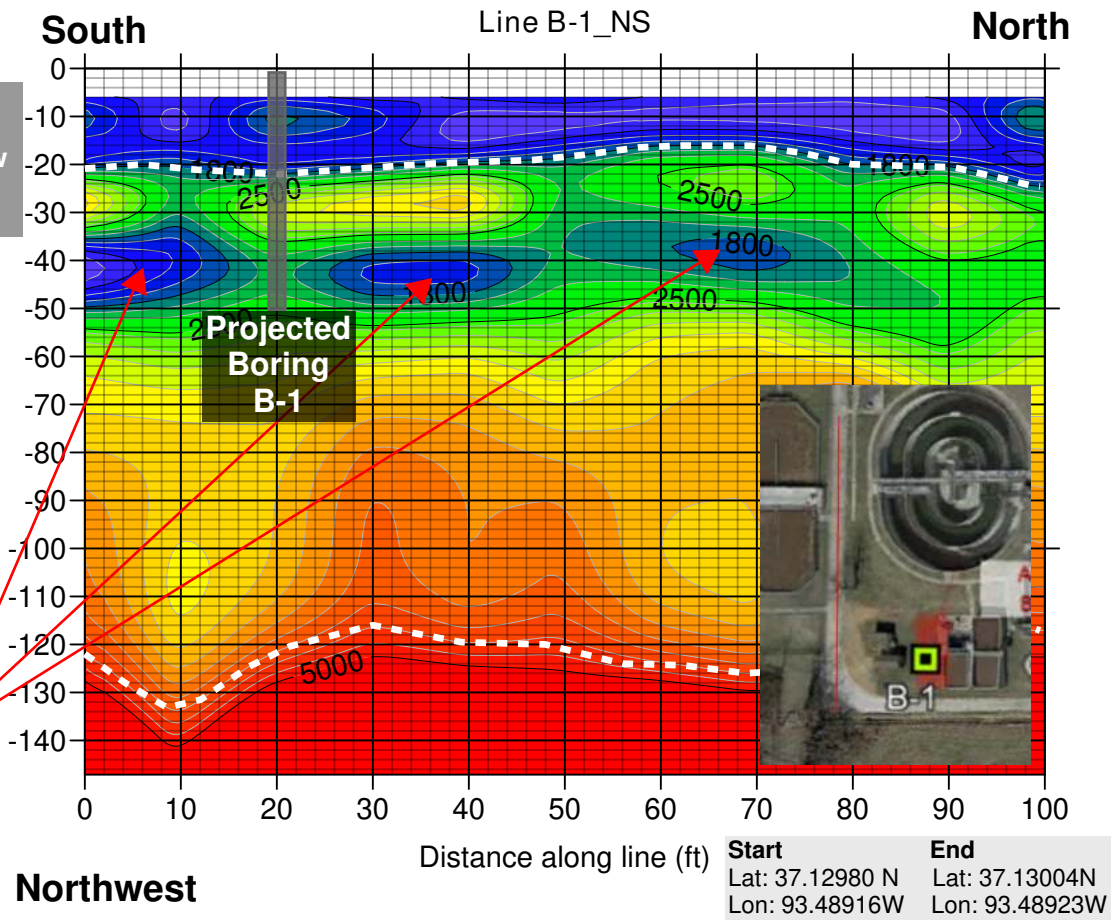
**End**  
Lat: 37.12959 N  
Lon: 93.48853W

Residual soils: Shear wave velocities consistent with potentially soft soils. Shallow excavations may encounter cobbles and boulders.

Fractured Bedrock

Competent Bedrock

Lower velocity zones consistent with presence of clay-rich or highly fractured rock. Linear pattern is consistent with dissolution along bedding planes or dissolution and fracturing at the intersection of vertical fractures and bedding planes.



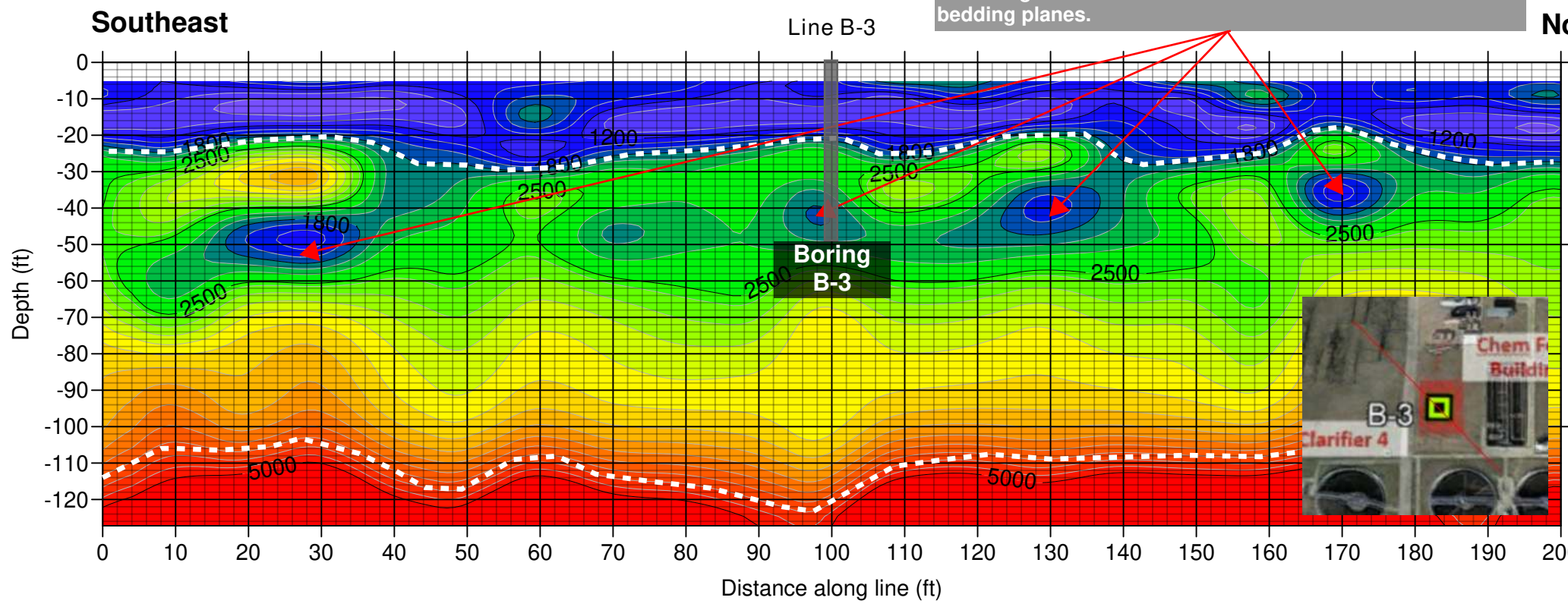
**Start**  
Lat: 37.12980 N  
Lon: 93.48916W

**End**  
Lat: 37.13004 N  
Lon: 93.48923W

Residual soils: Shear wave velocities consistent with potentially soft soils.

Fractured Bedrock

Competent Bedrock



**Start**  
Lat: 37.13065 N  
Lon: 93.48893W

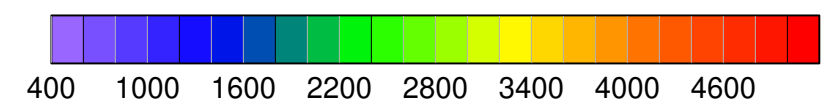
**End**  
Lat: 37.13099 N  
Lon: 93.48946W

Residual soils: Shear wave velocities consistent with potentially soft soils.

Fractured Bedrock

Competent Bedrock

Shear Wave Velocity (ft/sec)



Soil Profile	Shear Wave Velocity (ft/s)
Hard rock	$V_s > 5,000$
Rock	$2,500 < V_s \leq 5,000$
Very dense soil and soft rock	$1,200 < V_s \leq 2,500$
Stiff soil	$600 < V_s \leq 1,200$
Soft soil	$V_s < 600$

Legend

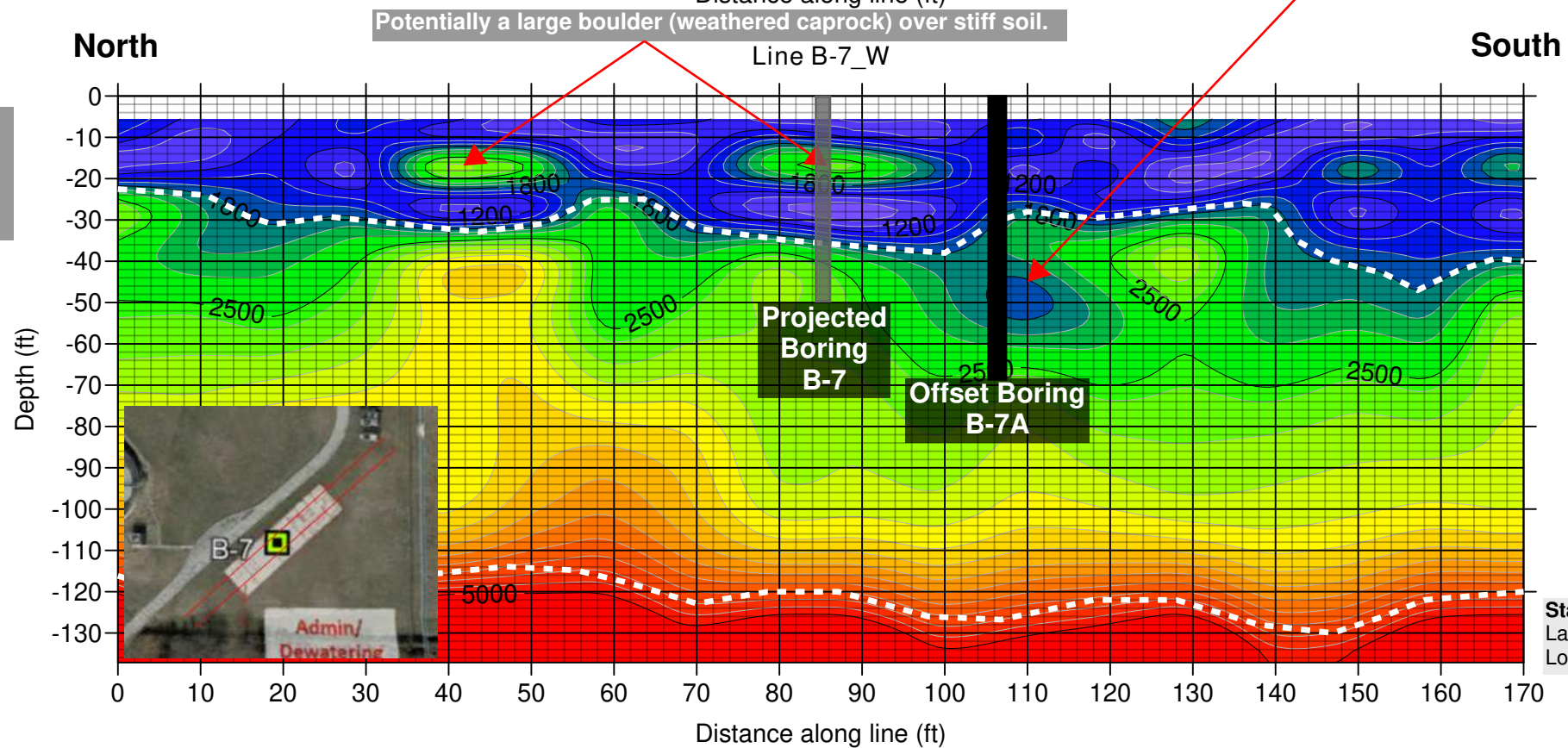
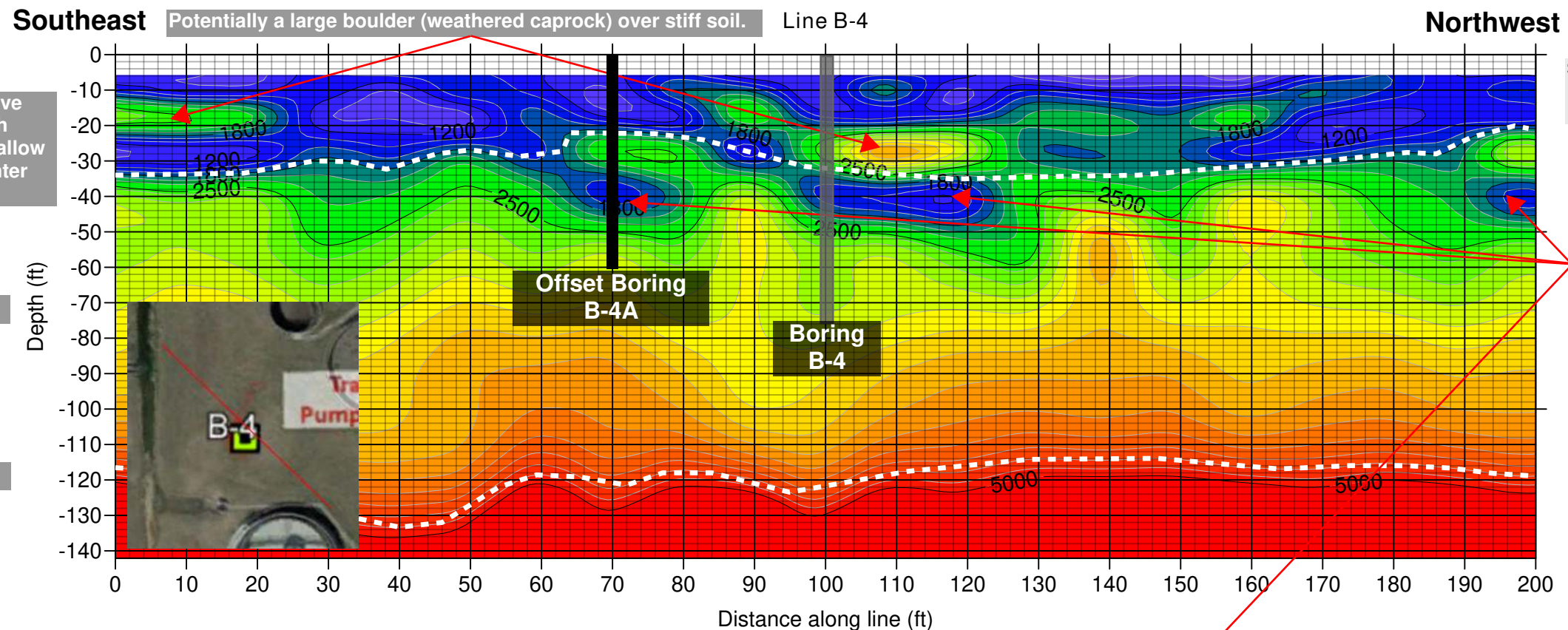
Notes

1. Profile Scales: Horizontal 1" = 20'  
Vertical 1" = 40'

MASW Profiles - B-1\_EW, NS & B-3

Project: City of Republic WWTF  
Client: Burns & McDonald  
Location: Republic, MO  
Project No.: B5205029  
Date: October 9, 2020





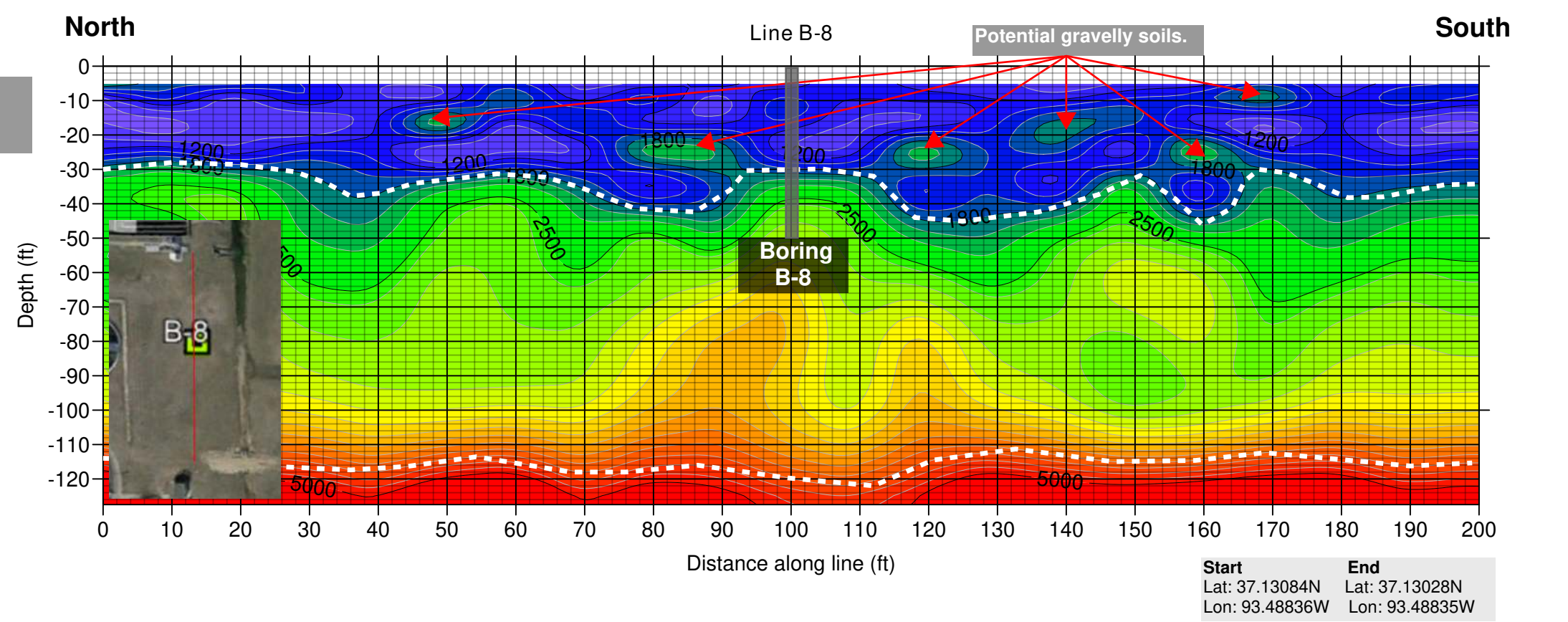
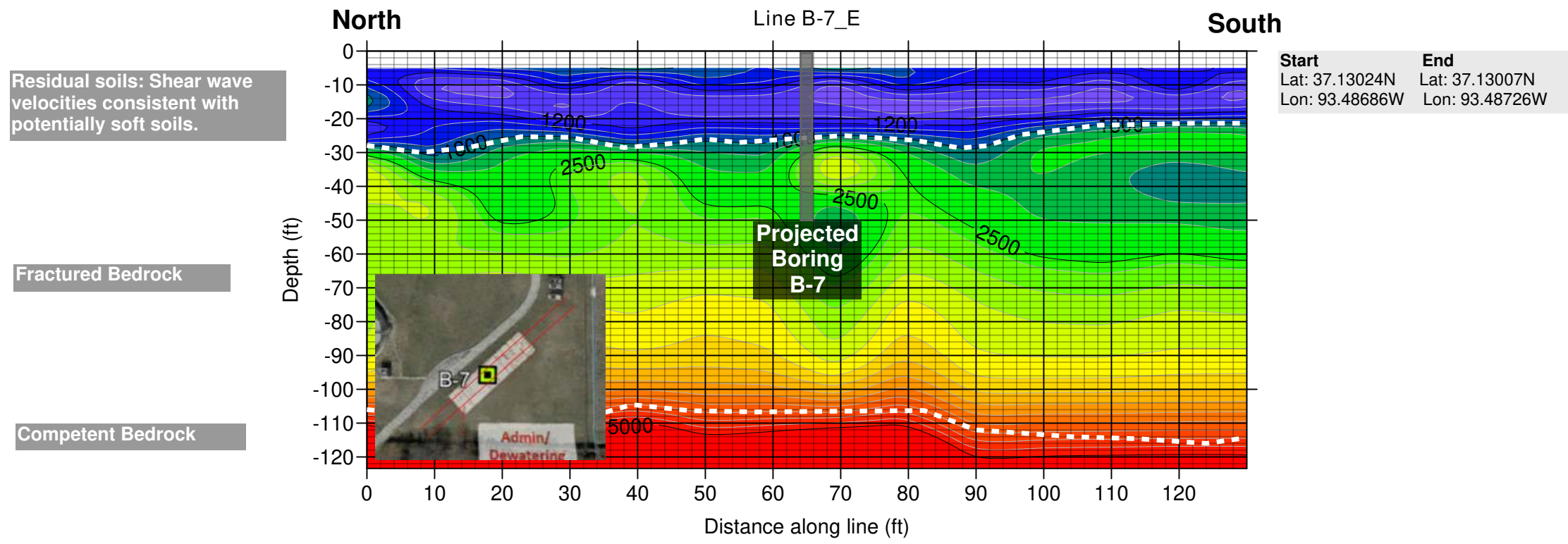
Soil Profile	Shear Wave Velocity (ft/s)
Hard rock	$V_s > 5,000$
Rock	$2,500 < V_s \leq 5,000$
Very dense soil and soft rock	$1,200 < V_s \leq 2,500$
Stiff soil	$600 < V_s \leq 1,200$
Soft soil	$V_s < 600$

Legend

Notes
1. Profile Scales: Horizontal 1" = 20' Vertical 1" = 40'

MASW Profiles - B-4 & B-7\_W

Project: City of Republic WWTF  
Client: Burns & McDonald  
Location: Republic, MO  
Project No.: B5205029  
Date: October 9, 2020



Soil Profile	Shear Wave Velocity (ft/s)
Hard rock	$V_s > 5,000$
Rock	$2,500 < V_s \leq 5,000$
Very dense soil and soft rock	$1,200 < V_s \leq 2,500$
Stiff soil	$600 < V_s \leq 1,200$
Soft soil	$V_s < 600$

Legend

Notes
1. Profile Scales: Horizontal 1" = 20' Vertical 1" = 40'

MASW Profiles - B-7\_E & B-8

Project: City of Republic WWTF  
 Client: Burns & McDonald  
 Location: Republic, MO  
 Project No.: B5205029  
 Date: October 9, 2020



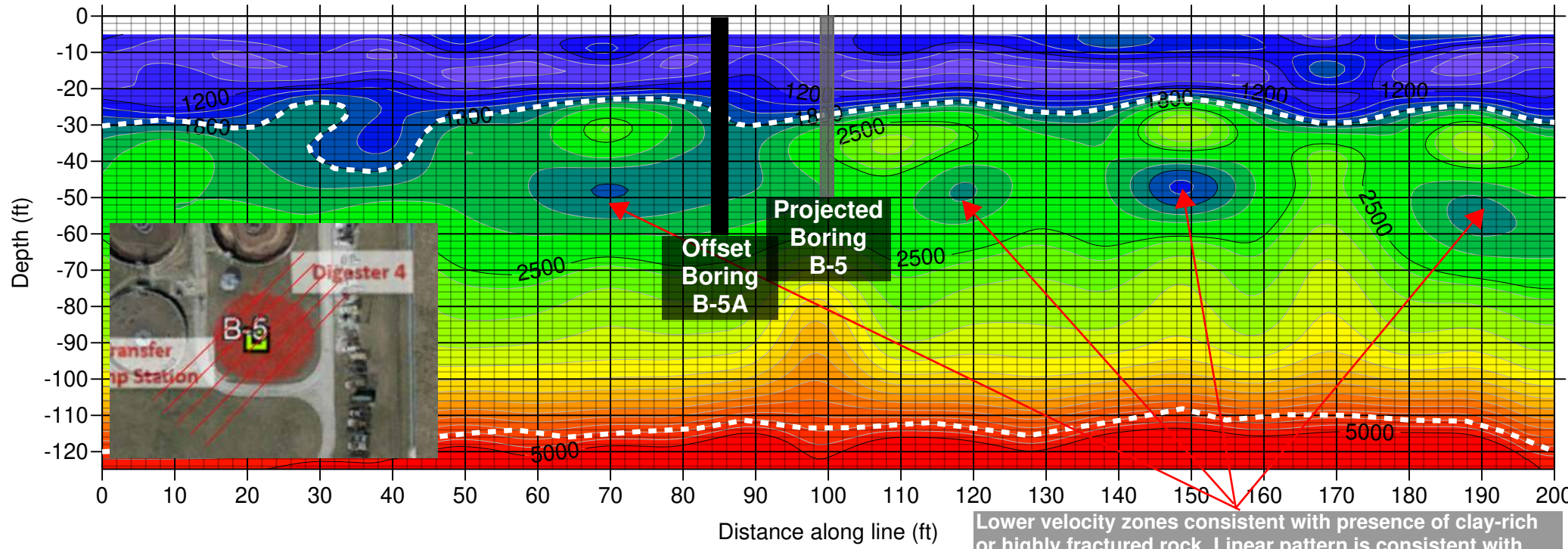
# Northeast

Line B-5\_15E

# Southwest

**Start**  
 Lat: 37.13100 N  
 Lon: 93.48699 W

**End**  
 Lat: 37.13049 N  
 Lon: 93.48730 W



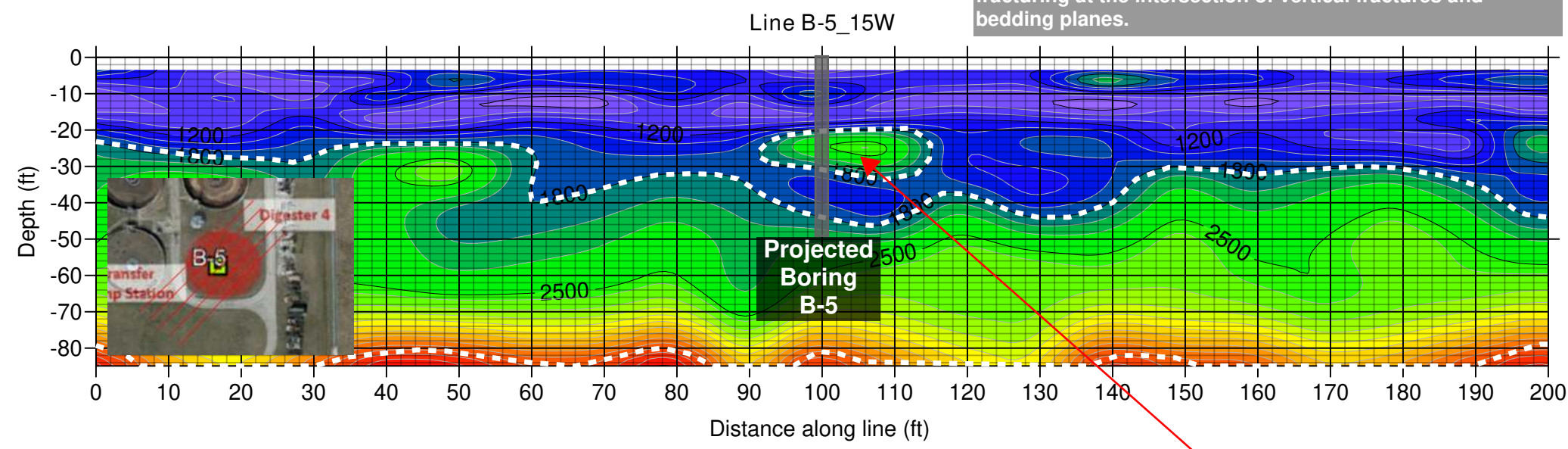
Residual soils: Shear wave velocities indicate potentially soft soils.

Fractured Bedrock

Competent Bedrock

**Start**  
 Lat: 37.13087 N  
 Lon: 93.48714 W

**End**  
 Lat: 37.13041 N  
 Lon: 93.48746 W



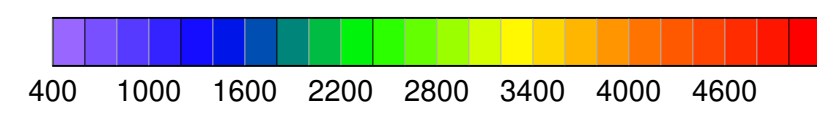
Residual soils: Shear wave velocities consistent with potentially soft soils. Shallow excavations may encounter cobbles and boulders.

Fractured Bedrock

Competent Bedrock

Potentially a large boulder (weathered caprock) over stiff soil.

Shear Wave Velocity (ft/sec)



Soil Profile	Shear Wave Velocity (ft/s)
Hard rock	$V_s > 5,000$
Rock	$2,500 < V_s \leq 5,000$
Very dense soil and soft rock	$1,200 < V_s \leq 2,500$
Stiff soil	$600 < V_s \leq 1,200$
Soft soil	$V_s < 600$

Legend

Notes
1. Profile Scales: Horizontal 1" = 20' Vertical 1" = 40'

MASW Profiles - B-5\_15E & B-5\_15W

Project: City of Republic WWTF  
 Client: Burns & McDonald  
 Location: Republic, MO  
 Project No.: B5205029  
 Date: October 8, 2020

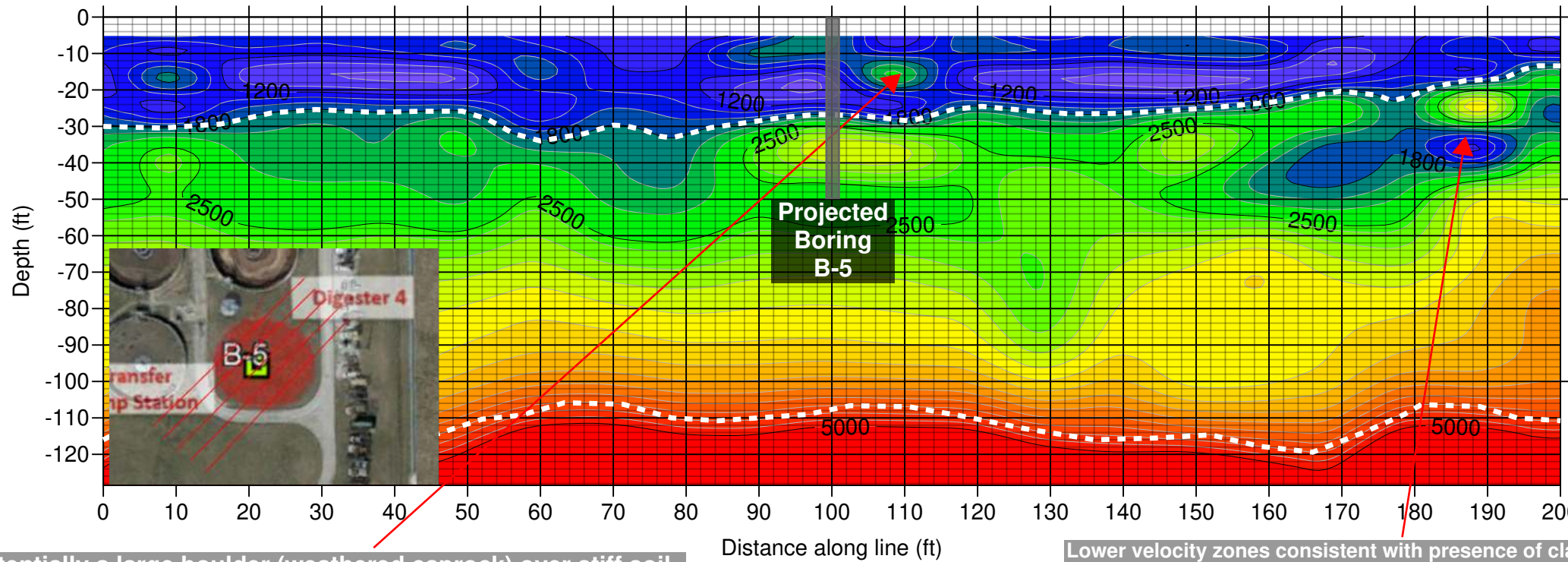
# Northeast

Line B-5\_30E

# Southwest

**Start**  
 Lat: 37.13100 N  
 Lon: 93.48699 W

**End**  
 Lat: 37.13049 N  
 Lon: 93.48730 W



Residual soils: Shear wave velocities consistent with potentially soft soils. Shallow excavations may encounter cobbles and boulders.

Fractured Bedrock

Competent Bedrock

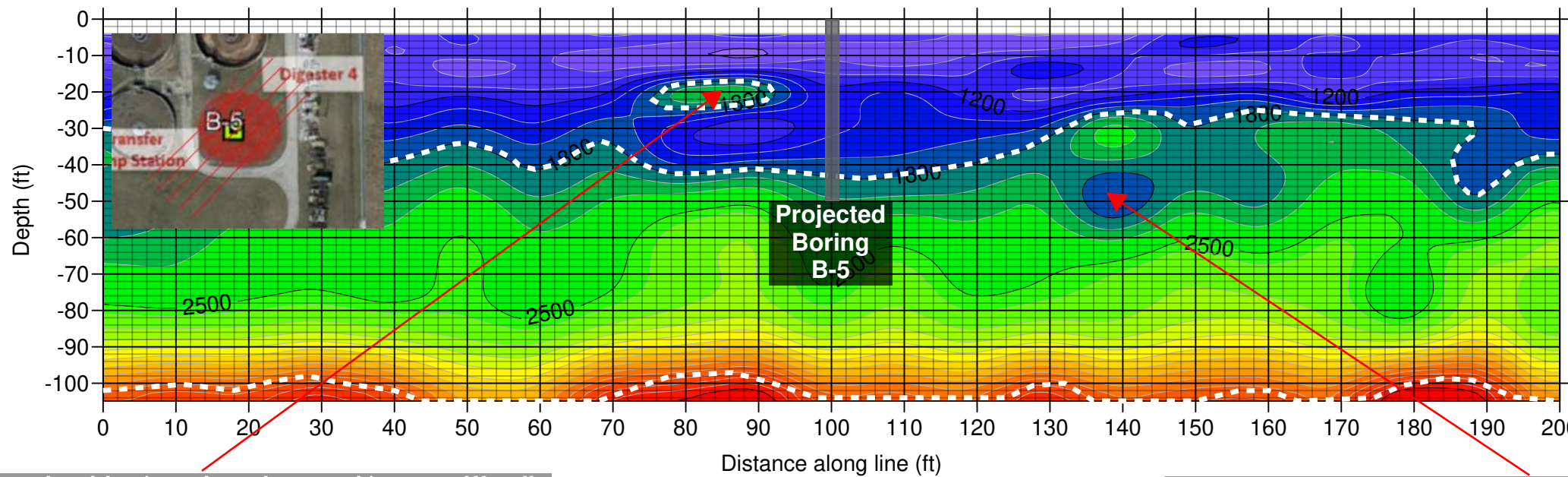
Potentially a large boulder (weathered caprock) over stiff soil.

Lower velocity zones consistent with presence of clay-rich or highly fractured rock. Appears that a potential fracture zone intersects the soil-bedrock interface at this location.

Line B-5\_30W

**Start**  
 Lat: 37.13085 N  
 Lon: 93.48724 W

**End**  
 Lat: 37.13035 N  
 Lon: 93.48762 W



Residual soils: Shear wave velocities consistent with potentially soft soils.

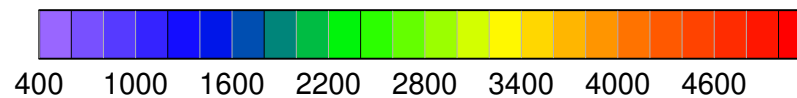
Fractured Bedrock

Competent Bedrock

Potentially a large boulder (weathered caprock) over stiff soil.

Lower velocity zones consistent with presence of clay-rich or highly fractured rock. Appears that a potential fracture zone intersects the soil-bedrock interface at this location.

Shear Wave Velocity (ft/sec)



Soil Profile	Shear Wave Velocity (ft/s)
Hard rock	$V_s > 5,000$
Rock	$2,500 < V_s \leq 5,000$
Very dense soil and soft rock	$1,200 < V_s \leq 2,500$
Stiff soil	$600 < V_s \leq 1,200$
Soft soil	$V_s < 600$

Legend

Notes

1. Profile Scales: Horizontal 1" = 20'  
 Vertical 1" = 40'

MASW Profiles - B-5\_30E & B-5\_30W

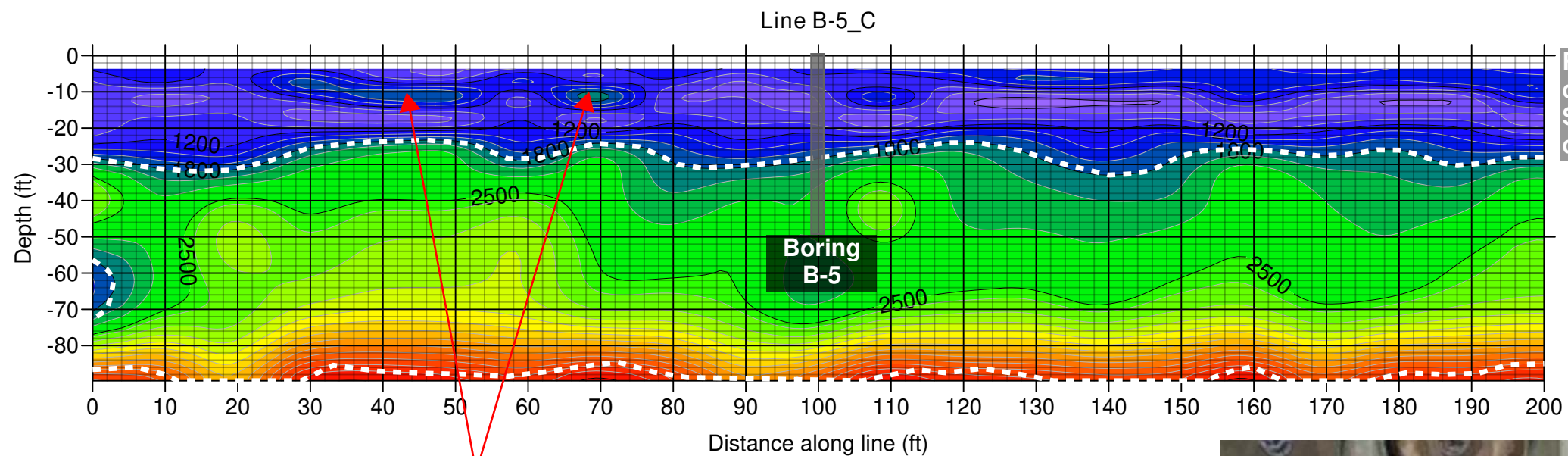
Project: City of Republic WWTF  
 Client: Burns & McDonald  
 Location: Republic, MO  
 Project No.: B5205029  
 Date: October 8, 2020



Northeast

Southwest

**Start**  
 Lat: 37.13101N  
 Lon: 93.48701W  
**End**  
 Lat: 37.13054N  
 Lon: 93.48734W



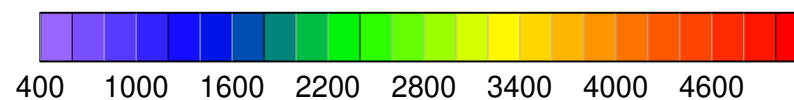
Residual soils: Shear wave velocities consistent with potentially soft soils. Shallow excavations may encounter cobbles and boulders.

Fractured Bedrock

Competent Bedrock

Potentially a large boulder (weathered caprock) over soft soil.

Shear Wave Velocity (ft/sec)



Soil Profile	Shear Wave Velocity (ft/s)
Hard rock	$V_s > 5,000$
Rock	$2,500 < V_s \leq 5,000$
Very dense soil and soft rock	$1,200 < V_s \leq 2,500$
Stiff soil	$600 < V_s \leq 1,200$
Soft soil	$V_s < 600$

Legend	Notes	MASW Profile - B-5_C
	1. Profile Scales: Horizontal 1" = 20' Vertical 1" = 40'	Project: City of Republic WWTF Client: Burns & McDonald Location: Republic, MO Project No.: B5205029 Date: October 8, 2020

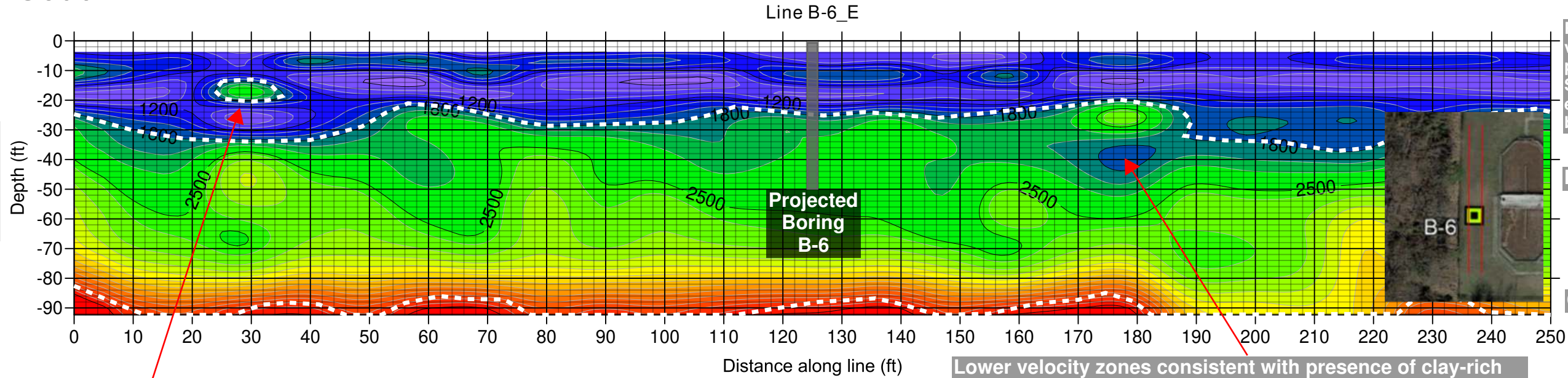


South

North

**Start**  
Lat: 37.12994N  
Lon: 93.48970W

**End**  
Lat: 37.13061N  
Lon: 93.48966W



Residual soils: Shear wave velocities consistent with potentially soft soils. Shallow excavations may encounter cobbles and boulders.

Fractured Bedrock

Competent Bedrock

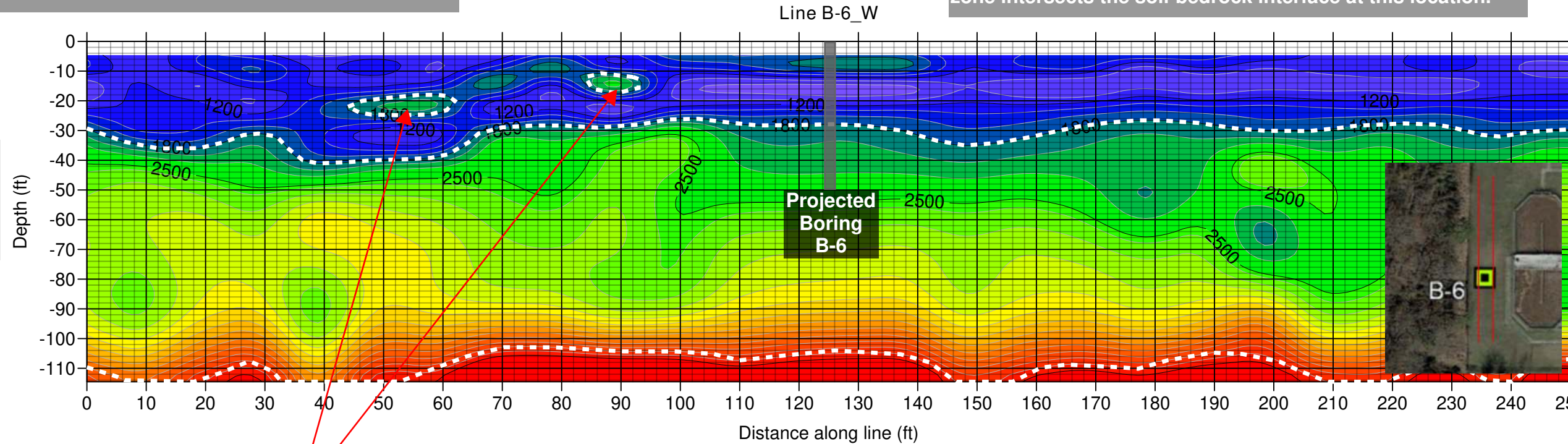


Potentially a large boulder (weathered caprock) over soft soil.

Lower velocity zones consistent with presence of clay-rich or highly fractured rock. Appears that a potential fracture zone intersects the soil-bedrock interface at this location.

**Start**  
Lat: 37.12988N  
Lon: 93.48985W

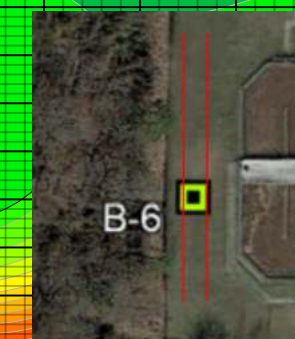
**End**  
Lat: 37.13056N  
Lon: 93.48973W



Residual soils: Shear wave velocities consistent with potentially soft soils. Shallow excavations may encounter cobbles and boulders.

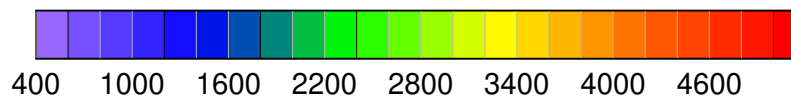
Fractured Bedrock

Competent Bedrock



Potentially a large boulder (weathered caprock) over soft soil.

Shear Wave Velocity (ft/sec)



Soil Profile	Shear Wave Velocity (ft/s)
Hard rock	$V_s > 5,000$
Rock	$2,500 < V_s \leq 5,000$
Very dense soil and soft rock	$1,200 < V_s \leq 2,500$
Stiff soil	$600 < V_s \leq 1,200$
Soft soil	$V_s < 600$

Legend

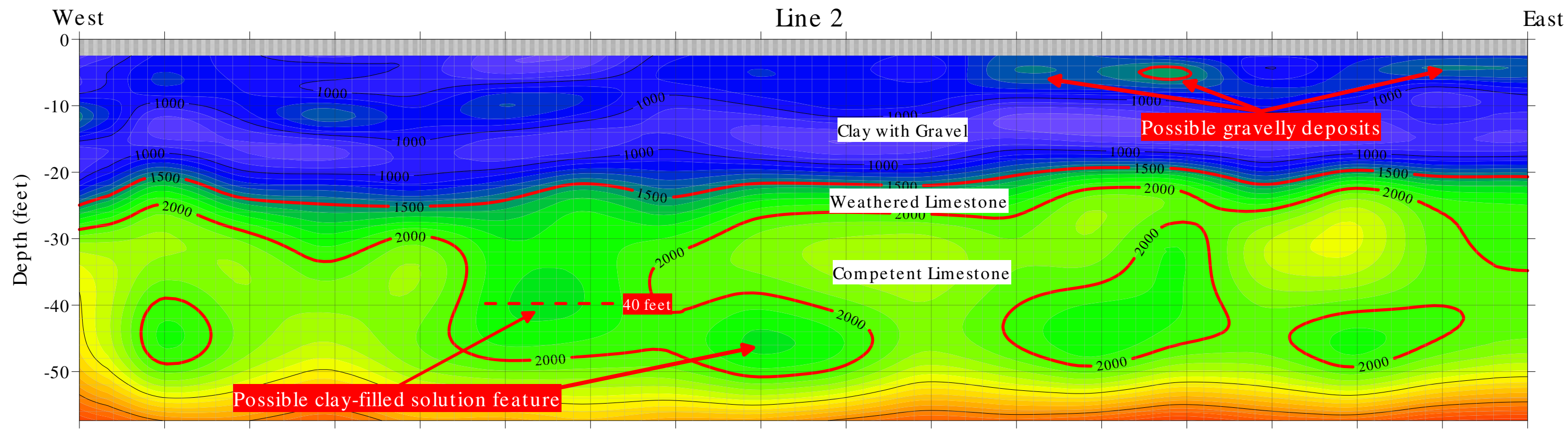
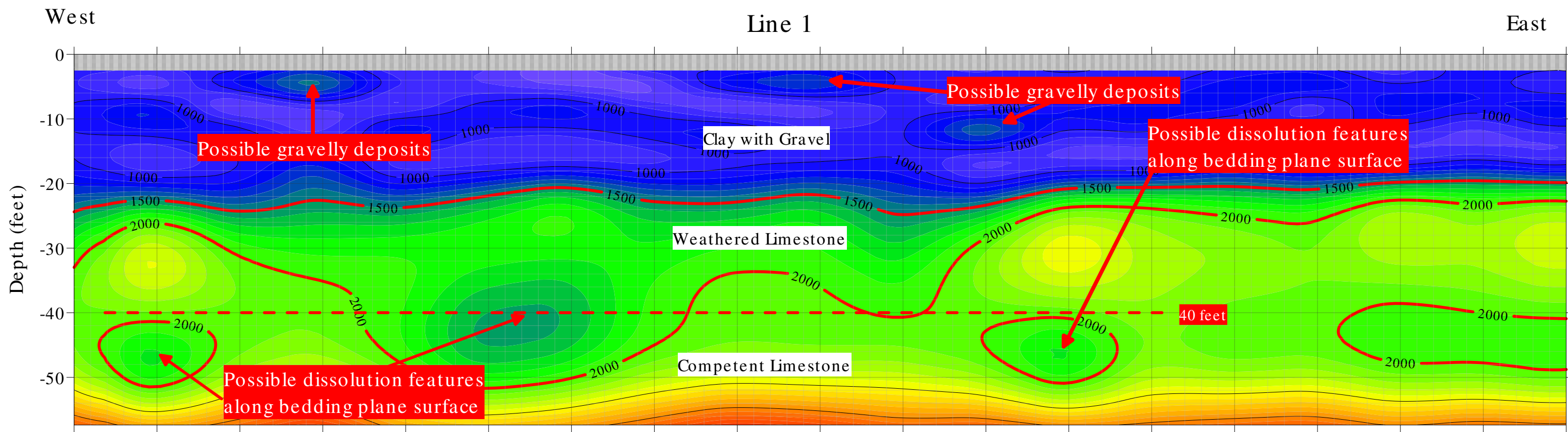
Notes

1. Profile Scales: Horizontal 1" = 20'  
Vertical 1" = 40'

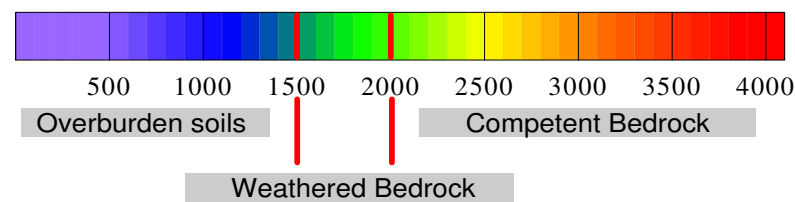
MASW Profiles - B-6\_E & B-6\_W

Project: City of Republic WWTF  
Client: Burns & McDonald  
Location: Republic, MO  
Project No.: B5205029  
Date: October 8, 2020





Surface Wave Velocity (feet/second)



Soil Properties Table

Soil Profile	Shear Wave Velocity (ft/s)
Hard rock	$V_s > 5,000$
Rock	$2,500 < V_s \leq 5,000$
Very dense soil and soft rock	$1,200 < V_s \leq 2,500$
Stiff soil	$600 < V_s \leq 1,200$
Soft soil	$V_s < 600$

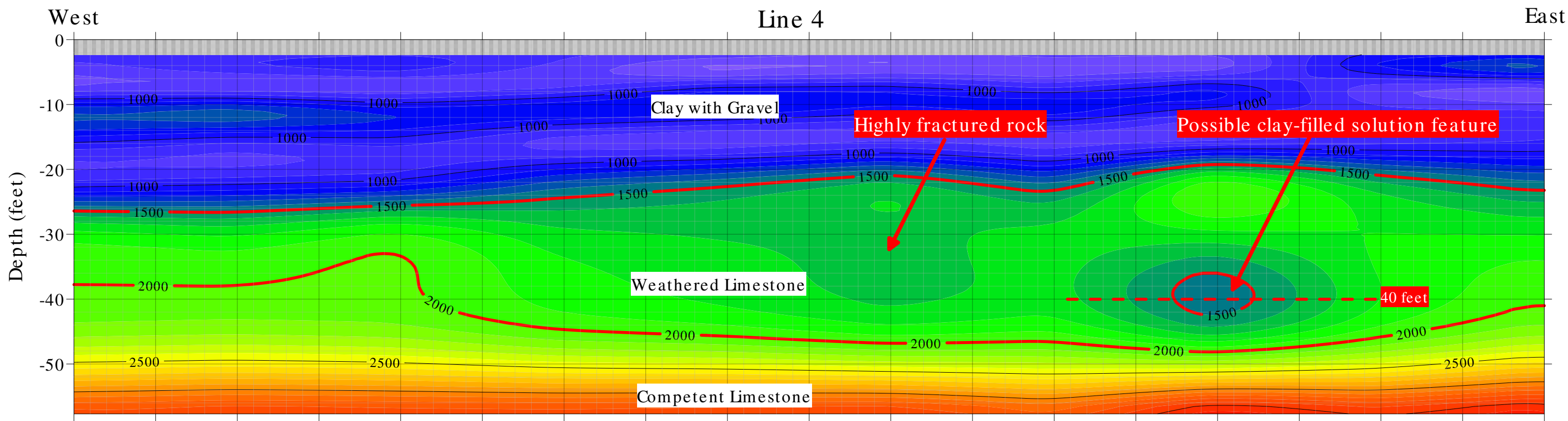
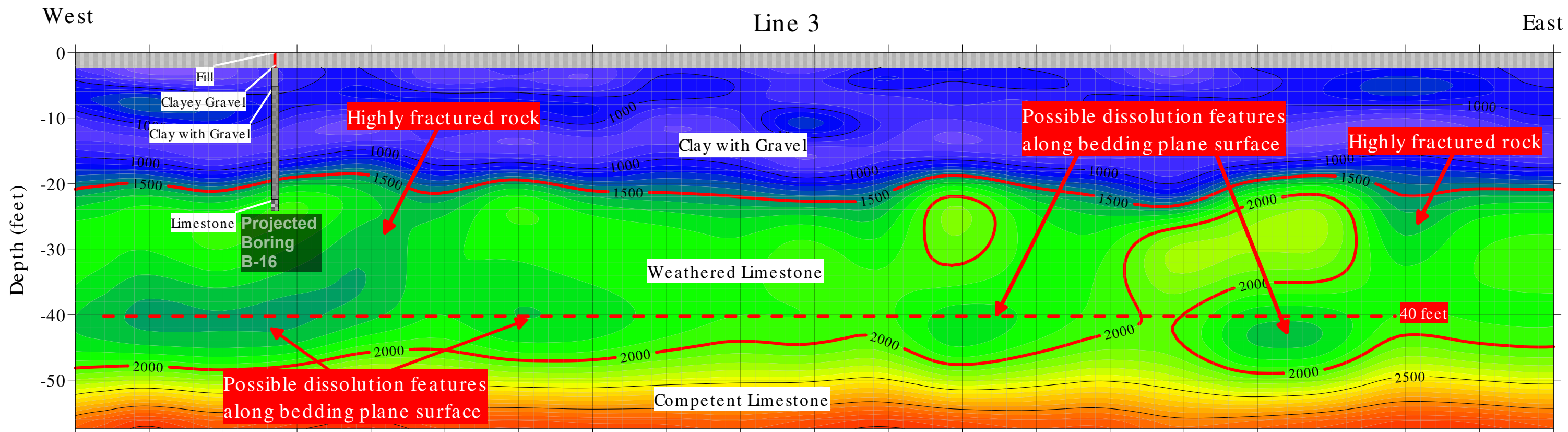
Notes

1. Red contours indicate approximate locations of material type changes.
2. Red dashed line represents possible dissolution features along a bedding plane at about 40 feet bsg.
3. Major gridlines on 10-foot intervals

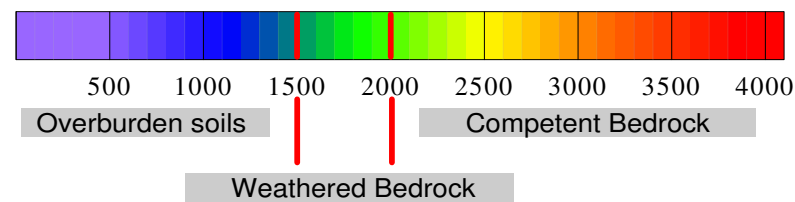
MASW Cross Sections

Project: Republic WWTF  
 Client: Burns & McDonnell  
 Location: Republic, Missouri  
 Terracon Project No.: B5215111  
 Date: July 26, 2022





Surface Wave Velocity (feet/second)



Soil Properties Table

Soil Profile	Shear Wave Velocity (ft/s)
Hard rock	$V_s > 5,000$
Rock	$2,500 < V_s \leq 5,000$
Very dense soil and soft rock	$1,200 < V_s \leq 2,500$
Stiff soil	$600 < V_s \leq 1,200$
Soft soil	$V_s < 600$

