

Job No.: J6S1718 J6S1718B J6S1718C  
Route: 100 100 100  
County: St. Louis St. Louis St. Louis

JOB SPECIAL PROVISIONS TABLE OF CONTENTS (ROADWAY)

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 <p>STATE OF MISSOURI        JOHN R.        LANDECK        NUMBER        PE-2013032918        PROFESSIONAL ENGINEER</p> <p>THIS SHEET HAS BEEN        SIGNED, SEALED AND DATED        ELECTRONICALLY</p>	<p><b>MISSOURI HIGHWAYS AND          TRANSPORTATION COMMISSION</b>          105 W. CAPITOL AVE.          JEFFERSON CITY, MO 65102          Phone 1-888-275-6636</p>
	<p><b>THOUVENOT, WADE &amp; MOERCHEN,          INC.</b>          720 Olive Street, Suite 200A          St. Louis, MO 63101          Certificate of Authority: 001528          Consultant Phone: 314-241-6300</p>
	<p>If a seal is present on this sheet, JSP's          have been electronically sealed and          dated.</p>
	<p>JOB NUMBER: J6S1718, J6S1718B,          and J6S1718C          ST. LOUIS COUNTY, MO          DATE PREPARED: 03/01/2021</p>
	<p>ADDENDUM DATE:</p>
<p>Only the following items of the Job Special Provisions (Roadway) are          authenticated by this seal: R-A. thru R-TT and R-BBB.</p>	

 <p>STATE OF MISSOURI        MATTHEW J.        JOOST        NUMBER        PE-2011007468        PROFESSIONAL ENGINEER</p> <p>THIS SHEET HAS BEEN        SIGNED, SEALED AND DATED        ELECTRONICALLY</p>	<p><b>MISSOURI HIGHWAYS AND          TRANSPORTATION COMMISSION</b>          105 W. CAPITOL AVE.          JEFFERSON CITY, MO 65102          Phone 1-888-275-6636</p>
	<p><b>THOUVENOT, WADE &amp; MOERCHEN,          INC.</b>          720 Olive Street, Suite 200A          St. Louis, MO 63101          Certificate of Authority: 001528          Consultant Phone: 314-241-6300</p>
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	<p>ADDENDUM DATE:</p>
<p>Only the following items of the Job Special Provisions (Roadway) are          authenticated by this seal: R-UU. thru R-AAA.</p>	

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JOB  
SPECIAL PROVISION  
(ROADWAY)

R-A. General - Federal JSP-09-02F

**1.0 Description.** The Federal Government is participating in the cost of construction of this project. All applicable Federal laws, and the regulations made pursuant to such laws, shall be observed by the contractor, and the work will be subject to the inspection of the appropriate Federal Agency in the same manner as provided in Sec 105.10 of the Missouri Standard Specifications for Highway Construction with all revisions applicable to this bid and contract.

**1.1** This contract requires payment of the prevailing hourly rate of wages for each craft or type of work required to execute the contract as determined by the Missouri Department of Labor and Industrial Relations and requires adherence to a schedule of minimum wages as determined by the United States Department of Labor. For work performed anywhere on this project, the contractor and the contractor's subcontractors shall pay the higher of these two applicable wage rates. State Wage Rates, Information on the Required Federal Aid Provisions, and the current Federal Wage Rates are available on the Missouri Department of Transportation web page at [www.modot.org](http://www.modot.org) under "Doing Business with MoDOT", "Contractor Resources". Effective Wage Rates will be posted 10 days prior to the applicable bid opening. These supplemental bidding documents have important legal consequences. It shall be conclusively presumed that they are in the bidder's possession, and they have been reviewed and used by the bidder in the preparation of any bid submitted on this project.

**1.2** The following documents are available on the Missouri Department of Transportation web page at [www.modot.org](http://www.modot.org) under "Doing Business with MoDOT"; "Standards and Specifications". The effective version shall be determined by the letting date of the project.

General Provisions & Supplemental Specifications

Supplemental Plans to July 2020 Missouri Standard Plans  
For Highway Construction

These supplemental bidding documents contain all current revisions to the published versions and have important legal consequences. It shall be conclusively presumed that they are in the bidder's possession, and they have been reviewed and used by the bidder in the preparation of any bid submitted on this project.

R-B. Contract Liquidated Damages JSP-13-01B

**1.0 Description.** Liquidated Damages for failure or delay in completing the work on time for this contract shall be in accordance with Sec 108.8. The liquidated damages include separate amounts for road user costs and contract administrative costs incurred by the Commission.

**2.0 Period of Performance.** Prosecution of work is expected to begin on the date specified below in accordance with Sec 108.2. Regardless of when the work is begun on this contract, all

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work shall be completed on or before the date specified below. Completion by this date shall be in accordance with the requirements of Sec 108.7.1.

Early Notice to Proceed (Demo work): July 26, 2021  
 Notice to Proceed: August 9, 2021  
 Completion Date: July 1, 2023

**2.1 Calendar Days.** The count of calendar days will begin on the date the contractor starts any construction operations on the project.

Job Number	Calendar Days	Daily Road User Cost
J6S1718	N/A	\$7,600
J6S1718B	N/A	\$7,600
J6S1718C	N/A	\$7,600

**3.0 Liquidated Damages for Contract Administrative Costs.** Should the contractor fail to complete the work on or before the completion date specified in Section 2.0, or within the number of calendar days specified in Section 2.1, whichever occurs first, the contractor will be charged contract administrative liquidated damages in accordance with Sec 108.8 in the amount of **\$3,000** per calendar day for each calendar day, or partial day thereof, that the work is not fully completed. For projects in combination, these damages will be charged in full for failure to complete one or more projects within the above specified completion date or calendar days.

**4.0 Liquidated Damages for Road User Costs.** Should the contractor fail to complete the work on or before the completion date specified in Section 2.0, or within the number of calendar days specified in Section 2.1, whichever occurs first, the contractor will be charged road user costs in accordance with Sec 108.8 in the amount specified in Section 2.1 for each calendar day, or partial day thereof, that the work is not fully completed. These damages are in addition to the contract administrative damages and any other damages as specified elsewhere in this contract.

R-C. Early Notice to Proceed (Demo Work) – Job J6S1718B Only

**1.0** The requirement in Sec 103.5 of the Missouri Standard Specifications for Highway Construction that the contractor "shall return the prescribed copies of the contract and bond, properly executed, to the office of the Commission within 15 days after the unexecuted contract has been mailed to the bidder" is waived for this project.

**1.1** Instead, the contractor shall return the prescribed copies of the contract and bond, properly executed, to the office of the Commission prior to the Early Notice to Proceed (Demo Work) Date found in the Job Special Provisions.

**1.1.1** This Early Notice to Proceed shall only apply to the work necessary to perform the demolition work prescribed at 2702 Mary Avenue. The contractor shall have 21 days to perform this work and shall be subject to the Liquidated Damages as specified in the "Liquidated Damages Specified" JSP.

**1.2** All other provisions in Sec 103.5 et seq. of the Missouri Standard Specifications for Highway Construction shall remain in full force and effect, and shall continue to govern the contractor and its subcontractors.

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R-D. Emergency Provisions and Incident Management JSP-90-11

**1.0** The contractor shall have communication equipment on the construction site or immediate access to other communication systems to request assistance from the police or other emergency agencies for incident management. In case of traffic accidents or the need for police to direct or restore traffic flow through the job site, the contractor shall notify police or other emergency agencies immediately as needed. The area engineer's office shall also be notified when the contractor requests emergency assistance.

**2.0** In addition to the 911 emergency telephone number for ambulance, fire or police services, the following agencies may also be notified for accident or emergency situation within the project limits.

Missouri State Highway Patrol – Troop C Office 891 Technology Drive Weldon Spring, MO 63304 (636) 300-2800	
St. Louis County Police Department Central County Precinct (2nd) 1333 Ashby Road St. Louis, MO 63132 (314) 615-0111	
MoDOT Transportation Management Center (TMC) 14301 S. Outer Forty Road Chesterfield, MO 63017 (314) 275-1500	
<b>City of Maplewood – J6S1718</b>	
<b>Police</b>	<b>Fire / EMS</b>
Maplewood Police Department 7601 Manchester Road Maplewood, MO 63143 (314) 645-3000	Maplewood Fire Department 7601 Manchester Road Maplewood, MO 63143 (314) 646-3666
<b>City of Brentwood – J6S1718B</b>	
<b>Police</b>	<b>Fire / EMS</b>
Brentwood Police Department 272 Hanley Industrial Court Brentwood, MO 63144 (314) 644-7100	Brentwood Fire Department 8756 Eulalie Avenue Brentwood, MO 63144 (314) 963-8612
<b>City of Rock Hill – J6S1718</b>	
<b>Police</b>	<b>Fire / EMS</b>
Rock Hill Police Department 827 N. Rock Hill Road Rock Hill, MO 63119 (314) 962-6600	Rock Hill Fire Department 827 N. Rock Hill Road Rock Hill, MO 63119 (314) 962-6254
<b>City of Glendale – J6S1718</b>	

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<b>Police</b>	<b>Fire / EMS</b>
Glendale Police Department 424 N. Sappington Road Glendale, MO 63122 (314) 965-0000	Glendale Fire Department 424 N. Sappington Road Glendale, MO 63122 (314) 965-7097
<b>City of Warson Woods – J6S1718</b>	
<b>Police</b>	<b>Fire / EMS</b>
Warson Woods Police Department 10015 Manchester Road Warson Woods, MO 63122 (314) 965-1131	Glendale Fire Department 424 N. Sappington Road Glendale, MO 63122 (314) 965-7097
<b>City of Kirkwood – J6S1718C</b>	
<b>Police</b>	<b>Fire / EMS</b>
Kirkwood Police Department 131 W. Madison Avenue Kirkwood, MO 63122 (314) 822-5858	Kirkwood Fire / Rescue 137 W. Argonne Drive Kirkwood, MO 63122 (314) 822-5883

**2.1** This list is not all inclusive. Notification of the need for wrecker or tow truck services will remain the responsibility of the appropriate police agency.

**2.2** The contractor shall notify enforcement and emergency agencies before the start of construction to request their cooperation and to provide coordination of services when emergencies arise during the construction at the project site. When the contractor completes this notification with enforcement and emergency agencies, a report shall be furnished to the engineer on the status of incident management.

**3.0** No direct pay will be made to the contractor to recover the cost of the communication equipment, labor, materials or time required to fulfill the above provisions.

R-E. Project Contact for Contractor/Bidder Questions JSP-96-05

All questions concerning this project during the bidding process shall be forwarded to the project contact listed below.

Stuart McNeil, PE, Project Contact  
MoDOT St. Louis District  
Project Manager  
1590 Woodlake Drive  
Chesterfield, MO 63017

Telephone Number: (314) 453-5042  
Email: [Stuart.McNeil@modot.mo.gov](mailto:Stuart.McNeil@modot.mo.gov)

All questions concerning the bid document preparation can be directed to the Central Office – Design at (573) 751-2876.

R-F. Liquidated Damages Specified

**1.0 Description.**

**1.1 Black Creek Bridge Reconstruction.** The contractor shall be permitted a full closure (all lanes) of Route 100 for a period of no more than 120 consecutive calendar days. This closure shall only be permitted from May to August of 2022.

**1.1.1** If the Black Creek Bridge Reconstruction is not complete and open to traffic prior to the end of the 120 consecutive calendar day closure period, the Commission, the traveling public, and state and local police and governmental authorities will be damaged in various ways, including but not limited to, increased construction administration cost, potential liability, traffic and traffic flow regulation cost, traffic congestion and motorist delay, with its resulting cost to the traveling public. These damages are not reasonably capable of being computed or quantified. Therefore, the contractor will be charged with liquidated damages specified in the amount of \$11,500.00 per day for each full day that the Black Creek Bridge Reconstruction is not complete and open to traffic in excess of the limitation as specified elsewhere in this special provision. It shall be the responsibility of the engineer to determine the quantity of excess closure time.

**1.2 Pedestrian Underpass at Mary Avenue Work.** The contractor shall be permitted a partial closure of Route 100 for a period of no more than 120 consecutive calendar days. This closure shall only be permitted from May to August of 2022. For the purposes of this item of work, partial closure shall be defined as one lane closed in each direction of Route 100.

**1.2.1** If the Pedestrian Underpass at Mary Avenue Work is not complete and open to traffic prior to the end of the 120 consecutive calendar day partial closure period, the Commission, the traveling public, and state and local police and governmental authorities will be damaged in various ways, including but not limited to, increased construction administration cost, potential liability, traffic and traffic flow regulation cost, traffic congestion and motorist delay, with its resulting cost to the traveling public. These damages are not reasonably capable of being computed or quantified. Therefore, the contractor will be charged with liquidated damages specified in the amount of \$1,000.00 per day for each full day that the Pedestrian Underpass at Mary Avenue Work is not complete and open to traffic in excess of the limitation as specified elsewhere in this special provision. It shall be the responsibility of the engineer to determine the quantity of excess closure time.

**1.3 Deer Creek Bridge Rehabilitation.** The contractor shall be permitted a partial closure of Route 100 for a period of no more than 42 consecutive calendar days. This closure shall only be permitted from May to August of 2022. For the purposes of this item of work, partial closure shall be defined as one lane closed in each direction of Route 100.

**1.3.1** If the Deer Creek Bridge Rehabilitation is not complete and open to traffic prior to the end of the 42 consecutive calendar day partial closure period, the Commission, the traveling public, and state and local police and governmental authorities will be damaged in various ways, including but not limited to, increased construction administration cost, potential liability, traffic and traffic flow regulation cost, traffic congestion and motorist delay, with its resulting cost to the traveling public. These damages are not reasonably capable of being computed or quantified. Therefore, the contractor will be charged with liquidated damages specified in the amount of \$1,000.00 per day for each full day that the Deer Creek Bridge Rehabilitation is not complete and

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open to traffic in excess of the limitation as specified elsewhere in this special provision. It shall be the responsibility of the engineer to determine the quantity of excess closure time.

**1.4 Demolition Work for 2702 Mary Avenue.** The contractor shall be granted early Notice to Proceed to complete this work, as noted in the “Early Notice to Proceed (Demo Work) – Job J6S1718B Only” JSP, and shall be completed within 21 consecutive calendar days from the early Notice to Proceed date.

**1.4.1** If the Demolition Work for 2702 Mary Avenue is not complete and earthwork restored to acceptable condition in accordance with Sec 202 prior to the end of the 21 consecutive calendar day period, the Commission, the traveling public, and state and local police and governmental authorities will be damaged in various ways, including but not limited to, increased construction administration cost, potential liability, traffic and traffic flow regulation cost, traffic congestion and motorist delay, with its resulting cost to the traveling public. These damages are not reasonably capable of being computed or quantified. Therefore, the contractor will be charged with liquidated damages specified in the amount of \$1,000.00 per day for each full day that the Demolition Work for 2702 Mary Avenue is not complete in excess of the limitation as specified elsewhere in this special provision. It shall be the responsibility of the engineer to determine the quantity of excess completion time.

**1.5** If the Construction Work on the Millman Lumber Company Property (Parcels 121, 122, 123, and 133) is not complete and open to traffic prior to the end of the 14 consecutive calendar day construction work period, the Commission, the traveling public, and state and local police and governmental authorities will be damaged in various ways, including but not limited to, increased construction administration cost, potential liability, traffic and traffic flow regulation cost, traffic congestion and motorist delay, with its resulting cost to the traveling public. These damages are not reasonably capable of being computed or quantified. Therefore, the contractor will be charged with liquidated damages specified in the amount of \$1,500.00 per day for each full day that the Construction Work on the Millman Lumber Company Property (Parcels 121, 122, 123, and 133) is not complete and open to traffic in excess of the limitation as specified elsewhere in this special provision. It shall be the responsibility of the engineer to determine the quantity of excess closure time.

**1.6** The said liquidated damages specified for the items of work noted above will be assessed regardless of whether it would otherwise be charged as liquidated damages under the Missouri Standard Specification for Highway Construction, as amended elsewhere in this contract.

R-G. Liquidated Damages for Winter Months JSP-04-17

**1.0 Description.** Revise Sec 108.8.1.3 (a) and (b) and substitute the following for the project:

- (a) Liquidated damages will be assessed from December 15 to March 15
- (b) Liquidated damages will be assessed for Saturdays, Sundays and Holidays.

R-H. Winter Months Requirements JSP-15-07A

**1.0 Description.** This project contains work which spans the winter months.

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**2.0 Work to be Completed.** When the contractor ceases operations for the winter months, any paving operation performed by the contractor shall not result in a lane height differential between adjacent lanes.

**3.0 Maintenance of Pavement Marking.** Prior to ceasing operations for winter months, a permanent or temporary stripe shall be provided on any completed length to the point that the original stripe was obliterated or obscured by the contractor's operation. Temporary striped areas shall be re-striped with the remaining route upon performance of the final striping.

**4.0 Winter Related Maintenance Activities.** The contractor shall have the project in a condition as not to interfere with the plowing of snow. The contractor shall also provide a taper at the end of his paving that will not be damaged by the plowing of snow.

**5.0 Basis of Payment.** There will be no direct pay for compliance with this provision.

R-I. Contractor Quality Control NJSP-15-42

**1.0** The contractor shall perform Quality Control (QC) testing in accordance with the specifications and as specified herein. The contractor shall submit a Quality Control Plan (QC Plan) to the engineer for approval that includes all items listed in Section 2.0, prior to beginning work.

**2.0 Quality Control Plan.**

- (a) The name and contact information of the person in responsible charge of the QC testing.
- (b) A list of the QC technicians who will perform testing on the project, including the fields in which they are certified to perform testing.
- (c) A proposed independent third party testing firm for dispute resolution, including all contact information.
- (d) A list of Hold Points, when specified by the engineer.
- (e) The MoDOT Standard Inspection and Testing Plan (ITP). This shall be the version that is posted at the time of bid on the MoDOT website ([www.modot.org/quality](http://www.modot.org/quality)).

**3.0 Quality Control Testing and Reporting.** Testing shall be performed per the test method and frequency specified in the ITP. All personnel who perform sampling or testing shall be certified in the MoDOT Technician Certification Program for each test that they perform.

**3.1 Reporting of Test Results.** All QC test reports shall be submitted as soon as practical, but no later than the day following the test. Test data shall be immediately provided to the engineer upon request at any time, including prior to the submission of the test report. No payment will be made for the work performed until acceptable QC test results have been received by the engineer and confirmed by QA test results.

**3.1.1** Test results shall be reported on electronic forms provided by MoDOT. Forms and Contractor Reporting Excel2Oracle Reports (CRE2O) can be found on the MoDOT website. All required forms, reports and material certifications shall be uploaded to a Microsoft SharePoint® site provided by MoDOT, and organized in the file structure established by MoDOT.

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**3.2 Non-Conformance Reporting.** A Non-Conformance Report (NCR) shall be submitted by the contractor when the contractor proposes to incorporate material into the work that does not meet the testing requirements or for any work that does not comply with the contract terms or specifications.

**3.2.1** Non-Conformance Reporting shall be submitted electronically on the Non-Conformance Report form provided on the MoDOT Website. The NCR shall be uploaded to the MoDOT SharePoint® site and an email notification sent to the engineer.

**3.2.2** The contractor shall propose a resolution to the non-conforming material or work. Acceptance of a resolution by the engineer is required before closure of the non-conformance report.

#### **4.0 Work Planning and Scheduling.**

**4.1 Two-week Schedule.** Each week, the contractor shall submit to the engineer a schedule that outlines the planned project activities for the following two-week period. The two-week schedule shall detail all work and traffic control events planned for that period and any Hold Points specified by the engineer.

**4.2 Weekly Meeting.** When work is active, the contractor shall hold a weekly project meeting with the engineer to review the planned activities for the following week and to resolve any outstanding issues. Attendees shall include the engineer, the contractor superintendent or project manager and any foreman leading major activities. This meeting may be waived when, in the opinion of the engineer, a meeting is not necessary. Attendees may join the meeting in person, by phone or video conference.

**4.3 Pre-Activity Meeting.** A pre-activity meeting is required in advance of the start of each new activity, except when waived by the engineer. The purpose of this meeting is to review construction details of the new activity. At a minimum, the discussion topics shall include: safety precautions, QC testing, traffic impacts, and any required Hold Points. Attendees shall include the engineer, the contractor superintendent and the foreman who will be leading the new activity. Pre-activity meetings may be held in conjunction with the weekly project meeting.

**4.4 Hold Points.** Hold Points are events that require approval by the engineer prior to continuation of work. Hold Points occur at definable stages of work when, in the opinion of the engineer, a review of the preceding work is necessary before continuation to the next stage.

**4.4.1** A list of typical Hold Point events is available on the MoDOT website. Use of the Hold Point process will only be required for the project-specific list of Hold Points, if any, that the engineer submits to the contractor in advance of the work. The engineer may make changes to the Hold Point list at any time.

**4.4.2** Prior to all Hold Point inspections, the contractor shall verify the work has been completed in accordance with the contract and specifications. If the engineer identifies any corrective actions needed during a Hold Point inspection, the corrections shall be completed prior to continuing work. The engineer may require a new Hold Point to be scheduled if the corrections require a follow-up inspection. Re-scheduling of Hold Points require a minimum 24-hour advance notification from the contractor unless otherwise allowed by the engineer.

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**5.0 Quality Assurance Testing and Inspection.** MoDOT will perform quality assurance testing and inspection of the work, except as specified herein. The contractor shall utilize the inspection checklists provided in the ITP as a guide to minimize findings by MoDOT inspection staff. Submittal of completed checklists is not required, except as specified in 5.1.

**5.1** Inspection and testing required in the production of concrete for the project shall be the responsibility of the contractor. Submittal of the 501 Concrete Plant Checklist is required.

**6.0 Basis of Payment.** No direct payment will be made for compliance with this provision.

R-J. MoDOT's Construction Workforce Program NJSP-15-17A

### **1.0 Description.**

**1.1** Projects utilizing federal funds include contract provisions for minority and female workforce utilization in the various trade crafts used to complete construction contracts. These federal contract workforce goals are described in the section labeled "Notice of Requirement for Affirmative Action to Ensure Equal Employment Opportunity". These goals are included in all MoDOT federal aid contracts and are under the authorization and enforcement of the U.S. Department of Labor (US DOL).

**1.2** The Federal workforce requirement (Goals – TABLE 1) is authorized in 41 CFR Part 60-4 and Executive Order 11246 which set Equal Employment Opportunity goals with Affirmative Action requirements.

**1.3** The required federal aid workforce provisions noted above, coupled with the following additional contract provisions, constitute MoDOT's Construction Workforce Program herein called Program.

**1.4** This provision does not require pre-qualification nor is it a condition of award.

**1.5** The Program does not eliminate or limit any actions the US DOL may take in relation to this contract's federal provisions.

**1.6** The Program goals included in the contract are separate from any Disadvantaged Business Enterprise (DBE) or On-The-Job (OJT) training provision that may be included as contract provisions. DBE and OJT goals may or may not be included in a contract based on the individual size of contracts, type of contract work, anticipated length of contract, available and willing resources or other reasons.

**1.7** Contractor, for the purpose of this provision, means the prime contractor and any and all subcontractors.

**1.8** It is expected that the contractor recognizes the construction workforce goals for both minority and female workers in the project's county and make efforts to attain those goals, if possible, through the existing workforce makeup of the prime (including subcontractors) that will be on the project and/or through hiring opportunities that may arise for the project. However, it is not the intent of this provision to compel any contractor to displace existing workforce or move workers around to just meet the workforce goals.

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**1.9** If the contractor's existing Missouri construction workforce meets or exceeds the federal workforce goals established in Table 1, then the OJT goal (Training Provision) if included in the contract, does not be apply.

**1.10 Contractor's Workforce Plan.** The Contractor shall submit its Workforce Plan a minimum of 1 week before construction starts. One plan shall be submitted for the project that shall include the cumulative planned workforce of the prime and subcontractor(s). The contractor shall prepare the plan, for total minority and female utilization, regardless of the craft. The Engineer will provide the Contractor with comments regarding their Workforce Plan prior to the start of construction. Once work starts, all monthly reporting shall include the craft of each worker reported. If the contractor's plan includes project manager, direct project support roles, project testers or other project professionals, these designations should also be included in addition to the workers designated by craft such as laborer, operator, carpenter, ironworker and others.

**1.11** The plan accepted by the engineer before the start of construction will be the effort expected of the prime contractor to maintain during the life of the project.

**1.12** If the contractors planned project workforce plan (including OJT hours if included in the contract) is short of the goals included in Table 1, there is opportunity for the contractor to receive a reimbursement of \$10.00 / hour for any new project minority and female hires needed through the remainder of the project. The reimbursement is applicable to work that qualifies for prevailing wage under the federal Davis-Bacon Act, 40 U.S.C. §§ 3141–3148, in accordance with an approved workforce plan. Any reimbursement must be pre-approved by the Engineer. The reimbursement is provided as a remedy to the contractor and as an aid in the long-term growth of experienced persons in the building of roads and bridges in Missouri. The contractor shall manage the plan through the life of the project as described in the plan or as modified, in coordination with the Engineer. The total amount available per project is not capped.

**1.13** The Contractor's workforce plan may include existing construction support and professional services staff.

**2.0 Forms and Documentation.** The bidder must submit the following documents if awarded the contract:

**Cumulative Workforce Utilization Reports.** This report is contract specific. One report shall be submitted to the Engineer by the 15<sup>th</sup> of each month. The report will be used to report the total workforce compliance data for the prime contractor and all subcontractors retained by the contractor on the Commission's construction contract. The reporting shall include the workforce hours per each craft broken down by gender and ethnicity. Construction Support, testing and other professional services hours shall be included as these hours are part of the overall plan. The report will include the previous month's hours worked for the project. For projects less than 60 days in length, only one report with total hours worked by classification is required at substantial completion of construction.

**3.0 Methods for Securing Workforce Participation and Good Faith Efforts.**

**3.1** By submitting a bid, the Bidder agrees, as a material term of the contract, to carry out MoDOT's Construction Workforce Program by making good-faith efforts to utilize minority and female workers on the contractor's job sites to the fullest extent consistent with submitting the

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lowest bid to MoDOT. The Bidder shall agree that the Program is incorporated into this document and agree to follow the Program. If a bidder is unable to meet the workforce goals at the time of bid, it shall be required to objectively demonstrate to MoDOT that the goals have been met or demonstrate a good faith effort has been made with the level of effort submitted prior to the start of construction.

**3.2** The Engineer, through consultation with MoDOT's External Civil Rights (ECR's) Division, may determine that the contractor has demonstrated that good-faith efforts to secure minority and female participation have been made.

**3.3** In evaluating good-faith efforts, the ECR's Division will take into consideration the affirmative actions listed in the Federal Provisions (including provisions of Executive Order 11246).

**3.4** MoDOT's Program allows the contractor flexibility to implement a project specific workforce and improve the diversity of their existing workforce that can be utilized across various areas of the state to meet future MoDOT Program goals and Federal Provisions.

**3.5** If the contractor's approved plan changes during the project and/or the available workforce changes from what is approved at any time, it is the contractor's responsibility to remedy, in coordination with MoDOT's ECR Division, the conditions as outlined and made available through this provision.

**4.0 Compliance Determination. (Required with project closeout)** All documentation and on-site information will be reviewed by MoDOT's ECR Division in making a determination of whether the contractor made sufficient good faith efforts to meet the compliance with MoDOT's Construction Workforce Program.

**5.0 Liquidated Damages.** If the contractor elects to not submit a workforce plan prior to work starting or fails to fulfill their workforce plan committed to prior to the start of construction, the contractor will be required to establish a good-faith effort determination, as to why either of these events occurred. MoDOT may sustain damages, the exact extent of which would be difficult or impossible to ascertain, as this impacts the cost of future road and bridge construction. Therefore, in order to liquidate those damages, MoDOT shall be entitled, at its sole discretion, to deduct and withhold the following amounts: **The sum of one thousand five hundred (\$1,500)**

**6.0 Administrative Reconsideration.** The contractor shall be offered the opportunity for administrative reconsideration upon written request related to findings and/or actions determined by MoDOT's ECR's Division. The Administrative Reconsideration Committee shall be composed of individuals not involved in the original MoDOT determination(s).

**7.0 Available Pre-Apprentice Training Programs.** The Commission has established a labor force recruiting program intended to assist contractors in identifying, interviewing and hiring qualified job applicants. MoDOT strongly encourages the hiring of individuals from the MoDOT funded pre-apprentice training programs.

**8.0 Independent Third-Party Compliance Monitor (Monitor).** MoDOT may utilize a monitor that will be responsible for tracking the project's workforce utilization for the information the contractor submits. The contractor and its subcontractors shall allow the monitor access to their reports, be available to answer the monitor's questions and allow the monitor to access to the site and to contractor and subcontractor employees. The monitor shall abide by the contractor's

project site protocols.

**9.0 Regional Diversity Council (Council).** (Applicable to the Kansas City and St. Louis District regions only) The Council shall consist of local community leaders, leadership of local construction trades, MoDOT staff, Industry representation, and a representative(s) from the Federal Highway Administration. The Council will meet quarterly and evaluate the workforce activity per each project according to the following criteria:

- a. Review monthly workforce reports.
- b. Review progress toward the stated project workforce program.
- c. Review findings of Administrative Reconsideration hearings.
- d. Recommend *other* workforce actions to MoDOT.

**10.0 Federal Workforce Goals.**

Female Participation for Each Trade is 6.9% Statewide for Missouri.

Minority Participation for Each Trade is shown below in Table 1.

**TABLE 1:**

<b>County</b>	<b>Goal (Percent)</b>	<b>County</b>	<b>Goal (Percent)</b>
Adair	4	Linn	4
Andrew	3.2	Livingston	10
Atchison	10	McDonald	2.3
Audrain	4	Macon	4
Barry	2.3	Madison	11.4
Barton	2.3	Maries	11.4
Bates	10	Marion	3.1
Benton	10	Mercer	10
Bollinger	11.4	Miller	4
Boone	6.3	Mississippi	11.4
Buchanan	3.2	Moniteau	4
Butler	11.4	Monroe	4
Caldwell	10	Montgomery	11.4
Callaway	4	Morgan	4
Camden	4	New Madrid	26.5
Cape Girardeau	11.4	Newton	2.3
Carroll	10	Nodaway	10
Carter	11.4	Oregon	2.3
Cass	12.7	Osage	4
Cedar	2.3	Ozark	2.3
Chariton	4	Pemiscot	26.5
Christian	2	Perry	11.4
Clark	3.4	Pettis	10
Clay	12.7	Phelps	11.4
Clinton	10	Pike	3.1
Cole	4	Platte	12.7
Cooper	4	Polk	2.3
Crawford	11.4	Pulaski	2.3
Dade	2.3	Putnam	4

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Dallas	2.3	Ralls	3.1
Daviess	10	Randolph	4
DeKalb	10	Ray	12.7
Dent	11.4	Reynolds	11.4
Douglas	2.3	Ripley	11.4
Dunklin	26.5	St. Charles	14.7
Franklin	14.7	St. Clair	2.3
Gasconade	11.4	St. Francois	11.4
Gentry	10	Ste. Genevieve	11.4
Greene	2	St. Louis City	14.7
Grundy	10	St. Louis County	14.7
Harrison	10	Saline	10
Henry	10	Schuyler	4
Hickory	2.3	Scotland	4
Holt	10	Scott	11.4
Howard	4	Shannon	2.3
Howell	2.3	Shelby	4
Iron	11.4	Stoddard	11.4
Jackson	12.7	Stone	2.3
Jasper	2.3	Sullivan	4
Jefferson	14.7	Taney	2.3
Johnson	10	Texas	2.3
Knox	4	Vernon	2.3
Laclede	2.3	Warren	11.4
Lafayette	10	Washington	11.4
Lawrence	2.3	Wayne	11.4
Lewis	3.1	Webster	2.3
Lincoln	11.4	Worth	10
		Wright	2.3

**STANDARD FEDERAL EQUAL EMPLOYMENT OPPORTUNITY CONSTRUCTION  
 CONTRACT SPECIFICATIONS (EXECUTIVE ORDER 11246)**

This contractor and subcontractor shall abide by the requirements of 41 CFR 60-1.4(a), 60-300.5(a) and 60-741.5(a). These regulations prohibit discrimination against qualified individuals based on their status as protected veterans or individuals with disabilities, and prohibit discrimination against all individuals based on their race, color, religion, sex, sexual orientation, gender identity or national origin. Moreover, these regulations require that covered prime contractors and subcontractors take affirmative action to employ and advance in employment individuals without regard to race, color, religion, sex, sexual orientation, gender identity, national origin, disability or veteran status.

As used in these specifications:

"Minority" includes;

- (i) Black (all person 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

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- (iii) American or other Spanish Culture or origin, regardless of race);  
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 American and maintaining identifiable tribal affiliations through membership and participation or community identification).

R-K. Notice to Bidders of Third Party Concurrence in Award JSP-98-19 – Job J6S1718B Only

**1.0** Bidders are advised that Commission is party to a contract with the City of Brentwood which provides that the City of Brentwood shall provide substantial funds for construction of Job No. J6S1718B by reason of which the City of Brentwood has the right to concur or not concur in Commission's award of a contract for this job.

**2.0** Bidders acknowledge that their bids are made with knowledge of and subject to the condition of the City of Brentwood concurrence in and prior authorization of any award of a contract for this job by Commission.

**3.0** Bidders agree that they shall be estopped, both in law and equity, to assert any right to award of a contract for this job by Commission should the City of Brentwood not concur in that award for any reason.

R-L. Notice to Bidders of Third Party Concurrence in Award JSP-98-19 – Job J6S1718C Only

**1.0** Bidders are advised that Commission is party to a contract with the City of Kirkwood which provides that the City of Kirkwood shall provide substantial funds for construction of Job No. J6S1718C by reason of which the City of Kirkwood has the right to concur or not concur in Commission's award of a contract for this job.

**2.0** Bidders acknowledge that their bids are made with knowledge of and subject to the condition of the City of Kirkwood concurrence in and prior authorization of any award of a contract for this job by Commission.

**3.0** Bidders agree that they shall be estopped, both in law and equity, to assert any right to award of a contract for this job by Commission should the City of Kirkwood not concur in that award for any reason.

R-M. Site Restoration

**1.0 Description.** Restore to its original condition any disturbed area at sites including, but not limited to, guardrail, pull box, conduit, pole base installations, and work to ADA facilities. Restoration shall be accomplished by placing material equivalent to that of the adjacent undisturbed area. Disturbed unpaved areas shall be fertilized and either seeded and mulched or sodded as directed by the engineer. The engineer will have the final authority in determining the acceptability of the restoration work.

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**2.0** If the contractor elects and receives approval from the engineer for alternate trench and/or pull box locations, any areas of concrete slope protection, sidewalk, pavement, shoulders, islands and medians – as well as any similar improvements consisting of asphaltic concrete materials – removed in conjunction with their construction shall be replaced with improvements of similar composition and thickness. Removals shall be achieved by means of full depth saw cuts; the resulting subgrade compacted to minimum density requirements and topped with 4 inches of compacted aggregate base course prior to replacement of surface materials. Concrete materials, used in replacement, shall be approved by the engineer. A commercial asphalt mix may be used for replacement of asphaltic surfacing upon approval of the engineer.

**2.1** Unless quantities and pay items for removal and subsequent replacement of improvements are contained in the plans for a specific location of removal work, no direct payment will be made for full depth saw cutting, and the removal and subsequent replacement of asphalt or concrete slope protection, sidewalk, pavement, shoulders, islands, medians, sod and the required dowel and tie bars removed and replaced by the contractor as a result of his election to vary the location of conduit runs and pull boxes. This work will be considered as included in the various unit bid prices for conduit and pull boxes established in the contract, and no additional payment will be made.

**2.2** Sidewalks and curb ramps that are disturbed as described in this provision shall be replaced to meet current ADA standards.

**2.2.1** Seed and mulch will not be an acceptable means to reestablish grass in disturbed areas adjacent to ADA facilities constructed with this project. Any grassy areas around these facilities that have been disturbed by the contractor in order to construct ADA compliant facilities shall be replaced with sod in accordance with Sec 808. For locations where an existing ADA facility is removed and replaced on a new, accessible alignment, the old alignment shall have the subgrade appropriately prepared and sod shall be installed at the surface.

**2.3** Areas that are used by the contractor for jobsite trailers, equipment and materials storage, or used for project staging areas that are disturbed shall be cleaned up and restored to a condition that is both acceptable to the engineer and, at a minimum, equivalent to the existing site condition.

**3.0 Basis of Payment.** The cost of restoration of disturbed areas will be incidental to the unit price of guardrail, pole base, conduit, pull box, and/or ADA facilities. No direct payment will be made for any materials or labor, which is performed under this provision

R-N. Property Owner Notification

**1.0 Description.** It shall be the contractor's responsibility to inform and notify the adjacent property owner 48 hours prior to starting any construction activities that may impact driveway access or occur along the frontage of the property owner's parcel. Notification shall be in written form and include the contractor's contact information, the engineer's contact information, and an estimated schedule of work and the associated impacts.

**2.0 Basis of Payment.** No direct payment will be made to the contractor for the labor, equipment, material, or time required to comply with this provision.

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R-O. Damage to Existing Pavement, Shoulders, Side Roads and Entrances

**1.0 Description.** This work shall consist of repairing any damage to existing pavement, shoulders, side roads, and entrances caused by contractor operations. This shall include, but is not limited to, damage caused by the traffic during contractor operations within the project limits including the work zone signing.

**2.0 Construction Requirements.** Any cracking, gouging or other damage to the existing pavement, shoulders, side roads, or entrances from general construction shall be repaired within twenty-four (24) hours of the time of damage at the contractor's expense. Repair of the damaged pavement, shoulders, side roads, or entrances shall be determined by the engineer.

**3.0 Method of Measurement.** No measurement of damaged pavement or shoulder areas or damaged side roads or entrances as described above shall be made.

**4.0 Basis of Payment.** No payment will be made for repairs to existing pavement, shoulders, side roads or entrances damaged by contractor operations.

R-P. ADA Compliance and Final Acceptance of Constructed Facilities JSP-10-01B

**1.0 Description.** The contractor shall comply with all laws pertaining to the Americans with Disabilities Act (ADA) during construction of pedestrian facilities on public rights of way for this project. An ADA Checklist is provided herein to be utilized by the contractor for verifying compliance with the ADA law. The contractor is expected to familiarize himself with the plans involving pedestrian facilities and the ADA Post Construction Checklist prior to performing the work.

**2.0 ADA Checklist.** The contractor can locate the ADA Checklist form on the Missouri Department of Transportation website:

[www.modot.org/business/contractor\\_resources/forms.htm](http://www.modot.org/business/contractor_resources/forms.htm)

**2.1** The ADA Checklist is intended to be a helpful tool for the contractor to use during the construction of the pedestrian facilities and a basis for the commission's acceptance of work. Prior to work being performed, the contractor shall bring to the engineer's attention any planned work that is in conflict with the design or with the requirement shown in the checklist. Situations may arise where the checklist may not fully address all requirements needed to construct a facility to the full requirements of current ADA law. In those situations, the contractor shall propose a solution to the engineer that is compliant with current ADA law using the following hierarchy of resources: 2010 ADA Standards for Accessible Design, Draft Public Rights of Way Accessibility Guidelines (PROWAG) dated November 23, 2005, MoDOT's Engineering Policy Guidelines (EPG), or a solution approved by the U.S. Access Board.

**2.2** It is encouraged that the contractor monitor the completed sections of the newly constructed pedestrian facilities in attempts to minimize negative impacts that his equipment, subcontractors or general public may have on the work. Completed facilities must comply with the requirements of ADA and the ADA Checklist or have documented reasons for the non-compliant items to remain.

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### **3.0 Coordination of Construction.**

**3.1** Prior to construction and/or closure on an existing pedestrian path of travel, the contractor shall submit a schedule of work to be constructed, which includes location of work performed, the duration of time the contractor expects to impact the facility and an accessible signed pedestrian detour compliant with MUTCD Section 6D that will be used during each stage of construction. This plan shall be submitted to the engineer for review and approval at or prior to the pre-construction conference. Accessible signed detours shall be in place prior to any work being performed that has the effect of closing an existing pedestrian travel way.

**3.2** When consultant survey is included in the contract, the contractor shall use their survey crews to verify that the intended design can be constructed to the full requirements as established in the 2010 ADA Standards. When 2010 ADA Standards do not give sufficient information to construct the contract work, the contractor shall refer to the PROWAG.

**3.3** When consultant survey is not included in the contract, the contractor shall coordinate with the engineer, prior to construction, to determine if additional survey will be required to confirm the designs constructability.

**4.0 Final Acceptance of Work.** The contractor shall provide the completed ADA Checklist to the engineer at the semi-final inspection. ADA improvements require final inspection and compliance with the ADA requirements and the ADA Checklist. Each item listed in the checklist must receive either a "YES" or an "N/A" score. Any item receiving a "NO" will be deemed non-compliant and shall be corrected at the contractor's expense unless deemed otherwise by the engineer. Documentation must be provided about the location of any non-compliant items that are allowed to remain at the end of the construction project. Specific details of the non-compliant items, the ADA requirement that the work was not able to comply with, and the specific reasons that justify the exception are to be included with the completed ADA Checklist provided to the engineer.

**4.1** Slope and grade measurements shall be made using a properly calibrated, 2 foot long, electronic digital level approved by the engineer.

**5.0 Basis of Payment.** The contractor will receive full pay of the contract unit cost for all sidewalk, ramp, curb ramp, median, island, approach work, cross walk striping, APS buttons, pedestrian heads, detectible warning systems and temporary traffic control measures that are completed during the current estimate period as approved by the engineer. Based upon completion of the ADA Checklist, the contractor shall complete any necessary adjustments to items deemed non-compliant as directed by the engineer.

**5.1** No direct payment will be made to the contractor to recover the cost of equipment, labor, materials, or time required to fulfill the above provisions, unless specified elsewhere in the contract documents.

### R-Q. Right of Way Requirements

**1.0 Description.** The Right of Way has been cleared on this project. However, there are some special requirements and conditions that have been agreed to in the negotiation process that the contractor shall adhere to.

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**2.0 Construction Requirements.** All materials and work performed for this item shall be in accordance with applicable Standard Specifications. Please note that the list of special requirements below may not be all inclusive. The contractor shall consult the Right of Way Negotiator's Report for a full detail of any special requirements at each parcel.

**2.1 Business Hours.** A number of parcels within the project require minimal or no disruptions during business hours. If specific business hours are not listed or where multiple tenants share a building, it shall be the responsibility of the contractor to verify the proper business hours with each business/tenant to plan the construction work accordingly. Where listed, business hours included in this JSP are current as of the time of the project's advertisement for bidders. However, business hours are subject to change and actual business hours may vary slightly from those hours listed herein, and may be temporarily adjusted during different times of the year. It shall be the responsibility of the contractor to verify the accuracy of the noted business hours and provide as little disruption as possible during construction operations.

### **3.0 Locations.**

**3.1 Parcel 21 – Sunnen Products Company.** The contractor shall notify the property owner five (5) business days prior to the beginning of any work that will block any portion of their entrance between the hours of 7:00 AM and 4:00 PM.

**3.2 Parcel 37 – Billboard at NW corner of Hanley Road.** The contractor and its sub-contractors, shall not implement or allow the construction, placement, or erection of any structures on the Temporary Construction Easement, or the storage of any objects, or the planting or growth of any landscaping on the TCE, that blocks, obstructs, hinders, or impairs the visibility of any portion of the Billboard, through or over said TCE. The contractor and its subcontractors may make use of the TCE area, including operation of construction equipment or use for working, so long as such use does not block, obstruct, hinder, or impair the visibility of any portion of the advertising surface of the Billboard from adjoining public streets or highways. There shall be no overnight placement or parking of any equipment permitted on the TCE.

**3.3 Parcels 39 and 40 – Foss Swim School.** The contractor shall notify the property owner in writing five (5) business days prior to the beginning of any work on the parcel, and shall cooperate with and regularly update the property owner on all progress and planned construction activities in proximity to the parcel. The contractor shall take care to not disrupt any utility services to the property the contractor's equipment, materials, and operations shall not block or interfere with access to the parcel.

**3.4 Parcel 57 – LK2 Kaim Kisner Studio.** The contractor shall give the property owner at least ten (10) business days' prior written notice of the commencement of any substantial work or repair in the area of the easements. Care shall be taken by the contractor to prevent stormwater runoff to areas outside of the easement. The contractor shall only be permitted to access the easement areas directly off of Manchester Road or adjacent easements on adjacent parcels. The contractor shall not block access to the parcel and all contractor equipment and materials shall be removed from the easement area as soon as practical upon completion of the construction work. All work on this parcel shall be completed prior to December 21, 2023.

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**3.5 Parcel 65 – K. Hall Designs.** All work within the easement needs to be completed during non-business hours. Business Hours for this business are 9:00 AM to 6:00 PM Monday through Saturday and Sunday from 11:00 AM to 5:00 PM.

**3.6 Parcel 67 – 8500 Manchester Road.** The contractor shall not store or stage equipment on the property.

**3.7 Parcel 73 – 8702 Manchester Road.** The contractor will not park vehicles or equipment or store any materials on the asphalt parking lots within this property except for the vehicles, equipment and materials that are actively being used to construct the features directly adjacent to or within the parcel. These features include, but are not limited to, sidewalks, drainage features, utilities, and the reconstruction of entrances and parking lots as shown on the construction plans for Project J6S1718B.

The contractor will only obstruct the use of a maximum of four (4) of the eight (8) parking spaces located within the Temporary Construction Easement at any given time, leaving at least four (4) of the eight (8) parking spaces available at all times during construction.

**3.8 Parcel 80 – 8611 Manchester Road.** This property is adjacent to Parcel 81, which has a building that will be demolished as a part of this project. It shall be the contractor's responsibility to inform and notify the owner of Parcel 80, and the owners of all other properties adjacent to Parcel 81, two (2) weeks prior to starting any demolition activities. Notification shall be in written form and include the contractor's contact information, the engineer's contact information, and an estimated schedule of work and the associated impacts.

**3.9 Parcel 90 – St. Mary Magdalen Church and School.** Temporary fencing shall be provided at the parking and school yard enclosure at this parcel during all periods of active construction operations. Refer to Job Special Provision "72-Inch Temporary Chain Link Fence" for additional details.

**3.10 Parcel 103 – Meineke.** The contractor shall ensure that there is unobstructed access to at least 2 of the 3 bays at all times during business hours. Business hours for this business are defined as Monday through Friday from 7:30 AM to 6:00 PM and Saturday from 7:30 AM to 4:00 PM.

**3.11 Parcel 111 – 9029 Manchester Road.** Due to the narrow width of the entrance at this property, all work shall be performed at night.

**3.12 Parcel 112 – Carl's Drive-In / High School Drive.**

**3.12.1** During construction, the contractor will maintain ingress and egress to the building (front and back) and parking lot (both driveways – Manchester and High School Drive will be completed in half sections, consisting of 4 phases). The contractor will also be required to maintain at least one (1) westbound lane of traffic open on Manchester Road (Route 100) and also one (1) lane open on High School Drive during construction.

**3.12.2** The contractor will install the new parking stalls on the west side of the building on High School Drive prior to any work being done on the property, and the contractor will not be permitted to close the new parking stalls during construction.

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**3.12.3** The temporary construction easement will only be used for active construction purposes. The contractor will not be permitted to stage or store items not directly related to construction on the property. The easements will be not be used for storm sewer construction purposes, and the property will not be used for the installation of the storm sewer line.

**3.12.4 Work Hours.** The contractor will only be allowed to work on the property during non-business hours on Tuesday through Saturday from 8 PM until 11 AM. The business is closed on Sundays and Mondays. During business hours, the contractor will not impede access into and out of the parking lot, front access in and out of the restaurant for customers, or rear access in and out of the building for employees and vendors. The contractor will also not impede access into and out of the parking lot and rear access in and out of the building for employees and vendors during non-business hours.

**3.12.5 Notice Letters and Construction Timeline.** The contractor will provide a written letter with at least 3 days' notice as to when work will begin on the property. Once work begins on the property, the contractor will only be allowed to work on the property for a maximum of 6 months, measured continuously from the start of construction at the property. The contractor will send a second letter to the owners upon completion of the work. All notification letters for Parcel 112 will need to be sent to:

Drive-In Realty, LLC and  
Carl's III, LLC  
Attn: Michael G. Franklin  
4328 Bridgeton Industrial Dr.  
Bridgeton, MO 63044

**3.13 Parcels 121, 122, 123, and 133 – Millman Lumber Company.**

**3.13.1 General Information.** No work shall be performed on this parcel during business hours. Normal business hours are 7:00 a.m. to 5:00 p.m. Monday through Friday and 8:00 a.m. to 12:00 p.m. on Saturday. Additionally, the contractor shall stage their construction operations in a manner that will keep access open at all times during business hours for employees, patrons, and others.

**3.13.2 Property Owner Notification.** The contractor shall provide written notification to the property owner no less than thirty (30) days prior to the start of the project. Additionally, the contractor shall provide written notice to the property owner no less than seven (7) days prior to commencement of work on each of the four parcels.

**3.13.3 Railway (Parcel 121).** The contractor shall not encumber, block, or inhibit the use and service of the railway near the east end of the property, and shall not access or disturb any part of the property to the east of the fence at any time.

**3.13.4 Entrance for Parcel 122.** Work on this entrance shall be completed at one time, and while under construction, the entrance for Parcel 123 shall remain open and free of construction. If at any time the contractor's operations blocks access to Parcel 122, the entrance for Parcel 123 shall be made easily accessible for truck and motor vehicle traffic.

**3.13.5 Parcel 123 Requirements.**

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**3.13.5.1 Entrance for Parcel 123.** Work on this entrance shall be completed at one time, and while under construction, the entrance for Parcel 122 shall remain open and free of construction. If at any time the contractor's operations blocks access to Parcel 123, the entrance for Parcel 122 shall be made easily accessible for truck and motor vehicle traffic.

**3.13.5.2 Parking spots on Parcel 123.** Work operations that disturb parking spots shall be performed outside of business hours nights or on weekends. No parking spots will be affected for more than two (2) days. All parking spots affected for more than this amount of time shall be subject to Liquidated Damages as defined in the "Liquidated Damages Specified" JSP.

### **3.13.6 Parcel 133 Requirements.**

**3.13.6.1 Entrances for Parcel 133.** Work on the eastern entrance to Manchester Road shall be completed at one time, and while under construction, the entrance to the parcel from Rock Hill Industrial Court shall remain open and free of construction. Work on the western entrance to Manchester Road shall be performed half at a time to permit constant access to the parcel. When working on the western entrance to Manchester Road, the eastern entrance to shall remain fully open and free of construction.

**3.13.6.2** The split rail fence on Parcel 133 is to be removed and shall be replaced upon completion for the construction work on the parcel.

**3.13.7 Timing and Damages.** The work on these four parcels shall be timed such that once work begins on each of the parcels, all construction work shall be completed within fourteen (14) days. Failure to complete the work on time for these parcels shall be subject to Liquidated Damages as specified in the "Liquidated Damages Specified" JSP.

**3.14 Parcels 131 and 132 – Trainwreck Saloon.** No work shall be performed on this parcel during business hours. Normal business hours are 11:00 a.m. to 10:00 p.m. Monday through Thursday, 11:00 a.m. to 11:30 p.m. Friday, 11:00 a.m. to 1:00 a.m. Saturday, and 11:00 a.m. to 12:00 a.m. Sunday. Additionally, the contractor shall stage their construction operations in a manner that will keep access to the business's front door (faces Manchester Road) at all times during business hours.

**3.15 Parcel 147 – Stanford Place Apartment Homes.** The contractor will only be permitted to obstruct the use of a maximum of 10 of the 19 parking spaces located within the TCE at any given time, leaving at least 9 of the 19 parking spaces available at all times.

**3.15.1** The existing, privately owned, lights and light poles will be removed by the contractor, in order to complete drainage work. The contractor shall replace the lights and light poles, using the same ones removed, in the same grassy area at the completion of the drainage work. The contractor shall be responsible for safe care, storage and handling of these privately owned lights and light poles during execution of the drainage work. The contractor shall replace any lost or damaged lights and light poles in kind at the contractor's expense.

### **3.16 Parcel 151 – CVS Pharmacy.**

**3.16.1 Notice Letters and Construction Timeline.** The contractor will provide a written letter with at least 5 days' notice as to when work will begin on the property. Once work begins on the property, the contractor work must be completed within one (1) calendar year, measured

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continuously from the start of construction at the property. All notification letters for Parcel 151 will need to be sent to:

MISSOURI CVS PHARMACY, L.L.C.  
c/o CVS Health Corporation  
One CVS Drive  
Woonsocket, RI 02896  
Attention: Property Administration, CVS Store No. 8248

**3.16.2** No parking of trucks or equipment will be permitted within the easement area.

**3.17 Parcel 158 – RSI Kitchen & Bath.** The contractor shall construct all entrances on this parcel ½ at a time.

**3.18 Parcel 168 – Signature Kitchen & Bath.** The contractor shall reinstall the parking curb in the first parking stall after work is completed on the property. The contractor shall not disturb the sign or curbing around the sign on the property. Should either the curb or sign be disturbed by the contractor's operations, it shall be repaired at the contractor's expense. The contractor shall construct the entrance for this parcel ½ at a time, with the western half to be constructed first; access is to be maintained for ease of trash collection pickup.

**3.19 Parcel 177 – 9804 Manchester Road.** The contractor shall keep ADA access to the business open at all times during business hours.

**3.20 Parcel 187 – 9842 Manchester Road.** All work must be completed during non-business hours. Business Hours for this business are 9:00 a.m. to 6:00 p.m. Monday, Tuesday, Wednesday, Friday, and Saturday. The business is closed on Thursday and Sunday.

**3.21 Parcel 192 – 7-Eleven.** The business owner, 7-Eleven, is intending to remove and replace their underground fuel storage tanks. The contractor shall coordinate and cooperate with said business owner, and their representatives, contractor and subcontractors for the removal and replacement of the underground fuel storage tanks.

**3.22 Parcel 197 – Berry Road Crossing.** The contractor shall perform all construction work in proximity to this parcel at night and after business hours so that all parking spaces can remain open.

**3.23 Parcel 199 – El Indio Restaurant.** The must reconstruct the eastern entrance prior to removing the western entrance.

**3.24 Parcel 209 – Residence at 91 Frederick Lane.** The contractor and its subcontractors shall take care to not disturb or otherwise damage the fence. In the event the contractor or its subcontractors damage the fence during the course of constructing the project, the damaged portion of the fence shall remain under direct personal supervision of a designated person at all times until the fence is restored. Any damage to the fence shall be fully repaired and restored in substantially the same condition within 24 hours.

**3.25 Parcel 214 – Dierbergs.** Entrances shall be constructed in such a way so that only one (1) entrance to the property is closed at any time with the following exception. The easternmost entrance must be completed ½ at a time, allowing access at all times. Work on the easternmost

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entrance may be done at the same time as one of the other entrances. None of the entrances may be closed and no work performed on any of the entrances between November 15 and December 31.

**3.26 Parcel 223 – 10042-50 Manchester Road.** The contractor shall avoid the new monument sign that has been built on the property.

**3.27 Parcel 224 – Ameren Missouri Substation.** The contractor will maintain at least 10-foot-wide, 24-hour access to Ameren’s facilities. The contractor will also use extra precaution what conducting any activity adjacent to, over, under or near Ameren’s underground or overhead electrical facilities and will take care to maintain proper support and stabilization for Ameren’s underground electrical facilities to prevent damage of collapse due to undermining. The contractor will provide no less than twenty (20) feet radial clearance from all of Ameren’s facilities, including towers, poles and overhead lines.

Except in the case of an emergency, the contractor will provide Ameren with written notification at least forty-eight (48) hours in advance of any digging or trenching adjacent to Ameren’s property. An Ameren field supervisor will be present during any digging or trenching operations. In the case of an emergency, the contractor will notify Ameren of any digging or trenching by phone as soon as possible.

**3.28 Parcel 231 – Marketplace at the Abbey.** There are landscaped beds between the parking lot and Manchester Road. During construction, contractor will grade the landscaping rock back from within these beds and store it within the temporary construction easement. Upon completion of the work along the parcel frontage, the contractor shall install new weed barrier geotextile fabric and re-install the landscaping rock that had been previously graded back. During execution of this work, the contractor shall take care to not disturb the landscaping bushes located with the easement areas.

**3.29 Parcel 245 – Dean Team Service Center.** No work shall be performed on this parcel during business hours. Normal business hours are 9:00 a.m. to 8:00 p.m. Monday, Wednesday, and Friday and 9:00 AM to 6:00 PM Tuesday, Thursday, and Saturday. The business is closed on Sundays.

**3.30 Parcel 246 – 10202-20 Manchester Road.** The contractor shall remove and discard the existing light pole that is located at approximately Sta. 249+00. During execution of their work, the contractor shall take care to not disturb the existing business sign and pole located in between the two entrances. The contractor shall also be responsible for re-stripping all parking lot striping lines that are disturbed during construction.

**3.31 Parcel 256 – St. Agnes Home.** Temporary fencing shall be provided along the frontage of the St. Agnes Home during all periods of active construction operations. Refer to Job Special Provision “72-Inch Temporary Chain Link Fence” for additional details.

**3.32 Parcel 258 – 10400-14 Manchester Road.** No work shall be performed on this parcel during business hours. Normal business hours are 9:00 a.m. to 7:00 p.m. Monday through Saturday. Additionally, the contractor shall stage their construction operations in a manner that will keep at least 10 of the 13 parking spaces open at all times during business hours.

**3.33 Parcel 267 – Bopp Chapel.** The contractor will keep the drive lane between the front building sidewalk and the temporary construction easement open and accessible at all times. The area will also be maintained free of construction traffic, equipment, and personnel, except for construction of the entrance driveway approach and sidewalk/ADA curb ramp tie-ins. Construction on the driveway approach will be performed half-at-a-time in order to maintain the drive lane open through the duration of the project.

**3.34 Parcels 274 and 275 – Lou Fusz Toyota.** Work within the easements on these parcels must be performed during non-business hours. Business hours for these parcels are defined as Monday through Saturday 10:00 a.m. to 7:00 p.m. and Sunday from 12:00 noon to 6:00 p.m. Additionally, at least one driveway entrance shall remain open at all times.

**4.0 Basis of Payment.** No direct payment will be made to the contractor for the labor, equipment, material, or time required to comply with this provision.

R-R. Delayed Access to Parcels Pending Acquisition

**1.0 Description.** Acquisition is pending for a number of parcels on the project. The contractor shall not be permitted to begin work within any designated Temporary Construction Easement, Permanent Easement, or New Right of Way on any of these parcels until the Right of Way acquisition has been completed. An anticipated date of possession has been provided for each parcel to assist with scheduling purposes.

**2.0 Construction Requirements.** The contractor shall verify with the engineer prior to beginning work on any of the parcels listed in this provision. The contractor will not be permitted access to work on any of these parcels until notification has been given by the engineer that the parcel has been cleared from this list.

**3.0 Parcels.** The following is the list of the parcels where acquisition is pending. All dates are 2021 unless otherwise noted.

- Parcel 32 (WEI'S INVESTMENT, LLC) – Anticipated Possession on or before July 31
- Parcel 33 (SHAM TEKWANI & NEETA TEKWANI) – Anticipated Possession on or before April 30
- Parcel 43 (FELICE PROPERTIES, LLC) – Anticipated Possession on or before August 31
- Parcel 44 (8106 MANCHESTER, LLC) – Anticipated Possession on or before August 31
- Parcel 44A (FELICE PROPERTIES, LLC) – Anticipated Possession on or before August 31
- Parcel 46 (BRENTCHESTER LLC) – Anticipated Possession on or before July 31
- Parcel 47 (DENNIS G. SCHARFF, TRUSTEE) – Anticipated Possession on or before April 30
- Parcel 53 (B E JAM, LLC) – Anticipated Possession on or before July 31
- Parcel 59 (RPM HOLDINGS, LLC) – Anticipated Possession on or before July 31
- Parcel 60 (MOIR R. STEVENS & ROSANNE S. HORAN TRUSTEES)– Anticipated Possession on or before August 31

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- Parcel 61 (8309 MANCHESTER RD. L.L.C.) – Anticipated Possession on or before May 31
- Parcel 64 (GWH, LLC) – Anticipated Possession on or before August 31
- Parcel 66 (SOVRAN ACQUISITION LIMITED PARTNERSHIP) – Anticipated Possession on or before April 30
- Parcel 67 (8500 MANCHESTER L.L.C. & LS INVESTMENTS, L.L.C.) – Anticipated Possession on or before April 30
- Parcel 73 (MORICE ENTERPRISES LLC) – Anticipated Possession on or before September 30
- Parcel 77 (RUSSO’S DEVELOPMENT LLC) – Anticipated Possession on or before August 31
- Parcel 79 (MANCHESTER ROAD PROPERTIES LLC) – Anticipated Possession on or before August 31
- Parcel 80 (NORMAN J. KNIGHT) – Anticipated Possession on or before April 30
- Parcel 84 (SUBURBAN PARTNERS, L.P.) – Anticipated Possession on or before April 30
- Parcel 86 (FOUNTAINS AT 270 LLC) – Anticipated Possession on or before July 31
- Parcel 98 (ASTI PROPERTIES, LLC) – Anticipated Possession on or before July 31
- Parcel 99 (H.M. BOEGEMAN REALTY CO. AND CREST DEVELOPMENT CO.) – Anticipated Possession on or before May 31
- Parcel 102 (BRENTWOOD CONDOMINIUM ASSOCIATION) – Anticipated Possession on or before April 30
- Parcel 103 (ASHICCA AUTO SERVICES, INC.) – Anticipated Possession on or before May 31
- Parcel 111 (ONT HOLDINGS 9029 LLC) – Anticipated Possession on or before July 31
- Parcel 121 (MISSOURI PACIFIC RAILROAD) – Anticipated Possession on or before June 30
- Parcel 122 (R & R INVESTMENT HOLDING, LLC) – Anticipated Possession on or before June 30
- Parcel 123 (MILLMAN LUMBER COMPANY) – Anticipated Possession on or before June 30
- Parcel 130 (RUSSO’S DEVELOPMENT LLC) – Anticipated Possession on or before April 30
- Parcel 131 (TRAINWRECK, LLC) – Anticipated Possession on or before July 31
- Parcel 133 (MILLMAN LUMBER COMPANY) – Anticipated Possession on or before June 30
- Parcel 137 (STRATFORD COURT APARTMENTS, LLC) – Anticipated Possession on or before May 31
- Parcel 140 (THE MANCHESTER PROFESSIONAL BUILDING, LLC) – Anticipated Possession on or before July 31

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- Parcel 170 (9910 LLC) – Anticipated Possession on or before April 30
- Parcel 175 (NR INVESTMENTS) – Anticipated Possession on or before July 31
- Parcel 180 (FHBC, LLC) – Anticipated Possession on or before April 30
- Parcel 181 (CS3 BP ASSOCIATES, LLC) – Anticipated Possession on or before April 30
- Parcel 185 (HOWE PROPERTIES, INC.) – Anticipated Possession on or before July 31
- Parcel 186 (9840 MANCHESTER ROAD L.L.C.) – Anticipated Possession on or before July 31
- Parcel 192 (THE SOUTHLAND CORPORATION) – Anticipated Possession on or before July 31
- Parcel 193 (MANCHESTER PROPERTY INVESTORS, LLC) – Anticipated Possession on or before April 30
- Parcel 194 (9910 LLC) – Anticipated Possession on or before May 31
- Parcel 199 (M B VENTURES, LLC) – Anticipated Possession on or before April 30
- Parcel 213 (ENTERPRISE BY YASOU, LLC) – Anticipated Possession on or before July 31
- Parcel 214 (CAPLACO TWENTY-FIVE, INC. & WARSON WOOD, INC) – Anticipated Possession on or before July 31
- Parcel 222 (WAYCLIFFE DEVELOPMENT CORP) – Anticipated Possession on or before April 30
- Parcel 227 (GENERAL GRANT REALTY CO.) – Anticipated Possession on or before August 31
- Parcel 229 (CROWN DIVERSIFIED INDUSTRIES CORP.) – Anticipated Possession on or before September 30
- Parcel 239 (CROWN DIVERSIFIED INDUSTRIES CORP.) – Anticipated Possession on or before August 31
- Parcel 249 (10260 MANCHESTER, LLC) – Anticipated Possession on or before July 31
- Parcel 252 (JOHN B. HEGEMAN LIVING TRUST) – Anticipated Possession on or before July 31
- Parcel 257 (SUNTRUP) – Anticipated Possession on or before July 31
- Parcel 259 (C&B PROPERTIES LLC) – Anticipated Possession on or before July 31
- Parcel 260 (SAINT LOUIS DENT COMPANY, LLC) – Anticipated Possession on or before July 31
- Parcel 261 (INVESTMENTS LLC 10502) – Anticipated Possession on or before July 31

**4.0 Basis of Payment.** No direct payment will be made to the contractor for the labor, equipment, material, or time required to comply with this provision.

R-S. Protection of Metrolink Facilities and Traffic

**METRO RAILWAY REQUIREMENTS STANDARD OPERATING PROCEDURES**

**1.0 PURPOSE AND SCOPE.** The purpose of the following requirements is to maintain a safe environment and efficient transit system for MetroLink customers, employees and Contractors when work is being performed on the MetroLink Right-of-Way (ROW). The following procedures must be followed and all requirements fulfilled before permission will be granted to any individual or group requesting access to the MetroLink Right-of-Way (ROW) to perform work. This includes all work on, under, above, or adjacent to the MetroLink Right-of-Way that has the potential to impact train operations. MetroLink Right-of-Way is defined as Metro owned property along MetroLink's Light Rail System, including main line tracks, yard track, shop tracks, and stations. Work performed on the Right-Of -Way outside of the alignment or area where trains operate that **will not** impact train operations, e.g. park and ride lots etc., is excluded from the scope detailed in the following procedures.

This procedure is applicable to Contractors and Metro Employees.

MetroLink Land Maps defining Metro property lines and a MetroLink Alignment Schematic are available from the Maintenance of Way (MOW) Department upon request.

Contractor must request a St. Louis Metrolink Track Access Permit Package from Metrolink. This package will contain all the latest exhibits and Standard Operating Procedures (SOPs) necessary for this project as well as any fees associated with working within Metrolink limits.

**Metro employees will not be used for flagging. All flagging work will need to be self-performed.**

**2.0 ATTACHMENTS/EXHIBITS**

EXHIBIT A: MetroLink - Contractor Right-of-Way Temporary Work Permit

EXHIBIT B: Metro Permit Fee Schedule

EXHIBIT C: MetroLink Alignment Schematic (available upon request)

EXHIBIT D: Indemnification Agreement and Required Insurance Coverage

EXHIBIT E: Metro Personnel Right of Way Work Permit (For Metro Employees Only)

EXHIBIT F: MetroLink Rail Systems Department Employee Safety Standards (available upon request)

EXHIBIT G: Operations Rule Book (available upon request)

Note: See paragraph 7.0 for information on how to obtain Exhibits above.

**3.0 DEFINITIONS**

**Flag Person** is a Tier 2 qualified Contractor or Metro Employee that is assigned as a dedicated flagger to protect work crews, personnel, and equipment working on or near the tracks to ensure safe passage of trains as described in SOP 103.04. Contractor will be responsible for providing Tier 2 qualified flaggers.

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**Fouling a Track** means placement of an individual, material or equipment in such proximity to the track that the individual, material or equipment could be struck by a moving train or on-track equipment, or in any case is within 8' 6" from the centerline of nearest track.

**Lookout** is a Tier 2 qualified Metro employee who is qualified to provide warning to ROW workers of approaching trains or on-track equipment. Lookout should be equipped with the necessary equipment to warn ROW workers of approaching trains, as well as flagging equipment to be used if it is necessary to warn approaching trains. The Lookout's sole duty is to look for approaching trains or on-track equipment and provide advanced warning to employees before arrival of the trains or on-track equipment. ***Contractor will be responsible for providing Tier 2 qualified flaggers.***

**No Clearance Zone** areas along the MetroLink Right of Way where there **is not** 8' 6" clearance from centerline of nearest track to nearest fixed object, e.g. wall, fence, bridge, steep embankment. Within these areas it **is not** possible for personnel to safely clear from fouling train movement. These areas are designated with reflective **No Clearance** signs on the right-of-way and by markings on the MetroLink Alignment Schematic.

**Operating Right-of-Way (ROW)** is the area within twenty (20) feet of the centerline of any track on the main line or yard.

**Pilot** is a Tier 3 qualified Metro employee assigned to facilitate track car or on-track equipment movement when the operator or driver is not qualified on the physical characteristics or rules of the portion of the alignment over which movement is to be made. The pilot will be responsible for the safe movement of on-track equipment for the work crew to which they are assigned.

**Right-of-Way (ROW)** is land, property and interests therein, acquired by the Agency.

**Train Detection** is a procedure by which a worker acquires ROW access safely by seeing approaching trains and leaving the track before the train arrives at the location at which they are working and which may be used only under certain conditions authorized by OCC.

#### **4.0 GENERAL REQUIREMENTS FOR ACCESS TO METROLINK RIGHT-OF- WAY**

All work within the "MetroLink ROW" is subject to the Metro approval. Work plans must be submitted for Metro Approval. MetroLink SOP 101.17 describes the work permit submittal requirements. Weekly track allocation meetings are held at the MetroLink Ewing Facility (Room M09) on Thursdays at 8:30am. A contractor representative must attend to discuss the following week's work. Metro SOP 101.23 describes the track allocation process.

**4.1** To access the MetroLink ROW all Contractor and Metro Employees must have a minimum of Tier 1 Safety Training and each work group must be accompanied by at least one person that is Tier 2 qualified to serve as a flag person or lookout. For unforeseen work for short durations, MetroLink Operations may authorize unqualified persons access to the ROW if accompanied by a qualified Metro Lookout.

**4.2** The work crew must have in their possession a copy of an approved work permit describing the work being performed. Contractor must also meet all additional requirements for ROW access described within this SOP and the referenced documents. Prior to the start of any proposed work the Contractor must submit a MetroLink - Contractor Right-of-Way Temporary Work Permit, and

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Metro Employees must submit a Metro Personnel Right of Way Work Permit. If Metro requires a detailed work plan, that plan must be approved prior to permit submittal. Once the work plan is approved, the permit can be submitted. For unforeseen work for short durations, MetroLink Operations can authorize access to the ROW without an approved work permit. Work permits are not required for LRV equipment maintenance performed on the mainline or in the yard & shops.

**4.3** Operators of track cars or on-track equipment must be Tier 3 qualified, unless a qualified Metro Pilot accompanies them. In that situation, the Operator must be at a minimum, Tier 1 qualified.

**4.4** A Metro Tier 3 qualified pilot must accompany Contractor track cars. The pilot is responsible to ensure the Contractor’s track car and on-track equipment is operated in compliance with Metro operating and safety rules. The contractor requirement for the Metro pilot can be waived by Metro, if it has been determined that the Contractor’s operator has sufficient experience with Metro operating and safety rules.

**5.0 ROW SAFETY TRAINING QUALIFICATIONS**

The following table summarizes the required ROW Safety Training necessary before any Contractor or Metro Employee will be allowed to perform any work on the ROW. Annual recertification is required for Tier 1, 2 &3 Training.

<b>Work or Duties</b>	<b>Training Required</b>
Any work within MetroLink Right-of-Way	Tier 1
Flagging to protect work crews, personnel and equipment in the Right-of-Way	Tier 1, and Tier 2
Operating a track car on MetroLink	Tier 1, Tier 2, and Tier 3

If Metro employees are not qualified at a minimum Tier 2 (Flagging and Radio Use), they must be escorted by another employee qualified to Tier 2.

*The Safety Department will maintain a list of ROW Safety Trained qualified persons and their level of qualification (e.g. Tier 1, 2, or 3). An updated list will be kept on file in the Rail Dispatcher’s Office. Dates, times and locations of Training class can be obtained by contacting Metro Safety Dept. or MetroLink Operations.*

**6.0 METRO REQUIREMENTS FOR CONTRACTOR**

**6.1** Contractor must, if requested by Metro, submit a detailed work plan to MetroLink Operations to be reviewed and approved by MetroLink Operations, Maintenance of Way, and Safety. After acceptance of the work plan, Contractor will obtain, through the procedure defined in this SOP, an approved **EXHIBIT A: MetroLink - Contractor Right-of-Way Temporary Work Permit** before any work can be performed and they must have their Metro approved Permit available at all times on the work site.

**6.2** Contractor may be required to reimburse Metro for all expenses as defined in EXHIBIT B: Metro Permit Fee Schedule. **Metro reserves the right to waive fees at its sole discretion.**

**6.3** Method of payment from Contractor to Metro will be determined by Metro. All Metro expenses for a particular Contractor shall then be accumulated under the associated permit number.

**6.4** Contractor will complete annual required ROW Safety Training as described in **Section 5 – ROW SAFETY TRAINING QUALIFICATIONS**. Annual recertification is required for Tier 1,2 &3 Training.

**6.5** Contractors will immediately stop any work that deviates from their approved Right-of-Way Temporary Work Permit or detailed work plan submitted. Metro should be contacted and must approve any alternate work procedures.

**6.6** Contractor work activities can be terminated immediately by MetroLink Operations, Maintenance of Way or Safety, at any time without notice. Typical conditions under which this may occur include, but are not limited to:

- a) Failure to comply with any of the requirements identified in this SOP or other documents referred to within.
- b) Safety related reasons.
- c) Operations schedule-related reasons.
- d) If work in progress deviates from the written work proposal approved by the Metro.
- e) Flag person(s) not available.
- f) Contractors' work interferes with the constant, continuous use of the tracks, property and facilities of MetroLink system, its employees, its customers or other Contractors working within the right-of-way.
- g) Accidents, injuries, near misses, or vehicle damage.
- h) Metro rule violations

**6.7** All on track equipment (including Hi-Rail Vehicles) must meet Federal Register 49 CFR, Part 214 standards, related to Roadway Maintenance Machine Safety. Contractor will be required to submit a list of qualified operators and which Roadway Maintenance Machines that they are qualified to operate on Metro. The Contractor will provide, for Metro approval, documentation of their training and qualification process.

**6.8** Contractor must satisfy all safety requirements including, but not limited to, those found in Exhibit F: METROLINK RAIL SYSTEMS DEPARTMENT EMPLOYEE SAFETY STANDARDS dated January 1996 and Exhibit G: MetroLink Operations Rule Book. Copies are available upon request from the MOW Department.

**6.9** Under no circumstances will Contractor access tracks with vehicles, equipment, or machinery, without explicit written permission of Metro. Each individual working on the ROW is responsible to supply their own personal protective equipment, including a reflective safety vest, hard hat, safety glasses, and work shoes with less than ½ inch heels (open toe or heel shoes are prohibited).

**6.10** These requirements should be followed for excavations:

- Excavations to either side of tracks must be at least **twenty feet** from the centerline of track.
- Excavation under, between or within the track structure or the removal of ballast is prohibited unless approved by Metro.
- Under-track cable installations must be directionally bored using the following procedures.

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- A minimum depth of 8 feet below top of ties shall be maintained at all times or 8 feet below flow line of ditch, whichever is greater, must be maintained to top of conduit(s).
- Conduit schedule Fiberglass Reinforced Epoxy (FRE) or equivalent is required.
- Excavations within 5 feet of either side of buried MetroLink signal, power, and communication cables must be performed by hand digging and with MOW personnel present at the dig site.
- When cable work is being performed parallel to MetroLink right-of-way, cables shall be laid at the same depth as MetroLink cables. The location of the cables shall be between MetroLink cables and the property line, **not** towards the track.
- If cable locates are required the Missouri One Call System, Inc. locate procedure for Missouri and Julie, Inc. procedures for Illinois must be followed.

**Note:** Any deviation from these requirements will only be allowed with written consent from Metro.

**6.11** Over-track crossings will be considered on a case-by-case basis. All over-track crossings must comply with both National Electric Safety Code (NESC) clearances and any MetroLink requirements imposed.

**6.12** Contractor shall only enter MetroLink Right-of-Way with an approved Work Permit, unless otherwise approved by MetroLink Operations.

**6.13 Work performed by a Contractor on MetroLink Right-of-Way within 20 feet of the centerline of a main line or yard track will require a Temporary Restriction to be issued on the Daily Operating Clearance.**

**6.14** If the Contractor is performing work outside of 20 feet of the center line of any main line or yard, and it is possible for equipment e.g. boom, or hoisted equipment etc, to foul the operating ROW or has potential of making contact with the catenary, a temporary restriction will be required.

**6.15** The temporary restriction will require a dedicated flag person to provide flag protection for the work crew(s). Speed Restriction Signs will need to be posted to identify the work zone to approaching trains. Refer to SOP 103.04 for more information on flagging requirements.

**6.16** In the event that the Contractor disturbs, or modifies Metro's property in any manner, the Contractor must restore the property to the same condition it was in before the Contractor performed work. Such restoration must be to the satisfaction of the Superintendent of Operations and the Superintendent of Rail ROW Maintenance. Contractor will be billed for all work required to restore property to original condition.

**6.17** Contractor must comply with all applicable federal, state, and local laws, regulations, and standards affecting their work.

**6.18** As a limitation to any rights or licenses that may be granted to the Contractor, Metro reserves the right to use and maintain its entire property. This includes Metro's right to construct, maintain, repair, renew, use, operate, change, modify, or relocate railroad tracks, roadways, station platforms, signal, communication, fiber optics, power, or other wire lines, pipelines and other facilities upon, along or across any or all parts of its property. All or any of the above mentioned use and maintenance may be done at any time or times by Metro without liability to the Contractor or to any other party for compensation or damages.

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**6.19** The Contractor is required to comply with Metro's Exhibit D "Insurance Specifications for MetroLink Contractors"

**6.20** Metro reserves the right to fully investigate all Contractor accidents, injuries, near misses, or vehicle damage and the Contractor and its employees agree to comply and assist Metro in all aspects of these investigations. This includes, but is not limited to, drug and alcohol testing, employee interviews, written reports, and requests for documentation.

Contractor employees who work on the MetroLink ROW will be required to comply with the Metro Drug and Alcohol Policy

## **7.0 CONTRACTORS PROCEDURE TO ACCESS METROLINK R.O.W.**

**7.1** Contractor will request a Right-of-Way Work Permit packet of information from:

**Control Center Manager  
MetroLink Operations  
700 South Ewing  
St. Louis, MO 63103  
314-982-1400 X2851  
[rowworkpermits@metrostlouis.org](mailto:rowworkpermits@metrostlouis.org)  
Fax 314-335-3429**

**7.2** MetroLink Operations will distribute SOP 101.17 with Exhibits A, B, and D to the Contractor. Contractor may request Exhibits C, F, and G. Exhibit E is for Metro employee use only.

**7.3** Contractor then submits their Permit Application Fee and MetroLink Contractor Right-of-Way Temporary Work Permit (Exhibit A). All other required documents should be submitted a minimum of 14 days prior to their proposed start date. This may include a detailed work plan and project drawings, indemnification agreement and required insurance coverage as described in the Description of Insurance Specifications (Exhibit D).

**7.4** MetroLink Operations distributes Permit and detailed work plan if required, to Real Estate, Risk Management and Safety Departments for approval and facilitates a pre-project planning meeting with Contractor(s).

**7.5** MetroLink Operations contacts Contractor with approval, permit number and necessary requirements for Tier 1-3 safety training. Permit numbers are assigned by MetroLink Operations as described in SOP 101.23.

**7.6** Contractor completes required safety training:

- Tier 1 Training: Persons working on or next to the MetroLink Right-of-Way.
- Tier 2 Training: Flagging and Radio Use.
- Tier 3 Training: Track Car Operation and Operating Rules

### **Notes:**

*1. Contractors are required to be trained at a minimum of Tier 1 to enter ROW. All work performed by the Contractor on the operating ROW must be protected by a qualified flagperson. An*

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*unqualified Contractor may be authorized to enter the alignment by Operations if escorted by a Metro Lookout.*

*2. Operators of track cars or on-track equipment on the MetroLink light rail system must be qualified to Tier 3, unless they are to be piloted by a qualified Metro Pilot (in this case, the Operator will be Tier 1 qualified at a minimum). A Metro Tier 3 qualified Pilot is required to direct the operation of Contractor's track cars and on-track equipment, unless otherwise approved by Metro.*

*3. Flaggers must be Metro Safety trained to a minimum of Tier 2. Work within the Metrolink Operating ROW (within 20ft of the centerline of an in service track) will require a restriction and flag protection per Metrolink SOP 101.17. **Contractor will be responsible for providing Tier 2 qualified flaggers.***

*4. Work within 10 feet of the overhead lines (catenary) or that otherwise could come in contact with the overhead lines requires de-energization of the lines. Exceptions must be approved by Metro. Refer to paragraph 8.0 below for Allowed Work Windows.*

**7.7 Contractor track cars must be piloted by a Metro Pilot qualified to Tier 3 of safety training.** The pilot will communicate with OCC and control the movement of track cars or group of track cars assigned to a single work crew. The Metro Pilot will be responsible for the safe movement of the on track equipment or track cars. The Metro Pilot requirement may be waived by Metro if it is determined that the operator has sufficient training and experience on the MetroLink alignment to safely operate track cars and on-track equipment, and the Operator is Tier 3 qualified.

**7.8 Contractor submits Right-of-Way Temporary Work Permit (Exhibit A) with permit number no later than **Wednesday 12 Noon**, prior to the week the work will be accomplished. Permit must be resubmitted every week during the length of the proposed project.**

**Note:** *If there is a Metro recognized holiday on Thursday, the work permits are due on Tuesday 12 Noon.*

**Note:** *If the project proposal changes significantly, a new MetroLink Right-of-Way Temporary Work Permit (Exhibit A) must be submitted. A new Permit Number will be assigned after the Permit is approved.*

**7.9 Contractor or a Metro Designee is required to attend weekly Track Allocation meetings held at the Metrolink Ewing Facility (Room MO9) on Thursdays at 8:30 am with MetroLink Operations and Maintenance of Way to respond to questions regarding proposed work. The Contractor's Metro Designee may represent the Contractor at this meeting if previously arranged. Metro SOP 101.23 describes the track allocation process.**

*All work requests are subject to Metro Approval*

**Note:** *Scheduling of work activities is subject to availability of Maintenance of Way, Operations and Safety personnel, as well as the effect it will have on customer service based on the impact the proposed work has on service quality and train schedules.*

**7.10** Metro Project Manager or MetroLink Operations will provide the Contractor with a copy of their approved temporary permit (Exhibit A), which must be available on the project site at all times during work activities to confirm permission to occupy MetroLink Right-of-Way.

**7.11** Contractor must contact OCC and request permission prior to accessing the ROW. OCC has authority over all activity along the ROW at all times.

**7.12** Once work is complete, and the work area is cleared of materials, equipment, tools, and personnel, the Contractor must contact OCC to confirm that they are clear of the ROW.

**7.13** Metro provides Contractor an invoice for appropriate fees upon completion of the work or on a monthly basis as necessary.

**7.14** Contractor submits payments to the Metro Accounts Receivable.

## **8.0 Allowed Work Windows**

### **8.1 Work under a Restriction (Work performed within 20 feet of the track, but not requiring de-energization of overhead wire, without risk of falling debris onto track way)**

- Work under a restriction is allowed from 7:30AM to 3:30PM. Other times may be approved by Metro
- Headway: Peak 6 minutes (M-F 5AM-10AM and 2PM-8PM)/ Off-Peak 10 minutes on each track.
- Work over Metro with potential of falling debris or other construction runoff will need to be performed after revenue service when trains are not operating. Additionally, it may be necessary to put track or overhead wire protection in place, to eliminate risk of damage or fouling by debris.

### **8.2 Work with Both Tracks Out of Service Nightly (After Revenue Service)**

- Work with both tracks out of service is allowed nightly after revenue service 1:45 a.m.-4:15 a.m. nightly.
- If work is within 10 feet of the overhead power line or that has the potential to come in contact with the line, a power down of the overhead lines will be required. Allow twenty (20) minutes each for a power down and a power up. Power UP/Power Down fee is \$500 (for each power down/quantity as required).
- If there is potential of falling debris or runoff, it will be necessary to put track or overhead wire protection in place, to eliminate risk of damage or fouling by debris.

### **8.3 Work with One Track Out of Service (Single Track)**

- With two (2) weeks' notice, Metro may remove one track from service and operate a single track beginning at 8:00 p.m. nightly on non-special event night.
- With two (2) weeks' notice, Metro may remove one track from service and operate on a single track all day Saturday and Sunday on non-special event days.
- Limits of single track will be Ewing Yard Interlocking (MP12.8) to Tucker Interlocking (MP14.3)
- Operations of this single track requires MetroLink to operate a special schedule that ends Blue Line service at Forest Park-DeBaliviere Station. Delays of 10 minutes are expected during this operation.

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- Operations of single track will need to be coordinated with other Metro maintenance and construction work. Operations is only able to support one single track daily.
- Special events include, but are not limited to: Cardinal Games, Mardi Gras, Race for the Cure, and Fair of St. Louis.
- Allow twenty (20) minutes each for a power down and power up.
- If there is potential of falling debris or runoff, it will be necessary to put track or overhead wire protection in place to eliminate risk of damage or fouling by debris.
- Allow one (1) hour at end of the outage for Metro test train, if required.

R-T. Coordination with Metro Transit

**1.0 Description.** The contractor shall be required to coordinate with Metro Transit where construction operations will involve work on or around existing transit stops. It is requested that the coordination begin prior to the project Preconstruction Conference to ensure minimal disruption in service on Metro's system.

**2.0 Construction Requirements.** All Metro Transit stops within the project limits shall remain open and operational throughout the duration of the project. In locations where the contractor's operations will involve work in proximity to a transit stop location, the contractor shall notify Metro Transit through the contacts listed below, not later than 72 hours prior to beginning work at that location. The contractor shall also take care to minimize exposure of transit users to construction hazards in proximity to all transit stops that are in service during work operations.

**2.1 Project Contacts.** The contractor shall notify the following contacts at Metro Transit coordinate scheduling throughout the project with them or their designated representative(s).

Ms. Natalie Siebert, Senior Planner Transit Operations  
Office: (314) 982-1400 x1816  
Cell: (314) 497-4916  
Email: nmsiebert@MetroStLouis.org

Mr. Lance Peterson, Director of Service Planning  
Office: (314) 982-1520  
Cell: (314) 220-6756  
Email: llpeterson@MetroStLouis.org

**3.0 Temporary Facilities.** In locations where the contractor's operations may affect a transit stop location, a temporary stop may be required. Signage of the temporary stop shall be in accordance with Specification Section 104.10.2, and placement shall be coordinated with Metro Transit. All temporary transit stops shall be located in proximity to the existing stop it is representing, accessible, clear and conspicuous to both the transit rider and facility operator, and be located where it is safe from hazards within the work area.

**4.0 Permanent Facilities.**

**4.1 Bus Stops.** Locations for proposed bus stops are identified in the contract plans. The contractor shall furnish a flush-mount anchor that is to be drilled into the concrete pad per manufacturer's recommendations. Metro Transit will install the new bus stop sign and post.

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**4.2 Bus Shelters.** Locations for proposed bus shelters are identified in the contract plans. The contractor shall construct the concrete pad for the shelters. Shelters will be furnished and installed by Metro upon completion of the pads.

**5.0 Basis of Payment.** No direct payment will be made for any labor, equipment, materials, and time required to comply with this provision.

R-U. Pedestrian Underpass Construction Requirements (Roadway) – Job J6S1718B Only

**1.0 Description.** Work is to be performed in the location of the pedestrian underpass and adjoining segment of Rogers Parkway as depicted in the contract plans and in accordance with these special provisions.

**2.0 Construction Requirements.**

**2.1 Compacting in Cut.** The 12-inch over-excavation necessary for placement of the Rogers Parkway Trail shall be paid for as Compacting in Cut. All materials and work performed for this item shall be in accordance with Sec 203.5.8. Measurement for Compacting in Cut will be made in accordance with Sec 203.8.

**2.1.1 Basis of Payment.** Payment for the accepted quantity for compacting in cut will be made in accordance with the contract unit bid price for the item listed below and includes all labor, equipment, materials, and time required to comply with this provision.

Item No.	Unit	Description
203-70.75	Station	Compacting in Cut

**2.2 Soft Soil Remediation.** Based on the geotechnical data, soft soils may be present in the area of the pedestrian underpass above an elevation of 433 feet. The contractor shall completely excavate soft soils within the limits depicted in the contract plans. The remediation shall extend to the bottom of the soft soils or to the depth required to satisfy global stability requirements as shown on the plans, whichever is greater. The contractor shall retain the services of a geotechnical engineer to verify soft soil has been removed. This excavated material shall be replaced with compacted Type 5 Aggregate Base material placed in no more than 6-inch thick lifts. The Type 5 Aggregate Base material shall be reinforced with Tensar BX 1200 or similar geogrid approved by the engineer at 2-foot vertical spacings, with the first layer placed at the bottom of the over-excavation. Geogrid shall be installed and overlapped in accordance with the manufacturer's recommendations.

**2.2.1** Excavation shall be in accordance with Sec 203, and placement of the aggregate base material shall be in accordance with Sec 304. Geogrid material shall be non-metallic type in accordance with Sec 1052.20.

**2.2.2 Method of Measurement.** Final measurement for soft soil remediation will be made to the nearest cubic yard.

**2.2.3 Basis of Payment.** Payment for the accepted quantity for soft soil remediation will be made in accordance with the contract unit bid price for the item listed below and includes all labor, equipment, materials, and time required to comply with this provision.

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203-99.07	CUYD	Soft Soil Remediation

**2.3 Class 3 Excavation.** Where proposed drainage structures are to be constructed within zones of other excavation types (e.g. Class A or excavation for modular block wall structures) and the bottom of structure elevation falls above the final elevation of excavation, no measurement or payment will be made for Class 3 Excavation. In these locations, appropriate fill material shall be placed up to the lower elevation of the bedding material required for placement of the drainage structure, and the Embankment Installation method depicted in Standard Plan 726.30. All materials and work performed for this item shall be in accordance with Sec 206.

**2.3.1 Basis of Payment.** Payment for Class 3 Excavation, in the locations accepted for payment, will be made in accordance with the contract unit bid price for the item listed below and includes all labor, equipment, materials, and time required to comply with this provision.

Item No.	Unit	Description
206-30.00	CUYD	Class 3 Excavation

**3.0 Basis of Payment.** With the exception of the pay items listed above, no direct payment will be made for any labor, equipment, materials, and time required to comply with this provision.

R-V. Rogers Parkway Pavement – Job J6S1718B Only

**1.0 Description.** Concrete headers shall be provided along the perimeter of the Rogers Parkway Trail as shown in the contract plans. These headers shall be 12 inches wide at the surface and shall be constructed to the depth and dimensions as depicted in the contract plans.

**2.0 Construction Requirements.**

**2.1 Type 5 Aggregate for Base (5 In. Thick).** A 5-inch thick layer of Type 5 Aggregate Base shall be placed underneath the Rogers Parkway trail pavement as depicted in the contract plans. All materials and work performed for this item shall be in accordance with Sec 304.

**2.1.1 Method of Measurement.** Final measurement for the aggregate base will be made in accordance with Sec 304.5.

**2.1.2 Basis of Payment.** Payment for 5-Inch thick Type 5 Aggregate Base, in the locations accepted for payment, will be made in accordance with the contract unit bid price for the item listed below and includes all labor, equipment, materials, and time required to comply with this provision.

Item No.	Unit	Description
304-99.05	SQYD	Type 5 Aggregate for Base (5 In. Thick)

**2.3 12-Inch Concrete Header.** Concrete headers shall be provided along the perimeter of the Rogers Parkway Trail. These headers shall be 12 inches wide at the surface and shall be constructed to the depth and dimensions as depicted in the contract plans.

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**2.3.1** All materials and work performed for this item shall be in accordance with Sec 502 and Great Rivers Greenway Trail Surfacing Standards. Concrete material shall be Class B with air entrainment.

**2.3.2 Method of Measurement.** Measurement will be made in accordance with Sec 502. All base rock and sub-base material below the concrete header shall be quantified and paid for as separate pay items associated with those items.

**2.3.3 Basis of Payment.** Payment for the accepted quantity for concrete headers will be made in accordance with the contract unit bid price for the item listed below and includes all labor, equipment, materials, and time required to comply with this provision.

Item No.	Unit	Description
502-99.03	Linear Foot	12-Inch Concrete Header

**3.0 Basis of Payment.** With the exception of the pay items listed above, no direct payment will be made for any labor, equipment, materials, and time required to comply with this provision.

R-W. Permeable Interlocking Concrete Pavement – Job J6S1718B Only

**1.0 Description.** The pedestrian connection between Rogers Parkway/South Mary Avenue and Manchester Road shall consist of permeable interlocking concrete pavement (PICP) as depicted in the contract plans.

**2.0 Construction Requirements.** All materials and work performed for this item shall be in accordance with Metropolitan St. Louis Sewer District Standard Specifications for Sewers and Drainage Facilities (2009 edition).

**2.1** Additional information on PICP may be found on MSD’s website at the following location:  
<https://msdprojectclear.org/what-we-do/stormwater-management/bmp-toolbox/stormwater-quality/permeable-pavement/permeable-interlocking-concrete-pavement/>

**3.0 Method of Measurement.** Final measurement for the permeable interlocking concrete pavement will be made in accordance with Sec 608. No direct payment will be made for the PICP informational signs, posts, or mounting hardware that are to be furnished and installed in conjunction with the PICP installation.

**4.0 Basis of Payment.** Payment permeable interlocking concrete pavement, in the locations accepted for payment, will be made in accordance with the contract unit bid price for the item listed below and includes all labor, equipment, materials, and time required to comply with this provision.

Item No.	Unit	Description
304-99.05	SQYD	ASTM No. 2 Aggregate, 12 In. Thick
304-99.05	SQYD	ASTM No. 57 Aggregate, 4 In. Thick
304-99.05	SQYD	ASTM No. 8 Bedding Course, 2 In. Thick
604-99.02	Each	Observation Well
605-99.03	LF	Perforated Underdrain Pipe, 4 In. Rigid, Schedule 40 PVC

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605-99.03	LF	4 In. Rigid Pipe, Schedule 40 PVC
610-99.05	SQYD	Permeable Interlocking Concrete Pavement (3-1/8" Thick)
624-99.05	SQYD	MSD Type 4 Filter Fabric

R-X. Pedestrian Underpass Storm Sewer Pipe and Structures – Job J6S1718B Only

**1.0 Description.** The contractor shall furnish and install storm sewer pipes and structures at all locations depicted in the contract plans.

**2.0 Construction Requirements.** The material furnished and installed by the contractor shall be in accordance with Sec 726 and Sec 731, and all applicable Metropolitan St. Louis Sewer District Standard Specifications for Sewers and Drainage Facilities (2009 edition), where required.

**3.0 Pipe Culverts.** Pipe culvert materials are identified in the contract plans. Exceptions for substitution of pipe culvert materials other than those identified shall not be permitted without approval of the engineer. Should the contractor propose a material type change for the pipe, the contractor shall be responsible for furnishing drainage calculations that have been approved, signed, and sealed by a Professional Engineer who is licensed in the State of Missouri in accordance with the laws relating to architects and professional engineers (Chapter 327, RSMo).

**3.1 Method of Measurement.** Measurement for the storm sewer pipe culverts will be made in accordance with Sec 724.4.

**3.2 Basis of Payment.** The storm sewer pipe culverts shall be paid for at the contract unit price for the items listed below and shall include all necessary equipment, materials, pipe collars, concrete headwalls, concrete toe walls and labor necessary for compliance with these provisions.

Item No.	Unit	Description
725-99.03	Linear Foot	6 In. Pipe Group B
726-99.03	Linear Foot	12 In. Class V Reinforced Concrete Pipe Culvert
726-99.03	Linear Foot	15 In. Class V Reinforced Concrete Pipe Culvert
726-99.03	Linear Foot	18 In. Class V Reinforced Concrete Pipe Culvert
726-99.03	Linear Foot	24 In. Class V Reinforced Concrete Pipe Culvert
726-99.03	Linear Foot	42 In. Class V Reinforced Concrete Pipe Culvert
726-99.03	Linear Foot	48 In. Class V Reinforced Concrete Pipe Culvert

**4.0 Storm Sewer Drainage Structures.** Storm sewer drainage structures, types, and locations are identified in the contract plans. Structures shall be in accordance with applicable Metropolitan St. Louis Sewer District Standard Specifications for Sewers and Drainage Facilities (2009 edition).

**4.1 Method of Measurement.** Measurement for the storm sewer drainage structures will be made in accordance with Sec 731.4.

**4.2 Basis of Payment.** The storm sewer drainage structures shall be paid for at the contract unit price for the items listed below and shall include all necessary equipment, materials, pipe collars, concrete headwalls, concrete toe walls and labor necessary for compliance with these provisions.

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Item No.	Unit	Description
731-99.02	Each	72 In. Manhole with 42 In. Reducer
731-99.02	Each	96 In. Manhole with 42 In. Reducer
731-99.02	Each	42 In. Area Inlet
731-99.02	Each	42 In. Grate Inlet with Side Intake
731-99.02	Each	42 In. Curb Inlet
731-99.02	Each	Double Curb Inlet

**5.0 Basis of Payment.** With the exception of the pay items listed above, no direct payment will be made for any labor, equipment, materials, and time required to comply with this provision.

R-Y. Pedestrian Underpass Sanitary Sewer Pipe and Structures – Job J6S1718B Only

**1.0 Description.** The contractor shall furnish and install sanitary sewer pipes and structures at all locations depicted in the contract plans.

**2.0 Construction Requirements.** The material furnished and installed by the contractor shall be in accordance with Sec 726 and Sec 731, and the Metropolitan St. Louis Sewer District Standard Specifications for Sewers and Drainage Facilities (2009 edition) where required.

**2.1** Sanitary sewer pipe and drainage structure materials are identified in the contract plans. Exceptions for substitution of pipe and drainage structure materials other than those identified shall not be permitted without approval of the engineer. Should the contractor propose a material type change for these items, the contractor shall be responsible for furnishing drainage calculations that have been approved, signed, and sealed by a Professional Engineer who is licensed in the State of Missouri in accordance with the laws relating to architects and professional engineers (Chapter 327, RSMo).

**2.2** Manhole frames and covers shall be lock type, sealing, watertight frames and covers, and shall be included in the cost of the manhole assembly.

**3.0 Method of Measurement.** Measurement for the sanitary sewer pipe and structures will be made in accordance with Sec 724.4 and Sec 731.4.

**4.0 Basis of Payment.** The sanitary sewer pipe and structures shall be paid for at the contract unit price for the items listed below and shall include all necessary equipment, materials, pipe collars, concrete headwalls, concrete toe walls and labor necessary for compliance with these provisions.

Item No.	Unit	Description
502-99.07	CUYD	Class B Concrete (Concrete Encasement)
725-99.03	Linear Foot	8 In. C-900 Pipe
725-99.03	Linear Foot	10 In. C-900 Pipe
731-99.02	Each	48 In. Manhole with External Foulwater Drop

**4.1** With the exception of the pay items listed above, no direct payment will be made for any labor, equipment, materials, and time required to comply with this provision.

R-Z. Hydrodynamic Separator – Job J6S1718B Only

**1.0 Description.** The hydrodynamic Separator shall consist of all work and materials required to furnish and install a hydrodynamic separator for treating stormwater.

**2.0 Materials.** The contractor shall furnish a hydrodynamic separating system that will meet or exceed the hydraulic and performance parameters set forth in the contract plans. The system shall be an off-line configuration and shall be a system approved by the Metropolitan St. Louis Sewer District (MSD).

**2.1** The contractor shall submit shop drawings of the proposed hydrodynamic separator system, prepared that have been prepared, signed, and sealed by a Professional Engineer who is licensed in the State of Missouri in accordance with the laws relating to architects and professional engineers (Chapter 327, RSMo), to MSD for approval prior to ordering or receiving the system components. The system shall include all materials required to install the hydrodynamic separating system, as shown in the contract plans.

**3.0 Construction Requirements.** The system shall be constructed and installed per the manufacturers recommendations. Connections to any existing infrastructure shall be in accordance with Sec 605.40.

**4.0 Technical Assistance.** The contractor shall obtain the services of a technical representative from the manufacturer to advise the engineer, if necessary. This advisor shall be a qualified representative, acceptable to the engineer. It will not be necessary for this representative to be present during the construction of the hydrodynamic separator, unless specifically requested by the engineer.

**5.0 Method of Measurement.** Measurement will be made per each.

**6.0 Basis of Payment.** The hydrodynamic separator shall be paid for at the contract unit price for the item listed below, and such payment shall include all construction, excavation, equipment, and materials necessary for the complete installation of the hydrodynamic separator system. Unless otherwise noted, no direct payment will be made for incidental items necessary to complete the work, including but not limited to, manholes, frame and covers, inlet and outlet pipes, excavation, subbase preparation, bedding, backfill, tools, or labor. The contract unit price and payment will be full compensation for providing a technical advisor as needed. Costs for any modifications to any existing infrastructure for the implementation of the proposed hydrodynamic separator system shall be borne by the contractor and considered incidental to the hydrodynamic separator system proposed.

Item No.	Unit	Description
731-99.02	Each	Hydrodynamic Separator, 48 in. Diameter

R-AA. Saw Cutting for Removal of Improvements

**1.0 Description.** Saw cutting will be necessary for removal of improvements in certain locations as depicted in the contract plans. A number of the locations and estimated saw cut lengths have been identified and quantified in the table for Removal of Improvements that has been included in the Schedule of Quantities. The list included within the Schedule of Quantities may not be all

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inclusive and the contractor's means and methods may require an alternate removal method be employed.

**2.0 Construction Requirements.** All materials and work performed for this item shall be in accordance with Sec 202.

**2.1 Exception for Full Depth Pavement Repair Saw Cutting.** This JSP does not apply to the perimeter and internal saw cutting required for full depth pavement repairs, which shall be governed by the requirements of Sec 613.

**3.0 Method of Measurement.** With the exception of full depth pavement repairs, no measurement shall be made for saw cutting.

**4.0 Basis of Payment.** With the exception of full depth pavement repairs, all saw cutting shall be considered incidental to and completely covered by the contract unit price for Item No. 202-20.10, "Removal of Improvements", per lump sum. No direct payment will be made for any labor, equipment, materials, and time required to comply with this provision.

R-BB. Demolition and Removal of Buildings – Job J6S1718B Only

**1.0 Description.** Three buildings within the City limits of Brentwood, MO shall be demolished, as indicated on the plans. All work shall be performed in accordance with Section 202, except as noted below.

**1.1 Possession of Buildings.** The Commission has possession of the buildings for Parcel 70 (8614 Manchester Rd), Parcel 71 (2702 Mary Ave.), and Parcel 81 (8615 Manchester Rd) as indicated on the plans.

**1.2** The contractor's attention is directed to the fact that an asbestos survey was completed for each parcel. Asbestos Containing Materials (ACM) are identified and catalogued in an Inspection and Survey report for each property. The contractor shall be required to remove them in accordance with Sec 202.40.

**2.0 Early Notice To Proceed.** The Commission will issue an early notice to proceed for the demolition work. See "Early Notice to Proceed (Demo Work)" JSP. The Commission reserves the right to designate the order of demolition work. Parcel 71 shall be demolished first in order to allow MSD to construct their improvements on that parcel. The contractor is further advised that removal of hazardous substances from the buildings may delay the issuance of the notice to remove and that the contractor is not to enter any properties nor conduct any demolition of any building until the hazardous material is removed.

**2.1** The Commission does not warrant that the listings or depictions of hazardous materials in the bidding documents are complete or accurately reflect either all hazardous materials or their precise locations within or adjacent to the project limits.

**2.2** The contractor shall complete the proper notification procedures in accordance with the appropriate federal, state, and local laws and regulations for demolition of structures. The notification procedures and forms are available electronically at <https://dnr.mo.gov/forms/780-1923-f.pdf> or you may contact the MDNR's Air Pollution Control Program at 1-800-361-4827.

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Notification is necessary at least 10 working days in advance of the start date for removal of asbestos or for the demolition of a building with or without reportable quantities of asbestos present. The contractor shall provide copies of all completed and approved forms to the engineer prior to any demolition work.

### **3.0 Demolition Permit from City of Brentwood, MO.**

**3.1** No building shall be demolished unless Lisa Koerkenmeier, Director of Planning and Development for the City of Brentwood, MO, has issued a demolition permit. Application shall be made for a demolition permit before work is started. The Director of Planning and Development shall issue the permit only upon a finding that the work will conform to all of the applicable ordinances of the City.

**3.2** The City has determined there shall be no demolition permit fee since it is a City project.

**3.3** Upon issuance of a demolition permit by the City, the applicant shall provide the following items to the Department of Planning and Development at least seven (7) business days prior to the anticipated date of demolition of all principal structures:

**3.3.1** Letters, in sufficient quantity as required by the Director of Planning and Development, typed on the demolition contractor's letterhead detailing the probable dates of demolition as stated on a weekly basis, i.e., demolition of this house will occur the week of January twelfth (12th) through sixteenth (16th).

**3.3.2** Envelopes, in sufficient quantity as required by the Director of Planning and Development, containing the demolition contractor's return address, the address of the property owner receiving the demolition notice and sufficient postage to mail the demolition notice.

**3.3.3** The Director of Planning and Development shall provide the demolition contractor a list of all properties within three hundred (300) feet of the principal structure to be demolished so that the demolition contractor can provide the items required.

**4.0 Construction Requirements.** Demolition of the buildings designated on the plans shall include complete removal and disposal of the existing building and foundation, landscaping, trees, curbs, parking stops, guardrail, drainage structures, inlets and pipes, and all existing pavement.

**4.1** All utility service connections to these buildings, including but not limited to, drainage pipes, gas, water, sewer, telephone, cable and electric, shall be completely removed.

**4.2 Parcel 70.** Once demolition is complete, clean dirt fill capable of growing vegetation shall be placed throughout the property limits. The finished grade shall have a continuous, gentle slope that directs storm water away from adjacent occupied properties. Large areas of ponding that allow mosquitos to flourish are not allowed. The property shall be cleaned up and restored with seeding and mulching and to a condition that is both acceptable to the engineer and to the City of Brentwood.

**4.3 Parcel 71.** It is anticipated that MSD will begin construction improvements on this parcel for their CSO Mary Ave Project on August 23, 2021. The contractor shall coordinate with Brian Kunz at 618-780-2015 (mobile) once demolition is substantially complete on this parcel. The contractor

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shall demobilize all equipment and any stored materials from the parcel once demolition activities cease.

**4.4 Parcel 81.** Once demolition is complete, clean dirt fill capable of growing vegetation shall be placed on the property limits. The finished grade shall have a continuous, gentle slope that directs storm water away from adjacent occupied properties. Large areas of ponding that allow mosquitos to flourish are not allowed. The property shall be cleaned up and restored with seeding and mulching and left in a condition that is both acceptable to the engineer and to the City of Brentwood.

**5.0 Demolition Completion Date.** Unless specified elsewhere, all buildings shall be completely demolished and removed, and site restoration completed, no later than November 30, 2021.

**6.0 Basis of Payment.** Payment for compliance with this specification will be made in accordance with the contract unit bid price for the item 202-99.50 Demolition and Removal of Buildings and includes all labor, equipment, materials, and time required to comply with this provision.

R-CC. Optional Pavements JSP-06-06G (J6S1718B Only)

**1.0 Description.** This work shall consist of a pavement composed of either Portland cement concrete or asphaltic concrete constructed on a prepared subgrade. This work shall be performed in accordance with the standard specifications and as shown on the plans or established by the engineer.

**2.0** The quantities shown reflect the total square yards of pavement surface designated for each pavement type as computed and shown on the plans.

**2.1** No additional payment will be made for asphaltic concrete mix quantities to construct the required 1:1 slope along the edge of the pavement, or for tack applied between lifts of asphalt.

**2.2** No additional payment will be made for aggregate base quantities outside the limits of the final surface area as computed and shown on the plans. When A2 shoulders are specified, payment for aggregate base will be as shown on the plans.

**2.3** The grading shown on the plans was designed for the thicker pavement option. For projects with grading in the contract, there will be no adjustment of the earthwork quantities due to adjusting the roadway subgrade for optional pavements.

**2.4** The contractor shall comply with Sections 401 through 403 for the asphalt option and Sections 501 and 502 for the concrete option.

**2.5** Pavement options composed of Portland cement concrete shall have contrast pavement marking for intermittent markings (skips), dotted lines, and solid intersection lane lines. The pavement markings shall be in accordance with Section 620. No additional payment will be made for the contrast pavement markings.

**3.0 Method of Measurement.** The quantities of concrete pavement will be measured in accordance with Section 502.14. The quantities of asphaltic concrete pavement will be measured in accordance with Section 403.22.

**4.0 Basis of Payment.** The accepted quantity of the chosen option will be paid for by the contract unit bid price for Item 401-99.05, Optional Pavement, per square yard.

R-DD. Relocating Water Service Leads

**1.0 Description.** Where indicated on the plans or directed by the engineer, existing water service leads, including privately-owned water valves, meters, and service leads which are connected to water mains, shall be adjusted to clear the proposed new improvement.

**2.0 Construction Requirements.** All adjustments shall be made in accordance with the prevailing plumbing code, rules, and regulations governing such work as prescribed by the Utility Company, County, or Municipality having jurisdiction over plumbing work.

**2.1** All adjustments requiring the crossing of the state route shall be performed by boring or by another suitable method. No cutting of the pavement shall be allowed.

**2.2** The adjustments are classified into ten (10) classes as follows:

- Class 1 - The contractor shall adjust the existing water valves to the new grade.
- Class 2 - The contractor shall relocate the existing water valve to near the right of way line.
- Class 3 - The contractor shall adjust the existing water meter to the new grade.
- Class 3A - The contractor shall adjust the existing water meter vault to the new grade.
- Class 4 - The contractor shall relocate the existing water meter to privately owned property.
- Class 5 - The contractor shall adjust the existing water service line to avoid interference with the storm sewer pipes.
- Class 6 - The contractor shall adjust the existing water service line to avoid interference with grading operations.
- Class 7 - The contractor shall reconnect the existing water service line to the relocated water main.
- Class 8 - The contractor shall extend the existing service line to the relocated water main.
- Class 9 - The contractor shall provide and install a new water valve and valve box near the right of way line.
- Class 10 - The contractor shall adjust existing water service line to avoid future grading/storm sewer interference.

**2.3** The service leads will be further broken down into four (4) categories: under 25mm dia. (1 in. dia.); 25mm dia. to less than 50mm dia. (1 in. dia. to less than 2 in. dia.); 50mm dia. to less than 75mm dia. (2 in. dia. to less than 3 in. dia.); and 75mm dia. (3 in. dia.) and above.

The contractor's attention is directed to the fact that the adjustments of some of the water service leads on this project may be carried out by the respective owner(s), and that it may be necessary to underrun this item.

**2.4** No additional payment shall be allowed for any claim for damages by the contractor due to the necessity for underrunning the Items of Relocating Service Connections.

**3.0 Method of Measurement.**

**4.0 Basis of Payment.** Payment for adjusting water service leads will be made at the contract unit bid price each, which price shall constitute full payment for all necessary excavation, backfilling, boring, furnishing all materials, including all necessary pipe and pipe fittings and all equipment, tools, labor, and work incidental thereto.

Item No.	Unit	Description
603-99.02	Each	Relocating Service Connections (Class 5) (3 In. or Less)

R-EE. 72-Inch Temporary Chain Link Fence

**1.0 Description.** The contractor shall provide temporary 72-inch chain link fence during construction at select parcels as denoted in the contract plans.

**2.0 Construction Requirements.** All materials and work performed for this item shall be in accordance with Sec 607. All temporary fencing shall be placed within the limits of the existing Right of Way or any Permanent or Temporary Construction Easements obtained for the project.

**3.0 Locations.**

**3.1 Parcel 90 – St. Mary Magdalen Church and School.** Temporary 6 foot tall fencing shall be provided at the parking and school yard enclosure at this parcel during all periods of active construction operations. The temporary fencing shall not be driven into the parking lot surfacing, but shall instead be placed on skids. The skids shall be anchored such that they are resistant to movement. Temporary fencing panels shall have a bottom bar. There shall be a gap of no greater than 2 inches below the bottom bar and the ground, and a gap of no greater than 2 inches between panels.

**3.1.1 Drive gates.** Existing fence drive gates located on this parcel along Manchester Road shall be used in place as part of this project. The gates shall be able to be latched and secured by means of a dual lock system. The contractor shall furnish two separately keyed lock and key sets. One lock and key set being for the contractor and the second lock and key set shall be provided to the owner / manager of the church and school property. The gates shall be kept locked except when needed for property owner access or by the contractor with prior approval from the property owner. All hardware and locks shall be considered incidental to the cost of the gate and no direct payment will be made.

**3.1.2 Removal of Temporary Fence.** Upon completion of the work on Parcel 90, the contractor will provide the property owner with a 90-day notice letter stating that owner can now install new fence at owner’s expense. The contractor will return 90 days after date on the letter to remove the temporary fence.

**3.2 Parcel 256 – St. Agnes Home.** Temporary fencing shall be provided along the frontage of the St. Agnes Home during all periods of active construction operations. Fence posts shall be driven into the ground. The temporary fence shall be tied into the existing fence at the ends of all fencing runs, and there shall be a gap of no greater than 2 inches at any tie-in location. Chain link fence around the parcel is to be replaced with new 48-inch chain link fence that is green powder-coated.

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**4.0 Method of Measurement.** Measurement will be made in accordance with Sec 607. The temporary 72-inch chain link fence shall be paid for only one time per parcel and no payment will be made for any relocation of the fencing within the parcel.

**5.0 Basis of Payment.** Payment for the accepted quantity for temporary 72-inch chain link fencing and gates will be made in accordance with the contract unit bid price for the item listed below and includes all labor, equipment, materials, and time required to comply with this provision.

Item No.	Unit	Description
607-99.02	Each	Temporary Drive Gate
607-99.03	Linear Foot	Green Powder Coated Chain Link Fence (48 IN.)
607-99.03	Linear Foot	72-Inch Temporary Chain Link Fence

R-FF. Stairs, Handrails, and Appurtenances at Curb Ramp 72

**1.0 Description.** This curb ramp location involves the removal and replacement of the existing stairs, handrails, and other appurtenances to match the grades of the ADA curb ramp that will be replaced at the Stairs, handrails, and appurtenances shall be installed at the Curb Ramp 72 location as depicted in the contract plans.

**2.0 Construction Requirements.** The location of the stairs and handrail to be removed and replace has been identified in the plans for the contractor's information for estimating purposes. No additional payment will be made for any design work or additional labor, equipment, materials, and time associated with a contractor-proposed modification to the stairs. Removal of the existing stairs, handrail and concrete shall be considered incidental to and included in the work for this pay item.

**2.1 Thickness.** The thickness of the concrete placed for the stairs, ramps, and sidewalk tie-ins shall be no less than 7 inches deep.

**2.2 Handrails.** Handrails shall be replaced in kind, with both balusters and shall have a black decorative coating that matches the existing building theme, and shall comply with PROWAG standards. A minimum of 6 inches of concrete shall be provided around all handrail posts and an appropriate watertight seal shall be placed at the joint between the handrail posts and concrete.

**2.3 Stairs.** The new stairs shall consist of three evenly spaced stairs with risers that are 7 inches tall. Tread depths shall comply with PROWAG standards.

**2.4** All work performed for this item shall be in accordance with Sec 304, 608, and 609; all materials shall be in accordance with Sec 1000. All concrete shall include 4 inches of Type 5 Aggregate Base underneath and any necessary integral curbing required for construction of the stairs.

**3.0 Method of Measurement.** No measurement will be made for this item.

**4.0 Basis of Payment.** Payment for the accepted quantity for the removal and replacement of the stairs at Curb Ramp 72 will be made in accordance with the contract unit bid price for the item

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listed below and includes all labor, equipment, materials, and time required to comply with this provision.

Item No.	Unit	Description
608-99.01	Lump Sum	Stairs and Handrails at Curb Ramp 72

R-GG. 7-Inch Concrete Curb Ramps (J6S1718 Only)

**1.0 Description.** ADA curb ramps shall be installed at the locations depicted in the contract plans.

**2.0 Construction Requirements.** Proposed curb ramp types have been identified in the plans for the contractor’s information for estimating purposes. The contractor may be permitted to deviate from the curb ramp type shown at a given location, provided that the contractor-proposed change has been approved by the engineer, stays within the constraints of all Right of Way and easements, and the final product is compliant with current ADA standards. No additional payment will be made for any design work or additional labor, equipment, materials, and time associated with a contractor-proposed modification to the ADA curb ramps.

**2.1 Thickness.** The thickness of the concrete placed for the ADA curb ramps shall be no less than 7 inches.

**2.2** All work performed for this item shall be in accordance with Sec 304, 608, and 609. All concrete curb ramps shall include 4 inches of Type 5 Aggregate Base underneath and any necessary integral curbing required for construction of an ADA-compliant ramp.

**3.0 Method of Measurement.** Measurement will be made per each ADA-compliant curb ramp installed by the contractor and accepted by the engineer. Base rock and integral curbing required for construction of the curb camps shall be considered incidental to the construction of the curb ramps and no measurement will be made for these items.

**4.0 Basis of Payment.** Payment for the accepted quantity for the ADA curb ramps will be made in accordance with the contract unit bid price for the item listed below and includes all labor, equipment, materials, and time required to comply with this provision.

Item No.	Unit	Description
608-99.02	Each	7" Concrete Curb Ramp

R-HH. 10-Foot-Wide Concrete Sidewalk and Curb Ramps – Job J6S1718B Only

**1.0 Description.** Sidewalk and ADA curb ramps placed on the J6S1718B project shall consist of a 10-foot wide concrete sidewalk that will be designated as a shared-use path. Additional construction requirements are necessary for installation of this sidewalk and ADA curb ramps as noted below.

**2.0 Construction Requirements.** Proposed curb ramp types have been identified in the plans for the contractor’s information for estimating purposes. The contractor may be permitted to deviate from the curb ramp type shown at a given location, provided that the contractor proposed

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change has been approved by the engineer, stays within the constraints of all Right of Way and easements, and the final product is compliant with current ADA standards. No additional payment will be made for any design work or additional labor, equipment, materials, and time associated with a contractor-proposed modification to the ADA curb ramps.

**2.1 Control Joints.** Lateral joints are to be constructed in accordance with Sec 608. No additional longitudinal joint in the center of the sidewalk is required.

**2.2 Thicknesses.** The thickness of the concrete sidewalk shall be no less than 4 inches and the thickness of the curb ramps shall be no less than 7 inches of concrete.

**2.3** All work performed for this item shall be in accordance with Sec 304, 608, and 609. All 10-foot-wide concrete curb ramps shall include 4 inches of Type 5 Aggregate Base underneath and any necessary integral curbing required for construction of an ADA-compliant ramp.

**3.0 Method of Measurement.** Measurement of concrete sidewalk will be made in accordance with Sec 608. For curb ramps, measurement will be made per each ADA-compliant curb ramp installed by the contractor and accepted by the engineer. Base rock and integral curbing required for construction of the curb camps shall be considered incidental to the construction of the curb ramps and no measurement will be made for these items.

**4.0 Basis of Payment.** Payment for the accepted quantity for the 10-foot wide sidewalk and ADA curb ramps will be made in accordance with the contract unit bid price for the items listed below and includes all labor, equipment, materials, and time required to comply with this provision.

Item No.	Unit	Description
608-99.02	Each	7" Concrete Curb Ramp (10 FT)
608-99.05	SQYD	4-In. Concrete Sidewalk (10 FT)

R-II. Thickened Sidewalk Slab Over Box Culvert – Job J6S1718B Only

**1.0 Description.** The 10-foot wide shared use path along the south side of Manchester Road is to fit within the footprint of the existing box culvert located at Route 100 Station 62+25. A thickened concrete sidewalk slab shall be constructed above this existing box culvert at the location depicted in the contract plans.

**2.0 Construction Requirements.** All materials and work performed for this item shall be in accordance with Sec 608.

**2.1 Excavation.** The existing material above the top slab of the existing box culvert, including, but not limited to, slope protection, sidewalk, aggregate base, and earthen material shall be removed to the elevation of the top of the existing box culvert slab. The contractor shall take care to not disturb or damage the existing box culvert. Any damage to the existing box culvert that is a result of the contractor's operations shall be repaired at the contractor's expense.

**2.2 Backfill.** Upon removal of the existing material, the contractor shall backfill any remaining voids between the outside walls of existing the box culvert with 1-inch clean rock up to the elevation of the top of the existing box culvert slab. Two layers of roofing felt shall be used as a

bond breaker between the top of the existing box culvert and the bottom of the thickened sidewalk slab. No direct payment will be made for backfill material or bond breaker.

**2.3 Sidewalk and Curb Concrete.** Concrete material shall be the same material as specified for the shared use path and is to be placed during the same concrete pour as adjacent sections of the shared use path. Placement shall also include the 6-inch integral curb for the shared use path.

**2.3.1** A transverse ½-inch preformed fiber joint shall be placed between the thickened sidewalk slab and the normal-depth segments of sidewalk and shall be considered incidental. The thickened sidewalk slab is approximately 12 inches thick. Variations in this thickness may occur, but no payment adjustment shall be made if a variation in the depth is found.

**2.5 Fencing.** A segment of fence will be placed along the shared use path in the vicinity of the existing box culvert. This fence shall be constructed as a continuous run of fencing at the limits depicted in the contract plans, however the contractor shall lay out the fence post locations such that they do not fall within the limits of the thickened sidewalk slab. Payment for the fence shall be paid for with the fencing pay item included in the contract and will not be included in the payment for the thickened sidewalk slab.

**3.0 Method of Measurement.** No measurement will be made for this item.

**4.0 Basis of Payment.** Payment for the accepted quantity for the thickened sidewalk slab to be placed over the existing box culvert will be made in accordance with the contract unit bid price for the item listed below and includes all labor, equipment, materials, and time required to comply with this provision.

Item No.	Unit	Description
608-99.01	Lump Sum	Thickened Sidewalk Slab Over Box Culvert

R-JJ. Modified Curb

**1.0 Description.** There are a number of locations on the project where grade differentials require concrete curbs or retaining walls. In locations where this height is between 8 inches and 12 inches, a Modified Curb shall be used.

**2.0 Construction Requirements.** All materials and work performed for this item shall be in accordance with Sec 609.

**2.1 Curb.** The Modified Curb shall be embedded into the ground a minimum of 18 inches below the lowest exposed elevation of the face of the Modified Curb and shall be 6 inches wide. Forming will not be required for any underground portion of the Modified Curb. The face of the Modified Curb shall be tapered from the 6-inch width at the lowest exposed elevation to 5 inches wide at the top as depicted in the contract plans.

**2.2 Reinforcement.** Tie bars shall be #4 epoxy coated steel bars placed at 30 inch spacing (on center) longitudinally along the length of the Modified Curb. The tie bars shall be “L” shaped (MoDOT Standard Bar Bill Shape 19). Lengths of the vertical and horizontal legs shall vary

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depending on curb height and will be determined by the contractor. The minimum cover around the bar shall be no less than 2 inches.

**3.0 Method of Measurement.** Measurement will be made in accordance with Sec 609.

**4.0 Basis of Payment.** Payment for the accepted quantity for the Modified Curb will be made in accordance with the contract unit bid price for the item listed below and includes all labor, equipment, materials, and time required to comply with this provision.

Item No.	Unit	Description
609-99.03	Linear Foot	Modified Curb

R-KK. Slurry and Residue Produced During Surface Treatment of PCCP and Bridge Decks – J6S1718B Only

**1.0 Description.** This work covers the requirements for controlling residue or slurry produced by milling, grinding, planing, grooving or other methods of surface treatments on new or existing PCCP and bridge decks in addition to Section 622.

**2.0 Construction Requirements.** The following shall be considered the minimum requirements for performing this work within the project limits.

**2.1** The contractor shall submit to the engineer for approval in writing prior to the pre-construction meeting, the best management practices (BMP's) to be used to protect the environment, including the method of disposal of the residue whether on right of way or off-site.

**2.2** When slurry is dispersed on the right of way, BMP's shall be installed to keep slurry or residue from entering paved ditches or structures discharging within the areas restricted by Section 622.303.8.6, from entering any waterways or from leaving the right of way.

**2.3** Upon approval of the contractor's BMP and residue disposal plan and prior to the contractor beginning surface treatment operations, the engineer will identify slurry or residue "no discharge zones".

**2.4** Operations may be suspended by the engineer during periods of rainfall or during freezing temperatures.

**3.0 Basis of Payment.** No direct payment for slurry or residue control requirements for BMP's will be made. Compliance with this specification along with the cost of all materials, labor and equipment necessary for the surface treatment work shall be included in and completely covered by the unit price bid for each of the items of work for surface treatment included in contract.

R-LL. Parking Blocks (J6S1718 Only)

**1.0 Description.** The contractor shall provide precast concrete parking blocks/wheel stops for the parking spaces adjacent to the right of way as indicated in the contract plans. Rubberized or plastic composite parking blocks will not be acceptable.

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**2.0 Construction Requirements.** All materials and work performed for this item shall be in accordance with Sec 703 and 1036. Parking blocks shall be precast concrete with longitudinal reinforcement. The parking blocks must fit within the parking space and shall be a minimum of 6 feet in length, no shorter than 6 inches in height, and a minimum of 8 inches wide at the base. The sides shall be tapered such that the base of the parking block is wider than the top. Water relief slots are to be provided at the base of the block to allow for water to pass underneath.

Parking blocks should fit flush to the ground and be placed near the nose of the parking space, centered between the painted stripes, and oriented perpendicular to the width of the parking space. One parking block shall be provided for each identified parking space requiring a parking block. The parking blocks shall be secured to the parking surface by means of no less than two vertical pins or rebars that pass through the middle block, one located neat each end. The tops of these pins or rebars are to be flush with the top surface of the parking block once installed.

**3.0 Method of Measurement.** Measurement will be made per each installed parking block.

**4.0 Basis of Payment.** Payment for the accepted quantity for parking blocks will be made in accordance with the contract unit bid price for the item listed below and includes all labor, equipment, materials, and time required to comply with this provision.

Item No.	Unit	Description
620-99.02	Each	Parking Block

R-MM. Precast Concrete Modular Block Wall – Job J6S1718B Only

**1.0 Description.** This work shall consist of furnishing and constructing precast concrete modular block walls with or without soil reinforcement in accordance with these specifications, as shown on the plans or as directed by the engineer.

**2.0 Materials.** All material shall be in accordance with Division 1000, Material Details, and specifically as follows:

<u>Item</u>	<u>Section</u>
Concrete .....	501
Select Granular Backfill for Structural Systems .....	1010
Geotextile .....	1011
Miscellaneous Drainage Material .....	1013
Reinforcing Steel for Concrete .....	1036
Resin Anchor Systems .....	1039
Mechanically Stabilized Earth Wall System Components .....	1052

**2.1** Concrete used in the production of the precast modular block units shall be first-purpose, fresh concrete. It shall not consist of returned, reconstituted, surplus or waste concrete.

**2.2** The unit fill shall consist of a granular backfill in accordance with Gradation D or E of Sec 1005.

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**2.3** Class B or B-1 concrete shall be used for cast-in-place concrete leveling pads used for the wall system.

**2.4** Reinforcement shall be either Grade 60 deformed bars or an equivalent steel welded wire reinforcement.

**2.5** Joint material shall be used in accordance with the wall manufacturer's recommendations.

### **3.0 Design Requirements.**

**3.1** The precast concrete modular block wall shall be designed and constructed to have a vertical face (zero batter). All units shall be wet-cast precast modular retaining wall units conforming to ASTM C1776. All units for the project shall be obtained from the same manufacturer. system patent holder/licensor and shall document compliance with the published quality control standards of the proprietary precast modular block system licensor for the previous three (3) years or the total time the manufacturer has been licensed, whichever is less. The manufacturer shall be licensed and authorized to produce the retaining wall units by the precast modular block and shall be from one of the pre-approved wall systems:

- Redi-Rock Wall, Redi-Rock International, LLC
- Stone Strong, Stone Strong, LLC
- Recon Retaining Walls, Recon Wall Systems, Inc.
- or approved alternate

**3.2** The contractor shall submit six complete sets of the manufacturer's design plans, details, and computations for each individual wall structure to the engineer. All submitted information shall be clear and complete, and thoroughly checked before the information is submitted. All submitted information shall be legible and of sufficient contrast to be suitable for archiving in accordance with MoDOT's current practice for archiving. Submitted information determined to be unsuitable for archiving purposes will be returned for corrective action.

**3.3** The contractor will be solely responsible for the content of the design plans, details, and computations that are submitted, and for the performance of the wall system. The contractor shall be solely responsible for ensuring that the information submitted by the manufacturer is in accordance with all contract plans and specifications and with the wall system used. Completed design plans shall contain all material, fabrication and construction requirements for erecting the wall system complete in place. The completed design plans shall show the longitudinal and lateral layout of the drainage systems used for the wall system. The contractor shall be responsible for the internal and external stability of the structure including compound stability. Overall global stability has been evaluated by the geotechnical engineer as described in the contract plans. The contractor shall be responsible for overall global stability for any wall sections that deviate from the overall global stability cases that vary from those described in the contract plans.

**3.4** All design plans, details, and computations submitted for distribution shall be signed, sealed, and stamped in accordance with the laws relating to architects and professional engineers (Chapter 327, RSMo).

**3.5** Precast concrete modular block walls shall be designed in accordance with the AASHTO specifications shown on the plans and in accordance with additional publications or specifications referenced within the AASHTO specifications. The seismic performance category, angle of internal friction for the selected granular backfill for structural systems and other design requirements shown on the plans shall be incorporated into the design of the wall system.

**3.6** Design shall also include specialized placement of the wall reinforcement, blocks, control joints, and all other necessary design elements to accommodate sanitary sewer and stormwater drainage structures, pipes and other utility appurtenances that are to be placed within the reinforcement and excavation limits of the retaining walls.

#### **4.0 Construction Requirements.**

**4.1 Unit Fill.** The contractor shall use a unit fill to fill the voids of the blocks for the wall system. This unit fill shall extend a minimum distance of 12 inches beyond the extreme back face of the wall system. Each course of the wall system shall have the unit fill in place before the next course of the wall system is placed.

**4.2 Drainage Requirements.** A drainage system shall be provided at the base of the wall as shown on the contract plans. The drainage system shall consist of a perforated pipe wrapped in a Class 2 geotextile to prevent clogging of the perforations. The pipe shall be placed in such a manner that water drains freely from the pipe. When the wall length is such that the slope of the pipe becomes excessive in the engineer's judgment, lateral drainpipes shall be installed underneath the concrete leveling pad.

**4.3 Foundation Preparation.** The foundation for the wall system shall be graded level for a width equal to or exceeding the length of the reinforcing strips, or as shown on the plans. Prior to wall construction, the foundation, if not on rock, shall be compacted as directed by the engineer. Any foundation soils found to be unsuitable shall be removed and replaced, as directed by the engineer.

**4.4 Geotechnical Engineer.** The contractor shall retain a geotechnical engineer to observe excavations to determine if unsuitable existing fill has been removed. This work will be considered completely covered by the contract unit price for Precast Concrete Modular Block Wall.

**4.5 Leveling Pad.** An unreinforced cast-in-place concrete leveling pad shall be provided at the foundation level for each base unit of the wall system. The leveling pad shall be built to the elevations shown on the plans and shall not be raised in elevation to allow for the use of a particular wall system. The leveling pad shall be built a minimum width of 12 inches and a minimum depth of 6 inches. The concrete on the leveling pad shall be cured a minimum of 12 hours before any of the wall system blocks are placed.

#### **4.6 Select Granular Backfill for Structural Systems Placement.**

**4.6.1** Select granular backfill for structural systems shall be placed concurrently with the placement of the retained backfill. The placement of the select granular backfill for structural systems shall closely follow the erection of each course of the wall system and shall be placed in such a manner to avoid any damage or disturbance to the wall material or any misalignment of the facing elements of the wall system. Any wall system material that becomes damaged or disturbed during the installation of the wall system shall be removed, replaced, or corrected at the

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contractor's expense, as directed by the engineer. Whenever placement of the select granular backfill for structural systems results in the wall facing system being misaligned or distorted outside the limits of this specification, the contractor shall correct the misalignment or distortion as directed by the engineer.

**4.6.2** The select granular backfill for structural systems shall be compacted in accordance with Sec 203, with the following exceptions:

- a) The minimum density shall be no less than 95 percent of maximum density, determined in accordance with AASHTO T 99.
- b) When the material used contains more than 30 percent retained on the  $\frac{3}{4}$  inch sieve, a method of compaction consisting of at least four passes by a heavy roller shall be used.
- c) The moisture content of the material prior to and during compaction shall be uniformly distributed throughout each layer. The placement moisture content shall be no lower than three percentage points less than the optimum moisture content and shall be no more than the optimum moisture content.
- d) Compaction within 3 feet of the back face of the wall system shall be achieved by at least three passes of a lightweight mechanical tamper, roller, or vibratory system.
- e) The contractor shall ensure that runoff within the wall system construction site is directed away from the wall facing during construction, and that runoff from adjacent areas of the general construction site is directed such that runoff does not enter the wall system construction site.
- f) Class 1 geotextile material shall be placed between the select granular backfill for structural systems, and the retained backfill and over the top of the select granular backfill for structural systems to prevent piping of in-situ soil into the wall system.
- g) Tamping-type (sheep's foot) rollers shall not be used for compaction of the select granular backfill for structural systems.

**4.6.3** The select granular backfill for structural systems shall be initially placed parallel to the wall system, and at the rear and middle of the soil reinforcement strips, and then moved toward the facing elements of the wall system. Construction equipment shall at no time come in direct contact with the soil reinforcement strips. Each course or layer shall be compacted up to or slightly above the location of the next connection for the reinforcement strips prior to placing the next layer of reinforcement strips as designated in the erection sequence provided by the manufacturer of the wall system.

#### **4.7 Construction Tolerances.**

**4.7.1** Wall systems shall be built in accordance with the dimensions and elevations specified on the plans and in accordance with the requirements of the system manufacturer. Alignments shall be maintained within the following dimensional tolerances:

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Dimensional Item	Dimensional Tolerance
Adjacent Face Panel / Block Joint Gaps	± 1/4 inch
Vertical and Horizontal Alignment of Facing Elements	± 1/16 inch per foot
Soil Reinforcement Strip Elevations	± 1 inch

**4.7.2** Vertical alignments shall be measured along a theoretical vertical line established from the top of the wall system to the base of the wall system.

**4.8 Pipe Encasement for Utility Appurtenances.** Any encasement required for the utility appurtenances in proximity to the Rogers Parkway and precast concrete modular block walls as identified in this JSP or in the contract plans, in particular the sanitary sewer line crossing at Walls 1 and 2, shall be considered incidental to and included in the cost of the precast concrete modular block wall.

**4.9 Technical Assistance.** The contractor shall be responsible for having a technical advisor from the wall system manufacturer available for assistance during the installation of the wall system.

**5.0 Method of Measurement.**

**5.1** Measurement of precast concrete modular block walls will be made to the nearest square foot. The quantity to be paid will be measured from the “Top of Wall” line to the “Theoretical Top of Leveling Pad” line shown on the plans. No adjustments in the measured quantity will be permitted for additional wall area required to meet the minimum wall elevations shown on the plans for any particular wall system.

**5.2** Final measurement will not be made except for authorized changes during construction or where appreciable errors are found in the contract quantity. The revision or correction will be computed and added to or deducted from the contract quantity.

**5.3** No measurement will be made for required excavation for placement of the leveling pad for the wall system. All other excavation required for the construction of the wall system will be included in roadway items.

**6.0 Basis of Payment.** Payment for the accepted quantity for precast concrete modular block walls will be made in accordance with the contract unit bid price for the item listed below and includes all labor, equipment, materials, and time as required to comply with this provision.

Item No.	Unit	Description
720-99.04	SQFT	Precast Concrete Modular Block Wall

R-NN. Re-construct Wall in Place (J6S1718 Only)

**1.0 Description.** This work shall consist of the removal of portions of existing retaining walls and reconstructing in kind as shown on the plans. Existing retaining walls consist of mortared stone walls, brick walls and small block retaining walls. The contractor shall evaluate each wall to be reconstructed in place and shall make a determination as to whether any existing wall materials are suitable for re-use for reconstruction. As required, this item shall also include temporary

storage of salvaged material. The contractor shall exercise extreme care to protect the portions of the retaining walls that are to remain and components which will be reconstructed. Should the contractor deem wall materials as unsuitable for re-use, they shall be properly disposed of off-site.

**2.0 Construction Requirements.** This work shall consist of reconstructing portions of the retaining wall with stone, brick, or masonry units laid in mortar, or block and in conformity with the lines and grades shown on the plans or established by the engineer. Removal and reconstruction of underground portions of the walls as well as any excavation, footings, bedding, backfill, reinforcement, mortars/adhesives, and other necessary components shall be considered incidental to the cost of this item.

**2.1** In general, the wall shall be laid with face joints to match the existing joint thickness. Exposed faces of the existing wall stones and bricks shall be exposed faces on the rebuilt or relocated wall stones or bricks. All stone or bricks shall be thoroughly wetted and laid upon their natural beds with joints approximately horizontal and vertical. Each stone or brick shall be settled into place in a full bed of mortar where required. Mortar for joints shall meet the requirements of Sec 1066.

**2.2 Materials.** Materials shall consist of existing sound and durable stones, bricks or blocks salvaged from removal operations for existing retaining walls. Material that is to be salvaged from existing structures shall be removed without damage, in sections which may be readily handled or transported, and shall be palletized at an accessible point. Walls shall be constructed in kind and reconstructed walls shall match the look and color of the undisturbed section of the walls.

**3.0 Method of Measurement.** Measurement for reconstructing retaining walls will be made to the nearest square foot. The quantity to be paid will be measured along the vertical face of reconstructed wall in view.

**4.0 Basis of Payment.** Payment for the accepted quantity for reconstructing walls in place will be made in accordance with the contract unit bid price for the item listed below and includes all labor, equipment, materials, and time as required to comply with this provision.

Item No.	Unit	Description
720-99.04	SQFT	Re-construct Wall in Place

R-OO. Small Block Wall

**1.0 Description.** This work shall consist of furnishing and constructing precast small block gravity retaining walls without soil reinforcement in accordance with these specifications, as shown on the plans or as directed by the engineer.

**2.0 Materials.** All material shall be in accordance with Division 1000, Material Details, and specifically as follows:

<u>Item</u>	<u>Section</u>
Concrete .....	501
Select Granular Backfill for Structural Systems .....	1010
Geotextile .....	1011

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Miscellaneous Drainage Material ..... 1013  
Resin Anchor Systems.....1039  
Small Block Wall Systems – Concrete Blocks.....1052.40

**2.1** The unit fill shall consist of a granular backfill in accordance with Gradation D or E of Sec 1005.

**2.2** Class B or B-1 concrete shall be used for cast-in-place concrete leveling pads used for the wall system.

**3.0 Design Requirements.**

**3.1** Only the small block wall systems shown in the bridge prequalified products listing will be allowed for use by the contractor. The bridge prequalified products list may be obtained through Bridge or MoDOT’s web site. Any deviations from the prequalified wall system details previously submitted to Bridge shall be specifically outlined in the cover letter submitted with the design plans, details and computations.

**3.2** The contractor shall submit six complete sets of the manufacturer’s design plans, details, and computations for each individual wall structure to the engineer. All submitted information shall be clear and complete, and thoroughly checked before the information is submitted. All submitted information shall be legible and of sufficient contrast to be suitable for archiving in accordance with MoDOT’s current practice for archiving. Submitted information determined to be unsuitable for archiving purposes will be returned for corrective action.

**3.3** The contractor will be solely responsible for the content of the design plans, details, and computations that are submitted, and for the performance of the wall system. The contractor shall be solely responsible for ensuring that the information submitted by the manufacturer is in accordance with all contract plans and specifications and with the wall system used. Completed design plans shall contain all material, fabrication and construction requirements for erecting the wall system complete in place. The completed design plans shall show the longitudinal and lateral layout of the drainage systems used for the wall system. The contractor shall be responsible for the internal and external stability of the structure including compound stability and overall global stability.

**3.4** All design plans, details, and computations submitted for distribution shall be signed, sealed, and stamped in accordance with the laws relating to architects and professional engineers (Chapter 327, RSMo).

**3.5** Small block walls shall be designed in accordance with the AASHTO specifications shown on the plans and in accordance with additional publications or specifications referenced within the AASHTO specifications. The seismic performance category, angle of internal friction for the selected granular backfill for structural systems and other design requirements shown on the plans shall be incorporated into the design of the wall system.

**4.0 Construction Requirements.**

**4.1 Unit Fill.** The contractor shall use a unit fill to fill the voids of the blocks for the wall system. This unit fill shall extend a minimum distance of 12 inches beyond the extreme back face of the

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wall system. Each course of the wall system shall have the unit fill in place before the next course of the wall system is placed.

**4.2 Precast Top Cap.** Precast top cap units shall be used. The top cap units shall be permanently attached utilizing either a resin anchor system or an equivalent detail approved by the engineer.

**4.3 Drainage Requirements.** A drainage system shall be provided at the base of the wall. The drainage system shall consist of a perforated pipe wrapped in a Class 2 geotextile to prevent clogging of the perforations. The pipe shall be placed in such a manner that water drains freely from the pipe. When the wall length is such that the slope of the pipe becomes excessive in the engineer's judgment, lateral drainpipes shall be installed underneath the concrete leveling pad.

**4.4 Foundation Preparation.** The foundation for the wall system shall be graded level as shown on the plans. Prior to wall construction, the foundation, if not on rock, shall be compacted as directed by the engineer. Any foundation soils found to be unsuitable shall be removed and replaced, as directed by the engineer.

**4.5 Geotechnical Engineer.** The contractor shall retain a geotechnical engineer to observe excavations to determine if unsuitable existing fill must be removed. This work will be considered completely covered by the contract unit price for Small Block Wall.

**4.6 Leveling Pad.** An unreinforced cast-in-place concrete leveling pad shall be provided at the foundation level for each base unit of the wall system. The leveling pad shall be built to the elevations shown on the plans and shall not be raised in elevation to allow for the use of a particular wall system. The leveling pad shall be built a minimum width of 12 inches and a minimum depth of 6 inches. The concrete on the leveling pad shall be cured a minimum of 12 hours before any of the wall system modules are placed.

**4.7 Select Granular Backfill for Structural Systems Placement.**

**4.7.1** Select granular backfill for structural systems shall be placed concurrently with the placement of the retained backfill. The placement of the select granular backfill for structural systems shall closely follow the erection of each course of the wall system and shall be placed in such a manner to avoid any damage or disturbance to the wall material or any misalignment of the facing elements of the wall system. Any wall system material that becomes damaged or disturbed during the installation of the wall system shall be removed, replaced, or corrected at the contractor's expense, as directed by the engineer. Whenever placement of the select granular backfill for structural systems results in the wall facing system being misaligned or distorted outside the limits of this specification, the contractor shall correct the misalignment or distortion as directed by the engineer.

**4.7.2** The select granular backfill for structural systems shall be compacted in accordance with Sec 203, with the following exceptions:

- a) The minimum density shall be no less than 95 percent of maximum density, determined in accordance with AASHTO T 99.
- b) When the material used contains more than 30 percent retained on the ¾ inch sieve, a method of compaction consisting of at least four passes by a heavy roller shall be used.

- c) The moisture content of the material prior to and during compaction shall be uniformly distributed throughout each layer. The placement moisture content shall be no lower than three percentage points less than the optimum moisture content and shall be no more than the optimum moisture content.
- d) Compaction within 3 feet of the back face of the wall system shall be achieved by at least three passes of a lightweight mechanical tamper, roller, or vibratory system.
- e) The contractor shall ensure that runoff within the wall system construction site is directed away from the wall facing during construction, and that runoff from adjacent areas of the general construction site is directed such that runoff does not enter the wall system construction site.
- f) Class 1 geotextile material shall be placed between the select granular backfill for structural systems, and the retained backfill and over the top of the select granular backfill for structural systems to prevent piping of in-situ soil into the wall system.
- g) Tamping-type (sheep's foot) rollers shall not be used for compaction of the select granular backfill for structural systems.

**4.8 Construction Tolerances.**

**4.8.1** Wall systems shall be built in accordance with the dimensions and elevations specified on the plans and in accordance with the requirements of the system manufacturer. Alignments shall be maintained within the following dimensional tolerances:

Dimensional Item	Dimensional Tolerance
Final Joint Gaps Between Adjacent Block Units	± 1/4 inch
Vertical and Horizontal Alignment of Facing Elements	± 1/16 inch per foot

**4.8.2** Vertical alignments shall be measured along a theoretical vertical line established from the top of the wall system to the base of the wall system. For walls that have a built-in setback, the alignment shall be measured along the theoretical vertical line and the straight line that describes the horizontal setback.

**4.9 Technical Assistance.** The contractor shall be responsible for having a technical advisor from the wall system manufacturer available for assistance during the installation of the wall system.

**5.0 Method of Measurement.**

**5.1** Measurement of small block walls will be made to the nearest square foot. The quantity to be paid will be measured from "Top of Wall Line" to the "Theoretical Top of Leveling Pad Line" shown on the plans. No adjustments in the measured quantity will be permitted for additional wall area required to meet the minimum wall elevations shown on the plans for any particular wall system.

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**5.2** Final measurement will not be made except for authorized changes during construction or where appreciable errors are found in the contract quantity. The revision or correction will be computed and added to or deducted from the contract quantity.

**5.3** No measurement will be made for required excavation for placement of the leveling pad for the wall system. All other excavation required for the construction of the wall system will be included in roadway items.

**6.0 Basis of Payment.** Payment for the accepted quantity for small block walls will be made in accordance with the contract unit bid price for the item listed below and includes all labor, equipment, materials, and time as required to comply with this provision.

Item No.	Unit	Description
720-99.04	SQFT	Small Block Wall

R-PP. Kirkwood Vertical Gateway Monument – Job J6S1718C Only

**1.0 Description.** The contractor shall provide a City of Kirkwood Vertical Gateway Monument at the location depicted in the plans.

**2.0 Construction Requirements.** All work performed for these items shall be in accordance with Sec 608, and materials shall be in accordance with those outlined in the Landscaping Job Special Provisions.

**3.0** No measurement will be made for the above-ground portions of the Gateway Monument. Measurement and payment for the footing shall be in accordance with Sec 701, 703, and 706.

**4.0 Basis of Payment.** Payment for the accepted quantity for the Kirkwood Vertical Gateway Monument will be made in accordance with the contract unit bid price for the item listed below and includes all labor, equipment, materials, and time as required to comply with this provision. Payment for the items related to the footing shall be paid for using standard contract pay items.

Item No.	Unit	Description
808-99.01	Lump Sum	Vertical Gateway Monument

R-QQ. Guidance for Temporary and Permanent Seeding

**1.0 Description.** The contractor shall provide temporary seeding and permanent seeding at the locations as directed by the engineer.

**2.0 Construction Requirements.** All work performed for these items shall be in accordance with Sec 805 and 806 and materials shall be in accordance with those outlined in the “Seeding and Sodding” JSP.

**3.0 Locations.**

**3.1 Temporary Seed and Mulch.** This project is expected to be performed in more than one construction season. As such, there may be erodible areas that will require protection during off-

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season periods. Temporary seeding and mulching shall be provided in accordance with Sec 806.50.

**3.2 Permanent Seed and Mulch.** Due to the urban nature of this corridor, sodding is the preferred method for re-establishment of turf growth. There may, however, be locations where sodding is less practical, such as on the slopes near bridges. All areas where seed and mulch will be applied in lieu of sodding shall be approved by the engineer.

**4.0 Method of Measurement.** Measurement will be made in accordance with Sec 805 for permanent seeding and Sec 806 for temporary seeding.

**5.0 Basis of Payment.** Basis of payment information for permanent seeding can be found in the “Seeding and Sodding” JSP. Payment for the accepted quantity for temporary seed and mulch will be made in accordance with the contract unit bid price for the item listed below and includes all labor, equipment, materials, and time required to comply with this provision.

Item No.	Unit	Description
806-10.17	Acre	Temporary Seeding and Mulching

R-RR. Remove and Relocate Privately-Owned Light Pole

**1.0 Description.** This work shall consist of removing existing light poles and luminaires and relocating them to locations within the project Permanent Easement or Temporary Construction Easement areas. Installation details shall be as required by the engineer.

**2.0 Construction Requirements.** This work shall be in accordance with Sec 901. Light poles and luminaires are to be carefully removed and relocated. Light pole bases or foundations may be removed and replaced with new foundations at the new pole locations as required. The contractor shall verify all materials with the engineer prior to ordering.

**2.1** Care shall be taken by the contractor to not damage any of the existing lighting components that are to be relocated. Should any items be damaged by the contractor’s handling or negligence, they shall be replaced in kind at the contractor’s cost.

**2.2** Lighting shall be maintained as operational during the normal hours of use throughout the duration of construction. Any disruption to lighting service within the normal lighting times shall be supplemented with temporary lighting at the contractor’s cost, and shall remain in place until normal lighting operation period can be restored.

**2.3 Light Pole Foundation.** The pole foundation that is compatible with the relocated pole shall be provided by the contractor, with the design being the responsibility of the contractor. The contractor shall provide shop drawings as required by the engineer prior to installation.

**2.4 Mounting Hardware and Wiring.** The contractor shall be responsible for providing all mounting hardware and wiring required for installing each relocated light pole and luminaire to the new light pole footing. Payment for this hardware shall be considered incidental to and included in the pay item listed below.

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**2.5 Test Period.** Upon completion of the light pole relocation work, the relocated light pole assemblies shall be subject to the 15-day test period requirements as defined in Sec 901.

**3.0 Method of Measurement.** Measurement will be made for each fully installed relocated light pole assembly, which includes removal of the existing.

**4.0 Basis of Payment.** Payment for the accepted quantity for the relocated light poles will be made in accordance with the contract unit bid price for the item listed below and includes all labor, equipment, materials, and time required to comply with this provision.

Item No.	Unit	Description
901-99.02	Each	Remove and Relocate Privately-Owned Light Pole

R-SS. Ornamental Lighting – Job J6S1718B Only

**1.0 Description.** This work shall consist of furnishing materials, labor, and equipment required to install ornamental pedestrian luminaires. Installation details shall be in accordance with the plans and the manufacturer’s recommendations. This work shall conform with applicable portions of Sec 901 of the Standard Specifications, as herein modified.

**2.0 Materials.**

**2.1 Luminaire.** The ornamental luminaire shall be a PAC series 63 watt LED Multi-Tap with GR3 Type 3 Glass Refractor, Post Top mounted, as manufactured by Pacific Lighting & Standards Co. or an approved equal. The fixture finish shall be black in color.

**2.2 Mounting Adapter.** Luminaires shall be provided with an adapter housing, if required, to ensure proper mating of luminaires with light poles. The adapter housing shall be attached to the poles and fit inside the luminaire to ensure a proper and tight installation. Adapter materials and coatings shall meet the requirements of section 2.1 above, except that only exposed adapter surfaces shall be black in color.

**2.3 Photometrics.** The luminaire shall be constructed to reduce the amount of veiling luminance. Prior to ordering luminaires, the contractor shall submit computer lighting calculations demonstrating a neutral effect on the veiling luminance conditions existing with the roadway luminaires already in place. These calculations shall indicate that the installation of the ornamental luminaires does not increase the maximum veiling luminance to average pavement luminance above existing conditions. The calculations shall indicate a graphical representation of each roadway configuration with all input values at the pavement elevation on a grid no larger than 10 feet along the roadway and 6 feet across the roadway in accordance with IES recommendations. The calculations shall indicate the overall statistics showing average, maximum, minimum, average to minimum ratio, veiling luminance ratio and any other pertinent information as may be required by the engineer.

**3.0 Construction Requirements.** Luminaires shall be installed in accordance with the manufacturer’s recommendations. The contractor shall verify all materials with the engineer prior to ordering.

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**3.1 Light Pole Foundation.** The pole foundation shall be provided per the manufacturer's recommendations, with the design being the responsibility of the contractor. The contractor shall provide shop drawings as required by the engineer prior to installation.

**3.2 Light Pole.** Light poles shall be 10-foot-tall durable corrosion resistant cast aluminum base with hand hole and cover, Pole Catalog Number DBCS-4F-10-BK-IUGFI, coated black in color, as manufactured by Pacific Lighting & Standards Co. or an approved equal.

**3.3 Mounting Hardware.** The contractor shall be responsible for providing all mounting hardware required for assembling each ornamental light pole, footing, and luminaire. Payment for this hardware shall be considered incidental to and included in the pay item listed below.

**4.0 Method of Measurement.** Luminaires, light poles, and foundations shall be installed in accordance with the manufacturer's recommendations. For the basis of this contract, the ornamental light pole and luminaire, including the footing and any hardware required for its assembly, shall be considered as a single unit at each installation location. Measurement will be made for each fully completed ornamental lighting assembly.

**5.0 Basis of Payment.** Payment for the accepted quantity for the ornamental lighting will be made in accordance with the contract unit bid price for the item listed below and includes all labor, equipment, materials, and time required to comply with this provision.

Item No.	Unit	Description
901-99.02	Each	Ornamental Light Pole and Luminaire – Brentwood Streetscaping

R-TT. Ornamental Lighting – Job J6S1718C Only

**1.0 Description.** This work shall consist of furnishing and installing ornamental lighting for the Kirkwood streetscape enhancements. Installation details shall be in accordance with the plans and the manufacturer's recommendations.

**2.0 Construction Requirements.** This work shall be in accordance with Sec 901. Luminaires, poles, and foundations shall be installed in accordance with the manufacturer's recommendations. The contractor shall verify all materials with the engineer prior to ordering.

**2.1 Luminaire.** The ornamental luminaire shall be a GAR/GAT/GLC Generation Series LED Part Number GAR-080-LED-E1-5-CCA-BK as manufactured by McGraw-Edison or an approved equal, fitted with a LED Luminaire having a white light output of 4000K.

**2.2 Light Pole.** Light poles shall be 14'-0" Washington (Straight Non-tapered Fluted Aluminum) Part Number 5D01AS-E-140050504UW-PD-DBL as manufactured by Valmont or an approved equal.

**2.3 Light Pole Foundation.** The pole foundation shall be provided per the manufacturer's recommendations, with the design being the responsibility of the contractor. The contractor shall provide shop drawings as required by the engineer prior to installation.

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**2.4 Mounting Hardware.** The contractor shall be responsible for providing all mounting hardware required for assembling each ornamental light pole, footing, and luminaire. Payment for this hardware shall be considered incidental to and included in the pay item listed below.

**3.0 Method of Measurement.** Luminaires, light poles, and foundations shall be installed in accordance with the manufacturer's recommendations. For the basis of this contract, the ornamental light pole and luminaire, including the footing and any hardware required for its assembly, shall be considered as a single unit at each installation location. Measurement will be made for each fully completed ornamental lighting assembly.

**4.0 Basis of Payment.** Payment for the accepted quantity for the ornamental lighting will be made in accordance with the contract unit bid price for the item listed below and includes all labor, equipment, materials, and time required to comply with this provision.

Item No.	Unit	Description
901-99.02	Each	Ornamental Light Pole and Luminaire – Kirkwood Streetscaping

R-UU. Pedestrian Underpass (Structural) Construction Requirements – Job J6S1718B Only

**1.0 Description.** This provision contains general construction requirements for this project.

**2.0 Construction Requirements.**

**2.1** In order to assure the least traffic interference, the work shall be scheduled so that a lane closure is for the absolute minimum amount of time required to complete the work. A lane shall not be closed until material is available for continuous construction and the contractor is prepared to diligently pursue the work until the closed lane is opened to traffic.

**2.2** Provisions shall be made to prevent damage to any existing utilities. Any damage sustained to the utilities as a result of the contractor's operations shall be the responsibility of the contractor. All costs of repair and disruption of service shall be as determined by the utility owners and as approved by the engineer.

**3.0 Method of Measurement.** No measurement will be made.

**4.0 Basis of Payment.** Payment for the above described work will be considered completely covered by the contract unit price for other items included in the contract.

R-VV. Pre-Engineered Precast Concrete Structures – Job J6S1718B Only

**1.0 Description.** This work shall consist of, but not limited to, constructing structures using precast units, wing walls and headwalls. Wing walls and headwalls may be precast units or cast-in-place.

**2.0 Material.** Materials shall be in accordance with the Specifications and specifically as follows:

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Item	Section
Backfill	206
Class B-1 Concrete	501
Flowable Backfill	621
Hot or Cold Weather Concreting	703
Gradation E Coarse Aggregate	1005
Curing	1026
Reinforcing Steel	1036
Mortar and Non-Metallic Expansion Mortar	1066

**2.1 Concrete and Reinforcing Steel.** Concrete shall be Class B-1 with Gradation E coarse aggregate. Reinforcing steel in three-sided or arch units shall be welded steel wire fabric or Grade 60 (420) deformed bars. Reinforcing steel in the footings, pedestals, wing walls and headwalls shall be Grade 60 (420) deformed bars.

**2.2 Steel.** Bolts and threaded rods used in connections of wing walls to three-sided or arch units and hooked bolts used in connections of attached headwalls to three-sided or arch units shall be in accordance with ASTM A 307. Connection plates and plate washers used in connections of wing walls to three-sided or arch units shall be in accordance with AASHTO M 270 Grade 36 (250). Nuts used in connections of wing walls to three-sided or arch units shall be in accordance with AASHTO M 292 Grade 2H. Inserts for all connections and all steel used for connections of detached headwalls to three-sided or arch units shall be in accordance with ASTM A 240 Type 304. Except for Type 304, all steel shall be galvanized after fabrication in accordance with Sec 1080.

**3.0 Manufacture.**

**3.1** Lifting devices or holes will be permitted in precast units. No more than four holes shall be cast in each unit. Drilled holes will not be allowed. Cast holes shall be tapered. Lifting devices used in lifting holes shall have sufficient bearing to avoid damage resulting from concentration of stresses around the lifting holes.

**3.2** Ends of three-sided and arch units shall be of such design and shall be so formed that when erected, shall make a continuous line with a smooth interior free of irregularities. Ends of three-sided and arch units shall be normal to the walls and centerline, except where beveled ends are specified. Surfaces of three-sided and arch units shall be smooth form or troweled.

**3.3** Precast units shall be stored in such a manner to prevent cracking or damage. Units shall not be moved until the concrete compressive strength has reached a minimum of 2500 psi (17 MPa). Units shall not be stored in an upright position until the concrete compressive strength has reached a minimum of 4000 psi (28 MPa).

**3.4** Precast units shall be clearly marked with waterproof paint. The following information shall be shown fill face of the north headwall.

- (a) Unit clear span and rise.
- (b) Date of manufacture.
- (c) Name or trademark of the manufacturer.

(d) Design earth cover.

**3.5** Permissible variations shall be in accordance with AASHTO M 259.

#### **4.0 Testing.**

**4.1** Concrete compressive strength shall be determined from compression tests made on cylinders. When the cylinder test strengths are less than the design concrete strength, then the concrete compressive strength shall be determined from compression tests made on cores. For cylinder testing, a minimum of four cylinders shall be taken during each production run. For core testing, one core shall be cut from three-sided and arch units selected at random from each group of 15 units or less of a particular size and production run. One core shall be cut from each group of four or fewer wing wall units. For each continuous production run, each group of 15 three-sided or arch units of a single size, fraction thereof or four wing wall units shall be considered separately for the purpose of testing and acceptance. A production run shall be considered continuous if not interrupted for more than 3 days.

**4.2** Cylinders shall be made and tested in accordance with ASTM C 39. Cores shall be obtained and tested for compressive strength in accordance with ASTM C 42. Requirements for lime curing will be waived.

**4.2.1** The compressive strength of the concrete in each group of units, as defined above, will be acceptable when the core test strength is equal to or greater than the design concrete strength. The manufacturer shall perform random selection and testing of the cores as approved by the engineer.

**4.2.2** If the compressive strength of the core tested is less than the design concrete strength, the unit from which that core was taken, may be recored. If the compressive strength of the recore is equal to or greater than the design concrete strength, the compressive strength of the concrete in that group of units will be acceptable.

**4.2.3** If the compressive strength of a recore is less than the design concrete strength, the unit from which that core was taken will be rejected. Two units from the remainder of the group shall be selected at random. One core shall be taken from each. If the compressive strengths of both cores are equal to or greater than the design concrete strength, the remainder of the units in that group will be acceptable. If the compressive strength of either of the two cores tested is less than the design concrete strength, the remainder of the units in the group will be rejected. However, at the recommendation of the manufacturer, each remaining unit in the remainder of the group may be cored and accepted individually. The units will be rejected which have cores with less than the design concrete strength.

**4.2.4** Core holes shall be plugged and cured by the manufacturer in such a manner that the units shall meet all the test requirements of these specifications.

**4.3** The manufacturer shall furnish all facilities, equipment and personnel necessary to conduct the required testing.

#### **5.0 Rejection.**

**5.1** Precast units will also be rejected due to the following conditions:

- (a) Fractures or cracks completely through the wall, except for a single end crack which does not exceed one-half the thickness of the wall.
- (b) Defects that indicates proportioning, mixing or molding which are not in accordance with this specification.
- (c) Honeycombed or open textured concrete.
- (d) Damaged unit ends, where such damage prevents making a satisfactory joint.

**5.2** Units may be repaired due to imperfections in manufacture, handling damage or construction. Repair procedures shall be submitted to the engineer for approval. Repairs will be acceptable when determined that repairs are sound, properly finished and cured and repaired units are in accordance with the requirements herein.

## **6.0 Construction Requirements.**

**6.1 Footings.** Footings shall be cast-in-place and constructed in accordance with grades shown on the structure plans. Footings shall be given a smooth float finish. A minimum 3-inch (75 mm) deep keyway shall be formed in the footings supporting three-sided and arch units. Keyways shall have 3 inches (75 mm) of clear between keyway edges and both faces of three-sided and arch units. Footing concrete shall reach an initial compressive strength of 2000 psi (14 MPa) before placement of units or before construction of cast in place wing walls. Surfaces shall not vary from the grades shown on the structure plans more than ¼ inch in 10 feet (6 mm in 3 m) when tested with a 10-foot (3 m) straightedge.

**6.2** Special care shall be taken in setting units to the true line and grade. Three-sided, arch and wing wall units shall be set on 6 x 6 inches (150 x 150 mm) masonite or steel shims. A minimum gap of 1/2 inch (13 mm) shall be provided between footings and the base of units. Footing keyways shall be completely filled with an approved non-shrink grout.

## **6.3 Joints Between Precast Units.**

**6.3.1** Butt joints shall be covered with a plastic joint compound in accordance with Sec 733 and a Type III external sealing band in accordance with ASTM C 877. Surfaces shall be free of dirt before joint material is applied. The entire joint shall be continuously covered. Joints between three-sided or arch units and wing walls and joints between three-sided or arch units and headwalls, shall be covered with the same method used for butt joints.

**6.3.2** Sealing bands shall be kept in the proper location over joints and care shall be taken to prevent damage during backfilling operations.

**6.3.3** Keyway joints shall be fabricated with a minimum 4 x 1-1/2 inches (100 x 40 mm) keyway. Keyway joints shall be sealed with an approved plastic joint compound or a tubular joint seal in accordance with Sec 733.

**6.4 Lift Holes.** Lift holes shall be filled prior to backfilling in accordance with Sec 733.

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## **6.5 Backfilling.**

**6.5.1** Backfill shall be placed and compacted in accordance with Sec 206 and the manufacturer's recommendation.

**6.5.2** Operation of equipment over the structure shall be in accordance with the manufacturer's recommendations.

**7.0 Method of Measurement.** No measurement will be made for precast concrete structures, but each will be considered a lump sum unit.

**8.0 Basis of Payment.** Payment for accepted precast concrete structures for the above described work, including all material, equipment, labor and any other incidental work necessary to complete this item in place, will be considered completely covered by the contract lump sum price for "PRECAST CONCRETE STRUCTURE".

R-WW. Design of Pre-Engineered Structures for Grade Separations – Job J6S1718B Only

**1.0 Design Parameters.** This provision contains general design parameters for pre-engineered precast concrete structures.

**2.0 Location and Layout.** The structure shall be designed in accordance with the details shown on the structure plans. Flat-topped three-sided units will not be allowed.

**2.1 Horizontal and Vertical Alignments.** Roadways above and below the structure shall be constructed to the profile grade and horizontal alignment shown on the roadway plans.

**2.2 Typical Roadway Sections.** Roadway sections above and below the structure shall provide, as applicable the same pavements, shoulders, curbs, medians and sidewalks shown on the roadway plans in the typical sections for these locations.

**2.3 Traffic Barrier.** Traffic barrier shall be installed as shown on the roadway plans.

## **3.0 Design.**

**3.1** The structure shall be designed in accordance with the design specifications and for the design loadings and additional parameters shown on the structure plans, except as modified herein.

**3.2** Minimum design concrete compressive strength shall be 4,000 psi (28 MPa).

**3.3** Hydrostatic pressure shall be considered when using flowable backfill.

**3.4** Horizontal pressures shall be increased for sloping backfill and live load surcharge.

**3.5** Minimum reinforcing steel cover shall be 2 inches (50 mm) for pedestals, collars, wingwalls and headwalls.

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**3.6** Reinforcing steel splicing and spacing requirements shall be in accordance with the design specifications shown on the structure plans and the manufacturer's recommendation.

**3.7** Minimum fill over the structure shall be the greater of 12 inches (300 mm) or total depth of the pavement and pavement bases shown on the roadway plans.

**3.8** Top of headwalls shall be 6 inches (150 mm) above the roadway fill.

**3.9** The structure shall be designed for a 75-year design life.

**3.10** Anchors and anchoring methods shall take into account the weight and seismic requirements of "Pedestrian Underpass Cast Stone Masonry" and "Pedestrian Underpass Phenolic Panel System". Refer to the Job Special Provisions for these items.

#### **4.0 Submittals.**

**4.1** The contractor shall submit to the engineer for approval the following items signed and sealed by a Professional Engineer who is licensed in the State of Missouri in accordance with the laws relating to architects and professional engineers (Chapter 327, RSMo), and in accordance with Authentication of Certain Documents in Sec 107:

**4.1.1** Three copies of design computations. Design computations that are computer-generated shall be accompanied by longhand examples of the design methodology that completely addresses all components of the structure.

**4.1.2** Five sets of shop drawings. Shop drawings shall be of sufficient detail and clarity to provide a permanent record of the structure for future reference. Shop drawings shall include the county and structure number on each sheet. Shop drawings shall include all details, dimensions and quantities necessary to construct the structure and shall include, but not be limited to, the following information:

(a) Structure clear span and rise.

(b) Three-sided or arch unit details showing all concrete dimensions and reinforcing steel requirements. The details shall show the location of units tied to the centerline of the roadway.

(c) Wing wall and headwall details when required showing all concrete dimensions, reinforcing steel and anchorage details. Wing wall plan, elevation and section views shall be provided. Headwall elevation and section views shall be provided.

(d) Structure backfill type and limits.

(e) Manufacturer's instructions, construction drawings and assembly drawings.

(f) Anchors and anchoring methods for both the Pedestrian Underpass Phenolic Panel System and the Pedestrian Underpass Cast Stone Masonry.

**4.2** The contractor shall submit computations electronically in Adobe Acrobat format.

**4.3** The contractor shall submit shop drawings electronically in Adobe Acrobat format.

**4.4** Construction or manufacture of any component of the structure shall not begin until written approval of computations and shop drawings have been received from the engineer.

**4.5** During construction, the contractor shall submit to the engineer construction change recommendations to resolve unexpected subsurface conditions or any other constructability issue. Construction of any required modification shall not begin until written approval of the construction change recommendations has been received from the engineer.

**4.6** After construction, the contractor shall submit final shop drawings electronically in Adobe Acrobat format. Final shop drawings shall include construction changes made to shop drawings during construction.

**4.7** Shop drawings shall be in accordance with Specifications of Computer Deliverable Contract Plans in the MoDOT Engineering Policy Guide.

**5.0 Method of Measurement.** No measurement will be made.

**6.0 Basis of Payment.** Payment for the above described work will be considered completely covered by the contract unit price for other items included in the contract.

R-XX. Vertical Drain for Three-Sided Structure – Job J6S1718B Only

**1.0 Description.** This work shall consist of furnishing and installing a vertical drain system consisting of drain core, geotextile fabric, perforated and unperforated drain pipe, couplers, porous backfill, as shown on the plans or as directed by the engineer.

**2.0 Material.** Materials shall be in accordance with the Specifications and specifically as follows:

Item	Section
Geotextile	1011 (Subsurface Drainage Geotextile)
Geocomposite Drainage Material	1012 (Vertical Drain at End Bents)
Miscellaneous Drainage Material	1013
Porous Backfill	1009 Grade 4

**3.0 Construction Requirements.**

**3.1** The contractor shall install the vertical drain system in accordance with the manufacturer's recommendations.

**3.2** If the core of the drain is not perforated, modifications shall be made to the core to provide adequate drainage into the drain pipe as approved by the engineer.

**3.3** Vertical and horizontal joints shall be constructed to form an uninterrupted drain face after compaction is completed. All joints shall have an overlap of geotextile to prevent any intrusion of fill material into the drain. Horizontal joints shall be designed to drain downward. Any cracks or openings in the drain adjacent to the fill will be cause for rejection of the drain, and the drain shall be replaced by the contractor, at the contractor's expense.

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**3.4** The backfill material shall be placed and compacted in accordance with Sec 206. The backfill shall be placed in such a manner as to prevent damage to the vertical drain system. The backfill material shall be as approved by the engineer.

**4.0 Method of Measurement.** The work provided herein will not be measured for payment, but will be considered completely paid for as a system, per each.

**5.0 Basis of Payment.** The accepted vertical drain system, complete in place, will be paid for at the contract price for “VERTICAL DRAIN FOR THREE-SIDED STRUCTURE”, Pay Item No. 715-99.02. No direct payment will be made for excavation, backfilling, compaction, drain pipe or other material and work.

R-YY. Waterproofing Membrane for Three-Sided Structure – Job J6S1718B Only

**1.0 Description.** This work shall consist of furnishing and placing a membrane waterproofing system on the top slab and sidewalls, or portions thereof, for three-sided structures as shown on the plans or as directed by the engineer.

**2.0 Materials.** The materials used in the waterproofing system shall consist of the following.

**2.1** Cold-applied, self-adhering rubberized asphalt/polyethylene membrane sheet with the following properties:

<b>Physical Properties</b>	
Thickness ASTM D 1777 or D 3767	60 mils (1.500 mm) min.
Width	36 inches (914 mm) min.
Tensile Strength, Film ASTM D 882	500 lb./in <sup>2</sup> (34.5 MPa) min.
Pliability [180° bend over 1 inch (25 mm) mandrel @ -20°F (-29°C)] ASTM S 146 (Modified) or D1970	No Effect
Puncture Resistance-Membrane ASTM E 154	40 lb. (178 N) min.
Permeability (Perms) ASTM E 96, Method B	0.1 max.
Water Absorption (% by Weight) ASTM D 570	0.2 max.
Peel Strength ASTM D 903	9 lb./in (1576 N/m) min.