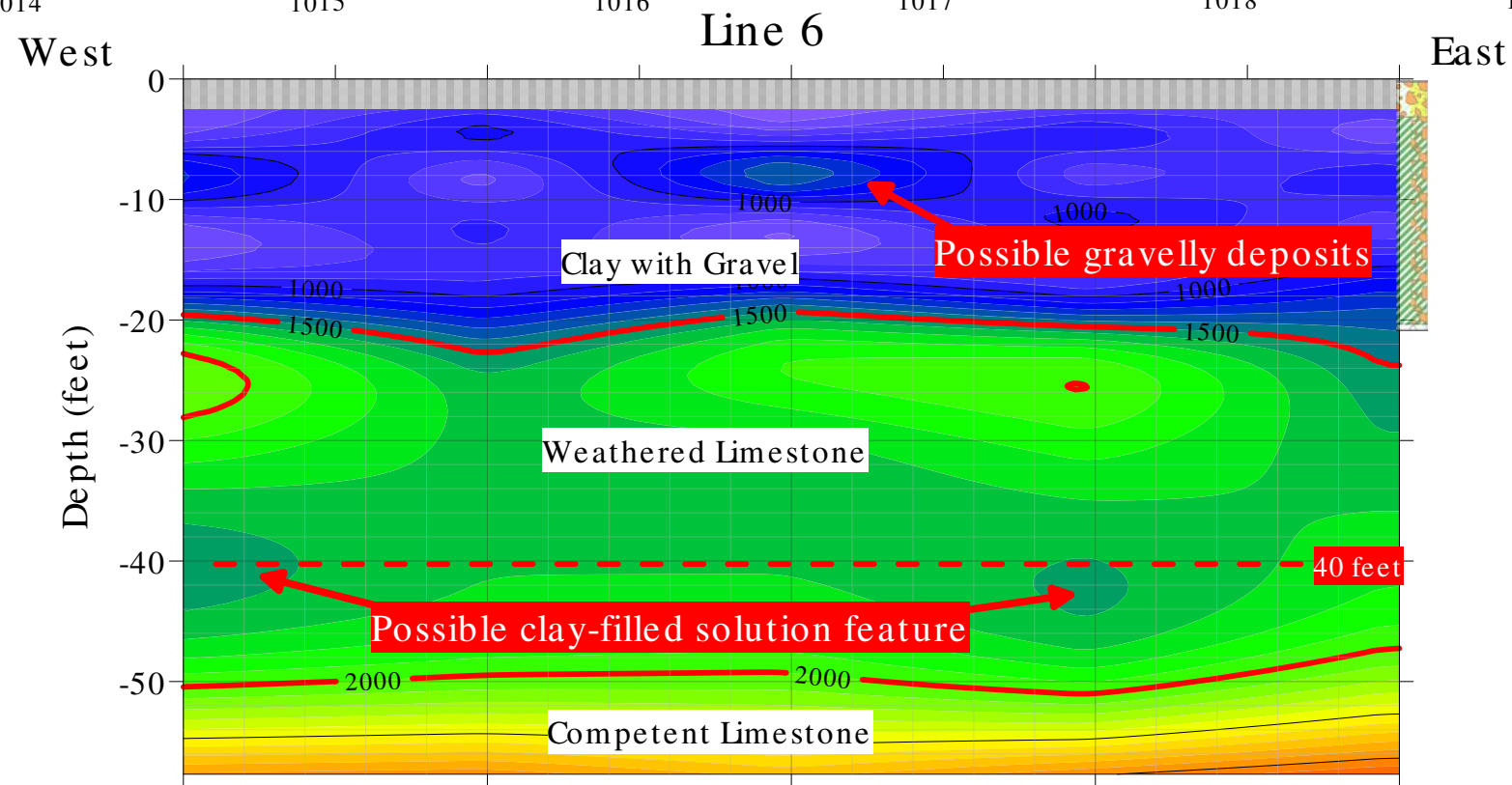
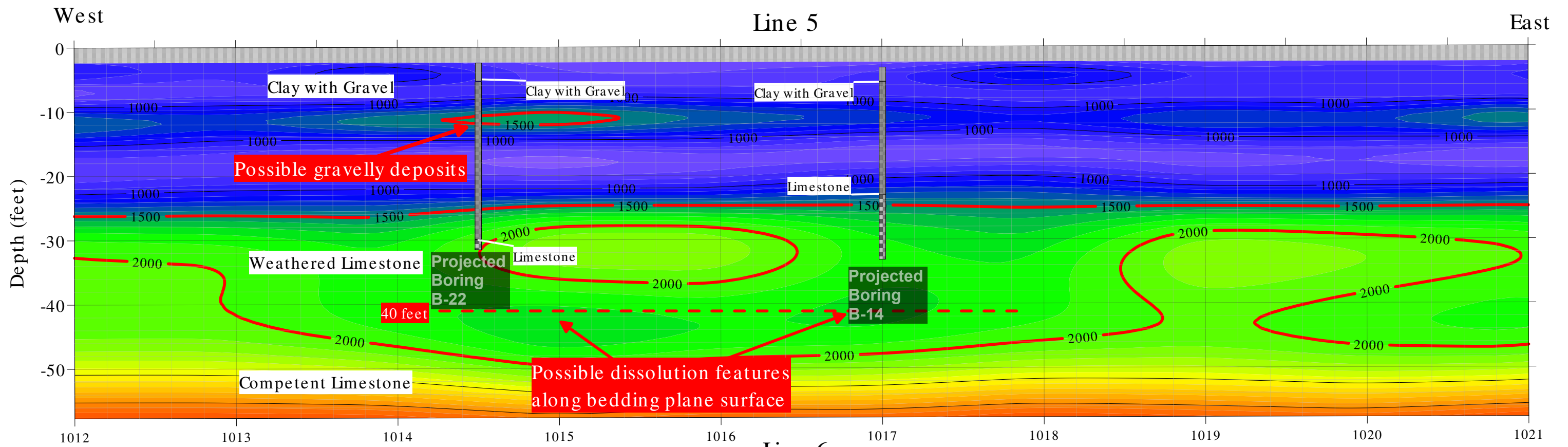
Notes

1. Red contours indicate approximate locations of material type changes.
2. Red dashed line represents possible dissolution features along a bedding plane at about 40 feet bsg.
3. Major gridlines on 10-foot intervals

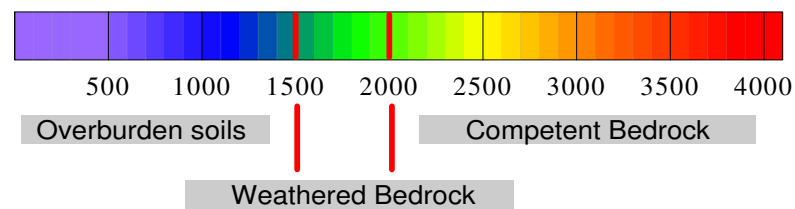
MASW Cross Sections

Project: Republic WWTF  
 Client: Burns & McDonnell  
 Location: Republic, Missouri  
 Terracon Project No.: B5215111  
 Date: July 26, 2022





Surface Wave Velocity (feet/second)



Soil Properties Table

Soil Profile	Shear Wave Velocity (ft/s)
Hard rock	$V_s > 5,000$
Rock	$2,500 < V_s \leq 5,000$
Very dense soil and soft rock	$1,200 < V_s \leq 2,500$
Stiff soil	$600 < V_s \leq 1,200$
Soft soil	$V_s < 600$

Notes

1. Red contours indicate approximate locations of material type changes.
2. Red dashed line represents possible dissolution features along a bedding plane at about 40 feet bsg.
3. Major grid lines on 10-foot intervals

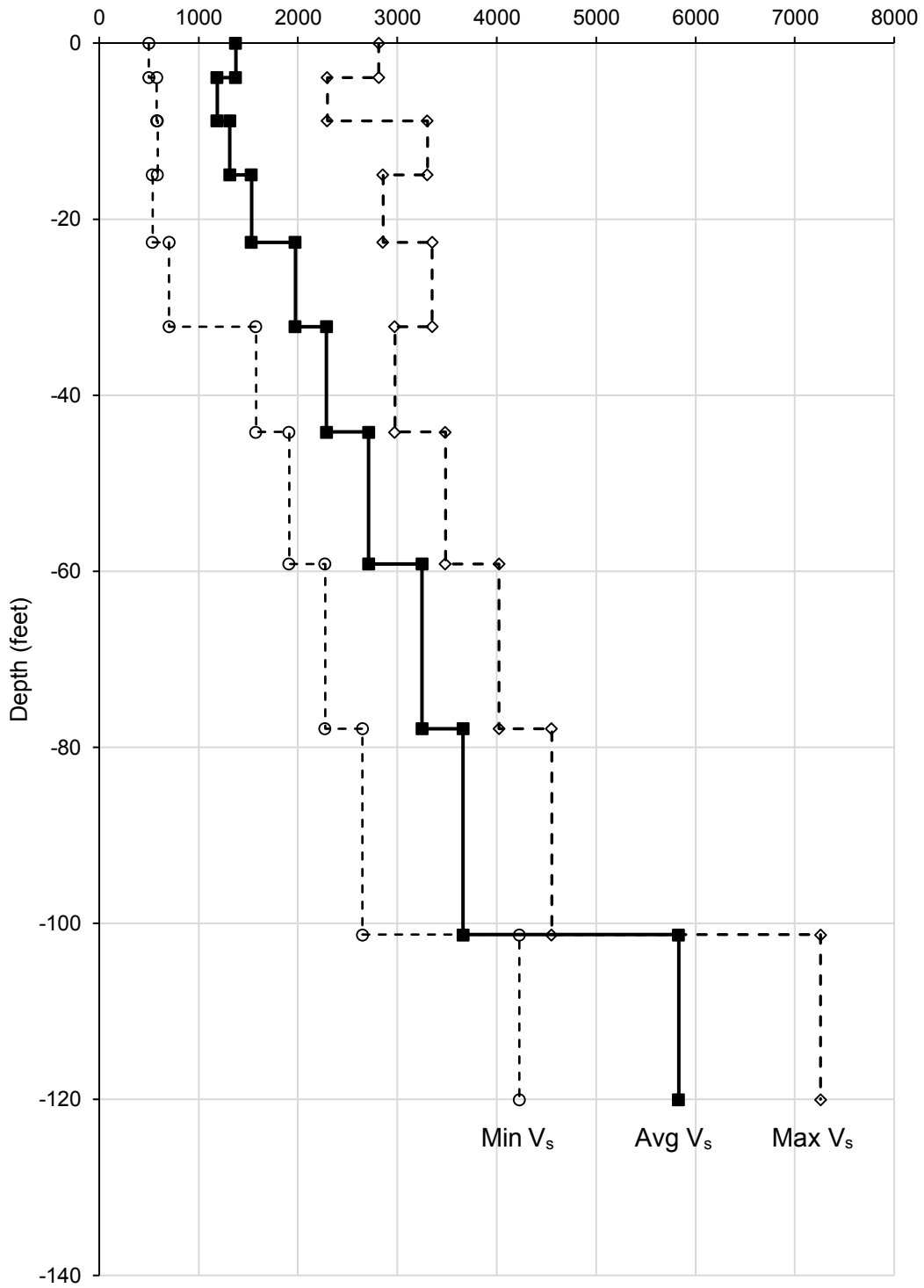
MASW Cross Sections

Project: Republic WWTF  
 Client: Burns & McDonnell  
 Location: Republic, Missouri  
 Terracon Project No.: B5215111  
 Date: July 26, 2022



# Shear Wave Velocity Profile

Velocity (feet per second)



Average Shear Wave Velocity (rounded) = 2,300 ft/s  
Site Class BC

Project Manager: KDF	Project No. B52050290
Drawn by: PBL	Scale: NA
Checked by: KCB	File Name: Vs Profile
Approved by: KDF	Date: 11/18/2020

  
**11600 Lilburn Park Rd**  
**Saint Louis, MO 63146-3535**

**SHEAR WAVE VELOCITY PROFILE**  
 REPUBLIC WASTEWATER TREATMENT PLANT IMPROVEMENTS  
 N. West Ave.  
 Republic, Missouri








## **SUPPORTING INFORMATION**

### **Contents:**

General Notes

Unified Soil Classification System

Description of Rock Properties

SAMPLING	WATER LEVEL	FIELD TESTS
 Rock Core  Split Spoon	 Water Initially Encountered  Water Level After a Specified Period of Time  Water Level After a Specified Period of Time  Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.	(N) Standard Penetration Test Resistance (Blows/Ft.) (HP) Hand Penetrometer (T) Torvane (DCP) Dynamic Cone Penetrometer (UC) Unconfined Compressive Strength (PID) Photo-Ionization Detector (OVA) Organic Vapor Analyzer

**DESCRIPTIVE SOIL CLASSIFICATION**

Soil classification is based on the Unified Soil Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

**LOCATION AND ELEVATION NOTES**

Unless otherwise noted, Latitude and Longitude are approximately determined using a hand-held GPS device. The accuracy of such devices is variable. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

**STRENGTH TERMS**

RELATIVE DENSITY OF COARSE-GRAINED SOILS <small>(More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance</small>		CONSISTENCY OF FINE-GRAINED SOILS <small>(50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance</small>		
Descriptive Term (Density)	Standard Penetration or N-Value Blows/Ft.	Descriptive Term (Consistency)	Unconfined Compressive Strength Qu, (psf)	Standard Penetration or N-Value Blows/Ft.
Very Loose	0 - 3	Very Soft	less than 500	0 - 1
Loose	4 - 9	Soft	500 to 1,000	2 - 4
Medium Dense	10 - 29	Medium Stiff	1,000 to 2,000	4 - 8
Dense	30 - 50	Stiff	2,000 to 4,000	8 - 15
Very Dense	> 50	Very Stiff	4,000 to 8,000	15 - 30
		Hard	> 8,000	> 30

RELATIVE PROPORTIONS OF SAND AND GRAVEL		RELATIVE PROPORTIONS OF FINES	
Descriptive Term(s) of other constituents	Percent of Dry Weight	Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	<15	Trace	<5
With	15-29	With	5-12
Modifier	>30	Modifier	>12

GRAIN SIZE TERMINOLOGY		PLASTICITY DESCRIPTION	
Major Component of Sample	Particle Size	Term	Plasticity Index
Boulders	Over 12 in. (300 mm)	Non-plastic	0
Cobbles	12 in. to 3 in. (300mm to 75mm)	Low	1 - 10
Gravel	3 in. to #4 sieve (75mm to 4.75 mm)	Medium	11 - 30
Sand	#4 to #200 sieve (4.75mm to 0.075mm)	High	> 30
Silt or Clay	Passing #200 sieve (0.075mm)		

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests <sup>A</sup>				Soil Classification		
				Group Symbol	Group Name <sup>B</sup>	
<b>Coarse-Grained Soils:</b> More than 50% retained on No. 200 sieve	<b>Gravels:</b> More than 50% of coarse fraction retained on No. 4 sieve	<b>Clean Gravels:</b> Less than 5% fines <sup>C</sup>	$Cu \geq 4$ and $1 \leq Cc \leq 3$ <sup>E</sup>	GW	Well-graded gravel <sup>F</sup>	
			$Cu < 4$ and/or $[Cc < 1 \text{ or } Cc > 3.0]$ <sup>E</sup>	GP	Poorly graded gravel <sup>F</sup>	
		<b>Gravels with Fines:</b> More than 12% fines <sup>C</sup>	Fines classify as ML or MH	GM	Silty gravel <sup>F, G, H</sup>	
			Fines classify as CL or CH	GC	Clayey gravel <sup>F, G, H</sup>	
	<b>Sands:</b> 50% or more of coarse fraction passes No. 4 sieve	<b>Clean Sands:</b> Less than 5% fines <sup>D</sup>	$Cu \geq 6$ and $1 \leq Cc \leq 3$ <sup>E</sup>	SW	Well-graded sand <sup>I</sup>	
			$Cu < 6$ and/or $[Cc < 1 \text{ or } Cc > 3.0]$ <sup>E</sup>	SP	Poorly graded sand <sup>I</sup>	
		<b>Sands with Fines:</b> More than 12% fines <sup>D</sup>	Fines classify as ML or MH	SM	Silty sand <sup>G, H, I</sup>	
			Fines classify as CL or CH	SC	Clayey sand <sup>G, H, I</sup>	
<b>Fine-Grained Soils:</b> 50% or more passes the No. 200 sieve	<b>Silts and Clays:</b> Liquid limit less than 50	<b>Inorganic:</b>	$PI > 7$ and plots on or above "A" line	CL	Lean clay <sup>K, L, M</sup>	
			$PI < 4$ or plots below "A" line <sup>J</sup>	ML	Silt <sup>K, L, M</sup>	
		<b>Organic:</b>	Liquid limit - oven dried	< 0.75	OL	Organic clay <sup>K, L, M, N</sup>
			Liquid limit - not dried			Organic silt <sup>K, L, M, O</sup>
	<b>Silts and Clays:</b> Liquid limit 50 or more	<b>Inorganic:</b>	$PI$ plots on or above "A" line	CH	Fat clay <sup>K, L, M</sup>	
			$PI$ plots below "A" line	MH	Elastic Silt <sup>K, L, M</sup>	
		<b>Organic:</b>	Liquid limit - oven dried	< 0.75	OH	Organic clay <sup>K, L, M, P</sup>
			Liquid limit - not dried			Organic silt <sup>K, L, M, Q</sup>
<b>Highly organic soils:</b>	Primarily organic matter, dark in color, and organic odor			PT	Peat	

<sup>A</sup> Based on the material passing the 3-inch (75-mm) sieve.

<sup>B</sup> If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

<sup>C</sup> Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

<sup>D</sup> Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay.

$$Cu = D_{60}/D_{10} \quad Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$$

<sup>F</sup> If soil contains  $\geq 15\%$  sand, add "with sand" to group name.

<sup>G</sup> If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

<sup>H</sup> If fines are organic, add "with organic fines" to group name.

<sup>I</sup> If soil contains  $\geq 15\%$  gravel, add "with gravel" to group name.

<sup>J</sup> If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

<sup>K</sup> If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

<sup>L</sup> If soil contains  $\geq 30\%$  plus No. 200 predominantly sand, add "sandy" to group name.

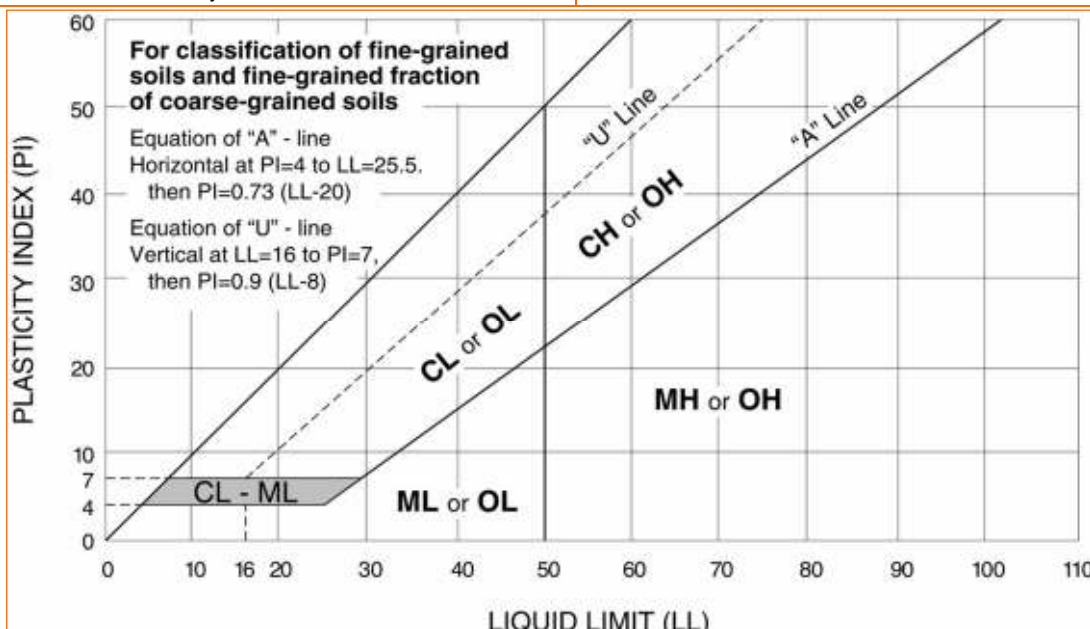
<sup>M</sup> If soil contains  $\geq 30\%$  plus No. 200, predominantly gravel, add "gravelly" to group name.

<sup>N</sup>  $PI \geq 4$  and plots on or above "A" line.

<sup>O</sup>  $PI < 4$  or plots below "A" line.

<sup>P</sup>  $PI$  plots on or above "A" line.

<sup>Q</sup>  $PI$  plots below "A" line.



WEATHERING	
Term	Description
<b>Unweathered</b>	No visible sign of rock material weathering, perhaps slight discoloration on major discontinuity surfaces.
<b>Slightly weathered</b>	Discoloration indicates weathering of rock material and discontinuity surfaces. All the rock material may be discolored by weathering and may be somewhat weaker externally than in its fresh condition.
<b>Moderately weathered</b>	Less than half of the rock material is decomposed and/or disintegrated to a soil. Fresh or discolored rock is present either as a continuous framework or as corestones.
<b>Highly weathered</b>	More than half of the rock material is decomposed and/or disintegrated to a soil. Fresh or discolored rock is present either as a discontinuous framework or as corestones.
<b>Completely weathered</b>	All rock material is decomposed and/or disintegrated to soil. The original mass structure is still largely intact.
<b>Residual soil</b>	All rock material is converted to soil. The mass structure and material fabric are destroyed. There is a large change in volume, but the soil has not been significantly transported.

STRENGTH OR HARDNESS		
Description	Field Identification	Uniaxial Compressive Strength, psi (MPa)
<b>Extremely weak</b>	Indented by thumbnail	40-150 (0.3-1)
<b>Very weak</b>	Crumbles under firm blows with point of geological hammer, can be peeled by a pocket knife	150-700 (1-5)
<b>Weak rock</b>	Can be peeled by a pocket knife with difficulty, shallow indentations made by firm blow with point of geological hammer	700-4,000 (5-30)
<b>Medium strong</b>	Cannot be scraped or peeled with a pocket knife, specimen can be fractured with single firm blow of geological hammer	4,000-7,000 (30-50)
<b>Strong rock</b>	Specimen requires more than one blow of geological hammer to fracture it	7,000-15,000 (50-100)
<b>Very strong</b>	Specimen requires many blows of geological hammer to fracture it	15,000-36,000 (100-250)
<b>Extremely strong</b>	Specimen can only be chipped with geological hammer	>36,000 (>250)

DISCONTINUITY DESCRIPTION			
Fracture Spacing (Joints, Faults, Other Fractures)		Bedding Spacing (May Include Foliation or Banding)	
Description	Spacing	Description	Spacing
<b>Extremely close</b>	< 3/4 in (<19 mm)	<b>Laminated</b>	< 1/2 in (<12 mm)
<b>Very close</b>	3/4 in – 2-1/2 in (19 - 60 mm)	<b>Very thin</b>	1/2 in – 2 in (12 – 50 mm)
<b>Close</b>	2-1/2 in – 8 in (60 – 200 mm)	<b>Thin</b>	2 in – 1 ft. (50 – 300 mm)
<b>Moderate</b>	8 in – 2 ft. (200 – 600 mm)	<b>Medium</b>	1 ft. – 3 ft. (300 – 900 mm)
<b>Wide</b>	2 ft. – 6 ft. (600 mm – 2.0 m)	<b>Thick</b>	3 ft. – 10 ft. (900 mm – 3 m)
<b>Very Wide</b>	6 ft. – 20 ft. (2.0 – 6 m)	<b>Massive</b>	> 10 ft. (3 m)

**Discontinuity Orientation (Angle):** Measure the angle of discontinuity relative to a plane perpendicular to the longitudinal axis of the core. (For most cases, the core axis is vertical; therefore, the plane perpendicular to the core axis is horizontal.) For example, a horizontal bedding plane would have a 0-degree angle.

ROCK QUALITY DESIGNATION (RQD) <sup>1</sup>	
Description	RQD Value (%)
<b>Very Poor</b>	0 - 25
<b>Poor</b>	25 – 50
<b>Fair</b>	50 – 75
<b>Good</b>	75 – 90
<b>Excellent</b>	90 - 100

1. The combined length of all sound and intact core segments equal to or greater than 4 inches in length, expressed as a percentage of the total core run length.

Reference: U.S. Department of Transportation, Federal Highway Administration, Publication No FHWA-NHI-10-034, December 2009  
Technical Manual for Design and Construction of Road Tunnels – Civil Elements

**WEATHERING**

Fresh	Rock fresh, crystals bright, few joints may show slight staining. Rock rings under hammer if crystalline.
Very slight	Rock generally fresh, joints stained, some joints may show thin clay coatings, crystals in broken face show bright. Rock rings under hammer if crystalline.
Slight	Rock generally fresh, joints stained, and discoloration extends into rock up to 1 in. Joints may contain clay. In granitoid rocks some occasional feldspar crystals are dull and discolored. Crystalline rocks ring under hammer.
Moderate	Significant portions of rock show discoloration and weathering effects. In granitoid rocks, most feldspars are dull and discolored; some show clayey. Rock has dull sound under hammer and shows significant loss of strength as compared with fresh rock.
Moderately severe	All rock except quartz discolored or stained. In granitoid rocks, all feldspars dull and discolored and majority show kaolinization. Rock shows severe loss of strength and can be excavated with geologist's pick.
Severe	All rock except quartz discolored or stained. Rock "fabric" clear and evident, but reduced in strength to strong soil. In granitoid rocks, all feldspars kaolinized to some extent. Some fragments of strong rock usually left.
Very severe	All rock except quartz discolored or stained. Rock "fabric" discernible, but mass effectively reduced to "soil" with only fragments of strong rock remaining.
Complete	Rock reduced to "soil". Rock "fabric" no discernible or discernible only in small, scattered locations. Quartz may be present as dikes or stringers.

**HARDNESS (for engineering description of rock – not to be confused with Moh's scale for minerals)**

Very hard	Cannot be scratched with knife or sharp pick. Breaking of hand specimens requires several hard blows of geologist's pick.
Hard	Can be scratched with knife or pick only with difficulty. Hard blow of hammer required to detach hand specimen.
Moderately hard	Can be scratched with knife or pick. Gouges or grooves to ¼ in. deep can be excavated by hard blow of point of a geologist's pick. Hand specimens can be detached by moderate blow.
Medium	Can be grooved or gouged 1/16 in. deep by firm pressure on knife or pick point. Can be excavated in small chips to pieces about 1-in. maximum size by hard blows of the point of a geologist's pick.
Soft	Can be gouged or grooved readily with knife or pick point. Can be excavated in chips to pieces several inches in size by moderate blows of a pick point. Small thin pieces can be broken by finger pressure.
Very soft	Can be carved with knife. Can be excavated readily with point of pick. Pieces 1-in. or more in thickness can be broken with finger pressure. Can be scratched readily by fingernail.

**Joint, Bedding, and Foliation Spacing in Rock <sup>1</sup>**

Spacing	Joints	Bedding/Foliation
Less than 2 in.	Very close	Very thin
2 in. – 1 ft.	Close	Thin
1 ft. – 3 ft.	Moderately close	Medium
3 ft. – 10 ft.	Wide	Thick
More than 10 ft.	Very wide	Very thick

1. Spacing refers to the distance normal to the planes, of the described feature, which are parallel to each other or nearly so.

Rock Quality Designator (RQD) <sup>1</sup>	
RQD, as a percentage	Diagnostic description
Exceeding 90	Excellent
90 – 75	Good
75 – 50	Fair
50 – 25	Poor
Less than 25	Very poor

Joint Openness Descriptors	
Openness	Descriptor
No Visible Separation	Tight
Less than 1/32 in.	Slightly Open
1/32 to 1/8 in.	Moderately Open
1/8 to 3/8 in.	Open
3/8 in. to 0.1 ft.	Moderately Wide
Greater than 0.1 ft.	Wide

1. RQD (given as a percentage) = length of core in pieces 4 inches and longer / length of run

References: American Society of Civil Engineers. Manuals and Reports on Engineering Practice - No. 56. Subsurface Investigation for Design and Construction of Foundations of Buildings. New York: American Society of Civil Engineers, 1976. U.S. Department of the Interior, Bureau of Reclamation, Engineering Geology Field Manual.

October 23, 2023

Burns & McDonnell  
9400 Ward Parkway  
Kansas City, MO 64114

**Attn:** Mr. Jason Garder, P.E.  
P: (816) 894-8257  
E: [jlgarder@burnsmcd.com](mailto:jlgarder@burnsmcd.com)

**RE:** Pre-Pier Drilling Services Report  
City of Republic Wastewater Treatment Plant  
915 N West Avenue  
Republic, Missouri 65738  
Terracon Project No. BL225004

Dear Mr. Garder:

Terracon Consultants, Inc. (Terracon) has completed pre-drilling services at 68 planned drilled pier locations for the referenced project (note: GRIT Building locations were DS-1 through DS-25 and Digester structure locations were DS-30 through DS-72). This study was performed in general accordance with Terracon Proposal PBL225004.1, dated July 13, 2023.

## Project Information

Due to variability of the bedrock and the possibility of karst formations within the bedrock, pre-drilled boreholes were performed at the planned drilled pier locations. The purpose of the pre-drilling was to evaluate the depth to bedrock and provide rock quality evaluation for rock sockets at the planned pier locations.

## Exploration and Testing Procedures

The pre-drilling was performed with a Central Mining Equipment (CME) drill rig on a track-mounted platform. Boreholes in the overburden materials were advanced using various methods including 3-inch casing advancer and/or mud rotary drilling techniques.

The bedrock materials were cored with diamond bit NQ2 sized coring equipment. Rock cores were retrieved where possible and placed in wax coated, cardboard rock core boxes. The rock cores were reviewed for recovery, Rock Quality Designation (RQD), and

pier bearing depths. Due to the use of drilling fluids during mud rotary drilling and rock coring procedures, water levels in the boreholes were not recorded.

Borings were terminated upon the collection of continuous, competent bedrock material extending to a minimum depth of the planned embedment depth of the drilled shaft plus a minimum of 1½ times the planned shaft diameter (approximately 8 feet for all piers). Competent bedrock material was determined by qualified geotechnical staff by reviewing RQD, recovery, and the presence of clay seams or voids. Upon completion of the boring, borings were plugged with a spider, and backfilled with auger cuttings and/or bentonite chips.

A Terracon representative logged each boring in the field noting sampling depths and determining boring termination based upon sampling a minimum of 8 feet of continuous, competent bedrock material. See the attached **Boring Logs** for conditions encountered at each boring location. For additional details and explanation of rock characteristics interpreted by the Professional Engineer or Registered Geologist, see **Supporting Information: Description of Rock Properties**.

Surface elevations noted on the logs were provided by Mr. Patrick Midyett and/or recorded from the staked locations in the field. Top of rock elevations are based on field measurements with a tape measure on tooling, and these elevations should only be considered accurate to the nearest ½ foot.

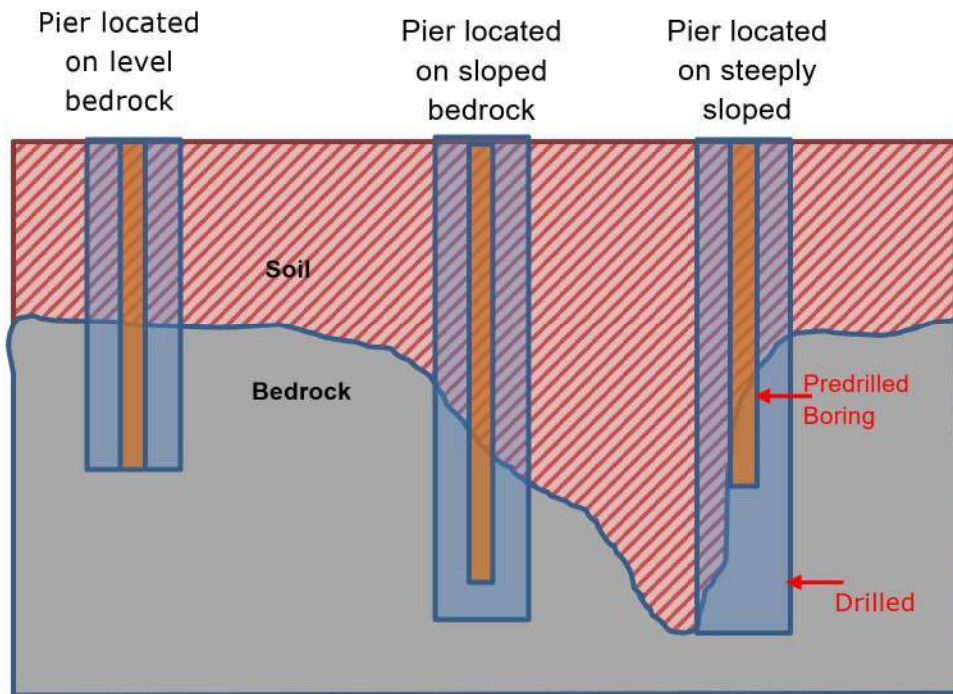
## Subsurface Conditions

The subsurface conditions were recorded in the field and are summarized on the attached boring logs. Some variations of the recommended start of rock socket depths may be encountered and should be anticipated due to the diameters of the drilled piers compared to the diameters of the test holes and the presence of steeply sloped bedrock. The start of the rock socket should not be considered until the entire pier diameter is completely in bedrock, and depths of piers should be adjusted accordingly. Rock sockets should be observed by a representative of Terracon during pier drilling.

Additionally, highly variable depths to top of rock were observed over short distances, indicating that sloping bedrock or pinnacles are potentially present at the site. Due to this condition, it is possible for drilled pier widths to partially be in rock and partially in soil. This condition cannot be determined by the small-diameter probe borings performed. Terracon recommends that the client be prepared to encounter this condition during drilled pier installation. Below is a diagram of possible pier installation conditions that could be encountered:

**Pre-Pier Drilling Services Report**

City of Republic Wastewater Treatment Plant | Republic, Missouri 65738  
 October 23, 2023 | Terracon Project No. BL225004



Based upon the conditions encountered during our drilling activities, the majority of pier locations are anticipated to be located on level bedrock.

A summary of the pier locations and recommended top of rock socket elevations can be found in the following table:

Pier #	Surface Elevation	Depth to Top of Rock <sup>2</sup>	Depth to Top of Rock Socket <sup>2</sup>	Top of Rock Socket Elevation <sup>2</sup>	Bottom of Rock Socket Elevation <sup>2</sup>	Void, Clay Seam, Poor RQD
DS-1	1273.91	17.0	24	1249.91	1241.91	Clay Seam
DS-2	1273.71	21.5	21.5	1252.21	1244.21	
DS-3	1273.39	18.0	20.5	1252.89	1244.89	Clay Seam
DS-4	1273.24	20.5	20.5	1252.74	1244.74	
DS-5	1273.68	23.0	23	1250.68	1242.68	
DS-6	1273.51	19.0	19	1254.51	1246.51	
DS-7	1273.32	20.0	20	1253.32	1245.32	
DS-8	1273.14	20.5	20.5	1252.64	1244.64	
DS-9	1273.66	22.5	22.5	1251.16	1243.16	
DS-10	1273.26	19.5	27	1246.26	1238.26	Clay Seam



**Pre-Pier Drilling Services Report**

City of Republic Wastewater Treatment Plant | Republic, Missouri 65738

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Pier #	Surface Elevation	Depth to Top of Rock <sup>2</sup>	Depth to Top of Rock Socket <sup>2</sup>	Top of Rock Socket Elevation <sup>2</sup>	Bottom of Rock Socket Elevation <sup>2</sup>	Void, Clay Seam, Poor RQD
DS-11	1273.1	20.0	20	1253.1	1245.1	
DS-12	1272.94	21.5	21.5	1251.44	1243.44	
DS-13	1273.53	30.0	30	1243.53	1235.53	
DS-14	1273.48	15.0	18	1255.48	1247.48	Clay Seam
DS-15	1272.71	24.5	24.5	1248.21	1240.21	
DS-16	1272.7	12.0	20	1252.7	1244.7	Clay Seam
DS-17	1273.37	19.0	19	1254.37	1246.37	
DS-18	1272.71	25.5	25.5	1247.21	1239.21	
DS-19	1272.52	28.5	28.5	1244.02	1236.02	
DS-20	1272.51	19.0	19	1253.51	1245.51	
DS-21	1272.59	21.5	21.5	1251.09	1243.09	
DS-22	1272.05	19.0	19	1253.05	1245.05	
DS-23	1272.46	19.5	19.5	1252.96	1244.96	
DS-24	1271.73	20.0	20	1251.73	1243.73	
DS-25	1272.34	22.0	22	1250.34	1242.34	
DS-30	1265.3	30.5	30.5	1234.8	1226.8	
DS-31	1265.95	29.5	29.5	1236.45	1228.45	
DS-32	1266.39	35.0	35	1231.39	1223.39	Clay Seam
DS-33	1266.74	26.0	26	1240.74	1232.74	
DS-34	1266.95	31.5	37	1229.95	1221.95	Clay Seam
DS-35	1266.9	31.5	31.5	1235.4	1227.4	
DS-36	1266.78	35.5	35.5	1231.28	1223.28	Clay Seam
DS-37	1266.67	32.5	32.5	1234.17	1226.17	
DS-38	1266.41	35.0	35	1231.41	1223.41	
DS-39	1266.05	32.0	32	1234.05	1226.05	Poor RQD
DS-40	1265.74	39.5	39.5	1226.24	1218.24	
DS-41	1265.45	32.0	32	1233.45	1225.45	
DS-42	1265.36	36.0	36	1229.36	1221.36	
DS-43	1265.23	27.5	29	1236.23	1228.23	
DS-44	1265.24	19.5	21	1244.24	1236.24	
DS-45	1265.17	30.0	30	1235.17	1227.17	
DS-46	1265.25	19.0	33.5	1231.75	1223.75	Clay Seam
DS-47	1265.16	17.5	29.5	1235.66	1227.66	
DS-48	1265.61	20.0	29	1236.61	1228.61	Clay Seam
DS-49	1266.1	21.0	25.5	1240.6	1232.6	Clay Seam

**Pre-Pier Drilling Services Report**

City of Republic Wastewater Treatment Plant | Republic, Missouri 65738

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Pier #	Surface Elevation	Depth to Top of Rock <sup>2</sup>	Depth to Top of Rock Socket <sup>2</sup>	Top of Rock Socket Elevation <sup>2</sup>	Bottom of Rock Socket Elevation <sup>2</sup>	Void, Clay Seam, Poor RQD
DS-50	1266.65	23.5	23.5	1243.15	1235.15	
DS-51	1266.82	27.0	30.5	1236.32	1228.32	Clay Seam
DS-52	1266.71	35.0	35	1231.71	1223.71	
DS-53	1266.43	40.5	40.5	1225.93	1217.93	Poor RQD
DS-54	1266.15	29.5	29.5	1236.65	1228.65	
DS-55	1265.72	31.0	36	1229.72	1221.72	Clay Seam
DS-56	1265.49	33.0	33	1232.49	1224.49	
DS-57	1265.36	27.0	27	1238.36	1230.36	
DS-58	1265.29	30.0	30	1235.29	1227.29	
DS-59	1265.44	32.5	32.5	1232.94	1224.94	
DS-60	1265.89	30.5	30.5	1235.39	1227.39	
DS-61	1266.37	30.0	30	1236.37	1228.37	
DS-62	1266.54	30.5	30.5	1236.04	1228.04	
DS-63	1266.24	31.5	31.5	1234.74	1226.74	
DS-64	1265.96	31.5	31.5	1234.46	1226.46	
DS-65	1265.57	23.0	29	1236.57	1228.57	Clay Seam
DS-66	1265.52	18.5	28.5	1237.02	1229.02	Clay Seam
DS-67	1265.55	30.0	30	1235.55	1227.55	
DS-68	1265.79	19.5	30	1235.79	1227.79	Clay Seam
DS-69	1266.15	30.5	30.5	1235.65	1227.65	
DS-70	1266.05	31.5	32.5	1233.55	1225.55	Clay Seam
DS-71	1265.71	20.0	20	1245.71	1237.71	
DS-72	1265.94	32.0	32	1233.94	1225.94	

1. Surface elevations were provided by the client or recorded from surveyed stakes in the field.
2. Depths and elevations are based on field measurements with a tape measure on tooling and should be considered accurate to the nearest 0.5 feet.

## General Comments

The information and analysis presented in this letter is based upon the data obtained from the borings performed at the indicated locations. This report does not reflect variations that may occur between borings, across the site, or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. If variations appear, Terracon should be immediately notified so that further evaluation and supplemental recommendations can be provided.

**Pre-Pier Drilling Services Report**

City of Republic Wastewater Treatment Plant | Republic, Missouri 65738  
October 23, 2023 | Terracon Project No. BL225004



The scope of services for this project does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

This letter has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical exploration practices. No warranties, either express or implied, are intended or made. Site safety, excavation support, and dewatering requirements are the responsibility of others.

We appreciate the opportunity to be of service to you on this project. Please do not hesitate to contact us if you have any questions or comments.

Sincerely,  
**Terracon**

A handwritten signature in black ink, appearing to read 'R. B. Dodson'.

Ripken B. Dodson, E.I.  
Geotechnical Staff Engineer

A handwritten signature in black ink, appearing to read 'Kole C. Berg'.

Kole Berg, P.E.  
Senior Geotechnical Consultant  
Missouri: PE-2002016417

## Rock Classification Notes

WEATHERING			
Term	Description		
<b>Fresh</b>	Mineral crystals appear bright; show no discoloration. Features show little or now staining on surfaces. Discoloration does not extend into intact rock.		
<b>Slightly weathered</b>	Rock generally fresh except along fractures. Some fractures stained and discoloration may extend <0.5 inches into rock.		
<b>Moderately weathered</b>	Significant portions of rock are dull and discolored. Rock may be significantly weaker than in fresh state near fractures. Soil zones of limited extent may occur along some fractures.		
<b>Highly weathered</b>	Rock dull and discolored throughout. Majority of rock mass is significantly weaker and has decomposed and/or disintegrated; isolated zones of stronger rock and/or soil may occur throughout.		
<b>Completely weathered</b>	All rock material is decomposed and/or disintegrated to soil. The rock mass or fabric is still evident and largely intact. Isolated zones of stronger rock may occur locally.		
STRENGTH OR HARDNESS			
Description	Field Identification		Uniaxial Compressive Strength, psi
<b>Extremely strong</b>	Can only be chipped with geological hammer. Rock rings on hammer blows. Cannot be scratched with a sharp pick. Hand specimens require several hard hammer blows to break.		>36,000
<b>Very strong</b>	Several blows of a geological hammer to fracture. Cannot be scratched with a 20d common steel nail. Can be scratched with a geologist's pick only with difficulty.		15,000-36,000
<b>Strong</b>	More than one blow of a geological hammer needed to fracture. Can be scratched with a 20d nail or geologist's pick. Gouges or grooves to ¼ inch deep can be excavated by a hard blow of a geologist's pick. Hand specimens can be detached by a moderate blow.		7,500-15,000
<b>Medium strong</b>	One blow of geological hammer needed to fracture. Can be distinctly scratched with 20d nail. Can be grooved or gouged 1/16 in. deep by firm pressure with a geologist's pick point. Can be fractured with single firm blow of geological hammer. Can be excavated in small chips (about 1-in. maximum size) by hard blows of the point of a geologist's pick;		3,500-7,500
<b>Weak</b>	Shallow indent by firm blow with geological hammer point. Can be gouged or grooved readily with geologist's pick point. Can be excavated in pieces several inches in size by moderate blows of a pick point. Small thin pieces can be broken by finger pressure.		700-3,500
<b>Very weak</b>	Crumbles under firm blow with geological hammer point. Can be excavated readily with the point of a geologist's pick. Pieces 1-in. or more in thickness can be broken with finger pressure. Can be scratched readily by fingernail.		150-700
DISCONTINUITY DESCRIPTION			
Fracture Spacing (Joints, Faults, Other Fractures)		Bedding Spacing (May Include Foliation or Banding)	
Description	Spacing	Description	Spacing
<b>Intensely fractured</b>	< 2.5 inches	<b>Laminated</b>	< ½-inch
<b>Highly fractured</b>	2.5 – 8 inches	<b>Very thin</b>	½ – 2 inches
<b>Moderately fractured</b>	8 inches to 2 feet	<b>Thin</b>	2 inches – 1 foot
<b>Slightly fractured</b>	2 to 6.5 feet	<b>Medium</b>	1 – 3 feet
<b>Very slightly fractured</b>	> 6.5 feet	<b>Thick</b>	3 – 10 feet
		<b>Massive</b>	> 10 feet
ROCK QUALITY DESIGNATION (RQD) <sup>1</sup>			
Description	RQD Value (%)		
<b>Very Poor</b>	0 - 25		
<b>Poor</b>	25 - 50		
<b>Fair</b>	50 - 75		
<b>Good</b>	75 - 90		
<b>Excellent</b>	90 - 100		

1. The combined length of all sound and intact core segments equal to or greater than 4 inches in length, expressed as a percentage of the total core run length.

# Boring Log No. DS-1

Graphic Log	Location: See Exploration Plan  Northing: 473555.67 Easting: 1351815.89  Depth (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results
	<b>OVERBURDEN</b>  Elevation: 1273.91 (Ft.) +/-	5 10 15			
	17.0 1256.91 <b>WEATHERED LIMESTONE &amp; CHERT</b>	20			
	22.0 1251.91 <b>CLAY SEAM</b>	25			
	24.0 1249.91 <b>LIMESTONE</b>	30		REC: 100% RQD: 100%	
	32.0 1241.91 <b>Boring Terminated at 32 Feet</b>				

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).  
 See [Supporting Information](#) for explanation of symbols and abbreviations.

**Notes**

Elevation Reference: Elevations were provided by others.

**Water Level Observations**

**Advancement Method**

5" Casing Advancement, then NQ rock coring

**Abandonment Method**

Boring backfilled with Auger Cuttings and/or Bentonite

**Drill Rig**  
#546

**Driller**  
DH

**Logged by**  
AL

**Boring Started**  
09-22-2023





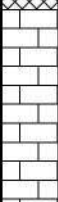

**Boring Completed**  
09-22-2023

## Boring Log No. DS-2

Graphic Log	Location: See <a href="#">Exploration Plan</a>  Northing: 473555.42 Easting: 1351828.98  Depth (Ft.) <span style="float: right;">Elevation: 1273.71 (Ft.) +/-</span>	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results
	<p><b>OVERBURDEN</b></p> <p>21.0 21.5 <b>WEATHERED LIMESTONE &amp; CHERT LIMESTONE</b></p> <p>29.5 <b>Boring Terminated at 29.5 Feet</b></p>	5 10 15 20 25			REC: 100% RQD: 98%


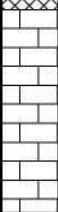

<p>See <a href="#">Exploration and Testing Procedures</a> for a description of field and laboratory procedures used and additional data (If any).                  See <a href="#">Supporting Information</a> for explanation of symbols and abbreviations.</p> <p><b>Notes</b>                  Elevation Reference: Elevations were provided by others.</p>	<p><b>Water Level Observations</b></p> <p><b>Advancement Method</b>                      5" Casing Advancement, then NQ rock coring</p> <p><b>Abandonment Method</b>                      Boring backfilled with Auger Cuttings and/or Bentonite</p>	<p><b>Drill Rig</b>                      #546</p> <p><b>Driller</b>                      DH</p> <p><b>Logged by</b>                      AL</p> <p><b>Boring Started</b>                      09-22-2023</p> <p><b>Boring Completed</b>                      09-22-2023</p>
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## Boring Log No. DS-3

Graphic Log	Location: See Exploration Plan  Northing: 473555.16 Easting: 1351842.14  Depth (Ft.) <span style="float: right;">Elevation: 1273.39 (Ft.) +/-</span>	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results
	<b>OVERBURDEN</b>	5 10 15			
	18.0 18.5 <b>WEATHERED LIMESTONE &amp; CHERT</b>	1255.39 1254.89			
	<b>CLAY SEAM</b>				
	20.5 <b>LIMESTONE</b>	1252.89			
	<b>LIMESTONE</b>			REC: 100% RQD: 100%	
	28.5 <b>Boring Terminated at 28.5 Feet</b>	1244.89			

See <a href="#">Exploration and Testing Procedures</a> for a description of field and laboratory procedures used and additional data (If any). See <a href="#">Supporting Information</a> for explanation of symbols and abbreviations.	<b>Water Level Observations</b>  (Empty)	<b>Drill Rig</b> #546  <b>Driller</b> DH  <b>Logged by</b> AL  <b>Boring Started</b> 09-27-2023  <b>Boring Completed</b> 09-27-2023
<b>Notes</b> Elevation Reference: Elevations were provided by others.	<b>Advancement Method</b> 5" Casing Advancement, then NQ rock coring  <b>Abandonment Method</b> Boring backfilled with Auger Cuttings and/or Bentonite	


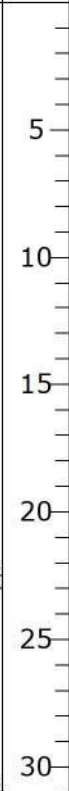

## Boring Log No. DS-4

Graphic Log	Location: See <a href="#">Exploration Plan</a>  Northing: 473554.91 Easting: 1351855.22  Depth (Ft.) <span style="float: right;">Elevation: 1273.24 (Ft.) +/-</span>	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results
	<b>OVERBURDEN</b>				
	<b>LIMESTONE</b>	20.5 <span style="float: right;">1252.74</span>			REC: 100% RQD: 100%
	<b>Boring Terminated at 28.5 Feet</b>	28.5 <span style="float: right;">1244.74</span>			

<p>See <a href="#">Exploration and Testing Procedures</a> for a description of field and laboratory procedures used and additional data (If any).                  See <a href="#">Supporting Information</a> for explanation of symbols and abbreviations.</p>	<p><b>Water Level Observations</b></p>	<p><b>Drill Rig</b> #546</p>
<p><b>Notes</b> Elevation Reference: Elevations were provided by others.</p>	<p><b>Advancement Method</b> 5" Casing Advancement, then NQ rock coring</p> <p><b>Abandonment Method</b> Boring backfilled with Auger Cuttings and/or Bentonite</p>	<p><b>Driller</b> DH</p> <p><b>Logged by</b> AL</p> <p><b>Boring Started</b> 10-02-2023</p> <p><b>Boring Completed</b> 10-02-2023</p>



# Boring Log No. DS-5

Graphic Log	Location: See <a href="#">Exploration Plan</a>  Northing: 473545.13 Easting: 1351815.69  Depth (Ft.) <span style="float: right;">Elevation: 1273.68 (Ft.) +/-</span>	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results
	<p><b>OVERBURDEN</b></p> <p>22.5 <span style="float: right;">1251.18</span></p> <p>23.0 <b>WEATHERED LIMESTONE &amp; CHERT</b> <span style="float: right;">1250.68</span></p> <p><b>LIMESTONE</b></p> <p>31.0 <span style="float: right;">1242.68</span></p> <p><b>Boring Terminated at 31 Feet</b></p>				<p>REC: 100%                      RQD: 88%</p>

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).  
 See [Supporting Information](#) for explanation of symbols and abbreviations.

**Notes**  
 Elevation Reference: Elevations were provided by others.

**Water Level Observations**

**Drill Rig**  
 #546

**Advancement Method**  
 5" Casing Advancement, then NQ rock coring

**Driller**  
 DH

**Logged by**  
 AL

**Abandonment Method**  
 Boring backfilled with Auger Cuttings and/or Bentonite

**Boring Started**  
 09-25-2023

**Boring Completed**  
 09-25-2023

## Boring Log No. DS-6

Graphic Log	Location: See Exploration Plan  Northing: 473544.88 Easting: 1351828.77  Depth (Ft.) <span style="float: right;">Elevation: 1273.51 (Ft.) +/-</span>	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results
	<p><b>OVERBURDEN</b></p> <p>18.5 <span style="float: right;">1255.01</span>                      19.0 <b>WEATHERED LIMESTONE &amp; CHERT</b>  <b>LIMESTONE</b> <span style="float: right;">1254.51</span></p> <p>27.0 <span style="float: right;">1246.51</span></p> <p><b>Boring Terminated at 27 Feet</b></p>				REC: 100% RQD: 95%

<p>See <a href="#">Exploration and Testing Procedures</a> for a description of field and laboratory procedures used and additional data (If any).                      See <a href="#">Supporting Information</a> for explanation of symbols and abbreviations.</p>	<p><b>Water Level Observations</b></p>	<p><b>Drill Rig</b> #546</p>
<p><b>Notes</b> Elevation Reference: Elevations were provided by others.</p>	<p><b>Advancement Method</b> 5" Casing Advancement, then NQ rock coring</p> <p><b>Abandonment Method</b> Boring backfilled with Auger Cuttings and/or Bentonite</p>	<p><b>Driller</b> DH</p> <p><b>Logged by</b> AL</p> <p><b>Boring Started</b> 09-27-2023</p> <p><b>Boring Completed</b> 09-27-2023</p>

## Boring Log No. DS-7

Graphic Log	Location: See Exploration Plan  Northing: 473544.62 Easting: 1351841.93  Depth (Ft.) <span style="float: right;">Elevation: 1273.32 (Ft.) +/-</span>	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results
	<b>OVERBURDEN</b>	5 10 15			
	19.5 <span style="float: right;">1253.82</span> 20.0 <b>WEATHERED LIMESTONE &amp; CHERT</b> <span style="float: right;">1253.32</span> <b>LIMESTONE</b>	20			REC: 100% RQD: 100%
	28.0 <span style="float: right;">1245.32</span> <b>Boring Terminated at 28 Feet</b>	25			

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any). See Supporting Information for explanation of symbols and abbreviations.	<b>Water Level Observations</b>  (Empty)	<b>Drill Rig</b> #546  <b>Driller</b> DH  <b>Logged by</b> AL  <b>Boring Started</b> 09-27-2023  <b>Boring Completed</b> 09-27-2023
<b>Notes</b> Elevation Reference: Elevations were provided by others.	<b>Advancement Method</b> 5" Casing Advancement, then NQ rock coring  <b>Abandonment Method</b> Boring backfilled with Auger Cuttings and/or Bentonite	

## Boring Log No. DS-8

Graphic Log	Location: See Exploration Plan  Northing: 473544.37 Easting: 1351855.02  Depth (Ft.) <span style="float: right;">Elevation: 1273.14 (Ft.) +/-</span>	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results
	<b>OVERBURDEN</b>	5 10 15			
	19.0 <span style="float: right;">1254.14</span> <b>WEATHERED LIMESTONE &amp; CHERT</b> 20.5 <span style="float: right;">1252.64</span>	20			
	<b>LIMESTONE</b>  28.5 <span style="float: right;">1244.64</span>	25	REC: 100% RQD: 100%		
	<b>Boring Terminated at 28.5 Feet</b>				




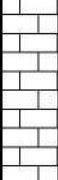

<p>See <a href="#">Exploration and Testing Procedures</a> for a description of field and laboratory procedures used and additional data (If any).                  See <a href="#">Supporting Information</a> for explanation of symbols and abbreviations.</p>	<p><b>Water Level Observations</b></p>	<p><b>Drill Rig</b> #546</p>
<p><b>Notes</b> Elevation Reference: Elevations were provided by others.</p>	<p><b>Advancement Method</b> 5" Casing Advancement, then NQ rock coring</p> <p><b>Abandonment Method</b> Boring backfilled with Auger Cuttings and/or Bentonite</p>	<p><b>Driller</b> DH</p> <p><b>Logged by</b> AL</p> <p><b>Boring Started</b> 10-02-2023</p> <p><b>Boring Completed</b> 10-02-2023</p>

## Boring Log No. DS-9

Graphic Log	Location: See Exploration Plan  Northing: 473534.59 Easting: 1351815.48  Depth (Ft.) <span style="float: right;">Elevation: 1273.66 (Ft.) +/-</span>	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results
	<b>OVERBURDEN</b>	5 10 15 20			
	22.0 <span style="float: right;">1251.66</span> 22.5 <b>WEATHERED LIMESTONE &amp; CHERT Limestone</b> <span style="float: right;">1251.16</span>	25			REC: 100% RQD: 97%
	30.5 <b>Boring Terminated at 30.5 Feet</b> <span style="float: right;">1243.16</span>	30			



See <a href="#">Exploration and Testing Procedures</a> for a description of field and laboratory procedures used and additional data (If any). See <a href="#">Supporting Information</a> for explanation of symbols and abbreviations.	<b>Water Level Observations</b>  (Empty)	<b>Drill Rig</b> #546  <b>Driller</b> DH  <b>Logged by</b> AL  <b>Boring Started</b> 09-25-2023  <b>Boring Completed</b> 09-25-2023
<b>Notes</b> Elevation Reference: Elevations were provided by others.	<b>Advancement Method</b> 5" Casing Advancement, then NQ rock coring  <b>Abandonment Method</b> Boring backfilled with Auger Cuttings and/or Bentonite	

## Boring Log No. DS-10

Graphic Log	Location: See Exploration Plan  Northing: 473534.59 Easting: 1351815.48  Depth (Ft.) <span style="float: right;">Elevation: 1273.26 (Ft.) +/-</span>	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results
	<b>OVERBURDEN</b>				
	<b>WEATHERED LIMESTONE &amp; CHERT</b>	19.5			
	<b>CLAY SEAM</b>	26.0			
	<b>LIMESTONE</b>	27.0			
	<b>Boring Terminated at 35 Feet</b>	35.0		REC: 100% RQD: 99%	




<p>See <a href="#">Exploration and Testing Procedures</a> for a description of field and laboratory procedures used and additional data (If any).                  See <a href="#">Supporting Information</a> for explanation of symbols and abbreviations.</p> <p><b>Notes</b>                  Elevation Reference: Elevations were provided by others.</p>	<p><b>Water Level Observations</b></p> <p><b>Advancement Method</b>                  5" Casing Advancement, then NQ rock coring</p> <p><b>Abandonment Method</b>                  Boring backfilled with Auger Cuttings and/or Bentonite</p>	<p><b>Drill Rig</b>                  #546</p> <p><b>Driller</b>                  DH</p> <p><b>Logged by</b>                  AL</p> <p><b>Boring Started</b>                  09-26-2023</p> <p><b>Boring Completed</b>                  09-26-2023</p>
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## Boring Log No. DS-11

Graphic Log	Location: See <a href="#">Exploration Plan</a>  Northing: 473534.34 Easting: 1351828.57  Depth (Ft.) <span style="float: right;">Elevation: 1273.1 (Ft.) +/-</span>	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results
	<b>OVERBURDEN</b>	5 10 15 20			
	<b>LIMESTONE</b>	20.0 <span style="float: right;">1253.1</span> 28.0 <span style="float: right;">1245.1</span>		REC: 100% RQD: 100%	
	<b>Boring Terminated at 28 Feet</b>				

<p>See <a href="#">Exploration and Testing Procedures</a> for a description of field and laboratory procedures used and additional data (If any).                  See <a href="#">Supporting Information</a> for explanation of symbols and abbreviations.</p> <p><b>Notes</b>                  Elevation Reference: Elevations were provided by others.</p>	<p><b>Water Level Observations</b></p> <p><b>Advancement Method</b>                  5" Casing Advancement, then NQ rock coring</p> <p><b>Abandonment Method</b>                  Boring backfilled with Auger Cuttings and/or Bentonite</p>	<p><b>Drill Rig</b>                  #546</p> <p><b>Driller</b>                  DH</p> <p><b>Logged by</b>                  AL</p> <p><b>Boring Started</b>                  09-27-2023</p> <p><b>Boring Completed</b>                  09-27-2023</p>
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## Boring Log No. DS-12

Graphic Log	Location: See Exploration Plan  Northing: 473534.08 Easting: 1351841.73  Depth (Ft.) <span style="float: right;">Elevation: 1272.94 (Ft.) +/-</span>	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results
	<b>OVERBURDEN</b>	5 10 15 20			
	<b>LIMESTONE</b>	21.5 <span style="float: right;">1251.44</span> 29.5 <span style="float: right;">1243.44</span>			REC: 100% RQD: 100%
	<b>Boring Terminated at 29.5 Feet</b>				

<p>See <a href="#">Exploration and Testing Procedures</a> for a description of field and laboratory procedures used and additional data (If any).                  See <a href="#">Supporting Information</a> for explanation of symbols and abbreviations.</p>	<p><b>Water Level Observations</b></p>	<p><b>Drill Rig</b> #546</p>
<p><b>Notes</b> Elevation Reference: Elevations were provided by others.</p>	<p><b>Advancement Method</b> 5" Casing Advancement, then NQ rock coring</p> <p><b>Abandonment Method</b> Boring backfilled with Auger Cuttings and/or Bentonite</p>	<p><b>Driller</b> DH</p> <p><b>Logged by</b> AL</p> <p><b>Boring Started</b> 09-29-2023</p> <p><b>Boring Completed</b> 09-29-2023</p>




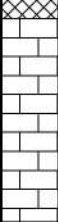



## Boring Log No. DS-13

Graphic Log	Location: See Exploration Plan  Northing: 473533.83 Easting: 1351854.81  Depth (Ft.) <span style="float: right;">Elevation: 1273.53 (Ft.) +/-</span>	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results
	<b>OVERBURDEN</b>	5 10 15 20 25			
	29.5 <span style="float: right;">1244.03</span> 30.0 <b>WEATHERED LIMESTONE &amp; CHERT</b> <b>LIMESTONE</b> <span style="float: right;">1243.53</span>	30			REC: 100% RQD: 98%
	38.0 <span style="float: right;">1235.53</span> <b>Boring Terminated at 38 Feet</b>	35			

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any). See Supporting Information for explanation of symbols and abbreviations.	<b>Water Level Observations</b>  (Empty)	<b>Drill Rig</b> #546  <b>Driller</b> DH  <b>Logged by</b> AL  <b>Boring Started</b> 09-25-2023  <b>Boring Completed</b> 09-25-2023
<b>Notes</b> Elevation Reference: Elevations were provided by others.	<b>Advancement Method</b> 5" Casing Advancement, then NQ rock coring  <b>Abandonment Method</b> Boring backfilled with Auger Cuttings and/or Bentonite	

## Boring Log No. DS-14

Graphic Log	Location: See Exploration Plan Northing: 473524.05 Easting: 1351815.28 Depth (Ft.) <span style="float: right;">Elevation: 1273.48 (Ft.) +/-</span>	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results
	<b>OVERBURDEN</b>				
	15.0 <b>WEATHERED LIMESTONE &amp; CHERT</b> <span style="float: right;">1258.48</span>	5			
	17.0 <b>CLAY SEAM</b> <span style="float: right;">1256.48</span>	10			
	18.0 <b>LIMESTONE</b> <span style="float: right;">1255.48</span>	15			
	26.0 <b>Boring Terminated at 26 Feet</b> <span style="float: right;">1247.48</span>	20		REC: 100% RQD: 100%	
		25			






<p>See <a href="#">Exploration and Testing Procedures</a> for a description of field and laboratory procedures used and additional data (If any).                  See <a href="#">Supporting Information</a> for explanation of symbols and abbreviations.</p> <p><b>Notes</b>                  Elevation Reference: Elevations were provided by others.</p>	<p><b>Water Level Observations</b></p> <p><b>Advancement Method</b>                  5" Casing Advancement, then NQ rock coring</p> <p><b>Abandonment Method</b>                  Boring backfilled with Auger Cuttings and/or Bentonite</p>	<p><b>Drill Rig</b>                  #546</p> <p><b>Driller</b>                  DH</p> <p><b>Logged by</b>                  AL</p> <p><b>Boring Started</b>                  09-26-2023</p> <p><b>Boring Completed</b>                  09-26-2023</p>
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## Boring Log No. DS-15

Graphic Log	Location: See Exploration Plan  Northing: 473523.8 Easting: 1351828.36  Depth (Ft.) <span style="float: right;">Elevation: 1272.71 (Ft.) +/-</span>	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results
		<div style="display: flex; align-items: center;"> <div style="margin-right: 5px;">5</div> <div style="margin-right: 5px;">10</div> <div style="margin-right: 5px;">15</div> <div style="margin-right: 5px;">20</div> <div style="margin-right: 5px;">25</div> <div style="margin-right: 5px;">30</div> </div>		<div style="display: flex; align-items: center;"> <div style="width: 10px; height: 10px; background-color: black; margin-right: 5px;"></div> </div>	<p>REC: 100% RQD: 93%</p>
	<p>24.0 <span style="float: right;">1248.71</span></p> <p>24.5 <b>WEATHERED LIMESTONE &amp; CHERT LIMESTONE</b> <span style="float: right;">1248.21</span></p> <p>32.5 <b>Boring Terminated at 32.5 Feet</b> <span style="float: right;">1240.21</span></p>				


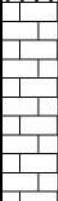

<p>See <a href="#">Exploration and Testing Procedures</a> for a description of field and laboratory procedures used and additional data (If any).                  See <a href="#">Supporting Information</a> for explanation of symbols and abbreviations.</p>	<p><b>Water Level Observations</b></p>	<p><b>Drill Rig</b> #546</p>
<p><b>Notes</b> Elevation Reference: Elevations were provided by others.</p>	<p><b>Advancement Method</b> 5" Casing Advancement, then NQ rock coring</p> <p><b>Abandonment Method</b> Boring backfilled with Auger Cuttings and/or Bentonite</p>	<p><b>Driller</b> DH</p> <p><b>Logged by</b> AL</p> <p><b>Boring Started</b> 09-28-2023</p> <p><b>Boring Completed</b> 09-28-2023</p>

## Boring Log No. DS-16

Graphic Log	Location: See <a href="#">Exploration Plan</a>  Northing: 473523.54 Easting: 1351841.52  Depth (Ft.) <span style="float: right;">Elevation: 1272.7 (Ft.) +/-</span>	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results
	<b><u>OVERBURDEN</u></b>				
	<b><u>WEATHERED LIMESTONE &amp; CHERT</u></b>	12.0 <span style="float: right;">1260.7</span> 13.5 <span style="float: right;">1259.2</span>			
	<b><u>CLAY SEAM</u></b>	20.0 <span style="float: right;">1252.7</span>			
	<b><u>LIMESTONE</u></b>	28.0 <span style="float: right;">1244.7</span>			REC: 100% RQD: 100%
	<b><i>Boring Terminated at 28 Feet</i></b>				

<p>See <a href="#">Exploration and Testing Procedures</a> for a description of field and laboratory procedures used and additional data (If any).                  See <a href="#">Supporting Information</a> for explanation of symbols and abbreviations.</p>	<p><b>Water Level Observations</b></p>	<p><b>Drill Rig</b> #546</p>
<p><b>Notes</b> Elevation Reference: Elevations were provided by others.</p>	<p><b>Advancement Method</b> 5" Casing Advancement, then NQ rock coring</p> <p><b>Abandonment Method</b> Boring backfilled with Auger Cuttings and/or Bentonite</p>	<p><b>Driller</b> DH</p> <p><b>Logged by</b> AL</p> <p><b>Boring Started</b> 09-29-2023</p> <p><b>Boring Completed</b> 09-29-2023</p>

## Boring Log No. DS-17

Graphic Log	Location: See <a href="#">Exploration Plan</a>  Northing: 473523.29 Easting: 1351854.6  Depth (Ft.) <span style="float: right;">Elevation: 1273.37 (Ft.) +/-</span>	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results
	<b>OVERBURDEN</b>	5 10 15			
	<b>LIMESTONE</b>	19.0 <span style="float: right;">1254.37</span> 20 25			REC: 100% RQD: 94%
	<b>Boring Terminated at 27 Feet</b>	27.0 <span style="float: right;">1246.37</span>			

See <a href="#">Exploration and Testing Procedures</a> for a description of field and laboratory procedures used and additional data (If any). See <a href="#">Supporting Information</a> for explanation of symbols and abbreviations.	<b>Water Level Observations</b>  (None recorded)	<b>Drill Rig</b> #546  <b>Driller</b> DH  <b>Logged by</b> AL  <b>Boring Started</b> 09-25-2023  <b>Boring Completed</b> 09-25-2023
<b>Notes</b> Elevation Reference: Elevations were provided by others.	<b>Advancement Method</b> 5" Casing Advancement, then NQ rock coring  <b>Abandonment Method</b> Boring backfilled with Auger Cuttings and/or Bentonite	

## Boring Log No. DS-18

Graphic Log	Location: See Exploration Plan Northing: 473513.51 Easting: 1351815.07 Depth (Ft.) <span style="float: right;">Elevation: 1272.71 (Ft.) +/-</span>	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results
	<p><b>OVERBURDEN</b></p> <p>25.0 <span style="float: right;">1247.71</span>                  25.5 <b>WEATHERED LIMESTONE &amp; CHERT LIMESTONE</b> <span style="float: right;">1247.21</span></p> <p>33.5 <span style="float: right;">1239.21</span></p> <p><b>Boring Terminated at 33.5 Feet</b></p>	5 10 15 20 25 30	REC: 100% RQD: 95%		




<p>See <a href="#">Exploration and Testing Procedures</a> for a description of field and laboratory procedures used and additional data (If any).                  See <a href="#">Supporting Information</a> for explanation of symbols and abbreviations.</p> <p><b>Notes</b>                  Elevation Reference: Elevations were provided by others.</p>	<p><b>Water Level Observations</b></p> <p><b>Advancement Method</b>                  5" Casing Advancement, then NQ rock coring</p> <p><b>Abandonment Method</b>                  Boring backfilled with Auger Cuttings and/or Bentonite</p>	<p><b>Drill Rig</b>                  #546</p> <p><b>Driller</b>                  DH</p> <p><b>Logged by</b>                  AL</p> <p><b>Boring Started</b>                  09-26-2023</p> <p><b>Boring Completed</b>                  09-26-2023</p>
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## Boring Log No. DS-19

Graphic Log	Location: See Exploration Plan  Northing: 473513.26 Easting: 1351828.15  Depth (Ft.) <span style="float: right;">Elevation: 1272.52 (Ft.) +/-</span>	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results
	<b>OVERBURDEN</b>	5 10 15 20 25			
	<b>LIMESTONE</b>	28.5 <span style="float: right;">1244.02</span> 30 35			REC: 100% RQD: 89%
	<b>Boring Terminated at 36.5 Feet</b>	36.5 <span style="float: right;">1236.02</span>			

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any). See Supporting Information for explanation of symbols and abbreviations.	<b>Water Level Observations</b>  (Empty)	<b>Drill Rig</b> #546
<b>Notes</b> Elevation Reference: Elevations were provided by others.	<b>Advancement Method</b> 5" Casing Advancement, then NQ rock coring	<b>Driller</b> DH
	<b>Abandonment Method</b> Boring backfilled with Auger Cuttings and/or Bentonite	<b>Logged by</b> AL
		<b>Boring Started</b> 09-28-2023
		<b>Boring Completed</b> 09-28-2023


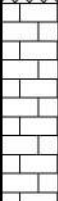

## Boring Log No. DS-20

Graphic Log	Location: See <a href="#">Exploration Plan</a>  Northing: 473513 Easting: 1351841.32  Depth (Ft.) <span style="float: right;">Elevation: 1272.51 (Ft.) +/-</span>	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results
	<b>OVERBURDEN</b>	5 10 15			
	<b>LIMESTONE</b>	19.0 <span style="float: right;">1253.51</span> 20 25			REC: 100% RQD: 95%
	<b>Boring Terminated at 27 Feet</b>	27.0 <span style="float: right;">1245.51</span>			

<p>See <a href="#">Exploration and Testing Procedures</a> for a description of field and laboratory procedures used and additional data (If any).                  See <a href="#">Supporting Information</a> for explanation of symbols and abbreviations.</p>	<p><b>Water Level Observations</b></p>	<p><b>Drill Rig</b> #546</p>
<p><b>Notes</b> Elevation Reference: Elevations were provided by others.</p>	<p><b>Advancement Method</b> 5" Casing Advancement, then NQ rock coring</p> <p><b>Abandonment Method</b> Boring backfilled with Auger Cuttings and/or Bentonite</p>	<p><b>Driller</b> DH</p> <p><b>Logged by</b> AL</p> <p><b>Boring Started</b> 09-29-2023</p> <p><b>Boring Completed</b> 09-29-2023</p>






## Boring Log No. DS-21

Graphic Log	Location: See <a href="#">Exploration Plan</a>  Northing: 473512.75 Easting: 1351854.4  Depth (Ft.) <span style="float: right;">Elevation: 1272.59 (Ft.) +/-</span>	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results
	<b>OVERBURDEN</b>	5 10 15 20			
	<b>LIMESTONE</b>	21.5 <span style="float: right;">1251.09</span>  29.5 <span style="float: right;">1243.09</span>			REC: 100% RQD: 100%
	<b>Boring Terminated at 29.5 Feet</b>				


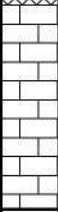

<p>See <a href="#">Exploration and Testing Procedures</a> for a description of field and laboratory procedures used and additional data (If any).                  See <a href="#">Supporting Information</a> for explanation of symbols and abbreviations.</p>	<p><b>Water Level Observations</b></p>	<p><b>Drill Rig</b> #546</p>
<p><b>Notes</b> Elevation Reference: Elevations were provided by others.</p>	<p><b>Advancement Method</b> 5" Casing Advancement, then NQ rock coring</p> <p><b>Abandonment Method</b> Boring backfilled with Auger Cuttings and/or Bentonite</p>	<p><b>Driller</b> DH</p> <p><b>Logged by</b> AL</p> <p><b>Boring Started</b> 10-03-2023</p> <p><b>Boring Completed</b> 10-03-2023</p>

## Boring Log No. DS-22

Graphic Log	Location: See Exploration Plan  Northing: 473530.86 Easting: 1351865.84  Depth (Ft.) <span style="float: right;">Elevation: 1272.05 (Ft.) +/-</span>	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results
	<b>OVERBURDEN</b>	5 10 15			
	<b>LIMESTONE</b>	19.0 <span style="float: right;">1253.05</span> 20 25			REC: 100% RQD: 100%
	<b>Boring Terminated at 27 Feet</b>	27.0 <span style="float: right;">1245.05</span>			



<p>See <a href="#">Exploration and Testing Procedures</a> for a description of field and laboratory procedures used and additional data (If any).                  See <a href="#">Supporting Information</a> for explanation of symbols and abbreviations.</p>	<p><b>Water Level Observations</b></p>	<p><b>Drill Rig</b> #546</p>
<p><b>Notes</b> Elevation Reference: Elevations were provided by others.</p>	<p><b>Advancement Method</b> 5" Casing Advancement, then NQ rock coring</p> <p><b>Abandonment Method</b> Boring backfilled with Auger Cuttings and/or Bentonite</p>	<p><b>Driller</b> DH</p> <p><b>Logged by</b> AL</p> <p><b>Boring Started</b> 10-03-2023</p> <p><b>Boring Completed</b> 10-03-2023</p>

## Boring Log No. DS-23

Graphic Log	Location: See <a href="#">Exploration Plan</a>  Northing: 473527.64 Easting: 1351877.19  Depth (Ft.) <span style="float: right;">Elevation: 1272.46 (Ft.) +/-</span>	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results
	<b>OVERBURDEN</b>				
	<b>LIMESTONE</b>	19.5 <span style="float: right;">1252.96</span>			REC: 100% RQD: 100%
	<b>Boring Terminated at 27.5 Feet</b>	27.5 <span style="float: right;">1244.96</span>			


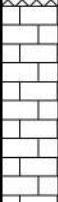

<p>See <a href="#">Exploration and Testing Procedures</a> for a description of field and laboratory procedures used and additional data (If any).                  See <a href="#">Supporting Information</a> for explanation of symbols and abbreviations.</p>	<p><b>Water Level Observations</b></p>	<p><b>Drill Rig</b> #546</p>
<p><b>Notes</b> Elevation Reference: Elevations were provided by others.</p>	<p><b>Advancement Method</b> 5" Casing Advancement, then NQ rock coring</p> <p><b>Abandonment Method</b> Boring backfilled with Auger Cuttings and/or Bentonite</p>	<p><b>Driller</b> DH</p> <p><b>Logged by</b> AL</p> <p><b>Boring Started</b> 10-02-2023</p> <p><b>Boring Completed</b> 10-02-2023</p>

## Boring Log No. DS-24

Graphic Log	Location: See <a href="#">Exploration Plan</a>  Northing: 473521.7 Easting: 1351865.66  Depth (Ft.) <span style="float: right;">Elevation: 1271.73 (Ft.) +/-</span>	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results
	<b>OVERBURDEN</b>	5 10 15 20			
	<b>LIMESTONE</b>	20.0 <span style="float: right;">1251.73</span> 28.0 <span style="float: right;">1243.73</span>		20 25	REC: 100% RQD: 100%
	<b>Boring Terminated at 28 Feet</b>				

<p>See <a href="#">Exploration and Testing Procedures</a> for a description of field and laboratory procedures used and additional data (If any).                  See <a href="#">Supporting Information</a> for explanation of symbols and abbreviations.</p> <p><b>Notes</b>                  Elevation Reference: Elevations were provided by others.</p>	<p><b>Water Level Observations</b></p> <p><b>Advancement Method</b>                  5" Casing Advancement, then NQ rock coring</p> <p><b>Abandonment Method</b>                  Boring backfilled with Auger Cuttings and/or Bentonite</p>	<p><b>Drill Rig</b>                  #546</p> <p><b>Driller</b>                  DH</p> <p><b>Logged by</b>                  AL</p> <p><b>Boring Started</b>                  10-03-2023</p> <p><b>Boring Completed</b>                  10-03-2023</p>
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## Boring Log No. DS-25

Graphic Log	Location: See <a href="#">Exploration Plan</a>  Northing: 473518.47 Easting: 1351877.02  Depth (Ft.) <span style="float: right;">Elevation: 1272.34 (Ft.) +/-</span>	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results
	<b>OVERBURDEN</b>	5 10 15 20			
	<b>LIMESTONE</b>	22.0 <span style="float: right;">1250.34</span>  30.0 <span style="float: right;">1242.34</span>			REC: 100% RQD: 100%
	<b>Boring Terminated at 30 Feet</b>	30			

<p>See <a href="#">Exploration and Testing Procedures</a> for a description of field and laboratory procedures used and additional data (If any).                  See <a href="#">Supporting Information</a> for explanation of symbols and abbreviations.</p>	<p><b>Water Level Observations</b></p>	<p><b>Drill Rig</b> #546</p>
<p><b>Notes</b> Elevation Reference: Elevations were provided by others.</p>	<p><b>Advancement Method</b> 5" Casing Advancement, then NQ rock coring</p> <p><b>Abandonment Method</b> Boring backfilled with Auger Cuttings and/or Bentonite</p>	<p><b>Driller</b> DH</p> <p><b>Logged by</b> AL</p> <p><b>Boring Started</b> 10-02-2023</p> <p><b>Boring Completed</b> 10-02-2023</p>

# Boring Log No. DS-30

Graphic Log	Location: See Exploration Plan  Northing: 473864.08 Easting: 1352646.28  Depth (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results
	<b>OVERBURDEN</b>  Elevation: 1265.3 (Ft.) +/-	5 10 15 20 25			
	26.0 <b>WEATHERED LIMESTONE &amp; CHERT</b> 1239.3	25			
	30.5 <b>LIMESTONE</b> 1234.8	30			REC: 100% RQD: 97%
	38.5 <b>Boring Terminated at 38.5 Feet</b> 1226.8	35			

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).  
 See [Supporting Information](#) for explanation of symbols and abbreviations.

**Notes**

Elevation Reference: Elevations were provided by others.

**Water Level Observations**

**Drill Rig**  
#546

**Advancement Method**  
5" Casing Advancement, then NQ rock coring

**Driller**  
DH


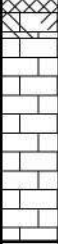

**Abandonment Method**  
Boring backfilled with Auger Cuttings and/or Bentonite

**Logged by**  
AL

**Boring Started**  
09-15-2023




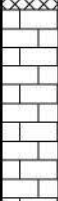

**Boring Completed**  
09-15-2023

## Boring Log No. DS-31

Graphic Log	Location: See <a href="#">Exploration Plan</a>  Northing: 473860.6 Easting: 1352660.26  Depth (Ft.) <span style="float: right;">Elevation: 1265.95 (Ft.) +/-</span>	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results
	<b>OVERBURDEN</b>	5 10 15 20 25			
	28.5 <span style="float: right;">1237.45</span> 29.5 <b>WEATHERED LIMESTONE &amp; CHERT LESTONE</b> <span style="float: right;">1236.45</span>	30			REC: 100% RQD: 98%
	37.5 <span style="float: right;">1228.45</span> <b>Boring Terminated at 37.5 Feet</b>				

<p>See <a href="#">Exploration and Testing Procedures</a> for a description of field and laboratory procedures used and additional data (If any).                      See <a href="#">Supporting Information</a> for explanation of symbols and abbreviations.</p>	<p><b>Water Level Observations</b></p>	<p><b>Drill Rig</b> #546</p>
<p><b>Notes</b> Elevation Reference: Elevations were provided by others.</p>	<p><b>Advancement Method</b> 5" Casing Advancement, then NQ rock coring</p> <p><b>Abandonment Method</b> Boring backfilled with Auger Cuttings and/or Bentonite</p>	<p><b>Driller</b> DH</p> <p><b>Logged by</b> AL</p> <p><b>Boring Started</b> 09-18-2023</p> <p><b>Boring Completed</b> 09-18-2023</p>

## Boring Log No. DS-32

Graphic Log	Location: See <a href="#">Exploration Plan</a>  Northing: 473852.54 Easting: 1352672.21  Depth (Ft.) <span style="float: right;">Elevation: 1266.39 (Ft.) +/-</span>	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results
	<b>OVERBURDEN</b>				
	26.5 <b>WEATHERED LIMESTONE &amp; CHERT</b> 28.0	1239.89 1238.39			
	<b>CLAY SEAM</b>				
	35.0 <b>LIMESTONE</b>  43.0	1231.39  1223.39			REC: 100% RQD: 100%
	<b>Boring Terminated at 43 Feet</b>				

<p>See <a href="#">Exploration and Testing Procedures</a> for a description of field and laboratory procedures used and additional data (If any).                  See <a href="#">Supporting Information</a> for explanation of symbols and abbreviations.</p> <p><b>Notes</b>                  Elevation Reference: Elevations were provided by others.</p>	<p><b>Water Level Observations</b></p> <p><b>Advancement Method</b>                  5" Casing Advancement, then NQ rock coring</p> <p><b>Abandonment Method</b>                  Boring backfilled with Auger Cuttings and/or Bentonite</p>	<p><b>Drill Rig</b>                  #546</p> <p><b>Driller</b>                  DH</p> <p><b>Logged by</b>                  AL</p> <p><b>Boring Started</b>                  09-19-2023</p> <p><b>Boring Completed</b>                  09-19-2023</p>
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## Boring Log No. DS-33

Graphic Log	Location: See <a href="#">Exploration Plan</a>  Northing: 473840.88 Easting: 1352680.68  Depth (Ft.) <span style="float: right;">Elevation: 1266.74 (Ft.) +/-</span>	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results
	<p><b>OVERBURDEN</b></p> <p>25.5 26.0 <b>WEATHERED LIMESTONE &amp; CHERT</b> <b>LIMESTONE</b></p> <p>34.0 <b>Boring Terminated at 34 Feet</b></p>				<p>REC: 100% RQD: 88%</p>
	<p>1241.24 1240.74  1232.74</p>				

<p>See <a href="#">Exploration and Testing Procedures</a> for a description of field and laboratory procedures used and additional data (If any).                  See <a href="#">Supporting Information</a> for explanation of symbols and abbreviations.</p>	<p><b>Water Level Observations</b></p>
<p><b>Notes</b>                  Elevation Reference: Elevations were provided by others.</p>	<p><b>Drill Rig</b> #546</p> <p><b>Driller</b> DH</p> <p><b>Logged by</b> AL</p> <p><b>Boring Started</b> 09-19-2023</p> <p><b>Boring Completed</b> 09-19-2023</p>
	<p><b>Advancement Method</b> 5" Casing Advancement, then NQ rock coring</p> <p><b>Abandonment Method</b> Boring backfilled with Auger Cuttings and/or Bentonite</p>

## Boring Log No. DS-34

Graphic Log	Location: See Exploration Plan  Northing: 473827.02 Easting: 1352684.65  Depth (Ft.) <span style="float: right;">Elevation: 1266.95 (Ft.) +/-</span>	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results
	<p><b>OVERBURDEN</b></p> <p>31.0 31.5 <b>WEATHERED LIMESTONE &amp; CHERT LIMESTONE</b></p> <p>36.0 37.0 <b>CLAY SEAM LIMESTONE</b></p> <p>45.0 <b>Boring Terminated at 45 Feet</b></p>	<p>5</p> <p>10</p> <p>15</p> <p>20</p> <p>25</p> <p>30</p> <p>35</p> <p>40</p> <p>45</p>		<p>REC: 100%</p> <p>RQD: 100%</p>	

<p>See <a href="#">Exploration and Testing Procedures</a> for a description of field and laboratory procedures used and additional data (If any).</p> <p>See <a href="#">Supporting Information</a> for explanation of symbols and abbreviations.</p>	<p><b>Water Level Observations</b></p>
<p><b>Notes</b></p> <p>Elevation Reference: Elevations were provided by others.</p>	<p><b>Drill Rig</b> #546</p> <p><b>Driller</b> DH</p> <p><b>Logged by</b> AL</p> <p><b>Boring Started</b> 09-19-2023</p> <p><b>Boring Completed</b> 09-19-2023</p>
	<p><b>Advancement Method</b> 5" Casing Advancement, then NQ rock coring</p> <p><b>Abandonment Method</b> Boring backfilled with Auger Cuttings and/or Bentonite</p>

## Boring Log No. DS-35

Graphic Log	Location: See Exploration Plan  Northing: 473812.64 Easting: 1352683.65  Depth (Ft.) <span style="float: right;">Elevation: 1266.9 (Ft.) +/-</span>	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results
	<p><b>OVERBURDEN</b></p> <p>31.0 31.5</p> <p><b>WEATHERED LIMESTONE &amp; CHERT LIMESTONE</b></p> <p>39.5</p> <p><b>Boring Terminated at 39.5 Feet</b></p>	<p>5</p> <p>10</p> <p>15</p> <p>20</p> <p>25</p> <p>30</p> <p>35</p>	<p>REC: 100%</p> <p>RQD: 100%</p>		



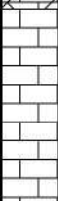
<p>See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).                  See Supporting Information for explanation of symbols and abbreviations.</p> <p><b>Notes</b>                  Elevation Reference: Elevations were provided by others.</p>	<p><b>Water Level Observations</b></p> <p><b>Advancement Method</b>                  5" Casing Advancement, then NQ rock coring</p> <p><b>Abandonment Method</b>                  Boring backfilled with Auger Cuttings and/or Bentonite</p>	<p><b>Drill Rig</b>                  #546</p> <p><b>Driller</b>                  DH</p> <p><b>Logged by</b>                  AL</p> <p><b>Boring Started</b>                  09-21-2023</p> <p><b>Boring Completed</b>                  09-21-2023</p>
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## Boring Log No. DS-36

Graphic Log	Location: See Exploration Plan Northing: 473799.48 Easting: 1352677.77 Depth (Ft.) <span style="float: right;">Elevation: 1266.78 (Ft.) +/-</span>	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results
	<b>OVERBURDEN</b>	5 10 15 20 25			
27.5	1239.28				
28.5	1238.28				
	<b>CLAY SEAM</b>	30			
35.5	1231.28	35			
	<b>LIMESTONE</b>	40			REC: 100% RQD: 85%
43.5	1223.28	43.5			
	<b>Boring Terminated at 43.5 Feet</b>				

<p>See <a href="#">Exploration and Testing Procedures</a> for a description of field and laboratory procedures used and additional data (If any).                  See <a href="#">Supporting Information</a> for explanation of symbols and abbreviations.</p> <p><b>Notes</b>                  Elevation Reference: Elevations were provided by others.</p>	<p><b>Water Level Observations</b></p> <p><b>Advancement Method</b>                  5" Casing Advancement, then NQ rock coring</p> <p><b>Abandonment Method</b>                  Boring backfilled with Auger Cuttings and/or Bentonite</p>	<p><b>Drill Rig</b>                  #546</p> <p><b>Driller</b>                  DH</p> <p><b>Logged by</b>                  AL</p> <p><b>Boring Started</b>                  09-21-2023</p> <p><b>Boring Completed</b>                  09-21-2023</p>
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## Boring Log No. DS-37

Graphic Log	Location: See <a href="#">Exploration Plan</a>  Northing: 473789.11 Easting: 1352667.77  Depth (Ft.) <span style="float: right;">Elevation: 1266.67 (Ft.) +/-</span>	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results
	<b>OVERBURDEN</b>	5 10 15 20 25			
	30.0 <b>WEATHERED LIMESTONE &amp; CHERT</b> 1236.67	30			
	32.5 <b>LIMESTONE</b> 1234.17	35	█		REC: 100% RQD: 100%
	40.5 <b>Boring Terminated at 40.5 Feet</b> 1226.17	40			

See <a href="#">Exploration and Testing Procedures</a> for a description of field and laboratory procedures used and additional data (If any). See <a href="#">Supporting Information</a> for explanation of symbols and abbreviations.	<b>Water Level Observations</b>  (None recorded)	<b>Drill Rig</b> #546  <b>Driller</b> DH  <b>Logged by</b> AL  <b>Boring Started</b> 09-21-2023  <b>Boring Completed</b> 09-21-2023
<b>Notes</b> Elevation Reference: Elevations were provided by others.	<b>Advancement Method</b> 5" Casing Advancement, then NQ rock coring  <b>Abandonment Method</b> Boring backfilled with Auger Cuttings and/or Bentonite	

## Boring Log No. DS-38

Graphic Log	Location: See <a href="#">Exploration Plan</a>  Northing: 473782.79 Easting: 1352654.82  Depth (Ft.) <span style="float: right;">Elevation: 1266.41 (Ft.) +/-</span>	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results
	<p><b>OVERBURDEN</b></p> <p>34.5 35.0 <b>WEATHERED LIMESTONE &amp; CHERT LIMESTONE</b></p> <p>43.0 <b>Boring Terminated at 43 Feet</b></p>	<p>5</p> <p>10</p> <p>15</p> <p>20</p> <p>25</p> <p>30</p> <p>35</p> <p>40</p>	<p>REC: 100%</p> <p>RQD: 85%</p>		



<p>See <a href="#">Exploration and Testing Procedures</a> for a description of field and laboratory procedures used and additional data (If any).                  See <a href="#">Supporting Information</a> for explanation of symbols and abbreviations.</p>	<p><b>Water Level Observations</b></p>
<p><b>Notes</b>                  Elevation Reference: Elevations were provided by others.</p>	<p><b>Drill Rig</b> #546</p> <p><b>Driller</b> DH</p> <p><b>Logged by</b> AL</p> <p><b>Boring Started</b> 09-11-2023</p> <p><b>Boring Completed</b> 09-11-2023</p>
	<p><b>Advancement Method</b> 5" Casing Advancement, then NQ rock coring</p> <p><b>Abandonment Method</b> Boring backfilled with Auger Cuttings and/or Bentonite</p>

# Boring Log No. DS-39

Graphic Log	Location: See Exploration Plan  Northing: 473781.28 Easting: 1352640.49  Depth (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results
	<b>OVERBURDEN</b>	5 10 15 20 25			
	31.0 1235.05 32.0 <b>WEATHERED LIMESTONE &amp; CHERT</b> <b>LIMESTONE</b>	30 35			REC: 100% RQD: 61%
	40.0 1226.05 <b>Boring Terminated at 40 Feet</b>	40			

<p>See <a href="#">Exploration and Testing Procedures</a> for a description of field and laboratory procedures used and additional data (If any).                  See <a href="#">Supporting Information</a> for explanation of symbols and abbreviations.</p>	<p><b>Water Level Observations</b></p>	<p><b>Drill Rig</b> #546</p>
<p><b>Notes</b> Elevation Reference: Elevations were provided by others.</p>	<p><b>Advancement Method</b> 5" Casing Advancement, then NQ rock coring</p> <p><b>Abandonment Method</b> Boring backfilled with Auger Cuttings and/or Bentonite</p>	<p><b>Driller</b> DH</p> <p><b>Logged by</b> AL</p> <p><b>Boring Started</b> 09-11-2023</p> <p><b>Boring Completed</b> 09-11-2023</p>



## Boring Log No. DS-40

Graphic Log	Location: See Exploration Plan Northing: 473784.77 Easting: 1352626.5 Depth (Ft.) <span style="float: right;">Elevation: 1265.74 (Ft.) +/-</span>	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results
	<b>OVERBURDEN</b>	5 10 15 20 25 30 35			
	<b>WEATHERED LIMESTONE &amp; CHERT</b> <b>LIMESTONE</b>	39.0 39.5 40 45			REC: 100% RQD: 94%
	<b>Boring Terminated at 47.5 Feet</b>	47.5			

<p>See <a href="#">Exploration and Testing Procedures</a> for a description of field and laboratory procedures used and additional data (If any).                  See <a href="#">Supporting Information</a> for explanation of symbols and abbreviations.</p> <p><b>Notes</b>                  Elevation Reference: Elevations were provided by others.</p>	<p><b>Water Level Observations</b></p> <p><b>Advancement Method</b>                  5" Casing Advancement, then NQ rock coring</p> <p><b>Abandonment Method</b>                  Boring backfilled with Auger Cuttings and/or Bentonite</p>	<p><b>Drill Rig</b>                  #546</p> <p><b>Driller</b>                  DH</p> <p><b>Logged by</b>                  AL</p> <p><b>Boring Started</b>                  08-31-2023</p> <p><b>Boring Completed</b>                  09-11-2023</p>
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# Boring Log No. DS-41

Graphic Log	Location: See Exploration Plan  Northing: 473792.83 Easting: 1352614.55  Depth (Ft.) <span style="float: right;">Elevation: 1265.45 (Ft.) +/-</span>	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results
	<p><b>OVERBURDEN</b></p>	<p>5 10 15 20 25 30</p>			
	<p>31.5 <span style="float: right;">1233.95</span>                      32.0 <span style="float: right;">1233.45</span></p> <p><b>WEATHERED LIMESTONE &amp; CHERT</b>  <b>LIMESTONE</b></p>	<p>35</p>			<p>REC: 100%                      RQD: 97%</p>
	<p>40.0 <span style="float: right;">1225.45</span></p> <p><b>Boring Terminated at 40 Feet</b></p>	<p>40</p>			

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).  
 See Supporting Information for explanation of symbols and abbreviations.

**Notes**  
 Elevation Reference: Elevations were provided by others.

**Water Level Observations**

**Drill Rig**  
 #546

**Advancement Method**  
 5" Casing Advancement, then NQ rock coring

**Driller**  
 DH

**Abandonment Method**  
 Boring backfilled with Auger Cuttings and/or Bentonite

**Logged by**  
 AL

**Boring Started**  
 09-01-0203



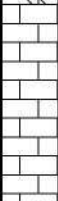

**Boring Completed**  
 09-01-0203

## Boring Log No. DS-42

Graphic Log	Location: See Exploration Plan  Northing: 473804.49 Easting: 1352606.08  Depth (Ft.)	Elevation: 1265.36 (Ft.) +/-	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results
			5 10 15 20 25 30 35 40			
	35.5 36.0 WEATHERED LIMESTONE & CHERT LIMESTONE 44.0 Boring Terminated at 44 Feet	1229.86 1229.36 1221.36			REC: 100% RQD: 96%	

<p>See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).                  See Supporting Information for explanation of symbols and abbreviations.</p> <p><b>Notes</b>                  Elevation Reference: Elevations were provided by others.</p>	<p><b>Water Level Observations</b></p> <p><b>Advancement Method</b>                  5" Casing Advancement, then NQ rock coring</p> <p><b>Abandonment Method</b>                  Boring backfilled with Auger Cuttings and/or Bentonite</p>	<p><b>Drill Rig</b>                  #546</p> <p><b>Driller</b>                  DH</p> <p><b>Logged by</b>                  AL</p> <p><b>Boring Started</b>                  09-01-2023</p> <p><b>Boring Completed</b>                  09-01-2023</p>
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## Boring Log No. DS-43

Graphic Log	Location: See <a href="#">Exploration Plan</a>  Northing: 473818.35 Easting: 1352602.11  Depth (Ft.) <span style="float: right;">Elevation: 1265.23 (Ft.) +/-</span>	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results
	<b>OVERBURDEN</b>	5 10 15 20 25			
	27.5 <span style="float: right;">1237.73</span> <b>WEATHERED LIMESTONE &amp; CHERT</b>	29.0 <span style="float: right;">1236.23</span>			
	<b>LIMESTONE</b>	30 35			REC: 100% RQD: 90%
	37.0 <span style="float: right;">1228.23</span> <b>Boring Terminated at 37 Feet</b>				

<p>See <a href="#">Exploration and Testing Procedures</a> for a description of field and laboratory procedures used and additional data (If any).                  See <a href="#">Supporting Information</a> for explanation of symbols and abbreviations.</p>	<p><b>Water Level Observations</b></p>	<p><b>Drill Rig</b> #546</p>
<p><b>Notes</b> Elevation Reference: Elevations were provided by others.</p>	<p><b>Advancement Method</b> 5" Casing Advancement, then NQ rock coring</p> <p><b>Abandonment Method</b> Boring backfilled with Auger Cuttings and/or Bentonite</p>	<p><b>Driller</b> DH</p> <p><b>Logged by</b> AL</p> <p><b>Boring Started</b> 09-01-2023</p> <p><b>Boring Completed</b> 09-01-2023</p>

## Boring Log No. DS-44

Graphic Log	Location: See <a href="#">Exploration Plan</a>  Northing: 473832.72 Easting: 1352603.11  Depth (Ft.) <span style="float: right;">Elevation: 1265.24 (Ft.) +/-</span>	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results
<b>OVERBURDEN</b>		5 10 15			
19.5 <b>WEATHERED LIMESTONE &amp; CHERT</b> 21.0	1245.74 1244.24	20			
<b>LIMESTONE</b>  29.0	1236.24	25		REC: 100% RQD: 95%	
<b>Boring Terminated at 29 Feet</b>					

<p>See <a href="#">Exploration and Testing Procedures</a> for a description of field and laboratory procedures used and additional data (If any).                  See <a href="#">Supporting Information</a> for explanation of symbols and abbreviations.</p> <p><b>Notes</b>                  Elevation Reference: Elevations were provided by others.</p>	<p><b>Water Level Observations</b></p> <p><b>Advancement Method</b>                  5" Casing Advancement, then NQ rock coring</p> <p><b>Abandonment Method</b>                  Boring backfilled with Auger Cuttings and/or Bentonite</p>	<p><b>Drill Rig</b>                  #546</p> <p><b>Driller</b>                  DH</p> <p><b>Logged by</b>                  AL</p> <p><b>Boring Started</b>                  09-05-2023</p> <p><b>Boring Completed</b>                  09-05-2023</p>
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# Boring Log No. DS-45

Graphic Log	Location: See Exploration Plan  Northing: 473845.89 Easting: 1352608.98  Depth (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results
	<p><b>OVERBURDEN</b></p>	<p>5 10 15 20 25</p>			
	<p>29.5 30.0</p> <p><b>WEATHERED LIMESTONE &amp; CHERT LIMESTONE</b></p> <p>1235.67 1235.17</p>	<p>30</p>			<p>REC: 100% RQD: 100%</p>
	<p>38.0</p> <p><b>Boring Terminated at 38 Feet</b></p> <p>1227.17</p>	<p>35</p>			

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).  
 See Supporting Information for explanation of symbols and abbreviations.

**Notes**  
 Elevation Reference: Elevations were provided by others.

**Water Level Observations**

**Advancement Method**  
 5" Casing Advancement, then NQ rock coring

**Abandonment Method**  
 Boring backfilled with Auger Cuttings and/or Bentonite

**Drill Rig**  
 #546




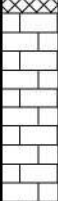

**Driller**  
 DH

**Logged by**  
 AL

**Boring Started**  
 09-06-2023

**Boring Completed**  
 09-06-2023

## Boring Log No. DS-46

Graphic Log	Location: See Exploration Plan  Northing: 473856.26 Easting: 1352618.99  Depth (Ft.) <span style="float: right;">Elevation: 1265.25 (Ft.) +/-</span>	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results
	<b>OVERBURDEN</b>				
	19.0 <b>WEATHERED LIMESTONE</b> <span style="float: right;">1246.25</span>	5			
	23.0 <b>CLAY SEAM</b> <span style="float: right;">1242.25</span>	10			
	33.5 <b>LIMESTONE</b> <span style="float: right;">1231.75</span>	15			
	41.5 <b>Boring Terminated at 41.5 Feet</b> <span style="float: right;">1223.75</span>	20			
		25			
		30			
		35			REC: 100% RQD: 100%
		40			









<p>See <a href="#">Exploration and Testing Procedures</a> for a description of field and laboratory procedures used and additional data (If any).                  See <a href="#">Supporting Information</a> for explanation of symbols and abbreviations.</p> <p><b>Notes</b>                  Elevation Reference: Elevations were provided by others.</p>	<p><b>Water Level Observations</b></p> <p><b>Advancement Method</b>                  5" Casing Advancement, then NQ rock coring</p> <p><b>Abandonment Method</b>                  Boring backfilled with Auger Cuttings and/or Bentonite</p>	<p><b>Drill Rig</b>                  #546</p> <p><b>Driller</b>                  DH</p> <p><b>Logged by</b>                  AL</p> <p><b>Boring Started</b>                  09-06-2023</p> <p><b>Boring Completed</b>                  09-06-2023</p>
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## Boring Log No. DS-47

Graphic Log	Location: See <a href="#">Exploration Plan</a>  Northing: 473862.58 Easting: 1352631.94  Depth (Ft.) <span style="float: right;">Elevation: 1265.16 (Ft.) +/-</span>	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results
	<b>OVERBURDEN</b>				
	<b>LIMESTONE</b>	29.5 <span style="float: right;">1235.66</span>			REC: 100% RQD: 98%
	<b>Boring Terminated at 37.5 Feet</b>	37.5 <span style="float: right;">1227.66</span>			

See <a href="#">Exploration and Testing Procedures</a> for a description of field and laboratory procedures used and additional data (If any). See <a href="#">Supporting Information</a> for explanation of symbols and abbreviations.	<b>Water Level Observations</b>  (None recorded)	<b>Drill Rig</b> #546  <b>Driller</b> DH  <b>Logged by</b> AL  <b>Boring Started</b> 09-06-2023  <b>Boring Completed</b> 09-06-2023
<b>Notes</b> Elevation Reference: Elevations were provided by others.	<b>Advancement Method</b> 5" Casing Advancement, then NQ rock coring  <b>Abandonment Method</b> Boring backfilled with Auger Cuttings and/or Bentonite	





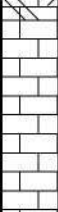

## Boring Log No. DS-48

Graphic Log	Location: See Exploration Plan  Northing: 473853.68 Easting: 1352643.38  Depth (Ft.)	Elevation: 1265.61 (Ft.) +/-	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results
	<b>OVERBURDEN</b>		5			
	11.0 <b>CHERT BOULDER</b>	1254.61	10			
	12.0 <b>OVERBURDEN</b>	1253.61	15			
	20.0 <b>WEATHERED LIMESTONE</b>	1245.61	20			
	25.0 <b>CLAY SEAM</b>	1240.61	25			
	26.5 <b>WEATHERED LIMESTONE &amp; CHERT</b>	1239.11	28			
	28.5 <b>CLAY SEAM</b>	1237.11	30			
	29.0 <b>LIMESTONE</b>	1236.61	35			REC: 100% RQD: 90%
	37.0 <b>Boring Terminated at 37 Feet</b>	1228.61				

<p>See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).                  See Supporting Information for explanation of symbols and abbreviations.</p>	<p><b>Water Level Observations</b></p>	<p><b>Drill Rig</b> #546</p>
<p><b>Notes</b> Elevation Reference: Elevations were provided by others.</p>	<p><b>Advancement Method</b> 5" Casing Advancement, then NQ rock coring</p> <p><b>Abandonment Method</b> Boring backfilled with Auger Cuttings and/or Bentonite</p>	<p><b>Driller</b> DH</p> <p><b>Logged by</b> AL</p> <p><b>Boring Started</b> 09-15-2023</p> <p><b>Boring Completed</b> 09-15-2023</p>



## Boring Log No. DS-49

Graphic Log	Location: See Exploration Plan  Northing: 473849.53 Easting: 1352658.88  Depth (Ft.) <span style="float: right;">Elevation: 1266.1 (Ft.) +/-</span>	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results
	<b>OVERBURDEN</b>				
	20.0 <span style="float: right;">1246.1</span>	5			
	21.0 <b>CHERT BOULDER</b> <span style="float: right;">1245.1</span>	10			
	22.0 <b>CLAY SEAM</b> <span style="float: right;">1244.1</span>	15			
	<b>WEATHERED LIMESTONE &amp; CHERT</b>				
	25.5 <span style="float: right;">1240.6</span>	20			
	<b>LIMESTONE</b>				
	33.5 <span style="float: right;">1232.6</span>	25			
	<b>Boring Terminated at 33.5 Feet</b>	30		 REC: 100% RQD: 90%	

See <a href="#">Exploration and Testing Procedures</a> for a description of field and laboratory procedures used and additional data (If any). See <a href="#">Supporting Information</a> for explanation of symbols and abbreviations.	<b>Water Level Observations</b>  (Empty)	<b>Drill Rig</b> #546  <b>Driller</b> DH  <b>Logged by</b> AL  <b>Boring Started</b> 09-18-2023  <b>Boring Completed</b> 09-18-2023
<b>Notes</b> Elevation Reference: Elevations were provided by others.	<b>Advancement Method</b> 5" Casing Advancement, then NQ rock coring  <b>Abandonment Method</b> Boring backfilled with Auger Cuttings and/or Bentonite	

# Boring Log No. DS-50

Graphic Log	Location: See Exploration Plan Northing: 473838.18 Easting: 1352670.23 Depth (Ft.)	Elevation: 1266.65 (Ft.) +/-	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results
<b>OVERBURDEN</b>			5 10 15 20			
core barrel broke during retrieval, top of steel present at approximately 20' below grade			23.5			
<b>LIMESTONE</b>			25 30			REC: 100% RQD: 91%
<b>Boring Terminated at 31.5 Feet</b>			31.5			

<p>See <a href="#">Exploration and Testing Procedures</a> for a description of field and laboratory procedures used and additional data (If any).</p> <p>See <a href="#">Supporting Information</a> for explanation of symbols and abbreviations.</p>	<p><b>Water Level Observations</b></p>	<p><b>Drill Rig</b> #546</p>
	<p><b>Notes</b> Elevation Reference: Elevations were provided by others.</p>	<p><b>Advancement Method</b> 5" Casing Advancement, then NQ rock coring</p> <p><b>Abandonment Method</b> Boring backfilled with Auger Cuttings and/or Bentonite</p>

# Boring Log No. DS-51

Graphic Log	Location: See Exploration Plan Northing: 473822.68 Easting: 1352674.38 Depth (Ft.)	Elevation: 1266.82 (Ft.) +/-	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results
<b>OVERBURDEN</b>			5 10 15 20 25 30 35			
	27.0	1239.82				
	28.0 <b>WEATHERED LIMESTONE &amp; CHERT</b>	1238.82				
	29.0 <b>CLAY SEAM</b>	1237.82				
	30.0 <b>WEATHERED LIMESTONE &amp; CHERT</b>	1236.82				
	30.5 <b>CLAY SEAM</b>	1236.32				
	<b>LIMESTONE</b>					
	38.5	1228.32				REC: 100% RQD: 99%
	<b>Boring Terminated at 38.5 Feet</b>					

<p>See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).                  See Supporting Information for explanation of symbols and abbreviations.</p> <p><b>Notes</b>                  Elevation Reference: Elevations were provided by others.</p>	<p><b>Water Level Observations</b></p>	<p><b>Drill Rig</b>                  #546</p>
	<p><b>Advancement Method</b>                  5" Casing Advancement, then NQ rock coring</p> <p><b>Abandonment Method</b>                  Boring backfilled with Auger Cuttings and/or Bentonite</p>	<p><b>Driller</b>                  DH</p> <p><b>Logged by</b>                  AL</p> <p><b>Boring Started</b>                  09-20-2023</p> <p><b>Boring Completed</b>                  09-20-2023</p>

# Boring Log No. DS-52

Graphic Log	Location: See Exploration Plan  Northing: 473807.18 Easting: 1352670.23  Depth (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results
	<p style="text-align: right;">Elevation: 1266.71 (Ft.) +/-</p> <p><b>OVERBURDEN</b></p>	<p>5</p> <p>10</p> <p>15</p> <p>20</p> <p>25</p> <p>30</p>			
		<p>34.5      1232.21</p> <p>35.0      1231.71</p> <p><b>WEATHERED LIMESTONE &amp; CHERT LIMESTONE</b></p>	<p>35</p> <p>40</p>		
	<p>43.0      1223.71</p> <p><b>Boring Terminated at 43 Feet</b></p>				

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).  
 See Supporting Information for explanation of symbols and abbreviations.

**Notes**  
 Elevation Reference: Elevations were provided by others.

**Water Level Observations**

**Drill Rig**  
 #546

**Advancement Method**  
 5" Casing Advancement, then NQ rock coring

**Driller**  
 DH

**Abandonment Method**  
 Boring backfilled with Auger Cuttings and/or Bentonite

**Logged by**  
 AL

**Boring Started**  
 09-20-2023

**Boring Completed**  
 09-20-2023

# Boring Log No. DS-53

Graphic Log	Location: See Exploration Plan  Northing: 473795.84 Easting: 1352658.88  Depth (Ft.) <span style="float: right;">Elevation: 1266.43 (Ft.) +/-</span>	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results
	<b>OVERBURDEN</b>	5 10 15 20 25 30 35			
	40.0 <span style="float: right;">1226.43</span> 40.5 <b>WEATHERED LIMESTONE &amp; CHERT</b> <span style="float: right;">1225.93</span> <b>LIMESTONE</b>	40			REC: 100% RQD: 66%
	48.5 <span style="float: right;">1217.93</span> <b>Boring Terminated at 48.5 Feet</b>	45			

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).  
 See Supporting Information for explanation of symbols and abbreviations.

**Water Level Observations**

**Drill Rig**  
#546

**Notes**

Elevation Reference: Elevations were provided by others.

**Advancement Method**  
5" Casing Advancement, then NQ rock coring

**Driller**  
DH  
**Logged by**  
AL

**Abandonment Method**  
Boring backfilled with Auger Cuttings and/or Bentonite

**Boring Started**  
09-21-2023  
**Boring Completed**  
09-21-2023

## Boring Log No. DS-54

Graphic Log	Location: See <a href="#">Exploration Plan</a>  Northing: 473791.68 Easting: 1352643.38  Depth (Ft.) <span style="float: right;">Elevation: 1266.15 (Ft.) +/-</span>	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results
	<p><b>OVERBURDEN</b></p> <p>29.0 <span style="float: right;">1237.15</span>                      29.5 <span style="float: right;">1236.65</span></p> <p><b>WEATHERED LIMESTONE &amp; CHERT LIMESTONE</b></p> <p>37.5 <span style="float: right;">1228.65</span></p> <p><b>Boring Terminated at 37.5 Feet</b></p>	5 10 15 20 25 30 35			REC: 100% RQD: 91%

<p>See <a href="#">Exploration and Testing Procedures</a> for a description of field and laboratory procedures used and additional data (If any).                      See <a href="#">Supporting Information</a> for explanation of symbols and abbreviations.</p> <p><b>Notes</b>                      Elevation Reference: Elevations were provided by others.</p>	<p><b>Water Level Observations</b></p> <p><b>Advancement Method</b>                      5" Casing Advancement, then NQ rock coring</p> <p><b>Abandonment Method</b>                      Boring backfilled with Auger Cuttings and/or Bentonite</p>	<p><b>Drill Rig</b>                      #546</p> <p><b>Driller</b>                      DH</p> <p><b>Logged by</b>                      AL</p> <p><b>Boring Started</b>                      09-11-2023</p> <p><b>Boring Completed</b>                      09-11-2023</p>
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# Boring Log No. DS-55

Graphic Log	Location: See Exploration Plan Northing: 473795.84 Easting: 1352627.88 Depth (Ft.)	Elevation: 1265.72 (Ft.) +/-	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results
	<b>OVERBURDEN</b>		5 10 15 20 25			
	30.5	1235.22	30			
	31.0	1234.72				
	<b>WEATHERED LIMESTONE</b>					
	<b>WEATHERED LIMESTONE &amp; CHERT</b>					
	34.0	1231.72	35			
	<b>CLAY SEAM</b>					
	36.0	1229.72	40			
	<b>LIMESTONE</b>					
	44.0	1221.72				REC: 100% RQD: 97%
	<b>Boring Terminated at 44 Feet</b>					

<p>See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).          See Supporting Information for explanation of symbols and abbreviations.</p>	<p><b>Water Level Observations</b></p>	<p><b>Drill Rig</b> #546</p>
	<p><b>Notes</b> Elevation Reference: Elevations were provided by others.</p>	<p><b>Advancement Method</b> 5" Casing Advancement, then NQ rock coring</p> <p><b>Abandonment Method</b> Boring backfilled with Auger Cuttings and/or Bentonite</p>

# Boring Log No. DS-56

Graphic Log	Location: See <a href="#">Exploration Plan</a>  Northing: 473807.18 Easting: 1352616.53  Depth (Ft.) <span style="float: right;">Elevation: 1265.49 (Ft.) +/-</span>	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results
	<p><b>OVERBURDEN</b></p>	<p>5</p> <p>10</p> <p>15</p> <p>20</p> <p>25</p> <p>30</p>			
	<p>32.5 <span style="float: right;">1232.99</span></p> <p>33.0 <b>WEATHERED LIMESTONE &amp; CHERT</b> <span style="float: right;">1232.49</span></p> <p><b>LIMESTONE</b></p>	<p>35</p>			<p>REC: 100%</p> <p>RQD: 100%</p>
	<p>41.0 <span style="float: right;">1224.49</span></p> <p><b>Boring Terminated at 41 Feet</b></p>	<p>40</p>			

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).  
 See [Supporting Information](#) for explanation of symbols and abbreviations.

**Notes**

Elevation Reference: Elevations were provided by others.