**2.2** Ancillary Materials: Adhesives, Conditioners, Primers, Mastic, Two-Part Liquid Membranes, and Sealing Tapes as required by the manufacturer of the membrane and film for use with the respective membrane waterproofing system.

**3.0 Construction.**

**3.1** The areas requiring waterproofing shall be prepared and the waterproofing shall be installed in accordance with the manufacturer’s instructions. The Contractor shall not install any part of a membrane waterproofing system in wet conditions, or if the ambient or concrete surface temperature is below 40° (4° C), unless allowed by the Engineer.

**3.2** Surfaces to be waterproofed shall be smooth and free from projections which might damage the membrane sheet. Projections or depressions on the surface that may cause damage to the membrane shall be removed or filled as directed by the Engineer. The surface shall be power

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washed and cleaned of dust, dirt, grease, and loose particles, and shall be dry before the waterproofing is applied.

**3.3** The Contractor shall uniformly apply primer to the entire area to be waterproofed, at the rate stated in the manufacturer's instructions, by brush, or roller. The Contractor shall brush out primer that tends to puddle in low spots to allow complete drying. The primer shall be cured according to the manufacturer's instructions. Primed areas shall not stand uncovered overnight. If membrane sheets are not placed over primer within the time recommended by the manufacturer, the Contractor shall recoat the surfaces at no additional cost.

**3.4** The installation of the membrane sheet to primed surfaces shall be such that all joints are shingled to shed water by commencing from the lowest elevation of the buried structure's top slab and progress towards the highest elevation. The membrane sheets shall be overlapped as required by the manufacturer. The Contractor shall seal with mastic any laps that were not thoroughly sealed. The membrane shall be smooth and free of wrinkles and there shall be no depressions in horizontal surfaces of the finished waterproofing. After placement, exposed edges of membrane sheets shall be sealed with a troweled bead of a manufacturer's recommended mastic, or two-part liquid membrane, or with sealing tape.

**3.5** Sealing bands at joints between precast segments shall be installed prior to the waterproofing system being applied. Where the waterproofing system and sealing band overlap, the installation shall be planned such that water will not be trapped or directed underneath the membrane or sealing band.

**3.6** Care shall be taken to protect and to prevent damage to the waterproofing system prior to and during backfilling operations. The waterproofing system shall be removed as required for the installation of slab mounted guardrails and other appurtenances. After the installation is complete, the system shall be repaired and sealed against water intrusion according to the manufacturer's instructions and to the satisfaction of the Engineer.

**3.7** Lift holes shall be filled with a polyethylene plug. The plug shall not project beyond the inside surface after installation nor project above the outside surface to the extent that may cause damage to the membrane. When metal lifting inserts are used, their sockets shall be filled with mastic or mortar compatible with the membrane.

**4.0 Method of Measurement.** The waterproofing system will not be measured for payment.

**5.0 Basis of Payment.** This work will be paid for at the contract lump sum price unit price for 731-9901, "WATERPROOFING MEMBRANE FOR THREE-SIDED STRUCTURE", per Lump Sum.

R-ZZ. Dewatering – Job J6S1718B Only

**1.0 Description.** This provision covers dewatering the site as necessary to provide a suitable condition for the construction of the structures, as approved by the engineer. This work shall include dewatering for the underpass and adjacent retaining walls for both stages of construction. This work shall be done in accordance with Sec 206 and this specification.

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**2.0 Construction Requirements.** Dewatering shall provide a dry work area suitable to construct the structures within specifications, as approved by the engineer. Typical dewatering methods consist of, but are not limited to, construction of cofferdams, seal courses, over excavation, well point systems, dewatering and drainage diversion. Any dewatering method utilized shall conform to all environmental laws and regulations.

**3.0 Method of Measurement.** No measurement will be made.

**4.0 Basis of Payment.** Payment for dewatering will be made regardless of which dewatering means is utilized. No payment will be made if the work area is not maintained in a dewatered state, as approved by the engineer. The lump sum payment for dewatering will be full compensation and no time extensions will be made regardless of which means and methods are utilized by the contractor.

R-AAA. Temporary Shoring – Job J6S1718B Only

**1.0 Description.** This work shall consist of installing temporary shoring as required in accordance with Sec 206, the underpass plans and this special provision to retain the fill during stage construction.

**2.0 Construction Requirements.** The responsibility for the design and construction of the temporary shoring shall rest solely with the contractor. The design and plans for the temporary shoring shall be signed and sealed by a Professional Engineer who is licensed in the State of Missouri in accordance with the laws relating to architects and professional engineers (Chapter 327, RSMo). The design shall insure that the temporary shoring is braced or substantially secured to prevent soil movement during construction of the underpass. Temporary shoring shall not be removed until it is no longer needed for staged construction. The temporary shoring shall become the property of the contractor.

**3.0 Method of Measurement.** No measurement will be made.

**4.0 Basis of Payment.** Payment for the above described work, including all material, equipment, labor and any other incidental work necessary to complete this item, will be considered completely covered by the contract price for 206-55.00, “Temporary Shoring”, per lump sum.

R-BBB. Supplemental Revisions JSP-18-01Q

Compliance with [2 CFR 200.216 – Prohibition on Certain Telecommunications and Video Surveillance Services or Equipment](#).

The Missouri Highways and Transportation Commission shall not enter into a contract (or extend or renew a contract) using federal funds to procure or obtain equipment, services, or systems that uses covered telecommunications equipment or services as substantial or as critical technology as part of any system where the video surveillance and telecommunications equipment was produced by Huawei Technologies Company, ZTE Corporation, Hytera Communications Corporation, Hangzhou Hikvision Digital Technology Company, or Dahua Technology Company (or any subsidiary or affiliate of such entities).

## Stormwater Compliance Requirements

**1.0 Description.** This provision requires the contractor to provide a Water Pollution Control Manager (WPCM) for any project that includes land disturbance on the project site and the total area of land disturbance, both on the project site, and all Off-site support areas, is one (1) acre or more. Regardless of the area of Off-site disturbance, if no land disturbance occurs on the project site, these provisions do not apply. When a WPCM is required, all sections within this provision shall be applicable, including assessment of specified Liquidated Damages for failure to correct Stormwater Deficiencies, as specified herein. This provision is in addition to any other stormwater, environmental, and land disturbance requirements specified elsewhere in the contract.

**1.1 Definitions.** The project site is defined as all areas designated on the plans, including temporary and permanent easements. The project site is equivalent to the “permitted site”, as defined in MoDOT’s State Operating Permit. An Off-site area is defined as any location off the project site the contractor utilizes for a dedicated project support function, such as, but not limited to, staging area, plant site, borrow area, or waste area.

**1.2 Reporting of Off-Site Land Disturbance.** If the project includes any planned land disturbance on the project site, prior to the start of work, the contractor shall submit a written report to the engineer that discloses all Off-site support areas where land disturbance is planned, the total acreage of anticipated land disturbance on those sites, and the land disturbance permit number(s). Upon request by the engineer, the contractor shall submit a copy of its land disturbance permit(s) for Off-site locations. Based on the total acreage of land disturbance, both on and Off-site, the engineer shall determine if these Stormwater Compliance Requirements shall apply. The Contractor shall immediately report any changes to the planned area of Off-site land disturbance. The Contractor is responsible for obtaining its own separate land disturbance permit for Off-site areas.

**2.0 Water Pollution Control Manager (WPCM).** The Contractor shall designate a competent person to serve as the Water Pollution Control Manager (WPCM) for projects meeting the description in Section 1.0. The Contractor shall ensure the WPCM completes all duties listed in Section 2.1.

### 2.1 Duties of the WPCM:

- (a) Be familiar with the stormwater requirements including the current MoDOT State Operating Permit for construction stormwater discharges/land disturbance activities; MoDOT’s statewide Stormwater Pollution Prevention Plan ( SWPPP); the Corps of Engineers Section 404 Permit, when applicable; the project specific SWPPP, the Project’s Erosion & Sediment Control Plan; all applicable special provisions, specifications, and standard drawings; and this provision;
- (b) Successfully complete the MoDOT Stormwater Training Course within the last 4 years. The MoDOT Stormwater Training is a free online course available at MoDOT.org;
- (c) Attend the Pre-Activity Meeting for Grading and Land Disturbance and all subsequent Weekly Meetings in which grading activities are discussed;

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- (d) Oversee and ensure all work is performed in accordance with the Project-specific SWPPP and all updates thereto, or as designated by the Engineer;
- (e) Review the project site for compliance with the Project SWPPP, as needed, from the start of any grading operations until final stabilization is achieved, and take necessary actions to correct any known deficiencies to prevent pollution of the waters of the state or adjacent property owners prior to the engineer's weekly inspections;
- (f) Review and acknowledge receipt of each MoDOT Inspection Report (Land Disturbance Inspection Record) for the Project within forty eight (48) hours of receiving the report and ensure that all Stormwater Deficiencies noted on the report are corrected as soon as possible, but no later than stated in Section 5.0.

**3.0 Pre-Activity Meeting for Grading/Land Disturbance and Required Hold Point.** A Pre-Activity meeting for grading/land disturbance shall be held prior to the start of any land disturbance operations. No land disturbance operations shall commence prior to the Pre-Activity meeting except work necessary to install perimeter controls and entrances. Discussion items at the pre-activity meeting shall include a review of the Project SWPPP, the planned order of grading operations, proposed areas of initial disturbance, identification of all necessary BMPs that shall be installed prior to commencement of grading operations, and any issues relating to compliance with the Stormwater requirements that could arise in the course of construction activity at the project.

**3.1 Hold Point.** Following the pre-activity meeting for grading/land disturbance and subsequent installation of the initial BMPs identified at the pre-activity meeting, a Hold Point shall occur prior to the start of any land disturbance operations to allow the engineer and WPCM the time needed to perform an on-site review of the installation of the BMPs to ensure compliance with the SWPPP is met. Land disturbance operations shall not begin until authorization is given by the engineer.

**4.0 Inspection Reports.** Weekly and post run-off inspections will be performed by the engineer and each Inspection Report (Land Disturbance Inspection Record) will be entered into a web-based Stormwater Compliance database. The WPCM will be granted access to this database and shall promptly review all reports, including any noted deficiencies, and shall acknowledge receipt of the report as required in Section 2.1 (f.).

**5.0 Stormwater Deficiency Corrections.** All stormwater deficiencies identified in the Inspection Report shall be corrected by the contractor within 7 days of the inspection date or any extended period granted by the engineer when weather or field conditions prohibit the corrective work. If the contractor does not initiate corrective measures within 5 calendar days of the inspection date or any extended period granted by the engineer, all work shall cease on the project except for work to correct these deficiencies, unless otherwise allowed by the engineer. All impact costs related to this halting of work, including, but not limited to stand-by time for equipment, shall be borne by the Contractor. Work shall not resume until the engineer approves the corrective work.

**5.1 Liquidated Damages.** If the Contractor fails to complete the correction of all Stormwater Deficiencies listed on the MoDOT Inspection Report within the specified time limit, the Commission will be damaged in various ways, including but not limited to, potential liability, required mitigation, environmental clean-up, fines and penalties. These damages are not reasonably capable of being computed or quantified. Therefore, the contractor will be charged with liquidated damages specified in the amount of \$2,000 per day for failure to correct one or

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more of the Stormwater Deficiencies listed on the Inspection Report within the specified time limit. In addition to the stipulated damages, the stoppage of work shall remain in effect until all corrections are complete.

**6.0 Basis of Payment.** No direct payment will be made for compliance with this provision.

#### COVID-19 Safety

**1.0 Description.** The coronavirus disease 2019 or COVID-19 has reached a pandemic stage across the United States, including the State of Missouri. To reduce the impact of COVID-19 outbreak conditions on businesses, workers, customers and the public, the contractor shall be aware of all COVID-19 guidance from the Center for Disease Control (CDC) and other government health mandates. The contractor shall conduct all operations in conformance with these safety directives. The guidance may change during the project construction and the contractor shall change and adapt their operation and safety protocols accordingly.

**2.0 Safety Plan.** The contractor shall include these procedures in the project safety plan as called for in the contract documents and revise the safety plan as needed.

**3.0 Essential Work.** In accordance with any state or local Stay at Home Order, care for the infrastructure has been deemed essential and MoDOT is moving forward with construction projects, this project is considered essential and the contractor and their employees, subcontractors and suppliers are considered essential business and performing essential functions.

**4.0 Basis of Payment.** Compliance with regulations and laws pertaining to COVID-19 is covered under Sec 107 of the Missouri Standard Specifications for Highway Construction. No direct payment will be made for compliance with this provision.

#### Anti-Discrimination Against Israel Certification

By signing this contract the Company certifies 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 as defined by Section 34.600 RSMo. This certification shall not apply to contracts with a total potential value of less than One Hundred Thousand Dollars (\$100,000) or to contractors with fewer than ten (10) employees.

**Delete Sec 413.10.5.5 and substitute with the following:**

**413.10.5.5 Weather Limitations and Calendar Restrictions.** Micro-surfacing shall not be placed when the air or surface temperature is below 50 F; or when the forecasted low temperature for the next 48 hours, as reported by the National Weather Service, is below 40 F; or after October 1 of each calendar year. Temperatures shall be obtained in accordance with MoDOT Test Method TM 20. Micro-surfacing may be placed on a damp surface but shall not be placed on a wet surface with free standing water.

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***Delete Sec 413.30.2.3 and substitute with the following:***

**413.30.2.3 Reclaimed Asphalt.** No reclaimed asphalt pavement or reclaimed asphalt shingles are allowed.

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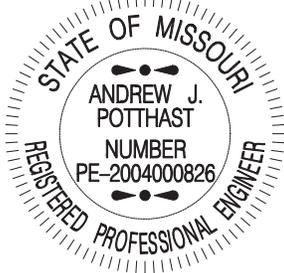
(Job Special Provisions shall prevail over General Special Provisions whenever in conflict therewith.)

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Additional Information:

St. Louis County Dept. of Transportation Job Special Provisions for Traffic  
 Signal Construction

 <p><b>THIS SHEET HAS BEEN SIGNED, SEALED, AND DATED ELECTRONICALLY.</b></p>	<p><b>MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION</b>          105 W. CAPITOL AVE.          JEFFERSON CITY, MO 65102          Phone 1-888-275-6636</p>
	<p><b>HDR ENGINEERING</b>          401 South 18<sup>th</sup> Street, Suite 300          St. Louis, MO 63103          Certificate of Authority: 000856          Consultant Phone: 314-425-8300</p>
	<p>If a seal is present on this sheet, JSP's          have been electronically sealed and          dated.</p>
	<p>JOB NUMBER: J6S1718, J6S1718B,          and J6S1718C          ST. LOUIS COUNTY, MO          DATE PREPARED: 03/01/2021</p>
<p>ADDENDUM DATE:</p>	
<p>Only the following items of the Job Special Provisions (Traffic, Signals &amp; Signing) are authenticated by this seal: T-A. thru T-F.</p>	

 <p><b>THIS SHEET HAS BEEN SIGNED, SEALED, AND DATED ELECTRONICALLY.</b></p>	<p><b>MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION</b>          105 W. CAPITOL AVE.          JEFFERSON CITY, MO 65102          Phone 1-888-275-6636</p>
	<p><b>HDR ENGINEERING</b>          401 South 18<sup>th</sup> Street, Suite 300          St. Louis, MO 63103          Certificate of Authority: 000856          Consultant Phone: 314-425-8300</p>
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<p>ADDENDUM DATE:</p>	
<p>Only the following items of the Job Special Provisions (Traffic, Signals &amp; Signing) are authenticated by this seal: T-G. thru T-Q. and T-U. thru T-X.</p>	

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 <p>This document has been signed, sealed and dated electronically.</p>	<p><b>MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION</b>          105 W. CAPITOL AVE.          JEFFERSON CITY, MO 65102          Phone 1-888-275-6636</p>
	<p><b>THOUVENOT, WADE &amp; MOERCHEN, INC.</b>          720 Olive Street, Suite 200A          St. Louis, MO 63101          Certificate of Authority: 001528          Consultant Phone: 314-241-6300</p>
	<p>If a seal is present on this sheet, JSP's have been electronically sealed and dated.</p>
	<p>JOB NUMBER: J6S1718, J6S1718B, and J6S1718C          ST. LOUIS COUNTY, MO          DATE PREPARED: 03/01/2021</p>
	<p>ADDENDUM DATE:</p>
<p>Only the following items of the Job Special Provisions (Traffic, Signals &amp; Signing) are authenticated by this seal: T-R. thru T-T. and T-Y. thru T-Z.</p>	

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JOB  
SPECIAL PROVISION  
TRAFFIC, SIGNALS & SIGNING

T-A. Work Zone Traffic Management Plan (WZTMP)

**1.0 Description.** Work zone traffic management shall be in accordance with applicable portions of Division 100 and Division 600 of the Standard Specifications, and specifically as follows.

**1.1 Work Zone Specialist (WZS).** The Traffic Management Plan shall name an individual, either employed by the contractor or hired by the contractor, to act as the Work Zone Specialist (WZS) throughout the entirety of the project. The (WZS) will have no job duties other than traffic control. The WZS shall be in direct charge of the temporary traffic control pre-activity meeting and traffic control items such as; setup, communications, reviews, and reporting of all daily work zones on the project. Any change in personnel for the WZS shall be submitted in written form to the engineer. The WZS shall be trained and certified as a Traffic Control Supervisor from an organization such as ATSSA or equivalent and will be directly involved with daily traffic management and traffic management planning. It will be the responsibility of the WZS to coordinate daily traffic management with the contractor's traffic control crews, inspector or engineer and the ST. Louis Traffic Management Center (TMC). The WZS shall be required to be on the project daily and remain on the project until all work zones have been removed for the day. The WZS shall be on site before the first work zone sign is placed for the day and until the last traffic control device is taken down for the day. The WZS shall remain on site the entire time daily/nightly lane drops are in use. The WZS shall maintain daily contact with the engineer or inspector on the project.

**1.2 Work Zone Set Up.** The WZS shall direct the configuration and placement of each work zone daily and ensures work zones are set up and maintained in accordance with the EPG. The WZS shall conduct a daily meeting with the set up crew to determine which traffic control devices are required, their locations and set up and take down times.

**1.3 Work Zone Communication.** The WZS shall notify the TMC before the first work zone sign is set up and after the last traffic control item is taken down at the end of each work day or night. The WZS shall also to notify the inspector of any work zone cancellation for the day. Notification of cancellations shall be made prior to 3:00 pm for nighttime work zones, as well as for daytime work zones the following day. The WZS shall also notify the inspector or engineer 2 weeks before any new lane closures or detours are put into place.

**1.4 Work Zone Reviews.** Once the traffic control has been placed for the day, the WZS shall review the work zone to ensure all devices are legible and clean, installed in the correct location with the correct spacing and convey the correct message. The WZS shall approve the work zone before any work can begin. The WZS shall also review the job site hourly to determine if any traffic control devices need to be added, reconfigured or cleaned. If the engineer or inspector notifies the WZS of any safety or traffic related concerns in the work zone, the engineer or inspector will communicate the type of deficiency as per Sec 616.4.2.5.2. This communication will be verbal and documented in writing via the DWR for that day. The DWR entry will include the time of verbal communication. The WZS will also document the deficiency in their daily report. For Category 1 deficiencies, the written documentation will include the time of notification and the time of correction. Any liquidated damages assessed shall be placed on the next Engineer's estimate as per 1.7 of this section.

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**1.5 Work Zone Reporting.** After the WZS has conducted the daily initial review of the work zone, the WZS shall record the findings. Thereafter, the WZS shall conduct reviews on an hourly bases and subsequently record findings, required corrections and times the corrections were completed. Copies of the WZS review documentation shall be furnished to the Engineer within 24 hours.

**1.6 Maintaining Work Zones and Work Zone Reviews.** The Work Zone Specialist (WZS) shall maintain work zones in accordance with Sec 616.3.3 and as further stated herein. The WZS shall coordinate and implement any changes approved by the engineer. The WZS shall ensure all traffic control devices are maintained in accordance with Sec 616, the work zone is operated within the hours specified by the engineer, and will not deviate from the specified hours without prior approval of the engineer. The WZS is responsible to manage work zone delay in accordance with these project provisions. When requested by the engineer, the WZS shall submit a weekly report that includes a review of work zone operations for the week. The report shall identify any problems encountered and corrective actions taken. Work zones are subject to unannounced inspections by the engineer and other departmental staff to corroborate the validity of the WZS's review and may require immediate corrective measures and/or additional work zone monitoring.

**1.6.1** Work zone signs and bases shall be removed from both inside and outside shoulders of the roadway when not in use and the end of each work shift. This includes signs and bases used for daily or nightly lane closures.

**1.7 Work Zone Conflict Resolution.** Any conflict resolution shall be in accordance with Sec 616.4. Failure to make corrections on time may result in the engineer suspending work. The suspension will be non-excusable and non-compensable regardless of whether road user costs are being charged for closures.

## **2.0 Traffic Management Schedule.**

**2.1** Traffic management schedules shall be submitted to the engineer for review prior to the start of work and prior to any revisions to the traffic management schedule. The traffic management schedule shall include the proposed traffic control measures, the hours traffic control will be in place, and work hours.

**2.2** The contractor shall request permission at least two working days prior to lane closures or shifting traffic onto detours, and 14 calendar days prior to the imposition of height, width or weight restrictions. This is to ensure closures do not conflict with other work within the zone of influence and the work zone information on the MoDOT's website can remain real-time. In accordance with Management of Traffic (MOT) procedures, the contractor shall submit lane closures for the following week to the engineer by 3:00pm on Monday.

**2.3** The engineer shall be notified as soon as practical of any postponement due to weather, material or other circumstances.

**2.4** In order to ensure minimal traffic interference, the contractor shall schedule lane closures for the absolute minimum amount of time required to complete the work. Lanes shall not be closed until material is available for continuous construction and the contractor is prepared to diligently pursue the work until the closed lane is opened to traffic.

**2.5 Traffic Congestion.** The contractor shall, upon approval of the engineer, take proactive measures to reduce traffic congestion in the work zone. The contractor shall immediately implement appropriate mitigation strategies whenever traffic congestion reaches an excess of **10**

**minutes** to prevent congestion from escalating beyond this delay threshold. If disruption of the traffic flow occurs and traffic is backed up in queues equal to or greater than the delay time threshold listed above then the contractor shall immediately review the construction operations which contributed directly to disruption of the traffic flow and make adjustments to the operations to prevent the queues from reoccurring. Traffic delays may be monitored by physical presence on site or by utilizing real-time travel data through the work zone that generate text and/or email notifications where available. The engineer monitoring the work zone may also notify the contractor of delays that require prompt mitigation. The contractor may work with the engineer to determine what other alternative solutions or time periods would be acceptable. The contractor may refer to the Work Zone Analysis Spreadsheet found in the electronic deliverables under the MoDOT Online Plans Room for detailed information on traffic delays.

**2.5.1 Traffic Safety.**

**2.5.1.1 Recurring Congestion.** Where traffic queues routinely extend to within 1000 feet of the ROAD WORK AHEAD, or similar, sign on a divided highway or to within 500 feet of the ROAD WORK AHEAD, or similar, sign on an undivided highway, the contractor shall extend the advance warning area, as approved by the engineer.

**2.5.1.2 Non-Recurring Congestion.**When a traffic queue extends to within 1000 feet of the ROAD WORK AHEAD, or similar, sign on a divided highway or to within 500 feet of the ROAD WORK AHEAD, or similar, sign on an undivided highway due to non-recurring congestion, the contractor shall deploy a means of providing advance warning of the traffic congestion, as approved by the engineer. The warning location shall be no less than 1000 feet and no more than 0.5 mile in advance of the end of the traffic queue on divided highways and no less than 500 feet and no more than 0.5 mile in advance of the end of the traffic queue on undivided highways.

**3.0 Work Hour Restrictions.**

**3.1** There are six major holiday periods shown below. All lanes shall be scheduled to be open to traffic during these holiday periods, from 12:00 noon on the last working day proceeding the holiday until 9:00 a.m. on the first working day subsequent to the holiday.

- Memorial Day
- Labor Day
- Thanksgiving
- Christmas
- New Year’s Day

**3.1.1 Independence Day.** The lane restrictions specified in Section 3.1 shall also apply to Independence Day, except that the restricted periods shall be as follows:

- 12:00 noon July 2, 2021 – 6:00 a.m. July 6, 2021
- 12:00 noon July 1, 2022 – 6:00 a.m. July 5, 2022

**3.2** The contractor shall not perform any construction operation on the roadway, including the hauling of material within the project limits, during restricted periods, holiday periods or other special events specified in the contract documents. Any work requiring a temporary reduction the the number of through lanes of traffic shall be completed during the following hours:

Location	Days	Allowable Work Hours
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EB RTE 100 West of McKnight	Monday - Friday	7 PM – 7AM
EB RTE 100 West of McKnight	Saturday - Sunday	6 PM – 7 AM
EB RTE 100 East of McKnight	Monday - Friday	24 Hours
EB RTE 100 East of McKnight	Saturday - Sunday	24 Hours
WB RTE 100 West of McKnight	Monday - Friday	9 PM – 7 AM
WB RTE 100 West of McKnight	Saturday - Sunday	9 PM – 7 AM
WB RTE 100 East of McKnight	Monday - Friday	6 PM – 12 Noon
WB RTE 100 East of McKnight	Saturday - Sunday	24 Hours

**3.3** The contractor shall not alter the start time, ending time, or a reduction in the number of through lanes of traffic or ramp closures without advance notification and approval by the engineer. The only work zone operation approved to begin 30 minutes prior to a reduction in through traffic lanes or ramp closures is the installation of traffic control signs. Should lane or ramp closures be placed or remain in place, prior to the approved starting time or after the approved ending time, the Commission, the traveling public, and state and local police and governmental authorities will be damaged in various ways, including but not limited to, increased construction administration cost, potential liability, traffic and traffic flow regulation cost, traffic congestion and motorist delays, with a resulting cost to the traveling public. These damages are not easily computed or quantified. Therefore, the contractor will be charged with liquidated damages specified in the amount of **\$1000 per 15 minute increment** for each 15 minutes that the temporary lane or ramp closures are in place and not open to traffic in excess of the limitation as specified elsewhere in this special provision. It shall be the responsibility of the engineer to determine the quantity of unapproved closure time.

**3.3.1** The said liquidated damages specified will be assessed regardless if it would otherwise be charged as liquidated damages under the Missouri Standard Specification for Highway Construction.

**4.0 Detours and Lane Closures.**

**4.1** The contractor shall provide changeable message signs (CMS) notifying motorists of future traffic disruption and possible traffic delays one week before traffic is shifted to a detour or prior to lane closures. The CMS shall be installed at a location as approved or directed by the engineer. The CMS shall be capable of communication with the Transportation Management Center (TMC), if applicable, prior to installation on right of way. All messages planned for use in the work zone shall be approved and authorized by the engineer or its designee prior to deployment. Permanent dynamic message signs (DMS) owned and operated by MoDOT may also be used to provide warning and information for the work zone. Permanent DMS shall be operated by the TMC, and any messages planned for use on DMS shall be approved and authorized by the TMC at least 72 hours in advance of the work.

**4.2** At least one lane of traffic in each direction shall be maintained at all times except for brief intervals of time required when the movement of the contractor’s equipment will seriously hinder

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the safe movement of traffic. Periods during which the contractor will be allowed to interrupt traffic will be designated by the engineer.

## 5.0 Coordination

**5.1** The contractor shall coordinate traffic management and construction between this project and any other projects on Route 100, and projects which affect Route 100, including all future projects. The contractor shall be aware of the following job:

J6S3259 – Route 100: From US 61/67 (Kirkwood Rd./Lindbergh Blvd.) to I-270, Resurfacing, ADA Transition Plan Upgrades, Traffic Signal Replacements

**5.2** This list of projects is not all inclusive. The contractor shall be aware that there may be other projects including, but not limited to, utility, Metropolitan Sewer District (MSD), St. Louis City, Bi-State Development Agency, Metro, private, MoDOT maintenance, permit, or other projects that may impact project construction or traffic control in the vicinity of this project. It shall be the responsibility of the contractor to determine what, if any, projects other than the ones listed above may impact this project and work to coordinate construction and traffic management efforts between this project and any other project involved.

**6.0 Basis of Payment.** No direct payment will be made to the contractor to recover the cost of equipment, labor, materials or time required to fulfill the above provisions, unless specified elsewhere in the contract documents. All authorized changes in the traffic control plan shall be provided for as specified in Sec 616.

## T-B. Temporary Traffic Control

**1.0 Description.** All work necessary to maintain safe and efficient traffic flow through the work areas shall be provided by the contractor. This will include furnishing, relocating, and removing temporary traffic control devices, truck mounted attenuators and equipment, and the removal and relocation or covering and uncovering of existing signs and other traffic control devices in accordance with the contract documents or as directed by the engineer.

**2.0 Work requirements.** Work shall be in accordance with Sec 616, Sec 612, and the contract plans.

**3.0 Method of Measurement.** The quantities shown on the plans shall be considered an estimate and may be subject to change based on field conditions. This work will not be measured for payment, but will be considered a lump sum unit. Multiple use of the typical traffic control applications shall be considered included in the lump sum unit. Any Value Engineering proposals to the temporary traffic control will not be paid for through value engineering but will be covered under Temporary Traffic Control, lump sum.

## 4.0 Basis of Payment.

**4.1** Partial payments will be made as follows:

- a) The first partial payment will be made when five percent of the original contract amount is earned. This payment will be the lesser of 50 percent of the contract price for the item of temporary traffic control or 5 percent of the original contract price.

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- b) The second partial payment will be made when 50 percent of the original contract amount is earned. This payment will be the lesser of 25 percent of the original contract price for the item of temporary traffic control or 2.5 percent of the original contract price.
- c) The third partial payment will be made when 75 percent of the original contract amount is earned. This payment will be the lesser of 20 percent of the original contract price for the item of temporary traffic control or 2 percent of the original contract price.
- d) When the engineer has accepted the contract for maintenance in accordance with Sec 105, the remaining contract price for the item of temporary traffic control will be paid.
- e) The above partial payment schedule may be adjusted by the engineer if proof of invoices submitted by the contractor demonstrate additional temporary traffic control costs were incurred earlier than the above proposed schedule. The total payment for temporary traffic control will not exceed the bid amount for Temporary Traffic Control, lump sum, unless covered by a cost change order as referenced in the following Section 4.3.

**4.1.1** For the purposes of this provision, the term “original contract price” will be construed as the total dollar value of the construction items (excluding temporary traffic control) of the original contract.

**4.2** Payment for Temporary Traffic Control shall be made and considered completely covered by the contract unit price bid for:

Item No.	Unit	Description
616-99.01	L.S.	Temporary Traffic Control

No direct payment will be made for the following:

- a) Incidental items necessary to complete the work, unless specifically provided as a pay item in the contract.
- b) Installing, operating, maintaining, cleaning, repairing, removing or replacing traffic control devices.
- c) Covering and uncovering existing signs and other traffic control devices.
- d) Relocating temporary traffic control devices, including permanent traffic control devices temporarily relocated, unless specifically included as a pay item in the contract.
- e) Providing channelizers.
- f) Worker apparel.
- g) Flaggers, pilot vehicles, and appurtenances at flagging stations.
- h) Furnishing, installing, operating, maintaining, and removing construction-related vehicle and equipment lighting.
- i) Construction and removal of temporary equipment crossovers, including restoring pre-existing crossovers.

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- j) Removing existing pavement markings, installing temporary pavement markings, and removing and relocating temporary pavement markings as necessary for staging operations.
- k) Installing “Drive Smart” and “Point of Presence” signs.

**4.3** Any additional work deemed necessary by the engineer that requires temporary traffic control and is not covered by the contract plans will be included in the cost change order for the additional work. However, if the added work is required in a stage where temporary traffic control is already in place, no additional traffic control pay will be allowed in this case.

T-C. Traffic Signal Maintenance and Programming

**1.0 Description.** Traffic signal maintenance and timing for this project shall be in accordance with Section 902 of the Standard Specifications, and specifically as follows.

**2.0 Qualified Traffic Engineer**

**2.1** The Contractor shall have an experienced traffic engineer with a Professional Engineer’s (PE) license in Missouri as well as a Professional Traffic Operations Engineer (PTOE) certification (hereafter referred to as “Contractor’s traffic engineer”) with the noted experience defined below. The Engineer shall approve the traffic engineer prior to them being hired.

**2.2 Experience.** Any proposed Contractor traffic engineer shall be able to demonstrate personal successful previous experience in the following tasks:

**2.2.1 Response.** The Contractor’s traffic engineer shall have the ability to be on site within one (1) hour of being requested.

**2.2.2 Corridor Management:** Time/space diagram manipulation in order to successfully adjust offsets and splits for rapidly changing traffic demands.

**2.2.3 Controller Programming:** Ability to program by hand and by software Phase, TBC, and Coordination levels of any Commission-owned Advanced Traffic Signal Controller.

**2.2.4 Intersection Programming:** Implementation of adjusted and/or new timing plans as a result of changing traffic demand.

**2.2.5 Signal Software:** Use and understanding of TransCore traffic control software.

**2.3** The Contractor shall submit the names(s) of proposed traffic engineer(s) and the name(s) of all other personnel on their proposed staff along with detailed experience in all tasks outlined in Paragraph 2.2 above. The Engineer reserves the right to reject any Contractor traffic engineer, before the start of work, who does not have sufficient experience or, at any point during the project, which does not satisfy the requirements set forth within this Job Special Provision. A list of potential traffic engineers shall be submitted for review to the Commission prior to bid.

**2.4 VPN Access.** The Commission operates the noted signals through a central signal system which is capable of remote adjustments to controller programming.

**2.4.1** The approved contractor's traffic engineer and any staff assigned to manage the traffic signals during the project is encouraged to apply for VPN (Virtual Private Network) access with the Engineer once the project is awarded. If approved, the Engineer will assign a unique IP address to the Contractor's traffic engineering staff, which will allow for remote access to the Commission's central signal control system as appropriate and the ability to interface with the noted signals on this project.

### **3.0 Existing Traffic Signals and Communication System**

**3.1** The Contractor shall notify the Engineer three (3) weeks prior to the date of bridge closure and detour implementation. The contractor shall meet with the Engineer's representatives to discuss their traffic mitigation plan at least one (1) week before the date of the first closure and as needed between construction stages. The traffic mitigation plan should at a minimum include:

- Proposed Timing Plan changes and any models
- Anticipated locations of concern
- A map in electronic format displaying the locations and names of the signals as detailed in Paragraphs 3.2 and 3.3 below.
- Other traffic mitigation efforts

**3.2** Once the bridge closure has been implemented by the Contractor, the Contractor shall then be solely responsible for the following signals' controller programming until completion of all closures necessary to complete the Contractor's work. Maintenance at these locations for items other than controller programming issues or incidents caused by controller programming or other construction done by the Contractor shall remain with the Commission. If any part of an existing traffic signal or its controller within the limits of this project has otherwise been modified or adjusted by the Contractor, or the Contractor makes any roadway changes to reduce the traffic capacity through a signalized intersection within the limits of the project, or the Contractor begins work at an intersection with signals already in operation, the Contractor shall then be solely responsible for that signal's controller programming and all signal maintenance as specified in 902.2 and 902.3, except for power costs, until Final Acceptance of the project.

#### **Commission Signals:**

- Route 100 at Oakland Avenue
- Route 100 at Laclede Station Road
- Route 100 at McKnight Road/Rock Hill Road
- Route 100 at Kortwright Avenue
- Route 100 at Berry Road
- Route 100 at Warson Woods Boulevard
- Route 100 at Sappington Road
- Route 100 at Woodlawn Avenue
- Route 100 at Sylvan Place

#### **St. Louis County Signals:**

- Route 100 at Hanley Road
- Route 100 at Brentwood Boulevard

#### **Additional Commission Signals for Detour:**

(If Necessary):

- Route 100 at Route 61/67

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- Route 61/67 at Litzsinger Road
- Route 61/67 at Clayton Road
- Route 61/67 at I-64 (SPUI)
- I-64 at McKnight Road (Both Ends)

**3.3** The Engineer shall provide to the Contactor with two (2) weeks' notice an electronic report on the existing phasing and timing of each traffic signal which may be the Contractor's responsibility to program. The Engineer shall be available to the Contractor before any changes are made to a signal or controller to answer any questions about the report. In lieu of the report, the Contractor's traffic engineer may obtain this information from the Commission's central signal control system. Once the Contractor has modified a signal or controller for any reason, the Contractor shall be solely responsible for the existing timing plans and all subsequent timing changes.

**3.4** The Contractor shall notify the Engineer of the changes no later than (1) working day after changes are programmed if unable to provide advance notice as specified in 902.2.

**3.5** The Contractor shall be solely responsible for maintaining the coordination at any affected signal to the satisfaction of the Engineer until completion of work as set forth in section 3.2 of this provision. Maintenance of coordination may include the synchronization of the affected controller's internal time clocks to the second using an atomic clock, or other means approved by the Engineer. If time clock synchronization is used, the Contractor shall verify all affected controllers are synchronized at least one (1) time per week with a report to the Engineer. This report will be in the form of a documentation record as spelled out in the Work Zone Traffic Management Plan.

#### **4.0 Existing Traffic Signal Maintenance and Response**

**4.1** The Contractor shall respond to any signal timing complaints or malfunction complaints for those locations detailed in Section 3.0 of this provision and as specified in Section 902.21.1. Response time shall be one (1) hour for complaints received by the contractor between 6 AM and 6 PM on non-holiday weekdays, and two (2) hours for all other times. For some cases (due to travel times or other extenuating circumstances) additional time may be acceptable within reason, but must be approved by the Engineer. These timeframes will replace the '24 hour' response time in Section 105.14 for any signal-related incidents, where the entire cost of the work, if performed by Commission personnel or a third party, will be computed as described in Section 108.9 and deducted from the payments due the Contractor.

**4.2** The Contractor must supply a contact name and phone number who will be responsible for receiving signal timing complaints for the Engineer. These complaints may be forwarded directly to the Contractor by someone other than the Engineer, including but not limited to the Commission's Customer Service Representatives, and will not relieve the Contractor from properly responding based on the response times of this Provision. The Contractor shall respond to the Engineer within 12 hours of the complaint as to the remedy. The Contractor shall submit to the Engineer a weekly report of complaints received and remedies performed throughout the duration of the project.

#### **5.0 Original Signal Controller Programming and Acceptance**

**5.1** The Contractor will be responsible for restoring the original signal controller programming at existing intersections and coordination plans for each intersection immediately upon bridge reopening. The Engineer shall preserve and house the original controller files and provide the

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Contractor with access to those files in order to perform the restoration of the original plans. Normal plan restoration can be done by a manual command in the signal control system or a preprogrammed time-of-day command change. For any locations rendered offline at the time of re-opening, these locations shall be returned to normal operation by hand. The contractor will be relieved of signal programming maintenance at an existing restored intersection once 48 consecutive hours have passed without a programming malfunction, including restoring normal signal programming to the satisfaction of the Commission.

**6.0 Post Project Report**

**6.1** The Contractor shall submit to the Engineer a post project report, four to six weeks after the final signal adjustments have been completed. The report shall include at a minimum an observation report, summary of timing changes and locations, summary of complaints, and any other pertinent information regarding the contractor’s efforts for managing these signal corridors in one electronic document.

**7.0 Deliverables**

**7.1** All deliverables mentioned in this provision shall be submitted to the Engineer in a timely manner to the satisfaction of the Engineer prior to receiving full compensation for this work.

- Experience submittal
- Preliminary Traffic Mitigation Plan
- Notification of Detour Implementation
- Time Base Reports, As Needed
- Complaint Resolutions
- Notification of Restoration to Normal Operations
- Post Project Report

**8.0 Construction Requirements.** Construction requirements shall conform to Sections 902, 1061 and 1092.

**9.0 Method of Measurement.** Method of measurement shall conform to Section 902.

**10.0 Basis of Payment.** Payment will be considered full compensation for all Contractor services, installation, and labor to complete the described work:

Item Number	Description	Unit
616-99.01	Traffic Signal Maintenance and Programming	Lump Sum

T-D. NTCIP Compliant Changeable Message Sign (Contractor Furnished and Retained)

**1.0 Description.** All solar powered changeable message signs, hereinafter referred to as a CMS, shall be in accordance with these specifications.

**2.0 Material.** Each CMS shall consist of an all LED (light emitting diode) matrix message board, solar/battery power supply and a user-operated interface, as specified, all mounted on a heavy duty, towable trailer.

**2.1** Each CMS shall be either Full Matrix or Character Matrix, and have the following minimum characteristics:

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- (a) Full Matrix - Each CMS shall be the Full Matrix type with the capability of providing one, two, and three lines of individual changeable characters with minimum heights of 52 (1300), 28 (700), and 18 (450) inches (mm), respectively. Full Matrix signs shall be capable of both static and dynamic graphics, and full display sized messages.
- (b) Character Matrix (Three Line) – Each CMS shall consist of a minimum of three lines containing eight individual changeable characters per line. Each character shall be a minimum of 12 inches wide and 18 inches (450 mm) high.
- (c) Sign firmware shall comply with the current FHWA and DOT (Department of Transportation) NTCIP standards and support all NTCIP mandatory objects.
- (d) The sign controller shall be remotely accessible by the MoDOT St Louis District Transportation Management Center (TMC) through the Commission’s ATMS (Advanced Traffic Management System) software, currently TransSuite provided by TransCore. The contractor will be responsible for ensuring the CMS is added to the ATMS software.
- (e) The CMS shall have a cellular data modem compatible with the district’s current cellular IP (packet data) service provider and be capable of allowing the MoDOT St Louis District TMC ATMS software to have full control of the NTCIP compliant CMS controller remotely. Modem shall be capable of being programmed with a static IP.
- (f) The sign shall have a GPS unit that can assist in locating the sign’s position when polled by the TMC. The GPS unit must be remotely accessible by the TMC and be part of or work with the provided communication modem.
- (g) Physical access to the onboard computer shall be protected by a padlock or other locking handle mechanism. Electronic access to the onboard computer shall be protected by a username and password.

**2.2 Full matrix CMS and character matrix CMS shall meet the following:**

- (a) The overall sign dimensions shall not be less than 72 inches (1800 mm) high x 126 inches (3150 mm) wide.
- (b) The CMS shall be legible up to a distance of 650 feet (200 m) for both day and night operations and shall be visible for ½-mile (800 m) with 18 inch (450 mm) characters.
- (c) When fully raised in the display position, the bottom of the CMS board shall be at least a height of 7 feet (2100 mm) from the ground and shall be able to rotate a complete 360 degrees atop the lift mechanism. A sight tube, used to aim the CMS board to oncoming traffic, shall be installed on the CMS board or mast. The CMS shall have an electrical hydraulic lifting mechanism that includes a manual lifting and lowering relief mechanism as a backup. It also must be able to be locked into various viewing angles as determined best for the motorists by the CMS operator.
- (d) All LED displays and control circuitry shall be operational from -20 F (6 C) to 120 F (50 C). The LED's shall have a rated life of 100,000 hours. The LED's shall be ITE amber in color on a flat black background.

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- (e) The CMS face shall be constructed that if an individual panel or pixel fails the rest of the face shall continue to display the message.
- (f) All costs and coordination needed for testing to verify modem communication, sign NTCIP compliance, remote GPS status polling, ability to control the sign via the St Louis District's ATMS software provided by TransCore shall be the sole responsibility of the Contractor. Full integration into TransCore's ATMS shall be completed at least 5 business days prior to use of the CMS in the project. TransCore contact information will be provided to the contractor by contacting MoDOT's Gateway Guide staff at 314-275-1526 or via email at ggtech@modot.mo.gov with details of the request. No other support shall be provided by MoDOT other than TransCore contact information. Information provided shall include, at a minimum, CMS make and model, IP address, and proposed locations and messages.
- (g) The Contractor shall be responsible for all monthly cellular service fees for the duration of the project.
- (h) The unit shall be able to withstand a 65-mph (105-kmph) maximum road wind speed. The trailer shall be able to support the fully extended CMS board in an 80-mph (130-kmph) wind load.
- (i) Solar charging system shall allow for total autonomy of 24/7/365 continuous operation.
- (j) All exterior surfaces except the sign face shall be cleaned, primed, and finished with two coats of Highway Safety Orange and the sign interior itself shall be cleaned and finished with one coat of corrosion inhibiting primer and two coats of flat black. The sign face shall be covered with a rigid translucent material to prevent damage to the sign face caused by the environment.

**3.0 Construction Requirements.** Prior to placing a CMS on a project, the engineer shall verify proposed CMS location is void of conflict with another DMS or CMS locations presently established. If a conflict is present, the engineer shall contact the Traffic Management Center (TMC) at 314-275-1526 to mitigate. If no conflict is present, engineer shall provide Traffic Management Center (TMC) with the Job Number, Route, County, specific CMS location, and a CMS identification number that is permanently affixed to the CMS. The engineer and contractor shall verify the message displayed on board is compliant with CMS messaging policies. The contractor shall place the CMS 6 feet [2 meters] off of the right edge of shoulder at the location shown on the plans or as directed by the engineer. The CMS shall be placed so that the right side of the unit is advanced approximately 3 degrees ahead with the direction of traffic. CMS shall not be located in medians. CMS shall be delineated with a minimum of five non-metallic channelizing devices. Installation, including location and placement, shall be approved by the engineer. If needed, the contractor shall relocate the CMS as directed by the engineer.

**3.1** When not in use, the CMS shall be stored no closer than 30 feet [10 meters] to the edge of pavement carrying traffic, unless it is in a properly protected area or an off-site storage area or as otherwise directed by the engineer.

**4.0 Basis of Payment.** All expenses incurred by the contractor in integrating, maintaining, relocating, operating and protecting the changeable message signs as outlined above shall be paid for at the contract unit price for Item 616-99.02 NTCIP Compliant Changeable Message Sign, Contractor Furnished and Retained, per Each.

**4.1** Cost for channelizers shall be included in the contract unit price for CMS.

**4.2** Cost for cellular phone hookup and monthly usage fee for the duration of the project shall be included in the contract unit price for CMS.

Item Number	Unit	Description
616-99.02	Each	NTCIP Compliant Changeable Message Sign (Contractor Furnished and Retained)

T-E. Bike Pavement Markings and Accessible Parking Pavement Markings

**1.0 Description.** This work shall consist of installing bike lane symbols and arrows and accessible parking symbols as shown in the plans.

**2.0 Materials.** The contractor’s work shall consist of furnishing and placing thermoplastic markings for the bike lane symbols and arrows and accessible parking symbols as shown in the plans and in accordance with Section 620 of the Standard Specifications.

**3.0 Basis of Payment.** Payment for furnishing and installing the bike lane symbols and arrows shall include all materials, equipment, tools, labor, and work incidental thereto, and shall be considered to be completely covered by the contract unit prices for:

Item No.	Unit	Description
620-99.02	Each	Bike Lane Arrow Preformed Thermoplastic Pavement Marking
620-99.02	Each	Bike Lane Bike Preformed Thermoplastic Pavement Marking
620-99.02	Each	Shared Use Sharrow Preformed Thermoplastic Pavement Marking
620-99.02	Each	Accessible Parking Symbol Preformed Thermoplastic Pavement Marking

T-F. Removal and Delivery of Existing Signs JSP-12-01B

**1.0 Description.** All Commission-owned signs removed from the project shall remain the property of the Commission and shall be disassembled and delivered as specified herein.

**2.0 Disassembly and Delivery.** All Commission-owned signs, not to include abandoned billboard signs, designated for removal in the plans, and any other signs designated by the engineer, shall be removed by the contractor and delivered to the address below. The contractor shall call the phone number listed below 48 hours prior to delivery and make arrangements for delivery during normal business hours.

MoDOT Barrett Station Operations Complex  
2309 Barrett Station Road  
Ballwin, MO 63021  
Phone: (314) 205-7310

**2.1** Signs shall be removed from sign supports and structures prior to delivery. Sign supports and structures shall become the property of the Contractor and removed from the project. Any

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oversized sign panels shall be disassembled or cut into widths of 8-feet or less with no restriction on length. Signs shall be stacked neatly in bins provided by MoDOT at the delivery site.

**3.0 Basis of Payment.** All costs associated with removing, disassembling, storing, and transporting of signs shall be considered as completely covered by the contract unit price for Item No. 202-20.10, "Removal of Improvements", per lump sum.

T-G. Disposition of Existing MoDOT Assets

**1.0** Existing assets shall be removed and delivered to a designated MoDOT facility as described herein. Existing assets, including signal cabinet assemblies and ITS facilities shall be removed by the contractor, tagged with the time and date of removal and intersection name, and transported to the Missouri Department of Transportation's maintenance lot located at 2309a Barrett Station Road, Ballwin, Missouri 63021 within 48 hours. The contractor shall notify the following MoDOT signal shop Supervisors 24 hours prior to each delivery:

Ron Mize, Cell 314-565-6727, Office 314-205-7320

Dennis Hixson, Cell 314-565-6726, Office 314-205-7319.

All other existing signal and lighting equipment to be removed as shown on plans or as directed by Engineer shall be removed and disposed of by the contractor.

**2.0** The contractor shall exercise reasonable care in the handling of existing assets and the signal cabinet assemblies during removal and transportation. Should any of the equipment be damaged by the contractor's negligence, it shall be replaced at the contractor's expense. All other equipment removed from the intersections shall become the property of the contractor and be removed from MoDOT right-of-way.

**3.0** The contractor shall restore those areas disturbed by the equipment removal or installation according to specifications herein. This work will be considered included in the unit contract price for Removal of Improvements.

T-H. Coordination with ITS Staff and Utility Locates

**1.0 Description.** Any work that will impact the existing communications network must be coordinated with the Commission's St. Louis District ITS staff. This includes but not limited to removal and replacement of any existing communications equipment, adding new devices and changes to power sources or disconnects. Minor modifications to the existing communications network can have significant impacts on the system and operation of other ITS and traffic signal systems.

**1.1** MoDOT is a member of MO-One-Call System. Prior to any excavation or work within MoDOT Right-Of-way, the contractor must contact MO-One Call at 1-800-DIG-RITE and request for Utility Locates within noted project limits. If the scope of work contains modification, addition and/or expansion of existing underground MoDOT ITS, lighting, or signal facilities, the contractor must notify the MoDOT Utilities Locate staff prior to any work, in order for MoDOT to update MoDOT utility location records with Missouri One Call.

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**2.0 Contact.** Initial contact must be made at least seven calendar days before work that may impact the existing communications network commences. Contact the ITS staff via an email at [SLITS@modot.mo.gov](mailto:SLITS@modot.mo.gov). The engineer shall be notified prior to making contact with ITS staff. For MoDOT Utility location updates, the contractor must contact MoDOT TMC at 314-275-1500 and ask for Utility Locate Section at least seven calendar days before performing any work.

**3.0** The ITS and network devices located within the project limits are a crucial part of the traffic operation system for this area. It is imperative that the downtime be kept to a minimum when adding, removing, or modifying any existing ITS and network devices. This may require the contractor to perform work that will affect existing network devices during nighttime and/or weekend hours, at the discretion of the Engineer. Allowable timeframes for this work will be subject to the need for ITS devices in the area to be used to manage other traffic impacting workzones.

**4.0 Basis of Payment.** No direct payment shall be made for compliance with this provision.

T-I. Coordination with MoDOT Signal Shop for Cabinet Entry

**1.0 Description.** Commission-furnished color-coded pad locks have been placed on all of MoDOT's signal cabinets in addition to the key used to unlock the door handle. To gain access to the appropriate cabinets during the project all contractors shall coordinate with MoDOT's signal shop to obtain the proper keys and locks..

**1.0.1 Keys & Locks.** Red locks & keys are provided when a contractor has modified the signal cabinet and MoDOT staff shall not have access to the cabinet until it is accepted for maintenance. The blue keys are provided for entry into the cabinet where MoDOT's Signal Shop group deems the access to be minor in nature (entry to the cabinet to make a simple network switch connection, for example).

**1.0.2 Completion of Project.** At the completion of the project all keys and pad locks distributed to contractor during the project shall be returned to the Signal Shop supervisor or their representative and keys shall not be reproduced.

**2.0 Contact.** Initial contact must be made at least seven calendar days before work begins, preferably when the project has the notice to proceed or during the pre-construction meeting, if applicable. MoDOT's Signal Shop supervisors shall be notified prior to work beginning. Contact the signal shop via email at [sltrs@modot.mo.gov](mailto:sltrs@modot.mo.gov) to coordinate which padlocks are to be used.

**3.0 Basis of Payment.** No direct payment shall be made for compliance with this provision.

T-J. Rectangular Rapid Flashing Beacon

**1.0 Description.** This work shall consist of furnishing and installing a Solar-Powered Rectangular Rapid Flashing Beacon (RRFB) assembly at the locations as shown in the plans. The installation shall comply with the latest version of the Manual of Uniform Traffic Control Devices, with the specifications as detailed on the plans, and with all manufacturers' recommendations.

**2.0 Material.** The RRFB assembly shall include all equipment and material necessary for the installation of two (2) solar powered units. This equipment includes, but is not limited to, 15' Signal

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Post (powder coated black), "Type C" concrete base, signs, pushbutton, beacon, solar panel, control box, battery, wiring, mounting hardware and all additional equipment necessary for the installation of two solar powered units. All advanced signing associated with the crossing will be paid for separately per contract plans.

**3.0 Method of Measurement.** Measurement shall not be made for the work involved for furnishing and installing the two RRFB assemblies, but shall be considered a lump sum unit.

**4.0 Basis of Payment.** All costs involved with the labor, materials including powder coating, equipment, and tools necessary for this work as required by the manufacturer, will be paid for at the contract unit price for:

902-99.02 Rectangular Rapid Flashing Beacon, per each.

T-K. Video Detection System

**1.0 Description.** If video is provided by the Contractor to enable any needed detection, this work shall consist of furnishing, installing and placing into operation a vehicle detection system that detects vehicles by processing video images and providing detection outputs to a traffic signal controller.

**2.0 System Requirements.** Delete Secs. 902.13.4 and 1092.4.7.7 in their entirety and substitute the following:

**902.13.4 Video Detection System.** The system shall include all equipment shown on the plans and described in these specifications, plus any incidental items necessary for the satisfactory operation and maintenance of the system. All original identifying information from the packaging of each installed camera shall be placed in the signal cabinet. Up to date reference manuals or user guides are required in pdf format. The video detection system shall be installed per the manufacturer's recommendations. The installer shall be certified by the video detection system's manufacturer to install the system. All coaxial cable runs (if used) shall be continuous without splice from the cabinet to the camera. If requested by the engineer, a factory certified representative from the supplier shall be available for on-site assistance for a minimum of one day during installation.

**902.13.4.1 Camera.** The bottom of the video camera shall be mounted a minimum of 30 feet (9.0 m) above the pavement, unless otherwise indicated on the plans or approved by the Engineer.

**902.13.4.2 Extra Service Outlet.** A separate grounded 120 VAC service outlet shall be provided in the controller cabinet for supplying power to the parts of the video detection system requiring AC power. Use of the grounded service outlet located on the cabinet door will not be permitted.

**1092.4.7.7.1 System Requirements.** The video detection system shall provide flexible detection zone placement at any location and at any orientation within the combined field of view of the image processors. Preferred presence detector zone configurations shall be a box, lines or similar placed across lanes of traffic or lines placed parallel with lanes of traffic. Detection zones shall be capable of overlapping, and be configurable to be directional in order to prevent vehicles that approach from all but 1 direction from activating the detection zone.

**1092.4.7.7.1.1** The detection zones shall be created by drawing the detection zones on the video image. A graphical user interface shall be built into the video detection system and displayed on a video monitor or computer. It shall be possible to edit previously defined detector configurations to fine-tune detection zone placement.

**1092.4.7.7.1.2** When a vehicle is detected by crossing a detection zone, there shall be a visual change on the video display, such as a flashing symbol or a change in color or intensity to verify proper operation of the video detection system.

**1092.4.7.7.1.3** Overall performance of the video detection system shall be comparable to inductive loops. Using camera optics and in the absence of occlusion, the video detection system shall be able to detect vehicle presence with 98% accuracy under normal day and night conditions with only slight deterioration in performance under adverse weather conditions, including fog, snow and rain. When visibility exceeds the capabilities of the camera, the video detection system shall default to placing a call on all detectors. Supportive documentation is required to meet this specification.

**1092.4.7.7.1.4** The video detection system shall be capable of being programmed via remote communication through the Commission's Ethernet network via serial connection or Ethernet connection. It shall provide at a minimum 2 frames per second moving image and real time detection displays to a remote computer using supplied video detection system software through the Commission's network for all cameras. All components, existing cabinet wiring changes, and/or modules needed to communicate through the Commission's network other than Commission furnished communication gear shall be included as part of the video detection system. If provided with an IP address by the Commission, the contractor will program and connect the video detection system into the Commission supplied communication gear before project acceptance.

**1092.4.7.7.1.5** The video system must integrate/be compatible with an Advanced Transportation Signal Controller (ATC). This applies not only to the existing controller brand but any other signal controller that meets ATC requirements.

**1092.4.7.7.1.6** The system must be able to be accessed and configured remotely by users with a rudimentary understanding of video systems/signal controllers. Any and all software to interface the video system is to be included.

**1092.4.7.7.1.7** In addition to presence detection, the video detection system shall be capable of performing at a minimum the following calculations in real time and store all values for each camera view for any visible lane without the addition of another device:

- a) Speed
- b) Volume
- c) Lane Occupancy
- d) Vehicle Classification
- e) Other available performance measures

**1092.4.7.7.1.8** For speed calculations thru movements are required. Turning movement measurements are desired but not required. For volume measurements/calculations both mainline thru and all turning movements are required. All values are to be assigned to detector channels within the controller.

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If this requirement cannot be met all values must be able to be exported thru an excel spreadsheet. Other performance measures must be clearly defined. In all cases all performances measures must be ultimately available in an easily usable, exportable format.

**1092.4.7.7.2 Video Detection System Components.** The video detection system will be defined as the complete assembly of all required equipment and components for detection of vehicles. Each video detection system shall consist of the video camera(s), lightning arrester for video cabling, processor unit(s), control device (track ball or keypad; no mouse allowed), software and license for system control via a computer (if applicable), communication components, and a color monitor. All camera views shall be obtainable without requiring the disconnection and reconnection of cables within the system.

**1092.4.7.7.2.1 Video Detection System Software.** The video detection system shall include software that detects vehicles in multiple lanes using only the video image. Detection zones shall be defined using a video monitor and control device to place the zones on a video image, which may include a laptop computer. A minimum of 12 detection zones per camera shall be available.

**1092.4.7.7.2.2 Video Detection System Connections.** All bus connections in the video detection system shall be corrosion resistant. Serial communications to a computer shall be through an RS-232/RS-422 serial port through a subminiature "D" connector with a computer running supplied system software. The port shall have the capability to access detection system data as well as the real-time imagery needed to show detector actuations. The processor shall have a RJ-45 plug using Ethernet 10/100 protocols.

**1092.4.7.7.2.2.1** The equipment shall be provided with either a NEMA TS1 or NEMA TS2 interface as shown on the plans.

**1092.4.7.7.2.2.1.1** For TS1 systems, the video detection system shall be equipped with a TS1 detector interface for a minimum of 16 detector outputs, or 32 detector outputs if required by Job Special Provisions. Logic output levels shall be compatible with the TS1. A subminiature "D" connector on the video detection system shall be used for interfacing to these outputs.

**1092.4.7.7.2.2.1.2** For TS2 systems, the video detection system shall be equipped with a TS2 Type 1 detector interface, where detector information is transmitted serially via an RS-485 data path. A 15-pin subminiature "D" connector, meeting the requirements of the TS2 standard, shall be used for the serial detector output. A minimum of 16 detector outputs is required, with the capability of expansion to 32 outputs if required by Job Special Provisions.

**1092.4.7.7.2.2.1.3** The contractor shall be responsible for any changes or additions to either an existing or new cabinet in order to provide a properly functional video detection system and monitor display. This may include, but is not limited to, additional SDLC connectors, a MMU (malfunction management unit), shelf relocation and component reorganization. No direct pay for any changes or additions. All required connections will be considered part of the video detection system installation.

**1092.4.7.7.2.2.2** The video detection system shall be provided for either single camera or multiple camera installations as shown on the plans. Multiple camera installations shall be configured so that failure of 1 camera or control module shall not affect the operation of the remaining cameras or control modules.

**1092.4.7.7.2.2.2.1** All video detection systems shall have a RS-170 (NTSC) video input to process another synchronous video source in real-time. The video detection system shall have at least 1 RS-170 (NTSC) video output.

**1092.4.7.7.2.2.2.2** The video detection system shall be capable of providing the connection of a local surveillance camera or other non-detection video source. The video from the auxiliary input shall not be processed for video detection. The video detection system shall have an RS-170 (NTSC) composite video output, which may correspond to any of the video inputs, as selected remotely via RS-232 or locally by front panel switch. Multiple video inputs shall be routed into external video switchers (mounted to the monitor if provided).

**1092.4.7.7.2.2.2.3** The video detection system shall be able to turn any detection zone in the default detector pattern on or off by internal time base control. The video detection system shall also be capable of switching to any detector pattern at the request of the user by either a menu selection with the control device or through a computer.

**1092.4.7.7.2.3 Monitor.** The monitor shall be a LCD active matrix with a minimum 7" diagonal screen color monitor, an NTSC-M system and BNC video in-out connections built into the housing. The unit shall be compact and lightweight, securely mounted to the cabinet shelving, have low power consumption, constructed to operate under extreme temperature conditions, and run on AC power. AC adaptor shall be included. The monitor shall be installed to automatically power on when the cabinet door is opened and automatically power off when the cabinet door is closed. A manual on/off switch shall be provided. If the video detection system is installed in a 332 or 336 cabinet or NEMA cabinet housing a master controller or in one that does not have shelf space, the screen size will be 5" diagonal with all other noted provisions unchanged.

**1092.4.7.7.2.4 Video Camera and Housing.** The video detection system supplier shall furnish the video camera for traffic detection. The camera shall produce a color video image of vehicles during daylight hours, with an optional production of black and white images during nighttime hours. The video shall produce a clear image for scenes with a luminance from a minimum range of 0.18 to 929 foot-candles (2.0 to 10,000 lux).

**1092.4.7.7.2.4.1** The camera shall provide a minimum resolution of 430 lines horizontal (TVL) and 350 lines vertical under NTSC operation.

**1092.4.7.7.2.4.2** The camera shall include an electronic shutter or auto iris control based on average scene luminance and shall be equipped with an auto iris lens.

**1092.4.7.7.2.4.3** The camera shall have a variable focal length. The maximum aperture of the lens shall not be smaller than f1.8 and the minimum aperture shall not be larger than f300. The camera shall have a horizontal field of view ranging from a minimum angle of view between 5 degrees and 10 degrees wide to a maximum angle of at least 45 degrees. The adjustments for focus and focal length shall be made without opening up the camera housing.

**1092.4.7.7.2.4.4** The camera shall be contained in an enclosure that is waterproof and dust-tight to NEMA-4 specifications. A minimum 5W heater shall be incorporated in the camera to prevent the formation of condensation and to assure proper operation of the lens' iris mechanism. The heater shall not interfere with the operation of the image sensor electronics, and it shall not cause interference with the video signal. The enclosure shall allow the camera to be rotated in the field during installation.

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**1092.4.7.7.2.4.5** The housing shall be equipped with a sun shield that prevents sunlight from directly entering the lens. The sun shield shall include a provision for water diversion to prevent water from flowing in the camera field of view, and shall be able to slide forward and back.

**1092.4.7.7.2.4.6** The total weight of the enclosure, camera, lens, housing, sun shield and mounting bracket shall be less than 10 pounds (4.5 kg).

**1092.4.7.7.2.5 Cable.** Coaxial cable, if used, shall be a 75 ohm, precision video cable with 20 AWG (0.50 mm<sup>2</sup>) solid bare copper conductor, maximum of 10.1 ohms/m Nom. D.C.R., solid polyethylene insulating dielectric, 96% minimum tinned copper double-braided shield with a black polyethylene outer covering. The signal attenuation shall not exceed 0.8 dB per 100 feet (30 m) at 10 MHz. Nominal outside diameter shall be 0.305 inches (7.7 mm). The cable shall be in accordance with Belden Type 8281, West Penn P806 or approved equal.

**1092.4.7.7.2.5.1** Seventy-five ohm BNC plug connectors shall be used with coaxial cable, if used. The supplier of the video detection system shall approve the coaxial cable, BNC connectors and crimping tool, and provide a 10% extra quantity of the needed BNC connectors with the system. The manufacturer's instructions shall be followed.

**1092.4.7.7.2.5.2** Multi-conductor cable shall be per the manufacturer's recommendation and in accordance with Sec 1061.

**1092.4.7.7.2.5.3** Twisted pair cable shall meet recommendations of the video detection system manufacturer. Pairs shall be untinned, with an overall shield. Individually shielded pairs will not be allowed.

**1092.4.7.7.2.6 Maintenance and Support.** The supplier shall maintain an ongoing program of technical support and software updates for the video detection system following expiration of the warranty period. The supplier shall maintain an adequate inventory of parts to support maintenance and repair of the video detection system.

**1092.4.7.7.2.7 Warranty of Video Detection System.** The video detection system shall be warranted to be free of defects in material and workmanship for a minimum of two years, with the cameras being warranted for the same for two years. During the warranty period, technical support from factory certified personnel or factory certified installers shall be available from the supplier. Ongoing software support by the supplier shall include updates for the processor unit and computer software and shall be provided at no cost during the warranty period. The update of the processor unit software to be National Transportation Communications for ITS Protocol (NTCIP) compliant shall be included.

**1092.4.7.7.2.8 Training of Video Detection System.** A minimum of one day (6 hours) of training shall be provided in the operation, setup and maintenance of the video detection system. Please contact the engineer to set up said training.

**3.0 Construction Requirements.** Construction requirements shall conform to Sec 902.

**4.0 Method of Measurement.** Method of measurement shall conform to Sec 902.

**5.0 Basis of Payment.** Accepted video detection systems will be made at the contract unit price

per each. Payment will be considered full compensation for all labor, equipment and material to complete the described work.

**5.1** No direct payment will be made for programming the video detection system and its local intersection controller.

T-L. ATC Traffic Signal Controller

**1.0 Description.** The Commission's St. Louis District is utilizing TransCore's TransSuite software as their Advanced Traffic Management System (ATMS), therefore all signal controllers must be able to interface with their TCS program.

**2.0 Material.** All traffic signal controllers purchased and installed on this project shall be selected from the list below and match the cabinet type and connections indicated on the D-37C sheet for each intersection(s). The controllers on the list below are the only controllers that are tested, fully functional, and approved with the version of TransSuite that the St. Louis District is currently operating (TransSuite version 19.4):

Controller/Firmware Type	Firmware Supported	Cabinet Type (Match in field)
Econolite Cobalt	32.65.10 or newer	NEMA TS2 Type 1 or 2
Econolite ASC/3	2.66	NEMA TS2 Type 1 or 2
McCain Omni EX	1.11	NEMA TS2 Type 1 or 2
Intelight X3	MaxTime 2.1.1	NEMA TS2 Type 1 or 2

**3.0 Construction Requirements.** Contractor shall ensure that the signal controller as noted above is programmed to be compatible with the previously mentioned version of TransSuite TCS system.

**4.0 Acceptance Testing.** All controllers shall be tested per the Commission's specifications. Programming and testing should be done prior to any installation and approved by the Commission's engineer or representative. The contractor shall provide a copy of the signal programming to the engineer via an USB Flash drive.

**5.0 Documentation.** Contractor shall provide the engineer with an electronic copy of the manufacturer's signal controller manual or link to the website where the manual can be downloaded in .pdf format.

**6.0 Basis of Payment.** Measurement and payment for work covered by this specification shall include all equipment, tools and materials necessary and shall be paid at the contract unit price as follows:

Item No.	Type	Description
902-99.02	Each	ATC Traffic Signal Controller

T-M. Network Connected Signal Monitor

**1.0 Description.** The Commission's signal cabinet shall have a flashing yellow arrow compatible monitor installed with an internal RJ-45 plug for 10/100 Ethernet communication that

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is connected to the Commission’s computer network through Commission furnished Ethernet switch and allow a remote user running the monitor’s software to interface with any specific monitor.

**2.0 Performance.**

**2.1 Inputs.** If video detection is used, inputs into controller shall be via SDLC port. Signal cabinet to be TS2 Type 2 setup with 3 ea. SDLC connectors and the monitor to be a Malfunction Management Unit (MMU).

**2.2 Status and Event Logging.** Monitor shall be able to remotely communicate, at a minimum, active status, current faults, and event logs for at least the previous 7 days.

**2.3 Flashing Yellow Arrow.** Monitor shall be capable of operating a flashing yellow arrow for left turns by utilizing unused yellow channels on the pedestrian load switches.

**2.4 Software and Configuration.** Software needed to communicate to any network-enabled monitor shall be provided to the Commission for an unlimited number of users.

**3.0 Construction Requirements.**

**3.1 Requirements.** Construction requirements shall conform to Sections 902 and 1092.

**3.2 Setup and Training.** A minimum of one day of training shall be provided in the operation, setup communication and maintenance of the monitors.

**3.3 Acceptance Testing.** Contractor shall demonstrate that all network-connected monitors are remotely communicating and individually addressable via supplied software and Commission furnished devices from the Commission’s St. Louis Traffic Management Center in order to satisfy the requirements of this provision. No direct payment will be made for this testing.

**4.0 Method of Measurement.** Method of measurement shall conform to Sec 902.

**5.0 Basis of Payment.** No direct payment will be made for the software. Payment will be considered full compensation for all labor, equipment, and material to complete the described work other than Commission furnished devices needed to complete the network connections. Payment will be made as follows:

Item No.	Type	Description
902-99.02	Each	Network Connected Signal Monitor

T-N. 12-Position Backpanel Flashing Yellow Arrow (Oakland, McKnight, Sappington, and Sylvan Intersections)

**1.0 Definition.** This work will include modifying the cabinets to provide new Special and Standard Overlaps to accommodate Flashing Yellow Arrow installation and programming as detailed on the plan sheets. The installation, cabinet modification, and programming of 3-section permissive only FYA and 4-section protected/permissive FYA signal heads and new FYA signs will vary by intersection. There are four categories for the cabinet modifications:

- One-approach modification
- Two-approach modification
- Three-approach modification
- Four-approach modification

The contractor shall refer to the plans for more details.

**1.1 Default Load Switch Assignment – 12 position cabinets**

**1.1.1 Description.** The contractor shall apply 12-compact Flashing Yellow Arrow installation method on all 12-position traffic signal cabinets. The NEMA Load Switch assignment for 12-compact FYA installation method is as follows:

12-Position Cabinet FYA NEMA Load Switch Assignments											
1	2	3	4	5	6	7	8	9	10	11	12
OLA FYA	PHASE 2	OLB FYA	PHASE 4	OLC FYA	PHASE 6	OLD FYA	PHASE 8	PHASE 2 PED	PHASE 4 PED	PHASE 6 PED	PHASE 8 PED
								PHASE 1 LEFT	PHASE 3 LEFT	PHASE 5 LEFT	PHASE 7 LEFT

**1.2.2 Wiring.** The contractor shall use following color code for the installation of Flashing Yellow Arrow:

If separate 7-conductor cable is present for the existing left turn signal head:

- Red Wire = Load Switch 1, 3, 5, or 7 Red output = 4-section Red Left Arrow
- Orange Wire = Load Switch 1, 3, 5, or 7 Yellow output = 4-section Steady Yellow Arrow
- Black/White Wire = Load Switch 1, 3, 5, or 7 Green output = 4-section Flashing Yellow Arrow
- Green Wire = Load Switch 9, 10, 11, or 12 Yellow output = 4-section Green Arrow

If no separate 7-conductor cable is present for the existing, permissive only, left turn signal head:

- Black Wire = Load Switch 1, 3, 5, or 7 Red output = 3-section Red Left Arrow
- Blue Wire = Load Switch 1, 3, 5, or 7 Yellow output = 3-section Steady Yellow Arrow
- Black/White Wire = Load Switch 1, 3, 5, or 7 Green Output = 3-section Flashing Yellow Arrow

If existing cabinet wiring does not allow the described color code to be met, the contractor shall tag all wires with assigned phases and direction used for the successful completion of the installation of Flashing Yellow Arrow.

**1.2.3 Signal Monitor programming.** The contractor shall use 12 channel programming mode for the signal monitor.

**1.2.4** The contractor shall notify the engineer 24 hours after any successful modification to the load switch assignment, wiring, Controller and MMU programming described in this document.

T-O. MoDOT TS2 Type 1 Cabinet Assembly

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**1.0 Description.** The cabinet assembly shall meet, as a minimum, all applicable sections of the latest revisions as found in the NEMA TS2 Standard Publication and sections 902 and 1092 of the Missouri Standard Specifications for Highway Construction manual. Where differences occur, this specification shall govern.

## **2.0 Materials.**

**2.1 Cabinet.** The cabinet shall be constructed from aluminum with a minimum thickness of 0.125 inches. The cabinet shall be designed and manufactured with materials that will allow rigid mounting, whether intended for pole, base or pedestal mounting. All mounting points where the cabinet is bolted to the foundation shall be reinforced at the factory by welding in an additional layer of material equal to the thickness of the material that the cabinet is constructed from. Triangular gussets are also required when the base plate and cabinet walls are welded together vs. continuous rolled material. A rain channel shall be incorporated into the design of the main door opening to prevent liquids from entering the enclosure. All external hardware shall be stainless steel. Unless otherwise specified, the cabinet exterior shall be supplied with a natural aluminum finish. Unless otherwise specified, the interior of the cabinet shall be white. Sufficient care shall be taken in handling to ensure that scratches are minimized. All surfaces shall be free from weld flash. Welds shall be smooth, neatly formed, free from cracks, blowholes and other irregularities. All sharp edges shall be ground smooth. The cabinet shall be equipped with (2) lifting brackets for installation and removal purposes.

**2.2 Cabinet Doors.** The cabinet shall include front and rear doors of NEMA type 3R construction with rain tight gaskets. A stiffener plate shall be welded across the inside of the main door to prevent flexing. Doors shall include a mechanism capable of holding the door open at approximately 90 and 165 degrees under windy conditions. Manual placement of the mechanism shall not be required by field personnel. Only the main door shall have ventilation louvers. A plaque designation "Traffic Control" shall be affix to each main cabinet door.

**2.3 Door Alarm.** The front and rear doors shall be equipped with switches wired to the traffic signal controller alarm with 1 input for logging and reporting of a door open condition.

**2.4 Shelves.** No less than (2) shelves shall be provided and each shall have the ability to be independently removed, relocated, and adjusted. The front edge of each shelf shall have holes predrilled at a spacing of no greater than 8 inches to accommodate tie-wrapping to secure cables/harnesses.

**2.5 Mounting Rails.** A minimum of one set of vertical "C" channels shall be mounted on each interior wall of the cabinet for the purpose of mounting the cabinet components. The channels shall accommodate spring mounted nuts or studs. All mounting rails shall extend to within 7 inches of the top and bottom of the cabinet.

**2.6 Pull-out Drawer.** The cabinet shall be equipped with a pull-out drawer/shelf assembly. A 1½ inch deep drawer shall be provided in the cabinet, mounted directly beneath the controller support shelf. The drawer shall have a hinged top cover and shall be capable of accommodating one complete set of cabinet prints and manuals. This drawer shall support 50 pounds in weight when fully extended. The drawer shall open and close smoothly. The drawer dimensions shall make maximum use of available depth offered by the controller shelf and be a minimum of 18 inches wide.

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**2.7 Police Door.** The police door shall contain only (1) switch used for flash/auto operations. The ability to turn field indications off from the police panel will not be permitted.

**2.8 Lighting.** The cabinet shall include no less than (3) field replaceable LED light assemblies along the top and sides of the cabinet. The LED panels shall be controlled by a manually activated toggle switch on the tech panel.

**2.9 Fans/Ventilation.** The components of the system as well as the CFM requirements shall be in compliance with the MoDOT 902 & 1092 specifications.

**2.10 Heater.** The cabinet shall be supplied with a 200 Watt fan heater with thermostat control that is designed to protect electronics from the effects of low temperatures such as corrosion, freezing or condensation, which can damage critical components within a control enclosure. Housing shall be constructed of aluminum. Overall dimensions including mounting areas shall be approximately: 4inch depth, 4inch width, 5.50inch height.

**2.11 Switch Guards.** All switches shall include switch guards. All switches shall be clearly labeled.

**2.12 Receptacles and power strip(s).** One 8-outlet IP-addressable power strip shall be provided and Commission-furnished. The installation of the power strip shall be included in the cost of the cabinet assembly. The main door tech panel shall contain a 15 amp duplex GFI receptacle. A separate grounded service outlet shall be provided in the controller cabinet for supplying power to the video detection monitor. The monitor shall be installed to automatically power on when the cabinet door is opened and automatically power off when the cabinet door is closed. The use of the grounded service outlet located on the cabinet door will not be permitted for this function. A manual on/off switch shall also be provided and mounted to the main door tech panel.

**2.13 16-Position Back Panel Wiring.** All new signal cabinets shall have a 16-position load switch back panel and conform to the following specifications. Regardless of the number of phases specified on the plans, all load switch positions shall be completely wired for use. The load switch back panel shall be configured for NEMA Configuration "A" or "G" as designated on the signal plans. Vehicle phases, overlaps (including FYA configurations), and pedestrian phases shall be wired such that it must work with a Type 16 MMU. The cabinet shall include both a DT panel and a CTB (SDLC) panel with 6 harnesses.

**2.14 Intersections with Video Detection.** For intersections with video detection, the cabinet shall be wired to automatically power on the video monitor when the cabinet door is open.

**2.15 Load Switch.** The front of the load switch shall be provided with (3) indicators to show the input signal from the controller to the load switch and (3) indicators to show the output to the field devices. The full complement of load switches shall be supplied with each cabinet to allow for maximum phase utilization for which the cabinet is designed.

**2.16 SDLC.** All connection points shall be protected by a BIU 15 pin surge suppressor used for the protection of any devices on Port 1 Synchronous Data Link Control (SDLC). Each cabinet shall be provided with a SDLC hub assembly and (6) SDLC cables unless otherwise noted on the order form. All mechanical connections shall be soldered.

**2.17 Surge Protection.** Surge protection shall be a modular plug in type product as listed in the MoDOT Traffic APL.

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**2.18 AC line filter.** The AC line filter shall protect equipment from malfunctions due to conducted interference coming into the equipment from line, especially line to ground (common mode) noise and transients. Overall dimensions including mounting areas shall be approximately: 4.17inch width and 3.53inch height.

**2.19 Signal Buss Relay.** The relay shall be a direct “drop-in” replacement for existing mercury displacement relays. The relay shall be a single pole solid state or hybrid relay. Overall dimensions including mounting areas shall be approximately: 2.5inch depth, 2inch width, 5 inch height.

**2.20 Field Wiring termination.** All field wires shall be attached to the back panel terminal strips via a mechanical copper lug, which can accommodate wire sizes from 14AWG - 6AWG. Lugs shall be provided for all field outputs to maximize the cabinet design.

**2.21 Flash Transfer Relays.** The full complement of relays shall be supplied with each cabinet to allow for maximum phase utilization for which the cabinet is designed.

**2.22 Cabinet Wiring Prints.** Paper cabinet prints as well as electronic media shall be provided with each cabinet. (4) paper copies shall be provided (22” X 34”) and (1) electronic copy in pdf and dgn format. All flash program wiring configurations shall be represented on the cabinet print (Red, Amber, No Flash, FYA, Ped, FYA & Ped).

**2.23 Generator Attachment.** A generator plug shall be installed on each cabinet unless otherwise noted. The access door shall be hinged, lockable and watertight. The plug shall conform to the (NEMA L5-30 configuration). An automatic transfer switch shall be provided which will switch power to/from “line”, “UPS” or “generator” when power from one of the sources has been lost or gained. The unit shall be rated for 30 amps and shall contain either a LCD display or indicator lights that validate the following: Line in, Line out, UPS in, UPS out and “from” generator. The unit shall contain a main breaker (on/off switch), a UPS bypass breaker (switch) and a Generator breaker (switch). To minimize the impact of the presence of the auto transfer switch, the dimensions shall be no greater than 12” wide X 6” deep X 4” high. The unit shall be constructed of either aluminum or stainless steel.

### **3.0 Testing.**

**3.1** Each controller and cabinet assembly shall be tested as a complete entity under signal load in accordance with Missouri Standard Specifications Section 902 for a minimum of 30 days after installation.

**3.2** Each assembly shall be delivered with a signed document detailing the cabinet final tests performed. The cabinet shall be assembled and tested by the controller manufacturer or authorized local distributor to ensure proper component integration and operation.

### **4.0 Warranty and Training.**

**4.1** If a Controller and/or Malfunction Management Unit are ordered with a cabinet assembly, the Controller and Malfunction Management Unit shall be warranted by the manufacturer against mechanical and electrical defects for a period of 2 years from date of shipment. The manufacturer’s warranty shall be supplied in writing with each cabinet and controller. Second party extended warranties are not acceptable.

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**4.2** The cabinet assembly and all other components shall be warranted for a period of one year from date of shipment. Any defects shall be corrected by the manufacturer or supplier at no cost to the owner.

**4.3** MoDOT may require training on the maintenance and operation of NEMA TS2 cabinet assemblies. Maintenance and operation personnel shall be trained on troubleshooting, maintenance and repair of cabinets and all serviceable equipment. Training shall include field level troubleshooting and bench repair. This training shall be for a minimum of sixteen hours over two days. Training shall be conducted at a time and location mutually agreeable by the contractor and the signal shop traffic supervisor or as directed by MoDOT.

**5.0 Method of Measurement.** Method of measurement shall conform to Sections 902 and 1092 of the Standard Specifications.

**6.0 Basis of Payment.** Payment included with cost of pay item 902-42.83 (Controller Assembly Housing, NEMA TS2 Controller) paid per each. Payment will be considered full compensation for all labor, equipment and material to complete the described work as shown on the plans. No additional payment will be made to provide conformance.

T-P. Audible Pedestrian Pushbuttons and Signing

**1.0 Description.** Audible pedestrian pushbuttons and signing will be required for all pedestrian indications at all the intersections.

**2.0 Installation.** Audible signals should be installed as part of a pushbutton assembly.

**3.0 Equipment.**

**3.1 Walk Indications.** Accessible pedestrian signals shall have both audible and vibrotactile walk indications.

**3.2 Vibrotactile.** Vibrotactile walk indications shall be provided by a tactile arrow on the pushbutton that vibrates during the walk interval. Tactile arrow shall be located on the pushbutton that vibrates during the walk interval. Tactile arrow shall be located on the pushbutton, have high visual contrast (light on dark or dark on light), and shall be aligned parallel to the direction of travel on the associated crosswalk.

**3.3 Audible.** Accessible pedestrian signals shall have an audible walk indication during the walk interval only. The audible walk indication shall be audible from the beginning of the associated crosswalk.

**3.4 Pushbutton signage.** In addition to standard pedestrian sign requirements, all pushbuttons for the locations mentioned in 1.0 shall have additional signage to indicate crosswalk direction by use of a tactile arrow and the name of the street containing the crosswalk served by the audible pedestrian signal. The sign shall be located immediately above the push button mechanism and parallel to the crosswalk controlled by the button. The street name shall be the name of the street or reasonable abbreviation whose crosswalk is controlled by the push button. Signage shall comply with ADA Accessibility Guidelines (ADAAG) 703.2 specifications for Braille and raised print.

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**3.4.1 Arrow.** Signs shall include a tactile arrow aligned parallel to the crosswalk direction. The arrow shall be raised 0.8 mm (.03 inch) minimum and shall be 4 mm (1.5 in) minimum in length. The arrowhead shall be open at 45 degrees to the shaft and shall be 33 percent of the length of the shaft. Stroke width shall be 10 percent minimum and 15 percent maximum of arrow length. The arrow shall contrast with the background.

**3.4.2 Street Name.** Accessible pedestrian signals (APS) shall include street name information aligned parallel to the crosswalk direction and shall comply with Revised Draft Guidelines for Accessible Public Rights-of-Way R409.3 or shall provide street name information in audible format.

#### **4.0 Performance.**

**4.1 Audible Locator Tone.** Locator tone that tells the pedestrian that the intersection is equipped with APS and where it is. Pushbutton locator tones shall have duration of 0.15 seconds or less, and shall repeat at 1-second intervals. Pushbutton locator tones shall be intensity responsive to ambient sound, and be audible 6 to 12 feet from the pushbutton, or to the building line. The locator tone shall operate during the DON'T WALK and flashing DON'T WALK intervals only and shall be deactivated when the pedestrian signal is not operative.

**4.2 Verbal Wait Message.** Acknowledge tone that tells the pedestrian that they have placed a call and informational message that tells the pedestrian to "Wait to cross" street name at intersecting street name.

**4.3 Verbal Walk Message.** The verbal messages shall provide a clear message that the walk interval is in effect, as well as to which crossing it applies. If available, the audio tone feature will not be used. The verbal message that is provided at regular intervals throughout the timing of the walk interval shall be the term "walk sign," which will be followed by the name of the street to be crossed.

**4.4 Volume.** Automatic volume adjustment in response to ambient traffic sound level will be provided up to a maximum volume of 100 dB. The units shall be responsive to ambient noise level changes up to no more than 5 dB louder than ambient sound. Tone or voice volume measured at 36 inches from the unit shall be 2dB minimum and 5dB maximum above ambient noise level. At installation, signal system is to be adjusted to be audible at no more than 5 to 12 feet from the system.

#### **5.0 Documentation and Support.**

**5.1 Operation and Maintenance Manuals.** Two copies of the operation and maintenance manuals for each station shall be included.

**5.2 USB with Audible Messages.** The Contractor shall provide two copies of USB data card to the Engineer that contains files for the manufacturer's audible messages for complete operation of all APS signals at all stations.

**6.0 Construction Requirements.** Construction requirements shall conform to Sec 902, 1061, and 1092.

**7.0 Method of Measurement.** Method of measurement shall conform to Sec 902.

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**8.0 Payment.** Payment for the audible signals will be for each unit per bid item, 902-99.02, “Audible Pedestrian Pushbutton and Signing”, per each. This will include all wiring, power adaptors, and installation hardware needed. Payment for signing will be included in the pay item for audible pedestrian pushbutton.

T-Q. St. Louis County Owned Signals

**1.0 Description.** St. Louis County (County) owns the traffic signals located at the intersection of Route 100 (Manchester Rd.) and Brentwood Blvd. Loop detectors for those signals are located in the intersection approach pavement to be milled. In addition, the project requires the contractor to remove existing and install new pedestrian pushbuttons at this intersection; at a pedestrian accessible location per the project plans.

**2.0 Construction Requirements.**

**2.1 Loop Detectors.** Existing loop detectors shall be disconnected before milling near the detection area. Replacement loop detectors shall be as shown in the plans and meet St. Louis County standards. The contractor shall let the engineer know two weeks prior to milling each ramp to allow time for coordination with the County. Replacement loop detectors shall be installed within 5 calendar days of the removal of the existing detectors. If the detection is not installed and operational within 5 days, liquidated damages of \$1000 per day will be assessed for each day the detection is not fully operational.

**2.2 Pedestrian Pushbuttons.** The contractor shall exercise care in removing existing and installing new pushbuttons. Should any new or existing pushbuttons be rendered inactive due to the contractor’s negligence, they shall be replaced at the contractor’s expense. The contractor shall be responsible for securing any permit which may be needed from County. The contractor shall also coordinate this work, along with returning any existing pedestrian signal equipment as directed by the County, with the below contact at least two weeks before commencing any work on the County’s signal facilities.

**2.3 Contact.** The contractor shall reach out to the following contact to coordinate all work on St. Louis County’s signal facilities at least two weeks prior to commencing any work. The contractor shall also notify the engineer when making contact with the County.

Scott Halter  
St. Louis County Dept. of Transportation  
Traffic Signals  
314-615-0202

**3.0 Basis of Payment.** Payment for removal and installation of in-pavement loop detectors and pedestrian signals will be made with the standard pay items included in the contract. No direct pay will be made for compliance with this provision.

T-R. Traffic Signal Enhancements at Hanley Road – Job J6S1718B Only

**1.0 Description.** The traffic signal replacement at the intersection of Route 100 (Manchester Road) and Hanley Road includes certain aesthetic signal enhancements that are to be

constructed at the locations identified in the contract plans. These enhancements shall be added in accordance with MoDOT Standards.

**2.0 Construction Requirements.** All materials and work performed for this item shall be in accordance with Sec 902 (MoDOT) for the enhancements. St. Louis County Specification Section 904 shall apply to all underlying signal materials that are to receive the enhancements.

**3.0 Method of Measurement.** Measurement will be made in accordance with Sec 902.

**4.0 Basis of Payment.** Payment for the accepted quantities for the traffic signal enhancements at Hanley Road will be made in accordance with the contract unit bid prices for the items listed below and includes all labor, equipment, materials, and time required to comply with this provision.

Item No.	Unit	Description
902-99.02	Each	Illuminated Street Name Sign
902-99.02	Each	Black Powder Coated Mast Arm & Signal Post
902-99.02	Each	Black Powder Coated Pedestrian Post

T-S. Powder Coating JSP-04-06

**1.0 Scope.** This specification covers a powder coating finish for metallic components.

**2.0 Basis of Acceptance.** Basis of acceptance of the powder coated components will be based on a manufacturer's certification, including certified test results for all performance requirements, submitted by the contractor and upon results of any tests performed by the engineer. The contractor shall repair any areas damaged during the testing process by a written method of repair recommended by the powder coating manufacturer. All repairs shall be subject to the engineer's approval.

**3.0 Material.**

**3.1 Color.** The finished powder coating shall be in the color specified in the contract.

**3.2 Powder Coating Type.** The powder coating shall be a urethane or triglycidyl isocyanate (TGIC) polyester resin type.

**3.3 Galvanizing.** When galvanizing is specified, all surfaces of the component shall be galvanized prior to powder coating in accordance with ASTM A 123. Components shall not be water or chromate quenched prior to powder coating.

**3.3.1 Testing of Galvanizing.** The procedure for determining the mass of coating shall be in accordance with ASTM A 90. This method shall be used in cases where the area of the test specimen can be accurately tested. On specimens shaped so that the area cannot be calculated, the mass of coating shall be determined with a magnetic gauge in accordance with ASTM E 376. The powder coating shall be removed by solvent removal or other any other method that does not affect the zinc coating.

**4.0 Workmanship.**

**4.1 Fabrication.** After fabrication of the component, all welds, bolted connections, holes, cut

ends, etc. shall be free of slag, burrs or other imperfections that would affect the overall appearance or performance of the finished product.

**4.2 Finish of Galvanized Components.** When galvanizing is required prior to powder coating, all galvanized surfaces shall be in accordance with the Finish and Appearance requirements of ASTM A 123 prior to application of the powder coating. Prior to powder coating, all surfaces shall be free of uncoated areas, blisters, flux deposits, gross cross inclusions, lumps, globules, runs, drips and sags. Zinc high spots, such as metal drip line, and other rough areas shall be removed by cleaning with hand or power tools as described in SSPC Surface Preparation Specification 2 or 3. The zinc shall be removed until the zinc is level with the surrounding area, taking care that the base coating is not removed by the cleaning methods. The final galvanized surface shall be an applicable substrate to ensure proper adhesion of the powder coating. After removal of high spots and other rough areas, the coated surface shall be inspected to verify the required zinc coating thickness is in accordance with ASTM A 123 utilizing a magnetic field type thickness instrument in accordance with ASTM E 376. Any component that does not comply with the zinc coating thickness requirement before or after removal of high spots or rough areas shall be repaired in accordance with ASTM A 780.

**4.3 Finish of Powder Coating.** The powder coated surface shall be smooth, free of thin spots, pinholes, blemishes, and other coating imperfections.

**5.0 Powder Coating Application.** The powder coating shall be applied in accordance with all requirements of the supplier of the powder coating material. When powder coating is to be applied over galvanized surfaces, the powder coating application shall also be in accordance with the requirements supplied by the galvanizer. This shall include storage and pre-treatment of the component prior to application of the powder coating. If there is a conflict in application method between the powder coating supplier and the galvanizer, the powder coater shall resolve the conflict prior to application of any powder coating.

**6.0 Performance Requirements.** The finished components shall be delivered to the project site with no damage to the powder coating. The contractor shall repair any damaged areas in accordance with the requirements of the powder coating manufacturer at the engineer's discretion. Damage to the powder coating may be cause for rejection. The powder coating of the finished components shall be in accordance with the following requirements:

Item	Test Method	Requirement
Salt Spray Corrosion, 500 hrs, single scribe	ASTM B 117	Creepage shall not exceed ¼" in either direction from scribe
Cross Hatch Adhesion, min	ASTM D 3359	5A and 5B
Pencil Hardness, Gouge, min	ASTM D 3363	F
Pencil Hardness, Scratch, min	ASTM D 3363	F
Coating Thickness, mils, min <sup>a</sup>	ASTM E 376	3.0
Gloss, 60°, min	ASTM D 523	20
Chemical Resistance <sup>b</sup>	ASTM D 1308	Coating shall show only a slight circular mark

<sup>a</sup> For components with an underlying non-magnetic coating over steel, the powder coating thickness will be the difference in thickness measurements with and without the powder coating.

<sup>b</sup> The open spot test shall be performed with 5 drops 95% toluene/5% MEK for 30 s.

T-T. Illuminated Street Signs

**1.0 Description.** This work shall cover all labor and materials necessary to furnish and install illuminated street signs, of the type specified at locations shown on the Construction Plans.

**2.0 Material.** All materials shall be in accordance with Section 903 and Division 1000, Material Details on the 2017 edition of the Standard Specifications for Highway Construction, unless specifically stated otherwise herein.

**2.1 Mechanical Specifications.** The outer dimensions of the illuminated sign assembly shall be as specified in the details of the Construction Plans.

**2.1.1** The maximum exterior finish thickness of the sign shall be 5.625 inches.

**2.1.2** The long edges of the sign shall be made from a single section of 6000 series aluminum extrusion. The end caps shall be made from a single section of aluminum and shall be affixed to the frame with stainless steel screws. The power supply shall be mounted internally in one of the end caps. The non-electrical end cap shall be removable to enable replacing panels and components.

**2.1.3** The sign shall have a front panel that is UV, weather, abrasion, and impact resistant. The front panel shall be replaceable so that maintaining agencies have the option to supply their own sheeting and film for the sign faces.

**2.2 Exterior Finish.** All exterior surfaces of the sign assembly shall be powder-coated black paint in accordance with Military Standard MIL-C24712. Finish will meet the requirements of ASTM D3359, ASTM D3363, and ASTM D552.

**2.2.1** The sign enclosure shall have a weatherproof design that ensures water does not reach internal components.

Illuminated Street Name Signs shall be one-faced signs with a white background with black letters.

**2.3 Mounting System (Rigid Back Brace Mounting).** Each sign shall be supplied with the rigid back brace mounting brackets on two positions on the back of the sign. The rigid back brace mounting brackets will be powder-coated black paint to an exact match of the sign extrusions, and shall be in accordance with Military Standard MIL-C-24712. The finish will meet the requirements of ASTM D3359, ASTM D3363, and ASTM D552. The rigid back brace mounting brackets used to affix the sign to the mast arm pole shall not extend more than 3/16" (inch) above the top horizontal surface, and the opposite end of that same bracket shall not extend more than 3/16" (inch) below the bottom horizontal surface of the sign, as viewed from the front.

**2.4 Environmental Specifications.** The sign shall be designed and constructed to withstand 241 Km/h (150 mph) wind loads in conformance with the requirements of the AASHTO publication, "Standard Specifications for Structural Supports of Highway Signs, Luminaires and Traffic Signals, 4<sup>th</sup> Edition 2001.

**2.4.1** The sign and power supply shall be able to withstand and operate at temperature

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extremes of -22 degrees F to +140 degrees F.

**2.4.2** A representative sample of the product shall be tested in accordance with the Standards for Electric Signs (UL 48).

**2.5 Luminance.** The entire surface of the sign panel must be evenly illuminated with a minimum average brightness reading at the letters of 780 lux and a variation of no more than 15% for any reading from the average (minimum of 50 readings). Each background reading measured must not vary by more than 10% (minimum of 50 readings) from the average of the background brightness readings. The light transmission factor of the sign panel must provide a letter to background ratio of a minimum of 4:1.

**2.6 Light Source.** The light source for the sign shall be LEDs (light emitting diodes). LEDs shall be mounted along both the top and bottom edges of the sign. The LEDs shall evenly illuminate a light panel that is the same dimensions of the sign face. The LEDs shall have a minimum rated lumen maintenance of 70% at 60,000 hours.

**2.7 Quality Assurance.** The light manufacturer must be ISO 9002:2000 compliant.

**2.8 Electrical Standards.** The sign shall be listed and approved to UL 48 Standards by a Nationally Recognized Testing Laboratory. The outside of the sign shall be marked with a certification mark for Electric Signs UL 48.

**2.9 Wiring.** Wiring for the power supply to the LED sign shall be 2 Conductors and 1 Bare Neutral 8 AWG wire (MoDOT Pay Item No. 901-99.03) shall be in accordance with Sec 902 and 1000. No direct payment for wiring in this section will be made.

**3.0 Construction Methods.** Illuminated Street Name Signs, of the typed specified, shall be installed according to the manufacturer's specifications.

T-U. St. Louis County Traffic Signals General Information for Brentwood Blvd. Signal

**1.0 Description.** The traffic signal at Route 100 and Brentwood will be owned, operated, and maintained by St. Louis County. Items shown below are to be built to St. Louis County standards and specifications. Section 904 of the St. Louis County Standard is attached at the end of these traffic signal special provisions. The following JSPs may be worded to modify these specifications.

**2.0 Basis of Payment:** Below is a table that list the MoDOT Pay Item and the corresponding St. Louis County Pay Item:

MoDOT Pay Item in Bid Book	St. Louis County Item Number	Description
9029902	904-28.10	MISC. Post, Signal, w/Sq. Pedestal Base and Post Cap, 10' Total Height, Aluminum
9029902	904-49.22	MISC. Detector, Pedestrian Push Button, APS, Freezeproof
9029903	904-85.05	MISC. Cable, Detector Loop, #14 Gauge, 1 Conductor, w/Tube Jacket (In Conduit and Pull Boxes)

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9029903	904-85.06	MISC. Cable, Detector Loop, #14 Gauge, 1 Conductor, w/Tube Jacket (In Sawed Slot)
9029902	904-89.17	MISC. Preformed Pull Box (17"W x 30"L x 26"min.H), Reinforced Polymer Concrete
9029907	904-91.73	MISC. Base, Type C-3, Concrete

T-V. As-Built Drawings for Traffic Signal and Pedestrian Signal Installations and Modifications (STLCDOT) for Brentwood Blvd. Signal

For all new traffic signal and pedestrian signal installations, and modifications to existing installations (including, but not limited to, underground conduit, wiring, pull boxes, concrete bases, signal heads, detectors, posts, poles, and mast arms; including relocation and/or removal), Contractor shall provide As-Built Drawings for each and every location, as defined below.

As-built drawings shall reflect all changes made in the specifications and working drawings during the construction process, and show the exact dimensions, geometry, and location of all elements of the signal work completed under the contract.

- A. Prepare and maintain one (1) set of as-built drawings using an unaltered set of original project plans, to show all as-constructed information, including:
  - 1) Any plan clarifications or Change Order changes.
  - 2) Locations of any new underground installations.
  - 3) Location, size, and type, of products or components used/constructed in the work.
  
- B. Neatly prepare as-built drawings as follows:
  - 1) Place markings on the project record drawings using red ink or red pencil.
  - 2) Do not eradicate or write over original figures.
  - 3) Line out superseded material.
  - 4) Submit additional drawings if the required information cannot be clearly shown on the original set of project plans. The additional drawings must be at least 11 by 17 inches and at most 24 by 36 inches.
  - 5) Sign and date each sheet verifying that all as-built information shown on the drawings is correct.
  
- C. Review the as-built drawings with the Engineer during the progress of the work to assure that all changes and other required information are being recorded.
  
- D. Upon completion of the work, Contractor shall submit as-built drawings to the Engineer for review to determine completeness and adequacy of the drawings. If the as-built drawings are unacceptable, Contractor must inspect, measure, and survey the work as necessary to record the required additional information.

**Basis of Payment**

No direct payment will be made for compliance with this specification.

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T-W. Warranties and Guarantees (STLCDOT) for Brentwood Blvd. Signal

Section 904.10 Guarantee of the St. Louis County *Standard Specifications for Road and Bridge Construction* shall be removed and replaced with the following:

- 1) All electrical equipment and related components shall be warranted by the manufacturer to be free from defects in workmanship and material for at least one (1) year from the date of project acceptance. Any components found to be defective during the warranty period shall be replaced free of charge. All warranties provided shall be transferred to St. Louis County upon project acceptance.
- 2) The Contractor shall guarantee satisfactory in-service operation of all Contractor supplied and installed electrical equipment and related components for a period of six (6) months from the date of final acceptance of the entire project.
  - a) Upon notice from the Engineer of unsatisfactory in-service operation of Contractor supplied and installed electrical equipment and/or related components, the Contractor shall immediately begin the correction, repair or replacement process. This notice from the Engineer may be given anytime within the guarantee period specified in Section 904.10(1). The Contractor shall be responsible for having the defective work, materials or equipment corrected, repaired or replaced within three (3) working days after notification by the Engineer. Unless otherwise approved by the Engineer, if defective materials or equipment cannot be repaired or replaced within this time, the Contractor shall make arrangements for their temporary replacement with similar materials or equipment. In any event, if in the opinion of the Director and at his sole discretion, immediate repairs and/or adjustments are determined to be necessary to provide for the safe and efficient movement of traffic, and the Contractor is not capable of making such repairs and/or adjustments to the satisfaction of the Director; the Director will order County personnel or other qualified Engineers or technicians to make immediate repairs and/or adjustments. The Contractor will be charged the entire cost of the work performed by County or other qualified personnel (if paid by the County). The Contractor will be charged for all labor (including benefits and indirect overhead), materials, and equipment furnished by the County in making immediate repairs and/or adjustments. There will be a three (3) hour minimum call-up time for overtime. The work performed by County or other qualified personnel will in no way jeopardize any part of this guarantee.

T-X. Contractor Verification of Signal Base Locations

**1.0 Description.** The Contractor shall field verify that the proposed traffic signal base locations will not need to be shifted to avoid utilities prior to ordering the traffic signal equipment. The Contractor shall be proactive in the discovery of potential utility conflicts. The Contractor shall directly contact the utility companies to verify the location of facilities, and coordinate with the utility company and the Engineer to determine if a conflict will be encountered due to the work proposed in the contract. If a conflict is anticipated, the Contractor shall perform test holes to field verify no conflicts exist with proposed traffic signal base locations.

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If a conflict is determined, the Contractor shall shift the signal base location, as approved by the Engineer. The Contractor shall coordinate construction activities with the utilities, and take measures to ensure the integrity of the existing facilities are not disturbed during construction.

The contractor will be compensated for the additional mast arm length if required. The Contractor shall not order materials until measurements are field verified.

**2.0 Basis of payment.** No direct payment will be made to the contractor to recover the cost of equipment, labor, materials, incidentals, or time required to fulfill the above provisions, unless specified elsewhere in the contract document.

T-Y. St. Louis County Traffic Signals General Information for Signal at Hanley Road

**1.0 Description.** The traffic signal at Route 100 and Hanley will be owned, operated, and maintained by St. Louis County. Items shown below are to be built to St. Louis County standards and specifications for the signal at Hanley Road. Section 904 of the St. Louis County Standard is attached at the end of these traffic signal special provisions. The following JSPs may be worded to modify these specifications.

**2.0 Basis of Payment:** Below is a table that list the MoDOT Pay Item and the corresponding St. Louis County Pay Item:

MoDOT Pay Item in Bid Book	St. Louis County Item Number	Unit	Description
902-99.02	904-02.14	Each	Signal Head, Type 4S
902-99.02	904-02.34	Each	Signal Head, Type 34S
902-99.02	904-05.43	Each	Signal Head, Type 3B, Terminal Compartment, and Astro Bracket Mounting
902-99.02	904-05.44	Each	Signal Head, Type 4B, Terminal Compartment, and Astro Bracket Mounting
902-99.02	904-24.01	Each	Signal Head, Type 1S, Pedestrian
902-99.02	904-28.10	Each	Post, Signal, w/Sq. Pedestal Base and Post Cap, 10' Total Height, Aluminum
902-99.02	904-32.38	Each	19' Pole, w/38' Mast Arm, Steel
902-99.02	904-32.44	Each	19' Pole, w/44' Mast Arm, Steel
902-99.02	904-49.22	Each	Detector, Pedestrian Push Button, APS, Freezeproof
902-99.01	904-49.80	Lump Sum	Relocate Video Detection System
902-99.03	904-54.00	LF	Conduit, 4"
902-99.02	904-74.99	Each	Conduit Repair (Locate broken conduit, excavate, remove existing cable, repair/replace conduit, reinstall cable, backfill and restore) (Does not include sidewalk or pavement removal and replacement.)
902-99.03	904-82.06	LF	Cable, Power, #6 Gauge, 1 Conductor
902-99.03	904-83.05	LF	Cable, Signal, #14 Gauge, 5 Conductor

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902-99.03	904-83.07	LF	Cable, Signal, #14 Gauge, 7 Conductor
902-99.03	904-84.00	LF	Wire, Stranded Ground, #6 Gauge
902-99.03	904-85.18	LF	Cable, Push Button and/or Detector Loop Lead-In, #18 Gauge, 2 Conductor (Shielded)
902-99.03	904-85.34	LF	Cable, Communication, #18 Gauge, 4 Conductor (APS)
902-99.03	904-85.85	LF	Cable, Power, Video Detection Camera
902-99.02	904-88.01	Each	Pull Box, Single, Concrete
902-99.02	904-88.02	Each	Pull Box, Double, Concrete
902-99.02	904-91.59	Each	Base, Type B-9, Concrete
902-99.02	904-91.73	Each	Base, Type C-3, Concrete
902-99.02	904-91.88	Each	Base, Type D-8PH, Concrete

T-Z. St. Louis County Signal Job Special Provisions Information

**1.0 Description.** St. Louis County Job Special Provisions have been provided as an attachment to these JSPs as “Additional Information - St. Louis County Dept. of Transportation Job Special Provisions for Traffic Signal Construction” for signal work at the Route 100 (Manchester Road) intersections at Hanley Road and at Brentwood Boulevard. Items and materials provided for these intersections shall be in accordance with St. Louis County Standards and Specifications as noted in these specifications. However, MoDOT Standards and Specifications defined in Division 100, General Conditions of the Contract, shall supersede any St. Louis County Standards and Specifications whenever in conflict, most specifically with respect to Scope of Work (Sec 104), Control of Work (Sec 105), and Prosecution and Progress (Sec 108). Since MoDOT will be administering the contract for this project, MoDOT’s engineer shall be responsible for providing guidance to the contractor relating to any conflict between these two sets of Standards and Specifications.

**2.0 Basis of Payment:** No direct payment will be made to the contractor to recover the cost of equipment, labor, materials, incidentals, or time required to fulfill the above provisions, unless specified elsewhere in the contract document.

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(DRAINAGE)

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 <p>STATE OF MISSOURI  <b>TRICIA  M. BOHLER</b>  NUMBER  <b>PE-2000149999</b>  PROFESSIONAL ENGINEER</p> <p>THIS SHEET HAS BEEN  SIGNED, SEALED AND DATED  ELECTRONICALLY.</p>	<b>MISSOURI HIGHWAYS AND  TRANSPORTATION COMMISSION</b> 105 W. CAPITOL AVE. JEFFERSON CITY, MO 65102 Phone 1-888-275-6636
	<b>CIVIL DESIGN, INC.</b> 5220 Oakland Avenue St. Louis, MO 63110 Certificate of Authority: 006804 Consultant Phone: 314-863-5570
	If a seal is present on this sheet, JSP's have been electronically sealed and dated.
	JOB NUMBER: J6S1718, J6S1718B, and J6S1718C ST. LOUIS COUNTY, MO DATE PREPARED: 03/01/2021
	ADDENDUM DATE:
Only the following items of the Job Special Provisions (Drainage) are authenticated by this seal: D-A. thru D-L.	

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JOB  
SPECIAL PROVISION  
(DRAINAGE)

D-A. Adjusting Manholes, Inlets, Valves and Pull Boxes

**1.0 Height Adjustment.** Regardless of type or size, the manholes, inlets, valves and pull boxes shown in the plans require adjustment to match the new grade of pavement. The existing manholes shall be adjusted and installed according to standard plan 731.00U. Adjusting rings shall not exceed 12 inches in height.

**2.0 Concrete Collars.** Damaged concrete collars on manholes shall be replaced as directed by the engineer. The replacement concrete collars shall be 4 inches deep and 18 inches wide around the manhole.

**3.0** The contractor is advised that the Metropolitan St. Louis Sewer District, MoDOT, St Louis City -Water Division, and St. Louis City Traffic/Lighting Division have manholes, valves and/or and pull boxes located within the project limits that will require adjustments. The Contractor shall adjust these facilities to grade as necessary. The Contractor shall contact the respective utility regarding any questions regarding the adjustment of these facilities.

**3.1** The contractor shall notify the engineer if manholes, valves or pull boxes belonging to utilities other than those listed above are encountered that will require adjustment. The contractor shall coordinate work with the affected utility to ensure that the completed facilities meet ADA requirements.

**4.0 Basis of Payment.** All costs associated with compliance with this special provision for all material, equipment, and labor shall be completely covered by the contract unit price for:

<u>Item Number</u>	<u>Type</u>	<u>Description</u>
604-20.20	Each	Adjusting Basin or Inlet

**5.0** Pull boxes not owned by MoDOT or the municipality or specified as required work by the Contractor may require adjustment due to work in the contract. The Contractor shall contact the respective utility owners regarding any questions about the adjustment of these facilities. The Contractor shall contact the respective utility owner, at least 3 weeks prior to adjustment of these facilities to allow the utility owner to make necessary adjustments. The Contractor shall coordinate with the respective utility owners for scheduling and providing the necessary grade requirements for each adjustment.

Contractor shall directly contact Utility companies to verify location of facilities and status of relocation/adjustment work. The contractor shall coordinate construction activities with Utility Companies and take measures to ensure the integrity of the existing facilities are not disturbed until such time as the Utility Companies have completed the adjustment work.

The Commission cannot warrant the information above which was provided by the utility owners.

D-B. MSD As-Built Submittals (18MSD-00549)

**1.0 Description.** Metropolitan St. Louis Sewer District (MSD) requires as-built drawings of the constructed drainage facilities to be submitted for their records. The contractor shall perform all work necessary to produce and submit the final as-built drainage plans to MSD, per MSD’s as-built submittal requirements. The contractor shall submit the MSD as-builts for 18MSD-00549 and subsequent revisions after all drainage structures related to the project have been constructed or adjusted.

**1.1** The contractor shall provide a copy of the as-built drainage plans to the MoDOT engineer at the time of the MSD submittal.

**2.0 Basis of Payment.** No direct payment will be made for this item and shall be considered incidental to the following:

<u>Item Number</u>	<u>Type</u>	<u>Description</u>
627-40.00	Lump Sum	Contractor Furnished Surveying and Staking

D-C. Culvert Clean Out

**1.0 Description.** This work shall consist of removal of debris and silt from existing inlets, and manholes and the connecting inlet and outlet pipe at locations designated on the plans as “**culvert cleanout**”, or by the Engineer.

**2.0 Construction Requirements.** The designated inlet/manhole and inlet/outlet pipe shall be cleaned by a method and process approved by the Engineer. All debris and silt shall be removed from drainage structures to clean out of the outlet pipe. Removed material shall be properly disposed of by the contractor off the right of way. The entire outlet pipe from the inlet or manhole, to the next drainage structure downstream shall be cleaned out. Upon completion of the cleanout, the drainage structure and pipes shall be thoroughly flushed with water.

**3.0 Method of Measurement.** Measurement for Culvert Cleanout will be made per each.

**4.0 Basis of Payment.** The accepted quantity of culvert cleanout will be paid for at the contract unit price for:

<u>Item Number</u>	<u>Type</u>	<u>Description</u>
206-35.00	Each	Culvert Cleanout

Payment will be considered full compensation for all labor, equipment, and material necessary to clean out the designated culverts and drop inlets and manholes.

D-D. MSD Drainage Structures

**1.0 Description.** Metropolitan St. Louis Sewer District (MSD) standard drainage structures will be used on this project at the locations specified on the plans. Contractor shall follow the Metropolitan St. Louis Sewer District Standard Specifications for Sewers and Drainage Facilities (2009 edition) for standard details.

**2.0 Basis of Measurement.** Measurement will be made for each structure for the vertical distance between the elevation of the top structure and the elevation of the flowline at the structure base and will include all necessary assemblies associated with that structure, such as adapter rings, joints, connectors, grade adjustment rings, waterproofing required to adhere to MSD standards for storm drainage structures.

**MSD PCC 42” Short Top Manhole**

**MSD PCC 48” Manhole** includes 1-standard MSD Frame and Cover

**MSD PCC 48” Manhole with Locking Cover** includes 1-standard MSD Frame and Cover, and Locks

**MSD PCC 60” Manhole** includes 1-standard MSD Frame and Cover

**MSD PCC 60” Manhole with Locking Cover** includes 1-standard MSD Frame and Locking Cover, and Locks

**MSD PCC 72” Manhole** includes 1-standard MSD Frame and Cover

**MSD PCC 72” Manhole with Locking Cover** includes 1-standard MSD Frame and Locking Cover, and Locks

**MSD PCC Area Inlet** includes 1-standard MSD base, 4 Way Concrete Unit, Inlet stone and Cover

**MSD PCC Single Street Inlet – 48” Base** includes 1-MSD standard 48” base, single curb inlet unit, Inlet Stone and Cover

**MSD PCC Single Street Inlet – 60” Base** includes 1-MSD standard 60” base, single curb inlet unit, Inlet Stone and Cover

**MSD PCC Double Street Inlet** includes 1- MSD standard double inlet base, PCC Unit “B” and 2- inlet stone and cover.

**MSD PCC Double Trapped Street Inlet** includes 1-MSD standard double inlet trapped base, PCC Unit “B” and 2- inlet stone and cover.

**MSD PCC 2 Grate Inlet – 48” Base** includes 1- MSD standard 48” base, 2 Grate Inlet Seat, and Grates

**MSD PCC 2 Grate Inlet with Side Intake – 48” Base** includes 1- MSD standard 48” base, 2 Grate Inlet seat & cast iron side intake

**MSD PCC 2 Grate Inlet with Side Intake – 60” Base** includes 1- MSD standard 60” base, 2 Grate Inlet seat & cast iron side intake

**MSMSD PCC Trapped 2 Grate Inlet with Side Intake** includes 1-MSD standard trapped base, 2 grate inlet seat & cast iron side intake.

**3.0 Basis of Payment.** Payment for work associated with these drainage structures will include the entire cost for all assemblies necessary to furnish and install the entire structure, including all materials, equipment, labor and work will be made under the bid items for MSD drainage structures included in the contract.

The accepted quantity for drainage structures will be paid for at the contract unit price for:

<u>Item Number</u>	<u>Type</u>	<u>Description</u>
731-99.03	Pay Depth	MSD PCC 42” Short top Manhole
731-99.03	Pay Depth	MSD PCC 48” Manhole
731-99.03	Pay Depth	MSD PCC 48” Manhole with Locking Cover
731-99.03	Pay Depth	MSD PCC 60” Manhole
731-99.03	Pay Depth	MSD PCC 60” Manhole with Locking Cover
731-99.03	Pay Depth	MSD PCC 72” Manhole
731-99.03	Pay Depth	MSD PCC 72” Manhole with Locking Cover
731-99.03	Pay Depth	MSD PCC Area Inlet – 4 Sides

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731-99.03	Pay Depth	MSD PCC Area Inlet – 3 Sides
731-99.03	Pay Depth	MSD PCC Single Street Inlet – 48” Base
731-99.03	Pay Depth	MSD PCC Single Street Inlet – 60” Base
731-99.03	Pay Depth	MSD PCC Double Street Inlet
731-99.03	Pay Depth	MSD PCC Double Trapped Street Inlet
731-99.03	Pay Depth	MSD PCC 2 Grate Inlet – 48” Base
731-99.03	Pay Depth	MSD PCC Trapped 2 Grate Inlet – 48” Base
731-99.03	Pay Depth	MSD PCC 2 Grate Inlet – 48” Base
731-99.03	Pay Depth	MSD PCC 2 Grate Inlet with Side Intake – 48” Base
731-99.03	Pay Depth	MSD PCC 2 Grate Inlet with Side Intake – 60” Base
731-99.03	Pay Depth	MSD PCC 2Trapped 2 Grate Inlet with Side Intake – 48” Base

D-E. ADA Compliant Gate

**1.0 Description.** This work shall consist of providing an ADA Compliant Storm Gate in the locations shown on the plans.

**2.0 Construction Requirements.** The designated ADA compliant gate shall meet the Americans with Disabilities Act. The grate should not have slot openings greater than ½” in the direction of travel. Grates with elongated openings will be placed with long dimension perpendicular to the dominant direction of travel.

**3.0 Method of Measurement.** Measurement for ADA Compliant Gate will be made per each drainage structure specified in the plans.

**4.0 Basis of Payment.** The accepted ADA Compliant Gate will be paid for at the contract unit price for:

Payment will be considered full compensation for all labor, equipment, and material necessary to provide and place ADA Compliant Gate in the location specified on the plans.

<u>Item Number</u>	<u>Type</u>	<u>Description</u>
614-99.02	Each	ADA Compliant Gate

D-F. Class III RCP Pipe

**1.0 Description.** Class 3 RCP Pipe will be used on this project at the locations specified on the plans. Contractor shall follow the Metropolitan St. Louis Sewer District Standard Specifications for Sewers and Drainage Facilities (2009 edition) for standard details, material specifications, and construction requirements.

**2.0 Basis of Payment.** Payment for work associated with these drainage structures will include furnishing and installing Class 3 RCP Pipe, including all gaskets, joints, materials, equipment, labor and work will be made under the bid items for Class 3 RCP Pipe included in the contract.

The accepted quantity for drainage structures will be paid for at the contract unit price for:

<u>Item Number</u>	<u>Type</u>	<u>Description</u>
725-99.03	Linear Feet	15” Class III RCP Pipe

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725-99.03 Linear Feet 18" Class III RCP Pipe  
 725-99.03 Linear Feet 24" Class III RCP Pipe

D-G. MSD Standard Connection to Large Sewers

**1.0 Description.** Connecting structures to a large sewer will be required at the locations specified on the plans. Contractor shall follow the Metropolitan St. Louis Sewer District Standard Specifications for Sewers and Drainage Facilities (2009 edition) for Connection to Large Sewer standard details (Sheet 68 & 69), material specifications, and construction requirements.

**2.0 Basis of Payment.** Payment for work associated with Connection to Large Sewers will include all excavation, labor and material necessary to perform this task.

The accepted quantity will be paid for at the contract unit price for:

<u>Item Number</u>	<u>Type</u>	<u>Description</u>
726-99.02	EACH	MSD Standard Connection to Large Sewers

D-H. Replace EXISTING Manhole Cover with Locking Cover

**1.0 Description.** Replace Manhole Cover with Locking Cover will be required at the locations specified on the plans. Contractor shall follow the Metropolitan St. Louis Sewer District Standard Specifications for Sewers and Drainage Facilities (2009 edition) for Connection to Large Sewer standard details, material specifications, and construction requirements.

**2.0 Basis of Payment.** Payment for work associated with Replace Manhole Cover with Locking Cover will include all labor and material necessary to perform this task.

The accepted quantity will be paid for at the contract unit price for:

<u>Item Number</u>	<u>Type</u>	<u>Description</u>
731-99.02	EACH	Replace Manhole Cover with Locking Cover

D-I. 8" PVC

**1.0 Description.** Class 8" PVC Pipe will be used on this project at the locations specified on the plans. Contractor shall follow the Metropolitan St. Louis Sewer District Standard Specifications for Sewers and Drainage Facilities (2009 edition) for standard details, material specifications, and construction requirements.

**2.0 Basis of Payment.** Payment for work associated with these drainage structures will include furnishing and installing 8" PVC Pipe, including all gaskets, joints, materials, equipment, labor and work will be made under the bid items for 8" PVC Pipe included in the contract.

The accepted quantity will be paid for at the contract unit price for:

<u>Item Number</u>	<u>Type</u>	<u>Description</u>
725-99.03	Linear Feet	8" PVC Pipe

D-J. TBR&R Per MSD Inspector

**1.0 Description.** This project falls within the jurisdiction of the Metropolitan St. Louis Sewer District. The MSD inspector may choose to replace existing drainage structures based on condition. At this time there is no way to determine which structures will be identified by the inspector for replacement. Structures with the potential for removal and replacement are identified on the plans as “TBR&R Per MSD Inspector”.

If the MSD inspector requires existing structure replacement, the Contractor shall follow the Metropolitan St. Louis Sewer District Standard Specifications for Sewers and Drainage Facilities (2009 edition) for standard details, material specifications, and construction requirements.

**2.0 Basis of Payment.** Payment for work associated with TBR&R Per MSD Inspector will include furnishing and installing the designated drainage structure, all excavation, connection to existing or new pipe, including all gaskets, joints, materials, equipment, labor and work will be made under the bid items for TBR&R Per MSD Inspector included in the contract.

The accepted quantity will be paid for at the contract unit price for:

<u>Item Number</u>	<u>Type</u>	<u>Description</u>
731-99.02	EACH	TBR&R Per MSD Inspector

D-K. 8" Cleanout

**1.0 Description.** An 8" Cleanout will be used on this project at the location specified on the plans. Contractor shall follow detail provided in the plans.

**2.0 Basis of Payment.** Payment for work associated with this item will include furnishing and installing the 8" Cleanout, including backfill, material, labor and work will be made under the bid items for included in the contract.

The accepted quantity for drainage structures will be paid for at the contract unit price for:

<u>Item Number</u>	<u>Type</u>	<u>Description</u>
725-99.02	EACH	8" CLEANOUT

D-L. Replace Existing Drainage Structure Top

**1.0 Description.** Replacing existing inlet tops will be required at the locations specified on the plans. Contractor shall field verify existing structures to determine proper type and size prior to ordering. Contractor shall follow the Metropolitan St. Louis Sewer District Standard Specifications for Sewers and Drainage Facilities (2009 edition) Sewer standard details, material specifications, and construction requirements. If the existing structure is not an MSD standard, Missouri Department of Transportation Standard Plans will be used.

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**2.0 Basis of Payment.** Payment for work associated with Replace Existing Drainage Structure top will include all labor and material necessary to perform this task.

The accepted quantity for will be paid for at the contract unit price for:

<u>Item Number</u>	<u>Type</u>	<u>Description</u>
731-99.02	EACH	Replace Existing Inlet Top with Manhole Frame & Cover
731-99.02	EACH	Replace Existing Inlet Top with Manhole Frame & Locking Cover

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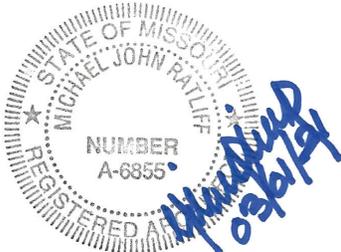
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	<b>PLANNING DESIGN STUDIO</b> P.O. Box 179279 St. Louis, MO 63117 Certificate of Authority: 001845 Consultant Phone: 314-241-3600
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	JOB NUMBER: J6S1718, J6S1718B, and J6S1718C ST. LOUIS COUNTY, MO DATE PREPARED: 03/01/2021
	ADDENDUM DATE:
Only the following items of the Job Special Provisions (Landscape Architecture) are authenticated by this seal: L-A. thru L-L.	

	<b>MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION</b> 105 W. CAPITOL AVE. JEFFERSON CITY, MO 65102 Phone 1-888-275-6636
	<b>ARCTURIS, INC.</b> 701 Market Street, Suite 1300 St. Louis, MO 63101 Certificate of Authority: 002742 Consultant Phone: 314-206-7100
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	JOB NUMBER: J6S1718, J6S1718B, and J6S1718C ST. LOUIS COUNTY, MO DATE PREPARED: 03/01/2021
	ADDENDUM DATE:
Only the following items of the Job Special Provisions (Landscape Architecture) are authenticated by this seal: L-M. thru L-U.	

Job No.: J6S1718 J6S1718B J6S1718C  
Route: 100 100 100  
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JOB  
SPECIAL PROVISION  
(LANDSCAPE ARCHITECTURE)

L-A. Aesthetic Requirements of Precast Concrete Modular Block Walls – Job J6S1718B Only

**1.0 Description.** This work shall consist of furnishing and constructing precast concrete modular block walls, with or without geosynthetic reinforcement, based on the following aesthetic and general requirements.

**1.1 Administrative Requirements.**

**1.1.1 Preconstruction Meeting.** As directed by the Owner, the Contractor shall schedule a preconstruction meeting at the project site prior to commencement of retaining wall construction. Participation in the preconstruction meeting shall be required of the Contractor, Retaining Wall Design Engineer, any sub-contractors performing work around the retaining walls, and the Resident Engineer. The Contractor shall provide notification to all parties at least 10 calendar days prior to the meeting.

**1.1.2 Preconstruction Meeting Agenda:**

**1.1.2.1** The Retaining Wall Design Engineer shall explain all aspects of the retaining wall construction drawings.

**1.1.2.2** The Retaining Wall Design Engineer shall explain the required bearing capacity of soil below the retaining wall structure and the shear strength of in-situ soils assumed in the retaining wall design to the Resident Engineer.

**1.1.2.3** The Retaining Wall Design Engineer shall explain the required shear strength of fill soil in the reinforced, retained and foundation zones of the retaining wall.

**1.1.2.4** The Retaining Wall Design Engineer shall explain any measures required for coordination of the installation of utilities or other obstructions in the reinforced or retained fill zones of the retaining wall.

**1.1.2.5** The Retaining Wall Installation Contractor shall explain all excavation needs, site access and material staging area requirements to the Contractor.

**1.2 Delivery, Storage and Handling.**

**1.2.1** The Retaining Wall Installation Contractor shall inspect the materials upon delivery to ensure that the proper type, grade and color of materials have been delivered.

**1.2.2** The Retaining Wall Installation Contractor shall store and handle all materials in accordance with the manufacturer's recommendations as specified herein and in a manner that prevents deterioration or damage due to moisture, temperature changes, contaminants, corrosion, breaking, chipping, UV exposure or other causes. Damaged materials shall not be incorporated into the work.

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**1.2.3** Precast modular blocks shall be stored in an area with positive drainage away from the blocks. Be careful to protect the block from mud and excessive chipping and breakage. Precast modular blocks shall not be stacked more than three (3) units high in the storage area.

## **2.0 Precast Modular Block Retaining Wall Units.**

**2.1** Each concrete block shall be cast in a single continuous pour without cold joints.

**2.2** Without field cutting or special modification, the precast modular block units shall be capable of achieving a minimum radius of 14 ft - 6 in (4.42 m).

**2.3** The precast modular block unit face texture shall be selected by the owner from the available range of textures available from the precast modular block manufacturer. Each textured block facing unit shall have a unique texture pattern that repeats with a maximum frequency of once in any 15 square feet (1.4 square meters) of wall face. Anticipated texture to be Ledgestone.

**2.4** The block color shall be selected by the owner from the available range of colors available from the precast modular block manufacturer. Anticipated color to be Rosemary.

**2.5** All precast modular block units shall be sound and free of cracks or other defects that would interfere with the proper installation of the unit, impair the strength or performance of the constructed wall. PMB units to be used in exposed wall construction shall not exhibit chips or cracks in the exposed face or faces of the unit that are not otherwise permitted. Chips smaller than 1.5" (38 mm) in its largest dimension and cracks not wider than 0.012" (0.3 mm) and not longer than 25% of the nominal height of the PMB unit shall be permitted. PMB units with bug holes in the exposed architectural face smaller than 0.75" (19 mm) in its largest dimension shall be permitted. Bug holes, water marks, and color variation on non-architectural faces are acceptable. PMB units that exhibit cracks that are continuous through any solid element of the PMB unit shall not be incorporated in the work regardless of the width or length of the crack.

## **3.0 Precast Modular Block Wall System Installation.**

**3.0.1** The precast modular block structure shall be constructed in accordance with the construction drawings, these specifications and the recommendations of the retaining wall system component manufacturers. Where conflicts exist between the manufacturer's recommendations and these specifications, these specifications shall prevail.

**3.0.2** Drainage components. Pipe, geotextile and drainage aggregate shall be installed as shown on the construction shop drawings.

### **3.0.3 Precast Modular Block Installation.**

**3.0.3.1** The first course of block units shall be placed with the front face edges tightly abutted together on the prepared leveling pad at the locations and elevations shown on the construction drawings. Contractor shall take special care to ensure that the bottom course of block units are in full contact with the leveling pad, are set level and true and are properly aligned according to the locations shown on the construction drawings.

**3.0.3.2** The elevation of retained soil fill shall not be less than 1 block course (18 inches (457 mm)) below the elevation of the reinforced backfill throughout the construction of the retaining wall.

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**3.0.3.3** If included as part of the precast modular block wall design, cap units shall be secured with an adhesive in accordance with the precast modular block manufacturer's recommendation.

### **3.1 Wall Infill and Reinforced Backfill Placement.**

**3.1.1** Compactive effort within 3 feet of the back of the precast modular blocks should be accomplished with walk-behind compactors. To avoid damage to the installed blocks, heavy equipment should not be operated within 3 feet of the back of the precast modular blocks.

**3.1.2** At the end of each work day, the Retaining Wall Installation Contractor shall grade the surface of the last lift of the granular wall infill to a  $3\% \pm 1\%$  slope away from the precast modular block wall face and compact it.

**3.1.3** The Contractor shall protect the precast modular block wall structure against surface water runoff at all times through the use of berms, diversion ditches, silt fence, or any other necessary measures to prevent soil staining of the wall face, scour of the retaining wall foundation or erosion of the reinforced backfill or wall infill.

### **3.2 Obstructions in the Infill and Reinforced Fill Zone.**

**3.2.1** The Retaining Wall Installation Contractor shall make all required allowances for obstructions behind and through the wall face in accordance with the approved construction shop drawings.

**3.2.2** Should unplanned obstructions become apparent for which the approved construction shop drawings do not account, the affected portion of the wall shall not be constructed until the Retaining Wall Design Engineer can appropriately address the required procedures for construction of the wall section in question.

### **3.3 Completion.**

**3.3.1** For walls supporting unpaved areas, a minimum of 12" (300 mm) of compacted, low-permeability fill shall be placed over the granular wall infill zone of the precast modular block retaining wall structure. The adjacent retained soil shall be graded to prevent ponding of water behind the completed retaining wall.

**3.3.2** For retaining walls with crest slopes of 5H:1V or steeper, silt fence shall be installed along the wall crest immediately following construction. The silt fence shall be located 3' to 4' (0.9 m to 1.2 m) behind the uppermost precast modular block unit. The crest slope above the wall shall be immediately seeded to establish vegetation. The Contractor shall ensure that the seeded slope receives adequate irrigation and erosion protection to support germination and growth.

## **L-B. Pedestrian Underpass Phenolic Panel System – Job J6S1718B Only**

**1.0 Description.** This section includes the exterior solid phenolic cladding panel system and accessories as required for a complete drained and back-ventilated system for the pedestrian underpass tunnel.

## **2.0 References.**

## **2.1 ASTM International (ASTM).**

**2.1.1** ASTM B 117 - Standard Practice for Operating Salt Spray (Fog) Apparatus.

**2.1.2** ASTM D 635 - Standard Test Method for Small Scale Burning.

**2.1.3** ASTM D 1929 - Standard Test Method for Ignition Temperature.

**2.0.1.4** ASTM D 2244 - Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates.

**2.1.5** ASTM D 2247 - Standard Practice for Testing Water Resistance of Coatings in 100% Relative Humidity.

**2.1.6** ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

**2.1.7** ASTM E 119 - Standard Test Method for Fire Rated or Fire Resistive Construction.

**2.1.8** ASTM E 330 - Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors Under the Influence of Wind Loads.

## **2.2 International Organization for Standardization (ISO).**

**2.2.1** ISO 105 A02-93 - Tests for Color Fastness -- Part A02: Grey scale for assessing change in color.

**2.2.2** ISO 178 - Determination of Flexural Properties.

**2.2.3** ISO 527-3 - Determination of Tensile Properties.

**2.2.4** ISO 846 - Evaluation of the Action of Organisms.

## **2.3 National Fire Protection Association (NFPA):**

**2.3.1** NFPA 268 - Standard Test Method for Determining Ignitibility of Exterior Wall Assemblies Using a Radiant Heat Energy Source.

**2.3.2** NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components.

## **3.0 Submittals.**

**3.1 Product Data.** Manufacturer's data sheets on each product to be used, including:

**3.1.1** Preparation instructions and recommendations.

**3.1.2** Storage and handling requirements and recommendations.

**3.1.3** Installation methods.

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**3.2 Shop Drawings.** Submit plan, section, elevation and perspective drawings necessary to describe and convey the layout, profiles and product components, including edge conditions, panel joints, fixture location, anchorage, accessories, finish colors, patterns and textures

**3.3 Code Compliance.** Documents showing product compliance with local building code shall be submitted. These documents shall include, but not be limited to, appropriate Evaluation Reports and/or test reports supporting the use of the product. Alternate materials must be approved by the engineer of record prior to the bid date.

**3.4 Engineering Calculations.** Submit engineering calculations as required by the local building code, showing that the installed panels and attachments system meets the wind load requirements for the project.

**3.5 Selection Samples.** For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns. Please note that samples are only representative for color and pattern and not for thickness or edge finish. Metallic colors may also show a slight fluctuation in appearance due to the metal flake orientation from batch to batch

**3.6 Verification Samples.** For each finish product specified, two samples a minimum of 3.5 inches by 3.5 inches (89 mm by 89 mm) representing actual product, color, and patterns. Sample edges may vary from field panel edges.

**3.7 Operation and Maintenance Data.** Submit operation, maintenance, and cleaning information for products covered under this section.

#### **4.0 Quality Assurance.**

**4.1 Manufacturer Qualifications.** All panel products specified in this section will be supplied by a single manufacturer with a minimum of 25 years' experience.

**4.1.1** Products covered under the Work listed in this section are to be manufactured in an ISO 9001 certified facility.

**4.1.2** Products covered under the work listed in this section are to be manufactured in an ISO 14001 Certified facility.

**4.2 Installer Qualifications.** All products listed in this section are to be installed by an installing firm who can prove 3 years in business and exemplary workmanship. Installing firm must have evidence of installing wall panel systems and is suitable for the execution of the work.

**4.3 Mock-Up.** Provide a mock-up for evaluation of the product and application workmanship. Mock-up shall include 2-3 panels in order to observe joints and fastening methods.

**4.3.1** Do not proceed with remaining work until workmanship, color, and sheen are approved by Engineer.

**4.3.2 Pre-Installation Meetings.** Conduct pre-installation conference to verify project requirements, substrate conditions, manufacturer's installation instructions and manufacturer's warranty requirements.

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## **5.0 Delivery, Storage, and Handling.**

### **5.1 Delivery.**

**5.1.1** During transportation, use stable, flat pallets that are at least the same dimension as the sheets.

**5.1.2** Materials shall be packaged to minimize or eliminate the possibility of damage during shipping. Items such as wooden side boards, wooden lid, and spacers or protective sheeting between panels shall be used to protect the panels from surface and/or edge damage.

### **5.2 Storage.**

**5.2.1** Store products in an enclosed area protected from direct sunlight, moisture and heat. Maintain a consistent temperature and humidity.

**5.2.2** Store products in manufacturer's and/or fabricators unopened packaging until ready for installation.

**5.2.3** Stack panels using protective dividers to avoid damage to decorative surface.

**5.2.4** For horizontal storage, store sheets on pallets of equal or greater size as the sheets with a protective layer between the pallet and sheet and on top of the uppermost sheet.

**5.2.5** Do not store sheets, or fabricated panels vertically.

### **5.3 Handling.**

**5.3.1** Remove protective film within 24 hours of the panels being removed from the pallet.

**5.3.2** When moving sheets, lift evenly to avoid dragging panels across each other and scratching the decorative surface.

**5.3.3** Remove all labels and stickers immediately after installation.

## **6.0 Project Conditions.**

**6.1** Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

**6.2 Field Measurements.** Verify actual measurements/openings by field measurements performed by the installer prior to release for fabrication. Recorded measurements to be indicated on shop drawings based on field measurements provided by the installer. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

## **7.0 Warranty.**

**7.1 Warranty.** At project closeout, provide manufacturer's limited warranty documentation and material data property sheet.

**8.0 Method of Measurement.**

**8.1** The Engineer will measure the square footage of wall panels installed.

**9.0 Basis of Payment.** Payment for the accepted quantity of Pedestrian Underpass Phenolic Panel System will be made in accordance with the contract unit bid price for the items listed below and includes all labor, materials, incidental items, equipment and supervision required to design, prepare shop drawings, manufacture, fabricate furnish and install.

Item No.	Unit	Description
703-99.04	SQFT	Pedestrian Underpass Wall Panel
703-99.04	SQFT	Pedestrian Underpass Wave Panel

**10.0 Wall Panels.**

**10.1 Material.** Solid panel manufactured by Trespa International or approved equal using a combination of high pressure and temperature to create a flat panel created from thermosetting resins, homogenously reinforced with natural fibers and an integrated decorative surface or printed décor. Local Trespa representative is R-S Products, Inc.; P.O. Box 356, Ballwin, MO 63122-0356. Contact Allison Boss (636-448-5440) ([aboss@rsstl.com](mailto:aboss@rsstl.com)) or Scott Brumbach (636-262-4320) ([sjbrumbach@rsstl.com](mailto:sjbrumbach@rsstl.com)). Contractor shall provide contact information for manufacturer representative for any approved equal manufacturer of this wall panel.

**10.1.1** Panel Size: 8'x6"

**10.1.2** Panel Thickness: 10mm (3/8")

**10.1.3** Panel Type: Single sided decorative, or double sided decorative, or Varitop, or Duocolor.

**10.1.4** Panel Decor: Unicolor. As selected by the Engineer from manufacturer's standard decor palette, see Standard Delivery Program North America.

**10.1.5** Panel Core: Fire retardant (FR) black core.

**10.1.6 Physical Properties.**

**10.1.6.1 Modulus of Elasticity.** 1,300,000 psi (9000 N/mm<sup>2</sup>) minimum, ISO 178.

**10.1.6.2 Tensile Strength.** 10,100 psi (70 N/mm<sup>2</sup>) minimum, ISO 527-2.

**10.1.6.3 Flexural Strength.** 14,500psi (120 N/mm<sup>2</sup>) minimum, ISO 178.

**10.1.6.4 Thermal Conductivity.** 2.1 BTU/inch/ft<sup>2</sup>.hr.°F, EN 12524.

**10.1.6.5** Structural Performance (ASTM E330):

**10.1.6.5.1** Panels shall be designed to withstand the Design Wind Load based upon the local building code, but in no case less than 15 pounds per square foot (psf). Wind load testing shall be done in accordance with this standard to obtain the following results:

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**10.1.6.5.2** Normal to the plane of the wall, the maximum panel deflection shall not exceed L/175.

**10.1.6.5.3** Normal to the plane of the wall between supports, deflection of the aluminum sub-framing members shall not exceed L/175 or 3/4 inch, whichever is less.

**10.1.6.5.3.1** At 1-1/2 times design pressure, permanent deflection of framing members shall not exceed L/100 of span length and components shall not experience failure or gross permanent distortion. If system tests are not available, mockups shall be constructed, and tests performed under the direction of an independent third party laboratory which show compliance to the minimum standards listed above.

**10.1.6.6 Fire Performance.**

**10.1.6.6.1 Flame Spread.** Class A, Less than 25, ASTM E 84.

**10.1.6.6.2 Smoke Development.** Less than 450, ASTM E 84.

**10.1.6.6.3 Ignition Temperature.** Greater than 650 degree F (350 degree C) above ambient, ASTM D1929.

**10.1.6.6.4 Burning Classification.** CC1 or CC2, ASTM D635.

**10.1.6.6.5** When required for compliance with local building codes, the wall cladding assembly shall show no degradation of the rating of Fire-Resistant Assemblies, ASTM E119.

**10.1.6.6.6** When required for compliance with local building codes, the wall cladding assembly including cladding and non-cladding elements such as, but not limited to, specific weather resistive barriers and/or exterior insulation materials, shall meet the performance requirements of NFPA 285. Performance shall be determined by actual testing in accordance with NFPA 285 or through an equivalency analysis provided by a recognized fire protection expert.

**10.1.6.6.7** When required for compliance with local building codes, the wall cladding assembly shall not ignite when exposed to a radiant heat energy source, NFPA 268.

**10.1.6.7 Finish Performance.** Electron Beam Cure resin in conformance with the following general requirements:

**10.1.6.7.1 Decor.** As selected by the Engineer from manufacturer's standard decors or a custom color to be matched by the panel supplier.

**10.1.6.7.2 Humidity Resistance.** No formation of blisters when subjected to condensing water fog at 100% relative humidity and 100 degree F (38 degree C) for 3000 hours, ASTM D 2247.

**10.1.6.7.3 Salt Spray Resistance.** Corrosion creepage from scribe line (1/16 inch (1.6 mm) max.) and minimum blister rating of 8 within the test specimen field, ASTM B117.

**10.1.6.7.4 Weather Exposure.** Tested to two standards using a Xenon Arc Light and water to simulate weather exposure.

**10.1.6.7.4.1** Florida test cycle of 3000 hours=10 years (vertical application).

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**10.1.6.7.4.2** EN 438-2:29 Western European test cycle of 1000 hours=10 years (vertical application)

**10.1.6.7.5 Color Stability.** The decorative surface comply with, classification, 4 - 5 measured with the grey scale according to ISO 105 A02-93 according to test method EN 438-2:29.

**10.1.6.7.6 Microbial Characteristics.** Will not support micro-organic growth (ISO 846).

#### **10.1.6.8 Mounting Systems.**

**10.1.6.8.1** TS210 - Concealed fastening over fixed depth aluminum sub-framing.

**10.1.6.8.2** Other installation systems - Include test documentation showing compliance with the performance criteria set forth in the specification and in accordance with the local building code.

**10.1.6.9 Aluminum Sub Structure.** Aluminum sub-structure designed to withstand structural loading due to wind load and the dead load of the panel, painted as required to conceal behind the open joinery of the attachment system.

**10.1.6.9.1** Extrusions, including corner closures, joint closures and vent screens, formed members, sheet, and plate shall conform with the recommendations of the manufacturer.

**10.1.6.10 Extruded Aluminum Trim.** Black.

**10.1.6.11 Fasteners (Concealed/Exposed).** Fasteners shall be non-corrosive and as recommended by panel manufacturer. Exposed fasteners shall be colored to match panels where required by the Engineer.

### **11.0 Fabrication.**

**11.1 Panels.** Solid phenolic wall panels with no voids, air spaces or foamed insulation in the core material.

**11.2** Accessory items in accordance with manufacturer's recommendations and approved submittals.

**11.3 Panel Weight.** 8 mm (2.4 lb/ft<sup>2</sup>), 10 mm (3 lb/ ft<sup>2</sup>), 13 mm (3.8 lb/ ft<sup>2</sup>).

**11.4 Panel Bow.** = 2 mm / m (= 0.079 inch/39.38 inches).

**11.5 Panel Dimensions.** Field fabrication shall be allowed where necessary but shall be kept to a minimum. All fabrication shall be done under controlled shop conditions when possible.

**11.6 Appearance.** Panel lines, breaks, and angles shall be sharp, true, and surfaces free from warp and buckle.

### **12.0 Examination.**

**12.1** Do not begin installation until substrates have been properly prepared. Surfaces to receive panels shall be even, smooth, dry, and free from defects detrimental to the installation of the panel

system. Notify Contractor in writing of conditions detrimental to proper and timely completion of the work.

**12.2** Confirm exterior sheathing is plumb and level, with no deflection greater than 1/4 inch (6 mm) in 20 feet (6096 mm). If substrate preparation is the responsibility of another installer, notify Engineer of unsatisfactory preparation before proceeding. Do not proceed with installation until unsatisfactory conditions have been corrected.

**13.0 Preparation.** Clean surfaces thoroughly prior to installation. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

**14.0 Installation.**

**14.1** Install solid phenolic wall panels and sub-frame system in accordance with manufacturer's instructions.

**14.2** Install solid phenolic wall panels plumb and level and accurately spaced in accordance with manufacturer's recommendations and approved submittals and drawings.

**14.3** Anchor panels and sub-framing securely per engineering recommendations and in accordance with approved shop drawings to allow for necessary movement and structural support.

**14.4** Fasten solid phenolic wall panels with fasteners approved for use with supporting substrate.

**14.5** Do not install panels or component parts which are observed to be defective or damaged including, but not limited to: warped, bowed, abraded, scratched, and broken members.

**14.6** Do not cut or trim component parts during installation in a manner that would damage the finish, decrease the strength, or result in visual imperfection or a failure in performance. Return component parts with require alteration to the shop for re-fabrication or replacement.

**14.7** Install profiles and trim with fasteners appropriate for use with adjoining construction as indicated on the Contract Drawings and as recommended by manufacturer.

**15.0 Adjusting and Cleaning.**

**15.1** Remove masking or panel protection as soon as possible after installation. Any masking intentionally left in place after panel installation on an elevation, shall become the responsibility of the General Contractor to remove.

**15.2** Adjust final panel installation so that all joints are true and even throughout the installation. Panels out of plane shall be adjusted with the surrounding panels to minimize any imperfection.

**15.3** Repair panels with minor damage. Remove and replace panels damaged beyond repair as a direct result of the panel installation. After installation, panel repair and replacement shall become the responsibility of the General Contractor.

**15.4** Clean finished surfaces as recommended by panel manufacturer. After installation cleaning, cleaning during construction shall become the responsibility of the General Contractor.

L-C. Pedestrian Underpass Lighting – Job J6S1718B Only

**1.0 Description.** This section includes furnishing all materials and labor required for the installation of lighting, controllers, wiring, conduit and other related accessories for the lighting of the pedestrian underpass. The work includes:

1.1 Bollard luminaires at pedestrian underpass.

1.2 Interior luminaires at pedestrian underpass.

**2.0 References.**

2.1 ANSI/NFPA 70 National Electrical Code.

**3.0 Project Record Documents.**

3.1 Accurately record actual locations of each luminaire.

**4.0 Qualifications.**

4.1 **Manufacturer:** Company specializing in manufacturing products specified in this Section with minimum three years documented experience.

**5.0 Regulatory Requirements.**

5.1 Conform to requirements of ANSI/NFPA 70.

5.2 Furnish products listed and classified by Underwriters Laboratories, Inc. or other testing firm acceptable to authority having jurisdiction as suitable for purpose specified and shown.

**6.0 Delivery, Storage, and Handling.**

6.1 Accept products on site. Inspect for damage.

**7.0 Warranties.**

7.1 Provide 5-year manufacturer's warranty on all LED fixtures.

**8.0 Products.**

**8.1 Luminaires.**

8.1.1 Furnish the following products as indicated on Drawings.

8.1.2 **Twin Fixture and Pole Assembly:** Altitude ALT 1 by Kim Lighting, represented by LEC & Company. 314.298.7500, [www.lecwb.com](http://www.lecwb.com) or equal.

8.1.2.1 **Model Numbers:** Kim ALT1-28L-40-3K7-5W-UNV-A34-XX-7PR-HDL-SW7PR (Fixtures) and Kim PRA14-4125-TWIN ALT1 FIXTURES AT 180-XX (14' Pole)

**8.1.3 Interior Luminaries:** Pursuit-Bidirectional by Architectural Area Lighting, represented by LEC & Company. 314.298.7500, www.lecwb.com or equal.

**8.1.4 Model Number:** AAL RN-ID-88'-250LM/FT-3K8-AS-AS-DL-UNV-W-EMFX-SWP-XXX-SWUSB

**8.1.5 LED Lamps.**

**8.1.5.1** Per fixture Led color temperature binning +/- 275K from specified fixture color temperature.

**8.1.5.2** Minimum 70CRI.

**8.1.5.3** LEDs meet or exceed LM79 standard.

**8.1.6** Luminaire to be IP66 rated.

**8.2 Foundations and Bases.**

**8.2.1** Concrete, as indicated on plans, provide reinforcing as indicated on plans, or as recommended by the manufacturer.

**8.3 LED Drivers.**

**8.3.1** UL listed.

**8.3.2** Minimum .9 power factor.

**8.3.3** Less than 20% THD.

**8.3.4** Minimum 9kV surge suppression protection.

**8.3.5** Voltage: Match luminaire voltage.

**8.4** Provide a disconnecting means for each circuit at the fixture.

**9.0 Examination.**

**9.1** Examine each luminaire to determine suitability for lamps specified.

**10.0 Installation.**

**10.1** Install in accordance with manufacturers' instructions.

**10.2** Install lamps in each luminaire.

**10.3** Bond luminaires and metal accessories to branch circuit equipment grounding conductor.

**11.0 Field Quality Control.**

**11.1** Operate each luminaire after installation and connection. Inspect for improper connections and operation.

**12.0 Adjusting.**

**12.1** Aim and adjust luminaires to provide illumination levels and distribution as directed. This work will be completed at night after hours. Contractor shall provide all labor to aim fixtures as directed by the Engineer.

**12.2** Relamp luminaires which have failed lamps at Date of Substantial Completion.

**13.0 Cleaning.**

**13.1** Clean electrical parts to remove conductive and deleterious materials.

**13.2** Remove dirt and debris from enclosure.

**13.3** Clean photometric control surfaces as recommended by manufacturer.

**13.4** Clean finishes and touch up damage.

**14.0 Method of Measurement.** Measurement shall be made in accordance with Sec 901.

**14.1 Basis of Payment.** Payment for the accepted quantity of light fixtures installed will be made in accordance with the contract unit bid price for the items listed below and includes all labor, materials, incidental items, equipment, meters, panels, boxes, connections, accessories and supervision required to design, prepare shop drawings, manufacture, fabricate, furnish and install.

Item No.	Unit	Description
901-99.02	EA	F1-LED Twin Fixture and Pole Assembly at Underpass
901-99.02	EA	F2-LED Underpass Up/Down Fixture, 4 Foot Length
901-99.02	EA	F2-LED Underpass Up/Down Fixture, 8 Foot Length

L-D. Pedestrian Underpass Interior Paint – Job J6S1718B Only

**1.0 Description.** This work shall consist of all labor and materials necessary for providing and installing acrylic-based primer and finish coating for the interior of the pedestrian underpass.

**2.0 Submittals.**

**2.1 Product Data.** Submit manufacturer's product data and installation instructions for each material and product used. Include manufacturer's Material Safety Data Sheets.

**3.0 References.**

**3.1** ASTM D 412 Tensile Strength

**3.2** ASTM D 522 Mandrel Bend Flexibility

**3.3** ASTM D 2247 Moisture Resistance

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- 3.4 ASTM D 3273 Mold Resistance
- 3.5 ASTM D 4541 Direct Tensile Bond
- 3.6 ASTM D 6904 Resistance to Wind Driven Rain
- 3.7 ASTM E 84 Flame Spread and Smoke Developed
- 3.8 ASTM E 96 Water Vapor Permeability
- 3.9 South Coast Air Quality Management District (SCAQMD) Rule 1113
- 3.10 U.S. Environmental Protection Agency (USEPA) EPA Method 24 VOC
- 3.11 NCHRP National Cooperative Highway Research Program
- 3.12 NCHRP 244 Chloride Ion Penetration Reduction

#### **4.0 Quality Assurance.**

**4.1 Manufacturer's Qualifications.** The manufacturer shall be a company with at least thirty-five years of experience in manufacturing specialty coatings and regularly engaged in the manufacture and marketing of products specified herein. The manufacturer shall have an ISO 9001:2008 certified quality system and ISO 14001:2004 certified environmental management system.

**4.2 Installer's Qualifications.** The contractor shall be qualified to perform the work specified by reason of experience. Contractor shall have at least 5 years experience in commercial coating application and shall have completed at least 3 projects of similar size and complexity. Contractor shall provide proof before commencement of work that he/she will maintain and supervise a qualified crew of applicators through the duration of the work. When requested Contractor shall provide a list of the last three comparable jobs including the name, location, and start and finish dates for the work.

**4.3 Mock-ups.** The contractor shall install a mock-up using proposed application means and methods to a wall area of at least 25 sq. ft. (2.32 sq.m.) for evaluation and approval by the design professional, building owner, or owner's representative/quality assurance agent.

#### **4.4 Field Quality Control Tests.**

**4.4.1** Conduct tests in accordance with ASTM D4541 on mock-up to verify adhesion of installed primer and top coat to prepared substrate. Test at least 3 specimens and report results to design professional, building owner, or owner's representative/quality assurance agent. Mock-up size shall be 3 feet by 3 feet.

**4.4.2** Conduct tests during coating installation as directed by design professional, building owner, or owner's representative/quality assurance agent to verify adhesion throughout the course of the installation.

#### **5.0 Delivery, Storage and Handling.**

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**5.1** Deliver products in original packaging, labeled with product identification, manufacturer, batch number, and shelf life.

**5.2** Store products in a dry area with temperature maintained between 50 and 85 degrees F (10 and 29 degrees C). Protect from direct sunlight. Protect from freezing. Protect from extreme heat (>90 degrees F [32 degrees C]).

**5.3** Handle products in accordance with manufacturer's printed instructions.

**6.0 Warranty.** Provide manufacturer's standard limited warranty.

## **7.0 Materials.**

**7.1 Concrete and stucco substrate primer.** Acrylic-based, tinted, high-pH compatible primer/sealer.

**7.1.1 Performance and Physical Properties:** Meet or exceed the following values for material cured at 73 degrees F (23 degrees C) and 50 percent relative humidity (unless otherwise specified).

**7.1.1.1 Application.** Spray, roller, or brush.

**7.1.1.2 Working time.** 10-20 minutes, depending on ambient conditions.

**7.1.1.3 Adhesion to concrete.** 680 psi (4.69 MPa), ASTM D 4541

**7.1.1.4 Flame Spread Index.** 0, ASTM E 84,

**7.1.1.5 Smoke Developed.** 10, ASTM E 84

**7.1.1.6 Water vapor transmission.** 30 perms (1720 ng/Pa.s.sq.m.), tested at 3 dry mils applied in one coat, ASTM E 96, wet cup method.

**7.1.1.7 VOC.** < 100 g/L, EPA 24, complies with SCAQMD Rule 1113

**7.2 Concrete masonry substrate primer.** Acrylic-based based, masonry block-filler/primer. Single component acrylic-based primer, containing acrylic polymer, and fine mineral fillers. Product shall comply with the following:

**7.2.1 Performance and Physical Properties.** Meet or exceed the following values for material cured at 73 degrees F (23 degrees C) and 50 percent relative humidity (unless otherwise specified).

**7.2.2 Application.** Spray, roller, or brush.

**7.2.3 Working Time.** 10-20 minutes.

**7.2.4 Flame Spread.** < 25, ASTM E 84

**7.2.5 Smoke Developed.** < 450, ASTM E 84

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**7.2.6 VOC:** <100 g/L, EPA 24, Complies with SCAQMD Rule 1113

**7.3 Finish Coating.** Single component acrylic-based coating, containing acrylic polymer, and colored pigments. Color 80804 StoPrime as manufactured by Sto Corp., 3800 Camp Creek Parkway, Building 1400, Suite 120, Atlanta, Georgia 30331. Product shall comply with the following:

**7.3.1 Performance and Physical Properties.** Meet or exceed the following values for material cured at 73 degrees F (23 degrees C) and 50 percent relative humidity (unless otherwise specified).

**7.3.2 Working Time.** 10-30 minutes, depending on ambient conditions.

**7.3.3 Application.** Spray, roller, or brush.

**7.3.4 Resistance to wind-driven rain.** No water penetration, weight gain less than 0.02 lbs. (0.01 kg), ASTM D 6904

**7.3.5 Tensile Strength.** 386 psi (2.7 MPa), minimum at break, ASTM D 412

**7.3.6 Elongation at Break.** 306% minimum, ASTM D 412

**7.3.7 Flexibility Mandrel Bend Elongation.** No cracking (% elongation greater than 32) at -14 degrees F (-26 degrees C), ASTM D 522.

**7.3.8 Moisture Resistance.** No adhesion loss, discoloration, blistering, cracking, flaking, ASTM D 2247, 14 day exposure.

**7.3.9 Mold Resistance.** No Mold Growth at 90 days, ASTM D 3273

**7.3.10 Adhesion to Concrete.** 320 psi (2.20 MPa), ASTM D 4541

**7.3.11 Water Vapor Permeability.** 25 perms (1434 ng/Pa.s.sq.m.), tested at 10 dry mils applied in one coat, ASTM E 96, wet cup method.

**7.3.12 Carbon Dioxide Diffusion Resistance Coefficient.** 1,400,000, EN-1062

**7.3.13 Carbon Dioxide Diffusion Resistance.** 200 m

**7.3.14 VOC.** <50 g/L, EPA 24, Complies with SCAQMD Rule 1113

**7.3.15 Chloride Ion Penetration Reduction.** 90.7%, NCHRP-244, Phase 1 method.

**7.3.16 Solids Content.** 53%, by volume.

**7.4** Color to be Sto Custom Color match from sample to be provided by Engineer.

**8.0 Installation.**

**8.1 Surface Preparation.** All surfaces must be clean, dry, sound, and free of frost and contamination such as mildew, dirt, grease, oils, salts, efflorescence and any other contamination that may affect adhesion. Coordinate installation with adjacent work to ensure proper sequence of construction. Protect adjacent areas and landscaping from contact due to mixing, handling, and installation of materials.

**8.2 Mixing.** Mix products in accordance with published literature for the product. Mix for approximately 3 minutes using a slow-speed drill and paddle to a uniform consistency. Avoid entrapping air in the liquid during mixing.

**8.3 Application.** Apply primer to prepared substrate in accordance with written instructions presented on the primer product being used.

**8.4 Protection.** Provide protection of installed materials from water infiltration into or behind them. Provide protection of installed materials from dust, dirt, precipitation, freezing and continuous high humidity until they are fully dry.

**8.4.1** Provide coping and/or flashing at sills, projecting features, deck attachments, roof/wall intersections, parapets and similar construction details to prevent water entry into wall assembly or into and behind the finish system. Seal penetrations through the finished wall surface with backer rod and sealant or other appropriate means to provide a watertight condition.

**9.0 Method of Measurement.** The Engineer will measure the square footage of the interior tunnel surface painted.

**10.0 Basis of Payment.** Payment for the accepted quantity of Pedestrian Underpass Interior Paint will be made in accordance with the contract unit bid price for the item listed below and includes all labor, materials, incidental items, equipment, accessories and supervision required to design, prepare shop drawings, manufacture, fabricate, furnish and install.

Item No.	Unit	Description
703-99.04	SQFT	Pedestrian Underpass Interior Paint

L-E. Pedestrian Underpass Cast Stone Masonry – Job J6S1718B Only

**1.0 Description.** This section includes the manufacture, delivery, and installation of Architectural Cast Stone as shown on the drawings and as described in this specification. Contractor shall furnish and install the Cast Stone covered by this specification. Any changes to the materials described in this specification will require prior approval from the City of Brentwood before ordering of the materials.

**2.0 Reference Standards.**

**2.1** ASTM C 150 / C 150M - Standard Specification for Portland Cement.

**2.2** ASTM C 1116 / C 1116M - Standard Specification for Fiber-Reinforced Concrete.

**2.3** ASTM C 1364 - Standard Specification for Architectural Cast Stone.

**2.4** Cast Stone Institute Standard Specification ([www.caststone.org](http://www.caststone.org)).

### **3.0 Definitions.**

**3.1** Cast Stone - A refined architectural concrete building unit manufactured to simulate natural cut stone, used in masonry applications.

**3.2** Dry Cast – manufactured from zero slump concrete.

**3.3** Vibrant Dry Tamp (VDT) casting method: Vibratory ramming of earth moist, zero-slump concrete against a rigid mold until it is densely compacted.

**3.4** Machine casting method: Manufactured from earth moist, zero-slump concrete compacted by machinery using vibration and pressure against a mold until it becomes densely consolidated.

**3.5** Wet Cast – Manufactured from measurable slump concrete.

**3.6 Wet casting method.** Manufactured from measurable slump concrete and vibrated into a mold until it becomes densely consolidated.

### **4.0 Submittals.**

**4.1 Product Data.** Submit manufacturer's product data.

**4.2 Shop Drawings.** Submit manufacturer's shop drawings including profiles, cross sections, reinforcement, exposed faces, arrangement of joints, anchoring methods, anchors, annotation of components, and their locations in project as indicated on the Drawings.

**4.3 Shop Tickets.** Submit manufacturer's shop tickets including profiles, cross sections, modular unit lengths, reinforcement, exposed faces, and annotation of components proposed for use in project according to cross sections as indicated on the Drawings.

**4.4 Catalog Cuts.** Submit manufacturer's catalog cuts showing page and product numbers of units proposed for use in project.

**4.5 Verification Samples.** Submit pieces of actual cast stone components, 12 inches (305 mm) square, illustrating range of color and texture to be anticipated in components furnished for project.

**4.6 Test Results.** Submit manufacturer's test results of cast stone components made previously by manufacturer using materials from same sources proposed for use in project.

### **5.0 Quality Assurance.**

**5.1 Manufacturer Qualifications.** A Cast Stone Institute Certified Producer, with a minimum of 10 years of experience in producing cast stone of types required for project.

**5.1.1** Plant shall have adequate capacity to furnish quality, sizes, and quantity of cast stone required without delaying progress of the Work.

**5.1.2** Products previously produced by plant and exposed to weather shall exhibit satisfactory appearance.

**5.2 Standards.** Unless otherwise specified in this section, cast stone shall comply with the following:

**5.2.1** ASTM C 1364.

**5.2.2** Cast Stone Institute Standard Specification.

**5.3 Mock-ups.** Provide full-size cast stone components for installation in mock-up of exterior wall. Approved mock-ups will become standard for appearance and workmanship.

**5.3.1** Mock-ups can remain as part of the completed Work if deemed acceptable by the Engineer.

**5.3.2** Mock-up shall include tunnel and typical adjoining retaining wall material.

## **6.0 Delivery, Storage, and Handling.**

### **6.1 Delivery.**

**6.1.1** Deliver cast stone components secured to shipping pallets and protected from damage and discoloration.

**6.1.2** Protect corners from damage.

**6.1.3** Number each piece individually to match shop drawings and schedules.

### **6.2 Storage.**

**6.2.1** Store cast stone components and installation materials in accordance with manufacturer's instructions.

**6.2.2** Store cast stone components on pallets with nonstaining, waterproof covers.

**6.2.3** Ventilate under covers to prevent condensation.

**6.2.4** Prevent contact with dirt.

**6.3 Handling.** Protect cast stone components during handling and installation to prevent chipping, cracking, or other damage.

## **7.0 Scheduling.**

**7.1** Schedule and coordinate production and delivery of cast stone components with unit masonry work to optimize on-site inventory and to avoid delaying the Work.

## **8.0 Cast Stone Masonry.**

**8.1 Cast Stone.** Sourced from Continental Cast Stone. Website: [www.continentalcaststone.com](http://www.continentalcaststone.com)

**8.1.1 Compressive Strength.** ASTM C 1364.

**8.1.2 Absorption, Cold Water.** ASTM C 1364.

**8.1.3 Linear Shrinkage.** ASTM C 1364.

**8.2 Surface Texture.** ASTM C 1364.

**8.3 Color and Finish.**

**8.3.1** Continental Cast Stone Color to be selected from manufacturer's standard colors. Contractor to provide samples for Owner to select color.

**8.4 Permissible Variation in Color**

**8.4.1 Total Color Difference.** ASTM C 1364, 6 units.

**8.4.2 Hue Difference.** ASTM C 1364, 2 units.

**9.0 Cast Stone Materials.**

**9.1 Portland Cement.** ASTM C 150, Type I; white or gray as required to match specified color.

**9.2 Coarse Aggregate.** ASTM C 1364; granite, quartz, or limestone.

**9.3 Fine Aggregate.** ASTM C 1364, natural or manufactured sands.

**9.4 Coloring Pigments.** ASTM C 1364, inorganic iron oxides.

**9.5 Chemical Admixtures.** ASTM C 1364.

**9.6 Water.** Potable.

**9.7 Reinforcement.** Where required by ASTM C 1364, epoxy-coated steel.

**9.8 Fiber Reinforcement.** ASTM C 1116, fibrous nylon.

**10.0 Mortar Materials.** Per manufacturer's specification.

**11.0 Accessories.**

**11.1 Anchors.** Non-corrosive type, sized for conditions. Type 304 stainless steel.

**11.2 Sealants.** Type N.

**11.3 Cleaner.** Manufacturer's standard-strength, general-purpose cleaner designed for removing mortar and grout stains, efflorescence, and other construction stains from new masonry surfaces without discoloring or damaging masonry surfaces. Approved for intended use by cast stone masonry manufacturer and approved by cleaner manufacturer for use on cast stone and adjacent masonry materials.

## **12.0 Fabrication.**

**12.1 Shapes.** Unless otherwise indicated on the Drawings, provide:

**12.1.1** Suitable wash on exterior sills, copings, projecting courses, and components with exposed top surfaces.

**12.1.2** Drips on projecting components, wherever possible.

## **12.2 Reinforcement.**

**12.2.1** As required to withstand handling and structural stresses.

**12.2.2** Comply with ASTM C 1364.

**12.2.3** Minimum of 0.25 percent of cross-sectional area of panels which exceed 24 inches (600 mm) in width.

**12.2.4** Minimum Reinforcing Cover: Twice diameter of reinforcing bars.

**12.2.5** Units less than 24 inches in either transverse or longitudinal direction may be unreinforced in that direction if structural conditions allow.

## **12.3 Curing.**

**12.3.1** Cure cast stone components with a direct-fired steam generator at a minimum temperature of 105 degrees F (41 degrees C) for a minimum of 6 hours, within 12 hours of fabrication.

**12.3.2** Cure cast stone components in presence of carbon monoxide and carbon dioxide to promote carbonation at surface, to minimize efflorescence.

**12.4 Finishing.** Remove blemishes from exposed surfaces before packaging for shipment.

**12.5 Manufacturing Tolerances.** Manufacture cast stone components within tolerances in accordance with Cast Stone Institute Standard Specification.\

## **13.0 Source Quality Control.**

**13.1 Sampling and Testing.** ASTM C 1364.

**14.0 Examination.** Examine construction to receive cast stone masonry. Notify Engineer if construction is not acceptable. Do not begin installation until unacceptable conditions have been corrected.

**14.1 Visual Inspection.** Visually inspect cast stone components for fit and finish in accordance with ASTM C 1364 before installation. Do not install unacceptable components.

## **15.0 Installation.**

**15.1 General.** Install cast stone masonry in conjunction with pedestrian underpass structure, phenolic panel system and aesthetic retaining walls.

## **15.2 Setting.**

**15.2.1** Drench cast stone components with clear, running water immediately before installation.

**15.2.2** Do not use pry bars or other equipment in a manner that could damage cast stone components.

**15.2.3** Fill dowel holes and anchor slots completely with mortar or non-shrink grout.

**15.2.4** Set cast stone components in a full bed of mortar, unless otherwise indicated on the Drawings.

**15.2.5** Fill vertical joints with mortar.

**15.2.6** Make joints 3/8 inch (9 mm), unless otherwise indicated on the Drawings.

**15.2.7** Leave head joints in copings and similar components open for sealant.

**15.2.8** Rake mortar joints 3/4 inch (19 mm) for pointing.

**15.2.9** Sponge face of each stone to remove excess mortar.

**15.2.10** Tuck point joints to a slight concave profile.

## **15.3 Sealant Joints.**

**15.3.1** Prime ends of cast stone components, insert properly sized foam backing rod, and install required sealant using sealant gun.

**15.3.2** Provide sealant joints at following locations and as indicated on the Drawings.

**15.3.3** Cast stone components with exposed tops.

**15.3.4** Joints at relieving angles.

**15.3.5** Control and expansion joints.

## **16.0 Setting Tolerances.**

**16.1 Tolerances.** Comply with Cast Stone Institute Standard Specification.

**16.1.1 Variation from Plumb.** Do not exceed 1/8 inch in 5 feet (3 mm in 1.5 m) or 1/4 inch in 20 feet (6 mm in 6 m) or more.

**16.1.2 Variation from Level.** Do not exceed 1/8 inch in 5 feet (3 mm in 1.5 m), 1/4 inch in 20 feet (6 mm in 6 m), or 3/8 inch (9 mm) maximum.

**16.1.3 Variation in Joint Width.** Do not vary joint width more than 1/8 inch (3 mm) or 1/4 of nominal joint width, whichever is greater.

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**16.1.4 Variation in Plane Between Adjacent Surfaces.** Do not exceed 1/8-inch (3-mm) difference between planes of adjacent components or adjacent surfaces indicated to be flush with components.

**17.0 Surface Repair.** Repair chipping and other surface damage noticeable when viewed in direct daylight at 20 feet (6 m). Repair with matching touchup material provided by manufacturer and in accordance with manufacturer's instructions. Repair methods and results to be approved by Engineer.

**18.0 Field Quality Control.** Inspection and Acceptance shall be per manufacturer's specifications.

**19.0 Cleaning.**

**19.1 In-Progress Cleaning.** Clean cast stone components as work progresses. Remove mortar fins and smears before tooling joints.

**19.2 Final Cleaning.** Clean exposed cast stone, after mortar is thoroughly set and cured.

**19.3 Cleaner.** Wet surfaces with water before applying cleaner. Apply cleaner to cast stone in accordance with cleaner manufacturer's instructions. Remove cleaner promptly by rinsing thoroughly with clear water.

**20.0 Water Repellant.** Apply silane or siloxane water repellant for weatherproofing cast stone masonry in accordance with manufacturer's instructions. Apply water repellant after pointing, repair, cleaning, inspection, and acceptance are completed.

**21.0 Protection.** Protect installed cast stone masonry from splashing and other damage during construction.

**22.0 Method of Measurement.** Measurement shall be made in accordance with Sec 703.

**23.0 Basis of Payment.**

**24.1** Payment for the accepted quantity of Pedestrian Underpass Cast Stone Masonry will be made in accordance with the contract unit bid price for the items listed below includes all labor, materials, incidental items, equipment, fasteners, anchors, accessories and supervision required to design, prepare shop drawings, manufacture, fabricate, furnish and install.

Item No.	Unit	Description
703-99.04	EA	Pedestrian Underpass Cast Stone Masonry Column
703-99.04	SQFT	Pedestrian Underpass Cast Stone Masonry Facade
703-99.04	LF	Pedestrian Underpass Cast Stone Masonry Coping

L-F. Concrete Pavers – Job J6S1718B Only

**1.0 Description.** Concrete pavers shall be provided as the finished surface of the Rogers Parkway Trail as depicted on the plans. The pavers shall be constructed to the depth and

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dimensions as depicted in the contract plans. Concrete Unit Paver work includes paver units, sand bed, sand joints, sand-lock spray, sealer and edging.