**Water Level Observations**

**Drill Rig**  
#546

**Advancement Method**  
5" Casing Advancement, then NQ rock coring

**Driller**  
DH

**Abandonment Method**  
Boring backfilled with Auger Cuttings and/or Bentonite


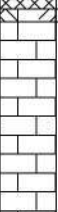

**Logged by**  
AL

**Boring Started**  
09-08-2023

**Boring Completed**  
09-08-2023



# Boring Log No. DS-57

Graphic Log	Location: See Exploration Plan Northing: 473822.68 Easting: 1352612.38 Depth (Ft.)	Elevation: 1265.36 (Ft.) +/-	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results
	<b>OVERBURDEN</b>		5 10 15 20 25			
	26.5 27.0	<b>WEATHERED LIMESTONE &amp; CHERT</b>	25 30			
		<b>LIMESTONE</b>	30 35			REC: 100% RQD: 83%
	35.0	<b>Boring Terminated at 35 Feet</b>	35			


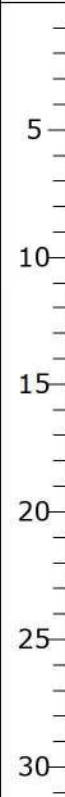
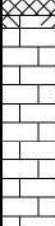
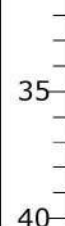


<p>See <a href="#">Exploration and Testing Procedures</a> for a description of field and laboratory procedures used and additional data (If any).</p> <p>See <a href="#">Supporting Information</a> for explanation of symbols and abbreviations.</p>	<p><b>Water Level Observations</b></p>	<p><b>Drill Rig</b> #546</p>
	<p><b>Notes</b> Elevation Reference: Elevations were provided by others.</p>	<p><b>Advancement Method</b> 5" Casing Advancement, then NQ rock coring</p> <p><b>Abandonment Method</b> Boring backfilled with Auger Cuttings and/or Bentonite</p>

## Boring Log No. DS-58

Graphic Log	Location: See <a href="#">Exploration Plan</a>  Northing: 473838.18 Easting: 1352616.54  Depth (Ft.) <span style="float: right;">Elevation: 1265.29 (Ft.) +/-</span>	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results
	<b>OVERBURDEN</b>	5 10 15 20 25			
	29.5 <span style="float: right;">1235.79</span> 30.0 <b>WEATHERED LIMESTONE &amp; CHERT</b> <b>LIMESTONE</b> <span style="float: right;">1235.29</span>	30			REC: 100% RQD: 100%
	38.0 <span style="float: right;">1227.29</span> <b>Boring Terminated at 38 Feet</b>	35			

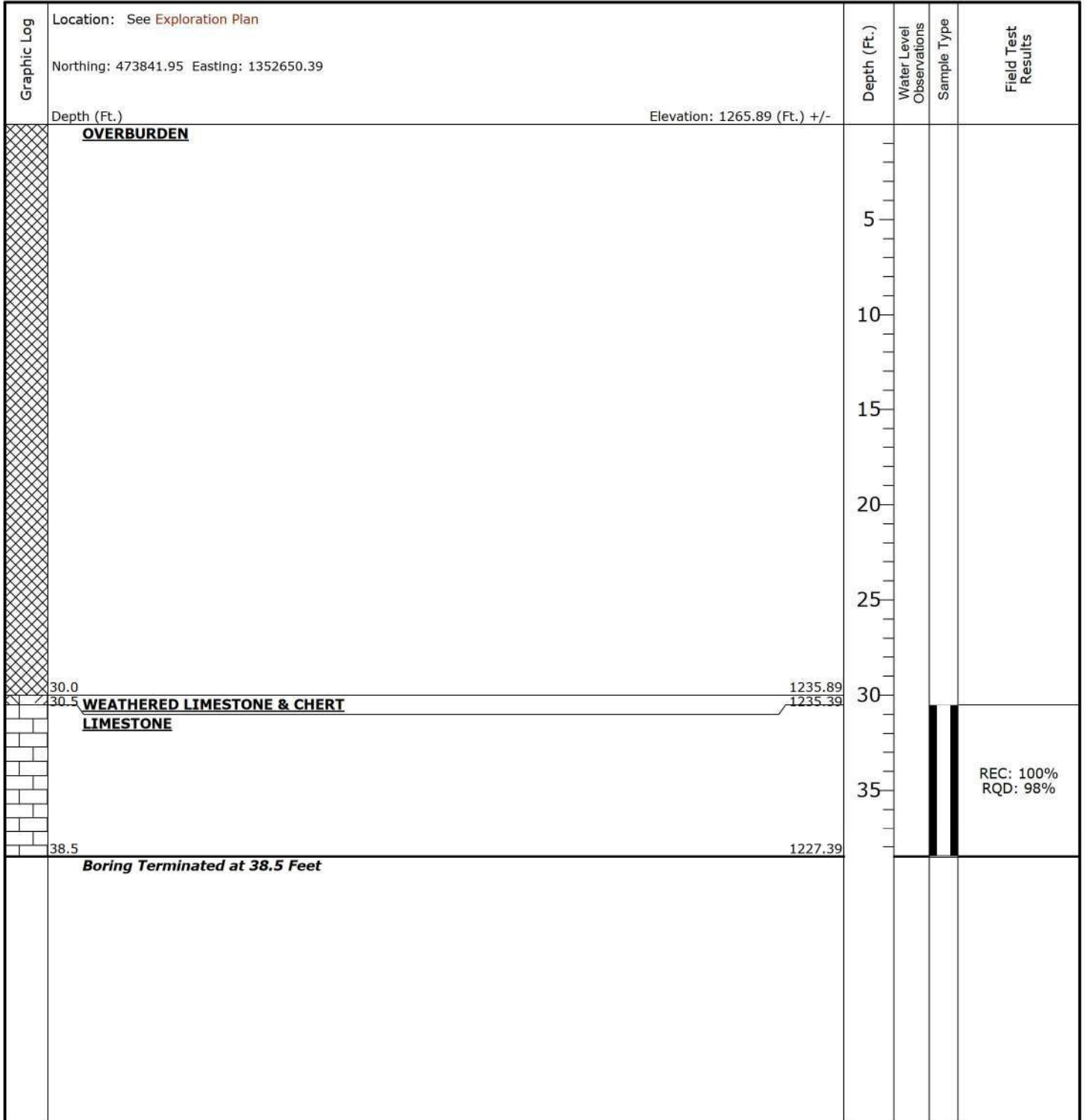
See <a href="#">Exploration and Testing Procedures</a> for a description of field and laboratory procedures used and additional data (If any). See <a href="#">Supporting Information</a> for explanation of symbols and abbreviations.	<b>Water Level Observations</b>  (Empty)	<b>Drill Rig</b> #546  <b>Driller</b> DH  <b>Logged by</b> AL  <b>Boring Started</b> 09-05-0203  <b>Boring Completed</b> 09-05-0203
<b>Notes</b> Elevation Reference: Elevations were provided by others.	<b>Advancement Method</b> 5" Casing Advancement, then NQ rock coring  <b>Abandonment Method</b> Boring backfilled with Auger Cuttings and/or Bentonite	

# Boring Log No. DS-59

Graphic Log	Location: See <a href="#">Exploration Plan</a>  Northing: 473849.53 Easting: 1352627.88  Depth (Ft.) <span style="float: right;">Elevation: 1265.44 (Ft.) +/-</span>	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results
	<p><b>OVERBURDEN</b></p>				
	<p>32.0 <span style="float: right;">1233.44</span>                      32.5 <b>WEATHERED LIMESTONE &amp; CHERT</b>  <b>LIMESTONE</b> <span style="float: right;">1232.94</span></p>				REC: 100% RQD: 100%
	<p>40.5 <span style="float: right;">1224.94</span>  <b>Boring Terminated at 40.5 Feet</b></p>				


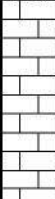

<p>See <a href="#">Exploration and Testing Procedures</a> for a description of field and laboratory procedures used and additional data (If any).                  See <a href="#">Supporting Information</a> for explanation of symbols and abbreviations.</p>	<p><b>Water Level Observations</b></p>	<p><b>Drill Rig</b> #546</p>
<p><b>Notes</b> Elevation Reference: Elevations were provided by others.</p>	<p><b>Advancement Method</b> 5" Casing Advancement, then NQ rock coring</p> <p><b>Abandonment Method</b> Boring backfilled with Auger Cuttings and/or Bentonite</p>	<p><b>Driller</b> DH</p> <p><b>Logged by</b> AL</p> <p><b>Boring Started</b> 09-06-2023</p> <p><b>Boring Completed</b> 09-06-2023</p>

## Boring Log No. DS-60



See <a href="#">Exploration and Testing Procedures</a> for a description of field and laboratory procedures used and additional data (If any). See <a href="#">Supporting Information</a> for explanation of symbols and abbreviations.	<b>Water Level Observations</b>  (None recorded)	<b>Drill Rig</b> #546  <b>Driller</b> DH  <b>Logged by</b> AL  <b>Boring Started</b> 09-12-2023  <b>Boring Completed</b> 09-12-2023
<b>Notes</b> Elevation Reference: Elevations were provided by others.	<b>Advancement Method</b> 5" Casing Advancement, then NQ rock coring  <b>Abandonment Method</b> Boring backfilled with Auger Cuttings and/or Bentonite	

# Boring Log No. DS-61

Graphic Log	Location: See <a href="#">Exploration Plan</a>  Northing: 473831.35 Easting: 1352661.96  Depth (Ft.) <span style="float: right;">Elevation: 1266.37 (Ft.) +/-</span>	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results
	<b>OVERBURDEN</b>	5 10 15 20 25			
	<b>LIMESTONE</b>	30 35	1236.37 1228.37		REC: 100% RQD: 100%
	<b>Boring Terminated at 38 Feet</b>				

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).  
 See [Supporting Information](#) for explanation of symbols and abbreviations.

**Notes**

Elevation Reference: Elevations were provided by others.

**Water Level Observations**

**Advancement Method**  
 5" Casing Advancement, then NQ rock coring

**Abandonment Method**  
 Boring backfilled with Auger Cuttings and/or Bentonite

**Drill Rig**  
 #546

**Driller**  
 DH

**Logged by**  
 AL

**Boring Started**  
 09-20-2023

**Boring Completed**  
 09-20-2023

## Boring Log No. DS-62

Graphic Log	Location: See <a href="#">Exploration Plan</a>  Northing: 473815.67 Easting: 1352662.65  Depth (Ft.) <span style="float: right;">Elevation: 1266.54 (Ft.) +/-</span>	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results
		5 10 15 20 25 30 35			
	30.0 <span style="float: right;">1236.54</span> 30.5 <b>WEATHERED LIMESTONE &amp; CHERT LIMESTONE</b> <span style="float: right;">1236.04</span> 38.5 <span style="float: right;">1228.04</span> <b>Boring Terminated at 38.5 Feet</b>				REC: 100% RQD: 100%


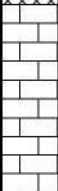

See <a href="#">Exploration and Testing Procedures</a> for a description of field and laboratory procedures used and additional data (If any). See <a href="#">Supporting Information</a> for explanation of symbols and abbreviations.	<b>Water Level Observations</b>  <b>Advancement Method</b> 5" Casing Advancement, then NQ rock coring  <b>Abandonment Method</b> Boring backfilled with Auger Cuttings and/or Bentonite	<b>Drill Rig</b> #546  <b>Driller</b> DH  <b>Logged by</b> AL  <b>Boring Started</b> 09-20-2023  <b>Boring Completed</b> 09-20-2023
<b>Notes</b> Elevation Reference: Elevations were provided by others.		

## Boring Log No. DS-63

Graphic Log	Location: See Exploration Plan  Northing: 473804.1 Easting: 1352652.05  Depth (Ft.) <span style="float: right;">Elevation: 1266.24 (Ft.) +/-</span>	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results
	<b>OVERBURDEN</b>	5 10 15 20 25 30 35			
	31.0 <span style="float: right;">1235.24</span> 31.5 <b>WEATHERED LIMESTONE &amp; CHERT</b> <b>LIMESTONE</b> <span style="float: right;">1234.74</span>				
	39.5 <span style="float: right;">1226.74</span> <b>Boring Terminated at 39.5 Feet</b>				REC: 100% RQD: 92%

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any). See Supporting Information for explanation of symbols and abbreviations.	<b>Water Level Observations</b>  (None recorded)	<b>Drill Rig</b> #546  <b>Driller</b> DH  <b>Logged by</b> AL  <b>Boring Started</b> 09-12-2023  <b>Boring Completed</b> 09-12-2023
<b>Notes</b> Elevation Reference: Elevations were provided by others.	<b>Advancement Method</b> 5" Casing Advancement, then NQ rock coring  <b>Abandonment Method</b> Boring backfilled with Auger Cuttings and/or Bentonite	







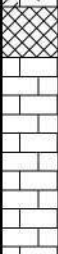

## Boring Log No. DS-64

Graphic Log	Location: See <a href="#">Exploration Plan</a>  Northing: 473803.42 Easting: 1352636.37  Depth (Ft.) <span style="float: right;">Elevation: 1265.96 (Ft.) +/-</span>	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results
	<b>OVERBURDEN</b>	5 10 15 20 25 30			
	<b>LIMESTONE</b>	31.5 <span style="float: right;">1234.46</span> 39.5 <span style="float: right;">1226.46</span>			REC: 100% RQD: 97%
	<b>Boring Terminated at 39.5 Feet</b>				

<p>See <a href="#">Exploration and Testing Procedures</a> for a description of field and laboratory procedures used and additional data (If any).                  See <a href="#">Supporting Information</a> for explanation of symbols and abbreviations.</p> <p><b>Notes</b>                  Elevation Reference: Elevations were provided by others.</p>	<p><b>Water Level Observations</b></p> <p><b>Advancement Method</b>                  5" Casing Advancement, then NQ rock coring</p> <p><b>Abandonment Method</b>                  Boring backfilled with Auger Cuttings and/or Bentonite</p>	<p><b>Drill Rig</b>                  #546</p> <p><b>Driller</b>                  DH</p> <p><b>Logged by</b>                  AL</p> <p><b>Boring Started</b>                  09-08-2023</p> <p><b>Boring Completed</b>                  09-08-2023</p>
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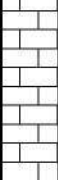



## Boring Log No. DS-65

Graphic Log	Location: See <a href="#">Exploration Plan</a>  Northing: 473814.02 Easting: 1352624.8  Depth (Ft.) <span style="float: right;">Elevation: 1265.57 (Ft.) +/-</span>	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results
	<b>OVERBURDEN</b>				
	<b>WEATHERED LIMESTONE</b>	23.0			
	<b>CLAY SEAM</b>	24.5			
	<b>CLAY SEAM</b>	25.0			
	<b>WEATHERED LIMESTONE &amp; CHERT</b>	27.0			
	<b>CLAY SEAM</b>	29.0			
	<b>LIMESTONE</b>	37.0		 REC: 100% RQD: 99%	
<b>Boring Terminated at 37 Feet</b>					

See <a href="#">Exploration and Testing Procedures</a> for a description of field and laboratory procedures used and additional data (If any). See <a href="#">Supporting Information</a> for explanation of symbols and abbreviations.	<b>Water Level Observations</b>  (Empty)	<b>Drill Rig</b> #546  <b>Driller</b> DH  <b>Logged by</b> AL  <b>Boring Started</b> 09-08-2023  <b>Boring Completed</b> 09-08-2023
<b>Notes</b> Elevation Reference: Elevations were provided by others.	<b>Advancement Method</b> 5" Casing Advancement, then NQ rock coring  <b>Abandonment Method</b> Boring backfilled with Auger Cuttings and/or Bentonite	

## Boring Log No. DS-66

Graphic Log	Location: See Exploration Plan  Northing: 473829.7 Easting: 1352624.12  Depth (Ft.) <span style="float: right;">Elevation: 1265.52 (Ft.) +/-</span>	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results
	<b>OVERBURDEN</b>	5 10 15			
	<b>WEATHERED LIMESTONE</b>	18.5 <span style="float: right;">1247.02</span>			
	<b>CLAY SEAM</b>	22.0 <span style="float: right;">1243.52</span>			
	<b>LIMESTONE</b>	28.5 <span style="float: right;">1237.02</span>			
	<b>LIMESTONE</b>	36.5 <span style="float: right;">1229.02</span>		 REC: 100% RQD: 88%	
<b>Boring Terminated at 36.5 Feet</b>					




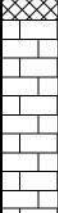
See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any). See Supporting Information for explanation of symbols and abbreviations.	<b>Water Level Observations</b>  (Empty)	<b>Drill Rig</b> #546  <b>Driller</b> DH  <b>Logged by</b> AL  <b>Boring Started</b> 09-07-2023  <b>Boring Completed</b> 09-07-2023
<b>Notes</b> Elevation Reference: Elevations were provided by others.	<b>Advancement Method</b> 5" Casing Advancement, then NQ rock coring  <b>Abandonment Method</b> Boring backfilled with Auger Cuttings and/or Bentonite	

## Boring Log No. DS-67

Graphic Log	Location: See <a href="#">Exploration Plan</a>  Northing: 473841.26 Easting: 1352634.72  Depth (Ft.) <span style="float: right;">Elevation: 1265.55 (Ft.) +/-</span>	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results
	<p><b>OVERBURDEN</b></p> <p>29.5 <span style="float: right;">1236.05</span></p> <p>30.0 <b>WEATHERED LIMESTONE &amp; CHERT LIMESTONE</b> <span style="float: right;">1235.55</span></p> <p>38.0 <span style="float: right;">1227.55</span></p> <p><b>Boring Terminated at 38 Feet</b></p>				REC: 100% RQD: 100%

<p>See <a href="#">Exploration and Testing Procedures</a> for a description of field and laboratory procedures used and additional data (If any).</p> <p>See <a href="#">Supporting Information</a> for explanation of symbols and abbreviations.</p>	<p><b>Water Level Observations</b></p>	<p><b>Drill Rig</b> #546</p>
<p><b>Notes</b> Elevation Reference: Elevations were provided by others.</p>	<p><b>Advancement Method</b> 5" Casing Advancement, then NQ rock coring</p> <p><b>Abandonment Method</b> Boring backfilled with Auger Cuttings and/or Bentonite</p>	<p><b>Driller</b> DH</p> <p><b>Logged by</b> AL</p> <p><b>Boring Started</b> 09-07-2023</p> <p><b>Boring Completed</b> 09-07-2023</p>

## Boring Log No. DS-68

Graphic Log	Location: See <a href="#">Exploration Plan</a>  Northing: 473832.68 Easting: 1352643.38  Depth (Ft.) <span style="float: right;">Elevation: 1265.79 (Ft.) +/-</span>	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results
	<b>OVERBURDEN</b>				
	19.0 <b>WEATHERED LIMESTONE</b> <span style="float: right;">1246.79</span>	5 10 15 20			
	26.5 <b>CLAY SEAM</b> <span style="float: right;">1239.29</span>	25			
	30.0 <b>LIMESTONE</b> <span style="float: right;">1235.79</span>	30			REC: 100% RQD: 88%
	38.0 <b>Boring Terminated at 38 Feet</b> <span style="float: right;">1227.79</span>	35			

See <a href="#">Exploration and Testing Procedures</a> for a description of field and laboratory procedures used and additional data (If any). See <a href="#">Supporting Information</a> for explanation of symbols and abbreviations.	<b>Water Level Observations</b>  (Empty)	<b>Drill Rig</b> #546  <b>Driller</b> DH  <b>Logged by</b> AL  <b>Boring Started</b> 09-07-2023  <b>Boring Completed</b> 09-07-2023
<b>Notes</b> Elevation Reference: Elevations were provided by others.	<b>Advancement Method</b> 5" Casing Advancement, then NQ rock coring  <b>Abandonment Method</b> Boring backfilled with Auger Cuttings and/or Bentonite	

## Boring Log No. DS-69

Graphic Log	Location: See <a href="#">Exploration Plan</a>  Northing: 473822.68 Easting: 1352653.38  Depth (Ft.) <span style="float: right;">Elevation: 1266.15 (Ft.) +/-</span>	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results
	<p><b>OVERBURDEN</b></p> <p>30.0 <span style="float: right;">1236.15</span>                      30.5 <b>WEATHERED LIMESTONE &amp; CHERT LIMESTONE</b> <span style="float: right;">1235.65</span></p> <p>38.5 <span style="float: right;">1227.65</span></p> <p><i>Boring Terminated at 38.5 Feet</i></p>				REC: 100% RQD: 100%

<p>See <a href="#">Exploration and Testing Procedures</a> for a description of field and laboratory procedures used and additional data (If any).                      See <a href="#">Supporting Information</a> for explanation of symbols and abbreviations.</p> <p><b>Notes</b>                      Elevation Reference: Elevations were provided by others.</p>	<p><b>Water Level Observations</b></p> <p><b>Advancement Method</b>                      5" Casing Advancement, then NQ rock coring</p> <p><b>Abandonment Method</b>                      Boring backfilled with Auger Cuttings and/or Bentonite</p>	<p><b>Drill Rig</b>                      #546</p> <p><b>Driller</b>                      DH</p> <p><b>Logged by</b>                      AL</p> <p><b>Boring Started</b>                      09-12-2023</p> <p><b>Boring Completed</b>                      09-12-2023</p>
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## Boring Log No. DS-70

Graphic Log	Location: See Exploration Plan  Northing: 473812.68 Easting: 1352643.38  Depth (Ft.) <span style="float: right;">Elevation: 1266.05 (Ft.) +/-</span>	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results
		5 10 15 20 25 30 35 40			
	31.5 <span style="float: right;">1234.55</span> 32.0 <span style="float: right;">1234.05</span> 32.5 <span style="float: right;">1233.55</span> 40.5 <span style="float: right;">1225.55</span>				
	<b>OVERBURDEN</b>				
	<b>WEATHERED LIMESTONE &amp; CHERT</b>				
	<b>CLAY SEAM</b>				
	<b>LIMESTONE</b>				
	<b>Boring Terminated at 40.5 Feet</b>				

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any). See Supporting Information for explanation of symbols and abbreviations.	<b>Water Level Observations</b>  REC: 100% RQD: 100%	<b>Drill Rig</b> #546  <b>Driller</b> DH  <b>Logged by</b> AL  <b>Boring Started</b> 09-12-2023  <b>Boring Completed</b> 09-12-2023
<b>Notes</b> Elevation Reference: Elevations were provided by others.	<b>Advancement Method</b> 5" Casing Advancement, then NQ rock coring  <b>Abandonment Method</b> Boring backfilled with Auger Cuttings and/or Bentonite	

## Boring Log No. DS-71

Graphic Log	Location: See <a href="#">Exploration Plan</a>  Northing: 473822.68 Easting: 1352633.38  Depth (Ft.) <span style="float: right;">Elevation: 1265.71 (Ft.) +/-</span>	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results
	<b>OVERBURDEN</b>	5 10 15			
	19.5 <span style="float: right;">1246.21</span> 20.0 <b>WEATHERED LIMESTONE &amp; CHERT</b> <b>LIMESTONE</b> <span style="float: right;">1245.71</span>	20			REC: 100% RQD: 84%
	28.0 <span style="float: right;">1237.71</span> <b>Boring Terminated at 28 Feet</b>	25			

See <a href="#">Exploration and Testing Procedures</a> for a description of field and laboratory procedures used and additional data (If any). See <a href="#">Supporting Information</a> for explanation of symbols and abbreviations.	<b>Water Level Observations</b>  <b>Advancement Method</b> 5" Casing Advancement, then NQ rock coring  <b>Abandonment Method</b> Boring backfilled with Auger Cuttings and/or Bentonite	<b>Drill Rig</b> #546  <b>Driller</b> DH  <b>Logged by</b> AL  <b>Boring Started</b> 09-07-2023  <b>Boring Completed</b> 09-07-2023
<b>Notes</b> Elevation Reference: Elevations were provided by others.		

## Boring Log No. DS-72

Graphic Log	Location: See <a href="#">Exploration Plan</a>  Northing: 473822.68 Easting: 1352643.38  Depth (Ft.) <span style="float: right;">Elevation: 1265.94 (Ft.) +/-</span>	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results
	<p><b>OVERBURDEN</b></p> <p>31.5 32.0</p> <p><b>WEATHERED LIMESTONE &amp; CHERT LIMESTONE</b></p> <p>1234.44 1233.94</p> <p>40.0 <span style="float: right;">1225.94</span></p> <p><b>Boring Terminated at 40 Feet</b></p>	5 10 15 20 25 30 35 40	REC: 100% RQD: 100%		

<p>See <a href="#">Exploration and Testing Procedures</a> for a description of field and laboratory procedures used and additional data (If any).                      See <a href="#">Supporting Information</a> for explanation of symbols and abbreviations.</p> <p><b>Notes</b>                      Elevation Reference: Elevations were provided by others.</p>	<p><b>Water Level Observations</b></p> <p><b>Advancement Method</b>                      5" Casing Advancement, then NQ rock coring</p> <p><b>Abandonment Method</b>                      Boring backfilled with Auger Cuttings and/or Bentonite</p>	<p><b>Drill Rig</b>                      #546</p> <p><b>Driller</b>                      DH</p> <p><b>Logged by</b>                      AL</p> <p><b>Boring Started</b>                      09-12-2023</p> <p><b>Boring Completed</b>                      09-12-2023</p>
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## Republic, MO WWTP - MBR

Activity ID	Activity Name	Remaining Duration	Start	Finish	Gantt Chart											
					2022	2023	2024	2025	2026	2027						
MBR-BODR-CD-1190	Conceptual Design Documents Review and Approval by Owner	0	16-Aug-22 A	29-Aug-22 A	[Gantt bar: Aug 16 - Aug 29, 2022]											
MBR-BODR-CD-1200	Owner Conceptual Design Workshop	0		29-Aug-22 A	[Gantt bar: Aug 29, 2022]											
MBR-BODR-CD-1210	BODR Q3/Q4 Review and Incorporate Comments	0	02-Sep-22 A	25-Apr-23 A	[Gantt bar: Sep 2 - Apr 25, 2023]											
MBR-BODR-CD-1205	Value Engineering	0	22-Nov-22 A	20-Jan-23 A	[Gantt bar: Nov 22 - Jan 20, 2023]											
MBR-BODR-CD-1220	BODR Review & Approval by Owner	0	26-Apr-23 A	05-May-23 A	[Gantt bar: Apr 26 - May 5, 2023]											
MBR-BODR-CD-1230	BODR Review and Approval by MDNR	0	05-May-23 A	05-Jun-23 A	[Gantt bar: May 5 - Jun 5, 2023]											
<b>Preliminary Design - MBR</b>																
MBR-PLD-1250	Preliminary Design MBR Process Basin and Building	0	22-Nov-22 A	23-Mar-23 A	[Gantt bar: Nov 22 - Mar 23, 2023]											
MBR-PLD-1260	Preliminary Design Balance of Plant	0	22-Nov-22 A	15-May-23 A	[Gantt bar: Nov 22 - May 15, 2023]											
MBR-PLD-1945	Incorporate Comments back from MBR Vendors	0	01-Mar-23 A	22-Mar-23 A	[Gantt bar: Mar 1 - Mar 22, 2023]											
MBR-PLD-1950	MBR/Biological Package Q4 Review	0	22-Mar-23 A	23-Mar-23 A	[Gantt bar: Mar 22 - Mar 23, 2023]											
MBR-PLD-1960	Work Description Complete	0	03-Apr-23 A	15-May-23 A	[Gantt bar: Apr 3 - May 15, 2023]											
MBR-PLD-1310	Preliminary Design - Q3/4 Review and Incorporate Comments - Process	0	15-May-23 A	09-Jun-23 A	[Gantt bar: May 15 - Jun 9, 2023]											
MBR-PLD-1270	Preliminary Estimate Develop and Review	0	16-May-23 A	14-Jun-23 A	[Gantt bar: May 16 - Jun 14, 2023]											
MBR-PLD-1280	Preliminary Engineering Deliverable (For estimating purposes)	0	16-May-23 A		[Gantt bar: May 16, 2023]											
MBR-PLD-1370	Preliminary Design Documents Review and Approval by Owner	0	17-May-23 A	31-May-23 A	[Gantt bar: May 17 - May 31, 2023]											
MBR-PLD-1390	Owner Preliminary Design Workshop	0		24-May-23 A	[Gantt bar: May 24, 2023]											
<b>Pre-Final Design - MBR</b>																
MBR-PFD-1400	Pre-Final Design	0	09-Jun-23 A	20-Oct-23 A	[Gantt bar: Jun 9 - Oct 20, 2023]											
MBR-PFD-1460	Pre-Final Design - Q3/4 Review and Incorporate Comments	0	06-Oct-23 A	20-Oct-23 A	[Gantt bar: Oct 6 - Oct 20, 2023]											
MBR-PFD-1520	Pre-Final Design Review (Owner/Permitting)	0	01-Nov-23 A	08-Nov-23 A	[Gantt bar: Nov 1 - Nov 8, 2023]											
MBR-PFD-1380	Develop Pre-Final Estimate Based on Pre-Final Design and Submit	0	01-Nov-23 A	18-Dec-23 A	[Gantt bar: Nov 1 - Dec 18, 2023]											
MBR-PFD-1540	Owner Pre-Final Design Workshop	0		08-Nov-23 A	[Gantt bar: Nov 8, 2023]											
<b>Permitting</b>																
MBR-PMT-3400	MDNR Issue Anti-DEG Report	0	14-Jul-23 A	14-Sep-23 A	[Gantt bar: Jul 14 - Sep 14, 2023]											
MBR-PMT-3380	Submit Change in Operating Permit to MDNR	0	11-Aug-23 A	11-Aug-23 A	[Gantt bar: Aug 11, 2023]											
MBR-PMT-3390	MDNR Operating Permit Review Period	60	14-Aug-23 A	20-Mar-24	[Gantt bar: Aug 14 - Mar 20, 2024]											
MBR-PMT-3460	Issue Statement of Work Complete to MDNR (within 60 days of SC)	43	27-Jul-26	24-Sep-26	[Gantt bar: Jul 27 - Sep 24, 2026]											
<b>Environmental Permitting</b>																
<b>National Historic Preservation Act Section 106</b>																
MBR-EPMT-1670	Cultural - Field Work/Desktop Evaluation	0	01-Jul-22 A	01-Jul-22 A	[Gantt bar: Jul 1, 2022]											
MBR-EPMT-1680	Cultural - Prepare and Submit	0	01-Jul-22 A	01-Jul-22 A	[Gantt bar: Jul 1, 2022]											
MBR-EPMT-1690	Cultural - Receive Agency Approval	0	01-Jul-22 A	01-Jul-22 A	[Gantt bar: Jul 1, 2022]											
<b>Endangered Species Act</b>																
MBR-EPMT-1700	Endangered Species - Field Work/Desktop Evaluation	0	01-Jul-22 A	01-Jul-22 A	[Gantt bar: Jul 1, 2022]											
MBR-EPMT-1710	Endangered Species - Prepare and Submit	0	01-Jul-22 A	01-Jul-22 A	[Gantt bar: Jul 1, 2022]											
MBR-EPMT-1720	Endangered Species - Receive Agency Approval	0	01-Jul-22 A	01-Jul-22 A	[Gantt bar: Jul 1, 2022]											
<b>State Protected Species</b>																
MBR-EPMT-1730	State Species-Field work/Desktop Evaluation	0	01-Jul-22 A	01-Jul-22 A	[Gantt bar: Jul 1, 2022]											
MBR-EPMT-1740	State Species-Prepare and Submit	0	01-Jul-22 A	01-Jul-22 A	[Gantt bar: Jul 1, 2022]											
MBR-EPMT-1750	State Species-Receive Agency Approval	0	01-Jul-22 A	01-Jul-22 A	[Gantt bar: Jul 1, 2022]											
<b>Procurement &amp; Subcontracting</b>																
<b>Plan</b>																
MBR-PCS-1760	Draft Procurement Plan	0	24-Jul-23 A	11-Aug-23 A	[Gantt bar: Jul 24 - Aug 11, 2023]											
MBR-PCS-1780	Refine Procurement Plan with Preliminary Design	0	14-Aug-23 A	25-Aug-23 A	[Gantt bar: Aug 14 - Aug 25, 2023]											
MBR-PCS-1790	Draft Sub Agreement, Div 1s, RFP Documents	0	28-Aug-23 A	18-Sep-23 A	[Gantt bar: Aug 28 - Sep 18, 2023]											











Republic, MO WWTP - MBR

Activity ID	Activity Name	Remaining Duration	Start	Finish	Gantt Chart																																																																					
					2022			2023			2024			2025			2026			2027																																																						
					F	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
MBR-PH2-PC-3310	Package 2, 3, & 4 (3D Model, Valves, Electrical, Controls)	0	07-Jun-23 A	14-Nov-23 A	[Gantt bar for Package 2, 3, & 4 (3D Model, Valves, Electrical, Controls)]																																																																					
MBR-PH2-PC-3290	Sign MBR Equipment Package - FNTF	20	27-Feb-24	25-Mar-24	[Gantt bar for Sign MBR Equipment Package - FNTF]																																																																					
MBR-PH2-PC-4280	Fabrication & Delivery MBR Equipment Package	250	26-Mar-24	19-Mar-25	[Gantt bar for Fabrication & Delivery MBR Equipment Package]																																																																					
<b>Solids Pumps (WAS and Digester Feed) Package - PMP-35 (PO)</b>		180	24-Jul-23 A	07-Nov-24	[Gantt bar for Solids Pumps (WAS and Digester Feed) Package - PMP-35 (PO)]																																																																					
MBR-PH2-PC-3675	Development of Info for Procurement - Solids Pumps (WAS and Digester Feed) Pa	0	24-Jul-23 A	28-Jul-23 A	[Gantt bar for Development of Info for Procurement - Solids Pumps (WAS and Digester Feed) Pa]																																																																					
MBR-PH2-PC-4435	Vendor Review of Technical Package Documents for Solids Pumps (WAS and Digi	0	31-Jul-23 A	07-Aug-23 A	[Gantt bar for Vendor Review of Technical Package Documents for Solids Pumps (WAS and Digi]																																																																					
MBR-PH2-PC-4436	Prepare Final Technical and Front End Package Documents for Solids Pumps (WA	0	08-Aug-23 A	06-Oct-23 A	[Gantt bar for Prepare Final Technical and Front End Package Documents for Solids Pumps (WA																																																																					
MBR-PH2-PC-5000	RFP Solids Pumps (WAS and Digester Feed) Package - PMP-35 (PO)	0	06-Oct-23 A	27-Oct-23 A	[Gantt bar for RFP Solids Pumps (WAS and Digester Feed) Package - PMP-35 (PO)]																																																																					
MBR-PH2-PC-4437	Proposal Due Date for Solids Pumps (WAS and Digester Feed) Package - PMP-35	0	27-Oct-23 A	27-Oct-23 A	[Gantt bar for Proposal Due Date for Solids Pumps (WAS and Digester Feed) Package - PMP-35]																																																																					
MBR-PH2-PC-2450	Bid Review - Solids Pumps (WAS and Digester Feed) Package - PMP-35	0	30-Oct-23 A	22-Nov-23 A	[Gantt bar for Bid Review - Solids Pumps (WAS and Digester Feed) Package - PMP-35]																																																																					
MBR-PH2-PC-5010	Sign Solids Pumps (WAS and Digester Feed) Package - PMP-35 (PO)	20	27-Feb-24	25-Mar-24	[Gantt bar for Sign Solids Pumps (WAS and Digester Feed) Package - PMP-35 (PO)]																																																																					
MBR-PH2-PC-5020	Submit and Review/Approve Solids Pumps (WAS and Digester Feed) Package - P	70	26-Mar-24	02-Jul-24	[Gantt bar for Submit and Review/Approve Solids Pumps (WAS and Digester Feed) Package - P]																																																																					
MBR-PH2-PC-5030	Fabrication & Delivery Solids Pumps (WAS and Digester Feed) Package - PMP-35	90	03-Jul-24	07-Nov-24	[Gantt bar for Fabrication & Delivery Solids Pumps (WAS and Digester Feed) Package - PMP-35]																																																																					
<b>Scum Removal Package - SCM-31 (PO)</b>		235	24-Jul-23 A	29-Jan-25	[Gantt bar for Scum Removal Package - SCM-31 (PO)]																																																																					
MBR-PH2-PC-3685	Development of Info for Procurement - Scum Removal Package - SCM-31	0	24-Jul-23 A	28-Jul-23 A	[Gantt bar for Development of Info for Procurement - Scum Removal Package - SCM-31]																																																																					
MBR-PH2-PC-4438	Vendor Review of Technical Package Documents for Scum Removal Package - SC	0	31-Jul-23 A	11-Aug-23 A	[Gantt bar for Vendor Review of Technical Package Documents for Scum Removal Package - SC]																																																																					
MBR-PH2-PC-4439	Prepare Final Technical and Front End Package Documents for Scum Removal Pa	0	14-Aug-23 A	20-Oct-23 A	[Gantt bar for Prepare Final Technical and Front End Package Documents for Scum Removal Pa]																																																																					
MBR-PH2-PC-5040	RFP Scum Removal Package - SCM-31 (PO)	0	23-Oct-23 A	13-Nov-23 A	[Gantt bar for RFP Scum Removal Package - SCM-31 (PO)]																																																																					
MBR-PH2-PC-4440	Proposal Due Date for Scum Removal Package - SCM-31 (PO)	0	13-Nov-23 A	13-Nov-23 A	[Gantt bar for Proposal Due Date for Scum Removal Package - SCM-31 (PO)]																																																																					
MBR-PH2-PC-2460	Bid Review - Scum Removal Package - SCM-31	0	14-Nov-23 A	27-Nov-23 A	[Gantt bar for Bid Review - Scum Removal Package - SCM-31]																																																																					
MBR-PH2-PC-5050	Sign Scum Removal Package - SCM-31 (PO)	20	27-Feb-24	25-Mar-24	[Gantt bar for Sign Scum Removal Package - SCM-31 (PO)]																																																																					
MBR-PH2-PC-5060	Submit and Review/Approve Scum Removal Package - SCM-31 (PO)	90	26-Mar-24	31-Jul-24	[Gantt bar for Submit and Review/Approve Scum Removal Package - SCM-31 (PO)]																																																																					
MBR-PH2-PC-5070	Fabrication & Delivery Scum Removal Package - SCM-31 (PO)	125	01-Aug-24	29-Jan-25	[Gantt bar for Fabrication & Delivery Scum Removal Package - SCM-31 (PO)]																																																																					
<b>Scum Removal Pump Package - PMP-36 (PO)</b>		225	24-Jul-23 A	15-Jan-25	[Gantt bar for Scum Removal Pump Package - PMP-36 (PO)]																																																																					
MBR-PH2-PC-3695	Development of Info for Procurement - Scum Removal Pump Package - PMP-36	0	24-Jul-23 A	11-Aug-23 A	[Gantt bar for Development of Info for Procurement - Scum Removal Pump Package - PMP-36]																																																																					
MBR-PH2-PC-4441	Vendor Review of Technical Package Documents for Scum Removal Pump - PMP-	0	14-Aug-23 A	18-Aug-23 A	[Gantt bar for Vendor Review of Technical Package Documents for Scum Removal Pump - PMP-]																																																																					
MBR-PH2-PC-4442	Prepare Final Technical and Front End Package Documents for Scum Removal Pu	0	21-Aug-23 A	26-Oct-23 A	[Gantt bar for Prepare Final Technical and Front End Package Documents for Scum Removal Pu]																																																																					
MBR-PH2-PC-5080	RFP Scum Removal Pump - PMP-36 (PO)	0	26-Oct-23 A	16-Nov-23 A	[Gantt bar for RFP Scum Removal Pump - PMP-36 (PO)]																																																																					
MBR-PH2-PC-4443	Proposal Due Date for Scum Removal Pump - PMP-36 (PO)	0	16-Nov-23 A	16-Nov-23 A	[Gantt bar for Proposal Due Date for Scum Removal Pump - PMP-36 (PO)]																																																																					
MBR-PH2-PC-2470	Bid Review - Scum Removal Pump Package - PMP-36	0	17-Nov-23 A	22-Nov-23 A	[Gantt bar for Bid Review - Scum Removal Pump Package - PMP-36]																																																																					
MBR-PH2-PC-5090	Sign Scum Removal Pump - PMP-36 (PO)	20	27-Feb-24	25-Mar-24	[Gantt bar for Sign Scum Removal Pump - PMP-36 (PO)]																																																																					
MBR-PH2-PC-5100	Submit and Review/Approve Scum Removal Pump - PMP-36 (PO)	90	26-Mar-24	31-Jul-24	[Gantt bar for Submit and Review/Approve Scum Removal Pump - PMP-36 (PO)]																																																																					
MBR-PH2-PC-5110	Fabrication & Delivery Scum Removal Pump - PMP-36 (PO)	115	01-Aug-24	15-Jan-25	[Gantt bar for Fabrication & Delivery Scum Removal Pump - PMP-36 (PO)]																																																																					
<b>Mixers Package Package - MIX-31 (PO)</b>		243	24-Jul-23 A	06-Dec-24	[Gantt bar for Mixers Package Package - MIX-31 (PO)]																																																																					
MBR-PH2-PC-3705	Development of Info for Procurement - Mixers Package - MIX-31	0	24-Jul-23 A	11-Aug-23 A	[Gantt bar for Development of Info for Procurement - Mixers Package - MIX-31]																																																																					
MBR-PH2-PC-4444	Vendor Review of Technical Package Documents for Mixers Package - MIX-31 (PC	0	14-Aug-23 A	18-Aug-23 A	[Gantt bar for Vendor Review of Technical Package Documents for Mixers Package - MIX-31 (PC																																																																					
MBR-PH2-PC-4445	Prepare Final Technical and Front End Package Documents for Mixers Package - I	0	21-Aug-23 A	27-Dec-23	[Gantt bar for Prepare Final Technical and Front End Package Documents for Mixers Package - I]																																																																					
MBR-PH2-PC-5120	RFP Mixers Package - MIX-31 (PO)	15	27-Dec-23	17-Jan-24	[Gantt bar for RFP Mixers Package - MIX-31 (PO)]																																																																					
MBR-PH2-PC-4446	Proposal Due Date for Mixers Package - MIX-31 (PO)	1	18-Jan-24	18-Jan-24	[Gantt bar for Proposal Due Date for Mixers Package - MIX-31 (PO)]																																																																					
MBR-PH2-PC-2480	Bid Review - Mixers Package - MIX-31	10	19-Jan-24	01-Feb-24	[Gantt bar for Bid Review - Mixers Package - MIX-31]																																																																					
MBR-PH2-PC-5130	Sign Mixers Package - MIX-31 (PO)	20	27-Feb-24	25-Mar-24	[Gantt bar for Sign Mixers Package - MIX-31 (PO)]																																																																					
MBR-PH2-PC-5140	Submit and Review/Approve Mixers Package - MIX-31 (PO)	90	26-Mar-24	31-Jul-24	[Gantt bar for Submit and Review/Approve Mixers Package - MIX-31 (PO)]																																																																					
MBR-PH2-PC-5150	Fabrication & Delivery Mixers Package - MIX-31 (PO)	90	01-Aug-24	06-Dec-24	[Gantt bar for Fabrication & Delivery Mixers Package - MIX-31 (PO)]																																																																					
<b>Solids Conveyor Package - CVY-31 (PO)</b>		195	24-Jul-23 A	29-Nov-24	[Gantt bar for Solids Conveyor Package - CVY-31 (PO)]																																																																					
MBR-PH2-PC-4447	Development of Info for Procurement - Solids Conveyor Package - CVY-31	0	24-Jul-23 A	11-Aug-23 A	[Gantt bar for Development of Info for Procurement - Solids Conveyor Package - CVY-31]																																																																					
MBR-PH2-PC-4448	Vendor Review of Solids Conveyor Package - CVY-31 (PO)	0	14-Aug-23 A	18-Aug-23 A	[Gantt bar for Vendor Review of Solids Conveyor Package - CVY-31 (PO)]																																																																					
MBR-PH2-PC-4449	Prepare Final Technical and Front End Package Documents for Solids Conveyor F	0	21-Aug-23 A	21-Sep-23 A	[Gantt bar for Prepare Final Technical and Front End Package Documents for Solids Conveyor F]																																																																					























## **EXHIBIT K – PRE-FINAL DESIGN DOCUMENTS**

### **Work Description**

This Work Description identifies major definable components of the Project as they can be defined at the time that the Agreement was prepared. In addition to the major components called out herein, the Work Description outlines the general requirements for each design element. The intent of this document is to establish the scope and criteria of products, materials, and equipment to be furnished and installed under the Agreement. The Design-Builder will develop the final design documents and construct the Work in accordance with the criteria identified herein.

#### **01 00 00 GENERAL CONDITIONS**

1. All supervision, administrative costs, and temporary facilities necessary to construct the work.
2. No sales tax included. Owner to provide exemption certificate for the project.
3. Temporary Power will be provided by the Design Builder.
4. Does not include cost for water consumption for testing of structures or facilities.
5. Does not include cost of chemicals for startup, testing or operation of the facility.
6. Includes cost of obtaining, installing, and maintaining the SWPPP.
7. Builders risk insurance will be provided by Design Builder.
8. Design and construction administration are included for the duration of the schedule.
9. Design will be completed following the 2018 IBC except where noted.
10. Special Inspections will be performed by a 3<sup>rd</sup> party and paid for by the Design Builder.
11. Civil testing lab services will be performed by a 3<sup>rd</sup> party and paid for by the Design-Builder, including civil testing for soil and concrete.
12. Performance and Payment bonds are included for the entire contract amount. Surety companies executing BONDS will appear on the Treasury Department’s most current list (Circular 570 as amended) and be authorized to transact business in Missouri.”
13. All O&M manuals will be provided in paper (1 set) and electronic PDF form.
14. In the event that there are discrepancies between the Preliminary Engineering Report and this document, this document shall govern.
15. This project is under current prevailing wages as of the date of the contract execution, and as outlined in Exhibit C.
16. The Design-Builder agrees to take steps to ensure that disadvantaged business enterprises (DBEs) are utilized when possible as sources of supplies, equipment, construction, and services as required by 2 CFR 200.321.

#### **01 01 00 SPECIAL SITE CONDITIONS**

1. No hazardous or special waste are known of at this time or anticipated to be

encountered in the course of this project other than as identified in the Asbestos and Hazardous Materials Survey Report dated April 26, 2023 as prepared by Burns & McDonnell.

2. Groundwater is expected to be consistent with the conditions documented as part of the geotechnical investigation.
3. On site soils are expected to be consistent with those documented as part of the geotechnical investigation.

#### **01 01 50 OWNER FURNISHED ITEMS**

1. Operation and maintenance of existing facilities during construction and through project start-up.
2. Access to project sites as needed to perform work.
3. Land acquisition, easements or right-of-way as may be required.
4. Cost of offsite power, gas, telecom, ISP upgrades if required.
5. Permanent power and fiber optic relocation around the new MBR project site.
6. Chemicals as required for startup and testing, including initial fill of new chemical systems.

#### **01 50 00 CONSTRUCTION EQUIPMENT**

1. All construction equipment necessary to complete the work is included.

#### **02 41 19 SELECTIVE DEMOLITION**

1. Includes fees for disposal for any excess material.
2. Demolition of existing site improvements, such as asphalt paving, concrete sidewalks, light poles, power poles, overhead electric, etc. to limits required for installation of new construction.
3. Demolition of existing domestic water well.
4. Demolition of existing activated sludge control station.
5. Demolition of existing fence on east side of property.

#### **03 05 13 CONCRETE FORMWORK**

1. Exterior Forms
  - a. Fill any repairable honeycomb; patch all tie holes.
  - b. No architectural or rubbed finish; no grout finish.
  - c. Joints to be noticeable, but not protruding.
  - d. Chamfer tops on all exposed edges.

#### **03 15 50 VAPOR RETARDER**

1. ASTM E1745, Class A or B, min thickness of 10 mil.
2. Applied below all concrete slabs to receive concrete coatings or other floor coverings.

### **03 20 00 CONCRETE REINFORCEMENT**

1. Deformed bars: ASTM A615, Grade 60 – No epoxy
2. Mechanical splices used where indicated.
3. Rebar quantities based upon 200 lbs per cubic yard of concrete where not indicated on the Drawings.
4. Drill and epoxy dowels at interface of new concrete construction to existing structures.

### **03 30 05 VOID FORMS**

1. Installed under all foundations supported by drilled shafts, unless 1'-6" of over-excavation with structural fill replacement is chosen as an alternate method.
2. Acceptable manufacturers: Void Form International and Savway Carton Forms.

### **03 30 00 CONCRETE**

1. ASTM C150 Type I/II or ASTM C595 Type IL (MS).
  - a. Include fly ash (max 25% replacement) if Type F is available.
  - b. Silica fume may be substituted up to 10% replacement of Portland Cement (PC) or Portland Lime Cement (PLC)
2. 1" nominal maximum aggregate
3. Fill and encasement – 3,000 psi
4. Site pavements, curbs, gutters, and sidewalks – 4,000 psi, maximum w/cm ratio of 0.45
5. Structural concrete – 4,500 psi, maximum w/cm ratio of 0.42
6. Pre-cast concrete – As determined by precast manufacturer design. 5,000 psi minimum
7. Drilled shafts – 4000 psi, 0.45 w/cm ratio.
8. All concrete supplied for the project will meet the latest applicable code.
9. Foundations
  - a. All foundations to extend below frost line.
  - b. Drilled shaft foundations for Digester No. 4 and Grit and Fine Screening Building.
  - c. Reference Div 31 for subgrade requirements.
10. PVC waterstop at all construction joints in wastewater containing structures.
11. The following structures will be leak tested in accordance with ACI 350.1:
  - a. Influent pump station wet well
  - b. Grit headcell chamber and elevated screen channels
  - c. Process basin splitter structure
  - d. Process basin
  - e. RAS splitter structure
  - f. MBR tanks
  - g. MBR building backpulse/filtrate tank
  - h. Digester No. 4.

### **03 41 00 PRECAST STRUCTURAL CONCRETE**

1. Exterior and interior insulated wall panels, including reveals, and light and medium sandblast textures.
2. Solid prestressed roof plank panels at the chemical building, dewatering building, and MBR electrical and chemical rooms.
3. Double tee roof sections at the MBR building and grit removal and fine screening building.
4. Embedded plates and connection hardware:
  - a. Stainless steel where exposed or crosses a panel joint.
  - b. Uncoated steel at all other locations.

### **05 05 19 POST INSTALLED ANCHORS**

1. Wet or submerged service: AISI Type 304 or 316 adhesive anchors where indicated.
2. Non-submerged anchors in moderate to severe corrosion potential: AISI Type 304 or 316 adhesive anchors or wedge anchors where indicated.
3. Low corrosion potential: galvanized wedge or adhesive anchors.
4. Adhesive epoxy:
  - a. Hilti Hit-HY 200 for dry installations.
  - b. Hilti Hit HY-500 for wet installations.
  - c. Hilti Hit HY-270 for masonry.
  - d. Approved equal.

### **05 12 00 STEEL**

1. Wide flange, ASTM A992.
2. Channels, angles, and plates, ASTM A36.
3. S shapes: ASTM A572, Grade 50.
4. Hot-dipped galvanized steel and hardware unless indicated otherwise.
5. Stainless steel:
  - a. AISI Type 304 or 316 where indicated.
6. Anchor bolts:
  - a. Cast-in-place: Galvanized ASTM F1554 Grade 36 anchor bolts or stainless steel where indicated on Drawings.
  - b. Post-installed anchors:
    - See Section **05 05 19**

### **05 31 00 STEEL DECKING**

1. 1 ½” depth, ASTM A653, Grade 50.
2. Zinc-coated G90 finish.
3. Welded or screw fasteners at supports and side laps.

**05 45 00 ALUMINUM**

1. Aluminum association structural shapes, 6061-T6 with 304 stainless steel bolts.
2. Guardrail: 1.9" OD aluminum two rail system with kickplate unless indicated to match existing four rail system.
3. Handrail: 1.5" OD aluminum.
4. Ladders to be of aluminum construction unless noted otherwise.
5. Grating to be swage locked striated I-bar grating with banded openings.
6. Stair treads to be serrated swage locked bar grating.
7. See Section 08 34 83 for Floor Access Doors.

**05 50 00 MISCELLANEOUS METALS**

1. Bollards – 6-inch diameter Schedule 40 Steel, concrete filled, painted safety yellow, with rust-inhibitive paint.

**06 10 00 ROUGH CARPENTRY**

1. Treated wood blocking at roof and roof parapet.

**06 40 23 INTERIOR ARCHITECTURAL WOODWORK**

1. Breakroom and conference room cabinets in the Admin space. Upper and lower cabinets with solid surface countertop as shown
2. Restroom vanities as shown with solid surface countertops
3. Cabinets are to be PLAM with solid surface countertops

**06 70 00 STRUCTURAL COMPOSITES**

1. Fiberglass reinforced plastic (FRP) platform, ladders and grating to be supplied at the grit removal and fine screening building platform, and the chemical and dewatering building containment areas.
2. Resin system: premium grade vinyl ester.

**06 85 81 FIBER REINFORCED PLASTIC COVERS**

1. FRP covers to be provided over the MBR tank channels.
2. Covers shall be flush with top of concrete surface.

**07 16 00 BITUMINOUS DAMPPROOFING**

1. Apply to exterior of concrete walls at the following locations:
  - a. Influent pump station valve vault
  - b. Influent pump station meter vault
  - c. Chemical vault at process basin

- d. MBR Building Basement Walls
- 2. Bituminous Dampproofing:
  - a. Product: Tnemec Tneme-Tar Hi Build Series 46H-413; 16-20 mils DFT.
    - i. Or Engineer Approved Equal

**07 54 19 POLYVINYL CHLORIDE ROOFING**

- 1. Buildings to have minimum 80 mil PVC Membrane Roofing System to meet regional hail requirements.
- 2. Vapor barrier and tapered insulation on roof deck with crickets.
- 3. Perimeter of building to have prefinished metal coping over galvanized steel cleat on top of parapet wall.
- 4. Conductor heads and downspouts to be provided at each scupper.
- 5. Overflow scuppers trimmed with prefinished sheet metal.
- 6. Canopy roof with prefinished standing seam roofing, gutter, and downspout.
- 7. Sunshade/canopies over passage doors as indicated on drawings
- 8. Walkway pads as indicated on drawings.

**07 62 00 SHEET METAL FLASHING AND TRIM**

- 1. Buildings to have prefinished sheet metal flashing and trim.

**07 72 36 ROOF SCUTTLES**

- 1. 3'-0"x3'-0" roof scuttle with ladder, safety post and guardrail with gate for fall protection as indicated on drawings.

**07 84 13 THROUGH-PENETRATION FIRESTOP SYSTEMS**

- 1. Fire caulk and mineral wool at any penetration through fire rated walls as shown on drawings

**07 92 00 JOINT SEALANTS**

- 1. Doors/windows/louvers and construction joints in concrete.
- 2. Interior and exterior vertical precast wall joints and interior horizontal precast roof plank joints.
- 3. Interior joints at top of walls.
- 4. Fire rated mineral wool and sealant where required.

**08 11 00 STEEL FRAMES**

- 1. Interior administration building doors to have steel frames
- 2. Exterior administration building doors to have steel frames by PEMB supplier (except for aluminum doors)

**08 14 00 DOORS**

1. Interior administration building doors to be hollow metal.

**08 16 13 FRP DOORS AND FRAMES**

1. All single passage doors; 3'-0"x7'-2" 1-3/4 x 5 3/4" thick with 2" frame.
2. All double passage doors: 6'-4"x7'-2" 1-3/4" x 5 3/4" thick with 2" frame
3. Electrical rooms to have removable transom and/or mullions as shown on drawings
4. All doors to have glazing except doors into electrical rooms.

**08 33 23 OVERHEAD COILING DOORS**

1. Manual powder coated steel doors rated for wind load per structural drawings and specification

**08 34 83 FLOOR ACCESS DOORS**

1. Aluminum construction with Type 316 stainless steel hardware
2. Load rating:
  - a. Pedestrian traffic: 300 psf
  - b. Vehicular traffic: AASHTO HS-20
3. Provide protective grating.

**08 41 13 ALUMINUM-FRAMED ENTRANCES AND STOREFRONT**

1. Aluminum double doors and frame in storefront at entrance of administration building

**08 45 23 FIBERGLASS SANDWICH PANEL SKYLIGHT AND WALL SYSTEM**

1. Removable Kalwall translucent wall panels for removal of equipment and chemical storage as shown on drawings

**08 51 13 WINDOWS**

1. Fixed storefront framing, as required.
2. Operable storefront framing, as required.

**08 70 00 FINISH HARDWARE**

2. Standard door hardware; includes lever handle, weather stripping, drip cap, threshold, sweep, hinges, closers, locksets, astragals, panic devices as required by code for egress.
3. Finishes to be suitable for their environment.



**08 80 00 GLASS AND GLAZING**

1. Exterior: Insulated glazing unit (IGU) tinted low-E coating on tempered outboard lite, 0.060" PVB laminated inboard lite.
2. Interior: nominal 1/4" laminated safety glass between similarly conditioned spaces.
3. Interior: insulated glazing unit (IGU) between conditioned and unconditioned spaces. Assembly indicated in #1 of this section without the tinted low-E coating

**08 91 00 ARCHITECTURAL LOUVERS**

1. 4" deep prefinished aluminum louvers with insect screens

**09 21 16 GYPSUM BOARD ASSEMBLIES**

1. Standard 3 5/8" 20ga metal framing, except as noted on the Structural Drawings at the electrical rooms for the influent screening building and grit removal and fine screening building.
2. 5/8" standard gypsum board
3. 5/8" Fire code gypsum board at interior walls as indicated
4. 5/8" mold/moisture resistant gypsum board at restrooms, locker room, lab, and existing grit building for the IPS electrical space
5. Additional layers of gypsum board for fire rating as shown on drawings
6. Gypsum ceilings as indicated in drawings

**09 51 23 ACOUSTICAL CEILING TILE SYSTEM**

1. Acoustical ceiling tiles ceiling height 10'-0" AFF
2. All areas of administration building unless noted otherwise as open to structure, moisture resistant gypsum board, or gypsum board ceilings
3. 2'x2' drop in panel acoustical ceiling
  - a. Basis of Design: Performa Symphony M as manufactured by CertainTeed.

**09 51 23 RESILIENT WALL BASE**

1. As indicated on drawings

**09 68 13 FLOORING**

1. As indicated on drawings in Room Finish Schedules

**09 90 00 PROTECTIVE COATINGS**

1. Color coded painting of exposed-to-view piping if not stainless steel or PVC.
2. All exposed process piping to have color coded labels or stencils with directional arrows.
3. 2 coat epoxy/polyurethane system for all bollards and non-stainless steel or HDG

pipe/supports exposed to UV.

4. 2 coat epoxy coating system for interior/submerged non-stainless steel or HDG pipe/supports not exposed to UV.
5. Hot-dip galvanized steel will not be coated.
6. Chemical containment to have 3 coat chemical resistant containment coating.
7. Touch-up paint as required for non-stainless-steel equipment.
8. Peak Flow Clarifier mechanism, launder trough, and interior basin wall, including all prep and wash down as required.

#### **10 14 00 SIGNAGE**

1. Room signage in admin building outside each door
2. Chemical warning signs on doors for rooms where chemicals are stored
3. Aluminum Building identification letters
4. Building plaque in the administration building

#### **10 44 00 FIRE PROTECTION SPECIALTIES**

1. Portable fire extinguishers as noted and shown on drawings
2. Fire extinguishers: Approved fire extinguishers with wall brackets – 10 lb. ABC units for all buildings as required.
3. Fire extinguishers: Clean agent units for Electrical rooms

#### **10 51 26 SOLID PLASTIC LOCKERS AND BENCHES**

1. As shown in administration building locker room

#### **12 35 53 LABORATORY CASEWORK AND ACCESSORIES**

1. Laboratory casework and equipment as shown on drawings and will be provided as a part of the Owner's Allowance.

#### **13 34 19 PRE-ENGINEERED METAL BUILDING**

1. Canopies as shown on drawings
2. Pre-engineered admin building
3. Bird netting and mitigation measures on canopies and covered patios/carports

#### **22 00 00 PLUMBING**

1. Materials:
  - (a) Natural Gas Piping:
    - a. Below Grade: Polyethylene
    - b. Above Grade: Black Steel (threaded)
  - (b) Drainage and Vent Piping: Sch. 40 PVC
  - (c) Potable/Non-Potable Water:
    - a. Below Grade NPS 3 and smaller: Copper

- b. Below Grade NPS 4 and larger: DIP
- c. Above Grade NPS 2 and smaller: Copper
- d. Above Grade NPS 3 and larger: DIP
- (d) Pipe Insulation:
  - a. Type: Flexible Elastomeric
  - b. Thickness: 1” to 2”
  - c. R-Value: R-4 per inch
- (e) Hangers/Supports and Hardware:
  - a. Existing Grit Building (210): Hot-dipped galvanized strut and stainless steel hardware
  - b. Grit Removal and Fine Screening Building (240): Stainless steel strut and hardware
  - c. Chemical Building (340): Stainless steel strut and hardware
  - d. MBR Building (420): Stainless steel strut and hardware
  - e. Dewatering Building (540): Stainless steel strut and hardware
  - f. Administration Building (700): Copper supports (for copper piping), Hot-dipped galvanized hangers (for DWV piping) and stainless steel hardware
- 2. Grit Removal and Fine Screening Building (240) Fixtures:
  - (a) Hose bibbs
  - (b) Floor drains
- 3. Chemical Building (340) Fixtures:
  - (a) Reduced pressure backflow preventor
  - (b) Combination emergency shower/eyewash
  - (c) Through-wall emergency shower
  - (d) Through-wall emergency eyewash
  - (e) Two tepid water mixing valves for emergency shower/eyewash equipment
  - (f) Tank-style, 80 gal. electric water heater w/6 kW heating element
  - (g) Recirculation pump for hot water line
  - (h) Hose bibb
  - (i) Freeze-proof wall hydrant
  - (j) Floor drains
- 4. MBR Building (420) Fixtures:
  - (a) Two reduced pressure backflow preventors
  - (b) Two combination emergency shower/eyewash
  - (c) Two tepid water mixing valves for emergency shower/eyewash equipment
  - (d) Tank-style, 80 gal. electric water heater w/6 kW heating element
  - (e) Hose bibbs
  - (f) Floor drains
  - (g) NPW booster pump skid (2x 40 HP pumps w/VFD control)
- 5. Dewatering Building (540) Fixtures:
  - (a) Two reduced pressure backflow preventors
  - (b) Pedestal-mounted emergency eye/face wash
  - (c) Tepid water mixing valve for emergency eye/face wash equipment
  - (d) Tank-style, 15 gal. electric water heater w/6 kW heating element
  - (e) Hose bibb
  - (f) Freeze-proof wall hydrant

- (g) Floor drains
- (h) Trench drain
- 6. Administration Building (700) Fixtures:
  - (a) Reduced pressure backflow preventor
  - (b) Combination emergency shower/eyewash
  - (c) Tepid water mixing valves for emergency shower/eyewash equipment
  - (d) Tank-style, 80 gal. electric water heater w/6 kW heating element
  - (e) Recirculation pump for hot water line
  - (f) Floor drains
  - (g) Two electric water coolers with bottle fill station
  - (h) One-piece alcove shower
  - (i) Three vitreous China lavatory sinks with faucets
  - (j) Three wall-hung vitreous China water closets with flushometer valves
  - (k) Free-standing, plastic utility sink with faucet
  - (l) Terrazzo, five-sided mop basin with faucet
  - (m) Stainless steel kitchenette sink with faucet

## 23 00 00 HVAC

- 1. Materials:
  - (a) Ductwork:
    - a. Existing Grit Building (210): G90 galvanized steel
    - b. Grit Removal and Fine Screening Building (240):
      - 1. Process Area: Aluminum
      - 2. Electrical Room: G90 galvanized steel
    - c. Chemical Building (340): G90 galvanized steel
    - d. MBR Building (420):
      - 1. Chemical Rooms: Aluminum
      - 2. Electrical Room/Process Area: G90 galvanized steel
    - e. Dewatering Building (540):
      - 1. Process Area: Aluminum
      - 2. Electrical Room: G90 galvanized steel
    - f. Administration Building (700): G90 galvanized steel
  - (b) Hangers/Supports and Hardware:
    - a. Existing Grit Building (210): Hot-dipped galvanized strut and stainless steel hardware
    - b. Grit Removal and Fine Screening Building (240):
      - 1. Process Area: Stainless steel strut and hardware
      - 2. Electrical Room: Hot-dipped galvanized strut and stainless steel hardware
    - c. Chemical Building (340):
      - 1. Alum Room: Stainless steel strut and hardware
      - 2. Electrical Room: Hot-dipped galvanized strut and stainless steel hardware
    - d. MBR Building (420):

1. Chemical Rooms: Stainless steel strut and hardware
2. Process Area: Stainless steel strut and hardware
3. Electrical Room: Hot-dipped galvanized strut and stainless steel hardware
- e. Dewatering Building (540):
  1. Process Area: Stainless steel strut and hardware
  2. Electrical Room: Hot-dipped galvanized strut and stainless steel hardware
- f. Administration Building (700): Hot-dipped galvanized strut and stainless steel hardware
- (c) Ductwork Insulation (for AHU ductwork only):
  - a. Outdoor Supply/Return ductwork:
    1. 2" thick flexible elastomeric, R-8 total minimum, with aluminum jacketing
    2. 2" thick mineral-fiber board, R-8 total minimum, with aluminum jacketing
  - b. Indoor Supply/Return ductwork:
    1. 1–2" thick mineral-fiber blanket, R-6 total minimum
    2. 1-1/2"–2" thick mineral-fiber board, R-6 total minimum
2. Existing Grit Building (210) Equipment:
  - (a) Air Handling Unit (IPS-AHU-001) (BARD wall unit)
    - a. Electrical (V/Ph/Hz): 480/3/60
    - b. Electric heat input: 9 kW
    - c. Accessories:
      1. Unit-mounted NEMA 3R disconnect switch
      2. Brackets for wall-mounting.
      3. MERV 8 filters
      4. Phenolic-coated coils
  - (b) Thermostat with automatic changeover capability (IPS-T-001)
3. Grit Removal and Fine Screening Building (240) Equipment:
  - (a) Gas-Fired Makeup Air Unit (GRT-MAU-001)
    - a. Electrical (V/Ph/Hz): 480/3/60
    - b. Natural Gas input: 500 MBH
    - c. Accessories:
      1. Shipped loose NEMA 4X disconnect switch
      2. Roof curb
      3. Aluminum mesh filtered weatherhood
      4. Stainless steel heat exchanger
      5. Discharge air temperature sensor
      6. Gas pressure regulator
      7. Sail switch
  - (b) Gas-Fired Makeup Air Unit (GRT-MAU-002)
    - a. Electrical (V/Ph/Hz): 480/3/60
    - b. Natural Gas input: 400 MBH
    - c. Accessories:
      1. Shipped loose NEMA 4X disconnect switch

2. Rails for grade-mounting on equipment pad
3. Aluminum mesh filtered weatherhood
4. Stainless steel heat exchanger
5. Discharge air temperature sensor
6. Gas pressure regulator
7. Sail switch
- (c) Three Aluminum Upblast Exhaust Fans (GRT-EF-001/002/003)
  - a. Electrical (V/Ph/Hz): 480/3/60
  - b. Accessories:
    1. Shipped loose NEMA 4X disconnect switch
    2. Wall-mounting bracket kit
    3. Explosion proof, Class 1, Division 2 rated motor with aluminum rub ring
    4. Sail switch
- (d) Air Handling Unit (GRT-AHU-001) (BARD wall unit)
  - a. Electrical (V/Ph/Hz): 480/3/60
  - b. Electric heat input: 6 kW
  - c. Accessories:
    1. Unit-mounted NEMA 3R disconnect switch
    2. Brackets for wall-mounting.
    3. MERV 8 Filters
    4. Phenolic-coated coils
- (e) Thermostat with automatic changeover capability (GRT-T-001)
- (f) Go/No-Go lights inside and outside every entrance
- (g) Miscellaneous diffusers/registers/grilles
4. Chemical Building (240) Equipment:
  - (a) Gas-Fired Makeup Air Unit (CHM-MAU-001)
    - a. Electrical (V/Ph/Hz): 480/3/60
    - b. Natural Gas input: 150 MBH
    - c. Accessories:
      1. Unit-mounted NEMA 4X disconnect switch
      2. Roof curb
      3. Aluminum mesh filtered weatherhood
      4. Stainless steel heat exchanger
      5. Discharge air temperature sensor
      6. Gas pressure regulator
      7. Sail switch
  - (b) Two Aluminum Upblast Exhaust Fans (CHM-EF-001/002)
    - a. Electrical (V/Ph/Hz): 120/1/60
    - b. Accessories:
      1. Unit mounted NEMA 4X disconnect switch
      2. Wall-mounting bracket kit
      3. Sail switch (CHM-EF-001 only)
  - (c) Two Motorized Control Dampers (CHM-CD-001/002)
    - a. Electrical (V/Ph/Hz): 120/1/60
    - b. Power open and power close

- c. Galvanized steel
- (d) Electric Unit Heater (CHM-EUH-001)
  - a. Electrical (V/Ph/Hz): 480/3/60
  - b. Electric Heating Element: 3 kW
  - c. Accessories:
    - 1. Unit-mounted disconnect switch
    - 2. Unit mounted thermostat
    - 3. Wall-mounting bracket kit
- (e) Thermostat with automatic changeover capability (CHM-T-001)
- (f) Miscellaneous diffusers/registers/grilles
- 5. MBR Building (420) Equipment:
  - (a) Two Air Handling Units (MBR-AHU-001/002)
    - a. Electrical (V/Ph/Hz): 480/3/60
    - b. Electric heat input: 9 kW
    - c. Accessories:
      - 1. Unit-mounted NEMA 3R disconnect switch
      - 2. Roof curb
      - 3. MERV 8 Filters
      - 4. Duct mounted smoke detector
  - (b) Two Gas-Fired Makeup Air Unit (MBR-MAU-001/002)
    - a. Electrical (V/Ph/Hz): 480/3/60
    - b. Natural Gas input: 500 MBH
    - c. Accessories:
      - 1. Unit-mounted NEMA 4X disconnect switch
      - 2. Curb
      - 3. Aluminum mesh filtered weatherhood
      - 4. Stainless steel heat exchanger
      - 5. Discharge air temperature sensor
      - 6. Gas pressure regulator
      - 7. Sail switch
  - (c) Two Aluminum Upblast Exhaust Fans (MBR-EF-001/002)
    - a. Electrical (V/Ph/Hz): 120/1/60
    - b. Accessories:
      - 1. Unit mounted NEMA 4X disconnect switch
      - 2. Roof curb
      - 3. Sail switch (MBR-EF-001 only)
  - (d) Two Aluminum Upblast Exhaust Fans (MBR-EF-004/006)
    - a. Electrical (V/Ph/Hz): 480/3/60
    - b. Accessories:
      - 1. Unit mounted NEMA 4X disconnect switch
      - 2. Roof curb
      - 3. Sail switch
  - (e) Two Aluminum Upblast Exhaust Fans (MBR-EF-003/005)
    - a. Electrical (V/Ph/Hz): 480/3/60
    - b. Accessories:
      - 1. Unit mounted NEMA 4X disconnect switch

- 2. Wall-mounting bracket kit
- 3. Sail switch
- (f) Motorized Control Dampers (MBR-CD-001/002)
  - a. Electrical (V/Ph/Hz): 120/1/60
  - b. Power open and power close
- (g) Three thermostats with automatic changeover capability (MBR-T-001/002/003)
- (h) Miscellaneous diffusers/registers/grilles
- 6. Dewatering Building (540) Equipment:
  - (a) Gas-Fired Makeup Air Unit (DWB-MAU-001)
    - a. Electrical (V/Ph/Hz): 480/3/60
    - b. Natural Gas input: 200 MBH
    - c. Accessories:
      - 1. Unit-mounted NEMA 4X disconnect switch
      - 2. Roof curb
      - 3. Aluminum mesh filtered weatherhood
      - 4. Stainless steel heat exchanger
      - 5. Gas pressure regulator
      - 6. Sail switch
  - (b) Aluminum Upblast Exhaust Fans (DWB-EF-001)
    - a. Electrical (V/Ph/Hz): 120/1/60
    - b. Accessories:
      - 1. Shipped loose NEMA 4X disconnect switch
      - 2. Roof curb
      - 3. Sail switch
      - 4. Duct mounted smoke detector
  - (c) Aluminum Upblast Exhaust Fans (DWB-EF-002)
    - a. Electrical (V/Ph/Hz): 120/1/60
    - b. Accessories:
      - 1. Shipped loose NEMA 4X disconnect switch
      - 2. Roof curb
  - (d) Air Handling Unit (DWB-AHU-001)
    - a. Electrical (V/Ph/Hz): 480/3/60
    - b. Electric heat input: 9 kW
    - c. Accessories:
      - 1. Unit-mounted NEMA 3R disconnect switch
      - 2. Roof curb
      - 3. MERV 8 Filters
  - (e) Two thermostats with automatic changeover capability (DWB-T-001/002)
  - (f) Go/No-Go lights inside and outside every entrance
  - (g) Miscellaneous diffusers/registers/grilles
- 7. Administration Building (700) Equipment:
  - (a) Two Air Handling Units (ADM-AHU-001/002)
    - a. Electrical (V/Ph/Hz): 480/3/60
    - b. Natural Gas input: 80 MBH
    - c. Accessories:



1. Unit-mounted NEMA 3R disconnect switch
2. Curb
3. MERV 8 Filters
- (b) Two Aluminum Upblast Exhaust Fans (ADM-EF-001/002)
  - a. Electrical (V/Ph/Hz): 120/1/60
  - b. Accessories:
    1. Unit mounted NEMA 3R disconnect switch
    2. Wall-mounting bracket kit
- (c) Two thermostats with automatic changeover capability (ADM-T-001/002)
- (d) Miscellaneous diffusers/registers/grilles

## 26 05 11 MEDIUM-VOLTAGE SWITCHGEAR

1. ELC-MVSWGR-010
  - (a) Outdoor sheltered aisle enclosure 12470V, 40KA, 1200A bus. SPDs and microprocessor based relays.
  - (b) Breakers as shown on drawings.
  - (c) Outfitted with generator paralleling and source transfer controls.

## 26 05 11 LOW VOLTAGE POWER CONDUCTORS AND CABLES

1. Cable:
  - a. MV Power: 15 kV, EPR insulation, MV-105.
  - b. LV Power: 600V, XHHW-2 insulation, PVC jacket.
    - i. Exception: MC style armored flexible cable may be used in Administration Building for lighting and small power.
    - ii. Exception: THWN for Administration building and lighting and small power (120VAC, non-process related) for other buildings
  - c. LV VFD Motor Feeder: 1000/2000V rated VFD power cable. XHHW-2 with 100% copper tape shield, three-phase conductors w/ three symmetrical grounds, and overall PVC jacket.
  - d. LV Control: 600V, #14AWG multiconductor, XHHW-2 insulation, overall PVC jacket.
    - a. Instrument: 600V, #18 AWG, twisted pair/triad with PVC insulation and PVC jacket. Individual shielding.
    - b. Category 6: Unshielded, bonded pairs, #23 AWG solid conductors, polyolefin insulation, PVC jacket. Belden 7940A or equal.
    - c. Fiber: Stranding as indicated, loose-tube, PVC jacket, water-blocked. OS2 single mode
2. Cable Terminations:
  - a. Motors: 1-hole compression lugs with motor splice kit (3M 5300-series or equal) except 2-hole compression lugs for #4/0 AWG and larger.
  - b. Controls: Pre-insulated ferrules or ring lugs as required by device.
  - c. Instruments: Pre-insulated ferrules or locking fork lugs to match device.
  - d. Single-mode Fiber: Field-installed duplex LC connectors.

- e. Cable Splices: No splicing except for low voltage lighting and receptacle circuits.

**26 05 26 GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS**

1. Bare copper, tinned, #3/0 AWG min. for counterpoise and risers.
2. Below-grade Connections: Welded (CAD Weld).
3. Above-Grade Connections: Bolted/mechanical. Silicon-bronze hardware.
4. Ground Rods: 3/4"x10', copper-clad steel, pointed or segmented-type.
5. Test Wells: HDPE or polymer concrete handholes.
6. Equipment to be grounded:
  - a. Steel-reinforced concrete foundations, #3/0 AWG.
  - b. Building/Structural Steel, #3/0 AWG.
  - c. Controls (PLC) Cabinets/Panels, #2 AWG.
  - d. Cable Tray, #3/0 AWG.
  - e. Motors 50 HP and larger, #3/0 AWG.
  - f. Motors less than 50 HP, #2 AWG.
  - g. Electrical Distribution Equipment 400 Amp or greater, #3/0 AWG.
  - h. Electrical Distribution Equipment less than 400 Amp, #2 AWG.
  - i. Platforms and Handrails, #2 AWG.

**26 05 33 RACEWAY, BOXES, SEALS, AND FITTINGS FOR ELECTRICAL SYSTEMS**

1. Refer to the Space Materials Matrix for conduit types, support materials, and enclosure ratings/materials to be used in each location.

**26 05 36 CABLE TRAYS FOR ELECTRICAL SYSTEMS**

1. Aluminum, Ladder-type with 9" rung. Install per NEMA VE-2.

**26 05 43 UNDERGROUND DUCT BANK AND HANDHOLES**

1. Duct Banks:
  - a. Reinforcement:
    - i. Steel reinforcement and structural concrete required within 5-feet of foundations, manholes, passing under roadways and other driving surfaces.
    - ii. Yard duct banks will be installed with a flowable utility fill, no reinforcement required.
  - b. Direct-Bury: Banks of direct-bury conduit (not passing under driving surfaces) will be installed with a flowable utility fill.
  - c. Concrete and Utility Fill: Red-dyed flowable fill except min. 2500-psi concrete for steel-reinforced duct bank.
  - d. Minimum Coverage: 30-inches.
2. Raceway:

- a. Duct Bank: Reference Materials Matrix
  - b. Direct-Buried:
    - i. Reference materials matrix.
  - c. Risers: PVC-coated RGS or Rigid Fiberglass (RTRC) elbows. Risers to be PVC-coated RGS except where permitted otherwise by Engineer.
3. Handholes:
- a. Precast concrete manholes for duct banks.
  - b. Small yard handholes for additional pulling (e.g. yard lighting) may be polymer concrete (e.g. Quazite boxes).
  - c. Install traceable caution tape to mark all underground electrical.

**26 05 53 IDENTIFICATION FOR ELECTRICAL SYSTEMS**

- 1. Provide instruments with wired SS tags.
- 2. Label individual conductors for control and instrument cables (heat shrink-type labels).
- 3. Label cables at each termination point, box entry, and splice (wrap around-type labels).
- 4. Equipment Nameplates:
  - a. White with black lettering, 4"x2".
- 5. Required for each device/equipment with a cable.

**26 11 16 SECONDARY UNIT SUBSTATION**

- 1. Aluminum or copper windings.
- 2. Edible, seed oil based less flammable insulating liquid.
- 3. Primary and secondary air terminal chambers.
- 4. Provide two 3000 KVA rated, 12470 primary, 480 VAC secondary.
- 5. May be substituted for pad mounted due to lead times.

**26 24 13 LOW VOLTAGE SWITCHBOARDS**

- 1. Aluminum or copper bus, sized as indicated.
- 2. Provide kirk key or automatic transfer scheme as indicated.
- 3. For DWB-SWBD-020 only, provide active harmonic mitigation system

**26 24 13 LOW VOLTAGE DISTRIBUTION TRANSFORMERS**

- 1. Dry-type, ventilated with 115°C rise. Copper or Aluminum coils. Provide as indicated on the drawings.
- 2. Pad mounted, environmentally friendly oil filled, copper or aluminum coils, loop or radial connected primary as indicated. Provide size and quantity as indicated.

**26 24 16 PANELBOARDS**

- 1. Copper or aluminum bus, main breaker, fully-rated.
- 2. Provide as indicated on the drawings.

3. Surge Protection Device (with Surge Counter) required for all panelboards.  
(Assume 80kA rating as minimum)
4. 120 VAC Panels shall be provided with spare 20A-1P breakers to fill panel space.

### **26 24 19 MOTOR CONTROL CENTERS**

1. Smart enabled system, internally networked, with Ethernet/IP Protocol
2. Aluminum bus.
3. MCC shall be supplemented with an Active Harmonic Mitigation system (integral or external) sized to reduce harmonic content from MCC and MCC equipment below values allowed by IEEE 519. Mitigation system to be applied, one per MCC.
4. Provide the following MCCs, outfitted with breaker and motor starters as indicated on the drawings.
  - a. MBR-MCC-021
  - b. MBR-MCC-022
  - c. MBR-MCC-023
  - d. MBR-MCC-024

### **26 27 26 WIRING DEVICES**

1. As indicated on the drawings

### **26 29 13 ENCLOSED CONTROLLERS**

1. Safety Switches:
  - a. Heavy-duty type, make-before break.
  - b. Enclosure: Refer to Space Material Matrix.
  - c. Provide auxiliary SPDT contact option for VFD safety switches.
2. Pilot Devices:
  - a. Heavy duty, 30mm, NEMA 4X.
  - b. Lights to be push-to-test LED.
3. Motor Starters:
  - a. Provide with adjustable magnetic-only motor circuit protector (MCP). MCP to be provided with external, lockable handle that indicates “ON”, “OFF”, and “TRIP”.
  - b. Provide with 120-Vac CPT and controls as indicated.
  - c. Starters for process equipment to be provided with Ethernet-capable solid-state overload relay.
4. Contactors: Magnetically held, 30A, minimum 3-pole with Hand-Off-Auto control and indicating lights.

### **26 29 23 VARIABLE FREQUENCY MOTOR CONTROLLERS**

1. Provide standalone VFDs with voltage, horsepower, input/output filters, and low harmonic drive architecture as indicated or required (Active-front end, 18-pulse, or Matrix topologies).

2. Provide with input circuit breaker.
3. Provide with 120-Vac CPT, controls, and pilot devices (As per 26 29 13) as indicated.
4. Provide with Ethernet/IP control capability.
5. Provide standalone VFDs for the following loads
  - a. Influent Pumps 1 through 4.
  - b. Sludge Pumps 1 and 2.

**26 32 13 ENGINE GENERATOR SETS**

1. Provide two new 1750 KW, 0.8 PF, 12470 KVA diesel generators in weather protective enclosures. Relocate existing plant generator to new Dewatering Building

**26 33 53 STATIC UNINTERRUPTIBLE POWER SUPPLY**

1. Provide 5 KVA 120 VAC per specifications.

**26 41 00 TRANSFER SWITCHES**

1. Provide for new buildings on site as specified.

**26 50 00 LIGHTING**

1. As required in the lighting schedule and plans.

**28 31 00 FIRE ALARM AND MASS NOTIFICATION SYSTEMS**

1. Provide detection and mass notification system for the process room in the Dewatering Building and east MBR Chemical storage room.

**31 20 50 SITE PREPARATION AND EARTHWORK**

1. All compactions shall be proof rolled where practical.
2. In lieu of proofrolling due to site constraints, compactions shall be per Standard Proctor (ASTM D698) using sheepsfoot roller or self-propelled compactor.
3. Excavation shall be as necessary to construct structures in accordance with the drawings.
4. Fill to be acquired onsite to extents possible and offsite as necessary for all backfill of new structures.
5. Finish grading of site and access roads.
6. Compact to 95% of the material's standard Proctor dry density for backfill.
7. Dewatering at creek crossing/s.
8. Dewatering of incidental water at other excavations.

**31 20 50 STRUCTURAL EXCAVATION**

1. All compactions shall be proofrolled where practical.
2. In lieu of proofrolling due to site constraints, compactions shall be per Standard Proctor (ASTM D698) using sheepsfoot roller or self-propelled compactor.

3. Backfilling of Structures to 95% for general soil and structural fill.
4. Pavement and floor slabs subgrade to 95%.
5. Overexcavation of high plasticity soil to a minimum of 2' below foundations and floor slabs backfilled with Low Volume Change (LVC) structural fill.
6. Backfill around structure walls will include a 1'-6" wide column of granular material around the walls with the remainder of backfill completed with on-site soils.

**31 20 50 TRENCH EXCAVATION/BACKFILL**

1. 4" aggregate bedding below pipe and 12" aggregate bedding above pipe— ¾" clean granular materials.
2. Backfill around pipe. Above pipe – 24" to 95% per Standard Proctor (ASTM D 698)
3. Reinforced concrete encasement for all process piping below structures.

**32 11 23 CRUSHED AGGREGATE BASE AND SURFACE COURSE**

1. 4" MODOT Grade 4 below concrete driveway and as shown on plans.
2. 4-foot wide, 4" thick MODOT Grade 4 between sidewalks and buildings.
3. 6" MODOT Type 1 Aggregate Base for new asphalt drive.

**31 63 29 DRILLED SHAFT FOUNDATIONS**

1. Applicable to the grit removal and fine screening building and digester no. 4.
2. 3' diameter and socketed 3' into rock.
3. No load test.
4. Concrete: Reference 03 30 00
5. Reinforcement: Reference 03 20 00.

**32 12 14 BITUMINOUS PRIME COAT**

1. MC-30 Cutback Bitumen per ASTM D2027.

**32 12 15 BITUMINOUS TACK COAT**

1. SS-1 or SS-1h Asphalt Emulsions per ASTM D977.

**32 12 17 HOT-MIX ASPHALTIC-CONCRETE PAVEMENT**

1. 2" of Bituminous Pavement BP-1 or BP-2 and 7" of Bituminous Base BB conforming to Section 401 of the Missouri Standard Specifications for Highway Construction, Latest Edition for Composition of the Mix.
2. Asphalt Binder PG 64-22 conforming to Section 1015 of the Missouri Standard Specifications for Highway Construction, Latest Edition.

### **32 16 00 CONCRETE CURBS, GUTTERS, STAIRS, SIDEWALKS, AND DRIVES**

1. All curb shall be 6-inches tall unless specified otherwise on the drawings.
2. All sidewalks shall slope away from the building at a minimum of 0.50% and a max of 2.0% to ensure drainage and ADA compliance.
3. Grade, Form, Pour, Finish, and Strip Sidewalks
4. Sidewalks to be 5-foot wide minimum, 4-inches thick.
5. All sidewalks shall have a minimum 2% cross-slope.
6. Grade, Form, Pour, Finish, and Strip curb and gutter.
7. Control joints shall be spaced every 5-feet (max) in sidewalks and every 10-feet in curb and gutter.
8. No caulking of control joints.
9. Concrete shall be 4000psi.

### **32 31 13 CHAIN-LINK FENCES AND GATES**

1. 6-foot chain link fabric, 2-inch diamond mesh. Bottom selvage twisted and top selvage knuckled. 3 rows of 2 strand barbed wire.
2. 12-foot manual single-swing gate.
3. 16-foot motor-operated cantilevered sliding gate.

### **32 92 00 SEEDING**

1. Design/Builder to return topsoil and fine grade site and seed any disturbed areas.
2. Seed mix will be suitable for continued Owner maintenance.
3. Seeding areas to be clear of vegetation, rock, and other materials which would interfere with grading and tillage operations.
4. Topsoil will be stockpiled at beginning of the project and re-spread or removed off site at the end.
5. No topsoil import is included in the project.
6. Permanent erosion control mat shall be installed downstream of the existing reinforced concrete box culvert. Voids shall be filled with topsoil and seeded.

### **33 11 00 PRESSURE PIPE**

1. Buried Yard Piping:
  - (a) Ductile Iron Pipe: AWWA C115, C150, and C151.
    - a. All pipe and fittings shall be cement-mortar lined per AWWA C104 except the following will be Protecto 401 ceramic epoxy lined if ductile iron pipe is used:
      1. Existing screens to influent PS.
      2. Influent PS to Grit removal and fine screen building.
      3. Grit removal and fine screen building to process basin (including piping from splitter to process basin).
      4. SSFM from digesters to dewatering building.
      5. WAS from MBR building to blending tie in location.

- 6. RAS from MBR building to process basin.
  - b. Minimum 350 psi for 4-inch through 12-inch diameter pipes.
  - c. Minimum 250 psi for 14-inch through 20-inch diameter pipes.
  - d. Minimum 200 psi for 24-inch diameter pipes.
- (b) PVC: AWWA C900
  - a. Minimum 150 psi for 4- through 12-inch diameter sewer pipes.
  - b. Minimum 100 psi for 14- through 20-inch diameter sewer pipes.
  - c. Minimum 200 psi for 4- through 6-inch diameter water main pipes.
- (c) Restrained mechanical or restrained push-on-type joints for pipe and fittings.
- (d) Ductile iron piping to include exterior bituminous coating for pipe and fittings.
- (e) Ductile iron piping to include polyethylene encasement (minimum 8 mils) for pipe and fittings.
- 2. Water Service Piping:
  - (a) For pipes less than or equal to 3-inches in diameter.
  - (b) Polyethylene plastic tubing: ASTM D2737 SDR 9 200 psi
  - (c) PVC: ASTM D1785 Schedule 80 PVC
- 3. Interior Process Piping
  - (a) Ductile Iron Pipe, Flanged Pipe & Fittings
  - (b) Primed and painted.
- 4. Exposed Exterior Process Piping
  - (a) Ductile Iron Pipe, Flanged Pipe & Fittings
  - (b) Primed and painted.
  - (c) Heat traced (for freeze protection), insulated, and jacketed.
- 5. Misc PVC Pipe
  - (a) Sch 80, Glue Fittings
  - (b) All solvents must be compatible with chemicals being used.
- 6. Chemical Feed Piping
  - (c) Chemical feed piping to be flexible PE tubing in PVC carrier pipe or rigid PVC piping

### **33 12 16 UTILITY VALVES AND ACCESSORIES**

- 1. Valves AWWA nut, manual handwheel, or motor actuation, as indicated on the drawings. Buried valves shall be mechanical joint, exposed/interior valves shall be flanged. Paint shall be epoxy in the interior and on the exterior per AWWA C550.
- 2. Air Release Valves shall conform to AWWA C512.
  - (a) Heavy-duty wastewater style
  - (b) Stainless steel internal parts
  - (c) Isolation valve at connection
- 3. Butterfly valves for water service shall conform to AWWA C504.
  - (a) Ductile or cast iron body
  - (b) 316 stainless steel stem
  - (c) Synthetic rubber seat
- 4. Butterfly valves for air service shall conform to AWWA C504.
  - (d) Ductile or cast iron body
  - (e) 316 stainless steel stem



- (f) Synthetic rubber seat
- 5. Check valves shall be swing-type and conform to AWWA C508.
  - (a) Iron body
  - (b) Full opening
  - (c) Stainless steel hinge pin with outside lever and weight
- 6. Plug valves shall conform to AWWA C517.
  - (a) Cast iron body and cover
  - (b) Cast or ductile iron plug
  - (c) Synthetic rubber facing
- 7. Modulating Pinch Valve: Onyx 4"x2.5" DEC Reduced Port Pinch Valve
- 8. Valve boxes shall be two-piece cast iron with extension stems and marked drop cover.

**33 12 42 SUBMERSIBLE PROPELLER PUMPS**

- 1. Equipment manufacturer: Sulzer or Flygt.
- 2. Four (4) Submersible Pumps for internal recycle
  - a. Capacity: Two at 4,170 gpm and two at 2,780 gpm
  - b. Design Head: 57 feet
  - c. Max Horsepower: 115 and 60 hp
- 3. Accessories:
  - a. Pump Discharge Connection
  - b. Rail Guides, stainless steel
  - c. Lifting Chain or Cable
  - d. Guide Rails
  - e. Cable Holder
- 4. Spare Parts: One shelf spare pump and as specified in Section 33 12 42.
- 5. Startup: Supplier shall provide start-up, and testing services for pumps as specified in DIVISION 01 and Section 33 12 42.

**33 31 13 GRAVITY PIPE**

- 1. Buried Yard Piping: Ductile Iron ASTM A746
- 2. Buried Yard Piping: PVC
  - a. ASTM F891 for cleanouts and laterals only.
  - b. ASTM D3034 SDR 35 (for depths of cover less than or equal to 10-feet).
  - c. ASTM D3034 SDR 26 (for depths of cover greater than 10-feet).
  - d. ASTM F679 minimum 46 psi pipe stiffness (for depths of cover less than or equal to 10-feet).
  - e. ASTM F679 minimum 115 psi pipe stiffness (for depths of greater than 10-feet).
- 3. ASTM F891 PVC cleanouts and Cast-Iron cleanouts.
- 4. Manholes
  - (a) Standard Precast Concrete Manholes, minimum 48-inch diameter, minimum wall thickness equal to 1/12 of inside diameter (in inches) plus one inch, minimum 6-inch base section.
  - (b) Resilient pipe connectors.
  - (c) FRP or Steel Steps at 12- to 16-inch intervals.

(d) Neenah manhole frame and covers.

**33 31 50 PIPE INSTALLATION**

1. General pipe installation and jointing.
2. Polyethylene encasement for DIP.
3. Field testing.
4. Disinfection for potable water.

**33 32 22 SUBMERSIBLE PUMPS**

1. Equipment manufacturer: Flygt.
2. Four (4) Submersible Pumps for influent pumping
  - a. Capacity: Two at 4,170 gpm and two at 2,780 gpm
  - b. Design Head: 57 feet
  - c. Max Horsepower: 115 and 60 hp
3. Accessories:
  - a. Pump Discharge Connection
  - b. Rail Guides, stainless steel
  - c. Lifting Chain or Cable
  - d. Guide Rails
  - e. Cable Holder
4. Spare Parts: as specified in Section 33 32 22.
5. Startup: Supplier shall provide start-up, and testing services for pumps as specified in DIVISION 01 and Section 33 32 22.

**35 20 16 SLIDE GATES AND STOP LOGS**

1. Equipment manufacturer: Golden Harvest.
1. Conform to AWWA C561
2. Gates:
  - a. Quantity as specified in Section 35 20 16.
3. Accessories:
  - a. Rising Stems, 304 stainless steel
  - b. Seals, neoprene
  - c. Fasteners and Anchor Bolts, 316 stainless steel
  - d. Actuator Lift Nuts
  - e. Wheel or Crank Operators or Electric.
  - f. Stop Collars
4. Spare Parts: as specified in Section 35 20 16.
5. Startup: Supplier shall provide start-up and testing services for gates as specified in DIVISION 01, including leak testing.

**Division 40 PROCESS CONTROL AND INSTRUMENTATION REQUIREMENTS**

1. Provide Control and Remote IO Panels
  - a. MBR-CP-060 and remote IO as required.
  - b. MBR-RIO-xxx
  - c. CHM-CP-060

- d. GRT-CP-060
  - e. IPS-CP-060
  - f. DWB-CP-060
2. Provide instrumentation as indicated
- a. Influent Pump Station:
    - i. s2Redundant radar level sensors
    - ii. Provide and install Backup float level switches in the wet well. (count 6)for triplex control
    - iii. Provide pressure sensors and install two magnetic flow meters.
    - iv. Provide and install two pressure transmitters for two force mains.
    - v. Program SCADA to control four influent pumps to maintain a constant we well level by using selected level from redundant sensors. Provide control mode for operation when we well is split. Provide flow control mode utilizing valving on the head, sending excess flows to the peak flow clarified.
  - b. Grit Building
    - i. High level float for fine screen alarming switch.
    - ii. Provide and install on rotameter.
    - iii. Install one flow transmitter provided by others.
    - iv. Install six (6) radar level sensors provided by others.
    - v. Instrumentation as required by the Fine Screen System
    - vi. Instrumentation as required by the Grit System
    - vii. Provide and install gas level analyzers with combustible gas and H2S sensor in two locations.
    - viii. Program SCADA to monitor HVAC equipment, gas sensing, Grit Skid, and Fine Screen skid.
  - c. Process Basins
    - i. One High level float switch for splitter structure alarming
    - ii. Provide and install 12 process analyzers with ORP (count 9), DO (count 9), and pH (count 6) sensors.
    - iii. Program SCADA to maintain per basin (count 3) DO setpoint by varying blower speed. Blowers connected one per basin with one spare blower. Manual valving to be used to provide blower to basin connectivity. Correlation to be established in SCADA screens.
    - iv. Program SCADA to interlock scum skimming system with high level cutoff of scum pumps.
  - d. Scum Pump Station
    - i. Floats as required for the Scum Pumping Skid.
  - e. MBR System and Building
    - i. MBR Tank level transmitters and floats
    - ii. RAS, WAS and Filtrate Flow metering.
    - iii. Filtrate Turbidity Sensors and Transmitters
    - iv. Pump manufacturer instruments as required by the pump manufacturer.
    - v. Chemical Tote Scales
  - f. Chemical Building

- i. Alum Tank Level transmitter and leak alarm sensor.
  - g. Digesters
    - i. DO Probes, one per digester.
  - h. Solids Handling Building
    - i. Sludge Pump Instruments as required by the pump manufacturer.
    - ii. Sludge Pump Flow Meter
    - iii. Instrumentation as required by the Centrifuge Manufacturer
    - iv. Instrumentation as required by the Screw Conveyor Manufacturer.
- 3. Control Panel Hardware Requirements:
  - a. Field Terminations: PLC/RIO Enclosures shall be provided with dedicated field wiring terminals. Field wires shall not terminate directly on control equipment.
  - b. Enclosures shall be free-standing, NEMA 12 with 3-pt latch and pad-lockable handle for electrical rooms. NEMA 4X SS for all other locations.
  - c. Communication Protocol: Ethernet/IP.
  - d. Network Switches: Managed Switches, with SFPs and required for a complete and functional system.
  - e. Panel mounted PCs: Provide panel mounted PC to run Wonderware HMI application as indicated.
  - f. PLCs:
    - i. Allen-Bradley CompactLogix for process equipment skids and the Influent Pump Station.
    - ii. Allen Bradley ControlLogix for the MBR Building
  - g. RIOs
    - i. Allen Bradley ControlLogix I/O system
  - h. IO Counts
    - i. As shown in the P&IDs and IO list.
- 4. Instrumentation Requirements
  - a. Float Switch: Free-floating, mercury-free level switch.
  - b. Magnetic Flow Meters: Aluminum NEMA 4X transmitter, local display, 120-Vac power supply, 4-20mA HART output, measurement + reference electrodes, flanged body, submergence rated where installed below-grade, 0.5% accuracy, grounding rings.
  - c. Pressure Gages: Bourdon tube-type or diaphragm type, 4.5" dial, 1% accuracy, 2-valve block and bleed manifold except provide compatible diaphragm seals for chemical lines.
  - d. Pressure Transmitters: Die-cast aluminum NEMA 4X housing, local display, 316L wetted parts, 1/2" NPT process connection, 0.075% accuracy, close-coupled mounting, 2-valve block and bleed manifold, 4-20mA HART output.
  - e. Non-Contacting Level Transmitters: Radar technology mounting and power as required for the application..
  - f. Process Analyzers: Hach Transmitters with associated Dissolved Oxygen, pH, and Orthophosphate sensors.
- 5. Administration Building Network and PC Hardware

- a. One network rack outfitted with
    - i. UPS sized for rack mounted equipment.
    - ii. Two (2) Layer 3 network switches.
    - iii. One Rack mounted SCADA Server
    - iv. Fiber optic patch panels as required
    - v. CAT 6 Patch Panels as required.
    - vi. One (1) KVM Switch
  - b. Four (4) SCADA Workstations outfitted with dual monitors.
  - c. Two (2) SCADA Workstation outfitted with a single monitor.
  - d. Three (3) Large format wall mount displays.
  - e. Two (2) Thick clients with KVMs.
  - f. One (1) Printer
6. Software Requirements:
- a. Provide integration services to include PLC programming, HMI programming, network integration and other services to provide a complete an functional system.
  - b. Provide updated licensing to cover one year as required in the specifications.
  - c. Work to be performed by modify existing client Wonderware SCADA software to suit the project.
  - d. Provide Integration services to include automation, monitor, and control for the following Plant PLC connected systems.
    - i. Influent Pump Station and flow splitting controls.
    - ii. Aeration Basin, 3 Basin DO control, 3 Zone Monitoring with internal recirculation pumping, and basin mixing system.
    - iii. Mixing for wastewater holding tanks.
    - iv. Scum Tipping Trough
    - v. Alum Chemical Feed
    - vi. WAS Pumping
    - vii. Sludge Pumping
    - viii. Digester DO Control (4 Digester)
    - ix. Polymer Feed
  - e. Provide Integration services to include remote monitoring and control (varies by system) for the following vendor supplied systems. Vendor system automation provided by equipment supplier as required.
    - i. Grit Handling
    - ii. Fine Screens
    - iii. Membrane Bioreactor System
    - iv. Centrifuges
    - v. Sludge Conveyor
  - f. Provide monitoring for the following:
    - i. Run/Fail status for HVAC equipment except the Administration Building.
    - ii. Hazardous Gas Monitoring for H<sub>2</sub>S and combustible gas in the Grit Building.

- iii. Major electrical equipment status, including switchboard power monitoring, generator monitoring, and transfer scheme monitoring.
  - 2. Other work
    - a. PLC / HMI / Reports Programming Development, Testing, Startup, Training.
    - b. Controls Startup, Configuration, Testing, Training, O&M Manuals.

**41 22 00 CRANES AND HOISTS**

- 1. 1 monorail hoist in MBR building and Dewatering building. Sizes indicated in specification.
- 2. Portable stainless steel davit crane with three pedestal bases at the process basin. Tern model number as indicated on Drawings.

**43 11 31 ROTARY HELICAL SCREW BLOWERS**

- 1. Equipment manufacturer: Aerzen.
- 2. Helical screw positive displacement blowers. Four for aeration service and five for aerobic digestion.
  - a. Aeration:
    - i. Capacity: 3,300 scfm, each
    - ii. Design Pressure: 9.0 psi
    - iii. Max Horsepower: 200 hp
  - b. Digesters:
    - i. Capacity: 4,100 scfm, each
    - ii. Design Pressure: 7.5 psi
    - iii. Max Horsepower: 250 hp
- 3. Accessories:
  - a. Sound enclosure with vibration isolators and cooling/ventilation fan.
  - b. Discharge pressure relief valve.
  - c. Inlet filter.
  - d. Discharge silencer.
  - e. Check valve.
  - f. Flexible Connections.
  - g. Integral VFD and control panel.
- 4. Spare Parts: as specified in Section 43 11 31.
- 5. Startup: Supplier shall provide start-up, and testing services for pumps as specified in DIVISION 01 and Section 43 11 31.

**43 22 47 LARGE BUBBLE MIXING SYSTEMS**

- 1. Equipment Manufacturer: Enviromix, Inc.
- 2. Two complete large bubble mixing systems
  - a. Process basin mixing system (three trains)
    - i. Two compressors (duty/standby)

- ii. One receiver tank
    - iii. Air distribution and balancing to maintain suspended solids at 4,000 to 12,000 mg/L
  - b. Holding basin mixing system (Holding Basin 1 and 2)
    - i. One compressor
    - ii. Two receiver tanks
    - iii. Air distribution and balancing to maintain suspended solids at 100 to 500 mg/L
- 3. Spare parts: as Specified in Section 43 22 57.
- 4. Startup: Supplier shall provide start-up and testing services for mixing systems as specified in DIVISION 01 and Section 43 22 57.

**43 23 13 END SUCTION SOLIDS HANDLING PUMPS**

- 1. Equipment manufacturer: Sulzer.
- 2. Four (4) end suction solids handing pumps for RAS pumping
  - a. Capacity: 7,500 gpm
  - b. Design Head: 28 feet
  - c. Max Horsepower: 100 hp
- 3. Accessories:
  - a. Mechanical Seals
  - b. Coupling and guard.
  - c. Base plate.
- 4. Spare Parts: as specified in Section 43 23 13.
- 5. Startup: Supplier shall provide start-up, and testing services for pumps as specified in DIVISION 01 and Section 43 23 13.

**43 23 58 ROTARY LOBE PUMPS**

- 1. Equipment manufacturer: Netzch.
- 2. Four (4) rotary lobe for WAS and centrifuge feed pumping
  - a. WAS service:
    - i. Total Solids: 0.5 – 1.0%
    - ii. Capacity: 320 gpm
    - iii. Design Head: 5 psi
    - iv. Max Horsepower: 15 hp
  - b. Centrifuge feed service:
    - i. Total Solids: 1.5 – 2.5%
    - ii. Capacity: 185 gpm
    - iii. Design Head: 11 psi
    - iv. Max Horsepower: 7.5 hp
- 3. Spare Parts: as specified in Section 43 23 58.
- 4. Startup: Supplier shall provide start-up, and testing services for pumps as specified in DIVISION 01 and Section 43 23 58.

**43 26 13 SUBMERSIBLE CHOPPER PUMPS**

1. Equipment manufacturer: Vaughan.
2. Two submersible chopper pumps (one installed) for scum pumping
  - a. Capacity: 350 gpm
  - b. Design Head: 16 feet
  - c. Max Horsepower: 5 hp
3. Accessories:
  - a. Pump Discharge Connection
  - b. Rail Guides, stainless steel
  - c. Lifting Chain or Cable
  - d. Guide Rails
  - e. Cable Holder
  - f. Recirculation nozzle assembly
4. Spare Parts: spare pump and as specified in Section 46 26 13.
5. Startup: Supplier shall provide start-up, and testing services for pumps as specified in DIVISION 01 and Section 46 26 13.

#### **46 21 33 SCREENING EQUIPMENT**

1. Equipment Manufacturer: SAVECO North America, Inc.
2. Three fully automatic, self-cleaning, channel mounted rotating drum screens at the Grit Removal and Fine Screening Building.
  - a. Peak Capacity per Screen: 6.3 MGD
  - b. Perforation Size: 6 mm
  - c. Minimum angle of screens: 35 degrees
3. One screw conveyor to transport screenings from all screens to a dumpster for disposal.
  - a. Minimum conveyor belt length: 25 ft
4. Accessories:
  - a. Screen covers, 316 stainless steel
  - b. Six ultrasonic level transducers with 316 stainless steel mounting brackets and expansion anchors
  - c. Three float style level switches
  - d. Three solenoid valves to control flow to the compaction zone spray wash assembly and screen wash assembly on each screen
  - e. Three electric actuated full port ball valves, 316 stainless steel, to control flow to the basket spray wash assembly on each screen
5. Spare Parts: as specified in Section 46 21 33.
6. Startup: Supplier shall provide start-up and testing services for mixing systems as specified in DIVISION 01 and Section 46 21 33.

#### **46 23 00 GRIT REMOVAL EQUIPMENT**

1. Equipment Manufacturer: Hydro International.
2. One Eutek HeadCell® grit removal unit
  - a. Peak Hourly Flow: 12.6 MGD



- b. Diameter: 12 ft
- c. Trays per Unit: 7
- 3. One Eutek OpTeaCup® and Grit Snail® grit classifying/dewatering unit.
  - a. Design Flow: 200 gpm
- 4. Spare Parts: As recommended by manufacturer.
- 5. Startup: Supplier shall provide start-up and testing services for mixing systems as specified in DIVISION 01 and Section 43 20 00.

**46 25 43 TIPPING TROUGH SCUM SKIMMING EQUIPMENT**

- 1. Equipment Manufacturer: Jim Myers & Sons (JMS)
- 2. Three tipping troughs for removal of scum from process basin.
- 3. Diameter: 12 inch
- 4. Electric actuator and stand.
- 5. Spare Parts: As recommended by manufacturer.
- 6. Startup: Supplier shall provide start-up and testing services for mixing systems as specified in DIVISION 01 and Section 46 25 43.

**46 33 01 CHEMICAL FEED AND STORAGE SYSTEMS**

- 1. Liquid Feed Systems:
  - a. One dual-pump skid shall be provided compatible with aluminum sulfate.
  - b. Metering skids shall be provided with:
    - i. Two pumps, calibration column, pressure gauges, pressure relief valve, pulsation damper, and isolation valves. Pumps will have integral controls.
    - ii. Pumps shall be diaphragm with adjustable stroke length or variable frequency drive by ProMinent, Grundfos, or Equal.
  - c. Two pump skids for MBR cleaning chemicals (sodium hypochlorite and citric acid) as provided by MBR Supplier.
- 2. Chemical Storage Systems
  - a. One 5,000 gal indoor, double-wall bulk tank for aluminum sulfate by Snyder.
  - b. Three 330 gallon spill containment scales for storage of sodium hypochlorite, citric acid, and polymer totes by Scaletron.
- 3. Chemical injection quills by Saf-T-Flo or equal.
- 4. Chemical static mixers by Westfall or equal.

**46 41 23 SUBMERSIBLE MIXERS**

- 1. As required to achieve required mixing in the deox basin.

**46 51 31 FLEXIBLE MEMBRANE TUBE DIFFUSERS**

- 2. Equipment Manufacturer: Environmental Dynamics, Inc. (EDI).

3. Four digester tube-style diffuser systems including air diffusers, air piping manifolds and laterals, piping supports, anchor bolts, pipe anchors, and any additional materials required by Supplier's design.
  - a. Solids Concentration: 0.5 to 2%
  - b. pH Range: 5.5 to 7.5
  - c. Temperature: 12 to 25°C
  - d. Sidewater Depth:
    - i. Minimum: 12 ft
    - ii. Normal Operating Depth: 13 ft
    - iii. Maximum: 14 ft
  - e. Maximum available pressure at top of dropleg: 6.5 psig at a maximum air rate of 4,100 scfm per digester including static pressure, pressure loss through air piping, and pressure loss through the membrane
4. Spare Parts: as specified in Section 46 51 31.
5. Startup:
  - a. Supplier shall provide start-up and testing services for tube diffuser systems as specified in DIVISION 01 and Section 46 51 31.

**46 51 36 DISC DIFFUSERS**

1. Equipment Manufacturer: Environmental Dynamics, Inc. (EDI).
2. Three process basin disc-type diffuser systems including air diffusers, air piping manifolds and laterals, piping supports, anchor bolts, pipe anchors, and any additional materials required by Supplier's design.
  - a. Mixed Liquor Suspended Solids Concentration: 5,000 to 14,000 mg/L
  - b. pH Range: 5.5 to 7.5
  - c. Temperature: 12 to 25°C
  - d. Sidewater Depth: 18.2 ft
  - e. Maximum available pressure at top of dropleg: 8.5 psig at a maximum air rate of 1,650 scfm per cell including static pressure, pressure loss through air piping, and pressure loss through the membrane
3. Spare Parts: as specified in Section 46 51 36.
4. Startup:
  - a. Supplier shall provide start-up and testing services for disc diffuser systems as specified in DIVISION 01.

**46 53 49 MEMBRANE BIOREACTOR SYSTEM**

1. Membrane Bioreactor System as provided by Veolia.
2. Membrane system:
  - a. 32 ZeeWeed 500EV cassettes
  - b. Air distribution valves, permeate distribution valves, level instrumentation, and ejector assemblies.
3. Additional equipment provided by Veolia:
  - a. Four positive displacement blower by Aerzen with associated enclosures, valves, and instruments.

- b. Four permeate pumps by Boerger with associated valves and instruments.
- c. Two chemical feed systems. One for sodium hypochlorite and one for citric acid. Dual pump skids with mag drive pumps by Finish Thompson and associated valves, instruments, and controls.
- d. Two air compressors by Gardner Denver and receiver tank with associated instruments.

**46 76 33 DEWATERING CENTRIFUGES AND POLYMER FEED SYSTEM**

- 1. Centrifuge Equipment Manufacturer: Flottweg. Polymer System Manufacturer: Clearwater1 (formerly UGSI)
- 2. One dewatering centrifuge and associated polymer feed system.
  - a. Solids loading rate: 1,830 lbs/hr
  - b. Hydraulic loading rate: 185 gpm.
- 3. Accessories:
  - a. PLC control panel and local control panel.
  - b. Drive motor, belt guard, grease lubrication system, scroll drive.
  - c. Skid-mounted polymer system for use with emulsion polymer, including:
    - i. 1 to 10 gph progressive cavity metering pump
    - ii. Activation chamber
    - iii. Flow indication
    - iv. Pressure regulator
- 4. Spare parts: as specified in Sections 46 76 33 and 46 33 33.
- 5. Supplier shall provide start-up and testing services as specified in DIVISION 01, Section 46 76 33 and Section 46 33 33.

**46 77 11 SLUDGE CONVEYORS**

- 1. Equipment Manufacturer: Spirac.
- 2. One inclined and one horizontal screw conveyor. dewatering centrifuge and associated polymer feed system.
  - a. Capacity: 1,300 lbs/hr and 200 ft<sup>3</sup>/hr.
  - b. Solids percentage: 15-25%
  - c. Inclined conveyor: 25 degree inclination and 11 inch diameter screw
  - d. Horizontal conveyor: 0 degree inclination and 12 inch diameter screw
- 3. Accessories:
  - a. Drain and flush connections.
  - b. Safety devices including shields and covers, pull switch, horn and strobe, and warning lights.
  - c. Zero speed switch
  - d. PLC control panel and two local control panels.
  - e. Heat trace and insulation on outdoor portion of horizontal conveyor.
- 4. Spare parts: as specified in Section 47 77 11.
- 5. Supplier shall provide start-up and testing services as specified in DIVISION 01, Section 47 77 11.



## Pre-Final Design Drawings

The Pre-Final Design Drawing package includes the drawings listed below. All drawings are the listed Revision and dated October 20, 2023.