## **2.0 References.**

### **2.1 American Society for Testing and Materials.**

**2.1.1** ASTM C33 - Standard Specification for Concrete Aggregates.

**2.1.2** ASTM C936-96 - Standard Specification for Solid Concrete Interlocking Paving Units.

## **3.0 Submittals.**

**3.1 Samples.** Submit two (2) samples of each paver size, illustrating style, size, color range and surface texture of units being provided.

**3.2 Manufacturer's Installation Instructions.** Submit substrate requirements, and installation methods.

**3.3** Product information for: Sealer and Sand Lok Admixture.

## **4.0 Qualifications.**

**4.1 Installer.** Company specializing in performing work of this section with minimum three years documented experience.

## **5.0 Mockup.**

**5.1** Construct mockup of each pavement pattern, (approximately 100 sq.ft.), including setting bed, pavers, edging, joint sealers, control joint, expansion joint, and accessories to pattern indicated. Accepted mockup may be incorporated into part of work. Locate mock-up as directed by Engineer.

## **6.0 Products.**

**6.1** Permeable Pavers at Pedestrian Underpass shall be Hollandstone (size 4" x 8" x 3 1/8"). Color: Bethany Ledge Blend. Any changes to the materials described in this specification will require prior approval from the City of Brentwood before ordering of the materials.

**6.2** Pavers shall conform to the following:

**6.2.1 Type.** ASTM C936-96, Hydraulically pressed concrete of 8,000 psi minimum, 28 day compressive strength.

**6.2.2 Air Entrained.** 5 to 7%; Moisture Content: 7%; Moisture Absorption: 5% Max. (per ASTM C-140)

**6.2.3 Nominal Size.** 7.28" X 4.7" to 5.4" X 2.36" (see drawings).

**6.2.4 Sand for Setting Bed and Joint Filler.** Concrete sand conforming to ASTM C33. The bedding sand should be sharp, washed, and free from foreign material. Masonry mortar sand

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should not be used. Clean river or bank sand containing a maximum of 30 percent particle size of No. 10 (2 mm) sieve.

**6.2.5 Edging.** Concrete Trail Edge.

**6.2.6 Sealer.** A “Clear Surface Sealer” - deep penetrating single coat siloxane-based sealer, recommended for long term durability and stain resistance.

**6.2.7 Sand – Lock Admixture** shall be manufactured to reduce movement of sand used as paver joint filler and recommend for this application and location.

## **7.0 Execution.**

**7.1** All materials and work performed for this item shall be in accordance with Sec 608 and installation shall be performed in accordance with the manufacturer’s guidelines.

**7.2** Verify that substrate is level or to correct gradient, smooth, capable of supporting pavers and imposed loads, and ready to receive work of this section.

**7.3** The surfaces indicated to receive pavers shall be reviewed by Owner with paver installer for compliance with requirements for installation tolerances and other conditions affecting performance of concrete pavers. Proceed only after all unsatisfactory conditions have been corrected.

**7.4** Verify gradients and elevations of substrate are correct.

**8.0 Preparation.** Treat soil with herbicide to retard plant growth.

**9.0 Construction of Sand Bedding Course.** The sand bedding course material shall be evenly spread over the area to be paved and screeded to a level that will produce the required one-inch thickness when the paving stones have been placed and vibrated. Do not use sand to compensate for uneven elevations or an improperly compacted base. Screenshot sand with a straight, true strike board. Once screeded and leveled, this sand laying course shall not be disturbed in any way.

## **10.0 Installation.**

**10.1 General.** Do not use unit pavers with chips, cracks, voids, discoloration, and other defects that might be visible or cause staining in finished work.

**10.2** Cut unit pavers with motor-driven masonry saw equipment to provide clean, sharp, unchipped edges. Cut units to provide pattern indicated and to fit adjoining work neatly. Use full units without cutting, where possible. No cuts should result with a paver less than one-third of the original dimension. Hammer cutting is not acceptable.

**10.3** Paving stones shall be laid in patterns as noted on the drawings. The joint between the stones shall be approximately 1/16 – 1/8” wide. String lines shall be used to hold all patterns true.

**10.4** The gaps at the edge of the paved surface shall be filled with the standard edge pieces or with stones cut to fit. Stones shall be cut to a straight, even surface, without cracks or chips.

**10.5** Paving stones shall be vibrated into the sand laying course using a vibrator capable of 3,000 to 5,000 pounds compaction force with the surface clean and joints open.

**10.6** After first vibration, sand containing at least 3%-1/8" particles, shall be brushed over the surface and vibrated into the joints with additional passes of the plate vibrator so as to completely fill the joints. Do not vibrate or tamp unrestrained edges.

**10.7** After final vibrating, the surface shall be true to grade and shall not vary by more than 1/4 inch when tested with a 10-foot straight edge at any location on the surface.

**10.8** Sand - Lock shall be installed per manufactures recommendations but not on permeable pavement.

**10.9** Upon completion of work covered in this section, the contractor shall clean all work areas by removing all debris, surplus material and equipment from the site.

**11.0 Repair.** Apply surface sealer to all unit paver areas at the manufacturer's recommended rate for maximum penetration with single coat application.

**12.0 Protection.** Provide final protection and maintain condition in a manner required to ensure unit paver work is without damage or deterioration at time of substantial completion.

**13.0 Method of Measurement.** Measurement shall be made in accordance with Sec 608. All base rock and earthwork below the concrete pavers shall be quantified and paid for as separate pay items associated with those items.

**14.0 Basis of Payment.** Payment for the accepted quantity of Concrete Pavers and Sand Setting Bed shall be completely covered by the contract unit price for Item No. 608-99.05, "Concrete Pavers". No direct payment will be made for any labor, equipment, materials, and time required to comply with this provision.

Item No.	Unit	Description
608-99.05	SQYD	Rogers Parkway Concrete Pavers

L-G. Irrigation – Job J6S1718B Only

**1.0 Description.** The contractor shall furnish and install a landscape irrigation system as indicated on the drawings which includes the design of a point of connection, a water meter, backflow prevention devices, valves, piping, and quick coupler valves. The system shall be in accordance with the following design criteria:

**1.1** The irrigation system shall be designed for winterization procedures. Provide blowout points near point-of-connection, with strategically placed isolation valves.

**1.2 Valves:** Gate valves shall be provided to allow shutting down various sections of the system independent of the entire system. Valves shall be installed in green plastic gate valve boxes or approved equal. Boxes to be set at finish grade with tops of quick coupler valves 2-inches below top of box cover.

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**1.3 Backflow Prevention:** All backflow prevention devices must comply with requirements set forth by the local health department and city water departments. Prevent any back siphonage after sectional valves are closed. All backflow prevention devices shall be enclosed with a "Lok Box" Model #2.

**1.4 Quick Coupling Valves:** Provide quick couplers as shown on the drawings. Quick coupler valves shall be installed in green plastic gate valve boxes or approved equal. Boxes to be set at finish grade with tops of quick coupler valves 2-inches below top of box cover.

**2.0 Submittals.** Prepare and submit the items listed below.

**2.1 Product Data.** Submit a complete material list prior to performing any work. Catalog data and full descriptive literature must be submitted for every product used.

**2.2 As-Built Drawings.** Record accurately on one set of contract drawings, or previously submitted shop drawings, all changes in the work constituting departures from the original contract drawings. The changes and dimensions shall be recorded in a legible and workmanlike manner to the satisfaction of the Engineer. Submit record drawings prior to final inspection of work. Dimensions shall be from three permanent points of reference (buildings, monuments, sidewalks, curbs, pavements, etc.) Data to be shown on record drawings shall be recorded day to day as the project is being installed. Show locations and depths of the point of connection, routing of main and lateral lines (dimension maximum 100 feet along routing), quick coupling valves, all related equipment (backflow prevention devices, quick coupler valves, etc.).

**2.3 Equipment.** Supply the following equipment as part of this work item: Three couplers and matching hose swivels, one valve box cover key or wrench, one 5-foot tee wrench for operating gate valves, if necessary. The above equipment shall be turned over to the Engineer at final inspection.

**3.0 Materials.**

**3.1 PVC Pipe.** Provide clean, dry and covered location for storage of all pipe during installation. Pipe shall be 2" Class 200 PVC.

**3.2 Valves.** Manufacturer's standard, of type and size indicated. Isolation valves: Harvard - quarter turn, brass, threaded, line-sized ball-valves, or Nibco bronze, threaded, line-sized gate-valves. Manual Shut-Off Valves shall be cast bronze globe valves.

**3.3 Backflow Preventer.** 2" FEBCO Model 860 Backflow prevention device shall be enclosed with a "Lok Box" Model #2, or approved equal.

**3.4 Valve Box with Cover.** Shall be Rainbird, or approved equal.

**3.5 Sleeves.** Sleeves shall be twice the nominal size of the pipe to be carried within, unless noted differently. Under walks, paving and where indicated on drawings, install Schedule 40 PVC (ASTM D-1785) for sleeves 4" diameter and smaller. Sleeves 6" and larger shall be Class 200 PVC. Tape ends of sleeves and mark sleeve locations with above grade stakes with appropriate annotation, i.e.. "irrigation sleeves". Stakes shall be protected. Do not backfill over sleeve locations behind back of curbs or along walk edges, until work has been completed. PROVIDE TWO SPARE EMPTY 4" SLEEVES UNDER PEDESTRIAN UNDERPASS, CAP AND MARK AS SPARES.

**3.6 Water Supply.** Supply shall be as indicated on the drawings including a water meter installed per local codes.

**3.7 Trenching and Backfilling.** Excavate straight and true with bottom uniformly sloped to low points. Excavate trenches to a depth of 3 inches below invert of pipe, unless otherwise indicated. Provide following minimum cover over top of installed piping: Main line pipe, 24" and Lateral piping, 18" minimum. Backfill with clean material from excavation. Remove organic material as well as rocks and debris larger than 1-inch diameter. Place acceptable backfill material in 6-inch lifts, compacting each lift. Backfilling of trenches containing plastic pipe shall be done when pipe is cool to avoid excessive contraction in cold weather. Such backfilling can be done in early morning hours or the pipe may be water cooled prior to backfilling procedures. Where pipe is pulled into the ground, slit-domes shall be compacted to original grade after pulling.

**4.0 Execution**

**4.1 Installation.** Unless otherwise indicated, comply with requirements of Uniform Plumbing Code, and requirements of the Local Plumbing Code. Install piping, valves, meter and backflow preventor in accordance with manufacturer's written instructions. Install control valve boxes parallel or perpendicular to any adjacent site item such as curbs, walks, walls, etc. Locate valve boxes in landscape beds whenever possible. Install control valves in valve box, arranged for easy adjustment and removal.

**4.2 Testing.** Notify Engineer in writing when testing will be conducted. Conduct tests in presence of Owner's Representative for approval. Test water piping and valves before backfilling trenches, to a hydrostatic pressure of not less than 100 psi. Piping may be tested in sections to expedite the work. Remove and repair piping, connections, valves that do not pass hydrostatic testing.

**5.0 Method of Measurement.**

**5.1** This item will not be measured. The Engineer will verify entire irrigation has been installed, is operational, and all submittals have been provided.

**6.0 Basis of Payment.**

**6.1 Basis of payment.** Payment for the above includes all labor, materials, incidental items, equipment, accessories, and supervision required to design, prepare shop drawings and as-built drawings, manufacture, fabricate, furnish and install.

Item No.	Unit	Description
808-99.01	Lump Sum	Irrigation System

L-H. Protection of Existing Trees

**1.0 Description.** This work shall consist of all labor and materials necessary to protect all existing trees by the Contractor throughout the entire duration of the grading and construction of the project.

**2.0 General Requirements.** All trees within the project limits or Contractor's working area shall have protection zones and shall not be damaged by Contractor's activities.

## 2.1 Definitions.

**2.1.1 Diameter at Breast Height (DBH)** shall mean the diameter of the tree as measured 4.5 feet above adjacent grade.

**2.1.2 Critical Root Zone (CRZ)** shall mean the area of soil extending from the tree trunk outward a distance of one foot for every one inch of trunk diameter at DBH. As an example, a tree having a caliper of twelve (12) inches at DBH will have a CRZ extending 12' from the tree trunk in all directions.

**2.1.3** Unless approved first by the Owner, a tree protection zone shall, at a minimum, encompass the critical root zone and shall be established around each tree and any vegetation to be preserved.

**2.2** The following activities shall be prohibited within the tree protection zones: stockpiling of any type, including construction material, debris, soil, and mulch; altering soils, including grade changes, surface treatment, and compaction due to vehicle, equipment, and foot traffic; trenching for utility installation or repair and irrigation system installation; and attaching anything to trunks or use of equipment that causes injury to any tree to remain.

**2.3** Pruning to provide clearance for structures, vehicular traffic, and construction equipment shall be performed under the direction and supervision of a licensed arborist under the direction of the Owner and shall conform to all International Society of Arboriculture tree pruning standards.

**2.4** Trees must be maintained in good health throughout construction. Maintenance may include watering the root protection zone and/or washing foliage dirtied by construction activities.

## 3.0 Damage.

**3.1** Contractor shall be responsible for any trees damaged by construction activity that are not otherwise designated for removal and shall pay the Owner as liquidated damages and not as a penalty, the sum of two hundred fifty dollars (\$250) for each damaging event. The total amount payable to the Owner as liquidated damages may be deducted from any sums due or to become due to Contractor from Owner.

**3.2** If a tree designated to remain is removed or irreversibly damaged, the contractor shall be required to remove the remaining tree and stump at no expense to the Owner, replace the tree with a new 3 inch caliper tree of the same species, as approved by the Owner, and shall pay an additional penalty to the Owner of one hundred dollars (\$100) for every inch over 3 inches of the damaged tree's caliper.

**3.3** Contractor shall submit an incident report to the Owner and payment shall be deducted from sums due to the Contractor.

**4.0 Root Pruning.** When construction activities must encroach into the CRZ, Contractor shall notify the Owner before proceeding with any such work.

**4.1** Tree roots shall be pruned in such a fashion as to allow for completion of construction. The contractor shall employ a licensed arborist to supervise root pruning that conforms to all International Society of Arboriculture tree pruning standards.

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**5.0 Basis of Payment.** No direct payment will be made for tree protection but shall be considered incidental to the contract.

L-I. Soil Preparation – Job J6S1718B Only

**1.0 Description.** Soil preparation as described below will be completed in all areas where Sod will be established.

**2.0 Work.** Soil Preparation Work includes:

**2.1** Verify prepared soil base is ready to receive the Work of this section.

**2.2** Prepare sub-soil to eliminate uneven areas and low spots. Maintain lines, levels, profiles and contours. Make changes in grade gradual. Blend slopes into level areas.

**2.3** Remove foreign materials, weeds and undesirable plants and their roots. Remove contaminated sub-soil.

**3.0 Basis of Payment.** No direct payment will be made for soil prep but shall be considered incidental to the contract.

L-J. Turf Grass Sodding – Job J6S1718B Only

**1.0 Description.** This Section Includes:

**1.1** Fertilizing.

**1.2** Sod installation.

**1.3** Maintenance.

**2.0 Definitions.**

**2.1 Weeds.** Include Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

**3.0 Quality Assurance.**

**3.1 Sod.** Root development capable of supporting its own weight without tearing, when suspended vertically by holding upper two corners.

**4.0 Qualifications.**

**4.1 Sod Producer.** Company specializing in manufacturing Products specified in this section with minimum three years documented experience.

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**4.2 Installer.** Company specializing in performing work of this section with minimum three years documented experience, approved by sod producer.

## **5.0 Delivery, Storage, and Handling.**

**5.1** Deliver sod on pallets. Protect exposed roots from dehydration. Place sod in shaded areas, where feasible.

**5.2** Do not deliver more sod than can be laid within 24 hours.

## **6.0 Maintenance Service.**

**6.1** The maintenance of sodded turf area shall be the Contractor's responsibility until final acceptance by the Owner. The first mowing will not be attempted until the sod is securely in place, uniform in appearance, and the turf blades have reached a height of 4 inches.

## **7.0 Warranty.**

**7.1** Contractor shall warrant that all sodded lawns planted under this Contract will be healthy and in a condition of greater than 80 percent active growth one (1) year from date of Substantial Completion. Any delay in completion of sodding operations which extends the planting into more than one planting season shall extend the Warranty Period correspondingly.

## **8.0 Materials.**

### **8.1 Sod.**

**8.1.1** Sod shall be an improved variety of turf type fescue. Submit seed mix for approval.

**8.1.2** Sod shall be nursery grown, of high quality, and free of disease nematodes, and soil-borne insects. Sod shall be free of noxious weeds, including but not limited to Common Bermuda Grass, Quack Grass, Johnson Grass, Poison Ivy, Yellow Nutsedge, Nibblewill, Canadian or Russian Thistle, Bindweed, Bentgrass, Wild Garlic, Ground Ivy, Perennial Sorel, Wild Violet, and Bromegrass. Sod shall be considered free of other weed types if less than 5 weed plants are found per 100 square feet of area.

**8.1.3** All sod should have two full seasons' growth before harvesting. Sod with less than two seasons' growth is subject to rejection.

**8.1.4** All sod shall be stripped at a uniform solid thickness of approximately one-inch, plus or minus ¼". Measurement for thickness shall exclude top growth and thatch and shall be determined at the time of field cutting. Sod thatch, uncompressed shall not exceed ½".

**8.1.5** Root development shall be such that standard size pieces will support their own weight and retain their shape, when suspended vertically from a firm grasp on the uppermost 10% of area, or when rolled and unrolled three times.

**8.1.6** Before stripping, the sod shall be mowed uniformly at a height of 2 to 2-1/2 inches.

**8.1.7** Sod shall not be harvested or transplanted when moisture content (excessively dry or wet) may adversely affect survival of the sod.

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**8.1.8** Sod shall be harvested, delivered and installed within a period of 24 hours. Sod not transplanted within this period shall be inspected and subject to rejection.

**8.1.9** Sod shall be a 90% : 10%, turf-type Fescue/Kentucky Bluegrass blend, containing a mixture of equal parts by weight of three improved varieties of the turf-type Fescue.

## **9.0 Accessories.**

**9.1 Fertilizer.** Commercial grade; recommended for grass, with fifty percent of elements derived from organic sources; of proportion necessary to eliminate deficiencies of topsoil to the following proportions: nitrogen 20 percent, phosphoric acid 20 percent, soluble potash 20 percent.

**9.2 Water.** Clean, fresh and free of substances or matter capable of inhibiting vigorous growth of grass.

**9.3 Wood Pegs.** Softwood, sufficient size and length to anchor sod on slope.

**9.4 Herbicide.** As recommended by sod installer and approved by Owner's Representative.

**10.0 Harvesting Sod.** Machine cut sod and load on pallets in accordance with TPI standards. Cut sod in area not exceeding one sq.yd., with minimum ½ inch and maximum 1-inch topsoil base.

## **11.0 Source Quality Control.**

**11.1** Analyze to ascertain percentage of nitrogen, phosphorus, potash, soluble salt content, organic matter content, and pH value.

**11.2** Provide recommendation for fertilizer and lime application rates for specified sod grass species.

**12.0 Preparation of subsoil.** Turf areas shall be tilled to a minimum depth of 6 inches. 4 inches of topsoil, per Sec. 804, shall be spread evenly over all areas to receive sod.

## **13.0 Fertilizing.**

**13.1** Prepare the sod bed by uniformly applying 12 pounds of 12N-12P-12K slow release fertilizer per 1,000 square feet of turf grass area to be planted. The fertilizer shall be thoroughly incorporated into the top six inches of soil with a mechanical tiller, or other approved method. Sod bed shall be in a firm, but uncompacted condition with a firm texture prior to laying of sod.

**13.2** Apply fertilizer after smooth raking of topsoil and prior to installation of sod.

**13.3** Apply fertilizer no more than 48 hours before laying sod.

**13.3** Lightly water soil to aid dissipation of fertilizer.

## **14.0 Laying Sod.**

**14.1** Sod areas indicated on drawings, or as defined in related specifications sections.

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**14.2** The sodding operation shall not commence until site conditions are satisfactory. Sodding shall not be done when the ground is excessively wet, frozen, or untillable.

**14.3** All areas to be sodded shall be fine graded before sodding and be free of deleterious materials, including weeds, existing grasses, tree branches, stones greater than one-inch diameter, concentrations of crushed rock, mortar and other debris. Grades for the flow lines of swales and ditches, shall be carefully established. Sod shall be placed so that it is level and even with the thatch surface of the sod.

**14.4** Sod shall be installed in tightly abutted parallel rows with the lateral joints staggered at a minimum distance equal to the width of the sod slab. Voids between sod strips will not be accepted. Any netting used to hold the sod in place during transportation shall be removed before laid.

**14.5** For sloping surfaces, sod shall be laid beginning at the base of the slope, with staggered joints and at right angles to the flow of water. Sod placed on 3:1 slopes or steeper, and in ditch flow lines, shall be staked with 6 stakes per square yard or roll of sod. Stakes shall be wood, ½" by 1" by 12" and shall be driven into the ground, leaving approximately ½" of the top above the sod line. Stakes should be set sufficiently in the ground to permit mowing.

**14.6** The sod shall be watered immediately after installation. Prevent sod from drying during progress of work. After sodding is completed in any one section, the entire area shall be thoroughly irrigated to at least one-inch depth below the new sod pad. Subsequent watering should maintain moisture to a depth of at least 4 inches.

**14.7** All sodded areas should be staked.

## **15.0 Maintenance.**

**15.1** Maintenance shall begin immediately after planting. The sod shall be protected and maintained by watering, mowing, fertilizing and replanting for as long as it is necessary to establish a uniform stand of grass. Any sod not surviving prior to its first mowing shall be replaced with new sod from the same source. Mowing of the sod will be the responsibility of the Contractor until final acceptance by the Owner.

**15.2** Mow grass at regular intervals to maintain at maximum height of 2-1/2 inches. Do not cut more than 1/3 of grass blade at each mowing.

**15.3** The maintenance of the sodded turf area shall be the Contractor's responsibility until final acceptance by the Owner.

**15.4** Immediately replace sod on areas showing deterioration or bare spots.

**15.5** Protect sodded areas with warning signs during maintenance period.

## **16.0 Inspections.**

**16.1** The Contractor shall notify the Owner's Representative for final inspection. The request shall be in written form and received at least ten (10) calendar days before the anticipated date of inspection.

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**16.2** Based on the sole judgment of the Owner's Representative, he shall certify in writing as to the satisfaction and substantial completion of the project.

**17.0 Method of Measurement.** Measurement shall be made in accordance with Sec 803.

**18.0 Basis of Payment.**

**18.1** Basis of payment: Payment for the accepted quantity of sod will be made in accordance with the contract unit bid price for the item listed below and includes all labor, materials, incidental items, equipment, accessories and supervision required to design, prepare shop drawings, manufacture, fabricate, furnish and install.

**18.2** No direct payment will be made for topsoil to be installed as part of the sod. Topsoil shall be considered incidental to the contract.

Item No.	Unit	Description
803-10.00A	SQYD	Turf Type Tall Fescue Sodding

L-K. Landscape Planting – Job J6S1718B Only

**1.0 Description.** Landscape plantings will be installed in compliance with Section 808. This section describes further requirements associated with landscape development including trees, shrubs and grass plants, and hardwood mulch.

**2.0 References.**

**2.1 American National Standards Institute.**

**2.1.1** ANSI A300 - Tree Care Operations - Tree, Shrub and Other Woody Plant Maintenance - Standard Practices. (Most current versions)

**2.1.2** ANSI Z60.1 - Nursery Stock. (2004)

**3.0 Definitions.**

**3.1 Weeds.** Include Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, Brome Grass and any plant life not specified.

**3.2 Plants.** Living trees, plants, and ground cover specified in this Section, and described in ANSI Z60.1.

**4.0 Quality Assurance.**

**4.1 Tree Pruning.** ANSI A300 Pruning Standards for Woody Plants.

**5.0 Qualifications.**

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**5.1 Nursery.** Company specializing in growing and cultivating plants with three years' documented experience.

**5.2 Installer.** Company specializing in installing and planting plants with five years' documented experience.

## **6.0 Schedule.**

**6.1** Tree, Shrub and Ground Cover Plantings will only be planted in planting season listed below. Contractor should schedule other work to meet these time frames.

**6.1.1 Spring.** March 1 until April 30

**6.1.2 Fall.** September 15 until November 30.

**6.2** Planting season for Native Grass Plugs and Perennial/Native Grass Quart Container shall be from March 1 to March 31.

**6.3** Planting season for Sod is from March 15 to May 31 and from September 1 to October 31.

**6.4** Notify Engineer a minimum of 48 hours prior to installing phases of the work for in field plant placement verification for no more than a total of two such meetings. Some minor location adjustment may occur.

## **7.0 Delivery, Storage, and Handling.**

**7.1** Handle plants from bottom of ball. Protect plant roots and tops from sun or drying winds until final planting. Plants with cracked, broken or loosely wrapped balls will be rejected.

**7.2** Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

**7.3** Deliver and install plant life materials within a 72-hour period. Keep plant containers and root balls moist throughout planting process. Proof of moisture must be found within top two inches of soil.

**7.4** Plant material damaged as a result of delivery, storage or handling will be rejected and replaced at no cost to the project.

**7.5** Spray deciduous plants in foliage with an anti-desiccant immediately after digging to prevent dehydration. Dig, pack, transport and handle plants with care to ensure protection against injury. Protect all plants from drying out. If plants cannot be planted immediately upon delivery, properly protect them with soil, wet peat moss, or in a manner acceptable to the Engineer. Water heeled-in plantings daily. Only use anti-desiccant if forecast during planting and for two (2) weeks afterward is for temperatures over 80 degrees Fahrenheit.

**7.6** Cover plants transported on open vehicles with a protective covering to prevent wind burn.

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**8.0 Environmental Requirements.** Do not install plant life when ambient temperatures may drop below 35 degrees F or rise above 90 degrees F for greater than 24 hours. Do not install plant life when wind velocity exceeds 30 mph.

## **9.0 Trees, Plants, and Ground Cover.**

### **9.1 Planting Stock.**

**9.1.1 Species.** In accordance with Standardized Plant Names, official code of American Joint Committee on Horticulture Nomenclature.

**9.1.2 Plants.** No. 1 Grade conforming to "American Standard for Nursery Stock" of American Association of Nurserymen (AAN); well-branched, vigorous and balanced root and top growth; free from disease, injurious insects, mechanical wounds, broken branches, decay and other defects.

**9.1.3 Trees.** Furnish with reasonably straight trunks, free of disease and pest damage with well-balanced tops, and single leader. No trees with co-dominant leaders will be accepted.

## **9.2 Trees, Plants, and Ground Cover.**

**9.2.1** Species and size identifiable in plant schedule, grown in climatic conditions similar to those in locality of the Work. Species with a "Y" shaped trunk or no main leader may be rejected if this is not true to species.

## **10.0 Mulch Materials.**

**10.1 Hardwood Bark Mulch Material.** Composted, shredded hardwood bark, dark brown in color, free of weeds and other organic matter and matter detrimental to plant life.

**10.2** Filter Fabric (placed under gravel mulch) shall be a nonwoven needlepunched geotextile made of 100% polypropylene staple filament, made drainage and separation applications.

**10.2.1 Weight.** 7.0 oz./SY

**10.2.2 Tensile Strength.** 180LBs. (ASTM D-4632)

**10.2.3 Permittivity.** 1.0 Sec-1

**11.0 Erosion Control Blanket.** Erosion Control Blanket; Double Net Coconut Blanket - 100% coconut fiber matrix stitched with biodegradable thread between natural jute netting, meeting the following criteria:

**11.0.1 Top Netting.** 100% biodegradable leno woven natural jute top netting (approximate weight: 9.3 lbs. per 1000 sq. ft.).

**11.0.2 Matrix Material.** 100% coconut fiber (0.50 lbs per SY)

**11.0.2 Bottom Netting.** 100% biodegradable natural jute fiber (approximate weight: 7.7 lbs. per 1000 sq. ft.)

**11.0.3 Stitching** Biodegradable thread on 1.5” centers

**11.0.4 Standard Roll.** Width = 6.67’; Length = 108’; Weight = 52 lbs.; Area = 80 SY

**12.0 Filter Fabric.** Filter fabric shall be a Nonwoven geotextile fabric that complies with Section 1011, for use as a Separation Geotextile - meeting AASHTO Class 1 criteria.

**13.0 Accessories.** 20-Gallon Slow Release Tree Water Bag – submit manufactures information for approval.

**14.0 Fertilizers.**

**14.1** Fertilizer for Sod establishment areas is described under JSP K Soil Preparation.

**14.2** Fertilizer for Trees and Shrubs plantings shall be a slow release fertilizer spike (in the range of 15-10-9) specially formulated for use on newly planted trees and shrubs. Spikes shall be used per manufactures recommendations and set just beyond the circumference of the root ball and never closer than 24” to the trunk.

**15.0 Soil Materials.**

**15.1 Topsoil.**

**15.1.1** For landscape planting beds and all other areas, topsoil to be provided and installed by Contractor.

**15.1.2** Topsoil shall be friable, free of weeds and other materials deleterious to plant growth and rocks larger than ½ inch diameter. If indicated by soil tests, supplement on-site topsoil with compost as specified.

**15.1.3** Acceptable sources for imported topsoil include, but are not limited to, the following:

**15.1.3.1** Fick Supply Company, Wildwood, MO 636-532-4978

**15.1.3.2** Kirkwood Material Supply, Kirkwood, MO 314-822-9644

**15.1.3.3** Brentwood Material Company, St. Louis, MO 314-968-0184

**15.1.4** Topsoil shall be medium textured soil with the following neutral to medium acid pH ranges:

**15.1.4.1** Topsoil for planting beds – 6.0 to 7.5 pH

**15.1.5** Add pH modifiers to topsoil as required to meet the above pH ranges based on soil test results.

**15.1.6** Amending on-site soil with soil amendment materials to produce an acceptable soil media is an acceptable option to importing topsoil, providing above criteria is met.

**15.2 Peat Moss.** Shredded, loose, sphagnum moss; free of lumps, roots, inorganic material or acidic materials; minimum of 85 percent organic material measured by oven dry weight, pH range of 4 to 5; moisture content of 30 percent.

### **15.3 Plant Soil Mix.**

**15.3.1 Planting Beds.** 25% Peat Moss and 75% Topsoil

**15.3.2 Tree Pits.** 50% Existing Soil and 50% Topsoil

### **16.0 Examination.**

**16.1** Verify the location of all utilities prior to beginning work to avoid conflicts during digging.

**16.2** Verify that a required water source is available, in proper location, and ready for use. Verify the location of all utilities to avoid conflict during digging.

**17.0 Planting.** Excavate planting pit as shown on the drawings. Set plants vertical, where possible. Remove non-biodegradable root containers. Set plants in pits or beds, partly filled with prepared plant mix, at minimum depth as indicated on Drawings under each plant. Backfill and compact soil in shallow lifts. Saturate soil with water when pit or bed is half full of soil and again when full. Soil should be brought to grades shown on drawings. Install Fertilizer spikes around planting.

### **18.0 Installation of Accessories.**

**18.1** Wrap deciduous shade and flowering tree trunks and place guying system. Maintain guys throughout planting process.

**18.2** Install one 20-Gallon Slow Release Tree Water Bag per tree planting.

**19.0 Tree Pruning.** When pruning of newly installed trees is required, lightly prune trees in accordance with ANSI A300 Maintenance Pruning Type: Crown Cleaning. Refer to Section 01450 for pruning of existing trees.

**20.0 Field Quality Control.** Plants will be rejected when ball of earth surrounding roots has been disturbed or damaged prior to or during planting.

### **21.0 Contractor Care of Plants.**

**21.1** Per paragraph 808.4.1, the Contractor is responsible for the proper care of all plants until Final Inspection and Acceptance.

**21.2** This JSP defines the Contractors responsibilities in the "proper care" of all plants (from date of planting until the following August 31st date) as being:

**21.2.1** Straighten trees to plumb and re-guy as required.

**21.2.2** Water Trees by filling the Tree Water Bags at least:

**21.2.2.1** Once a week during May and September.

**21.2.2.2** Twice a week during June, July and August.

**21.2.3 Water Sod Areas at least:**

**21.2.3.1** Weekly to provide a minimum ½“ water per week during May and September.

**21.2.3.2** 2 times a week providing a min. ½“ water per watering during June, July & August.

**21.2.4** Contractor will coordinate their responsible care of plants with the project owner’s maintenance, that will include mowing of the sodded lawn areas.

**22.0 Plant Material Warranty.** Contractor to furnish 12-month warranty after Final Inspection and Acceptance for all landscape plantings including trees, shrubs, grass plugs, perennial and groundcover. If dormancy of plants requires verification of viability during the next growing season, the Warranty Period for those plants will commence following such verification. For any delay in completion of planting operations that extends the planting into more than one planting season, the Warranty Period shall begin whenever Substantial Completion Acceptance is granted. Any plants that are 25 percent or more dead shall be considered dead and shall be replaced at no charge. A tree shall be considered dead when the main leader has died back or 25 percent or more of the crown is dead. Contractor shall not be held responsible for failures due to neglect by Engineer, vandalism, or other actions beyond the Contractor’s control, during Warranty Period. Report such occurrences to Owner in writing within 10 calendar days of observation.

**23.0 Method of Measurement.** This item will not be measured for payment.

**24.0 Basis of Payment.** The accepted quantity of plants shall be paid for at the contract unit prices for the items listed below and shall include all necessary equipment, materials and labor necessary for compliance with these provisions.

Item No.	Unit	Description
804-10.00	CY	Topsoil
808-99.02	Each	Silver Linden
808-02.03	Each	River Birch
808-03.03	Each	Eastern Redbud
808-01.07	Each	Skyline Honey-Locust
808-99.02	Each	Kousa Dogwood
808-99.02	Each	Grey Owl Juniper
808-05.20	Each	Gro-Low Sumac
808-05.04	Each	New Jersey Tea
808-99.02	Each	Yellow Twig Dogwood
808-99.02	Each	Blue Grama ‘Blond Ambition’
808-99.02	Each	Feather Reed Grass
808-99.02	Each	Little Bluestem
808-99.02	Each	Prairie Dropseed
808-99.02	Each	Heath Aster
808-99.02	Each	Threadleaf Coreopsis
808-99.02	Each	Woodland Phlox
808-99.02	Each	Black-Eyed Susan

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L-L. Ornamental Fencing

**1.0 Description.** This work shall consist of furnishing and erecting ornamental fencing as shown on the plans or as directed by the engineer. Work shall include all tools, equipment, and labor necessary for installation.

**2.0 Construction Requirements.**

**2.1 Materials.** All material shall be in accordance with Sec 1043 Fence Material. Contractor shall submit detail drawing of each type of product including over dimensions and options.

**2.1.1 Ornamental Fence.** Shall be 48" high fence.

**2.1.1.1** Steel for fence assembly components shall conform to ASTM A653/A653M, with a minimum yield strength of 45,000 psi. All steel shall be hot-dip galvanized and powder coated finish. Color to be black.

**2.1.1.2** Steel material for pickets shall be 5/8" square, 18 gauge. All rails shall be steel channel 1 1/4"x 15/16", 14 gauge. All posts shall be 2" square, 16 gauge.

**2.1.2 Barrier Wall Fence.** Shall be 1'-6" high bridge fence.

**2.1.2.1** Steel for fence assembly components shall conform to ASTM A653/A653M, with a minimum yield strength of 45,000 psi. All steel shall be hot-dip galvanized and powder coated finish. Color to be black.

**2.1.2.2** Steel material for pickets shall be 1" square, 18 gauge. All rails shall be steel channel 1 3/8" x 1 1/2", "U" Channels, 14 gauge. All posts shall be 2" square, 16 gauge. Pickets should be inserted in the holes in the rails, pre-punched prior to installation.

**2.1.2.3 Mounting.** Mounting methods will be as shown on drawings.

**2.2 Delivery.** Products should be delivered to the project site in manufacturer's original, unopened containers and packaging, and the packages are to be examined upon delivery to ensure all products are complete and undamaged.

**2.3 Storage and Handling.** Store products in a protected, dry area in manufacturer's unopened containers and packaging. Care shall be taken to protect product's finish from damage during handling, staging, and installation.

**2.4 Coordination.** Coordinate with bridge work and site work to insure proper installation. Field verification of fence dimensions shall be conducted prior to fencing installation.

**2.5 Fence Installation.**

**2.5.1** Proceed with installation only after any unsatisfactory conditions have been corrected. Comply with manufacturer's installation instructions unless more stringent requirements are instructed by the engineer.

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**2.5.2** All fencing shall be installed level, plumb, true, and securely mounted as indicated on Drawings. All posts and pickets shall be installed plumb and vertical.

**3.0 Method of Measurement.** Measurement shall be made in accordance with Sec 607.10.4.

**3.1** Acceptance for ornamental fencing installation shall be given by the engineer, upon satisfactory completion of each section or area indicated on the drawings or as otherwise specified.

**4.0 Basis of Payment.** Payment for the accepted quantity of ornamental fencing will be made in accordance with the contract unit bid prices for the items listed below and includes all labor, equipment, materials, and time required to comply with this provision.

Item No.	Unit	Description
607-99.03	Linear Foot	48" Decorative Pedestrian Fence (Structures)
607-99.03	Linear Foot	18" Decorative Pedestrian Fence (Structures)

L-M. Site Furnishings – Job J6S1718B and J6S1718C Only

**1.0 Description.** Contractor shall coordinate installation of site furnishings selected by the City of Brentwood. All locations for site furnishings shall be approved by the engineer prior to installation. Work shall include all tools, equipment, and labor necessary for installation.

**2.0 Construction Requirements.**

**2.1 Materials.** All material shall be in accordance with Division 1000, Material Details, and manufacturer’s requirements. Contractor shall furnish the engineer with detail drawings of each type of product including overall dimensions and options as well as all maintenance manuals for all site furnishings.

**2.2 Benches.** Benches shall have cast aluminum legs and steel supports and shall be powder coated, textured black. The bench should be a minimum of 72” in length with the seat approximately 17” to 18” above finished grade and shall have the capacity to support a minimum of 200 lbs./linear foot. Benches shall be surface mounted and have a minimum of 0.40” pre-drilled holes to receive anchor bolts. Bench slats shall be of recycled plastic and a cedar color.

**2.3 Waste/Recycling Receptacles.** Receptacles shall be manufactured of steel panels, which are galvanized finished and powder coated black, and shall include an option for use of a City logo on the receptacles. The receptacles should be a minimum of 47” high x 40” wide x 30” depth. Two reusable plastic liners for an overall capacity of 70 gallons for waste and recycling material shall be furnished. Receptacles are to be surface mounted per manufacturer’s guidelines.

**2.4 Banner Pole.** Banner poles shall be 14’-0” aluminum sign posts with a black, power coat finish. Install banner pole level, plumb, true, and securely anchored at locations indicated on shop drawings. Poles shall be mounted to the footing per pole manufacturer’s guidelines. Footing shall be constructed as detailed in the Bridge Drawings, Pedestrian Underpass on Sheet 8 of 13. Payment for the structural footing shall be considered incidental to and included in the Banner Pole pay item listed below.

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**2.5 Street Sign Poles.** Street sign poles shall be the diameter, height and type detailed on the project signing plans with a black, power coat finish. Poles shall be mounted on a footing as outlined in Section 903. Sign footings shall be paid for separately.

**2.6 Regulatory and Warning Sign Poles.** Regulatory and warning sign poles shall be the diameter, height and type detailed on the project signing plans with a black, power coat finish. Poles shall be mounted on a footing as outlined in Section 903. Sign footings shall be paid for separately.

**2.7 Black Vinyl Sign Wrap.** Regulatory and warning sign backing shall be 3M black vinyl film or approved equal, to be applied per manufacturer specifications to rear surface.

**2.8 Black Vinyl Sign Wrap, Signal Signs.** Signal signs installed at the Hanley/Manchester Road intersection traffic signal on the mast arms or signal poles shall have 3M black vinyl film or approved equal applied to the back of the sign, to be applied per manufacturer specifications to rear surface.

**2.9 Delivery, Storage and Handling.** Products shall be delivered to site in manufacturer's original, unopened containers and packaging. Upon delivery, packages shall be examined to ensure all products are complete and undamaged. Products shall be stored in a protected, dry area in manufacturer's unopened containers and packaging. The contractor shall take care to protect product's finish from damage during handling and installation.

**3.0 Method of Measurement.** Benches, Waste Receptacles, Banner Poles, Street Sign Enhancements and Regulatory and Warning Sign Enhancements shall be installed in accordance with the manufacturer's recommendations. For the basis of this contract, the benches, waste receptacles, and banner poles, including the footing and any hardware required for its assembly, shall be considered as a single unit at each installation location. Measurement will be made for each fully completed assembly.

**4.0 Basis of Payment.** Payment for the accepted quantity of site furnishings will be made in accordance with the contract unit bid prices for the items listed below and includes all labor, equipment, materials, and time required to comply with this provision.

Item No.	Unit	Description
608-99.02	Each	Bench
608-99.02	Each	Waste/Recycling Receptacle
608-99.02	Each	Banner Pole
608-99.02	Each	Street Sign Poles, Powdercoated
608-99.02	Each	Warning and Regulatory Sign Poles, Powdercoated
903-99.04	Square feet	Black Vinyl Sign Wrap
903-99.04	Square feet	Black Vinyl Sign Wrap, Signal Signs

L-N. Decorative Concrete Paving (Route 100 Mainline)

**1.0 Description.** The contractor shall install stamped, colored decorative concrete paving at the locations along mainline Route 100 as depicted in the contract plans.

## **2.0 Construction Requirements.**

**2.1 Materials.** All material shall be in accordance with Sec 608.2. The contractor shall provide all material certifications for concrete coloring pigment, including manufacturer technical and safety data for each product. The contractor shall also supply samples of all concrete color and texture for prior review and approval by the engineer prior to construction of the mockup.

**2.1.1 Color Pigment.** Color pigment shall be added to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup. Color shall be Soloman Color 775 Sedona, as manufactured by Soloman Colors, or approved equal.

**2.1.2 Stamped Concrete Pattern.** Pattern used shall be Bomanite Pattern: Granite Setts or approved equal. Polyethylene/plastic sheeting used in the stamping process shall be of sufficient thickness to adequately transfer the design while resisting tearing or breakage.

**2.2 Mockup.** A mockup or test patch of the decorative concrete shall be constructed by the contractor to demonstrate aesthetic effects and set quality standards for materials and execution. The location of the mockup shall be approved by the engineer and shall be of sufficient size for review and approval with the minimum acceptable size being 5'x5' square.

**2.3 Subgrade and Baserock.** Subgrade preparation shall be in accordance with Sec 209. Baserock material shall be Type 5 Aggregate Base in accordance with Sec 304 and shall be of the thickness identified in the contract plans. All deficient areas of subgrade and baserock shall be corrected prior to placement of the decorative concrete paving. No direct payment will be made for preparation of the subgrade or for Type 5 Aggregate Base.

**2.4 Joints.** Joints and saw cuts shall be placed in a manner similar to the adjacent concrete sidewalk. Joint filler material shall be in accordance with Sec 1057.

## **2.5 Concrete Protection and Curing.**

**2.5.1 Curing Compound.** Curing compound shall be a clear compound in accordance with Sec 1055 that will not react with or otherwise change the color of the concrete pigment.

**2.5.2 Protection.** The contractor shall take care to not damage the decorative concrete paving once it has been placed. Traffic shall be excluded for a minimum of 14 days after placement. When construction traffic is permitted, maintain decorative concrete pavement as clean as possible by removing surface stains and spillage of materials as they occur, and maintain free of stains, discoloration, dirt, and other foreign material. The contractor shall replace any damaged sections of decorative concrete pavement at their cost.

**3.0 Method of Measurement.** Measurement shall be made in accordance with Sec 608.4 to the nearest 1/10 square yard.

**4.0 Basis of Payment.** Approved locations of decorative concrete paving shall be paid for at the contract unit price for the item listed below and shall include all necessary equipment, materials and labor necessary for compliance with these provisions.

Item No.	Unit	Description
608-99.05	SQYD	Decorative Concrete Paving

L-O. Sodding (Route 100 Mainline)

**1.0 Description.** The contractor shall perform finish grading and preparation of areas along mainline Route 100 as shown on the plans to be seeded and sodded. Upon completion of grading work, the contractor shall place seeding and sodding at the locations identified on the contract plans. Work shall include all tools, equipment, and labor necessary for the placing and finishing of seed and sod.

**2.0 Construction Requirements.**

**2.1 Materials.** All materials shall be in accordance with Sec 803 and Sec 805. The contractor shall submit product data for each type of product, to include a certification for each mixture for turfgrass sod and grass seed.

**2.1.1 Turfgrass Sod.** The contractor shall furnish viable sod of uniform density, color, and texture that is strongly rooted and capable of vigorous growth and development when planted.

**2.1.1.1 Sod Species.** Sod shall be rated for sun and partial shade and proportioned by weight as follows: 20 percent Kentucky bluegrass (*Poa pratensis*) and 80 percent Jaguar turf type fescue (*Festuca arundinacea* 'Jaguar').

**2.1.2 Fertilizers.** Fertilizer shall be commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition: 1 lb/1000 sq. ft. of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.

**2.1.2.2 Slow-Release Fertilizer.** Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.

**2.1.4 Straw Mulch.** Mulching of all seeded areas shall be in accordance with Sec 802.

**2.3 Delivery, Storage and Handling.**

**2.3.1 Sod.** Harvest, deliver, store, and handle sod according to requirements in "Specifications for Turfgrass Sod Materials" and "Specifications for Turfgrass Sod Transplanting and Installation" sections in Turfgrass Producers International (TPI) "Guideline Specifications to Turfgrass Sodding." Deliver sod within 24 hours of harvesting and in time for planting promptly. Protect sod from breakage and drying.

**2.4 Turf Area Preparation.** Preparation of planting area for soil placement shall be in accordance with Sec 801 and planting soil mix shall be in accordance with the "Planting Soil, Fertilizer, and Landscaping Mulch" JSP. The engineer shall accept all area of finish grading prior to planting.

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**2.4.1** Prepared area should be moistened before planting if soil is dry. The area should be watered thoroughly and the surface allowed to dry before planting, taking care to not create muddy soil.

**2.5 Sodding.** Sod shall be place in accordance with Sec 803.3. Sod shall not be placed if dormant or if ground is frozen or muddy.

**2.6 Turf Maintenance.** Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. Roll, regrade, and replant bare or eroded areas and re-mulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.

**2.6.1** Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than one-third of grass height. Remove no more than one-third of grass-leaf growth in initial or subsequent mowings.

**3.0 Method of Measurement.** Measurement shall be made in accordance with Sec 803.5 and Sec 805.7.

**3.1** Acceptance sodding installation shall be in accordance with Sec 803.4 and Sec 805.4. Acceptance shall be given by the engineer, upon satisfactory completion of each section or area indicated on the drawings or as otherwise specified.

**4.0 Basis of Payment.** Sodding shall be paid for at the contract unit prices for the items listed below and shall include all necessary equipment, materials and labor necessary for compliance with these provisions.

Item No.	Unit	Description
803-99.05A	SQYD	Sodding

L-P. Planting Soil, Fertilizer, and Landscaping Mulch (Route 100 Mainline)

**1.0 Description.** The contractor shall perform finish grading and preparation of areas along mainline Route 100 as shown on plans, for curbed planting beds, tree pits with grates, and open tree wells. Work shall include all tools, equipment, and labor necessary for the mixing, placing, finish grading and compacting of Topsoil and Planting Soil Mix.

**2.0 Construction Requirements.**

**2.1 Materials.** All material shall be in accordance with Sec 804. The contractor shall submit one (1/2) c.f. sample of approved topsoil mix and planting soil mix for testing.

**2.1.1 Planting Soil Mix.**

**2.1.1.1** Planting Soil Mix shall conform to the following mix requirements: Three (3) parts approved topsoil, one (1) part natural organic matter, and one (1) part sand as described below.

**2.1.2 Topsoil.**

**2.1.2.1** Topsoil is preferred to be from off-site sources and shall conform to the following requirements:

**2.1.2.1.1** Fertile, friable, natural loam, surface soil, reasonably free of subsoil, clay clumps, brush weeds and other litter, and free of roots, stumps, stone larger than 1 inch in any dimension, and other extraneous or toxic matter harmful to plant growth.

**2.1.2.1.2** Approved topsoil must contain at least 2% natural organic matter by weight, when dried and tested in accordance with current methods of the Association of Official Agricultural Chemists.

**2.1.2.1.3** Soil acidity range shall be between pH 6.0 – 7.0 inclusive.

**2.1.2.1.4** Soil fertility shall be rated high in natural nutrients based on the coordinated ratings in pounds per acre as established by the Natural Soil and Fertilizer Research Committee.

**2.1.2.2 Natural Organic Matter.**

**2.1.2.2.1 Peat Moss.** Shall be Type 1 sphagnum peat moss; finely divided with a pH of 3.1 – 5.0.

**2.1.2.2.2 Sedge Peat.** Shall be pulverized, decomposed type of peat with pH reading of 4.5 or higher, water absorbing capacity of 1100-2000%, and a moisture content approximately 30%. There should be approximately 4 cubic feet or 6 bushels per 100 pounds of peat.

**2.1.2.2.3 Leaf Mold.** Shall be thoroughly shredded, well-composted leaf material, free of trash.

**2.1.2.2.4 Pine Bark.** Shall be potting grade pine bark with no particle size larger than ½ inch and less than 10% wood fiber.

**2.1.2.3 Sand.** Sand shall be fine, clean masonry sand.

**2.2 Fertilizer.**

**2.2.1 Planting Tablets.** Tightly compressed chip-type, long-lasting, slow-release, commercial-grade planting fertilizer in tablet form. Tablets shall break down with soil bacteria, converting nutrients into a form that can be absorbed by plant roots. Tablets size shall be 10-grams with a nutrient composition of 20% nitrogen, 10% phosphorous, and 5% potassium by weight, plus micronutrients. Fertilizer shall be added as an incidental item to the planting soil mix as needed to achieve soil fertility.

**2.3 Planting Area Mulch.** Shall be natural color organic mulch consisting of shredded hardwood. Mulch shall range between 3 inches maximum to ½ inch minimum size and shall be placed as shown on the plans.

**2.4 Placement.**

**2.4.1** After excavation and filling topsoil to the sub-grade is completed and approved, the contractor shall place approved topsoil and planting soil mix to a minimum compacted depth as follows:

**2.4.1.1** Groundcover, Grass and Shrub Planting Beds shall receive planting soil unit as per planting details and specifications.

**2.4.1.2** Individual Shrubs and Canopy and Flowering Trees shall receive planting soil mix as per planting details and planting specifications.

**2.4.2** Use approved topsoil and planting soil mix in relatively dry state, and place during dry weather. Approved topsoil or planting soil mix shall not be placed while in a frozen or muddy condition, when the subgrade is excessively wet, or in a condition that may otherwise be detrimental to proper grading or proposed sodding or seeding.

**2.4.3** The approved topsoil and amended soil mix shall be loosely placed in horizontal layers so that the successive lifts will blend together. The maximum thickness per lift of compacted fill shall not exceed six (6) inches.

**2.5 Planting Area Mulching.**

**2.3.1** Install weed-control barriers before mulching according to manufacturer's written instructions. Mulch backfilled surfaces of planting areas and other areas indicated. Completely cover area to be mulched, overlapping edges a minimum of 6 inches and secure seams with galvanized pins.

**2.3.2 Trees in Turf Areas.** Apply organic mulch ring of 3-inch average thickness, with 36-inch radius around trunks or stems. Do not place mulch within 6-inches of trunks or stems.

**2.3.3 Mulch in Planting Areas.** Apply 3-inch average thickness of organic mulch over whole surface of planting area, and finish level with adjacent finish grades. Do not place mulch within 3-inches of trunks or stems. Mulch shall be incidental to the planting.

**2.4 Clean-Up.** After the approved topsoil and planting soil mix has been spread and the final grades approved, it shall be cleared of all grade stakes, surface trash and other objects that would hinder maintenance. Paved areas over which hauling operations are conducted shall be kept clean, and any soil that is spilled upon the surface shall be promptly removed.

**2.4.1** The wheels of all vehicles shall be kept clean to avoid tracking soil on the surfacing of roads, walks or other paved areas.

**3.0 Method of Measurement.** Measurement shall be made in accordance with Sec 801, 802.4 and 804.4.

**3.1** Acceptance for Planting Soil installation shall be given by the engineer, upon satisfactory completion of each section or area indicated on the drawings or as otherwise specified.

**4.0 Basis of Payment.** Approved planting soil mixes, fertilizer and landscaping mulch shall be paid for at the contract unit prices for the items listed below and shall include all necessary equipment, materials and labor necessary for compliance with these provisions.

Item No.	Unit	Description
804-99.07A	CUYD	Planting Soil Mix

L-Q. Landscape Plants (Route 100 Mainline)

**1.0 Description.** The contractor shall furnish and install landscape edgings and plants at the locations along mainline Route 100 depicted in the contract plans. Work shall include all tools, equipment, and labor necessary for the installation of trees, shrubs, plants, and steel edging.

**2.0 Construction Requirements.**

**2.1 Materials.** All material shall be in accordance with Sec 808. The contractor shall submit product data for each type of product, and include a list of plant material sources.

**2.1.1 Landscape Plants.** Landscape plants furnished shall be in accordance with Sec 808.2.1.

**2.1.2 Landscape Edging.** Landscape edging shall be standard commercial-steel edging, fabricated in sections of standard lengths, with loops stamped from or welded to face of sections to receive stakes. The size shall be 3/16-inch-thick x 5 1/2" inches deep, and the finish shall be manufacturer's standard paint.

**2.2 Planting Area Establishment.** The planting area for soil placement and mix planting soil shall be prepared according to Section 804 for Planting Soil, with manufactured planting soil placed over exposed subgrade.

**2.3 Excavation.** Planting pits shall be excavated with sides sloping inward at a 45-degree angle, and the sides of the planting pit should be scarified if smeared or smoothed during excavation. Excavations with vertical sides will not be acceptable. The perimeter of bottom shall be trimmed, leaving center area of bottom raised slightly to support root ball and assist in drainage away from center. The base should not be further disturbed. The root ball should sit on undisturbed base soil to prevent settling.

**2.3.1 Planting Pits and Trenches** shall be excavated to the dimensions as shown on the drawings. Excavations shall be approximately three times as wide as the ball diameter but should not be deeper than the depth of the root ball, measured from the root flare to the bottom of the root ball. Excavations shall be at least 12 inches wider than root spread and deep enough to accommodate vertical roots for bare-root stock. Excavations shall be approximately three times as wide as the ball diameter.

**2.4 Tree and Shrub Planting.**

**2.4.1 Roots.** At time of planting, the root flare shall be visible at top of root ball in accordance with ANSI Z60.1. If root flare is not visible, soil shall be removed in a level manner from the root ball to where the top-most root emerges from the trunk. After soil removal to expose the root flare, the root ball shall still meet size requirements. Stem girdling roots and kinked roots shall be removed prior to planting. Any injured roots are to be removed by cutting cleanly, and are not to be broken. After root pruning, the plant shall be set plumb and in center of planting pit or trench with root flare even with adjacent finish grades and backfilled with planting soil mix. Trees shall be backfilled with excavated soil.

**2.4.2. Balled and Burlapped Stock.** Once some backfill has been placed around root ball to stabilize plant, the burlap, rope, and wire baskets can be cut from tops of root balls and from sides and carefully removed, but should not be removed from under root balls. Planting stock shall not be used if root ball is cracked or broken before or during planting operation.

**2.4.3 Container Grown Stock.** Root balls shall carefully be removed from the container without damaging root ball or plant. Backfill shall be placed around the root ball in layers and tamped. When the planting pit is approximately one-half filled, the pit shall be watered thoroughly and planting tablets may be added. They should be equally distributed around the planting pit and placed about one inch from root tips. Tablets shall not be placed in the bottom of the hole. Upon placement of planting tablets, the backfilling process may be completed.

**2.4.4** All trees and shrubs shall be thoroughly watered after planting is complete.

**2.4.4 Slopes.** When planting on slopes, the plant shall be set so the root flare on the uphill side is flush with the surrounding soil on the slope; the edge of the root ball on the downhill side will be above the surrounding soil. Enough soil shall be applied to cover the downhill side of the root ball.

**2.5 Tree and Shrub Pruning.** Pruning may be performed to remove only injured, dying, or dead branches from trees and shrubs. Tree leaders shall not be cut. Pruning shall be performed in accordance with standard professional horticultural and arboricultural practices and shall retain the natural character of the plant. Pruning shall not be performed for shape. Pruning paint shall not be applied to any wounds.

**2.6 Ground Cover and Plant Planting.** Plants other than trees and shrubs shall be laid out in even rows with triangular spacing as indicated in the contract plans. Holes shall be dug large enough to allow spreading of roots and planting soil shall be used as backfill, with a slight saucer indentation left around plants to hold water. All plants shall be thoroughly watered upon completion of planting. Care shall be taken to not cover plant crowns with wet soil. Plants shall also be protected from hot sun and wind; however, any such protection shall be removed if plants show evidence of recovery from transplanting shock.

## **2.7 Edging Installation.**

**2.7.1 Steel Edging.** Steel edging shall be installed according to manufacturer's written instructions, and anchored with steel stakes spaced approximately 30 inches apart, driven below top elevation of edging.

**2.7.2 Shovel-Cut Edging.** Mulched areas shall be separated from turf areas, curbs, and paving with a 45-degree, 4- to 6-inch deep, shovel-cut edge as indicated on contract plans.

**2.8 Plant Maintenance.** The contractor shall be responsible for care and maintenance of all plantings in accordance with Sec 808.4.

**3.0 Method of Measurement.** This item will not be measured for payment.

**3.1** Acceptance for landscape plant installation shall be in accordance with Sec 808.4.3. Acceptance shall be given by the engineer, upon satisfactory completion of each section or area indicated on the drawings or as otherwise specified.

**4.0 Basis of Payment.** The accepted quantity of plants and landscape edging shall be paid for at the contract unit prices for the items listed below and shall include all necessary equipment materials and labor necessary for compliance with these provisions.

Item No.	Unit	Description
808-99.03	Linear Foot	Landscape Edging
808-01.06	Each	Ginkgo
808-01.19	Each	Black Gum
808-99.02	Each	Japanese Zelkova
808-99.02	Each	Spartan Juniper
808-99.02	Each	Andorra Creeping Juniper
808-05.04	Each	Redosier Dogwood
808-99.02	Each	Baltimore Oriole Daylily
808-99.02	Each	Dwarfed Winged Burning Bush
808-99.02	Each	Crimson Pygmy Barberry
808-99.02	Each	Shamrock Inkberry
808-99.02	Each	Wintergreen Boxwood
808-99.02	Each	Elijah Blue Fescue

L-R. Stone Veneer Assemblies for Kirkwood Gateway Monument – Job J6S1718C Only

**1.0 STONE SOURCES**

**1.0.1** Varieties and Sources: Subject to compliance with requirements, provide stone of the following variety and from the following source:

**1.0.1.1** Rough cut limestone, Dover Gray limestone to match Phase One in color, appearance, and finish.

**1.1 MANUFACTURERS.**

**1.1.1** In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

**1.1.1.1** Products: Subject to compliance with requirements, provide one of the products specified.

**1.2 STONE.**

**1.2.1** Match Phase One of Independence Boulevard (at Prospect and Independence) for variety, color range, finish, and other stone characteristics relating to aesthetic effects.

**1.2.2** Limestone Building Stone Standard: ASTM C 568, classification as follows:

**1.2.2.1** Classification: III (High-Density) except change requirements per ASTM C 568 for density, absorption by weight, and modulus of rupture to, respectively, 150 lb/cu.ft. (2400 kg/cu. m.) minimum, 5 percent maximum, and 800 psi (5.5 MPa) minimum.

**1.2.2.2** Classification: III ( High-Density).

**1.2.3** Kansas Limestone Grade and Color: Dover gray limestone – Coquinoclal limestone with traces of quartz and calcite, with no clay. Color to be light gray with some buff and dark black

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highlights, but predominately gray to match Phase One of Boulevard, according to grade and color classification established by ILI. Rough cut finish. Cladding thickness 4" +/- 1/8".

### **1.3 MORTAR MATERIALS.**

**1.3.1** Portland Cement: ASTM C150, Type I or II

**1.3.2** Aggregate: ASTM C 144 and as follows:

**1.3.2.1** For pointing mortar, use aggregate graded with 100 percent passing No.16 (1.18-mm) sieve.

**1.3.3** Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.

**1.3.4** Water: Potable.

**1.3.5** Products:

**1.3.5.1** Mortar Cement:

**1.3.5.1.1** Lafarge Corporation; Lafarge Mortar Cement.

**1.3.5.1.2** Hydrated Lime: ASTM C 207, Type S.

**1.3.5.2** Cold-Weather Admixture:

**1.3.5.2.1** Euclid Chemical Co.; Accelguard 80.

### **1.4 VENEER ANCHORS.**

**1.4.1** Materials:

**1.4.1.1** Hot-Dip Galvanized Steel Sheet: ASTM A 366/A 366M, cold-rolled, carbon-steel sheet hot-dip galvanized after fabrication to comply with ASTM A 153/A 153M, Class B-2.

**1.4.1.2** Stainless-Steel Sheet: ASTM A 666, Type 304.

**1.4.2** Corrugated-Metal Veneer Anchors: Not less than 0.030-inch- (0.76-mm-) thick by 7/8-inch- (22-mm-) wide stainless-steel sheet with corrugations having a wavelength of 0.3 to 0.5 inch (7.6 to 13 mm) and an amplitude of 0.06 to 0.10 inch (1.5 to 2.5 mm).

### **1.5 MISCELLANEOUS MASONRY ACCESSORIES.**

**1.5.1** Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.

**1.5.2** Dampproofing for Limestone: Cementitious formulations that are recommended by ILI (Indiana Limestone Institute) and that are nonstaining to stone, compatible with joint sealants, and noncorrosive to veneer anchors and attachments.

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**1.5.3 Weep Holes (only as required):**

**1.5.3.1 Round Plastic Tubing:** Medium-density polyethylene, 3/8-inch (10-mm) OD by thickness of stone veneer assembly.

**1.5.3.2 Wicking Material:** Cotton or polyester rope, 1/4 to 3/8 inch (6 to 10 mm) in diameter, in length required to produce 2-inch (50-mm) exposure on exterior and 18 inches (450 mm) in cavity behind stone veneer assembly.

**1.5.3.3 Plastic Weep Hole/Vent:** One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, designed to fill head joint with outside face held back 1/8 inches (3 mm) from exterior face of stone veneer, in color selected from manufacturer's standard.

**1.5.4 Cavity Drainage Stone:** Washed gravel or washed crushed stone complying with ASTM C 33, Size No. 6.

**1.5.5 Cavity Drainage Material:** 3/4-inch-(19-mm-)thick, free-draining mesh made from polyethylene strands.

**1.5.6 Products:**

**1.5.6.1 Plastic Weep Hole/Vent**

**1.5.6.1.1** Dur-O-Wal, a Dayton Superior Company; Cell Vent.

**1.5.6.1.2** Hohmann & Barnard, Inc.; #QV Quadro-Vent.

**1.5.6.1.3** Masonry Reinforcing Corporation of America; Cell Vent.

**1.5.6.2 Cavity Drainage Material:**

**1.5.6.2.1** Advanced Building Products, Inc.; Mortar Break.

**1.5.6.2.2** CavClear; CavClear Masonry Mat.

**1.5.6.2.3** Mortar Net USA, Ltd.; Mortar Net.

**1.5.6.2.4** PolyLite Manufacturing Corp.; Mortar Stop.

**1.6 MASONRY CLEANERS.**

**1.6.1 Job-Mixed Detergent Solution:** Solution of 1/2 -cup (0.14-L) dry-measure tetrasodium polyphosphate and 1/2-cup (0.14-L) dry-measure laundry detergent dissolved in 1 gal. (4 L) of water.

**1.6.2 Proprietary Acidic Cleaner:** Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from stone masonry surfaces without discoloring or damaging masonry surfaces; expressly approved for intended use by stone producer.

**1.6.2.1 Products:**

**1.6.2.1.1** Diedrich Technologies, Inc.; 202 New Masonry Detergent.

**1.6.2.1.2** Dominion Restoration, Inc.; DR-60 Stone and Masonry Cleaner.

**1.6.2.1.3** ProSoCo, Inc.; Sure Klean No. 600 Detergent.

**1.6.2.1.4** ProSoCo, Inc.; Sure Klean Restoration Cleaner.

**1.7 STONE FABRICATION.**

**1.7.1 General:** Fabricate stone in sizes and shapes necessary to comply with requirements indicated, including details on Drawings.

**1.7.1.1** For limestone, comply with recommendations in ILI's "Indiana Limestone Handbook."

**1.7.2** Rough cut finish stone to produce pieces of thickness, size, and shape indicated and to comply with fabrication and construction tolerances recommended by applicable stone association or, if none, by stone source, for faces, edges, beds, and backs.

**1.7.2.1** Clean sawed backs of stone to remove rust stains and iron particles.

**1.7.3** Thickness: 4 inches (100 mm) plus or minus 1/8 inch.

**1.7.4** Dress Joints (bed and vertical) straight and at right angle to face, unless otherwise indicated in details.

**1.7.5** Shape stone for type of masonry (pattern) as follows:

**1.7.5.1** Sawed bed, random-range ashlar with random course heights and random lengths (interrupted coursed).

**1.7.6** Finish exposed faces and edges of stone to comply with requirements indicated for finish and to match approved samples.

**1.7.6.1** Finish: As indicated on details to match Phase One Improvements.

**1.7.7** Carefully inspect stone at quarry or fabrication plant for compliance with requirements for appearance, material, and fabrication. Replace defective units before shipment.

**1.8 MORTAR MIXES.**

**1.8.1 General:** Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.

**1.8.1.1** Do not use calcium chloride.

**1.8.1.2** Add cold-weather admixture (if used) at same rate for all mortar, regardless of weather conditions, to ensure that mortar color is consistent.

**1.8.1.3** Mixing Pointing Mortar: Thoroughly mix cementitious and aggregate materials together before adding water. Then mix again, adding only enough water to produce a damp, unworkable mix that will retain its form when pressed into a ball. Maintain mortar in this dampened condition for one to two hours. Add remaining water in small portions until mortar reaches desired consistency. Use mortar within 30 minutes of final mixing; do not retemper or use partially hardened material.

**1.8.2** Preblended, Dry Mortar Mix: Finish dry mortar ingredient in the form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

**1.8.3** Mortar for Stone Masonry: Comply with ASTM C 270 Proportion Specification.

**1.8.4** Mortar for Stone Masonry: Comply with ASTM C 270 Property Specification.

**1.8.4.1** Extended-Life Mortar: Mortar complying with ASTM C 1142 may be used instead of mortar specified above, at Contractor's option.

**1.8.4.2** Limit cementitious materials in mortar to Portland cement, mortar cement, and lime.

**1.8.4.3** Mortar for Setting Stone: Type N.

**1.8.4.4** Mortar for Pointing Stone: Type N.

## **2.0 EXAMINATION.**

**2.0.1** Examine surfaces indicated to receive stone veneer assemblies, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

**2.0.1.1** Examine substrate to verify that dovetail slots, inserts, reinforcement, veneer anchors, flashing, and other items installed in unit masonry or concrete and required for or extending into stone veneer assemblies are correctly installed.

**2.0.1.2** Proceed with installation only after unsatisfactory conditions have been corrected.

## **2.1 PREPARATION.**

**2.1.1** Advise installers of other work about specified requirements for placement of reinforcement, veneer anchors, flashing, and similar items to be built into stone veneer assemblies.

**2.1.2** Clean dirty or stained stone surfaces by removing soil, stains, and foreign materials before setting. Clean stone by thoroughly scrubbing with fiber brushes and then drenching with clear water. Use only mild cleaning compounds that contain no caustic or harsh materials or abrasives.

## **2.2 SETTING OF STONE VENEER, GENERAL.**

**2.2.1** Perform necessary field cutting as stone is set. Use power saws to cut stone. Cut lines straight and true with edges eased slightly to prevent snipping.

**2.2.2** Sort stone before it is placed in wall to remove stone that does not comply with requirements relating to aesthetic effects, physical properties, or fabrication, or that is otherwise suitable for intended use.

**2.2.3** Arrange and trim stones for accurate fit in three-course, random-range ashlar pattern with random course heights, random lengths (interrupted coursed), and uniform joint widths.

**2.2.4** Arrange stones with color and size variations uniformly dispersed for an evenly blended appearance.

**2.2.5** Set stone to comply with requirements indicated on Drawings. Install veneer anchors, supports, fasteners, and other attachments indicated or necessary to secure stone veneer assemblies in place. Set stone accurately in locations indicated with edges and faces aligned according to established relationships and indicated tolerances.

**2.2.6** Maintain uniform joint widths except for variations due to different stone sizes and where minor variations are required to maintain bond alignment, if any. Lay walls with joints not less than 3/8 inch (10 mm) at narrowest points nor more than 1/2 inch (13 mm) at widest points.

**2.2.7** Provide expansion, control, and pressure-relieving joints of widths and at locations indicated.

**2.2.7.1** Keep expansion and pressure-relieving joints free of mortar and other rigid materials.

**2.2.7.2** Sealing expansion, control, and pressure-relieving joints is specified in Division 7 Section "Joint Sealants."

**2.2.8** Install embedded flashing and weep holes at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.

**2.2.8.1** At lintels and shelf angles, extend flashing full length of angles but not less than 4 inches (100 mm) into masonry at each end.

**2.2.8.2** At heads and sills, extend flashing 4 inches (100 mm) at ends and turn up not less than 2 inches (50 mm) to form a pan.

**2.2.8.3** Interlock end joints of ribbed sheet metal flashing by overlapping ribs not less than 1-1/2 inches (38 mm) or as recommended by flashing manufacturer, and seal lap with elastomeric sealant complying with requirements in Division 7 Section "Joint Sealants" for application indicated.

**2.2.8.4** Extend sheet metal flashing 1/2 inch (13 mm) beyond face of masonry at exterior and turn flashing down to form a drip.

**2.2.8.5** Install metal drip edges beneath flashing at exterior face of wall. Stop flashing 1/2 inch (13 mm) back from outside face of wall and adhere flashing to top of metal drip edge.

**2.2.8.6** Install metal flashing termination beneath flashing at exterior face of wall. Stop flashing 1/2 inch (13 mm) back from outside face of wall and adhere flashing to top of metal flashing termination.

**2.2.8.7** Cut flashing flush with face of wall after masonry wall construction is completed.

**2.2.9** Coat limestone with dampproofing as follows:

**2.2.9.1** Stone at Grade: Beds, joints, and back surfaces to at least 12 inches (300 mm) above finish-grade elevations.

**2.2.9.2** Stone Extending below Grade: Beds, joints, back surfaces, and face surface below grade.

**2.2.9.3** Allow cementitious dampproofing formulations to cure before setting dampproofed stone. Do not damage or remove dampproofing in the course of handling and setting stone.

**2.2.10** Place weep holes and vents in joints where moisture may accumulate, including at base of cavity walls, above shelf angles, and at flashing.

**2.2.10.1** Use round plastic tubing, wicking material, or plastic weep hole/vents to form weep holes.

**2.2.10.2** Use wicking material to form weep holes above flashing in stone sills. Turn wicking down at lip of sill to be as inconspicuous as possible.

**2.2.10.3** Space weep holes 24 inches (600 mm) o.c.

**2.2.10.4** Space weep holes formed from wicking material 16 inches (400 mm) o.c.

**2.2.10.5** In cavities, place pea gravel to a height of 2 inches (50 mm) above top of flashing embedded in the wall, as masonry construction progresses.

**2.2.10.6** Place cavity drainage material in cavities for full height of cavity.

**2.2.11** Trim wicking material used in weep holes flush with outside face of wall after mortar has set.

**2.2.12** Install vents in vertical head joints at the top of each continuous cavity at spacing indicated. Use plastic weep hole/vent to form vents.

**2.2.12.1** Close cavities off vertically and horizontally with blocking in manner indicated. Install through wall flashing and weep holes above horizontal blocking.

### **2.3 CONSTRUCTION TOLERANCES.**

**2.3.1** Variation from Plumb: For vertical lines and surfaces, do not exceed ¼ inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (10 mm in 6 m), or ½ inch in 40 feet (13 mm in 12 m) or more. For external corners, expansion joints, control joints, and other conspicuous lines, do not exceed ¼ inch in 20 feet (6 mm in 6 m) or ½ inch in 40 feet (13 mm in 12 m) or more.

**2.3.2** Variation from Level: For bed joints and lines of exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines, do not exceed ¼ inch in 20 feet (6 mm in 6 m) or ½ inch in 40 feet (13 mm in 12m) or more.

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**2.3.3** Variation of Linear Building Line: For position show in plan, do not exceed ½ inch in 20 feet (13 mm in 6 m) or ¾ inch in 40 feet (19 mm in 12 m) or more.

**2.3.4** Measure variation from level, plumb, and position shown in plan as variation of the average plane of the face of each stone from level, plumb, or dimensional plane.

**2.3.5** Variation in Mortar-Joint Thickness: Do not vary from joint size range indicated.

**2.3.6** Variation in Plane between Adjacent Stones: Do not exceed one-half of tolerance specified for thickness of stone.

**2.3.7** Variation in Planed on Face of Individual Stone: Do not exceed one-half of tolerance specified for thickness of stone.

## **2.4 INSTALLATION OF ANCHORED STONE VENEER ASSEMBLIES.**

**2.4.1** Anchor stone veneer to unit masonry with metal veneer anchors as follows:

**2.4.1.1** Embed corrugated-metal anchors in unit masonry mortar joints or grouted cells for distance at least one-half of veneer thickness.

**2.4.1.2** Embed anchors in veneer mortar joints to within 1 inch (25 mm) of face.

**2.4.2** Space veneer anchors not more than 16 inches (400 mm) o.c. vertically and 24 inches (600 mm) o.c. horizontally. Install additional veneer anchors within 12 inches (300 mm) of openings, sealant joints, and perimeter at intervals not exceeding 12 inches (300 mm).

**2.4.3** Set stone in full bed of mortar with full head joints, unless otherwise indicated. Build veneer anchors into mortar joints as stone is set.

**2.4.4** Fill with mortar as stone is set

**2.4.5** Provide 1-inch (25-mm) air space between stone veneer assemblies and backup construction, unless otherwise indicated. Keep air space free of mortar droppings and debris.

**2.4.5.1** Place mortar spots in cavity at veneer anchors to maintain spacing.

**2.4.5.2** Slope beds toward air space to minimize mortar protrusion into air space. As work progresses, trowel mortar fins protruding into air space flat against back of veneer.

**2.4.6** Rake out joints for pointing with mortar to depth of not less than ½ inch (13mm) before setting mortar has hardened. Rake joints to uniform depths with square bottoms and clean sides. Match Phase One joints.

## **2.5 POINTING.**

**2.5.1** Prepare stone-joint surfaces for pointing with mortar by removing dust and mortar particles. Where setting mortar was removed to depths greater than surrounding areas, apply pointing mortar in layers not more than 3/8 inch (10 mm) deep until a uniform depth is formed.

**2.5.2** Point stone joints by placing and compacting pointing mortar in layers not more than 3/8 inch (10 mm) deep. Compact each layer thoroughly and allow to become thumbprint hard before applying next layer.

**2.5.3** Tool joints, when pointing mortar is thumbprint hard, with a smooth jointing tool to produce the following joint profile:

**2.5.3.1** Joint Profile: Concave to match Phase One stone joints.

## **2.6 ADJUSTING AND CLEANING.**

**2.6.1** Remove and replace stone veneer assemblies of the following description:

**2.6.1.1** Broken, chipped, stained, or otherwise damaged stone. Stone may be repaired if methods and results are approved by Landscape Architect or KCMO Parks and Recreation dept Representative.

**2.6.1.2** Defective Joints.

**2.6.1.3** Stone veneer assemblies not matching approved samples and mockups.

**2.6.1.4** Stone veneer assemblies not complying with other requirements indicated.

**2.6.2** Replace in a manner that result in stone veneer assemblies' matching approved samples and mockups, complying with other requirements, and showing no evidence of replacement.

**2.6.3** In-Progress Cleaning: Clean stone veneer assemblies as work progresses. Remove mortar fins and smears before tooling joints.

**2.6.4** Final Cleaning: After mortar is thoroughly set and cured, clean stone veneer assemblies as follows:

**2.6.4.1** Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.

**2.6.4.2** Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.

**2.6.4.3** Wet wall surfaces with water before applying cleaner, remove cleaner promptly by rinsing thoroughly with clear water

**2.6.4.4** Clean stone veneer assemblies by bucket and brush hand-cleaning method described in BIA Technical Note No. 20 Revised II, using job-mixed detergent solution.

**2.6.4.5** Clean stone veneer assemblies with proprietary acidic cleaner applied according to manufacturer's written instructions.

**2.6.4.6** Clean limestone veneer assemblies to comply with recommendations in ILI's "Indiana Limestone Handbook."

## **2.7 GRAFFITI CONTROL.**

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**2.7.1** Clean stone veneer not less than five (5) days after completion of work to prepare for graffiti control protection. Clean stone using clean water and stiff bristle brushes. Do not use wire brushes, acid type cleaning products or other cleaning compounds with caustic or harsh fillers.

**2.7.2** Provide final protection and maintain conditions, in a manner acceptable to fabricator and installer, which ensures stone veneer being without damage, discolorations or deterioration during subsequent construction and until time of substantial completion.

**2.7.3** Protective Coating: Clear, penetrating water and oil repellent suitable for use on exterior stone and concrete surfaces. Coating shall not darken surfaces applied to and shall not form a gloss surface.

**2.7.3.1** Surface Preparation: Prepare surfaces according to manufacturer's recommendations. Use of acid or acidic solutions will not be allowed. Surfaces to be sealed must be thoroughly dry. Surface and air temperature should be at least 50 degrees Fahrenheit at time of application and for eight hours following application. First application shall be at least 28 days after completion of actual stone work.

**2.7.3.2** Application: Apply protective coating with a brush or airless spray or as according to manufacturer's instructions. Apply to surfaces indicated to achieve maximum absorption and protection against graffiti. Apply to the following surfaces: exposed concrete and exposed stonework. Apply two (2) protective coatings.

**2.7.4** Apply additional coats of protective coating to surfaces disturbed by weather or subsequent work that reduces the protective quality of the coating. Acceptable manufacturers: ProSoCo, Inc. Sure Clean Stand-Off Tile, and Masonry Protor.

## **2.8 EXCESS MATERIALS AND WASTE.**

**2.8.1** Excess Stone: Stack excess stone where directed by Owner for Owner's use.

**2.8.2** Disposal as Fill Material: Dispose of clean masonry waste, including mortar and excess or soil-contamination sand, by crushing and mixing with fill material as fill is placed.

**2.8.2.1** Crush masonry waste to less than 4 inches (100 mm) in greatest dimension.

**2.8.2.2** Mix masonry waste with at least two parts of specified fill material for each part of masonry waste. Fill material is specified in Division 2 Section "Earthwork."

**2.8.2.3** Do not dispose of masonry waste as fill within 18 inches (450 mm) of finished grade.

**2.8.3** Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other waste, and legally dispose of off Owner's property.

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**1.0 SUMMARY.** Section includes unit masonry assemblies for the Monument Marker.

**1.0.1** Related Sections include "Stone Veneer Assemblies" and "Unit Masonry Assemblies"

## **1.1 DEFINITIONS.**

**1.1.1 Cast Stone:** Architectural precast concrete building units intended to simulate natural cut stone.

## **1.2 SUBMITTALS.**

**1.2.1 Product Data:** Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for cast stone units.

**1.2.2 Shop Drawings:** Show fabrication and installation details for cast stone units as required. Include dimensions; details of reinforcement and anchorages, if any; and indication of finished faces.

**1.2.2.1** Include elevations showing layout of units and locations of joints and anchors.

**1.2.3 Samples for Verification:** For each mortar color required, showing the full range expected in the finished construction. Make samples using the same sand and mortar ingredients to be used on Project. Label samples to indicate type and amount of colorant used.

**1.2.4** Submit (3) 6" x 12" Samples for each type of cast stone unit required. Make available for Landscape Architect's or Owner's representative review at project site before installing cast stone. The samples should in general be typical to the texture, color, and finish of specified.

**1.2.4.1** Approved Samples may be installed in the Work, if applicable to the project.

**1.2.5 Qualification Data:** For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

**1.2.5.1** Include copies of material test reports for completed projects, indicating compliance of cast stone with ASTM C 1364.

**1.2.6 Material Test Reports:** From a qualified testing agency indicating and interpreting test results for compliance of cast stone with requirements indicated.

## **1.3 QUALITY ASSURANCE.**

**1.3.1 Manufacturer Qualifications:** A firm experienced in manufacturing cast stone units similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to manufacture required units.

**1.3.2 Testing Agency Qualifications:** An independent testing agency qualified according to ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.

**1.3.3 Source Limitations for Cast Stone:** Obtain cast stone units through one source from a single manufacturer.

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**1.3.4** Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color, from one manufacturer for each cementitious component and from one source or producer for each aggregate.

#### **1.4 DELIVERY, STORAGE, AND HANDLING.**

**1.4.1** Pack, handle, and ship cast stone units in suitable packs or pallets.

**1.4.1.1** Lift with wide-belt slings; do not use wire rope or ropes that might cause staining. Move cast stone units, if required, using dollies with wood supports.

**1.4.1.2** Store cast stone units on wood skids or pallets with nonstaining, waterproof covers. Arrange to distribute weight evenly and to prevent damage to units. Ventilate under covers to prevent condensation.

**1.4.2** Store installation materials on elevated platforms, under cover, and in a dry location.

**1.4.3** Store mortar aggregates where grading and other required characteristics can be maintained, and contamination avoided.

#### **1.5 COORDINATION.**

**1.5.1** Coordinate production and delivery of cast stone with unit masonry work and stone veneer construction to minimize the need for on-site storage and to avoid delaying the Work.

**1.5.2** Coordinate work with all other contractors.

#### **2.0 MANUFACTURERS.**

**2.0.1** Manufacturers: Subject to compliance with requirements, provide products by one of the following:

**2.0.1.1** Caliber Cast Stone 636.978.4000

**2.0.1.2** Midwest Block & Brick 314.291.3200

**2.0.1.3** Mid-America Slate & Stone 314.348.1616

**2.0.2** Or approved equal manufacturer.

#### **2.1 CAST STONE MATERIALS.**

**2.1.1** Embedded Anchors and Other Inserts: Fabricated from steel complying with ASTM A 36/A 36M, and hot-dip galvanized to comply with ASTM A 123.

#### **2.2 CAST STONE UNITS.**

**2.2.1** Provide cast stone units complying with ASTM C 1364.

**2.2.2** Reinforce units as indicated and as required by ASTM C 1364. Use galvanized or epoxy-coated reinforcement when covered with less than 1-1/2 inches (38 mm) of material.

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**2.2.3** Fabricate units with sharp arris and details accurately reproduced with indicated texture on all exposed surfaces, unless otherwise indicated.

**2.2.3.1** Slope exposed horizontal surfaces at least 1:12, unless otherwise indicated.

**2.2.3.2** Provide drips on projecting elements, unless otherwise indicated.

**2.2.3.3** Cure and finish units as follows:

**2.2.3.3.1** Cure units in totally enclosed curing room under dense fog and water spray at 95 percent relative humidity for 24 hours.

**2.2.3.3.2** Yard cure units until the sum of the mean daily temperatures for each day equals or exceeds 350 deg F.

**2.2.3.3.3** Acid etch units to remove cement film from surfaces indicated to be finished.

**2.2.4** Colors and Textures: Match existing units.

## **2.3 MORTAR MATERIALS.**

**2.3.1** Provide mortar materials that comply with Division 4 Section "Unit Masonry."

**2.3.2** Masonry Cement: ASTM C 91

**2.3.2.1** For pigmented mortar, use colored masonry cements of formulation required to produce color as selected from manufacturer's standard formulations to match Phase One improvements. Pigments shall not exceed 5 percent of masonry cement by weight for mineral oxides or 1 percent for carbon black.

**2.3.3** Mortar Aggregate: ASTM C 144.

**2.3.3.1** White-Mortar Aggregates: Natural, white sand or ground, white stone.

**2.3.4** Mortar Pigments: Natural and synthetic iron oxides, compounded for use in mortar mixes. Use only pigments with record of satisfactory performance in masonry mortars.

**2.3.5** Water: Potable.

## **2.4 ACCESSORIES.**

**2.4.1** Anchors: Type and size indicated, fabricated from steel complying with ASTM A 36/A 36M, and hot-dip galvanized to comply with ASTM A 123.

**2.4.2** Dowels: Round steel bars complying with ASTM A 36/A 36M or ASTM A 615/A 615 M, ½-inch (12-mm) diameter, and hot-dip galvanized to comply with ASTM A 123.

**2.4.3** Job-Mixed Detergent Solution: Solution of ½ cup (125 mL) of dry-measure tetrasodium polyphosphate and ½ cup (125mL) of dry-measure laundry detergent dissolved in 1 gal. (4 L) of water.

## **2.5 MORTAR MIXES.**

**2.5.1** Setting Mortar: Comply with ASTM C 270, Proportion Specification, Type N.

**2.5.1.1** Pigmented Mortar: Select and proportion pigments with other ingredients to produce color required. Do not exceed pigment-to-cement ratio of 1:10, by weight.

**2.5.1.2** Masonry Cement Mortar: Use masonry cement of selected color.

**2.5.2** Install as per manufacturer recommendations in a manner consistent with the glass masonry installation in Phase II of the Independence Blvd. Streetscape.

## **2.6 SOURCE QUALITY CONTROL.**

**2.6.1** Employ an independent testing agency to sample and test cast stone units according to ASTM C 1364.

## **3.0 EXAMINATION.**

**3.0.1** Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of cast stone.

**3.0.1.1** Proceed with installation only after unsatisfactory conditions have been corrected.

## **3.1 INSTALLATION.**

**3.1.1** Set cast stone as indicated on Drawings. Install anchors, supports, fasteners, and other attachments indicated or necessary to secure units in place. Set units accurately in locations indicated with edges and faces aligned according to established relationships and indicated tolerances.

**3.1.2** Drench stone units with clear water just before setting.

**3.1.3** Set units in full bed of mortar with full head joints, unless otherwise indicated. Build anchors and ties into mortar joints as units are set.

**3.1.3.1** Fill dowel holes and anchor slots with mortar.

**3.1.3.2** Fill collar joint solid as units are set.

**3.1.3.3** Build concealed flashing into mortar joints as stone units are set.

**3.1.3.4** Leave head joints open in coping and other stone units with exposed horizontal surfaces. Keep joints clear of mortar, and rake out to receive sealant. Sponge the face of each stone to remove excess mortar.

**3.1.4** Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.

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**3.1.5** Provide expansion, control, and pressure-relieving joints of widths and at locations indicated.

**3.1.5.1** Sealing joints per cast stone manufacturer recommendations.

**3.1.5.2** Keep joints free of mortar and other rigid materials.

**3.1.6** Protect stone while on ground (and after setting) from splashing mortar and damage from other trades during construction.

## **3.2 INSTALLATION TOLLERANCES.**

**3.2.1** Comply with Cast Stone Institute technical manual No. 04435-90.

**3.2.2** Variation from Plum: Do not exceed 1/8 inch in 10 feet (3 mm in 3 m) or ¼ inch in 20 feet (6 mm in 6m) or more.

**3.2.3** Variation from Level: Do not exceed 1/8 inch in 10 feet (3 mm in 3 m), ¼ inch in 2 feet (6 mm in 6 m), or 3/8 inch (9 mm) maximum.

**3.2.4** Variation in Joint Width: Do not vary joint thickness more than 1/8 inch in 36 inches (3 mm in 900 mm) or one-fourth of nominal joint width, whichever is less.

**3.2.5** Variation in Plane between Adjacent Surfaces (Lipping): Do not exceed 1/16-inch (1.5-mm) difference between planes of adjacent units or adjacent surfaces indicated to be flush with units.

## **3.3 ADJUSTING AND CLEANING.**

**3.3.1** Remove and replace stained and otherwise damaged stone units and stone units not matching approved Samples. Cast stone may be repaired if methods and results are approved by owner's rep.

**3.3.2** Replace stone units in a manner that results in cast stone matching approved Samples, complying with other requirements, and showing no evidence of replacement.

**3.3.3** In-Progress Cleaning: Clean cast stone as work progresses. Remove mortar fins and smears before tooling joints.

**3.3.4** Final Cleaning: After mortar is thoroughly set and cured, clean exposed cast stone as follows:

**3.3.4.1** Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.

**3.3.4.2** Clean cast stone by bucket and brush hand-cleaning method described in BIA Technical Notes No.20 Revised II, using job-mixed detergent solutions.

## **3.4 GRAFFITI CONTROL.**

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**3.4.1** Clean cast stone not less than five(5) days after completion of work to prepare for graffiti control protection. Clean cast stone using clean water and stiff bristle brushes. Do not use wire brushes, acid type cleaning products or other cleaning compounds with caustic or harsh fillers.

**3.4.2** Provide final protection and maintain conditions, in a manner acceptable to fabricator and installer, which ensures cast stone being without damage, discolorations. Or deterioration during subsequent construction and until time of substantial completion.

**3.4.3** Protective Coating: Clear, penetrating water and oil repellent suitable for use on exterior stone and concrete surfaces. Coating shall not darken surfaces applied to and shall not form a gloss surface.

**3.4.3.1** Surface Preparation: Prepare surfaces according to manufacturer's recommendations. Use of acid or acidic solutions will not be allowed. Surfaces to be sealed must be thoroughly dry. Surface and air temperatures should be at least 50 degrees Fahrenheit at time of application and for eight hours following application. First application shall be at least 28 days after completion of actual stone work.

**3.4.3.2** Application: Apply protective coating with a brush, roller, or airless spray or as according to manufacturer's instructions. Apply to surfaces indicated to achieve maximum absorption and protection against graffiti. Apply to the following surfaces: exposed concrete and exposed stonework. Apply two (2) protective coatings.

**3.4.3.3** Apply additional coats of protective coating to surfaces disturbed by weather or subsequent work that reduces the protective quality of the coating.

**3.4.3.4** Acceptable Manufacturers: ProSoCo, Inc. Sure Clean Stand-Off Tile, and Masonry Protor.

L-T. Unit Masonry Assemblies for Kirkwood Gateway Monument – Job J6S1718C Only

## **1.0 SUMMARY.**

**1.0.1** This Section includes unit masonry assemblies consisting of the following:

**1.0.1.1** Concrete masonry units (CMU's)

**1.0.1.2** Building (common) brick.

**1.0.1.3** Mortar and grout.

**1.0.1.4** Reinforcing steel.

**1.0.1.5** Masonry joint reinforcement

**1.0.1.6** Ties and anchors.

**1.0.2** Products furnished, but not installed, under this Section include the following:

**1.0.2.1** Dovetail slots for masonry anchors, installed under Division 3 Section “Cast-in-Place Concrete.”

**1.0.3** Products installed, but not furnished, under this Section include the following:

**1.0.3.1** Cast-stone trim, furnished under Division 4 Section “Cast Stone.”

**1.0.3.2** Steel for unit masonry, furnished under Division 5 section “Metal Fabrications.”

## **1.1 DEFINITIONS.**

**1.1.1** Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

## **1.2 PERFORMANCE REQUIREMENTS.**

**1.2.1** Provide unit masonry that develops indicated net area compressive strengths ( $f'_m$ ) at 28 days.

**1.2.2** Determine net-area compressive strength ( $f'_m$ ) of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

**1.2.3** Determine net-area compressive strength ( $f'_m$ ) of masonry by testing masonry prisms according to ASTM C 1314.

## **1.3 SUBMITTALS.**

**1.3.1** Product Data: For each type of product indicated.

**1.3.2** Shop Drawings: For the following:

**1.3.2.1** Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.

**1.3.2.2** Stone Trim Units: Show sizes, profiles, and locations of each stone trim unit required.

**1.3.2.3** Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, “Details and Detailing of Concrete Reinforcement.”

**1.3.2.4** Fabricated Flashing: Detail corner units, end-dam units, and other special applications.

**1.3.3** Samples for Initial Selection: For the following:

**1.3.3.1** Face brick, in the form of straps of five or more bricks.

**1.3.4** Samples for Verification: For each type and color of the following:

**1.3.4.1** Brick.

**1.3.5** Qualification Data: For testing agency.

**1.3.6 Material Certificates:** Include statements of material properties indicating compliance with requirements including compliance with standards and type designations within standards. Provide for each type and size of the following:

**1.3.6.1** Masonry units.

**1.3.6.1.1** Include material test reports substantiating compliance with requirements.

**1.3.6.1.2** For Masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.

**1.3.6.2** Preblended, dry mortar mixes. Include description of type and proportions of ingredients.

**1.3.6.3** Grout mixes. Include description of type and proportions of ingredients.

**1.3.6.4** Reinforcing bars.

**1.3.6.5** Joint reinforcement.

**1.3.6.6** Anchors, ties, and metal accessories.

**1.3.7 Mix Designs:** For each type of mortar and grout. Include description of type and proportions of ingredients.

**1.3.7.1** Include test reports, per ASTM C 780, for mortar mixes required to comply with property specification.

**1.3.7.2** Include test reports, per ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

**1.3.8 Statement of Compressive Strength of Masonry:** For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

**1.3.9 Cold-Weather Procedures:** Detailed description of methods, materials, and equipment to be used to comply with cold-weather requirements.

## **1.4 QUALITY ASSURANCE.**

**1.4.1 Testing Agency Qualifications:** An independent agency qualified according to ASTM C 1093 for testing indicated, as documented according to ASTM 548.

**1.4.2 Source Limitations for Masonry Units:** Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, through one source from a single manufacturer for each product required.

**1.4.3 Source Limitations for Mortar Materials:** Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from a single manufacturer for each cementitious component and from one source or producer for each aggregate.

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**1.4.4 Preconstruction Testing Service:** Owner will engage a qualified independent testing agency to perform preconstruction testing indicated below. Payment for these services will be made by Owner. Retesting of materials that fail to meet specified requirements shall be done at Contractor's expense.

**1.4.4.1 Clay Masonry Unit Test:** For each type of unit required, per ASTM C 67.

**1.4.4.2 Concrete Masonry Unit:** For each type of unit required, per ATM C 140.

**1.4.4.3 Mortar Test (Property Specification):** For each mix required, per ASTM C 780.

**1.4.4.4 Grout Test (Compressive Strength):** For each mix required, per ASTM C 1019.

## **1.5 DELIVERY, STORAGE, AND HANDLING.**

**1.5.1** Deliver masonry materials to project in undamaged condition. Store masonry units on elevated platforms in a dry location. If units are not stored in and enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

**1.5.2** Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

**1.5.3** Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

**1.5.4** Deliver preblended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into dispensing silo. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.

**1.5.5** Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

## **1.6 PROJECT CONDITIONS.**

**1.6.1 Protection of Masonry:** During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

**1.6.1.1** Extend cover a minimum of 24 inches down both sides and hold cover securely in place.

**1.6.1.2** Where 1 wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.

**1.6.2** Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.

**1.6.3 Stain Protection**

**1.6.3.1** Masonry units.

**1.6.3.2** Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.

**1.6.3.3** Protect sills, ledges, and projections from mortar droppings.

**1.6.3.4** Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.

**1.6.3.5** Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

**1.6.4** Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

**1.6.4.1** Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.

**1.6.5** Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

## **2.0 MANUFACTURERS.**

**2.0.1** In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

**2.0.1.1** Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.

**2.0.1.2** Products: Subject to compliance with requirements, provide one of the products specified.

**2.0.1.3** Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

**2.0.1.4** Manufacturers: Subject to compliance with requirements, provide products by one of the manufactures specified.

## **2.1 MASONRY UNITS, GENERAL.**

**2.1.1** Defective Units: Referenced masonry unit standards may allow a certain percentage of units to exceed tolerances and to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects, including dimensions that vary from specified dimensions by more than stated tolerances, will be exposed in the completed Work or will impair the quality of completed masonry.

## **2.2 CONCRETE MASONRY UNITS (CMUs).**

**2.2.1 Integral Water Repellent:** Provide units made with integral water repellent for exposed units and where indicated.

**2.2.1.1 Integral Water Repellent:** Liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive according to ASTM E 514, with test period extended to 24 hours, show no visible water or leaks on the back of test specimen.

**2.2.2 Concrete Masonry Units:** ASTM C 90

**2.2.2.1 Unit Compressive Strength:** Provide units with minimum average net-area compressive strength of 3050 psi.

**2.2.2.2 Weight Classification:** Normal weight.

**2.2.2.3 Size (Width):** Manufactured to dimensions 3/8 inch less than nominal dimensions.

## **2.3 BRICK.**

**2.3.1 General:** Match Kirkwood Courthouse brick color. 70% Savannah Wellington, 30% Red Sand.

**2.3.2** Provide units with minimum average net-area compressive strength of 4400 psi.

**2.3.3** Provide brick that has been tested according to ASTM C67 and is rated "not efflorescent".

## **2.4 MORTAR AND GROUT MATERIALS.**

**2.4.1 Portland Cement:** ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

**2.4.2 Hydrated Lime:** ASTM C 207, Type S

**2.4.3 Portland Cement-Lime Mix:** Packaged blend of Portland cement complying with ASTM C 150, Type I or Type III, and hydrated lime complying with ASTM C 207, Type S.

**2.4.4 Mortar Cement:** ASTM C 1329.

**2.4.5 Aggregate for Mortar:** ASTM C 144.

**2.4.5.1** For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.

**2.4.5.2** For joints less than ¼ inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.

**2.4.5.3 White-Mortar Aggregates:** Natural white sand or crushed white stone.

**2.4.6 Aggregate for Grout:** ASTM C 476 with Slurry of 8-11 inches.

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**2.4.7 Cold-Weather Admixture:** Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar or composition indicated.

**2.4.8 Water-Repellent Admixture:** Liquid water-repellant mortar admixture intended for use with concrete masonry units, containing integral water repellent by same manufacturer.

**2.4.9 Water;** Potable.

## **2.5 REINFORCEMENT.**

**2.5.1 Uncoated Steel Reinforcing Bars:** ASTM A 615/A 615M, Grade 60.

**2.5.2 Masonry Joint Reinforcement, General:** ASTM A 951.

**2.5.2.1 Interior Walls:** Hot-dip galvanized, carbon steel.

**2.5.2.2 Exterior Walls:** Hot-dip galvanized, carbon steel.

**2.5.2.3 Spacing of Cross Rods, Tabs, and Cross Ties:** Not more than 16 inches o.c.

**2.5.2.4 Provide in lengths of not less than 10 feet.**

**2.5.3 Masonry Joint Reinforcement for Single-Wythe Masonry:** Either ladder or truss type with single pair side rods.

**2.5.4 Masonry Joint Reinforcement for Multiwythe Masonry:**

**2.5.4.1 Ladder type with 1 side rod at each face shell of hollow masonry units more than 4 inches (100 mm) in width, plus 1 side rod at each wythe of masonry 4 inches (100 mm) or less in width.**

**2.5.4.2 Tab type, either ladder or truss design, with 1 side rod at each face shell of backing wythe and with rectangular tabs sized to extend at least halfway through facing wythe but with at least 5/8-inch (16-mm) cover on outside face.**

**2.5.4.3 Adjustable (two-piece) type, either ladder or truss design, with one side rod at each face shell of backing wythe and with separate ties that extend into facing wythe. Ties have two hooks that engage eyes or slots in reinforcement and resist movement perpendicular to wall. Ties extend at least halfway through facing wythe but with at least 5/8-inch (16-mm) cover on outside face.**

## **2.6 TIES AND ANCHORS.**

**2.6.1 Corrugated Metal Ties:** Metal strips not less than 7/8 inch wide with corrugations having a wavelength of 0.3 to 0.5 inch and an amplitude of 0.06 to 0.10 inch made from steel sheet, galvanized after fabrication not less than [0.043 inch (1.1 mm)] [0.053 inch (1.3 mm)] [0.067 inch (1.7 mm)] [0.097 inch (2.5 mm)] thick.

**2.6.2** Wire Ties, General: Unless otherwise indicated, size wire ties to extend at least halfway through veneer but with at least 5/8-inch cover on outside face. Outer ends of wires are bent 90 degrees and extend 2 inches parallel to face of veneer.

## **2.7 MASONRY CLEANERS.**

**2.7.1** Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

## **2.8 MORTAR AND GROUT MIXES.**

**2.8.1** General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated. Do not use masonry cement or plastic element.

**2.8.1.1** Do not use calcium chloride in mortar or grout.

**2.8.1.2** Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

**2.8.2** Preblended, Dry Mortar Mix: Furnish dry mortar ingredient in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

**2.8.3** Mortar for Unit Masonry: Comply with ASTM C 270, Property Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.

**2.8.3.1** For masonry below grade or in contact with earth, use Type M.

**2.8.3.2** For reinforced masonry, use Type S.

**2.8.3.3** For mortar parge coats, use Type M.

**2.8.3.4** For exterior, above-grade, load-bearing and non-load bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N.

**2.8.4** Grout for Unit Masonry: Comply with ASTM C 476.

**2.8.4.1** Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.

**2.8.4.2** Provide grout with a slump of 8 to 11 inches (200 to 280 mm) as measured according to ASTM C 143/C 143M.

**2.8.4.3** Grout shall attain a compressive strength on 2500 psi at 28 days, 3/8" maximum aggregate.

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**2.8.5 Epoxy Pointing Mortar:** Mix epoxy pointing mortar to comply with mortar manufacturer's written instructions.

### **3.0 EXAMINATION.**

**3.0.1** Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

**3.0.1.1** For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.

**3.0.1.2** Verify that foundations are within tolerances specified.

**3.0.1.3** Verify that reinforcing dowels are properly placed.

**3.0.2** Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.1 INSTALLATION, GENERAL.**

**3.1.1 Thickness:** Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.

**3.1.2** Build chases and recesses to accommodate items specified in this and other Sections.

**3.1.3** Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.

**3.1.4** Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

**3.1.5** Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.

**3.1.5.1** Mix units from several pallets or cubes as they are placed.

**3.1.6 Matching Existing Masonry:** Match coursing, bonding, color, and texture of existing masonry.

**3.1.7 Wetting of Brick:** Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested per ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

**3.1.8** Comply with construction tolerances in ACI 530.1/ASCE 6/TMS 602 and with the following:

**3.1.8.1** For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet.

**3.1.8.2** For vertical alignment of exposed head joints, do not vary from plumb by more than ¼ inch in 10 feet.

**3.1.8.3** For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet.

**3.1.8.4** Keep cavities clean of mortar droppings and other materials during construction and strike joints facing cavities flush.

## **3.2 LAYING MASONRY WALLS.**

**3.2.1** Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thickness and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

**3.2.2** Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less than nominal 4-inch (100-mm) horizontal face dimension at corners or jambs.

**3.2.3** Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2 inches. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

**3.2.4** Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.

**3.2.5** Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

**3.2.6** Fill space between steel frames and masonry solidly with mortar, unless otherwise indicated.

**3.2.7** Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below and rod mortar or grout into core.

**3.2.8** Fill cores in hollow concrete masonry units with grout 24 inches under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.

**3.2.9** Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above, unless otherwise indicated.

**3.2.9.1** Install compressible filler in joint between top of partition and underside of structure above.

**3.2.9.2** Fasten partition top anchors to structures above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tube down into grout to provide 1/2-inch clearance between end of anchor rod and end of tube. Space anchors 48 inches o.c., unless otherwise indicated.

**3.2.9.3** Wedge non-load-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.

### **3.3 MORTAR BEDDING AND JOINTING.**

**3.3.1** Lay concrete masonry units as follows:

**3.3.1.1** With face shells fully bedded in mortar and with head joints of depth equal to bed joints.

**3.3.1.2** Install compressible filler in joint between top of partition and underside of structure above.

**3.3.1.3** With webs fully bedded in mortar in grouted masonry, including starting course on footings.

**3.3.1.4** With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.

**3.3.2** Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

**3.3.3** Set Stone trim units in full bed of mortar with full vertical joints. Fill dowel, anchor, and similar holes.

**3.3.3.1** Clean soiled surfaces with fiber brush and soap powder and rinse thoroughly with clear water.

**3.3.3.2** Allow cleaned surfaces to dry before setting.

**3.3.3.3** Wet joint surfaces thoroughly before applying mortar.

**3.3.4** Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.

**3.3.5** Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint), unless otherwise indicated.

### **3.4 REINFORCED UNIT MASONRY INSTALLATION.**

**3.4.1** Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.

**3.4.1.1** Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.

**3.4.1.2** Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.

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**3.4.2** Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.

**3.4.3** Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.

**3.4.3.1** Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.

**3.4.3.2** Limit height of vertical grout pours to not more than 60 inches.

### **3.5 FIELD QUALITY CONTROL.**

**3.5.1** Inspectors: Owner will engage qualified independent inspectors to perform inspections and prepare reports. Allow inspectors to scaffold and work areas, as needed to perform inspections.

**3.5.1.1** Place grout only after inspectors have verified compliance of grout spaces and grades, sizes, and locations of reinforcement.

**3.5.2** Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections indicated below and prepare test reports:

**3.5.2.1** Payment for these services will be made by Owner.

**3.5.2.2** Retesting of materials failing to comply with specified requirements shall be done at Contractor's expense.

**3.5.3** Testing Frequency: One set of tests for each 5000 sq.ft. of wall area or portion thereof.

**3.5.4** Clay Masonry Unit Test: For each type of unit provided, per ASTM C 67.

**3.5.5** Concrete Masonry Unit Test: For each type of unit provided, per ASTM C 140.

**3.5.6** Mortar Test (Property Specification): For each mix provided, per ASTM C 780. Test mortar for mortar air content and compressive strength.

**3.5.7** Grout test (Compressive Strength): For each mix provided, per ASTM C 1019.

### **3.6 PARGING.**

**3.6.1** Parge exterior faces of below-grade masonry walls, where indicated, in 2 uniform coats to a total thickness of  $\frac{3}{4}$  inch. Dampen wall before applying first coat and scarify first coat to ensure full bond to subsequent coat.

**3.6.2** Use a steel-trowel finish to produce a smooth, flat, dense surface with a maximum surface variation of  $\frac{1}{8}$  inch per foot. Form a wash at top of parging and a cove at bottom.

**3.6.3** Damp-cure parging for at least 24 hours and protect parging until cured.

### **3.7 REPAIRING, POINTING, AND CLEANING.**

**3.7.1** Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

**3.7.2** Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, opening, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

**3.7.3** In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

**3.7.4** Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

**3.7.4.1** Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.

**3.7.4.2** Test cleaning methods on sample wall panel; leave one-half of panel un-cleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.

**3.7.4.3** Protect adjacent stone and non masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent of polyethylene film and waterproof masking tape.

**3.7.4.4** Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.

**3.7.4.5** Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.

**3.7.4.6** Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.

**3.7.4.7** Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.

**3.7.4.8** Clean stone trim to comply with stone supplier's written instructions.

**3.7.4.9** Clean limestone units to comply with recommendations in ILI's "Indiana Limestone Handbook."

### **3.8 MASONRY WASTE DISPOSAL.**

**3.8.1** Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

**3.8.2** Excess Masonry Waste: Remove masonry waste and legally dispose of off Owner's property.



**METROPOLITAN ST. LOUIS SEWER DISTRICT**

**CSO – MARY AVENUE SOUTH OF MANCHESTER CSO  
INTERCEPTOR (I-132)/OUTFALL (L-106) ELIMINATION PHASE I  
(MODOT)**

**MSD PROJECT NO. 13404-015.1**

**JOB SPECIAL PROVISIONS (JSP) - SEWER**

**FEBRUARY 22, 2021**

**HDR PROJECT NO. 10134934**

Engineer's Seal: See Following TOC Page

HDR Engineering, Inc.  
401 South 18<sup>th</sup> Street, Suite 300  
St. Louis, MO 63103  
Phone: (314) 425-8300  
Engineering Certificate No. 000856



**METROPOLITAN ST. LOUIS SEWER DISTRICT**

**CSO – MARY AVENUE SOUTH OF MANCHESTER CSO INTERCEPTOR (I-132)/  
OUTFALL (L-106) ELIMINATION PHASE I (MODOT)  
MSD PROJECT NO. 13404-015.1**

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EXHIBIT 1 – Metropolitan St. Louis Sewer District Pre-Qualified Deep Sewer Construction Contractor List

EXHIBIT 2 – Geotechnical Data Reports

EXHIBIT 3 – List of Properties / Structures for Inspection and Condition Survey if Blasting is Implemented

EXHIBIT 4 – MDNR NPDES Operating Permit

	<b>MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION</b> 105 W. CAPITOL AVE. JEFFERSON CITY, MO 65102 Phone 1-888-275-6636
	HDR Engineering, Inc. 401 S. 18 <sup>th</sup> St., Suite 300 St. Louis, MO 63103 314-425-8300
	JOB NUMBER: J6S1718B ST. LOUIS COUNTY, MO DATE PREPARED:
Digitally signed by Erin M. Jearls Date: 2021.03.01 14:24:21-06'00' Date:	ADDENDUM DATE:
Only the following items of the Job Special Provisions (Sewer) are authenticated by this seal: Metropolitan St. Louis Sewer District Project – CSO – Mary Avenue South of Manchester CSO Interceptor (I-132)/Outfall (L-106) Elimination Phase I (MoDOT) (13404-015.1)	

A. MSD and MoDOT Coordination

The CSO – Mary Avenue South of Manchester CSO Interceptor (I-132)/Outfall (L-106) Elimination Phase I (MoDOT) sewer project (MSD Project Number 13404-015.1) is a Metropolitan St. Louis Sewer District (MSD) project that MoDOT is letting in required combination with project J6S1718B. MSD is funding the entire 13404 project and MSD has full oversight on the 13404 project. MoDOT will provide payments to the contractor for work on 13404 but MSD staff will oversee the inspection, materials oversight, shop drawing approval and other MSD contract oversight as performed on an MSD let project.

B. Project Contact for Contractor/Bidder Questions

All questions concerning the bid document preparation can be directed to the Central Office – Design at (573) 751-2876.

MSD Design Contact:

Ms Patricia Pride  
Metropolitan St. Louis Sewer District  
2350 Market Street  
St. Louis, MO 63103  
phone: 314-768-6275  
email: [PAPRID@stlmsd.com](mailto:PAPRID@stlmsd.com)

C. Requests for Information During Construction

The resident engineer will be responsible for distribution of the RFI to appropriate design staff and returning a response to the contractor.

MSD Construction Contact:

Mr. Mike Shelton  
Metropolitan St. Louis Sewer District  
2350 Market Street  
St. Louis, MO 63103  
phone: 314-768-6387  
email: [mshelton@stlmsd.com](mailto:mshelton@stlmsd.com)

D. Deep Sewer Contractor

The sewer subcontractor performing the "Deep Sewer" installation work on J6S1718B shall be prequalified to perform this work by Metropolitan St. Louis Sewer District and the sewer subcontractor shall be on MSD's preapproved "Deep Sewer" contractor list. The list of "Deep Sewer" contractors that are prequalified with the Metropolitan St. Louis Sewer District can be found in Exhibit 1 of JSP-Sewer. The prime contractor will be permitted to perform the work themselves, if on MSD's preapproved "Deep Sewer" contractor list, or to use a subcontractor on the preapproved list.

E. Signs

The contractor shall furnish a sign at each of his major work locations to inform the public of the work under construction. The layout shall conform to the Metropolitan St. Louis Sewer District (MSD) Standard Details of Sewer Construction. The sign(s) shall be located so as to not interfere with other utility, road, and bridge construction occurring the same area and as approved by the Engineer.

No additional payment will be made for the required signs.

F. MSD Standard Specifications

All bid items shown in the plans and bidding documents that are Metropolitan St. Louis Sewer District (MSD) bid items shall be constructed according to the current Metropolitan St. Louis Sewer District's Standard Construction Specifications for Sewers and Drainage Facilities, 2009 (MSD Specifications), available online at <https://msdprojectclear.org/doing-business/design-construction/standard-construction-specs/>, MSD Standard Details of Sewer Construction available online at <https://msdprojectclear.org/doing-business/design-construction/standard-construction-specs/standard-details-sheet/>, and the additional MSD Technical Specifications located within JSP-Sewer, unless otherwise noted in these specifications.

G. Known Utility Conflicts/Issues

**1.1 SEWER SEGMENT FROM APPROXIMATE STATION 2+89 TO 6+61**

Spire has an existing 2" gas line located along the east side of Van Mark Way and Mary Avenue, as shown on sheet 2 and sheet 3 of 5 on the CSO – Mary Avenue South of Manchester CSO Interceptor (I-132)/Outfall (L-106) Elimination Phase I (MoDOT) sewer plans (MSD Project Number 13404-015.1). The intent is to remove and replace it as part of the sewer construction.

The intent of the remainder of the 2" gas line along the sewer alignment (stations 0+00 to 2+89) is further identified in the remaining portion of the J6S1718B project document.

An Ameren Missouri overhead electric will be crossed near sewer alignment station 5+50, with intent to maintain use.

The Gym Set located near sewer alignment station 5+25 shall be removed by the City of Brentwood prior to construction of the CSO Mary Ave –Phase I sewer project, and will not be replaced. The Contractor shall contact the City of Brentwood’s Parks Director 30 days prior to needing the removal of the gym set. Upon completion of construction, the Contractor shall bring the trench back up to grade and seed and straw within the Gym Set area.

The contractor is advised to coordinate the construction of the sewer work with the appropriate utilities.

H. List of Pipe Suppliers

The names of Pipe Suppliers with the names of the manufacturers of the pipe to be used for the work shall be entered in the spaces provided below. Upon award of a contract, the named suppliers and pipe shall be used and furnished. The type of pipe material shall be indicated.

PIPE ITEM	TYPE OF PIPE MATERIAL	SUPPLIER / MANUFACTURER
36” Sanitary Sewer	Ductile Iron Pipe	
36" Sanitary Sewer	Other	

I. List of Subcontractors

The names of Subcontractors to be used for the CSO – Mary Avenue South of Manchester CSO Interceptor (I-132)/Outfall (L-106) Elimination Phase I (MoDOT) sewer project work (MSD Project Number 13404-015.1) must be a pre-qualified deep sewer construction Contractor, described in this JSP-Sewer Section D, and shall be entered in the spaces provided below. Upon award of a contract, the named subcontractor(s) shall be used.

No work will be subcontracted

Names and Addresses of Subcontractor	Area of Work	\$ Value
	Excavation	
	Sanitary Sewers	
	Manholes	
	Paving	
	<b>Subcontracts Total</b>	

J. Required Contractor Submittals

The following is a list of key submittals and shop drawings that are required for MSD approval before any sewer work shall be allowed to commence. This is not a complete list and each technical specification listed in JSP-Sewer should be reviewed:

- Concrete Mix Design (Antimicrobial Additive)
- Aggregate Material
- Corrosion Monitoring for Ductile Iron Pipe
- Rock Removal
- Earthwork
- Pipe Sewers (include sanitary and necessary storm)
- Precast Manholes

K. Change Orders

If any substantial change is made in the original plan and extent of the work, MSD agrees that changes in the costs will be covered by a change order having approval of MSD and Commission PRIOR to the performance of the work.

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**SECTION 01 11 00**  
**SUMMARY OF WORK**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. Work:
1. The Work within the Contract includes the following project portions:
    - a. The Missouri Department of Transportation (MoDOT) Route 100-Manchester Road Project (J6S1718B) (MSD #19MSD-00347).
    - b. The CSO – Mary Avenue South of Manchester CSO Interceptor (I-132)/Outfall (L-106) Elimination Phase I (MoDOT), Metropolitan St. Louis Sewer District Project No. 13404-015.1.
  2. The technical specifications located in the Job Special Provisions (JSP)-Sewer of this Contract, and as discussed in this Section 01 11 00 – Summary of Work, relate to the CSO – Mary Avenue South of Manchester CSO Interceptor (I-132)/Outfall (L-106) Elimination Phase I (MoDOT) (13404) project portion. Herein, it is referred to as the CSO Mary Avenue – Phase I.
  3. The CSO Mary Avenue – Phase I project portion drawings (Sheets 1-5) are located within the MoDOT Route 100-Manchester Road Project (J6S1718B) drawing set, listed on the Index Sheet as MARY AVE SAN SEWER (MA).
  4. The work of the CSO Mary Avenue – Phase I project portion of the Contract, as described in this specification Section 01 11 00, shall be completed by an approved Metropolitan St. Louis Sewer District’s pre-qualified deep sewer construction Contractor listed in JSP-Sewer, Exhibit 1.
- B. General:
1. Furnish all, materials, tools, equipment, materials, supplies, and manufactured articles, and furnish all labor, transportation, services, including fuel, power, water, and essential communication, and performing all Work or other operations required for fulfillment of the Contract in strict accordance with provisions of Contract Documents. The Work shall be complete, and all work, materials, and services not expressly indicated or called for in the Contract Documents which may be necessary for the complete and proper construction of the Work in good faith shall be provided by the Contractor as though originally so indicated, at no increase in cost to the Owner.
  2. It is the intent of the Contract Documents to describe a functionally complete project. Furnish and install all supplementary or miscellaneous items, appurtenances, and devices incidental to or necessary for a sound, secure, complete, and functional installation.

**1.2 WORK COVERED BY CONTRACT**

- A. This CSO Mary Avenue – Phase I project portion of the construction schedule is to be closely coordinated with the MoDOT Route 100-Manchester Road Project (J6S1718B) portion of the Contract.
- B. The Work of this CSO Mary Avenue – Phase I project portion within the Contract is generally described as follows:  
The Contractor shall furnish all the materials, tools, equipment, labor to perform the installation of approximately 682 feet of 12-inch and 36-inch diameter sanitary sewers and appurtenances, 7 manholes and 1 cleanout, and other associated work in accordance with all the requirements of these specifications, and the drawings made a part thereof.
- C. The Project is located in the area shown on the plans and extends north from one downstream connection immediately south of Manchester Road, paralleling Van Mark Way, Mary Avenue and Dorothy Avenue, and terminating at the intersection of Florence and Mary Avenues, all within the City of Brentwood.

- D. The Contractor is responsible for hauling and disposal of any surplus excavated material resulting from site grading and excavation.
- E. Perform site clearing, topsoiling and final grading for the CSO Mary Avenue – Phase I project portion in accordance with the most recent version of the Missouri Standard Specifications for Highway Construction, and the MoDOT Route 100-Manchester Road Project (J6S1718B) JSP.

### **1.3 CONTRACT METHOD**

- A. The Work hereunder for this CSO Mary Avenue – Phase I project portion will be constructed under a Total Bid Price contract with unit prices.
- B. The Metropolitan St. Louis Sewer District has entered an agreement with the Missouri Department of Transportation as part of this Contract.
- C. The CSO Mary Avenue – Phase I project portion has been designed by HDR Engineering, Inc. (HDR). Specific engineering duties and responsibilities will be assumed by HDR during the completion of the Work under a separate agreement with the Metropolitan St. Louis Sewer District.

### **1.4 JSP-SEWER AND EXHIBITS**

- A. JSP-Sewer contains the CSO Mary Avenue – Phase I project portion technical specifications.
- B. Exhibit 1 of the JSP-Sewer provides a list of pre-qualified deep sewer construction Contractors accepted by the Metropolitan St. Louis Sewer District.
- C. Exhibit 2 of the JSP-Sewer contains the Geotechnical Data Reports (GDR) for this CSO Mary Avenue – Phase I project portion.
  - 1. A Report dated March 20, 2020, prepared by 7NT, Consulting Engineers, St. Louis, MO, entitled: “Geotechnical Data Report for the CSO – Mary South of Manchester CSO Interceptor (I-132)/Outfall (L-106) Elimination – Phase I (13404) St. Louis, Missouri 7NT Number: D140-MO” consisting of 100 pages.
  - 2. A partial report dated April 13, 2018, prepared by Shannon & Wilson, Incc, Geotechnical and Environmental Consulting Engineers, St. Louis, MO, entitled: “Geotechnical Data Report L-106 (Brentwood) Sewer Separation, RDP Tributaries (Deer Creek) CSO Tunnel (MSD No. 12441) St. Louis, Missouri Shannon & Wilson Number: 41-1-37530-005” consisting of 48 out of the original 170 pages. Only a portion of this full GDR is provided for additional information on borings B17-1 & B17-2 done during the preliminary design effort, as they pertain to this CSO Mary Avenue – Phase I project portion.
- D. Exhibit 3 of the JSP-Sewer provides a list of properties/structures for inspection and condition survey if blasting is implemented for this CSO Mary Avenue – Phase I project portion.
- E. Exhibit 4 of the JSP-Sewer contains the MDNR NPDES Operating Permit for this CSO Mary Avenue – Phase I project portion.

### **1.5 WORK BY OTHERS**

- A. This project Contract construction schedule is to be closely coordinated with the City of Brentwood’s Deer Creek Flood Mitigation Project – Phase I and CSO Mary Avenue – Phase I Project (DCFM-PH I), with construction start September 2020. The downstream portion of the CSO Mary Avenue – Phase I project portion shall connect to the upstream end of the DCFM-PHI project.
- B. Interferences with Work on Utilities: The Contractor shall cooperate fully with all utility forces of the Owner or forces of other public or private agencies engaged in the relocation, altering, or otherwise rearranging of any facilities which interfere with the progress of the Work, and shall schedule the Work to minimize interferences with said relocation, altering, or other rearranging of facilities

## 1.6 WORK HOURS

- A. Construction work hours, noise, air quality, vibration or other permitted levels shall comply with City of Brentwood requirements.

## 1.7 CONTRACTOR'S USE OF SITE

- A. The Contractor's use of the Site shall be limited to its construction operations including on-site storage of materials.

## 1.8 WORK SEQUENCE AND MILESTONE

- A. This CSO Mary Avenue – Phase I project portion of the construction schedule is to be closely coordinated with the MoDOT Route 100-Manchester Road Project (J6S1718B) portion of the Contract (MSD #19MSD-00347).
  - 1. Provide construction schedule as defined in the most recent version of the Missouri Standard Specifications for Highway Construction, and the MoDOT Route 100-Manchester Road Project (J6S1718B) JSP.
  - 2. Construction across Manchester Road and traffic control shall be closely coordinated with the MoDOT Route 100-Manchester Road Project (J6S1718B) Pedestrian Underpass. One lane of traffic in each direction of Manchester Road will need to remain open at all times.
- B. This project Contract construction schedule is to be closely coordinated with the City of Brentwood's Deer Creek Flood Mitigation Project – Phase I and CSO Mary Avenue – Phase I Project (DCFM-PH I), with construction start September 2020. The downstream portion of the CSO Mary Avenue – Phase I project shall connect to the upstream end of the DCFM-PHI project.
  - 1. Demolition of property 2702 Mary Avenue shall be completed by August 23, 2021 as denoted as a milestone in the MoDOT Route 100-Manchester Road Project (J6S1718B) JSP.
- C. The Contractor shall organize and plan the construction activities to assure the safety and reliability of, and to minimize the interruption to all utilities.
- D. The proposed Work sequence shall be submitted to the Engineer in the Construction Progress Schedule.

## 1.9 OUTAGE PLAN AND REQUESTS

- A. This Project as described within this specification 01 11 00 as CSO Mary Avenue – Phase I, when complete will remain inactive until completion of the future CSO Mary Avenue – Phase II under separate contract. Refer to Section 01 31 30.
- B. Unless the Contract Documents indicate otherwise, the Contractor shall not remove from service any existing operating pipeline, channel, equipment, structure, road, or any other facility without permission from the Owner.
- C. An outage to any customer shall require specific approval of the Owner. The Owner reserves the right to reject any request for an outage.
- D. In some cases it may be necessary, at Contractor's expense, to either install temporary facilities for service or schedule the Work during a period when the outage would have minimal impact on the customer.
- E. Service connections shall be performed during dry weather periods unless specifically allowed by the Owner to occur during wet weather season.
- F. The maximum duration of any outage shall be as approved by the Owner.
- G. Van Mark Way and Dorothy Avenue shall remain open to residential traffic. Residents along Mary Avenue shall maintain access to their home.

- H. The Gym Set located near sewer alignment station 5+25 shall be removed by the City of Brentwood prior to construction of the CSO Mary Ave –Phase I sewer project, and will not be replaced. The Contractor shall contact the City of Brentwood’s Parks Director 30 days prior to needing the removal of the gym set. Upon completion of construction, the Contractor shall bring the trench back up to grade and seed and straw within the Gym Set area.

#### **1.10 OWNER USE OF SITE**

- A. The Metropolitan St. Louis Sewer District shall be allowed access to the Site during the period of construction.

#### **1.11 PROJECT MEETINGS**

- A. Preconstruction Conference
1. The Metropolitan St. Louis Sewer District representatives shall be in attendance to discuss matters specific to this CSO Mary Avenue – Phase I project portion as specified in 01 11 00.
- B. Progress Meetings
1. The ENGINEER will schedule and hold regular on-site progress meetings.
  2. Metropolitan St. Louis Sewer District representatives shall be in attendance at progress meetings in addition to regular on-Site progress meetings. The CONTRACTOR, ENGINEER, and OWNER shall attend each meeting. During each meeting, the CONTRACTOR shall provide the required schedules as defined in the most recent version of the Missouri Standard Specifications for Highway Construction, and the MoDOT Route 100-Manchester Road Project (J6S1718B) JSP, and present any issues that may impact its progress with a view to resolve these issues expeditiously.

#### **1.12 CONTRACTOR-FURNISHED PRODUCTS**

- A. Contractor shall furnish all products for the CSO Mary Avenue – Phase I project portion.
- B. Components required to be supplied in quantity within a Specification Section shall all be the same and shall be interchangeable.
- C. Provide construction schedule, submittals, quality control, and record drawings for the CSO Mary Avenue – Phase I project portion in accordance with the most recent version of the Missouri Standard Specifications for Highway Construction, and the MoDOT Route 100-Manchester Road Project (J6S1718B) JSP.
- D. Document Retention:
1. Contractor to retain copies of any reports, plans, permits and documents submitted to the Metropolitan St. Louis Sewer District, as well as any underlying research and data used to develop said submittals, for a period of seven (7) years from the date of the contract completion unless otherwise notified by the Metropolitan St. Louis Sewer District.
  2. At any time during the information retention period identified above, upon request by the Metropolitan St. Louis Sewer District, Contractor shall provide copies of any research and data underlying any of the reports, plans, permits, and documents submitted to the Metropolitan St. Louis Sewer District pursuant to this section within a reasonable timeframe

#### **1.13 REFERENCES**

- A. The Metropolitan St. Louis Sewer District’s Standard Construction Specifications for Sewers and Drainage Facilities, 2009 (MSD Specifications) shall be utilized as referenced in these specifications, and are available online at <https://msdprojectclear.org/doing-business/design-construction/standard-construction-specs/>.
- B. The Standard Details shown on Sheets 1 through 72 in the MSD Specifications are to be used for this project where applicable and are available online at <https://msdprojectclear.org/doing-business/design-construction/standard-construction-specs/standard-details-sheet/>.

**PART 2 - PRODUCTS - (NOT APPLICABLE TO THIS SECTION)**

**PART 3 - EXECUTION - (NOT APPLICABLE TO THIS SECTION)**

**END OF SECTION**

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**SECTION 01 22 00**  
**MEASUREMENT AND PAYMENT (UNIT PRICE)**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
1. Defines how work items are measured and paid for on Unit Price Contracts.
  2. In the case of conflict between this Section and the measurement methods specified in the individual Technical Specification Sections, the measurement methods in Technical Specification Sections shall govern.
  3. The Contractor shall receive payment for work after it is installed. Payment for material delivered and suitably stored shall be paid for as allowed by the most recent version of the Missouri Standard Specifications for Highway Construction, and the MoDOT Route 100-Manchester Road Project (J6S1718B) Job Special Provisions (JSP).
  4. Partial payment may be requested for items partially installed when agreed to by the Owner.
- B. Related Sections include but are not necessarily limited to:
1. Division 01 - General Requirements.
  2. Applications for Payment requirements per Missouri Standard Specifications for Highway Construction, and the MoDOT Route 100-Manchester Road Project (J6S1718B) Job Special Provisions (JSP).

**1.2 REFERENCES**

- A. Metropolitan St. Louis Sewer District: "Standard Construction Specifications for Sewers and Drainage Facilities, 2009", hereinafter referred to as the MSD Standard Specifications, are available online at <https://msdprojectclear.org/doing-business/design-construction/standard-construction-specs/>. Should a conflict between the Contract Documents and the MSD Standard Specifications arise, these Contract Documents shall govern.

**1.3 UNIT PRICE ITEMS**

- A. Quantity and measurement estimates stated in the Bid Tabulation are estimates for bidding purposes only. Actual payments shall be based on actual quantities installed, in-place, as measured and/or verified by the Engineer.
- B. Unless otherwise stated in the Contract Documents, the Bid Unit Prices shall be in effect throughout the contract duration.
- C. Except as defined above, the Contractor shall make no claim, nor receive any compensation, for anticipated profits, loss of profit, damages, or any extra payment due to any difference between the amounts of work actually completed, or materials or equipment furnished, and the estimated quantities.
- D. The Owner can only pay for quantities that exceed the estimated quantities so long as the total payments to the Contractor do not exceed the Contract Price. If the added quantities will result in payments that exceed the Contract Price, a Change Order will need to be executed before payment can be made for the added quantities.
- E. If any substantial change is made in the original plan and extent of the work, the Metropolitan St. Louis Sewer District agrees that changes in the costs will be covered by a change order having approval of the Metropolitan St. Louis Sewer District and Commission PRIOR to the performance of the work.
- F. Contractor shall assist Engineer by providing necessary equipment, workers, and survey personnel as required to measure quantities.

- G. Unless stated in the Contract Documents, measured quantities shall be rounded to the nearest whole integer.
- H. Measurement:
1. Measurement for progress payment shall be made by, or approved by, the Engineer based on the actual quantities installed. The actual quantities installed can be adjusted for corrections to previous calculations, incomplete elements or components if agreed to in advance and in writing by the Engineer.
  2. Unless otherwise provided for in the Contract Documents, Unit Price items are all inclusive of all related work, direct and indirect costs, to provide a complete and functional item.
  3. The final measurement shall be based on actual installed quantities, jointly measured and agreed to by the Contractor and the Engineer. Quantities can be adjusted (increased or decreased) based on a final calculation of quantities by the Engineer and Contractor.
- I. Payment:
1. Progress payments shall be in accordance with the Contract Documents based on estimated quantities installed paid at the Bid Unit Price.
  2. The final payment shall be based on actual quantities, fully installed, tested and placed into service, paid at the Bid Unit Price.

#### 1.4 MEASUREMENT AND PAYMENT DEFINITION FOR PAY ITEMS

- A. Measurement and Payment Definition per Pay Item:
1. Bottom Sect. of Manhole-27" Pipe – 36" Pipe: Payment for the work and materials required to install bottom sections of manholes for 36-inch diameter pipe at Manholes 6S, 7S, 8S, 9S, 10S, and 11S as described in MSD Specifications, Part 4, Pipe Sewer Construction, Section I.6.c, pages 70 and 71 and per MSD Standard Detail Sheet 21. Payment shall include all costs for the addition of an antimicrobial additive to the concrete mix
  2. Curb – Concrete Rem. and Rep.: Payment for the work and materials to remove and replace curb as described in MSD Specifications, Part 9, Miscellaneous, Section D.7., page 122, shall be made at the bid unit price per lineal foot. Concrete curb shall be Type S to match MoDOT Route 100-Manchester Road Project (J6S1718B) drawing set Sheet No. 17 & 54.
  3. Ductile Iron Pipe – 36 Inch Class 52: Payment for the work and materials required to install 36-inch ductile iron pipe, class 52 as described in MSD Specifications, Part 4, Pipe Sewer Construction, Section I.2, page 69, shall be made at the bid unit price for per linear foot. Payment shall include all costs for corrosion monitoring.
  4. Excavation Class "A" (Rock Excavation) (Deep Sewer): Payment for the work and materials required for Class A (rock) excavation as described in MSD Specifications, Part 3, Excavation, Section B.1, page 43 shall be made at the bid unit price for the computed volume in cubic yards as described in MSD Specifications, Part 3, Excavation, Section H.5, page 53, and MSD Standard Detail Sheet 1, Table 1, Payline Width of Trench. Per Section 31 23 00, excavation support shall be included in the unit price.
  5. Excavation Class "B" (Deep Sewer): Payment for the work and materials required for Class B excavation as described in MSD Specifications, Part 3, Excavation, Section B.1, page 43 shall be made at the bid unit price for the computed volume in cubic yards as described in MSD Specifications, Part 3, Excavation, Section H.5, page 53, and MSD Standard Detail Sheet 1, Table 1, Payline Width of Trench. Per Section 31 23 00, excavation support shall be included in the unit price.
  6. Excavation Class "C" (Deep Sewer): Payment for the work and materials required for Class C excavation as described in MSD Specifications, Part 3, Excavation, Section B.1, page 43 shall be made at the bid unit price for the computed volume in cubic yards as described in MSD Specifications, Part 3, Excavation, Section H.5, page 53, and MSD Standard Detail Sheet 1, Table 1, Payline Width of Trench. . Per Section 31 23 00, excavation support shall be included in the unit price.

7. Foulwater Drop – 12 Inch Pipe: Payment for the work and materials to install 12-inch foulwater drops at Manholes 9S and 11S shall be made as described in MSD Specifications, Part 4, Pipe Sewer Construction, Section I.6.d, page 71, at the bid unit price for each location.
8. Granular Backfill: Payment shall be made for pipe backfill as described in MSD Specifications, Part 4, Pipe Sewer Construction, Section I.13, page 73, and MSD Standard Detail Sheet 1, Table 1, Payline Width of Trench, at the bid unit price for the computed volume in cubic yards in place after final compacting.
9. Manhole – Standard Construction: Payment for the work and materials required to install standard manholes as described in MSD Specifications, Part 4, Pipe Sewer Construction, Section I.6.a and I.6.b, page 70, and per MSD Standard Detail Sheet 21, shall be made at the bid unit price per vertical liner foot. Payment shall include all costs for the addition of an antimicrobial additive to the concrete mix
10. Manhole Cover Seals: Payment shall be made for manhole cover seals on manholes 6S, 7S, 8S, 9S, and 9.1S located within the 100-year floodplain limits as described in MSD Specifications, Part 2, Materials, Section D.4.a, page 27, and Part 4, Pipe Sewer Construction, Section G.7.d, page 66.
11. Manhole Frame Seals: Payment shall be made for manhole frame seals on manholes 6S, 7S, 8S, 9S, and 9.1S located within the 100-year floodplain limits as described in MSD Specifications, Part 2, Materials, Section D.4.b, page 27, and Part 4, Pipe Sewer Construction, Section G.7.d, page 66.
12. Mobilization: Payment for the work and materials required for mobilization in accordance with Section 01 71 13 – Mobilization shall be made at the Lump Sum bid unit price once the items listed in Paragraph 1.1 of Section 01 71 13 have been completed.
13. Pipe Sewer – 12 Inch (Sanitary/Combined): Payment for the work and materials required to install 12-inch sanitary sewer as described in MSD Specifications, Part 4, Pipe Sewer Construction, Section I.2, page 69, shall be made at the bid unit price for each linear foot.
14. Pipe Sewer – 36 Inch (Sanitary/Combined): Payment for the work and materials required to install 36-inch sanitary sewer as described in MSD Specifications, Part 4, Pipe Sewer Construction, Section I.2, page 69, shall be made at the bid unit price for each linear foot.
15. Protection and Restoration of Site: All costs of property protection outside of payline limits; cleanup and restoration of site and working areas; pavement replacement outside of payline limits; and seeding and sodding outside of payline limits are included in the Lump Sum bid unit price for the protection and restoration of the site in place.
16. Seeding: Payment for the work and materials required for seeding as described in MSD Specifications, Part 8, Protection and Restoration of Site, Section H.5, page 115, shall be made at the bid unit price per square yard for seeding in place.
17. Sidewalks & Driveway Concrete-Rem. and Rep.: Payment for the work and materials to remove and replace concrete sidewalk and driveway as described in MSD Specifications, Part 9, Miscellaneous, Section D.6.b., page 122, shall be made at the bid unit price per square yard of concrete sidewalk and driveway in place.
18. Street Pvmt-Asphl Conc Surf & Rigid Base-Rem and Rep: Payment for the work and materials to remove and replace asphaltic street pavement shall be made at the unit price per square yard of asphaltic street in place. The area for which payment will be made shall not extend beyond two (2) feet each side of the standard payline for excavation for sewers, manholes, and structures, and shall exclude inlet sumps and curbing. Such payments shall include costs of labor, equipment, primer, saw cutting and asphaltic concrete required for removing and replacing the completed base and pavement surface. New asphalt pavement shall match MoDOT Route 100-Manchester Road Project (J6S1718B) drawing set Sheet No. 17 & 54.

## 1.5 APPLICATION FOR PAYMENT

- A. Provide an Application for Payment per the Missouri Standard Specifications for Highway Construction, and the MoDOT Route 100-Manchester Road Project (J6S1718B) JSP.

**PART 2 - PRODUCTS - (NOT APPLICABLE TO THIS SECTION)**

**PART 3 - EXECUTION - (NOT APPLICABLE TO THIS SECTION)**

**END OF SECTION**

**SECTION 01 31 30**  
**CONSTRUCTION AND SCHEDULE CONSTRAINTS**

**PART 1 - GENERAL**

**1.1 THE REQUIREMENT**

- A. Work for the CSO – Mary Avenue South of Manchester CSO Interceptor (I-132)/Outfall (L-106) Elimination Phase I (MoDOT) portion of this project, herein referred to as the CSO Mary Avenue – Phase I, shall be scheduled, sequenced, and performed in a manner which minimizes disruption to the public.
- B. The Contractor shall incorporate the construction and schedule constraints of this Section in preparing the construction schedules required under the most recent version of the Missouri Standard Specifications for Highway Construction, and the Missouri Department of Transportation (MoDOT) Route 100-Manchester Road Project (J6S1718B) Job Special Provisions (JSP).
- C. Demolition of property 2702 Mary Avenue shall be completed by August 23, 2021 as denoted as a milestone in the MoDOT Route 100-Manchester Road Project (J6S1718B) JSP.
- D. Related Sections include but are not necessarily limited to:
  - 1. Division 01 - General Requirements.

**1.2 EXISTING SANITARY SEWER**

- A. Unless indicated otherwise, temporary pumping, piping, power, lighting, controls, instrumentation, alarms, security devices, and safety devices shall be provided by the Contractor whenever its activities affects operation of the existing sewer facilities.
- B. The construction constraints in this Section do not include every item affecting the completion of the Work, but are intended to describe the sequence of critical events necessary to minimize the impact to the residents and disruption to the existing sewer. It shall be understood and agreed by the Contractor that the critical events described are not inclusive and that additional items of Work not included may be required to minimize disruption and ensure compliance. Deviation from or modification of these construction constraints is permitted if techniques and methods known to the Contractor will result in minimizing the impact to the residents and reducing disruption to the sewer operation, and if deviation is approved in advance by the Engineer.

**1.3 COORDINATION**

- A. Contractor shall coordinate work schedule with the MoDOT Route 100-Manchester Road Project (J6S1718B) portion of the Contract.
- B. Contractor shall coordinate work schedule with the City of Brentwood’s Deer Creek Flood Mitigation Project – Phase I and CSO Mary Avenue – Phase I Project.

**1.4 CONSTRUCTION ACCESS AND CONSTRAINTS**

- A. Construction Access: Access for all construction activities shall be from roadways, TCEs and Construction Limits. The posted weight limits for all roadways and bridges shall be observed.
- B. The Contractor shall maintain operations of the existing sanitary sewer throughout construction until both CSO Mary Avenue – Phase I and Phase II (future, to be constructed by others) are constructed and operational. The new sanitary sewer shall be constructed “in the dry” and no sanitary flow shall be permitted to be diverted or conveyed to the new sanitary sewer as part of CSO Mary Avenue – Phase I.
- C. All sewer improvement within CSO Mary Avenue – Phase I of this Project will remain inactive.

## 1.5 BYPASSING

- A. Bypassing of untreated or partially treated sewage to surface waters or drainage courses is prohibited. In the event accidental bypassing is caused by the Contractor's operations, notify the Owner and Engineer immediately. The Owner shall immediately be entitled to employ others to stop the bypassing and costs incurred therefore will be deducted from the Contractor's construction progress payments.

## 1.6 TEMPORARY CONNECTIONS

- A. Making connections to existing sewer facilities or other operations that interfere with the operation of the existing sewer shall be thoroughly planned in advance, and required equipment, materials, and labor shall be on hand at the time of undertaking the connections. Work shall be completed as quickly as possible and with as little delay as possible and shall proceed continuously (24 hours a day and seven days a week) if necessary to complete modifications and/or connections in the minimum time.
- B. The cost of any temporary sewer facilities and night, weekend, or holiday activity and overtime payments required during process interruptions shall be included in the Work.
- C. The Contractor shall provide the necessary equipment and appurtenances. Prior to installing said equipment and appurtenances, Contractor shall furnish a submittal on the proposed components and installation for Engineer's review and approval.

## 1.7 PERMITS

- A. The Contractor shall abide by the conditions of all permits and shall obtain proof of satisfaction of conditions from issuers of permits prior to acceptance of the Work by the Owner
- B. Conditions affecting the Contractor are found in the following permits and agreements. Copies of these permit conditions for permits already obtained are attached as Exhibits of the JSP-Sewer:
  - 1. Exhibit 4 - Metropolitan St. Louis Sewer District's MDNR NPDES Operating Permit.
- C. The Contractor shall obtain the permits listed above, if not already obtained.
  - 1. The Owner shall be responsible for, and reimburse the Contractor for, fees for all construction permits and licenses obtained by the Contractor for the Work. No Contractor markup will be allowed.
  - 2. The Contractor shall demonstrate compliance with the requirements for all required construction permits and licenses by submitting to the Owner two (2) copies of all such permits and licenses prior to the commencement of the specific Work covered by the permit or license.
  - 3. Metropolitan St. Louis Sewer District Lateral Reconnection Permit. No Cost.
  - 4. City of Brentwood (Right-of-Way/Excavation, Plumbing): The City of Brentwood agrees to waive all permit fees, inspection fees, escrow, and as-built deposits for this sewer construction work.
  - 5. Missouri Department of Transportation: Permit to Work on Right-of-Way.
- D. The Contractor is responsible for the development of the Stormwater Pollution Prevention Plan (SWPPP) in accordance with the most recent version of the Missouri Standard Specifications for Highway Construction, the MoDOT Route 100-Manchester Road Project (J6S1718B) JSP, NPDES Permit and the City of Brentwood's requirements.

## 1.8 PERMIT SCHEDULE CONSTRAINTS

- A. General: It is the Contractor's responsibility to coordinate and plan the construction activities to integrate each permit schedule constraint into the performance of the overall Work.
- B. The permit schedule constraints in the permits listed above does not mean that every constraint or special condition has been identified. This does not substitute for the Contractor's coordination and planning for completion of the Work within Contract times.
  - 1. Refer to Permit Documents Provided.

**1.9 TRAFFIC SAFETY AND ACCESS TO PROPERTIES**

- A. Comply with all rules and regulations of the city, state, and county authorities regarding closing or restricting the use of private and public streets or highways. No public or private road shall be closed, except by express written permission of the jurisdictional authority and Owner. Conduct the Work so as to assure the least possible obstruction to traffic and normal commercial pursuits. Protect all obstructions with traveled roadways by installing approved signs, barricades, and lights where necessary for safety of the public. The convenience of the general public and residents adjacent to the project, and the protection of persons and property are of prime importance and shall be provided for in an adequate and satisfactory manner. The Contractor shall clean public roads in the project vicinity as required by the city, state and county authorities, and Owner.
- B. When flaggers and guards are required by regulation or when deemed necessary for safety, the Contractor shall furnish them with approved apparel and other regulation traffic control devices.

**1.10 SITE FLOODING**

- A. Portions of the sewer alignment are within the 100-year flood plain. The Contractor shall be responsible for protecting the Work, materials, and equipment from flooding and shall notify the Engineer of each site flooding occurrence on the same day flooding occurs so that flooding can be documented and impacts on the project schedule can be determined.

**PART 2 - PRODUCTS - (NOT APPLICABLE TO THIS SECTION)**

**PART 3 - EXECUTION - (NOT APPLICABLE TO THIS SECTION)**

**END OF SECTION**

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**SECTION 01 32 26**  
**CONSTRUCTION PROGRESS DOCUMENTATION**

**PART 1 – GENERAL**

**1.1 SUMMARY**

- A. Contractor shall prepare and submit to Engineer for acceptance a Schedule of Unit Prices that allocates cost to each item of the Work for the CSO – Mary Avenue South of Manchester CSO Interceptor (I-132)/Outfall (L-106) Elimination Phase I (MoDOT), Metropolitan St. Louis Sewer District Project No. 13404-015.1 described in Section 01 11 00.
- B. Upon request of Engineer, promptly furnish data and information that substantiates and supports the amounts indicated in the Schedule of Unit Prices.
- C. Submit preliminary Schedule of Unit Prices to Engineer for initial review. Contractor shall incorporate Engineer's comments into the Schedule of Unit Prices and resubmit to Engineer. Engineer may require corrections and re-submittals until Schedule of Unit Prices is acceptable.
- D. Schedule of Unit Prices may be used as a basis for negotiating price of changes, if any, in the Work.

**1.2 SUBMITTALS**

- A. Informational Submittals: Submit the following:
  - 1. Submit to Engineer the Schedule of Unit Prices in the form and quantity required by the most recent version of the Missouri Standard Specifications for Highway Construction, and the Missouri Department of Transportation (MoDOT) Route 100-Manchester Road Project (J6S1718B) Job Special Provisions (JSP).
  - 2. Content of Schedule of Unit Prices Submittals shall be in accordance with Article 1.3 of this Specifications section.
  - 3. Timing of Submittals:
    - a. Submit preliminary Schedule of Unit Prices within time limit in accordance with Article 1.4 of this Specification section.
    - c. Submittal of the Schedule of Unit Prices for acceptance by Engineer. Engineer will not accept Applications for Payment without an acceptable Schedule of Unit Prices.
    - d. When required by Engineer, promptly submit updated Schedule of Unit Prices to include cost breakdowns for changes in the Contract Price.

**1.3 SCHEDULE OF UNIT PRICES:**

- A. After review of the preliminary schedule at the preconstruction conference, and before submission of the first Application for Payment, Contractor shall prepare and submit to Engineer a Schedule of Unit Prices covering each unit price item. The Schedule of Unit Prices, showing the value of each kind of work, shall be acceptable to Engineer before any Application for Payment is prepared.
- B. The sum of the items listed in the Schedule of Unit Prices shall equal the Contract Price. Such items as Bond premium, temporary construction facilities, and plant may be listed separately in the Schedule of Unit Prices, provided the amounts can be substantiated. Overhead and profit shall not be listed as separate items.
- C. The Schedule of Unit Prices shall have sufficient detail such that partial completion of separable items of work can easily be calculated.
- D. An unbalanced Schedule of Unit Prices providing for overpayment of Contractor on items of Work

which would be performed first will not be accepted. The Schedule of Unit Prices shall be revised and resubmitted until acceptable to Engineer. Final acceptance by Engineer shall indicate only consent to the Schedule of Unit Prices as a basis for preparation of applications for progress payments, and shall not constitute an agreement as to the value of each indicated item.

#### **1.4 SCHEDULE OF PAYMENTS:**

- A. Within 15 days after award of contract, Contractor shall furnish to Engineer a schedule of estimated bi-monthly payments in accordance with the Missouri Department of Transportation (MoDOT) Route 100-Manchester Road Project (J6S1718B) technical specifications. The schedule shall be revised and resubmitted each time an Application for Payment varies more than 10 percent from the estimated payment schedule. The schedule shall be updated by the Contractor annually. The annual update shall be submitted to the Engineer and Owner during the month of November and shall cover the balance of the project's duration.

#### **1.5 SURVEY DATA**

- A. All field books, notes, and other data developed by Contractor in performing surveys required as part of the Work shall be available to Engineer for examination throughout the construction period. All such data shall be submitted to Engineer with the other documentation required for final acceptance of the Work.

#### **1.6 LAYOUT DATA**

- A. Contractor shall keep neat and legible notes of measurements and calculations made in connection with the layout of the Work. Copies of such data shall be furnished to the Resident Project Representative for use in checking Contractor's layout. All such data considered of value to Owner will be transmitted to Owner by Engineer with other records upon completion of the Work.

#### **1.7 DAILY REPORTS**

- A. The Contractor shall prepare and submit a daily report to the Construction Manager documenting the construction activities, workers engaged at the site broken down by trade, subcontractors engaged at the site, equipment in use at the site, materials received, and direction received. The format of the daily report shall be acceptable to the Construction Manager.
- B. The report for the previous day shall be submitted to the Construction Manager for review prior to the end of the subsequent business day. Comments by the Construction Manager shall be discussed and Daily Reports shall be revised by the Contractor to incorporate relevant comments. Submission of Daily Reports shall be a condition for recommendation of Progress Payments.

#### **1.8 SCHEDULE OF LABOR AND EQUIPMENT RATES**

- A. Before submission of the first Application for Payment, Contractor shall prepare and submit to Engineer a Schedule of Labor and Equipment Rates for review and approval. The schedule shall include the hourly payroll costs for each job classification of employee in the direct employ of the Contractor and all Subcontractors. The schedule shall also include the hourly, daily, weekly, and monthly costs for construction equipment either owned by the Contractors and Subcontractors or which is planned to be rented by the Contractor or Subcontractor during the prosecution of the work. The approved schedule of labor and equipment rates will be utilized to determine the cost of the work.

### **PART 2 – PRODUCTS - (NOT APPLICABLE TO THIS SECTION)**

### **PART 3 – EXECUTION - (NOT APPLICABLE TO THIS SECTION)**

#### **END OF SECTION**

**SECTION 01 53 30**  
**PROTECTION OF EXISTING FACILITIES**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. The Contractor shall protect all existing utilities and improvements not designated for removal during all phases of Work. The Contractor shall restore damaged or temporarily relocated utilities and improvements to a condition equal to or better than prior to such damage or temporary relocation, all in accordance with the contract documents.
- B. Related Sections include but are not necessarily limited to:
  - 1. Division 01 - General Requirements.
  - 2. Division 31 – Earthwork

**1.2 RIGHTS-OF-WAY**

- A. The Contractor shall not do any Work that would affect any oil, gas, sewer, or water pipeline; any telephone, telegraph, or electric transmission line; any fence; or any other structure except as designated in the contract documents, nor shall the Contractor enter upon the rights-of-way involved until the Contractor has secured authority therefore from the proper party. The Contractor shall implement actions required by those agreements.
- B. After authority has been obtained, the Contractor shall give said party due notice of its intention to begin Work, if required by said party, and shall remove, shore, support, or otherwise protect such pipeline, transmission line, ditch, fence, or structure, or replace the same.

**1.3 PROTECTION OF STREET OR ROADWAY MARKERS**

- A. The Contractor shall not destroy, remove, or otherwise disturb any existing survey markers or other existing street or roadway markers without proper authorization. No pavement breaking or excavation shall be started until all survey or other permanent marker points that will be disturbed by the construction operations have been properly referenced. Survey markers or points disturbed by the Contractor shall be accurately restored after street or roadway resurfacing has been completed

**1.4 RESTORATION OF PAVEMENT**

- A. Refer to the Missouri Department of Transportation (MoDOT) Route 100-Manchester Road Project (J6S1718B) drawings for future grading and pavement conditions.
- B. General: All paved areas damaged during construction shall be replaced with similar materials of equal thickness to match MoDOT Route 100-Manchester Road Project (J6S1718B) drawings, except where specific resurfacing requirements have been called for in the Contract Documents or in the requirements of the agency issuing the permit. The pavement restoration requirement to match MoDOT Route 100-Manchester Road Project (J6S1718B) drawings shall apply to all components of existing sections, including sub-base, base, and pavement. Temporary and permanent pavement shall conform to the requirements of the affected pavement owner. Pavements which are subject to partial removal shall be neatly saw cut in straight lines.
- C. Temporary Resurfacing: Wherever required by the public authorities having jurisdiction, the Contractor shall place temporary surfacing promptly after backfilling and shall maintain such surfacing for the period of time fixed by said authorities before proceeding with the final restoration of improvements.

- D. Permanent Resurfacing: In order to obtain a satisfactory junction with adjacent surfaces, the Contractor shall saw cut back and trim the edge so as to provide a clean, sound, vertical joint before permanent replacement of an excavated or damaged portion of pavement. Damaged edges of pavement along excavations and elsewhere shall be trimmed back by saw cutting in straight lines. All pavement restoration and other facilities restoration shall be constructed to finish grades compatible with adjacent undisturbed pavement.
- E. Restoration of Sidewalks or Private Driveways: Wherever sidewalks or private driveways have been removed for purposes of construction, the Contractor shall place suitable temporary sidewalks or driveways promptly after backfilling and shall maintain them in satisfactory condition. Maintain temporary until permanent are installed, where requirements are completed and accepted.

### 1.5 EXISTING UTILITIES AND IMPROVEMENTS

- A. General: The Contractor shall protect underground Utilities and other improvements which may be impaired during construction operations, regardless of whether or not the Utilities are indicated on the Drawings. The Contractor shall take all possible precautions for the protection of unforeseen Utility lines to provide for uninterrupted service and to provide such special protection as may be necessary.
- B. Except where the Drawings indicate Utilities have been field located during design or certain Utility locations shall be exposed as part of the Work, the Contractor shall be responsible for exploratory excavations at it deems necessary to determine the exact locations and depths of Utilities which may interfere with its Work. All such exploratory excavations shall be performed as soon as practicable after Notice to Proceed and, in any event, a sufficient time in advance of construction to avoid possible delays to the Contractor's progress. When such exploratory excavations show the Utility location as shown on the Drawings to be in error, the Contractor shall so notify the Engineer.
- C. The number of exploratory excavations required shall be that number which is sufficient to determine the alignment and grade of the Utility.
- D. Utilities to be Moved: In case it shall be necessary to move the property of any public utility or franchise holder, such utility company or franchise holder will, upon request of the Contractor, be notified by the Owner to move such property within a specified reasonable time. When utility lines that are to be removed are encountered within the area of operations, the Contractor shall notify the Engineer a sufficient time in advance for the necessary measures to be taken to prevent interruption of service.
- E. Utilities to be Temporarily Removed or Relocated: Where the proper completion of the Work requires the temporary or permanent removal and/or relocation of an existing Utility or other improvement which is indicated, the Contractor shall remove and, without unnecessary delay, temporarily replace or relocate such Utility or improvement in a manner satisfactory to the Engineer and the owner of the facility. In all cases of such temporary removal or relocation, restoration to the former location shall be accomplished by the Contractor in a manner that will restore or replace the Utility or improvement as nearly as possible to its former locations and to as good or better condition than found prior to removal.
- F. Owner's Right of Access: The right is reserved to the Owner and to the owners of public utilities and franchises to enter at any time upon any public street, alley, right-of- way, or easement for the purpose of making changes in their utilities and property utilities made necessary by the Work of this Contract.

- G. **Underground Utilities Indicated:** Existing Utility lines that are indicated or the locations of which are made known to the Contractor prior to excavation and that are to be retained, and all Utility lines that are constructed during excavation operations shall be protected from damage during excavation and backfilling and, if damaged, shall be immediately repaired or replaced by the Contractor, unless otherwise repaired by the owner of the damaged Utility. If the owner of the damaged utility performs its own repairs, the Contractor shall reimburse said owner for the costs of repair.
- H. **Underground Utilities Not Indicated:** In the event that the Contractor damages existing Utility lines that are not indicated or the locations of which are not known to the Contractor prior to excavation, a verbal report of such damage shall be made immediately to the Engineer and a written report thereof shall be made promptly thereafter. The Engineer will immediately notify the owner of the damaged Utility. If the Engineer is not immediately available, the Contractor shall notify the Utility owner of the damage. If directed by the Engineer, repairs shall be made by the Contractor under the provisions for changes and extra Work.
- I. **Costs of locating and repairing damage not due to failure of the Contractor to exercise reasonable care, and removing or relocating such Utility facilities not indicated in the Contract Documents with reasonable accuracy, and for equipment on the project which was actually working on that portion of the Work which was interrupted or idled by removal or relocation of such Utility facilities, and which was necessarily idled during such Work will be paid for as extra Work.**
- J. **Approval of Repairs:** All repairs to a damaged Utility or improvements are subject to inspection and approval by an authorized representative of the Utility or improvement owner before being concealed by backfill or other Work.
- K. **Maintaining in Service:** Unless indicated otherwise, oil and gasoline pipelines, power and telephone or communication cable ducts, gas and water mains, irrigation lines, sewer lines, storm drain lines, poles, and overhead power and communication wires and cable encountered along the line of the Work shall remain continuously in service during all the operations under the Contract, unless other arrangements satisfactory to the Engineer are made with the owner of said pipelines, duct, main, irrigation line, sewer, storm drain, pole, or wire or cable. The Contractor shall be responsible for and shall repair all damage due to its operations, and the provisions of this Section shall not be abated even in the event such damage occurs after backfilling or is not discovered until after completion of the backfilling.

#### **1.6 TREES OR SHRUBS WITHIN STREET RIGHTS-OF-WAY AND PROJECT LIMITS**

- A. **General:** Except where trees or shrubs are indicated to be removed, the Contractor shall exercise all necessary precautions so as not to damage or destroy any trees or shrubs, including those lying within street rights-of-way and project limits, and shall not trim or remove any trees unless such trees have been approved for trimming or removal by the jurisdictional agency or Owner. Existing trees and shrubs which are damaged during construction that are outside of street rights-of-way and project limits shall be trimmed or replaced by the Contractor or a certified tree company under permit from the jurisdictional agency and/or the Owner. Tree trimming and replacement shall be accomplished in accordance with the following paragraphs.
- B. **Trimming:** Symmetry of the tree shall be preserved; no stubs or splits or torn branches left; clean cuts shall be made close to the trunk or large branch. Spikes shall not be used for climbing live trees. Cuts over 1-1/2 inches in diameter shall be coated with a tree paint product that is waterproof, adhesive, and elastic, and free from kerosenes, coal tar, creosote, or other material injurious to the life of the tree.
- C. **Removal:** The Contractor shall immediately notify the jurisdictional agency and/or the Owner if any tree or shrub is damaged by the Contractor's operations outside of the street rights-of-way and project limits. If, in the opinion of said agency or the Owner, the damage is such that removal is necessary, the Contractor shall remove the tree or shrub at its own expense including removal of the stump to 12" below grade.

**1.7 LAWN AREAS**

- A. Lawn or landscaped areas damaged during construction shall be repaired to match the pre-construction condition, or as defined in the Property Owner Agreements, to the satisfaction of the land owner and the Owner.
- B. Refer to MoDOT Route 100-Manchester Road Project (J6S1718B) drawings and technical specification for future lawn and landscape care.

**1.8 PROTECTION OF STRUCTURES**

- A. The Contractor shall not damage, destroy, remove, or otherwise disturb any existing structures except those specified to be removed.
- B. Refer to MoDOT Route 100-Manchester Road Project (J6S1718B) drawings for future demolition plan.

**1.9 NOTIFICATION BY THE CONTRACTOR**

- A. Prior to any excavation in the vicinity of any existing underground facilities, including all water, sewer, storm drain, gas, petroleum products, or other pipelines; all buried electric power, communications, or television cables; all traffic signal and street lighting facilities; and all roadway and state highway rights-of-way, the Contractor shall notify the respective authorities representing the owners or agencies responsible for such facilities not less than 3 days, but not more than 7 days prior to excavation so that a representative of said owners or agencies can be present during such WORK if they so desire. The Contractor shall also notify Missouri One Call at 1-800-422-4133 at least 2 days, but no more than 14 days, prior to such excavation.

**PART 2 - PRODUCTS - (NOT APPLICABLE TO THIS SECTION)**

**PART 3 - EXECUTION (NOT APPLICABLE TO THIS SECTION)**

**END OF SECTION**

**Section 01 65 00**  
**PRODUCT DELIVERY REQUIREMENTS**

**PART 1 - GENERAL**

**1.1 SCOPE**

- A. This section covers packaging and shipping of materials and equipment.

**1.2 PREPARATION FOR SHIPMENT**

- A. All equipment shall be suitably packaged to facilitate handling and to protect against damage during transit and storage. All equipment shall be boxed, crated, or otherwise completely enclosed and protected during shipment, handling, and storage. All equipment shall be protected from exposure to the elements and shall be kept dry at all times.
- B. Painted and coated surfaces shall be protected against impact, abrasion, discoloration, and other damage. Painted and coated surfaces which are damaged prior to acceptance of equipment shall be repainted to the satisfaction of Engineer.
- C. Grease and lubricating oil shall be applied to all bearings and similar items.

**1.3 SHIPPING**

- A. Before shipping each item of equipment shall be tagged or marked as identified in the delivery schedule or on the Shop Drawings. Complete packing lists and bills of material shall be included with each shipment.

**PART 2 – PRODUCTS – (NOT APPLICABLE TO THIS SECTION)**

**PART 3 – EXECUTION – (NOT APPLICABLE TO THIS SECTION)**

**END OF SECTION**

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**SECTION 01 66 00**  
**PRODUCT STORAGE AND HANDLING REQUIREMENTS**

**PART 1 – GENERAL**

**1.1 SCOPE**

- A. This section covers delivery, storage, and handling of materials and equipment.

**1.2 DELIVERY**

- A. Contractor shall bear the responsibility for delivery of equipment, spare parts, special tools, and materials to the site and shall comply with the requirements specified herein and shall provide required information concerning the shipment and delivery of the materials specified in these Contract Documents. These requirements also apply to any subsuppliers making direct shipments to the jobsite.
- B. Contractor shall, either directly or through contractual arrangements with others, accept responsibility for the safe handling and protection of the equipment and materials furnished under this Contract before and after receipt at the port of entry. Acceptance of the equipment shall be made after it is installed, tested, placed in operation and found to comply with all the specified requirements.
- C. All items shall be checked against packing lists immediately on delivery to the site for damage and for shortages. Damage and shortages shall be remedied with the minimum of delay.
- D. Delivery of portions of the equipment in several individual shipments shall be subject to review of Engineer before shipment. When permitted, all such partial shipments shall be plainly marked to identify, to permit easy accumulation, and to facilitate eventual installation.

**1.3 STORAGE**

- A. Upon delivery, all equipment and materials shall immediately be stored and protected until installed in the Work.
- B. Stacked items shall be suitably protected from damage by spacers or load distributing supports that are safely arranged. No metalwork (miscellaneous steel shapes and reinforcing steel) shall be stored directly on the ground. Masonry products shall be handled and stored in a manner to hold breakage, chipping, cracking, and spalling to a minimum. Cement, lime, and similar products shall be stored off the ground on pallets and shall be covered and kept completely dry at all times. Pipe, fittings, and valves may be stored out of doors, but must be placed on wooden blocking. PVC pipe, geomembranes, plastic liner, and other plastic materials shall be stored off the ground on pallets and protected from direct sunlight.
- C. Pumps, motors, electrical equipment, and all equipment with antifriction or sleeve bearings shall be stored in weathertight structures maintained at a temperature above 60°F [16°C]. Electrical equipment, controls, and insulation shall be protected against moisture and water damage.
- D. Equipment having moving parts, such as gears, bearings, and seals, shall be stored fully lubricated with oil, grease, etc., unless otherwise instructed by the manufacturer. Manufacturer's storage instructions shall be carefully followed by Contractor.

- E. When required by the equipment manufacturer, moving parts shall be rotated a minimum of twice a month to ensure proper lubrication and to avoid metal to metal "welding". Upon installation of the equipment, Contractor shall, at the discretion of Engineer, start the equipment at one-half load for an adequate period of time to ensure that the equipment does not deteriorate from lack of use.
- F. When required by the equipment manufacturer, lubricants shall be changed upon completion of installation and as frequently as required thereafter during the period between installation and acceptance. New lubricants shall be put into the equipment by Contractor at the time of acceptance.
- G. Equipment and materials shall not show any pitting, rust, decay, or other deleterious effects of storage when installed in the Work.
- H. In addition to the protection specified for prolonged storage, the packaging of spare units and spare parts shall be for export packing and shall be suitable for long-term storage in a damp location. Each spare item shall be packed separately and shall be completely identified on the outside of the container.

#### **1.4 HANDLING**

- A. Stored items shall be laid out to facilitate their retrieval for use in the Work. Care shall be taken when removing the equipment for use to ensure the precise piece of equipment is removed and that it is handled in a manner that does not damage the equipment.
- B. During handling, carbon steel constructed material including chains, straps, and forks on lifting equipment shall not directly contact any equipment or material constructed of stainless steel. It shall be the Contractor's responsibility to correct any carbon steel contamination of stainless steel.

#### **PART 2 – PRODUCTS – (NOT APPLICABLE TO THIS SECTION)**

#### **PART 3 – EXECUTION – (NOT APPLICABLE TO THIS SECTION)**

#### **END OF SECTION**

**SECTION 01 71 13**  
**MOBILIZATION**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Contractor shall mobilize as required for the proper performance and completion of the Work and in accordance with the Contract Documents.
- B. Coordinate closely with the Missouri Department of Transportation (MoDOT) Route 100-Manchester Road Project (J6S1718B) portion of the Contract.
- C. Mobilization shall include at least the following items:
  - 1. Moving onto the Site of the Contractor's equipment necessary for the first month of operations.
  - 2. Arranging for erection of Contractor's Work and storage yards.
  - 3. Obtaining required permits.
  - 4. Having the Contractor's superintendent at the Site full time.
  - 5. Submitting initial submittals.
  - 6. General Conditions.
  - 7. Bonds and Insurance.
  - 8. Pre-construction meeting.
  - 9. Submittal of Preliminary Progress Schedule.
- D. Related Sections include but are not necessarily limited to:
  - 1. Division 01 - General Requirements.

**1.2 PAYMENT FOR MOBILIZATION**

- A. The Contractor's attention is directed to the condition that no payment for mobilization, or any part thereof, will be recommended for payment until the mobilization items listed above have been completed.

**PART 2 - PRODUCTS – (NOT APPLICABLE TO THIS SECTION)**

**PART 3 - EXECUTION – (NOT APPLICABLE TO THIS SECTION)**

**END OF SECTION**

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**SECTION 01 71 14**  
**PROTECTION AND RESTORATION OF SITE**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Contractor to follow Part 8 “Protection and Restoration of Site” in the Metropolitan St. Louis Sewer District Standard Construction Specifications for Sewers and Drainage Facilities, 2009, hereinafter referred to as the MSD Standard Specifications, and are available online at <https://msdprojectclear.org/doing-business/design-construction/standard-construction-specs/>.
- B. Related Sections include but are not necessarily limited to:
  - 1. Division 01 - General Requirements.
  - 2. Division 31 - Earthwork

**1.2 SUBMITTALS**

- A. See the Missouri Department of Transportation (MoDOT) Route 100-Manchester Road Project (J6S1718B) technical specifications for the mechanics and administration of the submittal process.
- B. Submit Pre-Construction Surveyor Qualifications for review by the Engineer.
- C. Submit the Water Quality Testing Lab to be used for water quality testing for review and approval of the Engineer.
- D. Provide the Contractor’s SWPPP per the MoDOT Route 100-Manchester Road Project (J6S1718B) technical specifications.
- E. Informational Submittals:
  - 1. Submit a copy of each agreement with property owners for additional working room or access.
  - 2. Submit a list of the addresses that were sent construction notification letters, including the dates the notification letters were mailed.
  - 3. Submit a list of the addresses that were sent a request to conduct the inspection and condition survey, including the dates the requests were mailed.
  - 4. Submit a list of the addresses that were sent a second request to conduct the inspection and condition survey by certified mail, including the dates the certified requests were mailed and a copy of each certified request letter.
  - 5. Submit a copy of all signed property owner permission acknowledgements to conduct the inspection and condition survey.
  - 6. Submit witnessed, signed and dated bound copies of all interior and exterior pre-construction, interim, and post-construction condition inspection survey reports and provide a copy to each property owner upon their request at no additional cost to the Owner.

**1.3 CONTRACTOR RESPONSIBILITY**

- A. MSD Standard Specifications Part 8, Section A, “Contractor Responsibility” the following conditions apply:
  - 1. The contractor has no working room adjacent to the existing easements, unless otherwise indicated on plans.
  - 2. The Contractor may make agreements with property owners for additional working room or access. The Owner shall be furnished with a copy of each agreement.
  - 3. The Contractor shall be responsible for notifying property owners at least 7 days, but not more than 14 days, in advance of the Work:

- a. All properties adjacent to the project alignment shall be notified of the project within 14 calendar days after Notice to Proceed. The letter included at the end of this Technical Specification section shall be mailed to each property. Provide the Owner with a list of addresses who were sent the notification.
- b. The letter shall indicate a contact person and telephone number for the Contractor.
4. The Contractor shall comply with all the requirements of the City of Brentwood and Missouri Department of Transportation, included in Project Manual.
5. Structure Condition Survey:
  - a. If blasting is planned to be utilized, the Contractor shall conduct interior and exterior condition inspection of the properties and structures at the locations listed in Exhibit 3 of the JSP-Sewer – List of Properties/Structures for Inspection.
  - b. Pre-Construction:
    - 1) Prior to beginning the Work under this section, request in writing from each property owner permission to conduct the inspection and condition survey. Include a proposed schedule for the inspection and condition survey. Request that the property owner return a signed and dated Contractor pre-printed acknowledgement giving permission to the Contractor to conduct the inspection and condition survey.
    - 2) In the event that a property owner denies access or if there is no response from the property owner for the inspection and condition survey, the Contractor shall notify such property owner, by certified mail, on the intent of the survey. If after two (2) weeks access is still denied or if there is no response from the property owner, the Owner, upon review of the submitted correspondence may waive the requirement for conducting the inspection and condition survey at that location.
    - 3) The pre-construction inspection and condition surveys shall produce baseline documentation for comparison against future inspections and condition surveys.
    - 4) The building exteriors, property and environs shall be observed. The exterior condition of, but not limited to, all structures, sidewalks, curbing, pavements, landscaping features, miscellaneous site improvements, and so forth shall be surveyed. Defects such as, but not limited to, evidence of cracking, damage, discoloration, drainage, ponding and so forth shall be documented. Any existing cracks shall be located, documented and photographed at the time of inspection. All existing deficiencies, major or minor, shall be documented. Documentation in the form of digital photographs with a written detailed log of each photograph shall be produced including a photo mosaic of exterior structure walls, foundation and roof where visible. Digital photographs shall be used to document exterior landscaping and flatwork such as driveways and sidewalks. Any supplementary notes, sketches, or diagrams voluntarily produced at the Contractor's discretion shall be submitted.
    - 5) Structure interiors, including the basement shall be observed. Defects such as, but not limited to, evidence of cracking, damage, discoloration, water intrusion, basement flooding and so forth shall be documented. Any existing cracks shall be located, documented and photographed at the time of inspection. All existing structural deficiencies, major or minor, shall be documented. Documentation in the form of digital photographs with a written detailed log of each photograph shall be produced. Any supplementary notes, sketches, diagrams of all walls, partitions, floors and ceilings, voluntarily produced at the Contractor's discretion shall be submitted.
    - 6) One calendar week prior to the start of construction, the Contractor shall prepare and deliver to the Engineer two bound copies of the pre-construction inspection and condition survey containing all field notes taken, sketches and diagrams prepared, photographs obtained, digital photographs and/or digital video obtained.