<b>DRAWING No.</b>	<b>DRAWING NAME</b>
<b>GENERAL</b>	
100G001	COVER
100G002	INDEX I
100G003	INDEX II
100G004	INDEX III
100G005	GENERAL LEGEND
100G006	SPACE MATERIAL MATRIX
<b>CIVIL</b>	
100C001	CIVIL LEGEND, ABBREVIATIONS, GENERAL NOTES, AND KEY MAP
100C002	CIVIL GENERAL NOTES
100C100	CIVIL OVERALL PROPERTY PLAN
100C101	CIVIL OVERALL SITE PLAN
100CD101	CIVIL DEMOLITION PLAN AREA 1
100CD102	CIVIL DEMOLITION PLAN AREA 2
100CD103	CIVIL DEMOLITION PLAN AREA 3
100CD104	CIVIL DEMOLITION PLAN AREA 4
100CD105	CIVIL DEMOLITION PLAN AREA 5
100CD106	CIVIL DEMOLITION PLAN AREA 6
100CD107	CIVIL DEMOLITION PLAN AREA 7
100CD108	CIVIL DEMOLITION PLAN AREA 8
100C102	CIVIL SITE PLAN AREA 1
100C103	CIVIL SITE PLAN AREA 2
100C104	CIVIL SITE PLAN AREA 3
100C105	CIVIL SITE PLAN AREA 4
100C106	CIVIL SITE PLAN AREA 5
100C107	CIVIL SITE PLAN AREA 6
100C108	CIVIL SITE PLAN AREA 7
100C109	CIVIL SITE PLAN AREA 8
100C110	CIVIL GRADING PLAN AREA 1
100C111	CIVIL GRADING PLAN AREA 2
100C112	CIVIL GRADING PLAN AREA 3
100C113	CIVIL GRADING PLAN AREA 4
100C114	CIVIL GRADING PLAN AREA 5
100C115	CIVIL GRADING PLAN AREA 6
100C116	CIVIL GRADING PLAN AREA 7
100C117	CIVIL GRADING PLAN AREA 8

100C118	CIVIL YARD PIPING PLAN AREA 1 - SHEET 1 OF 2
100C118A	CIVIL YARD PIPING PLAN AREA 1 - SHEET 2 OF 2
100C119	CIVIL YARD PIPING PLAN AREA 2
100C120	CIVIL YARD PIPING PLAN AREA 3
100C121	CIVIL YARD PIPING PLAN AREA 4
100C122	CIVIL YARD PIPING PLAN AREA 5
100C123	CIVIL YARD PIPING PLAN AREA 6
100C124	CIVIL YARD PIPING PLAN AREA 7
100C125	CIVIL YARD PIPING PLAN AREA 8
100C126	CIVIL YARD PIPING PLAN TABLE SHEET
100C127	CIVIL SITE PLAN AND GRADING CONTROL TABLE SHEET
100C501	DETAIL SHEET 1
100C502	DETAIL SHEET 2
100C503	DETAIL SHEET 3
100C504	DETAIL SHEET 4
<b>STRUCTURAL</b>	
100S001	STRUCTURAL LEGEND AND ABBREVIATIONS
100S002	STRUCTURAL GENERAL NOTES
100S003	STATEMENT OF SPECIAL INSPECTIONS SHEET 1
100S004	STATEMENT OF SPECIAL INSPECTIONS SHEET 2
100S005	STATEMENT OF SPECIAL INSPECTIONS SHEET 3
100S501	STRUCTURAL STANDARD CONCRETE DETAILS SHEET 1
100S502	STRUCTURAL STANDARD CONCRETE DETAILS SHEET 2
100S503	STRUCTURAL STANDARD CONCRETE DETAILS SHEET 3
100S504	STRUCTURAL STANDARD CONCRETE DETAILS SHEET 4
100S505	STRUCTURAL STANDARD CONCRETE DETAILS SHEET 5
100S506	STRUCTURAL STANDARD CONCRETE DETAILS SHEET 6
100S507	STRUCTURAL STANDARD STEEL DETAILS SHEET 1
100S508	STRUCTURAL STANDARD STEEL DETAILS SHEET 2
100S509	STRUCTURAL STANDARD STEEL DETAILS SHEET 3
100S510	STRUCTURAL STANDARD STEEL DETAILS SHEET 4
100S511	STRUCTURAL STANDARD STEEL DETAILS SHEET 5
100S512	STRUCTURAL STANDARD MASONRY DETAILS
100S513	STRUCTURAL STANDARD DRILLED SHAFT SCHEDULE AND SECTION
100S514	STRUCTURAL MISCELLANEOUS SUPPORT DETAILS SHEET 1
100S515	STRUCTURAL MISCELLANEOUS SUPPORT DETAILS SHEET 2
200S101	INFLUENT PUMP STATION OVERALL PLAN
200S102	INFLUENT PUMP STATION WET WELL BASE PLAN @ 1232.00'
200S103	INFLUENT PUMP STATION WET WELL PLAN @ 1256.50'
200S104	INFLUENT PUMP STATION WET WELL TOP PLAN
200S105	INFLUENT PUMP STATION VALVE VAULT BASE PLAN @ 1254.00'

200S106	INFLUENT PUMP STATION VALVE VAULT TOP PLAN
200S301	INFLUENT PUMP STATION SECTIONS SHEET 1
200S302	INFLUENT PUMP STATION SECTIONS SHEET 2
210S101	INFLUENT SCREENING BUILDING ELECTRICAL ROOM PLANS
240S101	GRIT REMOVAL & FINE SCREENING BUILDING OVERALL PLAN
240S102	GRIT REMOVAL & FINE SCREENING BUILDING DRILLED SHAFT LAYOUT PLAN
240S103	GRIT REMOVAL & FINE SCREENING BUILDING PLAN @ EL 1272.25' - AREA A
240S104	GRIT REMOVAL & FINE SCREENING BUILDING PLAN @ EL 1272.25' - AREA B
240S105	GRIT REMOVAL & FINE SCREENING BUILDING PLAN @ EL 1287.00' - AREA A
S40S106	GRIT REMOVAL & FINE SCREENING BUILDING PLAN @ EL 1287.00' - AREA B
240S107	GRIT REMOVAL & FINE SCREENING BUILDING PLAN @ EL 1293.00' - AREA A
240S108	GRIT REMOVAL & FINE SCREENING BUILDING PLAN @ EL 1294.33' - AREA B
240S109	GRIT REMOVAL & FINE SCREENING BUILDING ROOF PLAN
240S301	GRIT REMOVAL & FINE SCREENING BUILDING SECTIONS SHEET 1
240S302	GRIT REMOVAL & FINE SCREENING BUILDING SECTIONS SHEET 2
240S303	GRIT REMOVAL & FINE SCREENING BUILDING SECTIONS SHEET 3
240S304	GRIT REMOVAL & FINE SCREENING BUILDING SECTIONS AND DETAILS SHEET 1
240S305	GRIT REMOVAL & FINE SCREENING BUILDING SECTIONS AND DETAILS SHEET 2
240S401	GRIT REMOVAL & FINE SCREENING BUILDING STAIR PLANS
240S402	GRIT REMOVAL & FINE SCREENING BUILDING STAIR SECTIONS
300S101	PROCESS BASIN OVERALL PLAN
300S102	PROCESS BASIN AREA A BASE PLAN
300S103	PROCESS BASIN AREA B BASE PLAN
300S104	PROCESS BASIN AREA A TOP PLAN
300S105	PROCESS BASIN AREA B TOP PLAN
300S301	PROCESS BASIN SECTIONS SHEET 1
300S302	PROCESS BASIN SECTIONS SHEET 2
300S401	PROCESS BASIN & SPLITTER WALKWAY
300S402	PROCESS BASIN ENLARGED STAIR PLANS & SECTION
300S403	PROCESS BASIN CHEMICAL VAULT ENLARGED PLANS AND SECTIONS
310S101	PROCESS BASIN SPLITTER BASE PLAN
310S102	PROCESS BASIN SPLITTER TOP PLAN
310S301	PROCESS BASIN SPLITTER SECTIONS

320S101	PROCESS BASIN BLOWER PAD PLAN AND SECTION
330S101	SCUM PUMP STATION TOP PLAN AND SECTION
340S101	CHEMICAL BUILDING FOUNDATION PLAN
340S102	CHEMICAL BUILDING ROOF PLAN AND DETAIL
340S301	CHEMICAL BUILDING SECTIONS AND DETAILS
350S101	RAS SPLITTER BASE PLAN
350S102	RAS SPLITTER TOP PLAN
350S301	RAS SPLITTER SECTIONS
350S401	RAS SPLITTER ENLARGED STAIR PLAN
360S101	ELECTRICAL BUILDING FOUNDATION PLAN AND SECTION
370S101	GENERATOR PAD PLAN AND SECTION
400S101	MBR TANK AND BUILDING OVERALL PLAN
400S102	MBR TANK BASE PLAN
400S103	MBR TANK TOP PLAN
400S104	MBR TANK FRAMING PLAN
400S301	MBR TANK SECTIONS SHEET 1
400S302	MBR TANK SECTIONS SHEET 2
400S303	MBR TANK SECTIONS AND DETAILS
400S501	MBR TANK FLOW DEFLECTOR PLATE DETAILS
420S101	MBR BUILDING PLAN @ EL 1264.50'
420S102	MBR BUILDING PLAN @ EL 1272.00'
420S103	MBR BUILDING BRIDGE CRANE FRAMING PLAN
420S104	MBR BUILDING ROOF PLAN
420S301	MBR BUILDING SECTIONS
420S501	MBR BUILDING DETAILS
460S101	MBR BLOWER PAD PLAN AND SECTION
500S101	DIGESTER NO. 4 DRILLED SHAFT LAYOUT PLAN
500S102	DIGESTER NO. 4 PLAN
500S301	DIGESTER NO. 4 SECTIONS AND DETAIL
500S302	DIGESTER NO. 4 STAIR DETAILS AND SECTIONS
520S101	DIGESTER BLOWER PAD PLAN AND SECTION
540S101	DEWATERING BUILDING FOUNDATION PLAN
540S102	DEWATERING BUILDING ROOF PLAN
540S301	DEWATERING BUILDING SECTIONS SHEET 1
540S302	DEWATERING BUILDING SECTIONS SHEET 2
560S101	SLUDGE STORAGE PAD PLAN & SECTIONS
600S101	WW HOLDING BASIN OVERALL PLAN
600SD401	WW HOLDING BASIN PEAK FLOW PUMP STATION DEMO PLAN AND PHOTO
600S401	WW HOLDING BASIN PEAK FLOW PUMP STATION PLAN @ EL 1275.73'
600S402	WW HOLDING BASIN ENLARGED PLAN AND SECTIONS



640S101	PEAK FLOW CLARIFIER SPLITTER PLAN AND SECTION
700S101	ADMINISTRATION BUILDING FOUNDATION PLAN
700S301	ADMINISTRATION BUILDING FOUNDATION SECTIONS AND DETAILS
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100A001	ARCHITECTURAL LEGEND & ABBREVIATIONS
100A002	ARCHITECTURAL GENERAL NOTES
100A003	ARCHITECTURAL STANDARD DETAILS SHEET 1
100A004	ARCHITECTURAL STANDARD DETAILS SHEET 2
100A005	ARCHITECTURAL STANDARD DETAILS SHEET 3
100A006	ARCHITECTURAL STANDARD DETAILS SHEET 4
210A101	INFLUENT PUMP STATION ELECTRICAL ROOM FLOOR PLAN
210A301	INFLUENT PUMP STATION ELECTRICAL ROOM SECTIONS
210A601	INFLUENT PUMP STATION ELECTRICAL ROOM SCHEDULES AND DETAILS
240A101	GRIT REMOVAL & FINE SCREENING BUILDING LOWER LEVEL FLOOR PLAN AND CODE REVIEW
240A102	GRIT REMOVAL & FINE SCREENING BUILDING UPPER LEVEL FLOOR PLAN
240A103	GRIT REMOVAL & FINE SCREENING BUILDING REFLECTED CEILING PLAN
240A104	GRIT REMOVAL & FINE SCREENING BUILDING ROOF PLAN
240A201	GRIT REMOVAL & FINE SCREENING BUILDING NORTH ELEVATION
240A202	GRIT REMOVAL & FINE SCREENING BUILDING SOUTH ELEVATION
240A203	GRIT REMOVAL & FINE SCREENING BUILDING EAST ELEVATION
240A204	GRIT REMOVAL & FINE SCREENING BUILDING WEST ELEVATION
240A301	GRIT REMOVAL & FINE SCREENING BUILDING SECTION SHEET 1
240A302	GRIT REMOVAL & FINE SCREENING BUILDING SECTION SHEET 2
240A601	GRIT REMOVAL & FINE SCREENING BUILDING SCHEDULES AND DETAILS
320A101	PROCESS BASIN BLOWER PAD FLOOR PLAN
320A102	PROCESS BASIN BLOWER PAD ROOF PLAN
320A201	PROCESS BASIN BLOWER PAD ELEVATIONS
320A202	PROCESS BASIN BLOWER PAD ELEVATION AND DETAILS
340A101	CHEMICAL BUILDING FLOOR PLAN AND CODE PLANS
340A102	CHEMICAL BUILDING ROOF PLAN
340A201	CHEMICAL BUILDING NORTH AND SOUTH ELEVATIONS
340A202	CHEMICAL BUILDING EAST AND WEST ELEVATIONS
340A301	CHEMICAL BUILDING SECTIONS
340A601	CHEMICAL BUILDING SCHEDULES AND DETAILS SHEET 1
420A101	MBR BUILDING CODE PLANS
420A102	MBR BUILDING OVERALL FLOOR PLANS
420A103	MBR BUILDING ENLARGED LOWER LEVEL FLOOR PLAN

420A104	MBR BUILDING ENLARGED UPPER LEVEL FLOOR PLAN
420A201	MBR BUILDING NORTH AND SOUTH ELEVATION
420A202	MBR BUILDING EAST AND WEST ELEVATION
420A301	MBR BUILDING SECTION SHEET 1
420A601	MBR BUILDING SCHEDULES AND DETAILS SHEET 1
520A101	DIGESTER BLOWER PAD FLOOR PLAN
520A102	DIGESTER BLOWER PAD ROOF PLAN
520A201	DIGESTER BLOWER PAD ELEVATIONS
520A301	DIGESTER BLOWER PAD SECTION
540A101	DEWATERING BUILDING FLOOR AND CODE PLANS
540A102	DEWATERING BUILDING ROOF PLAN
540A201	DEWATERING BUILDING NORTH AND SOUTH ELEVATIONS
540A202	DEWATERING BUILDING EAST AND WEST ELEVATIONS
540A301	DEWATERING BUILDING SECTIONS
540A601	DEWATERING BUILDING SCHEDULES AND DETAILS
700A101	ADMINISTRATION BUILDING CODE REVIEW
700A102	ADMINISTRATION BUILDING OVERALL FLOOR PLAN
700A103	ADMINISTRATION BUILDING FLOOR PLAN AREA A
700A104	ADMINISTRATION BUILDING FLOOR PLAN AREA B
700A105	ADMINISTRATION BUILDING ROOF PLAN
700A106	ADMINISTRATION BUILDING REFLECTED CEILING PLAN
700A201	ADMINISTRATION BUILDING NORTH AND SOUTH ELEVATIONS
700A202	ADMINISTRATION BUILDING EAST AND WEST ELEVATIONS
700A301	ADMINISTRATION BUILDING SECTIONS SHEET 1
700A302	ADMINISTRATION BUILDING SECTIONS SHEET 2
700A401	ADMINISTRATION BUILDING ENLARGED PLANS
700A402	ADMINISTRATION BUILDING INTERIOR LAB ELEVATIONS
700A403	ADMINISTRATION BUILDING ENLARGED RESTROOM PLAN, ELEVATIONS, AND SCHEDULE
700A404	ADMINISTRATION BUILDING INTERIOR LOCKER ROOM ELEVATIONS AND SECTIONS
700A405	ADMINISTRATION BUILDING INTERIOR BREAK ROOM ELEVATIONS
700A601	ADMINISTRATION BUILDING SCHEDULES AND DETAILS SHEET 1
700A602	ADMINISTRATION BUILDING SCHEDULES AND DETAILS SHEET 2
700A603	ADMINISTRATION BUILDING FLOORING PLAN AND SCHEDULE
<b>MECHANICAL</b>	
100M001	MECHANICAL LEGEND, ABBREVIATIONS, AND GENERAL NOTES
100M501	MECHANICAL STANDARD DETAILS
210MD101	INFLUENT SCREENING BUILDING MECHANICAL DEMOLITION FLOOR PLAN
210M101	INFLUENT SCREENING BUILDING MECHANICAL FLOOR PLAN

210M601	INFLUENT SCREENING BUILDING MECHANICAL SCHEDULES AND SEQUENCE OF OPERATIONS
240M101	GRIT REMOVAL AND FINE SCREENING BUILDING MECHANICAL LOWER LEVEL FLOOR PLAN
240M102	GRIT REMOVAL AND FINE SCREENING BUILDING MECHANICAL UPPER LEVEL FLOOR PLAN
240M103	GRIT REMOVAL AND FINE SCREENING BUILDING MECHANICAL ROOF PLAN
240M301	GRIT REMOVAL AND FINE SCREENING BUILDING MECHANICAL SECTIONS AND NATURAL GAS RISER DIAGRAM
240M601	GRIT REMOVAL AND FINE SCREENING BUILDING MECHANICAL SCHEDULES
240M602	GRIT REMOVAL AND FINE SCREENING BUILDING MECHANICAL SEQUENCE OF OPERATIONS
340M101	CHEMICAL BUILDING MECHANICAL FLOOR PLAN
340M102	CHEMICAL BUILDING MECHANICAL ROOF PLAN
340M601	CHEMICAL BUILDING MECHANICAL SCHEDULES AND SEQUENCE OF OPERATIONS
420M101	MBR BUILDING MECHANICAL FLOOR PLAN
420M102	MBR BUILDING MECHANICAL ROOF PLAN
420M301	MBR BUILDING MECHANICAL SECTIONS AND NATURAL GAS RISER DIAGRAM
420M601	MBR BUILDING MECHANICAL SCHEDULES
420M602	MBR BUILDING MECHANICAL SEQUENCE OF OPERATIONS
540M101	DEWATERING BUILDING MECHANICAL FLOOR PLAN
540M102	DEWATERING BUILDING MECHANICAL ROOF PLAN
540M601	DEWATERING BUILDING MECHANICAL SCHEDULES
540M602	DEWATERING BUILDING MECHANICAL SEQUENCE OF OPERATIONS
700M101	ADMINISTRATION BUILDING MECHANICAL OVERALL FLOOR PLAN
700M102	ADMINISTRATION BUILDING MECHANICAL ENLARGED FLOOR PLAN AREA A
700M103	ADMINISTRATION BUILDING MECHANICAL ENLARGED FLOOR PLAN AREA B
700M104	ADMINISTRATION BUILDING OVERALL REFLECTED CEILING PLAN
700M301	ADMINISTRATION BUILDING MECHANICAL SECTIONS
700M601	ADMINISTRATION BUILDING MECHANICAL SCHEDULES AND SEQUENCE OF OPERATIONS
700M701	ADMINISTRATION BUILDING NATURAL GAS RISER DIAGRAM
<b>PLUMBING</b>	
100P501	PLUMBING STANDARD DETAILS
240P101	GRIT REMOVAL AND FINE SCREENING BUILDING DOMESTIC WATER LOWER LEVEL FLOOR PLAN
240P102	GRIT REMOVAL AND FINE SCREENING BUILDING SANITARY SEWER AND VENT LOWER LEVEL FLOOR PLAN

240P103	GRIT REMOVAL AND FINE SCREENING BUILDING DOMESTIC WATER UPPER LEVEL FLOOR PLAN
240P301	GRIT REMOVAL AND FINE SCREENING BUILDING PLUMBING SECTIONS
240P601	GRIT REMOVAL AND FINE SCREENING BUILDING PLUMBING SCHEDULES AND RISER DIAGRAMS
340P101	CHEMICAL BUILDING PLUMBING FLOOR PLAN
340P301	CHEMICAL BUILDING PLUMBING SECTIONS
340P601	CHEMICAL BUILDING PLUMBING SCHEDULES
340P701	CHEMICAL BUILDING DOMESTIC WATER RISER DIAGRAM
340P702	CHEMICAL BUILDING SANITARY SEWER AND VENT RISER DIAGRAM
420P101	MBR BUILDING PLUMBING FLOOR PLAN
420P301	MBR BUILDING PLUMBING SECTIONS AND ENLARGED PLAN
420P601	MBR BUILDING PLUMBING SCHEDULES
420P701	MBR BUILDING DOMESTIC WATER RISER DIAGRAM
420P702	MBR BUILDING SANITARY SEWER AND VENT RISER DIAGRAM
540P101	DEWATERING BUILDING PLUMBING FLOOR PLAN
540P601	DEWATERING BUILDING PLUMBING SCHEDULES AND RISER DIAGRAMS
700P101	ADMINISTRATION BUILDING DOMESTIC WATER FLOOR PLAN
700P102	ADMINISTRATION BUILDING DOMESTIC WATER ENLARGED FLOOR PLAN AREA A
700P103	ADMINISTRATION BUILDING DOMESTIC WATER ENLARGED FLOOR PLAN AREA B
700P104	ADMINISTRATION BUILDING SANITARY SEWER AND VENT FLOOR PLAN
700P105	ADMINISTRATION BUILDING SANITARY SEWER AND VENT ENLARGED FLOOR PLAN AREA A
700P106	ADMINISTRATION BUILDING SANITARY SEWER AND VENT ENLARGED FLOOR PLAN AREA B
700P107	ADMINISTRATION BUILDING PLUMBING ROOF PLAN
700P601	ADMINISTRATION BUILDING PLUMBING SCHEDULES
700P701	ADMINISTRATION BUILDING DOMESTIC WATER RISER DIAGRAM
700P702	ADMINISTRATION BUILDING SANITARY SEWER AND VENT RISER DIAGRAM
<b>PROCESS &amp; INSTRUMENTATION</b>	
100DI601	P&ID LEGEND, ABBREVIATIONS AND GENERAL NOTES SHEET 1
100DI602	P&ID LEGEND, ABBREVIATIONS AND GENERAL NOTES SHEET 2
100DI603	P&ID LEGEND, ABBREVIATIONS AND GENERAL NOTES SHEET 3
100DI604	INFLUENT PUMP STATION P&ID
100DI605	GRIT REMOVAL P&ID
100DI606	FINE SCREENING P&ID

100DI607	ANAEROBIC ZONES P&ID
100DI608	ANOXIC ZONES P&ID
100DI609	AEROBIC ZONES P&ID
100DI610	AERATION BLOWERS P&ID
100DI611	RAS PUMPING P&ID
100DI612	MBR TANK P&ID
100DI613	FILTRATE TANK P&ID
100DI614	MBR BLOWERS P&ID
100DI615	CITRIC ACID FEED SYSTEM P&ID
100DI616	SODIUM HYPOCHLORITE FEED SYSTEM P&ID
100DI617	ALUM FEED SYSTEM P&ID
100DI618	WAS AND SCUM PUMPING P&ID
100DI619	DIGESTERS 1 & 2 P&ID
100DI620	DIGESTERS 3 & 4 P&ID
100DI621	DIGESTER BLOWERS P&ID
100DI622	DEWATERING FEED PUMPS P&ID
100DI623	SOLIDS DEWATERING P&ID
100DI624	WASTEWATER HOLDING BASIN 1 P&ID
100DI625	WASTEWATER HOLDING BASIN 2 P&ID
100DI626	MIXING COMPRESSED AIR P&ID
<b>PROCESS</b>	
100D001	PROCESS LEGEND, ABBREVIATIONS, AND GENERAL NOTES
100D501	PROCESS STANDARD DETAILS SHEET 1
100D502	PROCESS STANDARD DETAILS SHEET 2
100D503	PROCESS STANDARD DETAILS SHEET 3
100D601	LIQUIDS PROCESS FLOW DIAGRAM
100D602	SOLIDS PROCESS FLOW DIAGRAM
100D603	HYDRAULIC PROFILE
200D101	INFLUENT PUMP STATION PLAN
200D301	INFLUENT PUMP STATION SECTION
210DD101	INFLUENT SCREENING BUILDING ELECTRICAL ROOM DEMOLITION PLAN
210D101	INFLUENT SCREENING BUILDING LARGE BUBBLE MIXING PLAN
210D301	INFLUENT SCREENING BUILDING LARGE BUBBLE MIXING SECTIONS
240D101	GRIT REMOVAL & FINE SCREENING BUILDING GRIT REMOVAL PLAN
240D102	GRIT REMOVAL & FINE SCREENING BUILDING FINE SCREEN PLAN
240D301	GRIT REMOVAL & FINE SCREENING BUILDING FINE SCREEN AND GRIT REMOVAL SECTIONS
240D302	GRIT REMOVAL & FINE SCREENING BUILDING FINE SCREEN AND GRIT REMOVAL SECTIONS

300D101	PROCESS BASIN PLAN
300D301	PROCESS BASIN SECTIONS SHEET 1
300D302	PROCESS BASIN SECTIONS SHEET 2
300D401	PROCESS BASIN ENLARGED PLAN SHEET 1
300D402	PROCESS BASIN ENLARGED PLAN SHEET 2
310D101	PROCESS BASIN SPLITTER PLAN AND SECTIONS
320D101	PROCESS BASIN BLOWER PAD PLAN AND SECTION
330D101	SCUM PUMP STATION PLAN AND SECTION
340D101	CHEMICAL BUILDING PLAN
340D101	CHEMICAL BUILDING SECTIONS
350D101	RAS SPLITTER PLAN AND SECTION
400D101	MBR TANK PLAN
400D301	MBR TANK SECTIONS
420D101	MBR BUILDING PLAN
420D301	MBR BUILDING SECTIONS SHEET 1
420D302	MBR BUILDING SECTIONS SHEET 2
420D401	MBR BUILDING ENLARGED PLAN
460D101	MBR BLOWER PAD PLAN AND SECTIONS
500DD101	DIGESTERS DEMOLITION PLAN AND SECTION
500D101	DIGESTERS PLAN
500D301	ENLARGED DIGESTER SECTIONS
500D401	ENLARGED DIGESTER PLAN
500D402	SLUDGE CONTROL VALVE VAULT PLAN AND SECTION
520D101	DIGESTER BLOWER PAD PLAN AND SECTION
540D101	DEWATERING BUILDING PLAN
540D301	DEWATERING BUILDING SECTIONS
600DD101	WASTEWATER HOLDING BASIN 1 DEMOLITION PLAN
600D101	WASTEWATER HOLDING BASIN 1 PLAN
600D301	WASTEWATER HOLDING BASIN 1 SECTION
620DD101	WASTEWATER HOLDING BASIN 2 DEMOLITION PLAN
620D101	WASTEWATER HOLDING BASIN 2 PLAN
620D301	WASTEWATER HOLDING BASIN 2 SECTION
640DD101	PEAK FLOW CLARIFIER SPLITTER DEMOLITION PLAN AND SECTION
640D101	PEAK FLOW CLARIFIER SPLITTER PLAN AND SECTION
<b>ELECTRICAL</b>	
100E001	ELECTRICAL LEGEND
100ED011	LP-E3 AND LP-E4 DEMOLITION ONE-LINE DIAGRAM
100ED012	PP-E1 AND PP-E2 DEMOLITION ONE-LINE DIAGRAM
100ED013	MCC-1 DEMOLITION ONE-LINE DIAGRAM
100ED014	MCC-E DEMOLITION ONE-LINE DIAGRAM

100ED015	TPS-TPP-020 DEMOLITION ONE-LINE DIAGRAM
100E010	OVERALL ONE-LINE DIAGRAM
100E011	12.47KV SWITCHGEAR ONE-LINE DIAGRAM SHEET 1 OF 2
100E012	12.47KV SWITCHGEAR ONE-LINE DIAGRAM SHEET 2 OF 2
100E013	INFLUENT SCREENING 480V POWER PANEL ONE-LINE DIAGRAM
100E014	GRIT 480V POWER PANEL ONE-LINE DIAGRAM
100E015	CHEMICAL 480V POWER PANEL ONE-LINE DIAGRAM
100E016	MBR 480V SWBD ONE-LINE DIAGRAM
100E017	MBR BASIN 1 480V MCC ONE-LINE DIAGRAM
100E018	MBR BASIN 2 480V MCC ONE-LINE DIAGRAM
100E019	MBR BASIN 3 480V MCC ONE-LINE DIAGRAM
100E020	MBR BASIN 4 480V MCC ONE-LINE DIAGRAM
100E021	DEWATERING 480V SWBD ONE-LINE DIAGRAM SHEET 1 OF 2
100E022	DEWATERING 480V MCC ONE-LINE DIAGRAM SHEET 2 OF 2
100E023	ADMIN 480V POWER PANEL ONE-LINE DIAGRAM
100E024	MV SWITCHGEAR ELEVATION VIEW
100E031	OVERALL NETWORK DIAGRAM
100E032	INFLUENT PUMP SCREENING AND GRIT/FINE SCREEN BUILDING NETWORK DIAGRAM
100E033	ELECTRICAL AND CHEMICAL BUILDING NETWORK DIAGRAM
100E034	MEMBRANE BIOREACTOR BUILDING NETWORK DIAGRAM
100E035	DEWATERING BUILDING NETWORK DIAGRAM
100E036	ADMINISTRATION BUILDING NETWORK DIAGRAM
100E051	LUMINAIRE SCHEDULE
100E061	CONTROL DIAGRAMS SHEET 1
100E062	CONTROL DIAGRAMS SHEET 2
100E063	CONTROL DIAGRAMS SHEET 3
100E080	INFLUENT SCREENING RISER DIAGRAM
100E081	GRIT, FINE SCREEN AND ANOXIC VALVE MODULE RISER DIAGRAM
100E082	GRIT BUILDING HVAC RISER DIAGRAM
100E083	PROCESS BASIN, SCUM PUMP STATION AND MBR BLOWER RISER DIAGRAM
100E084	CHEMICAL RISER DIAGRAM
100E085	MVSWGR AND GENERATOR RISER DIAGRAM
100E086	MBR TANK RISER DIAGRAM
100E087	MBR TANK DATA RISER DIAGRAM
100E088	MBR HVAC RISER DIAGRAM
100E089	MBR BUILDING RISER DIAGRAM
100E090	MBR ELECTRICAL ROOM RISER DIAGRAM
100E091	DEWATERING, PEAK FLOW CLARIFIER AND TRANSFER PUMP STATION RISER DIAGRAM
100E092	DEWATERING AND DIGESTER RISER DIAGRAM

100E093	DWB HVAC RISER DIAGRAM
100E094	WASTEWATER HOLDING BASIN RISER DIAGRAM
100E095	ADMINISTRATION BUILDING RISER DIAGRAM
100E101	MBR ELECTRICAL OVERALL SITE PLAN
100E102	ELECTRICAL SITE PLAN AREA 1
100E103	ELECTRICAL SITE PLAN AREA 2
100E104	ELECTRICAL SITE PLAN AREA 3
100E105	ELECTRICAL SITE PLAN AREA 4
100E106	ELECTRICAL SITE PLAN AREA 5
100E107	ELECTRICAL SITE PLAN AREA 6
100E108	ELECTRICAL SITE PLAN AREA 7
100E109	ELECTRICAL SITE PLAN AREA 8
100E301	ELECTRICAL DUCT BANK SECTIONS SHEET 1
100E302	ELECTRICAL DUCT BANK SECTIONS SHEET 2
100E303	ELECTRICAL DUCT BANK SECTIONS SHEET 3
100E304	ELECTRICAL DUCT BANK SECTIONS SHEET 4
100E305	ELECTRICAL DUCT BANK SECTIONS SHEET 5
100E306	ELECTRICAL DUCT BANK SECTIONS SHEET 6
100E307	ELECTRICAL DUCT BANK SECTIONS SHEET 7
100E501	GROUNDING DETAILS
100E502	UNDERGROUND DUCT AND RACEWAY DETAILS
100E503	RACEWAY PENETRATION AND TERMINATION DETAILS
100E504	RACEWAY SUPPORT AND MISC. INSTALLATION DETAILS
100E505	MISC. INSTALLATION DETAILS
100E506	HEAT TRACE INSTALLATION DETAILS
100E507	SECURITY DETAILS
020ED101	INFLUENT SCREENING CONVEYOR AND DEWATERING DEMOLITION PLAN
030E101	PEAKFLOW CLARIFIER ELECTRICAL PLAN
040ED501	TRANSFER PUMP STATION DEMOLITION PLAN
200E101	INFLUENT PUMP STATION ABOVE GRADE ELECTRICAL PLAN
200E102	INFLUENT PUMP STATION BELOW GRADE ELECTRICAL PLAN
210E101	INFLUENT SCREENING BUILDING POWER AND GROUNDING PLAN
210E102	INFLUENT SCREENING BUILDING SMALL POWER AND LIGHTING PLAN
210E103	INFLUENT SCREENING BUILDING INSTRUMENTATION AND CONTROLS PLAN
210E104	INFLUENT SCREENING BUILDING CABLE TRAY PLAN
210E105	INFLUENT SCREENING BUILDING ROOF PLAN
210E601	INFLUENT SCREENING BUILDING PANELBOARD SCHEDULE
240E101	GRIT REMOVAL AND FINE SCREENING BUILDING LOWER LEVEL POWER AND GROUNDING PLAN



240E102	GRIT REMOVAL AND FINE SCREENING BUILDING LOWER LEVEL SMALL POWER AND LIGHTING PLAN
240E103	GRIT REMOVAL AND FINE SCREENING BUILDING LOWER LEVEL INSTRUMENTATION AND CONTROLS PLAN
240E104	GRIT REMOVAL AND FINE SCREENING BUILDING UPPER LEVEL POWER AND GROUNDING PLAN
240E105	GRIT REMOVAL AND FINE SCREENING BUILDING UPPER LEVEL SMALL POWER AND LIGHTING PLAN
240E106	GRIT REMOVAL AND FINE SCREENING BUILDING UPPER LEVEL INSTRUMENTATION AND CONTROLS PLAN
240E107	GRIT REMOVAL AND FINE SCREENING BUILDING ROOF PLAN
240E601	GRIT REMOVAL AND FINE SCREENING BUILDING PANELBOARD SCHEDULE
300E101	PROCESS BASIN POWER AND INSTRUMENTATION PLAN
300E102	PROCESS BASIN LIGHTING PLAN
300E103	PROCESS BASIN CABLE TRAY PLAN
310E101	PROCESS BASIN SPLITTER ELECTRICAL PLAN
320E101	PROCESS BASIN BLOWER PAD ELECTRICAL PLAN AND SECTION
330E101	SCUM PUMP STATION ELECTRICAL PLAN AND SECTION
330E102	SCUM PUMP ELEVATION
340E101	CHEMICAL BUILDING POWER AND GROUNDING PLAN
340E102	CHEMICAL BUILDING SMALL POWER AND LIGHTING PLAN
340E103	CHEMICAL BUILDING INSTRUMENTATION AND CONTROLS PLAN
340E104	CHEMICAL BUILDING ROOF PLAN
340E601	CHEMICAL BUILDING PANELBOARD SCHEDULE
350E101	RAS SPLITTER ELECTRICAL & CONTROLS PLAN
360E101	ELECTRICAL BUILDING ELECTRICAL PLAN
360E601	ELECTRICAL BUILDING PANELBOARD SCHEDULE
370E101	GENERATORS ELECTRICAL PLAN
400E101	MBR TANKS ELECTRICAL AND INSTRUMENTATION BASE PLAN
400E102	MBR TANKS ELECTRICAL TOP PLAN
400E103	MBR TANKS CABLE TRAY PLAN
420E101	MBR BUILDING POWER AND GROUNDING PLAN
420E102	MBR BUILDING SMALL POWER AND LIGHTING PLAN
420E103	MBR BUILDING INSTRUMENTATION AND CONTROLS PLAN
420E104	MBR BUILDING CABLE TRAY PLAN
420E105	MBR BUILDING ROOF PLAN
420E601	MBR BUILDING PANELBOARD SCHEDULE
460E101	MBR BLOWER PAD PLAN AND SECTION
500E101	DIGESTER ELECTRICAL PLAN
500E102	SLUDGE CONTROL VALVE VAULT ELECTRICAL PLAN AND SECTION

520E101	DIGESTER BLOWER PAD ELECTRICAL PLAN
540E101	DEWATERING BUILDING POWER AND GROUNDING PLAN
540E102	DEWATERING BUILDING SMALL POWER AND LIGHTING PLAN
540E103	DEWATERING BUILDING INSTRUMENTATION AND CONTROLS PLAN
540E104	DEWATERING BUILDING CABLE TRAY PLAN
540E105	DEWATERING BUILDING ROOF PLAN
540E601	DEWATERING BUILDING PANELBOARD SCHEDULE
600E101	WASTEWATER HOLDING BASIN 1 ELECTRICAL PLAN
620E101	WASTEWATER HOLDING BASIN 2 ELECTRICAL PLAN
700E101	ADMINISTRATION BUILDING POWER AND GROUNDING PLAN
700E102	ADMINISTRATION BUILDING SMALL POWER
700E103	ADMINISTRATION BUILDING INSTRUMENTATION AND CONTROLS PLAN
700E104	ADMINISTRATION BUILDING LIGHTING PLAN
700E105	ADMINISTRATION BUILDING ROOF PLAN
700E601	ADMINISTRATION BUILDING PANELBOARD SCHEDULE
DRAWING No.	DRAWING NAME

**EXHIBIT L – CWSRF AND ARPA SPECIFICATION INSERTS**

## **Clean Water State Revolving Fund Specifications Requirements**

**State Revolving Fund:** This project is being financed through the Missouri State Revolving Fund, by the Water and Wastewater Loan Revolving Fund and federal Capitalization Grants to Missouri.

**Equal Employment Opportunity and Nondiscrimination in Employment – 41 CFR 60-4; E.O. 11246:** 41 CFR 60-4 published April 7, 1978 and amended October 3, 1980, requires that the SRF funding applicant and selected bidders comply with Executive Order 11246 for bids, contracts, and subcontracts for all federally assisted construction contracts exceeding \$10,000. The specifications explain the requirements for bidders and contractors under E.O. 11246.

- Bidders please see document titled “Standard Federal Equal Employment Opportunity Construction Contract Specifications (Executive Order 11246)”

**Disadvantaged Business Enterprises (DBE) (includes Minority-owned Business Enterprises/Women-owned Business Enterprises, MBE/WBE) – 40 CFR Part 33, 10 CSR 20-4.040(17), E.O. 11625 and 12138:** The applicant is an Equal Opportunity Employer and invites the submission of bids from Disadvantaged Business Enterprises.

- Bidders please see document titled “Missouri State Revolving Fund Procedures for Implementation Minority Business Enterprise/Women’s Business Enterprise”
- The selected bidders must complete the “Missouri State Revolving Fund Disadvantaged Business Enterprise (Minority and Women’s Business Enterprise) Utilization Worksheet”

**Employment of Unauthorized Aliens Prohibited – §285.530 RSMo:** Pursuant to §285.530.1, RSMo, the contractor assures that it, as well as its subcontractors, does not knowingly employ, hire for employment, or continue to employ an unauthorized alien to perform work within the State of Missouri, and shall affirm, by sworn affidavit and provision of documentation, its enrollment and participation in a federal work authorization program with respect to the employees working in connection with the contracted services. Further, the contractor assures that it, as well as its subcontractor shall sign an affidavit affirming that it does not knowingly employ any person who is an unauthorized alien in connection with the contracted services.

In accordance with §285.525 to 285.550, RSMo a general contractor or subcontractor of any tier shall not be liable when such contractor or subcontractor contracts with its direct subcontractor who violates subsection 1 of §285.530, RSMo if the contract binding the contractor and subcontractor affirmatively states that the direct subcontractor is not knowingly in violation of subsection 1 of §285.530, RSMo and shall not henceforth be in such violation and the contractor or subcontractor receives a sworn affidavit under the penalty of perjury attesting to the fact that the direct subcontractor’s employees are lawfully present in the United States.

- The selected contractor(s) must complete the “Business Entity Certification, Enrollment Documentation, and Affidavit of Work Authorization” form.
- In addition, the selected contractor(s) must enroll in the federal E-verify system, provide supporting documentation of enrollment, and provide verification documentation for enrollment in the Federal E-Verify system.

### **Davis-Bacon Act:**

- Bidders please see “Davis Bacon Act Requirements”
- Bidders please see “Davis-Bacon Act Requirements Funding Recipient Requirements”

**Contract Work Hours and Safety Standards Act – 40 U.S.C. 327-330:** The contractor(s) and subcontractor(s) shall comply with Sections 103 and 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 327–330) as supplemented by Department of Labor regulations (29 CFR part 5).

### **U.S. Environmental Protection Agency Certification of Non-segregated Facilities:**

- The selected bidders must complete this form.

**OSHA Training – §292.675, RSMo:** Any person signing a contract to work on the construction of public works for any public body shall provide a ten-hour Occupational Safety and Health Administration (OSHA) construction

## Clean Water State Revolving Fund Specifications Requirements

safety program for their on-site employees which includes a course in construction safety and health approved by OSHA or a similar program approved by the Missouri Department of Labor and Industrial Relations which is at least as stringent as an approved OSHA program. All employees are required to complete the program within sixty days of beginning work on such construction project.

**Debarment and Suspension – 10 CSR 20-4.040(17); E.O. 12549:** The Code of Federal Regulations at Title 2, Part 180, prohibits participation in USEPA funded contracts by persons excluded or disqualified from doing business with the federal government. Bidders are responsible for advising the Owner if they are excluded or disqualified, and to check whether subcontractors they intend to use are excluded or disqualified. All tiers of subcontractors have the same responsibility to notify the one for which they are providing services if they are excluded or disqualified, and to check the status of any subcontractors they intend to use. Status can be checked on the System for Award Management (SAM) located on the Internet at <https://www.sam.gov/SAM/>. All subcontracts at any tier should include this language.

- The selected bidders must complete the “Certification Regarding Debarment and Suspension” form.

**Small Business Act – P.L. 100-590:** Prior to awarding contracts, the SRF funding applicant and any contractor awarding subcontracts must take the following affirmative steps in accordance with Section 129 of Public Law 100-590, Small Business Administration Reauthorization and Amendment Act of 1988:

- a. Placing Small Business in Rural Areas (SBRA) on solicitation lists;
- b. Ensuring that SBRA are solicited whenever they are potential sources;
- c. Dividing total requirements, when economically feasible, into small tasks or quantities to permit maximum participation by SBRA;
- d. Establishing delivery schedules, where the requirements of work will permit which would encourage participation by SBRA; and
- e. Utilizing the services of the Small Business Administration and the Minority Business Development Agency of the U.S. Department of Commerce, as appropriate.

**Award of Contract – 10 CSR 20-4.040(18):** The applicant will award the contract to the lowest responsive, responsible bidder. The contract must be for a firm fixed-price.

The contract award will be awarded only to responsible contractors possessing the ability to perform successfully, which will be determined by considering such matters as contractor integrity, compliance with public policy, record of past performance, and financial and technical resources.

**Central Contractor Registration:** In accordance with the Federal Funding Accountability Act of 2006, the contractor assures that it, as well as its subcontractor(s), shall register in the the System for Award Management (SAM).

SAM is the Official U.S. Government system that consolidated the capabilities of Central Contractor Registration (CCR)/FedReg, Online Representations and Certifications Application (ORCA), and Excluded Parties List System (EPLS). There is NO fee to register for this site. If you had an active record in CCR, you have an active record in SAM. You do not need to do anything in SAM at this time, unless a change in your business circumstances requires updates to your Entity record(s) in order for you to be paid or receive an award, or you need to renew your Entity(s) prior to its expiration. To update or renew your Entity records(s) in SAM, you will need to create a SAM User Account located on the Internet at <https://www.sam.gov> and link it to your migrated Entity records. You will need a user account to search for registered entities in SAM.

If the prime contractor is not currently registered in SAM, they are required to do so, as their status will be checked in SAM using the Unique Entity Identifier (UEI) provided by SAM.

**Privity of Contract:** The Missouri Department of Natural Resources, its divisions, nor its employees are or will be a party to the contract(s) at any tier.

**Protests:** Neither the U.S. Environmental Protection Agency (USEPA) nor the Missouri Department of Natural Resources will be involved in protest(s) and their resolution.

## Clean Water State Revolving Fund Specifications Requirements

**Domestic Products Procurement Law – 10 CSR 20-4.040(17); §§34.350 - 34.359 RSMo:** All manufactured goods or commodities used or supplied in the performance of any contract or subcontract awarded on this project shall be manufactured, assembled or produced in the United States, unless obtaining American-made products would increase the cost of the contract by more than ten percent (10%). In accordance with §34.350 through 34.359 RSMo, a waiver may be requested from the owner.

- The selected bidders must complete the “Domestic Products Procurement Act – §§34.350 - 34.359 RSMo Certification” form.

**Anti-Lobbying Act – P.L. 101-121:** Sub-recipients who request or receive from the grant recipient a sub-grant, contract, or sub-contract exceeding \$100,000, at any tier under a federal grant shall comply with the Anti-Lobbying Act, Section 319 of Public Law 101-121, and file an Anti-Lobbying Certification form, and the Disclosure of Lobbying Activities form, if required, to the next tier above.

- Selected bidders must complete one of the following forms:
  - If the selected bidder lobbied on the behalf of this project, the contractor will complete the “Disclosure of Lobbying Activities” form.
  - If the selected bidder did not lobby on the behalf of this project, the contractor will complete the “Certification Regarding Lobbying” form.

**Record Retention:** The contractor(s) and sub-contractor(s) shall retain all project related records for three years after final payment(s) and all other pending matters are closed.

**Access to Construction Site and Contract Records – 10 CSR 20-4.040(17); Clean Water Act sec. 308 (B)i:** The contractor shall provide access to the project site and project records by, the Missouri State Auditor, the Missouri Department of Natural Resources, the Missouri Clean Water Commission, the Environmental Improvement and Energy Resources Authority, the USEPA, the Comptroller General of the United States, or any of their duly authorized representatives to any books, documents, papers, and records of the contractor which are directly pertinent to that specific contract for the purpose of making audit, examination, excerpts, and transcriptions.

**Payment Provisions – 10 CSR 20-4.040(20):** The owner shall make payment to the contractor in accordance with §8.960, RSMo. Retainage can be no more than 5%.

**False Claims Act:** The contractor(s) and sub-contractor(s), if required by future OMB guidance, shall promptly refer to the State of Missouri or other appropriate Inspector General any credible evidence that a principal, employee, agent, contractor, sub-grantee, subcontractor or other person has submitted a false claim under the False Claims Act or has committed a criminal or civil violation of laws pertaining to fraud, conflict of interest, bribery, gratuity or similar misconduct involving those funds.

**Clean Air Act - 42 U.S.C. 7506(C):** The contractor(s) and sub-contractor(s) shall comply with the Clean Air Act.

**Clean Water Act - 33 U.S.C. 1368:** The contractor(s) and sub-contractor(s) shall comply with the Clean Water Act.

**Energy Efficiency Requirements – Energy Policy and Conservation Act (P.L.94-163, 89 Stat. 871):** The contractor(s) and sub-contractor(s) shall comply with the mandatory standards and policies relating to energy efficiency which are contained in the State energy conservation plan issued in compliance with the Energy Policy and Conservation Act (P.L. 94-163, 89 Stat. 871).

**Recycled Materials – U.S.C. 6962 (RCRA Section 6002):** In accordance with Section 6002 of the Resource Conservation and Recovery Act (RCRA), preference shall be given to the procurement of specific products containing recycled materials identified in guidelines developed by the USEPA. Current guidelines are contained in 40 CFR Part 247-254.

**Historical and Archaeological – P.L. 93-291:** If during the course of construction evidence of deposits of historical or archaeological interest is found, the contractor shall cease operations affecting the find and shall notify the owner who shall notify the Missouri Department of Natural Resources and the Director, Division of State Parks, P.O. Box 176, Jefferson City, Missouri 65102-0176, Telephone (573) 751-2479. The contractor shall halt any further disturbances of the deposits until notified by the owner that they may proceed. The owner will issue a notice to

## Clean Water State Revolving Fund Specifications Requirements

proceed only after the state official has surveyed the find and made a determination to the Missouri Department of Natural Resources and the owner. Compensation to the contractor, if any, for lost time or changes in construction to avoid the find, shall be determined in accordance with changed conditions or change order provisions of the specifications.

**Missouri Products – Chap. 71.140 RSMo:** Preference shall be given to Missouri products in accordance with Chapter 71.140, Revised Statutes of Missouri.

- This applies to loan only funded projects. Please contact the solicitor to determine if applicable to this project.

Not Applicable

**Missouri Firms – §34.076 RSMo:** Pursuant to §34.076, Revised Statutes of Missouri, preference shall be given to those persons doing business as Missouri firms, corporations, or individuals, or which maintain Missouri offices or places of business, when the quality of performance promised is equal or better and the price quoted is the same or less. In addition, in order for a non-domiciliary Missouri bidder to be successful, his bid must be that same percentage lower than a domiciliary Missouri bidder's bid, as would be required for a Missouri bidder to successfully bid in the non-domiciliary's state.

- This applies to loan only funded projects. Please contact the solicitor to determine if applicable to this project.

**Prohibition on certain telecommunications and video surveillance services or equipment Certification – 2 CFR 200.216:** In accordance with 2 CFR 200.216, recipients and sub-recipients are prohibited from obligating or expending loan or grant funds to procure or obtain, extend or renew a contract to procure or obtain, or enter into a contract (or extend or renew a contract) to procure or obtain equipment, services, or systems that uses covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system. As described in Public Law 115-232, section 889, covered telecommunications equipment is telecommunications equipment produced by Huawei Technologies Company or ZTE Corporation (or any subsidiary or affiliate of such entities).

For the purpose of public safety, security of government facilities, physical security surveillance of critical infrastructure, and other national security purposes, video surveillance and telecommunications equipment produced by Hytera Communications Corporation, Hangzhou Hikvision Digital Technology Company, or Dahua Technology Company (or any subsidiary or affiliate of such entities).

**Anti-Discrimination Against Israel Act – §34.600, RSMo:** In compliance with §34.600 RSMo, the contracting company certifies that it is not currently engaged in and shall not, for the duration of the contract, engage in a boycott of goods or services from the State of Israel; companies doing business in or with Israel or authorized by, licensed by, or organized under the laws of the State of Israel; or persons or entities doing business in the State of Israel, in accordance with §34.600, RSMo. Any contract that fails to comply with the provisions of this section shall be void against public policy.

- This provision does not apply to contracts with a total potential value of less than one hundred thousand dollars or to contractors with fewer than ten employees.

**American Iron and Steel – Sec. 608(a) of the Federal Water Pollution Control Act:** In accordance with Sec. 608(a) of the Federal Water Pollution Control Act, the Participant assures that it, as well as its contractors and sub-contractors, will only use iron and steel products in the Project which are produced in the United States in a manner consistent with United States obligations under international agreements. 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.

The Participant understands that this requirement may only be waived by the applicable federal agency in limited situations as set out in §608(d) of the Federal Water Pollution Control Act.

The contractor shall submit all AIS certifications for any iron and steel requested for reimbursement. No applicable items will be reimbursed without the necessary AIS documentation.

## **Clean Water State Revolving Fund Specifications Requirements**

- Bidders please see AIS guidance titled “Implementation of American Iron and Steel provisions.”
- Bidders please see AIS waivers:
  - De-Minimis Waiver
  - National Product Waiver for Pig Iron and Direct Reduced Iron for State Revolving Fund Projects
  - National Product Waiver for Minor Components within Iron and Steel Products (with cost ceiling) for State Revolving Fund Projects
- Contractors bidding on this project must complete and include with their bid the “American Iron and Steel Certification” form.

### **Stormwater Permit – 10 CSR 20-6.200**

The Department requires the SRF funding applicant to verify their existing National Pollutant Discharge Elimination System (NPDES) permit(s) cover stormwater discharges or obtain the necessary permit(s). The following scenarios may be applicable:

1. The SRF funding applicant is a regulated Municipal Separate Storm Sewer System (MS4) per 10 CSR 20-6.200(1)(D)24 and their NPDES MS4 permit outlines compliance with construction stormwater requirements,
2. The design flow of the wastewater treatment plant is greater than or equal to 1 million gallon per day and the NPDES permit also regulates construction stormwater, or
3. Neither 1 or 2 above applies and the proposed project disturbs one (1) or more acres of total land area or less than one (1) acre as part of a common plan or sale resulting in the need for a land disturbance permit to discharge construction stormwater.

For further information, contact the Missouri Department of Natural Resources, Water Protection Program, Operating Permits Section, P.O. Box 176, Jefferson City, Missouri 65102. Telephone: (573) 522-4502.



**STANDARD FEDERAL EQUAL EMPLOYMENT OPPORTUNITY  
CONSTRUCTION CONTRACT SPECIFICATIONS  
(EXECUTIVE ORDER 11246)**

1. As used in these specifications:
  - a. "Covered area" means the geographical area described in the solicitation from which this contract resulted;
  - b. "Director" means Director, Office of Federal Contract Compliance Programs United States Department of Labor, or any person to whom the Director delegates authority;
  - c. "Employer identification number" means the Federal Social Security number used on the Employer's Quarterly Federal Tax Return, U.S. Treasury Department Form 941.
  - d. "Minority" includes:
    - (i) Black (all persons having origins in any of the Black African racial groups not of Hispanic origin);
    - (ii) Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American or other Spanish Culture or origin, regardless of race);
    - (iii) Asian and Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands); and
    - (iv) American Indian or Alaskan Native (all persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification).
2. Whenever the Contractor, or any Subcontractor at any tier, subcontracts a portion of the work involving any construction trade, it shall physically include in each subcontract in excess of \$10,000 the provisions of these specifications and the Notice which contains the applicable goals for minority and female participation and which is set forth in the solicitations from which this contract resulted.
3. If the contractor is participating (pursuant to 41 CFR 60-4.5) in a Hometown Plan approved by the U.S. Department of Labor in the covered area either individually or through an association, its affirmative action obligations on all work in the Plan area (including goals and timetables) shall be in accordance with that Plan for those trades which have unions participating in the Plan. Contractors must be able to demonstrate their participation in and compliance with the provisions of any such Hometown Plan. Each Contractor or Subcontractor participating in an approved Plan is individually required to comply with its obligations under the EEO clause, and to make a good faith effort to achieve each goal under the Plan in each trade in which it has employees. The overall good faith performance by other Contractors or Subcontractors toward a goal in an approved Plan does not excuse any covered Contractor's or Subcontractor's failure to take good faith efforts to achieve the Plan goals and timetables.
4. The Contractor shall implement the specific affirmative action standards provided in paragraphs 7 a through p of these specifications. The goals set forth in the solicitation from which this contract resulted are expressed as percentages of the total hours of employment and training of minority and female utilization the Contractor should reasonably be able to achieve in each construction trade in which it has employees in the covered area. Covered Construction Contractors performing construction work in geographical areas where they do not have a Federal or federally assisted construction contract shall apply the minority and female goals established for the geographical area where the work is being performed. Goals are published periodically in the FEDERAL REGISTER in notice form, and such notices may be obtained from any Office of Federal Contract Compliance Programs office or from Federal procurement contracting officers. The Contractor is expected to make substantially uniform progress in meeting its goals in each craft during the period specified.
5. Neither the provisions of any collective bargaining agreement, nor the failure by a union with whom the Contractor has a collective bargaining agreement, to refer either minorities or women shall excuse the Contractor's obligations under these specifications, Executive Order 11246, or the regulations promulgated pursuant thereto.
6. In order for the nonworking training hours of apprentices and trainees to be counted in meeting the goals, such apprentices and trainees must be employed by the Contractor during the training period, and the Contractor must have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees must be trained pursuant to training programs approved by the U.S. Department of Labor.
7. The Contractor shall take specific affirmative actions to ensure equal employment opportunity. The evaluation of the Contractor's compliance with these specifications shall be based upon its effort to achieve maximum results from its actions. The Contractor shall document these efforts fully, and shall implement affirmative action steps at least as extensive as the following:
  - a. Ensure and maintain a working environment free of harassment, intimidation, and coercion at all sites, and in all facilities at which the Contractor's employees are assigned to work. The Contractor, where possible, will assign

two or more women to each construction project. The Contractor shall specifically ensure that all foremen, superintendents, and other on-site supervisory personnel are aware of and carry out the Contractor's obligation to maintain such a working environment, with specific attention to minority or female individuals working at such sites or in such facilities.

b. Establish and maintain a current list of minority and female recruitment sources, provide written notification to minority and female recruitment sources and to community organizations when the Contractor or its unions have employment opportunities available, and maintain a record of the organizations' responses.

c. Maintain a current file of the names, addresses and telephone numbers of each minority and female off-the-street applicant and minority or female referral from a union, a recruitment source or community organization and of what action was taken with respect to each such individual. If such individual was sent to the union hiring hall for referral and was not referred back to the Contractor by the union or, if referred, not employed by the Contractor, this shall be documented in the file with the reason therefore, along with whatever additional actions the Contractor may have taken.

d. Provide immediate written notification to the Director when the union or unions with which the Contractor has a collective bargaining agreement has not referred to the Contractor a minority person or woman sent by the Contractor, or when the contractor has other information that the union referral process has impeded the Contractor's efforts to meet its obligations.

e. Develop on-the-job training opportunities and/or participate in training programs for the area which expressly include minorities and women, including upgrading programs and apprenticeship and training programs relevant to the Contractor's employment needs, especially those programs funded or approved by the Department of Labor. The Contractor shall provide notice of these programs to the sources compiled under 7b above.

f. Disseminate the Contractor's EEO policy by providing notice of the policy to unions and training programs and requesting their cooperation in assisting the Contractor in meeting its EEO obligations; by including it in any policy manual and collective bargaining agreement; by publicizing it in the company newspaper, annual report, etc.; by specific review of the policy with all management personnel and with all minority and female employees at least once a year; and by posting the company EEO policy on bulletin boards accessible to all employees at each location where construction work is performed.

g. Review, at least annually, the company's EEO policy and affirmative action obligations under these specifications with all employees having any responsibility for hiring, assignment, layoff, termination or other employment decisions including specific review of these items with onsite supervisory personnel such as Superintendents, General Foremen, etc., prior to the initiation of construction work at any job site. A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and disposition of the subject matter.

h. Disseminate the Contractor's EEO policy externally by including it in any advertising in the news media, specifically including minority and female news media, and providing written notification to and discussing the Contractor's EEO policy with other Contractors and Subcontractors with whom the Contractor does or anticipates doing business.

i. Direct its recruitment efforts, both oral and written, to minority, female and community organizations, to schools with minority and female students and to minority and female recruitment and training organizations serving the Contractor's recruitment area and employment needs. Not later than once month prior to the date for the acceptance of applications for apprenticeship or other training by any recruitment sources, the Contractor shall send written notification to organizations such as the above, describing the openings, screening procedures, and tests to be used in the selection process.

j. Encourage present minority and female employees to recruit other minority persons and women and, where reasonable, provide after school, summer and vacation employment to minority and female youth both on the site and in other areas of a Contractor's work force.

k. Validate all tests and other selection requirements where there is an obligation to do so under CFR Part 60-3.

l. Conduct, at least annually, an inventory and evaluation at least of all minority and female personnel for promotional opportunities and encourage these employees to seek or to prepare for, through appropriate training, etc., such opportunities.

m. Ensure that seniority practices, job classifications, work assignments and other personnel practices, do not have a discriminatory affect by continually monitoring all personnel and employment related activities to ensure that the EEO policy and the Contractor's obligations under these Specifications are being carried out.

n. Ensure that all facilities and company activities re nonsegregated except that separate or single-user toilet and necessary changing facilities shall be provided to assure privacy between the sexes.

o. Document and maintain a record of all solicitations of offers for subcontracts from minority and female

construction contractors and suppliers, including circulation of solicitations to minority and female contractor associations and other business associations.

p. Conduct a review, at least annually, of all supervisors' adherence to and performance under the Contractor's EEO policies and affirmative action obligations.

8. Contractors are encouraged to participate in voluntary associations which assist in fulfilling one or more of their affirmative action obligations (7a through p). The efforts of a contractor association, joint contractor-union, contractor-community, or other similar group of which the contractor is a member and participant, may be asserted as fulfilling any one or more of its obligations under 7a through p of these Specifications providing that the Contractor actively participates in the group, makes every effort to assure that the group has a positive impact on the employment of minorities and women in the industry, ensures that the concrete benefits of the program are reflected in the Contractor's minority and female workforce participation, makes a good faith effort to meet its individual goals and timetables, and can provide access to documentation which demonstrates the effectiveness of actions taken on behalf of the Contractor. The obligation to comply, however, is the Contractor's and failure of such a group to fulfill an obligation shall not be a defense for the Contractor's noncompliance.

9. A single goal for minorities and a separate single goal for women have been established. The Contractor, however, is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and non-minority. Consequently, the Contractor may be in violation of the Executive Order if a particular group is employed in a substantially disparate manner (for example, even though the Contractor has achieved its goals for women generally, the Contractor may be in violation of the Executive Order if a specific minority group of women is underutilized).

10. The Contractor shall not use the goals and timetables or affirmative action standards to discriminate against any person because of race, color, religion, sex, or national origin.

11. The Contractor shall not enter into any Subcontract with any person or firm debarred from Government contracts pursuant to Executive Order 11246.

12. The Contractor shall carry out such sanctions and penalties for violation of these Specifications and of the Equal Opportunity Clause, including suspension, termination and cancellation of existing subcontracts as may be imposed or ordered pursuant to Executive Order 11246, as amended, and its implementing regulations, by the Office of Federal Contract Compliance Programs. Any Contractor who fails to carry out such sanctions and penalties shall be in violation of these Specifications and Executive Order 11246, as amended.

13. The Contractor, in fulfilling its obligation under these Specifications, shall implement specific affirmative action steps, at least as extensive as those standards prescribed in paragraph 7 of these Specifications, so as to achieve maximum results from its efforts to ensure equal employment opportunity. If the Contractor fails to comply with the requirements of the Executive Order, the implementing regulations, or these Specifications, the Director shall proceed in accordance with 41-CFR 60-4.8.