- 7) If blasting is planned to be utilized, one calendar week prior to the start of construction within 500 feet of any property, Contractor shall prepare and deliver to the Engineer two bound copies of the pre-construction inspection and condition survey containing all field notes taken, sketches and diagrams prepared, photographs obtained, digital photographs and/or digital video obtained.
- c. During Construction:
  - 1) As construction progresses, the Contractor shall respond to complaints or claims of damage by visiting the property in question to document and photograph the areas of concern to the property owner. Within one week of visiting with the property owner, the Contractor shall prepare and deliver to the Owner two bound copies of a report containing all field notes taken, sketches and diagrams prepared, and/or digital photographs obtained. The results of the site visit documentation shall be compared to the results of the pre-construction inspection. Specific similarities and differences shall be noted in the report.
- d. Post-Construction:
  - 1) Post-Construction inspection will only be performed if a property owner indicates that damage has occurred, unless otherwise identified in an Agreement with Property Owners. The method of inspection shall be an in-field comparison to the preconstruction inspection, noting only the defects which are new or have changed since the initial inspection.
  - 2) One calendar week after completion of an inspection and condition survey, the Contractor shall prepare and deliver to the Engineer two bound copies of the post-construction inspection and condition survey report containing digital photographs. Any supplementary notes, sketches, diagrams, voluntarily produced at the Contractor's discretion shall be submitted. The results of the post-construction inspection and condition survey shall be compared to the results of the pre-construction inspection and condition survey. Specific similarities and differences shall be noted in the report.
- e. Pre-Construction Surveyor Qualifications:
  - 1) Qualified specialists, subject to review by the Engineer, shall perform the inspections and condition surveys.
- f. Photograph Requirements:
  - 1) Digital photographic images shall be stored on a DVD or external hard drive.
- g. Certifications:
  - 1) All copies of the pre-construction, interim, and post-construction inspection and condition survey reports shall be signed and dated by those taking part in the inspection. The execution of the reports shall be documented by an independent witness, such as the Engineer or property owner.
- h. Nothing contained herein shall relieve the Contractor of responsibility for claims arising from the Contractor's construction operations. Failure to inspect any structure, whether or not required under this section, nor the inadequacy of the inspections performed, shall not relieve the Contractor of its responsibility.
6. Contractor shall photograph all Haul Routes before and after they are used for this project. The Engineer shall be provided with two copies of the photographs bound in a report format.

#### 1.4 LAND DISTURBANCE ACTIVITY

- A. MSD Standard Specifications Part 8, Protection and Restoration of Site the following additions apply:
  1. Section B, Land Disturbance Activity, Paragraph 1 – the following corrections, modifications and additions apply:
    - a. Designation of Subparagraph c is deleted and verbiage following it shall be treated as a continuation of Subparagraph b.
    - b. Under Subparagraph b (as corrected from c) – the following additions apply:

- 10) Site boundaries and outfalls marked on a site map. An aerial/contour map will be provided by the Owner, upon request by the Contractor.
  - 11) Provide the Contractor's SWPPP per the MoDOT Route 100-Manchester Road Project (J6S1718B) specifications.
2. Section B, Land Disturbance Activity, Paragraph 2, Item 5, Subparagraph b – the following addition applies:
    - (1) Additional resources are available at the USEPA internet site, <http://cfpub.epa.gov/npdes/stormwater/swppp.cfm>.
  3. Section B, Land Disturbance Activity – the following additions apply:
  5. The Contractor may be required by MDNR to sample and report as a result of illegal discharges, compliance issues, complaint investigations, or other such evidence of contamination from construction activities on the project site. Settable solids from a stormwater outfall shall not exceed 2.5 ml/L per Standard Method 2540 F for storm events up to but not exceeding the local 2-year, 24-hour storm. Upon request by the Engineer, the Contractor shall obtain a split water quality sample. One sample shall be sent to a testing lab, and the other sample given to the Engineer. The Contractor, at his cost shall use a water quality testing lab approved by the Engineer.
  6. The Contractor shall be subject to the same enforcement action that is imposed on the Owner, by the State, due to violation of the permit.

#### **1.5 AGREEMENTS WITH PROPERTY OWNERS**

- A. None currently for the CSO – Mary Avenue South of Manchester CSO Interceptor (I-132)/Outfall (L-106) Elimination Phase I (MoDOT) (13404) project portion.

#### **1.6 SEEDING**

- A. MSD Standard Specifications Part 8, Protection and Restoration of Site, Section G, “Seeding” the following additions apply:
  1. The designation of a second paragraph is deleted and the verbiage of paragraph 2 is treated as a continuation of paragraph 1.
- B. Seeding will be done as a part of this CSO – Mary Avenue South of Manchester CSO Interceptor (I-132)/Outfall (L-106) Elimination Phase I (MoDOT) (13404) project portion where construction of sewer is complete and final grading is not ready to occur.

#### **1.7 OBSERVATION WELLS**

- A. Piezometers are to be plugged in accordance with the Rules of the Missouri Department of Natural Resources (MODNR) as set forth in 10 CSR 23-4.080. Piezometers must be plugged by a permitted monitoring well installation contractor. The well installation contractor shall plug the piezometers in accordance with the above Rules, and shall report the plugging details to MODNR and Metropolitan St. Louis Sewer District on registered report forms provided by MODNR. The owner of the wells shall be listed as the “Metropolitan St. Louis Sewer District - Ms. Patricia Pride. The location address shall be followed by “ - MSD #13404- 015.1” on applications to MODNR.

### **PART 2 - PRODUCTS – (NOT APPLICABLE TO THIS PROJECT)**

### **PART 3 - EXECUTION – (NOT APPLICABLE TO THIS PROJECT)**

### **END OF SECTION**

**CONTRACTOR LETTERHEAD**

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

RE: \_\_\_\_\_

Contract No. \_\_\_\_\_

Dear Property Owner or Resident:

Our Company has been selected by the Metropolitan St. Louis Sewer District to construct the above referenced sewer project that may be on, adjacent to, or abutting your property. Please note that the nature of this project may require work to take place at the same location on multiple occasions.

This letter is to inform you that construction on this sewer project will begin in the near future. We suggest that you remove any trees, shrubs or improvements located in the permanent easement that you wish to save prior to the start of construction. Also, if you have any underground improvements, such as sprinkler systems or invisible fences for dogs, we would appreciate you contacting us.

Contact\_ with our company at \_\_\_\_\_ - \_\_\_\_\_ - \_\_\_\_\_ if you have questions concerning the construction activity planned on your property. For after hour's emergency information, please contact the Metropolitan St. Louis Sewer District Customer Service Department at (314)768-6260.

Sincerely,

(COMPANY NAME)

\_\_\_\_\_  
Project Manager

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**SECTION 01 71 23**  
**SURVEY AND FIELD ENGINEERING**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes: Quality control, submittal, and project record document requirements for Contractor's survey and field engineering.
- B. Related Sections include but are not necessarily limited to:
  - 1. Division 01 - General Requirements.
  - 2. Missouri Department of Transportation (MoDOT) Manchester Road Project (J6S1718B) specifications, including the most recent version of the Missouri Highway and Transportation Commission General Provisions and Supplemental Specifications for document submittals.

**1.2 QUALITY ASSURANCE**

- A. Employ a Land Surveyor registered in the State of Missouri and acceptable to the Engineer, to perform the survey Work of this section.
- B. Employ a Professional Engineer of the discipline required for specific service on Project, licensed in the State of Missouri.

**1.3 SUBMITTALS FOR REVIEW**

- A. Submit name, address, and telephone number Contractor's Surveyor before starting survey work.
- B. Submit evidence of Land Surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certification.
- C. On request, submit documentation verifying accuracy of survey Work.
- D. Submit name, address, and telephone number of Contractor's Professional Engineer before starting field engineering work.

**1.4 PROJECT RECORD DOCUMENTS**

- A. Maintain a complete and accurate log of control and survey Work as it progresses.
- B. On completion of junction chambers and other structure foundation walls, manholes, and major site improvements, prepare a certified survey illustrating dimensions, locations, angles, and elevations of construction and site Work.
- C. Submit Record Documents under provisions of the MoDOT Manchester Road Project (J6S1718B) technical specification for project record documents.

**1.5 EXAMINATION**

- A. Verify locations of survey control points prior to starting Work.
- B. Notify Engineer of any discrepancies discovered.

**1.6 SURVEY REFERENCE POINTS**

- A. Protect survey control and reference points.
- B. Control datum for survey is that indicated on Drawings.

**1.7 SURVEY AND FIELD ENGINEERING REQUIREMENTS**

- A. Provide field surveying services.
- B. Utilize recognized survey practices.

- C. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
  - 1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
  - 2. Grid or axis for structures
- D. Periodically verify layouts by same means.

**1.8 SURVEYS FOR MEASUREMENT AND PAYMENT**

- A. Perform surveys to determine quantities of unit price Work, including control surveys to establish measurement reference lines. Notify Engineer prior to starting Work.

**1.9 CONTRACTOR'S LAND SURVEYOR AND PROFESSIONAL ENGINEER RESPONSIBILITIES**

- A. Contractor's Professional Engineer responsibilities: Sign Contractor's design when required by the Contract Specifications.
- B. Contractor's Land Surveyor responsibilities: Sign surveyor's field notes.

**PART 2 - PRODUCTS (NOT APPLICABLE TO THIS SECTION)**

**PART 3 - EXECUTION (NOT APPLICABLE TO THIS SECTION)**

**END OF SECTION**

**SECTION 03 09 00**  
**CONCRETE**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
  - 1. Cast-in-place concrete and grout.
  - 2. Concrete mixes, proportioning, and source quality control for precast concrete.
- B. Related Sections include but are not necessarily limited to:
  - 1. Division 01 - General Requirements.
  - 2. Section 33 05 16 – Precast Concrete Manhole Structures.

**1.2 QUALITY ASSURANCE**

- A. Referenced Standards:
  - 1. American Concrete Institute (ACI):
    - a. 117, Specification for Tolerances for Concrete Construction and Materials.
    - b. 211.1, Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete.
    - c. 212.3R, Chemical Admixtures for Concrete.
    - d. 304R, Guide for Measuring, Mixing, Transporting, and Placing Concrete.
    - e. 304.2R, Placing Concrete by Pumping Methods.
    - f. 305.1, Hot Weather Concreting.
    - g. 306.1, Cold Weather Concreting.
    - h. 318, Building Code Requirements for Structural Concrete.
    - i. 347, Guide to Formwork for Concrete.
    - j. CT-13, Concrete Terminology.
  - 2. ASTM International (ASTM):
    - a. A82, Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
    - b. A185, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
    - c. A615, Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
    - d. A1064, Standard Specification for Steel Wire and Welded Wire Replacement, Plain and Deformed, for Concrete.
    - e. C31, Standard Practice for Making and Curing Concrete Test Specimens in the Field.
    - f. C33, Standard Specification for Concrete Aggregates.
    - g. C39, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
    - h. C94/C94M, Standard Specification for Ready-Mixed Concrete.
    - i. C138, Standard Method of Test for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete.
    - j. C143, Standard Test Method for Slump of Hydraulic Cement Concrete.
    - k. C150, Standard Specification for Portland Cement.
    - l. C172, Standard Practice for Sampling Freshly Mixed Concrete.
    - m. C173, Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
    - n. C231, Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
    - o. C260, Standard Specification for Air-Entraining Admixtures for Concrete.
    - p. C289, Standard Test Method for Potential Alkali-Silica Reactivity of Aggregates (Chemical Method).

- q. C309, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
  - r. C494, Standard Specification for Chemical Admixtures for Concrete.
  - s. C618, Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
  - t. C1315, Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.
  - u. D882, Standard Test Method for Tensile Properties of Thin Plastic Sheeting.
  - v. D994, Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type).
  - w. D1056, Standard Specification for Flexible Cellular Materials-Sponge or Expanded Rubber.
  - x. D1709, Standard Test Methods for Impact Resistance of Plastic Film by the Free-Falling Dart Method.
  - y. D1751, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
  - z. D4783, Standard Test Methods for Resistance of Adhesive Preparations in Container to Attach by Bacteria, Yeast, and Fungi.
  - aa. E96, Standard Test Methods for Water Vapor Transmission of Materials.
  - bb. E329, Standard Specification for Agencies Engaged in Construction Inspection and/or Testing.
- 3. Corps of Engineers (COE):
    - a. CRD-C572, Specifications for Polyvinylchloride Waterstop.
    - b. CRD-C621, Standard Specification for Packaged, Dry, Hydraulic-Cement Grout (Nonshrink).
  - 4. National Ready Mixed Concrete Association (NRMCA).
  - 5. Missouri Department of Transportation.
- B. Quality Control:
- 1. Concrete testing agency:
    - a. Contractor to employ and pay for services of a testing laboratory to:
      - 1) Perform materials evaluation.
      - 2) Design concrete mixes.
      - 3) Perform testing of concrete placed during construction.
    - b. Concrete testing agency to meet requirements of ASTM E329.
  - 2. Do not begin concrete production until proposed concrete mix design has been approved by Engineer:
    - a. Approval of concrete mix design by Engineer does not relieve Contractor of his responsibility to provide concrete that meets the requirements of this Section.
  - 3. Adjust concrete mix designs when material characteristics, job conditions, weather, strength test results or other circumstances warrant:
    - a. Do not use revised concrete mixes until submitted to and approved by Engineer.
  - 4. Concrete cylinder break results shall be tabulated and provided to the Engineer along with trending curves between 3 day and 28 day breaks.
  - 5. Perform structural calculations as required to prove that all portions of the structure in combination with remaining forming and shoring system has sufficient strength to safely support its own weight plus the loads placed thereon.
- C. Qualifications:
- 1. Ready mixed concrete batch plant certified by NRMCA.

### 1.3 DEFINITIONS

- A. Per ACI CT-13 except as modified herein:
- 1. Concrete fill: Non-structural concrete.
  - 2. Exposed concrete: Exposed to view after construction is complete.
  - 3. Indicated: Indicated by Contract Documents.

4. Nonexposed concrete: Not exposed to view after construction is complete.
5. Required: Required by Contract Documents.
6. Specified strength: Specified compressive strength at 28 days.
7. Submitted: Submitted to Engineer.

#### 1.4 SUBMITTALS

##### A. Shop Drawings:

1. See Missouri Department of Transportation (MoDOT) Manchester Road Project (J6S1718B) technical specifications for requirements for the mechanics and administration of the submittal process.
2. Concrete mix designs proposed for use:
  - a. Concrete mix design submittal to include the following information:
    - 1) Sieve analysis and source of fine and coarse aggregates.
    - 2) Test for aggregate organic impurities.
    - 3) Test for deleterious aggregate per ASTM C289.
    - 4) Proportioning of all materials.
    - 5) Type of cement with mill certificate for cement.
    - 6) Type of fly ash with certificate of conformance to specification requirements.
    - 7) Slump.
    - 8) Air content.
    - 9) Antimicrobial additive content and EPA liquid antimicrobial additive registration number.
    - 10) Brand, type, ASTM designation, and quantity of each admixture and antimicrobial additive proposed for use.
    - 11) 28-day cylinder compressive test results of trial mixes per ACI 318 and as indicated herein.
    - 12) Certification letter from the precast concrete supplier to the Owner stating that the correct amount and the correct mixing procedure were followed for all antimicrobial concrete in precast structures. Certification letter shall be notarized.
    - 13) Certification letter from the ready-mix concrete supplier to the Owner stating that the correct amount and the correct mixing procedure were followed for all antimicrobial concrete furnished. Certification letter shall be notarized.
3. Product technical data including:
  - a. Acknowledgement that products submitted meet requirements of standards referenced.
  - b. Manufacturer's installation instructions.
  - c. Manufacturers and types:
    - 1) Joint fillers.
    - 2) Curing agents.
    - 3) Chemical sealer.
    - 4) Bonding and patching mortar.
    - 5) Construction joint bonding adhesive.
    - 6) Nonshrink grout with cure/seal compound.
    - 7) Waterstops.
4. Reinforcing steel:
  - a. Show grade, sizes, number, configuration, spacing, location and all fabrication and placement details.
  - b. In sufficient detail to permit installation of reinforcing without having to make reference to Contract Drawings.
  - c. Obtain approval of Shop Drawings by Engineer before fabrication.
  - d. Mill certificates.
5. Scaled (minimum 1/8 IN per FT) drawings showing proposed locations of construction joints, control joints, expansion joints (as applicable) and joint dimensions.
6. Strength test results of in place concrete including slump, air content and concrete temperature.
7. Certifications:

- a. Certification of standard deviation value in psi for ready mix plant supplying the concrete.
  - b. Certification that the material and sources submitted in the mix design will be used in the concrete for this Project.
  - c. Certification letters for antimicrobial admixture.
8. Test reports:
- a. Cement mill reports for all cement to be supplied.

## 1.5 DELIVERY, STORAGE, AND HANDLING

### A. Storage of Material:

1. Cement and pozzolan:
  - a. Store in moisture-proof, weather-tight enclosures.
  - b. Do not use if caked or lumpy.
2. Aggregate:
  - a. Store to prevent segregation and contamination with other sizes or foreign materials.
  - b. Obtain samples for testing from aggregates at point of batching.
  - c. Do not use frozen or partially frozen aggregates.
  - d. Allow sand to drain until moisture content is uniform prior to use.
3. Admixtures:
  - a. Protect from contamination, evaporation, freezing, or damage.
  - b. Maintain within temperature range recommended by manufacturer.
  - c. Completely mix solutions and suspensions prior to use.
4. Reinforcing steel: Support and store all reinforcing steel above ground.

### B. Delivery:

1. Concrete:
  - a. Prepare a delivery ticket for each load for ready-mixed concrete.
  - b. Truck operator shall hand ticket to Owner's Representative at the time of delivery.
  - c. Ticket to show:
    - 1) Mix identification mark.
    - 2) Quantity delivered.
    - 3) Amount of each material in batch.
    - 4) Outdoor temp in the shade.
    - 5) Time at which cement was added.
    - 6) Numerical sequence of the delivery.
    - 7) Amount of water added.
2. Reinforcing steel:
  - a. Ship to jobsite with attached plastic or metal tags with permanent mark numbers.
  - b. Mark numbers to match Shop Drawing mark number.

## PART 2 - PRODUCTS

### 2.1 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following products and manufacturers are acceptable:
1. Nonshrink, nonmetallic grout:
    - a. Sika "SikaGrout 212."
    - b. Euclid Chemical "NS Grout."
    - c. BASF Admixtures, Inc. "Masterflow 713."
  2. Waterstops, PVC:
    - a. Greenstreak Plastic Products, Inc.
    - b. W R Meadows .
    - c. Vinylex Corporation.
  3. Form coating:
    - a. Richmond "Rich Cote."

- b. Industrial Lubricants "Nox-Crete Form Coating."
- c. Euclid Chemical "Kurez DR VOX."
- 4. Antimicrobial additive:
  - a. ConShield Technologies, Inc.
  - b. Penetron.
  - c. Euclid Chemical/
- B. Submit request for substitution in accordance with MoDOT Route 100-Manchester Road Project (J6S1718B) technical specifications.

## 2.2 MATERIALS

- A. Portland Cement: Conform to ASTM C150 Type I/II.
- B. Fly Ash:
  - 1. ASTM C618, Class F or Class C.
  - 2. Nonstaining:
    - a. Hardened concrete containing fly ash to be uniform light gray color.
  - 3. Maximum loss on ignition: 4 percent.
  - 4. Compatible with other concrete ingredients.
  - 5. Obtain proposed fly ash from a source approved by the State Highway Department in the state where the Project is located for use in concrete for bridges.
- C. Admixtures:
  - 1. Air entraining admixtures: ASTM C260.
  - 2. Water reducing, retarding, and accelerating admixtures:
    - a. ASTM C494 Type A through E.
    - b. Conform to provisions of ACI 212.3R.
    - c. Do not use retarding or accelerating admixtures unless specifically approved in writing by Engineer and at no cost to Owner.
    - d. Follow manufacturer's instructions.
    - e. Use chloride free admixtures only.
  - 3. Maximum total water soluble chloride ion content contributed from all ingredients of concrete including water, aggregates, cementitious materials and admixtures by weight percent of cement:
    - a. 0.10 all concrete.
  - 4. Do not use calcium chloride.
  - 5. Pozzolanic admixtures: ASTM C618.
  - 6. Provide admixtures of same type, manufacturer and quantity as used in establishing required concrete proportions in the mix design.
- D. Antimicrobial additives for Concrete Manholes and Structures:
  - 1. Products:
    - a. ConmicShield® as manufactured by ConShield Technologies, Inc
    - b. Penetron BIOMIC
    - c. Or approved equal.
  - 2. Shall be used to render the concrete uninhabitable for bacteria growth for all sanitary concrete manholes and structures.
  - 3. All concrete and pre-cast concrete manholes and structures that will come into contact with sanitary sewerage shall have an antimicrobial additive to the mixture prior to pouring.
  - 4. Follow manufacturer's instructions.
  - 5. The liquid antimicrobial additive shall be an EPA registered material and the registration number shall be submitted prior to use in the project.
  - 6. The amount to be used shall be as recommended by the manufacturer of the antibacterial additive.
  - 7. The amount shall be added in the total water content of the concrete mix design.
  - 8. After the concrete takes initial set color identifier-indicator shall be applied to the interior surface.

9. The antimicrobial additive shall be used by factory certified pre-cast concrete plants.
  10. Where fill concrete comes in contact with sanitary sewage and is considered non-structural fill and would not reduce the structural integrity nor the durability of the structure, the Contractor may submit for review and approval by the Owner and Engineer a request not to use antibacterial additives.
- E. Water: Potable, clean, free of oils, acids and organic matter.
- F. Aggregates:
1. Normal weight concrete: ASTM C33, except as modified below.
  2. Fine aggregate:
    - a. Clean natural sand.
    - b. No manufactured or artificial sand.
  3. Coarse aggregate:
    - a. Crushed rock, natural gravel, or other inert granular material.
    - b. Maximum amount of clay or shale particles: 1 percent.
  4. Gradation of coarse aggregate:
    - a. Lean concrete and concrete topping: Size #7.
    - b. All other concrete: Size #57 or #67.
- G. Concrete Grout:
1. Nonshrink, nonmetallic grout:
    - a. Nonmetallic, noncorrosive, nonstaining, premixed with only water to be added.
    - b. Grout to produce a positive but controlled expansion.
    - c. Mass expansion not to be created by gas liberation.
    - d. Minimum compressive strength of nonshrink grout at 28 days: 6500 psi.
    - e. In accordance with COE CRD-C621.
- H. Reinforcing Steel:
1. Reinforcing bars: ASTM A615, Grade 60.
  2. Welded wire reinforcement:
    - a. ASTM A185 or ASTM A1064.
    - b. Minimum yield strength: 60,000 psi.
  3. Column spirals: ASTM A82 or ASTM A1064.
- I. Forms:
1. Prefabricated or job built.
  2. Wood forms:
    - a. 5/8 or 3/4 IN 5-ply structural plywood of concrete form grade.
    - b. Built-in-place or prefabricated type panel.
  3. Metal forms:
    - a. Metal forms may be used except for aluminum in contact with concrete.
    - b. Forms to be tight to prevent leakage, free of rust and straight without dents to provide members of uniform thickness.
  4. Chamfer strips: Clear white pine, surface against concrete planed.
  5. Place struts and walers as necessary to avoid form skin deviation and excessive deviation in flatness.
- J. Form Ties:
1. Commercially fabricated for use in form construction:
    - a. Field fabricated ties are unacceptable.
  2. Constructed so that ends or end fasteners can be removed without causing spalling at surfaces of the concrete.
  3. 3/4 IN minimum to 1 IN maximum diameter cones on both ends.
  4. Embedded portion of ties to be not less than 1 IN from face of concrete after ends have been removed.
  5. Cone size:
    - a. 3/4 IN minimum to 1 IN maximum diameter cones on both ends.

- b. Depth of cone not to exceed the concrete reinforcing cover.
  - 6. Provide ties with built-in waterstops in all walls that will be in contact with below grade soil.
  - 7. Form release: Nonstaining and shall not prevent bonding of future finishes to concrete surface.
- K. Waterstops:
- 1. Plastic: COE CRD-C572.
  - 2. Serrated with center bulb.
  - 3. Thickness: 3/8 IN.
  - 4. Length (general use): 6 IN unless indicated otherwise.
- L. Chairs, Runners, Bolsters, Spacers, and Hangers:
- 1. Stainless steel, epoxy coated, or plastic coated metal:
    - a. Plastic coated: Rebar support tips in contact with the forms only.
- M. Membrane Curing Compound:
- 1. ASTM C309, Type II-B.
  - 2. Resin based, dissipates upon exposure to UV light.
  - 3. Curing compound shall not prevent bonding of any future coverings, coatings or finishes.
- N. Expansion Joint Filler:
- 1. In contact with water or sewage:
    - a. Closed cell neoprene.
    - b. ASTM D1056, Class SC (oil resistant and medium swell) of 2 to 5 psi compression deflection (Grade SCE41).
  - 2. Exterior driveways, curbs and sidewalks:
    - a. Asphalt expansion joint filler.
    - b. ASTM D994.
  - 3. Other use:
    - a. Fiber expansion joint filler.
    - b. ASTM D1751.

**2.3 CONCRETE MIXES**

- A. General:
- 1. All concrete to be ready mixed concrete conforming to ASTM C94/C94M.
  - 2. Provide concrete of specified quality capable of being placed without segregation and, when cured, of developing all properties required.
  - 3. All concrete to be normal weight concrete.
  - 4. Provide pozzolan content for all cast-in-place construction.
- B. Strength:
- 1. Provide specified strength and type of concrete for general use concrete as follows:

TYPE	WEIGHT	SPECIFIED STRENGTH*
Precast Concrete	Normal weight	4,000 psi
Concrete Pavement	Normal weight	4,000 psi
Concrete Curb	Normal weight	4,000 psi
Water Retaining Structures	Normal weight	4,500 psi
All other general use concrete	Normal weight	4,000 psi

\* Minimum 28-day compressive strength.

- C. Air Entrainment:
- 1. Provide air entrainment in all concrete resulting in a total air content percent by volume as follows:

MAX AGGREGATE SIZE	TOTAL AIR CONTENT PERCENT
1 IN or 3/4 IN	6 ±1-1/2
<3/4 IN	6-1/2 ±1-1/2

2. Air content to be measured in accordance with ASTM C231, ASTM C173, or ASTM C138.

D. Slump - 4 IN maximum, 1 IN minimum:

1. Measured at point of discharge of the concrete into the concrete construction member.
2. 8 IN maximum after addition of superplasticizer (if used).
3. Concrete of lower than minimum slump may be used provided it can be properly placed and consolidated.
4. Pumped concrete:
  - a. Provide additional water at batch plant to allow for slump loss due to pumping.
  - b. Provide only enough additional water so that slump of concrete at discharge end of pump hose does not exceed maximum slump specified above.
5. Determine slump per ASTM C143.

E. Selection of Proportions:

1. General:
  - a. Proportion ingredients to:
    - 1) Produce proper workability, durability, strength, and other required properties.
    - 2) Prevent segregation and collection of excessive free water on surface.
2. Minimum cement contents and maximum water cement ratios for concrete to be as follows:

SPECIFIED STRENGTH	TARGET CEMENT, MAXIMUM AGGREGATE SIZE			MAXIMUM WATER CEMENT RATIO BY WEIGHT
	1/2 IN	3/4 IN	1 IN	
4,000	564	564	564	0.45
4,500	611	611		0.42

3. Fly ash:
  - a. For cast-in-place concrete only, a maximum of 25 percent by weight of Portland cement content per CY may be replaced with fly ash at rate of 1 LB fly ash for 1 LB of cement.
  - b. When fly ash is used, the water to cementitious materials ratio shall not exceed the maximum value specified herein.
4. Concrete mix proportioning methods for normal weight concrete:
  - a. Proportion mixture to provide desired characteristics using one of methods described below:
    - 1) Method 1 (Trial Mix):
      - a) Per ACI 318, Chapter 5, except as modified herein.
      - b) Air content within range specified above.
      - c) Record and report temperature of trial mixes.
      - d) Proportion trial mixes per ACI 211.1.
    - 2) Method 2 (Field Experience):
      - a) Per ACI 318, Chapter 5, except as modified herein:
      - b) Field test records must be acceptable to Engineer to use this method.
      - c) Test records shall represent materials, proportions and conditions similar to those specified.
5. Required average strength to exceed the specified 28-day compressive strength by the amount determined or calculated in accordance with the requirements of Chapter 5 of ACI 318 using the standard deviation of the proposed concrete production facility.

## **PART 3 - EXECUTION**

### **3.1 FORMING AND PLACING CONCRETE**

- A. Formwork:
1. Contractor is responsible for design and erection of formwork.
  2. Construct formwork so that concrete members and structures are of correct size, shape, alignment, elevation and position:
    - a. Allowable tolerances: As recommended in ACI 347.
  3. Provide slabs and beams of minimum indicated depth when sloping foundation base slabs or elevated floor slabs to drains:
    - a. For slabs on grade, slope top of subgrade to provide floor slabs of minimum uniform indicated depth.
    - b. Do not place floor drains through beams.
  4. Openings:
    - a. Provide openings in formwork to accommodate work of other trades.
    - b. Accurately place and securely support items built into forms.
  5. Chamfer strips: Place 3/4 IN chamfer strips in forms to produce 3/4 IN wide beveled edges on permanently exposed corners of members.
  6. Clean and adjust forms prior to concrete placement.
  7. Tighten forms to prevent mortar leakage.
  8. Coat form surfaces with form release agents prior to placing reinforcing bars in forms.
- B. Reinforcement:
1. Conform to ACI 117 for placement tolerances and fabrication of reinforcement.
  2. Bend reinforcement and provide bar spacers and support in accordance with the latest edition of ACI SP-66 Detailing Manual.
  3. Position, support and secure reinforcement against displacement.
  4. Locate and support with chairs, runners, bolsters, spacers and hangers, as required.
  5. Set wire ties so ends do not touch forms and are directed into concrete, not toward exposed concrete surfaces.
  6. Lap splice lengths: ACI 318 Class B top bar tension splices unless indicated otherwise on the Drawings.
  7. Extend reinforcement to within 2 IN of concrete perimeter edges:
    - a. If perimeter edge is earth formed, extend reinforcement to within 3 IN of the edge.
  8. Minimum concrete protective covering for reinforcement: As shown on Drawings.
  9. Do not weld reinforcing bars.
  10. Welded wire reinforcement:
    - a. Install welded wire reinforcement in maximum practical sizes.
    - b. Splice sides and ends with a splice lap length measured between outermost cross wires of each fabric sheet not less than:
      - 1) One spacing of cross wires plus 2 IN.
      - 2) 1.5 x development length.
      - 3) 6 IN.
    - c. Development length: ACI 318 basic development length for the specified fabric yield strength.
- C. Construction, Expansion, and Contraction Joints:
1. Locate joints as indicated on Contract Drawings or as shown on approved Shop Drawings:
    - a. Where construction joint spacing shown on Drawings exceeds the joint spacing indicated in Paragraph below, submit proposed construction joint location in conformance with this Section.
  2. Unplanned construction joints will not be allowed.
  3. Locate wall vertical construction joints at 30 FT maximum, unless otherwise indicated on the plans or alternate spacing is approved by the Engineer.
  4. Locate construction joints in floor slabs and foundation base slabs so that concrete placements are approximately square and do not exceed 2,500 SF.

5. Locate construction joints in columns and walls:
    - a. At the underside of beams, girders, haunches, drop panels, column capitals, and at floor panels.
    - b. Haunches, drop panels, and column capitals are considered part of the supported floor or roof and shall be placed monolithically therewith.
    - c. Column based need not be placed monolithically with the floor below.
  6. Install construction joints perpendicular to main reinforcement with all reinforcement continued across construction joints.
  7. At least 72 HRS shall elapse between placing of adjoining concrete construction.
  8. Thoroughly clean and remove all laitance and loose and foreign particles from construction joints.
  9. Before new concrete is placed, dampen concrete surfaces.
- D. Embedments:
1. Set and build in anchorage devices and other embedded items required for other work that is attached to, or supported by concrete.
  2. Use setting diagrams, templates and instructions for locating and setting.
- E. Waterstops, General:
1. Do not mix different types of waterstop materials in the same structure without specific approval from the Engineer.
  2. Contractor is responsible for waterstop selection and installation to provide leak-tight joints, to the minimum standard shown in the Contract Documents.
  3. Base selection on anticipated differential movement of mating surfaces.
  4. Waterstop manufacturer's representative shall provide on-site training of waterstop installation, splicing, welding and inspection procedures prior to construction, and at no additional cost.
- F. Placing Concrete:
1. Place concrete in compliance with ACI 304R and ACI 304.2R.
  2. Place in a continuous operation within planned joints or sections.
  3. Begin placement when work of other trades affecting concrete is completed.
  4. Place concrete by methods which prevent aggregate segregation.
  5. Do not allow concrete to free fall more than 4 FT.
  6. Where free fall of concrete will exceed 4 FT, place concrete by means of tremie pipe or chute.
  7. Concrete to be placed at its final location and not moved within the forms by vibratory methods.
  8. Concrete in tall forms to be placed in layers.
  9. Concrete shall not be placed so as to build up a height in one place and run down-slope to lower areas.
- G. Consolidation: Consolidate all concrete using mechanical vibrators supplemented with hand rodding and tamping, so that concrete is worked around reinforcement and embedded items into all parts of forms.
- H. Protection:
1. Protect concrete from physical damage or reduced strength due to weather extremes.
  2. In cold weather comply with ACI 306.1 except as modified herein:
    - a. Do not place concrete on frozen ground or in contact with forms or reinforcing bars coated with frost, ice or snow.

OUTDOOR TEMPERATURE AT PLACEMENT (IN SHADE)	CONCRETE TEMPERATURE AT MIXING
Below 30 DegF	70 DegF
Between 30-45 DegF	60 DegF
Above 45 DegF	50 DegF

- b. Do not place heated concrete that is warmer than 80 DegF.
  - c. If freezing temperatures are expected during curing, maintain the concrete temperature at or above 50 DegF for 7 days or 70 DegF for 3 days.
  - d. Do not allow concrete to cool suddenly.
  3. In hot weather comply with ACI 305.1 except as modified herein.
    - a. At air temperature of 90 DegF and above, keep concrete as cool as possible during placement and curing.
    - b. Do not allow concrete temperature to exceed 90 DegF at placement.
    - c. Prevent plastic shrinkage cracking due to rapid evaporation of moisture.
    - d. Do not place concrete when the actual or anticipated evaporation rate equals or exceeds 0.2 LBS/SF/HR as determined from ACI 305.1, Figure 2.1.5.
- I. Curing:
1. Begin curing concrete as soon as free water has disappeared from exposed surfaces.
  2. Cure concrete by use of moisture retaining cover, burlap kept continuously wet or by membrane curing compound.
  3. Provide protection as required to prevent damage to concrete and to prevent moisture loss from concrete during curing period.
  4. Provide curing for minimum of 7 days.
  5. Form materials left in place may be considered as curing materials for surfaces in contact with the form materials except in periods of hot weather.
  6. In hot weather follow curing procedures outlined in ACI 305.1.
  7. In cold weather follow curing procedures outlined in ACI 306.1.
  8. Curing vertical surfaces with a curing compound:
    - a. Cover vertical surfaces with a minimum of 2 coats of the curing compound.
    - b. Allow the preceding coat to completely dry prior to applying the next coat.
    - c. Apply the first coat of curing compound immediately after form removal.
    - d. Vertical surface at the time of receiving the first coat shall be damp with no free water on the surface.
    - e. A vertical surface is defined as any surface steeper than 1 vertical to 4 horizontal.
- J. Form Removal:
1. Remove forms after concrete has hardened sufficiently to resist damage from removal operations or lack of support.
  2. Where no reshoring is planned, leave forms and shoring used to support concrete until it has reached its specified 28-day compressive strength.

### 3.2 CONCRETE FINISHES

- A. Tolerances:
1. Class A: 1/8 IN in 10 FT.
  2. Class B: 1/4 IN in 10 FT.
- B. Surfaces Exposed to View:
1. Provide a smooth finish for exposed concrete surfaces and surfaces that are:
    - a. To be covered with a coating or covering material applied directly to concrete.
    - b. Scheduled for grout cleaned finish.
  2. Remove fins and projections, and patch voids, air pockets, and honeycomb areas with cement grout.
- C. Surfaces Not Exposed to View:
1. Patch voids, air pockets and honeycomb areas with cement grout.
  2. Fill tie holes with nonshrink, nonmetallic grout.
- D. Slab Float Finish:
1. After concrete has been placed, consolidated, struck off, and leveled, do no further work until ready for floating.
  2. Do not use water to aid in finishing.

3. Begin floating when water sheen has disappeared and surface has stiffened sufficiently to permit operation.
  4. During or after first floating, check planeness of entire surface with a 10 FT straightedge applied at not less than two different angles.
  5. Cut down all high spots and fill all low spots during this procedure to produce a surface within Class B tolerance throughout.
  6. Refloat slab immediately to a uniform sandy texture.
- E. Troweled Finish:
1. Float finish surface.
  2. Next power trowel, and finally hand trowel.
  3. Do not use water to aid in finishing.
  4. Produce a smooth surface which is relatively free of defects with first hand troweling.
  5. Perform additional trowelings by hand after surface has hardened sufficiently.
  6. Final trowel when a ringing sound is produced as trowel is moved over surface.
  7. Thoroughly consolidate surface by hand troweling.
  8. Leave finished surface essentially free of trowel marks, uniform in texture and appearance and plane to a Class A tolerance.
  9. On surfaces intended to support floor coverings remove any defects of sufficient magnitude that would show through floor covering by grinding.
- F. Broom Finish: Immediately after concrete has received a float finish as specified, give it a transverse scored texture by drawing a broom across surface.

### 3.3 GROUT

- A. Preparation:
1. Nonshrinking, nonmetallic grout:
    - a. Clean concrete surface to receive grout.
    - b. Saturate concrete with water for 24 HRS prior to grouting.
- B. Application:
1. Nonshrinking, nonmetallic grout:
    - a. Mix in a mechanical mixer.
    - b. Use no more water than necessary to produce flowable grout.
    - c. Place in accordance with manufacturer's instructions.
    - d. Completely fill all spaces and cavities below the bottom of baseplates.
    - e. Provide forms where baseplates and bedplates do not confine grout.
    - f. Where exposed to view, finish grout edges smooth.
    - g. Except where a slope is indicated on Drawings, finish edges flush at the baseplate, bedplate, member, or piece of equipment.
    - h. Protect against rapid moisture loss by covering with wet rags or polyethylene sheets.
    - i. Wet cure grout for 7 days, minimum.

### 3.4 FIELD QUALITY CONTROL

- A. Contractor will employ and pay for services of a concrete testing laboratory to perform testing of concrete placed during construction:
- B. Antimicrobial Additive Verification and Testing:
1. Antimicrobial Additive shall be required for all ready-mix and pre-cast concrete that will be in contact with sewage.
  2. The ready-mix supplier shall retain two cured pieces of concrete from each structure made with antimicrobial additive. The pieces must have a minimum of two square inches and be uniform. The specimens shall be placed in plastic bags and clearly labeled with the date, batch number, pipe or manhole dimension, manhole number, and specific project.
  3. One set of samples shall be retained by the pre-cast producer and one set shall be secured for the Owner. The Owner will randomly select and send seven samples to an approved bacteriological laboratory for testing.

4. Before production begins, the manufacturer shall conduct a bacteriological test using an independent bacteriological laboratory for the presence of the approved antimicrobial additive using ASTM D4783. The test shall use the Thiobacillus Thiooxidans strain for testing. The manufacturer shall submit one control sample without antimicrobial additive for testing also. Both samples shall be tested at the same time.
  5. All other selected specimens shall be tested by an approved independent bacteriological laboratory for the presence of the Owner approved antimicrobial additive using ASTM D4783. The Owner allows modified tests when not specified.
    - a. The report shall be sent to the respective parties.
    - b. Costs for testing shall be included in the installed price of the additive; The Owner requires a minimum of seven tests for each project.
    - c. Each piece of pipe, manhole, and cast-in-place structure shall be stenciled with the name of the antimicrobial additive on the interior and exterior.
- C. Tests During Construction:
1. Strength test:
    - a. For each strength test, mold and cure cylinders from each sample in accordance with ASTM C31:
      - 1) Cylinder size: Per ASTM C31:
        - a) 4 IN cylinders may not be used for concrete mixes with concrete aggregate size larger than 1 IN.
      - 2) Quantity:
        - a) 6 IN DIA by 12 IN high: 4 cylinders.
        - b) 4 IN DIA by 8 IN high: 6 cylinders.
    - b. Field cure 1 cylinder for the 7 day test:
      - 1) Laboratory cure the remaining.
    - c. Test cylinders in accordance with ASTM C39:
      - 1) 6 IN DIA cylinders:
        - a) Test 2 cylinders at 28 days for strength test result and the 1 field cured sample at 7 days for information.
        - b) Hold remaining cylinder in reserve.
      - 2) 4 IN DIA cylinders:
        - a) Test 3 cylinders at 28 days for strength test result and the 1 field cured cylinder at 7 days for information.
        - b) Hold remaining cylinders in reserve.
    - d. Strength test result:
      - 1) Average of strengths of two 6 IN DIA cylinders or three 4 IN DIA cylinders from the same sample tested at 28 days.
      - 2) If 1 cylinder in a test manifests evidence of improper sampling, molding, handling, curing, or testing, discard and test reserve cylinder(s); average strength of remaining cylinders shall be considered strength test result.
      - 3) Should all cylinders in any test show any of above defects, discard entire test.
    - e. Frequency of tests:
      - 1) All concrete:
        - a) 1 strength test to be taken not less than once a day, nor less than once for each 60 CU YD or fraction thereof placed in any 1 day.
        - b) Once for each 5,000 SF of slab or wall surface area placed each day.
        - c) If total volume of concrete on Project is such that frequency of testing required in above paragraph will provide less than 5 strength tests for each concrete mix, tests shall then be made from at least 5 randomly selected batches or from each batch if fewer than 5 batches are provided.
  2. Slump test:
    - a. Per ASTM C143.
    - b. Determined for each strength test sample.
    - c. Additional slump tests may be taken.
  3. Air content:

- a. Per ASTM C231, ASTM C173, and ASTM C138.
  - b. Determined for each strength test sample.
  4. Temperature: Determined for each strength test sample.
- D. Evaluation of Tests:
1. Strength test results:
    - a. Average of 28-day strength of two cylinders from each sample:
      - 1) If 1 cylinder manifests evidence of improper sampling, molding, handling, curing or testing, strength of remaining cylinder will be test result.
      - 2) If both cylinders show any of above defects, test will be discarded.
- E. Acceptance of Concrete:
1. Strength level of each type of concrete shall be considered satisfactory if both of the following requirements are met:
    - a. Average of all sets of 3 consecutive strength tests equals or exceeds the required specified 28-day compressive strength.
    - b. No individual strength test falls below the required specified 28-day compressive strength by more than 500 psi.
  2. If tests fail to indicate satisfactory strength level, perform additional tests and/or corrective measures as directed by Engineer:
    - a. Perform additional tests and/or corrective measures at no additional cost to Owner.
- F. Concrete tolerances per ACI 117.

### 3.5 SCHEDULES

- A. Form Types:
1. Surfaces exposed to view:
    - a. Prefabricated or job-built wood forms.
    - b. Laid out in a regular and uniform pattern with long dimensions vertical and joints aligned.
    - c. Produce finished surfaces free from offsets, ridges, waves, and concave or convex areas.
    - d. Construct forms sufficiently tight to prevent leakage of mortar.
  2. Surfaces normally submerged or not normally exposed to view: Wood or steel forms sufficiently tight to prevent leakage of mortar.
  3. Other types of forms may be used:
    - a. For surfaces not restricted to plywood or lined forms.
    - b. As backing for form lining.
- B. Grout:
1. Nonshrinking, nonmetallic grout: General use.
- C. Concrete:
1. Normal weight concrete: All concrete.
  2. Precast concrete: Where indicated on the drawings and specifications.
  3. Concrete pavement, curb and collars: Where indicated on the drawings and specifications.
  4. General use concrete: All other locations.
- D. Concrete Finishes:
1. Slab finishes:
    - a. Use following finishes as applicable, unless otherwise indicated:
      - 1) Floated finish: Surfaces intended to receive roofing, concrete topping, lean concrete, concrete fill and waterproofing.
      - 2) Troweled finish: Interior floor slabs, exposed roof slabs and base slabs of structures, equipment bases, and column bases.
      - 3) Broom finish: Sidewalks, docks, concrete stairs, and ramps.

### END OF SECTION

**SECTION 13 47 13**  
**CORROSION MONITORING FOR BURIED PIPING**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Note: This specification section includes the materials and requirements for the installation and testing of portions of a cathodic protection system on three sections of ductile iron pipe as identified in the Pipe Schedule shown in specification Section 40 05 19. The portions described herein provide for corrosion monitoring, and will facilitate the future installation of cathodic protection anodes should cathodic protection be required. This specification section does not cover the installation of cathodic protection anodes, or testing/commissioning of any future cathodic protection system. If Contractor chooses to use ductile iron pipe on the remaining pipe system as part of the CSO – Mary Avenue South of Manchester CSO Interceptor (I-132)/Outfall (L-106) Elimination Phase I (MoDOT) portion of the project, then corrosion monitoring provisions will be required for those additional ductile iron pipes as well.
- B. Section Includes:
  - 1. The materials, installation, and testing for the portions of the cathodic protection systems needed to facilitate corrosion monitoring and the future installation of cathodic protection anodes as described herein.
  - 2. Major components include test and bond stations, electrical isolation kits, wire, cable, and all attendant materials.
- C. The pipeline shall be ductile iron with polyethylene encasement.
- D. Provide all labor, materials, and equipment and perform all operations required to furnish, test and transport corrosion monitoring equipment as shown on the drawings or specified herein, including traffic rated concrete test boxes, electrical isolation kits, test leads, bond cables, and other related items.
- E. The drawings are diagrammatic and should not be scaled for exact locations except where dimensions are given. Field conditions, non-interference with other utilities and architectural, mechanical and structural features shall determine exact locations. All materials and equipment shall bear evidence of Underwriters Laboratory (UL) approval when UL standards exist and such product listings are available. All installations shall conform to the requirements of all applicable federal, state, and local laws, codes, and regulations.
- F. Related Sections include but are not necessarily limited to:
  - 1. Division 01 – General Requirements.
  - 2. Section 31 23 00 – Earthwork.
  - 3. Section 40 05 19 – Pipe: Ductile

**1.2 QUALITY ASSURANCE**

- A. Referenced Standards:
  - 1. American Association of State Highway and Transportation Officials (AASHTO)
  - 2. American Society for Testing and Materials (ASTM):
    - a. B3, Standard Specification for Soft or Annealed Copper Wire
    - b. B8, Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
    - c. C94, Standard Specification for Ready Mix Concrete
  - 3. American Water Works Association (AWWA):
    - a. C105, Polyethylene Encasement for Ductile-Iron Pipe Systems
  - 4. NACE International (former National Association of Corrosion Engineers) (NACE):
    - a. SP0169, Control of External Corrosion on Underground or Submerged Metallic Piping

Systems

- b. SP0286, Electrical Isolation of Cathodically Protected Pipelines
  5. National Electrical Manufacturer's Association (NEMA) Latest Revision:
    - a. TC2, Electrical Polyvinyl Chloride (PVC) Conduit
  6. National Fire Protection Association (NFPA):
    - a. 70, National Electric Code (NEC)
- B. Install all electrical components per the NEC, applicable local codes, and the recommended practices of NACE Standard SP0169, where applicable.
- C. Provide all materials, equipment, labor and supervision necessary for the completion of installation and testing.
- D. Contractor shall obtain the services of a Corrosion Engineer to inspect and test the installation of the cathodic protection system components described herein. The Contractor's Corrosion Engineer shall be a registered professional engineer with certification or licensing that includes education and experience in cathodic protection of buried or submerged metal structures, or a person accredited or certified by the NACE International (NACE) (formerly the National Association of Corrosion Engineers) at the level of Corrosion Specialist or Cathodic Protection Specialist (i.e., NACE CP Level 4). Such a person shall have not less than five years of experience inspecting cathodic protection systems.
- E. Maintain record drawings for the cathodic protection system components described herein continuously, throughout the installation of the equipment. Record drawings shall properly identify all items of equipment and material and shall show exact locations with dimensional ties to existing structures or survey monuments for all test stations and buried wires.

### 1.3 SUBMITTALS

- A. Submit shop drawings.
- B. Submit manufacturers' catalog data and descriptive literature for all material items listed below, including dimensions and materials of construction by specification reference and grade where applicable.
1. Corrosion test stations including enclosures and subcomponents.
  2. Wire and cable.
  3. Exothermic weld kits.
  4. Weld caps.
  5. Weld coatings.
  6. Wax tape.
  7. Warning tape.
  8. Polyethylene film for encasement of ductile iron.
- C. Submit testing and inspection reports by the Contractor's Corrosion Engineer documenting all pipeline continuity testing and test/bond station installations. All testing performed during the progression of this project shall be submitted in a tabulated and written report format within five (5) days of its conclusion. Submit reports in both hardcopy and electronic formats. The report shall be provided in Adobe PDF format and calculations and tabulated data shall be provided in Microsoft Excel format. The following tests are required as a minimum for this project. This does alleviate the need for additional testing as deemed necessary by the Contractor, Engineer, or the Engineer's representative.
- D. Testing
1. Pipeline continuity testing.
  2. Test station testing.
  3. Test lead integrity tests.
  4. Baseline (i.e., native) pipeline potentials at test stations.
  5. Electrical continuity tests.
  6. Electrical isolation tests.
    - a. Pipe from existing pipelines

7. Final inspection.
- E. Submit as-built drawings for the portions of the cathodic protection system described herein, as were maintained by the Contractor during installation of these components. Drawings shall properly identify all items of equipment and material, and be revised to show exact locations of all concrete test boxes (i.e., test stations), insulated pipe flanges (as required), and buried wires. Record the exact locations of all items using GPS coordinates with sub-meter accuracy.

## **PART 2 - MATERIALS**

### **2.1 TEST STATIONS**

- A. At-Grade Test Stations:
  1. Concrete Box: AASHTO H-20 rated round, pre-cast concrete boxes with nominal dimensions of 14-1/4-inch O.D. by 10-3/8-inch I.D. by 12-inches high, similar to the Christy G5 box with a cast iron supporting ring and lid. Mark cover "CP TEST" with cast letters. Provide additional 1-1/2-inch cast or welded block lettering indicating the owner "MSD" and the pipeline station number where it is installed. Install boxes slightly elevated to prevent the test station being the low point and water ponding in improved areas. In unimproved areas, install tops of test boxes 1-inch above grade with concrete collar slope of 2% all around to prevent water ponding.
  2. Test Board: Provide terminal boards of high impact strength Lexan to fit 3-inch conduit, with nickel plated copper bonding straps and all required wire termination hardware with dimensional stability from -60°F to +250°F. Provide 3-inch diameter by 3-inch long Schedule 80 PVC collar with each terminal board. Terminal board covers to be compatible size and construction to fit terminal boards. Provide Cott Big Fink or approved equal in color shown on drawings.
  3. Duct Sealant: Provide duct sealant to waterproof each PVC collar, such as Carlisle DUCT-SEAL™ 321 or equal.
  4. Terminal Lugs: All terminal lugs shall be high conductivity copper alloy manufactured specifically for making electrical connections such as IlSCO Type SLU, SLUH, or CP-4 lugs, or Burndy Type KLU or KA4C lugs.
  5. Wire and Cable ID Markers. All wires shall be coded with circular brass stamped or engraved identifiers as shown on the drawings. The letters and numbers shall be at least 3/16-inch tall. Secure each marker to the corresponding cable.
- B. Concrete Collar: Reinforced concrete pad with nominal dimension of 24-inch-square by 6-inch-thick concrete pad constructed of 4,000 psi ASTM C94 ready-mix concrete and No. 3 rebar.
- C. Conduit: Provide 1-1/2-inch diameter Sch 80 PVC pipe with solvent welded joints to act as trench conduit. Conduit shall be NEMA TC2 rated and UL listed.

### **2.2 WIRE AND CABLE**

- A. Conductors shall consist of stranded copper of the gage indicated. Wire sizes shall be based on American Wire Gage (AWG) and conform to the requirements of NEC. Copper wire shall be in conformance with ASTM B3 and ASTM B8.
- B. All wires terminating in a test station terminal box shall have a wire identifier attached within 4-inches of end of wire at terminal board, prior to backfill.
- C. A visual inspection of all wire shall be performed. Any wire with nicks, cuts, or other defects or damage in the insulation shall be rejected and immediately removed from the jobsite. If the integrity of any wire is in question, testing of the wire per ASTM D3032 for insulation-continuity proof shall be performed to the satisfaction of the Contractor's Corrosion Engineer. Any wire that fails the insulation-continuity proof test shall be rejected and immediately removed from the jobsite.

- D. Test Leads: Single conductor, stranded copper with THHN-THWN or HMWPE insulation and sized and colored as follows:
  - 1. Project Pipe Leads – No. 8 AWG Stranded THHN-THWN Black
  - 2. Bond Wire – No. 4 AWG HMWPE
- E. Phase taping of wires for color coding is not allowed.
- F. Each test lead wire shall be of sufficient length to extend from the attachment point on the pipe to the test box without a splice. Wires with cut or damaged insulation will not be accepted and replacement of the entire length of wire will be required at the Contractor's expense. Two test wires are required per station.
- G. Push-on, Mechanical Joint, and Flange Bond Wires: Bond wires shall be copper wire with high molecular weight polyethylene (HMWPE) insulation, sized and placed as shown drawings. Bond wires shall be as short as possible.

### **2.3 EXOTHERMIC WELD KITS AND WELD COATING**

- A. Weld Kits: Wire-to-pipe connections made by the exothermic welding process. Weld charges and mold size shall be as specified by the manufacturer for various pipe sizes and surface configurations. Weld charges for use on cast and ductile iron are different from those used on steel. Care should be taken during installation to be sure correct charges are used. Welding charges and molds shall be the product of a manufacturer regularly engaged in the production of such materials.
- B. Weld Cap Primer: Provide an elastomer-resin based corrosion resistant primer for underground services such as Royston Roybond Primer 747 or equal.
- C. Weld Caps: Provide pre-fabricated plastic caps filled with formable mastic compound on a base of elastomeric tape such as Royston Handy Cap 2 or equal.
- D. Weld Cap Overcoating: Overcoat with a 74% minimum solids by volume, cold-applied, black, thixotropic material containing plasticized coal tar pitch, solvents, and special fillers per MIL-C-18480A such as Protecto Wrap 160/160H, Carboline 300M, Tape-Coat TC Mastic or 3M Scotch Clad 244. Apply to at least 20 mils thickness.

### **2.4 WAX TAPE COATING FOR BURIED UNCOATED PIPE SPECIALS**

- A. General: Apply a wax tape coating system which conforms to AWWA C217 and consists of three parts: surface primer, wax-tape, and outer covering.
- B. The surface primer, wax-tape, and outer covering shall be from the same manufacturer.
- C. The primer shall be a blend of petrolatum, plasticizer, and corrosion inhibitors having a paste like consistency. It shall have a pour point of 100-degrees F to 110-degrees F and a flash point of 350-degrees. Use Trenton Wax-Tape Primer, or approved equal.
- D. The wax-tape shall consist of a synthetic-fiber felt, saturated with a blend of high melt microcrystalline wax, solvents, and corrosion inhibitors, forming a tape coating that is easily formable over irregular surfaces and which firms up after application. The tape shall have a saturant pour point between 125-degrees F and 130-degrees F and a dielectric strength equal to a minimum of 100-volts per mil. Tape thickness shall be 50-mils to 90-mils in 6-inch wide rolls. Use Trenton No. 1 wax-tape, or equal.
- E. The outer covering shall consist of two layers of a plastic wrapper. The plastic wrapper material shall consist of three 10-mil thick clear polyvinylidene chloride, high cling membranes wound together as a single sheet. Use Trenton Poly-Ply, or equal.

## **2.5 PLASTIC WARNING TAPE**

- A. Plastic warning tape for horizontal runs of buried leads in cable trenches shall be a minimum of 6-inches wide and a minimum of 4-mils thick and made of a non-detectable inert yellow plastic film designed for prolonged use underground and will not degrade when exposed to alkalis, acids, and other destructive elements commonly found in soil. The tape shall be printed with the warning, "Caution Cathodic Protection Cable Buried Below," or similar, clearly visible in repeating patterns along its entire length.

## **2.6 POLYETHYLENE ENCASUREMENT OF DUCTILE IRON PIPE**

- A. The polyethylene film and all relating materials used for the encasement of ductile iron pipe shall conform to the requirements of AWWA C105. See Section 40 05 19 – Pipe: Ductile.

# **PART 3 - EXECUTION**

## **3.1 GENERAL**

- A. Except as directed differently below or as shown on the drawings, the installation of corrosion control and monitoring facilities described herein shall conform to applicable portions of NACE SP0169 and NACE SP0286, and with all requirements of the legally constituted authorities having jurisdiction. Of special interest in NACE SP0169 is section 8.6: "Corrosion Control Test Stations, Connections, and Bonds". Of special interest in NACE SP0286 is Section 9; "Field Testing and Maintenance". Nothing in the drawings or specifications is to be construed to permit work not conforming to minimum requirements of these standard practices, regulations and codes. Where larger size or better grade materials than required by these regulations and codes are specified, the specification and drawings shall take precedence.

## **3.2 STORAGE OF MATERIAL**

- A. All materials and equipment to be used in construction shall be stored in such a manner to be protected from detrimental effects from the elements. If actual storage cannot be secured, materials and equipment shall be stacked well above ground level and protected from the elements as appropriate.

## **3.3 TEST STATIONS**

- A. Install test stations level at finished grade at the locations shown on the drawings. Install the test station such that it does not become a low point as time progresses. Place test stations as close to directly over the pipe as possible, but do not install test stations in traffic lanes. Where test stations must be near traffic lanes, install the test station in areas away from traffic hazards, such as in medians or behind curbs.
  - 1. Install reinforced concrete pad as shown if the site is unpaved.
  - 2. Place bottom of test box on native soil. Do not place gravel, sand or debris in test station box.
- B. Weld wires to the structure as shown on the drawings and terminate in the appropriate test station. Trench all wires at a minimum depth of 24 inches and place in Schedule 80 PVC electrical conduit. Leave a minimum of 18-inches of slack wire at the weld connection and a minimum of 18-inches of extra wire or cable at its terminus in each test box. Install plastic warning tape 12-inches above all horizontally trenched wire runs.
- C. Apply wire identification labels and leave exposed.
- D. Terminate test wires at the appropriate test board, as shown on the drawings.
- E. Apply duct seal to inside of the PVC collar after all wires have been routed through.

## **3.4 POLYETHYLENE ENCASUREMENT OF DUCTILE IRON PIPE**

- A. Polyethylene encase all ductile iron pipe per AWWA C105.

### 3.5 WIRE AND CABLE

- A. General: No less than two test wires shall be attached to the pipe at each designated test station site. All test wires shall terminate in the test station without a splice. A minimum of 18-inches of slack wire shall be coiled at the wire-to-pipe connection and in the test box.
- B. Connection to Pipe: Make copper wire connections to the pipeline with exothermic weld charges. All welding charges and installation material will be the product of a single manufacturer regularly engaged in the manufacture of the material. Use manufacturer's recommended cartridge size and type. Install, test, and coat each weld as described below.
  - 1. Preparation of Wire: Use a cutter to prevent deforming wire ends. Remove only enough insulation from the wire to allow the weld connection to be made. Do not use a hacksaw for cutting wire.
  - 2. Preparation of Metal: Remove all coating, dirt, grime and grease from the metal pipe at weld location by wire brushing and/or use of suitable safe solvents. Clean the pipe to a bright, shiny surface free of all serious pits and flaws by use of mechanical grinder or a file. The area of the pipe where the attachment is to be made must be absolutely dry. Failure to provide a dry surface for welding will result in a poor quality weld and could result in serious injury to the worker. Do not cut reinforcing rods when preparing metal surface for wire attachment.
  - 3. Attachment of Wire to Pipe: Attach the copper wire using an exothermic weld as shown on the drawings. The wire is to be held at 30° to 45° angle to the surface when welding. Attach only one wire at each weld location.
  - 4. Testing of All Completed Welds: As soon as the weld has cooled, test the weldment for strength by striking a sharp blow with a two-pound hammer while pulling firmly on the wire. All unsound welds are to be re-welded and re-tested. Remove all weld slag from the weldment.
  - 5. Coating of All Completed Welds: Thoroughly clean by wire brushing the area to be coated. The area must be completely dry. Apply the weld cap primer and the weld cap. Overcoat the weld cap with a bituminous mastic coating material in accordance with the manufacturer's recommendations. Completely coat the weld, all bare pipe surfaces around the weld and any exposed copper wire.
- C. Wire Trenching and Backfill:
  - 1. Depth: All buried horizontal test lead runs shall be installed at a minimum depth of 36-inches.
  - 2. Damaged Wire: Care shall be taken when installing wire and backfilling trench so that insulation is not broken, cut, nicked, or bruised. If wire insulation is damaged during installation, it shall be replaced completely at the Contractor's expense.
  - 3. Warning Tape: Install plastic warning tape over all wire runs 12-inches below grade.
- D. Installing Identification Markers:
  - 1. Install wire identification markers for each cable as shown on the drawings.
- E. Wire Splices or Repairs:
  - 1. Approval: No wire splices or insulation are permitted unless written approval is provided by the Engineer.
  - 2. Inspection: All splices and insulation repair methods shall be approved by the Engineer prior to repairing. All installations shall be inspected by the Engineer before burial.

### 3.6 EXCAVATION AND BACKFILLING

- A. Trenches for anode lead wires or header cables shall be a minimum of 36-inches deep or as shown otherwise on drawings. See Section 31 23 00 - Earthwork.

### 3.7 INSTALLATION OF CONDUIT

- A. Cover the bottom of the trench with a 3-inch layer of sand or stone free native material. Center the PVC conduit on the backfill layer. Place backfill over the conduit in layers not exceeding 6-inches deep and compact each layer thoroughly. Do not place tree roots, wood scrap, vegetable

matter or refuse in the backfill. Place plastic warning tape at a depth of 12-inches below final grade as shown on the drawings.

### 3.8 CONTINUITY BONDING

- A. During installation of the pipe, electrically bond across all pipe joints by installation of bond wires as shown on the drawings.
- B. Bond across all buried metallic in-line valves, dresser couplings, flexible couplings with thrust harness and bolted flanges and fittings with the exception of insulating flanges. Do not bond across insulating flanges.
- C. Bonding the pipe joints is necessary to achieve an adequate level of electrical continuity in the pipelines. Install all bond wires at minimum lengths that will still allow for maximum deflection of the joint or fitting per the manufacture's recommendations.
- D. Piping, pipe fitting, and specials 16-inches or smaller in diameter require 2-bond cables for each joint. All piping, pipe fittings, and specials larger than 16-inches diameter require 3 bond cables for each joint.
- E. Bond wires can either be attached to the pipe cylinder or directly to the outside edges of flanges that are welded to the pipe. Do not attach bond wires to valve bodies but instead to the valve flange.
- F. Document all bond locations for use in the final test report.

### 3.9 EXOTHERMIC WELDS

- A. File a minimum of the surface for placement of the weld mold on the ductile iron structure. The surface must be completely clean and dry (near white metal surface preparation).
- B. Insert a disk into the bottom of the cavity inside the mold. Dump the weld metal into mold being careful not to upset the disk. Tap the bottom of the plastic tube to loosen all the starting powder and spread it evenly over the weld metal. Place a small amount of starting powder on the top edge of the mold under the cover opening for easy ignition. Close the cover.
- C. When using No. 10 to No. 14 AWG wire conductors, it will be necessary to install a copper sleeve of adequate size over the bare wire and crimp in place before attempting to make the connection. The wire should protrude at least 1/8-inch from the end of the sleeve.
- D. Insert the conductor into the mold noting any special information under "positioning" in the manufacturer's instructions packaged with the welder.
- E. Follow all pertinent safety precautions per the specifications and ignite the weld charge with a flint gun. Move the flint gun away quickly to prevent fouling. If the flint gun should become fouled, soak it in household ammonia.
- F. After ignition, hold the welder in place for a moment to allow the weld to solidify. After the weld has cooled, remove the slag with a chipping hammer or wire brush.
- G. Test the weld integrity by striking it from the side with a two pound hammer. A typical problem for this type of weld is poor surface preparation of the pipe. This situation will result in the weld nugget being able to be knocked off the pipe with the tap of a hammer. If the weld comes off, move away a minimum of 3-inches and repeat steps A through G. Do not re-weld in the same location.
- H. Apply primer and weld cap per manufacturer's recommendation.
- I. Overcoat the weld cap and weld area, overlapping the pipe coating by 3-inches. Allow coating to cure per manufacturer's recommendation prior to repair of any pipe coating.
- J. Wet or damp exothermic weld molds will produce porous welds. The mold shall be completely dry before attempting to weld.

K. All connections shall be placed at distances shown on the drawings.

**3.10 WAX TAPE COATING FOR BURIED UNCOATED PIPE SPECIALS**

- A. Coat buried pipe flanges with a wax tape coating system in accordance with AWWA C217 and in accordance with manufacturer’s recommendations. Extend the wax tape coating system over the adjacent pipe coating by a minimum 12-inches or 18-inches away from the outside flange face, whichever distance is greater.
- B. The surfaces to receive the wax tape coating shall be clean and free of all dirt, grease, and other foreign material. Apply the primer by gloved hand or brush onto all exposed pipe surfaces. Cut strips of wax tape and apply them by gloved hand around all bolts, nuts, and other irregular shapes so that there are no voids or spaces under the tape. Apply a sufficient amount of tape to completely encapsulate all exposed pipe surfaces. The minimum wax tape thickness shall be 70 mils over smooth surfaces and 140 mils over sharp and irregular surfaces, or of a thickness required to fill all voids. Apply by hand, two layers of polyvinylidene chloride, high cling membrane sheet over the wax tape coating by tightly wrapping it around the pipe such that it adheres and conforms to the wax tape. Secure the plastic wrap to the pipe with adhesive tape.

**3.11 INSPECTION AND TESTING**

- A. Testing of Completed Welds: Pipe lead wire connections shall be inspected by the Engineer prior to backfilling. At the Engineer's discretion, tests to verify the soundness of the exothermic welds shall be conducted by the Contractor. Tests for this purpose shall consist of striking the weld nugget with a two pound hammer while steadily pulling on the wire. Note that the wire near the weld shall not be unnecessarily cold-worked during installation or testing. Remove and re-weld any welds that break loose or show signs of separating, as determined by the Engineer.
- B. Verification of Wire Identification: The Engineer shall be given the opportunity (two days’ notice) to verify that buried pipe lead wires are properly identified with wire markers prior to backfilling the wires and the welded wire-to-pipe connections.
- C. Testing of Pipe Lead Wire Integrity: After the pipe is buried, the pipe lead wire trenches are backfilled, and the test stations are installed, the Contractor will test each set of pipe lead wires at each test station for electrical continuity to the pipe. Potentials measured on each wire in a pair of test lead wires shall differ by no more than 2 mV. Resistance between pairs of test wires shall match theoretical resistances shown in table below. If more than twice the theoretical resistance is measured between a pair of pipe lead wires is measured, the Contractor shall excavate the pipe and replace the pipe lead wires.

<u>Wire Size</u>	<u>Resistance (Ohms/100 feet at 77 degree F)</u>
No. 4 AWG	0.026
No. 6 AWG	0.041
No. 8 AWG	0.065
No. 10 AWG	0.104
No. 12 AWG	0.165
No. 14 AWG	0.262

- D. Pipeline Electrical Continuity Testing: Conduct electrical continuity testing to demonstrate that all buried pipe joints (except insulated flanges) are either welded joints or have been electrically bonded across with bond wires. This testing shall be performed by the Contractor’s Corrosion Engineer. If electrical continuity is not demonstrated to the satisfaction of the Engineer, the Contractor shall replace bond cable connections until electrical continuity of the pipe is achieved.

Perform electrical continuity tests at each pipe span between manholes or maximum spacings of 800-feet of pipe. Circulate direct current (DC) through the pipeline using a 12-volt DC source. Use two pairs of directly connected test wires, one for current flow, one for voltage

measurement. Measure the voltage difference developed by the DC current flow. Calculate the electrical resistance of the pipeline section in Ohms using Ohm's Law. The resistance test acceptance criterion is less than 150 percent of the calculated resistance value. The resistance value shall be calculated using the pipe's cross section area of the pipe, its length, and consideration for the joint bond cables at each bonded joint, see table below.

Joint Type	Max. Allowable Resistance (Ohms)		
	Two Bonds/Joint	Three Bonds/Joint	Four Bonds/Joint
No. 4 AWG wire Bonds, Each Bond Wire Approximately 2-ft in Length	0.000254	0.000169	0.000127

- E. Furnish all test results in a letter report to the Engineer as described in Article 1.3 Submittals of this specification section.

**3.12 SYSTEM ACTIVATION**

- A. The Contractor's Corrosion Engineer shall perform final inspection and testing in the presence of the Owner's Representative and receive final approval from the Owner's Representative. Supervision is defined in this specification as requiring a minimum eight hours of onsite field work at the start of the inspections to work with the Cathodic Protection Technician to plan, direct, and verify the testing procedures and to provide troubleshooting as required.
- B. Provide a minimum of five days advance notice to the Engineer before the testing of corrosion monitoring system will be performed to allow for coordination and observance of these tests.
- C. Measure native potentials (i.e. baseline pipe-to-soil potentials) at all corrosion monitoring test stations. Make these measurements at all corrosion monitoring test station wires in each test station (e.g., where two wires are present, measure and record the native potential on each of the two wires). If the potentials measured on pairs of wires within a given test station (i.e., wires that land at the same spot on the pipe) differ by more than two millivolts, investigate the cause.
- D. Furnish all test results including all native potential readings taken at test stations, electrical continuity results dates, and times. Reference all data to pipe station numbers or other suitable stationing. Submit all data in a letter report to the Engineer as described in Article 1.3 Submittals of this specification section. The letter report shall include a description of the test methods, analysis of the data, and any conclusions about the effectiveness of the future system if anodes were to be added to provide cathodic protection.

**3.13 ACCEPTANCE CRITERION FOR DUCTILE IRON PIPE**

- A. Galvanic anodes for cathodic protection can be readily added to pipelines that are electrically continuous, isolated from other structures, and that have had test stations installed for monitoring. If galvanic anodes are installed through existing test stations in the future, the operation of the cathodic protection system shall be tested to ensure that all portions of the pipe are provided a full level of corrosion protection per the requirements of NACE SP0169. If these criteria cannot be met after the installation of anodes, deficiencies in construction should be corrected to insure compliance with criteria. After correction of construction deficiencies, if it is still not possible to meet protective criteria, testing should be conducted to determine cause of deficiency, and the deficiencies should be addressed by the Engineer.

**END OF SECTION**

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**SECTION 31 05 16**  
**AGGREGATE MATERIALS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:  
This Section includes aggregate materials for sanitary sewer construction. Additional aggregate materials are included and specified within other Sections of these Contract Documents.
  - 1. Sanitary Sewer Construction Aggregate:
    - a. Backfill, bedding and blended aggregate materials.
- B. Related Sections include but are not necessarily limited to:
  - 1. Division 01 - General Requirements.
  - 2. Section 31 23 00 – Earthwork.
  - 3. Section 33 30 00 – Sanitary Sewerage Utilities.

**1.2 REFERENCES**

- A. Metropolitan St. Louis Sewer District: “Standard Construction Specifications for Sewers and Drainage Facilities, 2009”, hereinafter referred to as the MSD Standard Specifications, are available online at <https://msdprojectclear.org/doing-business/design-construction/standard-construction-specs/>. Should a conflict between the Contract Documents and the MSD Standard Specifications arise, these Contract Documents shall govern.

**1.3 SUBMITTALS**

- A. See the Missouri Department of Transportation (MoDOT) Route 100-Manchester Road Project (J6S1718B) technical specifications for submittal procedures.
- B. Materials Source: Submit name of imported materials suppliers.
- C. Manufacturer's Certificate: Certify Products meet or exceed specified requirements of these and MSD Standard Specifications.

**1.4 QUALITY ASSURANCE**

- A. Perform Work in accordance with these and MSD Standard Specifications.

**PART 2 - PRODUCTS**

**2.1 BACKFILL, BEDDING AND BLENDED AGGREGATE MATERIALS**

- A. All products and accessories shall comply with the requirements of the MSD Standard Specifications – Part 2 “Materials of Construction”:
  - 1. Backfill and Bedding Aggregate Type:
    - a. MSD 1 – Bedding.
    - b. MSD 2 – Bedding.

B. All products and accessories shall comply with the St. Louis County Standard Specifications for Highway Construction:

1. Blended Aggregate Type:

a. Type 5 Aggregate:

<u>Sieve Size</u>	<u>Percent Passing</u>
1 inch sieve	100
1/2 inch sieve	60 to 90
No. 4 sieve	35 to 60
No. 30 sieve	10 to 35
No. 200 sieve	0 to 15

## 2.2 SOURCE QUALITY CONTROL

A. Refer to Missouri Department of Transportation (MoDOT) Route 100-Manchester Road Project (J6S1718B) technical specifications for quality requirements.

## 2.3 USAGE REQUIREMENTS

A. Backfill and Bedding

- MSD 1 – Bedding for rigid pipes 27-inch diameter and smaller and all flexible pipe 18-inch diameter and under.
- MSD 2 – Bedding for rigid pipes 30-inches in diameter and larger and flexible pipes 18-inches and larger.

B. Blended aggregate to be used in:

- Granular Backfill.

## PART 3 - EXECUTION

### 3.1 EXCAVATION

A. Remove excess excavated materials not intended for reuse, from the site.

### 3.2 STOCKPILING

- Stockpile materials on site at locations approved by the Engineer.
- Stockpile in sufficient quantities to meet Project schedule and requirements.
- Separate different aggregate materials with dividers or stockpile individually to prevent mixing.
- Direct surface water away from stockpile site to prevent erosion or deterioration of materials.
- Stockpile unsuitable materials on impervious material and cover to prevent erosion and leaching, until disposed of.

### 3.3 STOCKPILE CLEANUP

A. Remove stockpile, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

**END OF SECTION**

## SECTION 31 22 35 ROCK REMOVAL

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Removal of subsurface rock encountered during excavation, utilizing mechanical or blasting methods.
- B. Related Sections include but are not necessarily limited to:
  - 1. Division 01 – General Requirements.
  - 2. Section 31 23 00 – Earthwork.

#### 1.2 REFERENCED CODES AND STANDARDS

- A. The latest versions of listed publications shall apply:
  - 1. Metropolitan St. Louis Sewer District: “Standard Construction Specifications for Sewers and Drainage Facilities, 2009”, hereinafter referred to as the MSD Standard Specifications, are available online at <https://msdprojectclear.org/doing-business/design-construction/standard-construction-specs/>. Should a conflict between the Contract Documents and the MSD Standard Specifications arise, the Contract Documents shall govern.
    - a. MSD Standard Specifications, Part 3 – “Excavation”.
  - 2. National Fire Protection Association (NFPA).
    - a. NFPA 495 – Code for Manufacture, Transportation, Storage, and Use of Explosive Materials.
    - b. NFPA 498 – Standard for Explosives, Motor Vehicle Terminals.
  - 3. Bureau of Alcohol, Tobacco, and Firearms (ATF)
    - a. 27 CFR Part 555 – Commerce in Explosives
  - 4. U.S. Department of Labor, Occupational Safety and Health Administration (OSHA), Construction Standards and Interpretations 29 CFR Part 1926, Subpart U, Section 1926.900, “Blasting and Use of Explosives”.
  - 5. Missouri Blasting Safety Act.
  - 6. Missouri Division of Fire Safety
    - a. Missouri Explosives User Registration and Blaster License.
  - 7. St. Louis County Ordinance 711.220, “Blasting – Rules and Regulations”.
  - 8. Federal Regulations – 29 CFR Part 1926, Subpart U – Blasting and the Use of Explosives.
  - 9. Applicable Local Municipality Ordinances.
  - 10. International Society of Explosive Engineers (ISEE) Field Practice Guidelines for Blasting Seismographs.
  - 11. RI 8507 “Structure Response and Damage Produced by Ground Vibrations from Surface Blasting,” U.S. Bureau of Mines Report of Investigation by D.E. Siskind, M.S. Stagg, J.W. Kipps, and C.H. Dowding, 1980.

#### 1.3 DEFINITIONS

- A. Rock: Either “Class A” or “Class B” Excavation Classes as defined in MSD Standard Specifications, Part 3, Section B.
- B. Peak Particle Velocity (PPV): The maximum of the three ground vibration velocities measured in the vertical, longitudinal and transverse directions. Velocity units are expressed in inches per second (ips).
- C. Air-Overpressure: Temporary changes in ambient air pressure caused by blasting. Air-overpressure is expressed in units of psi or dB. Measurements for blasting are made with microphones having a flat frequency response for over-pressure in the 2 to 250 Hz range. A-weighted or C-weighted microphones shall not be used for these measurements.

- D. Occupied Building: Structure on or off construction limits that is occupied by humans or livestock.
- E. Residential Building: Includes single and multifamily dwellings, hotels, motels and any other structure containing sleeping quarters.
- F. Scale Distance: A factor describing relative vibration energy based on distance and charge-per-delay. For ground vibration control and prediction purposed, Scaled Distance (Ds) is obtained by dividing the distance of concern (D) by the square root of the charge-per-delay (W) –  $D_s = D/(W)^{1/2}$ .
- G. Charge-per-Delay (W): For purposes of vibration control, any charges firing within any 8-millisecond time period are considered to have a cumulative effect on vibration and air-overpressure effects. Therefore, the maximum charge-per-delay equals the sum of the weight of all charges firing within any 8-millisecond time period. For example, if two 10 lb. charges fire at 100 ms and one 15 lb. charge fires at 105 ms, the maximum charge per delay would be 35 lbs.
- H. Line Drilling: A method of controlling overbreak, in which a series of very closely spaced holes are drilled at the perimeter of the excavation. Line holes are generally not loaded with explosives; however, in some applications alternating holes may be loaded with light charges using detonating cord.
- I. Pre-splitting: A blasting technique in which the perimeter charges are detonated first in the firing sequence or as a separate blast ahead of production blasting. This technique is designed to generate a fracture in the plane of the pre-split holes drilled along the perimeter of the excavation.
- J. Production Holes: Blast holes in the main body of the rock mass being removed by drilling and blasting.
- K. Stemming: Crushed stone, tamped clay or other inert earth material placed in the unloaded collar area of blast holes for the purposes of confining explosive charges and limiting rock movement and air-overpressure.
- L. Buffer Holes: Blast holes in the main body of the rock mass being removed by drilling and blasting.
- M. Primary Initiation: The method whereby the blaster initiates the blast(s) from a remote and safe location. Primary initiation systems use pneumatic tubing or shock-tubes to convey firing energy from blasters to blast locations.
- N. Surface Blasting: All excavations where surface blasting techniques are required.
- O. Controlled Blasting: Excavation in rock in which the various elements of the blast, include hole size, position, alignment, depth, spacing, burden, charge size, distribution, and delay sequence are carefully controlled to excavate the rock to the desired lines with a relatively uniform surface with minimal overbreak and fracturing of the rock beyond the design excavation limits and to maintain resulting noise, overpressure and peak particle velocity within specified maximum limits.
- P. Prohibited Persons: Persons prohibited from handling or processing explosive materials as defined by the seven categories described in Section 555.11 of 27 CFR ATF Rules.
- Q. Delay: Distinct pause of pre-determined time between detonations of single charges or groups of charges.

#### 1.4 QUALITY CONTROL

- A. The design and execution of blasting shall be performed under the on-site supervision of a licensed blaster certified in the State of Missouri.

- B. The Contractor shall perform blast monitoring as required to satisfy its legal obligation relative to all permits and all applicable federal, state and local codes, laws, regulations and ordinances, and its contractual responsibilities, including safety.
- C. The Contractor shall perform blast monitoring to verify conformance with regard to air-overpressure and peak particle velocity criteria defined by this Section.
- D. The Contractor is required to retain the services of an experienced blasting consulting firm. Qualification requirements for these individuals are listed in Paragraph 1.7.
- E. The Contractor is required to retain the services of an (1) Independent Pre-Construction Surveyor(s) to perform a pre-construction survey and (2) Independent Blast Vibration Specialist(s) to monitor, report, analyze, and interpret the ground vibration and air-overpressure data collected and to recommend monitoring locations. Qualification requirements for these individuals are listed in Paragraph 1.7.

#### 1.5 SUBMITTALS DURING CONSTRUCTION

- A. Submittals for rock removal shall be provided in accordance with the requirements of the Missouri Department of Transportation (MoDOT) Route 100-Manchester Road Project (J6S1718B) technical specifications for submittal procedures.
- B. Qualifications: Contractor shall subcontract and submit written qualification for the (1) experienced blasting contractor (2) Independent Pre-Construction Surveyor, (3) Independent Blast Vibration Specialist(s), and (4) Project Blaster(s) that are intended to be used during blasting operations in the General Blasting Plan (described below). Documents required include, but are not limited to, resume including all related work experience, certifications, licenses, training, and references (provide three for each individual). Copies of all licenses, certificates and proof of training documentation shall also be provided. Qualification requirements for each listed individual(s) are listed in Paragraph 1.7.
- C. Permits: Contractor shall obtain all required local, state, and federal permits and shall submit to the Engineer a copy of all applicable permits for transportation, storage, and use of explosives a minimum 10 working days prior to scheduling a Preblast Meeting for review.
- D. General Blasting Plan: A General Blasting Plan prepared by an experienced blasting contractor shall be submitted by the Contractor to the Engineer a minimum 10 working days prior to scheduling a Preblast Meeting for review. The General Blasting Plan may be returned to the Contractor for revision or clarification prior to scheduling the Preblast Meeting. The General Blasting Plan shall include at a minimum the following items:
  - 1. A description of the experience record for the responsible blasting contractor, Blaster(s), and copies of the blasting license(s) and permit(s) as well as copies of the approved noise variances issued by local jurisdictions.
  - 2. Detail description of the methods and manner by which the blasting contractor will comply with pertinent laws, rules, regulations, and contract documents.
  - 3. Description of steps necessary to ensure that the proposed blasting activity does not cause injury, damage property, adversely affect traffic, or cause the migration/accumulation of noxious gases.
  - 4. A complete summary of proposed methods for transporting, handling, storage, and use of explosives.
  - 5. Details for a typical blast with the understanding that minor modifications in the field will be allowed. Significant changes to the blasting operations will require that a new Blasting Plan be submitted for review.
- E. Any changes to the blasting program shall require the Blasting Plan to be updated and submitted to the Engineer for review. Review of any Blasting Plan by the Engineer shall not relieve the Contractor of his responsibility for obtaining adequate rock breakage and limiting rock breakage to within the design excavation final lines and grades.

- F. Detailed Blasting Plan: At least 48 hours before commencing any blasting operations, the Contractor shall submit a Detailed Blasting Plan to the Engineer for review. The Detailed Blasting Plan shall include the following minimum information:
1. A plan drawn to scale showing the location, number, diameter, and depth of blast holes relative to the specified stations, slopes, lines, and grades.
  2. Type of explosive, including manufacturer and cartridge size, if applicable.
  3. Total weight of explosive in the blast and maximum weight per hole and per delay period.
  4. The delay sequencing and type and manufacturer of delays used.
  5. Type and nomenclature of detonators.
  6. Type and distribution of stemming used to fill the holes above and below charges.
  7. Description of proposed blasting system.
  8. Specific measures taken to protect adjacent structures.
  9. Type and methods of matting and covering blast area to mitigate flyrock.
  10. Communication procedures to confirm that the area is secured prior to blasting.
  11. Any redesign of the Detailed Blasting Plan shall be submitted to the Engineer for review.
  12. Samples of the proposed daily blasting report and daily seismograph monitoring report and forms to be used for blasting notification (including notification of OWNER), pre-blast inspection, blasting complaints, pre-blast inspection waiver, and procedure for handling blasting related complaints.
- G. Blast Report: The Contractor shall submit a Blast Report to the Engineer within 4 hours following each blast for review by the Engineer. This Report shall comply with requirements of State of Missouri Rules and Regulations of Safety Fire Commissioner, Rules and Regulations for Explosives and Blasting Agents, latest edition – Missouri Blasting Safety Act, and in addition include the following items:
1. Comments by the Blaster in charge regarding any misfires, unusual results, or unusual effects.
  2. Record of the vibration and air-over pressure monitoring data for each blast.
  3. Any other records required by federal, state, and local codes and regulations.
  4. Engineer’s review and approval of blasting activities, results, and Blast Report after each individual blast will be required prior to a making a request for approval of any subsequent blasts.
- H. Blasting Safety Plan: A Blasting Safety Plan shall be submitted by the Contractor to the Engineer a minimum of 10 working days prior to scheduling a Preblast Meeting for review. The Blasting Safety Plan shall include at a minimum, the following items:
1. A complete description of the clearing and guarding procedures that will be employed to ensure personnel, staff, visitors, and all other persons are at safe locations during blasting. This information shall include details regarding visible warning signs or flags, audible warning signals, method of determining blast area zones, access blocking methods, guard placement and guard release procedures, primary initiation method, and the system by which the Blaster-in-charge will communicate with security guards.
  2. Detailed description of how explosives will be safely stored, transported and used at the various work sites. Plans shall explain how storage magazines and explosives transport vehicles will satisfy all applicable regulations. This plan shall also indicate how explosives will be inventoried, secured, and guarded to prevent theft or unauthorized usage.
  3. Include Material Safety Data Sheets (MSDS) and specific details about hazard communication programs for employees.
  4. Equipment shall monitor the approach of lightning storms, and in the event of such, evacuation and site safety security plans shall be implemented.
  5. Contingency plans for handling of misfires caused by cut-offs or other sources.
  6. Fire prevention plan details, including smoking policies, procedures and limitations for work involving any open flames or sparks, description and location of all firefighting equipment, and firefighting and evacuation plans.
  7. Initial and ongoing blasting and fire safety training programs.

8. Description of the personal protective equipment that will be used by the Contractor's personnel, including but not limited to, safety glasses, hard-toe footwear, hard hats, and gloves.
  9. Description of blasting monitoring equipment and listing of individuals that will operate such equipment. Submittal shall indicate that all equipment meets the standards defined in Paragraph 1.2 of this Section.
  10. Obtain copies of all applicable codes, regulations and ordinances related to blasting, keep a copy in the project files at all times, and provide the Engineer with a copy. The Contractor's Safety Representative shall ensure that ongoing blasting work complies with all applicable regulations, and make arrangements for inspection if required by agencies having jurisdiction over such matters.
  11. List steps that will be taken to control flyrock (i.e. blasting mats).
  12. If carbon monoxide or other noxious fumes are likely to migrate from the blast location or accumulate within nearby structures, describe measures to detect and prevent their migration.
- I. Structure Condition Survey: A pre-construction survey shall be conducted by an experienced and qualified Independent Pre-Construction Surveyor in accordance with Section 01 71 14, Paragraph 1.3. for all structures within the influence range of any blasting operations, or within a minimum of 500 feet from any part of the Work as listed in JSP-Sewer, Exhibit 3 – List of Properties/Structures for Inspection and Condition Survey, whichever is a greater distance between the two.
- J. Blast Complaints Reports: The Contractor shall report to the Engineer in writing all blasting complaints received within 24 hours of receipt. Each blast complaint report shall include the name and address of the complaint, time received, date and time of blast complained about and a description of the circumstances which led to the complaint. In the event of damage claims, a report shall be prepared by the Contractor on the particular structure(s) as requested by the Engineer or County from those notes and photographs and submitted to the Engineer and County. The Contractor shall respond to claimant within a 30-day period. Failure to properly respond within a 30-day period would justify direct notification to Contractor's insurance underwriter by the Engineer for resolution and payment.
- K. On-Site Documentation:
1. The Contractor shall retain hard copies on-site of all applicable codes, regulations and ordinances related to blasting and provide additional copies to the Engineer. The Contractor's Safety Representative shall ensure that ongoing blasting work complies with all applicable regulations, and make arrangements for inspection if required by agencies having jurisdiction over such matters.

## 1.6 PRE-BLAST MEETING

- A. A pre-blast meeting shall be held at the site to discuss the proposed blasting operations. In attendance shall be the Owner, Engineer, Contractor, blasting contractor, Project Blaster(s), and all interested parties as required by law (e.g., utilities, railroads, local law enforcement agencies, and local emergency services). A pre-blast meeting is intended to initiate open communications with the blasting contractor and Project Blaster(s) relating to the requirements for rock drilling and blasting, and demolition. The Contractor will conduct the pre-blast meeting, which shall include a review and discussions of the following items: General Blasting Plan, Blast Safety Plan, and Pre-Construction Survey Report, Contractor's insurance policy covering blasting, and the requirements for preparing and providing the Detailed Blasting Plan, Blast Reports, and Blast Complaints Reports. A new pre-blast meeting will be required to designate new Project Blasters.

## 1.7 QUALIFICATIONS

- A. Explosives – Retain the services of an experienced blasting contractor with at least 10 years of experience in monitoring blasting operations (test blast and production blasts), interpreting ground vibration, air-overpressure, and impulse amplitudes for similar construction projects, and to prepare all blasting plans, test-blasting plans, and revisions to any of these plans. All blasting plans, test-blasting plans, and revisions shall be reviewed by and covered with a signed review letter by the blasting contractor. The blasting contractor must hold or be able to obtain an Explosive User Registration with the Missouri Division of Fire Safety before using any explosives.
- B. Blaster(s) – A project may have several Project Blasters, but only one blaster is in charge of each blast (blaster-in-charge). Responsibilities include delivery of explosives, storage, loading, and detonation of the blast. The blasting supervisors (blasters-in-charge) shall have a minimum of 10 years of experience, directly related to the specific types of excavation blasting they will oversee. All blasting supervisors shall be able to document the completion of at least three projects of similar scope and complexity. All blasters and supervising foreman shall be properly qualified and licensed in accordance with applicable federal, state and local government regulations. Necessary licenses include a Blaster License issued by the Missouri Fire Safety Commissioner. The Contractor is required to submit qualifications of all Blasters in accordance with Paragraph 1.5. Acceptance of the Blaster(s) qualifications is under the sole discretion of the Engineer. If deemed inadequate by the Engineer, the Contractor is responsible for providing another Blaster(s) with the appropriate credentials and experience. All persons that handle explosive materials, have control over them, or access to them, must not be prohibited persons, as defined in Section 555.11 of 27 CFR (ATF Rules).
- C. Independent Blast Vibration Specialist(s) – Qualified in the field of blast vibration and air-over pressure monitoring and inspection. Independent Blast Vibration Specialist(s) must be trained and certified in the use of vibration equipment being installed and used and have a minimum of 10 years of experience performing similar Work. More than one specialist may be needed to meet the required qualifications. The Contractor is required to submit qualifications of all Independent Blast Vibration Specialist(s) in accordance with Paragraph 1.5. Acceptance of the Independent Blast Vibration Specialist(s) qualifications is under the sole discretion of the Engineer. If deemed inadequate by the Engineer, the Contractor is responsible for providing another Independent Blast Vibration Specialist(s) with the appropriate credentials and experience.
- D. Independent Pre-Construction Survey Firm – A technician furnished by the Contractor’s insurance underwriter qualified in performing and documenting the existing conditions of buildings, homes and other related infrastructure (i.e., pavement, sidewalks, etc.) that could become damaged as a result of nearby blasting operations. The Independent Pre-Construction Survey Firm must be experienced and retain the appropriate certifications and licenses required by the State of Missouri, St. Louis County and other public agencies and have a minimum of 10 years of experience performing similar Work. The Contractor is required to submit qualifications of the Independent Pre-Construction Survey Firm in accordance with Paragraph 1.5. Acceptance of the Independent Pre-Construction Survey Firm qualifications is under the sole discretion of the Engineer. If deemed inadequate by the Engineer, the Contractor is responsible for providing another Independent Pre-Construction Survey Firm with the appropriate credentials and experience.

## 1.8 REGULATORY AND RELATED PROJECT REQUIREMENTS

- A. Conform to applicable State and local codes for explosive disintegration of rock and to NFPA 495 for handling explosive materials.
- B. Obtain permits from authorities having jurisdiction before explosives are brought to the site or drilling is started.

- C. Blasting and excavation work shall be conducted in a manner that limits all related vibrations to less than a peak particle velocity (PPV) in accordance with St. Louis County Ordinance 711.220, "Blasting – Rules and Regulations" at the nearest uncontrolled structures.
- D. The Contractor shall notify the Engineer, County, and City of Brentwood, at least 10 working days prior to blasting any holes, and the specific dates in which blasting shall be conducted. Blasting shall not occur on any dates not specifically identified and preapproved by the Engineer, County, and City of Brentwood. The Contractor shall coordinate the release of related scheduling information with the City of Brentwood and the County's Public Relations Departments and/or their representatives for dissemination and notification to the public.
- E. If a blast causes injury, damage to property, adversely affects traffic, or causes gases to migrate and/or accumulate in a potentially harmful manner, all blasting operations shall cease by order of the Engineer for a review of the procedures. The review will be conducted by the Engineer to ensure proper procedures and practices were used and to determine if procedures need to be revised. Should the findings of the review indicate the injury, damage, traffic delay, or migration/accumulation of gases was attributed to improper blasting operations, blasting may be suspended as described in Paragraph 3.6 and the may be requested to be removed from the project and replaced with another qualified Blaster at the Contractor's own expense.

#### **1.9 SCHEDULING**

- A. Scheduling of blasts shall be performed as required by the City of Brentwood. No blasts shall be scheduled or occur outside of these time limits.
- B. Schedule Work to minimize disruption of vehicular traffic in nearby public thoroughfares.
- C. Coordinate schedule with Engineer, County, City of Brentwood, local police, and fire departments including owners of nearby existing facilities and residents.

#### **1.10 COMPLIANCE WITH APPLICABLE CODES AND REGULATIONS:**

- A. Keep explosives on the site only in such quantity as needed for Work under way and only during time as being used. Notify Engineer at least 24 hours in advance of intention to store and use explosives. Store explosives in a secure manner and separate from all tools. Store caps or detonators safely at a point over 100-feet distant from explosives. Promptly remove from premises remaining material when need for explosives has ended.
- B. Conform to Federal, State, County, and local municipal laws, ordinances, and regulations relating to transportation, storage, handling, and use of explosives. If any of above-mentioned laws, ordinances, or regulations require a licensed Blaster to perform or supervise the work of blasting, employ a licensed Blaster. Require the Blaster to have their license on site and permit examination by Engineer or other officials having jurisdiction.
- C. Conduct operations involving explosives with all possible care to avoid injury to persons and property. Do blasting only with such quantities and strengths of explosives and in such manner as will break rock approximately to intended lines and grades, leaving rock not to be excavated in an unshattered condition. Avoid excessive cracking of rock upon or against which any structure will be built. Prevent injury to existing pipes, structures and property above or below ground. Cover rock with logs or mats, or both. Give sufficient warning to persons in vicinity of Work before a charge is exploded in accordance with the St. Louis County Ordinance 711.220, "Blasting – Rules and Regulations".
- D. Complete blasting within a distance of 50 feet before any portion of a masonry structure is placed or any pipe is laid.
- E. Determine presence of two-way-radios, stray electrical currents and other conditions adversely affecting blasting operations and implement necessary precautions to prevent accidents and premature blasts.

## 1.11 INDEMNITY

- A. Notwithstanding full compliance with this Section, review of all submittals and successful limitation to the peak particle velocity, the Contractor shall be solely responsible for any damage, direct or indirect, arising from blasting and shall hold the Owner, Engineer and their consultants harmless from any costs, liens, charges, claims or suits, including the costs of defense, arising from such damage, real or alleged.
- B. The Owner, the Engineer and their consultants shall be additionally-named insured on the insurance policy covering blasting carried by the Contractor and this requirement shall also be enforced on any subcontractor. A copy of this insurance policy shall be provided to the Engineer a minimum 5 working days prior to scheduling a pre-blast meeting for review.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Explosives – Type recommended by explosives subcontractor and acceptable to the regulating authority.
- B. Delay Device – Type recommended by explosives subcontractor and acceptable to the regulating authority.
- C. Blast Mat Materials – Type recommended by explosives subcontractor and acceptable to the regulating authority.

### 2.2 DELIVERY, STORAGE, AND HANDLING

- 1. Handle, transport, use, control, store, and monitor explosives as prescribed by the Bureau of Alcohol, Tobacco, and Firearms (ATF) 27 CFR Part 555, and the most stringent of the rules promulgated by the provisions specified in the Federal (OSHA) Standards, these Specifications, and state and local codes and ordinances.
- B. Do not leave explosives in an unprotected manner along or adjacent to any highway, street, alley, or other area where such explosives could endanger persons or property.
- C. Do not store, transport or keep caps or other detonators in the same place in which dynamite or other explosives are stored, transported or kept.
- D. Storage of explosives on the construction site during non-blasting periods is prohibited and magazines shall be empty during these periods. Only those explosive materials required for the scheduled day of blasting shall be allowed to be stored at the construction site.
- E. Provide a dedicated on-site vehicle that meets all permit requirements for the purpose of transporting explosive materials from the magazine to the blasting site.
- F. No statement in these Specifications shall be considered to relieve the Contractor from the sole responsibility for the safe transportation, use and storage of explosives.

### 2.3 WARNING SYSTEMS

- A. Erect signboards of adequate size stating that blasting operations are taking place in the area, and such signs shall be clearly visible at all points of access to the area. The signs shall clearly describe the aural signal system for warning of impending blasts and warn against the use of mobile radio transmitters. The use of signs to warn against the use of mobile transmitters shall be in accordance with 29 CFR Part 1926, Subpart U – Blasting and the Use of Explosives (1926.900(k)(3)).
- B. Mark all storage places with signs stating clearly and boldly, DANGEROUS EXPLOSIVES. Follow all requirements of the local, state, and federal agencies.
- C. Institute a system of audible signals to warn of impending blasts.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Verify site condition and location of nearby buildings, structures and other facilities, recording irregularities which exist prior to Work of this Section.
- B. Conduct survey and document conditions of buildings and structures near locations of rock removal, install blast monitoring equipment, and prior to blasting, photograph existing conditions identifying any existing irregularities.

### **3.2 PREPARATION**

- A. Identify required lines, levels, contours, and datum; establish quantity of rock to be removed to meet project requirements.
- B. Conduct survey and document conditions of buildings and structures near locations of rock removal, and prior to blasting, photograph existing conditions identifying existing irregularities.

### **3.3 ROCK REMOVAL – MECHANICAL METHOD**

- A. Excavate and remove rock by mechanical method at locations required by the Contract Documents, and when trimming bottom or sides of excavation is necessary to meet project requirements.
- B. Drill holes and utilize expansive tools, wedges, and/or mechanical disintegration compound, as appropriate, to fracture rock.
- C. Cut away rock at bottom of excavation to form level bearing surface for pipe and pipe bedding, and foundations of buildings and structures.
- D. Remove thinly bedded and fractured rock layers to provide a sound and unshattered base.
- E. In utility trenches, trim rock 6-inches below bottom of installed pipe and wider than outside diameter of installed pipe.

### **3.4 ROCK REMOVAL – BLASTING METHOD**

- A. If blasting method is utilized for rock disintegration, notify the Engineer, County, and City of Brentwood in accordance and as stated in this section.
- B. Coordinate with the Engineer, County, and City of Brentwood notification of owners of adjacent buildings, structures and utilities, prior to executing seismographic survey. Provide information explaining planned blasting, seismic operations and schedule. Allow sufficient time for County's and City of Brentwood's notification process to be completed and for owners to implement their own protective measures. Coordinate notification of police, fire departments and other public agencies of blasting time schedule with the Engineer, County, and City of Brentwood.
- C. Prior to blasting, allow sufficient time for the Engineer to take site measurements of rock quantities to be removed.
- D. Provide seismographic monitoring during all blasting operations in accordance with State of Missouri Rules and Regulations of Safety Fire Commissioner. The velocity shock wave shall not exceed the established limits of St. Louis County Ordinance 711.220, "Blasting – Rules and Regulations". The use of seismographic measurements shall be in accordance with Missouri Standards.
- E. Disintegrate rock and remove from excavation.
- F. Cut away at excavation bottom to form level bearing surface for pipe and pipe bedding, and foundations of buildings and structures.
- G. Remove thinly bedded and fractured rock layers to provide a sound and unshattered base.

- H. In utility trenches, trim rock in accordance with the Metropolitan St. Louis Sewer District's Standard Details of Sewer Construction for the size and type of pipe specified.

### **3.5 AIR-OVERPRESSURE (NOISE) LIMITATIONS**

- A. Air-over pressure shall not exceed 133 decibels when monitored with an instrument with a 2-hertz high pass at any occupied structure. Air over pressure monitoring shall take place at the nearest residential or business structures susceptible to damage or claims of annoyance.
- B. All measurements of blast induced air-over pressure shall be done in accordance with the standards developed by the Seismograph Section of the International Society of Explosive Engineers and published in the most current ISEE Field Practice Guidelines for Blasting Seismographs.

### **3.6 SUSPENSION OF BLASTING**

- A. Blasting operations may be suspended by the Engineer or Owner for any of the following reasons:
1. The Contractor's safety precautions are inadequate.
  2. Air-overpressure or ground motion levels exceed specified limits.
  3. Existing structural conditions on and off site are aggravated and are damaged by blasting.
  4. Blasting causes instability of slopes or causes damage to rock outside the prescribed limits of excavation.
  5. The results of the blasting, in the opinion of the Engineer or Owner, are not satisfactory.
  6. Failure of the Contractor to adhere to the submitted and accepted blast plan.
- B. Blasting operations shall not resume until the Engineer or Owner has approved the Contractor's revised blasting plan with modifications correcting the conditions causing the suspension.

**END OF SECTION**

**SECTION 31 23 00**  
**EARTHWORK**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
  - 1. Earthwork.
  - 2. Excavation, trenching, backfilling, and compacting for all underground utilities.
- B. Related Sections include but are not necessarily limited to:
  - 1. The “Geotechnical Data Report for the CSO – Mary South of Manchester CSO Interceptor (I-132)/Outfall (L-106) Elimination – Phase I (13404) St. Louis, Missouri 7NT Number: D140-MO” consisting of 100 pages and dated March 20, 2020 is included in JSP-Sewer, Exhibit 2 - Geotechnical Data Reports.
  - 2. A portion of the “Geotechnical Data Report L-106 (Brentwood) Sewer Separation, RDP Tributaries (Deer Creek) CSO Tunnel (MSD No. 12441) St. Louis, Missouri Shannon & Wilson Number: 41-1-37530-005” consisting of 48 out of the original 170 pages and dated April 13, 2018 is included in JSP-Sewer, Exhibit 2 - Geotechnical Data Reports.
  - 3. Any geological reports provided contain only general and preliminary information which is furnished as an example of soil conditions only, without any express or implied representation, warranty, guarantee, or agreement that the depths or character of materials are correctly shown, or that conditions affecting the work will not differ for those shown.
  - 4. Division 01 – General Requirements.
  - 5. Division 31 – Earthwork.
  - 6. Division 32 – Exterior Improvements.
  - 7. Section 33 05 16 – Precast Concrete Manhole Structures.
  - 8. Section 33 30 00 – Sanitary Sewerage Utilities.
  - 9. Division 40 – Process Integration.

**1.2 MEASUREMENT AND PAYMENT**

- A. Basis of Measurement and Payment shall conform to the Metropolitan St. Louis Sewer District’s Standard Construction Specifications for Sewers and Drainage Facilities, 2009, Part 3 – “Excavation”, Section H.
- B. Class A excavation shall be included in the bid price for pay item “Excavation Class “A” (Rock Excavation) (Deep Sewer)” for a given pipe size.
  - 1. References: Metropolitan St. Louis Sewer District (MSD): Standard Construction Specifications for Sewers and Drainage Facilities, 2009, Part 3 – “Excavation”, hereinafter referred to as the MSD Standard Specifications, are available online at <https://msdprojectclear.org/doing-business/design-construction/standard-construction-specs/>. Should a conflict between the Contract Documents and the MSD Standard Specifications arise, these Contract Documents shall govern.
  - 2. Pipe Sewers – the following additions apply:
    - (1) The design of the specified pipe(s) is based on the following parameters:

Pipe Size (Inches)	Standard Payline Width (Inches)	Maximum Allowable Trench Width (Inches)					
		VCP	PVC	FRP/RPM	PP	RCP	DIP
36	56	56	56	56	56	56	56
30	49	49	49	49	49	49	49
24	42	42	42	48	48	42	42

<b>18</b>	<b>36</b>						
<b>15</b>	<b>36</b>						
<b>12</b>	<b>30</b>						
<b>8</b>	<b>30</b>						

- c) The maximum allowable trench width is the anticipated width required to allow for reasonable working room during pipe installation, bedding placement and compaction, and backfilling of the trench. If the project plans and specifications require sheeting to be left in place, the maximum allowable trench width does not include the width of the sheeting.
- d) If the Contractor’s means and methods require a trench width greater than the manufacturer’s recommended trench width, the Contractor shall submit design calculations prepared by a licensed professional engineer confirming that the specified pipe has adequate strength. If the calculations indicate that pipe of greater strength is required due to the Contractor’s means and methods, no additional payment will be made for providing the higher strength pipe.

**1.3 QUALITY ASSURANCE**

**A. Referenced Standards:**

- 1. ASTM International (ASTM):
  - a. D698, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup>).
  - b. D4253, Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table.
  - c. D4254, Standard Test Methods for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density.
  - d. D4491, Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
  - e. D4632, Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.
  - f. D6241, Standard Test Method for Static Puncture Strength of Geotextiles and Geotextile-Related Products Using a 50-mm Probe.
- 2. State of Missouri Department of Transportation (MoDOT):
  - a. Standard Specification for Highway Construction.
- 3. Metropolitan St. Louis Sewer District: “Standard Construction Specifications for Sewers and Drainage Facilities”, 2009”, hereinafter referred to as the MSD Standard Specifications, are available online at <https://msdprojectclear.org/doing-business/design-construction/standard-construction-specs/>. Should a conflict arise between the Contract Documents and the MSD Standard Specifications arise, these Contract Documents shall govern.

**B. Qualifications:**

- 1. Testing and inspection performed by an independent soils testing agency to assure that all work complies with this Section shall be supervised by a Professional Engineer licensed in the State of Missouri.

**1.4 SUBMITTALS**

**A. Shop Drawings:**

- 1. See the MoDOT Route 100-Manchester Road Project (J6S1718B) technical specifications for requirements for the mechanics and administration of the submittal process.
- 2. Product technical data including:
  - a. Acknowledgement that products submitted meet requirements of standards referenced.
  - b. Manufacturer's installation instructions.
- 3. Submit to Engineer for approval the name, location, and qualifications of the independent soils testing agency selected and hired by Contractor for compaction testing and soils inspection:

- a. Include the name and qualifications of the supervising Professional Engineer to be designated the Soils Engineer.
  4. Submit sieve analysis reports on all granular materials:
    - a. Analysis shall include the source location and material description.
    - b. Analysis shall have been performed within 12 months of submittal.
  5. Submit respective pipe or conduit manufacturer's data regarding bedding methods of installation and general recommendations.
  6. Submit data for geotextile fabric and construction.
  7. Excavation Protection Plan: Describe sheeting, shoring, and bracing materials and installation required to protect excavations and adjacent structures and property: include structural calculation to support plan.
    - a. A shoring plan and structural calculations for all excavations 20 feet deep or greater shall be submitted and signed and sealed by a Registered Professional Engineer in the State of Missouri.
    - b. Sheeting or shoring shall be cut off no closer than 1.5 feet above the top of pipe and no less than 2 feet below the ground surface. No additional payment will be made for sheeting or shoring left in place.
  8. Material Source: Submit the name of imported fill materials supplier.
- B. Informational Submittals:
1. See MoDOT Route 100-Manchester Road Project (J6S1718B) technical specifications for requirements for the mechanics and administration of the submittal process.
  2. Submit soils inspection and testing results:
    - a. In-place moisture-density soil test reports. Fully document each with specific location or stationing information, lift or approximate elevation, and date, and other pertinent information.
    - b. Inspection records of subgrade and compaction. Fully document each with specific location or stationing information, lift or approximate elevation, and date, and other pertinent information.

## 1.5 SITE CONDITIONS

- A. Provide full access to public and private premises and fire hydrants, at street crossings, sidewalks and other points as designated by Owner to prevent interruption of facility operations or travel.
- B. Protect and maintain bench marks, monuments or other established points and reference points:
  1. If disturbed or destroyed, replace items to full satisfaction of Owner and controlling agency
- C. Verify location of existing underground utilities.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Material properties for compaction:
  1. Cohesionless materials include gravels, gravel-sand mixtures, sands and gravelly sands exclusive of clayey and silty material; materials which are free-draining and for which impact compaction will not produce a well-defined moisture-density relationship curve and for which the maximum density by impact methods will generally be less than by vibratory methods.
  2. Cohesive materials include materials for which impact compaction will produce a well-defined moisture-density relationship curve, and include silts and clays.
- B. Waste Materials:
  1. Includes excess suitable material and material unsuitable for use in the Work.
  2. Remove from work area as excavated.
  3. Keep excess suitable material segregated from other waste material.
- C. Borrow Materials:

1. Refers to all fill, backfill and embankment material obtained from approved locations on or off the Jobsite.
  2. Borrow shall include all excavating, handling and final disposal of material as specified.
  3. Material removed from borrow area(s) shall be approved by the Engineer.
- D. Aggregate Materials:
1. See Section 31 05 16 – Aggregate Materials.

## **PART 3 - EXECUTION**

### **3.1 PROTECTION**

- A. Protect existing surface and subsurface features on-site and adjacent to site as follows:
1. Call Missouri One Call service at 1-800-344-7483 not less than three working days before performing Work:
    - a. Request underground utilities to be located and marked within and surrounding construction areas.
  2. Adequately protect from damage all existing utilities, structures and property and remove or relocate only as indicated, specified or as directed by the Engineer.
  3. Protect and maintain bench marks, monuments or other established reference points and property corners:
    - a. If disturbed or destroyed, replace at own expense to full satisfaction of Owner and controlling agency.
  4. Verify location of utilities:
    - a. Omission or inclusion of utility items does not constitute non-existence or definite location.
    - b. Take necessary precautions to protect existing utilities from damage due to any construction activity.
    - c. Repair damages to utility items at own expense.
    - d. In case of damage, notify Engineer at once so required protective measures may be taken.
  5. Report inactive and abandoned utilities encountered in excavating and grading operations. Remove, plug, or cap as directed.
  6. Maintain free of damage existing facilities, sidewalks, structures, and pavement that are not indicated to be removed or required to be removed by the Work:
    - a. Any existing structure or facility that is inadvertently damaged, whether or not shown or fully located on the Plans, shall be repaired to original condition.
    - b. All repairs shall be made and paid for by Contractor.
  7. Confine operations to that area provided through easements, licenses, agreements and rights-of-way:
    - a. The Contractor's entrance upon any lands outside of that area provided by easements, licenses, agreements or public rights-of-way, shall be at the Contractor's sole liability.
  8. Provide full access to public and private premises, fire hydrants, street crossings, sidewalks and other points as designated by Owner.
  9. Avoid surcharge or excavation procedures which can result in heaving, caving, or slides.
- B. Salvageable Items: Carefully remove items to be salvaged to Owner, and store on Owner's designated premises unless otherwise directed.
- C. Unsuitable and waste materials:
1. Dispose of excess, unsuitable, and waste material in a legal manner off Site:
    - a. Place waste material on Site only as directed by the Engineer.
  2. Grade waste areas to drain and leave them with an orderly and neat appearance.

### **3.2 GENERAL REQUIREMENTS FOR EXCAVATION, FILLING, BACKFILLING, GRADING, AND TRENCHING**

- A. Excavation and Grading:

1. Perform as required by the Contract Drawings.
  2. Contract Drawings may indicate both existing grade and finished grade required for construction of Project:
    - a. Stake all units, structures, piping, roads, parking areas and walks and establish their elevations.
    - b. Perform other layout work required.
    - c. Replace property corner markers to original location if disturbed or destroyed.
  3. Protection of finish grade:
    - a. During construction, shape and drain embankment and excavations.
    - b. Maintain ditches and drains to provide drainage at all times.
    - c. Protect graded areas against action of elements prior to acceptance of work.
    - d. Re-establish grade where settlement or erosion occurs.
- B. Borrow:
1. Provide necessary amount of borrow material to construct all fill, backfill, and embankment compacted to the density required in this Section.
  2. Include cost of all borrow material in Bid Price.
  3. Obtain fill and backfill material necessary to produce grades required:
    - a. Obtain off-Site material if insufficient suitable material is available on Site.
    - b. Suitability of borrow materials and source shall be recommended by the Contractor's Soils Engineer for approval by Engineer.
    - c. Suitable excavated material approved by Engineer may also be used for fill and backfill.
  4. Grade borrow areas to drain and to maintain an orderly and neat appearance.
- C. Embankments, Fill, and Backfilling:
1. Construct embankments and fills as shown by the Contract Drawings, at locations and to lines of grade indicated.
  2. Completed fill shall correspond to shape of typical cross section or contour indicated regardless of method used to show shape, size, and extent of line and grade of completed work.
  3. Provide approved Fill Material which is free from roots, organic matter, trash, frozen material, and stones having maximum dimension greater than 6 IN:
    - a. Exclude rocks larger than 4 IN from the upper 2 FT of fill or embankment.
    - b. Place material in layers not exceeding 8 IN loose thickness.
    - c. Place layers horizontally and compact each layer prior to placing additional fill.
    - d. When rocks less than 6 IN are present, they shall be scattered and thoroughly consolidated with sufficient compacted soil to completely fill all voids between the rocks.
  4. Compact fill material using sheepfoot rollers, pneumatic rollers, vibrators, or other equipment as required to obtain specified density.
- D. Rock Excavation:
1. See Specification 31 22 35 – Rock Excavation.
- E. Dewatering:
1. Control grading around excavations to prevent surface water from flowing into excavation.
  2. Review available soils information before beginning excavation and determine where groundwater is likely to be encountered during excavation.
  3. Drain or pump surface and groundwater as required to continually maintain all excavations and trenches free of water or mud:
    - a. Commence when water first appears and continue until Work is complete to the extent that no damage will result from the presence of water.
    - b. Water control measures shall be sufficient to prevent softening and disturbance of subgrade, allow subgrade stabilization, allow base material and bedding to be placed in the dry, and to maintain stable excavation slopes or walls:
      - 1) Review site conditions and subsurface data before beginning excavation and determine where groundwater could be encountered during excavation.

- 2) Pumped ground water dewatering systems shall maintain groundwater at least 3 FT below the bottom of any excavation.
  - 3) Employ a dewatering specialist for selecting and operating pumped dewatering system.
  - c. Keep dewatering system in operation until dead load of pipe, structure and backfill exceeds possible buoyant uplift force on pipe or structure.
  4. Use pumps of adequate capacity to ensure rapid drainage.
  5. Construct and use drainage channels and subdrains as required.
  6. Discharge to approved drains or channels:
    - a. Contractor shall obtain Owner, State or local permits for discharge if such are required.
    - b. Water discharged to streams shall be free of silt and other objectionable materials.
    - c. Discharge water so that the work in progress and other properties are not damaged.
    - d. Do not interfere unduly with the use of streets, alleys, private drives, or entrances.
  7. Remove unsuitable excessively wet material and replace with approved material.
  8. Cost of surface water control, groundwater control, and dewatering shall be included in the unit prices for excavation shown in the Bid Tabulation:
    - a. Perform dewatering, if required, at no extra cost to Owner.
- F. Stockpiling:
1. Avoid overloading or surcharging by placing excavated material a sufficient distance from edge of excavation.
  2. Maintain and trim excavated materials to prevent inconvenience or damage to structures on-site or on adjoining property.
  3. Do not obstruct drainage patterns.
- G. Excavation Support:
1. Support excavations and slopes using sheeting, bracing, or other means as necessary to:
    - a. Protect life and property.
    - b. Conform to Federal, State and local regulations.
    - c. Avoid excessively wide cuts in unstable material.
    - d. Protect existing structures and facilities from soil movement.
  2. Plan layout of excavation operations to protect adjacent property and existing structures and facilities.
  3. Take precautions against movement or settlement of existing structures:
    - a. Establish and record elevations of existing facilities near excavations before excavating.
    - b. Remove sheeting and bracing in a manner that does not create voids or induce settlement of adjacent soil.
  4. If existing or adjacent structures show structural distress, or become endangered by any condition or event, cease operations immediately and notify Engineer:
    - a. Do not resume operations prior to correction or modification of procedures leading to the unstable condition.
  5. Remove shoring after progression of fill or backfill is sufficient to maintain stability.
  6. No additional payment will be made for sheeting or shoring left in place.
  7. Cost of excavation support shall be included in the unit prices for excavation shown in the Bid Tabulation:
    - a. Perform excavation support, when required, at no extra cost to Owner.

### 3.3 FIELD QUALITY CONTROL

- A. Include in bid price the cost of soils testing and inspection services indicated herein as being performed by the Soils Engineer.
- B. An acceptable independent soils testing agency shall be selected and paid for by the Contractor to perform all laboratory and field soil testing necessary to demonstrate compliance with compaction requirements and to inspect subgrade and soil materials:
  1. Moisture density relationships shall be established by the Soils Engineer for all materials to be compacted.

2. Soils Engineer shall record observations made of subgrade condition, compaction, and proofrolling.

C. The soil density testing frequency shall be as follows:

TEST LOCATION	COMPACTION DENSITY TEST FREQUENCY
Compacted subgrade:	1 test representative of each 500 SY of subgrade.
Sitework embankments and fills:	1 test representative of each 2,000 CY of fill.
Structural fill and backfill:	1 test representative of each 100 CY of fill.
Trench bedding material:	1 test at each 500 LF interval along the line.
Trench select backfill:	1 test at each 500 LF interval along the line.
Common trench backfill within street right-of-way, or under drives or parking lots	1 test representative of each 3 FT of trench depth representative of each 500 LF interval along the line. Concentrate tests at cross streets and drives.
Common trench backfill under turfed, sodded, plant seeded, and non-traffic areas:	1 test representative of each 3 FT of trench depth at each 1,000 LF interval along the line.

- D. Compaction of cohesionless soils with insufficient fines to perform ASTM D698 density testing:
  1. 3 passes of approved vibratory compaction equipment over each 8 IN lift of cohesionless granular material may be substituted for test conforming to ASTM D4254 - Testing of Cohesionless Material, if approved in writing by Engineer. All passes of compaction equipment shall be continuously observed by Soils Engineer.
- E. Give minimum of 24 HR advance notice to Soils Engineer when ready for compaction or subgrade testing and inspection.
- F. Should any compaction density test or subgrade inspection fail to meet Specification requirements, perform corrective work as necessary.
- G. Pay for all costs associated with corrective work and retesting resulting from failing compaction density tests.

### 3.4 COMPACTION DENSITY REQUIREMENTS

- A. Obtain recommendation from Soils Engineer with regard to suitability of soils and acceptable subgrade prior to subsequent operations.
- B. Control surface water and provide dewatering system necessary to successfully complete compaction and construction requirements.
- C. Remove frozen, loose, wet, or soft material and replace with approved material as directed by Engineer.
- D. Stabilize subgrade with granular materials as directed by Engineer.
- E. Compact granular and cohesionless material with vibratory equipment. Do not use water.
- F. Assure by results of testing that compaction densities comply with the following requirements:
  1. Site work:

LOCATION	COMPACTION DENSITY
Under Paved Areas, Sidewalks and Piping:	
Cohesionless soils	75 percent relative density per ASTM D4253 and ASTM D4254
Unpaved, Non-Traffic Areas:	
Cohesive soils	90 percent of ASTM D698 with moisture content within $\pm 3$ % of optimum.
Cohesionless soils	75 percent relative density per ASTM D4253 and ASTM D4254

**2. Structural fill and backfill:**

LOCATION	COMPACTION DENSITY
Outside structures next to walls, piers, columns and any other structural exterior member	95 percent per ASTM D698 with moisture content within $\pm 3$ % of optimum.
Outside structures under equipment support foundations, piping, or paving	95 percent per ASTM D698 with moisture content within $\pm 3$ % of optimum.
Under void	90 percent per ASTM D698 with moisture content within $\pm 3$ % of optimum.
Granular Fill Material used for any location described in this table.	75 percent relative density per ASTM D4253 and ASTM D4254

**3. Trenches:**

**a. Bedding material:**

LOCATION	SOIL TYPE	COMPACTION DENSITY
All locations	Granular material (MSD 1 or MSD 2 per 31 05 16)	75 percent of maximum relative density by ASTM D4253 and ASTM D4254

**b. Common trench backfill:**

LOCATION	SOIL TYPE	COMPACTION DENSITY
Under pavements, roadways, surfaces within highway right-of-ways, and under existing utilities where indicated on the Contract Drawings)	Cohesionless soils (Blended aggregate per 31 05 16)	75 percent of relative density by ASTM D4253 and ASTM D4254
Under turfed, sodded, plant seeded, non-traffic areas	Cohesive soils	90 percent of ASTM D698 with moisture content within $\pm 3$ % of optimum.

**3.5 SITE EXCAVATION AND GRADING**

**A. Excavation and Grading:**

1. Perform as required by the Contract Drawings.
  - a. Contract Drawings indicates both existing grade and MoDOT Route 100-Manchester Road Project (J6S1718B) project portion finished grade required for construction of Project:
    - 1) Stake all units, structures, piping, roads, parking areas and walks and establish their elevations.
    - 2) Perform other layout work required.
    - 3) Replace property corner markers to original location if disturbed or destroyed.

2. This specification shall be coordinated with the MoDOT Route 100-Manchester Road Project (J6S1718B) technical specifications.
  3. Protection of finish grade:
    - a. During construction, shape and drain embankment and excavations.
    - b. Maintain ditches and drains to provide drainage at all times.
    - c. Protect graded areas against action of elements prior to acceptance of Work.
    - d. Reestablish grade where settlement or erosion occurs.
- B. Subgrade Preparation:
1. Prepare ground surface for embankments or fills:
    - a. Before fill is started, disc or scarify to a minimum depth of 6 IN in all embankment and fill areas. Recompact with first lift of embankment.
    - b. Plow sloped surface to bench and break up surface so that fill material will bind with existing surface:
      - 1) Where ground surface is steeper than one vertical to four horizontal, bench with horizontal planes.
    - c. Perform all wetting, drying, stabilization, shaping, and compacting required to prepare an acceptable subgrade.
    - d. Extend subgrade to full width of surfaced area or surface improvement plus 1 FT.
    - e. Compact top 6 IN of subgrades to meet specified compaction densities for Site Work.
  2. Frost Protection:
    - a. Do not place Site Work, fill, embankments, or foundations on frozen ground.
    - b. When freezing temperatures may be expected, do not excavate to full depth indicated unless fill or foundations can be placed and completed immediately after the excavation has been completed and approved.
    - c. Protect subgrade from freezing if placement of fill or foundation is delayed.
  3. Subgrade Stabilization:
    - a. Remove all unsuitable material, including but not limited to material in a frozen, loose, wet, soft, or disturbed condition, and replace with approved fill material as directed by Engineer.
    - b. Where a stone mat of base stabilization rock or granular drainage material is indicated, or is approved by Engineer for stabilization of loose, soft, or wet materials, work and compact stone material into subgrade so that voids in stone are filled.
    - c. Do not place further construction on repaired or stabilized subgrades until subgrade compaction has been tested and subgrades have been approved by Engineer.
    - d. Payment for the work and materials required for removing unsuitable subgrade shall be made at the unit price per cubic yard for "Removal of Unsuitable Subgrade".
  4. Proofrolling:
    - a. Proofroll subgrade for Site Work and embankments after moisture conditioning and compaction to identify soft or disturbed areas:
      - 1) Use a fully loaded tandem dump truck or equipment providing an equivalent loading for proofrolling.
      - 2) Perform in presence of Soils Engineer.
    - b. Undercut and replace soft areas identified by proofrolling with fill or granular fill material if so directed by Engineer.
- C. Construct embankments and fills as required by the Contract Drawings:
1. Construct embankments and fills at locations and to lines of grade indicated:
    - a. Completed fill shall correspond to shape of typical cross section or contour indicated regardless of method used to show shape, size, and extent of line and grade of completed work.
    - b. Provide approved fill material which is free from roots, organic matter, trash, frozen material, and stones having maximum dimension greater than 6 IN:
      - 1) Ensure that stones larger than 4 IN are not placed in upper 6 IN of fill or embankment.
      - 2) Do not place material in layers greater than 8 IN loose thickness.
      - 3) Place layers horizontally and compact each layer prior to placing additional fill.

- c. Compact by sheepsfoot, pneumatic rollers, vibrators, or by other equipment as required to obtain specified density:
  - 1) Control moisture for each layer necessary to meet requirements of compaction.

### 3.6 TRENCHING, BACKFILLING, AND COMPACTING FOR UTILITIES

#### A. General:

1. Perform trenching and utility installation in accordance with general requirements for excavation, filling, backfilling, grading, and trenching.

#### B. Excavation for Appurtenances:

1. 12 IN (minimum) clear distance between outer surface and embankment.
2. See Section 33 05 16 for applicable requirements for manhole structures.

#### C. Trench Excavation:

1. Excavate trenches by open cut method to depth shown on Drawings and necessary to accommodate work:
  - a. Support existing utility lines and piping where proposed work crosses at a lower elevation:
    - 1) Stabilize excavation to prevent undermining of existing utility and piping.
2. Open trench outside buildings, units, and structures:
  - a. No more than the distance between two manholes, structures, units, or 300 LF, whichever is less.
  - b. Reduce distance as weather conditions dictate.
  - c. Conform to local codes and regulations.
3. Any trench or portion of trench, which is opened and remains idle for 7 calendar days, or longer, as determined by the Engineer, may be directed to be immediately refilled, without completion of work, at no additional cost to Owner:
  - a. Said trench may not be reopened until Engineer is satisfied that work associated with trench will be prosecuted with dispatch.
4. Observe following trenching criteria:
  - a. Trench size:
    - 1) Cut trench walls vertically from bottom of trench to 1 FT above top of pipe, conduit, or utility service.
    - 2) Keep trenches free of surface water runoff:
      - a) No separate payment for surface water runoff pumping will be made.
  - b. Cut trenches for electrical runs with minimum 30 IN cover, unless otherwise specified or shown on Drawings.
5. Erect barriers or other appropriate protection to prohibit accidental or unauthorized entry of persons into trenches.

#### D. Preparation of Trench Bottom:

1. Over-Excavation:
  - a. Backfill and compact to 90 percent of maximum dry density per ASTM D698.
  - b. Backfill with granular bedding material as option.
2. Rock Excavation:
  - a. Excavate minimum of 6 IN below bottom exterior surface of the pipe or conduit.
  - b. Backfill to grade with suitable earth or granular material.
  - c. Form bell holes in trench bottom.
3. Subgrade Stabilization:
  - a. Stabilize the subgrade when directed by the Engineer.
  - b. Observe the following requirements when unstable trench bottom materials are encountered:
    - 1) Notify Engineer and Soils Engineer when unstable materials are encountered:
      - a) Report extent of unstable condition using station numbers.
    - 2) Remove unstable trench bottom caused by Contractor failure to dewater, rainfall, or Contractor operations:
      - a) Replace with subgrade stabilization with no additional compensation.

- E. Backfilling Methods:
1. Do not backfill until tests to be performed on piping system show system is in full compliance to specified requirements.
  2. Carefully Compacted Backfill:
    - a. Furnish for all pipe bedding, and for compacted backfill up to 12 IN above top of pipe or conduit.
    - b. Comply with the following:
      - 1) Place backfill in lifts not exceeding 8 IN (loose thickness).
      - 2) Hand place, shovel slice, and vibrate all carefully compacted backfill.
      - 3) Observe specific pipe or conduit manufacturer's recommendations regarding backfilling and compaction.
      - 4) Compact each lift to specified requirements.
  3. Common Trench Backfill:
    - a. Perform in accordance with the following:
      - 1) Conform to compaction density requirements for location.
      - 2) Avoid displacing joints and appurtenances or causing any horizontal or vertical misalignment, separation, or distortion.
  4. Water flushing for consolidation is not permitted.
  5. Backfilling for Electrical Installations:
    - a. Place backfill in immediate vicinity of direct burial cable.
- F. Payment for excavation and granular backfill shall be made for the computed volume in cubic yards at the respective bid unit prices for excavation granular backfill as described in MSD Standard Detail Sheet 1, Table 1, Payline Widths of Trench and Pay-Quantities of Concrete.

### **3.7 MAINTENANCE AND REPAIR**

- A. Maintenance:
1. Protect newly graded areas from actions of the elements.
  2. Settling or erosion shall be filled, repaired and grades reestablished to elevations and slopes indicated.
- B. Correction of Settlement:
1. Settlement of embankments, backfill, or trenches occurring within 1 YR after Final Acceptance shall indicate defective work and shall be promptly corrected if the settlement results in the following:
    - a. Visible depressions, ruts, or ground slumping.
    - b. Pooling of water where positive slope existed or was required.
    - c. Voids beneath or beside slabs or structures.
    - d. Movement of soil exposing unfinished or waterproofed structure surfaces.
    - e. Movement of structures or facilities, including but not limited to foundation settlement, differential settlement, cracking, misalignment of adjacent objects, or movement of vertical elements out of plumb.
  2. Contractor shall correct settlement and damages arising from or attributable to the settlement.
  3. Make repairs within 10 days after due notification by Owner of embankment or backfill settlement and resulting damage.
  4. Make own arrangements for access to the site for purposes of correction and maintenance of corrected areas.

### **END OF SECTION**

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**SECTION 32 01 16**  
**PAVEMENT & CURB RESTORATION**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
  - 1. Asphaltic pavement for the purpose of repair of cut areas in existing asphalt paved areas and replacement of roadway section.
  - 2. Curb for the purpose of repair of existing cut areas.
- B. Related Sections include but are not necessarily limited to:
  - 1. Division 01 - General Requirements.

**1.2 QUALITY ASSURANCE**

- A. Referenced Standards:
  - 1. Missouri Department of Transportation (MoDOT):
    - a. Most Current Edition of the “Missouri Standard Specifications for Highway Construction” per the Missouri Highway and Transportation Commission.
  - 2. St. Louis County, Missouri Department of Transportation (STLCO DOT):
    - a. Most Current Edition of the “Standard Specifications for Road and Bridge Construction” per the Saint Louis County, Missouri Department of Transportation.
  - 3. City of Brentwood, Missouri:
    - a. Street Standards

**1.3 SYSTEM DESCRIPTION**

- A. Asphaltic Concrete Pavement:
  - 1. Remove and replace existing asphaltic pavement per which area shall not extend beyond two (2) feet each side of the standard payline for excavation for sewers, manholes, and structures, and shall exclude inlet sumps and curbing.
  - 2. Pavement shall match New Asphalt Pavement shown on the MoDOT Route 100-Manchester Road Project (J6S1718B) drawings set Sheet Numbers 5 & 6 and technical specifications.
- B. Concrete Curb:
  - 1. Remove and replace existing asphaltic curb with concrete curb as described in MSD Specifications, Part 9, Miscellaneous, Section D.7., page 122.
  - 2. Concrete curb shall be Type S to match the curb shown on the MoDOT Route 100-Manchester Road Project (J6S1718B) drawings set Sheet Numbers 5 & 6 and technical specifications.

**1.4 SUBMITTALS**

- A. Certified mix designs for each type of mix used.
- B. Shop Drawings:
  - 1. See MoDOT Route 100-Manchester Road Project (J6S1718B) technical specifications for requirements for the mechanics and administration of the submittal process.
  - 2. Product technical data including: Acknowledgement that products submitted meet requirements of standards referenced.

**1.5 ENVIRONMENTAL REQUIREMENTS**

- A. Do not place asphalt when ambient air or base surface temperature is less than 40 degrees F, or when surface is wet or frozen.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. Materials for asphaltic pavement shall be supplied, mixed, and delivered in accordance with MoDOT, STLCO DOT, and City of Brentwood, Missouri specifications noted above and all other related specifications noted therein.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Asphaltic pavement shall be installed in accordance with MoDOT, STLCO DOT, and City of Brentwood, Missouri specifications noted above and all other related specifications noted therein.

### **3.2 FIELD QUALITY CONTROL**

- A. Take samples and perform tests in accordance with Owner's MoDOT, STLCO DOT, and City of Brentwood, Missouri requirements.

### **3.3 PROTECTION OF FINISHED WORK**

- A. Immediately after placement, protect pavement from mechanical injury for 24 hours or until surface temperature is less than 140 degrees F.

**END OF SECTION**

**SECTION 32 92 00**  
**SEEDING, SODDING AND LANDSCAPING**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
  - 1. Seeding, sodding and landscape planting:
    - a. Soil preparation.
- B. Related Sections include but are not necessarily limited to:
  - 1. Division 01 - General Requirements.
  - 2. Missouri Department of Transportation (MoDOT) Route 100-Manchester Road Project (J6S1718B) technical specifications.

**1.2 REFERENCES**

- A. Metropolitan St. Louis Sewer District (MSD): Standard Construction Specifications for Sewers and Drainage Facilities, 2009, hereinafter referred to as the MSD Standard Specifications, are available online at <https://msdprojectclear.org/doing-business/design-construction/standard-construction-specs/>. Should a conflict between the Contract Documents and the MSD Standard Specifications arise, these Contract Documents shall govern.

**1.3 QUALITY ASSURANCE**

- A. Referenced Standards:
  - 1. American Nursery and Landscape Association/American National Standards Institute (ANLA/ANSI):
    - a. Z60.1, American Standard for Nursery Stock.
  - 2. AOAC International (AOAC).
  - 3. ASTM International (ASTM):
    - a. D2028, Standard Specification for Cutback Asphalt (Rapid-Curing Type).
    - b. D5276, Standard Test Method for Drop Test of Loaded Containers by Free Fall.
  - 4. United States Department of Agriculture (USDA)
- B. Quality Control:
  - 1. Fertilizer:
    - a. If Engineer determines fertilizer requires sampling and testing to verify quality, testing will be done at Contractor's expense, in accordance with current methods of the AOAC.
    - b. Upon completion of Project, a final check of total quantities of fertilizer used will be made against total area seeded.
    - c. If minimum rates of application have not been met, Contractor will be required to distribute additional quantities to make up minimum application specified.
- C. Perform Work in accordance with MSD Standard Specifications, Part 8 – Protection and Restoration of the Site.

**1.4 SUBMITTALS**

- A. Shop Drawings:
  - 1. See MoDOT Route 100-Manchester Road Project (J6S1718B) technical specifications for requirements for the mechanics and administration of the submittal process.
  - 2. Layout drawings:
    - a. Scaled Site plan (scale 1 IN = 20 FT or equal to scale of Project site plan Drawing) on reproducible Drawing to show:
      - 1) Areas to be seeded, sodded, and landscaped.

3. Product technical data including:
    - a. Acknowledgement that products submitted meet requirements of standards referenced.
    - b. Manufacturer's installation instructions.
    - c. Signed copies of vendor's statement for seed mixture required, stating botanical and common name, place of origin, strain, percentage of purity, percentage of germination, and amount of Pure Live Seed (PLS) per bag.
    - d. Type of herbicide to be used during first growing season to contain annual weeds and application rate.
    - e. Source and location of sod, plants, and plant material.
  4. Certification that each container of seed delivered will be labeled in accordance with Federal and State Seed Laws and equals or exceeds Specification requirements.
  5. Requests for plant substitutions shall only be made by written request to the Metropolitan St. Louis Sewer District. Written approval from the Metropolitan St. Louis Sewer District must be received before the Contractor orders plants.
- B. Informational Submittals:
1. See MoDOT Route 100-Manchester Road Project (J6S1718B) technical specifications for requirements for the mechanics and administration of the submittal process.
  2. Copies of invoices for fertilizer used on Project showing grade furnished, along with certification of quality and warranty.

## 1.5 SEQUENCING AND SCHEDULING

- A. Installation Schedule:
1. Provide schedule showing when trees, shrubs, groundcovers and other plant materials are anticipated to be planted.
  2. Show schedule of when lawn type and other grass areas are anticipated to be planted.
  3. Indicate planting schedules in relation to schedule for irrigation system installation, finish grading and topsoiling.
  4. Indicate anticipated dates Engineer will be required to review installation for initial acceptance and final acceptance.
- B. Pre-installation Meeting:
1. Meet with Engineer and other parties as necessary to discuss schedule and methods, unless otherwise indicated by Engineer.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Water:
1. Water free from substances harmful to grass or sod growth.
  2. Provide water from source approved prior to use.
- B. Plants:
1. Sound, healthy, vigorous, with normal top and root systems, free from disease, insect pests or their eggs, grown in same or colder climatic zone as Project:
    - a. Nursery grown stock, freshly dug:
      - 1) No heeled-in, cold storage or collected stock.
- C. Seeding:
1. Seeding shall comply with the requirement of MSD Standard Specifications, Part 8, Section G.
- D. Sodding:
1. Sodding shall comply with the requirements of MSD Standard Specifications, Part 8, Section F.
    - a. Bluegrass:

- 1) Unless otherwise noted, all sod shall be bluegrass, as described in MSD Standard Specifications, Part 8, Section F, paragraph 3.
- b. Zoysia:
  - 1) Zoysia sod shall be free from weeds, leaves, debris and excessive amounts of decomposed vegetable matter. It shall be surface clipped in the field to a two-inch grass height: be in strips of uniform width cut with straight edges and ends; be approximately eighteen inches wide and three to five feet long; have an adequate root system not less than one inch thick: and be fresh cut, moist, and in good condition.
- c. Fescue:
  - 1) Fescue sod shall be free from weeds, leaves, debris and excessive amounts of decomposed vegetable matter. It shall be surface clipped in the field to a two-inch grass height: be in strips of uniform width cut with straight edges and ends; be approximately eighteen inches wide and three to five feet long; have an adequate root system not less than one inch thick: and be fresh cut, moist, and in good condition.

## **PART 3 - EXECUTION**

### **3.1 SOIL PREPARATION**

- A. General:
  1. Limit preparation to areas which will be planted soon after.
  2. Provide facilities to protect and safeguard all persons on or about premises.
  3. Verify location and existence of all underground utilities:
    - a. Take necessary precaution to protect existing utilities from damage due to construction activity.
    - b. Repair all damages to utility items at sole expense.
  4. Provide facilities such as protective fences and/or watchmen to protect work from vandalism:
    - a. Contractor to be responsible for vandalism until acceptance of work in whole or in part.
- B. Preparation for Lawn-Type Seeding, Sprigging, or Sodding:
  1. Loosen surface to minimum depth of 4 IN.
  2. Remove stones over 1 IN in any dimension and sticks, roots, rubbish, and other extraneous matter.
  3. Prior to applying fertilizer, loosen areas to be seeded with a double disc or other suitable device if the soil has become hard or compacted.
  4. Correct any surface irregularities in order to prevent pocket or low areas which will allow water to stand.
  5. Distribute fertilizer uniformly over areas to be seeded and incorporate fertilizer into the soil in accordance with MSD Standard Specifications, Sections F and G.
  6. Remove stones or other substances from surface which will interfere with turf development or subsequent mowing operations.
  7. Grade lawn areas to a smooth, even surface with a loose, uniformly fine texture:
    - a. Roll and rake, remove ridges and fill depressions, as required to meet finish grades.
    - b. Limit fine grading to areas which can be planted soon after preparation.
  8. Restore lawn areas to specified condition if eroded or otherwise disturbed after fine grading and before planting.
  9. Topsoil shall be conform to ASTM D 5268 and shall be fertile, friable, naturally loamy, with a pH range of 5.5 to 7, a minimum of 4 percent of organic material, free of stones 1 inch or larger in any dimension, and other extraneous materials harmful to plant growth.

- a. Top Soil Source: Reuse surface soil stockpiled on the site. Verify suitability of surface soil to produce topsoil meeting the requirements and amend when necessary. Supplement with imported topsoil when quantities are insufficient. Clean topsoil of roots, plants, sods, stones, clay lumps, and other extraneous materials harmful to plant growth.

### 3.2 INSTALLATION

#### A. Seeding & Sodding:

1. Do not use seed which is wet, moldy, or otherwise damaged.
2. Perform seeding work from April 20 to May 15 for spring planting, and August 1 to September 15 for fall planting, unless otherwise approved by Engineer.
3. Employ satisfactory methods of sowing using mechanical power-driven drills or seeders, or mechanical hand seeders, or other approved equipment.
4. Stop work when work extends beyond most favorable planting season for species designated, or when satisfactory results cannot be obtained because of drought, high winds excessive moisture, or other factors:
  - a. Resume work only when favorable conditions develop.
5. Seed shall be applied at a rate and with the species specified in the Project Plans.
6. Prior to seeding, uneven areas and low spots shall be eliminated. Debris, roots, branches, stones, in excess of one (1) inch in size shall be removed. Surface shall be scarified to a depth of three (3) inches.
7. Areas where equipment used for excavation and slope shaping has compacted the subsoil shall be scarified to a depth of six (6) inches.
8. Seeded areas shall be prepared such that seed material will have intimate contact with the soil.
9. Seeded areas shall be planted using a rangeland type grain drill or no-till planter with positive-feed mechanism, such as by Truax™, Tye™ or J. Thom Wildseeder™. There shall be depth control bands that allow seed placement of 0.10 to 0.50 inch on all double discs. The drill shall have independently mounted press wheels that firm the seed bed around the seed without affecting the double discs. All instructions provided by the manufacturer of the seeding equipment shall be strictly observed and followed by the contractor. All drill-seeding methods shall be approved in writing by the Metropolitan St. Louis Sewer District.
10. Areas where drill-seeding is not feasible, as determined by the Metropolitan St. Louis Sewer District Inspector, shall be seeded using a hand-held broadcast seeder. Seed shall not be applied with a hand-held broadcast seeder if wind speed exceeds 15 miles per hour. Prior to application, the seeds shall be thoroughly mixed with a low-density, non-toxic bulking agent such as fine cocoa shell mulch, vermiculite or perlite. After seeding, the seed shall be raked or dragged into the soil surface to an average depth of 0.25 inch. In a separate operation, the seedbed shall be rolled with a weighted roller to firmly press the seed into the soil. The dragging and rolling operations shall be carried out perpendicular to the slope.
11. The seeded area shall be covered with erosion control blanket or other specified erosion control material within 24 hours of seeding. If precipitation is forecasted within 24 hours of seeding, then the seeded area shall be covered with erosion control blanket or other specified erosion control material the same day, prior to precipitation.
12. Equipment shall not be operated on the area after the seed and erosion control have been installed.

### 3.3 PLANTING TREES, SHRUBS, AND GROUND COVERS

#### A. Notification:

1. Notify Engineer of source of plants and plant materials at least 30 days prior to planting to permit Engineer's inspection of source qualifications.

#### B. Preparation:

1. Handle plants so that roots or balls are adequately protected from breakage of balls, from sun or drying winds:
    - a. Ensure tops or roots of plants are not permitted to dry out.
  2. During transportation, protect materials from wind and sun to prevent tops and roots from drying out.
  3. Protect tops of plants from damage:
    - a. Plants with damaged tops will be rejected.
  4. For purpose of inspection and planting identification, attach durable, legible labels to bundle or container of plant material delivered at the planting Site:
    - a. State correct plant name and size of each plant in weather-resistant ink on labels.
  5. Do not prune trees and shrubs at nursery.
- C. Planting Season:
1. Plant deciduous shade trees and shrubs any time the ground is suitable between October 15 and June 1.
  2. Plant evergreen material between September 1 and June 1.
  3. Plant ground covers between March 15 and June 1.
- D. Planting Procedure:
1. Indicate locations of plants for approval by Engineer before excavating plant locations.
  2. In event underground construction, utilities, obstructions, or rock are encountered in excavation of plantings, secure alternate locations from Engineer:
    - a. Make said changes without additional compensation.
    - b. Where tree locations fall under existing overhead wires, or crowd existing trees, adjust locations as directed by Engineer.
  3. Excavate pits and beds as necessary and in accordance with ANLA/ANSI Z60.1:
    - a. Loosen bottom of pits prior to planting.
    - b. Excavation for planting is unclassified. Excavate all materials without additional cost.
  4. Tree and shrub pits to be circular in shape with vertical sides at least 1 FT greater in diameter than ball diameter:
    - a. Pit to be of sufficient depth to provide 6 IN of planting soil under ball when set to natural grade.
  5. Shrub and ground cover beds:
    - a. Plant shrubs used in mass plantings in individual holes of required size.
    - b. Strip all sod from among mass planting.
    - c. For ground cover beds, remove sod from within limits of bed.
    - d. Add soil amendments as specified and mix or rototill with existing topsoil to a depth of 6 IN.
  6. Set plants straight or plumb, in locations when indicated and at such level that after settlement they bear same relationship to finished grade as they did in their former setting:
    - a. Carefully tamp planting soil under and around base of balls to prevent voids.
    - b. Remove burlap, rope and wires from top of balls.
    - c. Do not remove burlap from sides and bottom of balls.
  7. Backfill plants with planting soil:
    - a. Tamp to 1/2 depth of pit and thoroughly water and puddle before bringing backfill to proper grade.
    - b. After planting has been completed, flood pit again so that backfill is thoroughly saturated and settled.
  8. After planting is complete, form a level saucer 3 IN high around each tree extending to limit of plant pit for watering purposes.
  9. Mulch plant pit after saucer has been shaped:
    - a. Mulch to limits of pit and uniformly over ground cover beds to a depth of 3 IN.
    - b. In mass plantings of shrubs, mulch entire area uniformly among shrubs to a depth of 3 IN.

- c. If mulching is delayed and soil has dried out, water plants thoroughly before spreading mulch.
10. Staking: Stake trees immediately after planting in accordance with Nursery Standards.
11. Wrap deciduous trees 2 IN or more in caliper by neatly overlapping wrapping material between ground line and second branch:
  - a. Place ties at top and bottom of wrapping material and not more than 12 IN apart between top and bottom ties.
12. Remove dead or damaged branches:
  - a. Thin deciduous material to about 2/3 of initial branching.
  - b. Remove only dead or damaged branches from evergreens.
13. Water plants during planting operations:
  - a. Water each plant a minimum of once each week until final acceptance.
  - b. Apply sufficient water to moisten backfill about each plant so that moisture will extend into the surrounding soil.

### 3.4 MAINTENANCE AND REPLACEMENT

#### A. General:

1. Begin maintenance of planted areas immediately after each portion is planted and continue until final acceptance or for a specific time period as stated below, whichever is the longer.
2. Provide and maintain temporary piping, hoses, and watering equipment as required to convey water from water sources and to keep planted areas uniformly moist as required for proper growth.
3. Protection of new materials:
  - a. Provide barricades, coverings or other types of protection necessary to prevent damage to existing improvements indicated to remain.
  - b. Repair and pay for all damaged items.
4. Replace unacceptable materials with materials and methods identical to the original specifications unless otherwise approved by the Engineer.

#### B. Seeded or Sodded Lawns:

1. Maintenance period begins at completion of planting or installation of entire area to be seeded or sodded. An entire area is defined as a single lawn, multiple lawns, a phase or portion of the project, or the entire project.
2. The Contractor shall notify the Engineer when the entire project area has been planted and the Engineer will review the seeded or sodded area after installation for initial acceptance.
3. Maintain seeded lawns: 90 days, minimum, after installation and review of entire project area to be planted.
4. Maintain lawns by watering, fertilizing, weeding, mowing, trimming, and other operations such as rolling, regrading, and replanting as required to establish a smooth, uniform lawn, free of weeds and eroded or bare areas.
5. Lay out temporary lawn watering system and arrange watering schedule to avoid walking over muddy and newly seeded areas:
  - a. Use equipment and water to prevent puddling and water erosion and displacement of seed or mulch.
6. Mow lawns as soon as there is enough top growth to cut with mower set at recommended height for principal species planted:
  - a. Repeat mowing as required to maintain height.
  - b. Do not delay mowing until grass blades bend over and become matted.
  - c. Do not mow when grass is wet.
  - d. Time initial and subsequent mowings as required to maintain a height of 1-1/2 to 2 IN.
  - e. Do not mow lower than 1-1/2 IN.
7. Remulch with new mulch in areas where mulch has been disturbed by wind or maintenance operations sufficiently to nullify its purpose:
  - a. Anchor as required to prevent displacement.

8. Unacceptable plantings are those areas that do not meet the quality of the specified material, produce the specified results, or were not installed to the specified methods.
  9. Replant bare areas using same materials specified.
  10. Engineer will review final acceptability of installed areas at end of maintenance period.
  11. Maintain repaired areas until remainder of maintenance period or approved by Engineer, whichever is the longer period.
- C. Post Installation Plant Establishment
1. Post Installation Plant Establishment shall consist of methods and materials for plant establishment after installation to achieve the performance criteria contained in this Technical Specification.
  2. The Establishment Period shall be one year following the Metropolitan St. Louis Sewer District's acceptance of work in a project area which is defined as a specified Stabilization Reach in the Contract Drawings.
  3. The Contractor shall use the methods and materials as outlined in the Plant Establishment Plan provided by the Native Plant Expert.
  4. The Contractor shall keep a log of plant establishment activities, including date/time for each site visit along with general condition of the planting area and work performed. This log shall be supplied to the Metropolitan St. Louis Sewer District upon request.
  5. Any issues beyond the Contractor's control, such as destruction of plants by animals or neighbors, shall be immediately reported to the Metropolitan St. Louis Sewer District.
- D. Performance Criteria
1. Measures may include but are not limited to:
  2. Water sufficient to saturate the root system of the plantings once a week, especially during the months of March through August.
  3. Check the planted areas every two weeks for weed and invasive species growth, especially during the months of March through August.
  4. Trim or mow herbaceous vegetation whenever weeds approach 12 inches in height or start to develop seeds to keep weeds from setting seed. The herbaceous vegetation should be trimmed or mowed to a height of between 4 and 6 inches, taking care to not damage woody vegetation. Under no circumstances shall woody vegetation be mowed.
  5. Remove invasive species according to control recommendations by the Missouri Department of Conservation. Information is available at: <http://mdc.mo.gov/your-property/problem-plants-and-animals/invasive-plants>
  6. For any seeded area showing bare ground patches larger than 36"x36", Contractor shall hand seed using the seed mix specified in the Project Plans and cover with erosion control blanket or other specified erosion control material.
  7. Contractor shall remove required silt fencing after the Establishment Period and restore the fence area by hand seeding, using the seed mix specified in the Contract Documents.
  8. At the end of the Establishment Period, during the growing season (between May 1 and October 1), the Contractor shall notify the Metropolitan St. Louis Sewer District to request a Plant Establishment Inspection.

**END OF SECTION**

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**SECTION 33 05 00**  
**MANHOLE AND SEWER PIPE TESTING**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
1. This section governs construction methods and procedures for the testing of manholes and gravity sewers in accordance with the Contract Documents, Drawings and these Specifications
- B. Related Sections include but are not necessarily limited to:
1. Division 01 - General Requirements.

**1.2 REFERENCES**

- A. Metropolitan St. Louis Sewer District (MSD): Standard Construction Specifications for Sewers and Drainage Facilities, 2009, hereinafter referred to as the MSD Standard Specifications, are available online at <https://msdprojectclear.org/doing-business/design-construction/standard-construction-specs/>. Should a conflict between the Contract Documents and the MSD Standard Specifications arise, these Contract Documents shall govern.

**1.3 QUALITY ASSURANCE**

- A. Referenced Standards:
1. American National Standards Institute (ANSI):
    - a. B40.100, Pressure Gauges and Gauge Attachments.
  2. National Association of Sewer Service Companies (NASSCO):
    - a. Pipeline Assessment Certification Program (PACP)

**PART 2 - PRODUCTS - (NOT APPLICABLE TO THIS SECTION)**

**PART 3 - EXECUTION**

**3.1 MANHOLE TESTING**

- A. Manhole testing by one of the methods as set forth below shall be performed before acceptance by the Owner.
1. Vacuum Infiltration Testing:
    - a. The vacuum testing must be performed prior to backfilling around the manhole unless the Contractor provides documentation from the precast manhole manufacturer stating that the manhole may be vacuum tested after backfilling has taken place. The Contractor must submit this documentation prior to backfilling around any manhole.
    - b. The pipe plugs shall be installed in the connecting pipes and braced securely to prevent the plugs from being drawn into the manhole.
    - c. The vacuum test apparatus shall be placed inside or on top of the casting and the seal inflated according to manufacturer's directions as appropriate.
    - d. A vacuum of 10 IN of mercury shall be drawn and then the vacuum pump shall be shut off.
    - e. With valves closed, the time shall be measured for the vacuum to drop to 9 IN of mercury.
    - f. The manhole shall be acceptable if the time for the vacuum to drop from 10 IN to 9 IN is greater than 60 seconds for 4-FT DIA, 75 seconds for 5-FT DIA, 90 seconds for 6-FT DIA manholes, 105 seconds for 7-FT DIA manholes, and 120 seconds for 8-FT DIA manholes.

- g. If the manhole fails the test, the Contractor shall repair or rebuild the manhole, in a manner acceptable to the Owner, until it passes the test.
2. Manhole Exfiltration Testing:
  - a. Manhole Exfiltration Testing shall comply with MSD Standard Specifications, Part 4, Section B.4b. Exfiltration Testing, except that the allowable leakage limit shall be 100 gallons/inch of pipe diameter/mile of line/day when the average head on the test section is three feet (3') or less.
3. In addition, both the Manhole Infiltration Test and Exfiltration Test must demonstrate that the manhole joints are able to withstand a hydrostatic pressure of 20 psi without leakage to protect against excessive infiltration during a flood event. Where there is a conflict between 3.1A.1 and 3.1.A.2 above, the requirements of this paragraph shall govern.

### 3.2 SEWER PIPE TESTING

- A. Leakage testing by one of the methods as set forth below shall be conducted on sewers before acceptance by the Owner.
  1. The measurement of leakage for all sanitary sewers shall not exceed 100 gallons/inch of pipe diameter/mile of line/day, as required by the Missouri Department of Natural Resources Specifications.
  2. The required air testing, infiltration/exfiltration testing, or joint testing shall be successfully performed on carrier conduits prior to filling the void between the casing and the carrier conduits with sand or the sealing of the ends of the casing conduits.
- B. Air Testing:
  1. Each section of gravity pipeline between manholes and/or structures after backfill shall be tested as outlined below:
    - a. Contractor may perform air tests for all pipe diameters eight-inches (8") through twenty-seven inches (27").
    - b. Furnish all facilities required including necessary piping connection, test pumping equipment, pressure gauges, bulkheads, regulator to avoid over-pressurization, and all miscellaneous items required.
    - c. The pipe plug for introducing air to the sewer line shall be equipped with 2 taps.
      - 1) One tap will be used to introduce air into the line being tested through suitable valves and fittings, so that the input air may be regulated.
      - 2) The second tap will be fitted with valves and fittings to accept a pressure test gage indicating internal pressure in the sewer pipe.
      - 3) Additional valve and fitting will be incorporated on the tap used to check internal pressure so that a second test gauge may be attached to the internal pressure tap.
      - 4) The pressure test gauge will also be used to indicate loss of air pressure due to leaks in the sewer line.
    - d. The pressure test gauge shall meet the following minimum specifications:
      - 1) Size (diameter): 4-1/2 IN.
      - 2) Pressure Range: 0 to 15 psi.
      - 3) Figure Intervals: 1 psi increments.
      - 4) Minor Subdivisions: 0.05 psi.
      - 5) Pressure Tube: Bourdon Tube or diaphragm.
      - 6) Accuracy:  $\pm 0.25$  percent of maximum scale reading.
      - 7) Dial: White coated aluminum with black lettering, 270 degree arc and mirror edge.
      - 8) Pipe Connection: Low male 1/2 IN NPT.
      - 9) Calibration data not more than one year old will be supplied with all pressure test gages.
        - a) Certification of pressure test gauge will be required from the gage manufacturer.
        - b) This certification and calibration data will be available to the Engineer whenever air tests are performed.

2. Process:
- a. When gravity sewer pipe defined in 3.2.B.1.a is used it shall be air-tested in accordance with the requirements of ASTM F1417.
  - b. Plug ends of line and cap or plug all connections to withstand internal pressure.
    - 1) One of the plugs provided must have 2 taps for connecting equipment.
    - 2) After connecting air control equipment to the air hose, monitor air pressure so that internal pressure does not exceed 5.0 psig.
    - 3) After reaching 4.0 psig, throttle the air supply to maintain between 4.0 and 3.5 psig for at least 2 minutes in order to allow equilibrium between air temperature and pipe walls.
    - 4) During this time, check all plugs to detect any leakage.
    - 5) If plugs are found to leak, bleed off air, tighten plugs, and again begin supplying air.
    - 6) After temperature has stabilized, the pressure is allowed to decrease to 3.5 psig.
    - 7) At 3.5 psig, begin timing to determine the time required for pressure to drop to 2.5 psig.
    - 8) If the pressure remains at 3.5 psig for 30 minutes with no drop, the pipe shall be presumed free of defects.
    - 9) If the pressure begins to slowly drop within the first 30 minutes and if the total time, in seconds, for the air pressure to decrease from 3.5 psig to 2.5 psig is greater than that shown in the table below, the pipe shall be presumed free of defects.

Pipe Diameter (IN)	Minimum Time (min:sec)	Length for Minimum Time (FT)	Time for Longer Length (sec) L = Total Length
8	7:34	298	1.520 * L
10	9:26	239	2.374 * L
12	11:20	199	3.418 * L
15	14:10	159	5.342 * L
18	17:00	133	7.692 * L
21	19:50	114	10.470 * L
24	22:40	99	13.674 * L
27	25:30	88	17.306 * L
30	28:20	80	21.366 * L
33	31:10	72	25.852 * L
36	34:00	66	30.768 * L
42	39:48	57	41.883 * L
48	45:34	50	54.705 * L

- c. If air test fails to meet above requirements, repeat test as necessary after all leaks and defects have been repaired and backfilled.
- d. In areas where ground water is known to exist, install a one-half inch diameter capped pipe nipple, approximately 10 IN long, through manhole wall on top of 1 of the sewer lines entering the manhole.
  - 1) This shall be done at the time the sewer is installed.
  - 2) Immediately prior to the performance of the line acceptance test, ground water level shall be determined by removing pipe cap, blowing air through pipe nipple into the ground so as to clear it, and then connecting a clear plastic tube to pipe nipple.
  - 3) The hose shall be held vertically and a measurement of height in feet of water shall be taken after the water stops rising in this plastic tube.
  - 4) The height in feet shall be divided by 2.3 to establish the pounds of pressure that will be added to all readings.
- e. In lieu of the above paragraph, the Contractor may install a monitoring well to measure the height of the ground water prior to air testing.

- 1) The monitoring well shall be sized to allow measurement of the ground water from the surface and extend into the granular pipe bedding.
  - 2) The monitoring well shall be removed in a manner acceptable to the Owner.
- C. Infiltration/Exfiltration:
1. Infiltration/Exfiltration testing shall be in accordance with MSD Standard Specifications, Part 4, Section B.2.c., except that the allowable leakage limit shall be 100 gallons/inch of pipe diameter/mile of line/day.
- D. Joint Testing:
1. Joint testing for sewers larger than 27-inches in diameter shall be in accordance with MSD Standard Specifications, Part 4, Section B.2.d.
- E. In addition, the Leakage testing by one of the methods as set forth above must demonstrate that the sewer pipe joints are able to withstand a hydrostatic pressure of 20 psi without leakage to protect against excessive infiltration during a flood event. Where there is a conflict between the Leakage testing methods in 3.2.B, 3.2.C, and 3.2.D above, the requirements of this paragraph shall govern.

### 3.3 SEWER PIPE DEFLECTION TESTING

- A. Mandrel deflection testing shall be performed on all flexible pipe prior to construction approval and after completion of the backfill operation and compaction process.
- B. The mandrel (go/no-go) device shall be cylindrical in shape and constructed with 9 evenly spaced arms or prongs.
1. Mandrels with fewer arms will be rejected as not sufficiently accurate.
  2. The rigid mandrel shall have an outside diameter (OD) equal to 95 percent of the inside diameter (ID) of the pipe.
  3. The inside diameter of the pipe, for the purpose of determining the outside diameter of the mandrel, shall be the average outside diameter minus two minimum wall thicknesses for OD controlled pipe and the average inside diameter for ID controlled pipe, dimensions per appropriate standard.
  4. Statistical or other "tolerance packages" shall not be considered in mandrel sizing.
  5. The dimensions of the mandrel for PVC pipe shall be as listed in the table below. The "D" mandrel dimension shall carry a tolerance of  $\pm 0.01$  IN.
  6. Contact length (L) shall be measured between points of contact on the mandrel arm.
  7. The length shall not be less than as shown in the accompanying table.

Nominal Diameter (Inches)	"L" Mandrel Length (Inches)	"D" Mandrel Diameter (Inches)
ASTM D3034 SDR26		
8	8	7.37
10	10	9.21
12	10	10.96
15	12	13.42
ASTM F679 PS115		
18	18	16.49
21	21	19.44
24	24	21.87
27	27	24.65
30	24	28.21
36	24	33.78
42	24	39.24
48	24	44.80

- C. The Owner shall be responsible for approving the mandrel. The Contractor shall provide proving rings to verify this.

- D. The mandrel shall be hand-pulled by the Contractor through all flexible sewer lines.
  - 1. Any sections of sewer not passing the mandrel test shall be uncovered and the Contractor, at no additional cost to the Owner, shall re-round or replace the sewer to the satisfaction of the Owner.
  - 2. These repaired sections shall be retested.
- E. The testing shall be conducted after final trench backfill.

**END OF SECTION**

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**SECTION 33 05 16**  
**PRECAST CONCRETE MANHOLE STRUCTURES**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
1. Precast concrete manhole structures and appurtenant items:
    - a. Sanitary sewer manholes and appurtenances.
    - b. Drain manholes and appurtenances.
    - c. Storm sewer manholes and appurtenances.
    - d. Foulwater drops
    - e. Bottom Sections of Manholes
    - f. Special Large Diameter Manhole
    - g. Other Manhole Appurtenances.
    - h. Bedding and cover materials
- B. Related Sections include but are not necessarily limited to:
1. Division 01 - General Requirements.
  2. Section 01 22 00 – Measurement and Payment (Unit Price)
  3. Section 03 09 00 – Concrete.
  4. Section 31 23 00 - Earthwork.
  5. Division 33 - Utilities

**1.2 REFERENCES**

1. Metropolitan St. Louis Sewer District (MSD): Standard Construction Specifications for Sewers and Drainage Facilities, 2009, hereinafter referred to as the MSD Standard Specifications are available online at <https://msdprojectclear.org/doing-business/design-construction/standard-construction-specs/>. Should a conflict between the Contract Documents and the MSD Standard Specifications arise, these Contract Documents shall govern.

**1.3 QUALITY ASSURANCE**

- A. Referenced Standards:
1. ASTM International (ASTM):
    - a. A48/A48M, Standard Specification for Gray Iron Castings.
    - b. C150/C150M, Standard Specification for Portland Cement.
    - c. C478, Standard Specification for Precast Reinforced Concrete Manhole Sections.
    - d. C497, Standard Test Methods for Concrete Pipe, Manhole Sections, or Tile.
    - e. C877, Standard Specification for External Sealing Bands for Concrete Pipe, Manholes, and Precast Box Sections.
    - f. C913, Standard Specification for Precast Concrete Water and Wastewater Structures.
    - g. C923, Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals.
    - h. D1227, Standard Specification for Emulsified Asphalt Used as a Protective Coating for Roofing.
    - i. D4586, Standard Specification for Asphalt Roof Cement, Asbestos-Free.
  2. AASHTO
    - a. M198, Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants.

**1.4 SUBMITTALS**

- A. Shop Drawings:

1. See Missouri Department of Transportation (MoDOT) Route 100-Manchester Road Project (J6S1718B) technical specifications for requirements for the mechanics and administration of the submittal process.
  2. Product technical data including:
    - a. Acknowledgement that products submitted meet requirements of standards referenced.
    - b. Manufacturer's installation instructions.
    - c. Cover and frame construction, features, configuration and dimensions.
    - d. Antimicrobial additive data and certifications.
    - e. Manhole cover seals data and certifications.
    - f. Manhole frame seals data and certifications.
    - g. Concrete mix design.
    - h. External Joint Wrap data and certifications.
    - i. Steps
  3. Fabrication and/or layout drawings:
    - a. Include detailed diagrams of manholes showing typical components and dimensions, reinforcements and other details.
    - b. Itemize, on separate schedule, sectional breakdown of each manhole structure with all components and refer to drawing identification number or notation.
    - c. Indicate knockout elevations for all piping entering each manhole.
- B. Unless approved prior to submittal, submit all products from this Section in 1 complete submittal package. Include all products and accessories together.

## 1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with MSD Standard Specifications

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 66 00 – Product storage and handling requirements
- B. Comply with precast concrete manufacturer's instructions for unloading, storing, and moving precast manholes.
- C. Store precast manholes to prevent damage to Owner's property or other public or private property. Repair property damage from material's storage.
- D. Mark each precast structure by indentation or waterproof paint showing date of manufacture, manufacturer, and identifying symbols and numbers shown on Drawings to indicate its intended use.

## PART 2 - PRODUCTS

### 2.1 REQUIREMENTS

- A. All products shall comply with the requirements of the MSD Standard Specifications.
1. MSD Standard Specifications, Part 2 - "Materials for Construction"
  2. MSD Standard Specifications, Part 4 – "Pipe Sewer Construction"
  3. The following corrections, modifications, and additions to the MSD Standard Specifications, Part 4, "Pipe Sewer Construction" apply:
    - a. Section G, Structures, Paragraph 7, Setting of Castings, Frames, Fittings, and Steps, Subparagraph d – the following conditions apply:
      - 1) Manhole Cover Seals
        - a) General - Sanitary manhole covers on sanitary manholes 6S, 7S, 8S, 9S, and 9.1S shall be sealed with manhole cover gaskets such as those manufactured by Cretex Specialty Products or approved equal.

- b) Installation - The cover bearing surface area of both the frame and the cover shall be wire brushed and cleaned of all loose rust, scale, or debris. A small bead of butyl caulk, conforming to AASHTO M-198 Type B, shall be applied to the clean and dry bearing surface of the frame prior to the installation of the cover gasket. Care must be taken to ensure that any butyl that gets on the top of the gasket or on the side of the cover recess is removed. Detailed installation procedures shall be in accordance with the manufacturer's instructions.
  - 2) Manhole Frame Seals
    - a) General - An internal rubber seal shall be installed on sanitary manholes 6S, 7S, 8S, 9S, and 9.1S on this project. A rubber seal extension to cover any additional heights of chimney not covered by the seal itself shall be used as directed by the manufacturer's representative. The internal rubber seals shall be as manufactured by Cretex Specialty Products, or approved equal.
    - b) Installation – A flexible rubber mastic sealant shall be used in the joint between the manhole frame and chimney or cone. Detailed installation procedures shall be in accordance with the manufacturer's instructions.
  - 4. The manufacturer's representative shall be present at the site for not less than one full day to instruct the CONTRACTOR's personnel in proper installation techniques. ENGINEER shall also be present at time of instruction.
- B. All concrete and pre-cast concrete manholes, structures, etc. that will come into contact with sanitary sewerage shall have an antimicrobial additive to the mixture prior to pouring. See Section 03 09 00.

## 2.2 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
- 1. Manhole rings, covers and frames:
    - a. Neenah Foundry and Neenah Enterprises, Inc.
    - b. Deeter Foundry.
    - c. Or equal.
  - 2. Black mastic joint compound:
    - a. Kalktite 340.
    - b. Tufflex.
    - c. Plastico.
    - d. Or equal.
  - 3. Premolded joint compound:
    - a. RAM-NEK.
    - b. Kent Seal.
    - c. Or equal.
  - 4. Emulsified fibrated asphalt compound:
    - a. Sonneborn Hydrocide 700B.
    - b. Or equal.

## 2.3 SANITARY SEWER, STORM AND DRAIN MANHOLE STRUCTURE COMPONENTS

- A. Watertight Type Frame and Cover:
- 1. In accordance with MSD Standard Specifications, Part 2, Section D.4 – Watertight Type Castings.
  - 2. Frame and Cover shall be able to withstand a hydrostatic pressure of 20 psi without leakage.
- B. Special Coatings and Joint Treatment:
- 1. Joints of precast sections:
    - a. Black mastic compound: ASTM D4586.
  - 2. Vertical wall surfaces:

- a. Emulsified fibrated asphalt compound meeting ASTM D1227 Type II for all exterior vertical wall surfaces.
3. External Joint Wrap:
  - a. As manufactured by Mar-Mac Manufacturing Co., Inc., or approved equal.
  - b. Apply at all joints on any precast concrete manholes.
  - c. The collar shall be manufactured in accordance with ASTM C877 Type II and made of two layers with an outer layer of polyethylene film with a minimum tensile strength of 4,000 psi. The inner layer shall be polypropylene fabric with a mastic coating.
  - d. Steel straps located between the layers shall be used to tighten the collar on the manhole.
  - e. The joint collar should be 18-inches wide.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Verification of existing conditions before starting work.
- B. Verify items provided by other sections of Work are properly sized and located.
- C. Verify built-in items are in proper location, and ready for roughing into Work.
- D. Verify correct size of manhole excavation.

### **3.2 PREPARATION**

- A. Coordinate placement of inlet and outlet pipe or duct sleeves required by other sections.
- B. Do not install structures where site conditions induce loads exceeding structural capacity of structures.
- C. Inspect precast concrete structures immediately prior to placement in excavation to verify structures are internally clean and free from damage. Remove and replace damaged units.

### **3.3 INSTALLATION**

- A. Installation shall follow the MSD Standard Specifications; Part 4 – “Pipe Sewer Construction”.
- B. See Section 01 22 00 for identified structures with bottom sections and outside foulwater drops.

### **3.4 FIELD QUALITY CONTROL**

- A. Quality control shall follow the MSD Standard Specifications, Part 4 – “Pipe Sewer Construction”.