14. The Contractor shall designate a responsible official to monitor all employment related activity to ensure that the company EEO policy is being carried out, to submit reports relating to the provisions hereof as may be required by the Government and to keep records. Records shall at least include for each employee the name, address, telephone numbers, construction trade, union affiliation if any, employee identification number when assigned, social security number, race, sex, status (e.g., mechanic, apprentice trainee, helper, or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and locations at which the work was performed. Records shall be maintained in an easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, Contractors shall not be required to maintain separate records.

15. Nothing herein provided shall be construed as a limitation upon the application of other laws which establish different standards of compliance or upon the application of requirements for the hiring of local or other area residents (e.g., those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program).

**NOTICE OF REQUIREMENT FOR AFFIRMATIVE ACTION  
TO ENSURE EQUAL EMPLOYMENT OPPORTUNITY  
(EXECUTIVE ORDER 11246)**

1. The Offeror's or Bidder's attention is called to the "Equal Opportunity Clause" and the "Standard Federal Equal Employment Specifications" set forth herein.
2. The goals and timetables for minority and female participation, expressed in percentage terms for the Contractor's aggregate workforce in each trade on all construction work in the covered area, are as follows:

Timetables	Goals for minority participation for each trade	Goals for female participation in each trade
All years	%	6.9%

These goals are applicable to all the Contractor's construction work (whether or not it is Federal or federally assisted) performed in the covered area. If the contractor performs construction work in a geographical area located outside of the covered area, it shall apply the goals established for such geographical area where the work is actually performed. With regard to this second area, the contractor also is subject to the goals for both its federally involved and nonfederally involved construction.

The Contractor's compliance with the Executive Order and the regulations in 41 CFR Part 60-4 shall be based on its implementation of the Equal Opportunity Clause, specific affirmative action obligations required by the specifications set forth in 41 CFR 60-4.3(a), and its efforts to meet the goals. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade, and the contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor or from project to project for the sole purpose of meeting the Contractor's goals shall be a violation of the contract, the Executive Order and the regulations in 41 CFR Part 60-4. Compliance with the goals will be measured against the total work hours performed.

3. The Contractor shall provide written notification to the Director of the Office of Federal Contract Compliance Programs within 10 working days of award of any construction subcontract in excess of \$10,000 at any tier for construction work under the contract resulting from this solicitation. The notification shall list the name, address and telephone number of the subcontractor; employer identification number of the subcontractor; estimated dollar amount of the subcontract; estimated starting and completion dates of the subcontract; and the geographical area in which the subcontract is to be performed.

4. As used in this Notice, and in the contract resulting from this solicitation, the "covered area" is (insert description of the geographical areas where the contract is to be performed giving the state, county and city, if any)

Current goals for minority and female participation for each trade can be found at the US Department of Labor, Office of Federal Contract Compliance Programs (OFCCP) compliance assistance guides  
<https://www.dol.gov/ofccp/CAGuides/>. Construction Technical Assistance Guide  
[https://www.dol.gov/ofccp/TAGuides/TAC\\_FedContractors\\_JRF\\_QA\\_508c.pdf](https://www.dol.gov/ofccp/TAGuides/TAC_FedContractors_JRF_QA_508c.pdf)

## MISSOURI STATE REVOLVING FUND

### Procedures for Implementation

#### Minority Business Enterprise/Women's Business Enterprise

Each bidder/offeror must fully comply with the requirements, terms, conditions of 40 CFR Part 33 and DNR's regulations to award a fair share of subagreements to minority and women's business enterprises. The bidder/offeror commits itself to taking affirmative steps and complying with the Six Good Faith Efforts contained herein. Bidders/offerors will take affirmative steps prior to submission of bids/proposals.

#### Affirmative Steps

1. When feasible, segmenting total work requirements to permit maximum minority business and women business enterprises (MBE/WBE) participation.
2. Assuring that MBEs and WBEs are solicited whenever they are potential sources of goods or services. This step may include:
  - a. Sending letters or making other personal contacts with MBEs and WBEs (e.g. those whose names appear on lists prepared by the Missouri Office of Administration, the Missouri Department of Transportation, or the funding recipients and other MBEs and WBEs known to the bidder/offeror.) MBEs and WBEs should be contacted when other potential subcontractors are contacted, within reasonable time (fifteen days) prior to bid submission or closing date for receipt of initial offers. Those letters or other contacts should communicate the following:
    - i. Specific description of the work to be subcontracted;
    - ii. How and where to obtain a copy of plans and specifications or other detailed information needed to prepare a detailed price quotation;
    - iii. Date the quotation is due to the bidder/offeror;
    - iv. Name, address, and phone number of the person in the bidder/offeror's firm whom the prospective MBE/WBE subcontractor should contact for additional information.
  - b. Sending letters or making other personal contacts with local, state, federal and private agencies and DBE associations relevant to the project. Such contacts should provide the same information provided in the direct contacts to DBE firms.
3. Where feasible, establishing delivery schedules which will encourage participation by MBEs and WBEs.

## Determination of Compliance

It is to be noted that bidders/offerors must demonstrate compliance with DBE requirements in order to be deemed responsible. Demonstration of compliance shall include, but is not limited to, the following information:

1. Names, addresses and phone numbers of MBEs/WBEs expected to perform work;
2. Work to be performed by the MBEs and WBEs;
3. Aggregate dollar amount of work to be performed by MBEs and WBEs, showing aggregate to MBEs and aggregate to WBEs separately;
4. Description of contacts to MBE and WBE organizations, agencies and associations which serve MBEs/WBEs, including names of organizations, agencies and associations and dates of contacts;
5. Description of contacts to MBEs and WBEs, including number of contacts, fields, (i.e. equipment or material supplier, excavators, transport services, electrical subcontractors, plumbers, etc.) and dates of contacts.

The Six Good Faith Efforts, and Minority and Women's Business Enterprise Utilization Worksheet shall be included in the specifications.

All bidders/offerors should complete the Minority and Women's Business Enterprise Utilization Worksheet and submit to the funding recipient prior to contract award.

Additional information on DBE requirements can be found at [https://www.epa.gov/osbp/dbe\\_team.htm](https://www.epa.gov/osbp/dbe_team.htm)

**Lists of Certified Disadvantaged Business Enterprises** – To help comply with the Six Good Faith Efforts, please visit the following web sites to access existing lists of certified DBEs:

Small Business Administration [https://dsbs.sba.gov/dsbs/search/dsp\\_dsbs.cfm](https://dsbs.sba.gov/dsbs/search/dsp_dsbs.cfm)

Missouri Department of Transportation <https://www.modot.mo.gov/ecr/index.htm>

Office of Equal Opportunity <https://oeo.mo.gov/>

The contractor shall not discriminate on the basis of race, color, nation origin or sex in the performance of this contract. The contractor shall carry out applicable requirements of 40 CFR Part 33 in the award and administration of contracts awarded under EPA financial assistance agreements. Failure by the contractor to carry out these requirements is a material breach of this contract which may result in the termination of this contract or other legally available remedies.

(Funding recipients may establish alternative methods of compliance equivalent to or more stringent than the above.)

### **“Six Good Faith Efforts”**

The Six Good Faith Efforts are required methods to be used by all Loan and Grant recipients to ensure that all disadvantaged business enterprises (DBEs) have the opportunity to compete for procurements funded by EPA financial assistance dollars.

The prime contractor must pay its subcontractor for satisfactory performance no more than 30 days from the prime contractor’s receipt of payment from the recipient.

A recipient must be notified in writing by its prime contractor prior to any termination of a DBE subcontractor for convenience by the prime contractor.

If a DBE subcontractor fails to complete work under its subcontract for any reason, the recipient must require the prime contractor to employ the six good faith efforts described below if soliciting a replacement subcontractor.

A recipient must require its prime contractor to employ the six good faith efforts even if the prime contractor has achieved its Fair Share Goals. The current Fair Share Goals are 10% for Minority Business Enterprises and 5% for Women Business Enterprises in accordance with 40 CFR, Part 33, Subpart D.

#### **The Six Good Faith Efforts are:**

1. Ensure DBEs are made aware of contracting opportunities to the fullest extent practicable through outreach and recruitment activities. For Indian Tribal, State and Local Government recipients, this will include placing DBEs on solicitation lists and soliciting them whenever they are potential sources.
2. Make information on forthcoming opportunities available to DBEs and arrange time frames for contracts and establish delivery schedules, where requirements permit, in a way that encourages and facilitates participation by DBEs in the competitive process. This includes, whenever possible, posting solicitations for bids or proposals for a minimum of 30 calendar days before bid or proposal closing date.
3. Consider in the contracting process whether firms competing for large contracts could subcontract with DBEs. For Indian Tribal, State and Local Government recipients, this will include dividing total requirements when economically feasible into smaller tasks or quantities to permit maximum participation by DBEs in the competitive process.
4. Encourage contracting with a consortium of DBEs when a contract is too large for one of these firms to handle individually.
5. Use the services and assistance of the SBA and the Minority Business development Agency of the Department of Commerce.
6. If the prime contractor awards subcontracts, require the prime contractor to take the above steps.



**MISSOURI STATE REVOLVING FUND  
DISADVANTAGED BUSINESS ENTERPRISE  
(MINORITY AND WOMEN'S BUSINESS ENTERPRISE)  
UTILIZATION WORKSHEET**

Funding Recipient \_\_\_\_\_

Project No.: \_\_\_\_\_

Contractor/Engineer: \_\_\_\_\_

Contract Name: \_\_\_\_\_

Contract Contact Person: \_\_\_\_\_

Contractor MBE/WBE: Yes  No

OA / MODOT / EPA Certification No.: \_\_\_\_\_

Address: \_\_\_\_\_

Telephone No.: \_\_\_\_\_ Email Address \_\_\_\_\_

Amount of Contract \_\_\_\_\_ Total Contract MBE% \_\_\_\_\_ WBE % \_\_\_\_\_

1. MBE \_\_\_\_\_ Subcontractor \_\_\_\_\_

WBE \_\_\_\_\_ Address \_\_\_\_\_

Contact Person \_\_\_\_\_ Telephone No. \_\_\_\_\_

Email Address: \_\_\_\_\_

OA MBE/WBE Certification Number \_\_\_\_\_

MODOT MBE/WBE Certification (Yes) \_\_\_\_\_ (No) \_\_\_\_\_

Amount of Subcontract \_\_\_\_\_

Scope of Work \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

2. MBE \_\_\_\_\_ Subcontractor \_\_\_\_\_

WBE \_\_\_\_\_ Address \_\_\_\_\_

Contact Person \_\_\_\_\_ Telephone No. \_\_\_\_\_

Email Address: \_\_\_\_\_

OA MBE/WBE Certification Number \_\_\_\_\_

MODOT MBE/WBE Certification (Yes) \_\_\_\_\_ (No) \_\_\_\_\_

Amount of Subcontract \_\_\_\_\_

Scope of Work \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

3. MBE \_\_\_\_\_ Subcontractor \_\_\_\_\_  
WBE \_\_\_\_\_ Address \_\_\_\_\_  
Contact Person \_\_\_\_\_ Telephone No. \_\_\_\_\_  
Email Address: \_\_\_\_\_  
OA MBE/WBE Certification Number \_\_\_\_\_  
MODOT MBE/WBE Certification (Yes) \_\_\_\_\_ (No) \_\_\_\_\_  
Amount of Subcontract \_\_\_\_\_  
Scope of Work \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

4. MBE \_\_\_\_\_ Subcontractor \_\_\_\_\_  
WBE \_\_\_\_\_ Address \_\_\_\_\_  
Contact Person \_\_\_\_\_ Telephone No. \_\_\_\_\_  
Email Address: \_\_\_\_\_  
OA MBE/WBE Certification Number \_\_\_\_\_  
MODOT MBE/WBE Certification (Yes) \_\_\_\_\_ (No) \_\_\_\_\_  
Amount of Subcontract \_\_\_\_\_  
Scope of Work \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

5. MBE \_\_\_\_\_ Subcontractor \_\_\_\_\_  
WBE \_\_\_\_\_ Address \_\_\_\_\_  
Contact Person \_\_\_\_\_ Telephone No. \_\_\_\_\_  
Email Address: \_\_\_\_\_  
OA MBE/WBE Certification Number \_\_\_\_\_  
MODOT MBE/WBE Certification (Yes) \_\_\_\_\_ (No) \_\_\_\_\_  
Amount of Subcontract \_\_\_\_\_  
Scope of Work \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

6. MBE \_\_\_\_\_ Subcontractor \_\_\_\_\_  
WBE \_\_\_\_\_ Address \_\_\_\_\_  
Contact Person \_\_\_\_\_ Telephone No. \_\_\_\_\_  
Email Address: \_\_\_\_\_  
OA MBE/WBE Certification Number \_\_\_\_\_  
MODOT MBE/WBE Certification (Yes) \_\_\_\_\_ (No) \_\_\_\_\_  
Amount of Subcontract \_\_\_\_\_  
Scope of Work \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Prepared By: \_\_\_\_\_

Telephone Number: \_\_\_\_\_

Date: \_\_\_\_\_

SEP 08 2005

**EXECUTIVE ORDER  
05-30**  
SECRETARY OF STATE  
COMMISSION DIVISION

WHEREAS, since 1990, the Office of Administration, State of Missouri has endeavored to "establish and implement a plan to increase and maintain the participation of certified socially and economically disadvantaged small business concerns or minority business enterprises, directly or indirectly, in contracts for supplies, services, and construction contracts, consistent with targets determined after an appropriate study conducted to determine the availability of socially and economically disadvantaged small business concerns and minority business enterprises in the marketplace;" pursuant to Senate Bills 808 & 672 passed by the General Assembly and signed into law by then Governor Ashcroft; and

WHEREAS, such a study was conducted and found statistically significant disparities in state contractual expenditures for construction and the purchase of goods and services, as compared to the ready, willing and able minority and women-owned business enterprises (M/WBEs) in the state; and

WHEREAS, Executive Order 98-21 established goals to increase the percentage of goods and services procured from certified M/WBEs; and

WHEREAS, the goals for M/WBE participation established in Executive Order 98-21 have not been substantially met; and statistically significant disparities in state contractual expenditures for construction and the purchase of goods and services from minority and women-owned businesses in the state still exist; and

WHEREAS, on September 27, 2004, Behavioral Interventions, Inc. filed a lawsuit in the U.S. District Court, in the Western District of Missouri challenging the propriety of Missouri's M/WBE program. In January 2005, a preliminary injunction was issued ordering the Office of Administration, State of Missouri to suspend the placing of M/WBE requirements in any procurement by the State of Missouri. Because of the uncertainty created in the aftermath of the litigation, the program has undergone comprehensive revision not only to withstand constitutional scrutiny, but also to more adequately address the compelling needs and obstacles of minority and women-owned businesses to gain greater access to business opportunities, both public and private, within the state of Missouri; and

WHEREAS, the State of Missouri is dedicated to the compelling governmental interest in remedying race and sex based discrimination in a manner consistent with state and federal law; and

WHEREAS, the State of Missouri is committed to enhancing the economic health and prosperity of the state by promoting the greater use of minority and women-owned businesses. Job creation for Missouri residents, and therefore the success of minority and women-owned businesses, are paramount goals of this Administration; and

WHEREAS, the State of Missouri will gain enormously from improvements in expanded business opportunities for Missouri residents created by the expansion of minority and women-owned businesses and through the additional tax revenues generated by those individuals and businesses; and

WHEREAS, to further these goals, which are of the highest priority of this Administration, it is the policy of this Administration to develop economic opportunities for minority and women-owned businesses wherever possible.

NOW, THEREFORE, I, Matt Blunt, Governor of the State of Missouri, under the authority vested in me under the constitution and the laws of this state, to fulfill the mandate of the General Assembly in Senate Bills 808 & 672 and to pursue the compelling interest of remedying discrimination, do hereby declare the following narrowly tailored policies and procedures shall be adopted by the Executive Branch of state government in procuring all types of goods and services:

1. The Office of Supplier and Workforce Diversity (OSWD) is established to replace the Office of Equal Opportunity. All the authority, powers and privileges of the Office of Equal Opportunity is transferred to the OSWD. The Director of OSWD shall be appointed by the Governor. The Director of OSWD shall report to the Commissioner of Administration. The Director shall have primary responsibility for assisting in the coordination and implementation of affirmative action throughout all departments of the executive branch of state government, including programs to increase M/WBE participation, and advising the Governor on issues regarding equal employment opportunity, affirmative action, and efforts to administer affirmative action goals and timetables for implementation throughout the departments of the executive branch.

The Office of State Compliance Officer is hereby abolished. The Director of OSWD shall be the State's chief compliance officer for the executive branch of state government to ensure that the State of Missouri is complying with all federal and state laws concerning equal employment opportunity and affirmative action. If needed, the Director shall assist each department in developing an Affirmative Action Plan of Implementation. Additionally, the Director of OSWD shall review progress reports of the departments and shall meet biannually with each department director to evaluate departmental results and determine the course of future affirmative action goals, timetables, recruiting, planning, and implementation. The results of each meeting shall be reported in writing to the Governor and Commissioner of Administration.

Not later than January first of each calendar year, the Director of OSWD shall provide a report to the Governor and the Commissioner of Administration which summarizes the activities of each department pursuant to this Order and which contains recommendations for additional programs to accomplish the purposes of this Order.

The Commissioner of Administration shall provide the Director of OSWD with such facilities, staff, resources, equipment, and supplies as are necessary to carry out the duties set forth herein. The Director of OSWD shall submit a proposal each fiscal year to the Commissioner of Administration detailing the needs of the Office of Supplier and Workforce Diversity.

2. All state agencies shall continue to make every feasible effort to target the percentage of goods and services procured from certified MBEs and WBEs to 10% and 5%, respectively. These efforts shall include participation in an Executive Branch Contract Compliance Council which shall, in cooperation with the OSWD, review procurement efforts to assist in meeting the requirements of this Executive Order.
3. The Divisions of Purchasing and Materials Management (PMM) and Facilities Management, Design and Construction (FMDC) within the Office of Administration shall be authorized to implement the following programs to increase M/WBE procurement:
  - a. PMM shall be authorized to encourage prime contractors to subcontract with M/WBEs on all contracts of \$100,000 or greater. OSWD contracts shall include a provision for participation which will allow the bidders to tailor a plan to fit the contract. Mandatory percentage goals of M/WBE participation shall not be established in violation of federal or state law. M/WBE participation shall be encouraged by PMM in consultation with OSWD and the user agency depending on the availability of M/WBE vendors in the applicable commodity/service and geographical area. PMM shall consider M/WBE participation as a significant factor in a contract bid. The M/WBE participation will be evaluated along with other criteria in the award of a bid. It is intended that 10% MBE and 5% WBE percentage is desired. The participation can be met through the use of prime contractors, subcontractors, suppliers, joint ventures, or other arrangements that afford meaningful opportunities for M/WBE participation.

OSWD in conjunction with PMM shall also appoint a M/WBE Purchasing Manager for the purpose of promoting and coordinating the participation of M/WBEs in State of Missouri contracts.

b. FMDC shall be authorized to evaluate M/WBE participation in design contracts, as part of the quality-based selection process, for construction projects worth \$1.5 million or more. On contracts with lesser value, FMDC shall make special efforts to target M/WBEs as prime contractors. Overall participation targets for each fiscal year shall be 10% MBE and 5% WBE; however, mandatory percentage goals shall not be established in violation of federal or state law. The targets may be met through the use of prime contractors, subcontractors, joint ventures, or other arrangements that afford meaningful opportunities for M/WBE participation.

FMDC shall also be authorized to seek participation of M/WBEs on construction contracts. The targets shall be set on a project by project basis by FMDC in consultation with the OSWD, taking into account the availability of M/WBE contractors in the applicable geographic area and construction trade, with the overall participation targets for each fiscal year at 10% MBE and 5% WBE. The targets may be met through the use of prime contractors, subcontractors, suppliers, joint ventures, or other arrangements that afford meaningful opportunities for M/WBE participation.

c. Both FMDC and the PMM shall establish policies or rules to implement these programs which shall include a waiver provision for prime contractors who make a good faith effort to attain such targets but do not succeed. They shall also establish enforcement procedures in cooperation with the OSWD to assist contractors to meet subcontracting commitments. Their programs shall be reviewed annually to determine whether targets should be modified.

d. FMDC and PMM are authorized and directed to identify and consult with such entities as the St. Louis Minority Business Council, the Kansas City Minority Supplier Council and the Kansas City Council of Women Business Owners in identifying M/WBEs to participate in state procurements.

4. OSWD shall monitor the programs and work with FMDC and PMM in their implementation. The OSWD shall have the following responsibilities and carry out the following tasks:

a. to actively recruit, facilitate and serve as a clearinghouse for M/WBE contractors to participate in the programs;

b. to cooperate with the PMM and the FMDC in the administration and enforcement of the M/WBE participation programs;

c. to cooperate with the PMM and the FMDC in the development of policies, forms, and procedures to carry out the requirements of the M/WBE participation programs;

d. to participate in M/WBE target setting;

e. to perform fact-gathering and record-keeping to determine both the effectiveness of state participation programs and the availability and utilization of eligible M/WBEs on individual projects, including levels of participation and availability in specific areas;

f. to certify contractors as M/WBEs;

g. to assess the continuing need for M/WBE participation targets for specific contracting areas;

h. to monitor contractor participation with M/WBE targets; and

- i. to recommend sanctions for contractors who fail to faithfully execute M/WBE participation plans during the course of contract performance.
5. The programs shall be reviewed annually to monitor the level of M/WBE participation achieved in state contracting areas during the previous year. An assessment of the programs and whether their continuation is necessary shall be delivered to the Governor and the General Assembly. After it is determined that M/WBEs participate in state contracts in a manner commensurate with their presence and capability in the state marketplace, the programs set forth in section 2 will be terminated.
6. Executive Order No. 98-21 (1998) and article II of Executive Order 94-03 (1994) are hereby superseded and replaced by this Executive Order.



IN WITNESS WHEREOF, I have hereunto set my hand and caused to be affixed the Great Seal of the State of Missouri, in the City of Jefferson, on this 8th day of September, 2005.

A handwritten signature in black ink, appearing to read 'Matt Blunt', written over a horizontal line.

**Matt Blunt**  
Governor

**ATTEST:**

A handwritten signature in black ink, appearing to read 'Robin Carnahan', written over a horizontal line.

**Robin Carnahan**  
Secretary of State

WHEREAS, the State of Missouri is committed to enhancing the economic health and prosperity of Minority and Women Business Enterprises (M/WBEs) through the use of M/WBE contract benchmarks established in state contracts for supplies, services, and construction that are consistent with §§37.020 – 37.023, RSMo, and the findings of the most current disparity study; and

WHEREAS, upon funding being appropriated by the General Assembly in 2013, the Office of Administration (OA) commissioned a Disparity Study which was completed on October 24, 2014, that studied the utilization of M/WBEs in state contracts and the availability of M/WBEs in the applicable marketplace; and

WHEREAS, Executive Order 14-07 established the Disparity Study Oversight Review Committee to review the findings of the 2014 Disparity Study and to produce meaningful recommendations to assist the State of Missouri in developing a contracting process that is inclusive, promotes diversity, and provides greater opportunity for M/WBEs; and

WHEREAS, after conducting a thorough review and analysis of the findings of the 2014 Disparity Study, the Disparity Study Oversight Review Committee submitted its report to the Governor on January 27, 2015; and

WHEREAS, the Disparity Study Oversight Review Committee's report sets forth recommendations to help eliminate the lingering effects of discrimination to ensure a level playing-field for all Missouri business owners; and

WHEREAS, on September 14, 2015, the Ferguson Commission, created pursuant to Executive Order 14-15, released its final report which called for Missouri to implement a statewide M/WBE program "with outcomes measures that incorporate capacity building, mentoring, and education with respect to the state and local procurement system;" and

WHEREAS, the State of Missouri is dedicated to the compelling governmental interest of remedying race and sex based discrimination in a manner consistent with state and federal law.

NOW, THEREFORE, I, JEREMIAH W. (JAY) NIXON, GOVERNOR OF THE STATE OF MISSOURI, in recognition of the obligations of the State of Missouri and by virtue of the authority vested in me by the Constitution and the Laws of the State of Missouri, do hereby state that the following narrowly tailored policies and procedures shall be adopted by the Executive Branch of state government in procuring goods and services:

1. All state agencies shall make every feasible effort to increase the percentage of goods and services procured from certified M/WBEs in order to achieve the annual goals of 10% MBEs and 10% WBEs of all annual Executive Branch procurement funds. These efforts shall include participation in an Executive Branch Contract Compliance Council which shall, in cooperation with the Office of Administration, Office of Equal Opportunity (OEO), review procurement efforts to assist in meeting the requirements of this Executive Order.
2. Both the Division of Purchasing and Facilities Management, Design and Construction (FMDC) within the Office of Administration shall be authorized to implement the following program to increase M/WBE procurements:
  - a. Division of Purchasing and FMDC shall encourage prime contractors to subcontract with M/WBEs on state contracts. Division of Purchasing and FMDC contracts are permitted to include a provision setting forth participation of M/WBEs as prime contractors or subcontractors who perform a commercially useful function. M/WBE participation requirements shall be determined by the Division of Purchasing and FMDC, in consultation with OEO and the user agency, by evaluating the availability of M/WBE vendors in the applicable commodity/service and geographical area as determined by the most recent disparity study and other applicable factors. Division of Purchasing and FMDC shall use individual contract percentages to help meet the



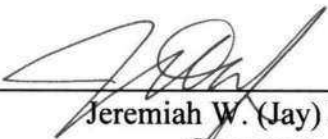
state's annual program goals. The M/WBE participation will be evaluated for responsiveness along with other criteria in the award of a bid. The participation can be met through the use of prime contractors, subcontractors, suppliers, joint ventures, or other arrangements that afford meaningful opportunities for M/WBE participation.

- b. Division of Purchasing and FMDC shall revise their policies and regulations to further implement this program which shall include a waiver provision for prime contractors who make a good faith effort to take all necessary and reasonable steps to attain such percentages but are otherwise unable to achieve them. Division of Purchasing and FMDC shall also establish enforcement procedures, in cooperation with OEO and the Contract Oversight Office within the Office of Administration, which shall include consequences for failure to meet percentage commitments unless a good faith waiver is obtained from the Division of Purchasing or FMDC, respectively.
  - c. Division of Purchasing and FMDC are authorized and directed to identify and consult with such other certifying entities as recommended by OEO in order to facilitate M/WBEs to participate in state procurements.
3. The Office of Administration shall also be authorized to:
- a. Conduct a comprehensive review of OEO and determine the need for increased funding and personnel to enable OEO to carry out the work it has been assigned.
  - b. Evaluate the state's current M/WBE eligibility standards and determine what revisions, if any, should be considered to applicable statutes and regulations. This includes an evaluation of whether M/WBE eligibility should be capped based upon a firm's gross income and/or personal net worth. The Office of Administration should refer to the Disparity Study and the Committee's report as a reference regarding potential revisions to the program's eligibility standards.
  - c. Research existing bonding and financing programs for small vendors that enhance access to bonding and working capital in order to reduce barriers to business development and success, and determine the feasibility of developing such a program within OEO.
  - d. Evaluate the existing experience and surety bonding requirements and determine what adjustments, if any, should be considered to facilitate increased M/WBE participation.
  - e. Evaluate the possibility of lengthening solicitation periods for vendors, whenever possible, in an effort to increase M/WBE participation.
  - f. Research the feasibility and consider establishing a Mentor-Protégé Program within OEO, whereby a larger firm provides instruction and training to an emerging firm to increase the protégé's skills, capacities, and business areas.
  - g. Educate and advise state agencies on implementing internal procedures that ensure compliance with §8.690 RSMo.
  - h. Implement an electronic contracting system that provides access to state contracting information and collects measureable data to document the achievement of M/WBE goals.
4. OEO shall work with the Division of Purchasing and FMDC in the implementation of this Executive Order, and shall have the following responsibilities:
- a. Actively recruit, certify, and serve as a clearinghouse for M/WBEs to participate in the program.
  - b. Partner with agencies and organizations that conduct similar services that can provide technical assistance and supportive services.

- c. Cooperate with the Division of Purchasing, FMDC, and the Contract Oversight Office in the administration and enforcement of the M/WBE participation program and contract requirements.
  - d. Cooperate with the Division of Purchasing and FMDC in the development of policies, forms, and procedures to carry out the requirements of the M/WBE participation program.
  - e. Provide guidance to the Division of Purchasing and FMDC in the setting of M/WBE individual contract percentages.
  - f. Review and record the effectiveness of the state agencies' participation in the program in light of the availability and utilization of eligible M/WBEs on individual contracts, and make recommendations to the agencies for improvement and enforcement of the program.
  - g. Provide outreach to M/WBEs to educate firms about the program, the state's procurement process, and business elements such as obtaining bonding, lines of credit, or other related services. Outreach efforts shall also serve to foster enhanced working relationships between M/WBEs and prime contractors.
  - h. Recommend sanctions for contractors who fail to faithfully execute M/WBE participation requirements during the course of contract performance.
5. OEO shall review the program annually to monitor the level of M/WBE participation achieved in state contracting areas during the previous fiscal year. An assessment of the program and whether the continuation is necessary shall be prepared by OEO and delivered to the Governor and the General Assembly by March after the completion of the fiscal year. After it is determined by OEO that M/WBEs participate in state contracts at a level commensurate with their presence and capability in the state marketplace, then the program set forth in this Executive Order shall be terminated. If the program is still deemed to be necessary on March 1, 2019, a new Disparity Study should be conducted and a new Disparity Study Oversight Review Committee should be appointed to review the results of that study.
6. This Order shall take effect immediately and supersedes Executive Order 05-30.



IN WITNESS WHEREOF, I have hereunto set my hand and cause to be affixed the Great Seal of the State of Missouri, in the City of Jefferson, on this 21st day of October, 2015.

  
 \_\_\_\_\_  
 Jeremiah W. (Jay) Nixon  
 Governor

ATTEST:

  
 \_\_\_\_\_  
 Jason Kander  
 Secretary of State



## Certification Regarding Debarment and Suspension

Applicant Name: \_\_\_\_\_

Project Name: \_\_\_\_\_

Project No.: \_\_\_\_\_ SAM.gov UEI No.: \_\_\_\_\_

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

- a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any governmental (federal, state, or local) entity;
- b) Have not within a three-year period preceding this certification been convicted of or had a civil judgment rendered against them for:
  - 1) Commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (federal, state, or local) transaction or contract under a public transaction;
  - 2) Violation of federal or state antitrust statutes relating to the submission of offers; or
  - 3) Commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;
- c) Are not presently indicted for, or otherwise criminally or civilly charged by a governmental entity (federal, state, or local) with, commission of any of the offenses enumerated in paragraph (1)(b) of this certification; and
- d) Have not, within a three-year period preceding this certification, had one or more public transactions (federal, state, or local) terminated for cause or default.

I understand that a false statement on this certification may be grounds for rejection of this proposal or termination of the award.

I am able to certify to the above statements.

I am unable to certify to the above statements and attached my explanation.

\_\_\_\_\_  
Typed Name of Authorized Representative

\_\_\_\_\_  
Title of Authorized Representative

\_\_\_\_\_  
Signature of Authorized Representative

\_\_\_\_\_  
Date



MISSOURI DEPARTMENT OF NATURAL RESOURCES  
DIVISION OF ENVIRONMENTAL QUALITY  
FINANCIAL ASSISTANCE CENTER

## **Certification Regarding Debarment and Suspension Instructions**

The Missouri Department of Natural Resources receives assistance from the federal government, and the funds provided to a community constitute a sub-agreement. Accordingly, each prospective recipient of a grant, loan, or cooperative agreement and any contractor or subcontractor must agree to fully comply with Executive Order 12549, 2 C.F.R. Part 180, and 2 C.F.R. Part 1532 regarding Debarment and Suspension.

“Principals,” for the purposes of this certification, means officers; directors; owners; partners; and persons having primary management or supervisory responsibilities within an entity (e.g., general manager; plant manager; head of a subsidiary, division, or business segment, and similar positions).

The prospective grant, loan, or cooperative agreement recipient should return the signed certification, and explanation if needed, with its application to:

Missouri Department of Natural Resources  
Financial Assistance Center  
PO Box 176  
Jefferson City, MO 65102-0176

Or email to [fac@dnr.mo.gov](mailto:fac@dnr.mo.gov).

The recipient of funding should also obtain a certification from their consulting engineer and prime contractor. The funding recipient shall also check the status on the System for Award Management (SAM) located on the Internet at <https://www.sam.gov/portal/public/SAM/>.

Each prospective subcontractor should submit a completed certification or explanation to the prime contractor for the project.

U.S. ENVIRONMENTAL PROTECTION AGENCY  
WATER QUALITY OFFICE

CERTIFICATION OF NONSEGREGATED FACILITIES

(Applicable to federally assisted construction contracts and related sub-contracts exceeding \$10,000 which are not exempt from the Equal Opportunity clause.)

The federally assisted construction contractor certifies that he does not maintain or provide for his employees any segregated facilities at any of his establishments, and that he does not permit his employees to perform their services at any location, under his control, where segregated facilities are maintained. The federally assisted construction contractor certifies further that he will not maintain or provide for his employees any segregated facilities at any of his establishments, and that he will not permit his employees to perform their services at any location, under his control, where segregated facilities are maintained. The federally assisted construction contractor agrees that a breach of this certification is a violation of the Equal Opportunity clause in this contract. As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, rest rooms and wash rooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directive or are in fact segregated on the basis of race, creed, color, or national origin, because of habit, local custom, or otherwise. The federally assisted construction contractor agrees that (except where he has obtained identical certifications from proposed subcontractors for specific time periods) he will obtain identical certifications from proposed subcontractors prior to the award of subcontracts exceeding \$10,000 which are not exempt from the provisions of the Equal Opportunity clause, and that he will retain such certifications in his files.

Signature \_\_\_\_\_ Date \_\_\_\_\_

Name and Title of Signer \_\_\_\_\_  
(Print or Type)

Firm Name \_\_\_\_\_

NOTE: The penalty for making false statements in offers is prescribed in 18 U.S.C. 1001.

EXHIBIT  
BUSINESS ENTITY CERTIFICATION, ENROLLMENT DOCUMENTATION,  
AND AFFIDAVIT OF WORK AUTHORIZATION

**BUSINESS ENTITY CERTIFICATION:**

The bidder/contractor must certify their current business status by completing either Box A or Box B or Box C on this Exhibit.

- BOX A:** To be completed by a non-business entity as defined below.
- BOX B:** To be completed by a business entity who has not yet completed and submitted documentation pertaining to the federal work authorization program as described at [http://www.dhs.gov/files/programs/gc\\_1185221678150.shtm](http://www.dhs.gov/files/programs/gc_1185221678150.shtm).
- BOX C:** To be completed by a business entity who has current work authorization documentation on file with a Missouri state agency including Division of Purchasing and Materials Management.

**Business entity**, as defined in section 285.525, RSMo, pertaining to section 285.530, RSMo, is any person or group of persons performing or engaging in any activity, enterprise, profession, or occupation for gain, benefit, advantage, or livelihood. The term “**business entity**” shall include but not be limited to self-employed individuals, partnerships, corporations, contractors, and subcontractors. The term “**business entity**” shall include any business entity that possesses a business permit, license, or tax certificate issued by the state, any business entity that is exempt by law from obtaining such a business permit, and any business entity that is operating unlawfully without such a business permit. The term “**business entity**” shall not include a self-employed individual with no employees or entities utilizing the services of direct sellers as defined in subdivision (17) of subsection 12 of section 288.034, RSMo.

Note: Regarding governmental entities, business entity includes Missouri schools, Missouri universities (other than stated in Box C), out of state agencies, out of state schools, out of state universities, and political subdivisions. A business entity does not include Missouri state agencies and federal government entities.

**BOX A – CURRENTLY NOT A BUSINESS ENTITY**

I certify that \_\_\_\_\_ (Company/Individual Name) **DOES NOT CURRENTLY MEET** the definition of a business entity, as defined in section 285.525, RSMo pertaining to section 285.530, RSMo as stated above, because: (check the applicable business status that applies below)

- I am a self-employed individual with no employees; **OR**
- The company that I represent employs the services of direct sellers as defined in subdivision (17) of subsection 12 of section 288.034, RSMo.

I certify that I am not an alien unlawfully present in the United States and if \_\_\_\_\_ (Company/Individual Name) is awarded a contract for the services requested herein under \_\_\_\_\_ (Bid/SFS/Contract Number) and if the business status changes during the life of the contract to become a business entity as defined in section 285.525, RSMo, pertaining to section 285.530, RSMo, then, prior to the performance of any services as a business entity, \_\_\_\_\_ (Company/Individual Name) agrees to complete Box B, comply with the requirements stated in Box B and provide the \_\_\_\_\_ (insert agency name) with all documentation required in Box B of this exhibit.

\_\_\_\_\_  
Authorized Representative’s Name (Please Print)

\_\_\_\_\_  
Authorized Representative’s Signature

\_\_\_\_\_  
Company Name (if applicable)

\_\_\_\_\_  
Date

**EXHIBIT , continued**

***(Complete the following if you DO NOT have the E-Verify documentation and a current Affidavit of Work Authorization already on file with the State of Missouri. If completing Box B, do not complete Box C.)***

**BOX B – CURRENT BUSINESS ENTITY STATUS**

I certify that \_\_\_\_\_ (Business Entity Name) **MEETS** the definition of a business entity as defined in section 285.525, RSMo, pertaining to section 285.530.

\_\_\_\_\_  
Authorized Business Entity Representative's  
Name (Please Print)

\_\_\_\_\_  
Authorized Business Entity  
Representative's Signature

\_\_\_\_\_  
Business Entity Name

\_\_\_\_\_  
Date

\_\_\_\_\_  
E-Mail Address

As a business entity, the bidder/contractor must perform/provide each of the following. The bidder/contractor should check each to verify completion/submission of all of the following:

- Enroll and participate in the E-Verify federal work authorization program (Website: <http://www.uscis.gov/e-verify>; Phone: 888-464-4218; Email: [e-verify@dhs.gov](mailto:e-verify@dhs.gov)) with respect to the employees hired after enrollment in the program who are proposed to work in connection with the services required herein; AND
- Provide documentation affirming said company's/individual's enrollment and participation in the E-Verify federal work authorization program. Documentation shall include EITHER the E-Verify Employment Eligibility Verification page listing the bidder's/contractor's name and company ID OR a page from the E-Verify Memorandum of Understanding (MOU) listing the bidder's/contractor's name and the MOU signature page completed and signed, at minimum, by the bidder/contractor and the Department of Homeland Security – Verification Division. If the signature page of the MOU lists the bidder's/contractor's name and company ID, then no additional pages of the MOU must be submitted; AND
- Submit a completed, notarized Affidavit of Work Authorization provided on the next page of this Exhibit.

**AFFIDAVIT OF WORK AUTHORIZATION:**

The bidder/contractor who meets the section 285.525, RSMo, definition of a business entity must complete and return the following Affidavit of Work Authorization.

Comes now \_\_\_\_\_ (Name of Business Entity Authorized Representative) as \_\_\_\_\_ (Position/Title) first being duly sworn on my oath, affirm \_\_\_\_\_ (Business Entity Name) is enrolled and will continue to participate in the E-Verify federal work authorization program with respect to employees hired after enrollment in the program who are proposed to work in connection with the services related to contract(s) with the State of Missouri for the duration of the contract(s), if awarded in accordance with subsection 2 of section 285.530, RSMo. I also affirm that \_\_\_\_\_ (Business Entity Name) does not and will not knowingly employ a person who is an unauthorized alien in connection with the contracted services provided under the contract(s) for the duration of the contract(s), if awarded.

*In Affirmation thereof, the facts stated above are true and correct. (The undersigned understands that false statements made in this filing are subject to the penalties provided under section 575.040, RSMo.)*

_____	_____
Authorized Representative's Signature	Printed Name
_____	_____
Title	Date
_____	_____
E-Mail Address	E-Verify Company ID Number

Subscribed and sworn to before me this \_\_\_\_\_ of \_\_\_\_\_. I am  
(DAY) (MONTH, YEAR)  
commissioned as a notary public within the County of \_\_\_\_\_, State of  
(NAME OF COUNTY)  
\_\_\_\_\_, and my commission expires on \_\_\_\_\_.  
(NAME OF STATE) (DATE)

_____	_____
Signature of Notary	Date



***(Complete the following if you have the E-Verify documentation and a current Affidavit of Work Authorization already on file with the State of Missouri. If completing Box C, do not complete Box B.)***

**BOX C – AFFIDAVIT ON FILE - CURRENT BUSINESS ENTITY STATUS**

I certify that \_\_\_\_\_ (Business Entity Name) **MEETS** the definition of a business entity as defined in section 285.525, RSMo, pertaining to section 285.530, RSMo, and have enrolled and currently participates in the E-Verify federal work authorization program with respect to the employees hired after enrollment in the program who are proposed to work in connection with the services related to contract(s) with the State of Missouri. We have previously provided documentation to a Missouri state agency or public university that affirms enrollment and participation in the E-Verify federal work authorization program. The documentation that was previously provided included the following.

- ✓ The E-Verify Employment Eligibility Verification page OR a page from the E-Verify Memorandum of Understanding (MOU) listing the bidder’s/contractor’s name and the MOU signature page completed and signed by the bidder/contractor and the Department of Homeland Security – Verification Division
- ✓ A current, notarized Affidavit of Work Authorization (must be completed, signed, and notarized within the past twelve months).

Name of **Missouri State Agency** or **Public University\*** to Which Previous E-Verify Documentation Submitted: \_\_\_\_\_

(\*Public University includes the following five schools under chapter 34, RSMo: Harris-Stowe State University – St. Louis; Missouri Southern State University – Joplin; Missouri Western State University – St. Joseph; Northwest Missouri State University – Maryville; Southeast Missouri State University – Cape Girardeau.)

**Date** of Previous E-Verify Documentation Submission: \_\_\_\_\_

Previous **Bid/Contract Number** for Which Previous E-Verify Documentation Submitted: \_\_\_\_\_

(if known) \_\_\_\_\_

\_\_\_\_\_  
Authorized Business Entity Representative’s Name (Please Print)

\_\_\_\_\_  
Authorized Business Entity Representative’s Signature

\_\_\_\_\_  
E-Verify MOU Company ID Number

\_\_\_\_\_  
E-Mail Address

\_\_\_\_\_  
Business Entity Name

\_\_\_\_\_  
Date

**FOR STATE USE ONLY**

Documentation Verification Completed By:

\_\_\_\_\_  
Buyer

\_\_\_\_\_  
Date

**Domestic Products Procurement Act – RSMo 34.350 – 34.359 Certification**

Each contract for the purchase or lease of manufactured goods or commodities by any public agency, and each contract made by a public agency for construction, alteration, repair, or maintenance of any public works shall contain a provision that any manufactured goods or commodities used or supplied in the performance of that contract or any subcontract thereto shall be manufactured or produced in the United States. (34.353.1 RSMo)

Project Name: \_\_\_\_\_

Project Number: \_\_\_\_\_

Contract Name: \_\_\_\_\_

Please check one of the following and sign where indicated.

All of the iron, steel, and manufactured goods used in the project are produced in the United States.

A waiver is being requested from the \_\_\_\_\_ to the domestic  
(owner)  
products provision due to the following exception:

The specified products are not manufactured or produced in the United States in sufficient quantities or manufactured or produced in the United States within the necessary time frames in sufficient quantities.

The cost for the specified products would increase the contract by more than 10 percent\*;  
or

Only one line of a product is manufactured or produced in the United States.

Documentation of at least one of the cases above must be provided. List below the materials that cannot comply with the Domestic Product Procurement Act provisions.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Additional sheets (attach if necessary)

\_\_\_\_\_  
Name of Contracting Firm

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Name and Title of Signer (Please type)

**\*In accordance with the Federal Water Pollution Control Act, Section 608, all iron and steel products used in a State Revolving Fund project should be produced in the United States. This requirement does not apply where the inclusion of iron and steel products produced in the United States will increase the cost of the overall project by more than 25 percent.**



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EPA Project Control Number

## CERTIFICATION REGARDING LOBBYING

### CERTIFICATION FOR CONTRACTS, GRANTS, LOANS AND COOPERATIVE AGREEMENTS

The undersigned certifies, to the best of his or her knowledge and belief, that:

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

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

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

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

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Typed Name & Title of Authorized Representative

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Signature and Date of Authorized Representative

The public reporting and recordkeeping burden for this collection of information is estimated to average 15 minutes per response. Send comments on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including through the use of automated collection techniques to the Director, Collection Strategies Division, U.S. Environmental Protection Agency (2822T), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460. Include the OMB control number in any correspondence. Do not send the completed form to this address.

### Disclosure of Lobbying Activities

Complete this form to disclose lobbying activities pursuant to 31 U.S.C. 1352  
(See reverse for public burden disclosure)

<p><b>1. Type of Federal Action:</b>  a. contract  _____ b. grant  c. cooperative agreement  d. loan  e. loan guarantee  f. loan insurance</p>	<p><b>2. Status of Federal Action:</b>  a. bid/offer/application  _____ b. initial award  c. post-award</p>	<p><b>3. Report Type:</b>  a. initial filing  _____ b. material change</p> <p><b>For material change only:</b>  Year _____ quarter _____  Date of last report _____</p>
<p><b>4. Name and Address of Reporting Entity:</b>  _____ Prime _____ Subawardee  _____ Tier _____, if Known:</p> <p><b>Congressional District, if known:</b></p>	<p><b>5. If Reporting Entity in No. 4 is Subawardee,</b>  Enter Name and Address of Prime:</p> <p><b>Congressional District, if known:</b></p>	
<p><b>6. Federal Department/Agency:</b></p>	<p><b>7. Federal Program Name/Description:</b></p> <p>CFDA Number, if applicable: _____</p>	
<p><b>8. Federal Action Number, if known:</b></p>	<p><b>9. Award Amount, if known:</b>  \$ _____</p>	
<p><b>10. a. Name and Address of Lobbying Registrant</b>  <i>(if individual, last name, first name, MI):</i></p>	<p><b>b. Individuals Performing Services</b> <i>(including address if different from No. 10a)</i>  <i>(last name, first name, MI):</i></p>	
<p><b>11. Information requested through this form is authorized by title 31 U.S.C. section 1352. This disclosure of lobbying activities is a material representation of fact upon which reliance was placed by the tier above when this transaction was made or entered into. This disclosure is required pursuant to 31 U.S.C. 1352. This information will be reported to the Congress semi-annually and will be available for public inspection. Any person who fails to file the required disclosure shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.</b></p>	<p><b>Signature:</b> _____</p> <p><b>Print Name:</b> _____</p> <p><b>Title:</b> _____</p> <p><b>Telephone No.:</b> _____ <b>Date:</b> _____</p>	
<p><b>Federal Use Only</b></p>	<p><b>Authorized for Local Reproduction</b>  Standard Form - LLL (Rev. 7-97)</p>	

## INSTRUCTIONS FOR COMPLETION OF SF-LLL, DISCLOSURE OF LOBBYING ACTIVITIES

This disclosure form shall be completed by the reporting entity, whether subawardee or prime Federal recipient, at the initiation or receipt of a covered Federal action, or a material change to a previous filing, pursuant to title 31 U.S.C. section 1352. The filing of a form is required for each payment or agreement to make payment to any lobbying entity for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with a covered Federal action. Complete all items that apply for both the initial filing and material change report. Refer to the implementing guidance published by the Office of Management and Budget for additional information.

1. Identify the type of covered Federal action for which lobbying activity is and/or has been secured to influence the outcome of a covered Federal action.
2. Identify the status of the covered Federal action.
3. Identify the appropriate classification of this report. If this is a followup report caused by a material change to the information previously reported, enter the year and quarter in which the change occurred. Enter the date of the last previously submitted report by this reporting entity for this covered Federal action.
4. Enter the full name, address, city, State and zip code of the reporting entity. Include Congressional District, if known. Check the appropriate classification of the reporting entity that designates if it is, or expects to be, a prime or subaward recipient. Identify the tier of the subawardee, e.g., the first subawardee of the prime is the 1st tier. Subawards include but are not limited to subcontracts, subgrants and contract awards under grants.
5. If the organization filing the report in item 4 checks "Subawardee," then enter the full name, address, city, State and zip code of the prime Federal recipient. Include Congressional District, if known.
6. Enter the name of the federal agency making the award or loan commitment. Include at least one organizational level below agency name, if known. For example, Department of Transportation, United States Coast Guard.
7. Enter the Federal program name or description for the covered Federal action (item 1). If known, enter the full Catalog of Federal Domestic Assistance (CFDA) number for grants, cooperative agreements, loans, and loan commitments.
8. Enter the most appropriate Federal identifying number available for the Federal action identified in item 1 (e.g., Request for Proposal (RFP) number; Invitations for Bid (IFB) number; grant announcement number; the contract, grant, or loan award number; the application/proposal control number assigned by the Federal agency). Included prefixes, e.g., "RFP-DE-90-001."
9. For a covered Federal action where there has been an award or loan commitment by the Federal agency, enter the Federal amount of the award/loan commitment for the prime entity identified in item 4 or 5.
10. (a) Enter the full name, address, city, State and zip code of the lobbying registrant under the Lobbying Disclosure Act of 1995 engaged by the reporting entity identified in item 4 to influence the covered Federal action.  
  
(b) Enter the full names of the individual(s) performing services, and include full address if different from 10(a). Enter Last Name, First Name, and Middle Initial (MI).
11. The certifying official shall sign and date the form, print his/her name, title, and telephone number.

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According to the Paperwork Reduction Act, as amended, no persons are required to respond to a collection of information unless it displays a valid OMB control Number. The valid OMB control number for this information collection is OMB No. 0348-0046. Public reporting burden for this collection of information is estimated to average 10 minutes per response, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the Office of Management and Budget, Paperwork Reduction Project (0348-0046), Washington, DC 20503



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
WASHINGTON, D.C. 20460

MAR 20 2014

OFFICE OF WATER

MEMORANDUM

SUBJECT: Implementation of American Iron and Steel provisions of P.L. 113-76,  
Consolidated Appropriations Act, 2014

FROM: f ( Andrew D. Sawyers, Director C.  
v) Office of Wastewater Management (4201M)

Peter C. Grevatt, Director   
Office of Ground Water and Drinking Water (4601M)

TO: Water Management Division Directors  
Regions I- X

P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an "American Iron and Steel (AIS)" requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works if the project is funded through an assistance agreement executed beginning January 17, 2014 (enactment of the Act), through the end of Federal Fiscal Year 2014.

Section 436 also sets forth certain circumstances under which EPA may waive the AIS requirement. Furthermore, the Act specifically exempts projects where engineering plans and specifications were approved by a State agency prior to January 17, 2014.

The approach described below explains how EPA will implement the AIS requirement. The first section is in the form of questions and answers that address the types of projects that must comply with the AIS requirement, the types of products covered by the AIS requirement, and compliance. The second section is a step-by-step process for requesting waivers and the circumstances under which waivers may be granted.

## Implementation

The Act states:

Sec. 436. (a)(1) None of the funds made available by a State water pollution control revolving fund as authorized by title VI of the Federal Water Pollution Control Act (33 U.S.C. 1381 et seq.) or made available by a drinking water treatment revolving loan fund as authorized by section 1452 of the Safe Drinking Water Act (42 U.S.C. 300j-12) shall be used for a project for the construction, alteration, maintenance, or repair of a public water system or treatment works unless all of the iron and steel products used in the project are produced in the United States.

(2) 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.

(b) Subsection (a) shall not apply in any case or category of cases in which the Administrator of the Environmental Protection Agency (in this section referred to as the “Administrator”) finds that—

(1) applying subsection (a) 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.

(c) If the Administrator receives a request for a waiver under this section, the Administrator shall make available to the public on an informal basis a copy of the request and information available to the Administrator concerning the request, and shall allow for informal public input on the request for at least 15 days prior to making a finding based on the request. The Administrator shall make the request and accompanying information available by electronic means, including on the official public Internet Web site of the Environmental Protection Agency.

(d) This section shall be applied in a manner consistent with United States obligations under international agreements.

(e) The Administrator may retain up to 0.25 percent of the funds appropriated in this Act for the Clean and Drinking Water State Revolving Funds for carrying out

the provisions described in subsection (a)(1) for management and oversight of the requirements of this section.

(f) This section does not apply with respect to a project if a State agency approves the engineering plans and specifications for the project, in that agency's capacity to approve such plans and specifications prior to a project requesting bids, prior to the date of the enactment of this Act.

The following questions and answers provide guidance for implementing and complying with the AIS requirements:

### **Project Coverage**

#### **1) What classes of projects are covered by the AIS requirement?**

All treatment works projects funded by a CWSRF assistance agreement, and all public water system projects funded by a DWSRF assistance agreement, from the date of enactment through the end of Federal Fiscal Year 2014, are covered. The AIS requirements apply to the entirety of the project, no matter when construction begins or ends. Additionally, the AIS requirements apply to all parts of the project, no matter the source of funding.

#### **2) Does the AIS requirement apply to nonpoint source projects or national estuary projects?**

No. Congress did not include an AIS requirement for nonpoint source and national estuary projects unless the project can also be classified as a 'treatment works' as defined by section 212 of the Clean Water Act.

#### **3) Are any projects for the construction, alteration, maintenance, or repair of a public water system or treatment works excluded from the AIS requirement?**

Any project, whether a treatment works project or a public water system project, for which engineering plans and specifications were approved by the responsible state agency prior to January 17, 2014, is excluded from the AIS requirements.

#### **4) What if the project does not have approved engineering plans and specifications but has signed an assistance agreement with a CWSRF or DWSRF program prior to January 17, 2014?**

The AIS requirements do not apply to any project for which an assistance agreement was signed prior to January 17, 2014.



**5) What if the project does not have approved engineering plans and specifications, but bids were advertised prior to January 17, 2014 and an assistance agreement was signed after January 17, 2014?**

If the project does not require approved engineering plans and specifications, the bid advertisement date will count in lieu of the approval date for purposes of the exemption in section 436(f).

**6) What if the assistance agreement that was signed prior to January 17, 2014, only funded a part of the overall project, where the remainder of the project will be funded later with another SRF loan?**

If the original assistance agreement funded any construction of the project, the date of the original assistance agreement counts for purposes of the exemption. If the original assistance agreement was only for planning and design, the date of that assistance agreement will count for purposes of the exemption only if there is a written commitment or expectation on the part of the assistance recipient to fund the remainder of the project with SRF funds.

**7) What if the assistance agreement that was signed prior to January 17, 2014, funded the first phase of a multi-phase project, where the remaining phases will be funded by SRF assistance in the future?**

In such a case, the phases of the project will be considered a single project if all construction necessary to complete the building or work, regardless of the number of contracts or assistance agreements involved, are closely related in purpose, time and place. However, there are many situations in which major construction activities are clearly undertaken in phases that are distinct in purpose, time, or place. In the case of distinct phases, projects with engineering plans and specifications approval or assistance agreements signed prior to January 17, 2014 would be excluded from AIS requirements while those approved/signed on January 17, 2014, or later would be covered by the AIS requirements.

**8) What if a project has split funding from a non-SRF source?**

Many States intend to fund projects with “split” funding, from the SRF program and from State or other programs. Based on the Act language in section 436, which requires that American iron and steel products be used in any project for the construction, alteration, maintenance, or repair of a public water system or treatment works receiving SRF funding between and including January 17, 2014 and September 30, 2014, any project that is funded in whole or in part with such funds must comply with the AIS requirement. A “project” consists of all construction necessary to complete the building or work regardless of the number of contracts or assistance agreements involved so long as all contracts and assistance agreements awarded are closely related in purpose, time and place. This precludes the intentional splitting of SRF projects into separate and smaller contracts or assistance agreements to avoid AIS coverage on some portion of a larger

project, particularly where the activities are integrally and proximately related to the whole. However, there are many situations in which major construction activities are clearly undertaken in separate phases that are distinct in purpose, time, or place, in which case, separate contracts or assistance agreement for SRF and State or other funding would carry separate requirements.

**9) What about refinancing?**

If a project began construction, financed from a non-SRF source, prior to January 17, 2014, but is refinanced through an SRF assistance agreement executed on or after January 17, 2014 and prior to October 1, 2014, AIS requirements will apply to all construction that occurs on or after January 17, 2014, through completion of construction, unless, as is likely, engineering plans and specifications were approved by a responsible state agency prior to January 17, 2014. There is no retroactive application of the AIS requirements where a refinancing occurs for a project that has completed construction prior to January 17, 2014.

**10) Do the AIS requirements apply to any other EPA programs, besides the SRF program, such as the Tribal Set-aside grants or grants to the Territories and DC?**

No, the AIS requirement only applies to funds made available by a State water pollution control revolving fund as authorized by title VI of the Federal Water Pollution Control Act (33 U.S.C. 1381 et seq.) or made available by a drinking water treatment revolving loan fund as authorized by section 1452 of the Safe Drinking Water Act (42 U.S.C. 300j-12)

**Covered Iron and Steel Products**

**11) What is an iron or steel product?**

For purposes of the CWSRF and DWSRF projects that must comply with the AIS requirement, an iron or steel product is one of the following made primarily of iron or steel that is permanently incorporated into the public water system or treatment works:

- Lined or unlined pipes or fittings;
- Manhole Covers;
- Municipal Castings (defined in more detail below);
- Hydrants;
- Tanks;
- Flanges;
- Pipe clamps and restraints;
- Valves;
- Structural steel (defined in more detail below);
- Reinforced precast concrete; and
- Construction materials (defined in more detail below).

**12) What does the term ‘primarily iron or steel’ mean?**

‘Primarily iron or steel’ places constraints on the list of products above. For one of the listed products to be considered subject to the AIS requirements, it must be made of greater than 50% iron or steel, measured by cost. The cost should be based on the material costs.