**END OF SECTION**

**SECTION 33 30 00**  
**SANITARY SEWERAGE UTILITIES**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
  - 1. Sanitary sewage pipe.
  - 2. Bedding and backfill materials.
- B. Related Sections include but are not necessarily limited to:
  - 1. Division 01 - General Requirements.
  - 2. Section 03 09 00 – Concrete.
  - 3. Section 31 05 16 – Aggregate Materials.
  - 4. Section 31 23 00 – Earthwork.
  - 5. Section 33 05 00 – Manholes and Sewer Pipe Testing.
  - 6. Section 33 05 16 – Precast Concrete Manhole Structures.
  - 7. Section 40 05 19 – Pipe: Ductile Pipe.
  - 8. Section 40 05 31 – Plastic Pipe.
  - 9. Section 40 05 36 – Fiberglass Sewer Pipe.

**1.2 REFERENCES**

- A. Metropolitan St. Louis Sewer District (MSD): Standard Construction Specifications for Sewers and Drainage Facilities, 2009, hereinafter referred to as the MSD Standard Specifications, are available online at <https://msdprojectclear.org/doing-business/design-construction/standard-construction-specs/>. Should a conflict between the Contract Documents and the MSD Standard Specifications arise, these Contract Documents shall govern.
- B. No additional technical specification other than this technical specification 33 30 00 is included for vitrified clay pipe (VCP) and corrugated polypropylene pipe (PP). The MSD Standard Specifications, including the modifications denoted in this Section 33 30 00, will govern for VCP and corrugated PP pipe.

**1.3 DEFINITIONS**

- A. Bedding: Fill placed under, beside and directly over pipe, prior to subsequent backfill operations.

**1.4 SUBMITTALS**

- A. Missouri Department of Transportation (MoDOT) Route 100-Manchester Road Project (J6S1718B) technical specifications for submittal procedures.
- B. Product Data: Submit data indicating pipe material to be used and pipe accessories.
- C. Manufacturer's Installation Instructions: Indicate special procedures required to install Products specified.
- D. Manufacturer's Certificate: Certify products meet or exceed the Specifications and specified requirements of the MSD Standard Specifications.

**1.5 CLOSEOUT SUBMITTALS**

- A. Project Record Documents: Record location of pipe runs, connections, manholes, cleanouts, and invert elevations.
- B. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

## 1.6 QUALITY ASSURANCE

- A. Perform Work in accordance with Metropolitan St. Louis Sewer District Standard Construction Specifications for Sewers and Drainage Facilities, 2009.

## 1.7 FIELD MEASUREMENTS

- A. Verify field measurements and elevations are as indicated on the Drawings.

## PART 2 - PRODUCTS

### 2.1 SANITARY SEWER PIPE MATERIALS

- A. MSD Standard Specifications:
  - 1. MSD Standard Specifications, Part 2, “Materials of Construction” – The following corrections, modifications and additions to the Standard Specifications, Part 2, “Materials of Construction” apply:
    - a. Section G, Pipe, Paragraph 1, Sanitary and Combined Sewer Pipe – the following addition applies:
      - f. Corrugated Polypropylene Pipe (PP) Sanitary and Combined Sewers – 12 inch – 60 inch.
    - b. Section G, Pipe, Paragraph 2, Stormwater Sewer Pipe – the following addition applies:
      - g. Corrugated Polypropylene Pipe (PP) Storm Sewers – 12 inch – 60 inch.
    - c. Section G, Pipe – the following addition applies:
      - 15. Corrugated Polypropylene Pipe (PP)  
It shall conform to the requirements of ASTM F2736 “Standard Specification for 6 to 30 inch Polypropylene (PP) Corrugated Single Wall Pipe And Double Wall Pipe” for double-walled, annular-corrugated sanitary sewer pipe 12 to 30 inch in diameter; or to the requirements of ASTM F2764 “Standard Specification for 30 to 60 inch Polypropylene (PP) Triple Wall Pipe and Fittings for Non-Pressure Sanitary Sewer” for triple-walled, annular corrugated sanitary sewer pipe 30 to 60 inch in diameter. Pipe shall have a minimum stiffness of 46psi when tested in accordance with ASTM D2412.
    - d. Section H, Joints, Paragraph 1, Joint Selection – under sub paragraph a, the following addition applies to the table “SANITARY AND COMBINED SEWERS”, “Joint Type”:  
Corrugated Polypropylene Pipe (PP) D
    - e. Section H, Joints, Paragraph 1, Joint Selection – under sub paragraph a, the following addition applies to the table “STORMWATER SEWERS”, “Joint Type”:  
Corrugated Polypropylene Pipe (PP) D
    - f. Section H, Joints, Paragraph 5, Type D Joints – the following addition applies:  
Type D joints shall also apply to all PP pipes.
  - 2. MSD Standard Specifications, Part 4, “Pipe Sewer Construction” - The following corrections, modifications and additions to the Standard Specifications, Part 4, “Pipe Sewer Construction” apply:
    - a. Section B, Pipe Field Tests, Paragraph 2, Reach Integrity Testing – delete the first sentence and the following replacement applies:
      - 1) All sanitary and combined sewers shall sustain a maximum leakage limit of 100 gallons/inch of pipe diameter/mile of line/day, as required by the Missouri Department of Natural Resources Specifications.
    - b. Section B, Pipe Field Tests, Paragraph 2, Reach Integrity Testing, Subparagraph c, Infiltrations/Exfiltration Testing – delete the sixth sentence, concerning leakage limits, and the following replacement applies:
      - 1) The measurement of leakage shall not exceed 100 gallons/inch of pipe diameter/mile of line/day, as required by the Missouri Department of Natural Resources Specifications.
    - c. Section D, Pipe Laying, Paragraph 3, Bedding, Cradling or Encasement – the following addition applies:

- 1) c. For 18" diameter or greater HDPE pipe, bedding above the spring line shall have each lift spread evenly and mechanically compacted with a minimum of two passes of a vibratory plate compactor.
  - d. Section I, Methods of Measurement and Basis of Payment, Paragraph 2, Pipe Sewers – the following addition applies:
    - 1) Payment also includes approved connectors for dissimilar pipe materials and all costs for connection of the pipe. When manhole tees are used for manhole structures, the distance between the inside faces shall be excluded from the length of completed pipe sewers for which payment will be made.
  3. The manufacturer of pipe equal to or greater than 36" diameter shall be listed on the JSP-Sewer. Only the listed manufacturer may be used. Failing to meet this requirement may result in rejection of bid.
- B. MSD Standard Specifications Part 2 Materials, Section G Pipe, paragraph 1 Sanitary and Combined Sewer Pipe, does not apply to this project. See below:
- C. For sanitary sewers equal to or less than 36-inch, the following pipe materials are approved for use:
1. Vitrified Clay Pipe (VCP).
  2. Polyvinyl Chloride Pipe (PVC).
  3. Fiberglass Reinforced Thermosetting Resin Pipe or Fiberglass Reinforced Polymer Mortar (FRP/RPM).
  4. Ductile Iron Pipe (DIP).
  5. Corrugated Polypropylene Pipe (PP).

## 2.2 TESTING

- A. All costs for field tests described in Section 33 05 00, shall be included in the various pay items and shall not be paid for separately.
- B. The cost for all other testing on all reaches, and all structure and manhole testing shall be included in the various pay items and shall not be paid for separately.

## 2.3 BEDDING AND COVER MATERIALS

- A. Bedding and cover shall conform to the requirements of Section 31 05 16.
- B. Soil Backfill from Above Pipe to Finish Grade for PVC Pipe shall conform to the requirements of Section 31 05 16 and the Metropolitan St. Louis Sewer District Standard Construction Specifications for Sewers and Drainage Facilities, 2009 version; Part 2 – “Materials of Construction”.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify excavation base is ready to receive Work and excavations, dimensions, and elevations are as indicated on drawings.

### 3.2 PREPARATION

- A. Remove large stones or other hard matter which could damage pipe or impede consistent backfilling or compaction.
- B. Follow manufacturer’s recommendations and instructions concerning Protecto401™ lining (or equal) of Ductile Iron Pipe.

**3.3 BEDDING**

- A. Fiberglass pipe shall be considered as a flexible pipe and shall be installed in a trench or tunnel as shown on the Contract Drawings and shall be installed in accordance with the requirements of the Metropolitan St. Louis Sewer District Standard Construction Specifications for Sewers and Drainage Facilities, 2009; Part 2 – “Materials of Construction”.

**3.4 INSTALLATION – PIPE**

- A. Install pipe, fittings, and accessories in accordance with the requirements of the Metropolitan St. Louis Sewer District Standard Construction Specifications for Sewers and Drainage Facilities, 2009; Part 4 – “Pipe Sewer Construction”.

**3.5 FIELD QUALITY CONTROL**

- A. Quality control and testing to conform to these Contract Documents and MSD Standard Specifications.

**3.6 PROTECTION OF FINISHED WORK**

- A. Protect pipe and bedding from damage or displacement until backfilling operation is in progress.

**END OF SECTION**

**SECTION 40 05 19**  
**PIPE: DUCTILE**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
  - 1. Ductile iron piping, fittings, and appurtenances.
- B. Related Sections include but are not necessarily limited to:
  - 1. Division 01 - General Requirements.
  - 2. Section 13 47 13 – Cathodic Protection for Buried Piping
  - 3. Division 31 – Earthwork.
  - 4. Section 33 05 00 – Manhole and Sewer Pipe Testing.
  - 5. Section 33 05 16 – Precast Concrete Manhole Structures.
  - 6. Section 33 30 00 – Sanitary Sewerage Utilities.

**1.2 QUALITY ASSURANCE**

- A. Referenced Standards:
  - 1. American Water Works Association/American National Standards Institute (AWWA/ANSI):
    - a. C105/A21.5, Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems.
    - b. C110/A21.10, Standard for Ductile-Iron and Gray-Iron Fittings.
    - c. C111/A21.11, Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
    - d. C150/A21.50, Standard for Thickness Design of Ductile-Iron Pipe.
    - e. C151/A21.51, Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water.
  - 2. Metropolitan St. Louis Sewer District (MSD): Standard Construction Specifications for Sewers and Drainage Facilities, 2009, hereinafter referred to as the MSD Standard Specifications, are available online at <https://msdprojectclear.org/doing-business/design-construction/standard-construction-specs/>. Perform Work in accordance with the MSD Standard Specifications. Should a conflict between the Contract Documents and the MSD Standard Specifications arise, these Contract Documents shall govern.

**1.3 SUBMITTALS**

- A. Shop Drawings:
  - 1. See Missouri Department of Transportation (MoDOT) Route 100-Manchester Road Project (J6S1718B) technical specifications for requirements for the mechanics and administration of the submittal process.
  - 2. Product Data: Ductile Iron Pipe lining.
  - 3. Certification of factory hydrostatic testing.

**PART 2 - PRODUCTS**

**2.1 ACCEPTABLE MANUFACTURERS**

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
  - 1. Polyethylene encasement tape:
    - a. Chase (Chasekote 750).
    - b. Kendall (Polyken 900).
    - c. 3 M (Scotchrap 50).
    - d. Or equal.

## 2.2 MATERIALS

- A. Ductile Iron Pipe:
  - 1. AWWA/ANSI C150/A21.50.
  - 2. AWWA/ANSI C151/A21.51.
  - 3. Or equal.
- B. Fittings:
  - 1. AWWA/ANSI C110/A21.10.
  - 2. Or equal.
- C. Gaskets:
  - 1. AWWA/ANSI C111/A21.11.
  - 2. Or equal.
- D. Polyethylene Encasement:
  - 1. AWWA/ANSI C105/A21.5.
  - 2. V-Bio Enhanced Polyethylene Encasement
  - 3. Or equal.
- E. Cathodic Protection Test Stations: See Section 13 47 13.

## 2.3 LININGS AND COATINGS

- A. Ductile Iron Pipe shall have a lining of Protecto401™ Ceramic Epoxy, or equal.
- B. Ductile Iron Pipe shall have a black asphaltic shop coating.

## 2.4 SOURCE QUALITY CONTROL

- A. Factory Test:
  - 1. Subject pipe to hydrostatic test of not less than 500 psi with the pipe under the full test pressure for at least 10 seconds.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Joining Method - Push-On Joints:
  - 1. Install in accordance with AWWA/ANSI C151/A21.51.
  - 2. Assemble push-on joints in accordance with manufacturer's directions.
  - 3. Bevel and lubricate spigot end of pipe to facilitate assembly without damage to gasket:
    - a. Use lubricant that is non-toxic, does not support the growth of bacteria, has no deteriorating effects on the gasket material, and imparts no taste or odor to water in pipe.
  - 4. Assure the gasket groove is thoroughly clean.
  - 5. For cold weather installation, warm gasket prior to placement in bell.
  - 6. Taper of bevel shall be approximately 30 degrees with centerline of pipe and approximately 1/4 IN back.
  - 7. See Section 13 47 13 for joint bonding.
- B. Cutting:
  - 1. Do not damage interior lining material during cutting.
  - 2. Use abrasive wheel cutters or saws.
  - 3. Make square cuts.
  - 4. Bevel and free cut ends of sharp edges after cutting.
- C. Pipe material shall terminate at a structure. Pipe lengths utilized shall be full length as much as possible.
- D. Install buried piping in accordance with Section 31 23 00.

**3.2 PIPE SCHEDULE**

A.

Pipe Segment	Pipe Length	Pipe Diameter	Minimum Pressure Class	Minimum Thickness Class
6S to 7S (Sheet 2)	109 ft	36"	250	52
7S to 8S (Sheet 2)	83 ft	36"	250	52
8S to 9S (Sheet 2)	55 ft	36"	250	52

**END OF SECTION**

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**SECTION 40 05 31**  
**PIPE: PLASTIC**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
  - 1. Plastic pipe.
- B. Related Sections include but are not necessarily limited to:
  - 1. Division 01 - General Requirements.
  - 2. Division 31 – Earthwork.
  - 3. Section 33 05 00 – Manhole and Sewer Pipe Testing.
  - 4. Section 33 05 16 – Precast Concrete Manhole Structures.
  - 5. Section 33 30 00 – Sanitary Sewerage Utilities.

**1.2 QUALITY ASSURANCE**

- A. Referenced Standards:
  - 1. ASTM International (ASTM):
    - a. PVC (polyvinyl chloride) materials:
      - 1) D3034, Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
      - 2) D3212, Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.
      - 3) F679, Standard Specification for Poly (Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings.
      - 4) F794, Standard Specification for Poly (Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter.
    - b. Installation:
      - 1) D2321, Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
  - 2. Metropolitan St. Louis Sewer District (MSD): Standard Construction Specifications for Sewers and Drainage Facilities, 2009, hereinafter referred to as the MSD Standard Specifications, are available online at <https://msdprojectclear.org/doing-business/design-construction/standard-construction-specs/>. Perform Work in accordance with the MSD Standard Specifications. Should a conflict between the Contract Documents and the MSD Standard Specifications arise, these Contract Documents shall govern.

**1.3 SUBMITTALS**

- A. See Missouri Department of Transportation (MoDOT) Route 100-Manchester Road Project (J6S1718B) technical specifications for requirements for the mechanics and administration of the submittal process.

**PART 2 - PRODUCTS**

**2.1 PVC AND PE SEWER PIPING**

- A. Materials:
  - 1. Furnish materials in full compliance with the following material specification.
  - 2. The requirements of this Specification are intended to provide for pipe and fittings suitable for non-pressure drainage of wastewater and surface water.
  - 3. Joining systems shall consist of an elastomeric gasket joint meeting requirements of ASTM D3212.
  - 4. Supply to the Engineer all information and sample of joining method for his evaluation:

- a. Only jointing methods acceptable to the Engineer will be permitted.
5. Provide pipe and fittings meeting or exceeding the following requirements:
  - a. PVC Pipe:
    - 1) 4 to 27 IN DIA: ASTM D3034 and ASTM F679, SDR 35.
    - 2) 8 to 30 IN DIA: ASTM F794.
    - 3) 4 to 18 IN DIA: ASTM F949.
  - b. PE Pipe:
    - 1) 12 to 60 IN DIA: ASTM F2306.
6. Ensure impact strengths and pipe stiffnesses in full compliance with these Specifications.
- B. Installation: Install pipe and fittings in accordance with ASTM D2321 and as recommended by the manufacturer:
  1. Provide for a maximum deflection of not more than 5 percent.

## **PART 3 - EXECUTION**

### **3.1 IDENTIFICATION**

- A. Identify each length of pipe clearly at intervals of 5 FT or less:
  1. Include manufacturer's name and trademark.
  2. Nominal size of pipe, appurtenant information regarding polymer cell classification and critical identifications regarding performance specifications and NSF approvals when applicable.

### **3.2 PVC AND PE SEWER PIPING**

- A. Installation: Install pipe and fittings in accordance with ASTM D2321 and as recommended by the manufacturer:
  1. Provide for a maximum deflection of not more than 5 percent.
- B. Infiltration and Exfiltration:
  1. See Section 33 05 00.
- C. Deflection:
  1. See Section 33 05 00.

**END OF SECTION**

**SECTION 40 05 36**  
**FIBERGLASS SEWER PIPE**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Description
1. Furnish all tools, equipment, materials, and supplies and perform all labor required to complete the Work as indicated in the Control Documents.
  2. Furnish, install, and test fiberglass (Glass-Fiber-Reinforced Thermosetting-Resin) sewer pipe, fittings, and appurtenances of the dimensions and to the lines and grades shown in the Contract Documents.
  3. Complete and workable piping systems and any miscellaneous fittings and specials required for proper completion of the Work shall be considered as having been included in this Section.
  4. Provide all jointing materials, other miscellaneous appurtenances, and accessories.
- B. Related Sections include but are not necessarily limited to:
1. Division 01 - General Requirements.
  2. Division 31 – Earthwork.
  3. Section 33 05 00 – Manhole and Sewer Pipe Testing.
  4. Section 33 05 16 – Precast Concrete Manhole Structures.
  5. Section 33 30 00 – Sanitary Sewerage Utilities.

**1.2 QUALITY ASSURANCE**

- A. Referenced Standards:
1. American Society of Testing Materials (ASTM):
    - a. D3262, Standard Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Sewer Pipe.
    - b. D4161, Standard Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe Joints Using Flexible Elastomeric Seals.
    - c. F477, Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
  2. Metropolitan St. Louis Sewer District (MSD): Standard Construction Specifications for Sewers and Drainage Facilities, 2009, hereinafter referred to as the MSD Standard Specifications, are available online at <https://msdprojectclear.org/doing-business/design-construction/standard-construction-specs/>. Perform Work in accordance with the MSD Standard Specifications. Should a conflict between the Contract Documents and the MSD Standard Specifications arise, these Contract Documents shall govern.

**1.3 SUBMITTALS**

- A. Shop Drawings:
1. Submit in accordance with Missouri Department of Transportation (MoDOT) Route 100-Manchester Road Project (J6S1718B) technical specifications.
  2. Detailed drawings of the pipe, gasket, joints, pipe special sections, connections, and test reports on the properties of the gasket material.
  3. Pipe-laying diagrams showing the location, length, strength designation, and number designation of each pipe section and special pipe section to be furnished. The station and elevation of the pipe invert at all changes in grade shall also be shown.
  4. Manufacturer's Certificate of Compliance with this Section and above referenced Standard's for each size of pipe and fittings used.
  5. Manufacturer's Certificate of Compliance for resin compound.
  6. Manufacturer's instructions on storage handling, transportation, and installation.

7. Certified test reports on materials manufactured for this product.
- B. A sample piece of pipe approximately three-foot long of each diameter, if requested by Engineer.

## **PART 2 - PRODUCTS**

### **2.1 SYSTEM PERFORMANCE**

- A. Pipe shall be designed for an external live loading, including impact, to AASHTO H-20 loading with earth cover as shown.
- B. The fiberglass piping system shall be specifically designed, constructed, and installed for service in sanitary sewers.

### **2.2 MATERIALS**

- A. Resin Systems: The manufacturer shall use only polyester resin systems with a proven history of performance on this particular application.
- B. Glass Components: The reinforcing glass fibers used to manufacture the components shall be of the highest quality commercial grade glass filaments with binder and sizing compatible with impregnating resins.
- C. The internal surface shall be suitable for service in a sanitary sewer pipe, and shall be highly resistant to exposure to sulfuric acid as produced by biological activity from hydrogen sulfide gases. Pipe must meet or exceed requirements of ASTM D3681.
- D. Silica Sand: Sand shall be minimum 98% silica with a maximum moisture content of 0.2%.
- E. Additives: Resin additives, such as curing agents, pigments, dyes, fillers, thixotropic agents, etc., when used, shall not detrimentally effect the performance of the product.
- F. Elastomeric Gaskets: Gaskets shall meet ASTM F477 and be supplied by qualified gasket manufacturers and be suitable for the service intended.
- G. For the open trench construction of the sanitary sewer lines with fiberglass pipe, the pipe stiffness specified when tested in accordance with the requirements of ASTM 2412, should be 46 psi for pipe with a diameter less than 66 inches.

### **2.3 MANUFACTURER AND PRODUCT CONSTRUCTION**

- A. Pipe: The pipes shall be manufactured in accordance with ASTM D3262.
- B. Joints:
  1. The pipe installed in open excavation shall be field connected with glass reinforced plastic sleeve couplings that utilize elastomeric sealing gaskets as the sole means to maintain joint water tightness. The joints shall utilize elastomeric sealing gaskets meeting the performance requirements of ASTM D4161 and shall be capable of withstanding an internal pressure of 22 psi.
- C. Fittings: All fittings shall be fabricated from pipe meeting the requirements of these standards. Ductile iron, stainless steel or fusion bonded epoxy coated steel fittings may also be used.
- D. Diameters: The outside diameter of pipe shall be per the ASTM D3262-Table 3.
- E. Lengths: Pipe shall be supplied in nominal lengths of 10 – 40 feet. Actual lay length shall be nominal +/- 2 inches. Special short lengths may be used where surface geography or installation conditions require shorter lengths.

- F. Wall Thickness: The average wall thickness of the pipe shall not be less than the nominal wall thickness published in the manufacturer's literature, and the minimum wall thickness at any point shall not be less than 87.5% of the nominal wall thickness.
- G. End Squareness: All points around each end of pipe shall fall within +/- ¼ inch or +/- 0.5% of the nominal diameter of the pipe, whichever is greater, to a plane perpendicular to the longitudinal axis of the pipe.

## 2.4 TESTING

- A. Pipes: Pipe shall be manufactured in accordance with ASTM D3262.
- B. Joints: Joints shall meet the requirements of ASTM D4161, except that the joint shall be capable of withstanding an internal pressure of 22 psi. Each joint will be tested at the time of installation prior to complete backfilling of the trench.
- C. Stiffness: Each pipe shall have sufficient strength to exhibit the minimum pipe stiffness at 5% deflection as required by the Engineer. Minimum pipe stiffness provided by pipe diameter shall be shown on the plans. Stiffness shall be tested in accordance with the test method of ASTM D2412. A minimum of one pipe shall be tested every 100 lengths of each type, grade, and size pipe produced.
- D. Chemical Resistance: Pipe shall meet or exceed the requirements of ASTM D3262 Table 4 when tested in accordance with ASTM D3681.
- E. In addition to production tests, the Owner requires qualification tests per ASTM D3262 for beam strength. Three tests shall be performed from three randomly selected pipes from the production run. Manufacturer shall submit qualification test data, from pipe manufactured of the same materials used in the pipe production run, to demonstrate compliance with qualification tests for long term chemical test and joint tightness test. Provide certification, sealed by a professional engineer, that materials used in the production run are the same materials used in manufacturing pipe upon which the long term chemical test and joint tightness test were performed.

## 2.5 CUSTOMER INSPECTION

- A. The Owner or the Engineer shall be entitled to inspect pipes and witness the manufacturing process.

## 2.6 PACKAGING, HANDLING, AND SHIPPING

- A. Packaging, handling, and shipping shall be performed in accordance with the Manufacturer's instructions.

# PART 3 - EXECUTION

## 3.1 INSTALLATION

- A. Installation: The Bedding, backfill and general installation requirements of pipe shall be in accordance with the project plans and specifications and the manufacturer's recommended practices.
- B. Pipe Handling: Use of slings, ropes or forklift is recommended. Do not use chains or cables. Lifting holes shall not be allowed.
- C. Jointing:
  - 1. Thoroughly clean the pipe bell coupling grooves and rubber gaskets to ensure no dirt is present.
  - 2. Apply a pipe lubricant to the pipe ends and gaskets. Use only the lubricant supplied by the manufacturer.
  - 3. Use suitable methods to push or pull the pipes together without damaging the pipes.

4. Contact manufacturer for maximum angular deflection allowed.
- D. Trench Shoring: Sheeting or shoring installed below the top of pipe and within 2 pipe diameters of the pipe to support the trench wall, shall be left in place. Sheeting or shoring shall be cut off no closer than 1.5 feet above the top of pipe and no less than 2 feet below the ground surface. No additional payment will be made for sheeting or shoring left in place.
- E. Bedding shall extend the full width of trench, 6-inches below the pipe and a minimum of 6-inches above the top of pipe. Bedding shall be installed per the pipe manufacturer's recommendations. Bedding is considered incidental to the pipe installation and no separate payment for bedding shall be made. Bedding shall be MSD #1 or #2.
- F. Field Test:
  1. Infiltration/Exfiltration Test: Maximum allowable leakage shall not exceed Owner's specification requirements.
  2. Low Pressure Air Test: Each run of pipe may be tested with air pressure (max 5 psi). The system passes the test if the pressure drop due to leakage through the pipe or pipe joints is less than or equal to the specified amount over the prescribed time period.
  3. Individual Joint Testing: For pipes large enough for man entry; individual joints may be pressure tested with a portable tester to 5 psi max. with air or water in lieu of line infiltration, exfiltration, or air testing.
  4. Deflection: Maximum allowable long-term deflection shall not exceed 5% of the initial diameter.

**END OF SECTION**

**JSP-SEWER, EXHIBIT 1**

**METROPOLITAN ST. LOUIS SEWER  
DISTRICT PRE-QUALIFIED DEEP SEWER  
CONSTRUCTION CONTRACTOR LIST**

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JSP-SEWER, EXHIBIT 1: METROPOLITAN ST. LOUIS SEWER DISTRICT PRE-QUALIFIED DEEP SEWER CONSTRUCTION CONTRACTOR LIST  
 CSO - Mary Avenue South of Manchester CSO Interceptor (I-132)/Outfall (L-106) Elimination Phase I (MoDOT) (13404):  
 MODOT COMPONENT

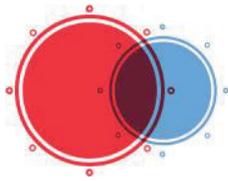
CONTRACTOR	CONTACT & ADDRESS	CITY	ST	ZIP CODE	PHONE #	FAX #	EMAIL
BATES UTILITY COMPANY INC	TIMOTHY BATES 841 WESTWOOD INDUSTRIAL PARK DR	WELDON SPRING	MO	63304	636-939-5628	636-939-5615	<a href="mailto:TIMBATES@BATESUTILITY.NET">TIMBATES@BATESUTILITY.NET</a>
CASTLE CONTRACTING LLC	AARON RETHERFORD 345 MARSHALL AVE STE 302	WEBSTER GROVES	MO	63119	314-421-0042	314-231-9157	<a href="mailto:AARON.RETHERFORD@DIGCASTLE.COM">AARON.RETHERFORD@DIGCASTLE.COM</a>
FRED M LUTH & SONS INC	ATTN: WILLIAM L LUTH 4516 MCREE AVENUE	ST LOUIS	MO	63110	314-771-3892	314-771-4486	<a href="mailto:ESTIMATING@FREDMLUTH.COM">ESTIMATING@FREDMLUTH.COM</a>
GERSHENSON CONSTRUCTION COMPANY	#2 TRUITT DR	EUREKA	MO	63025	636-938-9595	636-938-9501	<a href="mailto:LGALLOWAY@GERSHENSON.COM">LGALLOWAY@GERSHENSON.COM</a>
GOODWIN BROTHERS CONSTRUCTION	DOUG WACHSNICHT 4885 BAUMGARTNER ROAD	ST LOUIS	MO	63129	636-931-6084	636-931-6085	<a href="mailto:ESTIMATING@GOODWINBROS.COM">ESTIMATING@GOODWINBROS.COM</a>
J&J BORING INC	ATTN: JENNIFER BOUQUET PO BOX 357	WINFIELD	MO	63389	636-566-6766	636-668-6816	<a href="mailto:JENNIFER@JJBORING.COM">JENNIFER@JJBORING.COM</a>
JH BERRA CONSTRUCTION COMPANY INC	FRANCIS BERRA 5091 NEW BAUMGARTNER ROAD	ST LOUIS	MO	63129	314-487-5617	314-487-5817	<a href="mailto:FBERRA@JHBERRA.COM">FBERRA@JHBERRA.COM</a>
KCI CONSTRUCTION COMPANY	THOMAS HUSTER 10315 LAKE BLUFF DRIVE	ST LOUIS	MO	63123	314-200-6473	314-894-7418	<a href="mailto:TOMHUSTER@KCICONSTRUCTION.COM">TOMHUSTER@KCICONSTRUCTION.COM</a>
KELPE CONTRACTING INC	TOM KELPE 17955 MANCHESTER ROAD	WILDWOOD	MO	63038-0100	636-458-1400	636-458-1902	<a href="mailto:MWARNECKE@KELPE.COM">MWARNECKE@KELPE.COM</a>
KOLB GRADING LLC	5731 WESTWOOD DR	ST CHARLES	MO	63304	636-441-0200	636-441-8291	<a href="mailto:R.MYER@KOLBGRADING.COM">R.MYER@KOLBGRADING.COM</a>
L KEELEY CONSTRUCTION COMPANY	ATTN: BRAD BIDERMAN 500 S. EWING AVENUE SUITE G	ST LOUIS	MO	63103	314-598-3242	314-421-2266	<a href="mailto:BBIDERMAN@LKEELEY.COM">BBIDERMAN@LKEELEY.COM</a>
SAK CONSTRUCTION LLC	BOYD HIRTZ 864 HOFF ROAD	OFALLON	MO	63366	636-385-1000	636-385-1100	<a href="mailto:BIIDCPPC@SAKCON.COM">BIIDCPPC@SAKCON.COM</a>
SOUTHLAND CONTRACTING INC	JANIE RODRIGUEZ 608 HENRIETTA CREEK	ROANOKE	TX	76262	817-293-4263	817-293-5065	<a href="mailto:BIIDING@SOUTHLANDHOLDINGS.COM">BIIDING@SOUTHLANDHOLDINGS.COM</a>
SUPER EXCAVATORS INC	MONIQUE MEAD PRECONSTRUCTION COORDINATOR N59 W14601 BOBOLINK AVE	MENOMONEE FALLS	WI	53051	415-508-0318	262-252-3406	<a href="mailto:PLANS@SUPEREXCAVATORS.COM">PLANS@SUPEREXCAVATORS.COM</a>
UNNERSTALL CONTRACTING CO LLC	STEPHEN UNNERSTALL 2803 WEST OSAGE	PACIFIC	MO	63069	636-257-3003	636-257-3012	<a href="mailto:UCC2803@HOTMAIL.COM">UCC2803@HOTMAIL.COM</a>

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**JSP-SEWER, EXHIBIT 2**  
**GEOTECHNICAL DATA REPORT**  
**(GDR)**

- **March 20, 2020 GDR**
- **April 13, 2018 Partial GDR for Borings B17-1 & B17-2**

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# 7NT

Integrity. Reliability. Performance.

1033 CORPORATE SQUARE DRIVE  
ST LOUIS, MISSOURI 63132

March 20, 2020

Ms. Erin Jearls, PE  
HDR  
401 South 18<sup>th</sup> Street, Suite 300  
St. Louis, MO 63103

**Re: Geotechnical Data Report for the CSO – Mary South of Manchester CSO  
Interceptor (I-132)/Outfall (L-106) Elimination – Phase I (13404)  
St. Louis, Missouri  
7NT Number: D140-MO**

Dear Ms. Jearls:

7NT is pleased to submit the Geotechnical Data Report for the CSO – Mary South of Manchester CSO Interceptor (I-132)/Outfall (L-106) Elimination – Phase I (13404) in St. Louis, Missouri.

Assessment of site environmental conditions, including the detection of pollutants in the soil or groundwater, were beyond the scope of this exploration. However, had any contaminated soils been encountered, or any peculiar odors detected, the client would have been notified immediately.

## ***Field Investigations***

Phase 1 of the geotechnical field exploration was conducted by 7NT from August 27<sup>th</sup> to November 7<sup>th</sup>, 2019. Nine (9) borings were drilled for Phase 1 to maximum depths of 45 feet below ground surface (bgs) before being put on hold. Phase 1 was continued from January 17<sup>th</sup> to January 21<sup>st</sup>, 2020. Four (4) borings were drilled for the continued Phase I portion to maximum depths of 36.4 feet bgs. The boring locations and depths are summarized in the *Boring Locations* table. The boring locations are shown in the attached boring location plan. Boring logs are attached.

The borings were drilled utilizing hollow stem augers powered by a truck mounted CME 75 drill rig, a track mounted CME 55 drill rig, or an ATV mounted CME 550X drill rig. Standard Penetration Testing (SPT), utilizing a split spoon sampler, was conducted at 2.5-foot intervals to 10 feet and at 5.0-foot intervals to sampler refusal. Soil samples were collected at the borings and sealed in jars to prevent moisture loss. The soil samples were transported to the 7NT Laboratory for visual classification and laboratory testing.

## **Boring Locations**

<b>Boring No.</b>	<b>Approximate Location</b>	<b>North (degrees)</b>	<b>West (degrees)</b>	<b>Total Depth (feet)</b>
B19-1	South side of Manchester Road, east of Mary Avenue	38.61246	90.34657	45.5
B19-2	North side of Manchester Road, east of Mary Avenue	38.61251	90.34644	45.0
B19-3	Apartment complex, east end of Magdalene Avenue	38.61305	90.34623	54.3
B19-4	South side of Manchester Road, east of Mary Avenue	38.61244	90.34653	46.0
B19-5	South end of Bompert Avenue	38.61052	90.34477	21.0
B19-6	South property line of 2748 Mary Avenue	38.61103	90.34513	28.0
B19-7	Southeast corner of Mary Avenue and Brentshire Walk	38.61115	90.34589	20.5
B19-8	Executive Walk Apartments, east parking lot	38.61044	90.34695	26.3
B19-9	Southwest corner of 8710 Manchester Avenue	38.61151	90.34671	31.0
B19-1A	2748 Mary Avenue, center of property	38.61139	90.34528	34.4
B19-2A	Southeast corner of Mary Avenue and Manchester Road	38.61250	90.34500	28.3
B19-3A	Between Mary Avenue and Dorothy Avenue near Van Mark Way	38.61278	90.34500	31.2
B19-4A	Between Mary Avenue and Dorothy Avenue, north of B19-3A	38.61361	90.34500	36.4

Bedrock was cored using diamond bits and triple tube, swivel type, M design barrels with split inner barrel, and water as a drilling fluid. The inner barrel was retrieved and split open to expose the core for logging after each run. The cores were placed in wooden boxes with hooked lids. Core samples were collected from the rock for testing.

Each core run was logged while still in one-half of the split inner core barrel, and the Rock Quality Designation was determined according to ASTM D6032.

The groundwater conditions were monitored during drilling and after removal of augers. The groundwater levels are provided in the individual boring logs attached to this report.

### ***Subsurface Soil Conditions***

The subsurface conditions encountered consisted of fill and clay soils overlaying predominantly Limestone bedrock.

Cohesive fill and clay soils were encountered in all borings from immediately below the surface conditions to depths up to 41.3 feet bgs. SPT blow counts (N values) in the fill and clay ranged from weight of hammer to 30 blows per foot (bpf) indicating a very soft to hard consistency. Moisture Contents in the Clay and Silty Clay ranged from 7.8 to 97.3 percent. The cohesive fill and clay soils were classified as CH, CL, and CL-ML under the Unified Soil Classification System (USCS).

Cohesionless gravel soils were encountered in boring B-19-1A at depths between 22.0 feet and 28.4 feet bgs. N value in the gravel soil was 19 bpf indicating a medium dense relative density. Moisture content in the gravel soil was 46.1 percent. The gravel soil was classified as GC under the USCS.

Bedrock was encountered in all borings at depths varying from 5.3 to 41.3 feet bgs. The bedrock consisted of predominately Limestone. The Limestone was light gray to gray in color, moderately strong to very strong, and moderately fractured. Claystone, gray and soft, was present in B19-3 from 48.5 feet bgs to boring termination at 54.3 feet bgs. Voids were encountered in B19-1 from 26.0 to 29.2 feet, in B19-2 from 26.5 to 28.3 feet, in B19-4 from 25.7 to 28.6 feet, B19-9 from 22.4 to 23.5 feet, and B19-1A from 31.4 to 31.9 feet bgs.

Groundwater was encountered while drilling in eight borings at depths ranging from 6.0 to 29.5 feet bgs. Groundwater was present at the completion of drilling and removal of augers in seven borings at depths ranging from 7.5 to 30.5 feet bgs. The groundwater conditions observed reflect the conditions at the time of our exploration only. Fluctuations of the groundwater table should be expected to occur both seasonally and annually due to variations in rainfall, evaporation, transpiration, construction activities, and other site-specific factors.

Generalized descriptions of the subsurface conditions encountered at the project site are given above. More detailed descriptions are given in the attached boring logs. The stratification lines shown on the boring logs do not represent exact geological planes but approximate transitions between soil & rock types.

### ***Void Investigation***

Further investigation of the bedrock voids was performed in boring B19-4 on October 30, 2019. Investigation methods included borehole sonar, optical televiwing, and acoustic televiwing. The investigation determined that the voids are filled with water and loose cobbles. The cobbles appeared angular and varied in size from approximately 4-inch diameter to 12-inch diameter. Borehole sonar was not able to determine the horizontal extents of the voids due to presence of the cobbles. Results of the optical and acoustic televiwing are attached.

## Laboratory Test Results

Moisture content tests per ASTM D 2216, twenty (28) Atterberg Limits test per ASTM D 4318, and thirteen (13) sieve and hydrometer analysis tests per ASTM D 422 & ASTM D 1140 were conducted on selected representative split spoon samples. The *Soil Classification Test Results* table lists the Atterberg Limits and sieve and hydrometer analysis test results.

### Soil Classification Test Results

Boring No.	Depth (feet)	Soil Classification	Particle Size Distribution				Atterberg Limits		
		USCS	Gravel %	Sand %	Silt %	Clay %	LL	PL	PI
B19-1	8.5 – 10.0	Lean CLAY (CL)	--	--	--	--	34	16	18
B19-1	13.5 – 15.0	Fat CLAY (CH)	16.6	9.0	36.4	38.0	58	19	39
B19-2	1.0 – 2.5	Fat CLAY (CH)	1.6	5.8	14.2	78.4	102	31	71
B19-2	3.5 – 5.0	Fat CLAY (CH)	--	--	--	--	101	35	66
B19-3	13.5 – 15.0	Fat CLAY (CH)	--	--	--	--	71	18	53
B19-3	18.5 – 20.0	Fat CLAY (CH)	--	--	--	--	65	17	48
B19-3	28.5 – 30.0	Lean CLAY (CL)	5.1	34.4	35.7	24.8	29	17	12
B19-4	2.5 – 4.0	Clayey SAND (SC)	30.1	30.2	27.0	12.7	28	17	11
B19-4	12.0 – 13.5	Fat CLAY (CH)	--	--	--	--	72	25	47
B19-5	3.5 – 5.0	Lean CLAY (CL)	--	--	--	--	31	23	8
B19-5	13.5 – 15.0	Silty CLAY (CL-ML)	0.0	17.7	65.9	16.4	27	20	7
B19-6	3.5 – 5.0	Silty SAND (SM)	27.0	60.7	8.6	3.7	NP	NP	NP
B19-6	13.5 – 15.0	Lean SILT (ML)	--	--	--	--	26	22	4
B19-6	18.5 – 20.0	Silty CLAY (CL-ML)	--	--	--	--	21	15	6
B19-7	1.0 – 2.5	Lean SILT (ML)	--	--	--	--	29	23	6
B19-7	8.5 – 10.0	Lean SILT (ML)	0.8	9.8	70.9	17.5	28	24	4
B19-8	8.5 – 10.0	Lean CLAY (CL)	0.0	2.9	74.0	23.1	30	21	9
B19-8	13.5 – 15.0	Silty CLAY (CL-ML)	--	--	--	--	28	21	7
B19-9	3.5 – 5.0	Lean CLAY (CL)	--	--	--	--	31	19	12
B19-9	6.0 – 7.5	Clayey SAND (SC)	25.5	29.1	31.2	14.2	30	18	12
B19-1A	6.0 – 7.5	Fat CLAY (CH)	--	--	--	--	51	17	34
B19-1A	18.5 – 20.0	Silty CLAY (CL-ML)	0.0	4.8	77.3	17.9	28	22	6
B19-1A	23.5 – 25.0	Clayey GRAEL (GC)	37.3	30.3	23.8	8.6	27	17	10
B19-2A	13.5 – 15.0	Lean CLAY (CL)	--	--	--	--	34	20	14
B19-3A	1.0 – 2.5	Lean CLAY (CL)	--	--	--	--	37	22	15
B19-3A	13.5 – 15.0	Lean CLAY (CL)	16.0	28.9	29.0	26.1	40	16	24
B19-4A	8.5 – 10.0	Lean CLAY (CL)	0.0	2.7	65.3	32.0	41	17	24
B19-4A	18.5 – 20.0	Fat CLAY (CH)	--	--	--	--	57	19	38

Twenty-two (22) Uniaxial Compressive Strength tests per ASTM D 7012 Method C were conducted on selected representative rock core samples. The *Rock Test Results* table lists the rock core test results.

**Rock Test Results**

Boring No.	Depth (feet)	Uniaxial Compressive Strength (psi)
B19-1	17.8 – 20.2	16,025
B19-1	32.1 – 32.6	6,312
B19-1	43.3 – 43.8	13,081
B19-2	11.7 – 12.2	22,356
B19-2	22.2 – 22.7	19,019
B19-2	35.3 – 35.8	16,648
B19-2	41.1 – 41.7	21,589
B19-4	16.5 – 17.0	10,608
B19-4	22.6 – 23.1	14,935
B19-4	30.5 – 31.0	5,916
B19-4	33.5 – 34.0	12,793
B19-4	36.3 – 36.8	11,641
B19-4	42.0 – 42.5	6,644
B19-7	19.8 – 20.3	15,317
B19-8	22.5 – 23.0	24,701
B19-9	16.0 – 16.5	17,643
B19-9	24.6 – 25.1	13,883
B19-9	28.0 – 28.5	25,500
B19-1A	32.1 – 32.5	6,726
B19-2A	23.6 – 24.0	8,227
B19-3A	25.4 – 25.8	4,844
B19-4A	28.0 – 28.4	8,630

## ***Limitations of Liability***

The soils and rock encountered in the borings varied between locations. Other discontinuities in soil & rock type and geology may exist, including abrupt strata changes and soil & rock strength variations. The extent of these variations may not be fully determined from the borings or site reconnaissance. Additional variations may not become apparent until mass excavation commences.

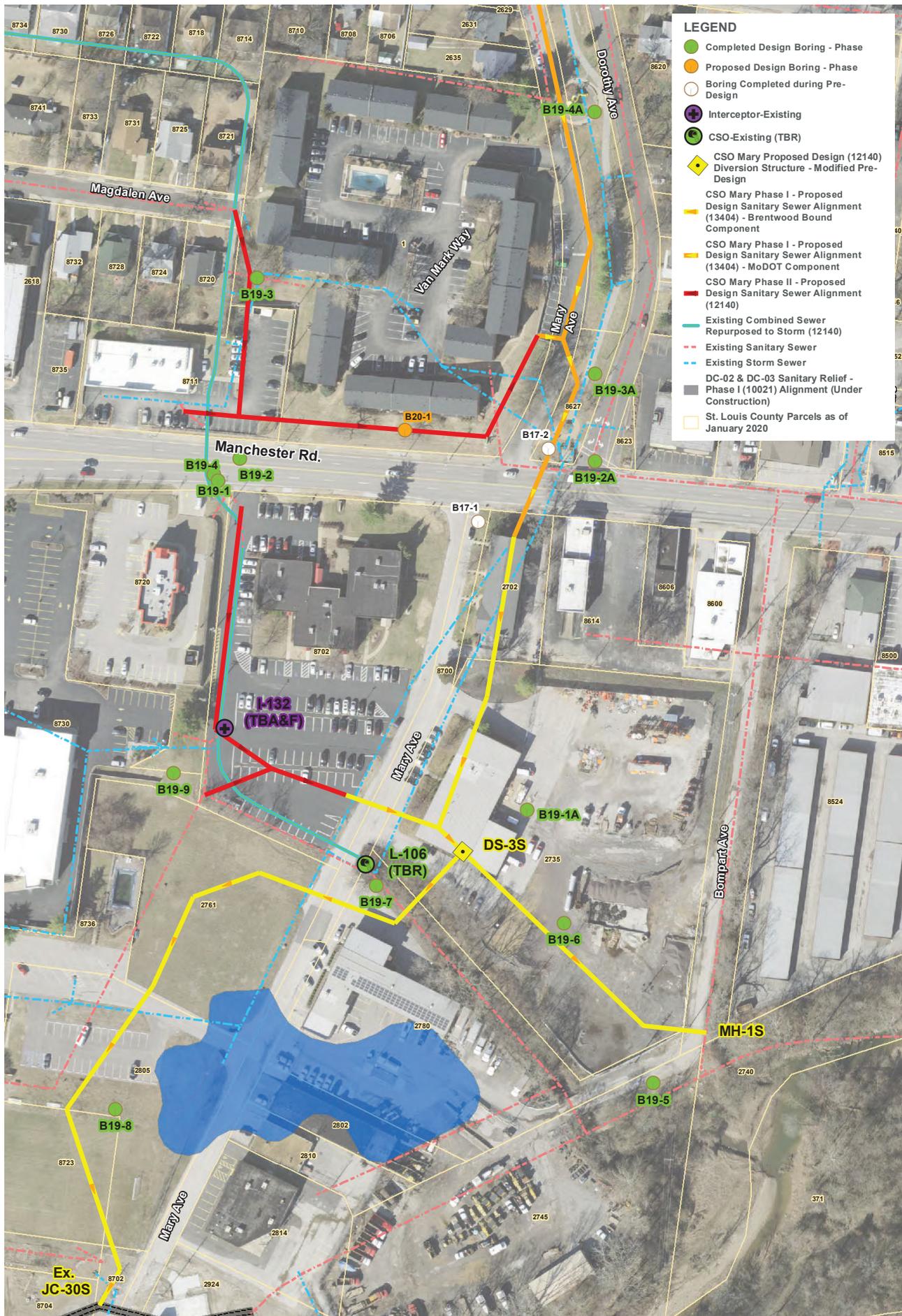
We appreciate the opportunity to offer these services. If you have any questions regarding this report or if we may be of further assistance to you, please contact our office at 937-435-3200.

Respectfully,  
7NT



Monica M. Oakes  
Project Manager

**Attachments:** Boring Location Plan  
Logs of Test Borings  
Acoustic and Optical Televiewing Logs  
Laboratory Test Results



**LEGEND**

- Completed Design Boring - Phase
- Proposed Design Boring - Phase
- Boring Completed during Pre-Design
- ⊕ Interceptor-Existing
- ⊖ CSO-Existing (TBR)
- ◆ CSO Mary Proposed Design (12140) Diversion Structure - Modified Pre-Design
- CSO Mary Phase I - Proposed Design Sanitary Sewer Alignment (13404) - Brentwood Bound Component
- CSO Mary Phase I - Proposed Design Sanitary Sewer Alignment (13404) - MoDOT Component
- CSO Mary Phase II - Proposed Design Sanitary Sewer Alignment (12140)
- Existing Combined Sewer Repurposed to Storm (12140)
- Existing Sanitary Sewer
- Existing Storm Sewer
- DC-02 & DC-03 Sanitary Relief - Phase I (10021) Alignment (Under Construction)
- St. Louis County Parcels as of January 2020

## BORING LOG LEGEND AND BORING LOGS

	ASPHALT		GYPSUM		SILT STONE
	BEDROCK		LIMESTONE		SILTY SAND
	BOULDERS AND COBBLES		PLASTIC SILT		POORLY-GRADED SAND
	BRECCIA		SILT		POORLY-GRADED SAND WITH CLAY
	HIGH PLASTIC CLAY		GRAVELY SILT		POORLY-GRADED SAND WITH SILT
	LOW PLASTIC CLAY		SANDY SILT		POORLY-GRADED GRAVELY SAND
	CHALK		HIGH PLASTICITY ORGANIC SILT OR CLAY		WELL-GRADED SAND
	CONCRETE		LOW PLASTICITY ORGANIC SILT OR CLAY		WELL-GRADED SAND WITH CLAY
	CORAL		PEAT		WELL- GRADED SAND WITH SILT
	FILL		SANDSTONE		WELL-GRADED GRAVELY SAND
	LOW TO HIGH PLASTICITY CLAY		CLAYEY SAND		GLACIAL TILL
	LOW PLASTICITY SILTY CLAY		POORLY-GRADED GRAVEL WITH SILT		TOPSOIL
	LOW PLASTICITY GRAVELY CLAY		POORLY-GRADED SANDY GRAVEL		BASALT
	LOW PLASTICITY SANDY CLAY		WELL-GRADED GRAVEL		POORLY-GRADED GRAVEL WITH CLAY
	COAL		WELL-GRADED GRAVEL WITH CLAY		
	CLAYEY GRAVEL		WELL-GRADED GRAVEL WITH SILT		
	SILTY GRAVEL		WELL-GRADED SANDY GRAVEL		
	POORLY-GRADED GRAVEL		SHALE		

### BORING LOG LEGEND



531 East 3rd STREET, DAYTON, OHIO 45402  
(937) 435-3200 FAX (937) 291-6549



# LOG OF TEST BORING

BORING NO.: B19-1 (Sheet 1/1)

CLIENT: HDR  
 PROJECT: Mary Avenue CSO  
 LOCATION: St Louis, MO  
 PROJECT NO: D140-MO DRILLER/INSP: D. Shope  
 BORING METHOD: 2.25" HSA RIG TYPE: CME 75

DATE STARTED: 8-27-19 COMPLETED: 8-28-19  
 TEMPERATURE/WEATHER: Sunny, 88 Degrees  
 NORTH: 38.61246 EAST: -90.34657  
 ELEVATION: \_\_\_\_\_ LINE: \_\_\_\_\_  
 CORE SIZE: HQ3 HAMMER: Auto

ELEV. (FEET)	DEPTH SCALE (FEET)	LAYER THICKNESS	GRAPHIC LOG	SAMPLE DESCRIPTION	SAMPLE			BLOWS PER 6 INCHES	SPT N	M/C (%)	RQD PP*
					NO.	TYPE REC	DEPTH (FEET)				
1	0.3		ASPHALT (4")								
2	0.7		CONCRETE (8")								
3			Soft to Medium Stiff Dark Gray Silty Clayey SAND, few gravel, trace rock fragments, fill debris, moist (FILL)	1	SS	1	5 - 3 - 1	4			
4	5.5			2	SS	2.5	2 - 4 - 5	9	7.8		
5			Medium Stiff to Soft Brown CLAY, little silty sand, few rock fragments, moist (CL)	3	SS	3.5	2 - 4 - 4	8	10.0		
6				4	SS	5	1 - 2 - 2	4	16.3		
7						6					
8						7.5					
9						8.5					
10	7.0					10					
11											
12											
13											
14	1.3		Stiff Red/Brown CLAY, little gravel, few sand, moist (CH)	5	SS	13.5	8 - 50/3" -	50+			
15			Light Gray/White, Moderately Fractured LIMESTONE	1	RC	14.8	- -				100%
16				2	RC	14.8	- -				63%
17						16					
18						16					
19						26					
20	8.0		19.8': 16,025 psi								
21											
22											
23			Light Brown with Gray Specks, Moderately Fractured LIMESTONE								
24	3.2										
25											
26			VOID	3	RC	26	- -				67%
27	3.2					36					
28											
29											
30			Gray, Moderately Fractured LIMESTONE								
31	4.7										
32											
33			32.1': 6,312 psi								
34			@ 33.4' to 33.9' Vuggy (Sparry) Limestone								
35			Light Gray/White, Moderately Fractured LIMESTONE	4	RC	36	- -				88%
36	4.2					45.5					
37											
38			Gray, Moderately Fractured LIMESTONE								
39											
40	4.7										
41											
42											
43			Light Gray/White, Moderately Fractured LIMESTONE								
44	1.0										
45	1.7		43.3': 13,081 psi								
46			Gray, Moderately Fractured LIMESTONE								
47			Boring Terminated at 45.5 feet								
48											
49											

\* Pocket Penetrometer Reading - Unconfined Compressive Strength, Tons/Sq.Ft.

**Ground Water Observations:**

DATE	TIME	CASING DEPTH	CAVE-IN	BAILED	WATER LEVEL
8/27/19		13.5			None

**BORING METHOD**

HSA - Hollow Stem Augers  
 CFA - Continuous Flight Augers  
 DC - Driving Casings  
 MD - Mud Drillings

**SAMPLE TYPE**

SS - Split Spoon  
 ST - Shelby Tube  
 CA - Continuous Auger  
 RC - Rock Core  
 CU - Cuttings  
 CT - Continuous Tube

Remarks: \_\_\_\_\_

BORING LOG REPORT D140-MO.GPJ 7NT TEMPLATE.GDT 11/13/19



# LOG OF TEST BORING

BORING NO.: B19-2 (Sheet 1/1)

CLIENT: HDR  
 PROJECT: Mary Avenue CSO  
 LOCATION: St Louis, MO  
 PROJECT NO: D140-MO DRILLER/INSP: D. Shope  
 BORING METHOD: 2.25" HSA RIG TYPE: CME 75

DATE STARTED: 8-30-19 COMPLETED: 9-4-19  
 TEMPERATURE/WEATHER: Sunny, 90 Degrees  
 NORTH: 38.61251 EAST: -90.34644  
 ELEVATION: \_\_\_\_\_ LINE: \_\_\_\_\_  
 CORE SIZE: HQ3 HAMMER: Auto

ELEV. (FEET)	DEPTH SCALE (FEET)	LAYER THICKNESS	GRAPHIC LOG	SAMPLE DESCRIPTION	SAMPLE			BLOWS PER 6 INCHES	SPT N	M/C (%)	RQD PP*
					NO.	TYPE REC	DEPTH (FEET)				
1	0.3			ASPHALT (4")							
2	0.7			CONCRETE (8")	1	SS	1	2 - 3 - 5	8		
3	2.0			Medium Stiff Red/Brown CLAY, few sand, trace gravel, moist (CH)			2.5				
4	2.3			Very Stiff Red/Brown CLAY, few gravel, moist (CH)	2	SS	3.5	19 - 14 - 8	22	36.9	
5				Gray, Slightly to Moderately Fractured LIMESTONE	1	RC	5.3	- -			74%
6				@ 6.5' Light Brown Limestone			11				
7				@ 8.1' Vuggy (Sparry) Limestone							
8					2	RC	11	- -			83%
9				11.7': 22,356 psi			21.1				
10		15.3									
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											
21	0.5			Light Gray, Slightly to Moderately Fractured LIMESTONE	3	RC	21.1	- -			73%
22				Gray, Slightly to Moderately Fractured LIMESTONE			31.1				
23	4.4			22.2': 19,019 psi							
24											
25											
26	1.0			Brownish Gray, Slightly to Moderately Fractured LIMESTONE							
27	1.8			VOID							
28											
29	2.8			Gray, Slightly Fractured LIMESTONE							
30											
31	0.8			Light Gray, Slightly Fractured LIMESTONE	4	RC	31.1	- -			87%
32	1.4			Gray, Slightly Fractured LIMESTONE			41.1				
33				@ 33.0' to 33.1' Vuggy (Sparry) Limestone							
34				Light Gray, Slightly Fractured LIMESTONE							
35				35.3': 16,648 psi							
36											
37											
38											
39	11.7										
40											
41											
42					5	RC	41.1	- -			100%
43							45				
44											
45											
46				Boring Terminated at 45.0 feet							
47											
48											
49											

\* Pocket Penetrometer Reading - Unconfined Compressive Strength, Tons/Sq.Ft.

**Ground Water Observations:**

DATE	TIME	CASING DEPTH	CAVE-IN	BAILED	WATER LEVEL
8/30/19		3.5			None

**BORING METHOD**

HSA - Hollow Stem Augers  
 CFA - Continuous Flight Augers  
 DC - Driving Casings  
 MD - Mud Drillings

**SAMPLE TYPE**

SS - Split Spoon  
 ST - Shelby Tube  
 CA - Continuous Auger  
 RC - Rock Core  
 CU - Cuttings  
 CT - Continuous Tube

Remarks: At 5' Augers began kicking and walking to the boring was moved 6' east. Drilling without sampling was performed in offset boring to top of rock, 5.3'.

BORING LOG REPORT D140-MO.GPJ 7NT TEMPLATE.GDT 11/13/19



# LOG OF TEST BORING

BORING NO.: B19-3 (Sheet 1/1)

CLIENT: HDR  
 PROJECT: Mary Avenue CSO  
 LOCATION: St Louis, MO  
 PROJECT NO: D140-MO DRILLER/INSP: D. Shope  
 BORING METHOD: 2.25" HSA RIG TYPE: CME 55

DATE STARTED: 10-16-19 COMPLETED: 10-16-19  
 TEMPERATURE/WEATHER: Sunny, 50 Degrees  
 NORTH: 38.61305 EAST: -90.34623  
 ELEVATION: \_\_\_\_\_ LINE: \_\_\_\_\_  
 CORE SIZE: HQ3 HAMMER: Auto

ELEV. (FEET)	DEPTH SCALE (FEET)	LAYER THICKNESS	GRAPHIC LOG	SAMPLE DESCRIPTION	SAMPLE			BLOWS PER 6 INCHES	SPT N	M/C (%)	RQD PP*
					NO.	TYPE REC	DEPTH (FEET)				
1	0.3			TOPSOIL (4")	1	GRAB	1	- -			
2				Brown CLAY, trace sand, trace gravel, moist (CL)	2	GRAB	1.5	- -			
3					3	GRAB	2	- -			
4	5.7				4	GRAB	2.5	- -			
5					5	GRAB	3	- -			
6					1	SS	3.5	5 - 11 - 16	27		
7	2.0			Very Stiff Brown CLAY, moist (CL)							
8				Stiff Brown CLAY, moist (CL)	2	SS	4.5	5 - 7 - 7	14		
9											
10											
11	5.5			Very Stiff Reddish Brown CLAY, trace sand, trace gravel, moist (CL)							
12											
13											
14											
15											
16	5.0			Hard Red & Brown CLAY, trace gravel, moist (CL)	3	SS	8.5	32 - 11 - 16	27		
17											
18											
19											
20	5.0			Medium Stiff Red & Brown CLAY, trace gravel, weathered limestone rock fragments, moist (CL)	4	SS	18.5	32 - 52 - 23	75		
21											
22											
23											
24											
25	10.0			Hard Gray CLAY (Weathered Limestone), moist (CL)	5	SS	23.5	2 - 4 - 6	10		
26											
27											
28				Soft Highly Fractured Gray LIMESTONE, clay seams	6	SS	28.5	1 - 2 - 5	7		
29											
30				Hard Gray CLAY (Weathered Limestone), moist (CL)	7	SS	33.5	50/3" - -	50+		
31											
32	7.8			Soft Highly Fractured Gray LIMESTONE, clay seams	8	SS	38.5	50/5" - -	50+		
33											
34				Soft Highly Fractured Gray CLAYSTONE, with limestone seams	1	RC	41.3	- -			20%
35											
36											
37	7.2			Soft Highly Fractured Gray CLAYSTONE, with limestone seams	2	RC	46.3	- -			10%
38											
39				Soft Highly Fractured Gray CLAYSTONE, with limestone seams	3	RC	51.3	- -			27%
40											
41	5.8			Soft Highly Fractured Gray CLAYSTONE, with limestone seams							
42											
43				Soft Highly Fractured Gray CLAYSTONE, with limestone seams							
44											
45				Soft Highly Fractured Gray CLAYSTONE, with limestone seams							
46											
47				Soft Highly Fractured Gray CLAYSTONE, with limestone seams							
48											
49				Soft Highly Fractured Gray CLAYSTONE, with limestone seams							
50											
51				Soft Highly Fractured Gray CLAYSTONE, with limestone seams							
52											
53				Soft Highly Fractured Gray CLAYSTONE, with limestone seams							
54											
55				Soft Highly Fractured Gray CLAYSTONE, with limestone seams							
56											
57				Soft Highly Fractured Gray CLAYSTONE, with limestone seams							
58											
59				Soft Highly Fractured Gray CLAYSTONE, with limestone seams							

\* Pocket Penetrometer Reading - Unconfined Compressive Strength, Tons/Sq.Ft.

**Ground Water Observations:**

DATE	TIME	CASING DEPTH	CAVE-IN	BAILED	WATER LEVEL
10/16/19		33.5			29.5
10/16/19			54.3		30.5
10/17/19			53.0		28.5

**BORING METHOD**

HSA - Hollow Stem Augers  
 CFA - Continuous Flight Augers  
 DC - Driving Casings  
 MD - Mud Drillings

**SAMPLE TYPE**

SS - Split Spoon  
 ST - Shelby Tube  
 CA - Continuous Auger  
 RC - Rock Core  
 CU - Cuttings  
 CT - Continuous Tube

Remarks: \_\_\_\_\_



# LOG OF TEST BORING

BORING NO.: B19-4 (Sheet 1/1)

CLIENT: HDR  
 PROJECT: Mary Avenue CSO  
 LOCATION: St Louis, MO  
 PROJECT NO: D140-MO DRILLER/INSP: D. Shope  
 BORING METHOD: 2.25" HSA RIG TYPE: CME 75

DATE STARTED: 10-29-19 COMPLETED: 10-31-19  
 TEMPERATURE/WEATHER: Windy, 40 Degrees  
 NORTH: 38.61244 EAST: -90.34653  
 ELEVATION: \_\_\_\_\_ LINE: \_\_\_\_\_  
 CORE SIZE: HQ3 HAMMER: Auto

ELEV. (FEET)	DEPTH SCALE (FEET)	LAYER THICKNESS	GRAPHIC LOG	SAMPLE DESCRIPTION	SAMPLE			BLOWS PER 6 INCHES	SPT N	M/C (%)	RQD PP*
					NO.	TYPE REC	DEPTH (FEET)				
1	0.3		ASPHALT (4")								
2	0.5		CONCRETE (6")								
3	0.5		AGGREGATE BASE (6")								
4	4.7		Medium Stiff Brown CLAY, few sand, few gravel, moist (CL)	1	SS	2.5 4	5 - 3 - 4	7			
6			Stiff Brown CLAY, few sand, few gravel, moist (CL)								
8				2	SS	7.5 9	2 - 4 - 6	10			
9	6.5										
13			Medium Stiff Brown CLAY, few sand, trace gravel, moist (CL)	3	SS	12 13.5	13 - 3 - 4	7			
14	2.0										
15			Hard Gray Moderately Fractured LIMESTONE	1	RC	14.5	- -				24%
16				2	RC	16.2	- -				70%
17						16.2					
18						26.6					
20	11.2										
26			VOID - some rock fragments recovered								
27	2.9			3	RC	26.6 36.3	- -				71%
28			Hard Gray Moderately Fractured LIMESTONE								
37	17.4			4	RC	36.3 46	- -				96%
46			Boring Terminated at 46.0 feet								

\* Pocket Penetrometer Reading - Unconfined Compressive Strength, Tons/Sq.Ft.

**Ground Water Observations:**

DATE	TIME	CASING DEPTH	CAVE-IN	BAILED	WATER LEVEL
10/29/19			44.0		26.0
10/31/19			43.5		26.0

**BORING METHOD**

HSA - Hollow Stem Augers  
 CFA - Continuous Flight Augers  
 DC - Driving Casings  
 MD - Mud Drillings

**SAMPLE TYPE**

SS - Split Spoon  
 ST - Shelby Tube  
 CA - Continuous Auger  
 RC - Rock Core  
 CU - Cuttings  
 CT - Continuous Tube

Remarks: \_\_\_\_\_



# LOG OF TEST BORING

BORING NO.: B19-5 (Sheet 1/1)

CLIENT: HDR  
 PROJECT: Mary Avenue CSO  
 LOCATION: St Louis, MO  
 PROJECT NO: D140-MO DRILLER/INSP: D. Shope  
 BORING METHOD: 2.25" HSA RIG TYPE: CME 75

DATE STARTED: 11-7-19 COMPLETED: 11-7-19  
 TEMPERATURE/WEATHER: Windy, 40 Degrees  
 NORTH: 38.61052 EAST: -90.34477  
 ELEVATION: \_\_\_\_\_ LINE: \_\_\_\_\_  
 CORE SIZE: HQ3 HAMMER: Auto

ELEV. (FEET)	DEPTH SCALE (FEET)	LAYER THICKNESS	GRAPHIC LOG	SAMPLE DESCRIPTION	SAMPLE			BLOWS PER 6 INCHES	SPT N	M/C (%)	RQD PP*
					NO.	TYPE REC	DEPTH (FEET)				
1	0.3			GRAVEL (3")							
2	2.8			Medium Stiff Brown Silty CLAY, little gravel, few sand, moist (CL-ML)	1	SS	1 2.5	5 - 4 - 4	8		
3				Soft Brown Silty CLAY, few gravel, few sand, moist (CL-ML)	2	SS	3.5 5	2 - 1 - 2	3		
4	3.0			Soft Gray Silty CLAU, few sand, trace gravel, moist (CL-ML)	3	SS	6 7.5	1 - 1 - 2	3		
5					4	SS	8.5 10	1 - 1 - 2	3		
6					5	SS	13.5 15	1 - WOH - WOH	0		
7					6	SS	18.5	50/2" - -	50+		24%
8					1	RC	18.7 18.9 21	- -			
9				Hard Gray Moderately Fractured LIMESTONE							
10				Boring Terminated at 21.0 feet							
11											
12											
13											
14											
15											
16											
17											
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49											

\* Pocket Penetrometer Reading - Unconfined Compressive Strength, Tons/Sq.Ft.

**Ground Water Observations:**

DATE	TIME	CASING DEPTH	CAVE-IN	BAILED	WATER LEVEL
11/7/19		18.5			None ▾
11/7/19			16.5		9.0 ▾

**BORING METHOD**

HSA - Hollow Stem Augers  
 CFA - Continuous Flight Augers  
 DC - Driving Casings  
 MD - Mud Drillings

**SAMPLE TYPE**

SS - Split Spoon  
 ST - Shelby Tube  
 CA - Continuous Auger  
 RC - Rock Core  
 CU - Cuttings  
 CT - Continuous Tube

Remarks: \_\_\_\_\_



# LOG OF TEST BORING

BORING NO.: B19-6 (Sheet 1/1)

CLIENT: HDR  
 PROJECT: Mary Avenue CSO  
 LOCATION: St Louis, MO  
 PROJECT NO: D140-MO DRILLER/INSP: D. Shope  
 BORING METHOD: 2.25" HSA RIG TYPE: CME 75

DATE STARTED: 11-5-19 COMPLETED: 11-5-19  
 TEMPERATURE/WEATHER: Sunny, 50 Degrees  
 NORTH: 38.61103 EAST: -90.34513  
 ELEVATION: \_\_\_\_\_ LINE: \_\_\_\_\_  
 CORE SIZE: HQ3 HAMMER: Auto

ELEV. (FEET)	DEPTH SCALE (FEET)	LAYER THICKNESS	GRAPHIC LOG	SAMPLE DESCRIPTION	SAMPLE			BLOWS PER 6 INCHES	SPT N	M/C (%)	RQD PP*
					NO.	TYPE REC	DEPTH (FEET)				
1	0.3			GRAVEL (3")	1	SS	1	7 - 9 - 14	23		
2				Very Stiff Dark Gray Silty CLAY FILL, few gravel, conder and wood debris, moist (CL-ML)	2	SS	2.5	10 - 8 - 18	26		
3					3	SS	5				
4	7.8				4	SS	6				
5				Medium Stiff Brown and Gray Mottled Silty CLAY, little sand, trae gravel, moist (CL-ML)	5	SS	7.5	13 - 9 - 13	22		
6					6	SS	8.5				
7				Stiff Brown CLAY, little sand, trace gravel, moist (CL)	7	SS	10	5 - 5 - 4	9		
8					8	SS	13.5				
9				Weathered LIMESTONE	9	SS	15	3 - 4 - 4	8		
10					10	SS	18.5				
11				Hard Gray Fractured LIMESTONE	11	SS	20	3 - 4 - 7	11		
12					12	SS	23.5				
13	11.0			Boring Terminated at 28.0 feet	13	RC	23.4	50/1" - -	50+		40%
14					14	RC	24.5				
15							28				

\* Pocket Penetrometer Reading - Unconfined Compressive Strength, Tons/Sq.Ft.

**Ground Water Observations:**

DATE	TIME	CASING DEPTH	CAVE-IN	BAILED	WATER LEVEL
11/5/19		18.5			17.5
11/5/19			22.0		12.5

**BORING METHOD**

HSA - Hollow Stem Augers  
 CFA - Continuous Flight Augers  
 DC - Driving Casings  
 MD - Mud Drillings

**SAMPLE TYPE**

SS - Split Spoon  
 ST - Shelby Tube  
 CA - Continuous Auger  
 RC - Rock Core  
 CU - Cuttings  
 CT - Continuous Tube

Remarks: \_\_\_\_\_



# LOG OF TEST BORING

BORING NO.: B19-7 (Sheet 1/1)

CLIENT: HDR  
 PROJECT: Mary Avenue CSO  
 LOCATION: St Louis, MO  
 PROJECT NO: D140-MO DRILLER/INSP: D. Shope  
 BORING METHOD: 2.25" HSA RIG TYPE: CME 75

DATE STARTED: 11-15-19 COMPLETED: 11-5-19  
 TEMPERATURE/WEATHER: Sunny, 45 Degrees  
 NORTH: 38.61115 EAST: -90.34589  
 ELEVATION: \_\_\_\_\_ LINE: \_\_\_\_\_  
 CORE SIZE: HQ3 HAMMER: Auto

ELEV. (FEET)	DEPTH SCALE (FEET)	LAYER THICKNESS	GRAPHIC LOG	SAMPLE DESCRIPTION	SAMPLE			BLOWS PER 6 INCHES	SPT N	M/C (%)	RQD PP*
					NO.	TYPE REC	DEPTH (FEET)				
1	0.3			TOPSOIL (3")	1	SS	1	2 - 3 - 5	8		
2	5.3			Medium Stiff Brown & Gray Mottled CLAY, few sand, trace gravel, moist (CL)	2	SS	2.5	2 - 3 - 4	7		
3						3.5					
4	8.5			Soft Gray CLAY, few sand, moist (CL)	3	SS	6	1 - 2 - 2	4		
5						7.5					
6						8.5					
7						10					
8	1.2			Medium Stiff Gray CLAY, moist (CL)	4	SS	8.5	1 - 2 - 2	4		
9						10					
10	5.3			Hard Gray Fractured LIMESTONE	5	SS	13.5	3 - 9 - 21	30		
11						15					
12											
13											
14											
15											
16											
17											
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44											
45											
46											
47											
48											
49											

\* Pocket Penetrometer Reading - Unconfined Compressive Strength, Tons/Sq.Ft.

**Ground Water Observations:**

DATE	TIME	CASING DEPTH	CAVE-IN	BAILED	WATER LEVEL
11/5/19		8.5			8.0
11/5/19			14.0		7.5

**BORING METHOD**

HSA - Hollow Stem Augers  
 CFA - Continuous Flight Augers  
 DC - Driving Casings  
 MD - Mud Drillings

**SAMPLE TYPE**

SS - Split Spoon  
 ST - Shelby Tube  
 CA - Continuous Auger  
 RC - Rock Core  
 CU - Cuttings  
 CT - Continuous Tube

Remarks: \_\_\_\_\_



# LOG OF TEST BORING

BORING NO.: B19-8 (Sheet 1/1)

CLIENT: HDR  
 PROJECT: Mary Avenue CSO  
 LOCATION: St Louis, MO  
 PROJECT NO: D140-MO DRILLER/INSP: C. Pierce III  
 BORING METHOD: 2.25" HSA RIG TYPE: CME 550X

DATE STARTED: 11-6-19 COMPLETED: 11-6-19  
 TEMPERATURE/WEATHER: Sunny, 55 Degrees  
 NORTH: 38.61044 EAST: -90.34695  
 ELEVATION: \_\_\_\_\_ LINE: \_\_\_\_\_  
 CORE SIZE: HQ3 HAMMER: Auto

ELEV. (FEET)	DEPTH SCALE (FEET)	LAYER THICKNESS	GRAPHIC LOG	SAMPLE DESCRIPTION	SAMPLE			BLOWS PER 6 INCHES	SPT N	M/C (%)	RQD PP*
					NO.	TYPE REC	DEPTH (FEET)				
1	0.7			TOPSOIL (8")	1	SS	1	4 - 4 - 5	9		
2	2.3			Medium Stiff Brown CLAY, little sand, trace gravel, moist (CL)			2.5				
3				Soft Brown CLAY, little sand, trace gravel, moist (CL)	2	SS	3.5	2 - 3 - 2	5		
4							5				
5	5.0				3	SS	6	3 - 3 - 3	6		
6							7.5				
7					4	SS	8.5	3 - 4 - 5	9		
8				Medium Stiff Brown CLAY, trace sand, trace gravel, moist (CL)			10				
9	5.0										
10											
11											
12											
13											
14				Stiff Brown and Gray CLAY, trace sand, trace gravel, moist (CL)	5	SS	13.5	4 - 5 - 5	10		
15	5.0						15				
16											
17											
18											
19	1.2			Hard Gray CLAY, some sand, some gravel, moist (CL)	6	SS	18.5	50/4" - -	50+		
20				Hard Gray Moderately Fractured LIMESTONE	1	RC	18.9	- -			70%
21							19.2				
22							26.3				
23	7.1										
24											
25											
26											
27				Boring Terminated at 26.3 feet							
28											
29											
30											
31											
32											
33											
34											
35											
36											
37											
38											
39											
40											
41											
42											
43											
44											
45											
46											
47											
48											
49											

\* Pocket Penetrometer Reading - Unconfined Compressive Strength, Tons/Sq.Ft.

**Ground Water Observations:**

DATE	TIME	CASING DEPTH	CAVE-IN	BAILED	WATER LEVEL
11/7/19		13.5			11.2
11/7/19					10.4

**BORING METHOD**

HSA - Hollow Stem Augers  
 CFA - Continuous Flight Augers  
 DC - Driving Casings  
 MD - Mud Drillings

**SAMPLE TYPE**

SS - Split Spoon  
 ST - Shelby Tube  
 CA - Continuous Auger  
 RC - Rock Core  
 CU - Cuttings  
 CT - Continuous Tube

Remarks: \_\_\_\_\_



# LOG OF TEST BORING

BORING NO.: B19-9 (Sheet 1/1)

CLIENT: HDR  
 PROJECT: Mary Avenue CSO  
 LOCATION: St Louis, MO  
 PROJECT NO: D140-MO DRILLER/INSP: C. Pierce III  
 BORING METHOD: 2.25" HSA RIG TYPE: CME 550X

DATE STARTED: 11-4-19 COMPLETED: 11-5-19  
 TEMPERATURE/WEATHER: Cloudy, 45 Degrees  
 NORTH: 38.61151 EAST: -90.34671  
 ELEVATION: \_\_\_\_\_ LINE: \_\_\_\_\_  
 CORE SIZE: HQ3 HAMMER: Auto

ELEV. (FEET)	DEPTH SCALE (FEET)	LAYER THICKNESS	GRAPHIC LOG	SAMPLE DESCRIPTION	SAMPLE			BLOWS PER 6 INCHES	SPT N	M/C (%)	RQD PP*
					NO.	TYPE REC	DEPTH (FEET)				
1	0.3			TOPSOIL (4")							
2	2.7			Stiff Brown CLAY, few sand, trace gravel, moist (CL)	1	SS	1 2.5	2 - 5 - 6	11		
3											
4	2.0			Hard Brown CLAY, few sand, trace gravel, moist (CL)	2	SS	3.5 5	12 - 13 - 20	33		
5											
6				Soft Brown CLAY, trace sand, trace gravel, wet (CL)	3	SS	6 7.5	6 - 3 - 2	5		
7											
8											
9					4	SS	8.5 10	1 - 1 - 1	2		
10											
11											
12											
13											
14					5	SS	13.5 15	5 - 7 - 23	30		
15	1.5			Stiff Brown CLAY, few sand, trace gravel, moist (CL)							
16				Hard Gray Moderately Fractured LIMESTONE	1	RC	15.5 21	- -			89%
17											
18											
19											
20	6.9										
21											
22					2	RC	21 31	- -			70%
23											
24	1.1			VOID							
25				Hard Gray Moderately Fractured LIMESTONE							
26											
27	7.5										
28											
29											
30											
31											
32				Boring Terminated at 31.0 feet							
33											
34											
35											
36											
37											
38											
39											
40											
41											
42											
43											
44											
45											
46											
47											
48											
49											

\* Pocket Penetrometer Reading - Unconfined Compressive Strength, Tons/Sq.Ft.

### Ground Water Observations:

DATE	TIME	CASING DEPTH	CAVE-IN	BAILED	WATER LEVEL
11/4/19		6.0			6.0
11/5/19					10.0

### BORING METHOD

HSA - Hollow Stem Augers  
 CFA - Continuous Flight Augers  
 DC - Driving Casings  
 MD - Mud Drillings

### SAMPLE TYPE

SS - Split Spoon  
 ST - Shelby Tube  
 CA - Continuous Auger  
 RC - Rock Core  
 CU - Cuttings  
 CT - Continuous Tube

Remarks: \_\_\_\_\_



# LOG OF TEST BORING

BORING NO.: B19-1A (Sheet 1/1)

CLIENT: HDR  
 PROJECT: Mary Avenue CSO  
 LOCATION: St Louis, MO  
 PROJECT NO: D140-MO DRILLER/INSP: C. Brough  
 BORING METHOD: 3.25" HSA RIG TYPE: CME 75

DATE STARTED: 1-18-20 COMPLETED: 1-18-20  
 TEMPERATURE/WEATHER: Sunny, 40 Degrees  
 NORTH: 38.61138889 EAST: -90.34527778  
 ELEVATION: 454 LINE: \_\_\_\_\_  
 CORE SIZE: NQ3 HAMMER: Auto

ELEV. (FEET)	DEPTH SCALE (FEET)	LAYER THICKNESS	GRAPHIC LOG	SAMPLE DESCRIPTION	SAMPLE			BLOWS PER 6 INCHES	SPT N	M/C (%)	RQD PP*
					NO.	TYPE REC	DEPTH (FEET)				
453.4	1	0.6		ASPHALT (7")							
452.9	2	0.5		AGGREGATE (6")	1	SS	1	16 - 10 - 6	16	10.8	
	3	1.9		Stiff Dark Brown CLAY, little fine to coarse sand, trace gravel, moist (CL)			2.5				
451.0	4			Medium Stiff Brown CLAY, little fine to coarse sand, trace gravel, moist (CL)	2	SS	3.5	6 - 4 - 5	9		
	5	3.0		Medium Stiff Brown FAT CLAY (CH)			5				
448.0	6			Medium Stiff Brown FAT CLAY (CH)	3	SS	6	4 - 5 - 4	9	16.2	
	7	2.0		Soft Gray CLAY, little fine to coarse sand, few gravel, wet (CL)			7.5				
446.0	8			Soft Gray CLAY, little fine to coarse sand, few gravel, wet (CL)	4	SS	8.5	2 - 2 - 1	3		
	9	3.0		Medium Stiff Gray Silty CLAY, trace fine to coarse sand, moist (CL-ML)			10				
443.0	11			Medium Stiff Gray Silty CLAY, trace fine to coarse sand, moist (CL-ML)							
	12	11.0		Medium Stiff Gray Silty CLAY, trace fine to coarse sand, moist (CL-ML)	5	SS	13.5	3 - 3 - 3	6		
	13						15				
	14										
	15										
	16										
	17										
	18										
	19										
	20										
	21										
432.0	22			Medium Dense Gray Clayey GRAVEL, some fine to coarse sand, some silt, moist (GC)							
	23	6.4		Medium Dense Gray Clayey GRAVEL, some fine to coarse sand, some silt, moist (GC)	6	SS	18.5	2 - 3 - 4	7	24.4	
	24						20				
	25										
	26										
	27										
	28										
425.6	29			28.4': Auger Refusal Limestone	1	RC	28.4	- -			50%
	30	3.0		Limestone	2	RC	29.4	- -			46%
	31						29.4				
422.6	32	0.5		VOID (6")			34.4				
422.1	33			Limestone							
	34	2.5		Limestone							
419.6	35			Boring Terminated at 34.4 feet							

\* Pocket Penetrometer Reading - Unconfined Compressive Strength, Tons/Sq.Ft.

**Ground Water Observations:**

DATE	TIME	CASING DEPTH	CAVE-IN	BAILED	WATER LEVEL
1/18/20		8.5			9.1

**BORING METHOD**

HSA - Hollow Stem Augers  
 CFA - Continuous Flight Augers  
 DC - Driving Casings  
 MD - Mud Drillings

**SAMPLE TYPE**

SS - Split Spoon  
 ST - Shelby Tube  
 CA - Continuous Auger  
 RC - Rock Core  
 CU - Cuttings  
 CT - Continuous Tube

Remarks: \_\_\_\_\_



# LOG OF TEST BORING

BORING NO.: B19-2A (Sheet 1/1)

CLIENT: HDR  
 PROJECT: Mary Avenue CSO  
 LOCATION: St Louis, MO  
 PROJECT NO: D140-MO DRILLER/INSP: C. Brough  
 BORING METHOD: 3.25" HSA RIG TYPE: CME 75

DATE STARTED: 1-21-20 COMPLETED: 1-21-20  
 TEMPERATURE/WEATHER: \_\_\_\_\_  
 NORTH: 38.6125 EAST: -90.345  
 ELEVATION: 448 LINE: \_\_\_\_\_  
 CORE SIZE: NQ3 HAMMER: Auto

ELEV. (FEET)	DEPTH SCALE (FEET)	LAYER THICKNESS	GRAPHIC LOG	SAMPLE DESCRIPTION	SAMPLE			BLOWS PER 6 INCHES	SPT N	M/C (%)	RQD PP*
					NO.	TYPE REC	DEPTH (FEET)				
447.7	1	0.3		ASPHALT (4")	1	SS	1	5 - 7 - 2	9		
447.1	2	0.6		CONCRETE (7")			2.5				
	3			Medium Stiff Gray CLAY, little fine to coarse sand, trace gravel, moist (CL)	2	SS	3.5	2 - 3 - 3	6		
	4						5				
	5				3	SS	6	3 - 3 - 3	6		
	6						7.5				
	7	12.1			4	SS	8.5	3 - 3 - 3	6	24.9	
	8						10				
	9										
	10										
	11										
	12										
435.0	13				Stiff Gray CLAY, some fine to coarse sand, trace gravel, moist (CL)	5	SS	13.5	3 - 6 - 7	13	23.4
	14						15				
	15										
	16	6.2									
	17										
	18										
428.8	19			LIMESTONE	6	SS	18.5	12 - 50/3" -	50+		
	20						19.25				
	21										
	22				21.8': Auger Refusal	1	RC	21.8	- -		0%
	23	9.1				2	RC	23.3	- -		61%
	24						23.3				
	25						28.3				
419.7	28			Boring Terminated at 28.3 feet							
	29										
	30										
	31										
	32										
	33										
	34										
	35										
	36										
	37										
	38										
	39										
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	42										
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	44										
	45										
	46										
	47										
	48										
	49										

\* Pocket Penetrometer Reading - Unconfined Compressive Strength, Tons/Sq.Ft.

**Ground Water Observations:**

DATE	TIME	CASING DEPTH	CAVE-IN	BAILED	WATER LEVEL
1/21/20	9:45	13.5			13.0

**BORING METHOD**

HSA - Hollow Stem Augers  
 CFA - Continuous Flight Augers  
 DC - Driving Casings  
 MD - Mud Drillings

**SAMPLE TYPE**

SS - Split Spoon  
 ST - Shelby Tube  
 CA - Continuous Auger  
 RC - Rock Core  
 CU - Cuttings  
 CT - Continuous Tube

Remarks: \_\_\_\_\_



# LOG OF TEST BORING

BORING NO.: B19-3A (Sheet 1/1)

CLIENT: HDR  
 PROJECT: Mary Avenue CSO  
 LOCATION: St Louis, MO  
 PROJECT NO: D140-MO DRILLER/INSP: C. Brough  
 BORING METHOD: 3.25" HSA RIG TYPE: CME 75

DATE STARTED: 1-19-20 COMPLETED: 1-19-20  
 TEMPERATURE/WEATHER: Sunny, 15 Degrees  
 NORTH: 38.61277778 EAST: -90.345  
 ELEVATION: 450 LINE: \_\_\_\_\_  
 CORE SIZE: NQ3 HAMMER: Auto

ELEV. (FEET)	DEPTH SCALE (FEET)	LAYER THICKNESS	GRAPHIC LOG	SAMPLE DESCRIPTION	SAMPLE			BLOWS PER 6 INCHES	SPT N	M/C (%)	RQD PP*
					NO.	TYPE REC	DEPTH (FEET)				
449.5	1	0.5		TOPSOIL (6")	1	SS	1	4 - 8 - 10	18	16.0	
	2	2.5		Very Stiff Brown CLAY, little fine to coarse sand, trace gravel, moist (CL)			2.5				
447.0	3			Medium Stiff to Stiff Brown CLAY, some fine to coarse sand, little gravel, moist (CL)	2	SS	3.5	5 - 4 - 5	9		
	4						5				
	5				3	SS	6	7 - 8 - 8	16		
	6						7.5				
	7				4	SS	8.5	3 - 4 - 6	10		
	8						10				
	9										
	10										
438.0	12			Very Stiff Brown CLAY, little fine to coarse sand, trace gravel, moist (CL)	5	SS	13.5	6 - 10 - 7	17	20.0	
	13						15				
	14										
	15										
	16										
433.0	17			Hard Light Brown SILTY CLAY, some fine to coarse sand, little gravel, moist (CL-ML)	6	SS	18.5	6 - 50/2" -	50+		
	18						19.5				
430.8	19			LIMESTONE							
	20										
	21			21.2': Auger Refusal	1	RC	21.1	- -			78%
	22						26.2				
	23										
	24										
	25										
	26										
	27				2	RC	26.2	- -			86%
	28						31.2				
	29										
	30										
418.8	31			Boring Terminated at 31.2 feet							
	32										
	33										
	34										
	35										
	36										
	37										
	38										
	39										
	40										
	41										
	42										
	43										
	44										
	45										
	46										
	47										
	48										
	49										

\* Pocket Penetrometer Reading - Unconfined Compressive Strength, Tons/Sq.Ft.

**Ground Water Observations:**

DATE	TIME	CASING DEPTH	CAVE-IN	BAILED	WATER LEVEL
1/19/20		21.2			None

**BORING METHOD**

HSA - Hollow Stem Augers  
 CFA - Continuous Flight Augers  
 DC - Driving Casings  
 MD - Mud Drillings

**SAMPLE TYPE**

SS - Split Spoon  
 ST - Shelby Tube  
 CA - Continuous Auger  
 RC - Rock Core  
 CU - Cuttings  
 CT - Continuous Tube

Remarks: \_\_\_\_\_



# LOG OF TEST BORING

BORING NO.: B19-4A (Sheet 1/1)

CLIENT: HDR  
 PROJECT: Mary Avenue CSO  
 LOCATION: St Louis, MO  
 PROJECT NO: D140-MO DRILLER/INSP: C. Brough  
 BORING METHOD: 3.25" HSA RIG TYPE: CME 75

DATE STARTED: 1-17-20 COMPLETED: 1-17-20  
 TEMPERATURE/WEATHER: Rainy, 40 Degrees  
 NORTH: 38.61361111 EAST: -90.345  
 ELEVATION: 458 LINE: \_\_\_\_\_  
 CORE SIZE: NQ3 HAMMER: Auto

ELEV. (FEET)	DEPTH SCALE (FEET)	LAYER THICKNESS	GRAPHIC LOG	SAMPLE DESCRIPTION	SAMPLE			BLOWS PER 6 INCHES	SPT N	M/C (%)	RQD PP*
					NO.	TYPE REC	DEPTH (FEET)				
457.5	1	0.5		TOPSOIL (6")	1	SS	1	4 - 3 - 3	6		
	2			Medium Stiff to Stiff Brown CLAY, trace fine to medium sand, moist (CL)	2	SS	2.5	4 - 4 - 5	9	97.3	
	3				3	SS	5	5 - 7 - 7	14		
	4				4	SS	7.5	2 - 4 - 4	8	23.2	
	5				5	SS	10	3 - 4 - 6	10		
	6				6	SS	13.5				
	7										
	8										
	9										
	10										
	11										
	12										
	13										
	14										
	15										
	16										
	17										
	18										
439.5	19	1.3		Hard Brown FAT CLAY (CH)	6	SS	18.5	3 - 2 - 50/3"	50+	37.5	
438.2	20			LIMESTONE							
	21			21.1': Auger Refusal	1	RC	21.2	- -			38%
	22				2	RC	26.1	- -			72%
	23				3	RC	31.1	- -			91%
	24										
	25										
	26										
	27										
	28										
	29										
	30										
	31										
	32										
	33										
	34										
	35										
	36										
421.6	37			Boring Terminated at 36.4 feet							
	38										
	39										
	40										
	41										
	42										
	43										
	44										
	45										
	46										
	47										
	48										
	49										

\* Pocket Penetrometer Reading - Unconfined Compressive Strength, Tons/Sq.Ft.

**Ground Water Observations:**

DATE	TIME	CASING DEPTH	CAVE-IN	BAILED	WATER LEVEL
					▽
					▼
					▽

**BORING METHOD**

HSA - Hollow Stem Augers  
 CFA - Continuous Flight Augers  
 DC - Driving Casings  
 MD - Mud Drillings

**SAMPLE TYPE**

SS - Split Spoon  
 ST - Shelby Tube  
 CA - Continuous Auger  
 RC - Rock Core  
 CU - Cuttings  
 CT - Continuous Tube

Remarks: \_\_\_\_\_



# Acoustic Televiewer

COMPANY: 7NT

PROJECT:

DATE LOGGED: 30 October 2019

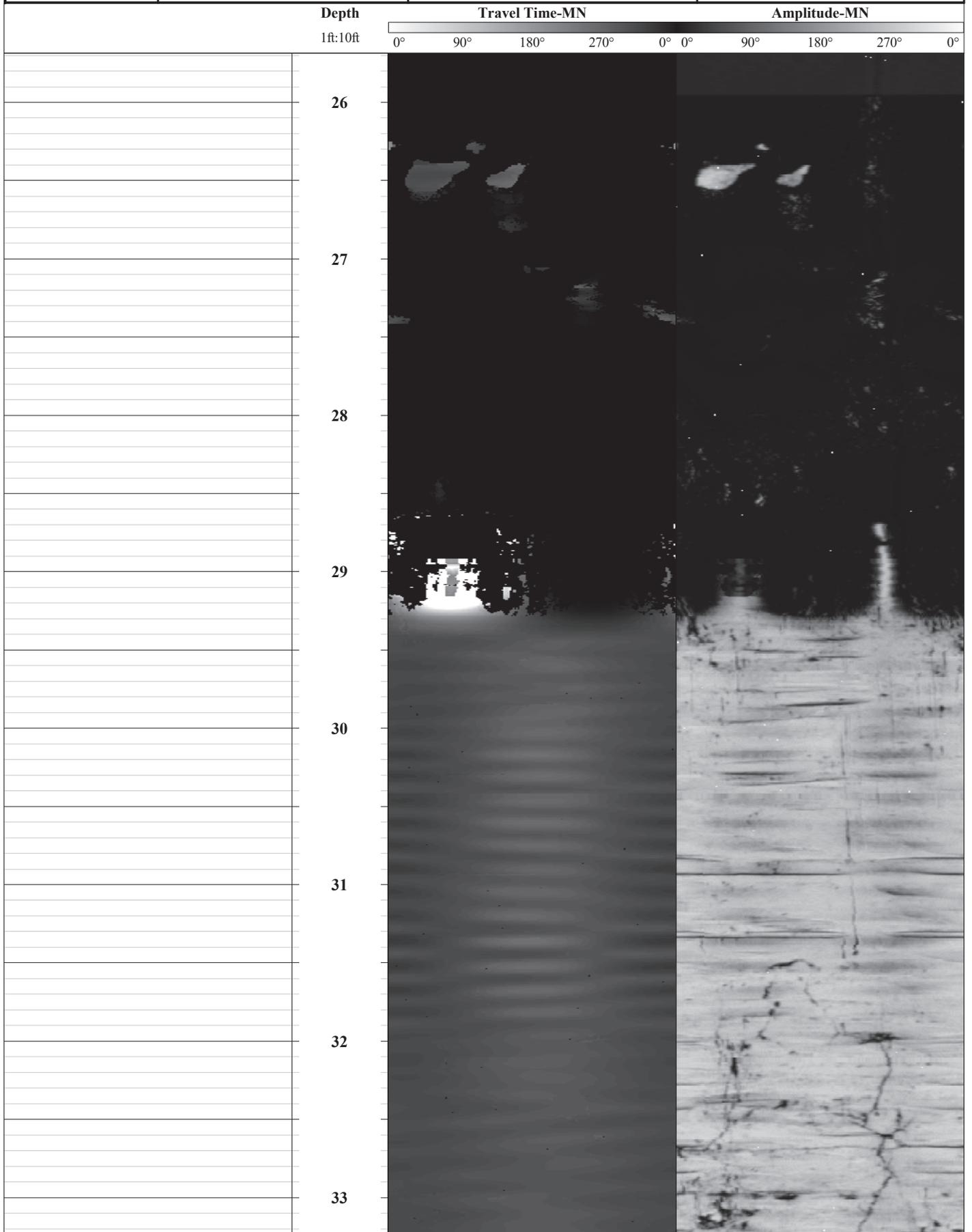
WELL: B19-4

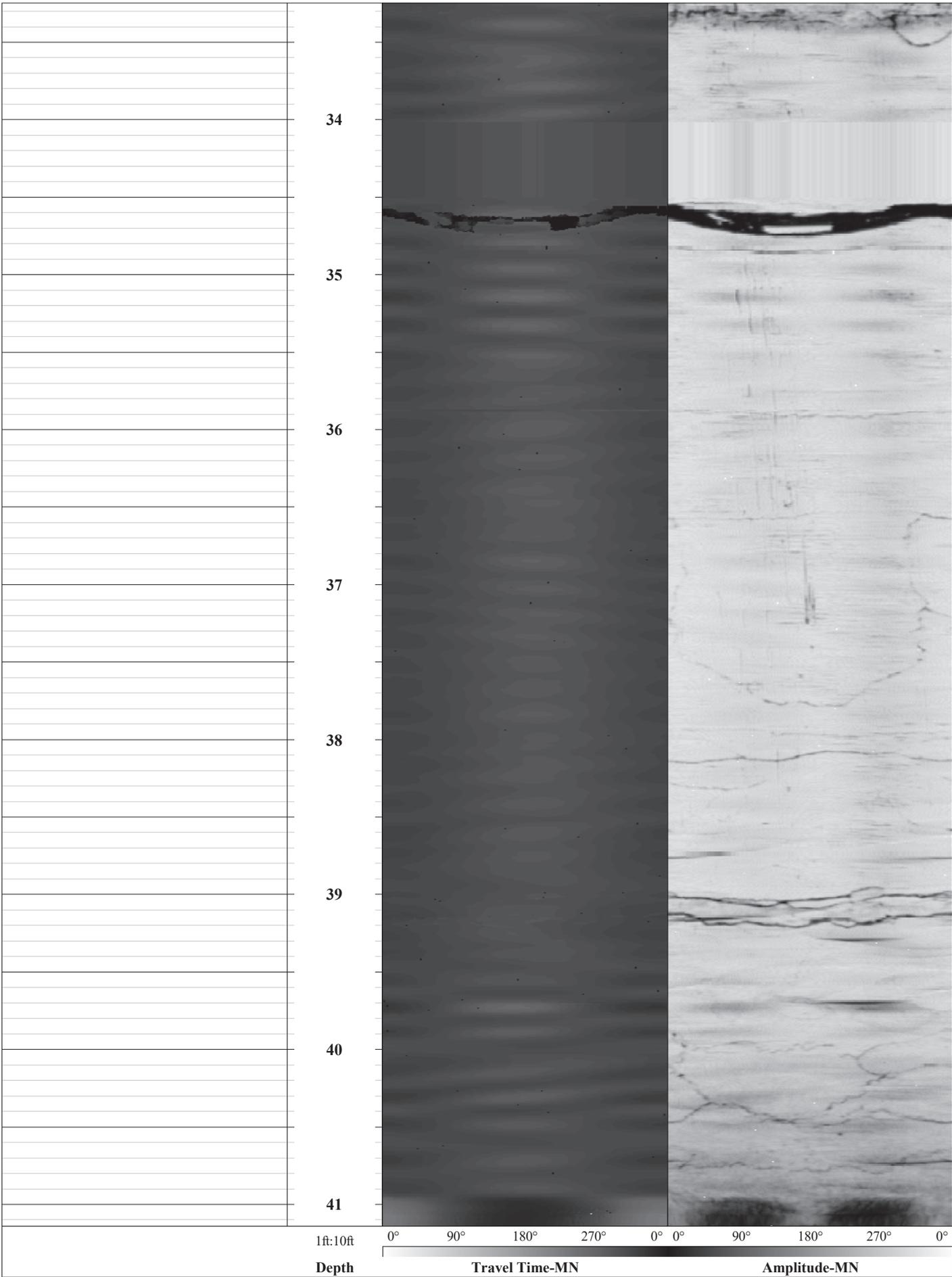
Colog, Inc.

Ocean Springs, MS 39564

Office: (256) 325-1504

www.colog.com







# Optical Televiewer

COMPANY: 7NT

PROJECT:

DATE LOGGED: 30 October 2019

WELL: B19-4

Colog, Inc.  
Ocean Springs, MS 39564  
Office: (256) 325-1504  
www.colog.com

Depth 1ft:10ft	Optical Image - MN				
	0°	90°	180°	270°	0°
9					
10					
11					
12					
13					
14					
15					
16					



Lined writing area for notes.

26

27

28

29

30

31

32

33





34

35

36

37

38

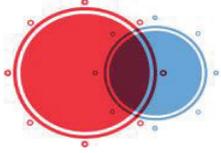


1ft:10ft

0° 90° 180° 270° 0°

Depth

Optical Image - MN



## ASTM D7012, Method C - Compressive Strength of Intact Rock Core Specimen

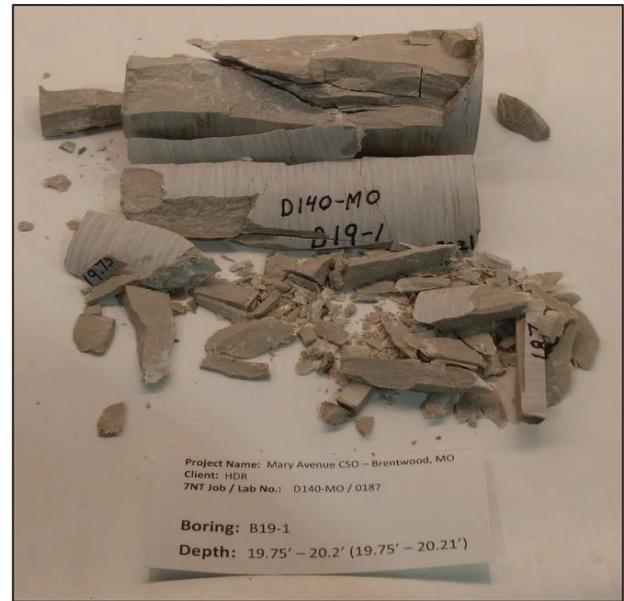
Client HDR, Inc. Project No. D140-MO  
 Project Mary Avenue CSO - Brentwood, MO Test Date: 10/16/2019

### Specimen Properties

Average Diameter, in:	2.4000
Average Height, in:	5.5150
Area, in <sup>2</sup> :	4.524
Volume, in <sup>3</sup> :	24.95
Wet Mass of Specimen, lb:	2.41
Moisture Content, %:	0.06
Dry Mass of Specimen, lb:	2.41
Wet Unit Weight, $\gamma$ (lb/ft <sup>3</sup> ):	167.0
Dry Unit Weight, $\gamma_d$ (lb/ft <sup>3</sup> ):	166.9

Description: B19-1 19.75'-20.21'

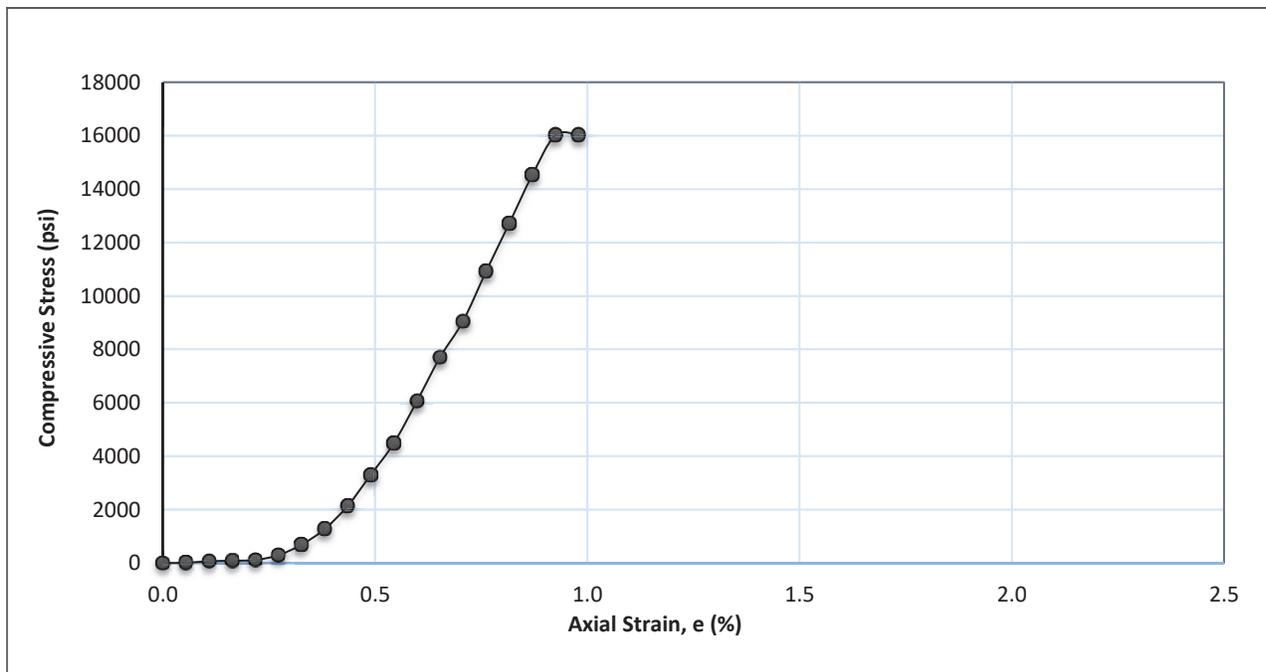
### Final Specimen Figure



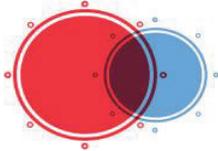
### Result

Compressive Strength of Rock Core, psi: 16025  
 Strain (%): 1.0

Bedrock Strength: Very Strong



Notes:



## ASTM D7012, Method C - Compressive Strength of Intact Rock Core Specimen

Client HDR, Inc.  
Project Mary Avenue CSO - Brentwood, MO

Project No. D140-MO  
Test Date: 10/16/2019

### Specimen Properties

Average Diameter, in:	2.3980
Average Height, in:	5.9320
Area, in <sup>2</sup> :	4.516
Volume, in <sup>3</sup> :	26.79
Wet Mass of Specimen, lb:	2.13
Moisture Content, %:	0.38
Dry Mass of Specimen, lb:	2.12
Wet Unit Weight, $\gamma$ (lb/ft <sup>3</sup> ):	137.3
Dry Unit Weight, $\gamma_d$ (lb/ft <sup>3</sup> ):	136.8

Description: B19-1 32.11'-32.6'

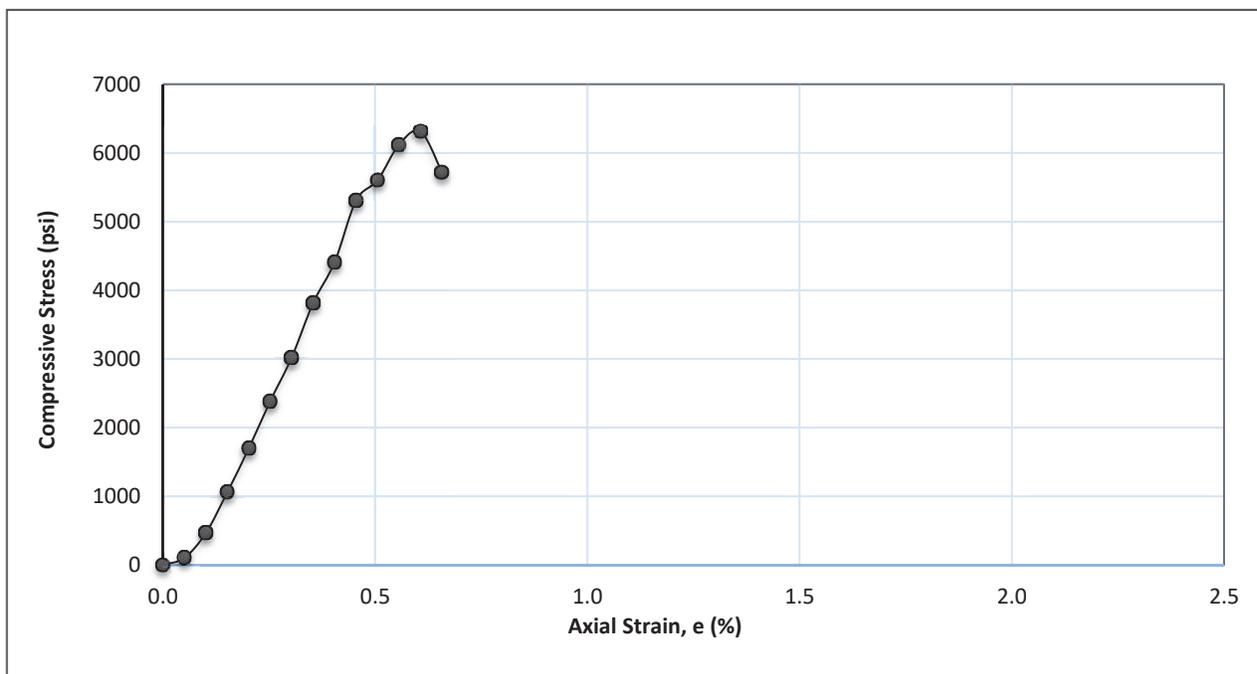
### Final Specimen Figure



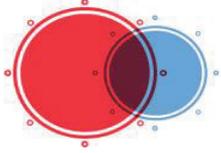
### Result

Compressive Strength of Rock Core, psi:	6312
Strain (%):	0.7

Bedrock Strength: Moderately Strong



Notes:



## ASTM D7012, Method C - Compressive Strength of Intact Rock Core Specimen

Client HDR, Inc.  
Project Mary Avenue CSO - Brentwood, MO

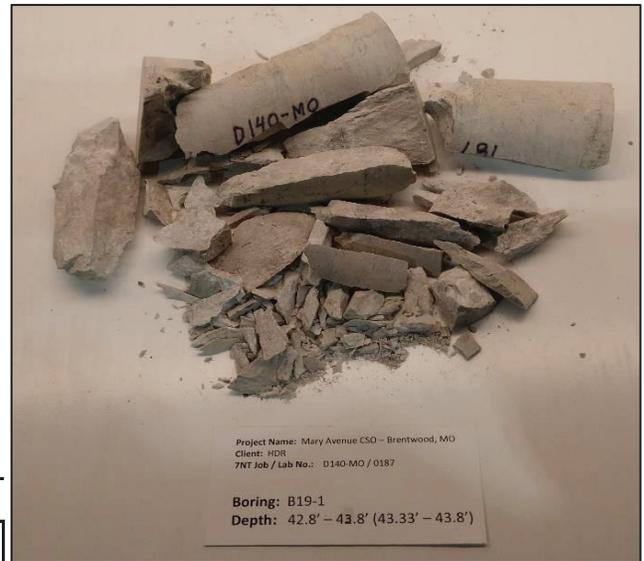
Project No. D140-MO  
Test Date: 10/16/2019

### Specimen Properties

Average Diameter, in:	2.4000
Average Height, in:	5.6550
Area, in <sup>2</sup> :	4.524
Volume, in <sup>3</sup> :	25.58
Wet Mass of Specimen, lb:	2.29
Moisture Content, %:	0.13
Dry Mass of Specimen, lb:	2.29
Wet Unit Weight, $\gamma$ (lb/ft <sup>3</sup> ):	154.9
Dry Unit Weight, $\gamma_d$ (lb/ft <sup>3</sup> ):	154.7

Description: B19-1 43.33'-43.8'

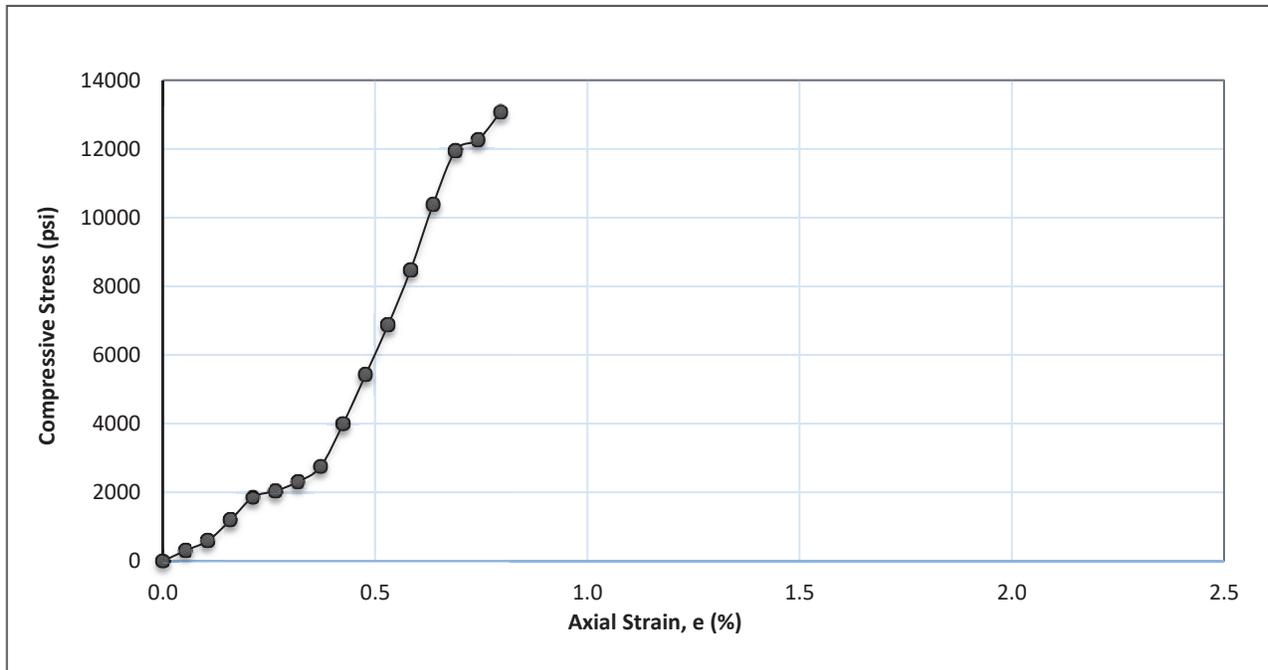
### Final Specimen Figure



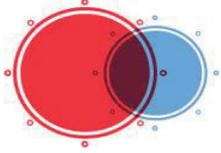
### Result

Compressive Strength of Rock Core, psi:	13081
Strain (%):	0.8

Bedrock Strength: Strong



Notes:



## ASTM D7012, Method C - Compressive Strength of Intact Rock Core Specimen

Client HDR, Inc.  
Project Mary Avenue CSO - Brentwood, MO

Project No. D140-MO  
Test Date: 10/16/2019

### Specimen Properties

Average Diameter, in:	2.3750
Average Height, in:	5.8570
Area, in <sup>2</sup> :	4.430
Volume, in <sup>3</sup> :	25.95
Wet Mass of Specimen, lb:	2.51
Moisture Content, %:	0.04
Dry Mass of Specimen, lb:	2.51
Wet Unit Weight, $\gamma$ (lb/ft <sup>3</sup> ):	167.3
Dry Unit Weight, $\gamma_d$ (lb/ft <sup>3</sup> ):	167.2

### Final Specimen Figure

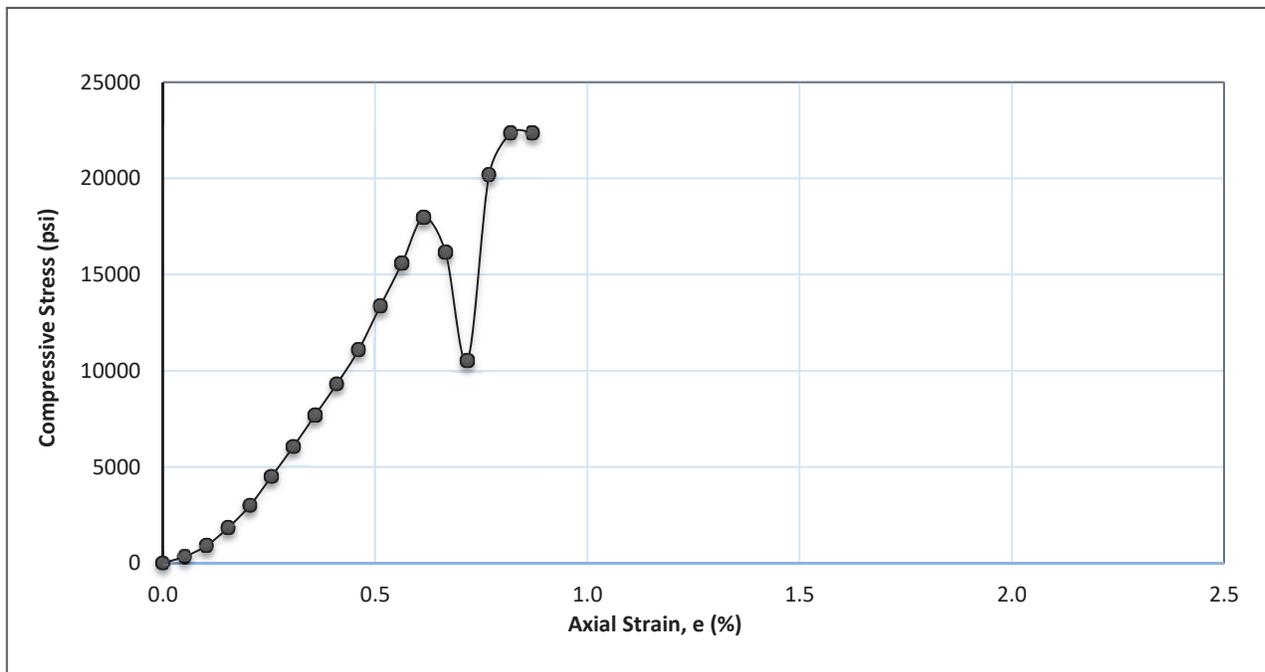


Description: B19-2 11.71'-12.2'

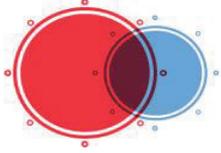
### Result

Compressive Strength of Rock Core, psi:	22356
Strain (%):	0.9

Bedrock Strength: Very Strong



Notes:



## ASTM D7012, Method C - Compressive Strength of Intact Rock Core Specimen

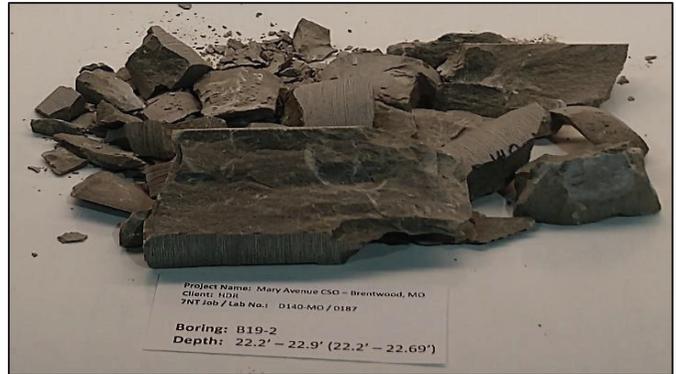
Client HDR, Inc.  
Project Mary Avenue CSO - Brentwood, MO

Project No. D140-MO  
Test Date: 10/16/2019

### Specimen Properties

Average Diameter, in:	2.3760
Average Height, in:	5.8410
Area, in <sup>2</sup> :	4.434
Volume, in <sup>3</sup> :	25.90
Wet Mass of Specimen, lb:	2.40
Moisture Content, %:	0.17
Dry Mass of Specimen, lb:	2.40
Wet Unit Weight, $\gamma$ (lb/ft <sup>3</sup> ):	160.4
Dry Unit Weight, $\gamma_d$ (lb/ft <sup>3</sup> ):	160.1

### Final Specimen Figure

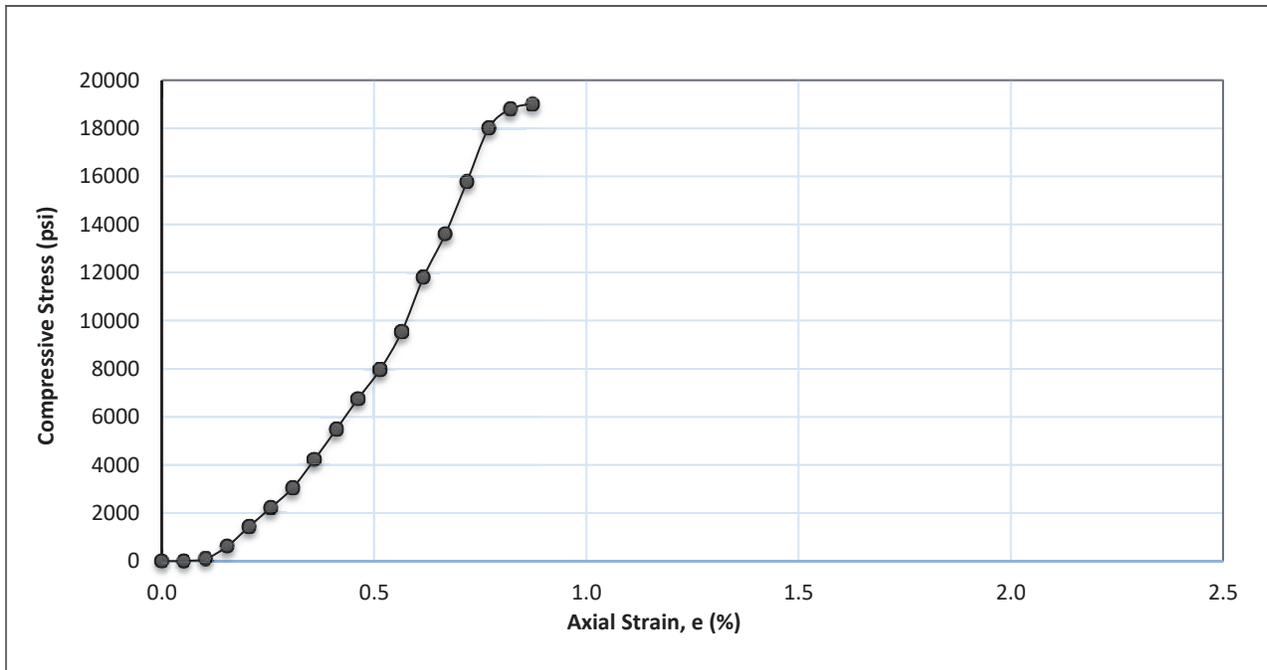


Description: B19-2 22.2'-22.69'

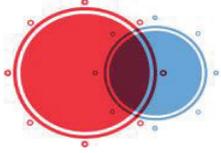
### Result

Compressive Strength of Rock Core, psi:	19019
Strain (%):	0.9

Bedrock Strength: Very Strong



Notes:



## ASTM D7012, Method C - Compressive Strength of Intact Rock Core Specimen

Client HDR, Inc.  
Project Mary Avenue CSO - Brentwood, MO

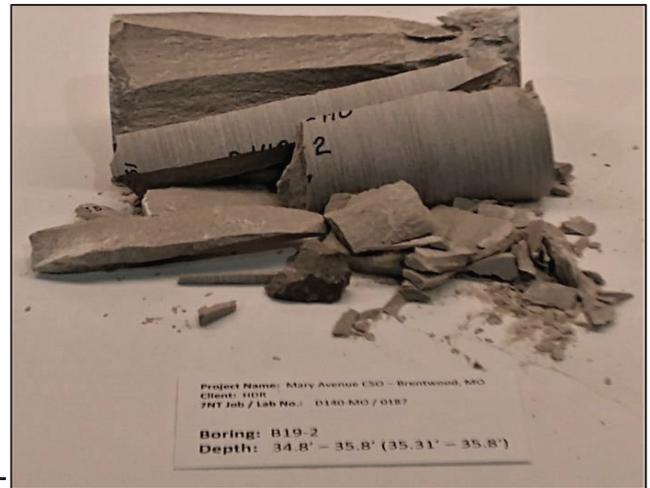
Project No. D140-MO  
Test Date: 10/16/2019

### Specimen Properties

Average Diameter, in:	2.3770
Average Height, in:	5.8690
Area, in <sup>2</sup> :	4.438
Volume, in <sup>3</sup> :	26.04
Wet Mass of Specimen, lb:	2.51
Moisture Content, %:	0.12
Dry Mass of Specimen, lb:	2.51
Wet Unit Weight, $\gamma$ (lb/ft <sup>3</sup> ):	166.6
Dry Unit Weight, $\gamma_d$ (lb/ft <sup>3</sup> ):	166.4

Description: B19-2 35.31'-35.8'

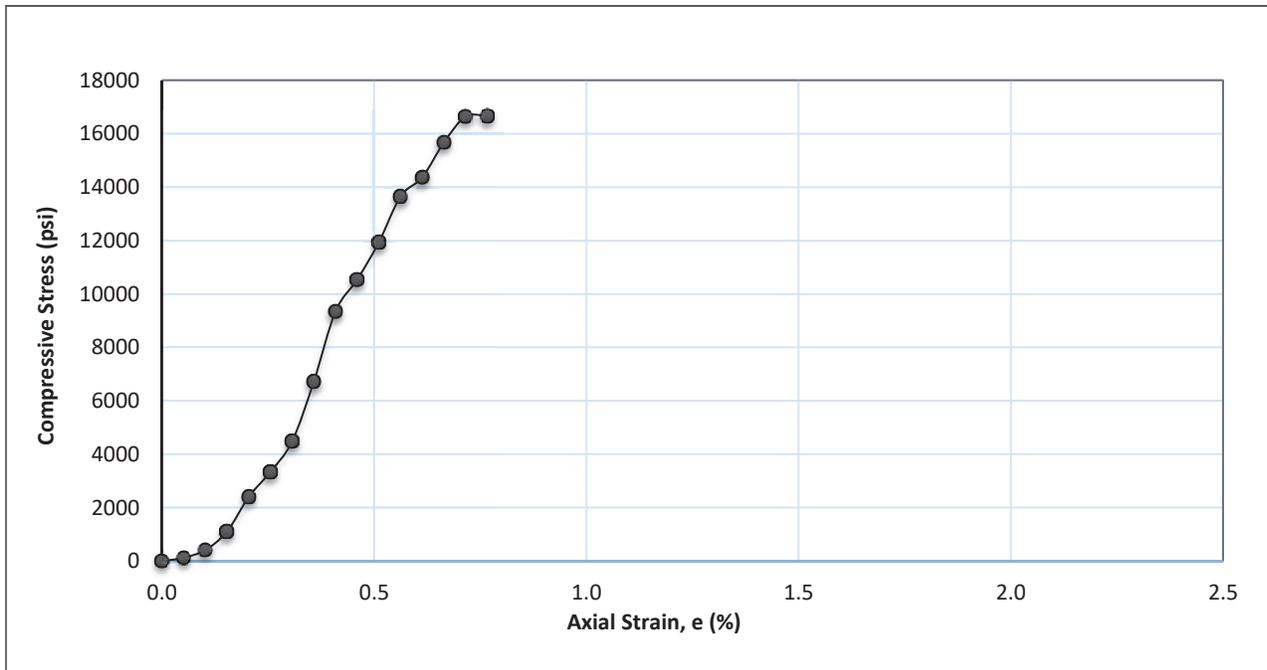
### Final Specimen Figure



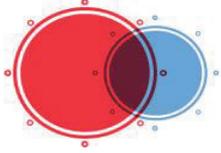
### Result

Compressive Strength of Rock Core, psi:	16648
Strain (%):	0.8

Bedrock Strength: Very Strong



Notes:



## ASTM D7012, Method C - Compressive Strength of Intact Rock Core Specimen

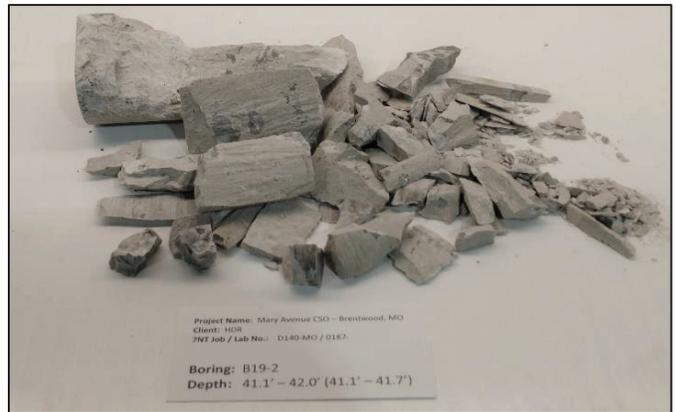
Client HDR, Inc.  
Project Mary Avenue CSO - Brentwood, MO

Project No. D140-MO  
Test Date: 10/16/2019

### Specimen Properties

Average Diameter, in:	2.3920
Average Height, in:	5.9150
Area, in <sup>2</sup> :	4.494
Volume, in <sup>3</sup> :	26.58
Wet Mass of Specimen, lb:	2.49
Moisture Content, %:	0.11
Dry Mass of Specimen, lb:	2.49
Wet Unit Weight, $\gamma$ (lb/ft <sup>3</sup> ):	162.1
Dry Unit Weight, $\gamma_d$ (lb/ft <sup>3</sup> ):	161.9

### Final Specimen Figure

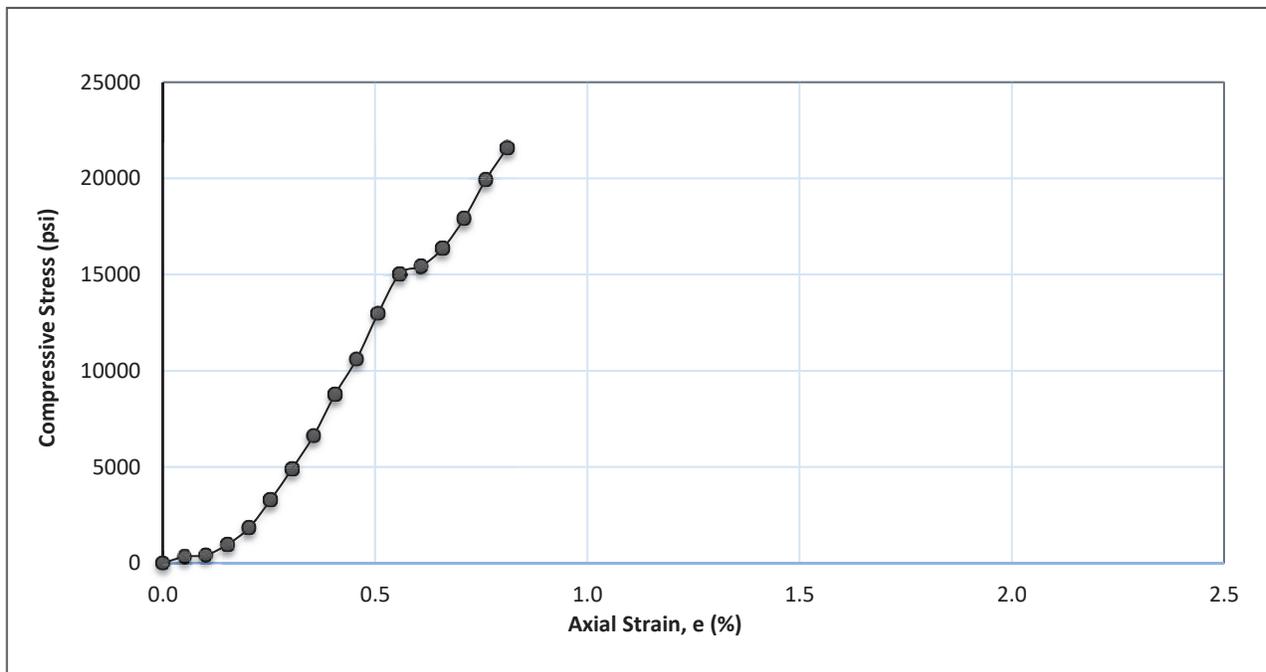


Description: B19-2 41.1'-41.7'

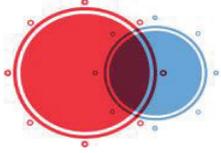
### Result

Compressive Strength of Rock Core, psi:	21589
Strain (%):	0.8

Bedrock Strength: Very Strong



Notes:



## ASTM D7012, Method C - Compressive Strength of Intact Rock Core Specimen

Client HDR, Inc.  
Project Mary Avenue CSO - Brentwood, MO

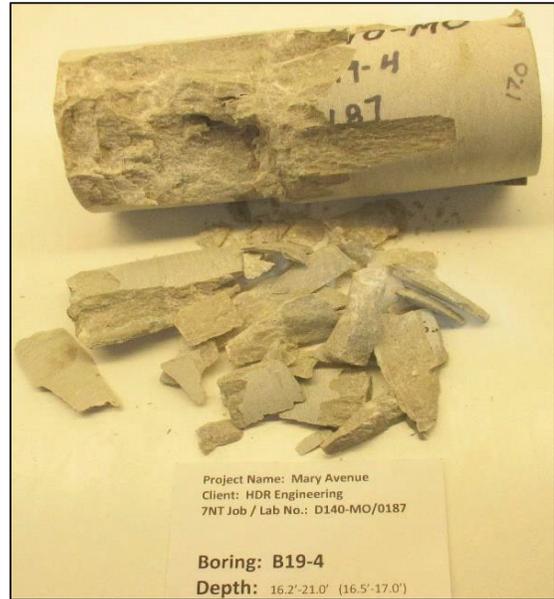
Project No. D140-MO  
Test Date: 11/18/2019

### Specimen Properties

Average Diameter, in:	2.3920
Average Height, in:	5.9520
Area, in <sup>2</sup> :	4.494
Volume, in <sup>3</sup> :	26.75
Wet Mass of Specimen, lb:	2.59
Moisture Content, %:	0.12
Dry Mass of Specimen, lb:	2.58
Wet Unit Weight, $\gamma$ (lb/ft <sup>3</sup> ):	167.1
Dry Unit Weight, $\gamma_d$ (lb/ft <sup>3</sup> ):	166.9

Description: B19-4 16.5'-17.0'

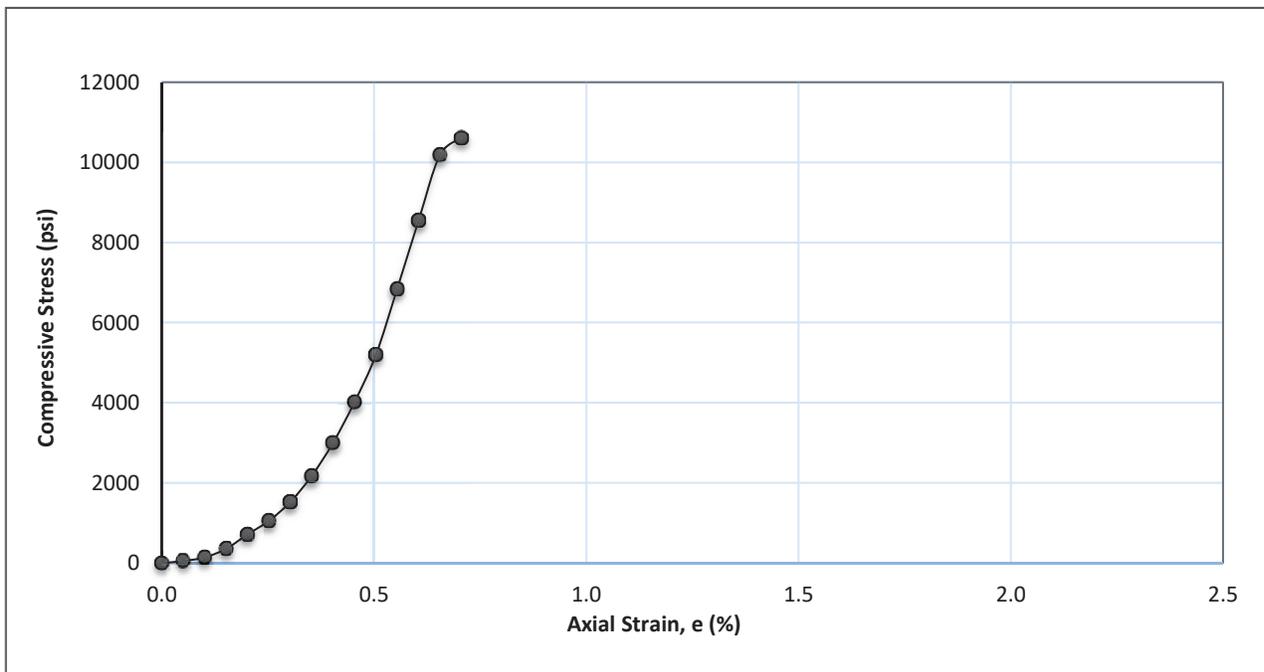
### Final Specimen Figure



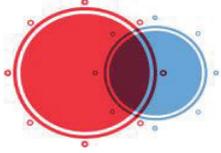
### Result

Compressive Strength of Rock Core, psi:	10608
Strain (%):	0.7

Bedrock Strength: Strong



Notes:



## ASTM D7012, Method C - Compressive Strength of Intact Rock Core Specimen

Client HDR, Inc.  
Project Mary Avenue CSO - Brentwood, MO

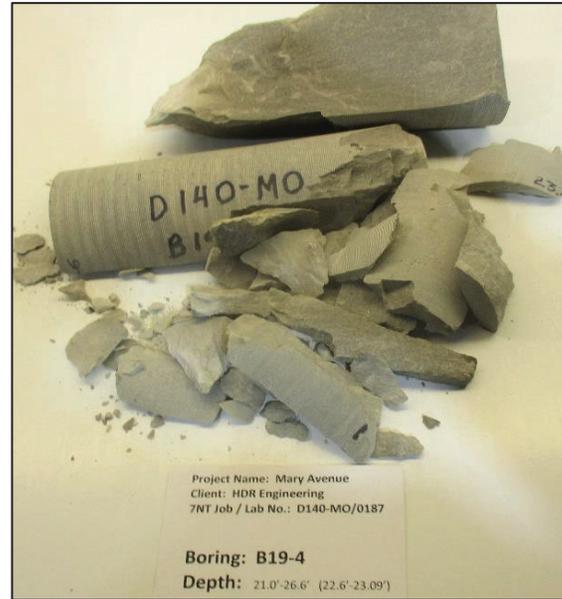
Project No. D140-MO  
Test Date: 11/18/2019

### Specimen Properties

Average Diameter, in:	2.3830
Average Height, in:	5.9100
Area, in <sup>2</sup> :	4.460
Volume, in <sup>3</sup> :	26.36
Wet Mass of Specimen, lb:	2.48
Moisture Content, %:	0.40
Dry Mass of Specimen, lb:	2.47
Wet Unit Weight, $\gamma$ (lb/ft <sup>3</sup> ):	162.5
Dry Unit Weight, $\gamma_d$ (lb/ft <sup>3</sup> ):	161.8

Description: B19-4 22.6'-23.09'

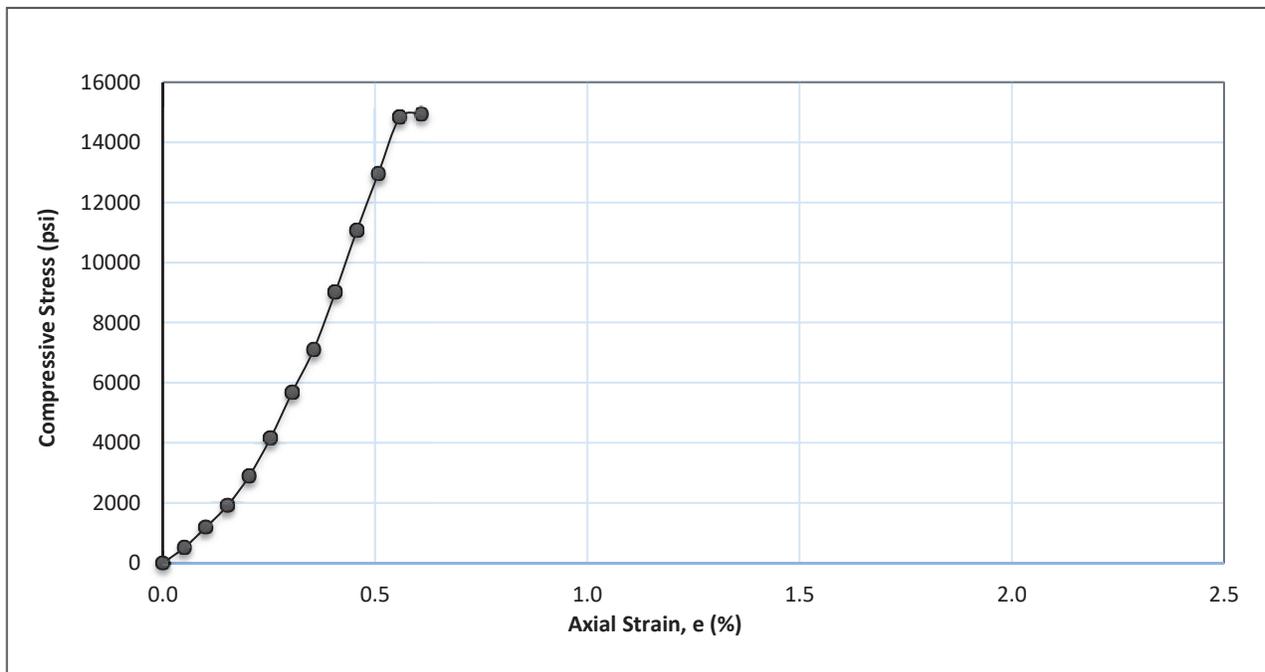
### Final Specimen Figure



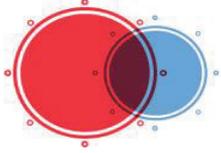
### Result

Compressive Strength of Rock Core, psi:	14935
Strain (%):	0.6

Bedrock Strength: Strong



Notes:



## ASTM D7012, Method C - Compressive Strength of Intact Rock Core Specimen

Client HDR, Inc.  
Project Mary Avenue CSO - Brentwood, MO

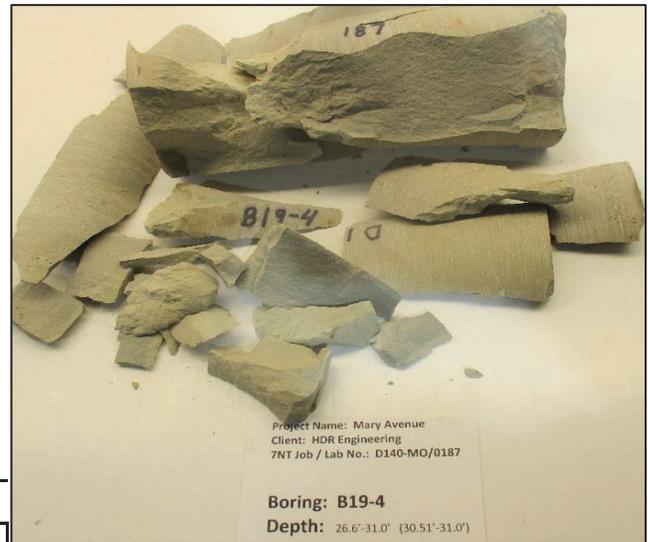
Project No. D140-MO  
Test Date: 11/18/2019

### Specimen Properties

Average Diameter, in:	2.3910
Average Height, in:	5.9180
Area, in <sup>2</sup> :	4.490
Volume, in <sup>3</sup> :	26.57
Wet Mass of Specimen, lb:	2.08
Moisture Content, %:	1.86
Dry Mass of Specimen, lb:	2.05
Wet Unit Weight, $\gamma$ (lb/ft <sup>3</sup> ):	135.5
Dry Unit Weight, $\gamma_d$ (lb/ft <sup>3</sup> ):	133.0

Description: B19-4 30.51'-31.0'

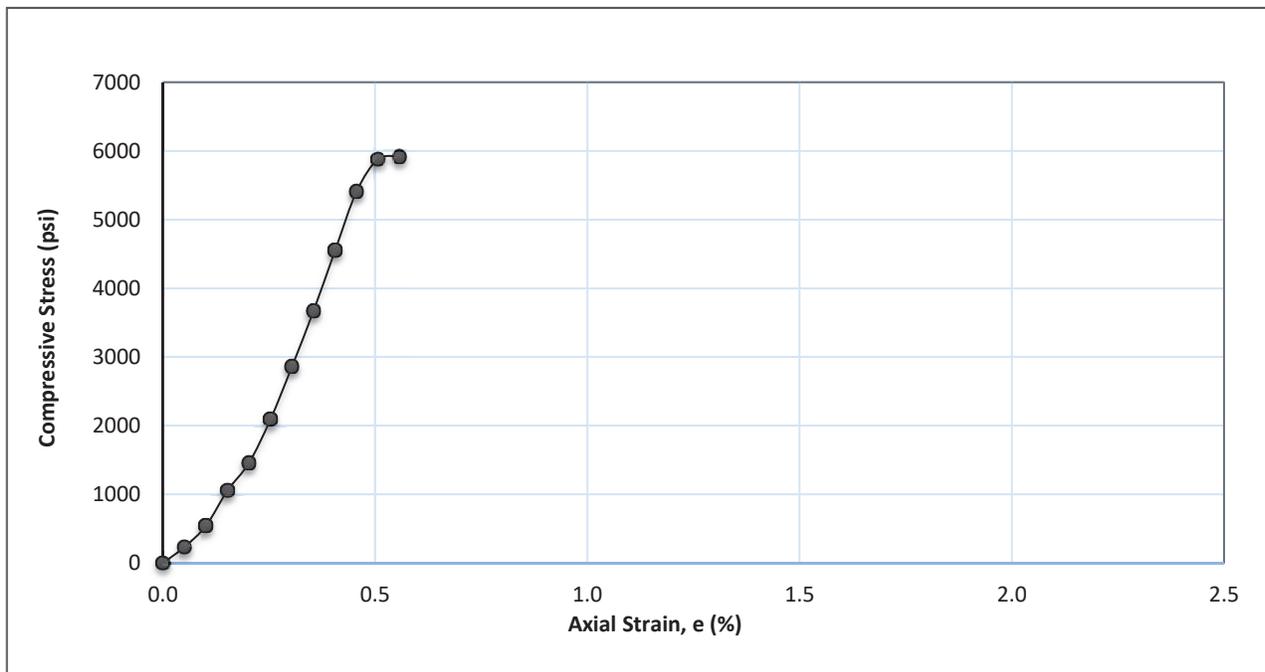
### Final Specimen Figure



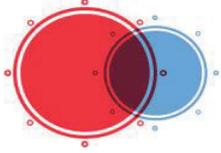
### Result

Compressive Strength of Rock Core, psi:	5916
Strain (%):	0.6

Bedrock Strength: Moderately Strong



Notes:



## ASTM D7012, Method C - Compressive Strength of Intact Rock Core Specimen

Client HDR, Inc.  
Project Mary Avenue CSO - Brentwood, MO

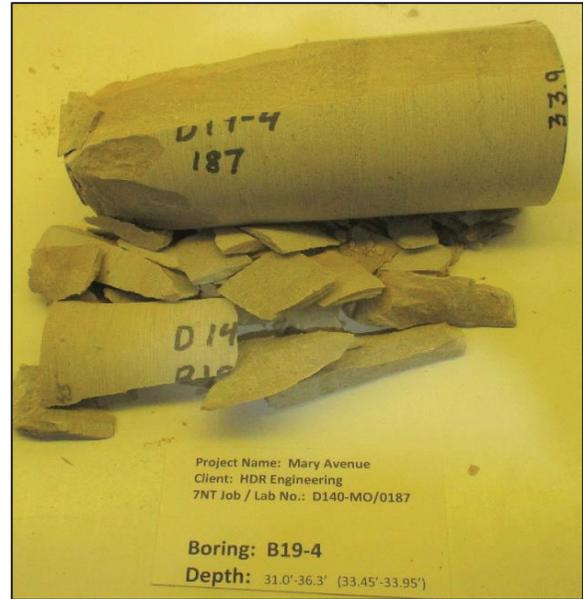
Project No. D140-MO  
Test Date: 11/18/2019

### Specimen Properties

Average Diameter, in:	2.3920
Average Height, in:	5.9900
Area, in <sup>2</sup> :	4.494
Volume, in <sup>3</sup> :	26.92
Wet Mass of Specimen, lb:	2.56
Moisture Content, %:	0.30
Dry Mass of Specimen, lb:	2.56
Wet Unit Weight, $\gamma$ (lb/ft <sup>3</sup> ):	164.5
Dry Unit Weight, $\gamma_d$ (lb/ft <sup>3</sup> ):	164.0

Description: B19-4 33.45'-33.95'

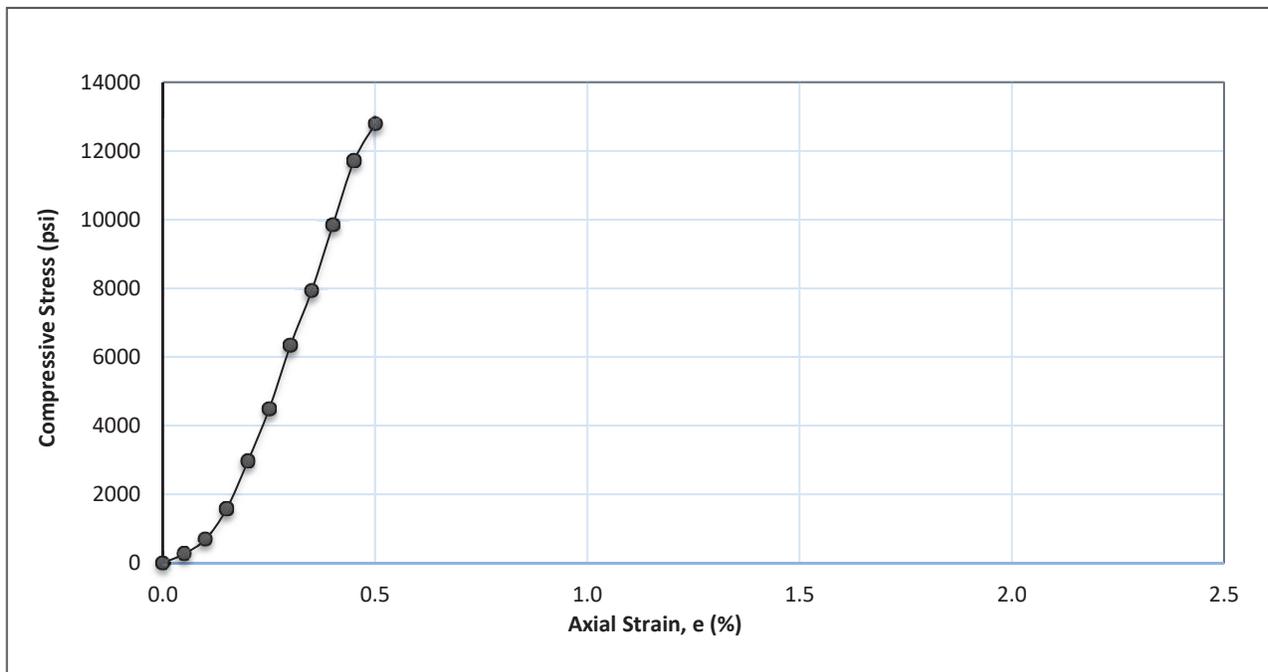
### Final Specimen Figure



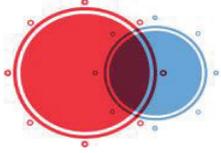
### Result

Compressive Strength of Rock Core, psi:	12793
Strain (%):	0.5

Bedrock Strength: Strong



Notes:



## ASTM D7012, Method C - Compressive Strength of Intact Rock Core Specimen

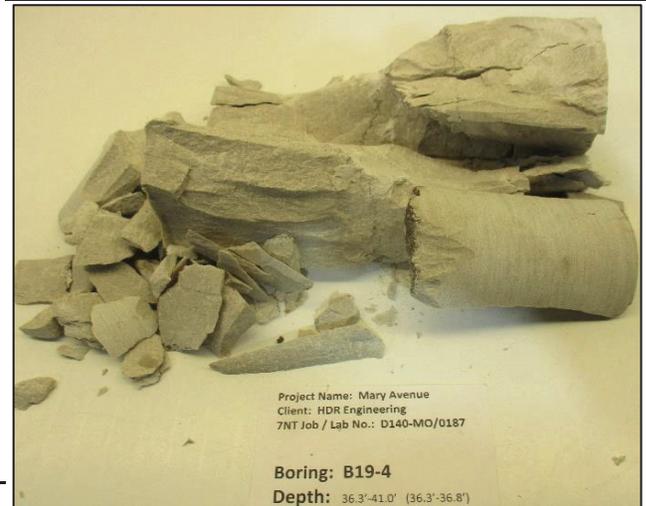
Client HDR, Inc. Project No. D140-MO  
 Project Mary Avenue CSO - Brentwood, MO Test Date: 11/18/2019

### Specimen Properties

Average Diameter, in:	2.3950
Average Height, in:	5.9590
Area, in <sup>2</sup> :	4.505
Volume, in <sup>3</sup> :	26.85
Wet Mass of Specimen, lb:	2.58
Moisture Content, %:	0.12
Dry Mass of Specimen, lb:	2.57
Wet Unit Weight, $\gamma$ (lb/ft <sup>3</sup> ):	165.8
Dry Unit Weight, $\gamma_d$ (lb/ft <sup>3</sup> ):	165.6

Description: B19-4 36.3'-36.8'

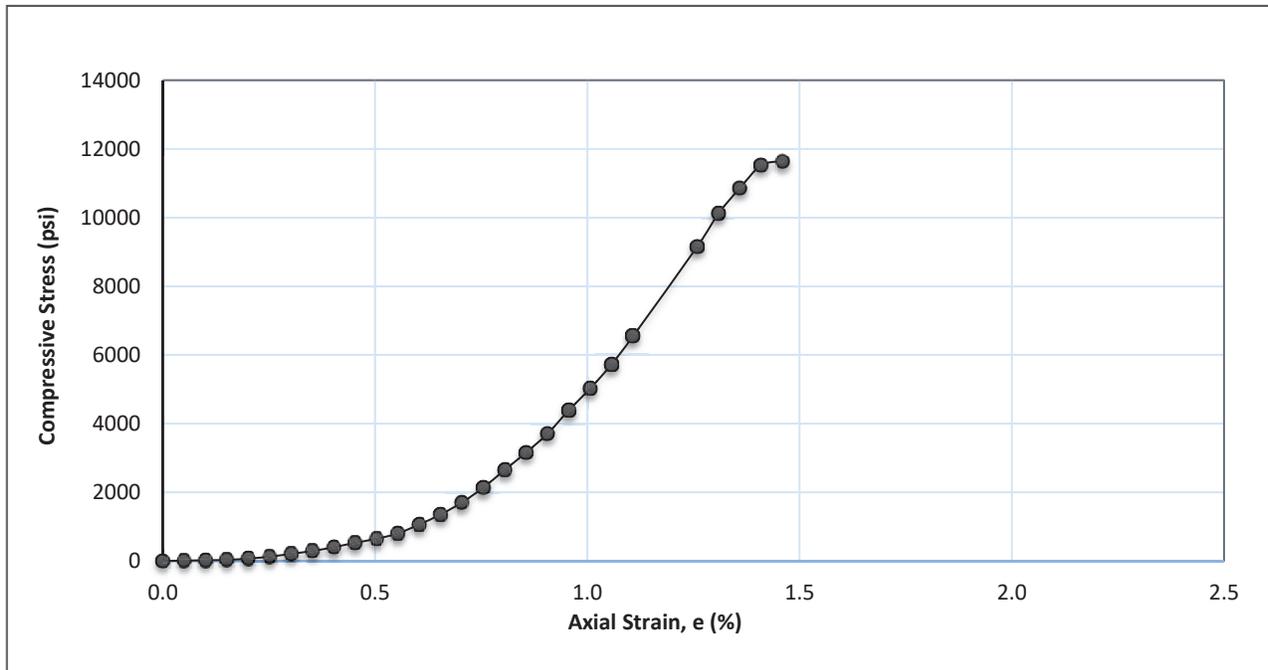
### Final Specimen Figure



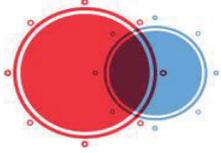
### Result

Compressive Strength of Rock Core, psi: 11641  
 Strain (%): 1.5

Bedrock Strength: Strong



Notes:



## ASTM D7012, Method C - Compressive Strength of Intact Rock Core Specimen

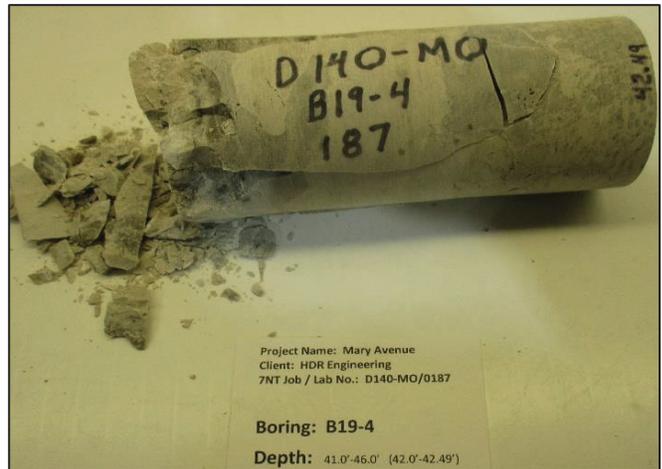
Client HDR, Inc. Project No. D140-MO  
 Project Mary Avenue CSO - Brentwood, MO Test Date: 11/18/2019

### Specimen Properties

Average Diameter, in:	2.3950
Average Height, in:	5.8790
Area, in <sup>2</sup> :	4.505
Volume, in <sup>3</sup> :	26.49
Wet Mass of Specimen, lb:	2.47
Moisture Content, %:	0.17
Dry Mass of Specimen, lb:	2.46
Wet Unit Weight, $\gamma$ (lb/ft <sup>3</sup> ):	161.0
Dry Unit Weight, $\gamma_d$ (lb/ft <sup>3</sup> ):	160.7

Description: B19-4 42.0'-42.49'

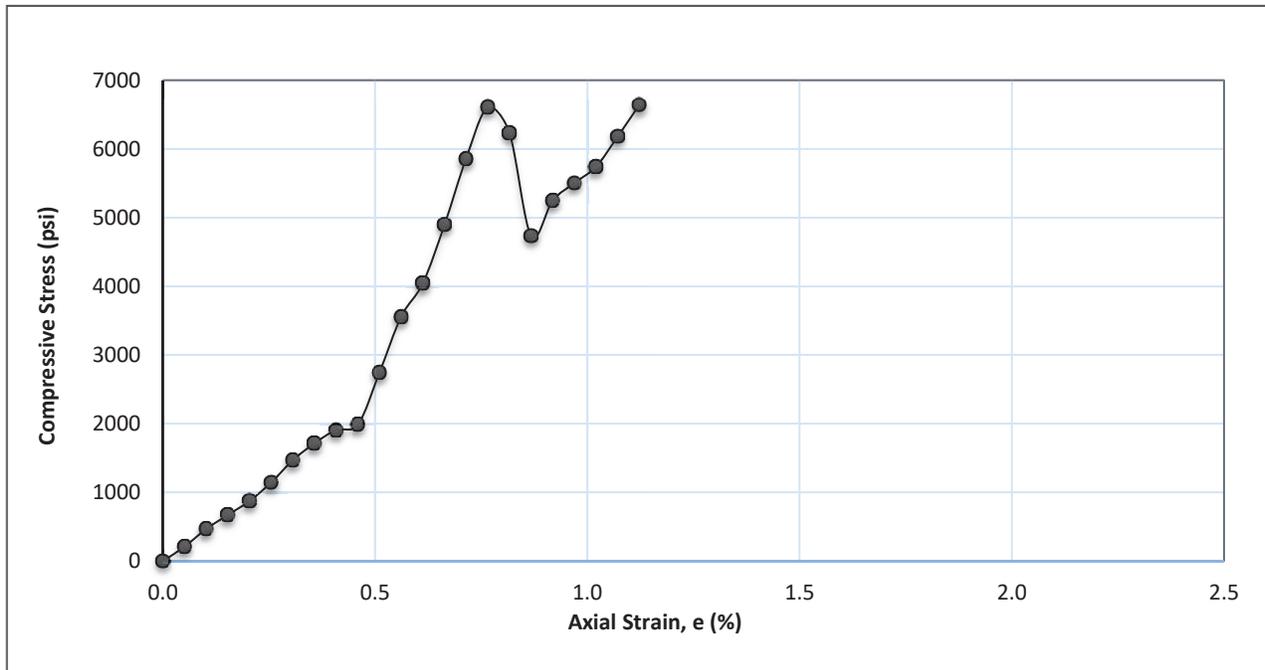
### Final Specimen Figure



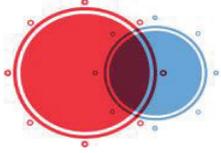
### Result

Compressive Strength of Rock Core, psi: 6644  
 Strain (%): 1.1

Bedrock Strength: Moderately Strong



Notes:



## ASTM D7012, Method C - Compressive Strength of Intact Rock Core Specimen

Client HDR, Inc.  
Project Mary Avenue CSO - Brentwood, MO

Project No. D140-MO  
Test Date: 11/18/2019

### Specimen Properties

Average Diameter, in:	2.4040
Average Height, in:	5.9660
Area, in <sup>2</sup> :	4.539
Volume, in <sup>3</sup> :	27.08
Wet Mass of Specimen, lb:	2.62
Moisture Content, %:	0.14
Dry Mass of Specimen, lb:	2.62
Wet Unit Weight, $\gamma$ (lb/ft <sup>3</sup> ):	167.3
Dry Unit Weight, $\gamma_d$ (lb/ft <sup>3</sup> ):	167.1

### Final Specimen Figure

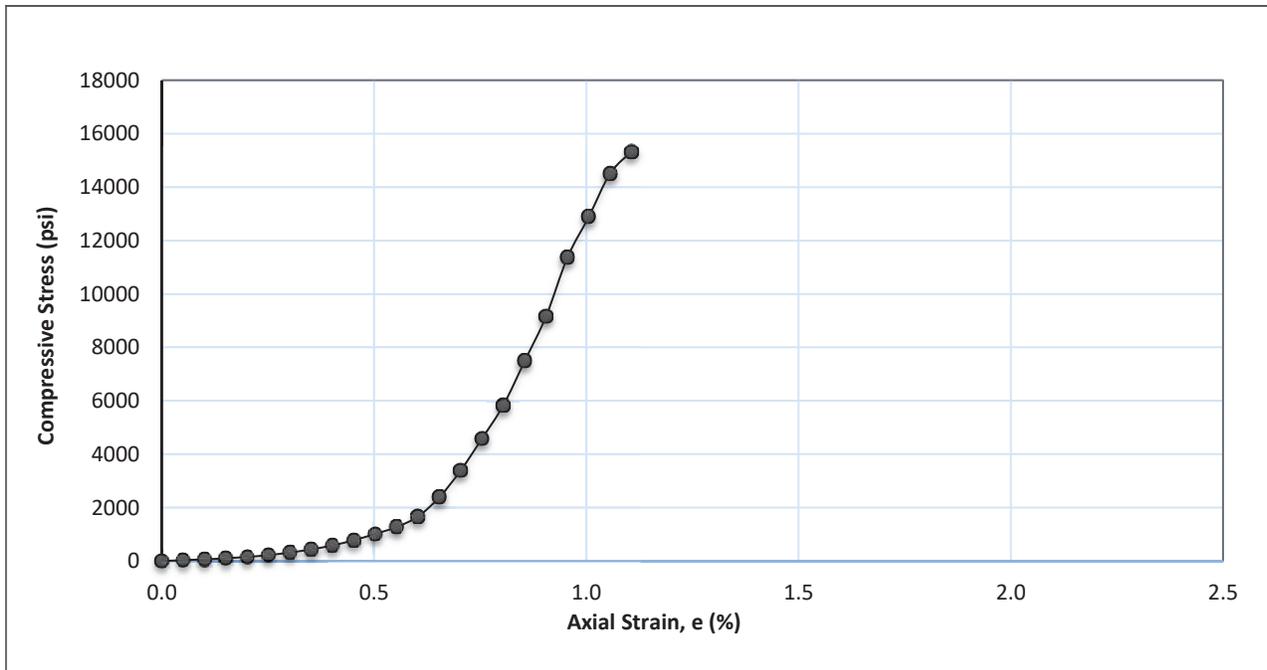


Description: B19-7 19.78'-20.28'

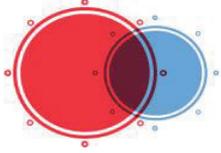
### Result

Compressive Strength of Rock Core, psi:	15317
Strain (%):	1.1

Bedrock Strength: Very Strong



Notes:



## ASTM D7012, Method C - Compressive Strength of Intact Rock Core Specimen

Client HDR, Inc.  
Project Mary Avenue CSO - Brentwood, MO

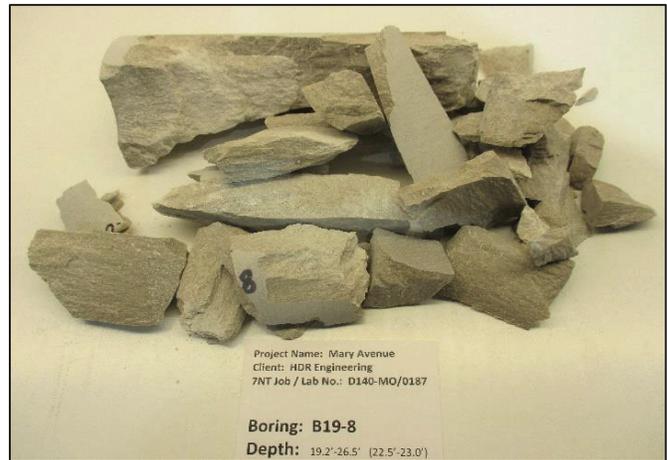
Project No. D140-MO  
Test Date: 11/18/2019

### Specimen Properties

Average Diameter, in:	2.4040
Average Height, in:	5.9810
Area, in <sup>2</sup> :	4.539
Volume, in <sup>3</sup> :	27.15
Wet Mass of Specimen, lb:	2.62
Moisture Content, %:	0.13
Dry Mass of Specimen, lb:	2.62
Wet Unit Weight, $\gamma$ (lb/ft <sup>3</sup> ):	166.9
Dry Unit Weight, $\gamma_d$ (lb/ft <sup>3</sup> ):	166.6

Description: B19-8 22.5'-23.0'

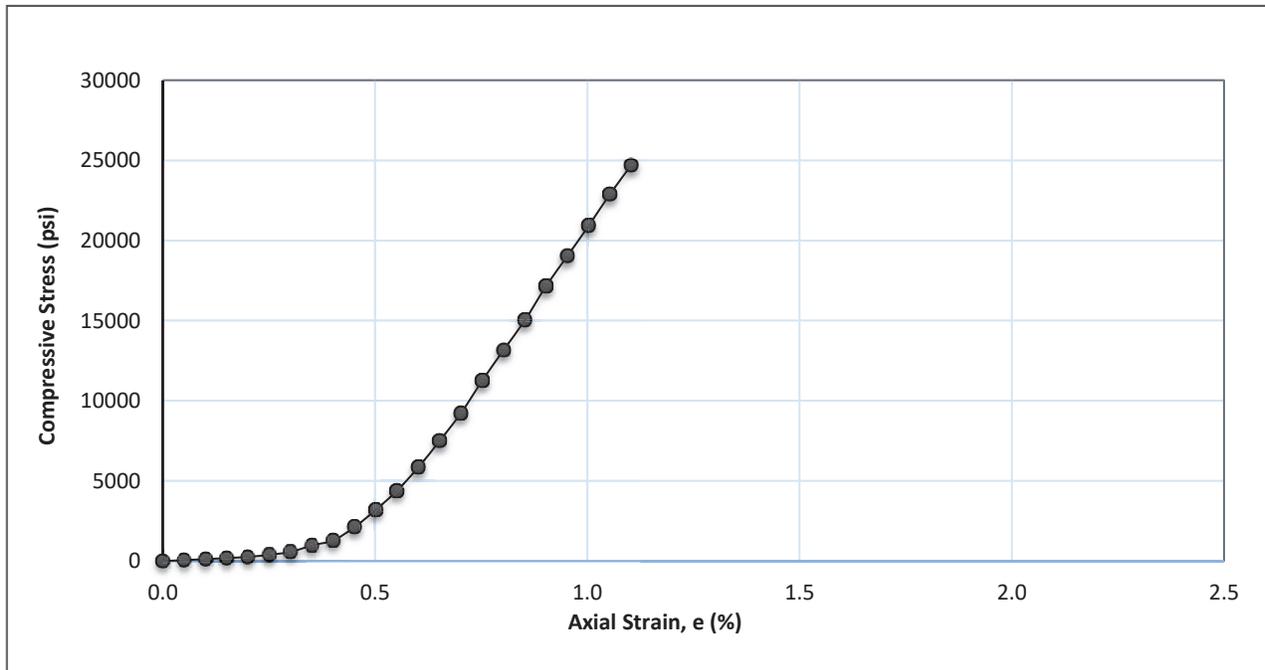
### Final Specimen Figure



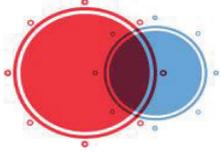
### Result

Compressive Strength of Rock Core, psi:	24701
Strain (%):	1.1

Bedrock Strength: Very Strong



Notes:



## ASTM D7012, Method C - Compressive Strength of Intact Rock Core Specimen

Client HDR, Inc. Project No. D140-MO  
 Project Mary Avenue CSO - Brentwood, MO Test Date: 11/18/2019

### Specimen Properties

Average Diameter, in:	2.3970
Average Height, in:	5.9590
Area, in <sup>2</sup> :	4.513
Volume, in <sup>3</sup> :	26.89
Wet Mass of Specimen, lb:	2.45
Moisture Content, %:	0.54
Dry Mass of Specimen, lb:	2.44
Wet Unit Weight, $\gamma$ (lb/ft <sup>3</sup> ):	157.4
Dry Unit Weight, $\gamma_d$ (lb/ft <sup>3</sup> ):	156.5

### Final Specimen Figure

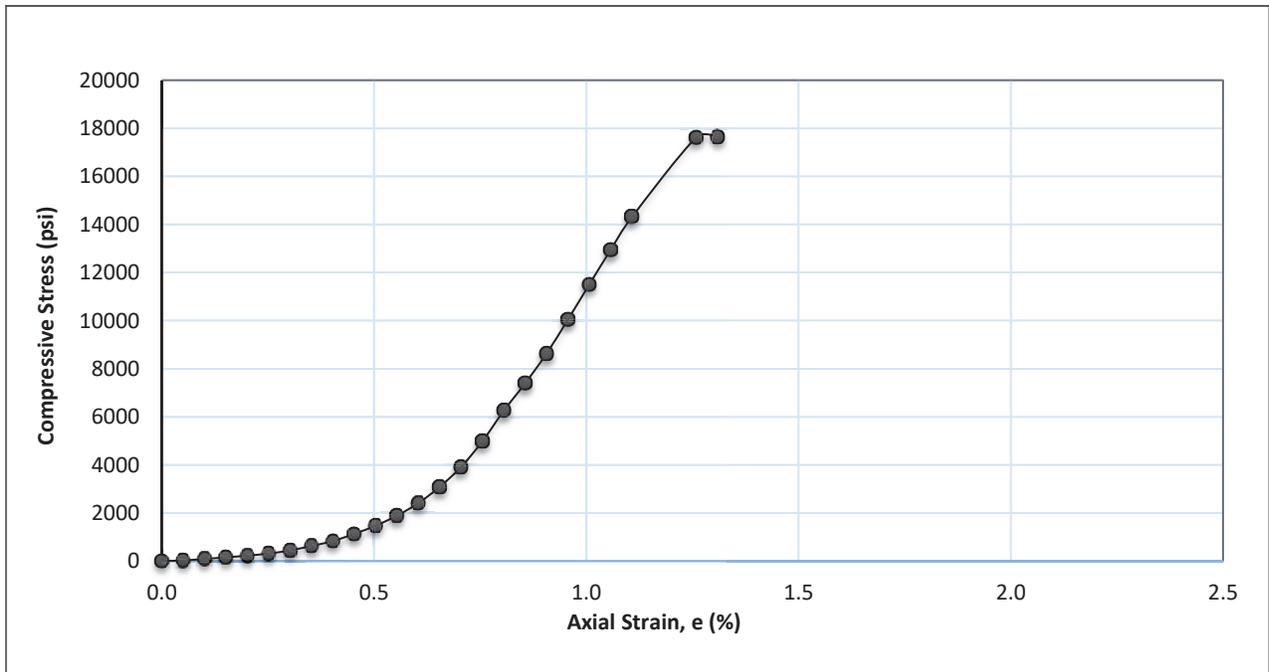


Description: B19-9 16.0'-16.5'

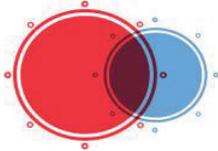
### Result

Compressive Strength of Rock Core, psi:	17643
Strain (%):	1.3

Bedrock Strength: Very Strong



Notes:



## ASTM D7012, Method C - Compressive Strength of Intact Rock Core Specimen

Client HDR, Inc.  
Project Mary Avenue CSO - Brentwood, MO

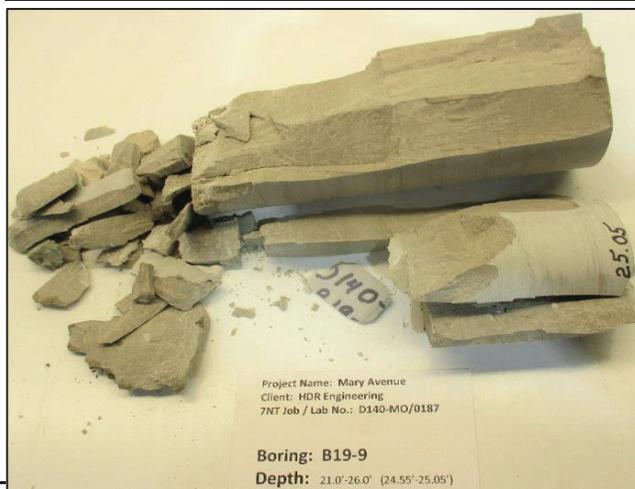
Project No. D140-MO  
Test Date: 11/18/2019

### Specimen Properties

Average Diameter, in:	2.4000
Average Height, in:	5.9420
Area, in <sup>2</sup> :	4.524
Volume, in <sup>3</sup> :	26.88
Wet Mass of Specimen, lb:	2.60
Moisture Content, %:	0.16
Dry Mass of Specimen, lb:	2.59
Wet Unit Weight, $\gamma$ (lb/ft <sup>3</sup> ):	166.9
Dry Unit Weight, $\gamma_d$ (lb/ft <sup>3</sup> ):	166.7

Description: B19-9 24.55'-25.05'

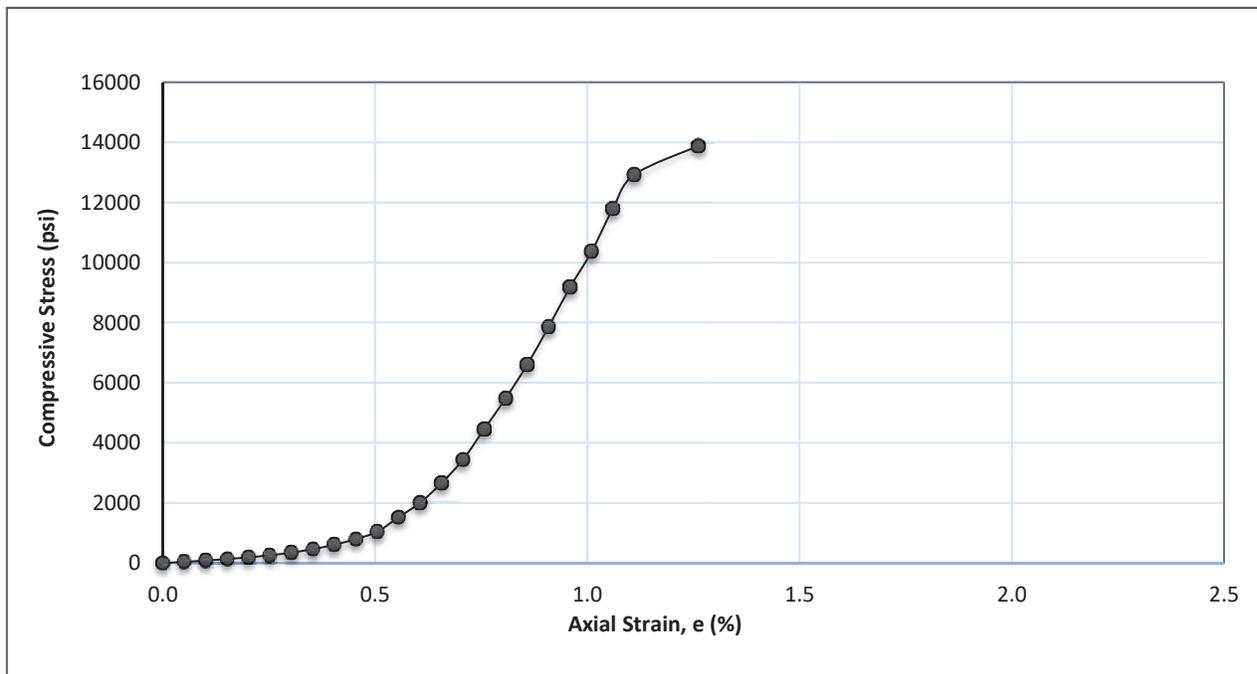
### Final Specimen Figure



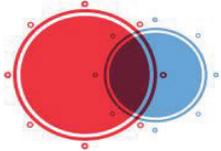
### Result

Compressive Strength of Rock Core, psi:	13883
Strain (%):	1.3

Bedrock Strength: Strong



Notes:



## ASTM D7012, Method C - Compressive Strength of Intact Rock Core Specimen

Client HDR, Inc.  
Project Mary Avenue CSO - Brentwood, MO

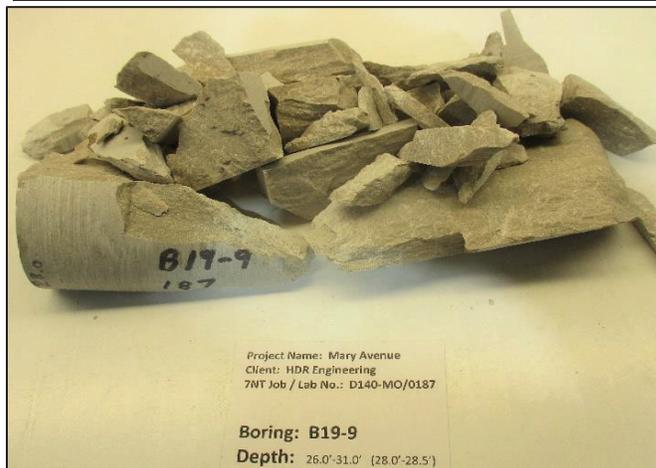
Project No. D140-MO  
Test Date: 11/18/2019

### Specimen Properties

Average Diameter, in:	2.3990
Average Height, in:	5.9330
Area, in <sup>2</sup> :	4.520
Volume, in <sup>3</sup> :	26.82
Wet Mass of Specimen, lb:	2.58
Moisture Content, %:	0.12
Dry Mass of Specimen, lb:	2.58
Wet Unit Weight, $\gamma$ (lb/ft <sup>3</sup> ):	166.5
Dry Unit Weight, $\gamma_d$ (lb/ft <sup>3</sup> ):	166.3

Description: B19-9 28.0'-28.5'

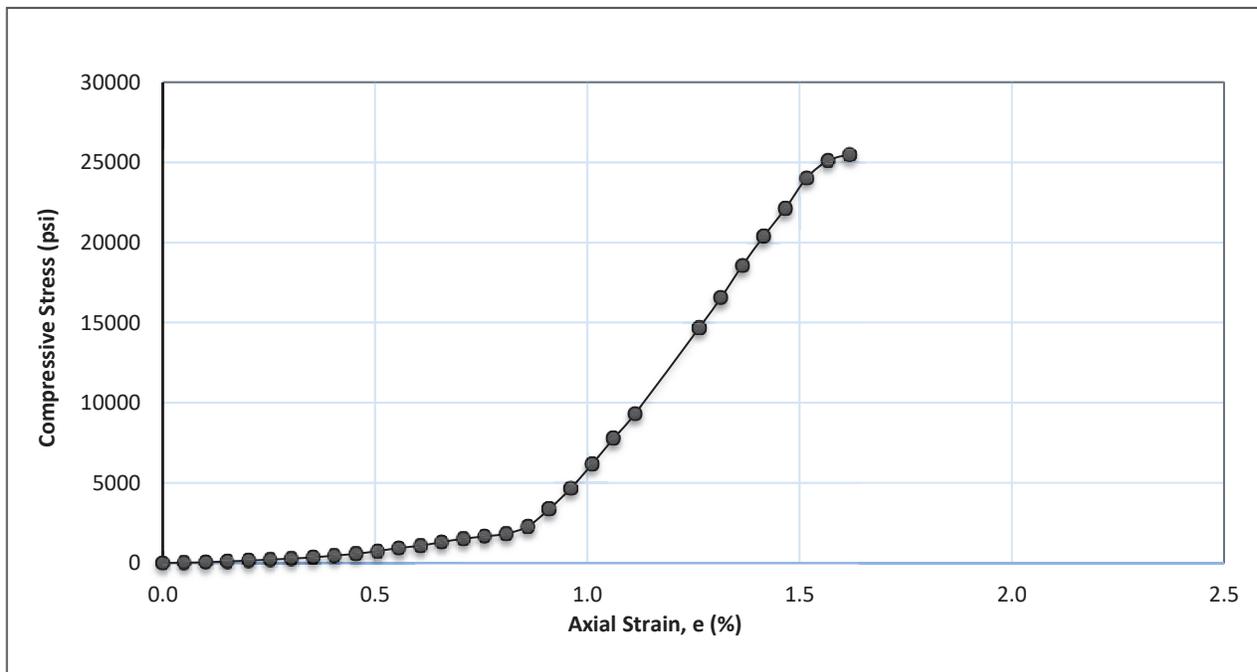
### Final Specimen Figure



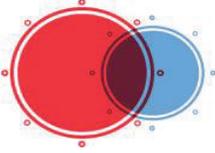
### Result

Compressive Strength of Rock Core, psi:	25500
Strain (%):	1.6

Bedrock Strength: Very Strong



Notes:



## ASTM D7012, Method C - Compressive Strength of Intact Rock Core Specimen

Client HDR, Inc. Project No. D140-MO  
 Project Mary Avenue CSO - Brentwood, MO Test Date: 2/7/2020

Location/ ID: B19-1A 32.10'-32.51'

### Specimen Properties

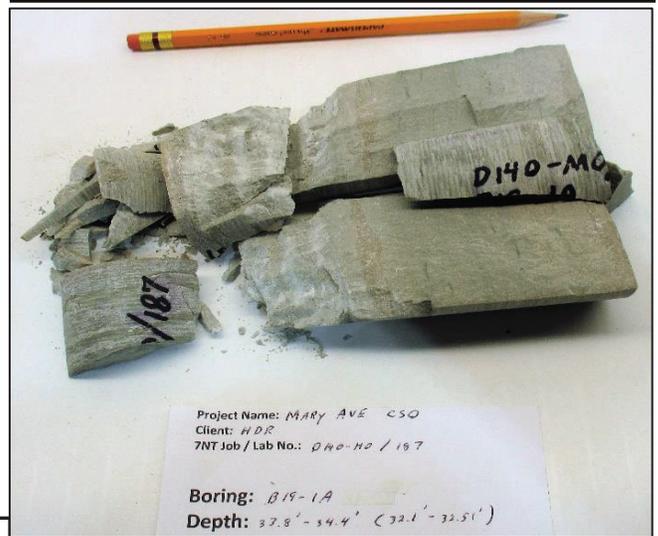
Average Diameter, in:	1.9840
Average Height, in:	4.9020
Area, in <sup>2</sup> :	3.092
Volume, in <sup>3</sup> :	15.15
Wet Mass of Specimen, lb:	1.45
Moisture Content, %:	0.38
Dry Mass of Specimen, lb:	1.44
Wet Unit Weight, $\gamma$ (lb/ft <sup>3</sup> ):	164.8
Dry Unit Weight, $\gamma_d$ (lb/ft <sup>3</sup> ):	164.2

Description: light gray micritic LIMESTONE, moderately weathered, shell fossils, calcite inclusions

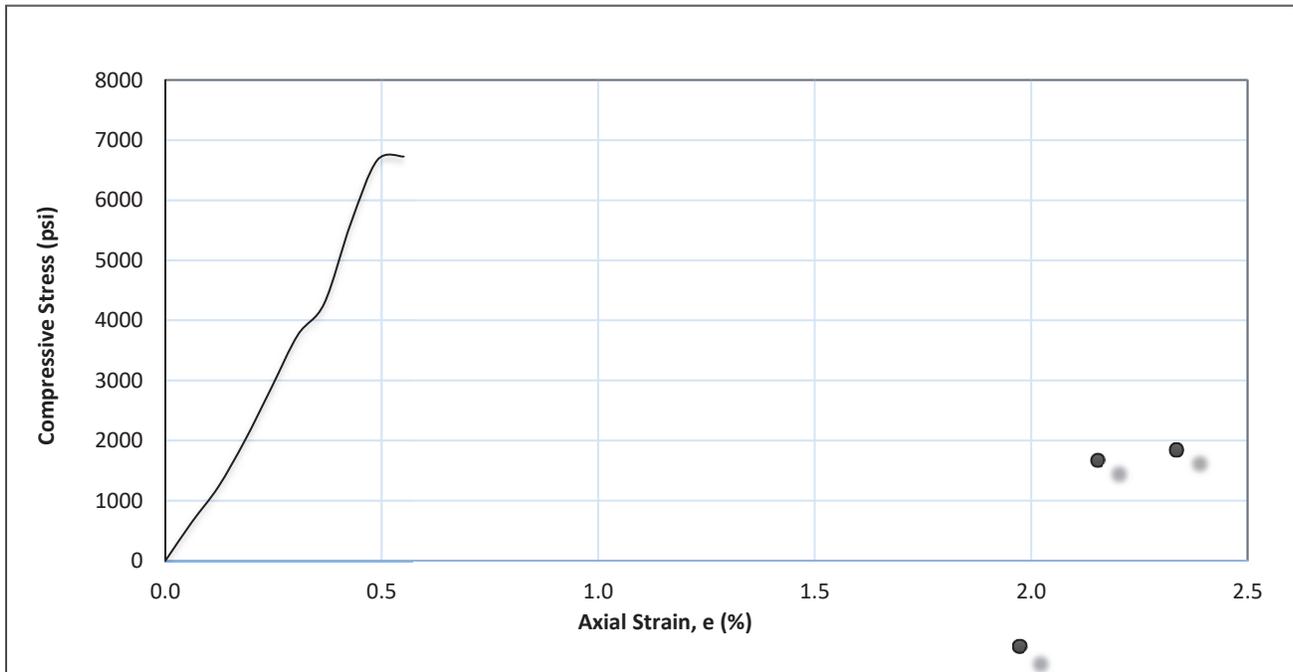
### Result

Compressive Strength of Rock Core, psi:	6726
Strain (%):	0.6

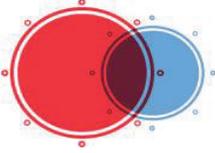
### Final Specimen Figure



Bedrock Strength: Moderately Strong



Notes:



## ASTM D7012, Method C - Compressive Strength of Intact Rock Core Specimen

Client HDR, Inc. Project No. D140-MO  
 Project Mary Avenue CSO - Brentwood, MO Test Date: 2/7/2020

Location/ ID: B19-2A 23.61'-23.97'

### Specimen Properties

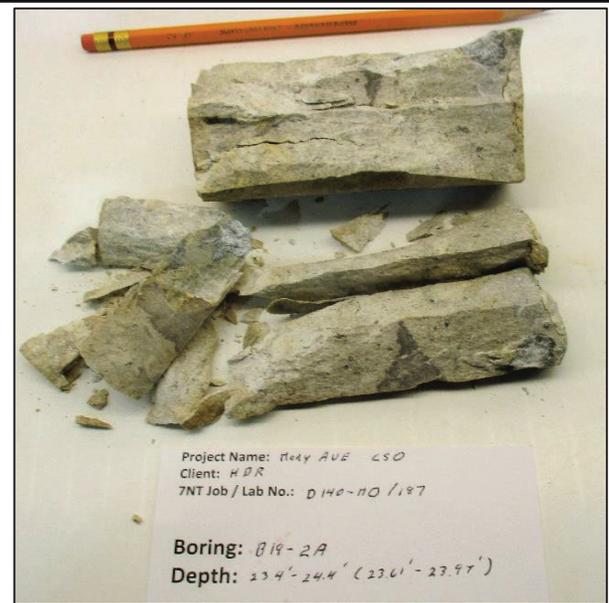
Average Diameter, in:	1.9850
Average Height, in:	3.9630
Area, in <sup>2</sup> :	3.095
Volume, in <sup>3</sup> :	12.26
Wet Mass of Specimen, lb:	1.11
Moisture Content, %:	0.36
Dry Mass of Specimen, lb:	1.10
Wet Unit Weight, $\gamma$ (lb/ft <sup>3</sup> ):	155.9
Dry Unit Weight, $\gamma_d$ (lb/ft <sup>3</sup> ):	155.3

Description: gray LIMESTONE, fossil clasts, calcite inclusions, chert nodules

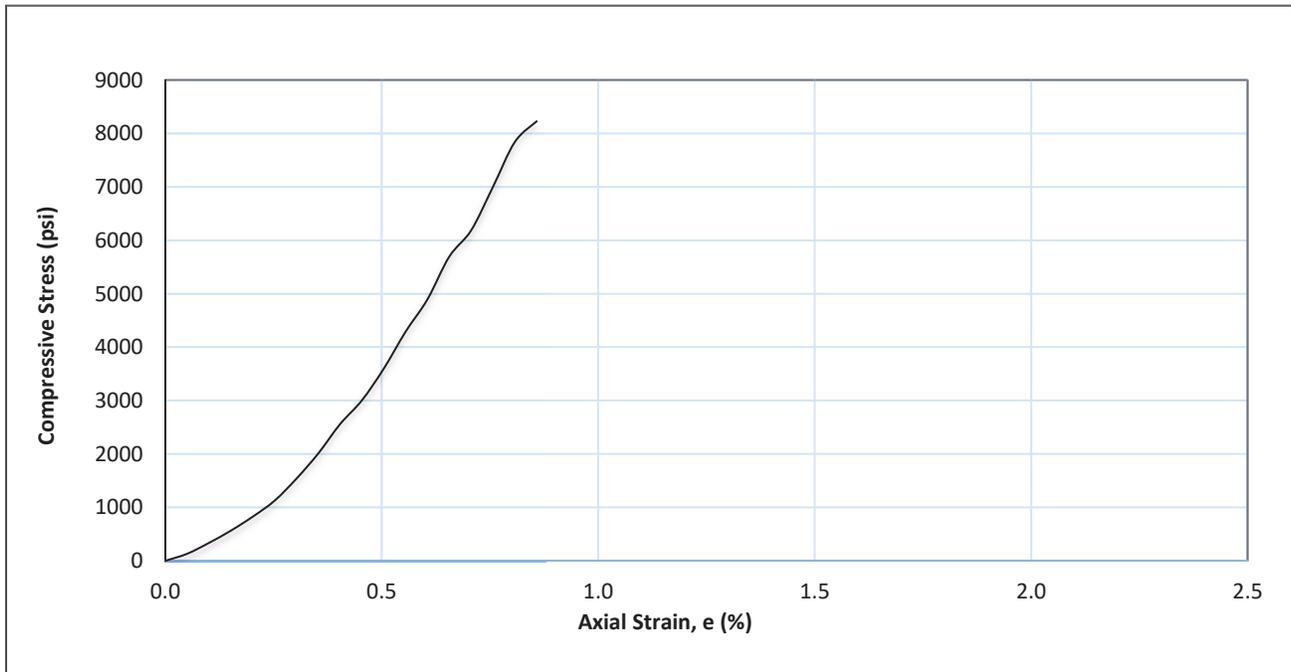
### Result

Compressive Strength of Rock Core, psi:	8227
Strain (%):	0.9

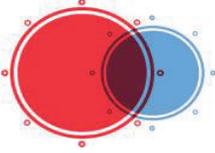
### Final Specimen Figure



Bedrock Strength: Strong



Notes:



## ASTM D7012, Method C - Compressive Strength of Intact Rock Core Specimen

Client HDR, Inc. Project No. D140-MO  
 Project Mary Avenue CSO - Brentwood, MO Test Date: 2/7/2020

Location/ ID: B19-3A 25.39'-25.80'

### Specimen Properties

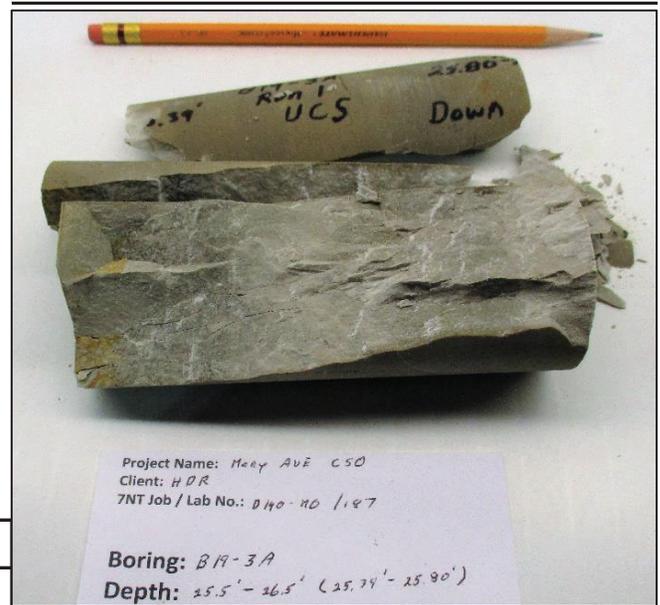
Average Diameter, in:	1.9870
Average Height, in:	4.8960
Area, in <sup>2</sup> :	3.101
Volume, in <sup>3</sup> :	15.18
Wet Mass of Specimen, lb:	1.39
Moisture Content, %:	2.38
Dry Mass of Specimen, lb:	1.36
Wet Unit Weight, $\gamma$ (lb/ft <sup>3</sup> ):	158.4
Dry Unit Weight, $\gamma_d$ (lb/ft <sup>3</sup> ):	154.7

Description: light gray micritic LIMESTONE, moderately weathered

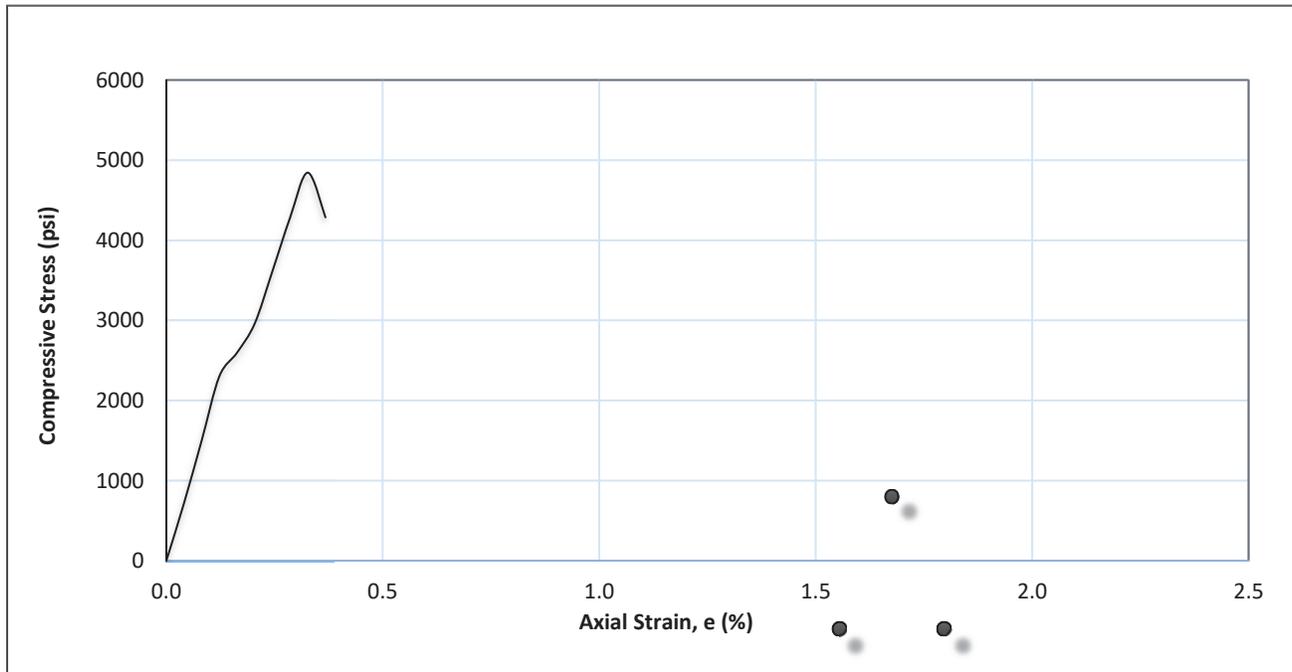
### Result

Compressive Strength of Rock Core, psi:	4844
Strain (%):	0.3

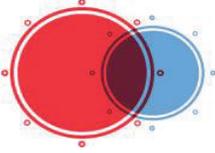
### Final Specimen Figure



Bedrock Strength: Moderately Strong



Notes:



# 7NT



## ASTM D7012, Method C - Compressive Strength of Intact Rock Core Specimen

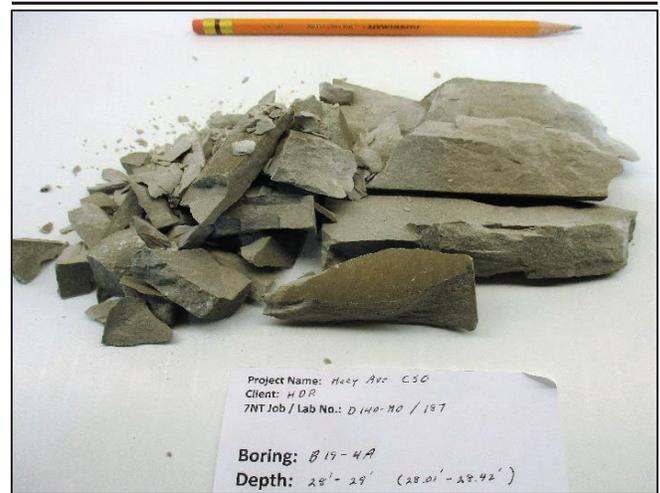
Client <u>HDR, Inc.</u>	Project No. <u>D140-MO</u>
Project <u>Mary Avenue CSO - Brentwood, MO</u>	Test Date: <u>2/7/2020</u>

Location/ ID: B19-4A 28.01'-28.42'

### Specimen Properties

Average Diameter, in:	1.9820
Average Height, in:	4.8550
Area, in <sup>2</sup> :	3.085
Volume, in <sup>3</sup> :	14.98
Wet Mass of Specimen, lb:	1.28
Moisture Content, %:	2.63
Dry Mass of Specimen, lb:	1.25
Wet Unit Weight, $\gamma$ (lb/ft <sup>3</sup> ):	147.8
Dry Unit Weight, $\gamma_d$ (lb/ft <sup>3</sup> ):	144.0

### Final Specimen Figure

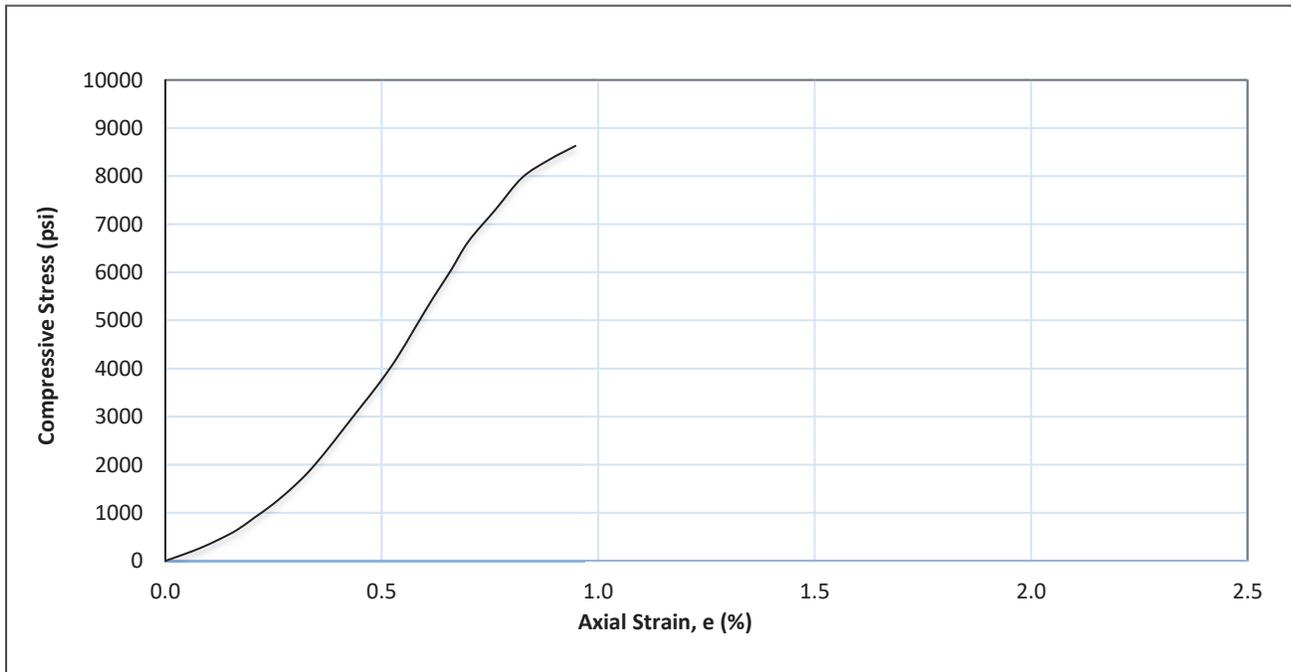


Description: light gray micritic LIMESTONE, moderately weathered

### Result

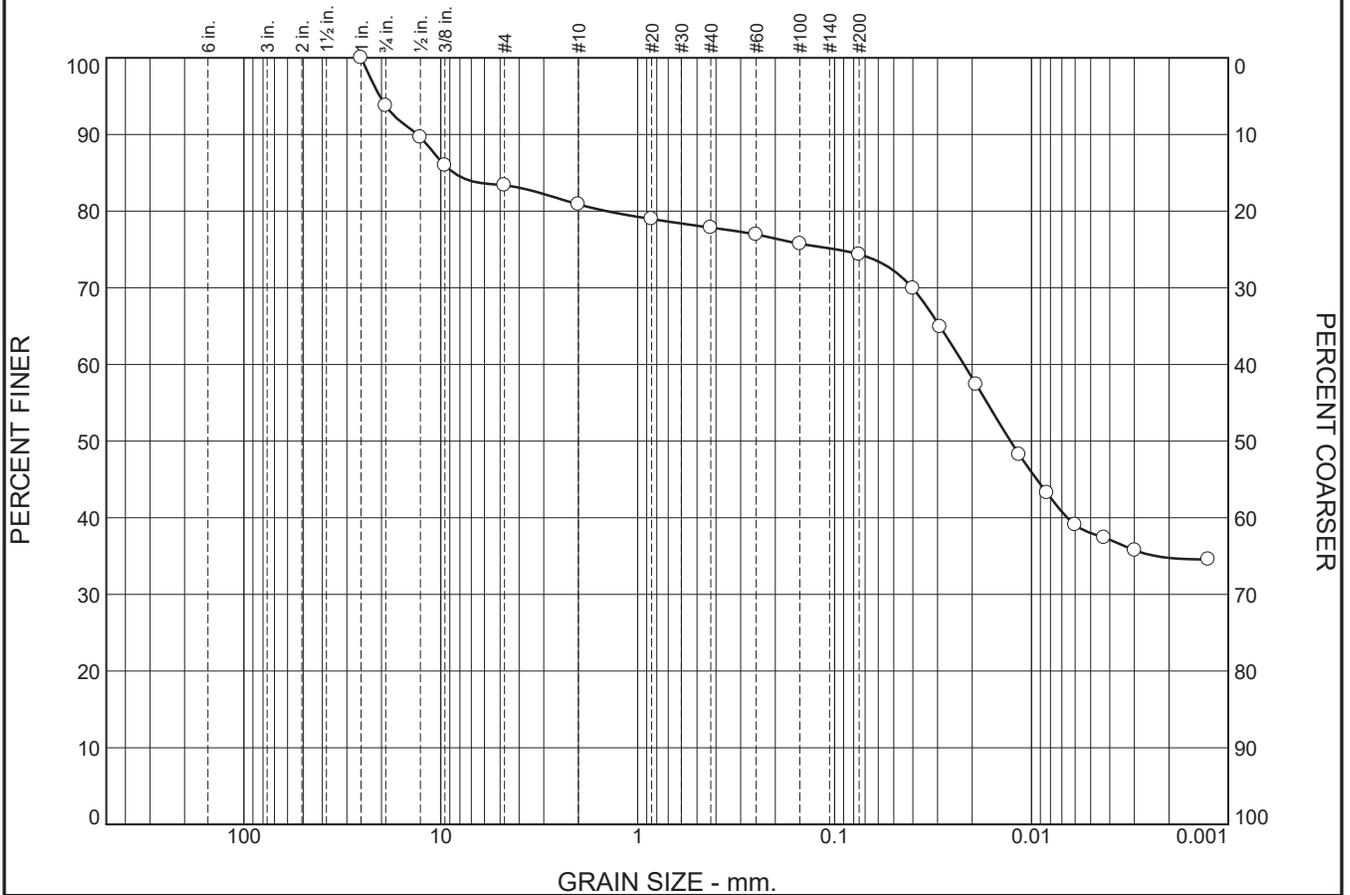
Compressive Strength of Rock Core, psi:	8630
Strain (%):	0.9

Bedrock Strength: Strong



Notes:

# Particle Size Distribution Report



GRAIN SIZE - mm.

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	6.2	10.4	2.5	3.1	3.4	36.4	38.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.0	100.0		
0.75	93.8		
0.5	89.6		
0.375	86.0		
#4	83.4		
#10	80.9		
#20	79.0		
#40	77.8		
#60	76.9		
#100	75.7		
#200	74.4		

**Material Description**

red/brown fat CLAY with gravel

**Atterberg Limits**

PL= 19      LL= 58      PI= 39

**Coefficients**

D<sub>90</sub>= 13.1652      D<sub>85</sub>= 8.5867      D<sub>60</sub>= 0.0220  
D<sub>50</sub>= 0.0128      D<sub>30</sub>=      D<sub>15</sub>=  
D<sub>10</sub>=      C<sub>u</sub>=      C<sub>c</sub>=

**Classification**

USCS= CH      AASHTO= A-7-6(28)

**Remarks**

Lab No.: 0187

\* (no specification provided)

Location: B19-1 S-5  
Sample Number: 0187

Depth: 13.5' - 15.0'

Date: 10/21/19



Client: HDR, Inc.  
Project: Mary Avenue CSO - Brentwood, MO

Project No: D140-MO

Figure

**GRAIN SIZE DISTRIBUTION TEST DATA**

10/22/2019

**Client:** HDR, Inc.

**Project:** Mary Avenue CSO - Brentwood, MO

**Project Number:** D140-MO

**Location:** B19-1 S-5

**Depth:** 13.5' - 15.0'

**Sample Number:** 0187

**Material Description:** red/brown fat CLAY with gravel

**Date:** 10/21/19

**PL:** 19

**LL:** 58

**PI:** 39

**USCS Classification:** CH

**AASHTO Classification:** A-7-6(28)

**Testing Remarks:** Lab No.: 0187

**Sieve Test Data**

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer	Percent Retained
280.01	15.84	0.00	1.0	0.00	100.0	0.0
			0.75	16.51	93.8	6.2
			0.5	27.40	89.6	10.4
			0.375	37.06	86.0	14.0
			#4	43.94	83.4	16.6
			#10	50.50	80.9	19.1
50.35	0.00	0.00	#20	1.19	79.0	21.0
			#40	1.89	77.8	22.2
			#60	2.45	76.9	23.1
			#100	3.20	75.7	24.3
			#200	4.06	74.4	25.6

**Hydrometer Test Data**

Hydrometer test uses material passing #10

Percent passing #10 based upon complete sample = 80.9

Weight of hydrometer sample = 50.35

Hygroscopic moisture correction:

Moist weight and tare = 60.28

Dry weight and tare = 59.24

Tare weight = 31.21

Hygroscopic moisture = 3.7%

Automatic temperature correction

Composite correction (fluid density and meniscus height) at 20 deg. C = -5.0

Meniscus correction only = 0.0

Specific gravity of solids = 2.65

Hydrometer type = 152H

Hydrometer effective depth equation:  $L = 16.294964 - 0.164 \times R_m$

Elapsed Time (min.)	Temp. (deg. C.)	Actual Reading	Corrected Reading	K	Rm	Eff. Depth	Diameter (mm.)	Percent Finer	Percent Retained
1.00	20.0	47.0	42.0	0.0136	47.0	8.6	0.0400	69.9	30.1
2.00	20.0	44.0	39.0	0.0136	44.0	9.1	0.0291	64.9	35.1
5.00	20.0	39.5	34.5	0.0136	39.5	9.8	0.0191	57.4	42.6
15.00	20.0	34.0	29.0	0.0136	34.0	10.7	0.0115	48.2	51.8
30.00	20.0	31.0	26.0	0.0136	31.0	11.2	0.0083	43.2	56.8
60.00	20.0	28.5	23.5	0.0136	28.5	11.6	0.0060	39.1	60.9
120.00	20.0	27.5	22.5	0.0136	27.5	11.8	0.0043	37.4	62.6

**Hydrometer Test Data (continued)**

Elapsed Time (min.)	Temp. (deg. C.)	Actual Reading	Corrected Reading	K	Rm	Eff. Depth	Diameter (mm.)	Percent Finer	Percent Retained
250.00	20.0	26.5	21.5	0.0136	26.5	11.9	0.0030	35.8	64.2
1440.00	19.0	26.0	20.8	0.0138	26.0	12.0	0.0013	34.6	65.4

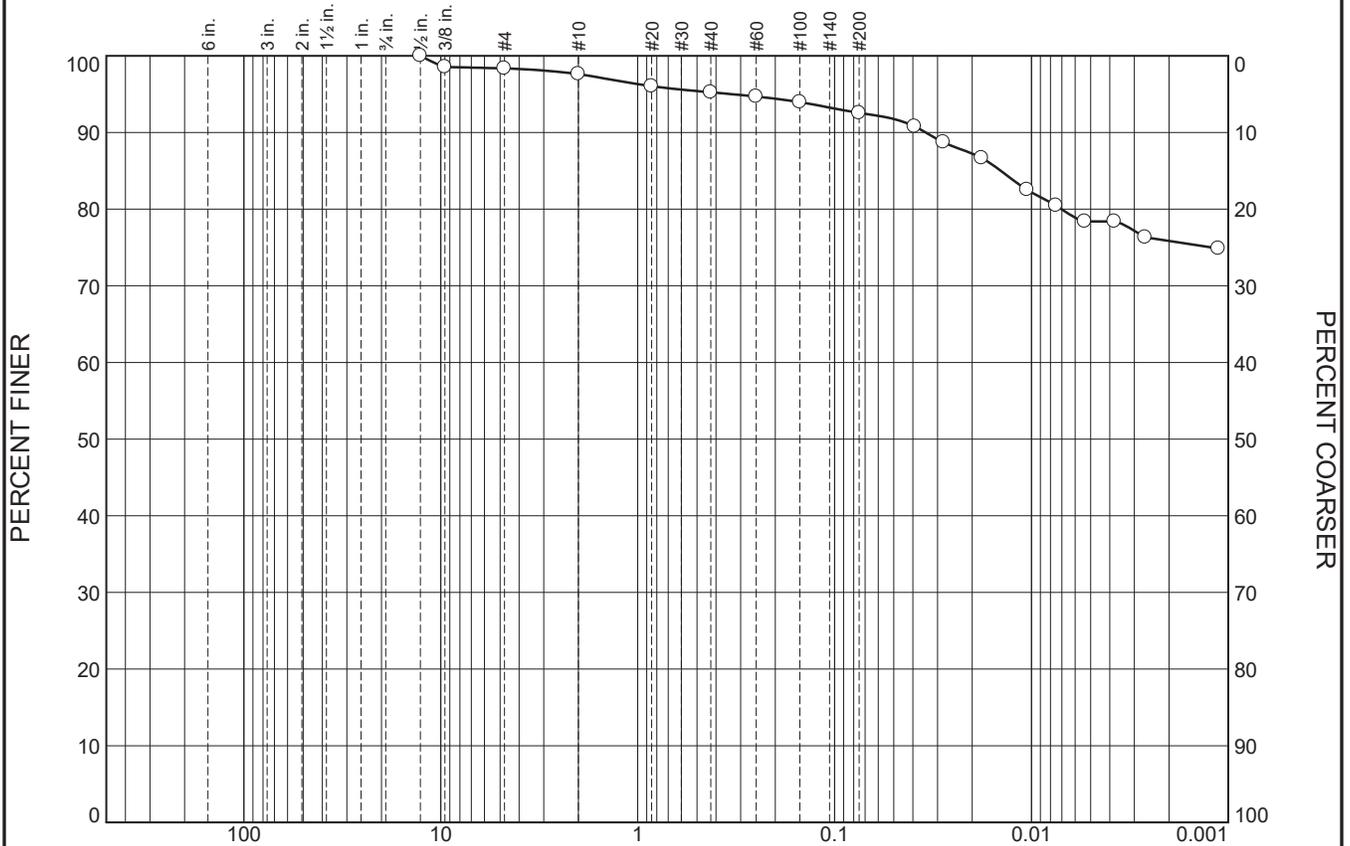
**Fractional Components**

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	6.2	10.4	16.6	2.5	3.1	3.4	9.0	36.4	38.0	74.4

D <sub>5</sub>	D <sub>10</sub>	D <sub>15</sub>	D <sub>20</sub>	D <sub>30</sub>	D <sub>40</sub>	D <sub>50</sub>	D <sub>60</sub>	D <sub>80</sub>	D <sub>85</sub>	D <sub>90</sub>	D <sub>95</sub>
					0.0066	0.0128	0.0220	1.4356	8.5867	13.1652	20.4304

<b>Fineness Modulus</b>
1.44

# Particle Size Distribution Report



GRAIN SIZE - mm.

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.6	0.8	2.4	2.6	14.2	78.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.5	100.0		
0.375	98.5		
#4	98.4		
#10	97.6		
#20	96.0		
#40	95.2		
#60	94.7		
#100	94.0		
#200	92.6		

**Material Description**

red/brown fat CLAY

**Atterberg Limits**

PL= 31      LL= 102      PI= 71

**Coefficients**

D<sub>90</sub>= 0.0344      D<sub>85</sub>= 0.0143      D<sub>60</sub>=  
D<sub>50</sub>=                  D<sub>30</sub>=                  D<sub>15</sub>=  
D<sub>10</sub>=                  C<sub>u</sub>=                  C<sub>c</sub>=

**Classification**

USCS= CH                  AASHTO= A-7-5(77)

**Remarks**

Lab No.: 0187

\* (no specification provided)

Location: B19-2 S-1  
Sample Number: 0187

Depth: 1.0' - 2.5'

Date: 10/21/19



Client: HDR, Inc.  
Project: Mary Avenue CSO - Brentwood, MO

Project No: D140-MO

Figure

**GRAIN SIZE DISTRIBUTION TEST DATA**

10/22/2019

**Client:** HDR, Inc.

**Project:** Mary Avenue CSO - Brentwood, MO

**Project Number:** D140-MO

**Location:** B19-2 S-1

**Depth:** 1.0' - 2.5'

**Sample Number:** 0187

**Material Description:** red/brown fat CLAY

**Date:** 10/21/19

**PL:** 31

**LL:** 102

**PI:** 71

**USCS Classification:** CH

**AASHTO Classification:** A-7-5(77)

**Testing Remarks:** Lab No.: 0187

**Sieve Test Data**

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer	Percent Retained
254.35	13.47	0.00	0.5	0.00	100.0	0.0
			0.375	3.51	98.5	1.5
			#4	3.94	98.4	1.6
			#10	5.73	97.6	2.4
50.88	0.00	0.00	#20	0.82	96.0	4.0
			#40	1.24	95.2	4.8
			#60	1.53	94.7	5.3
			#100	1.91	94.0	6.0
			#200	2.64	92.6	7.4

**Hydrometer Test Data**

Hydrometer test uses material passing #10

Percent passing #10 based upon complete sample = 97.6

Weight of hydrometer sample = 50.88

Hygroscopic moisture correction:

Moist weight and tare = 57.73

Dry weight and tare = 55.78

Tare weight = 30.26

Hygroscopic moisture = 7.6%

Automatic temperature correction

Composite correction (fluid density and meniscus height) at 20 deg. C = -5.0

Meniscus correction only = 0.0

Specific gravity of solids = 2.65

Hydrometer type = 152H

Hydrometer effective depth equation:  $L = 16.294964 - 0.164 \times R_m$

Elapsed Time (min.)	Temp. (deg. C.)	Actual Reading	Corrected Reading	K	Rm	Eff. Depth	Diameter (mm.)	Percent Finer	Percent Retained
1.00	20.0	49.0	44.0	0.0136	49.0	8.3	0.0392	90.8	9.2
2.00	20.0	48.0	43.0	0.0136	48.0	8.4	0.0280	88.7	11.3
5.00	20.0	47.0	42.0	0.0136	47.0	8.6	0.0179	86.7	13.3
15.00	20.0	45.0	40.0	0.0136	45.0	8.9	0.0105	82.5	17.5
30.00	20.0	44.0	39.0	0.0136	44.0	9.1	0.0075	80.5	19.5
60.00	20.0	43.0	38.0	0.0136	43.0	9.2	0.0054	78.4	21.6
120.00	20.0	43.0	38.0	0.0136	43.0	9.2	0.0038	78.4	21.6
250.00	20.0	42.0	37.0	0.0136	42.0	9.4	0.0026	76.3	23.7
1440.00	19.0	41.5	36.3	0.0138	41.5	9.5	0.0011	74.9	25.1

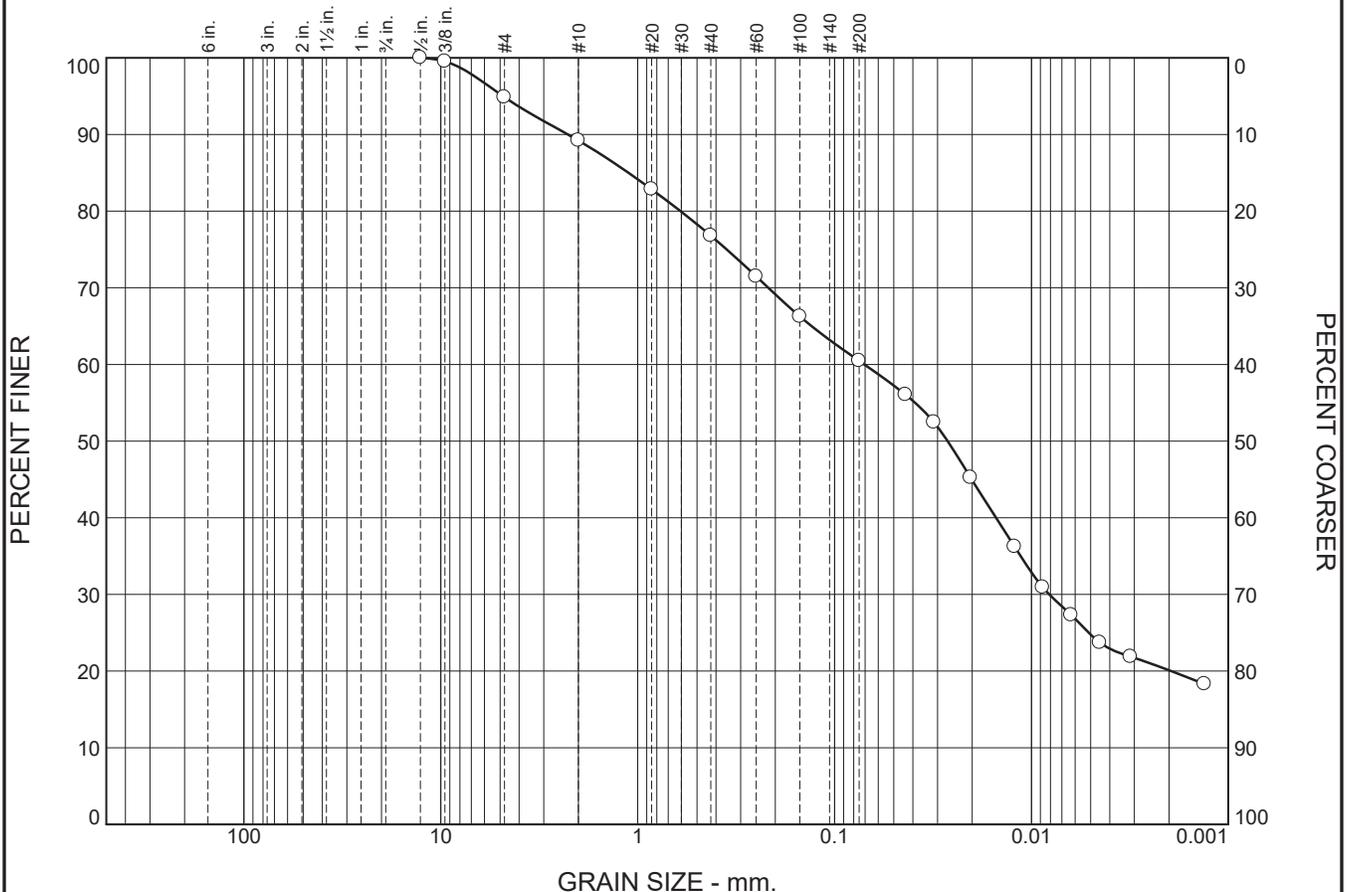
**Fractional Components**

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	0.0	1.6	1.6	0.8	2.4	2.6	5.8	14.2	78.4	92.6

D <sub>5</sub>	D <sub>10</sub>	D <sub>15</sub>	D <sub>20</sub>	D <sub>30</sub>	D <sub>40</sub>	D <sub>50</sub>	D <sub>60</sub>	D <sub>80</sub>	D <sub>85</sub>	D <sub>90</sub>	D <sub>95</sub>
								0.0070	0.0143	0.0344	0.3339

<b>Fineness Modulus</b>
0.24

# Particle Size Distribution Report



GRAIN SIZE - mm.

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	5.1	5.7	12.4	16.3	35.7	24.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.5	100.0		
0.375	99.5		
#4	94.9		
#10	89.2		
#20	82.8		
#40	76.8		
#60	71.5		
#100	66.3		
#200	60.5		

**Material Description**

red/brown sandy lean CLAY

**Atterberg Limits**

PL= 17      LL= 29      PI= 12

**Coefficients**

D<sub>90</sub>= 2.2633      D<sub>85</sub>= 1.1148      D<sub>60</sub>= 0.0706  
D<sub>50</sub>= 0.0267      D<sub>30</sub>= 0.0081      D<sub>15</sub>=  
D<sub>10</sub>=                  C<sub>u</sub>=                  C<sub>c</sub>=

**Classification**

USCS= CL                  AASHTO= A-6(5)

**Remarks**

Lab No.: 0187

\* (no specification provided)

**Location:** B19-3 SS-11  
**Sample Number:** 0187

**Depth:** 28.5' - 30.0'

**Date:** 12/3/19



**Client:** HDR, Inc.  
**Project:** Mary Avenue CSO - Brentwood, MO

**Project No:** D140-MO

**Figure**

**GRAIN SIZE DISTRIBUTION TEST DATA**

12/3/2019

**Client:** HDR, Inc.

**Project:** Mary Avenue CSO - Brentwood, MO

**Project Number:** D140-MO

**Location:** B19-3 SS-11

**Depth:** 28.5' - 30.0'

**Sample Number:** 0187

**Material Description:** red/brown sandy lean CLAY

**Date:** 12/3/19

**PL:** 17

**LL:** 29

**PI:** 12

**USCS Classification:** CL

**AASHTO Classification:** A-6(5)

**Testing Remarks:** Lab No.: 0187

**Sieve Test Data**

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer	Percent Retained
338.47	13.47	0.00	0.5	0.00	100.0	0.0
			0.375	1.49	99.5	0.5
			#4	16.69	94.9	5.1
			#10	35.08	89.2	10.8
50.45	0.00	0.00	#20	3.60	82.8	17.2
			#40	7.02	76.8	23.2
			#60	10.02	71.5	28.5
			#100	12.98	66.3	33.7
			#200	16.25	60.5	39.5

**Hydrometer Test Data**

Hydrometer test uses material passing #10

Percent passing #10 based upon complete sample = 89.2

Weight of hydrometer sample = 50.45

Hygroscopic moisture correction:

Moist weight and tare = 46.88

Dry weight and tare = 46.59

Tare weight = 30.55

Hygroscopic moisture = 1.8%

Automatic temperature correction

Composite correction (fluid density and meniscus height) at 20 deg. C = -5.0

Meniscus correction only = 0.0

Specific gravity of solids = 2.65

Hydrometer type = 152H

Hydrometer effective depth equation:  $L = 16.294964 - 0.164 \times R_m$

Elapsed Time (min.)	Temp. (deg. C.)	Actual Reading	Corrected Reading	K	Rm	Eff. Depth	Diameter (mm.)	Percent Finer	Percent Retained
1.00	20.8	36.0	31.1	0.0135	36.0	10.4	0.0436	56.0	44.0
2.00	20.8	34.0	29.1	0.0135	34.0	10.7	0.0313	52.4	47.6
5.00	20.8	30.0	25.1	0.0135	30.0	11.4	0.0204	45.2	54.8
15.00	20.8	25.0	20.1	0.0135	25.0	12.2	0.0122	36.2	63.8
30.00	21.0	22.0	17.2	0.0135	22.0	12.7	0.0088	30.9	69.1
60.00	21.0	20.0	15.2	0.0135	20.0	13.0	0.0063	27.3	72.7
120.00	21.0	18.0	13.2	0.0135	18.0	13.3	0.0045	23.7	76.3
250.00	20.9	17.0	12.2	0.0135	17.0	13.5	0.0031	21.9	78.1
1440.00	21.0	15.0	10.2	0.0135	15.0	13.8	0.0013	18.3	81.7

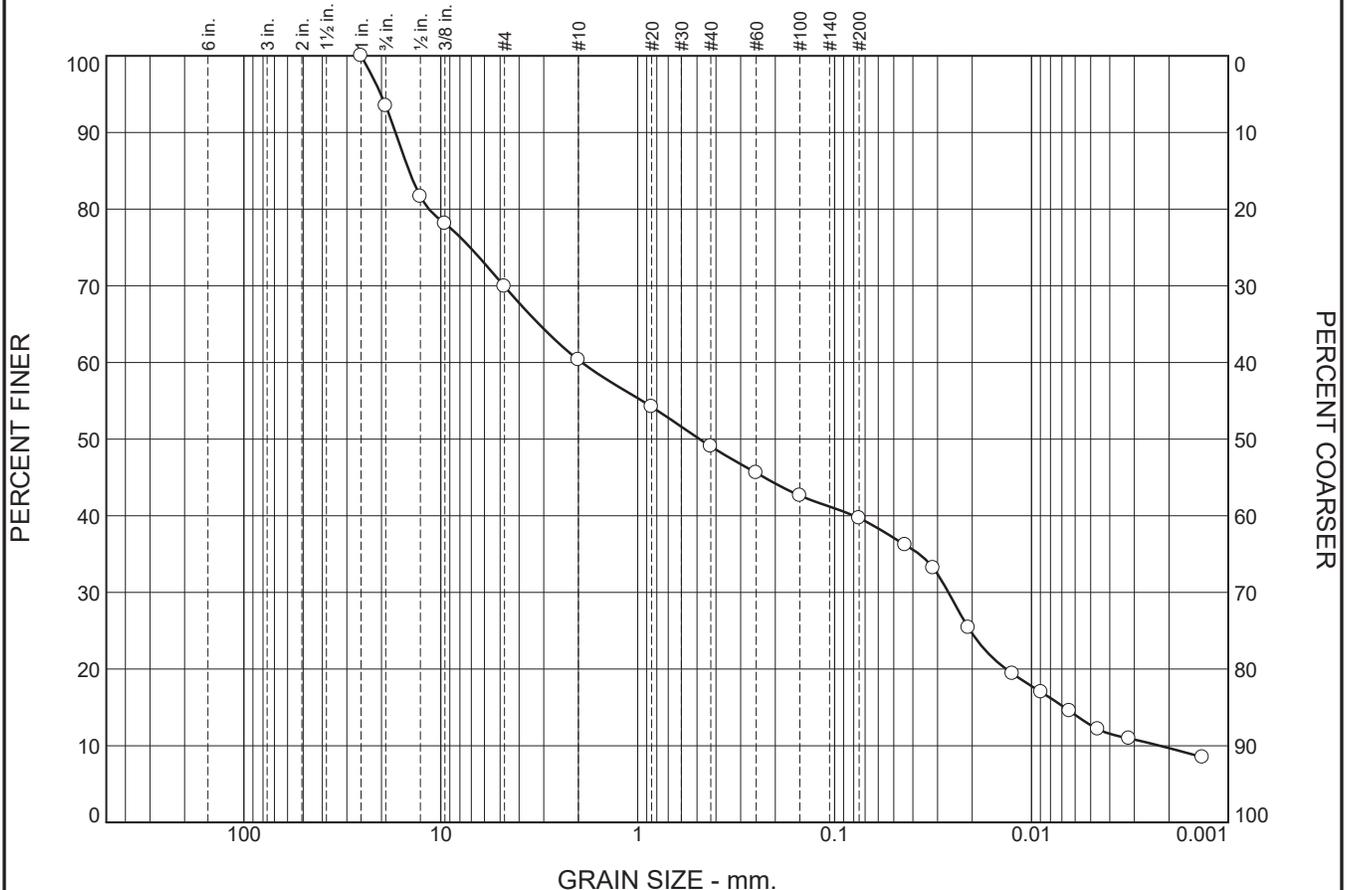
**Fractional Components**

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	0.0	5.1	5.1	5.7	12.4	16.3	34.4	35.7	24.8	60.5

D <sub>5</sub>	D <sub>10</sub>	D <sub>15</sub>	D <sub>20</sub>	D <sub>30</sub>	D <sub>40</sub>	D <sub>50</sub>	D <sub>60</sub>	D <sub>80</sub>	D <sub>85</sub>	D <sub>90</sub>	D <sub>95</sub>
			0.0020	0.0081	0.0151	0.0267	0.0706	0.6060	1.1148	2.2633	4.8349

<b>Fineness Modulus</b>
1.10

# Particle Size Distribution Report



GRAIN SIZE - mm.

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	6.5	23.6	9.6	11.3	9.3	27.0	12.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.0	100.0		
0.75	93.5		
0.5	81.6		
0.375	78.1		
#4	69.9		
#10	60.3		
#20	54.2		
#40	49.0		
#60	45.6		
#100	42.6		
#200	39.7		

**Material Description**

brown clayey SAND with gravel

**Atterberg Limits**

PL= 17      LL= 28      PI= 11

**Coefficients**

D<sub>90</sub>= 16.9834      D<sub>85</sub>= 14.4920      D<sub>60</sub>= 1.9237  
D<sub>50</sub>= 0.4846      D<sub>30</sub>= 0.0264      D<sub>15</sub>= 0.0068  
D<sub>10</sub>= 0.0022      C<sub>u</sub>= 861.46      C<sub>c</sub>= 0.16

**Classification**

USCS= SC      AASHTO= A-6(1)

**Remarks**

Lab No.: 0187  
Sample contains coal tar

\* (no specification provided)

**Location:** B19-4 SS-1  
**Sample Number:** 0187

**Depth:** 2.5' - 4.0'

**Date:** 12/3/19



**Client:** HDR, Inc.  
**Project:** Mary Avenue CSO - Brentwood, MO

**Project No:** D140-MO

**Figure**

**GRAIN SIZE DISTRIBUTION TEST DATA**

12/3/2019

**Client:** HDR, Inc.

**Project:** Mary Avenue CSO - Brentwood, MO

**Project Number:** D140-MO

**Location:** B19-4 SS-1

**Depth:** 2.5' - 4.0'

**Sample Number:** 0187

**Material Description:** brown clayey SAND with gravel

**Date:** 12/3/19

**PL:** 17

**LL:** 28

**PI:** 11

**USCS Classification:** SC

**AASHTO Classification:** A-6(1)

**Testing Remarks:** Lab No.: 0187

Sample contains coal tar

**Sieve Test Data**

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer	Percent Retained
456.30	13.69	0.00	1.0	0.00	100.0	0.0
			0.75	28.82	93.5	6.5
			0.5	81.30	81.6	18.4
			0.375	96.80	78.1	21.9
			#4	133.15	69.9	30.1
			#10	175.57	60.3	39.7
50.90	0.00	0.00	#20	5.16	54.2	45.8
			#40	9.52	49.0	51.0
			#60	12.43	45.6	54.4
			#100	14.94	42.6	57.4
			#200	17.42	39.7	60.3

**Hydrometer Test Data**

Hydrometer test uses material passing #10

Percent passing #10 based upon complete sample = 60.3

Weight of hydrometer sample = 50.90

Hygroscopic moisture correction:

Moist weight and tare = 48.26

Dry weight and tare = 48.06

Tare weight = 31.21

Hygroscopic moisture = 1.2%

Automatic temperature correction

Composite correction (fluid density and meniscus height) at 20 deg. C = -5.0

Meniscus correction only = 0.0

Specific gravity of solids = 2.65

Hydrometer type = 152H

Hydrometer effective depth equation:  $L = 16.294964 - 0.164 \times R_m$

Elapsed Time (min.)	Temp. (deg. C.)	Actual Reading	Corrected Reading	K	Rm	Eff. Depth	Diameter (mm.)	Percent Finer	Percent Retained
1.00	21.0	35.0	30.2	0.0135	35.0	10.6	0.0438	36.2	63.8
2.00	21.0	32.5	27.7	0.0135	32.5	11.0	0.0316	33.2	66.8
5.00	21.0	26.0	21.2	0.0135	26.0	12.0	0.0209	25.4	74.6
15.00	21.0	21.0	16.2	0.0135	21.0	12.9	0.0125	19.4	80.6
30.00	21.0	19.0	14.2	0.0135	19.0	13.2	0.0089	17.0	83.0
60.00	20.8	17.0	12.1	0.0135	17.0	13.5	0.0064	14.6	85.4
120.00	20.8	15.0	10.1	0.0135	15.0	13.8	0.0046	12.2	87.8

**7NT**

**Hydrometer Test Data (continued)**

Elapsed Time (min.)	Temp. (deg. C.)	Actual Reading	Corrected Reading	K	Rm	Eff. Depth	Diameter (mm.)	Percent Finer	Percent Retained
250.00	20.8	14.0	9.1	0.0135	14.0	14.0	0.0032	11.0	89.0
1440.00	20.6	12.0	7.1	0.0135	12.0	14.3	0.0014	8.5	91.5

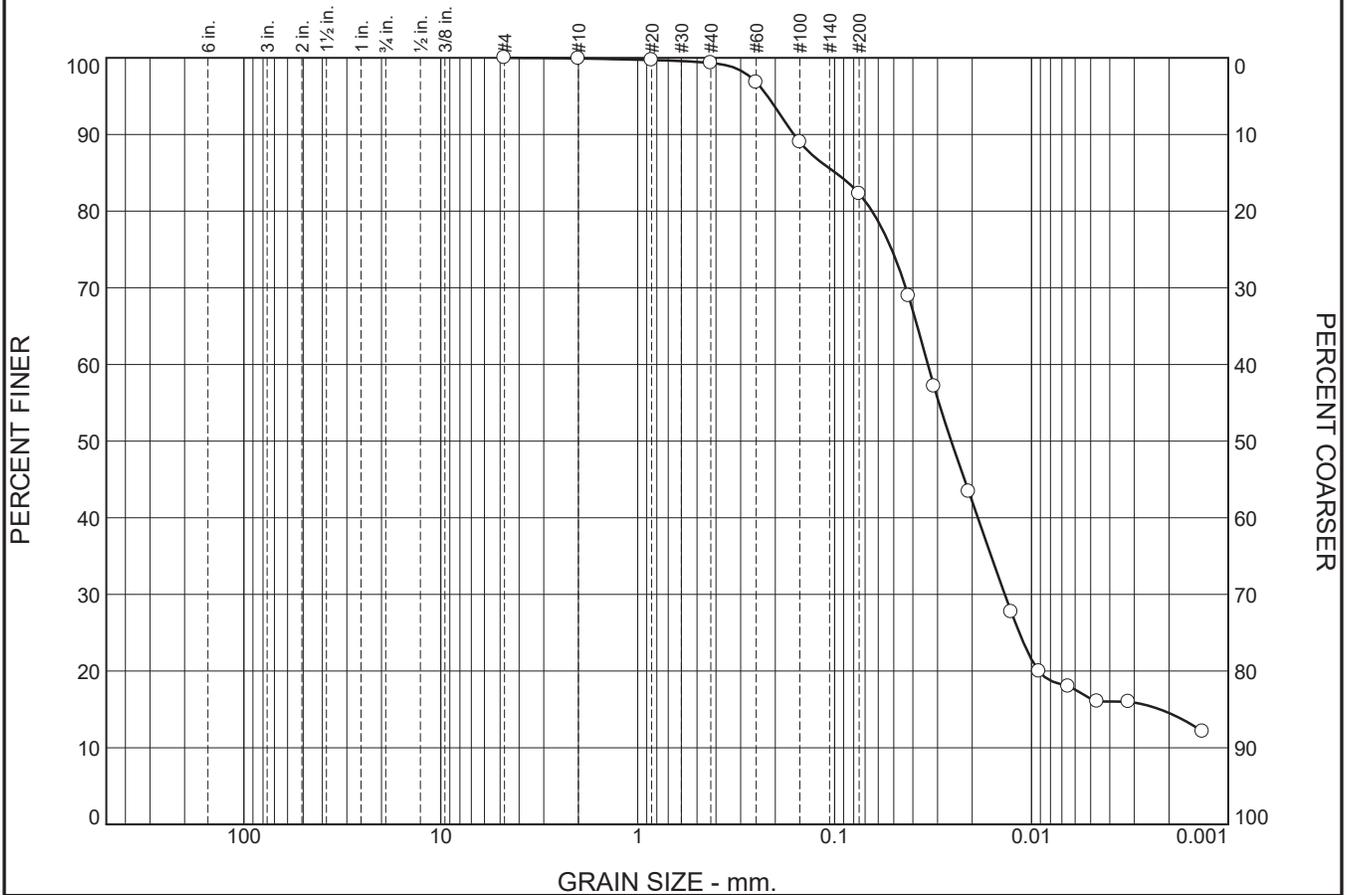
**Fractional Components**

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	6.5	23.6	30.1	9.6	11.3	9.3	30.2	27.0	12.7	39.7

D <sub>5</sub>	D <sub>10</sub>	D <sub>15</sub>	D <sub>20</sub>	D <sub>30</sub>	D <sub>40</sub>	D <sub>50</sub>	D <sub>60</sub>	D <sub>80</sub>	D <sub>85</sub>	D <sub>90</sub>	D <sub>95</sub>
	0.0022	0.0068	0.0134	0.0264	0.0798	0.4846	1.9237	11.5002	14.4920	16.9834	20.1681

Fineness Modulus	C <sub>u</sub>	C <sub>c</sub>
2.99	861.46	0.16

# Particle Size Distribution Report



GRAIN SIZE - mm.

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	0.6	17.0	65.9	16.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	99.7		
#40	99.3		
#60	96.8		
#100	89.0		
#200	82.3		

**Material Description**

gray silty CLAY with sand

**Atterberg Limits**

PL= 20      LL= 27      PI= 7

**Coefficients**

D<sub>90</sub>= 0.1609      D<sub>85</sub>= 0.0987      D<sub>60</sub>= 0.0336  
D<sub>50</sub>= 0.0255      D<sub>30</sub>= 0.0136      D<sub>15</sub>= 0.0022  
D<sub>10</sub>=              C<sub>u</sub>=              C<sub>c</sub>=

**Classification**

USCS= CL-ML      AASHTO= A-4(4)

**Remarks**

Lab No.: 0187

\* (no specification provided)

**Location:** B19-5 SS-5  
**Sample Number:** 0187

**Depth:** 13.5' - 15.0'

**Date:** 12/3/19



**Client:** HDR, Inc.  
**Project:** Mary Avenue CSO - Brentwood, MO

**Project No:** D140-MO

**Figure**

**GRAIN SIZE DISTRIBUTION TEST DATA**

12/3/2019

**Client:** HDR, Inc.

**Project:** Mary Avenue CSO - Brentwood, MO

**Project Number:** D140-MO

**Location:** B19-5 SS-5

**Depth:** 13.5' - 15.0'

**Sample Number:** 0187

**Material Description:** gray silty CLAY with sand

**Date:** 12/3/19

**PL:** 20

**LL:** 27

**PI:** 7

**USCS Classification:** CL-ML

**AASHTO Classification:** A-4(4)

**Testing Remarks:** Lab No.: 0187

**Sieve Test Data**

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer	Percent Retained
457.57	13.46	0.00	#4	0.00	100.0	0.0
			#10	0.39	99.9	0.1
52.18	0.00	0.00	#20	0.11	99.7	0.3
			#40	0.31	99.3	0.7
			#60	1.62	96.8	3.2
			#100	5.70	89.0	11.0
			#200	9.21	82.3	17.7

**Hydrometer Test Data**

Hydrometer test uses material passing #10

Percent passing #10 based upon complete sample = 99.9

Weight of hydrometer sample = 52.18

Hygroscopic moisture correction:

Moist weight and tare = 63.40

Dry weight and tare = 62.59

Tare weight = 30.05

Hygroscopic moisture = 2.5%

Automatic temperature correction

Composite correction (fluid density and meniscus height) at 20 deg. C = -5.0

Meniscus correction only = 0.0

Specific gravity of solids = 2.65

Hydrometer type = 152H

Hydrometer effective depth equation:  $L = 16.294964 - 0.164 \times R_m$

Elapsed Time (min.)	Temp. (deg. C.)	Actual Reading	Corrected Reading	K	Rm	Eff. Depth	Diameter (mm.)	Percent Finer	Percent Retained
1.00	20.8	40.0	35.1	0.0135	40.0	9.7	0.0422	68.9	31.1
2.00	20.8	34.0	29.1	0.0135	34.0	10.7	0.0313	57.2	42.8
5.00	20.8	27.0	22.1	0.0135	27.0	11.9	0.0208	43.4	56.6
15.00	20.8	19.0	14.1	0.0135	19.0	13.2	0.0127	27.7	72.3
30.00	21.0	15.0	10.2	0.0135	15.0	13.8	0.0092	20.0	80.0
60.00	21.0	14.0	9.2	0.0135	14.0	14.0	0.0065	18.0	82.0
120.00	21.0	13.0	8.2	0.0135	13.0	14.2	0.0046	16.0	84.0
250.00	20.9	13.0	8.2	0.0135	13.0	14.2	0.0032	16.0	84.0
1440.00	21.0	11.0	6.2	0.0135	11.0	14.5	0.0014	12.1	87.9

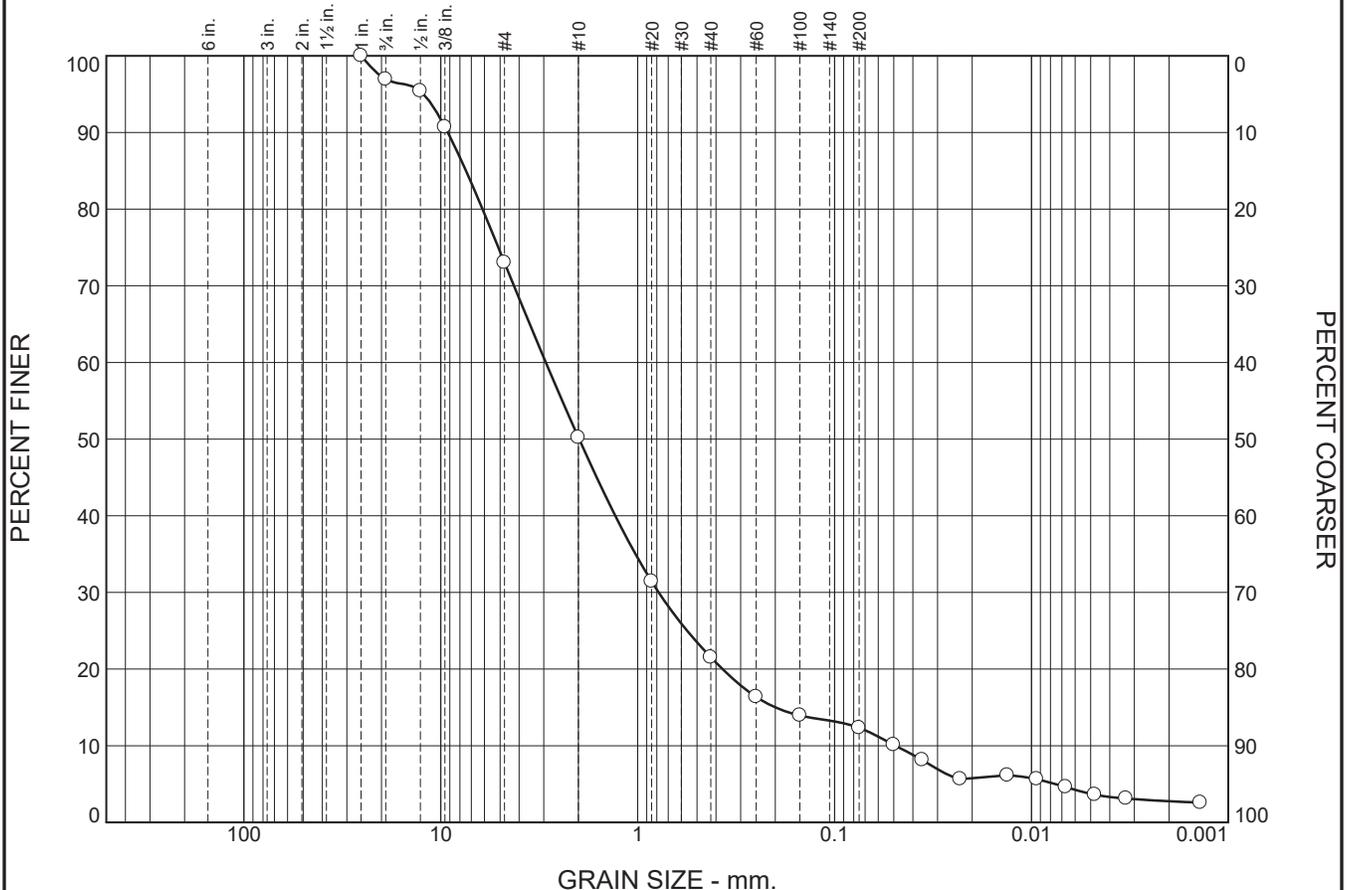
**Fractional Components**

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	0.0	0.0	0.0	0.1	0.6	17.0	17.7	65.9	16.4	82.3

D <sub>5</sub>	D <sub>10</sub>	D <sub>15</sub>	D <sub>20</sub>	D <sub>30</sub>	D <sub>40</sub>	D <sub>50</sub>	D <sub>60</sub>	D <sub>80</sub>	D <sub>85</sub>	D <sub>90</sub>	D <sub>95</sub>
		0.0022	0.0092	0.0136	0.0187	0.0255	0.0336	0.0644	0.0987	0.1609	0.2188

<b>Fineness Modulus</b>
0.13

# Particle Size Distribution Report



GRAIN SIZE - mm.

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	3.1	23.9	22.8	28.7	9.2	8.6	3.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.0	100.0		
0.75	96.9		
0.5	95.4		
0.375	90.7		
#4	73.0		
#10	50.2		
#20	31.4		
#40	21.5		
#60	16.4		
#100	13.9		
#200	12.3		

**Material Description**

black silty SAND with gravel

**Atterberg Limits**

PL= NP      LL= NP      PI= NP

**Coefficients**

D<sub>90</sub>= 9.2175      D<sub>85</sub>= 7.4498      D<sub>60</sub>= 2.9266  
D<sub>50</sub>= 1.9830      D<sub>30</sub>= 0.7820      D<sub>15</sub>= 0.1995  
D<sub>10</sub>= 0.0491      C<sub>u</sub>= 59.59      C<sub>c</sub>= 4.25

**Classification**

USCS= SM      AASHTO= A-1-a

**Remarks**

Lab No.: 0187  
\*\*Sample contains a lot of coal tar\*\*

\* (no specification provided)

Location: B19-6 SS-2  
Sample Number: 0187

Depth: 3.5' - 5.0'

Date: 12/3/19



Client: HDR, Inc.  
Project: Mary Avenue CSO - Brentwood, MO

Project No: D140-MO

Figure

**GRAIN SIZE DISTRIBUTION TEST DATA**

12/3/2019

**Client:** HDR, Inc.

**Project:** Mary Avenue CSO - Brentwood, MO

**Project Number:** D140-MO

**Location:** B19-6 SS-2

**Depth:** 3.5' - 5.0'

**Sample Number:** 0187

**Material Description:** black silty SAND with gravel

**Date:** 12/3/19

**PL:** NP

**LL:** NP

**PI:** NP

**USCS Classification:** SM

**AASHTO Classification:** A-1-a

**Testing Remarks:** Lab No.: 0187

\*\*Sample contains a lot of coal tar\*\*

**Sieve Test Data**

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer	Percent Retained
558.94	13.94	0.00	1.0	0.00	100.0	0.0
			0.75	16.79	96.9	3.1
			0.5	25.04	95.4	4.6
			0.375	50.65	90.7	9.3
			#4	146.98	73.0	27.0
			#10	271.34	50.2	49.8
50.79	0.00	0.00	#20	18.99	31.4	68.6
			#40	29.00	21.5	78.5
			#60	34.23	16.4	83.6
			#100	36.69	13.9	86.1
			#200	38.31	12.3	87.7

**Hydrometer Test Data**

Hydrometer test uses material passing #10

Percent passing #10 based upon complete sample = 50.2

Weight of hydrometer sample = 50.79

Hygroscopic moisture correction:

Moist weight and tare = 48.59

Dry weight and tare = 48.49

Tare weight = 31.76

Hygroscopic moisture = 0.6%

Automatic temperature correction

Composite correction (fluid density and meniscus height) at 20 deg. C = -5.0

Meniscus correction only = 0.0

Specific gravity of solids = 2.65

Hydrometer type = 152H

Hydrometer effective depth equation:  $L = 16.294964 - 0.164 \times R_m$

Elapsed Time (min.)	Temp. (deg. C.)	Actual Reading	Corrected Reading	K	Rm	Eff. Depth	Diameter (mm.)	Percent Finer	Percent Retained
1.00	21.0	15.0	10.2	0.0135	15.0	13.8	0.0501	10.1	89.9
2.00	21.0	13.0	8.2	0.0135	13.0	14.2	0.0359	8.1	91.9
5.00	21.0	10.5	5.7	0.0135	10.5	14.6	0.0230	5.6	94.4
15.00	21.0	11.0	6.2	0.0135	11.0	14.5	0.0132	6.1	93.9
30.00	21.0	10.5	5.7	0.0135	10.5	14.6	0.0094	5.6	94.4
60.00	20.8	9.5	4.6	0.0135	9.5	14.7	0.0067	4.6	95.4
120.00	20.8	8.5	3.6	0.0135	8.5	14.9	0.0048	3.6	96.4

**7NT**

**Hydrometer Test Data (continued)**

Elapsed Time (min.)	Temp. (deg. C.)	Actual Reading	Corrected Reading	K	Rm	Eff. Depth	Diameter (mm.)	Percent Finer	Percent Retained
250.00	20.8	8.0	3.1	0.0135	8.0	15.0	0.0033	3.1	96.9
1440.00	20.6	7.5	2.6	0.0135	7.5	15.1	0.0014	2.6	97.4

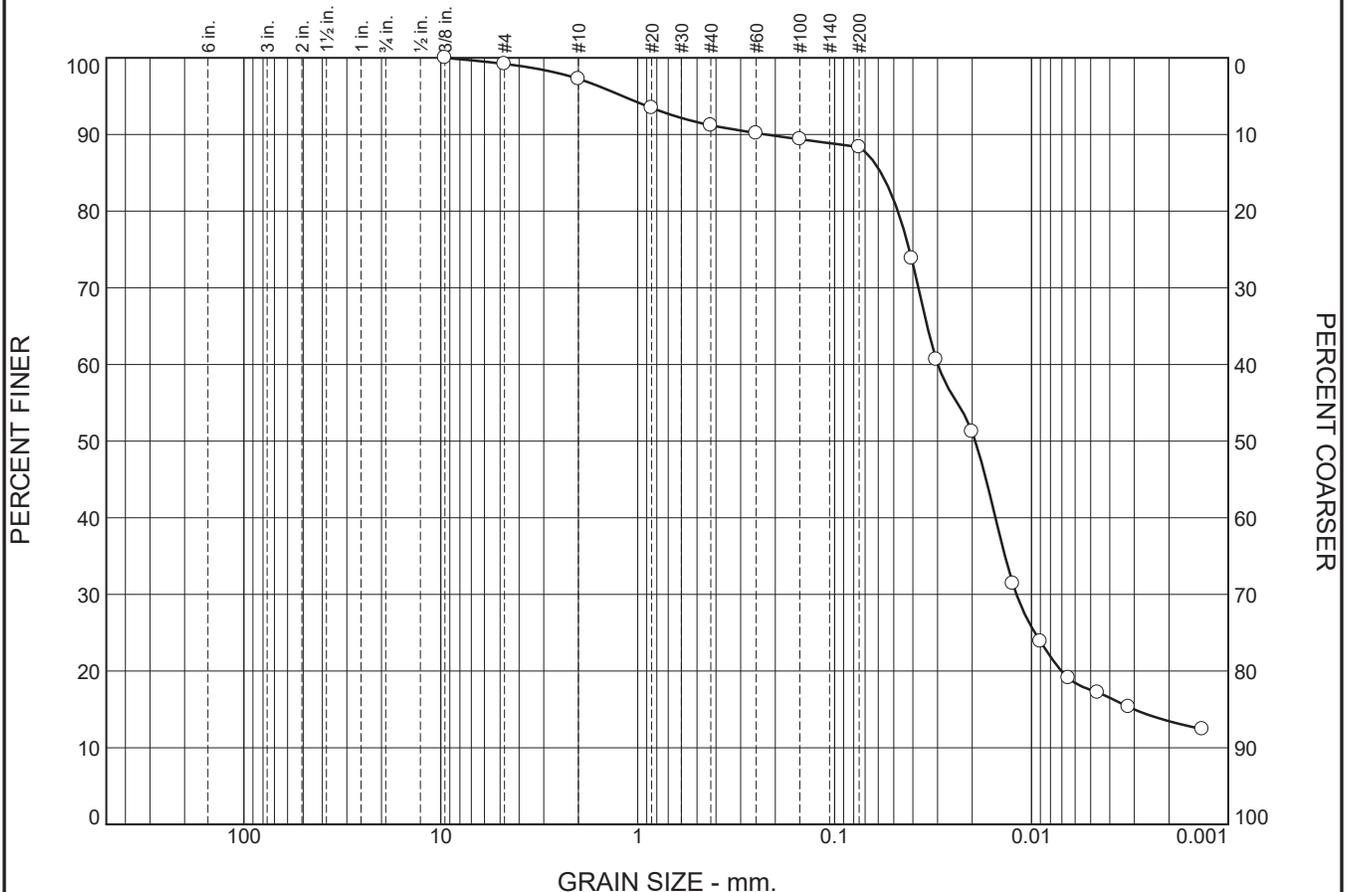
**Fractional Components**

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	3.1	23.9	27.0	22.8	28.7	9.2	60.7	8.6	3.7	12.3

D <sub>5</sub>	D <sub>10</sub>	D <sub>15</sub>	D <sub>20</sub>	D <sub>30</sub>	D <sub>40</sub>	D <sub>50</sub>	D <sub>60</sub>	D <sub>80</sub>	D <sub>85</sub>	D <sub>90</sub>	D <sub>95</sub>
0.0076	0.0491	0.1995	0.3706	0.7820	1.3007	1.9830	2.9266	6.1409	7.4498	9.2175	12.2157

Fineness Modulus	C <sub>u</sub>	C <sub>c</sub>
3.89	59.59	4.25

# Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.8	1.9	6.1	2.8	70.9	17.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375	100.0		
#4	99.2		
#10	97.3		
#20	93.5		
#40	91.2		
#60	90.2		
#100	89.4		
#200	88.4		

**Material Description**

brown/gray SILT

**Atterberg Limits**

PL= 24      LL= 28      PI= 4

**Coefficients**

D<sub>90</sub>= 0.2249      D<sub>85</sub>= 0.0581      D<sub>60</sub>= 0.0299  
D<sub>50</sub>= 0.0193      D<sub>30</sub>= 0.0119      D<sub>15</sub>= 0.0030  
D<sub>10</sub>=              C<sub>u</sub>=              C<sub>c</sub>=

**Classification**

USCS= ML              AASHTO= A-4(3)

**Remarks**

Lab No.: 0187

\* (no specification provided)

**Location:** B19-7 SS-4  
**Sample Number:** 0187

**Depth:** 8.5' - 10.0'

**Date:** 12/3/19



**Client:** HDR, Inc.  
**Project:** Mary Avenue CSO - Brentwood, MO

**Project No:** D140-MO

**Figure**

**GRAIN SIZE DISTRIBUTION TEST DATA**

12/3/2019

**Client:** HDR, Inc.

**Project:** Mary Avenue CSO - Brentwood, MO

**Project Number:** D140-MO

**Location:** B19-7 SS-4

**Depth:** 8.5' - 10.0'

**Sample Number:** 0187

**Material Description:** brown/gray SILT

**Date:** 12/3/19

**PL:** 24

**LL:** 28

**PI:** 4

**USCS Classification:** ML

**AASHTO Classification:** A-4(3)

**Testing Remarks:** Lab No.: 0187

**Sieve Test Data**

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer	Percent Retained
451.30	13.59	0.00	0.375	0.00	100.0	0.0
			#4	3.50	99.2	0.8
			#10	12.01	97.3	2.7
52.38	0.00	0.00	#20	2.04	93.5	6.5
			#40	3.26	91.2	8.8
			#60	3.82	90.2	9.8
			#100	4.24	89.4	10.6
			#200	4.79	88.4	11.6

**Hydrometer Test Data**

Hydrometer test uses material passing #10

Percent passing #10 based upon complete sample = 97.3

Weight of hydrometer sample = 52.38

Hygroscopic moisture correction:

Moist weight and tare = 64.68

Dry weight and tare = 64.17

Tare weight = 30.63

Hygroscopic moisture = 1.5%

Automatic temperature correction

Composite correction (fluid density and meniscus height) at 20 deg. C = -5.0

Meniscus correction only = 0.0

Specific gravity of solids = 2.65

Hydrometer type = 152H

Hydrometer effective depth equation:  $L = 16.294964 - 0.164 \times R_m$

Elapsed Time (min.)	Temp. (deg. C.)	Actual Reading	Corrected Reading	K	Rm	Eff. Depth	Diameter (mm.)	Percent Finer	Percent Retained
1.00	21.0	44.0	39.2	0.0135	44.0	9.1	0.0406	73.8	26.2
2.00	21.0	37.0	32.2	0.0135	37.0	10.2	0.0305	60.7	39.3
5.00	21.0	32.0	27.2	0.0135	32.0	11.0	0.0200	51.2	48.8
15.00	21.0	21.5	16.7	0.0135	21.5	12.8	0.0124	31.4	68.6
30.00	21.0	17.5	12.7	0.0135	17.5	13.4	0.0090	23.9	76.1
60.00	20.8	15.0	10.1	0.0135	15.0	13.8	0.0065	19.1	80.9
120.00	20.8	14.0	9.1	0.0135	14.0	14.0	0.0046	17.2	82.8
250.00	20.8	13.0	8.1	0.0135	13.0	14.2	0.0032	15.3	84.7
1440.00	20.6	11.5	6.6	0.0135	11.5	14.4	0.0014	12.4	87.6

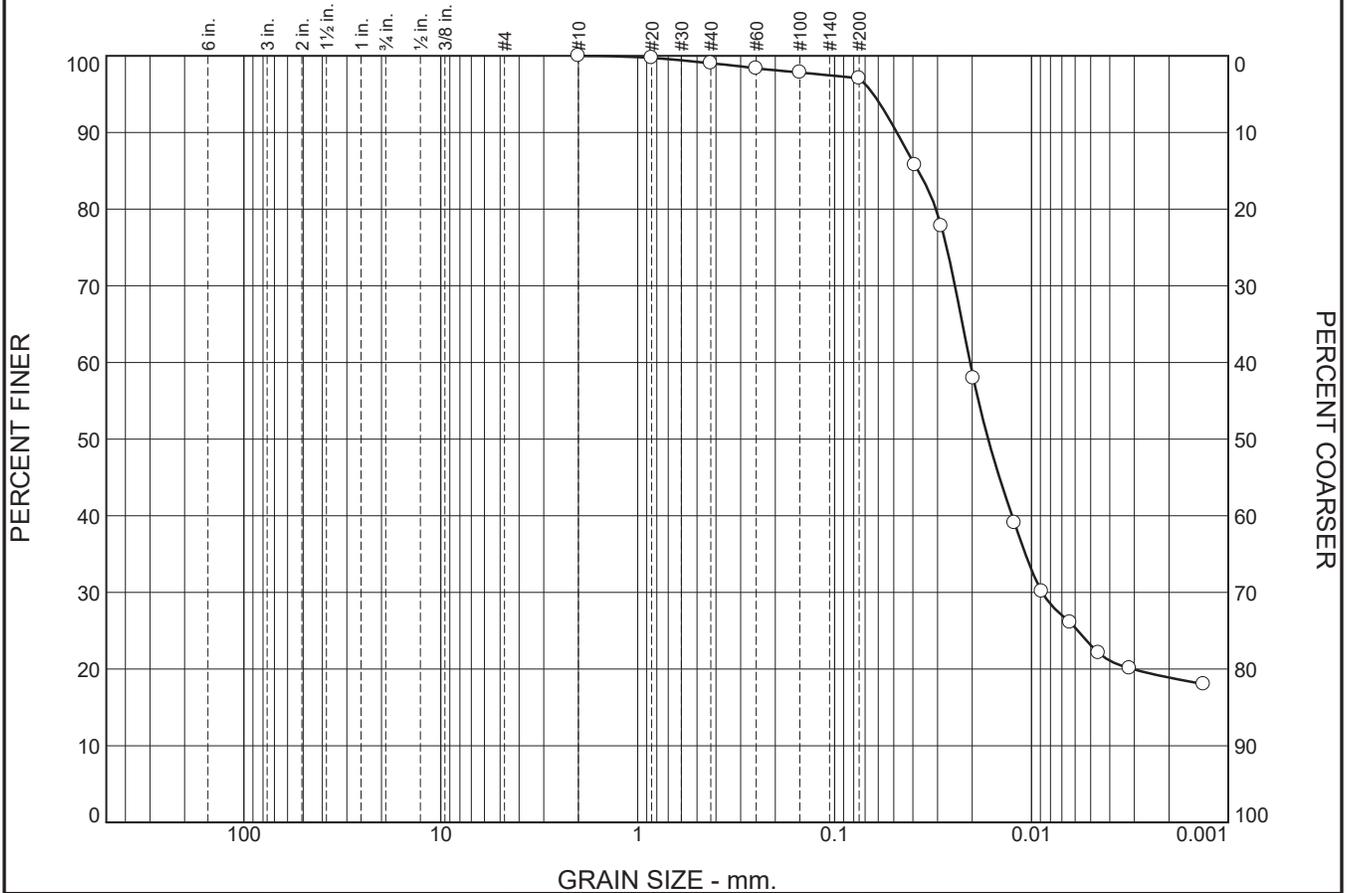
**Fractional Components**

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	0.0	0.8	0.8	1.9	6.1	2.8	10.8	70.9	17.5	88.4

D <sub>5</sub>	D <sub>10</sub>	D <sub>15</sub>	D <sub>20</sub>	D <sub>30</sub>	D <sub>40</sub>	D <sub>50</sub>	D <sub>60</sub>	D <sub>80</sub>	D <sub>85</sub>	D <sub>90</sub>	D <sub>95</sub>
		0.0030	0.0070	0.0119	0.0152	0.0193	0.0299	0.0477	0.0581	0.2249	1.1899

<b>Fineness Modulus</b>
0.36

# Particle Size Distribution Report



GRAIN SIZE - mm.

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	1.0	1.9	74.0	23.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	99.7		
#40	99.0		
#60	98.3		
#100	97.8		
#200	97.1		

**Material Description**

brown lean CLAY

**Atterberg Limits**

PL= 21      LL= 30      PI= 9

**Coefficients**

D<sub>90</sub>= 0.0483      D<sub>85</sub>= 0.0376      D<sub>60</sub>= 0.0205  
D<sub>50</sub>= 0.0166      D<sub>30</sub>= 0.0088      D<sub>15</sub>=  
D<sub>10</sub>=                  C<sub>u</sub>=                  C<sub>c</sub>=

**Classification**

USCS= CL                  AASHTO= A-4(8)

**Remarks**

Lab No.: 0187

\* (no specification provided)

**Location:** B19-8 SS-4  
**Sample Number:** 0187

**Depth:** 8.5' - 10.0'

**Date:** 12/3/19



**Client:** HDR, Inc.  
**Project:** Mary Avenue CSO - Brentwood, MO

**Project No:** D140-MO

**Figure**

**GRAIN SIZE DISTRIBUTION TEST DATA**

12/3/2019

**Client:** HDR, Inc.

**Project:** Mary Avenue CSO - Brentwood, MO

**Project Number:** D140-MO

**Location:** B19-8 SS-4

**Depth:** 8.5' - 10.0'

**Sample Number:** 0187

**Material Description:** brown lean CLAY

**Date:** 12/3/19

**PL:** 21

**LL:** 30

**PI:** 9

**USCS Classification:** CL

**AASHTO Classification:** A-4(8)

**Testing Remarks:** Lab No.: 0187

**Sieve Test Data**

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer	Percent Retained
400.40	13.57	0.00	#10	0.00	100.0	0.0
51.43	0.00	0.00	#20	0.14	99.7	0.3
			#40	0.50	99.0	1.0
			#60	0.85	98.3	1.7
			#100	1.12	97.8	2.2
			#200	1.50	97.1	2.9

**Hydrometer Test Data**

Hydrometer test uses material passing #10

Percent passing #10 based upon complete sample = 100.0

Weight of hydrometer sample = 51.43

Hygroscopic moisture correction:

Moist weight and tare = 67.76

Dry weight and tare = 66.97

Tare weight = 30.28

Hygroscopic moisture = 2.2%

Automatic temperature correction

Composite correction (fluid density and meniscus height) at 20 deg. C = -5.0

Meniscus correction only = 0.0

Specific gravity of solids = 2.65

Hydrometer type = 152H

Hydrometer effective depth equation:  $L = 16.294964 - 0.164 \times R_m$

Elapsed Time (min.)	Temp. (deg. C.)	Actual Reading	Corrected Reading	K	Rm	Eff. Depth	Diameter (mm.)	Percent Finer	Percent Retained
1.00	21.0	48.0	43.2	0.0135	48.0	8.4	0.0391	85.8	14.2
2.00	21.0	44.0	39.2	0.0135	44.0	9.1	0.0287	77.8	22.2
5.00	21.0	34.0	29.2	0.0135	34.0	10.7	0.0197	58.0	42.0
15.00	21.0	24.5	19.7	0.0135	24.5	12.3	0.0122	39.1	60.9
30.00	21.0	20.0	15.2	0.0135	20.0	13.0	0.0089	30.1	69.9
60.00	20.8	18.0	13.1	0.0135	18.0	13.3	0.0064	26.1	73.9
120.00	20.8	16.0	11.1	0.0135	16.0	13.7	0.0046	22.1	77.9
250.00	20.8	15.0	10.1	0.0135	15.0	13.8	0.0032	20.1	79.9
1440.00	20.6	14.0	9.1	0.0135	14.0	14.0	0.0013	18.1	81.9

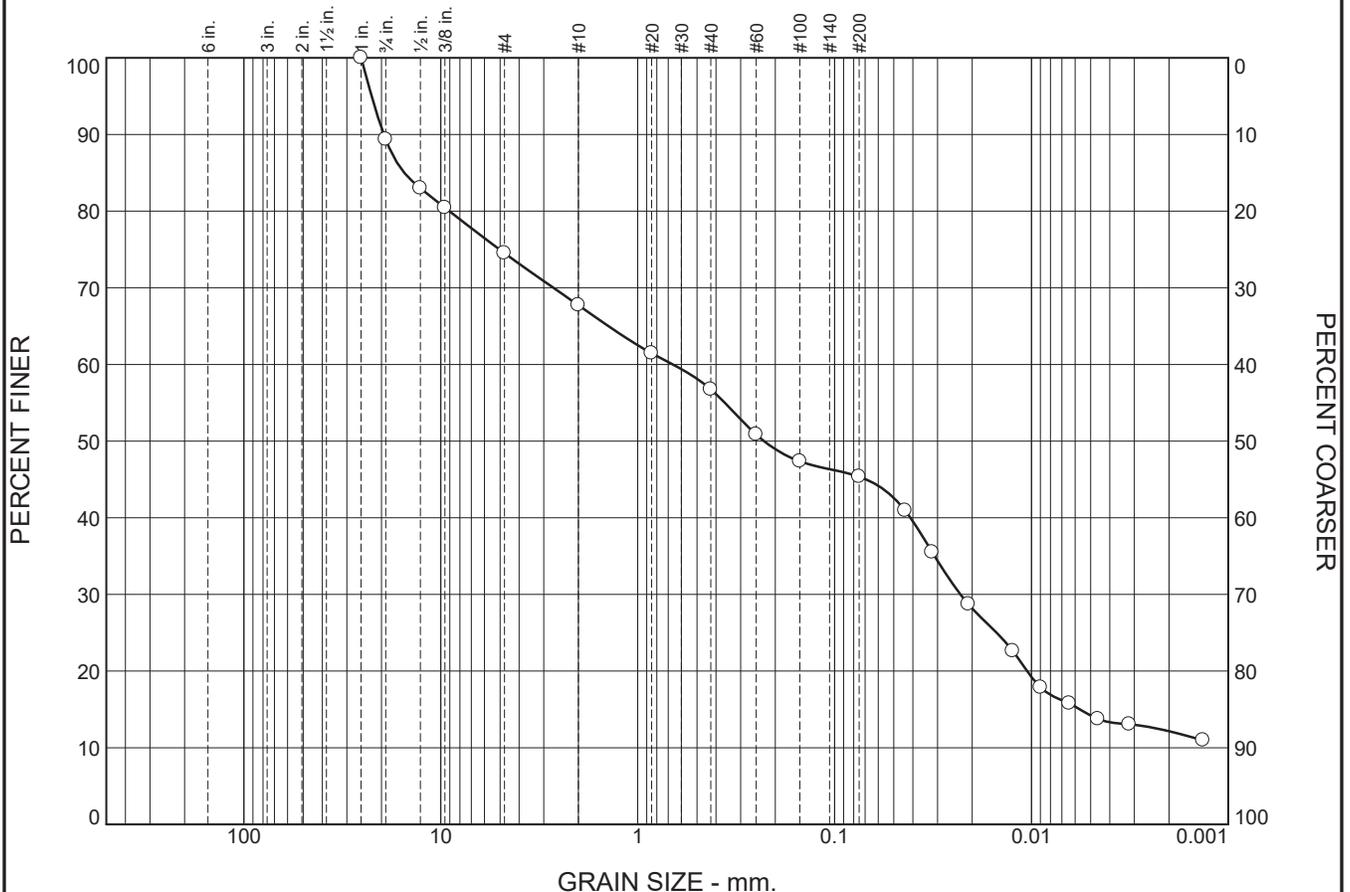
**Fractional Components**

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	0.0	0.0	0.0	0.0	1.0	1.9	2.9	74.0	23.1	97.1

D <sub>5</sub>	D <sub>10</sub>	D <sub>15</sub>	D <sub>20</sub>	D <sub>30</sub>	D <sub>40</sub>	D <sub>50</sub>	D <sub>60</sub>	D <sub>80</sub>	D <sub>85</sub>	D <sub>90</sub>	D <sub>95</sub>
			0.0031	0.0088	0.0125	0.0166	0.0205	0.0305	0.0376	0.0483	0.0635

<b>Fineness Modulus</b>
0.04

# Particle Size Distribution Report



GRAIN SIZE - mm.

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	10.7	14.8	6.8	11.0	11.3	31.2	14.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.0	100.0		
0.75	89.3		
0.5	83.0		
0.375	80.4		
#4	74.5		
#10	67.7		
#20	61.5		
#40	56.7		
#60	50.9		
#100	47.4		
#200	45.4		

**Material Description**

brown clayey SAND with gravel

**Atterberg Limits**

PL= 18      LL= 30      PI= 12

**Coefficients**

D<sub>90</sub>= 19.4829      D<sub>85</sub>= 15.3289      D<sub>60</sub>= 0.6628  
D<sub>50</sub>= 0.2281      D<sub>30</sub>= 0.0229      D<sub>15</sub>= 0.0057  
D<sub>10</sub>=              C<sub>u</sub>=              C<sub>c</sub>=

**Classification**

USCS= SC              AASHTO= A-6(2)

**Remarks**

Lab No.: 0187

\* (no specification provided)

**Location:** B19-9 SS-3  
**Sample Number:** 0187

**Depth:** 6.0' - 7.5'

**Date:** 12/3/19



**Client:** HDR, Inc.  
**Project:** Mary Avenue CSO - Brentwood, MO

**Project No:** D140-MO

**Figure**

**GRAIN SIZE DISTRIBUTION TEST DATA**

12/3/2019

**Client:** HDR, Inc.

**Project:** Mary Avenue CSO - Brentwood, MO

**Project Number:** D140-MO

**Location:** B19-9 SS-3

**Depth:** 6.0' - 7.5'

**Sample Number:** 0187

**Material Description:** brown clayey SAND with gravel

**Date:** 12/3/19

**PL:** 18

**LL:** 30

**PI:** 12

**USCS Classification:** SC

**AASHTO Classification:** A-6(2)

**Testing Remarks:** Lab No.: 0187

**Sieve Test Data**

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer	Percent Retained
523.20	13.49	0.00	1.0	0.00	100.0	0.0
			0.75	54.32	89.3	10.7
			0.5	86.66	83.0	17.0
			0.375	99.66	80.4	19.6
			#4	129.86	74.5	25.5
			#10	164.50	67.7	32.3
			50.91	0.00	0.00	#20
#40	8.26	56.7				43.3
#60	12.68	50.9				49.1
#100	15.31	47.4				52.6
#200	16.82	45.4				54.6

**Hydrometer Test Data**

Hydrometer test uses material passing #10

Percent passing #10 based upon complete sample = 67.7

Weight of hydrometer sample = 50.91

Hygroscopic moisture correction:

Moist weight and tare = 46.35

Dry weight and tare = 46.05

Tare weight = 30.71

Hygroscopic moisture = 2.0%

Automatic temperature correction

Composite correction (fluid density and meniscus height) at 20 deg. C = -5.0

Meniscus correction only = 0.0

Specific gravity of solids = 2.65

Hydrometer type = 152H

Hydrometer effective depth equation:  $L = 16.294964 - 0.164 \times R_m$

Elapsed Time (min.)	Temp. (deg. C.)	Actual Reading	Corrected Reading	K	Rm	Eff. Depth	Diameter (mm.)	Percent Finer	Percent Retained
1.00	21.0	35.0	30.2	0.0135	35.0	10.6	0.0438	40.9	59.1
2.00	21.0	31.0	26.2	0.0135	31.0	11.2	0.0319	35.5	64.5
5.00	21.0	26.0	21.2	0.0135	26.0	12.0	0.0209	28.7	71.3
15.00	21.0	21.5	16.7	0.0135	21.5	12.8	0.0124	22.6	77.4
30.00	21.0	18.0	13.2	0.0135	18.0	13.3	0.0090	17.9	82.1
60.00	20.8	16.5	11.6	0.0135	16.5	13.6	0.0064	15.8	84.2
120.00	20.8	15.0	10.1	0.0135	15.0	13.8	0.0046	13.7	86.3

**Hydrometer Test Data (continued)**

Elapsed Time (min.)	Temp. (deg. C.)	Actual Reading	Corrected Reading	K	Rm	Eff. Depth	Diameter (mm.)	Percent Finer	Percent Retained
250.00	20.8	14.5	9.6	0.0135	14.5	13.9	0.0032	13.1	86.9
1440.00	20.6	13.0	8.1	0.0135	13.0	14.2	0.0013	11.0	89.0

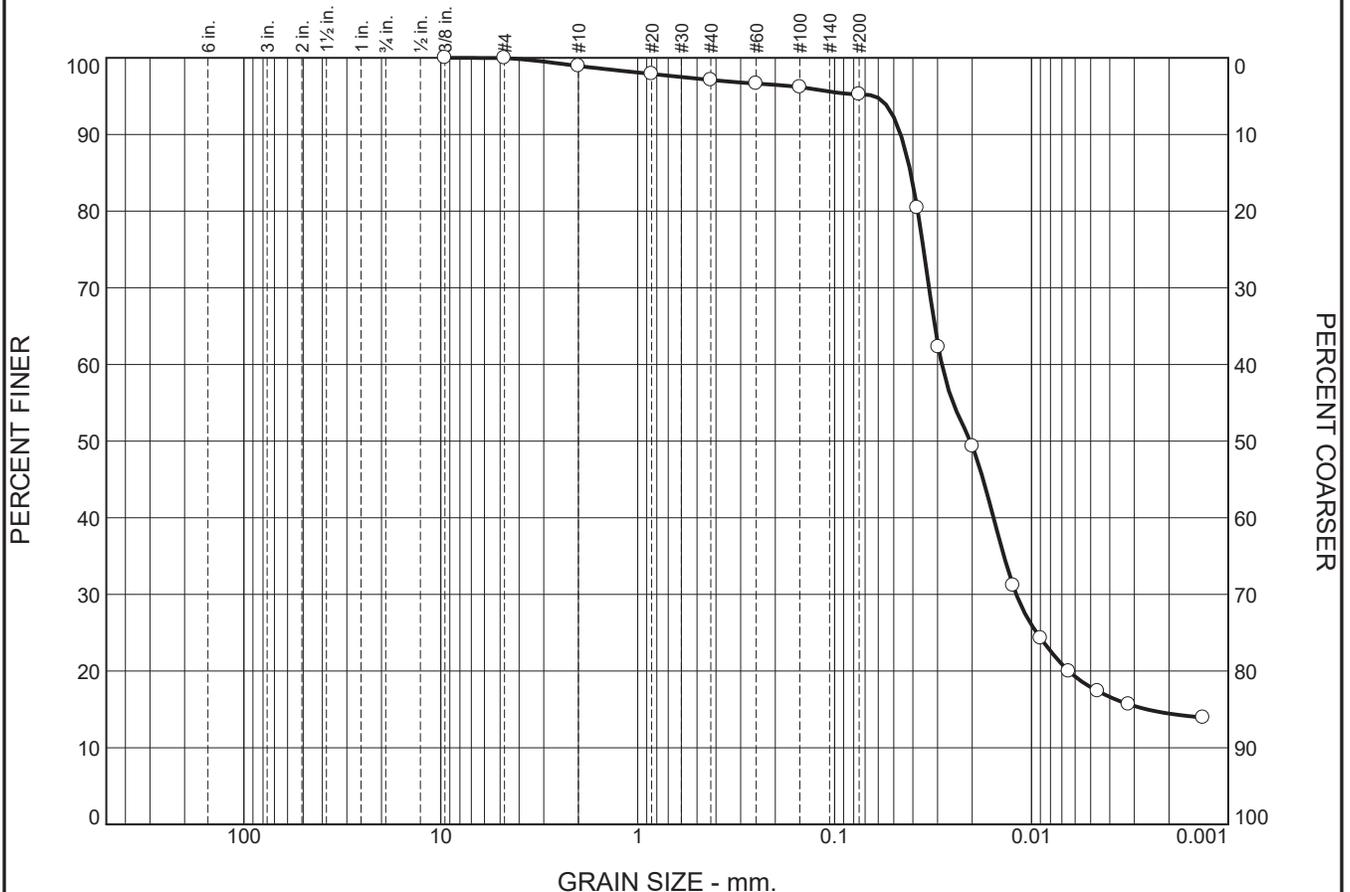
**Fractional Components**

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	10.7	14.8	25.5	6.8	11.0	11.3	29.1	31.2	14.2	45.4

D <sub>5</sub>	D <sub>10</sub>	D <sub>15</sub>	D <sub>20</sub>	D <sub>30</sub>	D <sub>40</sub>	D <sub>50</sub>	D <sub>60</sub>	D <sub>80</sub>	D <sub>85</sub>	D <sub>90</sub>	D <sub>95</sub>
		0.0057	0.0105	0.0229	0.0412	0.2281	0.6628	9.0483	15.3289	19.4829	22.4599

<b>Fineness Modulus</b>
2.63

# Particle Size Distribution Report



GRAIN SIZE - mm.

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	1.1	1.8	1.9	77.3	17.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375	100.0		
#4	100.0		
#10	98.9		
#20	97.9		
#40	97.1		
#60	96.6		
#100	96.2		
#200	95.2		

**Material Description**

gray/brown silty CLAY

**Atterberg Limits**

PL= 22      LL= 28      PI= 6

**Coefficients**

D<sub>90</sub>= 0.0462      D<sub>85</sub>= 0.0411      D<sub>60</sub>= 0.0285  
D<sub>50</sub>= 0.0204      D<sub>30</sub>= 0.0119      D<sub>15</sub>= 0.0026  
D<sub>10</sub>=              C<sub>u</sub>=              C<sub>c</sub>=

**Classification**

USCS= CL-ML      AASHTO= A-4(5)

**Remarks**

Lab NO:187

\* (no specification provided)

Location: B19-1A  
Sample Number: SS-6

Depth: 18.5'-20.0'

Date: 2/24/2020



Client: HDR, Inc.  
Project: Mary Avenue CSO - Brentwood, MO

Project No: D140-MO

Figure

**GRAIN SIZE DISTRIBUTION TEST DATA**

2/25/2020

**Client:** HDR, Inc.

**Project:** Mary Avenue CSO - Brentwood, MO

**Project Number:** D140-MO

**Location:** B19-1A

**Depth:** 18.5'-20.0'

**Sample Number:** SS-6

**Material Description:** gray/brown silty CLAY

**Date:** 2/24/2020

**PL:** 22

**LL:** 28

**PI:** 6

**USCS Classification:** CL-ML

**AASHTO Classification:** A-4(5)

**Testing Remarks:** Lab NO:187

**Sieve Test Data**

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer	Percent Retained
501.41	13.52	0.00	0.375	0.00	100.0	0.0
			#4	0.13	100.0	0.0
			#10	5.18	98.9	1.1
58.09	0.00	0.00	#20	0.61	97.9	2.1
			#40	1.07	97.1	2.9
			#60	1.35	96.6	3.4
			#100	1.62	96.2	3.8
			#200	2.18	95.2	4.8

**Hydrometer Test Data**

Hydrometer test uses material passing #10

Percent passing #10 based upon complete sample = 98.9

Weight of hydrometer sample = 58.09

Hygroscopic moisture correction:

Moist weight and tare = 39.99

Dry weight and tare = 39.84

Tare weight = 29.52

Hygroscopic moisture = 1.5%

Automatic temperature correction

Composite correction (fluid density and meniscus height) at 20 deg. C = -5.0

Meniscus correction only = 0.0

Specific gravity of solids = 2.65

Hydrometer type = 152H

Hydrometer effective depth equation:  $L = 16.294964 - 0.164 \times R_m$

Elapsed Time (min.)	Temp. (deg. C.)	Actual Reading	Corrected Reading	K	Rm	Eff. Depth	Diameter (mm.)	Percent Finer	Percent Retained
1.00	20.4	51.5	46.5	0.0136	51.5	7.8	0.0380	80.4	19.6
2.00	20.4	41.0	36.0	0.0136	41.0	9.6	0.0297	62.3	37.7
5.00	20.4	33.5	28.5	0.0136	33.5	10.8	0.0200	49.3	50.7
15.00	20.4	23.0	18.0	0.0136	23.0	12.5	0.0124	31.2	68.8
30.00	20.5	19.0	14.1	0.0136	19.0	13.2	0.0090	24.3	75.7
60.00	20.5	16.5	11.6	0.0136	16.5	13.6	0.0065	20.0	80.0
120.00	20.5	15.0	10.1	0.0136	15.0	13.8	0.0046	17.4	82.6
250.00	20.5	14.0	9.1	0.0136	14.0	14.0	0.0032	15.7	84.3
1440.00	20.5	13.0	8.1	0.0136	13.0	14.2	0.0013	13.9	86.1

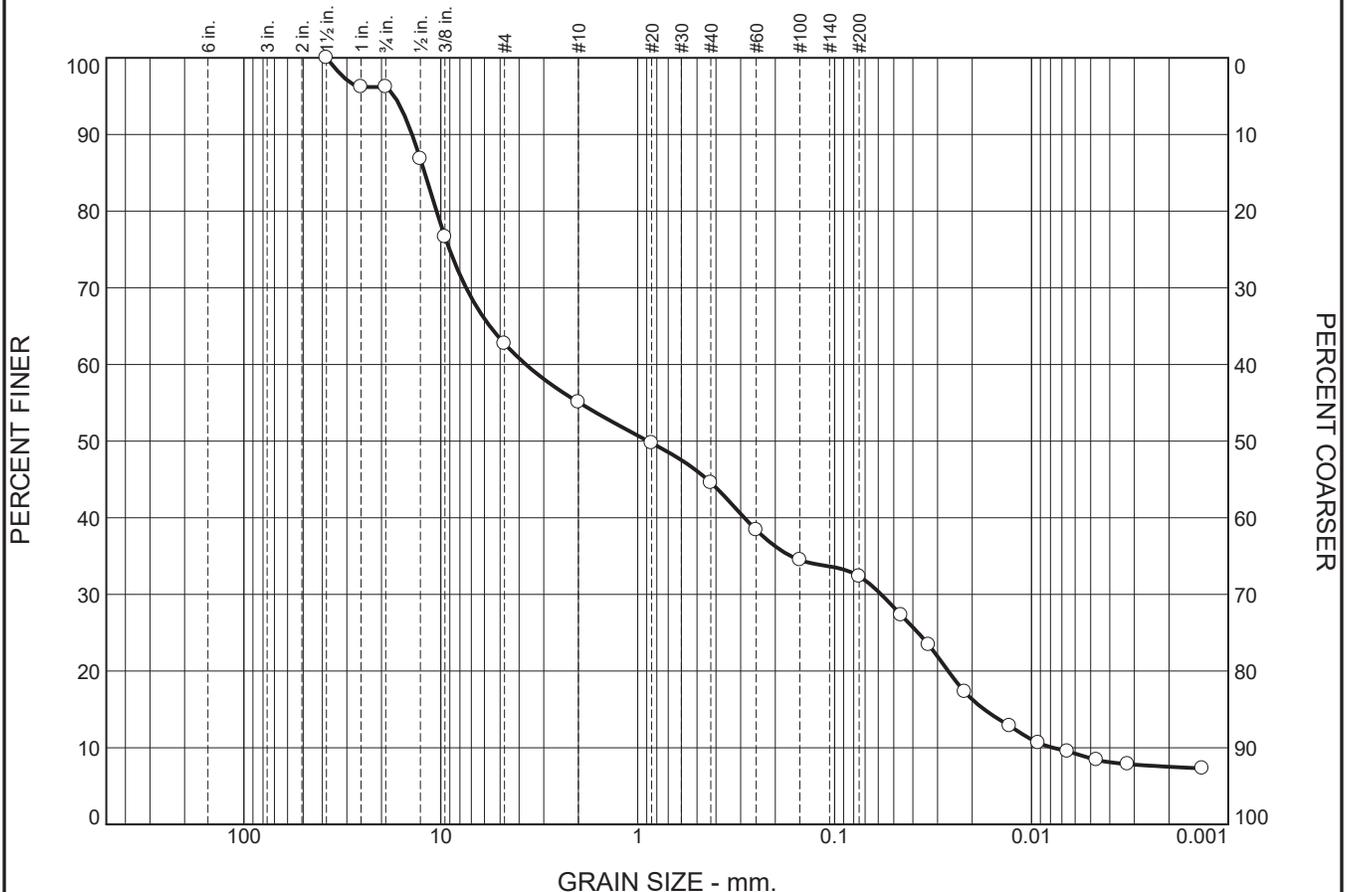
**Fractional Components**

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	0.0	0.0	0.0	1.1	1.8	1.9	4.8	77.3	17.9	95.2

D <sub>5</sub>	D <sub>10</sub>	D <sub>15</sub>	D <sub>20</sub>	D <sub>30</sub>	D <sub>40</sub>	D <sub>50</sub>	D <sub>60</sub>	D <sub>80</sub>	D <sub>85</sub>	D <sub>90</sub>	D <sub>95</sub>
		0.0026	0.0065	0.0119	0.0156	0.0204	0.0285	0.0378	0.0411	0.0462	0.0627

<b>Fineness Modulus</b>
0.12

# Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	3.8	33.5	7.6	10.5	12.2	23.8	8.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5	100.0		
1.0	96.2		
0.75	96.2		
0.5	86.8		
0.375	76.6		
#4	62.7		
#10	55.1		
#20	49.7		
#40	44.6		
#60	38.4		
#100	34.5		
#200	32.4		

**Material Description**

red/brown clayey GRAVEL with sand

**Atterberg Limits**

PL= 17      LL= 27      PI= 10

**Coefficients**

D<sub>90</sub>= 13.9963      D<sub>85</sub>= 12.0592      D<sub>60</sub>= 3.6972  
D<sub>50</sub>= 0.8868      D<sub>30</sub>= 0.0580      D<sub>15</sub>= 0.0174  
D<sub>10</sub>= 0.0078      C<sub>u</sub>= 476.82      C<sub>c</sub>= 0.12

**Classification**

USCS= GC      AASHTO= A-2-4(0)

**Remarks**

Lab NO:187

\* (no specification provided)

Location: B19-1A  
Sample Number: SS-7

Depth: 23.5'-25.0'

Date: 2/24/2020



Client: HDR, Inc.  
Project: Mary Avenue CSO - Brentwood, MO

Project No: D140-MO

Figure

## GRAIN SIZE DISTRIBUTION TEST DATA

2/25/2020

**Client:** HDR, Inc.

**Project:** Mary Avenue CSO - Brentwood, MO

**Project Number:** D140-MO

**Location:** B19-1A

**Depth:** 23.5'-25.0'

**Sample Number:** SS-7

**Material Description:** red/brown clayey GRAVEL with sand

**Date:** 2/24/2020

**PL:** 17

**LL:** 27

**PI:** 10

**USCS Classification:** GC

**AASHTO Classification:** A-2-4(0)

**Testing Remarks:** Lab NO:187

### Sieve Test Data

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer	Percent Retained
473.53	13.55	0.00	1.5	0.00	100.0	0.0
			1.0	17.50	96.2	3.8
			0.75	17.50	96.2	3.8
			0.5	60.60	86.8	13.2
			0.375	107.42	76.6	23.4
			#4	171.42	62.7	37.3
			#10	206.68	55.1	44.9
50.20	0.00	0.00	#20	4.85	49.7	50.3
			#40	9.56	44.6	55.4
			#60	15.18	38.4	61.6
			#100	18.76	34.5	65.5
			#200	20.70	32.4	67.6

### Hydrometer Test Data

Hydrometer test uses material passing #10

Percent passing #10 based upon complete sample = 55.1

Weight of hydrometer sample = 50.20

Hygroscopic moisture correction:

Moist weight and tare = 39.47

Dry weight and tare = 39.33

Tare weight = 29.79

Hygroscopic moisture = 1.5%

Automatic temperature correction

Composite correction (fluid density and meniscus height) at 20 deg. C = -5.0

Meniscus correction only = 0.0

Specific gravity of solids = 2.65

Hydrometer type = 152H

Hydrometer effective depth equation:  $L = 16.294964 - 0.164 \times R_m$

Elapsed Time (min.)	Temp. (deg. C.)	Actual Reading	Corrected Reading	K	Rm	Eff. Depth	Diameter (mm.)	Percent Finer	Percent Retained
1.00	20.4	29.5	24.5	0.0136	29.5	11.5	0.0460	27.3	72.7
2.00	20.4	26.0	21.0	0.0136	26.0	12.0	0.0333	23.4	76.6
5.00	20.4	20.5	15.5	0.0136	20.5	12.9	0.0218	17.3	82.7
15.00	20.4	16.5	11.5	0.0136	16.5	13.6	0.0129	12.8	87.2
30.00	20.5	14.5	9.6	0.0136	14.5	13.9	0.0092	10.6	89.4
60.00	20.5	13.5	8.6	0.0136	13.5	14.1	0.0066	9.5	90.5

7NT

**Hydrometer Test Data (continued)**

Elapsed Time (min.)	Temp. (deg. C.)	Actual Reading	Corrected Reading	K	Rm	Eff. Depth	Diameter (mm.)	Percent Finer	Percent Retained
120.00	20.5	12.5	7.6	0.0136	12.5	14.2	0.0047	8.4	91.6
250.00	20.5	12.0	7.1	0.0136	12.0	14.3	0.0032	7.9	92.1
1440.00	20.5	11.5	6.6	0.0136	11.5	14.4	0.0014	7.3	92.7

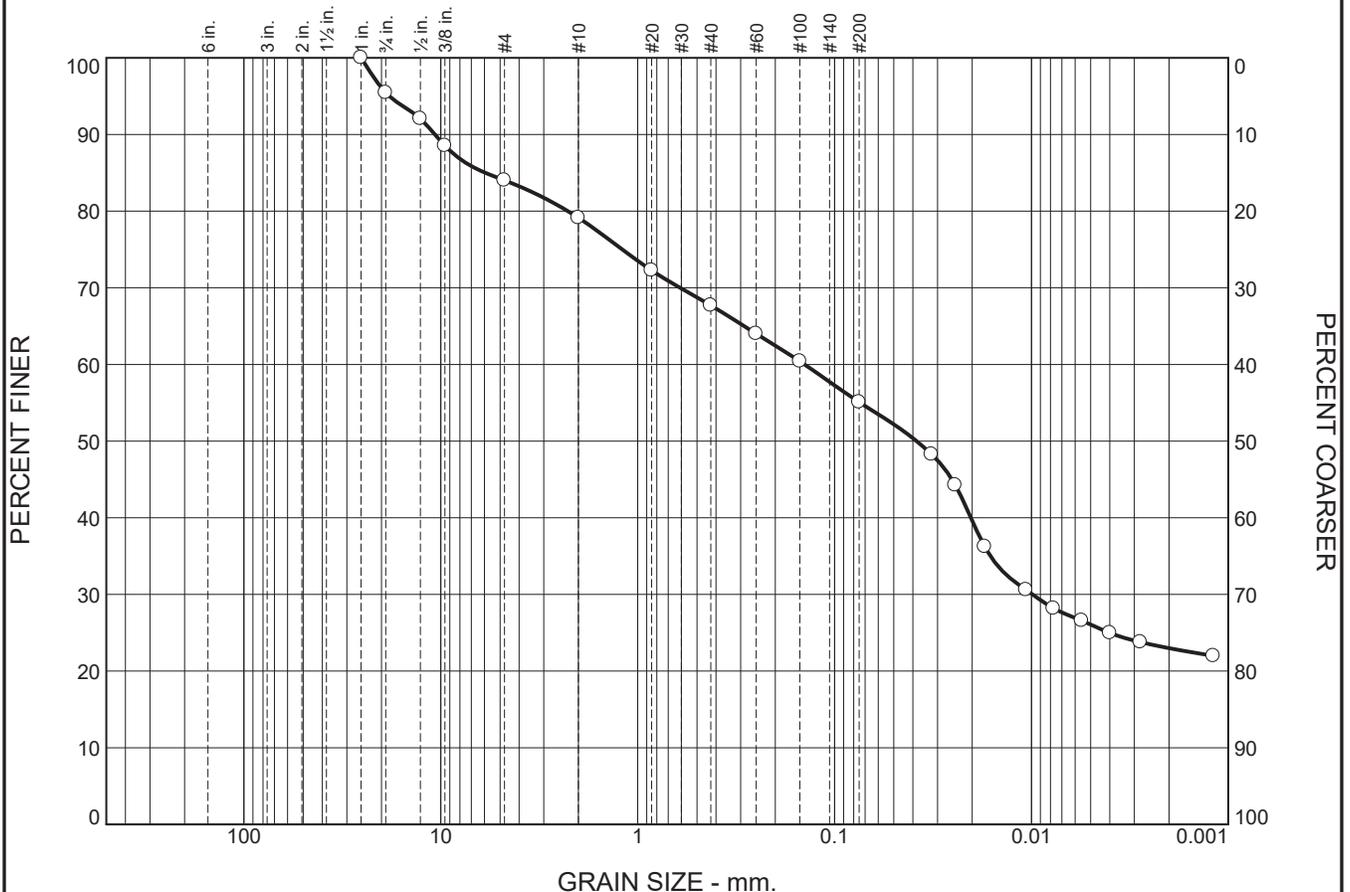
**Fractional Components**

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	3.8	33.5	37.3	7.6	10.5	12.2	30.3	23.8	8.6	32.4

D <sub>5</sub>	D <sub>10</sub>	D <sub>15</sub>	D <sub>20</sub>	D <sub>30</sub>	D <sub>40</sub>	D <sub>50</sub>	D <sub>60</sub>	D <sub>80</sub>	D <sub>85</sub>	D <sub>90</sub>	D <sub>95</sub>
	0.0078	0.0174	0.0265	0.0580	0.2871	0.8868	3.6972	10.5048	12.0592	13.9963	17.2211

Fineness Modulus	C <sub>u</sub>	C <sub>c</sub>
3.34	476.82	0.12

# Particle Size Distribution Report



GRAIN SIZE - mm.

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	4.5	11.5	4.9	11.4	12.6	29.0	26.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.0	100.0		
0.75	95.5		
0.5	92.1		
0.375	88.5		
#4	84.0		
#10	79.1		
#20	72.3		
#40	67.7		
#60	64.0		
#100	60.4		
#200	55.1		

**Material Description**

brown sandy lean CLAY with gravel

**Atterberg Limits**

PL= 16      LL= 40      PI= 24

**Coefficients**

D<sub>90</sub>= 10.7075      D<sub>85</sub>= 5.9552      D<sub>60</sub>= 0.1421  
D<sub>50</sub>= 0.0383      D<sub>30</sub>= 0.0099      D<sub>15</sub>=  
D<sub>10</sub>=                  C<sub>u</sub>=                  C<sub>c</sub>=

**Classification**

USCS= CL                  AASHTO= A-6(10)

**Remarks**

Lab NO:187

\* (no specification provided)

Location: B19-3A  
Sample Number: SS-5

Depth: 13.5'-15.0'

Date: 2/24/2020



Client: HDR, Inc.  
Project: Mary Avenue CSO - Brentwood, MO

Project No: D140-MO

Figure

**GRAIN SIZE DISTRIBUTION TEST DATA**

2/25/2020

**Client:** HDR, Inc.

**Project:** Mary Avenue CSO - Brentwood, MO

**Project Number:** D140-MO

**Location:** B19-3A

**Depth:** 13.5'-15.0'

**Sample Number:** SS-5

**Material Description:** brown sandy lean CLAY with gravel

**Date:** 2/24/2020

**PL:** 16

**LL:** 40

**PI:** 24

**USCS Classification:** CL

**AASHTO Classification:** A-6(10)

**Testing Remarks:** Lab NO:187

**Sieve Test Data**

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer	Percent Retained
417.07	15.75	0.00	1.0	0.00	100.0	0.0
			0.75	18.22	95.5	4.5
			0.5	31.86	92.1	7.9
			0.375	46.04	88.5	11.5
			#4	64.15	84.0	16.0
			#10	83.75	79.1	20.9
101.20	0.00	0.00	#20	8.77	72.3	27.7
			#40	14.62	67.7	32.3
			#60	19.34	64.0	36.0
			#100	23.95	60.4	39.6
			#200	30.75	55.1	44.9

**Hydrometer Test Data**

Hydrometer test uses material passing #10

Percent passing #10 based upon complete sample = 79.1

Weight of hydrometer sample = 101.20

Hygroscopic moisture correction:

Moist weight and tare = 45.63

Dry weight and tare = 45.33

Tare weight = 34.58

Hygroscopic moisture = 2.8%

Automatic temperature correction

Composite correction (fluid density and meniscus height) at 20 deg. C = -5.0

Meniscus correction only = 0.0

Specific gravity of solids = 2.65

Hydrometer type = 152H

Hydrometer effective depth equation:  $L = 16.294964 - 0.164 \times R_m$

Elapsed Time (min.)	Temp. (deg. C.)	Actual Reading	Corrected Reading	K	Rm	Eff. Depth	Diameter (mm.)	Percent Finer	Percent Retained
1.00	20.5	65.0	60.1	0.0136	65.0	5.6	0.0322	48.3	51.7
2.00	20.5	60.0	55.1	0.0136	60.0	6.5	0.0244	44.3	55.7
5.00	20.5	50.0	45.1	0.0136	50.0	8.1	0.0173	36.2	63.8
15.00	20.5	43.0	38.1	0.0136	43.0	9.2	0.0106	30.6	69.4
30.00	20.5	40.0	35.1	0.0136	40.0	9.7	0.0077	28.2	71.8
60.00	20.5	38.0	33.1	0.0136	38.0	10.1	0.0056	26.6	73.4
120.00	20.5	36.0	31.1	0.0136	36.0	10.4	0.0040	25.0	75.0

**Hydrometer Test Data (continued)**

Elapsed Time (min.)	Temp. (deg. C.)	Actual Reading	Corrected Reading	K	Rm	Eff. Depth	Diameter (mm.)	Percent Finer	Percent Retained
250.00	20.6	34.5	29.6	0.0135	34.5	10.6	0.0028	23.8	76.2
1462.00	19.5	32.5	27.4	0.0137	32.5	11.0	0.0012	22.0	78.0

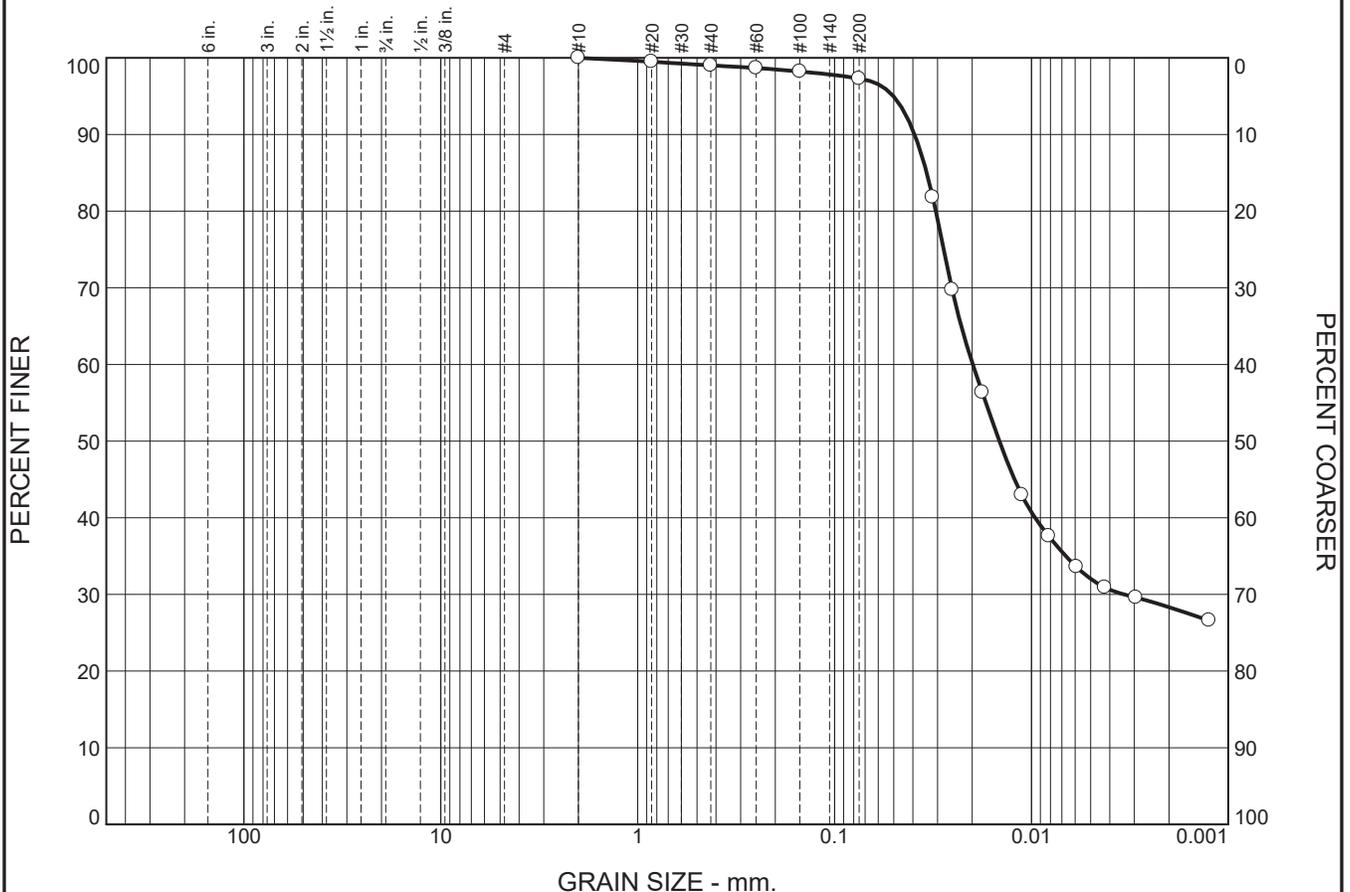
**Fractional Components**

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	4.5	11.5	16.0	4.9	11.4	12.6	28.9	29.0	26.1	55.1

D <sub>5</sub>	D <sub>10</sub>	D <sub>15</sub>	D <sub>20</sub>	D <sub>30</sub>	D <sub>40</sub>	D <sub>50</sub>	D <sub>60</sub>	D <sub>80</sub>	D <sub>85</sub>	D <sub>90</sub>	D <sub>95</sub>
				0.0099	0.0203	0.0383	0.1421	2.2623	5.9552	10.7075	18.2648

<b>Fineness Modulus</b>
1.81

# Particle Size Distribution Report



GRAIN SIZE - mm.

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	1.0	1.7	65.3	32.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	99.5		
#40	99.0		
#60	98.7		
#100	98.2		
#200	97.3		

**Material Description**

brown lean CLAY

**Atterberg Limits**

PL= 17      LL= 41      PI= 24

**Coefficients**

D<sub>90</sub>= 0.0392      D<sub>85</sub>= 0.0340      D<sub>60</sub>= 0.0199  
D<sub>50</sub>= 0.0145      D<sub>30</sub>= 0.0034      D<sub>15</sub>=  
D<sub>10</sub>=                      C<sub>u</sub>=                      C<sub>c</sub>=

**Classification**

USCS= CL                      AASHTO= A-7-6(24)

**Remarks**

Lab NO:187

\* (no specification provided)

Location: B19-4A  
Sample Number: SS-4

Depth: 8.5'-10.0'

Date: 2/24/2020



Client: HDR, Inc.  
Project: Mary Avenue CSO - Brentwood, MO

Project No: D140-MO

Figure

**GRAIN SIZE DISTRIBUTION TEST DATA**

2/25/2020

**Client:** HDR, Inc.

**Project:** Mary Avenue CSO - Brentwood, MO

**Project Number:** D140-MO

**Location:** B19-4A

**Depth:** 8.5'-10.0'

**Sample Number:** SS-4

**Material Description:** brown lean CLAY

**Date:** 2/24/2020

**PL:** 17

**LL:** 41

**PI:** 24

**USCS Classification:** CL

**AASHTO Classification:** A-7-6(24)

**Testing Remarks:** Lab NO:187

**Sieve Test Data**

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer	Percent Retained
342.37	13.62	0.00	#10	0.00	100.0	0.0
76.06	0.00	0.00	#20	0.39	99.5	0.5
			#40	0.75	99.0	1.0
			#60	1.01	98.7	1.3
			#100	1.36	98.2	1.8
			#200	2.07	97.3	2.7

**Hydrometer Test Data**

Hydrometer test uses material passing #10

Percent passing #10 based upon complete sample = 100.0

Weight of hydrometer sample = 76.06

Hygroscopic moisture correction:

Moist weight and tare = 44.37

Dry weight and tare = 44.18

Tare weight = 34.23

Hygroscopic moisture = 1.9%

Automatic temperature correction

Composite correction (fluid density and meniscus height) at 20 deg. C = -5.0

Meniscus correction only = 0.0

Specific gravity of solids = 2.65

Hydrometer type = 152H

Hydrometer effective depth equation:  $L = 16.294964 - 0.164 \times R_m$

Elapsed Time (min.)	Temp. (deg. C.)	Actual Reading	Corrected Reading	K	Rm	Eff. Depth	Diameter (mm.)	Percent Finer	Percent Retained
1.00	20.5	66.0	61.1	0.0136	66.0	5.5	0.0317	81.8	18.2
2.00	20.5	57.0	52.1	0.0136	57.0	6.9	0.0253	69.8	30.2
5.00	20.5	47.0	42.1	0.0136	47.0	8.6	0.0178	56.4	43.6
15.00	20.5	37.0	32.1	0.0136	37.0	10.2	0.0112	43.0	57.0
30.00	20.5	33.0	28.1	0.0136	33.0	10.9	0.0082	37.6	62.4
60.00	20.5	30.0	25.1	0.0136	30.0	11.4	0.0059	33.6	66.4
120.00	20.5	28.0	23.1	0.0136	28.0	11.7	0.0042	30.9	69.1
250.00	20.6	27.0	22.1	0.0135	27.0	11.9	0.0030	29.6	70.4
1465.00	19.5	25.0	19.9	0.0137	25.0	12.2	0.0013	26.6	73.4

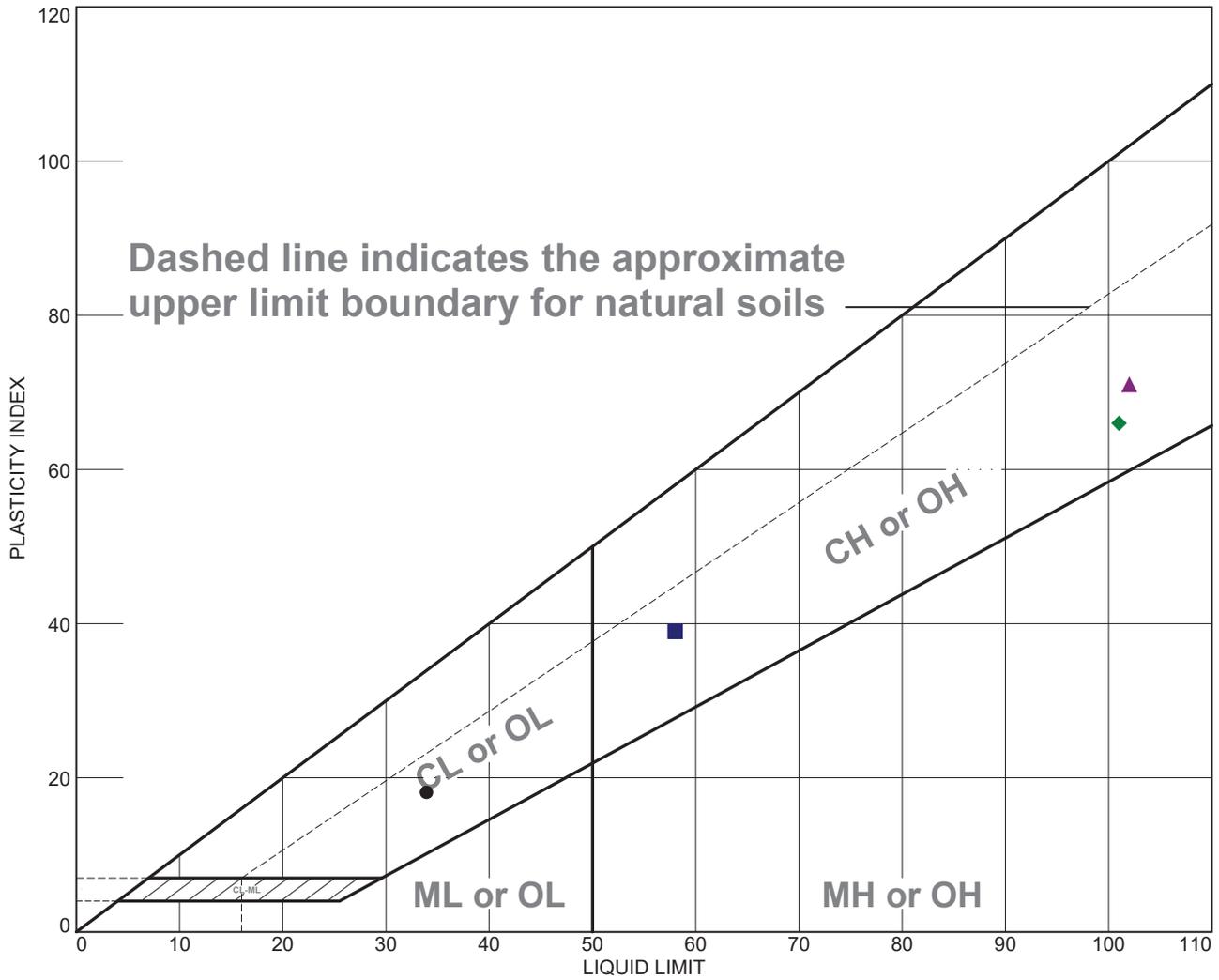
**Fractional Components**

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	0.0	0.0	0.0	0.0	1.0	1.7	2.7	65.3	32.0	97.3

D <sub>5</sub>	D <sub>10</sub>	D <sub>15</sub>	D <sub>20</sub>	D <sub>30</sub>	D <sub>40</sub>	D <sub>50</sub>	D <sub>60</sub>	D <sub>80</sub>	D <sub>85</sub>	D <sub>90</sub>	D <sub>95</sub>
				0.0034	0.0096	0.0145	0.0199	0.0306	0.0340	0.0392	0.0503

<b>Fineness Modulus</b>
0.04

# LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	brown CLAY (visual)	34	16	18			
■	red/brown fat CLAY with gravel	58	19	39	77.8	74.4	CH
▲	red/brown fat CLAY	102	31	71	95.2	92.6	CH
◆	red/brown fat CLAY (visual)	101	35	66			

**Project No.** D140-MO      **Client:** HDR, Inc.

**Project:** Mary Avenue CSO - Brentwood, MO

● <b>Location:</b> B19-1 S-4	<b>Depth:</b> 8.5' - 10.0'	<b>Sample Number:</b> 0187
■ <b>Location:</b> B19-1 S-5	<b>Depth:</b> 13.5' - 15.0'	<b>Sample Number:</b> 0187
▲ <b>Location:</b> B19-2 S-1	<b>Depth:</b> 1.0' - 2.5'	<b>Sample Number:</b> 0187
◆ <b>Location:</b> B19-2 S-2	<b>Depth:</b> 3.5' - 5.0'	<b>Sample Number:</b> 0187

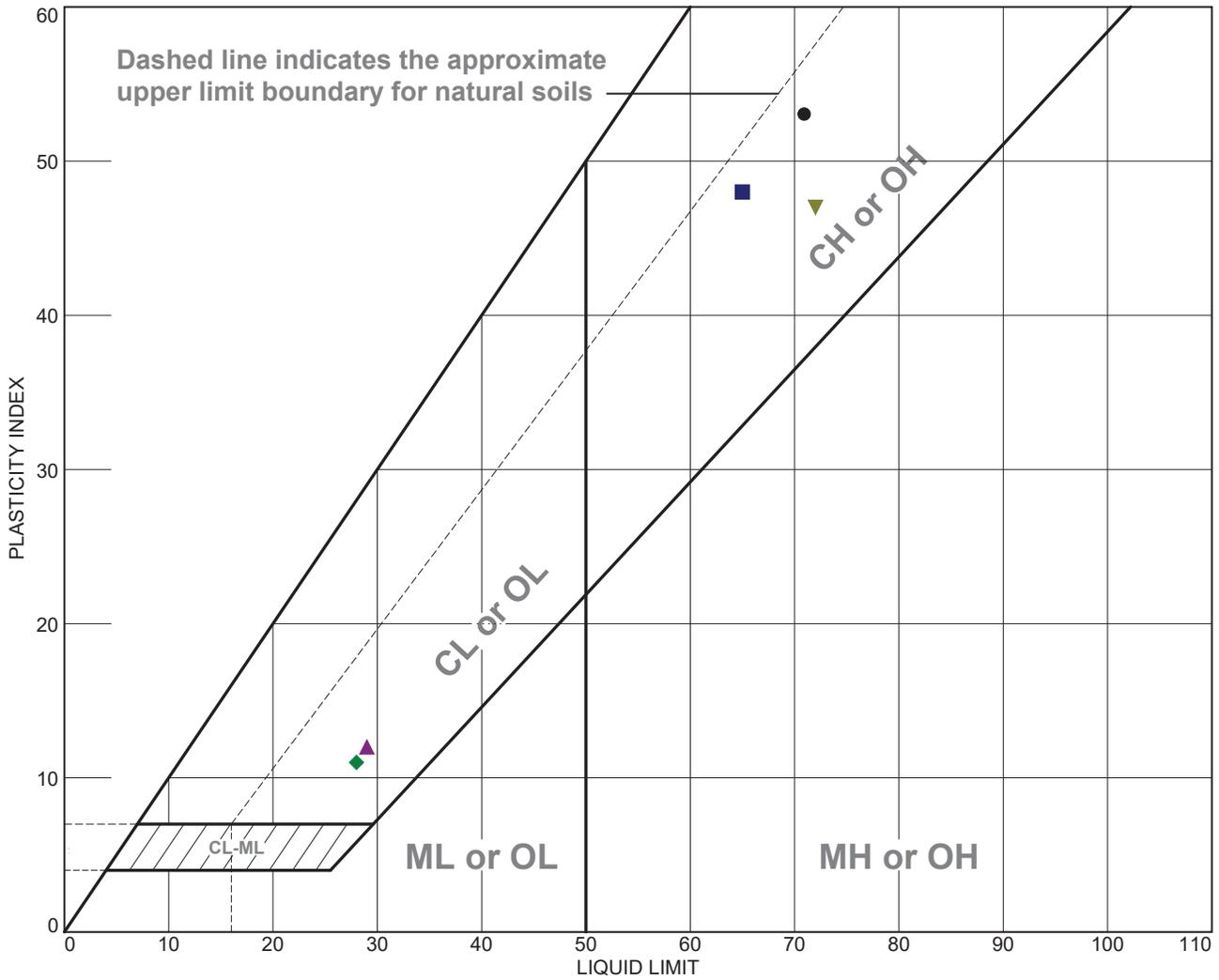
**Remarks:**

- Lab No.: 0187
- Lab No.: 0187
- ▲ Lab No.: 0187
- ◆ Lab No.: 0187



Figure

# LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	red/brown fat CLAY	71	18	53			
■	red/brown fat CLAY	65	17	48			
▲	red/brown sandy lean CLAY	29	17	12	76.8	60.5	CL
◆	brown clayey SAND with gravel	28	17	11	49.0	39.7	SC
▼	red/brown fat CLAY	72	25	47			

**Project No.** D140-MO      **Client:** HDR, Inc.

**Project:** Mary Avenue CSO - Brentwood, MO

- **Location:** B19-3 SS-8      **Depth:** 13.5' - 15.0'      **Sample Number:** 0187
- **Location:** B19-3 SS-9      **Depth:** 18.5' - 20.0'      **Sample Number:** 0187
- ▲ **Location:** B19-3 SS-11      **Depth:** 28.5' - 30.0'      **Sample Number:** 0187
- ◆ **Location:** B19-4 SS-1      **Depth:** 2.5' - 4.0'      **Sample Number:** 0187
- ▼ **Location:** B19-4 SS-3      **Depth:** 12.0' - 13.5'      **Sample Number:** 0187

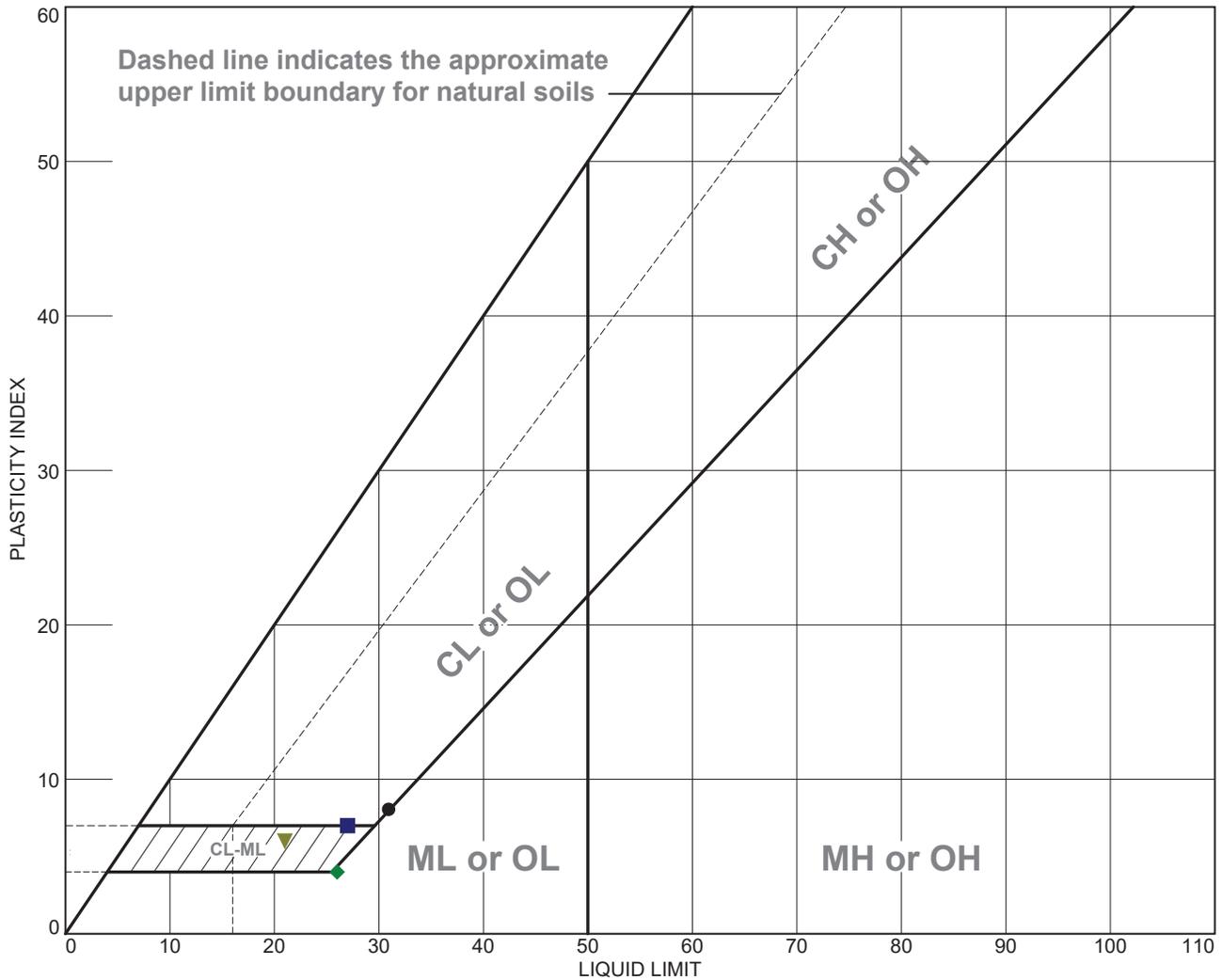
**Remarks:**

- Lab No.: 0187
- Lab No.: 0187
- ▲ Lab No.: 0187
- ◆ Lab No.: 0187
- ▼ Lab No.: 0187



Figure

# LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	brown/gray clayey SILT (visual)	31	23	8			
■	gray silty CLAY with sand	27	20	7	99.3	82.3	CL-ML
▲	black silty SAND with gravel	NP	NP	NP	21.5	12.3	SM
◆	brown SILT (visual)	26	22	4			
▼	brown clayey SILT (visual)	21	15	6			

**Project No.** D140-MO      **Client:** HDR, Inc.

**Project:** Mary Avenue CSO - Brentwood, MO

● **Location:** B19-5 SS-2

**Depth:** 3.5' - 5.0'

**Sample Number:** 0187

■ **Location:** B19-5 SS-5

**Depth:** 13.5' - 15.0'

**Sample Number:** 0187

▲ **Location:** B19-6 SS-2

**Depth:** 3.5' - 5.0'

**Sample Number:** 0187

◆ **Location:** B19-6 SS-5

**Depth:** 13.5' - 15.0'

**Sample Number:** 0187

▼ **Location:** B19-6 SS-6

**Depth:** 18.5' - 20.0'

**Sample Number:** 0187

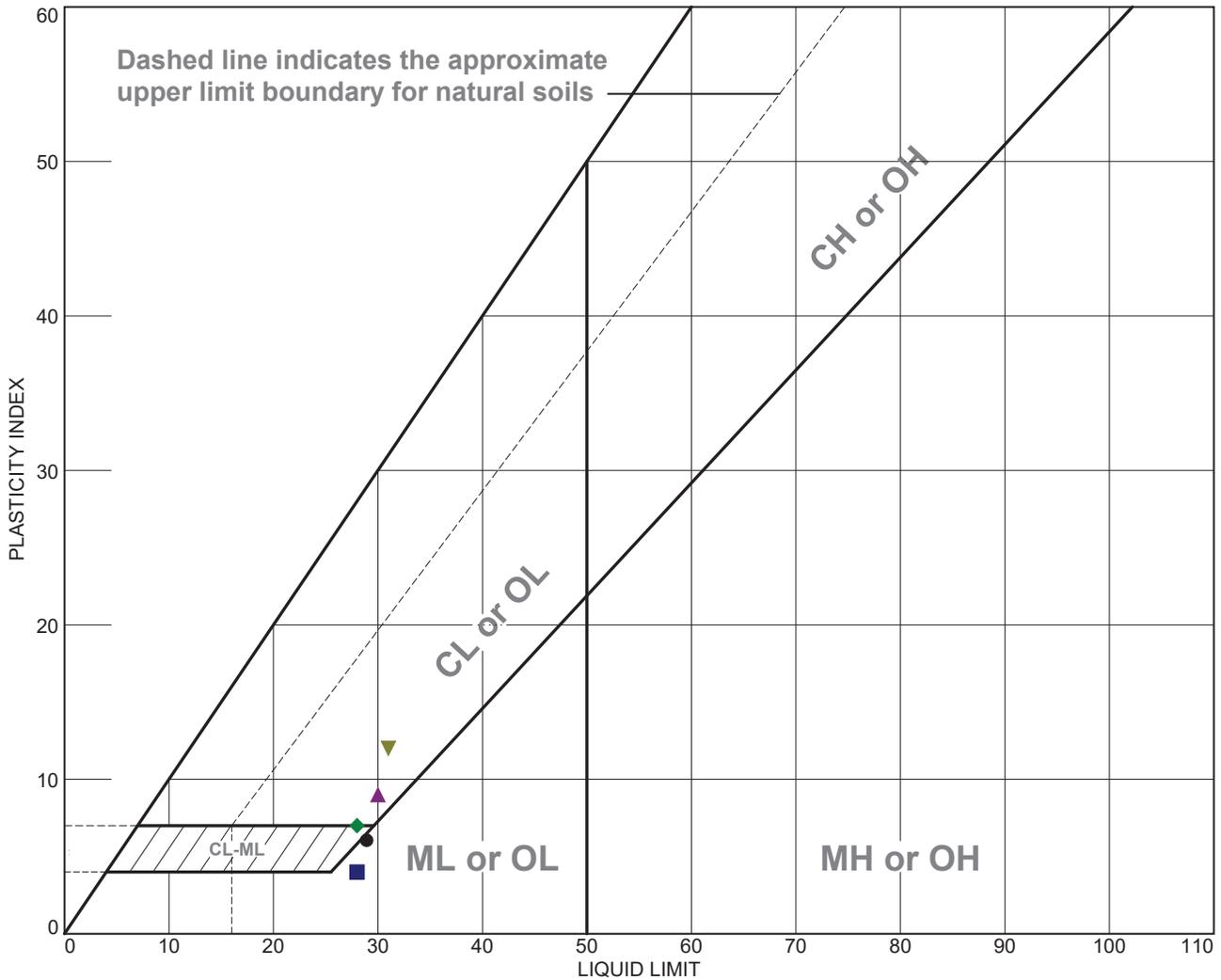
**Remarks:**

- Lab No.: 0187
- Lab No.: 0187
- ▲ Lab No.: 0187
- ◆ Lab No.: 0187
- ▼ Lab No.: 0187



Figure

# LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	brown clayey SILT (visual)	29	23	6			
■	brown/gray SILT	28	24	4	91.2	88.4	ML
▲	brown lean CLAY	30	21	9	99.0	97.1	CL
◆	brown clayey SILT (visual)	28	21	7			
▼	brown CLAY (visual)	31	19	12			

**Project No.** D140-MO      **Client:** HDR, Inc.

**Project:** Mary Avenue CSO - Brentwood, MO

● <b>Location:</b> B19-7 SS-1	<b>Depth:</b> 1.0' - 2.5'	<b>Sample Number:</b> 0187
■ <b>Location:</b> B19-7 SS-4	<b>Depth:</b> 8.5' - 10.0'	<b>Sample Number:</b> 0187
▲ <b>Location:</b> B19-8 SS-4	<b>Depth:</b> 8.5' - 10.0'	<b>Sample Number:</b> 0187
◆ <b>Location:</b> B19-8 SS-5	<b>Depth:</b> 13.5' - 15.0'	<b>Sample Number:</b> 0187
▼ <b>Location:</b> B19-9 SS-2	<b>Depth:</b> 3.5' - 5.0'	<b>Sample Number:</b> 0187

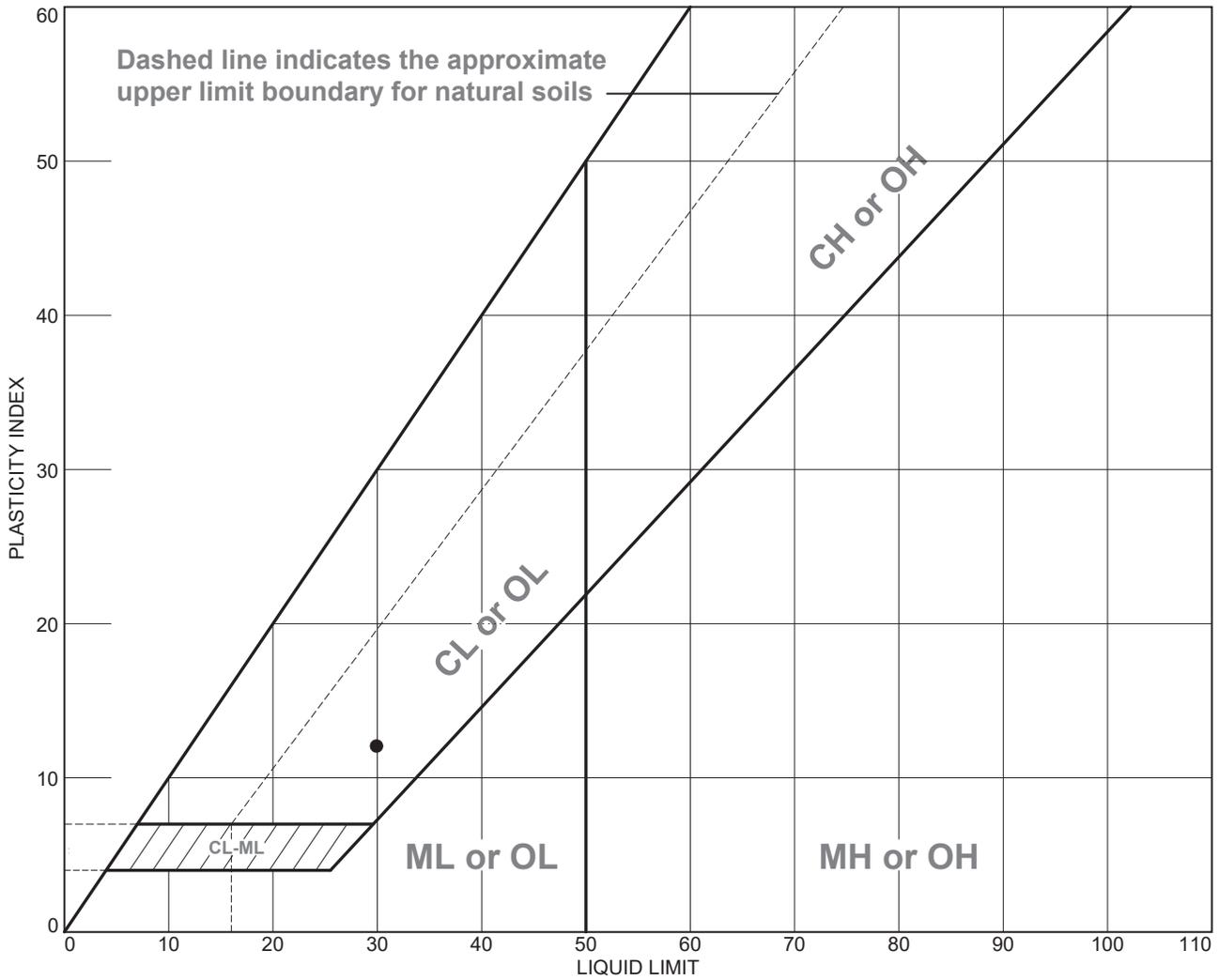
**Remarks:**

- Lab No.: 0187
- Lab No.: 0187
- ▲ Lab No.: 0187
- ◆ Lab No.: 0187
- ▼ Lab No.: 0187



Figure

# LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	brown clayey SAND with gravel	30	18	12	56.7	45.4	SC

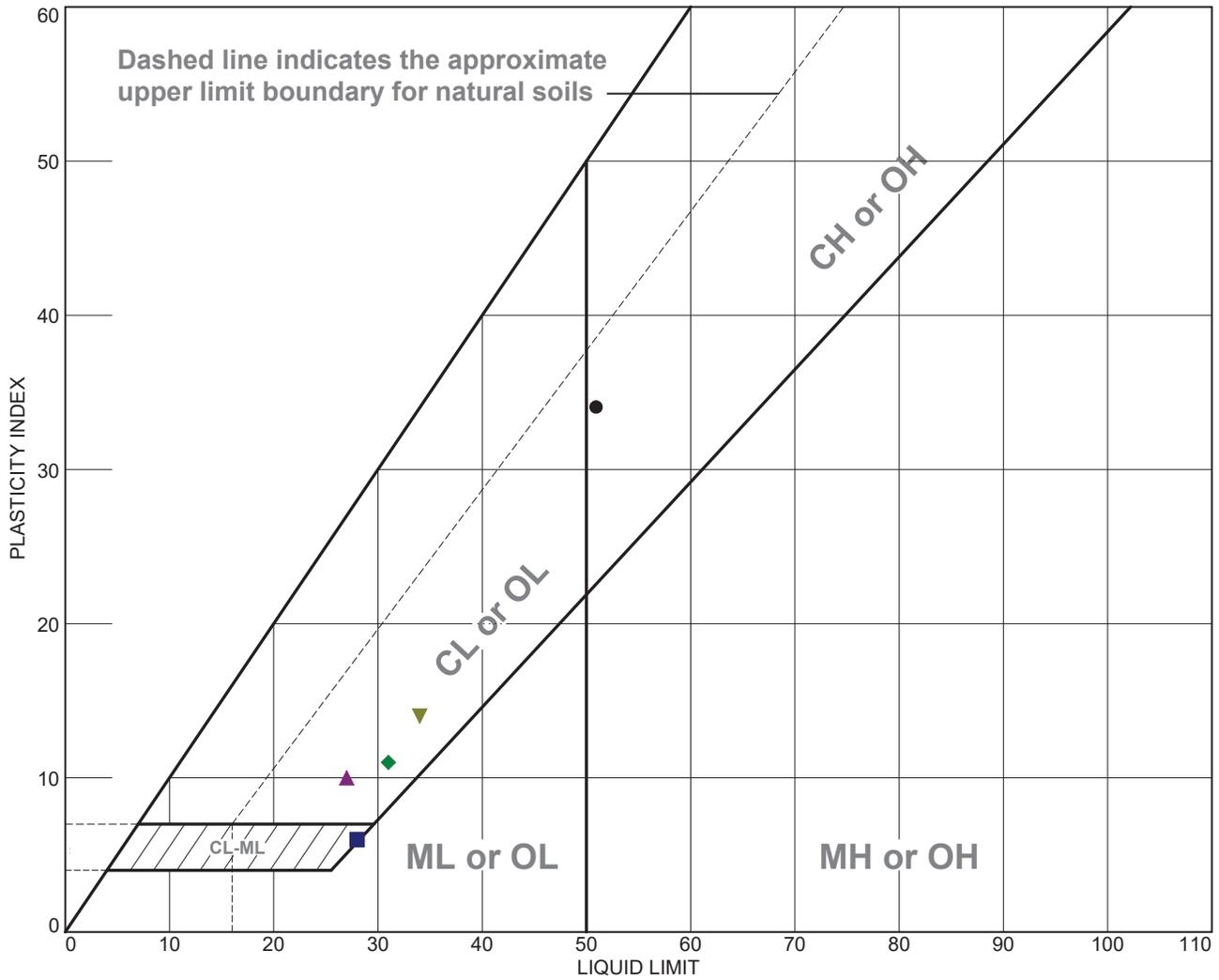
**Project No.** D140-MO     **Client:** HDR, Inc.  
**Project:** Mary Avenue CSO - Brentwood, MO  
**● Location:** B19-9 SS-3     **Depth:** 6.0' - 7.5'     **Sample Number:** 0187

**Remarks:**  
 ● Lab No.: 0187



Figure

# LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	red/brown fat CLAY (visual)	51	17	34			
■	gray/brown silty CLAY	28	22	6	97.1	95.2	CL-ML
▲	red/brown clayey GRAVEL with sand	27	17	10	44.6	32.4	GC
◆	gray/brown lean CLAY	31	20	11	94.5	89.8	CL
▼	brown CLAY (visual)	34	20	14			

**Project No.** D140-MO      **Client:** HDR, Inc.

**Project:** Mary Avenue CSO - Brentwood, MO

- **Location:** B19-1A      **Depth:** 6.0'-7.5'      **Sample Number:** SS-3
- **Location:** B19-1A      **Depth:** 18.5'-20.0'      **Sample Number:** SS-6
- ▲ **Location:** B19-1A      **Depth:** 23.5'-25.0'      **Sample Number:** SS-7
- ◆ **Location:** B19-2A      **Depth:** 3.5'-5.0'      **Sample Number:** SS-2
- ▼ **Location:** B19-2A      **Depth:** 13.5'-15.0'      **Sample Number:** SS-5

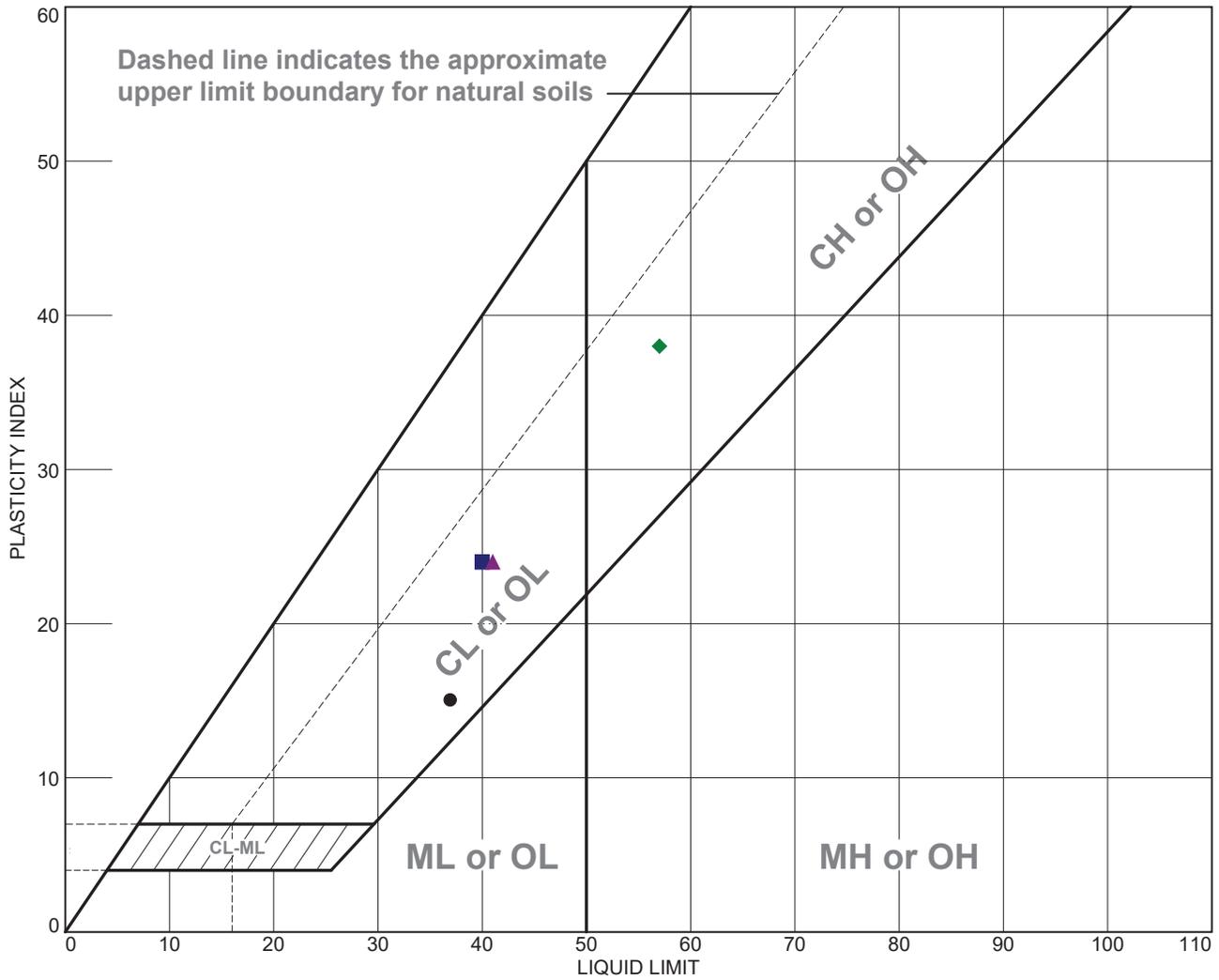
**Remarks:**

- Lab NO:187
- Lab NO:187
- ▲ Lab NO:187
- ◆ Lab NO:187
- ▼ Lab NO:187



Figure

# LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	brown CLAY (visual)	37	22	15			
■	brown sandy lean CLAY with gravel	40	16	24	67.7	55.1	CL
▲	brown lean CLAY	41	17	24	99.0	97.3	CL
◆	brown fat CLAY (visual)	57	19	38			

**Project No.** D140-MO      **Client:** HDR, Inc.

**Project:** Mary Avenue CSO - Brentwood, MO

● <b>Location:</b> B19-3A	<b>Depth:</b> 1.0'-2.5'	<b>Sample Number:</b> SS-1
■ <b>Location:</b> B19-3A	<b>Depth:</b> 13.5'-15.0'	<b>Sample Number:</b> SS-5
▲ <b>Location:</b> B19-4A	<b>Depth:</b> 8.5'-10.0'	<b>Sample Number:</b> SS-4
◆ <b>Location:</b> B19-4A	<b>Depth:</b> 18.5'-20.0'	<b>Sample Number:</b> SS-6

**Remarks:**

- Lab NO:187
- Lab NO:187
- ▲ Lab NO:187
- ◆ Lab NO:187



Figure

# 7NT

## ASTM D2216 - Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

Client: HDR, Inc.  
Project: Mary Avenue CSO - Brentwood, MO

Lab No.: 187  
Project No.: D140-MO  
Date: 10/22/2019

Boring Number	Sample Number	Depth (ft)	Depth (m)	Moisture Content (%)	Comments
B19-1	S-2	3.5 - 5.0	1.1 - 1.5	7.8	
B19-1	S-3	6.5 - 8.0	2.0 - 2.4	10.0	
B19-1	S-4	8.5 - 10.0	2.6 - 3.0	16.3	
B19-2	S-2	3.5 - 5.0	1.1 - 1.5	36.9	

# 7NT

## ASTM D2216 - Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

Client: HDR, Inc.  
Project: Mary Avenue CSO - Brentwood, MO  
Indianapolis, Indiana

Lab No.: 187  
Project No.: D140-MO  
Date: 12/3/2019

Boring Number	Sample Number	Depth (ft)	Depth (m)	Moisture Content (%)	Comments
B19-3	SS-8	13.5 - 15.0	4.1 - 4.6	24.7	
B19-3	SS-9	18.5 - 20.0	5.6 - 6.1	21.1	
B19-3	SS-10	23.5 - 25.0	7.2 - 7.6	28.1	
B19-3	SS-11	28.5 - 30.0	8.7 - 9.1	21.7	
B19-4	SS-1	2.5 - 4.0	0.8 - 1.2	10.6	
B19-4	SS-3	12.0 - 13.5	3.7 - 4.1		Non-Testable
B19-5	SS-2	3.5 - 5.0	1.1 - 1.5	22.4	
B19-5	SS-3	6.0 - 7.5	1.8 - 2.3	28.8	
B19-5	SS-5	13.5 - 15.0	4.1 - 4.6	28.7	
B19-6	SS-1	1.0 - 2.5	0.3 - 0.8	2.8	
B19-6	SS-2	3.5 - 5.0	1.1 - 1.5	5.6	
B19-6	SS-5	13.5 - 15.0	4.1 - 4.6	23.3	
B19-6	SS-6	18.5 - 20.0	5.6 - 6.1	21.1	
B19-7	SS-1	1.0 - 2.5	0.3 - 0.8	25.9	
B19-7	SS-4	8.5 - 10.0	2.6 - 3.0	28.1	
B19-7	SS-5	13.5 - 15.0	4.1 - 4.6	17.6	
B19-8	SS-3	6.0 - 7.5	1.8 - 2.3	20.5	
B19-8	SS-4	8.5 - 10.0	2.6 - 3.0	23.0	
B19-8	SS-5	13.5 - 15.0	4.1 - 4.6	23.6	
B19-9	SS-2	3.5 - 5.0	1.1 - 1.5		Non-Testable
B19-9	SS-3	6.0 - 7.5	1.8 - 2.3	16.7	
B19-9	SS-5	13.5 - 15.0	4.1 - 4.6	18.9	

# 7NT

## ASTM D2216 - Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

Client: HDR, Inc  
Project: Mary Avenue CSO - Brentwood, MO

Lab No.: 187  
Project No.: D140-MO  
Date: 2/24/2020

Boring Number	Sample Number	Depth (ft)	Depth (m)	Moisture Content (%)	Comments
B19-1A	SS-1	1.0 - 2.5	0.3 - 0.8	10.8	
B19-1A	SS-3	6.0 - 7.5	1.8 - 2.3	16.2	
B19-1A	SS-6	18.5 - 20.0	5.6 - 6.1	24.4	
B19-1A	SS-7	23.5 - 25.0	7.2 - 7.6	46.1	
B19-2A	SS-2	3.5 - 5.0	1.1 - 1.5		Erroneous Result
B19-2A	SS-4	8.5 - 10.0	2.6 - 3.0	24.9	
B19-2A	SS-5	13.5 - 15.0	4.1 - 4.6	23.4	
B19-3A	SS-1	1.0 - 2.5	0.3 - 0.8	16.0	
B19-3A	SS-5	13.5 - 15.0	4.1 - 4.6	20.0	
B19-4A	SS-2	3.5 - 5.0	1.1 - 1.5	97.3	
B19-4A	SS-4	8.5 - 10.0	2.6 - 3.0	23.2	
B19-4A	SS-6	18.5 - 20.0	5.6 - 6.1	37.5	

## Unified Soil Classification System

### PARTICLE SIZE IDENTIFICATION

<u>Description</u>	<u>Size</u>
Boulders	· Diameter: 12 inches or larger
Cobbles	· Diameter: 3 to 12 inches
Gravel	· Coarse - 3/4 to 3 inches · Fine - 3/4 to No. 4
Sand	· Coarse - No. 10 to No. 4 (Diameter of pencil lead) · Medium - No. 40 to No. 10 (Diameter of broom straw) · Fine - No. 200 to No. 40 (Diameter of human hair)
Silt and Clay	· Passing No. 200 (Cannot see particles)

### RELATIVE PROPORTIONS

<u>Description</u>	<u>Percent by Weight (%)</u>
Trace	0-5
Few	5-10
Little	10-20
Some	20-35
And	35-50

### MOISTURE CONDITIONS

<u>Description</u>	<u>Criteria</u>
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table

### COHESIVE SOILS (Silt and Clay)

#### CONSISTENCY

<u>Description</u>	<u>Blows/ft</u>
Very Soft	2
Soft	3-5
Medium Stiff	6-9
Stiff	10-16
Very Stiff	17-30
Hard	>30

#### PLASTICITY

<u>Degree of Plasticity</u>	<u>Plasticity Index</u>
None	0-4
Slight	5-7
Medium	8-22
High to Very High	Over 22

### COHESIONLESS SOIL (Sand, Gravel, and larger) RELATIVE DENSITY

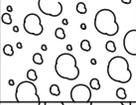
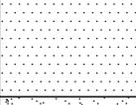
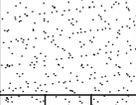
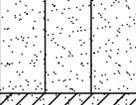
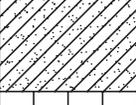
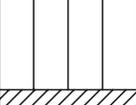
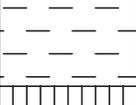
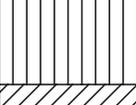
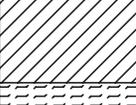
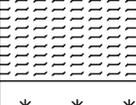
<u>Description</u>	<u>Blows/ft</u>	<u>Description</u>	<u>Blows/ft</u>
Very Loose	<4	Dense	31-50
Loose	4-10	Very Dense	>50
Medium Dense	11-30		

Soil Classification on Boring Logs is made by visual inspection of samples (as per ASTM D 2487).