**13) Can you provide an example of how to perform a cost determination?**

For example, the iron portion of a fire hydrant would likely be the bonnet, body and shoe, and the cost then would include the pouring and casting to create those components. The other material costs would include non-iron and steel internal workings of the fire hydrant (i.e., stem, coupling, valve, seals, etc). However, the assembly of the internal workings into the hydrant body would not be included in this cost calculation. If one of the listed products is not made primarily of iron or steel, United States (US) provenance is not required. An exception to this definition is reinforced precast concrete, which is addressed in a later question.

**14) If a product is composed of more than 50% iron or steel, but is not listed in the above list of items, must the item be produced in the US? Alternatively, must the iron or steel in such a product be produced in the US?**

The answer to both question is no. Only items on the above list must be produced in the US. Additionally, the iron or steel in a non-listed item can be sourced from outside the US.

**15) What is the definition of steel?**

Steel means an alloy that includes at least 50 percent iron, between .02 and 2 percent carbon, and may include other elements. Metallic elements such as chromium, nickel, molybdenum, manganese, and silicon may be added during the melting of steel for the purpose of enhancing properties such as corrosion resistance, hardness, or strength. The definition of steel covers carbon steel, alloy steel, stainless steel, tool steel and other specialty steels.

**16) What does ‘produced in the United States’ mean?**

Production in the United States of the iron or steel products used in the project requires that all manufacturing processes, including application of coatings, must take place in the United States, with the exception of metallurgical processes involving refinement of steel additives. All manufacturing processes includes processes such as melting, refining, forming, rolling, drawing, finishing, fabricating and coating. Further, if a domestic iron and steel product is taken out of the US for any part of the manufacturing process, it becomes foreign source material. However, raw materials such as iron ore, limestone and iron and steel scrap are not covered by the AIS requirement, and the

material(s), if any, being applied as a coating are similarly not covered. Non-iron or steel components of an iron and steel product may come from non-US sources. For example, for products such as valves and hydrants, the individual non-iron and steel components do not have to be of domestic origin.

**17) Are the raw materials used in the production of iron or steel required to come from US sources?**

No. Raw materials, such as iron ore, limestone, scrap iron, and scrap steel, can come from non-US sources.

**18) If an above listed item is primarily made of iron or steel, but is only at the construction site temporarily, must such an item be produced in the US?**

No. Only the above listed products made primarily of iron or steel, permanently incorporated into the project must be produced in the US. For example trench boxes, scaffolding or equipment, which are removed from the project site upon completion of the project, are not required to be made of U.S. Iron or Steel.

**19) What is the definition of ‘municipal castings’?**

Municipal castings are cast iron or steel infrastructure products that are melted and cast. They typically provide access, protection, or housing for components incorporated into utility owned drinking water, storm water, wastewater, and surface infrastructure. They are typically made of grey or ductile iron, or steel. Examples of municipal castings are:

- Access Hatches;
- Ballast Screen;
- Benches (Iron or Steel);
- Bollards;
- Cast Bases;
- Cast Iron Hinged Hatches, Square and Rectangular;
- Cast Iron Riser Rings;
- Catch Basin Inlet;
- Cleanout/Monument Boxes;
- Construction Covers and Frames;
- Curb and Corner Guards;
- Curb Openings;
- Detectable Warning Plates;
- Downspout Shoes (Boot, Inlet);
- Drainage Grates, Frames and Curb Inlets;
- Inlets;
- Junction Boxes;
- Lampposts;
- Manhole Covers, Rings and Frames, Risers;

Meter Boxes;  
Service Boxes;  
Steel Hinged Hatches, Square and Rectangular;  
Steel Riser Rings;  
Trash receptacles;  
Tree Grates;  
Tree Guards;  
Trench Grates; and  
Valve Boxes, Covers and Risers.

## **20) What is ‘structural steel’?**

Structural steel is rolled flanged shapes, having at least one dimension of their cross-section three inches or greater, which are used in the construction of bridges, buildings, ships, railroad rolling stock, and for numerous other constructional purposes. Such shapes are designated as wide-flange shapes, standard I-beams, channels, angles, tees and zees. Other shapes include H-piles, sheet piling, tie plates, cross ties, and those for other special purposes.

## **21) What is a ‘construction material’ for purposes of the AIS requirement?**

Construction materials are those articles, materials, or supplies made primarily of iron and steel, that are permanently incorporated into the project, not including mechanical and/or electrical components, equipment and systems. Some of these products may overlap with what is also considered “structural steel”. This includes, but is not limited to, the following products: wire rod, bar, angles, concrete reinforcing bar, wire, wire cloth, wire rope and cables, tubing, framing, joists, trusses, fasteners (i.e., nuts and bolts), welding rods, decking, grating, railings, stairs, access ramps, fire escapes, ladders, wall panels, dome structures, roofing, ductwork, surface drains, cable hanging systems, manhole steps, fencing and fence tubing, guardrails, doors, and stationary screens.

## **22) What is not considered a ‘construction material’ for purposes of the AIS requirement?**

Mechanical and electrical components, equipment and systems are not considered construction materials. Mechanical equipment is typically that which has motorized parts and/or is powered by a motor. Electrical equipment is typically any machine powered by electricity and includes components that are part of the electrical distribution system.

The following examples (including their appurtenances necessary for their intended use and operation) are NOT considered construction materials: pumps, motors, gear reducers, drives (including variable frequency drives (VFDs)), electric/pneumatic/manual accessories used to operate valves (such as electric valve actuators), mixers, gates, motorized screens (such as traveling screens), blowers/aeration equipment, compressors, meters, sensors, controls and switches, supervisory control and

data acquisition (SCADA), membrane bioreactor systems, membrane filtration systems, filters, clarifiers and clarifier mechanisms, rakes, grinders, disinfection systems, presses (including belt presses), conveyors, cranes, HVAC (excluding ductwork), water heaters, heat exchangers, generators, cabinetry and housings (such as electrical boxes/enclosures), lighting fixtures, electrical conduit, emergency life systems, metal office furniture, shelving, laboratory equipment, analytical instrumentation, and dewatering equipment.

**23) If the iron or steel is produced in the US, may other steps in the manufacturing process take place outside of the US, such as assembly?**

No. Production in the US of the iron or steel used in a listed product requires that all manufacturing processes must take place in the United States, except metallurgical processes involving refinement of steel additives.

**24) What processes must occur in the US to be compliant with the AIS requirement for reinforced precast concrete?**

While reinforced precast concrete may not be at least 50% iron or steel, in this particular case, the reinforcing bar and wire must be produced in the US and meet the same standards as for any other iron or steel product. Additionally, the casting of the concrete product must take place in the US. The cement and other raw materials used in concrete production are not required to be of domestic origin.

If the reinforced concrete is cast at the construction site, the reinforcing bar and wire are considered to be a construction material and must be produced in the US.

**Compliance**

**25) How should an assistance recipient document compliance with the AIS requirement?**

In order to ensure compliance with the AIS requirement, specific AIS contract language must be included in each contract, starting with the assistance agreement, all the way down to the purchase agreements. Sample language for assistance agreements and contracts can be found in Appendix 3 and 4.

EPA recommends the use of a step certification process, similar to one used by the Federal Highway Administration. The step certification process is a method to ensure that producers adhere to the AIS requirement and assistance recipients can verify that products comply with the AIS requirement. The process also establishes accountability and better enables States to take enforcement actions against violators.

Step certification creates a paper trail which documents the location of the manufacturing process involved with the production of steel and iron materials. A step certification is a process under which each handler (supplier, fabricator, manufacturer,

processor, etc) of the iron and steel products certifies that their step in the process was domestically performed. Each time a step in the manufacturing process takes place, the manufacturer delivers its work along with a certification of its origin. A certification can be quite simple. Typically, it includes the name of the manufacturer, the location of the manufacturing facility where the product or process took place (not its headquarters), a description of the product or item being delivered, and a signature by a manufacturer's responsible party. Attached, as Appendix 5, are sample certifications. These certifications should be collected and maintained by assistance recipients.

Alternatively, the final manufacturer that delivers the iron or steel product to the worksite, vendor, or contractor, may provide a certification asserting that all manufacturing processes occurred in the US. While this type of certification may be acceptable, it may not provide the same degree of assurance. Additional documentation may be needed if the certification is lacking important information. Step certification is the best practice.

## **26) How should a State ensure assistance recipients are complying with the AIS requirement?**

In order to ensure compliance with the AIS requirement, States SRF programs must include specific AIS contract language in the assistance agreement. Sample language for assistance agreements can be found in Appendix 3.

States should also, as a best practice, conduct site visits of projects during construction and review documentation demonstrating proof of compliance which the assistance recipient has gathered.

## **27) What happens if a State or EPA finds a non-compliant iron and/or steel product permanently incorporated in the project?**

If a potentially non-compliant product is identified, the State should notify the assistance recipient of the apparent unauthorized use of the non-domestic component, including a proposed corrective action, and should be given the opportunity to reply. If unauthorized use is confirmed, the State can take one or more of the following actions: request a waiver where appropriate; require the removal of the non-domestic item; or withhold payment for all or part of the project. Only EPA can issue waivers to authorize the use of a non-domestic item. EPA may use remedies available to it under the Clean Water Act, the Safe Drinking Water Act, and 40 CFR part 31 grant regulations, in the event of a violation of a grant term and condition.

It is recommended that the State work collaboratively with EPA to determine the appropriate corrective action, especially in cases where the State is the one who identifies the item in noncompliance or there is a disagreement with the assistance recipient.

If fraud, waste, abuse, or any violation of the law is suspected, the Office of Inspector General (OIG) should be contacted immediately. The OIG can be reached at 1-

888-546-8740 or [OIG\\_Hotline@epa.gov](mailto:OIG_Hotline@epa.gov). More information can be found at this website: <http://www.epa.gov/oig/hotline.htm>.

## **28) How do international trade agreements affect the implementation of the AIS requirements?**

The AIS provision applies in a manner consistent with United States obligations under international agreements. Typically, these obligations only apply to direct procurement by the entities that are signatories to such agreements. In general, SRF assistance recipients are not signatories to such agreements, so these agreements have no impact on this AIS provision. In the few instances where such an agreement applies to a municipality, that municipality is under the obligation to determine its applicability and requirements and document the actions taken to comply for the State.

### **Waiver Process**

The statute permits EPA to issue waivers for a case or category of cases where EPA finds (1) that applying these requirements would be inconsistent with the public interest; (2) iron and steel products are not produced in the US in sufficient and reasonably available quantities and of a satisfactory quality; or (3) inclusion of iron and steel products produced in the US will increase the cost of the overall project by more than 25 percent.

In order to implement the AIS requirements, EPA has developed an approach to allow for effective and efficient implementation of the waiver process to allow projects to proceed in a timely manner. The framework described below will allow States, on behalf of the assistance recipients, to apply for waivers of the AIS requirement directly to EPA Headquarters. Only waiver requests received from states will be considered. Pursuant to the Act, EPA has the responsibility to make findings as to the issuance of waivers to the AIS requirements.

### **Definitions**

The following terms are critical to the interpretation and implementation of the AIS requirements and apply to the process described in this memorandum:

**Reasonably Available Quantity:** The quantity of iron or steel products is available or will be available at the time needed and place needed, and in the proper form or specification as specified in the project plans and design.

**Satisfactory Quality:** The quality of iron or steel products, as specified in the project plans and designs.

**Assistance Recipient:** A borrower or grantee that receives funding from a State CWSRF or DWSRF program.



## Step-By-Step Waiver Process

### Application by Assistance Recipient

Each local entity that receives SRF water infrastructure financial assistance is required by section 436 of the Act to use American made iron and steel products in the construction of its project. However, the recipient may request a waiver. Until a waiver is granted by EPA, the AIS requirement stands, except as noted above with respect to municipalities covered by international agreements.

The waiver process begins with the SRF assistance recipient. In order to fulfill the AIS requirement, the assistance recipient must in good faith design the project (where applicable) and solicit bids for construction with American made iron and steel products. It is essential that the assistance recipient include the AIS terms in any request for proposals or solicitations for bids, and in all contracts (see Appendix 3 for sample construction contract language). The assistance recipient may receive a waiver at any point before, during, or after the bid process, if one or more of three conditions is met:

1. Applying the American Iron and Steel requirements of the Act 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.

Proper and sufficient documentation must be provided by the assistance recipient. A checklist detailing the types of information required for a waiver to be processed is attached as Appendix 1.

Additionally, it is strongly encouraged that assistance recipients hold pre-bid conferences with potential bidders. A pre-bid conference can help to identify iron and steel products needed to complete the project as described in the plans and specifications that may not be available from domestic sources. It may also identify the need to seek a waiver prior to bid, and can help inform the recipient on compliance options.

In order to apply for a project waiver, the assistance recipient should email the request in the form of a Word document (.doc) to the State SRF program. It is strongly recommended that the State designate a single person for all AIS communications. The State SRF designee will review the application for the waiver and determine whether the necessary information has been included. Once the waiver application is complete, the State designee will forward the application to either of two email addresses. For CWSRF waiver requests, please send the application to: [cwsrfwaiver@epa.gov](mailto:cwsrfwaiver@epa.gov). For DWSRF waiver requests, please send the application to: [dwsrfwaiver@epa.gov](mailto:dwsrfwaiver@epa.gov).

## Evaluation by EPA

After receiving an application for waiver of the AIS requirements, EPA Headquarters will publish the request on its website for 15 days and receive informal comment. EPA Headquarters will then use the checklist in Appendix 2 to determine whether the application properly and adequately documents and justifies the statutory basis cited for the waiver – that it is quantitatively and qualitatively sufficient – and to determine whether or not to grant the waiver.

In the event that EPA finds that adequate documentation and justification has been submitted, the Administrator may grant a waiver to the assistance recipient. EPA will notify the State designee that a waiver request has been approved or denied as soon as such a decision has been made. Granting such a waiver is a three-step process:

1. Posting – After receiving an application for a waiver, EPA is required to publish the application and all material submitted with the application on EPA’s website for 15 days. During that period, the public will have the opportunity to review the request and provide informal comment to EPA. The website can be found at: [https://water.epa.gov/grants\\_funding/aisrequirement.cfm](https://water.epa.gov/grants_funding/aisrequirement.cfm)
2. Evaluation – After receiving an application for waiver of the AIS requirements, EPA Headquarters will use the checklist in Appendix 2 to determine whether the application properly and adequately documents and justifies the statutory basis cited for the waiver – that it is quantitatively and qualitatively sufficient – and to determine whether or not to grant the waiver.
3. Signature of waiver approval by the Administrator or another agency official with delegated authority – As soon as the waiver is signed and dated, EPA will notify the State SRF program, and post the signed waiver on our website. The assistance recipient should keep a copy of the signed waiver in its project files.

## Public Interest Waivers

EPA has the authority to issue public interest waivers. Evaluation of a public interest waiver request may be more complicated than that of other waiver requests so they may take more time than other waiver requests for a decision to be made. An example of a public interest waiver that might be issued could be for a community that has standardized on a particular type or manufacturer of a valve because of its performance to meet their specifications. Switching to an alternative valve may require staff to be trained on the new equipment and additional spare parts would need to be purchased and stocked, existing valves may need to be unnecessarily replaced, and portions of the system may need to be redesigned. Therefore, requiring the community to install an alternative valve would be inconsistent with public interest.

EPA also has the authority to issue a public interest waiver that covers categories of products that might apply to all projects.

EPA reserves the right to issue national waivers that may apply to particular classes of assistance recipients, particular classes of projects, or particular categories of iron or steel products. EPA may develop national or (US geographic) regional categorical waivers through the identification of similar circumstances in the detailed justifications presented to EPA in a waiver request or requests. EPA may issue a national waiver based on policy decisions regarding the public's interest or a determination that a particular item is not produced domestically in reasonably available quantities or of a sufficient quality. In such cases, EPA may determine it is necessary to issue a national waiver.

If you have any questions concerning the contents of this memorandum, you may contact us, or have your staff contact Jordan Dorfman, Attorney-Advisor, State Revolving Fund Branch, Municipal Support Division, at [dorfman.jordan@epa.gov](mailto:dorfman.jordan@epa.gov) or (202) 564-0614 or Kiri Anderer, Environmental Engineer, Infrastructure Branch, Drinking Water Protection Division, at [anderer.kirsten@epa.gov](mailto:anderer.kirsten@epa.gov) or (202) 564-3134.

Attachments

## Appendix 1: Information Checklist for Waiver Request

The purpose of this checklist is to help ensure that all appropriate and necessary information is submitted to EPA. EPA recommends that States review this checklist carefully and provide all appropriate information to EPA. This checklist is for informational purposes only and does not need to be included as part of a waiver application.

Items	✓	Notes
<p>General</p> <ul style="list-style-type: none"> <li>• Waiver request includes the following information: <ul style="list-style-type: none"> <li>— Description of the foreign and domestic construction materials</li> <li>— Unit of measure</li> <li>— Quantity</li> <li>— Price</li> <li>— Time of delivery or availability</li> <li>— Location of the construction project</li> <li>— Name and address of the proposed supplier</li> <li>— A detailed justification for the use of foreign construction materials</li> </ul> </li> <li>• Waiver request was submitted according to the instructions in the memorandum</li> <li>• Assistance recipient made a good faith effort to solicit bids for domestic iron and steel products, as demonstrated by language in requests for proposals, contracts, and communications with the prime contractor</li> </ul>		
<p>Cost Waiver Requests</p> <ul style="list-style-type: none"> <li>• Waiver request includes the following information: <ul style="list-style-type: none"> <li>— Comparison of overall cost of project with domestic iron and steel products to overall cost of project with foreign iron and steel products</li> <li>— Relevant excerpts from the bid documents used by the contractors to complete the comparison</li> <li>— Supporting documentation indicating that the contractor made a reasonable survey of the market, such as a description of the process for identifying suppliers and a list of contacted suppliers</li> </ul> </li> </ul>		
<p>Availability Waiver Requests</p> <ul style="list-style-type: none"> <li>• Waiver request includes the following supporting documentation necessary to demonstrate the availability, quantity, and/or quality of the materials for which the waiver is requested: <ul style="list-style-type: none"> <li>— Supplier information or pricing information from a reasonable number of domestic suppliers indicating availability/delivery date for construction materials</li> <li>— Documentation of the assistance recipient's efforts to find available domestic sources, such as a description of the process for identifying suppliers and a list of contacted suppliers.</li> <li>— Project schedule</li> <li>— Relevant excerpts from project plans, specifications, and permits indicating the required quantity and quality of construction materials</li> </ul> </li> <li>• Waiver request includes a statement from the prime contractor and/or supplier confirming the non-availability of the domestic construction materials for which the waiver is sought</li> <li>• Has the State received other waiver requests for the materials described in this waiver request, for comparable projects?</li> </ul>		

## Appendix 2: HQ Review Checklist for Waiver Request

Instructions: To be completed by EPA. Review all waiver requests using the questions in the checklist, and mark the appropriate box as Yes, No or N/A. Marks that fall inside the shaded boxes may be grounds for denying the waiver. If none of your review markings fall into a shaded box, the waiver is eligible for approval if it indicates that one or more of the following conditions applies to the domestic product for which the waiver is sought:

1. The iron and/or steel products are not produced in the United States in sufficient and reasonably available quantities and of a satisfactory quality.
2. The inclusion of iron and/or steel products produced in the United States will increase the cost of the overall project by more than 25 percent.

Review Items	Yes	No	N/A	Comments
<b>Cost Waiver Requests</b> <ul style="list-style-type: none"> <li>• Does the waiver request include the following information?                             <ul style="list-style-type: none"> <li>– Comparison of overall cost of project with domestic iron and steel products to overall cost of project with foreign iron and steel products</li> <li>– Relevant excerpts from the bid documents used by the contractors to complete the comparison</li> <li>– A sufficient number of bid documents or pricing information from domestic sources to constitute a reasonable survey of the market</li> </ul> </li> <li>• Does the Total Domestic Project exceed the Total Foreign Project Cost by more than 25%?</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<b>Availability Waiver Requests</b> <ul style="list-style-type: none"> <li>• Does the waiver request include supporting documentation sufficient to show the availability, quantity, and/or quality of the iron and/or steel product for which the waiver is requested?                             <ul style="list-style-type: none"> <li>– Supplier information or other documentation indicating availability/delivery date for materials</li> <li>– Project schedule</li> <li>– Relevant excerpts from project plans, specifications, and permits indicating the required quantity and quality of materials</li> </ul> </li> <li>• Does supporting documentation provide sufficient evidence that the contractors made a reasonable effort to locate domestic suppliers of materials, such as a description of the process for identifying suppliers and a list of contacted suppliers?</li> <li>• Based on the materials delivery/availability date indicated in the supporting documentation, will the materials be unavailable when they are needed according to the project schedule? (By item, list schedule date and domestic delivery quote date or other relevant information)</li> <li>• Is EPA aware of any other evidence indicating the non-availability of the materials for which the waiver is requested? Examples include:                             <ul style="list-style-type: none"> <li>– Multiple waiver requests for the materials described in this waiver request, for comparable projects in the same State</li> <li>– Multiple waiver requests for the materials described in this waiver request, for comparable projects in other States</li> <li>– Correspondence with construction trade associations indicating the non-availability of the materials</li> </ul> </li> <li>• Are the available domestic materials indicated in the bid documents of inadequate quality compared those required by the project plans, specifications, and/or permits?</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

### **Appendix 3: Example Loan Agreement Language**

ALL ASSISTANCE AGREEMENT MUST HAVE A CLAUSE REQUIRING COMPLIANCE WITH THE AIS REQUIREMENT. THIS IS AN EXAMPLE OF WHAT COULD BE INCLUDED IN SRF ASSISTANCE AGREEMENTS. EPA MAKES NO CLAIMS REGARDING THE LEGALITY OF THIS CLAUSE WITH RESPECT TO STATE LAW:

Comply with all federal requirements applicable to the Loan (including those imposed by the 2014 Appropriations Act and related SRF Policy Guidelines) which the Participant understands includes, among other, requirements that all of the iron and steel products used in the Project are to be produced in the United States (“American Iron and Steel Requirement”) unless (i) the Participant has requested and obtained a waiver from the Agency pertaining to the Project or (ii) the Finance Authority has otherwise advised the Participant in writing that the American Iron and Steel Requirement is not applicable to the Project.

Comply with all record keeping and reporting requirements under the Clean Water Act/Safe Drinking Water Act, including any reports required by a Federal agency or the Finance Authority such as performance indicators of program deliverables, information on costs and project progress. The Participant understands that (i) each contract and subcontract related to the Project is subject to audit by appropriate federal and state entities and (ii) failure to comply with the Clean Water Act/Safe Drinking Water Act and this Agreement may be a default hereunder that results in a repayment of the Loan in advance of the maturity of the Bonds and/or other remedial actions.

#### **Appendix 4: Sample Construction Contract Language**

ALL CONTRACTS MUST HAVE A CLAUSE REQUIRING COMPLIANCE WITH THE AIS REQUIREMENT. THIS IS AN EXAMPLE OF WHAT COULD BE INCLUDED IN ALL CONTRACTS IN PROJECTS THAT USE SRF FUNDS. EPA MAKES NO CLAIMS REGARDING THE LEGALITY OF THIS CLAUSE WITH RESPECT TO STATE OR LOCAL LAW:

The Contractor acknowledges to and for the benefit of the City of \_\_\_\_\_ (“Purchaser”) and the \_\_\_\_\_ (the “State”) that it understands the goods and services under this Agreement are being funded with monies made available by the Clean Water State Revolving Fund and/or Drinking Water State Revolving Fund that have statutory requirements commonly known as “American Iron and Steel;” that requires all of the iron and steel products used in the project to be produced in the United States (“American Iron and Steel Requirement”) including iron and steel products provided by the Contractor pursuant to this Agreement. The Contractor hereby represents and warrants to and for the benefit of the Purchaser and the State that (a) the Contractor has reviewed and understands the American Iron and Steel Requirement, (b) all of the iron and steel products used in the project will be and/or have been produced in the United States in a manner that complies with the American Iron and Steel Requirement, unless a waiver of the requirement is approved, and (c) the Contractor will provide any further verified information, certification or assurance of compliance with this paragraph, or information necessary to support a waiver of the American Iron and Steel Requirement, as may be requested by the Purchaser or the State. Notwithstanding any other provision of this Agreement, any failure to comply with this paragraph by the Contractor shall permit the Purchaser or State to recover as damages against the Contractor any loss, expense, or cost (including without limitation attorney’s fees) incurred by the Purchaser or State resulting from any such failure (including without limitation any impairment or loss of funding, whether in whole or in part, from the State or any damages owed to the State by the Purchaser). While the Contractor has no direct contractual privity with the State, as a lender to the Purchaser for the funding of its project, the Purchaser and the Contractor agree that the State is a third-party beneficiary and neither this paragraph (nor any other provision of this Agreement necessary to give this paragraph force or effect) shall be amended or waived without the prior written consent of the State.

## Appendix 5: Sample Certifications

The following information is provided as a sample letter of **step** certification for AIS compliance. Documentation must be provided on company letterhead.

Date

Company Name

Company Address

City, State Zip

Subject: American Iron and Steel Step Certification for Project (XXXXXXXXXX)

I, (company representative), certify that the (melting, bending, coating, galvanizing, cutting, etc.) process for (manufacturing or fabricating) the following products and/or materials shipped or provided for the subject project is in full compliance with the American Iron and Steel requirement as mandated in EPA's State Revolving Fund Programs.

Item, Products and/or Materials:

1. XXXX
2. XXXX
3. XXXX

Such process took place at the following location:

\_\_\_\_\_

If any of the above compliance statements change while providing material to this project we will immediately notify the prime contractor and the engineer.

Signed by company representative



The following information is provided as a sample letter of certification for AIS compliance. Documentation must be provided on company letterhead.

Date

Company Name

Company Address

City, State Zip

Subject: American Iron and Steel Certification for Project (XXXXXXXXXXXX)

I, (company representative), certify that the following products and/or materials shipped/provided to the subject project are in full compliance with the American Iron and Steel requirement as mandated in EPA's State Revolving Fund Programs.

Item, Products and/or Materials:

1. XXXX
2. XXXX
3. XXXX

Such process took place at the following location:

\_\_\_\_\_

If any of the above compliance statements change while providing material to this project we will immediately notify the prime contractor and the engineer.

Signed by company representative



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
WASHINGTON, D.C. 20460

OFFICE OF WATER

**DECISION MEMORANDUM**

**SUBJECT:** De Minimis Waiver of Section 436 of P.L. 113-76, Consolidated Appropriations Act (CAA), 2014

**FROM:** Nancy K. Stoner  
Acting Assistant Administrator

The EPA is hereby granting a nationwide waiver pursuant to the “American Iron and Steel (AIS)” requirements of P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), section 436 under the authority of Section 436(b)(1) (public interest waiver) for de minimis incidental components of eligible water infrastructure projects. This action permits the use of products when they occur in de minimis incidental components of such projects funded by the Act that may otherwise be prohibited under section 436(a). Funds used for such de minimis incidental components cumulatively may comprise no more than a total of 5 percent of the total cost of the materials used in and incorporated into a project; the cost of an individual item may not exceed 1 percent of the total cost of the materials used in and incorporated into a project.

P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an “American Iron and Steel” (AIS) requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use specific domestic iron and steel products that are produced in the United States if the project is funded through an assistance agreement executed beginning January 17, 2014 (enactment of the Act), through the end of Fiscal Year 2014, unless the agency determines it necessary to waive this requirement based on findings set forth in Section 436(b). The Act states, “[the requirements] shall not apply in any case or category of cases in which the Administrator of the Environmental Protection Agency... finds that— (1) applying subsection (a) would be inconsistent with the public interest” 436(b)(1).

In implementing section 436 of the Act, the EPA must ensure that the section's requirements are applied consistent with congressional intent in adopting this section and in the broader context of the purposes, objectives, and other provisions applicable to projects funded under the SRF. Water infrastructure projects typically contain a relatively small number of high-cost components incorporated into the project. In bid solicitations for a project, these high-cost components are generally described in detail via project specific technical specifications. For these major components, utility owners and their contractors are generally familiar with the conditions of availability, the potential alternatives for each detailed specification, the approximate cost, and the country of manufacture of the available components.

Every water infrastructure project also involves the use of thousands of miscellaneous, generally low-cost components that are essential for, but incidental to, the construction and are incorporated into the physical structure of the project. For many of these incidental components, the country of manufacture and the availability of alternatives is not always readily or reasonably identifiable prior to procurement in the normal course of business; for other incidental components, the country of manufacture may be known but the miscellaneous character in conjunction with the low cost, individually and (in total) as typically procured in bulk, mark them as properly incidental. Examples of incidental components could include small washers, screws, fasteners (i.e., nuts and bolts), miscellaneous wire, corner bead, ancillary tube, etc. Examples of items that are clearly not incidental include significant process fittings (i.e., tees, elbows, flanges, and brackets), distribution system fittings and valves, force main valves, pipes for sewer collection and/or water distribution, treatment and storage tanks, large structural support structures, etc.

The EPA undertook multiple inquiries to identify the approximate scope of de minimis incidental components within water infrastructure projects during the implementation of the American Reinvestment and Recovery Act (ARRA) and its requirements (Buy American provisions, specifically). The inquiries and research conducted in 2009 applies suitably for the case today. In 2009, the EPA consulted informally with many major associations representing equipment manufacturers and suppliers, construction contractors, consulting engineers, and water and wastewater utilities, and performed targeted interviews with several well-established water infrastructure contractors and firms who work in a variety of project sizes, and regional and demographic settings to ask the following questions:

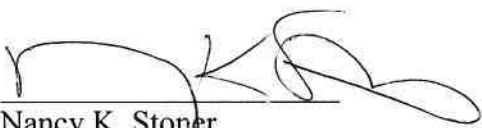
- What percentage of total project costs were consumables or incidental costs?
- What percentage of materials costs were consumables or incidental costs?
- Did these percentages vary by type of project (drinking water vs. wastewater treatment plant vs. pipe)?

The responses were consistent across the variety of settings and project types, and indicated that the percentage of total costs for drinking water or wastewater infrastructure projects represented by these incidental components is generally not in excess of 5 percent of the total cost of the materials used in and incorporated into a project. In drafting this waiver, the EPA has considered the de minimis proportion of project costs generally represented by each individual type of these incidental components within the many types of such components comprising those percentages, the fact that these types of incidental components are obtained by contractors in many different ways from many different sources, and the disproportionate cost and delay that would be imposed on projects if the EPA did not issue this waiver.

Assistance recipients who wish to use this waiver should in consultation with their contractors determine the items to be covered by this waiver and must retain relevant documentation (i.e., invoices) as to those items in their project files.

If you have any questions concerning the contents of this memorandum, please contact Timothy Connor, Chemical Engineer, Municipal Support Division, at [connor.timothy@epa.gov](mailto:connor.timothy@epa.gov) or (202) 566-1059 or Kirsten Anderer, Environmental Engineer, Drinking Water Protection Division, at [anderer.kirsten@epa.gov](mailto:anderer.kirsten@epa.gov) or (202) 564-3134.

Issued on: APR 15 2014

Approved by:   
Nancy K. Stoner  
Acting Assistant Administrator



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
WASHINGTON, D.C. 20460

FEB 18 2015

OFFICE OF WATER

**DECISION MEMORANDUM**

**SUBJECT:** National Product Waiver for Pig Iron and Direct Reduced Iron for State Revolving Fund Projects

**FROM:** *Ellen Delaney*  
for Kenneth J. Kopocis  
Deputy Assistant Administrator

The U.S. Environmental Protection Agency is hereby granting a national product waiver pursuant to the "American Iron and Steel" provisions of the Clean Water Act and Public Law 113-235, the "Consolidated and Further Continuing Appropriations Act, 2015," for certain intermediate goods used in the manufacture of iron and steel products.<sup>1</sup> This waiver permits the use of pig iron and direct reduced iron manufactured outside of the United States in domestic manufacturing processes for iron and steel products used in projects funded by a Clean Water or Drinking Water State Revolving Fund that may otherwise be prohibited absent this waiver. The waiver is retroactive and thus also applies to the use of non-domestic pig iron and direct reduced iron before the signature date.

**Background:** Pig iron and direct reduced iron are intermediate products of iron and steel manufacturing used as material feed sources in iron and steel foundries and steel mills. Pig iron is a product of iron ore smelting in a blast furnace. It is made from molten iron, which has been cast in the shape of "pigs" as it comes from the blast furnace. Direct reduced iron ore is produced from iron ore, pellets or fines, which are reduced in a solid state using natural gas. Hot briquetted iron, or HBI, is a compacted form of direct reduced iron with enhanced physical characteristics for shipment and storage.

**Coverage:** This waiver permits the use of iron and steel products that were manufactured using non-domestic pig iron and direct reduced iron in projects that receive funds from either the CWSRF or DWSRF. Any project that received or will receive funds from the CWSRF or DWSRF beginning with the enactment of P.L. 113-76, the "Consolidated Appropriations Act, 2014," may use this waiver for iron and steel that use these intermediate goods.

**Rationale:** The AIS provisions require CWSRF and DWSRF assistance recipients to use specific domestic iron and steel products that are produced in the United States if the project is funded

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<sup>1</sup>Absent a waiver, all treatment works and drinking water facilities that are constructed, in whole or in part, with funds from the CWSRF or the DWSRF, must use American made iron and steel. EPA is allowed under certain circumstances to provide waivers of this requirement.

through an SRF assistance agreement unless the Agency determines that it is necessary to waive this requirement. EPA has authority to issue waivers in accordance with Section 608(c)(2) of the Clean Water Act and the AIS provisions extended by P.L. 113-235, the “Consolidated and Further Continuing Appropriations Act, 2015,” under the authority of Section 424(b)(2). The provision states in part: “[the requirements] shall not apply in any case or category of cases in which the Administrator of the Environmental Protection Agency...finds that – iron and steel products are not produced in the United States in sufficient and reasonably available quantities and of a satisfactory quality.”

Product manufacturers and suppliers informed EPA of concerns about the sufficient availability of domestically produced pig iron and direct reduced iron. The iron and steel products produced at steel mills and foundries that use non-domestic intermediate goods are not compliant with the AIS requirements. AIS compliant products used at water and wastewater projects could be in extremely short supply should a waiver of the intermediate goods not be available.

EPA conducted extensive market research on the supply of pig iron and direct reduced iron and found that domestic supplies of these goods sold on the open market are generally not available. There are three major types of facilities that manufacture iron and steel finished products: basic oxygen furnace steel mills (BOF), electric arc furnace steel mills (EAF) and foundries. BOF steel mills undertake both iron making and steel making, as molten iron from the blast furnace is the required feedstock for BOF steel production. EAF steel mills and foundries, on the other hand, use iron and steel scrap as their principal feedstock, which must be supplemented with the use of pig iron and/or direct reduced iron in their manufacturing processes to achieve required steel qualities.

EPA market research has shown that BOF steel mills are able to produce adequate amounts of pig iron to meet their own demands, but these mills use the bulk of this production for their own processes and do not sell pig iron on the open market in sufficient quantities. At this time, there is only one producer of direct reduced iron operating in the U.S. and the company uses the output internally for EAF steel production. Therefore, EAF steel mills and foundries must import pig iron and direct reduced iron to meet their iron needs.

At least 60 percent of the nation’s steel production comes from the EAF steel mills that use non-domestic pig iron and direct reduced iron in their manufacturing processes. Consequently, the majority of steel used in water and wastewater projects would not be compliant with the AIS requirements absent this waiver. Similarly, most, if not all, of the iron foundries in the United States use non-domestic pig iron and direct reduced iron to produce cast and ductile iron products used by water and wastewater projects. Therefore, the majority of iron used in water and wastewater projects would not be compliant with the AIS requirements absent this waiver. Hence, EPA is hereby providing a nationwide waiver pursuant to AIS requirements to cover the non-domestic intermediate iron goods used in the manufacture of iron and/or steel components and products for water and wastewater projects.

Public Comments: EPA requested comments on the draft national waiver and a majority of the comments received were supportive of a national waiver. The commenters in support of the waiver agreed with the Agency’s conclusion that pig iron and direct reduced iron are not

produced in the United States in sufficient and reasonably available quantities to meet the needs of many domestic foundries and steel mills. These commenters believe that the waiver will ensure that pig iron and direct reduced iron are treated similarly to raw material inputs in iron and steel manufacturing and by doing so the EPA will preserve the viability of the AIS requirement. These commenters also state that the waiver would treat pig iron and direct reduced iron in a manner consistent with the implementation of other similar federal laws such as the Federal Highway Administration's Buy America requirement. The FHWA issued a similar nationwide waiver of the Buy America requirements in 1995 for pig iron and processed, pelletized and reduced iron ore.

A few commenters challenged the Agency's issuance of a nationwide waiver of the AIS requirements for pig iron and direct reduced iron. These commenters disagreed with the Agency's interpretation of the AIS requirements and stated that raw materials used in iron and steel production must also be produced in the United States. In addition, the commenters questioned whether the Agency could exempt iron and steel products that are composed of non-domestic materials.

The statutory language lists the categories of products that are considered "iron and steel products." The statutory requirements include provisions that allow the EPA to issue waivers under defined conditions, including the case where iron and steel products are not produced in the United States in sufficient and reasonably available quantities. The Agency's market research, supported by comments from manufacturers, has shown that pig iron and direct reduced iron are not produced in the United States in sufficient and reasonably available quantities. Therefore the Agency is authorized to issue a waiver for iron and steel products composed of non-domestic pig iron and direct reduced iron.

Legal Authority: Legal authority for the AIS requirements for CWSRF projects is included under Sec. 608(c)(2) of the Clean Water Act and previously under P.L. 113-76, the "Consolidated Appropriations Act, 2014," under the authority of Section 436(b)(2). Legal authority for the AIS requirements for DWSRF projects is included under P.L. 113-235, the "Consolidated and Further Continuing Appropriations Act, 2015," under the authority of Section 424(b)(2) and also previously under P.L. 113-76. This waiver will continue in force for DWSRF projects under any continuing resolutions or statutes that use similar language as in Section 424 of the "Consolidated and Further Continuing Appropriations Act, 2015."

If you have questions concerning the contents of this memorandum, please contact Timothy Connor, Chemical Engineer, Municipal Support Division, at [connor.timothy@epa.gov](mailto:connor.timothy@epa.gov) or (202) 566-1059 or Kiri Anderer, Environmental Engineer, Drinking Water Protection Division, at [anderer.kirsten@epa.gov](mailto:anderer.kirsten@epa.gov) or (202) 564-3134.



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
WASHINGTON, D.C. 20460

OCT 27 2015

OFFICE OF WATER

**DECISION MEMORANDUM**

**SUBJECT:** National Product Waiver for Minor Components within Iron and Steel Products (with Cost Ceiling) for State Revolving Fund Projects

**FROM:** Kenneth J. Kopocis *Kenneth J. Kopocis*  
Deputy Assistant Administrator

The U.S. Environmental Protection Agency is hereby granting a national product waiver pursuant to the "American Iron and Steel" provisions of the Clean Water Act and Public Law 113-235, the "Consolidated and Further Continuing Appropriations Act, 2015," (hereinafter referred to as "the Acts") for minor components within a product under an established cost ceiling.<sup>1</sup> The waiver will permit projects funded by the Clean Water State Revolving Fund or Drinking Water State Revolving Fund to use non-domestically produced miscellaneous minor components within an otherwise domestically produced iron and steel product for up to 5 percent of the total material cost of the product. These products could be prohibited absent this waiver. This waiver is retroactive, and so also applies to products purchased before the signature date of this waiver.

Coverage: The items covered by this waiver include miscellaneous minor components within iron and steel products as defined in the AIS provisions of the Acts. The specific minor components in covered iron and steel products will vary by product and manufacturer. Pursuant to this waiver, non-domestically produced miscellaneous minor components comprising up to 5 percent of the total material cost of an otherwise domestically produced iron and steel product may be used. This waiver does not exempt the whole product from the AIS requirements, and the primary iron or steel components of the product must be produced domestically. Unless subject to a separate waiver, all other iron and steel components in these products must still meet the AIS requirements. Valves and hydrants are also subject to the cost ceiling requirements described here. This waiver supersedes the EPA's previous guidance issued on May 30, 2014, (Question 1) related to minor components in valves and hydrants.

The coverage of this waiver is different from that of the existing national de minimis waiver. While the national de minimis waiver covers entire products (when those products are generally of low cost and incidental to the construction of the project), this waiver covers minor components within an iron and steel product. In addition, the national de minimis waiver is intended for assistance recipients to use for their projects, while this minor components waiver is intended to allow manufacturers to certify that their products comply with the AIS requirements.

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<sup>1</sup> Absent a waiver, all treatment works and drinking water facilities that are constructed, in whole or in part, with funds from the CWSRF or the DWSRF, must use American made iron and steel. The EPA is allowed under certain circumstances to provide waivers of this requirement.



Rationale: The AIS provisions require recipients of CWSRF and DWSRF assistance to use specific domestically-produced iron and steel products in their project, unless the Agency determines it is necessary to waive this requirement. The EPA has authority to issue waivers in accordance with Section 608(c)(1) of the Clean Water Act and the AIS provisions extended by P.L. 113-235, the “Consolidated and Further Continuing Appropriations Act, 2015,” under the authority of Section 424(b)(1). The provisions state in part: “[the requirements] shall not apply in any case or category of cases in which the Administrator of the Environmental Protection Agency...finds that...applying subsection (a) would be inconsistent with the public interest.”

Many product manufacturers and suppliers identified significant compliance challenges absent this waiver. Water and wastewater utilities are generally unable to obtain a range of AIS compliant iron and steel products (such as valves, hydrants and pipe restraints) that contain 100 percent domestic components. The manufacturers stated that the origin of a significant proportion of very small minor components cannot be reliably tracked or even discerned. They provided examples of product lines that would need duplicative inventories of extremely low-cost miscellaneous minor components in order to supply AIS compliant products. Manufacturers also raised concerns related to challenges of inventory tracking, inventory control and excessive costs associated with duplicative inventory needed to supply utilities with essential domestic products.

The EPA concludes that requiring manufacturers and suppliers to overcome the challenges identified above would be inconsistent with the public’s interest. In order to balance the reliability, availability and maximum supply of domestically produced iron and steel products, it is acceptable for a manufacturer to incorporate a relatively small proportion of miscellaneous minor components of non-domestic or unknown origin within an otherwise domestically manufactured product.

Legal Authority: Legal authority for the AIS requirements for CWSRF projects is included under Sec. 608(c)(1) of the Clean Water Act and previously under P.L. 113-76, “Consolidated Appropriations Act, 2014,” under the authority of Section 436(b)(1). Legal authority for the AIS requirements for DWSRF projects is included under P.L. 113-235, the “Consolidated and Further Continuing Appropriations Act, 2015”, under the authority of Section 424(b)(1) and also previously under P.L. 113-76. This waiver will continue in force for DWSRF projects under any continuing resolutions or statutes that use similar language as Section 424 of the “Consolidated and Further Continuing Appropriations Act, 2015.”

If you have any questions concerning the contents of this memorandum, please contact Timothy Connor, Chemical Engineer, Municipal Support Division, at [connor.timothy@epa.gov](mailto:connor.timothy@epa.gov) or (202) 566-1059 or Kiri Anderer, Environmental Engineer, Drinking Water Protection Division, at [anderer.kirsten@epa.gov](mailto:anderer.kirsten@epa.gov) or (202) 564-3134.

## American Iron and Steel Certification

The Contractor acknowledges to and for the benefit of \_\_\_\_\_ and the State of Missouri that it understands the goods and services under this Agreement are being funded with monies made available by the Clean Water State Revolving Fund and/or Drinking Water State Revolving Fund that have statutory requirements (see attached) commonly known as “American Iron and Steel;” that requires all of the iron and steel products used in the project to be produced in the United States (“American Iron and Steel Requirement”) including iron and steel products provided by the Contractor pursuant to this Agreement. The Contractor hereby represents and warrants to and for the benefit of the Purchaser and the State that (a) the Contractor has reviewed and understands the American Iron and Steel Requirement, (b) all of the iron and steel products used in the project will be and/or have been produced in the United States in a manner that complies with the American Iron and Steel Requirement, unless a waiver of the requirement is approved, and (c) the Contractor will provide any further verified information, certification or assurance of compliance with this paragraph, or information necessary to support a waiver of the American Iron and Steel Requirement, as may be requested by the Purchaser or the State. Notwithstanding any other provision of this Agreement, any failure to comply with this paragraph by the Contractor shall permit the Purchaser or State to recover as damages against the Contractor any loss, expense, or cost (including without limitation attorney’s fees) incurred by the Purchaser or State resulting from any such failure (including without limitation any impairment or loss of funding, whether in whole or in part, from the State or any damages owed to the State by the Purchaser). While the Contractor has no direct contractual privity with the State, as a lender to the Purchaser for the funding of its project, the Purchaser and the Contractor agree that the State is a third-party beneficiary and neither this paragraph (nor any other provision of this Agreement necessary to give this paragraph force or effect) shall be amended or waived without the prior written consent of the State.

\_\_\_\_\_  
Name of Contracting Firm

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Name and Title of Signer (Please type)

## **Davis Bacon Act Requirements**

Pursuant to the Federal Appropriations Act, all laborers and mechanics employed by contractors and subcontractors on projects funded directly by or assisted in whole or in part by and through the Federal Government pursuant to the Appropriations Act shall be paid wages at rates not less than those prevailing on projects of a character similar in the locality as determined by the Secretary of Labor in accordance with subchapter IV of chapter 31 of title 40, United States Code.

Additional guidance can be located at DOL's web site at <https://www.wdol.gov/index.aspx>

1. The Davis-Bacon (DB) prevailing wage requirements apply to the construction, alteration, and repair activity of infrastructure, including all construction, alteration and repair activity involving waste water or drinking water treatment plants is subject to DB. Prime contractors and subcontractors must follow the wage determination incorporated into the prime contract.

### **2. Contract and Subcontract provisions.**

(a) Minimum wages.

(1) All laborers and mechanics employed or working upon the site of the work will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3) ), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in § 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph (a)(2) of this section) and the Davis-Bacon poster (WH-1321) shall be

posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

- (2) Any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The EPA award official shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:
  - (i) The work to be performed by the classification requested is not performed by a classification in the wage determination; and
  - (ii) The classification is utilized in the area by the construction industry; and
  - (iii) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.
- (3) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the funding recipient(s) agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the funding recipient (s) to the MDNR. The MDNR will transmit the report, to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the MDNR or will notify the MDNR within the 30-day period that additional time is necessary.
- (4) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the and the funding recipient(s) do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the funding recipient shall refer the questions, including the views of all interested parties and the recommendation of the MDNR, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.
- (5) The wage rate (including fringe benefits where appropriate) shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.
- (6) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an

hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

- (7) If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

(b) Withholding.

- (1) The funding recipient(s), shall upon written request of the EPA Award Official or an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor under this contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the (Agency) may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

(c) Payrolls and basic records.

- (1) Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been

communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

- (2) The contractor shall submit weekly, for each week in which any contract work is performed, a copy of all payrolls to the funding recipient, that is, the entity that receives the grant or loan from the MDNR. As to each payroll copy received, the funding recipient shall provide written confirmation in a form satisfactory to the MDNR indicating whether or not the project is in compliance with the requirements of 29 CFR 5.5(a)(1) based on the most recent payroll copies for the specified week. The payrolls shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on the weekly payrolls. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at <http://www.dol.gov/esa/whd/forms/wh347instr.htm> or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the funding recipient (s) for transmission to the MDNR or EPA if requested by EPA, the MDNR, the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the funding recipient (s).
- (3) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:
  - (i) That the payroll for the payroll period contains the information required to be provided under § 5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under § 5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;
  - (ii) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid

the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;

- (iii) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.
  - (4) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph (c)(3) of this section.
  - (5) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.
  - (6) The contractor or subcontractor shall make the records required under paragraph (c)(1) of this section available for inspection, copying, or transcription by authorized representatives of the MDNR, EPA or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the Federal agency or State may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.
- (d) Apprentices and trainees.
- (1) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate,

who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

- (2) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the



wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

- (e) Equal employment opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.
- (f) Compliance with Copeland Act requirements. The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.
- (g) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR 5.5(a)(1) through (10) and such other clauses as the EPA determines may be appropriate, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.
- (h) Contract termination: debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.
- (i) Compliance with Davis-Bacon and Related Act requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.
- (j) Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and funding recipient(s), MDNR, EPA, the U.S. Department of Labor, or the employees or their representatives.
- (k) Certification of eligibility.
  - (1) By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).
  - (2) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

- (3) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

### **3. Contract Provision for Contracts in Excess of \$100,000.**

- (a) Contract Work Hours and Safety Standards Act. The following clauses shall be inserted in full in any contract in an amount in excess of \$100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. As used in this paragraph, the terms laborers and mechanics include watchmen and guards.
  - (1) Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.
  - (2) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (a)(1) of this section the contractor and any subcontractor responsible therefore shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (a)(1) of this section, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (a)(1) of this section.
  - (3) Withholding for unpaid wages and liquidated damages. The funding recipient, upon written request of the EPA Award Official or an authorized representative of the Department of Labor, shall withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (b)(2) of this section.
  - (4) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (a)(1) through (4) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier

subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (a)(1) through (4) of this section.

- (b) In any contract subject only to the Contract Work Hours and Safety Standards Act and not to any of the other statutes cited in [29 CFR 5.1](#), the contractor or subcontractor shall maintain payrolls and basic payroll records during the course of the work and shall preserve them for a period of three years from the completion of the contract for all laborers and mechanics, including guards and watchmen, working on the contract. Such records shall contain the name and address of each such employee, social security number, correct classifications, hourly rates of wages paid, daily and weekly number of hours worked, deductions made, and actual wages paid. Further, the records to be maintained under this paragraph shall be made available by the contractor or subcontractor for inspection, copying, or transcription by authorized representatives of the MDNR and the Department of Labor, and the contractor or subcontractor will permit such representatives to interview employees during working hours on the job.

#### **4. Compliance Verification**

- (a) The funding recipient shall periodically interview a sufficient number of employees entitled to DB prevailing wages (covered employees) to verify that contractors or subcontractors are paying the appropriate wage rates. As provided in [29 CFR 5.6\(a\)\(6\)](#), all interviews must be conducted in confidence.
- (b) The funding recipient must conduct interviews with a representative group of covered employees within two weeks of each contractor or subcontractor's submission of its initial weekly payroll data and two weeks prior to the estimated completion date for the contract or subcontract. Funding recipients must conduct more frequent interviews if the initial interviews or other information indicates that there is a risk that the contractor or subcontractor is not complying with DB. Funding recipients shall immediately conduct necessary interviews in response to an alleged violation of the prevailing wage requirements. All interviews shall be conducted in confidence.
- (c) The funding recipient shall periodically conduct spot checks of a representative sample of weekly payroll data to verify that contractors or subcontractors are paying the appropriate wage rates. The funding recipient shall establish and follow a spot check schedule based on its assessment of the risks of noncompliance with DB posed by contractors or subcontractors and the duration of the contract or subcontract. At a minimum, the funding recipient must spot check payroll data within two weeks of each contractor or subcontractor's submission of its initial payroll data and two weeks prior to the completion date the contract or subcontract. Funding recipients must conduct more frequent spot checks if the initial spot check or other information indicates that there is a risk that the contractor or subcontractor is not complying with DB . In addition, during the examinations the funding recipient shall verify evidence of fringe benefit plans and payments there under by contractors and subcontractors who claim credit for fringe benefit contributions.

- (d) The funding recipient shall periodically review contractors and subcontractors use of apprentices and trainees to verify registration and certification with respect to apprenticeship and training programs approved by either the U.S Department of Labor or a state, as appropriate, and that contractors and subcontractors are not using disproportionate numbers of, laborers, trainees and apprentices. These reviews shall be conducted in accordance with the schedules for spot checks and interviews described in Item 5(b) and (c) above.
  
- (e) Funding recipients must immediately report potential violations of the DB prevailing wage requirements to the EPA DB contact listed above and to the appropriate DOL Wage and Hour District Office listed at <http://www.dol.gov/esa/contacts/whd/america2.htm>.

## **Davis-Bacon Act Requirements**

### **Funding Recipient Requirements**

If the funding recipient encounters a unique situation at a site that presents uncertainties regarding Davis Bacon (DB) applicability, the funding recipient must discuss the situation with the MDNR before authorizing work on that site.

The funding recipients shall obtain the wage determination for the locality in which a covered activity subject to DB will take place prior to issuing requests for bids, proposals, quotes or other methods for soliciting contracts (solicitation) for activities subject to DB. These wage determinations shall be incorporated into solicitations and any subsequent contracts. The funding recipients may obtain wage determinations from the U.S. Department of Labor's web site, [www.wdol.gov](http://www.wdol.gov).

While the solicitation remains open, the funding recipient shall monitor [www.wdol.gov](http://www.wdol.gov) on a weekly basis to ensure that the wage determination contained in the solicitation remains current. The funding recipients shall amend the solicitation if DOL issues a modification more than 10 days prior to the closing date (i.e. bid opening) for the solicitation. If DOL modifies or supersedes the applicable wage determination less than 10 days prior to the closing date, the funding recipients may request a finding from the MDNR that there is not a reasonable time to notify interested contractors of the modification of the wage determination. The MDNR will provide a report of its findings to the funding recipient.

If the funding recipient does not award the contract within 90 days of the closure of the solicitation, any modifications or supersedes DOL makes to the wage determination contained in the solicitation shall be effective unless the MDNR, at the request of the funding recipient, obtains an extension of the 90 day period from DOL pursuant to 29 CFR 1.6(c)(3)(iv). The funding recipient shall monitor [www.wdol.gov](http://www.wdol.gov) on a weekly basis if it does not award the contract within 90 days of closure of the solicitation to ensure that wage determinations contained in the solicitation remain current.

If the funding recipient carries out an activity subject to DB by issuing a task order, work assignment or similar instrument to an existing contractor (ordering instrument) rather than by publishing a solicitation, the funding recipient shall insert the appropriate DOL wage determination from [www.wdol.gov](http://www.wdol.gov) into the ordering instrument.

Funding recipients shall review all subcontracts subject to DB entered into by prime contractors to verify that the prime contractor has required its subcontractors to include the applicable wage determinations.

As provided in 29 CFR 1.6(f), DOL may issue a revised wage determination applicable to a funding recipient's contract after the award of a contract or the issuance of an ordering instrument if DOL determines that the funding recipient has failed to incorporate a wage determination or has used a wage determination that clearly does not apply to the contract or ordering instrument. If this occurs, the funding recipient shall either terminate the contract or

ordering instrument and issue a revised solicitation or ordering instrument or incorporate DOL's wage determination retroactive to the beginning of the contract or ordering instrument by change order. The funding recipient's contractor must be compensated for any increases in wages resulting from the use of DOL's revised wage determination.

The funding recipient(s) shall insert in full in any contract in excess of \$2,000 which is entered into for the actual construction, alteration and/or repair, including painting and decorating, of a public building or public work, or building or work financed in whole or in part from Federal funds or in accordance with guarantees of a Federal agency or financed from funds obtained by pledge of any contract of a Federal agency to make a loan, grant or annual contribution (except where a different meaning is expressly indicated), and which is subject to the labor standards provisions of any of the acts listed in § 5.1, the following clauses:

- 1) The funding recipient shall periodically interview a sufficient number of employees entitled to DB prevailing wages (covered employees) to verify that contractors or subcontractors are paying the appropriate wage rates. As provided in 29 CFR 5.6(a)(6), all interviews must be conducted in confidence. The funding recipient must use Standard Form 1445 or equivalent documentation to memorialize the interviews. Copies of the SF 1445 are available from EPA on request.
- 2) The funding recipient shall establish and follow an interview schedule based on its assessment of the risks of noncompliance with DB posed by contractors or subcontractors and the duration of the contract or subcontract. At a minimum, the funding recipient must conduct interviews with a representative group of covered employees within two weeks of each contractor or subcontractor's submission of its initial weekly payroll data and two weeks prior to the estimated completion date for the contract or subcontract. The funding recipients must conduct more frequent interviews if the initial interviews or other information indicates that there is a risk that the contractor or subcontractor is not complying with DB. The funding recipients shall immediately conduct necessary interviews in response to an alleged violation of the prevailing wage requirements. All interviews shall be conducted in confidence.
- 3) The funding recipient shall periodically conduct spot checks of a representative sample of weekly payroll data to verify that contractors or subcontractors are paying the appropriate wage rates. The funding recipient shall establish and follow a spot check schedule based on its assessment of the risks of noncompliance with DB posed by contractors or subcontractors and the duration of the contract or subcontract. At a minimum, the funding recipient must spot check payroll data within two weeks of each contractor or subcontractor's submission of its initial payroll data and two weeks prior to the completion date the contract or subcontract. The funding recipients must conduct more frequent spot checks if the initial spot check or other information indicates that there is a risk that the contractor or subcontractor is not complying with DB . In addition, during the examinations the funding recipient shall verify evidence of fringe

benefit plans and payments there under by contractors and subcontractors who claim credit for fringe benefit contributions.

The funding recipient shall periodically review contractors and subcontractors use of apprentices and trainees to verify registration and certification with respect to apprenticeship and training programs approved by either the U.S Department of Labor or a state, as appropriate, and that contractors and subcontractors are not using disproportionate numbers of, laborers, trainees and apprentices. These reviews shall be conducted in accordance with the schedules for spot checks and interviews described in Item 5(b) and (c) above.

The contractor shall submit weekly, for each week in which any contract work is performed, a copy of all payrolls to the funding recipient, that is, the entity that receives the grant or loan from the MDNR. As to each payroll copy received, the funding recipient shall provide written confirmation in a form satisfactory to the MDNR indicating whether or not the project is in compliance with the requirements of 29 CFR 5.5(a)(1) based on the most recent payroll copies for the specified week.

The funding recipients must immediately report potential violations of the DB prevailing wage requirements to the EPA DB contact listed above and to the appropriate DOL Wage and Hour District Office listed at <https://www.dol.gov/esa/contacts/whd/america2.htm>.