Strata Changes - In the column "Soil Descriptions" on the drill log, the horizontal lines represent strata changes. A solid line represents an actually observed change, a dashed line (--) represents an estimated change.

Ground Water - Observations were made at the times indicated. Porosity of soil strata, weather conditions, site topography, etc. may cause changes in the water levels indicated on the logs.

# SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS	
			GRAPH	LETTER		
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS <small>(LITTLE OR NO FINES)</small>		GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES	
				GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES	
		GRAVELS WITH FINES <small>(APPRECIABLE AMOUNT OF FINES)</small>		GM	SILTY GRAVELS, GRAVEL-SAND-CLAY MIXTURES	
	MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	SAND AND SANDY SOILS	CLEAN SANDS <small>(LITTLE OR NO FINES)</small>		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
					SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
			SANDS WITH FINES <small>(APPRECIABLE AMOUNT OF FINES)</small>		SM	SILTY SANDS, SAND-SILT MIXTURES
			SC	CLAYEY SANDS, SAND-CLAY MIXTURES		
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY	
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS	
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY	
	MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
					CH	INORGANIC CLAYS OF HIGH PLASTICITY
					OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS	

April 13, 2018

Mr. Doug Hickey, Project Manager  
HDR Engineering  
401 South 18th Street, Suite 300  
St. Louis, MO 63103  
[Doug.Hickey@hdrinc.com](mailto:Doug.Hickey@hdrinc.com)

**Only a portion of this full April 13, 2018 Geotechnical Data Report is being provided as additional information for borings B17-1 & B17-2 as they pertain to the CSO – Mary Avenue South of Manchester CSO Interceptor (I-132)/Outfall (L-106) Elimination Phase I (MoDOT) (13404) project. Appendix information outside this project corridor has been excluded. Portions within Section 3.0 and Section 5.0 have been hatched in red that are outside this project corridor.**

**RE: GEOTECHNICAL DATA REPORT  
L-106 (BRENTWOOD) SEWER SEPARATION, RDP TRIBUTARIES (DEER CREEK) CSO TUNNEL (MSD NO. 12441)**

Dear Mr. Hickey:

Our geotechnical data report for the referenced project is attached. We have appreciated this opportunity to assist you on this project and look forward to working with you again. Please contact us if you have questions concerning this report.

Sincerely,

**SHANNON & WILSON, INC.**

William B. Kremer, P.E.  
Senior Associate

VMC:WBK/tad

Enc: Geotechnical Data Report, L-106 (Brentwood) Sewer Separation, RDP Tributaries (Deer Creek) CSO Tunnel (MSD No. 12441)

c: Darcy Riegel, HDR, 401 South 18<sup>th</sup> Street, Suite 300, St. Louis, MO, 63103,  
[Darcy.Riegel@hdrinc.com](mailto:Darcy.Riegel@hdrinc.com)

Everett Litton, WSP USA, 211 N. Broadway, Suite 2800, St. Louis, MO 63102,  
[everett.litton@wsp.com](mailto:everett.litton@wsp.com)

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**GEOTECHNICAL DATA REPORT  
L-106 (BRENTWOOD) SEWER SEPARATION  
RDP TRIBUTARIES (DEER CREEK) CSO TUNNEL  
MSD NO. 12441**

**April 13, 2018**

**Prepared for**

**METROPOLITAN ST. LOUIS  
SEWER DISTRICT**



**Only a portion of this full April 13, 2018 Geotechnical Data Report is being provided as additional information for borings B17-1 & B17-2 as they pertain to the CSO – Mary Avenue South of Manchester CSO Interceptor (I-132)/Outfall (L-106) Elimination Phase I (MoDOT) (13404) project. Appendix information outside this project corridor has been excluded. Portions within Section 3.0 and Section 5.0 have been hatched in red that are outside this project corridor.**



**And**



**Prepared by**



**2043 Westport Center Drive  
Saint Louis, MO 63141**

**Revision 2**

**41-1-37530-005**

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APPENDICES

APPENDIX A.....	FIGURES
APPENDIX B.....	SOIL CLASSIFICATION CRITERIA AND EXPLORATORY BORINGS
APPENDIX C.....	BORINGS BACKFILL REPORTS AND RESTORATION PHOTOS
APPENDIX D.....	LABORATORY TEST REPORTS
APPENDIX E .....	GIWP - NEAR SURFACE SEWERS

REVISION HISTORY

<b>Revision No. 0</b>	<b>Date: June 23, 2017</b>
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Initial issuance. No revisions applicable.

<b>Revision No. 1</b>	<b>Date: July 28, 2017</b>
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Revised per WSP comments.

<b>Revision No. 2</b>	<b>Date: April 13, 2018</b>
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Add boring B17-8, and boring backfill reports and restoration photos for all borings.

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**GEOTECHNICAL DATA REPORT  
L-106 (BRENTWOOD) SEWER SEPARATION  
RDP TRIBUTARIES CSO TUNNEL  
MSD NUMBER 12441**

**1.0 SCOPE OF WORK**

This Geotechnical Data Report (GDR) for the proposed L-106 (Brentwood) Sewer Separation was prepared for the Metropolitan St. Louis Sewer District (MSD); HDR, Inc. (HDR); and WSP by Shannon & Wilson, Inc. (S&W). This GDR presents geotechnical data collected during the FY17 geotechnical exploration program for use in designing and constructing the sewer. We understand that MSD may provide this GDR to Contractors for their use to plan construction and to develop designs for work elements for which they are responsible.

S&W's services are provided under the master subconsultant agreement (MSA) between HDR and S&W for professional services related to the RDP Tributaries & Upper RDP CSO Controls & Lower Meramec System Improvements (MSD Project No. 11153). The master subconsultant agreement is subject to MSD Contract No. 20202 which serves as the prime agreement between MSD and HDR. Services for the Brentwood Sewer Separation were authorized by Task Order 5 of the MSA. Specific exploration details are discussed within the Task Order. In brief, S&W's services included field oversight and logging of exploratory drilling and other field work for this study; assistance with coordination of site access and right-of-entry for drilling sites; laboratory testing; assembly of subsurface data; and GDR preparation. Exploratory drilling was provided by 7NT Enterprises, LLC (7NT) under separate contract through HDR.

**2.0 PROJECT DESCRIPTION**

The Brentwood Sewer Separation (MSD No. 12441) is part of the Brentwood and Linden Combined Sewer System, and the RDP Tributaries CSO Tunnel Project within the Deer Creek Watershed. The existing combined sewer system will be soft separated with private inflow removal. Soft separation will have sanitary flow to the Deer Creek Trunk sewer and peak sanitary overflow to the Deer Creek Sanitary Tunnel.

The project borings are arranged in northwesterly to southeasterly trending band through the City of Brentwood bounded by Manchester Road and Mary Avenue on the southeast, and Hatton Lane and Lawn Avenue on the northwest. The project area is located along a northwesterly to southeasterly trending upland ridge bounded by the Black Creek Valley to the northeast and the Deer Creek Valley to the southwest. Elevation is generally around 500 feet MSL.

### 3.0 EXPLORATION AND TESTING

The exploration program included 18 borings, designated B17-1 through B17-18, and laboratory testing of collected samples. Boring locations are shown on figure(s) provided in Appendix A. Boring coordinates surveyed by Kowelman Engineering of St. Louis are provided in Table 1. Northings and Eastings are based on Modified State Plane. Ground surface elevations are based on NAVD 1988.

**TABLE 1  
BORING COORDINATES**

<b>Boring</b>	<b>Northing</b>	<b>Easting</b>	<b>GS Elevation, feet</b>
B17-1	1011830.7	864360.9	449.5
B17-2	1011915.1	864442.2	447.7
B17-3	1013149.2	864422.3	477.5
B17-4	1013213.1	864258.7	476.4
B17-5	1013231.8	863773.7	461.0
B17-6	1012547.7	863642.7	477.1
B17-7	1012475.8	863223.1	473.7
B17-8	1012985.1	863330.6	480.3
B17-9	1013540.8	863585.1	477.7
B17-10	1014311.1	862197.7	478.3
B17-11	1014423.3	861915.2	483.4
B17-12	1014741.7	861491.9	492.0
B17-13	1014975.8	861027.0	503.1
B17-14	1015530.9	860800.1	515.0
B17-15	1015379.0	861441.7	511.7
B17-16	1015639.5	861373.9	526.8
B17-17	1015654.5	861568.8	518.7
B17-18	1015957.4	861556.0	536.1

Soil logs, rock core photographs, and other drilling-related measurements and observations are provided in Appendix B. Boring backfill reports and restoration photos are provided in Appendix C. Laboratory test results and details are provided in Appendix D. Exploration and testing were completed as generally defined in the Geotechnical Investigation Work Plan for the RDP Tributaries & Upper CSO Controls & Lower Meramec Systems Improvements Near Surface Sewers (GIWP Near Surface Sewers) prepared by WSP and S&W. A copy of the GIWP is provided in Appendix E.

Borings were extended in soil to auger refusal or a depth of 5 feet below the planned sewer invert, whichever came first. Borings were advanced using 4-1/4-inch hollow-stem augers. Soil samples were collected using a split-spoon sampler on 5-foot centers along the boring length, and at 2.5-foot centers from 5 feet above to 5 feet below the proposed sewer invert. Standard Penetration Tests were completed with each split-spoon sample, in general accordance with ASTM Standard D1586.

Borings that refused before reaching the target depth of 5 feet below the planned sewer invert were cored 5 feet below refusal to observe the condition of the rock. Coring was completed in 5-foot runs using wire-line, HQ-sized tools.

Collected soil samples were taken to S&W for laboratory determination of in-situ moisture content and Atterberg liquid and plastic limits, in general accordance with ASTM Standards D2216 and D4318, respectively. A summary of the laboratory test results is included in Table 2.

**TABLE 2  
LABORATORY TEST RESULTS SUMMARY**

Boring	Depth, feet	USCS	Water Content, %	Atterberg Limits		Undrained Shear Strength, tsf
				Liquid Limit, %	Plastic Limit, %	
B17-1	4.3	CL [Fill]	12.5	-	-	-
B17-1	9.3	CL	26.2	33.7	18.7	-
B17-1	11.1	CL	27.9	-	-	-
B17-1	12.3	CL	26.0	-	-	-
B17-1	12.8	CL	27.4	-	-	-
B17-1	13.8	CL	26.5	-	-	-
B17-1	16.8	CL	27.4	36.7	17.8	-
B17-1	19.3	CL	28.3	-	-	-
B17-1	21.8	CL	28.6	-	-	-
B17-2	4.3	CH	26.1	-	-	-
B17-2	9.3	CH	27.3	-	-	-
B17-2	11.8	CL	28.1	35.8	18.8	-
B17-2	14.3	CL	26.5	-	-	-
B17-2	16.8	CH	16.6	-	-	-
B17-3	4.3	CH	21.0	-	-	-
B17-3	9.3	CH	32.3	-	-	-
B17-4	4.3	CL	21.9	-	-	-
B17-4	9.3	CL	14.5	41.3	17.8	-
B17-4	14.3	CH	18.2	-	-	-

Boring	Depth, feet	USCS	Water Content, %	Atterberg Limits		Undrained Shear Strength, tsf
				Liquid Limit, %	Plastic Limit, %	
B17-4	19.3	CH	22.0	-	-	-
B17-4	21.8	CH	21.2	64.5	21.9	-
B17-4	24.3	CH	41.7	-	-	-
B17-4	26.8	CH	45.2	-	-	-
B17-4	29.3	CH	30.4	73.7	20.3	-
B17-4	31.3	CH	39.1	-	-	-
B17-5	6.8	CL	21.7	30.4	21.4	-
B17-5	9.2	GP	2.8	-	-	-
B17-6	4.3	CH	27.6	-	-	-
B17-6	9.3	CL	19.7	48.3	19.6	-
B17-6	14.3	CH	24.0	-	-	-
B17-6	19.3	LIMESTONE	30.0	-	-	-
B17-7	4.3	CL	22.2	-	-	-
B17-7	9.3	CH	21.4	72.1	25.8	-
B17-8	4.3	CL	23.0	-	-	-
B17-8	6.1	CL	24.6	-	-	-
B17-8	7.3	CL	24.2	48.2	15.9	0.48
B17-8	7.9	CL	25.2	-	-	-
B17-8	9.3	CH	21.8	-	-	-
B17-8	11.8	CH	39.9	-	-	-
B17-9	4.3	CH	24.6	-	-	-
B17-9	9.3	CH	23.6	60.8	18.2	-
B17-9	14.1	CH	19.4	-	-	-
B17-10	4.3	CL	30.5	-	-	-
B17-10	6.8	CL	28.7	32.6	20.9	-
B17-10	9.3	CL	24.6	-	-	-
B17-10	11.8	CH	24.4	61.2	18.4	-
B17-11	9.3	CL	22.7	-	-	-
B17-11	11.8	CL	23.0	40.3	17.1	-
B17-12	9.3	CH	22.2	-	-	-
B17-12	11.8	CH	22.7	53.1	17.5	-
B17-12	14.3	CH	22.6	-	-	-
B17-12	16.5	CH	17.1	-	-	-
B17-12	18.7	CH	19.7	-	-	-
B17-13	9.3	CL	23.0	-	-	-
B17-13	11.8	CL	24.5	-	-	-
B17-13	14.3	CL	22.4	43.2	14.4	-

Boring	Depth, feet	USCS	Water Content, %	Atterberg Limits		Undrained Shear Strength, tsf
				Liquid Limit, %	Plastic Limit, %	
B17-13	16.3	CL	14.0	-	-	-
B17-13	18.8	CL	10.9	-	-	-
B17-13	19.4	CH	14.9	-	-	-
B17-14	4.3	CL [Fill]	23.5	41.0	19.5	-
B17-14	6.8	CL	23.5	-	-	-
B17-14	9.3	CL	22.7	-	-	-
B17-14	11.8	CL	23.3	49.1	18.2	-
B17-14	14.3	CL	22.0	-	-	-
B17-14	16.8	CL	25.6	-	-	-
B17-15	4.3	CL	24.7	44.1	17.0	-
B17-15	9.3	CH	26.0	-	-	-
B17-15	11.8	CH	25.2	-	-	-
B17-15	14.3	CH	22.0	-	-	-
B17-15	16.8	CH	21.2	-	-	-
B17-16	4.3	CL	28.9	40.5	20.5	-
B17-16	6.8	ML	25.3	-	-	-
B17-16	9.3	CL	23.7	44.0	17.4	-
B17-16	11.8	CH	22.7	-	-	-
B17-16	14.3	CH	30.1	-	-	-
B17-17	4.3	CL [Fill]	21.7	-	-	-
B17-17	6.8	CL	23.5	35.7	19.3	-
B17-17	9.3	CH	21.2	-	-	-
B17-17	11.8	CH	24.2	-	-	-
B17-17	14.3	CH	19.7	58.4	19.8	-
B17-18	4.3	CL	22.8	-	-	-
B17-18	6.8	CL	22.2	38.9	19.6	-
B17-18	9.3	CL	23.0	-	-	-
B17-18	11.8	CL	21.7	-	-	-
B17-18	14.3	CH	32.5	88.7	25.9	-

Composite samples were prepared from soil samples recovered at various depths for each boring and sent to Teklab, Inc. of Collinsville, Illinois for determination of soil corrosivity parameters. A summary of the corrosivity test results is included in Table 3. Rock core was taken to S&W and photographed, then moved to the MSD core storage facility at 1600 Macklind Avenue in St. Louis. The scope of work for this project did not include laboratory rock testing.

No piezometers were installed for this project. Borings were backfilled with drill cuttings and the surface layer repaired to match the original conditions per City of Brentwood specifications. Drill sites were restored once backfilling was complete.

**TABLE 3  
CORROSIVITY TEST RESULTS**

Boring	Chloride, mg/Kg-dry	Sulfate, mg/Kg-dry	Sulfide, Total, mg/Kg-dry	pH (1:1)	Resistivity, Solid, Ohms/cm	Percent Moisture
B17-1	108	100 J	< 34	7.97	1810	19.3
B17-2	153	180	< 31	7.47	2060	19.7
B17-3	37 J	138	< 34	7.2	2280	18.6
B17-4	37 J	139	< 38	7.58	2690	24.6
B17-5	138	100 J	< 29	8.56	1310	6.9
B17-6	260	134	< 36	7.04	971	16.5
B17-7	1170	91 J	< 34	7.67	505	18.1
B17-8	45 J	161	< 36	7.19	2420	18.0
B17-9	231	232	< 31	7.79	1330	14.9
B17-10	188	172	< 38	7.67	2350	21.5
B17-11	32 J	186	< 36	8.77	2930	17.2
B17-12	56 J	197	< 31	7.76	2080	15.7
B17-13	109	125	< 36	8.39	1990	17.8
B17-14	314	100 J	< 35	7.37	847	18.3
B17-15	127	120 J	< 34	7.4	1010	19.2
B17-16	309	99 J	20 J	7.34	943	21.2
B17-17	310	70 J	< 36	7.01	990	17.3
B17-18	1020	< 133 S	< 36	6.37	503	25.3

#### 4.0 LOCAL GEOLOGY

In upland areas, the overburden soil consists of a thin cover of loess formed by wind-blown silt carried from the floodplains of the Missouri and Mississippi Rivers and deposited on the surrounding areas during the later stages of the last glacial period. The silt has been modified by weathering to lean clay in most areas. Residual, fat clay formed by weathering of the underlying Pennsylvanian System rock is typically present beneath the loess. In some cases, such as stream valley bottoms and sinkholes the fat clay residual soil has been eroded away leaving soil composed of water-deposited lean clay, silt, sand, gravel, and larger rock fragments.

The uppermost rock is composed of Pennsylvanian System clastic rocks that is predominantly shale, but can also include: claystone, siltstone, sandstone, coal, and limestone. The Pennsylvanian System rocks vary in thickness from tens of feet to absent and overlie limestone of the Mississippian System. The Mississippian System bedrock underlie the entire site and are greater than 100 feet thick. The bedrock strata dip is less than about 5 degrees and no known faults cross the project site.

The 1930's topography, Figure A2 in Appendix A, shows depressions known as "sinkholes", present in much of the project vicinity which indicates the non-solution prone Pennsylvanian System rocks are thin or absent over most of the project site. The result of the Pennsylvanian System rock absence is the underlying solution-prone Mississippian System limestone is exposed promoting subsurface dissolution, which in turn, promotes forming sinkholes.

Topography that contains sinkholes, disappearing streams, or other features that indicate the surface drainage flows into the subsurface rather than draining into surface streams and running off is called "karst" topography. Karst topography forms as the result of slightly acidic, meteoric water moving downward through natural fractures in the limestone bedrock dissolving the limestone forming solution cavities which may grow large enough for people to enter. The resultant solution cavities allow surface water to carry soil material from the overburden into the subsurface cavities, gradually creating topographic depressions called sinkholes. Sinkholes can appear to form rapidly when near surface soil or rock bridging a void can no longer span the void and collapse. Sinkholes are commonly bowl-shaped with relatively gentle side slopes but may be irregularly-shaped and steep-sided. Some sinkholes are several sinkholes joined together. The sinkhole's central opening or "throat" may be exposed or filled with washed-in soil. The natural soil washed into sinkholes is typically similar in composition to the adjacent in-place natural soil but may have less strength. Historically some sinkhole throats have been fitted with concrete or brick inlet structures to serve as storm sewer inlets.

## 5.0 SUBSURFACE PROFILE

Eleven of the 18 borings penetrated asphalt or concrete pavement. Pavement and granular base in the 11 borings had a combined thickness ranging from 0.3 feet to 1.2 feet. Overburden, including the Pennsylvanian System rock, beneath the pavement or ground surface consisted primarily of medium stiff to stiff, lean and fat clay. Pennsylvanian System rock is included in the overburden since the physical properties of this rock is similar to the physical properties of many soil types. Exceptions to the typical overburden soils are listed below.

- B17-1 and ~~B17-4~~ encountered soft to medium stiff clay to a depth of 15 and 20 feet, respectively.
- B17-2, ~~B17-5 and B17-9~~ encountered dense to very dense poorly graded gravel, possibly weathered limestone, over bedrock, with thicknesses up to 5 feet.
- B17-8 encountered soft lean clay to a depth of 8 feet over soft to stiff fat clay to 13 feet.
- B17-10 encountered saturated, soft, lean clay to 9 feet.
- B17-12 encountered very stiff to hard, fat clay to 18 feet.
- B17-14 and B17-16 encountered 3 to 4 feet of stiff, lean clay (fill).
- B17-17 encountered 7 feet of medium stiff, lean clay (fill) with traces of gravel.

Ten of the 18 borings encountered auger refusal on medium strength Mississippian System limestone bedrock at a depth of 11 to 19 feet. The remaining borings did not encounter auger refusal. Depths to the Pennsylvanian System rock and Mississippian System bedrock are listed in Table 4. In Table 4 the term “absent” is used in cases where the Pennsylvanian System rock was not encountered in the boring even though the boring encountered the underlying Mississippian System bedrock. The phrase “not encountered” is used in cases where the subject strata was not detected in the boring.

**TABLE 4  
TOP OF ROCK DATA**

<b>Boring</b>	<b>Top of Pennsylvanian System</b>	<b>Top of Mississippian System</b>
B17-1	Not encountered	Not encountered
B17-2	Absent	18.4 feet below grade
B17-3	Absent	12.1 feet below grade
B17-4	Not encountered	Not encountered
B17-5	Absent	12.7 feet below grade
B17-6	Absent	18.1 feet below grade
B17-7	Absent	11.0 feet below grade
B17-8	Not encountered	Not encountered
B17-9	Absent	15.0 feet below grade
B17-10	Absent	13.3 feet below grade
B17-11	Absent	13.0 feet below grade
B17-12	13.0 feet below grade	19.2 feet below grade
B17-13	19.1 feet below grade	Not encountered
B17-14	Not encountered	Not encountered
B17-15	Not encountered	Not encountered
B17-16	Not encountered	Not encountered
B17-17	Not encountered	Not encountered
B17-18	Not encountered	Not encountered

Groundwater was encountered in 3 of the 18 borings during drilling. Groundwater depth varied from 7.2 to 10.0 feet below grade. Recorded groundwater levels are shown in Table 5. None of the other borings encountered groundwater. The absence or presence of groundwater should not be construed to represent an exact or permanent condition. There is uncertainty with interpretation of short-term groundwater level readings in borings, particularly when the soil is of relatively low permeability such as the material overlying this site. Groundwater levels should be expected to fluctuate with variations in precipitation, site grading, and drainage conditions.

**TABLE 5  
WATER LEVEL DATA**

<b>Boring</b>	<b>Depth During Drilling</b>
B17-1	8.6 feet
B17-2	7.2 feet
B17-10	10.0 feet

## 6.0 LIMITATIONS OF REPORT

The purpose of this GDR is to present information collected during the geotechnical investigation program for the L-106 (Brentwood) Sewer Separation, RDP Tributaries (Deer Creek) CSO Tunnel (MSD No. 12441) Project. This GDR does not attempt to interpret the data or provide conclusions regarding design recommendations or construction considerations for the project.

Site exploration and testing identifies actual surface and subsurface conditions at the specific locations taken, at the time obtained, and only to the depths penetrated. Discrete sampling and testing should not be relied upon to accurately reflect natural variations that exist between borehole locations. S&W has attempted to conduct the services reported herein in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality and under similar conditions as this project.

The lines designating changes in soil and rock stratigraphy represent approximate boundaries. The actual interface or transition between materials may occur higher, lower, or more gradually than indicated. Subsurface conditions may be affected over time by natural processes and events such as floods, earthquakes, groundwater fluctuations or human activities.

The work scope did not include environmental assessment or investigation for the presence of wetlands or hazardous or toxic material in the water, soil or air on, below or around the site.

**SHANNON & WILSON, INC.**



*4/13/2018*

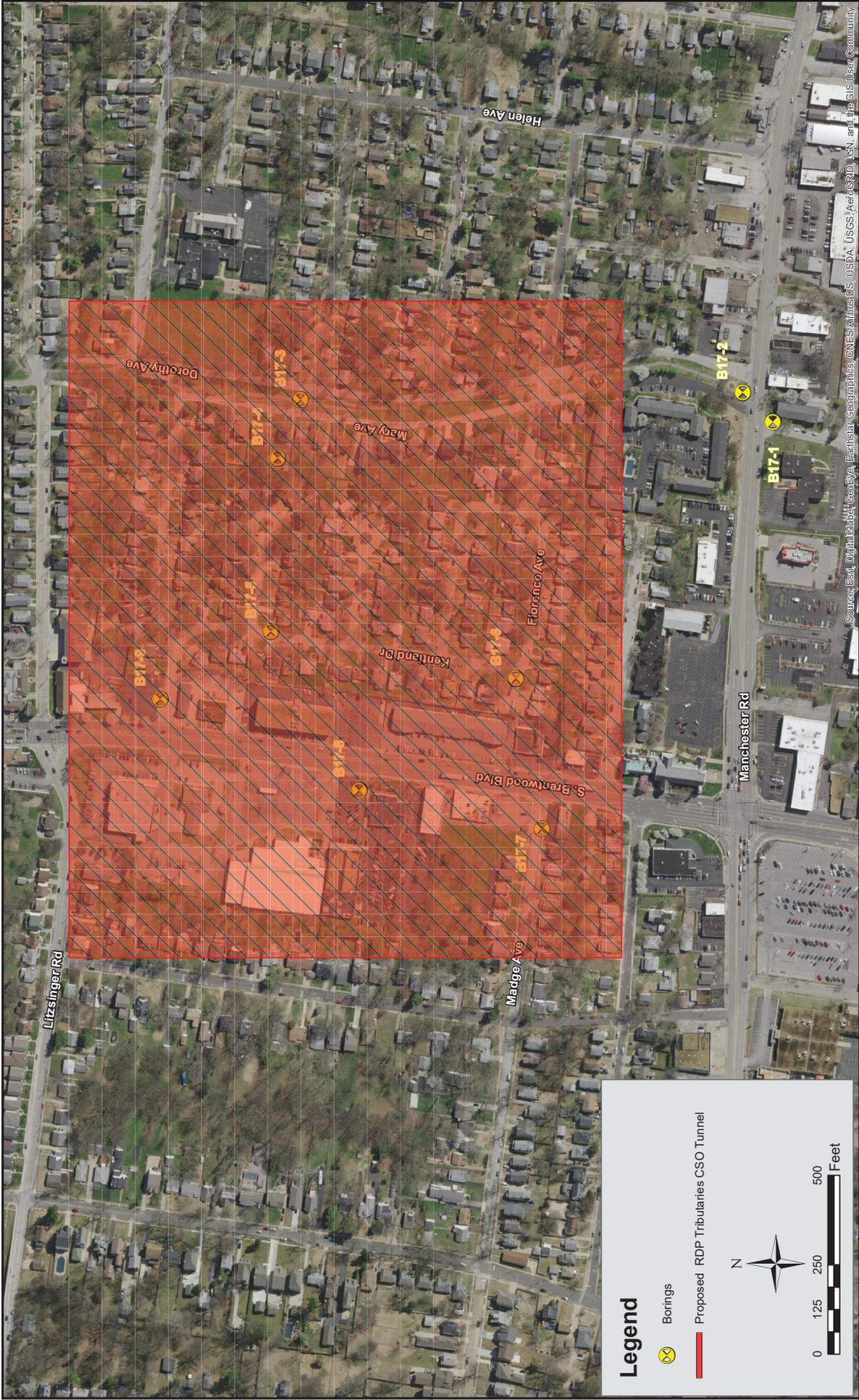
William B. Kremer, P.E.  
Senior Associate

Vonmarie Martinez-Chaluisant, P.E.  
Geotechnical Professional IV

VMC:WBK/tad

Appendix A  
Figures

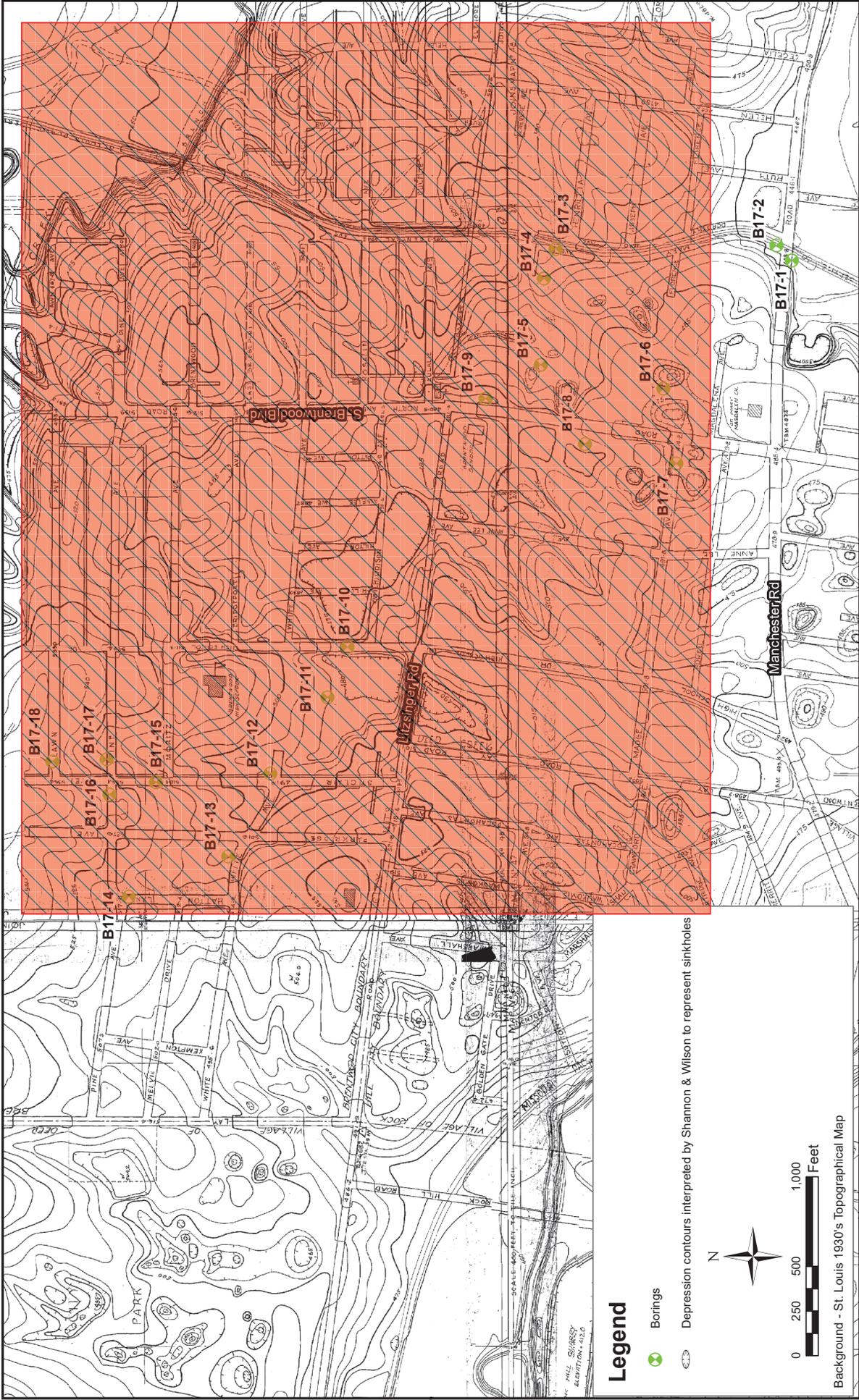
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**Legend**

-  Borings
-  Proposed RDP Tributaries CSO Tunnel





**Legend**

-  Borings
-  Depression contours interpreted by Shannon & Wilson to represent sinkholes



Background - St. Louis 1930's Topographical Map

**SHANNON & WILSON, INC.**  
 41-1-37530-005

L-106 (Brentwood) Separation Sewer - RDP Tributaries (Deer Creek) CSO Tunnel

MSD No. 12441

1930's Topographical Map

Figure A2

Appendix B  
Soil Classification Criteria and Exploratory Borings

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Soil logs presented in this GDR are a compilation of subsurface conditions and soil classifications determined from field and laboratory data as interpreted by the Geotechnical/Civil Engineer and/or Scientist. Observations, test results and measurements listed on the logs refer only to the identified interval or sample and only within the limits of the boring. Soil classifications are based on the Unified Soil Classification System (USCS) as provided in ASTM D2487 and visual-manual procedures as provided in ASTM D2488. Elements of the USCS criteria are given below. ASTM D2487 and ASTM D2488 should be referred to for additional criteria and information concerning the USCS.

### General Order of Classification Terms

Relative density or consistency, color, soil constituents, moisture condition, structure, plasticity, gradation, grain shape, cementation, organics, odor, other;  
(Geologic Name: FILL, TILL, ALLUVIUM, etc.) (USCS group symbol)

i.e. ... *Medium stiff, dark gray, lean CLAY, trace fine sand; moist; laminated (<2 mm) with light gray silt, occasional slickensides; (GLACIOLACUSTRINE)(CL-ML).*

#### Relative Density of Coarse-Grained Soils

(Nonplastic Silt, Sand, and Gravel)

N, SPT blows/foot	Relative Density
0-4	Very loose
4-10	Loose
10-30	Medium dense
30-50	Dense
over 50	Very dense

#### Relative Consistency of Fine-Grained Soils

(Plastic Silt and Clay)

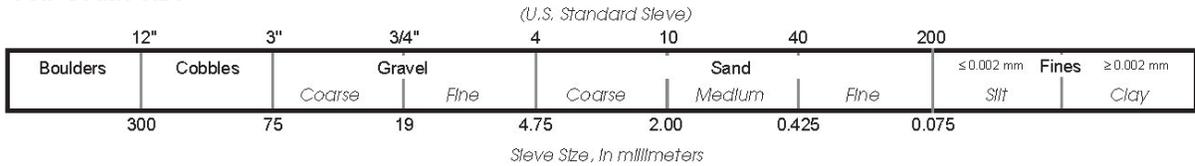
N, SPT blows/foot	Shear strength, tsf (kPa)	Unconfined strength, tsf (kPa)	Relative Consistency
< 2	< 0.13 (<12)	< 0.25 (<24)	Very soft
2 - 4	0.13 - 0.25 (12-24)	0.25 - 0.5 (24-48)	Soft
4 - 8	0.25 - 0.5 (24-48)	0.5 - 1 (48-96)	Medium stiff
8 - 15	0.5 - 1 (48-96)	1 - 2 (96-192)	Stiff
15 - 30	1 - 2 (96-192)	2 - 4 (192-383)	Very stiff
over 30	> 2 (>192)	> 4 (>383)	Hard

Standard Penetration Resistance (SPT or N value) is the sum of the blows required to drive a 2-inch OD by 1.375-inch ID (5 cm x 3.5 cm) split-spoon sampler 1 foot (30.5 cm) after seating 6 inches (15.2 cm) into undisturbed soil using a 140-pound (623 N) hammer free-falling 30 inches (76 cm) in accordance with ASTM D 1586-84. Driving is limited to 50 blows within any 6-inch interval. Samplers which have not driven the full 6-inch interval upon completing 50 blows (or 10 blows for 0 inches) are considered to have reached "split-spoon refusal".

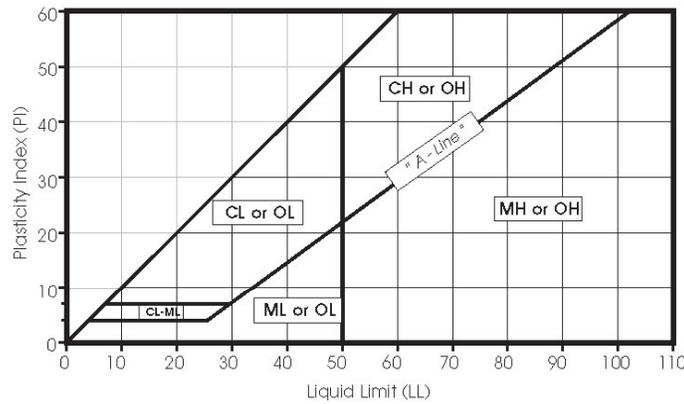
### Terms and Definitions

<b>Structure</b>	<b>Criteria</b>	<b>Plasticity</b>	<b>Criteria</b>
Partings	< 1/16" thickness (1.6 mm)	Nonplastic	Cannot roll 1/8-in. (3 mm) thread
Seam	1/16" - 1/2" thickness (1.6 to 12.7 mm)	Low	Can barely roll thread and cannot form lump when drier than plastic limit (PL)
Layer	> 1/2" thickness (12.7 mm)	Medium	Easy to roll thread. Need little rolling and kneading to reach PL. Cannot re-roll thread after PL reached. Lump crumbles when drier than PL
Pocket	irregular inclusion < 1 per foot (30.5 cm)	High	Need considerable rolling and kneading to reach PL. Can re-roll thread several times after PL reached. Lump can be formed without crumbling when drier than PL
Occasional	≤ 1 inclusion or layer per foot (30.5 cm)	<b>Dilatancy</b>	<b>Criteria</b>
Frequent	> 1 inclusion or layer per foot (30.5 cm)	None	No visible change in specimen.
Laminated	Alternating layers < 1/4" (6 mm) thick	Slow	Water appears slowly on specimen surface when shaken, disappears slowly when squeezed
Stratified	Alternating layers ≥ 1/4" (6 mm) thick	Rapid	Water appears quickly on specimen surface when shaken, disappears quickly when squeezed
Lensed	Small pockets of different soils	<b>Dry Strength</b>	<b>Criteria</b>
Fissured	Breaks easily along definite planes	None	Crumbles with handling
Slickensided	Polished, glossy, striated fracture planes	Low	Crumbles with little finger pressure
Blocky	Easily breaks into small angular lumps	Medium	Breaks with considerable finger pressure
Sheared	Disturbed texture, mix of strengths	High	Will not crumble or break with finger pressure.
Homogeneous	Uniform color and appearance	Very high	Will break between thumb and hard surface
Trace	Material comprises < 5% of sample	<b>Toughness</b>	<b>Criteria</b>
Few	Material comprises ≈ 5 to 10% of sample	Low	Slight pressure required to roll thread near PL.
Little	Material comprises ≈ 15 to 25% of sample	Medium	Weak, soft thread and lump
Some	Material comprises ≈ 30 to 45% of sample	High	Medium pressure required to roll thread near PL. Medium stiff thread and lump
Mostly	Material comprises ≈ 50 to 100% of sample	<b>Moisture Condition</b>	<b>Criteria</b>
<b>Cementation</b>	<b>Criteria</b>	Dry	Absence of moisture, dusty, dry to touch
Weak	Crumbles with little finger pressure	Moist	Damp but no visible water
Moderate	Breaks with considerable finger pressure	Wet	Visible free water, usually soil below water table
Strong	Will not crumble or break with finger pressure		
<b>Particle Angularity</b>	<b>Criteria</b>		
Angular	Sharp edges and unpolished plane surfaces		
Subangular	Similar to Angular but with rounded edges		
Subrounded	Nearly plane sides with well-rounded edges		
Rounded	Smoothly curved sides and no edges		
<b>Particle Shape</b>	<b>Criteria</b>		
Flat	Particles with width/thickness > 3		
Elongated	Particles with length/width > 3		
Flat and elongated	Meets criteria for both flat and elongated		
<b>Reaction with HCl</b>	<b>Criteria</b>		
None	No visible reaction		
Weak	Some reaction, bubbles form slowly		
Strong	Violent reaction, bubbles form immediately		

### Soil Grain Size



### Plasticity Chart (from ASTM D 2487-93)



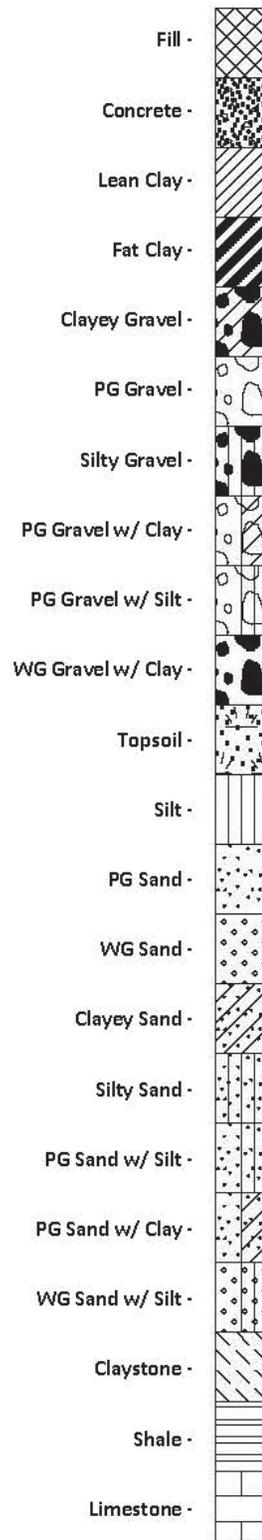
### Coarse-Grained Soils (> 50% Retained on No. 200 Sieve) (from ASTM D 2487-93)

			USCS			
			Group Name	Group Symbol		
GRAVEL % gravel > % sand	< 5 % fines	$C_u \geq 4$ and $1 \leq C_c \leq 3$	< 15% sand ≥ 15% sand	well-graded GRAVEL well-graded GRAVEL, with sand	GW	
		$C_u < 4$ or $C_c < 1$ or $C_c > 3$	< 15% sand ≥ 15% sand	poorly graded GRAVEL poorly graded GRAVEL, with sand	GP	
	5 - 12% fines	$C_u \geq 4$ and $1 \leq C_c \leq 3$	fines = ML or MH	< 15% sand ≥ 15% sand	well-graded GRAVEL, with silt well-graded GRAVEL, with silt and sand	GW-GM
			fines = CL, CH, (or CL-ML)	< 15% sand ≥ 15% sand	well-graded GRAVEL, with clay (or silty clay) well-graded GRAVEL, with clay and sand (or silty clay and sand)	GW-GC
		$C_u < 4$ or $C_c < 1$ or $C_c > 3$	fines = ML or MH	< 15% sand ≥ 15% sand	poorly graded GRAVEL, with silt poorly graded GRAVEL, with silt and sand	GP-GM
			fines = CL, CH, (or CL-ML)	< 15% sand ≥ 15% sand	poorly graded GRAVEL, with clay (or silty clay) poorly graded GRAVEL, with clay and sand (or silty clay and sand)	GP-GC
	> 12% fines		fines = ML or MH	< 15% sand ≥ 15% sand	silty GRAVEL silty GRAVEL, with sand	GM
			fines = CL or CH	< 15% sand ≥ 15% sand	clayey GRAVEL clayey GRAVEL, with sand	GC
			fines = CL-ML	< 15% sand ≥ 15% sand	silty, clayey GRAVEL silty, clayey GRAVEL, with sand	GC-GM
	SAND % sand ≥ % gravel	< 5 % fines	$C_u \geq 6$ and $1 \leq C_c \leq 3$	< 15% gravel ≥ 15% gravel	well-graded SAND well-graded SAND, with gravel	SW
			$C_u < 6$ or $C_c < 1$ or $C_c > 3$	< 15% gravel ≥ 15% gravel	poorly graded SAND poorly graded SAND, with gravel	SP
		5 - 12% fines	$C_u \geq 6$ and $1 \leq C_c \leq 3$	fines = ML or MH	< 15% gravel ≥ 15% gravel	well-graded SAND, with silt well-graded SAND, with silt and gravel
fines = CL, CH, (or CL-ML)				< 15% gravel ≥ 15% gravel	well-graded SAND, with clay (or silty clay) well-graded SAND, with clay and gravel (or silty clay and gravel)	SW-SC
$C_u < 6$ or $C_c < 1$ or $C_c > 3$			fines = ML or MH	< 15% gravel ≥ 15% gravel	poorly graded SAND, with silt poorly graded SAND, with silt and gravel	SP-SM
			fines = CL, CH, (or CL-ML)	< 15% gravel ≥ 15% gravel	poorly graded SAND, with clay (or silty clay) poorly graded SAND, with clay and gravel (or silty clay and gravel)	SP-SC
> 12% fines			fines = ML or MH	< 15% gravel ≥ 15% gravel	silty SAND silty SAND, with gravel	SM
			fines = CL or CH	< 15% gravel ≥ 15% gravel	clayey SAND clayey SAND, with gravel	SC
			fines = CL-ML	< 15% gravel ≥ 15% gravel	silty, clayey SAND silty, clayey SAND, with gravel	SC-SM

Note:  $C_u = D_{60}/D_{10}$   $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$

Where  $D_{60}$ ,  $D_{30}$ , and  $D_{10}$  are the particle diameters corresponding to 60, 30, and 10% finer on the cumulative particle size distribution curve, respectively (See ASTM C 136-93).

Soil Log Graphics



PG – Poorly Graded

WG – Well Graded

**Fine-Grained Soils** ( $\leq 50\%$  Retained on No. 200 Sieve) (from ASTM D 2487-93)

USCS

				Group Name	Group Symbol	
Liquid Limit (LL) < 50	Inorganic	$PI > 7$ and plots on or above "A-Line"	< 15% > No. 200	% sand $\geq$ % gravel	lean CLAY	CL
			15 to 29% > No. 200	% sand < % gravel	lean CLAY, with sand	
		$\geq 30\%$ > No. 200	% sand $\geq$ % gravel	< 15% gravel	sandy, lean CLAY	
			% sand < % gravel	$\geq 15\%$ gravel	sandy, lean CLAY, with gravel	
			% sand $\geq$ % gravel	< 15% sand	gravelly, lean CLAY	
			% sand < % gravel	$\geq 15\%$ sand	gravelly, lean CLAY, with sand	
	Inorganic	$4 \leq PI \leq 7$ and plots on or above "A-Line"	< 15% > No. 200	% sand $\geq$ % gravel	silty CLAY	CL-ML
			15 to 29% > No. 200	% sand < % gravel	silty CLAY, with sand	
		$\geq 30\%$ > No. 200	% sand $\geq$ % gravel	< 15% gravel	sandy, silty CLAY	
			% sand < % gravel	$\geq 15\%$ gravel	sandy, silty CLAY, with gravel	
			% sand $\geq$ % gravel	< 15% sand	gravelly, silty CLAY	
			% sand < % gravel	$\geq 15\%$ sand	gravelly, silty CLAY, with sand	
Inorganic	$PI < 4$ and plots below "A-Line"	< 15% > No. 200	% sand $\geq$ % gravel	SILT	ML	
		15 to 29% > No. 200	% sand < % gravel	SILT, with sand		
	$\geq 30\%$ > No. 200	% sand $\geq$ % gravel	< 15% gravel	sandy SILT		
		% sand < % gravel	$\geq 15\%$ gravel	sandy, SILT, with gravel		
		% sand $\geq$ % gravel	< 15% sand	gravelly SILT		
		% sand < % gravel	$\geq 15\%$ sand	gravelly SILT, with sand		
Organic ( $\frac{\text{oven-dried-LL} - \text{LL}}{\text{not-dried-LL}} < 0.75$ )	$PI \geq 4$ and plots on or above "A-Line"	< 15% > No. 200	% sand $\geq$ % gravel	organic CLAY	OL	
		15 to 29% > No. 200	% sand < % gravel	organic CLAY, with sand		
	$\geq 30\%$ > No. 200	% sand $\geq$ % gravel	< 15% gravel	sandy, organic CLAY		
		% sand < % gravel	$\geq 15\%$ gravel	sandy, organic CLAY, with gravel		
		% sand $\geq$ % gravel	< 15% sand	gravelly, organic CLAY		
		% sand < % gravel	$\geq 15\%$ sand	gravelly, organic CLAY, with sand		
Organic ( $\frac{\text{oven-dried-LL} - \text{LL}}{\text{not-dried-LL}} < 0.75$ )	$PI < 4$ and plots below "A-Line"	< 15% > No. 200	% sand $\geq$ % gravel	organic SILT	OH	
		15 to 29% > No. 200	% sand < % gravel	organic SILT, with sand		
	$\geq 30\%$ > No. 200	% sand $\geq$ % gravel	< 15% gravel	sandy, organic SILT		
		% sand < % gravel	$\geq 15\%$ gravel	sandy, organic SILT, with gravel		
		% sand $\geq$ % gravel	< 15% sand	gravelly, organic SILT		
		% sand < % gravel	$\geq 15\%$ sand	gravelly, organic SILT, with sand		
Liquid Limit (LL) $\geq 50$	Inorganic	$PI$ plots on or above "A-Line"	< 15% > No. 200	% sand $\geq$ % gravel	fat CLAY	CH
			15 to 29% > No. 200	% sand < % gravel	fat CLAY, with sand	
		$\geq 30\%$ > No. 200	% sand $\geq$ % gravel	< 15% gravel	sandy, fat CLAY	
			% sand < % gravel	$\geq 15\%$ gravel	sandy, fat CLAY, with gravel	
			% sand $\geq$ % gravel	< 15% sand	gravelly, fat CLAY	
			% sand < % gravel	$\geq 15\%$ sand	gravelly, fat CLAY, with sand	
	Inorganic	$PI$ plots below "A-Line"	< 15% > No. 200	% sand $\geq$ % gravel	elastic SILT	MH
			15 to 29% > No. 200	% sand < % gravel	elastic SILT, with sand	
		$\geq 30\%$ > No. 200	% sand $\geq$ % gravel	< 15% gravel	sandy, elastic SILT	
			% sand < % gravel	$\geq 15\%$ gravel	sandy, elastic SILT, with gravel	
			% sand $\geq$ % gravel	< 15% sand	gravelly, elastic SILT	
			% sand < % gravel	$\geq 15\%$ sand	gravelly, elastic SILT, with sand	
Organic ( $\frac{\text{oven-dried-LL} - \text{LL}}{\text{not-dried-LL}} < 0.75$ )	$PI$ plots on or above "A-Line"	< 15% > No. 200	% sand $\geq$ % gravel	organic CLAY	OH	
		15 to 29% > No. 200	% sand < % gravel	organic CLAY, with sand		
	$\geq 30\%$ > No. 200	% sand $\geq$ % gravel	< 15% gravel	sandy, organic CLAY		
		% sand < % gravel	$\geq 15\%$ gravel	sandy, organic CLAY, with gravel		
		% sand $\geq$ % gravel	< 15% sand	gravelly, organic CLAY		
		% sand < % gravel	$\geq 15\%$ sand	gravelly, organic CLAY, with sand		
Organic ( $\frac{\text{oven-dried-LL} - \text{LL}}{\text{not-dried-LL}} < 0.75$ )	$PI$ plots below "A-Line"	< 15% > No. 200	% sand $\geq$ % gravel	organic SILT	OH	
		15 to 29% > No. 200	% sand < % gravel	organic SILT, with sand		
	$\geq 30\%$ > No. 200	% sand $\geq$ % gravel	< 15% gravel	sandy, organic SILT		
		% sand < % gravel	$\geq 15\%$ gravel	sandy, organic SILT, with gravel		
		% sand $\geq$ % gravel	< 15% sand	gravelly, organic SILT		
		% sand < % gravel	$\geq 15\%$ sand	gravelly, organic SILT, with sand		

Note: For LL (Liquid Limit) and PI (Plasticity Index) see Plasticity Chart (ASTM D 2487-93).

**Highly Organic Soils** (from ASTM D 4427-92)

		Group Name	Group Symbol
Primarily organic matter, dark in color with organic odor		PEAT	PT

**Coarse-Grained Soils** (< 50% fines) (from ASTM D 2488-93)

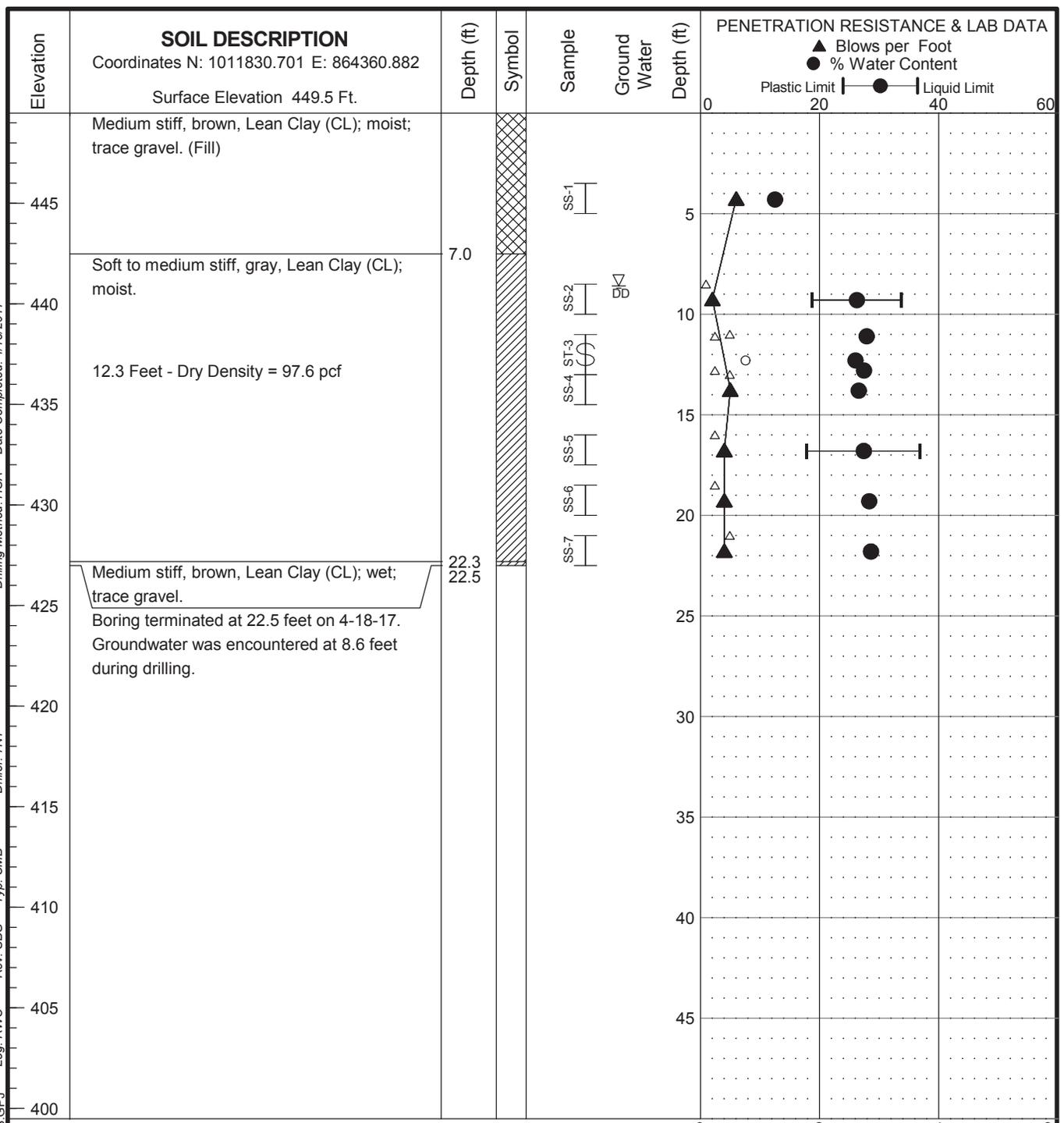
				Visual - Manual		
				Group Symbol		
				Group Name		
<b>GRAVEL</b>	≤ 5 % fines	Well-graded	< 15% sand ≥ 15% sand	well-graded GRAVEL well-graded GRAVEL, with sand	<b>GW</b>	
		Poorly graded	< 15% sand ≥ 15% sand	poorly graded GRAVEL poorly graded GRAVEL, with sand		
	10 % fines	Well-graded	fines = ML or MH	< 15% sand ≥ 15% sand	well-graded GRAVEL, with silt well-graded GRAVEL, with silt and sand	<b>GW-GM</b>
			fines = CL or CH	< 15% sand ≥ 15% sand	well-graded GRAVEL, with clay well-graded GRAVEL, with clay and sand	
		Poorly graded	fines = ML or MH	< 15% sand ≥ 15% sand	poorly graded GRAVEL, with silt poorly graded GRAVEL, with silt and sand	<b>GP-GM</b>
			fines = CL or CH	< 15% sand ≥ 15% sand	poorly graded GRAVEL, with clay poorly graded GRAVEL, with clay and sand	
	≥ 15 % fines	fines = ML or MH	< 15% sand ≥ 15% sand	silty GRAVEL silty GRAVEL, with sand	<b>GM</b>	
		fines = CL or CH	< 15% sand ≥ 15% sand	clayey GRAVEL clayey GRAVEL, with sand		<b>GC</b>
	<b>SAND</b>	≤ 5 % fines	Well-graded	< 15% gravel ≥ 15% gravel	well-graded SAND well-graded SAND, with gravel	
			Poorly graded	< 15% gravel ≥ 15% gravel	poorly graded SAND poorly graded SAND, with gravel	<b>SP</b>
10 % fines		Well-graded	fines = ML or MH	< 15% gravel ≥ 15% gravel	well-graded SAND, with silt well-graded SAND, with silt and gravel	
			fines = CL or CH	< 15% gravel ≥ 15% gravel	well-graded SAND, with clay well-graded SAND, with clay and gravel	<b>SW-SC</b>
		Poorly graded	fines = ML or MH	< 15% gravel ≥ 15% gravel	poorly graded SAND, with silt poorly graded SAND, with silt and gravel	
			fines = CL or CH	< 15% gravel ≥ 15% gravel	poorly graded SAND, with clay poorly graded SAND, with clay and gravel	<b>SP-SC</b>
≥ 15 % fines		fines = ML or MH	< 15% gravel ≥ 15% gravel	silty SAND silty SAND, with gravel	<b>SM</b>	
		fines = CL or CH	< 15% gravel ≥ 15% gravel	clayey SAND clayey SAND, with gravel		<b>SC</b>

**Inorganic and Organic Fine-Grained Soils** (≤ 50% fines) (from ASTM D 2488-93)

				Visual - Manual			
				Group Symbol			
				Group Name			
Dilatancy Dry Strength Toughness	None to slow Medium to high	15 to 25% > No. 200	< 15% > No. 200	lean CLAY	<b>CL</b>		
			% sand ≥ % gravel % sand < % gravel	lean CLAY, with sand lean CLAY, with gravel			
	Medium	≥ 30% > No. 200	% sand ≥ % gravel	< 15% gravel ≥ 15% gravel		sandy, lean CLAY sandy, lean CLAY, with gravel	
			% sand < % gravel	< 15% sand ≥ 15% sand		gravelly, lean CLAY gravelly, lean CLAY, with sand	
		Slow to Rapid	15 to 25% > No. 200	% sand ≥ % gravel		< 15% gravel ≥ 15% gravel	SILT SILT, with sand
				% sand < % gravel		< 15% gravel ≥ 15% gravel	SILT, with gravel sandy SILT sandy, SILT, with gravel
Low or nonplastic	≥ 30% > No. 200	% sand ≥ % gravel	< 15% sand ≥ 15% sand	gravelly SILT gravelly SILT, with sand			
		% sand < % gravel	< 15% sand ≥ 15% sand	fat CLAY fat CLAY, with sand fat CLAY, with gravel			
Dilatancy Dry Strength Toughness	None	15 to 25% > No. 200	< 15% > No. 200	fat CLAY	<b>CH</b>		
			% sand ≥ % gravel % sand < % gravel	fat CLAY, with sand fat CLAY, with gravel			
	High	≥ 30% > No. 200	% sand ≥ % gravel	< 15% gravel ≥ 15% gravel		sandy, fat CLAY sandy, fat CLAY, with gravel	
			% sand < % gravel	< 15% sand ≥ 15% sand		gravelly, fat CLAY gravelly, fat CLAY, with sand	
		None to slow	15 to 25% > No. 200	% sand ≥ % gravel		< 15% gravel ≥ 15% gravel	elastic SILT elastic SILT, with sand
				% sand < % gravel		< 15% gravel ≥ 15% gravel	elastic SILT, with gravel sandy, elastic SILT sandy, elastic SILT, with gravel
Low to medium	≥ 30% > No. 200	% sand ≥ % gravel	< 15% sand ≥ 15% sand	gravelly, elastic SILT gravelly, elastic SILT, with sand			
		% sand < % gravel	< 15% sand ≥ 15% sand	organic soil organic soil, with sand organic soil, with gravel			
Dilatancy Dry Strength Toughness	Slow to Rapid	15 to 25% > No. 200	< 15% > No. 200	organic soil	<b>OL-OH</b>		
			% sand ≥ % gravel % sand < % gravel	organic soil, with sand organic soil, with gravel			
	Low or nonplastic	≥ 30% > No. 200	% sand ≥ % gravel	< 15% gravel ≥ 15% gravel		sandy, organic soil sandy, organic soil, with gravel	
			% sand < % gravel	< 15% sand ≥ 15% sand		gravelly, organic soil gravelly, organic soil, with sand	
		Soil composed primarily of vegetable tissue in various stages of decomposition usually with an organic odor, a dark brown to black color, a spongy consistency, and a texture ranging from fibrous to amorphous.	Significant organic content	≥ 30% > No. 200		< 15% > No. 200	PEAT
						% sand ≥ % gravel % sand < % gravel	PEAT

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TRIBS SOIL BORING LOG 41-1-37530-005 RDP TRIBS SOIL LOGS.GPJ Log: RWC Rev: SBG Typ: CMB Driller: 7NT Date Completed: 4/18/2017 Drilling Method: HSA



**LEGEND**

- \* Sample Not Recovered
- 2-inch O.D. Split Spoon Sample
- ⊗ 3-inch O.D. Shelby Tube Sample
- Rock Core
- ▽ Ground Water Level - DD - During Drilling
- X.X - Time In Hours

- △ Pocket Penetrometer Shear Strength
- Vane Shear Strength
- ◆ Torvane Shear Strength
- ◇ Unconfined Compression Shear Strength
- Unconsolidated Undrained Shear Strength

**NOTES**

- The stratification lines represent the approximate boundaries between soil types, and the transition may be gradual.
- The discussion in the text of this report is necessary for a proper understanding of the nature of the subsurface materials.
- Groundwater level, if indicated above, is for the date specified, and may vary.
- Refer to KEY for explanation of "Symbols" and definitions.
- USCS designation is based on visual-manual classification and selected laboratory index testing.
- Approximate Street Address: 2702 MARY AVE

**L-106 (Brentwood) Sewer Separation  
 RDP Tributaries CSO Tunnel  
 MSD Project Number 12441**

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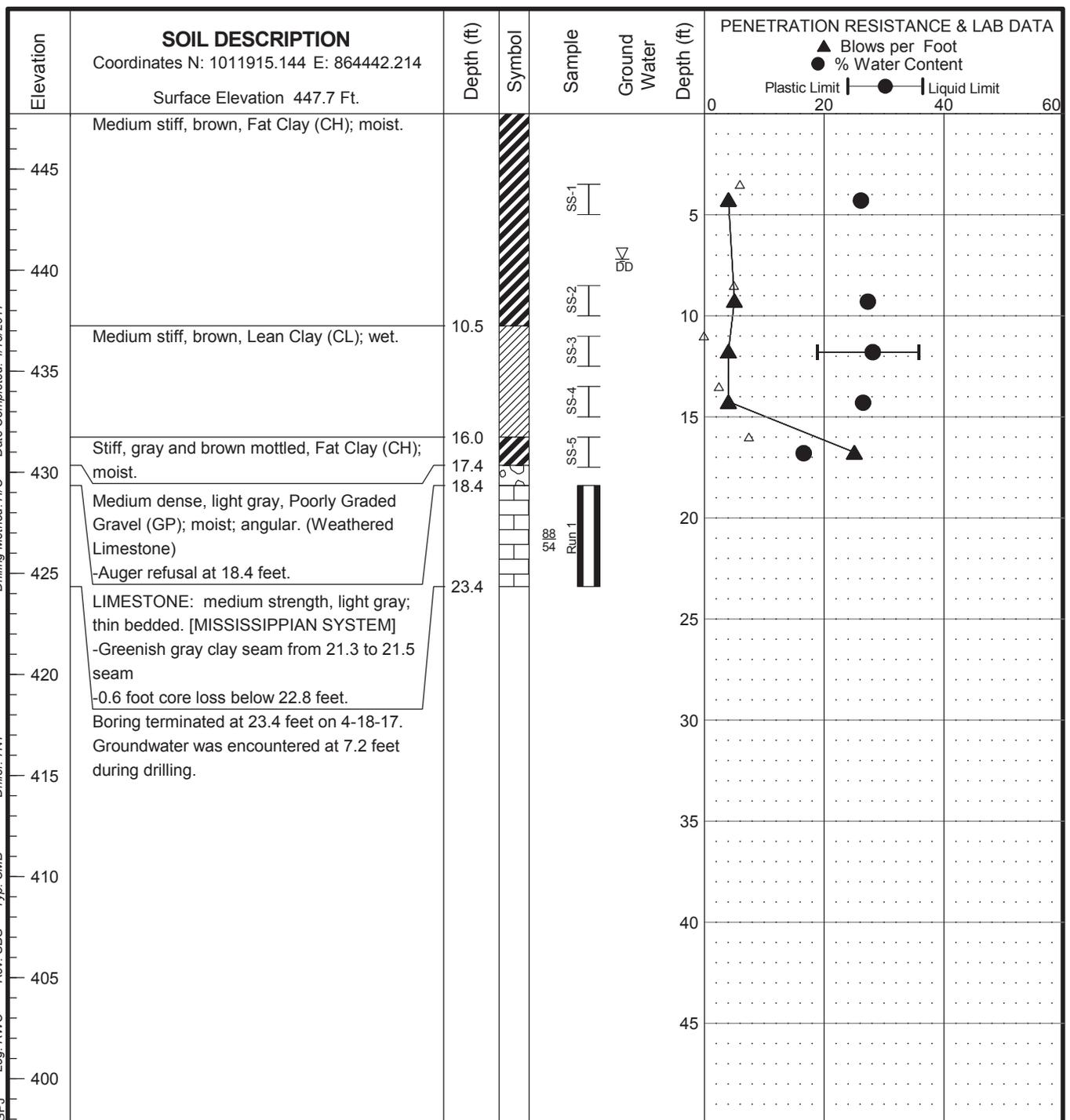
**LOG OF BORING B17-1**

April 2018
41-1-37530-005

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**SHANNON & WILSON, INC.**  
Geotechnical and Environmental Consultants
Page 1 of 1

TRIBS SOIL BORING LOG 41-1-37530-005 RDP TRIBS SOIL LOGS.GPJ Log: RWC Rev: SBG Typ: CMB Driller: 7NT Date Completed: 4/18/2017 Drilling Method: H/C



**LEGEND**

- \* Sample Not Recovered
- 2-inch O.D. Split Spoon Sample
- ▨ 3-inch O.D. Shelby Tube Sample
- Rock Core
- ▽ Ground Water Level - DD - During Drilling
- X.X - Time In Hours

- △ Pocket Penetrometer Shear Strength
- Vane Shear Strength
- ◆ Torvane Shear Strength
- ◇ Unconfined Compression Shear Strength
- Unconsolidated Undrained Shear Strength

**NOTES**

1. The stratification lines represent the approximate boundaries between soil types, and the transition may be gradual.
2. The discussion in the text of this report is necessary for a proper understanding of the nature of the subsurface materials.
3. Groundwater level, if indicated above, is for the date specified, and may vary.
4. Refer to KEY for explanation of "Symbols" and definitions.
5. USCS designation is based on visual-manual classification and selected laboratory index testing.
6. Approximate Street Address: 8627 MANCHESTER RD

**L-106 (Brentwood) Sewer Separation**  
**RDP Tributaries CSO Tunnel**  
**MSD Project Number 12441**

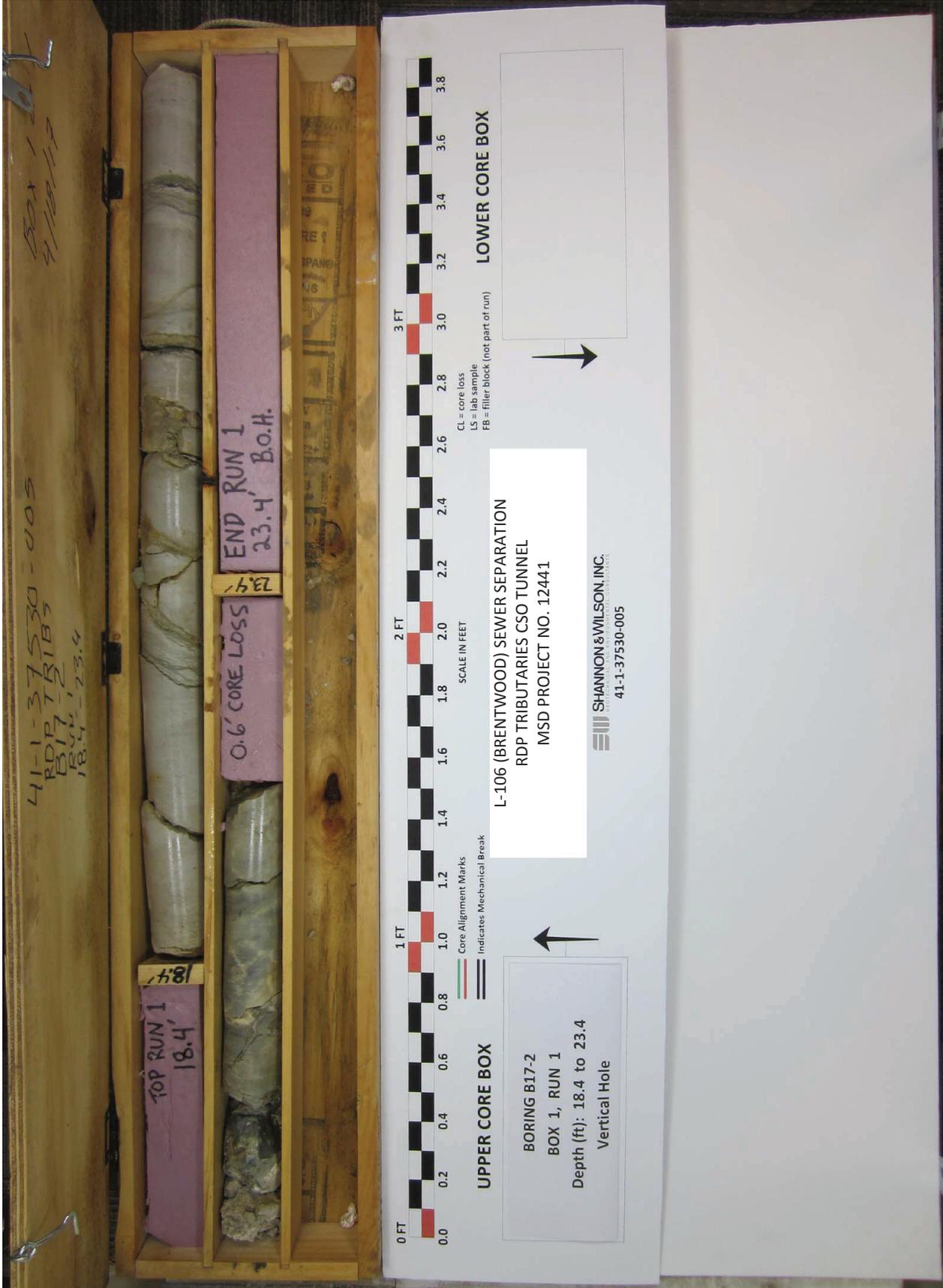
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**LOG OF BORING B17-2**

April 2018
41-1-37530-005

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**SHANNON & WILSON, INC.**  
Geotechnical and Environmental Consultants
Page 1 of 1



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Appendix C  
Borings Backfill Reports and Restoration Photos

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MSD - TRIBS Borings

Backfill Grout Quantity Worksheet

Boring Designation: B17-1  
Date: 4/18/17  
Observer: RWC

Depth to water(ft): 8.6

Hole Volume

Diameter (in.)	Volume (per Foot)	
	Cubic Feet	Gallons
1.0	0.0055	0.04
2.0	0.0218	0.16
3.0	0.0491	0.37
3.78	0.0780	0.58
4.0	0.0873	0.65
5.0	0.1364	1.02
6.0	0.1963	1.47
7.0	0.2673	2.00
8.0	0.3491	2.61
9.0	0.4418	3.31

Quantity Components Placed (per batch)			
Date:			
Portland Cement:			Pounds
Bentonite:			Pounds
Water:			Gallons
Batches:			

Quantity Components Placed (Total)		
Portland Cement:		Pounds
Powdered Bentonite:		Pounds
Water:		Gallons^
(^ gals. x 8.33lbs./gal)Water:		Pounds

Open Hole Volume: \_\_\_\_\_ Cu. Ft.

Specific Gravity	
Portland T1 Cement:	3.15
Powdered Bentonite:	2.65
Potable Water:	1.00

Total Grout Volume Placed in Cubic Feet*	
Portland Cement:	_____
Bentonite:	_____
Water:	_____
Total:	_____

1 cu.ft. H2O = 62.4 lbs.
1 gal. H2O = 8.33 lbs.
1 cu.ft. H2O = 7.48 gals.

Completion Details: <u>BACKFILL</u>
<u>WITH SOIL CUTTINGS</u>
<u>PER BRENTWOOD PERMIT</u>

\*To compute vol.(cu.ft.) from weight  
Cement Volume = Pounds/(3.15 x 62.4)  
Bentonite Volume= Pounds/(2.65 x 62.4)  
Water Volume= pounds/(1.0 x 62.4)

7NT Crew

Chief: JOHN GILLBERT

Notes: BOTH 22.5'  
2 1/4" 4 1/4" ID HSA

Misc. Calcs:

Boring: B17-1

MSD - TRIBS Borings

Backfill Grout Quantity Worksheet

Boring Designation: B17-2  
 Date: 4/10/17  
 Observer: RWC

Depth to water(ft): 7.2

Hole Volume

Diameter (in.)	Volume (per Foot)	
	Cubic Feet	Gallons
1.0	0.0055	0.04
2.0	0.0218	0.16
3.0	0.0491	0.37
3.78	0.0780	0.58
4.0	0.0873	0.65
5.0	0.1364	1.02
6.0	0.1963	1.47
7.0	0.2673	2.00
8.0	0.3491	2.61
9.0	0.4418	3.31

Quantity Components Placed (per batch)			
Date:			
Portland Cement:			Pounds
Bentonite:			Pounds
Water:			Gallons
Batches:			

Quantity Components Placed (Total)		
Portland Cement:		Pounds
Powdered Bentonite:		Pounds
Water:		Gallons^
(^ gals. x 8.33lbs./gal)Water:		Pounds

Open Hole Volume: \_\_\_\_\_ Cu. Ft.

Specific Gravity	
Portland T1 Cement:	3.15
Powdered Bentonite:	2.65
Potable Water:	1.00

Total Grout Volume Placed in Cubic Feet*	
Portland Cement:	_____
Bentonite:	_____
Water:	_____
Total:	_____

1 cu.ft. H2O = 62.4 lbs.
1 gal. H2O = 8.33 lbs.
1 cu.ft. H2O = 7.48 gals.

Completion Details: PLACE 50 LBS BENTONITE PELLETS TO 16' BGS BIF REMAINDER W/ SOIL CUTTING PER BRENTWOOD PERMIT

\*To compute vol.(cu.ft.) from weight  
 Cement Volume = Pounds/(3.15 x 62.4)  
 Bentonite Volume= Pounds/(2.65 x 62.4)  
 Water Volume= pounds/(1.0 x 62.4)

Notes: ADULT REPOSAL 18.4' BGS CORE TO 23.4 BGS

7NT Crew  
 Chief: JOHN GILBERT

Misc. Calcs:

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Boring: B17-2



From Esri, DigitalGlobe, et al.



4/18/2017 Before Drilling



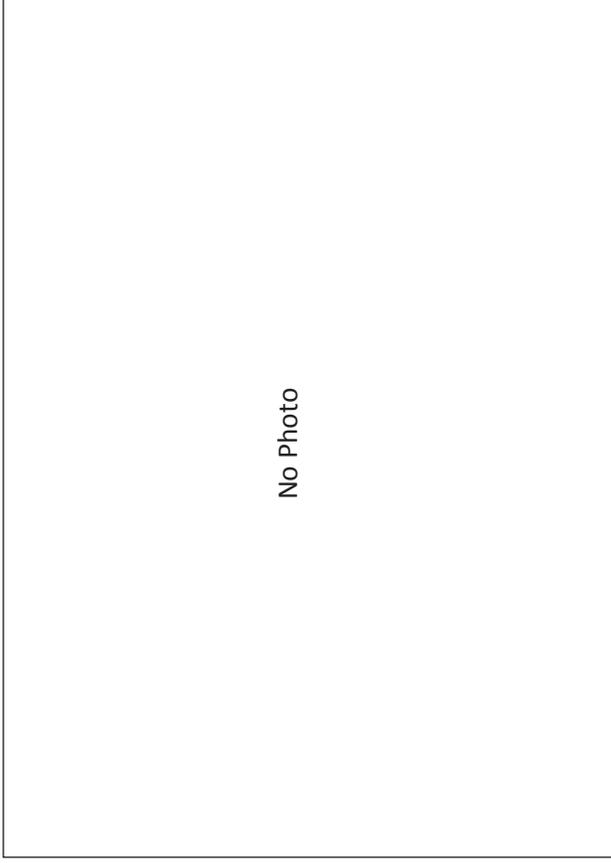
4/18/2017 After Drilling



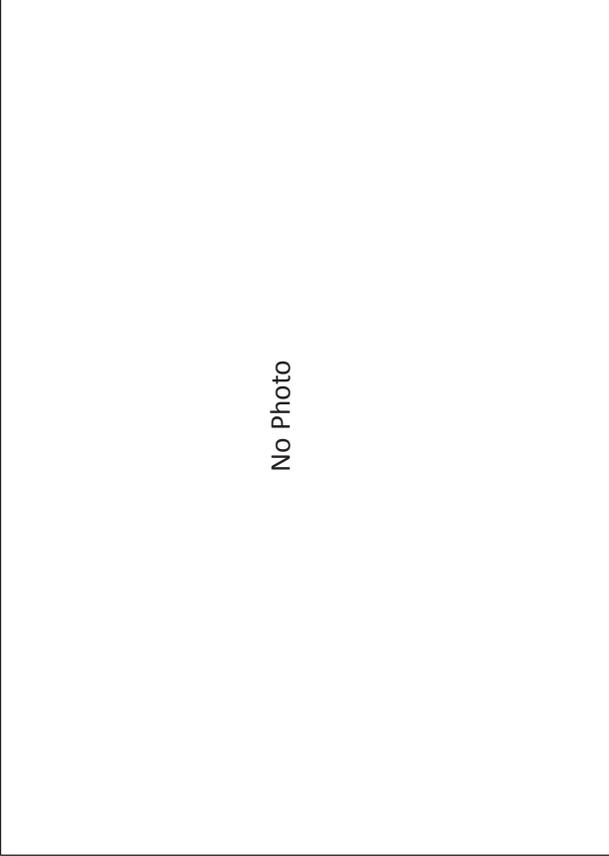
6/12/2017 Restoration Complete



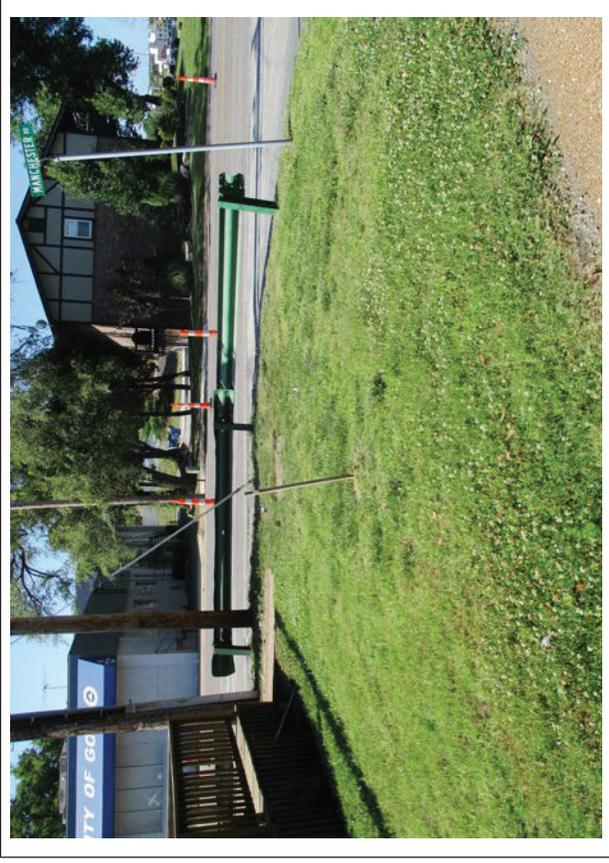
From Esri, DigitalGlobe, et al.



No Photo



No Photo



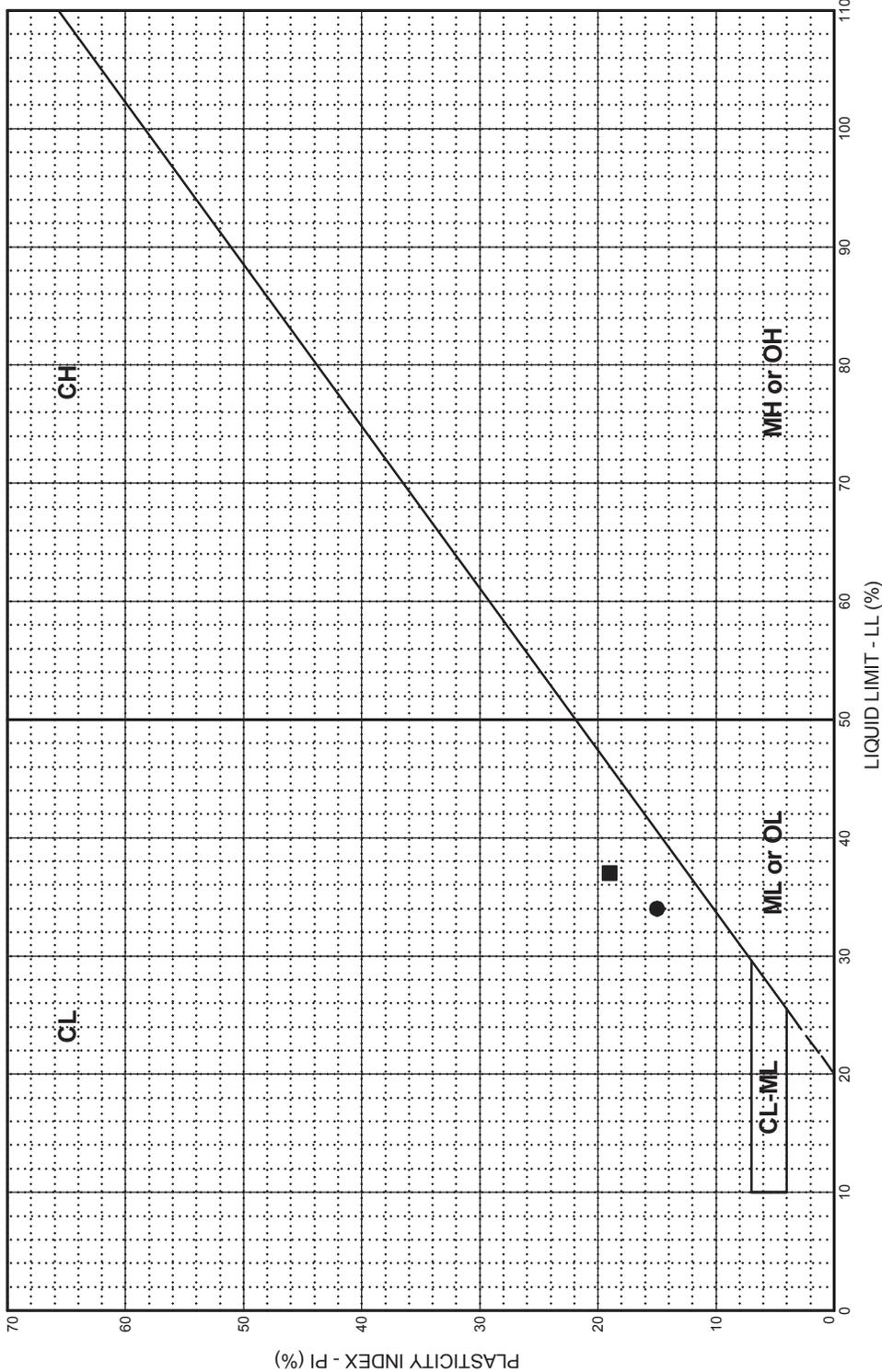
X/XX/2016 Before Drilling

X/XX/2016 After Drilling

6/12/2017 Restoration Complete

Appendix D  
Laboratory Test Reports

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**LEGEND**

- CL:** Low plasticity inorganic clays; sandy and silty clays
- CH:** High plasticity inorganic clays
- ML or OL:** Inorganic and organic silts and clayey silts of low plasticity
- MH or OH:** Inorganic and organic silts and clayey silts of high plasticity
- CL-ML:** Silty clays and clayey silts

BORING AND SAMPLE NO.		DEPTH (feet)	U.S.C.S. SYMBOL	SOIL CLASSIFICATION	LL %	PL %	PI %	NAT. W.C. %	PASS. #200, %	PLASTICITY CHART
●	B17-1, SS-2	9.3	CL	Gray, Lean Clay.	34	19	15	26.2		BORING B17-1
	B17-1, SS-5	16.8	CL	Gray, Lean Clay.	37	18	19	27.4		

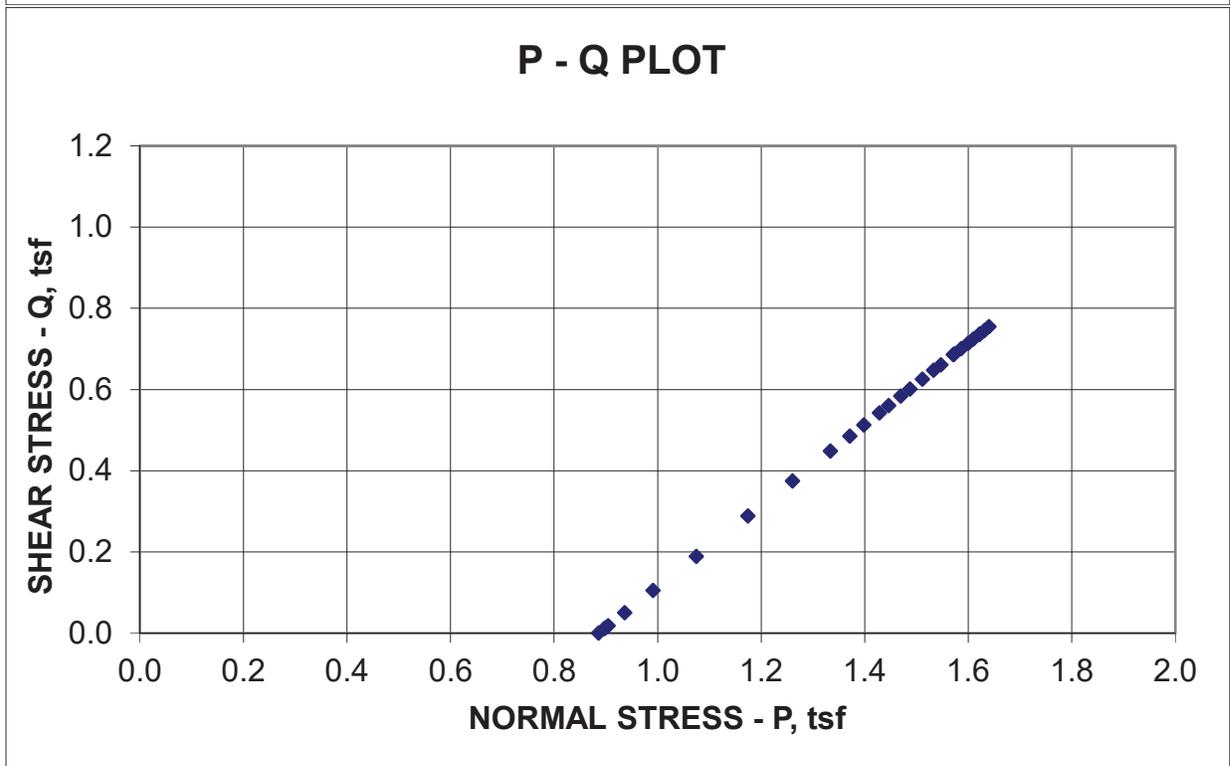
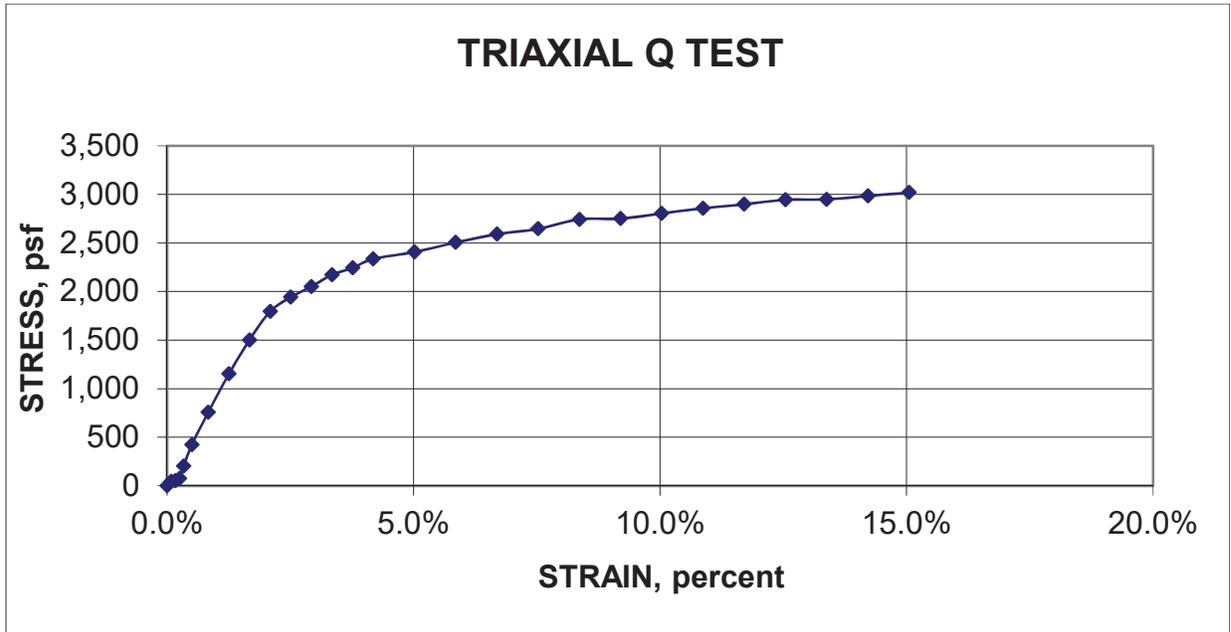
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Boring	B17-1	Tested by / Date	CMB	04/19/17
Sample	ST-3	Calculated by / Date	CMB	04/20/17
Depth (ft)	12.3	Checked by / Date		

Description Medium stiff, gray, Lean Clay (CL).

Specimen Data			Instrument Constants		
Height	5.980	inches	Deformation	0.001	inches/div
Diameter	2.857	inches	Load	1	lb/div.
H/D ratio	2.093		Confinment	12.3	psi
Volume	628.2	cc	Peak values		
Wet wt.	1237.61	grams			
Bulk Density	122.9	pcf	p	1.640	tsf
Dry Density	97.6	pcf	q	0.755	tsf
M.C.	26.0%	percent	strain	15.1%	%
Saturation	96.6%	percent	strain rate	0.040	in. per min.
Void ratio	0.727				
Gs	2.7	assumed			

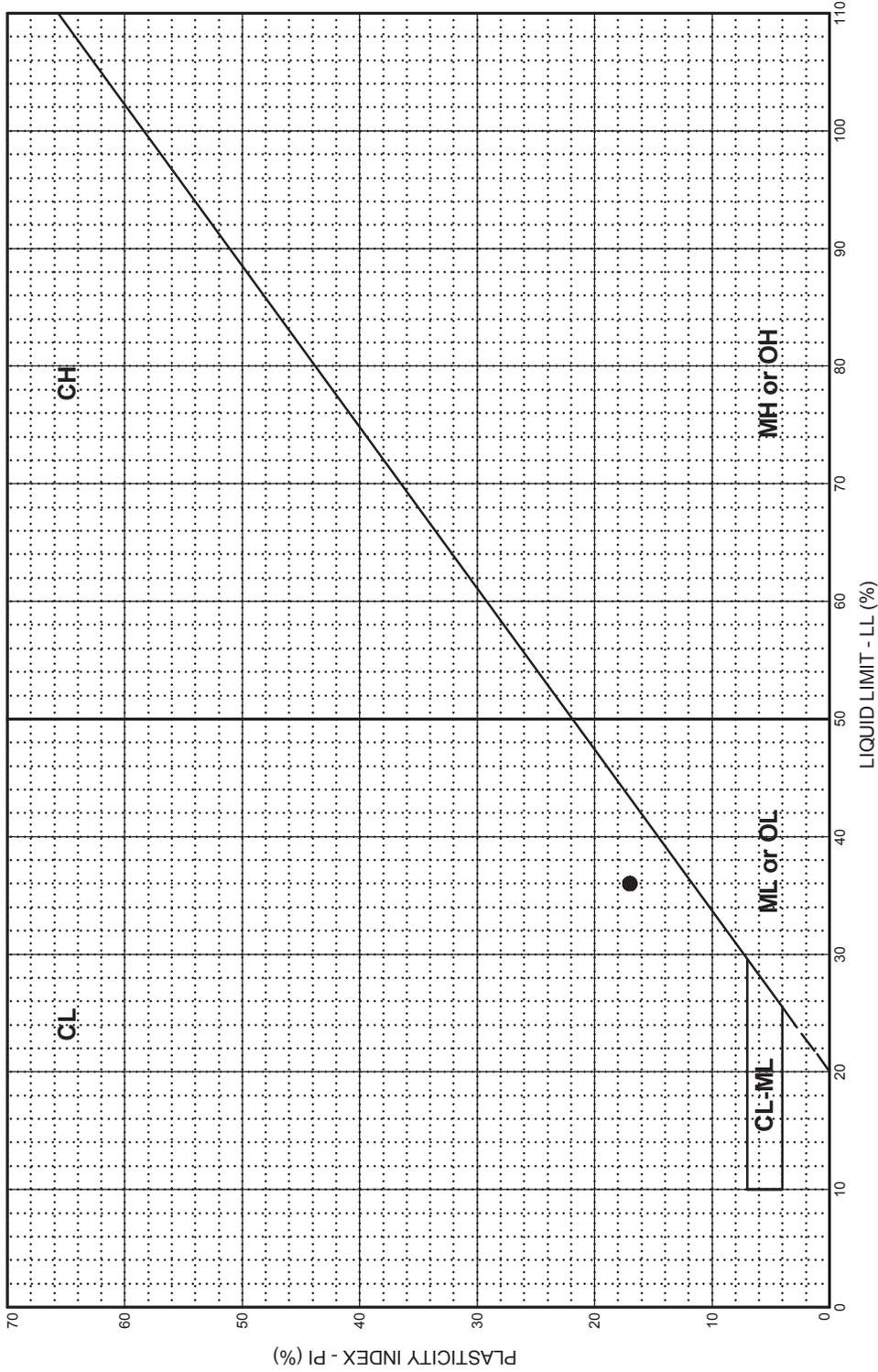
Deformation div.	Load div.	Strain %	Load lb	Stress tsf	p tsf	q tsf
0.000	0.0	0.0%	0.0	0.000	0.886	0.000
0.005	2.0	0.1%	2.0	0.022	0.897	0.011
0.010	2.3	0.2%	2.3	0.026	0.898	0.013
0.015	3.3	0.3%	3.3	0.037	0.904	0.018
0.020	9.0	0.3%	9.0	0.101	0.936	0.050
0.030	18.9	0.5%	18.9	0.211	0.991	0.106
0.050	34.0	0.8%	34.0	0.379	1.075	0.189
0.075	52.0	1.3%	52.0	0.577	1.174	0.288
0.100	67.9	1.7%	67.9	0.750	1.261	0.375
0.125	81.5	2.1%	81.5	0.897	1.334	0.448
0.150	88.6	2.5%	88.6	0.971	1.371	0.485
0.175	94.0	2.9%	94.0	1.026	1.398	0.513
0.200	99.9	3.3%	99.9	1.086	1.428	0.543
0.225	103.6	3.8%	103.6	1.121	1.446	0.561
0.250	108.3	4.2%	108.3	1.168	1.469	0.584
0.300	112.5	5.0%	112.5	1.203	1.487	0.602
0.350	118.0	5.9%	118.0	1.252	1.512	0.626
0.400	123.0	6.7%	123.0	1.295	1.533	0.647
0.450	126.6	7.5%	126.6	1.322	1.547	0.661
0.500	132.3	8.4%	132.3	1.371	1.571	0.686
0.550	133.7	9.2%	133.7	1.375	1.573	0.688
0.600	137.3	10.0%	137.3	1.401	1.586	0.701
0.650	141.0	10.9%	141.0	1.428	1.600	0.714
0.700	144.1	11.7%	144.1	1.449	1.610	0.724
0.750	147.5	12.5%	147.5	1.472	1.622	0.736
0.800	148.8	13.4%	148.8	1.474	1.623	0.737
0.850	151.7	14.2%	151.7	1.492	1.631	0.746
0.900	154.6	15.1%	154.6	1.509	1.640	0.755



Photograph  
of  
Failure

**UNCONSOLIDATED, UNDRAINED STRENGTH  
IN TRIAXIAL COMPRESSION**

**BORING - B17-1 : SAMPLE - ST-3**



**LEGEND**

**CL:** Low plasticity inorganic clays; sandy and silty clays

**CH:** High plasticity inorganic clays

**ML or OL:** Inorganic and organic silts and clayey silts of low plasticity

**MH or OH:** Inorganic and organic silts and clayey silts of high plasticity

**CL-ML:** Silty clays and clayey silts

BORING AND SAMPLE NO.		DEPTH (feet)	U.S.C.S. SYMBOL	SOIL CLASSIFICATION	LL %	PL %	PI %	NAT. W.C. %	PASS. #200, %	PLASTICITY CHART
● B17-2, SS-3		11.8	CL	Brown, Lean Clay.	36	19	17	28.1		<b>BORING B17-2</b>

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## Laboratory Results

<http://www.teklabinc.com/>

Client: Shannon & Wilson, Inc.  
 Client Project: RPD Tribs 41-1-37530-005  
 Lab ID: 17041169-001  
 Matrix: SOLID

Work Order: 17041169  
 Report Date: 26-Apr-17

Client Sample ID: B17-1

Collection Date: 04/19/2017 12:00

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
<b>EPA 600 2-78-054 METHOD 3.2.18.1</b>								
Resistivity, Solid		150		<b>1810</b>	Ohms/cm	1	04/25/2017 9:01	R231959
<b>EPA SW846 3550C, 5035A, ASTM D2974</b>								
Percent Moisture		0.1		<b>19.3</b>	%	1	04/24/2017 16:14	R231956
<b>STANDARD METHODS 4500-CL E (TOTAL)</b>								
Chloride	NELAP	61		<b>108</b>	mg/Kg-dry	1	04/25/2017 13:19	129598
<b>SW-846 9030B, 9034</b>								
Sulfide, Total	NELAP	34		<b>&lt; 34</b>	mg/Kg-dry	1	04/25/2017 10:45	129539
<b>SW-846 9036 (TOTAL)</b>								
Sulfate	NELAP	122	J	<b>100</b>	mg/Kg-dry	1	04/25/2017 13:22	129597
<b>SW-846 9045C</b>								
pH (1:1)	NELAP	1.00		<b>7.97</b>		1	04/21/2017 16:43	R231801



## Laboratory Results

<http://www.teklabinc.com/>

Client: Shannon & Wilson, Inc.  
 Client Project: RPD Tribs 41-1-37530-005  
 Lab ID: 17041169-002  
 Matrix: SOLID

Work Order: 17041169  
 Report Date: 26-Apr-17

Client Sample ID: B17-2

Collection Date: 04/19/2017 12:00

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
<b>EPA 600 2-78-054 METHOD 3.2.18.1</b>								
Resistivity, Solid		150		2060	Ohms/cm	1	04/25/2017 9:01	R231959
<b>EPA SW846 3550C, 5035A, ASTM D2974</b>								
Percent Moisture		0.1		19.7	%	1	04/24/2017 16:14	R231956
<b>STANDARD METHODS 4500-CL E (TOTAL)</b>								
Chloride	NELAP	60		153	mg/Kg-dry	1	04/25/2017 13:22	129598
<b>SW-846 9030B, 9034</b>								
Sulfide, Total	NELAP	31		< 31	mg/Kg-dry	1	04/25/2017 10:48	129539
<b>SW-846 9036 (TOTAL)</b>								
Sulfate	NELAP	121		180	mg/Kg-dry	1	04/25/2017 13:24	129597
<b>SW-846 9045C</b>								
pH (1:1)	NELAP	1.00		7.47		1	04/21/2017 16:47	R231801

**JSP-SEWER, EXHIBIT 3**

**LIST OF PROPERTIES/STRUCTURES FOR  
INSPECTION AND CONDITION SURVEY IF  
BLASTING IS IMPLEMENTED**

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**EXHIBIT 3: PROPERTIES/STRUCTURES FOR INSPECTION AND CONDITION SURVEY WITHIN 500' RADIUS IF BLASTING IS IMPLEMENTED**  
**CSO – Mary Avenue South of Manchester CSO Interceptor (I-132)/Outfall (L-106) Elimination Phase I (MoDOT):**  
**MODOT COMPONENT**

PARCEL ADDRESS			PARCEL OWNER ADDRESS				PARCEL OWNER	
Address	City	Zip Code	No. and Street	City	State	Zip Code	Owner	
1 VAN MARK WAY	BRENTWOOD	63144	2650 S HANLEY RD SUITE 200	SAINT LOUIS	MO	63144	SUBURBAN PARTNERS A MO LTD PTNSP	
2517 MARY AVE	BRENTWOOD	63144	2517 MARY AVE	SAINT LOUIS	MO	63144	GOULD JEFFREY B & CHRISTINE L H/W	
2523 MARY AVE	BRENTWOOD	63144	2523 MARY AVE	SAINT LOUIS	MO	63144	MONTEFALCON LOIDA	
2601 MARY AVE	BRENTWOOD	63144	2601 MARY AVE	SAINT LOUIS	MO	63144	PARRISH SHERRI L & GERALD WALTER JR H/H	
2605 MARY AVE	BRENTWOOD	63144	2605 MARY AVE	SAINT LOUIS	MO	63144	ROTTIAKOB JOHN J & MARY ELLEN H/W	
2609 MARY AVE	BRENTWOOD	63144	2609 MARY AVE	SAINT LOUIS	MO	63144	TILLEY BLAKE M & AMY C H/W	
2611 MARY AVE	BRENTWOOD	63144	2611 MARY AVE	SAINT LOUIS	MO	63144	MYERS ANDREW & STACEY T/E	
2614 DOROTHY AVE	BRENTWOOD	63144	2614 DOROTHY AVE	SAINT LOUIS	MO	63144	MOTCHAN KATHRYN S	
2618 DOROTHY AVE	BRENTWOOD	63144	2618 DOROTHY AVE	SAINT LOUIS	MO	63144	BRADLEY SEAN M & JENNIFER C T/E	
2621 MARY AVE	BRENTWOOD	63144	2621 MARY AVE	SAINT LOUIS	MO	63144	KRAEMER NANCY C	
2629 MARY AVE	BRENTWOOD	63144	2629 MARY AVE	SAINT LOUIS	MO	63144	KEELING DONALD & JENNIFER T/E	
2631 MARY AVE	BRENTWOOD	63144	2631 MARY AVE	SAINT LOUIS	MO	63144	FREEMAN RYAN ET AL J/T	
2635 MARY AVE	BRENTWOOD	63144	2635 MARY AVE	SAINT LOUIS	MO	63144	AZEEM ZAKIA SHAHEEN	
2635 RUTH AVE	BRENTWOOD	63144	1126 WESTMOOR PL	SAINT LOUIS	MO	63131	PHOENIX V LLC	
2636 RUTH AVE	BRENTWOOD	63144	2636 RUTH AVE	SAINT LOUIS	MO	63144	WILKE S MARTIN	
2637 HELEN AVE	BRENTWOOD	63144	2637 HELEN AVE	SAINT LOUIS	MO	63144	JONES BARRY E TR	
2639 RUTH AVE	BRENTWOOD	63144	479 RIDGE AVE	SAINT LOUIS	MO	63119	SHAW DOUGLAS E ETAL	
2640 RUTH AVE	BRENTWOOD	63144	2449 MARY AVE	SAINT LOUIS	MO	63144	NOWELL WILMA L TR	
2641 HELEN AVE	BRENTWOOD	63144	2641 HELEN AVE	SAINT LOUIS	MO	63144	OPPELT SHARON J	
2642 DOROTHY AVE	BRENTWOOD	63144	2642 DOROTHY AVE	SAINT LOUIS	MO	63144	BOWMAN MATTHEW THOMAS ETAL	
2643 RUTH AVE	BRENTWOOD	63144	2643 RUTH AVE	SAINT LOUIS	MO	63144	ZHOU ZHENQING & ERNING DUAN H/W	
2646 DOROTHY AVE	BRENTWOOD	63144	7930 CROYDON DR	SAINT LOUIS	MO	63123	HOUSE REMODELERS LLC	
2646 RUTH AVE	BRENTWOOD	63144	2646 RUTH AVE	SAINT LOUIS	MO	63144	ZIEHL LAUREL & CHARLES H/H	
2647 HELEN AVE	BRENTWOOD	63144	P O BOX 510032	SAINT LOUIS	MO	63151	RUSSO DEVELOPMENT LLC	
2647 RUTH AVE	BRENTWOOD	63144	2647 RUTH AVE	SAINT LOUIS	MO	63144	BROWN BRIAN C	
2650 DOROTHY AVE	BRENTWOOD	63144	2650 DOROTHY AVE	SAINT LOUIS	MO	63144	HMT INVESTMENTS	
2651 RUTH AVE	BRENTWOOD	63144	2651 RUTH AVE	SAINT LOUIS	MO	63144	GREENE GREGORY & TINISHIA H/W	
2652 RUTH AVE	BRENTWOOD	63144	P O BOX 510032	SAINT LOUIS	MO	63151	RUSSO DEVELOPMENT LLC	
2654 DOROTHY AVE	BRENTWOOD	63144	2654 DOROTHY AVE	SAINT LOUIS	MO	63144	KEENEY CLAYTON C ETAL J/T	
2654 RUTH AVE	BRENTWOOD	63144	P O BOX 510032	SAINT LOUIS	MO	63151	RUSSO DEVELOPMENT LLC	
2702 MARY AVE	BRENTWOOD	63144	12570 HIBLER WOODS DR	SAINT LOUIS	MO	63141	MARY AVENUE & COMPANY LLC	
2735 BOMPART AVE	BRENTWOOD	63144	2348 S BRENTWOOD BLVD	SAINT LOUIS	MO	63144	BRENTWOOD CITY OF	
2761 MARY AVE	BRENTWOOD	63144	2348 S BRENTWOOD BLVD	SAINT LOUIS	MO	63144	BRENTWOOD CITY OF	
2780 MARY AVE	BRENTWOOD	63144	2348 S BRENTWOOD BLVD	SAINT LOUIS	MO	63144	BRENTWOOD CITY OF	
8500 MANCHESTER RD	BRENTWOOD	63144	3477 WHITSETTS FORK RD	GLENCOE	MO	63038	8500 MANCHESTER LLC TRUSTEE ETAL	
8512 FLORENCE AVE	BRENTWOOD	63144	8512 FLORENCE AVE	SAINT LOUIS	MO	63144	GOEKE ROY F	

**EXHIBIT 3: PROPERTIES/STRUCTURES FOR INSPECTION AND CONDITION SURVEY WITHIN 500' RADIUS IF BLASTING IS IMPLEMENTED**  
**CSO – Mary Avenue South of Manchester CSO Interceptor (I-132)/Outfall (L-106) Elimination Phase I (MoDOT):**  
**MODOT COMPONENT**

PARCEL ADDRESS			PARCEL OWNER ADDRESS				PARCEL OWNER	
Address	City	Zip Code	No. and Street	City	State	Zip Code	Owner	
8513 MANCHESTER RD	BRENTWOOD	63144	P O BOX 510032	SAINT LOUIS	MO	63151	RUSSOS DEVELOPMENT LLC	
8515 MANCHESTER RD	BRENTWOOD	63144	1380 FERGUSON AVE	SAINT LOUIS	MO	63133	BARTENJURA HOLDINGS LLC	
8518 FLORENCE AVE	BRENTWOOD	63144	8518 FLORENCE AVE	SAINT LOUIS	MO	63144	GREEN STEVEN M & PALMER JAMES L T/E	
8519 FLORENCE AVE	BRENTWOOD	63144	8519 FLORENCE AVE	SAINT LOUIS	MO	63144	LAY ETHAN J	
8520 JOSEPH AVE	BRENTWOOD	63144	8520 JOSEPH AVE	SAINT LOUIS	MO	63144	SMITH JUSTIN M & KATHERINE M H/W	
8521 FLORENCE AVE	BRENTWOOD	63144	8521 FLORENCE AVE	SAINT LOUIS	MO	63144	FERGUSON MAURICE B	
8524 MANCHESTER RD	BRENTWOOD	63144	6467 MAIN ST	WILLIAMSVILLE	NY	14221	SOVRAN ACQUISITION LIMITED PARTNERSHIP	
8600 FLORENCE AVE	BRENTWOOD	63144	8608 FLORENCE AVE	SAINT LOUIS	MO	63144	HEINEMANN TOM K & JANET S H/W	
8600 MANCHESTER RD	BRENTWOOD	63144	8600 MANCHESTER RD	SAINT LOUIS	MO	63144	T & C PROPERTIES LLC	
8601 FLORENCE AVE	BRENTWOOD	63144	8601 FLORENCE AVE	SAINT LOUIS	MO	63144	KANG BRIAN	
8602 JOSEPH AVE	BRENTWOOD	63144	8742 RADLEY CT	SAINT LOUIS	MO	63144	WALKER PATSY CHANDLER TRUSTEE	
8603 MANCHESTER RD	BRENTWOOD	63144	P O BOX 510032	SAINT LOUIS	MO	63151	MANCHESTER ROAD PROPERTY LLC	
8606 JOSEPH AVE	BRENTWOOD	63144	8606 JOSEPH AVE	SAINT LOUIS	MO	63144	MCBRIDE THOMAS C	
8606 MANCHESTER RD	BRENTWOOD	63144	2348 S BRENTWOOD BLVD	SAINT LOUIS	MO	63144	BRENTWOOD CITY OF	
8607 FLORENCE AVE	BRENTWOOD	63144	8607 FLORENCE AVE	SAINT LOUIS	MO	63144	DOLL MARC & PRITCHETT LACEY T/E	
8608 FLORENCE AVE	BRENTWOOD	63144	8608 FLORENCE AVE	SAINT LOUIS	MO	63144	DONOHUE MEGHAN ROSE	
8608 JOSEPH AVE	BRENTWOOD	63144	8608 JOSEPH AVE	SAINT LOUIS	MO	63144	HAYWARD DOUGLAS M LYNN E H/W	
8609 JOSEPH AVE	BRENTWOOD	63144	8609 JOSEPH AVE	SAINT LOUIS	MO	63144	MCCOLLOUGH JANET D TRUSTEE	
8611 FLORENCE AVE	BRENTWOOD	63144	8611 FLORENCE AVE	SAINT LOUIS	MO	63144	DAVENPORT RONALD M & JAMIE L T/E	
8611 MANCHESTER RD	BRENTWOOD	63144	8623 FERNWOOD DR	COLUMBIA	IL	62236	KNIGHT NORMAN J	
8612 FLORENCE AVE	BRENTWOOD	63144	320 ASPEN VILLAGE DR	BALLWIN	MO	63021	168 Q & P L L C	
8613 FLORENCE AVE	BRENTWOOD	63144	8613 FLORENCE AVE	SAINT LOUIS	MO	63144	VANDEN HOEK STEVE L & BETH A H/W	
8613 JOSEPH AVE	BRENTWOOD	63144	8613 JOSEPH AVE	SAINT LOUIS	MO	63144	WINKLEMAN AUSTIN F SUSAN C H/W	
8614 JOSEPH AVE	BRENTWOOD	63144	8614 JOSEPH AVE	SAINT LOUIS	MO	63144	WELGE LOUIS M JOAN M	
8614 MANCHESTER RD	BRENTWOOD	63144	9944 W FLORISSANT AVE	SAINT LOUIS	MO	63136	AJIBOLA IDOWU	
8615 MANCHESTER RD	BRENTWOOD	63144	1731 DEL NORTE AVE	SAINT LOUIS	MO	63117	8615 MANCHESTER L L C	
8616 FLORENCE AVE	BRENTWOOD	63144	8616 FLORENCE AVE	SAINT LOUIS	MO	63144	FORTI NICHOLAS EDWARD	
8616 JOSEPH AVE	BRENTWOOD	63144	8646 JOSEPH AVE	SAINT LOUIS	MO	63144	TIPTON BRADFORD R & CHARLENE A T/E	
8617 JOSEPH AVE	BRENTWOOD	63144	8617 JOSEPH AVE	SAINT LOUIS	MO	63144	HANSEN BRIAN R & LEE R H/W	
8619 FLORENCE AVE	BRENTWOOD	63144	8619 FLORENCE AVE	SAINT LOUIS	MO	63144	SCHNARR JAMES R ETAL J/T	
8620 FLORENCE AVE	BRENTWOOD	63144	8620 FLORENCE AVE	SAINT LOUIS	MO	63144	MCCALPIN JAMES F & DOROTHY A H/W	
8620 JOSEPH AVE	BRENTWOOD	63144	8620 JOSEPH AVE	SAINT LOUIS	MO	63144	WOLF BRYAN A ETAL J/T	
8621 JOSEPH AVE	BRENTWOOD	63144	8621 JOSEPH AVE	SAINT LOUIS	MO	63144	RODGERS ALCUIN III ETAL	
8623 FLORENCE AVE	BRENTWOOD	63144	8623 FLORENCE AVE	SAINT LOUIS	MO	63144	ZOELLNER LAURA M & CHAD J H/H	
8623 MANCHESTER RD	BRENTWOOD	63144	8623 MANCHESTER RD	SAINT LOUIS	MO	63144	BRENTWOOD CITY OF	
8624 JOSEPH AVE	BRENTWOOD	63144	8624 JOSEPH AVE	SAINT LOUIS	MO	63144	GOGEL JOSEPH & SHARON H/W	

**EXHIBIT 3: PROPERTIES/STRUCTURES FOR INSPECTION AND CONDITION SURVEY WITHIN 500' RADIUS IF BLASTING IS IMPLEMENTED  
CSO – Mary Avenue South of Manchester CSO Interceptor (I-132)/Outfall (L-106) Elimination Phase I (MoDOT):  
MODOT COMPONENT**

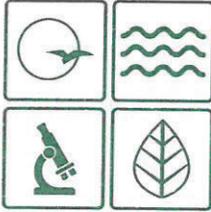
PARCEL ADDRESS			PARCEL OWNER ADDRESS				PARCEL OWNER	
Address	City	Zip Code	No. and Street	City	State	Zip Code	Owner	
8627 JOSEPH AVE	BRENTWOOD	63144	8627 JOSEPH AVE	SAINT LOUIS	MO	63144	WALKER AFRA JEAN	
8627 MANCHESTER RD	BRENTWOOD	63144	8627 MANCHESTER RD	SAINT LOUIS	MO	63144	BRENTWOOD CITY OF	
8629 JOSEPH AVE	BRENTWOOD	63144	8629 JOSEPH AVE	SAINT LOUIS	MO	63144	CAMPBELL KIMBERLY ETAL J/T	
8630 JOSEPH AVE	BRENTWOOD	63144	8630 JOSEPH AVE	SAINT LOUIS	MO	63144	MILLS ELLEN D	
8634 JOSEPH AVE	BRENTWOOD	63144	8634 JOSEPH AVE	SAINT LOUIS	MO	63144	KRAUSE PETER T & MICHELLE L H/W	
8635 JOSEPH AVE	BRENTWOOD	63144	8601 JOSEPH AVE	SAINT LOUIS	MO	63144	BRENNAN KIM ANN	
8700 MANCHESTER RD	BRENTWOOD	63144	2348 S BRENTWOOD BLVD	SAINT LOUIS	MO	63144	BRENTWOOD CITY OF	
8702 MANCHESTER RD	BRENTWOOD	63144	8706 MANCHESTER RD	SAINT LOUIS	MO	63144	MORICE ENTERPRISES L L C	
8706 FLORENCE AVE	BRENTWOOD	63144	8706 FLORENCE AVE	SAINT LOUIS	MO	63144	WERNER CHARLES A & MARY L T/E	
8707 KEYSTONE DR	BRENTWOOD	63144	8707 KEYSTONE DR	SAINT LOUIS	MO	63144	STEINBACH DARRELL R	
8708 FLORENCE AVE	BRENTWOOD	63144	8762 W KINGSBURY AVE	SAINT LOUIS	MO	63124	WERNER CHARLES A & MARY L H/W	
8710 FLORENCE AVE	BRENTWOOD	63144	8710 FLORENCE AVE	SAINT LOUIS	MO	63144	WERNER CHARLES A & MARY L H/W	
8711 KEYSTONE DR	BRENTWOOD	63144	8711 KEYSTONE DR	SAINT LOUIS	MO	63144	MULLEN DENNIS F SUSAN L H/W TRUSTEES	
8711 MANCHESTER RD	BRENTWOOD	63144	1952 BROWN RD	SAINT LOUIS	MO	63114	TRAN PROPERTIES LLC	
8714 FLORENCE AVE	BRENTWOOD	63144	8714 FLORENCE AVE	SAINT LOUIS	MO	63144	OBBERKROM SAMANTHA L	
8715 KEYSTONE DR	BRENTWOOD	63144	8715 KEYSTONE DR	SAINT LOUIS	MO	63144	WILLHOFT LOREN A	
8718 COVINGTON CT	BRENTWOOD	63144	37006 S 28TH AVE	FEDERAL WAY	WA	98003	BENNION DEAN & LESLI T/E	
8718 FLORENCE AVE	BRENTWOOD	63144	8718 FLORENCE AVE	SAINT LOUIS	MO	63144	BLAIR RONALD S FRANCES A H/W	
8718 KEYSTONE DR	BRENTWOOD	63144	8718 KEYSTONE DR	SAINT LOUIS	MO	63144	OBRECHT MICHAEL T	
8719 FLORENCE AVE	BRENTWOOD	63144	8719 FLORENCE AVE	SAINT LOUIS	MO	63144	BLAIR FRANK L JR & LILLIAN ADELE H/W	
8719 KEYSTONE DR	BRENTWOOD	63144	8719 KEYSTONE DR	SAINT LOUIS	MO	63144	VORA AJAYKUMER REKHA H/W	
8720 MAGDALEN AVE	BRENTWOOD	63144	8720 MAGDALEN AVE	SAINT LOUIS	MO	63144	JAUDON FERRIN L	
8720 MANCHESTER RD	BRENTWOOD	63144	13316 N MACARTHUR BLVD	OKLAHOMA CITY	OK	73142	PFS PROPERTIES 2 LLC	
8721 MAGDALEN AVE	BRENTWOOD	63144	3830 W 48TH ST	SHAWNEE MISSION	KS	66205	PACE KEITH T & MARY T T/E	
8722 FLORENCE AVE	BRENTWOOD	63144	8722 FLORENCE AVE	SAINT LOUIS	MO	63144	GREMAUD MILDA B	
8722 KEYSTONE DR	BRENTWOOD	63144	8722 KEYSTONE AVENUE	SAINT LOUIS	MO	63144	LOHMAN MATTHEW W DONNA K H/W	
8724 MAGDALEN AVE	BRENTWOOD	63144	8724 MAGDALEN AVE	SAINT LOUIS	MO	63144	DART NETANYA SUE	
8725 FLORENCE AVE	BRENTWOOD	63144	8725 FLORENCE AVE	SAINT LOUIS	MO	63144	OLSON MADINA M	
8725 KEYSTONE DR	BRENTWOOD	63144	41 NORTHCOTE	SAINT LOUIS	MO	63144	H & S HOLDINGS LLC	
8725 MAGDALEN AVE	BRENTWOOD	63144	8725 MAGDALEN AVE	SAINT LOUIS	MO	63144	BILLINGSLEY CRAIG & AIMEE H/W	
8726 FLORENCE AVE	BRENTWOOD	63144	8726 FLORENCE AVE	SAINT LOUIS	MO	63144	BLUM ANTHONY F & XIAOXIAN HU H/W	
8726 KEYSTONE DR	BRENTWOOD	63144	2711 MANDERLY DR	SAINT LOUIS	MO	63144	WESTON JOAN L	
8728 MAGDALEN AVE	BRENTWOOD	63144	8728 MAGDALEN AVE	SAINT LOUIS	MO	63144	HALL DUSTIN	
8729 FLORENCE AVE	BRENTWOOD	63144	8729 FLORENCE AVE	SAINT LOUIS	MO	63144	DUGAN JOHN F	
8730 MANCHESTER RD	BRENTWOOD	63144	16100 SWINGLEY RIDGE RD SUITE 210	CHESTERFIELD	MO	63017	FOUNTAINS AT 270 THE L L C	
8731 MAGDALEN AVE	BRENTWOOD	63144	8731 MAGDALEN AVE	SAINT LOUIS	MO	63144	AKINS AARON D & JENNIFER R H/W	

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**JSP-SEWER, EXHIBIT 4**

**MDNR NPDES OPERATING PERMIT**

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Missouri Department of dnr.mo.gov

# NATURAL RESOURCES

Eric R. Greitens, Governor

Carol S. Comer, Director

JUN 28 2017

Metropolitan St. Louis Sewer District  
2350 Market Street  
St. Louis, MO 63103

Dear Metropolitan St. Louis Sewer District:

Enclosed please find your Missouri State Operating Permit which authorizes land disturbance activities for MSD projects. This permit has been issued at your request and is based upon information submitted in your application to the department.

Please note that prior to the beginning of land disturbance activities other permits may also be required. Especially note the requirements for a Missouri Department of Natural Resources 401 Water Quality Certification and the U.S. Army Corps of Engineers 404 permit. A 401 Certification is needed when placing material, or fill, into the jurisdictional waters of the United States. Examples are culverts under road crossings, riprap along stream banks and storm water outfall pipes. The term jurisdictional waters refers to large lakes, rivers, streams and wetlands, including those that don't always contain water.

The permitting and certification process is shared between the department and the U.S. Army Corps of Engineers. More details can be found at the US Army Corps of Engineer's Website at <http://www.usace.army.mil/>. Some of these activities are also described on page 2, item 3 of the enclosed permit.

This permit contains several requirements and should be thoroughly read and understood by you. If your permit requires environmental monitoring, copies of the necessary forms have been enclosed. In all future correspondence regarding your permit please reference your permit number as shown on page 1 of the permit.

Please contact the Water Pollution Enforcement and Compliance Unit if you would like to schedule an Environmental Assistance Visit (EAV) at 573-751-1300. During the visit, staff will review the requirements of the permit and answer any questions that you may have. Staff will also be available to walk the site to advise on Best Management Practices required by the permit. The department's regional office staff may also contact you to schedule an EAV.

If you were adversely affected by this decision, you may be entitled to an appeal before the administrative hearing commission pursuant to 10 CSR 20-1.020 and Sections 644.051.6 and 621.250, RSMo. To appeal, you must file a petition with the administrative hearing commission within thirty days after the date this decision was mailed or the date it was delivered, whichever date was earlier. If any such petition is sent by registered mail or certified mail, it will be deemed filed on the date it is mailed; if it is sent by any method other than registered mail or certified mail, it will be deemed filed on the date it is received by the administrative hearing commission. Contact information for the AHC is as follows: Administrative Hearing Commission, Third Floor, 131 West High Street, Jefferson City, MO 65101 (Mailing address: P.O. Box 1557, Jefferson City, MO 65102-1557), Phone: 573-751-2422, Fax: 573-751-5018, Website: [www.oa.mo.gov/ahc](http://www.oa.mo.gov/ahc).



Recycled paper

Metropolitan St. Louis Sewer District  
Page Two

Please be aware that this facility may also be subject to any applicable county or other local ordinances or restrictions.

Sincerely,

WATER PROTECTION PROGRAM

A handwritten signature in cursive script that reads "David J. Lamb". The signature is written in black ink and is positioned above the typed name and title.

David J. Lamb  
Acting Director

DJL/vs

Enclosure

STATE OF MISSOURI  
DEPARTMENT OF NATURAL RESOURCES  
MISSOURI CLEAN WATER COMMISSION



MISSOURI STATE OPERATING PERMIT

**General Operating Permit**

In compliance with the Missouri Clean Water Law, (Chapter 644 R.S. Mo as amended, hereinafter, the Law), and the Federal Water Pollution Control Act (Public Law 92-500, 92nd Congress) as amended,

Permit No: MOR100010  
Owner: Metropolitan St. Louis Sewer District  
Address: 2350 Market Street  
St. Louis, MO 63103  
  
Continuing Authority: Metropolitan St. Louis Sewer District  
2350 Market Street  
St. Louis, MO 63103  
  
Facility Name: MSD projects  
Facility Address: 2350 Market Street  
ST LOUIS, MO 63103  
  
Legal Description: Land Grant 940, St. Louis County  
UTM Coordinates: 742438.118/4279537.596  
Receiving Stream: Various (U)  
First Classified Stream - ID#: Mississippi R. (P) 1707.02  
USGS# and Sub Watershed#: 07140101 - 0403

is authorized to discharge from the facility described herein, in accordance with the effluent limitations and monitoring requirements as set forth herein.

**FACILITY DESCRIPTION** All Outfalls SIC #1629  
All Outfalls - Construction or land disturbance activity (e.g., clearing, grubbing, excavating, grading, filling and other activity that results in the destruction of the root zone and/or land disturbance activity that is reasonably certain to cause pollution of waters of the state)

This permit authorizes only wastewater, including storm water, discharges under the Missouri Clean Water Law and the National Pollutant Discharge Elimination System, it does not apply to other regulated areas. This permit may be appealed in accordance with RSMo Section 644.051.6 and 621.250, 10 CSR 20-6.020, and 10 CSR 20-1.020.

July 01, 2017

Issue Date

Edward B. Galbraith, Director  
Division of Environmental Quality

June 22, 2022

Expiration Date

David J. Lamb, Acting Director  
Water Protection Program



## APPLICABILITY

1. This general permit authorizes the discharge of stormwater and certain non-stormwater discharges from land disturbance sites that disturb one or more acres or disturb less than one acre when part of a larger common plan of development or sale that will disturb a cumulative total of one or more acres over the life of the project. This general permit also authorizes the discharge of stormwater and certain non-stormwater discharges from smaller projects where the Missouri Department of Natural Resources (department) has exercised its discretion to require a permit [10 CSR 20-6.200(1)(B)].
2. This general permit is issued to a city, county, state or federal agency or other governmental jurisdiction for land disturbance projects performed by or under contract to the permittee.
3. A general stormwater control plan or stormwater pollution prevention plan (SWPPP) must be developed prior to issuance of this permit. These plans must include a narrative of the types and appropriate uses of Best Management Practices (BMPs) for erosion and sediment control and stormwater management. All water pollution controls on land disturbance sites shall conform to the storm water control program and/or SWPPP of the city, county or other governmental jurisdiction in which the land disturbance activity is occurring. The requirements of the stormwater control program and/or SWPPP must be at least as stringent as those described in this permit and 10 CSR 20-6.200.
4. A Missouri State Operating Permit must be issued before any site vegetation is removed or the site disturbed. Any site owner/operator subject to these requirements for stormwater discharges and who disturbs land prior to permit issuance from the department is in violation of both State regulations per 10 CSR 20-6.200(1)(A) and Federal regulations per 40 CFR 122.26. The legal owner of the property, right-of-way or the holder of an easement on the property, and operator on which the site is located are responsible for compliance with this permit.
5. This permit authorizes discharges from construction support activities (e.g., concrete or asphalt batch plants, equipment staging yards, material storage areas, excavated material disposal areas, borrow areas) provided that appropriate stormwater controls are designed, installed, maintained and provided:
  - a. The support activity is directly related to the construction site required to have permit coverage for stormwater discharges;
  - b. The support activity is not a commercial operation; and
  - c. The support activity does not continue to operate beyond the completion of the construction activity at the project it supports.The permittee is responsible for compliance with this permit for any construction support activities.
6. This permit authorizes non-stormwater discharges from the following activities provided that these discharges are addressed in the permittee's specific SWPPP required by this general permit:
  - a. Dewatering activities if there are no contaminants other than sediment present in the discharge, and the discharge is treated as specified in Requirements, Section 10.o. of this permit;
  - b. Flushing water hydrants and potable water lines;
  - c. Water only (i.e., without detergents or additives) rinsing of streets and buildings; and
  - d. Site watering to establish vegetation.
7. This general permit does not authorize the:
  - a. placement of fill materials in waters or floodplains
  - b. obstruction of stream flow,
  - c. redirection of stormwater across private property not owned or operated by the permittee, or

d. Changing the channel of a defined drainage course.

These actions may be regulated by other federal, state, or local entities, such as the U.S. Army Corps of Engineers or Federal Emergency Management Agency. This general permit addresses only the quality of the stormwater runoff and the minimization of off-site migration of sediments and other water contaminants.

8. This permit does not authorize land disturbance activity in jurisdictional waters of the United States, unless the permittee has obtained the required Clean Water Act Section 404 Department of the Army permit from the U.S. Army Corps of Engineers and its associated Section 401 Water Quality Certification from the department. Land disturbance activities may not begin in the affected waters of the United States until the required §404 permit and §401 water quality certification have been obtained.
9. This general permit prohibits any discharge of wastewater generated from air pollution control equipment or the containment of scrubber water in lined ponds to waters of the state.
10. This general permit prohibits any discharge of sewage or pollutants to waters of the state including but not limited to:
  - a. Any hazardous material, oil, lubricant, solid waste or other non-naturally occurring substance from the site, including fuels, oils, or other pollutants used in vehicle and equipment operation and maintenance;
  - b. Soaps or solvents used in vehicle and equipment washing;
  - c. Hazardous substances or petroleum products from an on-site spill or handling and disposal practices;
  - d. Wash and/or rinse waters from concrete mixing equipment including ready mix concrete trucks, unless managed by an appropriate control. Any such pollutants must be adequately treated and addressed in the SWPPP, and cannot be discharged to waters of the state;
  - e. Wastewater from washout and cleanout of stucco, paint, form release oils, curing compounds and other construction materials;
  - f. Domestic wastewaters, including gray waters; or
  - g. Industrial stormwater runoff.
11. The department reserves the right to revoke or deny coverage under this general permit to applicants for stormwater discharges from land disturbance activities at sites that have contaminated soils that will be disturbed by the land disturbance activity or where such materials are brought to the site to use as fill or borrow. A site-specific permit may be required to cover such activities.
12. If at any time the department determines that the quality of waters of the state may be better protected by requiring the owner/operator of the permitted site to apply for a site-specific or different general permit, the department may do so [10 CSR 20-6.010(13)(C)]. Examples of when this may occur:
  - a. The permittee is not in compliance with the conditions of this general permit;
  - b. The discharge no longer qualifies for this general permit due to changed site conditions and/or regulations; or
  - c. Information becomes available that indicates water quality standards have been or may be violated.The permittee will be notified in writing of the requirement to apply for a site-specific permit or a different general permit. When issued to the authorized permittee, the applicability of this general permit to the permittee is automatically terminated upon the effective date of the site-specific or different general permit.
13. Any owner/operator authorized by a general permit may request to be excluded from the coverage of the general permit and apply for a site-specific permit [10 CSR 20-6.010(13)(D)].

14. This operating permit does not affect, remove, or replace any requirement of the National Environmental Policy Act; the Endangered Species Act; the National Historic Preservation Act; the Comprehensive Environmental Response, Compensation and Liability Act; or the Resource Conservation and Recovery Act. Determination of applicability for the above mentioned acts is the responsibility of the permittee.
15. This permit does not supersede any requirement for obtaining project approval under an established local authority.
16. This permit is not transferable to other owners or operators.

#### EXEMPTIONS FROM PERMIT REQUIREMENTS

1. Facilities that discharge all stormwater runoff directly to a combined sewer system are exempt from stormwater permit requirements.
2. Land disturbance activity as described in 10 CSR 20-6.010(1)(B) and 10 CSR 20-6.200(1)(B).
3. Oil and gas related activities as listed in 40 CFR 122.26(a)(2)(ii).

#### REQUIREMENTS

1. Electronic Discharge Monitoring Report (eDMR) Submission System.  
Per 40 CFR Part 127 National Pollutant Discharge Elimination System (NPDES) Electronic Reporting Rule, reporting shall be submitted by the permittee via an electronic system to ensure timely, complete, accurate, and nationally-consistent set of data about the NPDES program. All general permit covered facilities under this master general permit shall comply with the department's requirements for electronic reporting.
  - a. Reporting Requirements.
    - (1) Application to participate in the department's eDMR system is required as part of the application for general permit coverage in order to constitute a complete permit application and may be accessed at [dnr.mo.gov/env/wpp/edmr.htm](http://dnr.mo.gov/env/wpp/edmr.htm).
    - (2) The permittee must electronically submit quarterly reports via the eDMR system.
  - b. Other actions. The following shall be submitted electronically after such a system has been made available by the department:
    - (1) General Permit Applications/Notices of Intent to discharge (NOIs);
    - (2) Notices of Termination (NOTs);
    - (3) No Exposure Certifications (NOEs); and
    - (4) Low Erosivity Waivers and Other Waivers from Stormwater Controls (LEWs).
  - c. Electronic Submissions. To access the eDMR system, use the following web link: <https://edmr.dnr.mo.gov/edmr/E2/Shared/Pages/Main/Login.aspx>.
  - d. Waivers from Electronic Reporting.
    - (1) The permittee must electronically submit reports unless a waiver is granted by the department in compliance with 40 CFR Part 127.
    - (2) The permittee may obtain a temporary or permanent electronic reporting waiver by first submitting an eDMR Waiver Request Form (Form 780-2692: <http://dnr.mo.gov/forms/780-2692-f.pdf>, by contacting the appropriate permitting office or emailing [edmr@dnr.mo.gov](mailto:edmr@dnr.mo.gov)). The department will either approve or deny this electronic reporting waiver request within 120 calendar days of receipt.
    - (3) Only permittees with an approved waiver request may submit reports on paper to the Department for the period that the approved electronic reporting waiver is effective.
2. Quarterly Reports: Permittees shall prepare a quarterly report with a list of active land disturbance sites including any off-site borrow or depositional areas associated with the construction project

and submit the following information electronically as an attachment to the eDMR system until such a time when the current or a new system is available to allow direct input of the data:

- a. The name of the project;
- b. The location of the project (including the county);
- c. The name of the primary receiving water(s) for each project;
- d. A description of the project;
- e. The number of acres disturbed;
- f. The percent of completion of the project;
- g. The projected date of completion.

The quarterly report(s) shall be maintained by the permittee and readily available for review by the department at the address provided on the application as well as submitted to the department quarterly via the department's eDMR system. When a permittee terminates permit coverage, the permittee shall submit with the request for termination, the final quarterly report for the current calendar quarter. The permittee shall submit quarterly reports according to Table A.

<b>Table A</b>		<b>Schedule for Quarterly Reporting</b>	
Activity for the months of:		Report is due:	
January, February, March (1st Quarter)		April 28	
April, May, June (2nd Quarter)		July 28	
July, August, September (3rd Quarter)		October 28	
October, November, December (4th Quarter)		January 28	

3. This permit is to ensure the design, installation and maintenance of effective erosion and sediment controls minimize the discharge of pollutants by:
  - a. Controlling stormwater volume and velocity within the site to minimize soil erosion;
  - b. Controlling stormwater discharges, including both peak flow rates and total stormwater volume, to minimize erosion at outlets and to minimize downstream channel and stream bank erosion and scour in the immediate vicinity of discharge points;
  - c. Minimizing the amount of soil exposed during construction activity;
  - d. Minimizing the disturbance of steep slopes;
  - e. Addressing factors such as the amount, frequency, intensity and duration of precipitation, the nature of resulting stormwater runoff, and soil characteristics, including the range of soil particle size expected to be present on the site to minimize sediment discharges from the site;
  - f. Providing and maintaining natural buffers around surface waters as detailed in 10.f,
  - g. Directing stormwater to vegetated areas to increase sediment removal and maximize stormwater infiltration and filtering, unless infeasible; and
  - h. Minimizing soil compaction and, unless infeasible, preserve topsoil. Minimizing soil compaction or preserving topsoil is not required where the intended function of a specific area of the site dictates that it be compacted or the topsoil be disturbed or removed.
4. Installation of Best Management Practices (BMPs) necessary to prevent soil erosion at the project boundary must be complete prior to the start of all phases of construction.
5. Install sediment controls along any perimeter areas of the site..
  - a. Remove any sediment per the manufacturer's instructions or before it has accumulated to one-half of the above-ground height of any perimeter control.
  - b. For sites where perimeter controls are infeasible, other practices shall be implemented to minimize discharges to perimeter areas of the site.
6. BMPs shall be maintained and remain in effective operating condition during the entire duration of the project, with repairs made within the timeframe specified in the Requirements Section 9 of this permit, until final stabilization has been achieved.
7. Minimize sediment track-out from the site.
  - a. Restrict vehicle traffic to properly designed exit points such as an aggregate stone with an underlying geotextile or non-woven filter fabric.

- b. Use appropriate stabilization techniques at all points that exit onto paved roads.
  - c. Remove any sediment that has been tracked out within the same business day or by the end of the next business day if track-out occurs on a non-business day.
8. SWPPP Development and Implementation: The primary requirement of this permit is the development and implementation of a SWPPP which incorporates site-specific practices to best minimize the soil exposure, soil erosion, and the discharge of pollutants. The permittee shall fully implement the provisions of the SWPPP required under this part as a condition of this general permit throughout the term of the land disturbance project. **The SWPPP must be developed prior to issuance of the permit and must be updated with details specific to the land disturbance site prior to conducting any land disturbance activities at the site.** Either an electronic copy or a paper copy of the SWPPP must be accessible to anyone on-site at all times when land disturbance operations are in progress, or other operational activities that may affect the maintenance or integrity of the BMP structures and made available as specified under the Records Section of this permit.
9. The SWPPP must:
- a. List and describe all points of discharge to receiving water(s);
  - b. Incorporate required practices identified below;
  - c. Incorporate erosion control practices specific to site conditions;
  - d. Provide for maintenance and adherence to the plan;
  - e. Discuss whether or not additional authorizations, such as a Section 404 permit and associated Section 401 Water Quality Certification are required for the project; and
  - f. Name the person responsible for inspection, operation and maintenance of BMPs.

The purpose of the SWPPP is to ensure the design, implementation, management and maintenance of BMPs in order to prevent sediment and other pollutants in stormwater discharges associated with the land disturbance activities; compliance with the Missouri Water Quality Standards; and compliance with the terms and conditions of this general permit.

The following manuals are acceptable resources for the selection of appropriate BMPs. *Developing Your Stormwater Pollution Prevention Plan: A Guide for Construction Sites*, (Document number EPA 833-R-06-004) published by the United States Environmental Protection Agency (USEPA) in May 2007. This manual as well as other information, including examples of construction SWPPPs, is available at the USEPA internet site at <https://www.epa.gov/npdes/developing-stormwater-pollution-prevention-plan-swppp>; and the latest version of *Protecting Water Quality: A field guide to erosion, sediment and stormwater best management practices for development sites in Missouri*, published by the department is available on the department's internet site at <http://www.dnr.mo.gov/env/wpp/wpcp-guide.htm>.

The permittee is not limited to the use of these guidance manuals. Other guidance publications may be used to select appropriate BMPs. However, all BMPs should be described and justified in the SWPPP.

10. SWPPP Requirements: The following information and practices shall be provided for in the SWPPP:
- a. Nature of the Construction Activity: The SWPPP briefly must describe the nature of the construction activity, including:
    - (1) The function of the project (e.g., low density residential, shopping mall, highway, etc.);
    - (2) The intended sequence and timing of activities that disturb the soils at the site;
    - (3) Estimates of the total area expected to be disturbed by excavation, grading, or other construction activities including off-site borrow and fill areas; and
    - (4) A general map (e.g., United States Geological Survey quadrangle map, a portion of a city or county map, or other map) with enough detail to identify the location of the construction site and waters of the state within one mile of the site.

- b. Site Map: The SWPPP must contain a legible site map showing the site boundaries and points of discharge to receiving water(s) and identifying:
- (1) Direction(s) of stormwater flow and approximate slopes for all phases of construction activities;
  - (2) Areas of soil disturbance and areas that will not be disturbed (or a statement that all areas of the site will be disturbed unless otherwise noted);
  - (3) Location of permanent and temporary structural and non-structural BMPs identified in the SWPPP;
  - (4) Locations where stabilization practices are expected to occur;
  - (5) Locations of off-site material, waste, borrow or equipment storage areas;
  - (6) Locations of all waters of the state (including wetlands);
  - (7) Locations where stormwater discharges to a surface water; and
  - (8) Areas where final stabilization has been accomplished and no further construction-phase permit requirements apply.
- c. Site Description: In order to identify the site, the SWPPP shall include facility and points of discharge to receiving water(s) information. The SWPPP shall have sufficient information to be of practical use to contractors and site construction workers to guide the installation and maintenance of BMPs.
- d. Selection of Temporary and Permanent BMPs: The permittee shall select, install, use, operate and maintain appropriate BMPs for the permitted site and list them in the SWPPP.
- e. Preservation of trees and vegetation: The SWPPP shall require existing vegetation and trees to be preserved where practical.
- f. Surface Water Buffers: For surface waters of the state, defined as “all waters within the jurisdiction of this state, including all rivers, streams, lakes and other bodies of surface and subsurface water lying within or forming a part of the boundaries of the state which are not entirely confined and located completely upon lands owned, leased or otherwise controlled by a single person or by two or more persons jointly or as tenants in common, located on or adjacent to the site,” the permittee must comply with (1)-(3), except as noted in (4):
- (1) Provide and maintain a 50-foot undisturbed natural buffer;
  - (2) Provide and maintain an undisturbed natural buffer that is less than 50 feet and is supplemented by erosion and sediment controls that achieve the sediment load reduction equivalent to a 50-foot undisturbed natural buffer; or
  - (3) If infeasible to provide and maintain an undisturbed natural buffer of any size, implement erosion and sediment controls to achieve the sediment load reduction equivalent to a 50-foot undisturbed natural buffer.
  - (4) The permittee is not required to comply with (1), (2) or (3) above if one of the following exceptions apply and documentation is provided in the SWPPP:
    - (a) As authorized per Clean Water Act Section 404 Department of the Army permit and its associated Section 401 Water Quality Certification from the department.
      1. The angle of any crossing shall be as perpendicular as feasible to the water course or natural stream buffer to minimize adverse impacts.
    - (b) If there is no discharge of stormwater to waters of the state through the area between the disturbed portions of the site and waters of the state located within 50 feet of your site. This includes situations where you have implemented permanent control measures that will prevent such discharges, such as a berm or other barrier.
    - (c) Where no natural buffer exists due to preexisting development disturbances that occurred prior to the initiation of planning for the current development of the site.
      1. Where some natural buffer exists but portions of the area within 50 feet of the waters of the state are occupied by preexisting development disturbances, you are required to comply with (1), (2), or (3) above.
    - (d) For linear projects where site constraints make it infeasible to implement a buffer or equivalent provided you limit disturbances within 50 feet of any waters of the state and/or you provide supplemental erosion and sediment controls to treat stormwater

- discharges from earth disturbances within 50 feet of the water of state.
- (e) For small residential lot construction as defined as 'a lot being developed for residential purposes that will disturb less than 1 acre of land, but is part a larger common plan of development or sale,' one has the option of complying with (1), (2) or (3) above or one of the following alternatives:
    - 1. Tiered-technology approach where:
      - a. A 50-foot or larger buffer is retained, no additional requirements are needed,
      - b. The buffer is greater than 30 feet but less than 50 feet wide, implement double perimeter controls spaced a minimum of at least 5 feet apart between land disturbance and water of the state, or
      - c. A less than or equal to 30-foot buffer is maintained, implement double perimeter controls between land disturbance and water of the state and stabilization activities completed with 7 calendar days of temporary or permanent cessation of land disturbance; or
    - 2. Sediment discharge risk based on the site's slope, location and soil type when combined with buffer width.
  
  - g. Measuring Buffer Width: Where the permittee is retaining a buffer of any size, the buffer should be measured perpendicularly from any of the following points, whichever is further landward from the water:
    - (1) The ordinary high water mark of the water body, defined as the line on the shore established by fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, and/or the presence of litter and debris; or
    - (2) The edge of the stream or river bank, bluff, or cliff, whichever is applicable.
  
  - h. Description of BMPs: The SWPPP shall include a description of both structural and non-structural BMPs used one or more times at the site, providing the following general information for each:
    - (1) Physical description of the BMP;
    - (2) Site conditions that must be met for effective use of the BMP;
    - (3) BMP installation/construction procedures, including typical drawings; and
    - (4) Operation and maintenance procedures for the BMP.
  
  - i. Specific Instance of BMPs: The SWPPP shall provide the following information for each specific instance where a BMP is to be installed:
    - (1) Whether the BMP is temporary or permanent;
    - (2) Where, in relation to other site features, the BMP is to be located;
    - (3) When the BMP will be installed in relation to each phase of the land disturbance procedures to complete the project; and
    - (4) Site conditions that must be met before removal of the BMP if the BMP is not a permanent BMP.
  
  - j. Disturbed Areas: Slopes for disturbed areas must be defined in the SWPPP. A site map or maps defining the sloped areas for all phases of the project must be included in the SWPPP.
    - (1) For soil disturbing activities that have temporarily ceased on any portion of the site and will not resume for a period exceeding 14 calendar days:
      - (a) The permittee shall construct BMPs to establish interim stabilization; and
      - (b) Stabilization must be initiated immediately and completed within 14 calendar days.
    - (2) For soil disturbing activities that have been permanently ceased on any portion of the site, final stabilization of disturbed areas must be initiated immediately and completed within 14 calendar days.
    - (3) Allowances to the 14 day completion period for temporary and final stabilization may be made due to weather and equipment malfunctions. In drought-stricken areas where initiating vegetative stabilization measures immediately are infeasible, alternative stabilization measures must be employed. The use of allowances shall be documented in the SWPPP.

- (4) Interim stabilization shall consist of well-established and maintained BMPs that are reasonably certain to protect waters of the state from sediment pollution over an extended period of time. This may require adding more BMPs to an area than is normally used during daily operations. These BMPs may include a combination of sediment basins, check dams, sediment fences and mulch. The types of BMPs used must be suited to the area disturbed, taking into account the number of acres exposed and the steepness of the slopes. If the slope of the area is greater than 3:1 (three feet horizontal to one foot vertical) or if the slope is greater than 3% and greater than 150 feet in length, then the permittee shall establish interim stabilization within seven days of ceasing operations on that part of the site.
  - (5) In limited circumstances, stabilization may not be required if the intended function of a specific area of the site necessitates that it remain disturbed.
- k. Installation: The permittee shall ensure the BMPs are properly installed at the locations and relative times specified in the SWPPP.
- (1) Peripheral or border BMPs to control runoff from disturbed areas shall be installed or marked for preservation before general site clearing is started. Note that this requirement does not apply to earth disturbances related to initial site clearing and establishing entry, exit and access of the site, which may require that stormwater controls be installed immediately after the earth disturbance.
  - (2) For phased projects, BMPs shall be properly installed as necessary prior to construction activities.
  - (3) Stormwater discharges from disturbed areas which leave the site shall pass through an appropriate impediment to sediment movement such as a sedimentation basin, sediment traps and/or silt fences prior to leaving the land disturbance site.
  - (4) A drainage course change shall be clearly marked on a site map and described in the SWPPP.
  - (5) If vegetative stabilization measures are being implemented, stabilization is considered “installed” when all activities necessary to seed or plant the area are completed.
- l. Sedimentation Basins: The SWPPP shall include a sedimentation basin for each drainage area with ten or more acres disturbed at one time.
- (1) The sedimentation basin shall be sized to a local 2-year, 24-hour storm. A 2-year, 24-hour storm event shall be determined for the project location using the National Oceanic and Atmospheric Administration’s National Weather Service Atlas 14 which can be located at <http://hdsc.nws.noaa.gov/hdsc/pfds/>.
  - (2) Basins designed and initiated under the 2012 Area-Wide Land Disturbance General Permit MO-R100000 or prior authorizations shall comply with the requirements held in those authorizations. Any construction activities designed and initiated under this authorization shall comply with the local 2-year, 24-hour storm event by January 1, 2018.
  - (3) Accumulated sediment shall be removed from the basin when basin is 50% full.
  - (4) Utilize outlet structures that withdraw water from the surface when discharging from basins and impoundments unless infeasible.
  - (5) Discharges from the basin shall not cause scouring of the banks or bottom of the receiving stream.
  - (6) The SWPPP shall require the basin be maintained until final stabilization of the disturbed area served by the basin.
  - (7) The SWPPP shall require both temporary and permanent sedimentation basins to have a stabilized spillway to minimize the potential for erosion of the spillway or basin embankment.
  - (8) Where use of a sediment basin is infeasible, the SWPPP shall evaluate and specify other similarly effective BMPs to be employed to control erosion and sediment delivery. These similarly effective BMPs shall be selected from appropriate BMP guidance documents authorized by this permit. The BMPs must provide equivalent water quality protection to achieve compliance with this permit.

- m. Pollution Prevention Measures: The SWPPP shall include BMPs for pollution prevention measures. At minimum such measures must be designed, installed, implemented and maintained to:
    - (1) Minimize the discharge of pollutants from equipment and vehicle washing, wheel wash water, and other wash waters. Wash waters must be treated in a sediment basin or alternative control that provides equivalent or better treatment prior to discharge;
    - (2) Minimize the exposure of building materials, building products, construction wastes, trash, landscape materials, fertilizers, pesticides, herbicides, detergents, sanitary waste, and other materials present on the site to precipitation and to stormwater. Minimization of exposure is not required in cases where the exposure to precipitation and to stormwater will not result in a discharge of pollutants, or where exposure of a specific material or product poses little risk or stormwater contamination (such as final products and material intended for outdoor use);
    - (3) Minimize the discharge of pollutants from spills and leaks and implement chemical spill and leak prevention and response procedures. Included but not limited to the installation of containment berms and use of drip pans at petroleum product and liquid storage tanks and containers; and
  - n. Roadways: Where applicable, upon installation of or connection to roadways, all efforts should be made to prevent the deposition of earth and sediment onto roadways through the use of proper BMPs.
    - (1) Stormwater inlets susceptible to receiving sediment from the permitted land disturbance site shall have curb inlet protection.
    - (2) Where stormwater will flow off the end of where a roadway terminates, a sediment catching BMP such as gravel berm or silt fence shall be provided.
    - (3) Curb inlets shall be cleaned weekly or following a precipitation event that generates a run-off.
  - o. Dewatering: Discharges from dewatering activities, including discharges from dewatering of trenches and excavations, are prohibited unless managed by appropriate controls. The SWPPP shall include a description of any anticipated dewatering methods.
    - (1) The SWPPP shall call for specific BMPs designed to treat water pumped from trenches and excavations and in no case shall this water be pumped off-site without being treated by the specified BMPs.
11. Good housekeeping practices shall be maintained at all times to keep waste from entering waters of the state. Solid and hazardous waste management include providing trash containers and regular site cleanup for proper disposal of solid waste such as scrap building material, product/material shipping waste, and food containers and cups, and providing containers and proper disposal of waste paints, solvents and cleaning compounds. The provision of portable toilets for proper disposal of sanitary sewage and the storage of construction materials should be kept away from drainage courses and low areas.
12. All fueling facilities present shall at all times adhere to applicable federal and state regulations concerning underground storage, above ground storage and dispensers.
13. Hazardous substances that are transported, stored, or used for maintenance, cleaning, or repair shall be managed according to the provisions of the Missouri Hazardous Waste Laws and Regulations.
14. Containers: All paint, solvents, petroleum products, petroleum waste products and storage containers such as drums, cans, or cartons shall be stored according to BMPs. The materials exposed to precipitation shall be stored in watertight, structurally sound, closed containers. All containers shall be inspected for leaks or spillage during the inspection of BMPs.

15. Amending/Updating the SWPPP: The permittee shall amend and update the SWPPP as appropriate during the term of the land disturbance activity. The permittee shall amend the SWPPP at a minimum whenever the:
  - a. Design, operation, or maintenance of BMPs is changed;
  - b. Design of the construction project is changed that could significantly affect the quality of the stormwater discharges;
  - d. Department notifies the permittee in writing of deficiencies in the SWPPP;
  - e. SWPPP is determined to be ineffective in minimizing or controlling erosion and sedimentation (e.g., there is visual evidence of excessive site erosion or excessive sediment deposits in streams or lakes); and/or
  - f. Department determines violations of water quality standards may occur or have occurred.
  
16. An individual shall be designated by the permittee as the lead for environmental matters. The lead individual for environmental matters shall have a thorough and demonstrable knowledge of the site's SWPPP and sediment and erosion control practices in general. The lead individual for environmental matters or a designated inspector knowledgeable in erosion, sediment and stormwater control principles shall inspect all structures that function to prevent pollution of waters of the state
  
17. Site Inspections: The permittee (or a representative of the permittee) shall conduct regularly scheduled inspections.
  - a. These inspections shall be conducted by a qualified person, one who is responsible for environmental matters at the site, or a person trained by and directly supervised by the person responsible for environmental matters at the site.
  - b. Inspections are only required during the project's normal working hours.
  - c. For disturbed areas that have not been finally stabilized, all installed BMPs and other pollution control measures shall be inspected for proper installation, operation and maintenance.
  - d. Areas on-site that have been stabilized must be inspected at least once per month.
    - (1) For areas where disturbed portions have undergone temporary stabilization at the same time active construction continues on other areas, inspections shall occur at least once a month while stabilized and when re-disturbed shall follow either frequency outlined in subsection h. below.
    - (2) For areas where disturbed portions have undergone final stabilization at the same time active construction continues on other areas, inspection frequency may be cease on the finally stabilized areas according to the following:
      - (a) After the first monthly inspection, inspect once more within 24 hours of a storm event of 0.25 inches or greater.
      - (b) If there are no issues or evidence of stabilization problems, further inspections may cease.
      - (c) If unstable site conditions or sediment movement are observed, the site must be re-stabilized and monthly inspections shall occur until final stabilization is confirmed following a storm event of 0.25 inches or greater.
  - e. All stormwater outfalls shall be inspected for evidence of erosion or sediment deposition.
  - f. When practicable the receiving stream shall also be inspected for 50 feet downstream of the outfall.
  - g. Any structural or maintenance problems shall be noted in an inspection report and corrected as soon as possible but no more than seven calendar days after the inspection.
    - (1) If weather conditions prevent correction of BMPs within seven calendar days, the reasons for the delay must be documented (including pictures) and there must be a narrative explaining why the work cannot be accomplished within the seven day time period.
    - (2) The documentation must be filed with the regular inspection reports.
    - (3) The permittee shall correct the problem as soon as weather conditions allow.
  - h. All BMPs must be inspected in accordance to one of the two schedules listed below, and any

changes to the frequency of inspections, including switching between the options listed below, must be documented in the SWPPP:

- (1) At least once every seven calendar days and within 48 hours after any storm event equal to or greater than a 2-year, 24-hour storm has ceased during a normal work day and within 72 hours if the event ceases during a non-work day such as a weekend or holiday;  
or
  - (2) Once every 14 calendar days and within 24 hours of the occurrence of a storm event of 0.25 inches or greater or the occurrence of runoff from snowmelt. To determine if a storm event of 0.25 inches or greater has occurred on-site, the permittee must either keep a properly maintained precipitation gauge on site, or obtain the storm event information from a weather station near the site.
    - (a) Inspections shall be conducted within 24 hours once a storm event has produced 0.25 inches within a 24 hour period, even if the storm event is still continuing.
    - (b) If the permittee has elected to inspect every 14 calendar days and there is a storm event at the site that continues for multiple days, and each day of the storm produces 0.25 inches or more of rain, the permittee is required to conduct an inspection within 24 hours of the first day of the storm and within 24 hours after the end of the storm.
18. The SWPPP must explain how the person responsible for erosion control will be notified when stormwater runoff occurs
19. Site Inspections Reports: A log of each inspection and copy of the inspection report shall be kept readily accessible and must be available upon request by the department. Electronic logs are acceptable as long as reports can be provided in a timely manner. If inspection reports are kept off-site, the SWPPP must indicate where they are stored. The inspection report shall be signed by the permittee or by the person performing the inspection if duly authorized to do so. The inspection report is to include the following minimum information:
- a. Inspector's name;
  - b. Date of inspection;
  - c. Observations relative to the effectiveness of the BMPs;
  - d. Actions taken or necessary to correct the observed problem; and
  - e. Listing of areas where land disturbance operations have permanently or temporarily stopped.
20. Notification to All Contractors: The permittee shall be responsible for notifying each contractor or entity (including utility crews and city employees or their agents) who will perform work at the site of the existence of the SWPPP and what action or precautions shall be taken while on-site to minimize the potential for erosion and the potential for damaging any BMP. The SWPPP shall contain a record of notification; for example, a list of contractors or entities given a copy of the SWPPP or education session sign-in sheet. The permittee is responsible for any damage a subcontractor may do to established BMPs and any subsequent water quality violation resulting from the damage.
21. Public Notification: The permittee shall post a copy of the public notification sign on page 15 of this permit at the main entrance to the site. The public notification sign must be visible from the public road that provides access to the site's main entrance. An alternate location is acceptable provided the public can see it and it is noted in the SWPPP. The public notification sign must remain posted at the site until the permit has been terminated.

## OTHER DISCHARGES

A record of each reportable release of hazardous substance shall be retained with the SWPPP and made available to the department upon request. The department may also require the submittal of a written or electronic report detailing measures taken to clean up the spill within five (5) days of the spill. Such a report must include the type of material spilled, volume, date of spill, date clean-up was completed, clean-up method, and final disposal method.

## SAMPLING REQUIREMENTS AND EFFLUENT LIMITATIONS

The department may require sampling and reporting as a result of illegal discharges, compliance issues, complaint investigations, or other such evidence of contamination from activities at the site. If such an action is needed, the department will specify in writing any sampling requirements, including such information as location, extent and parameters.

## RECORDS

1. The permittee shall retain copies of this general permit, the SWPPP and all amendments for the site, results of any monitoring and analysis, and all site inspection records. The records shall be accessible during normal business hours. The records shall be retained for a period of at least three years from the date of the Letter of Termination.
2. The permittee shall provide a copy of the SWPPP to the department, USEPA, or any local agency or government representative if they request a copy in the performance of their official duties.
3. The permittee shall provide a copy of the SWPPP to those who are responsible for installation, operation, or maintenance of any BMP. The permittee, their representative, and/or the contractor(s) responsible for installation, operation and maintenance of the BMPs shall have a current copy of the SWPPP with them when on the project site.

## LAND PURCHASE AND CHANGE OF OWNERSHIP

1. If the permittee sells any portion of the permitted site to a developer for commercial, industrial, or residential use, this land remains a part of the common sale and the new owner must obtain a permit prior to conducting any land disturbance activity. Therefore, the original permittee must amend the SWPPP to show that the property has been sold and therefore no longer under the original permit coverage.
2. Property of any size which is part of a larger common plan of development where the property has been stabilized and the original permit terminated will require application of a new land disturbance permit for any future land disturbance activity unless exempted per 10 CSR 20-6.010(1)(B), 10 CSR 20-6.200(1)(B), and 40 CFR 122.26(a)(2)(ii).
3. If the entire tract is sold to a single entity, then this permit shall be terminated when the new owner obtains a new land disturbance permit for the site.
4. If a portion of a larger common plan of development is sold to an individual for the purpose of building his or her own private residence, a permit is required if the portion of land sold is equal to or greater than one acre while no permit is required for less than one acre of land sold.

## TERMINATION

This permit may be terminated when all projects are stabilized. The project is considered to be finally stabilized when perennial vegetation, pavement, buildings, or structures using permanent materials cover all areas that have been disturbed. With respect to areas that have been vegetated, vegetation cover shall be at least 70% over 100% of the site. In order to terminate the permit, the permittee shall notify the department by submitting *Form H- Request for Termination of a General Permit* (<http://dnr.mo.gov/forms/780-1409-f.pdf>).

## DUTY TO REAPPLY

Unless terminated, the permittee shall submit an application for the renewal of this permit by submitting *Form E-Application for General Permit* (<http://dnr.mo.gov/forms/780-0795-f.pdf>) and

*Form G – Application for Stormwater Permit Under the General Permit: Land Disturbance* (<http://dnr.mo.gov/forms/780-1408-f.pdf>) no later than thirty (30) days prior to the permit's expiration date. If a facility submits a timely and complete application in accordance with 10 CSR 20-6.010(5)(B), (5)(C), and (10)(E)1, as well as § 644.051.10, RSMo 2015, if the department is unable, through no fault of the permittee, to issue a renewal prior to expiration of the previous permit, the terms and conditions of the expired permit are administratively continued and will remain fully effective and enforceable until such time when a permit action is taken. Failure to submit a renewal application for a facility that is still in operation is a violation of the Missouri Clean Water Law. As part of the complete application and as required by the federal NPDES eReporting rule, participation in the department's Electronic Discharge Monitoring Report Submission System (eDMR) will be required. Facilities already participating in eDMR need not re-apply upon renewal. More information can be found at: <http://dnr.mo.gov/env/wpp/edmr.htm>. Failure to apply for renewal of a permit may result in termination of this permit and enforcement action to compel compliance with this condition and the Missouri Clean Water Law. This permit may be applied for and issued electronically once made available by the director in accordance with Section 644.051.10, RSMo.

#### MODIFICATION, REVOCATION, AND REOPENING

1. The full implementation of this operating permit shall constitute compliance with all applicable federal and state statutes and regulations in accordance with §644.051.16, RSMo, and the CWA section 402(k); however, this permit may be reopened and modified, or alternatively revoked and reissued to comply with any applicable effluent standard or limitation issued or approved under Sections 301(b)(2)(C) and (D), 304(b)(2), and 307(a) (2) of the Clean Water Act, if the effluent standard or limitation so issued or approved:
  - a. contains different conditions or is otherwise more stringent than any effluent limitation in the permit; or
  - b. controls any pollutant not limited in the permit.
2. If this permit is reopened, modified or revoked pursuant to this Section, the permittee retains all rights under Chapter 536 and 644 Revised Statutes of Missouri upon the department's reissuance of the permit as well as all other forms of administrative, judicial, and equitable relief available under law.

#### STANDARD CONDITIONS

These Standard Conditions incorporate permit conditions as required by 40 CFR 122.41 or other applicable state statutes or regulations. These minimum conditions apply unless superseded by requirements specified in the permit.

1. Other Information: Where the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report to the department, it shall promptly submit such facts or information.
2. Duty to Comply: The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Missouri Clean Water Law and Federal Clean Water Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or denial of a permit renewal application.
3. Duty to Provide Information: The permittee shall furnish to the department, within a reasonable time, any information which the department may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit or to determine compliance with this permit. The permittee shall also furnish to the department upon request, copies of records required to be kept by this permit.

4. Inspection and Entry: The permittee shall allow the department, or an authorized representative (including an authorized contractor acting as a representative of the department), upon presentation of credentials and other documents as may be required by law, to:
  - a. Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of the permit;
  - b. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;
  - c. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and
  - d. Sample or monitor at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by the Federal Clean Water Act or Missouri Clean Water Law, any substances or parameters at any location.
  
5. Signatory Requirement:
  - a. All permit applications, reports required by the permit, or information requested by the department shall be signed and certified. (See 40 CFR 122.22 and 10 CSR 20-6.010)
  - b. The Federal Clean Water Act provides that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or non-compliance shall, upon conviction, be punished by a fine of not more than \$10,000 per violation, or by imprisonment for not more than six (6) months per violation, or by both.
  - c. The Missouri Clean Water Law provides that any person who knowingly makes any false statement, representation or certification in any application, record, report, plan, or other document filed or required to be maintained pursuant to sections 644.006 to 644.141 shall, upon conviction, be punished by a fine of not more than ten thousand dollars, or by imprisonment for not more than six months, or by both.



Missouri  
Department of  
Natural Resources

STORMWATER DISCHARGES  
FROM THIS LAND DISTURBANCE  
SITE ARE AUTHORIZED BY THE  
MISSOURI STATE OPERATING  
PERMIT NUMBER:

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ANYONE WITH QUESTIONS OR  
CONCERNS ABOUT  
STORMWATER DISCHARGES  
FROM THIS SITE, PLEASE  
CONTACT THE MISSOURI  
DEPARTMENT OF NATURAL  
RESOURCES AT

**1-800-361-4827**

**Missouri Department of Natural Resources**  
**Fact Sheet**  
**MO-R100000**

The Federal Water Pollution Control Act [Clean Water Act (CWA)] Section 402 of Public Law 92-500 (as amended) established the National Pollution Discharge Elimination System (NPDES) permit program. This program regulates the discharge of pollutants from point sources into the waters of the United States, and the release of stormwater from certain point sources. All such discharges are unlawful without a permit (Section 301 of the CWA). After a permit is obtained, a discharge not in compliance with all permit terms and conditions is unlawful. Missouri State Operating Permits (permit) are issued by the Missouri Department of Natural Resources (department) under an approved program, operated in accordance with federal and state laws (Federal CWA and Missouri Clean Water Law Section 644 as amended). Permits are issued for a period of five (5) years unless otherwise specified.

Per 40 CFR 124.56, 40 CFR124.8, and 10 CSR 20-6.020(1)(A)2., a Fact Sheet shall be prepared to give pertinent information regarding the applicable regulations, rationale for the development of effluent limitations and conditions, and the public participation process for the permit. A Fact Sheet is not an enforceable part of a permit.

This Fact Sheet is for a:

- Major
- Minor
- Industrial Facility
- Variance
- Master General Permit
- Permit with widespread public interest

**Definitions**

**Common Promotional Plan:** A plan undertaken by one (1) or more persons, to offer lots for sale or lease; where land is offered for sale by a person or group of persons acting in concert, and the land is contiguous or is known, designated or advertised as a common unit or by a common name or similar names, the land is presumed, without regard to the number of lots covered by each individual offering, as being offered for sale or lease as part of a common promotional plan.

**Immediately:** For the purposes of this permit, immediately should be defined as within 24 hours.

**Infeasible:** Infeasible means not technologically possible, or not economically practicable and achievable in light of best industry practices.

**Larger Common Plan of Development or Sale:** A contiguous area where multiple separate and distinct construction activities are occurring under one plan.

**Non-structural Best Management Practice:** Institutional, educational or pollution prevention practices designed to limit the amount of stormwater runoff or pollutants that are generated in the landscape. An example includes ordinance development.

**Ordinary High Water Mark:** The line on the shore established by fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation and/or the presence of litter and debris.

**Peripheral:** For the purposes of this permit, peripheral should be defined as the outermost boundary of the area that will be disturbed.

**Permanently:** For the purposes of this permit, permanently should be defined as any activity that has been

ceased without any intentions of future disturbance.

**Structural Best Management Practice:** Physical controls working individually or as a group, appropriate to the source, location, and area climate for the pollutant to be controlled. Examples include moving earth for sedimentation basin and planting vegetation.

**Waters of the state:** Section 644.016.1(27), RSMo defines waters of the state as, "All waters within the jurisdiction of this state, including all rivers, streams, lakes and other bodies of surface and subsurface water lying within or forming a part of the boundaries of the state which are not entirely confined and located completely upon lands owned, leased or otherwise controlled by a single person or by two or more persons jointly or as tenants in common."

## **Part I – Facility Information**

Facility Type: Industrial Stormwater  
Facility Description: Construction or land disturbance activity (e.g., clearing, grubbing, excavating, grading, filling, and other activities that result in the destruction of the root zone and/or land disturbance activity that is reasonably certain to cause pollution to waters of the state).

This permit establishes a SWPPP requirement to minimize pollutants of concern from this type of facility or for all facilities covered under this permit. 10 CSR 20-6.200(6)(A)7. specifies that "general permits shall contain BMP requirements and/or monitoring and reporting requirements to keep the stormwater from becoming contaminated." Local conditions are not considered when developing conditions for a general permit. A facility may apply for a site-specific permit if they desire a review of local conditions.

While drafting this permit for renewal, the department hosted four public meetings on January 27, February 24, April 18, and May 19, 2016, which allowed stakeholders to voice concerns about conditions within the permit and submit comments during the period of initial involvement. These concerns were taken into consideration when drafting the permit.

## **Part II – Receiving Stream Information**

### **APPLICABLE DESIGNATIONS OF WATERS OF THE STATE:**

Per Missouri Effluent Regulations (10 CSR 20-7.015), the waters of the state are divided into seven (7) categories. This permit applies to facilities discharging to the following water body categories:

Please mark all appropriate designated waters of the state categories of the receiving stream.

- Missouri or Mississippi River [10 CSR 20-7.015(2)]
- Lakes or Reservoirs [10 CSR 20-7.015(3)]
- Losing Streams [10 CSR 20-7.015(4)]
- Metropolitan No-Discharge Streams [10 CSR 20-7.015(5)]
- Special Streams [10 CSR 20-7.015(6)]
- Subsurface Waters [10 CSR 20-7.015(7)]
- All Other Waters [10 CSR 20-7.015(8)]

Missouri Water Quality Standards (10 CSR 20-7.031) defines the Clean Water Commission water quality objectives in terms of "water uses to be maintained and the criteria to protect those uses." The receiving stream and/or 1<sup>st</sup> classified receiving stream's beneficial water uses shall be maintained in accordance with 10 CSR 20-7.031(4). The BMP requirement established by this permit are intended to be protective of all streams that fall within the categories of receiving water bodies indicated above. A general permit does not take into consideration site-specific conditions.

### **Part III – Applicability**

Condition number 5 includes support activities. Those support activities are to become part of the land disturbance permitted area and included in the acreage calculations, whether the support activities are located adjacent to, on-site or off-site from the main land disturbance construction area. For example, if the main land disturbance site is 0.6 acres and the project needs fills that is gathered from a borrow site specific to this project which equals 0.5 acres, then the total acreage for this project is an acre or more and the conditions of this permit apply to both the main construction area and the borrow area.

Condition number 14 was expanded to include a more comprehensive list of state and federal requirements that must be taken into consideration.

If the proposed project encounters and will potentially affect a species of concern, please report it to the Missouri Department of Conservation and the United States Fish and Wildlife Service. For more information about requirements of the Endangered Species Act, please visit the following links:

1. To determine the potential for species of concern within or near a project, please visit the United States Fish and Wildlife Services’ “Information, Planning and Conservation” website at <http://ecos.fws.gov/ipac/>.
2. If there are listed species in the county or township, check to see if critical habitat has been designated and if that area overlaps or is near the project area. Critical habitat designations and associated requirements may also be found at 50 CFR Parts 17 and 226. For additional information, use the map view tool at <http://criticalhabitat.fws.gov/crithab/> to find data specific to the state and county.

The Missouri Department of Conservation’s internet site for the Natural Heritage Review may be very helpful and can be found at the following link, <https://naturalheritagereview.mdc.mo.gov/>.

### **Part IV – Exemptions**

Condition Number 2 was added to cite all state exemptions from permitting requirements, combining several previous cited exemptions into one condition and reference. This includes an exemption for linear construction where the entire disturbance, including clearing of land to access the linear disturbance, is less than two feet in width.

Condition Number 3 was added to cite federal regulations that exclude land disturbance projects related to the installation or maintenance work for oil and gas related activities.

### **Part V – Rationale of Technology Based Limitations & Permit Conditions**

#### **303(d) LIST & TOTAL MAXIMUM DAILY LOAD (TMDL):**

Section 303(d) of the Federal CWA requires that each state identify waters that are not meeting Water Quality Standards and for which adequate water pollution controls have not been required. Water Quality Standards protect such beneficial uses of water as whole body contact, maintaining fish and other aquatic life, and providing drinking water for people, livestock, and wildlife. The 303(d) list helps state and federal agencies keep track of waters that are impaired but not addressed by normal water pollution control programs.

#### **ANTI-BACKSLIDING:**

A provision in the Federal Regulations [CWA Section 303(d) (4); CWA Section 402(c); 40 CFR Part 122.44(I)] that requires a reissued permit to be as stringent as the previous permit with some exceptions.

- Applicable: Backsliding proposed in this permit conforms to the anti-backsliding provisions of Section 402(o) of the CWA and 40 CFR 122.44. The department has determined that technical mistakes were made in the previous permit [CWA 402(o)(2)(B)(ii)]. The Department has determined that technical mistakes or mistaken interpretations of law were made in issuing the

permit under section 402(a)(1)(b).

**Settleable Solids:** The Settleable Solids limitation was removed since has been determined to not be a statewide technology or water quality based limitation given a variability of soil type in the state. Increased technology based best management practices have been included and are a more appropriate technology based requirement.

**Water Quality Standard Narrative Prohibitions.** The previous permit contained language which referenced narrative compliance with the water quality standards found in 10 CSR 20-7.031. In order to comply with 40 CFR 122.44(d)(1), the permit writer has conducted reasonable potential determinations for each general and applicable specific criterion and established numeric effluent limitations where reasonable potential exists. While the removal of the previous permit language creates the appearance of backsliding, the permit writer has evaluated discharges associated with this general permit as to whether reasonable potential to cause excursions of specific or general criteria on a statewide level and found that no reasonable potential exists given the proper implementation of a Stormwater Pollution Prevention Plan and associated best management practices and that the requirements of this permit are equally protective as compared to the previous permit. Therefore, given this new information, and the fact that the previous permit special condition was not consistent with 40 CFR 122.44(d)(1), an error occurred in the establishment of the general criteria as a special condition of the previous permit.

**ANTIDEGRADATION:**

Antidegradation policies ensure protection of water quality for a particular water body on a pollutant by pollutant basis to ensure Water Quality Standards are maintained to support beneficial uses such as fish and wildlife propagation and recreation on and in the water. This also includes special protection of waters designated as an Outstanding National Resource Water or Outstanding State Resource Water [10 CSR 20-7.031(3) (C)]. Antidegradation policies are adopted to minimize adverse effects on water. The department has determined that the best avenue forward for implementing the Antidegradation requirements into general permits is by requiring the appropriate development and maintenance of a SWPPP. The SWPPP must identify all Best Management Practices (BMPs) that are reasonable and effective, taking into account environmental impacts and costs. This analysis must document why no discharge or no exposure options are not feasible at the facility. This selection and documentation of appropriate control measures will then serve as the analysis of alternatives and fulfill the requirements of the Antidegradation Rule and Implementation Procedure 10 CSR 20-7.031(3) and 10 CSR 20-7.015(9)(A)5.

Any facility seeking coverage under this permit, which undergoes expansion or discharges a new pollutant of concern, must update their SWPPP and select new BMPs that are reasonable and cost effective. New facilities seeking coverage under this permit are required to develop a SWPPP that includes this analysis and documentation of appropriate BMPs. Renewal of coverage for a facility requires a review of the SWPPP to assure that the selected BMPs continue to be appropriate.

- Applicable: The main pollutant of concern in this permit is sediment. Compliance with the technology-based limitations established in this permit for the protection of General Criteria, along with the evaluation and implementation of BMPs as documented in the SWPPP, meets the requirements of Missouri's Antidegradation Review [10 CSR 20-7.031(3), 10 CSR 20-7.031 Table A, and 10 CSR 20-7.015(9)(A)5].

**STORMWATER POLLUTION PREVENTION PLAN (SWPPP):**

In accordance with 40 CFR 122.44(3)(k) Best Management Practices (BMPs), BMPs are implemented to control or abate the discharge of pollutants when: (1) Authorized under Section 304(e) of the CWA for the control of toxic pollutants and hazardous substances from ancillary industrial activities; (2) Authorized under Section 402(p) of the CWA for the control of stormwater discharges; (3) Numeric effluent limitations are infeasible; or (4) The practices are reasonably necessary to achieve effluent limitations and standards or to carry out the purposes and intent of the CWA.

In accordance with Developing Your Stormwater Pollution Prevention Plan, a Guide for Construction Sites (EPA 833-R-06-004; [https://www3.epa.gov/npdes/pubs/sw\\_swppp\\_guide.pdf](https://www3.epa.gov/npdes/pubs/sw_swppp_guide.pdf)) published by the United States Environmental Protection Agency (EPA) in May 2007, BMPs are measures or practices used to reduce the amount of pollution entering waters of the state. BMPs may take the form of a process, activity, or physical structure. EPA developed resources and tools related to construction stormwater along with the BMPs to control and minimize stormwater ( <https://www.epa.gov/npdes/stormwater-discharges-construction-activities>). Along with EPA's resources and tools, the International Stormwater BMP database ([www.bmpdatabase.org/index.htm](http://www.bmpdatabase.org/index.htm)) may provide guidance on BMPs appropriate for specific industries.

Additionally in accordance with Stormwater Management, a SWPPP is a series of steps and activities to (1) identify sources of pollution or contamination, and (2) select and carry out actions which prevent or control the pollution of stormwater discharges.

- Applicable: A SWPPP shall be developed and implemented for each site and shall incorporate required practices identified by the department with jurisdiction, incorporate erosion control practices specific to site conditions, and provide for maintenance and adherence to the plan.

The new permit has been revised to allow permittees to store SWPPP documents electronically as long as they can be provided in an expedient manner.

Release of a hazardous substance must be reported to the department in accordance with 10 CSR 24-3.010. If the spill occurs outside of normal business hours, or if the permit holder cannot reach regional office staff for any reason, the permit holder is instructed to report the spill to the department's 24 hour Environmental Emergency Response hotline at (573) 634-2436 at the earliest practicable moment after discovery. Leaving a message on a department staff member voice-mail does not satisfy this reporting requirement.

#### **WATER QUALITY STANDARDS:**

Per 10 CSR 20-7.031(4), General Criteria shall be applicable to all waters of the state at all times, including mixing zones. Additionally, 40 CFR 122.44(d)(1) directs the department to include in each NPDES permit conditions to achieve water quality established under Section 303 of the CWA, including state narrative criteria for water quality.

#### **SPECIFIC CRITERIA CONSIDERATIONS:**

An evaluation of discharges associated with land disturbance activities has been conducted to determine if any pollutants discharged under this general permit would have reasonable potential to cause or contribute toward an excursion of specific water quality criterion. Pollutants discharged from land disturbance activities are not commonly associated with pollutants listed as specific criteria in the Missouri Water Quality Standards; therefore, reasonable potential to cause an excursion of a specific criterion does not exist.

#### **GENERAL CRITERIA CONSIDERATIONS:**

In accordance with 40 CFR 122.44(d)(1), effluent limitations shall be placed into the permit for those pollutants which have been determined to cause, have the reasonable potential to cause, or contribute to an excursion above any State water quality standard, including State narrative criteria for water quality. The rule further states that pollutants which have been determined to cause, have the reasonable potential to cause, or contribute to an excursion above a narrative criterion within an applicable State water quality standard, the permit shall contain a numeric effluent limitation to protect that narrative criterion. In order to comply with this regulation, the permit writer will complete reasonable potential determinations on whether the discharge will violate any of the general criteria listed in 10 CSR 20-7.031(4). These specific requirements are listed below followed by derivation and discussion [the lettering matches that of the rule itself, under 10 CSR 20-7.031(4)]. It should also be noted that Section 644.076.1, RSMo states that it shall be unlawful for any person to cause or permit any discharge of water contaminants from any water contaminant or point source located in Missouri that is in violation of sections 644.006 to 644.141 of the Missouri Clean Water Law or any

standard, rule or regulation promulgated by the commission.

- (a) Waters shall be free from substances in sufficient amounts to cause the formation of putrescent, unsightly or harmful bottom deposits or prevent full maintenance of beneficial uses. The SWPPP requires implementation of best management practices to store, prevent, or minimize stormwater and/or any related land disturbance activity discharges (namely sediment). If one follows their SWPPP and other permit conditions including timely inspections, no reasonable potential to cause an excursion of this narrative exists. Additionally, there had been no indication to the Department that a stream has had issues maintaining beneficial uses as a result of the controlled and managed stormwater discharges per the SWPPP. Therefore, based on the information reviewed during the drafting of this permit, no reasonable potential to cause or contribute to an excursion of this criterion exists.
- (b) Waters shall be free from oil, scum and floating debris in sufficient amounts to be unsightly or prevent full maintenance of beneficial uses. Please see (a) above as justification is the same.
- (c) Waters shall be free from substances in sufficient amounts to cause unsightly color or turbidity, offensive odor or prevent full maintenance of beneficial uses. Please see (a) above as justification is the same.
- (d) Waters shall be free from substances or conditions in sufficient amounts to result in toxicity to human, animal or aquatic life. This permit addresses discharges from land disturbance activities and it not expected to include an toxic pollutants. Best management practices are to be addressed in the SWPPP should any toxic pollutant of concern be on-site.
- (e) There shall be no significant human health hazard from incidental contact with the water. Please see (a) above as justification is the same.
- (f) There shall be no acute toxicity to livestock or wildlife watering. Please see (d) above as justification is the same.
- (g) Waters shall be free from physical, chemical or hydrologic changes that would impair the natural biological community. Please see (a) above as justification is the same.
- (h) Waters shall be free from used tires, car bodies, appliances, demolition debris, used vehicles or equipment and solid waste as defined in Missouri's Solid Waste Law, section 260.200, RSMo, except as the use of such materials is specifically permitted pursuant to section 260.200-260.247. Please see (a) above. Additionally, any solid wastes received or produced at this facility are wholly contained in appropriate storage facilities, are not discharged, and are disposed of offsite. Therefore, this discharge does not have reasonable potential to cause or contribute to an excursion of this criterion.

The settleable solids requirement was removed from this permit and was replaced with additional, more specific BMP requirements. The settleable solids limit was determined not to be protective of all waters across the state, therefore, it was removed. Examples of these BMPs include requirements to:

- Install and maintain perimeter controls along areas of the site that will receive pollutant discharges;
- Minimize sediment track-out from the site;
- Provide storage for runoff up to and including a 2-year, 24-hour storm event when designing sedimentation basins; and
- Direct stormwater to vegetated areas.

The minimum buffer width was increased from 25 feet to 50 feet. Studies have shown that a 50 foot vegetative buffer more adequately treats sediment from stormwater discharges. This appears to be standard in EPA's permit as well as in many other states. A literature review was conducted to assess the effectiveness of buffer widths in relation to sediment removal. In an early literature review on grass buffers in agricultural settings, Dosskey (2001) concluded that 40 -100% of sediment entering from cultivated fields was removed using buffer strips 0.5 to 20 meters. Liu *et al.* (2008) conducted an analysis of 85 estimates of sediment removal by vegetated buffers. They found that sediment removal efficiency ( $E_s$ , the percentage of inflowing sediment trapped within a buffer) increased with buffer width according to the relationship:  $E_s = 13.4 \log_e (w) + 56.9$  in

which  $w$  (m) is buffer width. This equation predicts that  $E_s$  increases from 78% for a 5 meter wide buffer to 88% and 97% at widths of 10 meters and 20 meters, respectively. Yaun *et al.* (2009; 93 estimates) and Zhang *et al.* (2010; 81 estimates) garnered similar results to Liu *et al.*

In order to design controls that match the sediment removal efficiency of a 50-foot buffer, first the permittee must know what this efficiency is for the site. The sediment removal efficiencies of natural buffers vary according to a number of site-specific factors, including precipitation, soil type, land cover, slope length, width, steepness, and the types of sediment controls used to reduce the discharge of sediment prior to the buffer.

Sediment removal efficiencies are based on the U.S. Department of Agriculture's RUSLE2 (Revised Universal Soil Loss Equation 2) model for slope profiles using a 100-foot long exposed slopes.

Sediment removal is defined as the annual sediment delivered at the downstream end of the 50-foot natural buffer (tons/yr/acre) divided by the annual yield from cleared area (tons/yr/acre).

Sediment removal is in part a function of (1) a perimeter control (i.e., silt fence) located between the disturbed portion of the site and the upland edge of the natural buffer and (2) stormwater flows traveling through a 50-foot buffer of undisturbed natural vegetation.

Additional guidance may be found at [https://www.epa.gov/sites/production/files/2017-02/documents/2017\\_cgp\\_final\\_appendix\\_g\\_-\\_buffer\\_reqs\\_508.pdf](https://www.epa.gov/sites/production/files/2017-02/documents/2017_cgp_final_appendix_g_-_buffer_reqs_508.pdf).

Inspection frequencies: Site inspection frequencies have been changed from the previous permit based upon guidance from the USEPA and from stakeholder discussions. These frequencies will allow flexibility but will still allow for frequent enough inspections to ensure that all BMPs are adequately functioning.

## **Part VI – Effluent Limitations Determination**

In this general permit, Technology-Based Effluent Limitations are established through the SWPPP and BMP requirements. Effective BMPs may have to be designed on a site-specific basis. The implementation of monitoring provides a tool for each facility to evaluate the effectiveness of BMPs to ensure protection of water quality.

## **Part VII – Land Purchase and Change of Ownership**

A “**larger common plan of development or sale**” is a contiguous area where multiple separate and distinct construction activities may be taking place at different times on different schedules under one plan. This term is used in conjunction with common promotional plan, as defined in §644, RSMo.

Any portion of a project that is sold to a developer is still considered part of a larger common plan of development or sale and will require a permit.

If a portion of a site is sold to an individual for the purpose of building his or her private residence:

- A permit is required if the portion of land sold is equal to or greater than one acre.
- A permit is not required if the portion of land sold is less than one acre.

## **Part VIII – Termination**

The word ‘plant density’ was removed from the first paragraph since the department determined that percent of vegetative cover more accurately describes the vegetative requirements of this permit. This decision was made after discussion within the department and with stakeholders.

It is preferable that temporary BMPs such as sediment fence be removed prior to permit termination to

eliminate potential solid waste issues that may occur as a result of unnecessary and unmaintained BMPs.

Additional options for winter site stabilization as part of the vegetation requirement may exist, such as using a seeded erosion control blanket.

### **Part IX – Duty to Reapply**

This section has been revised to reflect the current applicable statutes which require applicants to submit an application for coverage 30 days prior to expiration of this permit. Currently, a paper application is required; however, applicants are to submit an application for coverage electronically as soon as they are made available by the director. The department will announce the availability status of the new permit and the process to reapply at least 60 days prior to the expiration of the existing permit.

### **Part X – Standard Conditions**

This section was revised to only include the standard conditions that specifically apply to this permit. All other conditions have been removed.

### **Part XI – Administrative Requirements**

On the basis of preliminary staff review and applicable standards and regulations, the department, as administrative agent for the Missouri Clean Water Commission, proposes to issue a permit(s) subject to certain effluent limitations, schedules, and special conditions contained herein and within the permit. The proposed determinations are tentative pending public comment.

#### **PUBLIC NOTICE:**

The department shall give public notice that a draft permit has been prepared and its issuance is pending. Additionally, public notice will be issued if a public hearing is to be held because of a significant degree of interest or because of water quality concerns related to a draft permit. No public notice is required when a request for a permit modification or termination is denied; however, the requester and facility must be notified of the denial in writing.

The department must give public notice of a pending permit or of a new or reissued Missouri State Operating Permit. The public comment period is a length of time not less than thirty (30) days following the date of the public notice, during which interested persons may submit written comments about the proposed permit.

For persons wanting to submit comments regarding this proposed permit, please refer to the Public Notice page located at the front of this draft permit. The Public Notice page gives direction on how and where to submit appropriate comments.

- The Public Notice period seeking comments on this permit occurred from March 31 to May 1, 2017.

**DATE OF FACT SHEET:** 06/16/2017

**COMPLETED BY:**  
**CHRISTOPHER MILLER**  
**ENVIRONMENTAL SPECIALIST**  
**573-526-3337**  
**christopher.miller@dnr.mo.gov**

**EDITED BY:**  
**STACIA BAX**  
**ENVIRONMENTAL SUPERVISOR**  
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(UTILITIES)

JOB SPECIAL PROVISIONS TABLE OF CONTENTS

(Job Special Provisions shall prevail over General Special Provisions whenever in conflict therewith.)

U-A. Utilities

1

	<b>MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION</b> 105 W. CAPITOL AVE. JEFFERSON CITY, MO 65102 Phone 1-888-275-6636
	<b><i>Kivindyo Engineering Services, LLC</i></b> 1310 Papin Street, Suite 103 St. Louis, MO 63103 Certificate of Authority: 011893 Consultant Phone: 314-623-8942
	If a seal is present on this sheet, JSP's have been electronically sealed and dated.
	JOB NUMBER: J6S1718, J6S1718B, and J6S1718C ST. LOUIS COUNTY, MO DATE PREPARED: 03/01/2021
	ADDENDUM DATE:

Only the following items of the Job Special Provisions (Utilities) are authenticated by this seal: U-A.

**JOB  
SPECIAL PROVISION  
UTILITIES**

U-A. Utilities

1.0 For informational purposes only, the following is a list of names, addresses, and telephone numbers of the known utility companies in the area of the construction work for this improvement:

<u>Utility Name</u>	<u>Known Required Adjustment</u>	<u>Type</u>
Shaun Talley <b>Ameren-Missouri (Distribution)</b> 12121 Dorsett Road, Bldg W Maryland Heights, MO 63043 Telephone: (314) 344-9501 <a href="mailto:STalley@ameren.com">Email: STalley@ameren.com</a>	Yes	Power
Tim Mueth <b>Ameren-Missouri (Distribution)</b> 9823 Mackenzie Rd St Louis, MO 63123 Telephone: (314) 992-9713 <a href="mailto:tmueth@ameren.com">Email: tmueth@ameren.com</a>	Yes	Power
Jim Lashley <b>AT&amp;T (Distribution)</b> 12851 Manchester Rd. Des Peres, MO 63131 Telephone: (636) 402-7027 <a href="mailto:jl4728@att.com">Email: jl4728@att.com</a>	Yes	Communication
Elvis Brown <b>Charter</b> 101 Northwest Plaza St Ann, MO 63074 Telephone: (314) 386-1627 <a href="mailto:elvis.brown@charter.com">Email: elvis.brown@charter.com</a>	Yes	Communication
Eric Thies <b>Extenet</b> 3030 Warrenville Rd. Lisle, IL 60532 Telephone: (331) 231-6032 Email: ethies@extenetsystems.com	No	Communication
John DeBroeck <b>Fidelity Link</b>	No	Communication

64 N. Clark St. Sullivan, MO 63080 Telephone: (800) 392-8070 Email: <a href="mailto:john.debroeck@fidelitycommunications.com">john.debroeck@fidelitycommunications.com</a>		
Rick McKinley <b>Kirkwood Electric</b> 212 S. Taylor Ave. Kirkwood, MO 63122 Telephone: (314) 984-5925 Email: <a href="mailto:mckinlrj@kirkwoodmo.org">mckinlrj@kirkwoodmo.org</a>	Yes	Power
Clarence Patterson <b>Kirkwood Water</b> 212 S. Taylor Ave. Kirkwood, MO 63122 Telephone: (314) 822-5810 Email: <a href="mailto:patterca@kirkwoodmo.org">patterca@kirkwoodmo.org</a>	Yes	Water
Matthew Schnieder <b>Missouri American Water</b> 727 Craig Road Creve Coeur, MO 63131 Telephone: (314) 996-2352 Email: <a href="mailto:matthew.schneider@amwater.com">matthew.schneider@amwater.com</a>	Yes	Water
Jeremy Phillips <b>MCI (Verizon)</b> 500 Technology Drive Weldon Springs, MO 63304 Telephone: (636) 399-1023 Email: <a href="mailto:jeremy.phillips@verizon.com">jeremy.phillips@verizon.com</a>	Yes	Communication
Dave Still <b>MetroLink</b> 700 S. Ewing Ave. St. Louis, MO 63103 Telephone: (314) 982-1400 x 2878 Email: <a href="mailto:dstill@metrostlouis.org">dstill@metrostlouis.org</a>	Yes	Communication
Brian Langenbacher <b>Spire Energy</b> 4118 Shrewsbury Ave. Shrewsbury, MO 63119 Telephone: (314) 768-7767 Email: <a href="mailto:Richard.Frock@spireenergy.com">Richard.Frock@spireenergy.com</a>	Yes	Gas
Martin Koeller <b>St. Louis County – Department of Transportation</b> 1050 N. Lindbergh Blvd St. Louis, MO 63132 Telephone: (314) 615-0210 Email: <a href="mailto:mkoeller2@stlouisco.com">mkoeller2@stlouisco.com</a>	No	Signal Interconnect

**1.1** The existence and approximate location of utility facilities known to exist, as shown on the plans, are based upon the best information available to the Commission at this time. This information is provided by the Commission "as-is" and the Commission expressly disclaims any representation or warranty as to the completeness, accuracy, or suitability of the information for any use. Reliance upon this information is done at the risk and peril of the user, and the Commission shall not be liable for any damages that may arise from any error in the information. It is, therefore, the responsibility of the contractor to verify the above listing information indicating existence, location and status of any facility. Such verification includes direct contact with the listed utilities.

**1.2** The contractor agrees that any effects of the presence of the utilities, their relocation, contractor's coordination of work with the utilities and any delay in utility relocation shall not be compensable as a suspension of work, extra work, a change in the work, as a differing site condition or otherwise including but, without limitation, delay, impact, incidental or consequential damages. The contractor's sole remedy for the effects of the presence of utilities, delay in their relocation or any other effects shall be an excusable delay as provided in Section 105.7.3. The contractor waives, for itself, its subcontractors and suppliers the compensability of the presence of utilities, delay in their relocation and any cost to the contractor, its subcontractors and suppliers in any claim or action arising out of or in relation to the work under the contract.

**1.3** The contractor shall be solely responsible and liable for incidental and consequential damage to any utility facilities or interruption of the service caused by it or its subcontractors operation. The contractor shall hold and save harmless the Commission from damages to any utility facilities interruption of service by it or its subcontractor's operation.

**2.0** It shall be noted by the contractor that MoDOT is a member of Missouri One Call (800 Dig Rite). Some work on this project may be in the vicinity of MoDOT utility facilities, which includes but is not limited to traffic signal cables, highway lighting circuits, ITS cables, cathodic protection cables, etc. Prior to beginning work, the contractor shall request locates from Missouri One Call. The contractor shall also complete the Notice of Intent to Perform Work form located at the Missouri Department of Transportation website:

<http://www.modot.mo.gov/asp/intentToWork.shtml>

The contractor shall submit the form over the web (preferred method) or by fax to the numbers on the printed form. The notice must be submitted a minimum of 2 and a maximum of 10 working days prior to excavation just as Missouri One Call requires.

### **3.0 AMEREN-MISSOURI (DISTRIBUTION).**

Ameren-Missouri (Distribution) has the following existing facilities within the project limits:

- Overhead facilities along the south side of Rt. 100
  - Pole at Sta. 32+94, 42' LT will conflict with proposed Rt. 100 bridge over Black Creek. Ameren will relocate this pole during construction in coordination with the contractor.
  - Pole at Sta. 34+35, 37' RT will fall in proposed pavement. Ameren will relocate this pole during construction in coordination with the contractor.

- Pole at Sta. 34+89, 34' LT will fall in proposed pavement. Ameren will relocate this pole during construction in coordination with the contractor.
- Pole at Sta. 35+65, 33' LT will fall in proposed entrance curb radius with guy anchor in proposed sidewalk. Ameren will relocate this pole during construction in coordination with the contractor.
- Pole at Sta. 36+13, 33' LT will fall in proposed tree lawn with guy anchor in proposed sidewalk. Ameren will relocate this guy anchor or relocate pole during construction in coordination with the contractor.
- Pole at Sta. 37+39, 31' LT will fall in proposed tree lawn with guy anchor in proposed sidewalk. Ameren will relocate this guy anchor or relocate pole during construction in coordination with the contractor.
- Pole at Sta. 38+96, 34' LT will fall in proposed sidewalk. Ameren will relocate this pole during construction in coordination with the contractor.
- Pole at Sta. 47+79, 26' LT will fall in proposed tree lawn. No conflict with this pole is anticipated.
- Pole at Sta. 51+32, 25' LT will fall in proposed tree lawn. No conflict with this pole is anticipated.
- Pole guy anchor at Sta. 53+70, 34' LT will fall in proposed sidewalk. Ameren will relocate this guy anchor or relocate associated pole during construction in coordination with the contractor.
- Pole at Sta. 55+27, 24' LT will fall in proposed entrance with guy anchor in proposed sidewalk. Ameren will relocate this guy anchor or relocate pole during construction in coordination with the contractor.
- Pole at Sta. 58+52, 32' LT will fall in proposed sidewalk. Ameren will relocate this pole during construction in coordination with the contractor.
- Pole at Sta. 62+09, 24' LT will fall in proposed entrance curb radius with guy anchor in proposed sidewalk. Ameren will relocate this pole during construction in coordination with the contractor.
- Pole at Sta. 62+62, 34' LT will fall in southern edge of proposed sidewalk. No conflict with this pole is anticipated.
- Pole at Sta. 63+00, 33' LT will fall in proposed sidewalk. Ameren will relocate this pole during construction in coordination with the contractor.
- Pole at Sta. 65+39, 25' LT will fall in proposed tree lawn. No conflict with this pole is anticipated.
- Pole guy anchor at Sta. 69+07, 34' LT will fall in proposed sidewalk. Ameren will relocate this guy anchor or relocate associated pole during construction in coordination with the contractor.
- Pole and sidewalk guy anchor at Sta. 79+26, 51' LT will fall in proposed sidewalk. Sidewalk guy anchor will conflict with retaining wall construction. Ameren will relocate or temporarily remove this guy in coordination with the contractor.
- Pole at Sta. 82+14, 43' LT will fall in proposed pavement. Ameren will relocate this pole during construction in coordination with the contractor.
- Pole at Sta. 122+73, 26' LT will fall in proposed tree lawn. No conflict with this pole is anticipated.
- Pole at Sta. 125+10, 26' LT will fall in proposed tree lawn. No conflict with this pole is anticipated.

- Pole at Sta. 129+17, 25' LT will fall in proposed entrance and will conflict with proposed drainage. Ameren will relocate this pole during construction in coordination with the contractor.
- Pole at Sta. 131+02, 25' LT will conflict with proposed drainage. Ameren will relocate this pole during construction in coordination with the contractor.
- Pole at Sta. 136+47, 25' LT will fall in proposed sidewalk. Ameren will relocate this pole during construction in coordination with the contractor.
- Pole at Sta. 146+09, 38' LT falls close to proposed drainage. Ameren will relocate this pole during construction in coordination with the contractor.
- Pole at Sta. 148+89, 29' LT conflicts with proposed drainage. Ameren will relocate this pole during construction in coordination with the contractor.
- Pole at Sta. 153+67, 35' LT will fall in proposed sidewalk. No conflict with this pole is anticipated.
- Pole at Sta. 153+97, 59' LT will fall in proposed sidewalk. No conflict with this pole is anticipated.
- Pole at Sta. 169+65, 27' LT will fall in proposed tree lawn. No conflict with this pole is anticipated.
- Pole at Sta. 169+85, 27' LT will fall in proposed tree lawn. No conflict with this pole is anticipated.
- Pole at Sta. 170+09, 24' LT will fall in proposed tree lawn. No conflict with this pole is anticipated.
- Pole at Sta. 172+14, 25' LT will fall in proposed tree lawn. No conflict with this pole is anticipated.
- Pole at Sta. 173+49, 25' LT will fall in proposed tree lawn. No conflict with this pole is anticipated.
- Pole at Sta. 174+49, 25' LT will conflict with proposed drainage. Ameren will relocate this pole during construction in coordination with the contractor.
- Pole at Sta. 175+65, 25' LT will conflict with proposed drainage. Ameren will relocate this pole during construction in coordination with the contractor.
- Pole at Sta. 176+38, 26' LT will conflict with proposed drainage. Ameren will relocate this pole during construction in coordination with the contractor.
- Pole at Sta. 177+55, 25' LT will conflict with proposed drainage. Ameren will relocate this pole during construction in coordination with the contractor.
- Pole at Sta. 178+53, 24' LT will fall in proposed tree lawn. No conflict with this pole is anticipated.
- Pole at Sta. 179+69, 25' LT will fall in proposed tree lawn. No conflict with this pole is anticipated.
- Pole at Sta. 180+91, 25' LT will fall in proposed tree lawn. No conflict with this pole is anticipated.
- Pole at Sta. 182+05, 23' LT will fall in proposed tree lawn. No conflict with this pole is anticipated.
- Pole at Sta. 182+94, 23' LT will fall in proposed tree lawn. No conflict with this pole is anticipated.
- Pole at Sta. 184+29, 24' LT will fall in proposed tree lawn. No conflict with this pole is anticipated.
- Pole at Sta. 185+67, 25' LT will fall in proposed tree lawn. No conflict with this pole is anticipated.

- Pole at Sta. 186+98, 25' LT will conflict with proposed drainage. Ameren will relocate this pole during construction in coordination with the contractor.
- Pole at Sta. 187+97, 24' LT will fall in proposed tree lawn. No conflict with this pole is anticipated.
- Pole at Sta. 191+44, 25' LT conflicts with proposed sidewalk. Ameren will relocate this pole during construction in coordination with the contractor.
- Pole at Sta. 193+92, 26' LT conflicts with proposed sidewalk. Ameren will relocate this pole during construction in coordination with the contractor.
- Pole at Sta. 195+10, 26' LT conflicts with proposed drainage. Ameren will relocate this pole during construction in coordination with the contractor.
- Pole at Sta. 195+95, 28' LT will fall in proposed tree lawn. No conflict with this pole is anticipated.
- Pole at Sta. 197+23, 27' LT falls in proposed pavement. Ameren will relocate this pole during construction in coordination with the contractor.
- Pole at Sta. 197+46, 45' LT falls in proposed pavement. Ameren will relocate this pole during construction in coordination with the contractor.
- Pole at Sta. 198+95, 24' LT will fall in proposed tree lawn. No conflict with this pole is anticipated.
- Pole at Sta. 199+50, 24' LT will fall in proposed tree lawn. No conflict with this pole is anticipated.
- Pole at Sta. 200+44, 25' LT conflicts with proposed sidewalk. Ameren will relocate this pole during construction in coordination with the contractor.
- Pole at Sta. 201+94, 30' LT falls on the south side of proposed sidewalk. No conflict with this pole is anticipated.
- Pole at Sta. 202+30, 29' LT falls on the south side of proposed sidewalk. No conflict with this pole is anticipated.
- Pole at Sta. 204+05, 28' LT falls in proposed sidewalk. No conflict with this pole is anticipated.
- Pole at Sta. 204+40, 28' LT falls in proposed sidewalk. No conflict with this pole is anticipated.
- Pole at Sta. 206+08, 29' LT falls in proposed sidewalk. No conflict with this pole is anticipated.
- Pole at Sta. 207+91, 28' LT falls in proposed sidewalk. No conflict with this pole is anticipated.
- Pole at Sta. 209+70, 28' LT falls in proposed sidewalk. No conflict with this pole is anticipated.
- Pole at Sta. 211+00, 28' LT falls in proposed sidewalk. No conflict with this pole is anticipated.
- Pole at Sta. 219+89, 40' LT falls in proposed sidewalk. No conflict with this pole is anticipated.
- Pole at Sta. 223+32, 64' LT falls in proposed sidewalk. No conflict with this pole is anticipated.
- Pole at Sta. 230+64, 39' LT will conflict with proposed drainage. Ameren will relocate this pole during construction in coordination with the contractor.
- Pole at Sta. 252+84, 33' LT conflicts with proposed sidewalk. Ameren will relocate this pole during construction in coordination with the contractor.

- Overhead facilities along the north side of Rt. 100
  - Pole at Sta. 30+18, 56' RT falls in proposed pavement. Ameren will relocate this pole during construction in coordination with the contractor.
  - Pole at Sta. 30+24, 95' RT falls in proposed sidewalk. No conflict with this pole is anticipated.
  - Pole at Sta. 31+37, 40' RT conflicts with proposed sidewalk. Ameren will relocate this pole during construction in coordination with the contractor.
  - Overhead span on north side of Rt. 100 from Sta. 32+98 to Sta. 31+37 presents an operational conflict for the construction of the new Rt. 100 over Back Creek structure. Ameren will relocate this span ahead of construction.
  - Pole at Sta. 34+32, 43' RT falls on the north side of proposed sidewalk. No conflict with this pole is anticipated.
  - Pole at Sta. 43+84, 24' RT falls on the north side of proposed sidewalk. No conflict with this pole is anticipated.
  - Pole at Sta. 40+46, 24' RT will fall in proposed tree lawn. No conflict with this pole is anticipated.
  - Pole at Sta. 41+67, 25' RT will fall in proposed tree lawn. No conflict with this pole is anticipated.
  - Pole at Sta. 42+80, 24' RT will fall in proposed tree lawn. No conflict with this pole is anticipated.
  - Pole at Sta. 44+66, 24' RT will fall in proposed tree lawn. No conflict with this pole is anticipated.
  - Pole at Sta. 45+51, 24' RT will fall in proposed tree lawn. No conflict with this pole is anticipated.
  - Pole at Sta. 47+05, 24' RT falls in proposed curb. Ameren will relocate this pole during construction in coordination with the contractor.
  - Pole at Sta. 47+59, 24' RT falls just behind proposed curb and very clo. Ameren will relocate this pole during construction in coordination with the contractor.
  - Pole at Sta. 48+17, 24' RT will conflict with proposed drainage. Ameren will relocate this pole during construction in coordination with the contractor.
  - Pole at Sta. 49+57, 24' RT will fall in proposed tree lawn. No conflict with this pole is anticipated.
  - Pole at Sta. 50+42, 23' RT will conflict with proposed entrance. Ameren will relocate this pole during construction in coordination with the contractor.
  - Pole at Sta. 51+17, 23' RT falls in proposed curb. Ameren will relocate this pole during construction in coordination with the contractor.
  - Pole at Sta. 51+86, 24' RT will conflict with installation of proposed drainage. Ameren will relocate this pole during construction in coordination with the contractor.
  - Pole at Sta. 53+24, 24' RT will fall in proposed tree lawn. No conflict with this pole is anticipated.
  - Pole at Sta. 54+36, 24' RT will fall in proposed tree lawn. No conflict with this pole is anticipated.
  - Pole at Sta. 55+38, 23' RT will fall in proposed tree lawn. No conflict with this pole is anticipated.
  - Pole at Sta. 56+31, 24' RT will fall proposed entrance. Ameren will relocate this pole during construction in coordination with the contractor.

- Pole at Sta. 57+19, 24' RT will fall in proposed tree lawn. No conflict with this pole is anticipated.
- Pole at Sta. 58+47, 24' RT will fall in proposed tree lawn. No conflict with this pole is anticipated.
- Pole at Sta. 59+61, 24' RT will fall in proposed tree lawn. No conflict with this pole is anticipated.
- Pole at Sta. 60+19, 24' RT will fall in proposed paved treelawn area. No conflict with this pole is anticipated.
- Pole at Sta. 60+79, 23' RT will fall proposed entrance. Ameren will relocate this pole during construction in coordination with the contractor.
- Pole at Sta. 62+12, 24' RT will fall in proposed tree lawn. No conflict with this pole is anticipated.
- Pole at Sta. 63+14, 24' RT will fall in proposed tree lawn. No conflict with this pole is anticipated.
- Overhead facilities attached to Pole at Sta. 65+37, 24' RT will conflict with proposed fill. Ameren will install new pole and raise overhead facilities during construction in coordination with the contractor.
- Overhead facilities attached to Pole at Sta. 66+59, 25' RT will conflict with proposed fill. Ameren will install new pole and raise overhead facilities during construction in coordination with the contractor.
- Overhead facilities attached to Pole at Sta. 67+11, 24' RT will conflict with proposed fill. Ameren will install new pole and raise overhead facilities during construction in coordination with the contractor.
- Pole at Sta. 68+53, 25' RT will fall in proposed tree lawn. No conflict with this pole is anticipated.
- Pole at Sta. 70+01, 24' RT will fall in proposed tree lawn. No conflict with this pole is anticipated.
- Pole at Sta. 72+20, 36' RT will fall in proposed tree lawn. No conflict with this pole is anticipated.
- Pole at Sta. 73+00, 29' RT will fall in proposed tree lawn. No conflict with this pole is anticipated.
- Pole at Sta. 74+00, 11' RT will fall in proposed tree lawn. No conflict with this pole is anticipated.
- Pole at Sta. 75+33, 36' RT will fall in proposed tree lawn. No conflict with this pole is anticipated.
- Pole at Sta. 76+47, 40' RT will fall in proposed tree lawn. No conflict with this pole is anticipated.
- Pole at Sta. 78+46, 33' RT will fall in proposed tree lawn. No conflict with this pole is anticipated.
- Pole at Sta. 79+26, 26' RT will conflict with proposed sidewalk. Ameren will relocate this pole during construction in coordination with the contractor.
- Pole at Sta. 81+07, 25' RT will fall in proposed tree lawn. No conflict with this pole is anticipated.
- Pole at Sta. 82+12, 25' RT will fall in proposed tree lawn. No conflict with this pole is anticipated.
- Pole at Sta. 83+05, 25' RT will fall in proposed tree lawn. No conflict with this pole is anticipated.

- Pole at Sta. 84+21, 25' RT will fall in proposed tree lawn. No conflict with this pole is anticipated.
- Pole at Sta. 119+25, 25' RT will fall in proposed tree lawn. No conflict with this pole is anticipated.
- Pole at Sta. 120+18, 25' RT will fall in proposed tree lawn. No conflict with this pole is anticipated.
- Pole at Sta. 121+32, 25' RT will fall in proposed tree lawn. No conflict with this pole is anticipated.
- Pole at Sta. 122+37, 25' RT will fall in proposed tree lawn. No conflict with this pole is anticipated.
- Pole at Sta. 123+42, 24' RT will fall in proposed tree lawn. No conflict with this pole is anticipated.
- Pole at Sta. 124+45, 25' RT will conflict with proposed entrance. Ameren will relocate this pole during construction in coordination with the contractor.
- Pole at Sta. 124+64, 25' RT will fall in proposed tree lawn. No conflict with this pole is anticipated.
- Pole at Sta. 125+64, 25' RT will fall in proposed tree lawn. No conflict with this pole is anticipated.
- Pole at Sta. 127+22, 26' RT will fall in proposed tree lawn. No conflict with this pole is anticipated.
- Pole at Sta. 127+95, 25' RT will fall in proposed tree lawn. No conflict with this pole is anticipated.
- Pole at Sta. 128+91, 24' RT will fall in proposed tree lawn. No conflict with this pole is anticipated.
- Pole at Sta. 129+88, 24' RT will fall in proposed tree lawn. No conflict with this pole is anticipated.
- Pole at Sta. 131+06, 50' RT will conflict with proposed drainage. Ameren will relocate this pole during construction in coordination with the contractor.
- Pole at Sta. 131+22, 25' RT will conflict with proposed drainage. Ameren will relocate this pole during construction in coordination with the contractor.
- Pole at Sta. 132+21, 26' RT will in wide proposed entrance. No conflict with this pole is anticipated.
- Pole at Sta. 133+71, 26' RT will conflict with proposed sidewalk. Ameren will relocate this pole during construction in coordination with the contractor.
- Pole at Sta. 135+22, 27' RT will conflict with proposed entrance. Ameren will relocate this pole during construction in coordination with the contractor.
- Pole at Sta. 136+31, 28' RT will fall in north side of proposed sidewalk. No conflict with this pole is anticipated.
- Pole at Sta. 137+77, 39' RT will fall on north side of proposed sidewalk. No conflict with this pole is anticipated.
- Pole at Sta. 138+91, 38' RT will conflict with proposed sidewalk. Ameren will relocate this pole during construction in coordination with the contractor.
- Pole at Sta. 140+02, 40' RT will fall on north side of proposed sidewalk. No conflict with this pole is anticipated.
- Pole at Sta. 141+11, 40' RT will fall on north side of proposed sidewalk. No conflict with this pole is anticipated.

- Pole at Sta. 142+15, 38' RT will fall on north side of proposed sidewalk. No conflict with this pole is anticipated.
- Pole at Sta. 144+11, 40' RT has an associated guy wire that will conflict with the proposed sidewalk. Ameren will eliminate this conflict during construction in coordination with the contractor.
- Pole at Sta. 144+75, 40' RT will fall on north side of proposed sidewalk. No conflict with this pole is anticipated.
- Pole at Sta. 146+43, 27' RT will fall on south side of proposed sidewalk. No conflict with this pole is anticipated.
- Pole at Sta. 147+66, 30' RT has an associated guy wire that will conflict with the proposed sidewalk. Ameren will eliminate this conflict during construction in coordination with the contractor.
- Pole at Sta. 150+01, 26' RT will fall in proposed tree lawn. No conflict with this pole is anticipated.
- Pole at Sta. 157+87, 26' RT will fall in proposed tree lawn. No conflict with this pole is anticipated.
- Pole at Sta. 159+05, 26' RT will fall in proposed tree lawn. No conflict with this pole is anticipated.
- Pole at Sta. 161+41, 28' RT will conflict with proposed sidewalk. Ameren will relocate this pole during construction in coordination with the contractor.
- Pole at Sta. 162+79, 26' RT will conflict with proposed sidewalk. Ameren will relocate this pole during construction in coordination with the contractor.
- Pole at Sta. 163+80, 26' RT will fall in proposed tree lawn. No conflict with this pole is anticipated.
- Pole at Sta. 165+12, 28' RT will fall in proposed tree lawn. No conflict with this pole is anticipated.
- Pole at Sta. 165+78, 28' RT will fall in proposed tree lawn. No conflict with this pole is anticipated.
- Pole at Sta. 166+11, 28' RT will fall in proposed tree lawn. No conflict with this pole is anticipated.
- Pole at Sta. 167+44, 29' RT will fall in proposed tree lawn. No conflict with this pole is anticipated.
- Pole at Sta. 168+14, 29' RT will conflict with proposed sidewalk. Ameren will relocate this pole during construction in coordination with the contractor.
- Guy wire with anchor at Sta. 168+54, 29' RT will conflict with proposed bus pad. Ameren will relocate this guy wire and anchor during construction in coordination with the contractor.
- Pole at Sta. 169+54, 27' RT will fall in proposed tree lawn. No conflict with this pole is anticipated.
- Pole at Sta. 167+44, 29' RT will fall in proposed tree lawn. No conflict with this pole is anticipated.
- Pole at Sta. 174+02, 30' RT will conflict with proposed sidewalk. Ameren will relocate this pole during construction in coordination with the contractor.
- Pole at Sta. 177+32, 29' RT will fall in south edge of proposed sidewalk. No conflict with this pole is anticipated.
- Pole at Sta. 181+52, 71' RT will fall in proposed tree lawn. No conflict with this pole is anticipated.

- Pole at Sta. 181+66, 35' RT will conflict with proposed pavement. Ameren will relocate this pole during construction in coordination with the contractor.
- Pole at Sta. 183+80, 25' RT will fall in proposed tree lawn. No conflict with this pole is anticipated
- Pole at Sta. 186+16, 26' RT will fall in proposed tree lawn. No conflict with this pole is anticipated
- Pole at Sta. 188+90, 27' RT will conflict with proposed drainage. Ameren will relocate this pole during construction in coordination with the contractor.
- Pole at Sta. 189+98, 25' RT will conflict with proposed drainage. Ameren will relocate this pole during construction in coordination with the contractor.
- Pole at Sta. 191+21, 25' RT will conflict with proposed drainage. Ameren will relocate this pole during construction in coordination with the contractor.
- Pole at Sta. 194+79, 33' RT will conflict with proposed sidewalk. Ameren will relocate this pole during construction in coordination with the contractor.
- Pole at Sta. 197+37, 41' RT will conflict with proposed sidewalk. Ameren will relocate this pole during construction in coordination with the contractor.
- Pole at Sta. 200+61, 187' RT will conflict with proposed pavement. Ameren will relocate this pole during construction in coordination with the contractor.
- Pole at Sta. 201+90, 30' RT will fall too close to roadway. Ameren will relocate this pole during construction in coordination with the contractor.
- Pole at Sta. 210+99, 33' RT will fall in south edge of proposed sidewalk. No conflict with this pole is anticipated.
- Pole at Sta. 211+75, 33' RT will fall in south edge of proposed sidewalk. No conflict with this pole is anticipated.
- Pole at Sta. 212+50, 33' RT will fall in south edge of proposed sidewalk. No conflict with this pole is anticipated.
- Pole at Sta. 213+98, 32' RT will conflict with proposed sidewalk. Ameren will relocate this pole during construction in coordination with the contractor.
- Pole at Sta. 217+66, 26' RT will conflict with proposed sidewalk. Ameren will relocate this pole during construction in coordination with the contractor.
- Pole at Sta. 219+46, 25' RT will fall in proposed tree lawn. No conflict with this pole is anticipated.
- Pole at Sta. 220+61, 25' RT will fall in south edge of proposed sidewalk. No conflict with this pole is anticipated.
- Pole at Sta. 221+78, 25' RT will fall in south edge of proposed sidewalk. No conflict with this pole is anticipated.
- Pole at Sta. 222+95, 24' RT has guy anchors that will conflict with sidewalk. Ameren will relocate guy anchors during construction in coordination with the contractor.
- Pole at Sta. 224+05, 26' RT will conflict with proposed drainage. Ameren will relocate this pole during construction in coordination with the contractor.
- Pole at Sta. 227+18, 25' RT will conflict with proposed sidewalk. Ameren will relocate this pole during construction in coordination with the contractor.
- Pole at Sta. 232+70, 25' RT will fall in south edge of proposed sidewalk. No conflict with this pole is anticipated.
- Pole at Sta. 233+60, 26' RT will fall in south edge of proposed sidewalk. No conflict with this pole is anticipated.

- Pole at Sta. 234+66, 25' RT will fall in south edge of proposed sidewalk. No conflict with this pole is anticipated.
- Pole at Sta. 235+71, 26' RT has a guy anchor that will conflict with proposed sidewalk. Ameren will relocate this pole during construction in coordination with the contractor.
- Pole at Sta. 236+70, 26' RT will fall in proposed tree lawn. No conflict with this pole is anticipated
- Pole at Sta. 237+21, 25' RT will fall in proposed tree lawn. No conflict with this pole is anticipated
- Pole at Sta. 246+02, 25' RT will conflict with proposed drainage. Ameren will relocate this pole during construction in coordination with the contractor.
- Pole at Sta. 255+61, 53' RT will conflict with proposed sidewalk. Ameren will relocate this pole during construction in coordination with the contractor.
- Pole at Sta. 257+11, 54' RT will conflict with proposed sidewalk. Ameren will remove this pole during construction in coordination with the contractor.
  
- Overhead facilities along the west side of Woodlawn Ave., north of Rt. 100:
  - Pole at Sta. 255+15, 72' RT will conflict with proposed pavement. Ameren will relocate this pole during construction in coordination with the contractor.
  - Pole at Sta. 254+95, 114' RT will conflict with proposed pavement. Ameren will relocate this pole during construction in coordination with the contractor.
  - Pole at Sta. 254+90, 187' RT will conflict with proposed pavement. Ameren will relocate this pole during construction in coordination with the contractor.
  - Pole at Sta. 254+86, 259' RT will conflict with proposed pavement. Ameren will relocate this pole during construction in coordination with the contractor.
  
- Overhead facilities along the west side of Dorothy Ave. north of Rt. 100:
  - Pole at Sta. 65+04, 104' RT will fall in proposed tree lawn. No conflict with this pole is anticipated
  - Pole at Sta. 64+90, 155' RT will fall in proposed tree lawn. Guy and anchor for pole will conflict with proposed sidewalk. Ameren will relocate this pole during construction in coordination with the contractor.
  - Pole at Sta. 64+77, 303' RT will fall in proposed tree lawn. No conflict with this pole is anticipated
  - Pole at Sta. 65+04, 399' RT will fall in proposed tree lawn. No conflict with this pole is anticipated
  - Pole at Sta. 65+35, 491' RT will fall in proposed tree lawn. No conflict with this pole is anticipated
  
- Underground facilities along the north side of Rt. 100 from Sta. 21+06, 32' RT to the east side of Hanley Rd and continuing north leaving Rt. 100 right of way.
  - Buried facilities conflict with proposed drainage at Sta. 21+77, 29' RT. Ameren will relocate these facilities during construction in coordination with the contractor.
  
- Underground facilities along the south side of Rt. 100 from the east side of Andrew Dr. to the west side of Kenmore Dr.

- Buried facilities conflict with proposed drainage from Sta. 226+63, 29' LT to Sta. 228+24, 29' LT. Ameren will relocate this facility during construction in coordination with the contractor.
- Buried facilities conflict with proposed drainage at Sta. 237+11, 31' LT. Ameren will relocate this facility during construction in coordination with the contractor.
- Underground facilities crossing Rt. 100 at Sta. 217+86. No conflict with this facility is anticipated.
  
- Underground facilities crossing Rt. 100
  - Buried facilities crossing Rt. 100 at Sta. 217+86. No conflict with this facility is anticipated.
  - Buried facilities crossing Rt. 100 at Sta. 237+71. This facility conflicts with proposed drainage at Sta. 237+57, 21' LT. Ameren will relocate this facility during construction in coordination with the contractor.

The contractor shall coordinate with Ameren-Missouri as necessary and take measures to protect in place their existing facilities during construction.

The contractor shall directly contact Ameren-Missouri (Distribution) to verify the locations of their facilities.

The Commission cannot warrant the information above which was provided by Ameren-Missouri (Distribution).

The contractor shall discuss the planned work as it relates to Ameren Missouri's energized power lines and coordinate with Ameren Missouri for the installation of any insulation covers over the lines and/or any other designated requirements. Please note Ameren Missouri has revised its policy regarding the charges for placement, length of use and relocation of covers. The contractor is advised to contact Ameren Missouri regarding the current policy so the anticipated cost to the contractor can be estimated and a tentative schedule for this payment can be established. The Contractor shall contact Ameren Missouri at least two weeks in advance of when construction work is scheduled to begin to request covers to be placed at a given location.

**No direct payment will be made for this provision. The contractor is responsible for any charges from Ameren Missouri for this provision and payment will be directly to Ameren Missouri.**

#### **4.0 AT&T (Distribution)**

AT&T (Distribution) has the following existing facilities within the project limits:

##### **Overhead facilities along the north side of Rt. 100 throughout project.**

- Overhead facilities on the north side from east of Martin Drive at Sta. 01+76 to Sta. 12+00 at Bredell Avenue. No conflict with these facilities is anticipated.
  
- Overhead facilities on the north side from west of Bartold Avenue at Sta. 24+09 to Sta. 30+18 at S. Hanley Rd.

- Pole at Sta. 30+18 56' RT falls within the proposed roadway. Ameren will relocate this pole during construction in coordination with the contractor. AT&T-D to transfer to relocated Ameren pole after relocated pole is set.
- Overhead crossing of South Hanley Road on the north side of Rt. 100 from Sta. 30+18 57' RT to Sta. 31+10 100' RT.
  - Pole at Sta. 30+18 56' RT falls within the proposed roadway. Ameren will relocate this pole during construction in coordination with the contractor. AT&T-D to transfer to relocated Ameren pole after relocated pole is set.
- Overhead facilities on the north side running from a pole at Sta. 29+34 45' RT to the pole at Sta. 32+98 41' RT.
  - Pole at Sta. 32+98 45' RT is in conflict due to construction of the Black Creek Bridge. Ameren will relocate this pole during construction in coordination with the contractor. ATT-D will transfer overhead facilities and relocate the riser to relocated Ameren pole after pole is set.
- Overhead facilities on the north side of Rt. 100 running north along the west side of South Hanley Road from Sta. 31+38 40' RT to Sta. 31+05 98' RT.
  - Pole at Sta. 31+38 40' RT falls within the proposed sidewalk. Ameren will relocate this pole during construction in coordination with the contractor. AT&T-D to transfer overhead facilities, overhead guy, and riser to relocated Ameren pole and relocate down guy wires once it is set.
- Overhead facilities running west along the north side of Rt. 100 from just east of Porter Avenue at Sta. 38+57 to just east of S. McKnight Rd. at Sta. 152+86.
  - Pole at Sta. 47+05 23' RT falls within the proposed curb. Ameren will relocate this pole during construction in coordination with the contractor. AT&T-D to transfer to relocated Ameren pole after it is set.
  - Pole at Sta. 48+17 23' RT conflicts with proposed drainage inlet. Ameren will relocate this pole during construction in coordination with the contractor. AT&T-D to transfer to relocated Ameren pole after it is set.
  - Pole at Sta. 50+42 23' RT falls within the proposed entrance. Ameren will relocate this pole during construction in coordination with the contractor. AT&T-D to transfer to relocated Ameren pole after it is set.
  - Pole at Sta. 51+17 23' RT falls within the proposed curb. Ameren will relocate this pole during construction in coordination with the contractor. AT&T-D to transfer to relocated Ameren pole after it is set.
  - Pole at Sta. 51+86 24' RT conflicts with proposed drainage inlet. Ameren will relocate this pole during construction in coordination with the contractor. AT&T-D to transfer to relocated Ameren pole after it is set.
  - Pole at Sta. 56+31 24' RT falls within the proposed entrance. Ameren will relocate this pole during construction in coordination with the contractor. AT&T-D to transfer to relocated Ameren pole after it is set.
  - Pole at Sta. 57+19 24' RT is being replaced as part of Ameren maintenance. Ameren will relocate this pole during construction in coordination with the contractor. AT&T-D to transfer to relocated Ameren pole after it is set.

- Pole at Sta. 60+79 23' RT falls within the proposed curb. Ameren will relocate this pole during construction in coordination with the contractor. AT&T-D to transfer to relocated Ameren pole and reconnect the three service drops after pole is set.
- Pole at Sta. 62+12 24' RT is being replaced as part of Ameren maintenance. Ameren will replace this pole during construction in coordination with the contractor. AT&T-D to transfer to new Ameren pole once replacement pole is set.
- ATT-D guy down wires at Sta. 63+13 24' RT fall within the proposed sidewalk. ATT-D will relocate these guys during construction in coordination with the contractor.
- Pole at Sta. 64+47 24' RT is being replaced by a taller pole due to a change in proposed grade for the roadway. Ameren will replace this pole during construction in coordination with the contractor. AT&T-D to transfer to new Ameren pole once replacement pole is set.
- Pole at Sta. 65+37 24' RT is being replaced by a taller pole due to a change in proposed grade for the roadway. Ameren will replace this pole during construction in coordination with the contractor. AT&T-D to transfer to new Ameren pole once replacement pole is set.
- Pole at Sta. 66+59 25' RT is being replaced by a taller pole due to a change in proposed grade for the roadway. Ameren will replace this pole during construction in coordination with the contractor. AT&T-D to transfer to new Ameren pole once replacement pole is set.
- Pole at Sta. 67+11 24' RT is being replaced by a taller pole due to a change in proposed grade for the roadway. Ameren will replace this pole during construction in coordination with the contractor. AT&T-D to transfer to new Ameren pole once replacement pole is set.
- Pole at Sta. 69+08 34' LT is being replaced as part of Ameren maintenance. Ameren will replace this pole during construction in coordination with the contractor. AT&T-D to transfer to new Ameren pole, relocate riser, and relocate down guy once replacement pole is set.
- Pole at Sta. 79+26, 26' RT falls within the proposed sidewalk. Ameren will relocate this pole during construction in coordination with the contractor. AT&T-D to transfer to new Ameren pole once relocated pole is set.
- ATT-D guy down wire at Sta. 121+32 25' RT falls within the proposed sidewalk. ATT-D will relocate this guy during construction in coordination with the contractor.
- Pole at Sta. 123+42 24' RT falls within the proposed curb. Ameren will relocate this pole during construction in coordination with the contractor. AT&T-D to transfer to relocated Ameren pole after it is set.
- Pole at Sta. 124+45 25' RT falls within the proposed entrance. Ameren will relocate this pole during construction in coordination with the contractor. AT&T-D to transfer to relocated Ameren pole after it is set.
- Pole at Sta. 131+06 50' RT conflicts with proposed drainage and sidewalk. Ameren will relocate this pole during construction in coordination with the contractor. AT&T-D to transfer to relocated Ameren pole after it is set.
- Pole at Sta. 131+22 25' RT conflicts with proposed drainage and sidewalk. Ameren will relocate this pole during construction in coordination with the contractor. AT&T-D to transfer to relocated Ameren pole after it is set.

- Pole at Sta. 132+22 26' RT is being replaced as part of Ameren maintenance. Ameren will replace this pole during construction in coordination with the contractor. AT&T-D to transfer to new Ameren pole once replacement pole is set.
- Pole at Sta. 133+71 26' RT falls within the proposed sidewalk. Ameren will relocate this pole during construction in coordination with the contractor. AT&T-D to transfer to relocated Ameren pole after it is set.
- Pole at Sta. 135+22 26' RT falls within the proposed entrance. A Ameren will relocate this pole during construction in coordination with the contractor. AT&T-D to transfer to relocated Ameren pole after it is set.
- Pole at Sta. 138+91 38' RT falls within the proposed sidewalk. Ameren will relocate this pole during construction in coordination with the contractor. AT&T-D to transfer to relocated Ameren pole after it is set.
- Pole at Sta. 161+41 28' RT falls within the proposed sidewalk. Ameren will relocate this pole during construction in coordination with the contractor. AT&T-D to transfer to relocated Ameren pole after it is set.
- Pole at Sta. 168+14 29' RT falls within the proposed sidewalk. Ameren will relocate this pole during construction in coordination with the contractor. AT&T-D to transfer to relocated Ameren pole after it is set.
- Overhead facilities running to the north off the pole at Sta. 42+80 25' RT. No conflict with these facilities is anticipated.
- Overhead facilities running to the north off the pole at Sta. 43+84 25' RT. No conflict with these facilities is anticipated.
- Overhead facilities running to the north off the pole at Sta. 44+66 26' RT. No conflict with these facilities is anticipated.
- Overhead facility running north off the pole at Sta. 55+39 23' RT continuing north along the west side of Cecelia Avenue. No conflict with these facilities is anticipated.
- Overhead facilities running to the north off the pole at Sta. 59+61 25' RT. No conflict with these facilities is anticipated.
- Overhead facilities running to the northeast off the pole at Sta. 60+79 24' RT.
  - Pole at Sta. 60+79 23' RT falls within the proposed curb. Ameren will relocate this pole during construction in coordination with the contractor. AT&T-D to transfer to relocated Ameren pole after relocated pole is set.
- Overhead facilities running to the north off the pole at Sta. 60+79 24' RT.
  - Pole at Sta. 60+79 23' RT falls within the proposed curb. Ameren will relocate this pole during construction in coordination with the contractor. AT&T-D to transfer to relocated Ameren pole after relocated pole is set.
- Overhead facilities running to the north off the pole at Sta. 62+12 26' RT.

- Pole at Sta. 62+12 26' RT is being replaced as part of Ameren maintenance. Ameren will replace this pole during construction in coordination with the contractor. AT&T-D to transfer to new Ameren pole once replacement pole is set.
- Overhead facilities running to the north off the pole at Sta. 63+14 25' RT. No conflict with these facilities is anticipated.
- Overhead facilities running to the northwest off the pole at Sta. 79+26 26' RT.
  - Pole at Sta. 79+26 26' RT falls within the proposed sidewalk. Ameren will relocate this pole during construction in coordination with the contractor. AT&T-D to transfer to relocated Ameren pole after relocated pole is set.
- Overhead facilities running to the northeast off the pole at Sta. 80+24 25' RT. No conflict with these facilities is anticipated.
- Overhead facilities running to the north off the pole at Sta. 80+24 25' RT. No conflict with these facilities is anticipated.
- Overhead facilities running to the northeast off the pole at Sta. 82+07 25' RT. No conflict with these facilities is anticipated.
- Overhead facilities running to the north off the pole at Sta. 82+07 25' RT. No conflict with these facilities is anticipated.
- Overhead facilities running to the northeast off the pole at Sta. 83+12 26' RT. No conflict with these facilities is anticipated.
- Overhead facilities running to the north off the pole at Sta. 83+12 26' RT. No conflict with these facilities is anticipated.
- Overhead facilities running to the north off the pole at Sta. 125+64 25' RT. No conflict with these facilities is anticipated.
- Overhead facilities running to the north off the pole at Sta. 131+22 25' RT at Bremerton Road.
  - Pole at Sta. 131+06 50' RT conflicts with proposed drainage and sidewalk. Ameren will relocate this pole during construction in coordination with the contractor. AT&T-D to transfer to relocated Ameren pole after relocated pole is set.
  - Pole at Sta. 131+22 25' RT conflicts with proposed drainage and sidewalk. Ameren will relocate this pole during construction in coordination with the contractor. AT&T-D to transfer to relocated Ameren pole after relocated pole is set.
- Overhead facilities running to the northeast off the pole at Sta. 132+22 26' RT.
  - Pole at Sta. 132+22 26' RT is being replaced as part of Ameren maintenance. Ameren will replace this pole during construction in coordination with the contractor. AT&T-D to transfer to new Ameren pole once replacement pole is set.
- Overhead facilities running to the north off the pole at Sta. 132+22 26' RT.

- Pole at Sta. 132+22 26' RT is being replaced as part of Ameren maintenance. Ameren will replace this pole during construction in coordination with the contractor. AT&T-D to transfer to new Ameren pole once replacement pole is set.
- Overhead facilities running to the northwest off the pole at Sta. 135+22 27' RT.
  - Pole at Sta. 135+22 26' RT falls within the proposed entrance. Ameren will relocate this pole during construction in coordination with the contractor. AT&T-D to transfer to relocated Ameren pole after relocated pole is set.
- Overhead facilities running to the north off the pole at Sta. 136+32 29' RT. No conflict with these facilities is anticipated.
- Overhead facilities running along the north side of Rt. 100 starting at a pole at Sta. 154+75 just east of South McKnight Road and continuing to Sta. 170+39, just west of McKinley Avenue. No conflict with these facilities is anticipated.
- Overhead facilities running to the north off the pole at Sta. 159+06 26' RT. No conflict with these facilities is anticipated.
- Overhead facilities running to the north off the pole at Sta. 165+13 26' RT. No conflict with these facilities is anticipated.
- Overhead facilities running to the north off the pole at Sta. 170+39 28' RT. No conflict with these facilities is anticipated.
- Overhead facility running north along the west side of O'Day starting at the pole at Sta. 188+90 27' RT.
  - Pole at Sta. 188+90 27' RT conflicts with proposed drainage structure. Ameren will relocate this pole during construction in coordination with the contractor. AT&T-D to transfer to relocated Ameren pole after relocated pole is set.
- Overhead facilities running to the north off the pole at Sta. 195+62 41' RT. No conflict with these facilities is anticipated.
- Overhead facilities running to the north off the pole at Sta. 200+61 26' RT. No conflict with these facilities is anticipated.
- Overhead facilities running along the north side of Rt. 100 starting at a pole just east of N. Sappington Road at Sta. 222+95 and continuing west to a pole Sta. 255+61 53' RT, just west of Woodlawn Avenue.
  - Pole at Sta. 227+18 25' RT falls in proposed curb. Ameren will relocate this pole during construction in coordination with the contractor. AT&T-D to transfer to relocated Ameren pole after relocated pole is set.
  - Stub pole at Sta. 228+35 23' RT falls in proposed curb. ATT-D will remove this pole and transfer to existing pole at Sta. 228+24 25' RT during construction in coordination with the contractor.

- ATT-D guy down wires at Sta. 231+26 25' RT fall within the proposed sidewalk. ATT-D will install a sidewalk arm and relocate these guys during construction in coordination with the contractor.
  - Pole at Sta. 234+66 25' RT is being replaced as part of Ameren maintenance. Ameren will replace this pole during construction in coordination with the contractor. AT&T-D to transfer to new Ameren pole once replacement pole is set.
  - Stub pole at Sta. 237+21 25' RT falls in proposed curb. ATT-D will remove this pole during construction in coordination with the contractor and transfer to existing pole at Sta. 237+80 26' RT.
  - Stub pole at Sta. 237+83 25' RT falls in proposed curb. ATT-D will remove this pole during construction in coordination with the contractor and transfer to existing pole at Sta. 237+80 26' RT.
  - ATT-D guy down wire at Sta. 243+88 26' RT falls within the proposed sidewalk. ATT-D will relocate this guy during construction in coordination with the contractor.
  - Pole at Sta. 246+02 25' RT falls within 0.38' of proposed drainage structure. Ameren will relocate this pole during construction in coordination with the contractor. AT&T-D to transfer to relocated Ameren pole after relocated pole is set.
  - Pole at Sta. 246+46 27' RT falls within 0.3' of proposed drainage structure. Kirkwood Electric will relocate this pole during construction in coordination with the contractor. AT&T-D to transfer to relocated pole after pole is set.
  - Stub pole at Sta. 247+42 23' RT falls in proposed curb. ATT-D will remove this pole and transfer to existing pole at Sta. 247+47 24' RT during construction in coordination with the contractor.
  - Pole at Sta. 250+08 41' RT falls in proposed sidewalk. Kirkwood Electric will relocate this pole during construction in coordination with the contractor. AT&T-D to transfer to relocated Kirkwood Electric pole after it is set.
- Overhead facilities running north along the west side of Woodlawn Avenue from Sta. 255+61 53' RT through project limits.
    - Pole at Sta. 254+86 259' RT falls in proposed roadway. Ameren will relocate this pole during construction in coordination with the contractor. AT&T-D to transfer to relocated Ameren pole after relocated pole is set.
    - Pole at Sta. 254+90 187' RT falls in proposed roadway. Ameren will relocate this pole during construction in coordination with the contractor. AT&T-D to transfer to relocated Ameren pole after relocated pole is set.

**Overhead facilities along the south side of Rt. 100 throughout project.**

- Overhead facilities running to the south off the pole at Sta. 05+80 23' LT. No conflict with these facilities is anticipated.
- Overhead facilities running to the southwest off the pole at Sta. 05+80 23' LT. No conflict with these facilities is anticipated.
- Overhead facilities running to the south off the pole at Sta. 69+10 46' LT.
  - Pole at Sta. 69+10 46' LT is being replaced as part of Ameren maintenance. Ameren will replace this pole during construction in coordination with the

contractor. AT&T-D to transfer to new Ameren pole, and down guy and riser to be relocated by ATT-D once pole is set.

- Overhead facility running south along the east side of N. Rock Hill Road starting at the pole at Sta. 154+97 59' LT.
  - ATT-D guy down wire at Sta. 153+97 59' LT falls within the proposed sidewalk. ATT-D will relocate this guy during construction in coordination with the contractor.
- Overhead facilities running to the south off the pole at Sta. 182+94 25' LT. No conflict with these facilities is anticipated.
- Overhead facilities on the south side running off the pole at Sta. 182+94 just west of Kortwright Avenue and continuing west to the pole at Sta. 207+91, west of Frederick Lane North.
  - Pole at Sta. 186+98 25' LT conflicts with proposed drainage structure. Ameren will relocate this pole during construction in coordination with the contractor. AT&T-D to transfer to relocated Ameren pole after relocated pole is set.
  - Pole at Sta. 191+44 25' LT falls within the proposed sidewalk. Ameren will relocate this pole during construction in coordination with the contractor. AT&T-D to transfer to relocated Ameren pole after relocated pole is set.
  - Pole at Sta. 193+92 26' LT falls within the proposed sidewalk. Ameren will relocate this pole during construction in coordination with the contractor. AT&T-D to transfer to relocated Ameren pole after relocated pole is set.
  - Pole at Sta. 195+10 26' LT conflicts with proposed drainage structure and falls within 0.37' of the proposed curb. Ameren will relocate this pole during construction in coordination with the contractor. AT&T-D to transfer to relocated Ameren pole after relocated pole is set.
  - Pole at Sta. 197+23 27' LT falls in proposed roadway. Ameren will relocate this pole during construction in coordination with the contractor. AT&T-D to transfer to relocated Ameren pole after relocated pole is set.
  - Pole at Sta. 197+46 45' LT falls in proposed roadway. Ameren will relocate this pole during construction in coordination with the contractor. AT&T-D to transfer to relocated Ameren pole after relocated pole is set.
  - Pole at Sta. 200+44 25' LT falls in proposed sidewalk. Ameren will relocate this pole during construction in coordination with the contractor. AT&T-D to transfer to relocated Ameren pole after relocated pole is set.
- Overhead facilities on the south side running west off the stub pole at Sta. 255+50 just west of Woodlawn Avenue to a stub pole at Sta. 258+49.
  - ATT-D stub pole at Sta. 255+50 32' LT and the accompanying sidewalk guy anchor fall in proposed curb. ATT-D will remove this pole and guy and transfer to existing pole at Sta. 255+53 33' LT during construction in coordination with the contractor.
  - Pole at Sta. 257+18 30' LT falls in proposed sidewalk. Kirkwood Electric will relocate this pole during construction in coordination with the contractor. AT&T-D to transfer to relocated Kirkwood Electric pole once relocated pole is set.
  - ATT-D stub pole at Sta. 258+49 29' LT falls in proposed sidewalk. Kirkwood Electric will relocate their pole and riser at that location during construction in

coordination with the contractor. AT&T-D to transfer to relocated Kirkwood Electric after relocated pole is set.

**Overhead facilities crossing Rt. 100 throughout project.**

- Overhead crossing at Sta. 03+81 west of Martin Drive. No conflict with these facilities is anticipated.
- Overhead crossing at Sta. 39+65 east of Porter Avenue. No conflict with these facilities is anticipated.
- Overhead crossing at Sta. 45+50 just west of Mercantile Drive. No conflict with these facilities is anticipated.
- Overhead crossing at Sta. 55+33 just west of Cecelia Avenue.
  - Pole at Sta. 55+27 24' LT falls within the proposed entrance. Ameren will relocate this pole during construction in coordination with the contractor. AT&T-D to transfer to relocated Ameren pole after relocated pole is set.
- Overhead crossing at Sta. 57+29 west of Lillian Avenue.
  - Pole at Sta. 57+19 24' RT is being replaced as part of Ameren maintenance. Ameren will replace this pole during construction in coordination with the contractor. AT&T-D to transfer to new Ameren pole once replacement pole is set.
- Overhead crossing at Sta. 63+08 just west of Bompert Avenue. This overhead line continues south along the west side of Bompert Avenue.
  - Pole at Sta. 63+00 32' LT is being eliminated by Ameren. AT&T-D to transfer to closest Ameren pole and will relocate overhead guy and riser to new pole during construction in coordination with the contractor.
- Overhead crossing at Sta. 84+24 west of Annalee Avenue. No conflict with these facilities is anticipated.
- Overhead crossing at Sta. 136+40 east of Creve Coeur Drive.
  - Ameren guy pole at Sta. 136+47 25' LT fall in proposed sidewalk. Ameren will relocate this pole during construction in coordination with the contractor. AT&T-D to transfer to relocated Ameren pole after relocated pole is set.
- Overhead crossing at Sta. 142+23 east of Raritan Avenue. No conflict with these facilities is anticipated.
- Overhead crossing at Sta. 145+56 east of Raritan Drive. No conflict with these facilities is anticipated.
- Overhead crossing at Sta. 153+26 just east of South McKnight Rd. No conflict with these facilities is anticipated.

- Overhead crossing at Sta. 169+60 west of McKinley Avenue. No conflict with these facilities is anticipated.
- Overhead crossing at Sta. 189+01 west of O'Day Avenue and continuing north along the west side of O'Day Avenue.
  - Pole at Sta. 188+90 27' RT conflicts with proposed drainage structure. Ameren will relocate this pole during construction in coordination with the contractor. AT&T-D to transfer to relocated Ameren pole after relocated pole is set.
- Overhead crossing at Sta. 195+31 west of Fairdale Avenue.
  - Pole at Sta. 195+10 26' LT conflicts with proposed drainage structure and falls within' 0.37' of the proposed curb. Ameren will relocate this pole during construction in coordination with the contractor. AT&T-D to transfer to relocated Ameren pole after relocated pole is set.
- Overhead crossing at Sta. 200+53 just west of Monier Place.
  - Pole at Sta. 200+44 25' LT falls in proposed sidewalk. Ameren will relocate this pole during construction in coordination with the contractor. AT&T-D to transfer to relocated Ameren pole after relocated pole is set.
  - Pole at Sta. 200+61 26' RT falls in proposed roadway. Ameren will relocate this pole during construction in coordination with the contractor. AT&T-D to transfer to relocated Ameren pole after relocated pole is set.
- Overhead crossing at Sta. 203+94 west of Salem Hills Drive. No conflict with these facilities is anticipated.
- Overhead crossing at Sta. 225+34 west of Sappington Road. No conflict with these facilities is anticipated.
- Overhead crossing at Sta. 228+31 west of Sappington Road. No conflict with these facilities is anticipated.
- Overhead crossing at Sta. 230+60 east of Bennett Avenue. No conflict with these facilities is anticipated.

**Underground facilities along the north side of Rt. 100**

- Buried facilities along the north side of Rt. 100 from Sta. 00+39 to Sta. 01+70. No conflict with these facilities is anticipated.
- Buried facilities along the north side of Rt. 100 from Sta. 01+76 to 11+34. No conflict with these facilities is anticipated.
- Buried facilities under the sidewalk just west of the Metro bridge between Sta. 23+82 and Sta. 24+01. No conflict with these facilities is anticipated.
- Buried facilities between the utility pole at Sta. 23+88 36' RT and the ATT cabinet at Sta. 23+99 46' RT. No conflict with these facilities is anticipated.

- Buried facilities running along the north side of Rt. 100 between the manhole at Sta. 24+03 35' RT and the utility pole at Sta. 24+71 42' RT. No conflict with these facilities is anticipated.
- Buried facilities running along the north side of Rt. 100 between the manhole at Sta. 24+03 35' RT and the utility pole at Sta. 24+72 57' RT. No conflict with these facilities is anticipated.
- Buried facilities running along the north side of Rt. 100 starting at a manhole at Sta. 24+03 36' RT and continuing west to a manhole at Sta. 29+95 54' RT. No conflict with these facilities is anticipated.
- Buried facilities running along the north side of Rt. 100 starting at a manhole at Sta. 24+03 36' RT and continuing west to a manhole at Sta. 29+95 54' RT. This runs parallel to the previous facility. No conflict with these facilities is anticipated.
- Buried facilities running northeast along the north curb line of Rt. 100 starting at Sta. 26+24 40' RT and continuing north through project limits. No conflict with these facilities is anticipated.
- Buried facility running to the southwest outside of existing right of way from the west side of S. Hanley at Sta. 31+15 107' RT and continuing to the southwest under the Black Creek bridge. These facilities reenter the existing right of way at Sta. 32+70 50' RT and continues west north of the north curb line of Rt. 100 between Sta. 33+90 and the hand hole at Sta. 39+51 39' RT.
  - Proposed drainage pipe conflicts with this facility at Sta. 39+10 39' RT. AT&T-D will relocate this facility during construction in coordination with the contractor.
- Buried facilities exiting a hand hole at Sta. 39+51 39' and continuing west across Porter Avenue. These facilities run west under the sidewalk on the north side of Rt. 100 and end at the utility pole at Sta. 40+46 24' RT. No conflict with these facilities is anticipated.
- Buried facilities transitioning from overhead to underground at the utility pole at Sta. 47+60 24' RT and continuing north along the east side of Louis Avenue.
  - Proposed drainage pipe conflicts with this facility at Sta. 47+67 36' RT. AT&T-D will relocate this facility during construction in coordination with the contractor.
- Buried facilities transitioning from overhead to underground at the utility pole at Sta. 54+37 24' RT and continuing north through project limits. No conflict with these facilities is anticipated.
- Buried facilities transitioning from overhead to underground at the utility pole at Sta. 58+48 24' RT and continuing north along the east side of Helen Avenue through the project limits. No conflict with these facilities is anticipated.

- Buried facilities transitioning from overhead to underground at the utility pole at Sta. 63+14 25' RT and continuing west along the north side of Rt. 100 to Sta. 131+21 on the west side of Bremerton Rd.
  - Proposed drainage structure conflicts with facility from Sta. 63+57 28' RT to Sta. 63+63 28' RT. AT&T-D will relocate this facility during construction in coordination with the contractor.
  - Proposed drainage structure conflicts with facility from at Sta. 65+31 28' RT. AT&T-D will relocate this facility during construction in coordination with the contractor.
  - Proposed drainage pipe conflicts with facility at Sta. 71+78 29' RT. AT&T-D will relocate this facility during construction in coordination with the contractor.
  - Proposed drainage pipe conflicts with facility between Sta. 72+64 32' RT and Sta. 73+00 34' RT. AT&T-D will relocate this facility during construction in coordination with the contractor.
  - Proposed drainage pipe conflicts with facility at Sta. 82+98 29' RT. AT&T-D will relocate this facility during construction in coordination with the contractor.
  - Proposed drainage structure conflicts with facility from Sta. 118+90 28' RT to Sta. 119+00 28' RT. AT&T-D will relocate this facility during construction in coordination with the contractor.
  - Proposed drainage structure conflicts with facility from Sta. 121+85' RT to Sta. 121+94 29' RT. AT&T-D will relocate this facility during construction in coordination with the contractor.
  - Proposed drainage structure conflicts with facility from Sta. 125+78 28' RT to Sta. 125+87 27' RT. AT&T-D will relocate this facility during construction in coordination with the contractor.
  - Proposed drainage structure conflicts with facility from Sta. 126+34 25' RT to Sta. 126+37 25' RT. AT&T-D will relocate this facility during construction in coordination with the contractor.
  - Proposed drainage structure conflicts with facility from Sta. 126+98 28' RT to Sta. 127+07 28' RT. AT&T-D will relocate this facility during construction in coordination with the contractor.
  - Proposed drainage structure conflicts with facility from Sta. 130+28 25' RT to Sta. 130+37 25' RT. AT&T-D will relocate this facility during construction in coordination with the contractor.
  - Proposed drainage structure conflicts with facility at Sta. 131+18 32' RT. AT&T-D will relocate this facility during construction in coordination with the contractor.
  
- Buried facilities transitioning from overhead to underground at the utility pole at Sta. 64+48 25' RT and heading west along the north side of Rt 100 to Sta. 64+53. No conflict with these facilities is anticipated.
  
- Buried facilities transitioning from overhead to underground at the utility pole at Sta. 79+26 26' RT and heading north through project limits. No conflict with these facilities is anticipated.
  
- Buried facilities transitioning from overhead to underground at the utility pole at Sta. 133+71 26' RT and heading north through project limits. No conflict with these facilities is anticipated.

- Buried facilities transitioning from overhead to underground at the utility pole at Sta. 144+75 40' RT and heading north through project limits. No conflict with these facilities is anticipated.
- Buried facilities transitioning from overhead to underground at the utility pole at Sta. 148+33 26' RT at Dunkirk Drive and heading north through project limits.
  - Proposed drainage pipe conflicts with facility at Sta. 148+30 32' RT. AT&T-D will relocate this facility during construction in coordination with the contractor.
- Buried facilities transitioning from overhead to underground at the utility pole at Sta. 150+01 26' RT and heading north through project limits. No conflict with these facilities is anticipated.
- Buried facilities transitioning from overhead to underground at the utility pole at Sta. 152+00 32' RT and heading north through project limits. No conflict with these facilities is anticipated.
- Buried facilities running along the north side of Rt. 100 from Sta. 150+00 to a manhole at Sta. 159+19 28' RT. No conflict with these facilities is anticipated.
- Buried facilities transitioning from overhead to underground at the utility pole at Sta. 154+75 36' RT and heading north through project limits. No conflict with these facilities is anticipated.
- Buried facilities along the north side of Rt. 100 from Sta. 154+05 86' RT to Sta. 154+52 48' RT. No conflict with these facilities is anticipated.
- Buried facilities running parallel to Rt. 100 on the north side from Sta. 165+85 to the power pole at Sta. 167+44 28' RT. No conflict with these facilities is anticipated.
- Buried facilities running along the north side of Rt. 100 from Sta. 182+91, just west of Kortwright Avenue, and continuing west to Sta. 206+59, across from Frederick Lane.
  - Proposed drainage structure conflicts with these facilities from Sta. 184+72 28' RT and Sta. 184+78 28' RT. AT&T-D will relocate this facility during construction in coordination with the contractor.
  - Proposed drainage structure conflicts with these facilities from Sta. 185+52 28' RT and Sta. 185+60 28' RT. AT&T-D will relocate this facility during construction in coordination with the contractor.
  - Proposed drainage structure conflicts with these facilities from Sta. 186+24 28' RT and Sta. 186+36 28' RT. AT&T-D will relocate this facility during construction in coordination with the contractor.
  - Proposed drainage structure conflicts with these facilities from Sta. 187+14 28' RT and Sta. 187+26 28' RT. AT&T-D will relocate this facility during construction in coordination with the contractor.

- Proposed drainage structure conflicts with these facilities from Sta. 188+15 28' RT and Sta. 188+23 28' RT. AT&T-D will relocate this facility during construction in coordination with the contractor.
- Proposed drainage pipe conflicts with these facilities between Sta. 186+25 28' RT and Sta. 191+28 27' RT. AT&T-D will relocate this facility during construction in coordination with the contractor.
- Proposed drainage structure conflicts with these facilities between Sta. 189+86 28' RT and Sta. 189+91 28' RT. AT&T-D will relocate this facility during construction in coordination with the contractor.
- Proposed drainage structure conflicts with these facilities between Sta. 191+19 27' RT and Sta. 191+28 27' RT. AT&T-D will relocate this facility during construction in coordination with the contractor.
- Proposed drainage structure conflicts with these facilities between Sta. 201+92 36' RT and Sta. 201+97 36' RT. AT&T-D will relocate this facility during construction in coordination with the contractor.
- Proposed drainage pipe conflicts with these facilities at Sta. 203+87 32' RT. AT&T-D will relocate this facility during construction in coordination with the contractor.
- Buried facilities transitioning from overhead to underground at the utility pole at Sta. 200+61 26' RT and continuing north through project limits. No conflict with these facilities is anticipated.
- Buried facilities running north off the north side of Rt. 100 starting at Sta. 206+59 39' RT and continuing north through project limits. No conflict with these facilities is anticipated.
- Buried facilities exiting a utility pole on the east side of N. Sappington Road at Sta. 222+95 24' RT and continuing west along the north side of Rt. 100 to at Sta. 253+80, just east of Woodlawn Avenue.
  - Proposed drainage structure conflicts with these facilities from Sta. 224+07 24' RT and Sta. 224+33 24' RT. AT&T-D will relocate this facility during construction in coordination with the contractor.
  - Proposed drainage pipe conflicts with these facilities at Sta. 226+61 28' RT. AT&T-D will relocate this facility during construction in coordination with the contractor.
  - Proposed drainage structure conflicts with these facilities from Sta. 229+52 27' RT to Sta. 229+65 27' RT. AT&T-D will relocate this facility during construction in coordination with the contractor.
  - Proposed drainage structure conflicts with these facilities from Sta. 230+30 27' RT to Sta. 230+42 27' RT. AT&T-D will relocate this facility during construction in coordination with the contractor.
  - Proposed drainage pipe conflicts with these facilities from Sta. 232+36 32' RT and Sta. 233+34 28' RT. AT&T-D will relocate this facility during construction in coordination with the contractor.
  - Proposed drainage structure conflicts with these facilities from Sta. 233+47 29' RT and 233+59 29' RT. AT&T-D will relocate this facility during construction in coordination with the contractor.

- Proposed drainage structure conflicts with these facilities from Sta. 236+58 24' RT and 236+66 24' RT. AT&T-D will relocate this facility during construction in coordination with the contractor.
- Proposed drainage structure conflicts with these facilities from Sta. 242+71 22' RT to Sta. 242+83 22' RT. AT&T-D will relocate this facility during construction in coordination with the contractor.
- Proposed drainage structure and pipe conflict with these facilities from Sta. 244+75 21' RT to Sta. 245+50 23' RT. AT&T-D will relocate this facility during construction in coordination with the contractor.
- Proposed drainage structure and pipe conflict with these facilities from Sta. 245+50 23' RT and 246+50 21' RT. AT&T-D will relocate this facility during construction in coordination with the contractor.
- Buried facilities transitioning from overhead to underground at the utility pole at Sta. 225+16 26' RT west of N. Sappington Rd. and continuing north through project limits.
  - Proposed drainage pipe conflicts with these facilities at Sta. 225+16 31' RT. AT&T-D will relocate this facility during construction in coordination with the contractor.
- Buried facilities transitioning from overhead to underground at the utility pole at Sta. 230+56 24' RT and continuing north for 3' before joining the buried facilities running along the north side of Rt. 100. No conflict with these facilities is anticipated.
- Buried facilities transitioning from overhead to underground at the utility pole at Sta. 232+71 25' RT and heading north through project limits.
  - Proposed drainage pipe conflicts with these facilities at Sta. 232+71 29' RT. AT&T-D will relocate this facility during construction in coordination with the contractor.
- Buried facilities exiting a utility pole east of Mariedale Court at Sta. 241+01 25' RT and continuing west along the north side of Rt. 100 to Sta. 241+94, just east of Mariedale Court.
  - Proposed drainage structure conflicts with these facilities from Sta. 241+32 29' RT to Sta. 241+40 29' RT. AT&T-D will relocate this facility during construction in coordination with the contractor.
- Buried facilities transitioning from overhead to underground at the utility pole at Sta. 250+10 41' RT and continuing north through project limits. No conflict with these facilities is anticipated.
- Buried facilities just west of Woodlawn Avenue from Sta. 255+56 and Sta. 258+83. No conflict with these facilities is anticipated.

#### **Underground facilities along the south side of Rt. 100**

- ATT duct bank on the south side of Rt. 100 running under the eastbound lanes of Rt. 100 from a manhole east of the project limits at 00+00 and continuing west to Sta. 18+67. No conflict with these facilities is anticipated.

- Buried facilities running west along the south side of Rt. 100 exiting from a manhole at Sta. 07+57 23' LT. These facilities pass under the curb at the southeast quadrant of Rt. 100 at Oakland Ave. and continue to a manhole on the southwest side of Oakland Ave. at Sta. 08+29 55' LT. No conflict with these facilities is anticipated.
- Buried facilities along the south side of Rt. 100 from Sta. 18+67 to Sta. 20+96. No conflict with these facilities is anticipated.
- Buried facilities exiting a manhole at Sta. 14+76 23' LT and heading southeast through the project limits. No conflict with these facilities is anticipated.
- Buried facilities exiting a manhole at Sta. 14+76 23' LT and running parallel to the west along the existing curb line to the east side of Laclede Station Rd. No conflict with these facilities is anticipated.
- Buried facilities exiting a manhole at Sta. 14+76 23' LT and heading south, crossing the shoulder and curb on the south side of Rt. 100. These facilities then turn to the west at Sta. 14+80 and run parallel under the existing sidewalk to Sta 15+31. No conflict with these facilities is anticipated.
- Buried facilities exiting a manhole at Sta. 18+66 29' LT and heading due south through the project limits. No conflict with these facilities is anticipated.
- Buried facilities running along the south side of Rt. 100 between Sta. 23+16 and Sta. 23+69. No conflict with these facilities is anticipated.
- Buried facilities running south off the south side of Rt. 100 just east of Mary Avenue from Sta. 66+09 28' LT to Sta. 66+46 264' LT.
  - Proposed pedestrian tunnel conflicts with facilities from Sta. 65+94 28' LT and Sta. 66+47 265' LT. AT&T-D will relocate this facility during construction in coordination with the contractor.
- Buried facilities running south off the south side of Rt. 100 just east of Mary Avenue from Sta. 66+12 32' LT and Sta. 66+50 264' LT
  - Proposed pedestrian tunnel conflicts with facilities from Sta. 66+12 32' LT to 66+50 264' LT. AT&T-D will relocate this facility during construction in coordination with the contractor.
- Buried facilities running parallel to Rt. 100 on the south side from Sta. 67+09 32' LT to Sta. 67+56 32' LT. No conflict with these facilities is anticipated.
- Buried facilities running along the south side of Rt. 100 starting at N. Rock Hill Rd. at Sta. 155+13 118' LT and continuing west to Sta. 207+94.
  - Proposed retaining wall falls within 1' of these facilities east of Mueck Terrace Drive from Sta. 174+18 29' LT and Sta. 174+63 30' LT. AT&T-D will relocate this facility during construction in coordination with the contractor.

- Proposed retaining wall conflicts with these facilities east of Kortwright Avenue from Sta. 179+68 31' LT and Sta. 181+40 32' LT. AT&T-D will relocate this facility during construction in coordination with the contractor.
- Proposed signal base conflicts with these facilities at Sta. 182+74 34' LT. AT&T-D will relocate this facility during construction in coordination with the contractor.
- Proposed drainage structure conflicts with these facilities from Sta. 185+50 28' RT and 185+60 33' LT. AT&T-D will relocate this facility during construction in coordination with the contractor.
- Proposed drainage pipe conflicts with these facilities from Sta. 186+45 30' LT to Sta. 186+59 30' LT. AT&T-D will relocate this facility during construction in coordination with the contractor.
- Proposed drainage structure and pipe conflict with these facilities from Sta. 194+04 24' LT and Sta. 194+72 26' LT. AT&T-D will relocate this facility during construction in coordination with the contractor.
- Proposed drainage pipe conflicts with these facilities at Sta. 194+01 30' LT. AT&T-D will relocate this facility during construction in coordination with the contractor.
- Proposed drainage pipe conflicts with these facilities at Sta. 194+09 30' LT. AT&T-D will relocate this facility during construction in coordination with the contractor.
- Proposed drainage structure and pipe conflict with this facility from Sta. 188+24 28' LT and Sta. 189+46 31' LT. AT&T-D will relocate this facility during construction in coordination with the contractor.
- Proposed drainage structure conflicts with these facilities between Sta. 195+14 24' and 195+21 24' LT. AT&T-D will relocate this facility during construction in coordination with the contractor.
- Proposed drainage pipe conflicts with these facilities at Sta. 204+05 22' LT. AT&T-D will relocate this facility during construction in coordination with the contractor.
- Proposed drainage pipe conflicts with these facilities from Sta. 206+05 26' LT to Sta. 206+10 26' LT. AT&T-D will relocate this facility during construction in coordination with the contractor.
- Buried facility exiting pole at Sta. 204+05 28' LT and heading east to handhole at Sta. 204+00 28' LT. No conflict with these facilities is anticipated.
- Buried facility starting at Sta. 222+93, just east of N. Sappington Road, and continuing west along the south side of Rt. 100 to Sta. 225+76.
  - Proposed drainage structure conflicts with these facilities at Sta. 223+11 37' LT. AT&T-D will relocate this facility during construction in coordination with the contractor.
  - Proposed drainage pipe conflicts with these facilities at Sta. 224+02 42' LT. AT&T-D will relocate this facility during construction in coordination with the contractor.
  - Proposed drainage pipe conflicts with these facilities at Sta. 225+73 33' LT. AT&T-D will relocate this facility during construction in coordination with the contractor.
  - Proposed drainage pipe conflicts with these facilities at Sta. 227+28 32' LT. AT&T-D will relocate this facility during construction in coordination with the contractor.

- Buried facilities starting at a manhole in the intersection of Rt. 100 and Woodlawn Ave. at Sta. 254+47 29' LT and continuing west along the south side of Rt. 100 to a manhole at Lindbergh Blvd. at Sta. 281+54 49' LT. No conflict with these facilities is anticipated.

**Underground facilities crossing Rt. 100 throughout project.**

- Buried facilities exiting a manhole east of the eastern project limits and heading diagonally to the northeast, crossing Rt. 100 at Sta. 00+00. No conflict with these facilities is anticipated.
- Buried facilities exiting a manhole under the eastbound lanes of Rt. 100 just east of the eastern project limits and crossing Rt. 100 diagonally in a southwest direction, ending at Sta. 00+14 47' LT. No conflict with these facilities is anticipated.
- Buried facilities crossing Rt. 100 at Sta. 01+71 just west of Martin Drive. No conflict with these facilities is anticipated.
- Buried facilities crossing Rt. 100 at Sta. 01+74 just west of Martin Drive. No conflict with these facilities is anticipated.
- Buried facilities crossing Rt. 100 at Sta. 07+58 east of Oakland Avenue. No conflict with these facilities is anticipated.
- Buried facilities exiting a manhole at Sta. 14+76 23' LT and crossing Rt. 100 at Sta. 14+80 just east of Laclede Station Rd. No conflict with these facilities is anticipated.
- Buried facilities exiting a manhole at Sta. 14+76 23' LT and heading north, crossing Rt. 100 at Sta. 14+81 just east of Laclede Station Rd. No conflict with these facilities is anticipated.
- Buried facilities exiting a manhole at Sta. 14+76 23' LT and heading south, crossing the shoulder and curb on the south side of Rt. 100 at Sta. 14+81. No conflict with these facilities is anticipated.
- Buried facilities crossing Rt. 100 at Sta. 23+89. No conflict with these facilities is anticipated.
- Buried facilities crossing Rt. 100 at Sta. 26+28. No conflict with these facilities is anticipated.
- Buried facilities crossing Rt. 100 at Sta. 29+96 just east of South Hanley. No conflict with these facilities is anticipated.
- Buried facilities crossing Rt. 100 at Sta. 45+24 diagonally from east to west starting at Sta. 44+89 31' LT and ending at the utility pole at Sta. 45+51 25' RT. No conflict with these facilities is anticipated.
- Buried facilities crossing Rt. 100 at Sta. 45+53 just west of Mercantile Drive and continuing south along the west side of Mercantile Drive through project limits.

- Proposed drainage pipe conflicts with this facility from Sta. 45+46 38' LT to Sta. 45+46 45' LT. AT&T-D will relocate this facility during construction in coordination with the contractor.
- Buried facilities transitioning from overhead to underground at the utility pole at Sta. 51+86 24' RT and continuing south crossing RT. 100 at Sta. 51+85.
  - Buried facilities at Sta. 51+86 24' RT are exiting an Ameren pole at the same location that is in conflict. Ameren will relocate this pole and ATT will need to relocate their underground facilities during construction in coordination with the contractor.
  - Proposed drainage pipe conflicts with this facility at Sta. 51+84 21' RT. AT&T-D will relocate this facility during construction in coordination with the contractor.
- Buried facilities transitioning from overhead to underground at the utility pole at Sta. 54+37 24' RT and heading south crossing RT. 100 at Sta. 51+85. No conflict with these facilities is anticipated.
- Buried facilities transitioning from overhead to underground at the utility pole at Sta. 55+39 24' RT and heading south crossing Rt. 100 at Sta. 55+40. No conflict with these facilities is anticipated.
- Buried facilities transitioning from overhead to underground at the utility pole at Sta. 57+19 25' RT and crossing RT. 100 diagonally at Sta. 57+05 and continuing to the southeast through the project limits. No conflict with these facilities is anticipated.
- Buried facilities running along the south side of Rt. 100 starting at Sta. 64+83 27' LT and continuing west to Sta. 66+09 28' LT. No conflict with these facilities is anticipated.
- Buried facilities exiting the utility pole at Sta. 66+60 25' RT and crossing Rt. 100 diagonally southeast to Sta. 66+13 32' LT.
  - Proposed pedestrian tunnel conflicts with facilities from Sta. 66+13 32' LT to Sta. 66+22 24' LT. AT&T-D will relocate this facility during construction in coordination with the contractor.
- Buried facilities crossing Rt. 100 at Sta. 66+53 just west of Mary Ave and continuing south along the west side of Mary Avenue through project limits.
  - Proposed drainage pipe conflicts with facility at Sta. 66+58 39' LT. AT&T-D will relocate this facility during construction in coordination with the contractor.
- Buried facilities crossing at Sta. 66+82 just west of Mary Avenue. This facility exits the utility pole at Sta. 66+60 25' RT and crosses Rt. 100 diagonally southwest to Sta. 67+09 32' LT.
  - Proposed drainage pipe conflicts with facilities at Sta. 66+66 17' RT. AT&T-D will relocate this facility during construction in coordination with the contractor.
  - Proposed drainage pipe conflicts with these facilities at Sta. 67+03 25' LT. AT&T-D will relocate this facility during construction in coordination with the contractor.

- Buried facilities crossing Rt. 100 just west of South Brentwood Blvd. at Sta. 78+26. No conflict with these facilities is anticipated.
- Buried facilities transitioning from overhead to underground at the utility pole at Sta. 82+06 24' RT and crossing Rt. 100 at Sta. 82+03 and continuing south along the west side of Collier Avenue through project limits.
  - Proposed drainage pipe conflicts with facility at Sta. 82+05 17' RT. AT&T-D will relocate this facility during construction in coordination with the contractor.
- Buried facilities transitioning from overhead to underground at the utility pole east of Manderly Drive at Sta 121+32 25' RT and crossing Rt. 100 at Sta. 121+35.
  - Proposed drainage pipe conflicts with facility at Sta. 121+32 18' RT. AT&T-D will relocate this facility during construction in coordination with the contractor.
- Buried facilities transitioning from overhead to underground at the utility pole west of Manderly Drive at Sta 124+46 23' RT and crossing Rt. 100 at Sta. 124+46. No conflict with these facilities is anticipated.
- Buried facilities crossing Rt. 100 at Sta. 131+21. These facilities continue south down the east side of Bremerton on the south side of Rt. 100, and they continue north along the west side of Bremerton on the north side of Rt. 100.
  - Proposed drainage structure conflicts with facility at Sta. 131+19 26' LT. AT&T-D will relocate this facility during construction in coordination with the contractor.
  - Proposed drainage structure conflicts with facility at Sta. 131+21 28' RT. AT&T-D will relocate this facility during construction in coordination with the contractor.
- Buried facilities crossing Rt. 100 at Sta. 131+44. These facilities continue south down the west side of Bremerton on the south side of Rt. 100, and they continue north along the west side of Bremerton on the north side of Rt. 100.
  - Proposed drainage structure conflicts with facility at Sta. 131+57 28' LT. AT&T-D will relocate this facility during construction in coordination with the contractor.
- Buried facilities transitioning from overhead to underground at the utility pole just west of Creve Coeur Drive at Sta.137+77 40' RT and crossing Rt. 100 at Sta. 137+45.
  - Proposed drainage pipe conflicts with facility at Sta. 137+66 30' RT. AT&T-D will relocate this facility during construction in coordination with the contractor.
- Buried facilities crossing Rt. 100 at Sta.138+56 west of Creve Coeur Drive. No conflict with these facilities is anticipated.
- Buried facilities transitioning from overhead to underground at the utility pole on the north side of Rt.100 just west of Rock Hill Industrial Court at Sta. 142+16 38' RT and crossing the centerline of Rt. 100 at Sta. 142+21. No conflict with these facilities is anticipated.
- Buried facilities crossing the centerline of Rt. 100 at Sta.145+40 west of Raritan Avenue. No conflict with these facilities is anticipated.

- Buried facilities transitioning from overhead to underground at the utility pole on the north side of Rt.100 at Sta. 152+86 32' RT just east of South McKnight Road. These facilities run diagonally to the southwest and crosses the centerline of Rt. 100 at Sta. 153+46. These facilities continue down the east side of S. McKnight Road through the project limits. No conflict with these facilities is anticipated.
- Buried facility crossing the centerline of S. McKnight Rd. at Sta. 154+50. These facilities continue along the west side of S. McKnight Road on both the north and south sides of Rt. 100 through project limits. No conflict with these facilities is anticipated.
- Buried facilities exiting hand hole on the south side of Rt.100 at Sta. 169+60 37' LT at McKinley Avenue. These facilities cross the centerline of Rt. 100 at Sta. 169+55 and continues along the west side of McKinley Avenue through the project limits. No conflict with these facilities is anticipated.
- Buried facilities crossing the centerline of Rt. 100 just west of O'Day Avenue at Sta. 189+03. These facilities exit the dip at the utility pole at Sta.190+11 25' LT on the south side and terminate at the utility pole on the north side of Rt. 100 at Sta.188+90 27' RT.
  - Proposed drainage pipe conflicts with this facility at Sta. 188+90 27' RT. AT&T-D will relocate this facility during construction in coordination with the contractor.
  - Buried facilities at Sta. 188+90 27' RT are exiting an Ameren pole at the same location that is in conflict. Ameren will relocate this pole and ATT will need to relocate their underground facilities during construction in coordination with the contractor.
- Buried facilities crossing the centerline of Rt. 100 at Sta. 190+07 east of Tavalon Avenue.
  - Proposed drainage structure conflicts with this facility at Sta. 190+07 27' RT.
  - Proposed drainage structure conflicts with these facilities between Sta. 191+19 27' RT and Sta. 191+28 27' RT. AT&T-D will relocate this facility during construction in coordination with the contractor.
- Buried facilities crossing Rt. 100 at Sta.197+94 on the west side of North Berry. These facilities continue north along the west side of North Berry Road. No conflict with these facilities is anticipated.
- Buried facilities crossing Rt. 100 at Sta. 200+48. These facilities run along the west side of Monier Place on the south side of Rt. 100. No conflict with these facilities is anticipated.
- Buried facilities crossing Rt. 100 at Sta. 203+98 west of Salem Hills Drive. No conflict with these facilities is anticipated.
- Buried facilities crossing Rt. 100 at Sta. 205+13 and continuing south along the east side of Frederick Lane North.
  - Proposed drainage pipe conflicts with this facility at Sta. 205+12 31' RT. AT&T-D will relocate this facility during construction in coordination with the contractor.
  - Proposed drainage pipe conflicts with this facility at Sta. 205+13 20' LT. AT&T-D will relocate this facility during construction in coordination with the contractor.

- Buried facilities crossing Rt. 100 at Sta. 222+92. These facilities continue along the east side of N. Sappington Road on the north side of Rt. 100. No conflict with these facilities is anticipated.
- Buried facilities crossing Rt. 100 at Sta. 223+05. These facilities exit a dip on the power pole at Sta. 222+95 24' RT on the north side and head south crossing Rt. 100 and continuing along the east side of N. Sappington Road through project limits. No conflict with these facilities is anticipated.
- Buried facilities crossing Rt. 100 at Sta. 225+57 west of N. Sappington Road. These facilities continue north and south through the northern and southern project limits.
  - Proposed drainage pipe conflicts with these facilities at Sta. 225+56 33' RT. AT&T-D will relocate this facility during construction in coordination with the contractor.
- Buried facilities transitioning from overhead to underground at the utility pole on the north side of Rt.100 at Sta. 227+18 26' RT west of N. Sappington Road and crossing Rt. 100 at Sta. 227+21. No conflict with these facilities is anticipated.
- Buried facilities transitioning from overhead to underground at the utility pole at Sta. 232+71 25' RT and heading south crossing Rt. 100 at Sta. 232+71 and continuing south through project limits. No conflict with these facilities is anticipated.
- Buried facilities crossing Rt. 100 at Sta. 237+16. These facilities continue along the east side of Kenmore Drive through project limits.
  - Proposed drainage pipe conflicts with these facilities at Sta. 237+20 21' RT. AT&T-D will relocate this facility during construction in coordination with the contractor.
- Buried facilities crossing Rt. 100 just east of Woodlawn Avenue at Sta. 254+19. These facilities begin to cross Rt. 100 on the north side at Sta. 253+73 80' RT and end at a manhole in the eastbound lanes of Rt. 100 at Sta. 254+44 34' LT. No conflict with these facilities is anticipated.
- Buried facilities exiting a manhole in the eastbound lanes of Rt. 100 at Sta. 254+44 34' LT and heading north crossing Rt.100 and continuing north under the northbound lane of Woodlawn Avenue through project limits. No conflict with these facilities is anticipated.
- Buried facilities exiting a manhole in the eastbound lanes of Rt. 100 at Sta. 254+47 29' LT and heading north crossing Rt.100 and continuing north under the northbound lane of Woodlawn Avenue. No conflict with these facilities is anticipated.
- Buried facilities exiting a manhole in the eastbound lanes of Rt. 100 at Sta. 254+47 29' LT and heading in a northwest direction crossing the centerline of Rt.100 at Sta. 254+83 and ending at Sta. 255+56 56' RT, just west of Woodlawn Avenue. No conflict with these facilities is anticipated.

- Buried facilities crossing Rt. 100 at Sta. 258+85, west of Woodlawn Avenue. These facilities continue south through the southern project limits. No conflict with these facilities is anticipated.

**Underground facilities on side streets throughout the project.**

- Buried facilities along the west side of Martin Drive. No conflict with these facilities is anticipated.
- Buried facilities along the west side of Martin Drive starting at Sta. 01+70 40' RT and continuing north through project limits. No conflict with these facilities is anticipated.
- Buried facilities crossing Laclede Station Rd. between Sta. 15+34 31' LT and Sta. 15+80 53' LT on the south side of Rt. 100. No conflict with these facilities is anticipated.
- Buried facilities running along the east side of Laclede Station Rd. starting at Sta. 15+50 30' RT and continuing northwest through project limits. No conflict with these facilities is anticipated.
- Buried facilities running along the east side of Laclede Station Rd. starting at Sta. 15+64 27' RT and continuing northwest through project limits. No conflict with these facilities is anticipated.
- Buried facilities on the north side of Rt. 100 exiting a manhole at Sta. 29+95 54' RT and continuing to the northeast crossing South Hanley Road to Sta. 31+15 107' RT. No conflict with these facilities is anticipated.
- Buried facilities leaving the handhole at Sta. 39+51 39' RT and continuing north along the east side of Porter Avenue through the project limits. No conflict with these facilities is anticipated.
- Buried facilities running north along the east side of Porter Avenue starting at the hand hole at Sta. 39+51 39' RT. No conflict with these facilities is anticipated.
- Buried facilities running south along the east side of Mercantile Drive starting at Sta. 44+89 31' LT and continuing south through project limits.
  - Proposed drainage pipe conflicts with this facility at Sta. 44+89 38' LT. AT&T-D will relocate this facility during construction in coordination with the contractor.
- Buried facilities crossing under the sidewalk on the north side of Rt. 100 and then running north along the east side of Salem Road starting at the utility pole Sta. 51+20 31' RT and continuing north through project limits. No conflict with these facilities is anticipated.
- Buried facilities running north along the west side of Salem Rd. starting at the utility pole at Sta. 51+86 24' RT and continuing north through project limits.
  - Buried facilities at Sta. 51+86 24' RT are exiting an Ameren pole at the same location that is in conflict. Ameren will relocate this pole and ATT will need to

relocate their underground facilities during construction in coordination with the contractor.

- Buried facilities transitioning from overhead to underground at the power pole at Sta. 55+39 24' RT and continuing north along the west side of Cecelia Avenue through project limits.
  - Proposed drainage pipe conflicts with this utility at Sta. 55+39 30' RT. AT&T-D will relocate this facility during construction in coordination with the contractor.
- Buried facilities running north along the east side of Dorothy Avenue starting at Sta. 65+01 26' RT to Sta. 64+83 73' RT.
  - Proposed drainage pipe crosses facility at Sta. 64+89 59' RT. AT&T-D will relocate this facility during construction in coordination with the contractor.
- Buried facilities on the south side of Rt. 100 crossing Mary Ave. between Sta. 66+20 209' LT and Sta. 66+74 194' LT.
  - Proposed drainage conflicts with facilities from Sta. 66+17 209' LT. AT&T-D will relocate this facility during construction in coordination with the contractor.
  - Proposed drainage conflicts with facilities from Sta. 66+74 197' LT. AT&T-D will relocate this facility during construction in coordination with the contractor.
- Buried facilities transitioning from overhead to underground at the utility pole at Sta. 131+23 26' RT and continuing north along the west side of Bremerton Road through project limits.
  - Proposed drainage conflicts with these facilities at Sta. 131+23 26' RT. AT&T-D will relocate this facility during construction in coordination with the contractor.
  - Buried facilities exiting an Ameren pole at Sta. 131+23 26' RT that is in conflict. Ameren will relocate this pole and ATT will need to relocate their underground facilities during construction in coordination with the contractor.
- Buried facilities transitioning from overhead to underground at the utility pole at Sta. 137+77 39' RT and continuing north along the west side of Creve Coeur Drive through project limits. No conflict with these facilities is anticipated.
- Buried facilities transitioning from overhead to underground at the utility pole at Sta. 141+12 39' RT and continuing north along the west side of Rock Hill Industrial Court through project limits. No conflict with these facilities is anticipated.
- Buried facilities running along the east side of S. McKnight Road from Sta. 153+00 36' RT and Sta. 153+14 109' RT. No conflict with these facilities is anticipated.
- Buried facilities crossing S. McKnight Rd. on the north side of Rt. 100 between Sta. 153+02 110' RT and Sta. 153+80 140' RT. No conflict with these facilities is anticipated.
- Buried facilities running along the east side of North Rock Hill Road starting at the manhole at Sta. 159+19 48' RT and continuing north through project limits. No conflict with these facilities is anticipated.

- Buried facilities running along the east side O'Day Avenue, starting at Sta. 188+32 28' RT and continuing north through project limits.
  - Proposed drainage structure conflicts with these facilities from Sta. 188+29 46' RT and Sta. 188+32 42' RT. AT&T-D will relocate this facility during construction in coordination with the contractor.
- Buried facilities transitioning from overhead to underground at the power pole at Sta. 222+95 24' RT and continuing north along the east side of N. Sappington Road through project limits. No conflict with these facilities is anticipated.
- Buried facilities on the north side of Rt. 100 running north along the east side of Bennett Avenue starting at Sta. 231+36 29' RT and continuing north through project limits. No conflict with these facilities is anticipated.
- Buried facilities transitioning from overhead to underground at the power pole at Sta. 232+71 25' RT and continuing north through project limits. No conflict with these facilities is anticipated.
- Buried facilities running along the east side of Mariedale Court starting at Sta. 241+94 29' RT and continuing north through project limits. No conflict with these facilities is anticipated.
- Buried facilities transitioning from overhead to underground at the power pole at Sta. 250+08 41' RT and continuing north through project limits.
  - Buried facilities at Sta. 250+08 41' RT are exiting a Kirkwood utility pole at the same location that is in conflict. Kirkwood Electric will relocate this pole and ATT will need to relocate their underground facilities during construction in coordination with the contractor.
- Buried facilities exiting a manhole at Sta. 254+44 34' and heading south along the east side of Woodlawn Avenue through project limits. No conflict with these facilities is anticipated.
  - Proposed drainage structure conflicts with these facilities from Sta. 255+65 28' LT and Sta. 255+72 28' LT. AT&T-D will relocate this facility during construction in coordination with the contractor.
  - Proposed drainage structure conflicts with these facilities from Sta. 255+86 26' LT and Sta. 255+96 27' LT. AT&T-D will relocate this facility during construction in coordination with the contractor.
  - Proposed drainage structure conflicts with these facilities from Sta. 263+13 27' LT and Sta. 263+22 26' LT. AT&T-D will relocate this facility during construction in coordination with the contractor.
  - Proposed drainage pipe conflicts with these facilities from Sta. 264+77 25' LT and Sta. 268+88 27' LT.
  - Proposed drainage structure conflicts with these facilities from Sta. 266+29 26' LT and Sta. 266+35 26' LT. AT&T-D will relocate this facility during construction in coordination with the contractor.

- Proposed drainage structure conflicts with these facilities from Sta. 268+77 25' LT and Sta. 268+88 25' LT. AT&T-D will relocate this facility during construction in coordination with the contractor.

**Manholes / Handholes throughout the project that will need to be adjusted to grade:**

- Manhole at Sta. 07+57 22' RT falls within the new roadway and will need to be adjusted to grade. ATT&D will perform this work during construction in coordination with the contractor.
- Manhole at Sta. 14+76 23' RT falls in new roadway and will need to be adjusted to grade. ATT&D will perform this work during construction in coordination with the contractor.
- Handhole at Sta. 39+52 38' RT falls in proposed curb and will need to be adjusted to grade. ATT&D will perform this work during construction in coordination with the contractor.
- Manhole at Sta. 82+00 43' LT falls within the new roadway and will need to be adjusted to grade. ATT&D will perform this work during construction in coordination with the contractor.
- Handhole at Sta. 189+66 28' LT falls in proposed sidewalk and will need to be adjusted to grade. ATT&D will perform this work during construction in coordination with the contractor.
- Handhole at Sta. 194+55 25' LT falls within 1' of proposed drainage. ATT-D will relocate these facilities during construction in coordination with the contractor.
- Handhole at Sta. 204+00 28' LT falls in proposed sidewalk and will need to be adjusted to grade. ATT&D will perform this work during construction in coordination with the contractor.
- Manhole at Sta. 217+16 36 LT falls within the new roadway and will need to be adjusted to grade. ATT&D will perform this work during construction in coordination with the contractor.
- Manhole at Sta. 231+15 29' RT falls within the new sidewalk and will need to be adjusted to grade. ATT&D will perform this work during construction in coordination with the contractor.
- Manhole at Sta. 254+44 34' LT falls within the new roadway and curb on proposed island and will need to be adjusted to grade. ATT&D will perform this work during construction in coordination with the contractor.
- Manhole at Sta. 254+47 29' LT falls within the new roadway and will need to be adjusted to grade. ATT&D will perform this work during construction in coordination with the contractor.

**Pedestals throughout the project that will need to be relocated.**

- Pedestal at Sta. 64+94 356' RT falls within 0.5' of proposed tunnel trail. AT&T-D will relocate this facility during construction in coordination with the contractor.
- Pedestal at Sta. 65+41 31' LT falls within proposed sidewalk. AT&T-D will relocate this facility during construction in coordination with the contractor.
- Pedestal at Sta. 169+05 31' RT falls within proposed sidewalk. AT&T-D will relocate this facility during construction in coordination with the contractor.
- Pedestal at Sta. 170+31 26' RT falls within proposed sidewalk. AT&T-D will relocate this facility during construction in coordination with the contractor.
- Pedestal at Sta. 250+12 41' RT falls within proposed sidewalk. AT&T-D will relocate this facility during construction in coordination with the contractor.
- Pedestal at Sta. 258+47 34' LT falls within proposed sidewalk. AT&T-D will relocate this facility during construction in coordination with the contractor.

AT&T-D has at grade access points for its facilities at various location throughout the project. Some of these access points may need to be adjusted to new grades. The contractor shall coordinate directly with AT&T-D for these adjustments. AT&T-D's representative for this will be as follows:

- Jim Lashley (ph: 636.255.2121, email: [ww8571@att.com](mailto:ww8571@att.com))

The contractor shall contact AT&T-D a minimum of 4 weeks ahead of need for adjustment.

The contractor shall coordinate with AT&T (Distribution), as necessary, and take measures to protect in place their existing facilities during construction.

The contractor shall directly contact AT&T (Distribution) to verify the locations of their facilities.

The Commission cannot warrant the information above which was provided by AT&T (Distribution).

## **5.0 CHARTER**

**Charter Communications has the following existing facilities within the project limits:**

- **Overhead facilities along the north side of Rt. 100 throughout project.**
  - Overhead facilities running west along the north side of Rt. 100 from Sta. 00+23 at Big Bend to Sta. 20+49, just east of Circle Drive. No conflict with these facilities is anticipated.
  - Overhead facilities running north from a pole at Sta. 06+46 30' RT. No conflict with these facilities is anticipated.

- Overhead facilities running north from a pole at Sta. 11+31 32' RT. No conflict with these facilities is anticipated.
- Overhead facilities running north along the east side of Laclede Station Road from a pole at Sta. 15+46 32' RT. No conflict with the facilities is anticipated.
- Overhead facilities running north from a pole at Sta. 17+34 31' RT. No conflict with these facilities is anticipated.
- Overhead facilities running west along the north side of Rt. 100 starting at a pole just west of Hanley at Sta. 32+98 41' RT to Sta. 169+55, just west of McKinley Avenue.
  - Pole at Sta. 32+98 41' RT is being relocated to move span away during construction of the Black Creek Bridge. Ameren will relocate this pole during construction in coordination with the contractor. Charter will transfer to the relocated pole during construction in coordination with the contractor.
  - Pole at Sta. 47+05 23' RT falls within the proposed curb. Ameren will relocate this pole during construction in coordination with the contractor. Charter will transfer to the relocated pole during construction in coordination with the contractor.
  - Pole at Sta. 48+17 23' RT conflicts with proposed drainage. Ameren will relocate this pole during construction in coordination with the contractor. Charter will transfer to the relocated pole during construction in coordination with the contractor.
  - Pole at Sta. 50+42 23' RT falls in proposed entrance. Ameren will relocate this pole during construction in coordination with the contractor. Charter will transfer to the relocated pole during construction in coordination with the contractor.
  - Pole at Sta. 51+17 23' RT falls in proposed curb. Ameren will relocate this pole during construction in coordination with the contractor. Charter will transfer to the relocated pole during construction in coordination with the contractor.
  - Pole at Sta. 51+86 24' RT falls within 1' of the proposed curb. Ameren will relocate this pole during construction in coordination with the contractor. Charter will transfer to the relocated pole during construction in coordination with the contractor.
  - Pole at Sta. 56+31 24' RT falls in a proposed entrance. Ameren will relocate this pole during construction in coordination with the contractor. Charter will transfer to the relocated pole during construction in coordination with the contractor.
  - Pole at Sta. 57+19 24' RT falls within 1.4' of proposed curb. Ameren will relocate this pole during construction in coordination with the contractor. Charter will transfer to the relocated pole during construction in coordination with the contractor.
  - Pole at Sta. 60+79 23' RT falls in proposed roadway. Ameren will relocate this pole during construction in coordination with the contractor. Charter will transfer to the relocated pole during construction in coordination with the contractor.

- Pole at Sta. 62+12 24' RT is being replaced as part of Ameren maintenance. Ameren will replace this pole during construction in coordination with the contractor. Charter will transfer to the replacement pole during construction in coordination with the contractor.
- Pole at Sta. 64+47 24' RT is being replaced by a taller pole. Ameren will replace this pole during construction in coordination with the contractor. Charter will transfer to the replacement pole during construction in coordination with the contractor.
- Pole at 65+37 24' RT is being replaced by a taller pole. Ameren will replace this pole during construction in coordination with the contractor. Charter will transfer to the replacement pole during construction in coordination with the contractor.
- Pole at 66+59 25' RT is being replaced by a taller pole. Ameren will replace this pole during construction in coordination with the contractor. Charter will transfer to the replacement pole during construction in coordination with the contractor.
- Pole at 67+11 24' RT is being replaced by a taller pole. Ameren will replace this pole during construction in coordination with the contractor. Charter will transfer to the replacement pole during construction in coordination with the contractor.
- Pole at Sta. 79+26 26' RT falls in proposed sidewalk. Ameren will relocate this pole during construction in coordination with the contractor. Charter will transfer to the relocated pole during construction in coordination with the contractor.
- Charter guy down wire at Sta. 81+07 25' RT falls in proposed sidewalk. Charter will convert this to a sidewalk guy and relocate it during construction in coordination with the contractor.
- Charter guy down wire at Sta. 121+32 25' RT falls in proposed sidewalk. Charter will relocate guy during construction in coordination with the contractor.
- Pole at Sta. 123+42 24' RT falls in proposed curb. Ameren will relocate this pole during construction in coordination with the contractor. Charter will transfer to the relocated pole during construction in coordination with the contractor.
- Pole at Sta. 124+45 25' RT falls in proposed roadway. Ameren will relocate this pole during construction in coordination with the contractor. Charter will transfer to the relocated pole during construction in coordination with the contractor.
- Pole at Sta. 131+06 50' RT conflicts with proposed drainage. Ameren will relocate this pole during construction in coordination with the contractor. Charter will transfer to the relocated pole and relocate down guy wire during construction in coordination with the contractor.
- Pole at Sta. 131+22 25' RT falls in proposed sidewalk and conflicts with drainage. Ameren will relocate this pole during construction in coordination with the contractor. Charter will transfer to the relocated pole during construction in coordination with the contractor.
- Pole at Sta. 132+22 26' RT is being replaced as part of Ameren maintenance. Ameren will replace this pole during construction in coordination with the

- contractor. Charter will transfer to the replacement pole during construction in coordination with the contractor.
- Pole at Sta. 133+71 26' RT falls in proposed sidewalk. Ameren will relocate this pole during construction in coordination with the contractor. Charter will transfer to the relocated pole and relocate down guy wire during construction in coordination with the contractor.
  - Pole at Sta. 135+22 26' RT falls in proposed entrance. Ameren will relocate this pole during construction in coordination with the contractor. Charter will transfer to the relocated pole and relocate down guy wire during construction in coordination with the contractor.
  - Pole at Sta. 138+91 38' RT falls in proposed sidewalk. Ameren will relocate this pole during construction in coordination with the contractor. Charter will transfer to the relocated pole and relocate down guy wire during construction in coordination with the contractor.
  - Pole at Sta. 161+41 28' RT falls in proposed sidewalk. Ameren will relocate this pole during construction in coordination with the contractor. Charter will transfer to the relocated pole during construction in coordination with the contractor.
  - Pole at Sta. 168+14 29' RT falls in proposed sidewalk. Ameren will relocate this pole during construction in coordination with the contractor. Charter will transfer to the relocated pole during construction in coordination with the contractor.
  - Charter guy down wire at Sta. 169+54 27' RT falls in proposed sidewalk. Charter will relocate guy during construction in coordination with the contractor.
- Overhead facilities running north off a power pole at Sta. 65+37 24' RT.
    - Pole at 65+37 24' RT is being replaced by a taller pole. Ameren will replace this pole during construction in coordination with the contractor. Charter will transfer to the replacement pole during construction in coordination with the contractor.
  - Overhead facilities running north off a power pole at Sta. 42+80 25' RT. No conflict with these utilities is anticipated.
  - Overhead facilities running north off a power pole at Sta. 43+84 25' RT. No conflict with these facilities is anticipated.
  - Overhead facilities running north off a power pole at Sta. 47+60 24' RT. No conflict with these facilities is anticipated.
  - Overhead facilities running north off a power pole at Sta. 55+39 24' RT. No conflict with these facilities is anticipated.
  - Overhead facilities running north off a power pole at Sta. 58+48 24' RT. No conflict with these facilities is anticipated.
  - Overhead facilities running north off a power pole at Sta. 62+12 24' RT.

- Pole at Sta. 62+12 24' RT is being replaced as part of Ameren maintenance. Ameren will replace this pole during construction in coordination with the contractor. Charter will transfer to the replacement pole during construction in coordination with the contractor.
- Overhead facilities running north of a power pole at Sta. 63+13 24' RT.
  - Charter guy down wires at Sta. 63+13 24' RT fall in proposed sidewalk. Charter will relocate these guys during construction in coordination with the contractor.
- Overhead facilities running north off a power pole at Sta. 65+37 24' RT.
  - Pole at 65+37 24' RT is being replaced by a taller pole. Ameren will replace this pole during construction in coordination with the contractor. Charter will transfer to the replaced pole during construction in coordination with the contractor.
- Overhead facilities running north off a power pole at Sta. 68+74 26' RT. No conflict with these facilities is anticipated.
- Overhead facilities running north off a power pole at Sta. 79+26 26' RT.
  - Pole at Sta. 79+26 26' RT falls in proposed sidewalk. Ameren will relocate this pole during construction in coordination with the contractor. Charter will transfer to the relocated pole during construction in coordination with the contractor.
- Overhead facilities running north off a power pole at Sta. 81+07 27' RT.
  - Charter guy down wire at Sta. 81+07 25' RT falls in proposed sidewalk. Charter will convert this to a sidewalk guy and relocate it during construction in coordination with the contractor.
- Overhead facilities running north off a power pole at Sta. 83+12 26' RT. No conflict with these facilities is anticipated.
- Overhead facilities running north off a power pole at Sta. 122+37 26' RT. No conflict with these facilities is anticipated.
- Overhead facilities running north off a power pole at Sta. 131+22 25' RT and continuing along the west side of Bremerton Road.
  - Pole at Sta. 131+22 25' RT falls in proposed sidewalk and conflicts with drainage. Ameren will relocate this pole during construction in coordination with the contractor. Charter will transfer to the relocated pole during construction in coordination with the contractor.
  - Pole at Sta. 131+06 50' RT conflicts with proposed drainage. Ameren will relocate this pole during construction in coordination with the contractor. Charter will transfer to the relocated pole and relocate down guy wire during construction in coordination with the contractor.

- Overhead facilities running north off a power pole at Sta. 132+22 26' RT and continuing along the west side of Bremerton Road.
  - Pole at Sta. 132+22 26' RT is being replaced as part of Ameren maintenance. Ameren will replace this pole during construction in coordination with the contractor. Charter will transfer to the replacement pole during construction in coordination with the contractor.
- Overhead facilities running north off a power pole at Sta. 136+32 29' RT. No conflict with these facilities is anticipated.
- Overhead facilities running north off a power pole at Sta. 141+12 40' RT. No conflict with these facilities is anticipated.
- Overhead facilities running north off a power pole at Sta. 148+33 26' RT. No conflict with these facilities is anticipated.
- Overhead facilities running north off a power pole at Sta. 168+14 29' RT through project limits.
  - Pole at Sta. 168+14 29' RT falls in proposed sidewalk. Ameren will relocate this pole during construction in coordination with the contractor. Charter will transfer to the relocated pole during construction in coordination with the contractor.
- Overhead facilities running north off a power pole at Sta. 169+54 27' RT through project limits.
  - Charter guy down wire at Sta. 169+54 27' RT falls in proposed sidewalk. Charter will relocate guy during construction in coordination with the contractor.
- Overhead facilities running north along the west side of Hudson Avenue off a power pole at Sta. 177+33 30' RT.
  - Pole at Sta. 177+32 29' RT is being replaced as part of Ameren maintenance. Ameren will replace this pole during construction in coordination with the contractor. Charter will transfer to the replacement pole during construction in coordination with the contractor.
- Overhead facilities running north along the east side of Kortwright Avenue starting at a pole at Sta. 181+52 71' RT and continuing north through project limits.
  - Pole at Sta. 181+52 71' RT falls in proposed curb. Ameren will relocate this pole during construction in coordination with the contractor. Charter will transfer to the relocated pole during construction in coordination with the contractor.
- Overhead facilities running west along the north side of Rt. 100 from Sta. 182+93, just west of Kortwright Avenue, to Sta. 189+98.
  - Pole at Sta. 187+55 26' RT conflicts with proposed drainage. Charter will relocate this facility during construction in coordination with the contractor.

- Pole at Sta. 188+90 27' RT conflicts with proposed drainage. Ameren will relocate this pole during construction in coordination with the contractor. Charter will transfer to the relocated pole during construction in coordination with the contractor.
- Pole at Sta. 189+98 25' RT is being replaced as part of Ameren maintenance. Ameren will replace this pole during construction in coordination with the contractor. Charter will transfer to the replacement pole during construction in coordination with the contractor.
- Overhead facilities running north off a power pole at Sta. 186+16 27' RT through project limits. No conflict with these facilities is anticipated.
- Overhead facilities running north off a power pole at Sta. 188+90 27' RT and running along the west side of O' Day Avenue through project limits.
  - Pole at Sta. 188+90 27' RT conflicts with proposed drainage. Ameren will relocate this pole during construction in coordination with the contractor. Charter will transfer to the relocated pole during construction in coordination with the contractor.
- Overhead facilities running north off a power pole at Sta. 195+62 41' RT. No conflict with these facilities is anticipated.
- Overhead facilities running north off a power pole at Sta. 200+61 26' RT.
  - Pole at Sta. 200+61 26' RT falls within 1' of proposed curb. Ameren will relocate this pole during construction in coordination with the contractor. Charter will transfer to the relocated pole during construction in coordination with the contractor.
- Overhead facilities running west along the north side of Rt. 100 from west of Frederick Lane at Sta. 211+76 to Sta. 214+94, just east of Andrew Drive.
  - Pole at Sta. 213+98 32' RT falls in proposed sidewalk. Ameren will relocate this pole during construction in coordination with the contractor. Charter will transfer to the relocated pole during construction in coordination with the contractor.
- Overhead facilities running west along the north side of Rt. 100 from west of Andrew Drive at Sta. 219+46 to Sta. 255+61, just west of Woodlawn Avenue.
  - Pole at Sta. 227+18 25' RT falls in proposed curb. Ameren will relocate this pole during construction in coordination with the contractor. Charter will transfer to the relocated pole during construction in coordination with the contractor.
  - Stub pole at Sta. 228+35 23' RT with ATT-D and Charter overhead facilities falls in proposed curb. ATT-D will remove this pole and Charter will relocate during construction in coordination with the contractor.
  - Pole at Sta. 234+66 25' RT is being replaced as part of Ameren maintenance. Ameren will replace this pole during construction in coordination with the

- contractor. Charter will transfer to the replacement pole during construction in coordination with the contractor.
- Charter guy down wire at Sta. 235+71 25' RT falls in proposed sidewalk. Charter will relocate this guy during construction in coordination with the contractor.
  - Stub pole at Sta. 237+83 25' RT with ATT-D and Charter overhead facilities falls in proposed curb. ATT-D will remove this pole and Charter will relocate during construction in coordination with the contractor.
  - Pole at Sta. 246+02 25' RT conflicts with proposed drainage. Ameren will relocate this pole during construction in coordination with the contractor. Charter will transfer to the relocated pole during construction in coordination with the contractor.
  - Pole at Sta. 246+46 27' RT conflicts with proposed drainage. Ameren will relocate this pole during construction in coordination with the contractor. Charter will transfer to the relocated pole during construction in coordination with the contractor.
- Overhead facilities running north off a power pole at Sta. 225+95 24' RT. No conflict with these facilities is anticipated.
  - Overhead facilities running north off a power pole at Sta. 250+08, 41' RT.
    - Pole at Sta. 250+08 41' RT falls in proposed sidewalk. Ameren will relocate this pole during construction in coordination with the contractor. Charter will transfer to the relocated pole during construction in coordination with the contractor.
  - Overhead facilities running north of a power pole at Sta. 255+61, 53' RT and running north along the west side of Woodlawn Avenue through project limits.
    - Pole at Sta. 254+86 259' RT falls in proposed roadway. Ameren will relocate this pole during construction in coordination with the contractor. Charter will transfer to the relocated pole during construction in coordination with the contractor.
    - Pole at Sta. 254+90 187' RT falls in proposed roadway. Ameren will relocate this pole during construction in coordination with the contractor. Charter will transfer to the relocated pole during construction in coordination with the contractor.
    - Pole at Sta. 254+95 114' RT falls in proposed roadway. Ameren will relocate this pole during construction in coordination with the contractor. Charter will transfer to the relocated pole during construction in coordination with the contractor.
    - Pole at Sta. 255+15 72' RT falls in proposed roadway. Ameren will relocate this pole during construction in coordination with the contractor. Charter will transfer to the relocated pole during construction in coordination with the contractor.
- **Overhead facilities along the south side of Rt. 100 throughout project.**

- Overhead facilities running along the south side from Sta. 04+15 to Sta. 05+81. No conflict with these facilities is anticipated.
- Overhead facilities running along the south side of Rt. 100 from Sta. 31+92 115' LT to Sta. 32+99 59' LT.
  - Pole at Sta. 32+99 59' LT conflicts with the proposed Black Creek Bridge structure. Charter will relocate this pole during construction in coordination with the contractor.
- Overhead facilities running along the south side of Rt. 100 from a pole at Sta. 32+94 42' LT and continuing south through project limits. No conflict with these facilities is anticipated.
- Overhead facilities running southwest off a pole west of Lillian Avenue at Sta. 58+51 32' LT.
  - Pole at Sta. 58+52 32' LT falls in proposed sidewalk. Ameren will relocate this pole during construction in coordination with the contractor. Charter will transfer to the relocated pole during construction in coordination with the contractor.
- Overhead facilities running south along the west side of Bompert Avenue off a pole at Sta. 63+00 33' LT.
  - Pole at Sta. 63+00 32' LT falls in proposed sidewalk. Ameren will relocate this pole during construction in coordination with the contractor. Charter will transfer to the relocated pole during construction in coordination with the contractor.
- Overhead facilities running south along the east side of N. Rock Hill Rd starting at a pole at Sta. 153+67 35' LT.
  - Charter guy down wire at Sta. 153+97 59' LT falls in proposed sidewalk. Charter will relocate guy during construction in coordination with the contractor.
- Overhead facilities running west along the south side of Rt. 100 from Sta. 169+65, just west of McKinley Avenue, to Sta. 211+00, just west of Frederick Lane North.
  - Charter guy anchor at Sta. 169+65 27' LT falls in proposed sidewalk. Charter will relocate guy during construction in coordination with the contractor.
  - Pole at Sta. 175+66 26' LT conflicts with proposed drainage. Ameren will relocate this pole during construction in coordination with the contractor. Charter will transfer to the relocated pole during construction in coordination with the contractor.
  - Pole at Sta. 176+38 26' LT falls in proposed sidewalk and conflicts with proposed drainage. Ameren will relocate this pole during construction in coordination with the contractor. Charter will transfer to the relocated pole during construction in coordination with the contractor.
  - Pole at Sta. 177+55 26' LT conflicts with proposed drainage. Ameren will replace this pole during construction in coordination with the contractor.

- Charter will transfer to the replacement pole during construction in coordination with the contractor.
- Pole at Sta. 186+98 25' LT conflicts with proposed drainage. Ameren will replace this pole during construction in coordination with the contractor. Charter will transfer to the replacement pole during construction in coordination with the contractor.
  - Pole at Sta. 191+44 25' LT falls in proposed sidewalk. Ameren will relocate this pole during construction in coordination with the contractor. Charter will transfer to the relocated pole during construction in coordination with the contractor.
  - Pole at Sta. 193+92 26' LT falls in proposed sidewalk. Ameren will relocate this pole during construction in coordination with the contractor. Charter will transfer to the relocated pole during construction in coordination with the contractor.
  - Pole at Sta. 195+10 26' LT conflicts with proposed drainage. Ameren will replace this pole during construction in coordination with the contractor. Charter will transfer to the replacement pole during construction in coordination with the contractor.
  - Pole at Sta. 197+23 27' LT falls in proposed roadway. Ameren will relocate this pole during construction in coordination with the contractor. Charter will transfer to the relocated pole during construction in coordination with the contractor.
  - Pole at Sta. 200+44 25' LT falls in proposed sidewalk. Ameren will relocate this pole during construction in coordination with the contractor. Charter connects mid-span to the overhead line attached to this pole and will transfer to the relocated overhead line attached to the relocated pole during construction in coordination with the contractor.
- Overhead facilities running south off a pole at Sta. 175+28 26' LT. No conflict with these facilities is anticipated.
  - Overhead facilities running south off a pole at Sta. 175+66 26' LT.
    - Pole at Sta. 175+66 26' LT conflicts with proposed drainage. Ameren will relocate this pole during construction in coordination with the contractor. Charter will transfer to the relocated pole during construction in coordination with the contractor.
  - Overhead facilities running south off a pole at Sta. 182+94 25' LT. No conflict with these facilities is anticipated.
  - Overhead facilities running south off a power pole at Sta. 191+44 25' LT through project limits.
    - Pole at Sta. 191+44 25' LT falls in proposed sidewalk. Ameren will relocate this pole during construction in coordination with the contractor. Charter will transfer to the relocated pole during construction in coordination with the contractor.

- Overhead facilities running south along the east side of N. Berry Road from a mid-span connection at Sta. 197+43 27' RT.
  - Pole at Sta. 197+23 27' LT falls in proposed roadway. Ameren will relocate this pole during construction in coordination with the contractor. Charter connects mid-span to the overhead line attached to this pole and will transfer to the relocated overhead line attached to the relocated pole during construction in coordination with the contractor.
- Overhead facilities running south off a power pole at Sta. 198+95 24' LT through project limits. No conflict with these facilities is anticipated.
- Overhead facilities running south off a power pole at Sta. 200+44 25' LT.
  - Pole at Sta. 200+44 25' LT falls in proposed sidewalk. Ameren will relocate this pole during construction in coordination with the contractor. Charter connects mid-span to the overhead line attached to this pole and will transfer to the relocated overhead line attached to the relocated pole during construction in coordination with the contractor.
- Overhead facilities running south off a power pole at Sta. 201+94 31' LT. No conflict with these facilities is anticipated.
- Overhead facilities running south off mid-span overhead cable at Sta. 205+59 29' LT. No conflict with these facilities is anticipated.
- Overhead facilities running south off a power pole at Sta. 209+70 29' LT. No conflict with these facilities is anticipated.
- **Overhead facilities crossing Rt. 100 throughout project.**
  - Overhead crossing at Sta. 00+16 just west of Big Bend Blvd. No conflict with these facilities is anticipated.
  - Overhead crossing at Sta. 03+00 west of Martin Drive. No conflict with these facilities is anticipated.
  - Overhead crossing at Sta. 05+83 east of Oakland Avenue. No conflict with these facilities is anticipated.
  - Overhead crossing at Sta. 15+43 just east of Laclede Station Rd. No conflict with these facilities is anticipated.
  - Overhead crossing at Sta. 18+84 just east of Circle Drive. No conflict with these facilities is anticipated.
  - Overhead crossing at Sta. 32+96 just west of S. Hanley.
    - Pole at Sta. 32+94 42' LT conflicts with the proposed Black Creek Bridge structure. Ameren will relocate this pole during construction in coordination with

the contractor. Charter will transfer to the relocated pole during construction in coordination with the contractor.

- Overhead crossing at Sta. 34+34 west of S. Hanley Rd.
  - Pole at Sta. 34+35 37' LT falls in proposed roadway. Ameren will relocate this pole during construction in coordination with the contractor. Charter will transfer to the relocated pole during construction in coordination with the contractor.
- Overhead crossing at Sta. 35+72 west of S. Hanley Rd.
  - Pole at Sta. 35+65 33' LT falls in proposed curb. Ameren will relocate this pole during construction in coordination with the contractor. Charter will transfer to the relocated pole during construction in coordination with the contractor.
- Overhead crossing at Sta. 37+41 east of Porter Avenue.
  - Charter guy down wire at Sta. 37+39 31' LT falls in proposed sidewalk. Charter will relocate this guy during construction in coordination with the contractor.
- Overhead crossing at Sta. 39+65 just east of Porter Avenue. No conflict with these facilities is anticipated.
  - Overhead crossing at Sta. 40+39. No conflict with these facilities is anticipated.
- Overhead crossing at Sta. 45+06 at Mercantile Drive. No conflict with these facilities is anticipated.
- Overhead crossing at Sta. 51+25 east of Salem Drive.
  - Pole at Sta. 51+17 23' RT falls in proposed curb. Ameren will relocate this pole during construction in coordination with the contractor. Charter will transfer to the relocated pole during construction in coordination with the contractor.
- Overhead crossing at Sta. 55+33 at Cecelia Avenue.
  - Pole at Sta. 55+27 24' LT falls in proposed roadway. Ameren will relocate this pole during construction in coordination with the contractor. Charter will transfer to the relocated pole during construction in coordination with the contractor.
- Overhead crossing at Sta. 56+40 west of Lillian Avenue.
  - Pole at Sta. 56+31 24' RT falls in a proposed entrance. Ameren will relocate this pole during construction in coordination with the contractor. Charter will transfer to the relocated pole during construction in coordination with the contractor.
- Overhead crossing at Sta. 57+30 east of Helen Avenue.
  - Pole at Sta. 57+19 24' RT falls within 1.4' of proposed curb. Ameren will relocate this pole during construction in coordination with the contractor. Charter will transfer to the relocated pole during construction in coordination with the contractor.

- Overhead crossing at Sta. 58+50 just east of Helen Avenue.
  - Pole at Sta. 58+52 32' LT falls in proposed sidewalk. Ameren will relocate this pole during construction in coordination with the contractor. Charter will transfer to the relocated pole during construction in coordination with the contractor.
- Overhead crossing at Sta. 63+08 at Bompert Avenue.
  - Pole at Sta. 63+00 32' LT falls in proposed sidewalk. Ameren will relocate this pole during construction in coordination with the contractor. Charter will transfer to the relocated pole during construction in coordination with the contractor.
- Overhead crossing at Sta. 68+74 west of Mary Avenue. No conflict with these facilities is anticipated.
- Overhead crossing at Sta. 79+26 just west of Brentwood Blvd.
  - Pole at Sta. 79+26 26' RT falls in proposed sidewalk. Ameren will relocate this pole during construction in coordination with the contractor. Charter will transfer to the relocated pole during construction in coordination with the contractor.
- Overhead crossing at Sta. 77+68 at South Brentwood Blvd. No conflict with these facilities is anticipated.
- Overhead crossing at Sta. 84+24 west of Annelee Avenue. No conflict with these facilities is anticipated.
- Overhead crossing at Sta. 121+37 east of Manderly Drive.
  - Charter guy down wire at Sta. 121+32 25' RT falls in proposed sidewalk. Charter will relocate guy during construction in coordination with the contractor.
- Overhead crossing at Sta. 137+51 just west of Creve Coeur Drive. No conflict with these facilities is anticipated.
- Overhead crossing at Sta. 146+29 at Raritan Drive. No conflict with these facilities is anticipated.
- Overhead crossing at Sta. 150+07 west of Dunkirk Drive. No conflict with these facilities is anticipated.
- Overhead crossing at Sta. 151+31 east of N. Rock Hill Road. No conflict with these facilities is anticipated.
- Overhead crossing at Sta. 153+26 just east of N. Rock Hill Road. No conflict with these facilities is anticipated.
- Overhead crossing at Sta. 169+60, just west of McKinley Avenue.

- Charter guy down wire at Sta. 169+54 27' RT falls in proposed sidewalk. Charter will relocate guy during construction in coordination with the contractor.
- Overhead crossing at Sta. 177+45 just west of Mueck Terrace Drive.
  - Pole at Sta. 177+32 29' RT is being replaced as part of Ameren maintenance. Ameren will replace this pole during construction in coordination with the contractor. Charter will transfer to the replacement pole during construction in coordination with the contractor.
  - Pole at Sta. 177+55 26' LT conflicts with proposed drainage. Ameren will relocate this pole during construction in coordination with the contractor. Charter will transfer to the relocated pole during construction in coordination with the contractor.
- Overhead crossing at Sta. 182+94 west of Kortwright Avenue. No conflict with these facilities is anticipated.
- Overhead crossing at Sta. 195+31 west of Fairdale Avenue.
  - Pole at Sta. 195+10 26' LT conflicts with proposed drainage. Ameren will relocate this pole during construction in coordination with the contractor. Charter will transfer to the relocated pole during construction in coordination with the contractor.
- Overhead crossing at Sta. 200+53 west of Monier Place.
  - Pole at Sta. 200+44 25' LT falls in proposed sidewalk. Ameren will relocate this pole during construction in coordination with the contractor. Ameren will replace this pole during construction in coordination with the contractor. Charter will transfer to the replacement pole during construction in coordination with the contractor.
- Pole at Sta. 200+61 26' RT falls within 1' of proposed curb. Ameren will relocate this pole during construction in coordination with the contractor. Charter will transfer to the relocated pole during construction in coordination with the contractor.
- Overhead crossing at Sta. 203+94 west of Salem Hills. No conflict at these facilities is anticipated.
- Overhead crossing at Sta. 219+62 west of Andrew Drive. No conflict with these facilities is anticipated.
- Overhead crossing at Sta. 223+06 at N. Sappington Road. No conflict with these facilities is anticipated.
- Overhead crossing at Sta. 225+34 west of N. Sappington Road. No conflict with these facilities is anticipated.
- Overhead crossing at Sta. 226+04 west of N. Sappington Road. No conflict with these facilities is anticipated.
- Overhead crossing at Sta. 229+20 east of Bennett Avenue.

- Stub pole at Sta. 228+35 23' RT with ATT-D and Charter overhead facilities falls in proposed curb. This pole will be removed and Charter will transfer to the existing Ameren pole at Sta. 228+24 25' RT during construction in coordination with the contractor.
- Overhead crossing at Sta. 231+96 at Bennett Avenue. No conflict with these facilities is anticipated.
- Overhead crossing at Sta. 235+62 just west of Glendale Gardens Drive. No conflict with these facilities is anticipated.
- Overhead crossing at Sta. 246+14 at Dickson Street.
  - Pole at Sta. 246+02 25' RT conflicts with proposed drainage. Ameren will relocate this pole during construction in coordination with the contractor. Charter will transfer to the relocated pole during construction in coordination with the contractor.
- Overhead crossing at Sta. 247+93 just west of Dickson Street. No conflict with these facilities is anticipated.
- Overhead crossing at Sta. 248+66 just west of Dickson Street. No conflict with these facilities is anticipated.
- **Underground facilities along the north side of Rt. 100**
  - Buried facilities exiting a riser at Sta. 01+76 28' RT and continuing north through project limits. No conflict with these facilities is anticipated.
  - Buried facilities running along the north side of Rt. 100 from Sta. 37+48 31' RT to Sta. 39+64 34' RT.
    - Proposed drainage conflicts with these facilities at Sta. 39+10 36' RT. Charter will relocate this facility during construction in coordination with the contractor.
  - Buried facilities exiting at riser at Sta. 39+64 34' RT and continuing north along the east side of Porter Avenue through project limits. No conflict with these facilities is anticipated.
  - Buried facilities running along the north side of Rt. 100 exiting a riser at Sta. 135+22 26' RT and continuing west to Sta. 136+18 32' RT.
    - Buried facilities exit a riser on a power pole at Sta. 135+22 26' RT that is in conflict and will be relocated by Ameren. Charter will relocate this facility during construction in coordination with the contractor.
  - Buried facilities running along the north side of Rt. 100 exiting a riser at Sta. 135+22 26' RT and continuing north along the west side of Creve Coeur Drive. No conflict with these facilities is anticipated.

- Buried facilities exiting a riser on a power pole at Sta. 137+77 40' RT and continuing west along the north side of Rt. 100 to a power pole at Sta. 141+12 39' RT. No conflict with these facilities is anticipated.
- Buried facilities exiting a riser on a power pole at Sta. 137+77 40' RT and continuing north through project limits. No conflict with these facilities is anticipated.
- Buried facilities from the east side of Kortwright Avenue at Sta. 181+53 72' RT and running southwest along the north side of Rt. 100 to Sta. 182+89 29 RT. No conflict with these facilities is anticipated.
- Buried facilities running along the north side of Rt. 100 from Sta. 200+65 31' RT to Sta. 214+80 32' RT.
  - Proposed drainage structure falls within 1.5' of facilities at Sta. 202+94 35' RT. Charter will relocate this facility during construction in coordination with the contractor.
  - Handhole at Sta. 209+40 37' RT falls in proposed sidewalk. Charter will adjust these facilities to grade during construction in coordination with the contractor.
  - Proposed drainage structure falls within 1.2' of facilities from Sta. 208+79 39' RT and Sta. 208+84 39' RT. Charter will relocate this facility during construction in coordination with the contractor.
- **Underground facilities along the south side of Rt. 100**
  - Buried facilities exiting a riser at Sta. 33+94 42' LT and continuing west along the south side of Rt. 100 to a riser at Sta. 35+71 33' LT.
    - The proposed Black Creek Bridge reconstruction conflicts with this facility from Sta. 32+94 42' LT to Sta. 33+30 44' LT. Charter will relocate this facility during construction in coordination with the contractor.
    - Pedestal falls in proposed sidewalk at Sta. 34+87 38' LT. Charter will relocate this facility during construction in coordination with the contractor.
  - Buried facilities running along the south side of Rt. 100 from Sta. 163+79 to Sta. 164+44. No conflict with these facilities is anticipated.
  - Buried facilities exiting a riser at Sta. 169+64 27' LT and running south through project limits. No conflict with these facilities is anticipated.
  - Buried facilities running south along the east side of N. Berry Road starting at Sta. 197+30 37' LT and continuing south through project limits. No conflict with these utilities is anticipated.
  - Buried facilities running along the south side of Rt. 100 starting at Sta. 197+30 37' LT and continuing west to Sta. 200+40 26' LT.
- **Underground facilities crossing Rt. 100 throughout project.**
  - Buried facilities crossing Rt. 100 at Sta. 37+40. No conflict with these facilities is anticipated.

- Buried facilities crossing Rt. 100 at Sta. 39+57 and continuing south along the east side of Breckenridge Industrial Court.
  - Proposed drainage structure conflicts with these facilities from Sta. 39+54 22' RT to Sta. 39+54 27' RT. Charter will relocate this facility during construction in coordination with the contractor.
- Buried facilities crossing Rt. 100 at Sta. 65+36 just west of Dorothy Avenue.
  - Proposed drainage pipe conflicts with facilities at Sta. 66+35 13' RT. Charter will relocate this facility during construction in coordination with the contractor.
- Buried facilities crossing Rt. 100 at Sta. 66+59 just west of Mary Avenue.
  - Proposed drainage pipe conflicts with facilities at Sta. 66+62 31' LT. Charter will relocate this facility during construction in coordination with the contractor.
- Buried facilities crossing Rt. 100 at Sta. 129+50 just east of Bremerton Road.
  - Proposed drainage conflicts with facilities at Sta. 129+52 25' LT. Charter will relocate this facility during construction in coordination with the contractor.
- Buried facilities crossing Rt. 100 at Sta. 163+80 west of N Rockhill Road. No conflict with these facilities is anticipated.
- Buried facilities crossing Rt. 100 at Sta. 182+91 west of Kortwright Avenue. No conflict with these facilities is anticipated.
- Buried facilities crossing Rt. 100 at Sta. 200+52 west of Monier Place. No conflict with these facilities is anticipated.
- Buried facilities crossing Rt. 100 at Sta. 214+87 east of Andrew Drive. No conflict with facilities is anticipated.

The contractor shall coordinate with Charter Communication as necessary and take measures to protect in place their existing facilities during construction.

The contractor shall directly contact Charter Communication to verify the locations of their facilities.

The Commission cannot warrant the information above which was provided by Charter Communication.

## **6.0 EXTENET**

Extenet has the following existing facilities within the project limits:

- Underground facilities crossing Rt. 100 on the east side of Brentwood Blvd at Sta. 76+35. No impact to these facilities is anticipated.
- Underground facilities along the south side of Rt. 100 from the western project limits to Sta. 279+66, 50' LT. No impact to these facilities is anticipated.

The contractor shall coordinate with Extenet as necessary and take measures to protect in place their existing facilities during construction.

The contractor shall directly contact Extenet to verify the locations of their facilities.

The Commission cannot warrant the information above which was provided by Extenet.

## **7.0 FIDELITY LINK**

FidelityLink has the following existing facilities within the project limits:

- Underground facilities along the north side of Rt. 100 from Sta. 183+92, 24' RT to the west side of Kortwright Ave. and continuing off of right of way along Kortwright Ave.
  - Handhole at Sta. 183+92, 24' RT falls in proposed bus and will need to be adjusted to grade. FidelityLink will perform this work during construction in coordination with the contractor.
- Underground facilities crossing Rt. 100 at Sta. 184+08 and continuing south off of right of way along the east side of Blossom Ave. No conflict with this facility is anticipated.

The contractor shall coordinate with Extenet as necessary and take measures to protect in place their existing facilities during construction.

The contractor shall directly contact Extenet to verify the locations of their facilities.

The Commission cannot warrant the information above which was provided by FidelityLink.

## **8.0 EXTENET**. Extenet has the following existing facilities within the project limits:

- Underground facilities crossing Rt. 100 at Sta. 76+35 and continuing north along the east side of Brentwood Blvd. through the northern project limits. No impact to these facilities is anticipated.

The contractor shall coordinate with Extenet as necessary and take measures to protect in place their existing facilities during construction.

The contractor shall directly contact Extenet to verify the locations of their facilities.

The Commission cannot warrant the information above which was provided by Extenet Communication.

## **9.0 FIDELITYLINK**. FidelityLink has the following existing facilities within the project limits:

- Underground facilities crossing Rt. 100 at Sta. 184+07. No impact to these facilities is anticipated.
- Underground facilities on north side of Rt. 100 from Sta.183+93 to Sta. 182+12.
  - Proposed Bus Station pad conflicts with existing handhole at Sta. 184+07 23' RT. FidelityLink to relocate facility during construction in coordination with contractor.
  - Proposed Signal Base conflicts with this facility at Sta. 182+29 33' RT. FidelityLink to relocate facility during construction in coordination with contractor.

The contractor shall coordinate with FidelityLink as necessary and take measures to protect in place their existing facilities during construction.

The contractor shall directly contact FidelityLink to verify the locations of their facilities.

The Commission cannot warrant the information above which was provided by Fidelity Link.

## **10.0 KIRKWOOD ELECTRIC**

Kirkwood Electric has the following existing facilities within the project limits:

### **Underground facilities along the north side of Rt. 100:**

- Underground facility along Rt. 100 from Sta. 244+04 38' RT to 244+40 24' RT.
  - Underground facility in conflict with proposed drainage pipe at Sta. 244+06 35' RT. Kirkwood will relocate this facility during construction in coordination with the contractor.
  
- Underground facility along Rt. 100 from Sta. 246+46 28' RT to Sta. 246+74 27' RT.
  - Underground facility in conflict with proposed drainage pipe from Sta. 246+46 28' RT and Sta. 246+74 27' RT. Kirkwood will relocate this facility during construction in coordination with the contractor.

### **Underground facilities along the south side of Rt. 100:**

- Underground facility along Rt. 100 from Sta. 246+01 28' LT and Sta. 247+58 29' LT. No conflict with this facility is anticipated.

### **Overhead facilities along the north side of Rt. 100 from Sta. 236+68 to Sta. 266+08:**

- Overhead facility running north off north side of Rt. 100 starting at Sta. 236+71 26' RT through northern project limits. No conflict with this utility is anticipated.
  
- Overhead facility running north off north side of Rt. 100 starting at Sta. 244+41 25' RT through northern project limits. No conflict with this utility is anticipated.
  
- Overhead facility running north off north side of Rt. 100 starting at Sta. 250+08 41' RT through northern project limits. No conflict with this utility is anticipated.
  
- Overhead facility running north off north side of Rt. 100 starting at Sta. 268+08 37' RT through northern project limits. No conflict with this utility is anticipated.
  
- Pole at Sta. 237+90 31' RT falls in the proposed sidewalk. Kirkwood will relocate this pole during construction in coordination with the contractor.
  
- Pole at Sta. 246+46 28' RT falls within proposed sidewalk. Kirkwood will relocate this pole during construction in coordination with the contractor.
  
- Pole at Sta. 250+08 41' RT falls within proposed sidewalk. Kirkwood will relocate this pole during construction in coordination with the contractor.

- Guy wire for pole at Sta. 243+88 26' RT falls in the proposed sidewalk. The City of Kirkwood will relocate guy during construction in coordination with the contractor.

**Overhead facilities along the south side of Rt. 100 from Sta. 252+84 to Sta. 258+49.**

- Overhead facility running south off south side of Rt. 100 starting at Sta. 252+84 32' LT through northern project limits. No conflict with this facility is anticipated.
- Pole at Sta. 252+85 32' LT falls in proposed sidewalk. The City of Kirkwood will relocate this pole during construction in coordination with the contractor.
- Pole at Sta. 253+99 32" LT falls within proposed sidewalk. Kirkwood will relocate this pole during construction in coordination with the contractor.
- Pole at Sta. 254+37 60' LT falls within proposed pavement. Kirkwood will relocate this pole during construction in coordination with the contractor.
- Pole at Sta. 255+53 33' LT falls within proposed sidewalk. Kirkwood will relocate this pole during construction in coordination with the contractor.
- Pole at Sta. 257+20 30' LT falls within proposed sidewalk. Kirkwood will relocate this pole during construction in coordination with the contractor.
- Pole at Sta. 258+50 30' LT falls within proposed sidewalk. Kirkwood will relocate this pole during construction in coordination with the contractor.
- Guy wire for pole at Sta. 247+47 27' LT is in conflict with the proposed sidewalk. The City of Kirkwood will change this to a sidewalk guy during construction in coordination with the contractor.
- Guy wire for pole at Sta. 248+43 28' LT is in conflict with the proposed sidewalk. The City of Kirkwood will change this to a sidewalk guy during construction in coordination with the contractor.
- Guy wire for pole at Sta. 249+19 27' LT is in conflict with the proposed sidewalk. The City of Kirkwood will change this to a sidewalk guy during construction in coordination with the contractor.

**Overhead facilities crossing Rt. 100 throughout project.**

- Overhead crossing at Sta. 243+98 west of Mariedale Court. No conflict with this utility is anticipated.
- Overhead crossing at Sta. 246+13 at Dickson Street. No conflict with this utility is anticipated.
- Overhead crossing at Sta. 247+44 west of Dickson Street. No conflict with this utility is anticipated.

- Overhead crossing at Sta. 248+27 west of Dickson Street. No conflict with this utility is anticipated.
- Overhead crossing at Sta. 248+65 west of Dickson Street. No conflict with this utility is anticipated.
- Overhead crossing at Sta. 249+03 west of Dickson Street. No conflict with this utility is anticipated.
- Overhead crossing at Sta. 251+42 east of Woodlawn Avenue. No conflict with this utility is anticipated.
- Overhead crossing at Sta. 252+65 east of Woodlawn Avenue. No conflict with this utility is anticipated.
- Overhead crossing at Sta. 254+33 on east side of Woodlawn Avenue at Rt. 100. No conflict with this utility is anticipated.
- Overhead crossing at Sta. 258+45 west of Woodlawn Avenue. No conflict with this utility is anticipated.
- Overhead crossing at Sta. 263+43 at Wood Avenue. No conflict with this utility is anticipated.
- Overhead crossing at Sta. 268+20 at Bernice Avenue. No conflict with this utility is anticipated.

**Overhead facilities along side streets on the north side of Rt. 100.**

- Overhead facility along west side of Woodlawn Avenue just north of Rt. 100 from Sta. 254+26 111' RT to north end of project limits. No conflict with this utility is anticipated.
- Overhead facility along west side of Woodlawn Avenue just north of Rt. 100 from Sta. 254+95 115' RT to Sta. 294+90 187' RT. No conflict with this utility is anticipated.

**Overhead facilities along side streets on the south side of Rt. 100.**

- Overhead facility along east side of Woodlawn Avenue just south of Rt. 100 from Sta. 254+38 60' LT to south end of project limits. No conflict with this utility is anticipated.

**Overhead facilities crossing side streets on the north side of Rt. 100.**

- Overhead crossing of Woodlawn Avenue from Sta. 254+26 111' RT to Sta. 254+95 114' RT, just north of Rt. 100. No conflict with this utility is anticipated.

**Overhead facilities crossing side streets on the south side of Rt. 100.**

- Overhead crossing of Woodlawn Avenue from Sta. 254+37 32' LT to Sta. 255+50 32' LT, just south of Rt. 100. No conflict with this utility is anticipated.

The contractor shall coordinate with Kirkwood Electric as necessary and take measures to protect in place their existing facilities during construction.

The contractor shall directly contact Kirkwood Electric to verify the locations of their facilities.

The Commission cannot warrant the information above which was provided by Kirkwood Electric.

## **11.0 KIRKWOOD WATER**

**Kirkwood Water has the following existing facilities along Rt. 100 within the project limits:**

- 8" cast iron main running along the north side of Rt. 100 on the north side of existing u-gutter from Sta. 237+50 to Sta. 246+14.
  - Proposed drainage structure conflicts with main at Sta. 241+36 28' RT. Kirkwood Water will relocate this facility during construction in coordination with the contractor.
  - Proposed drainage structure conflicts with main from Sta. 242+71 22' RT to Sta. 242+82 22' RT. Kirkwood Water will relocate this facility during construction in coordination with the contractor.
  - Proposed drainage structure and pipe conflict with main from Sta. 244+90 21' RT to Sta. 245+01 21' RT. Kirkwood Water will relocate this facility during construction in coordination with the contractor.
- 8" ductile iron main running in the northern westbound lane of Rt. 100 from Sta. 246+14 to Sta. 263+33.
  - Proposed drainage pipe conflicts with main between Sta. 246+12 24' RT to Sta. 246+50 24' RT. Kirkwood Water will relocate this facility during construction in coordination with the contractor.
- 8" cast iron main running under the westbound lanes of Rt. 100 from Sta. 263+33 to western project limits. No conflict with these facilities is anticipated.

**Kirkwood Water has the following existing facilities crossing Rt. 100 within the project limits:**

- 6" cast iron main crossing Rt. 100 at Sta. 246+15 and continuing along the west side of Dickson Street. No conflict with these facilities is anticipated.
- 6" cast iron main crossing Rt. 100 at Sta. 255+15 and continuing south along west side of Woodlawn Ave. No conflict with these facilities is anticipated.
- 4" cast iron main crossing Rt. 100 at Sta. 263+61 and continuing south under southbound lane of Wood Ave. No conflict with these facilities is anticipated.
- 4" cast iron main crossing Rt. 100 at Sta. 266+08 and continuing south along the west side of Sylvan Place.
  - Drainage pipe conflicts with main at Sta. 266+08 25' LT. Kirkwood Water will relocate this facility during construction in coordination with the contractor.

- 6" cast iron main crossing Rt. 100 at Sta. 268+40 and continuing south along west side of Bernice Ave.
  - Drainage pipe conflicts with main at Sta. 268+41 26' LT. Kirkwood Water will relocate this facility during construction in coordination with the contractor.
- 6" cast iron main crossing Rt. 100 at Sta. 271+59 and continuing south under the pavement of Curran Ave. No conflict with these facilities is anticipated.
- 6" cast iron main crossing Rt. 100 at Sta. 275+01 and continuing south along west side of Taylor Avenue. No conflict with these facilities is anticipated.
- 8" cast iron main running along the centerline of Lindbergh Blvd and crossing the eastbound lanes of Rt. 100 at Sta. 281+92. This main connects to the 8" cast iron main running under the westbound lanes of Rt. 100 at 281+85 27' RT.

**Kirkwood Water has the following facilities on side streets along Rt. 100 within the project limits:**

- 6" cast iron main running north along the west side of Sturgis Drive at Sta. 238+87. No conflict with this facility is anticipated.
- 6" cast iron main running north along the west side of Mariedale Ct. at starting at Sta. 242+48 22' RT.
  - Proposed drainage pipe conflicts with water main at Sta. 242+48 33' RT. Kirkwood Water will relocate this facility during construction in coordination with the contractor.
- 3/4" copper service line running west off an existing 6" main running along the west side of Woodlawn Ave starting at Sta. 254+91 159' LT. No conflict with this facility is anticipated.
- 6" cast iron main running north along Lynchester Ln under the pavement at Sta. 269+16. No conflict with this facility is anticipated.

**Kirkwood Water has Main Line Water Valves that will require adjustment:**

- Valve falls in proposed curb at Sta. 238+87 27' RT and will need to be adjusted to grade by Kirkwood Water during construction in coordination with the contractor.
- Valve falls in proposed curb at Sta. 245+74 23' RT and will need to be adjusted to grade by Kirkwood Water during construction in coordination with the contractor.
- Valve falls in proposed curb/gutter at Sta. 254+27 78' RT and will need to be adjusted to grade by Kirkwood Water during construction in coordination with the contractor.
- Valve falls in roadway at Sta. 254+35 80' RT and will need to be adjusted to grade by Kirkwood Water during construction in coordination with the contractor.

- Valve falls in proposed roadway at Sta. 258+14 30' LT and will need to be adjusted to grade by Kirkwood Water during construction in coordination with the contractor.
- Valve falls in roadway at Sta. 266+08 21' RT and will need to be adjusted to grade by Kirkwood Water during construction in coordination with the contractor.
- Valve falls in proposed curb at Sta. 266+15 37' RT and will need to be adjusted to grade by Kirkwood Water during construction in coordination with the contractor.
- Valve falls in roadway at Sta. 267+07 30' LT and will need to be adjusted to grade by Kirkwood Water during construction in coordination with the contractor.
- Valve falls in proposed curb at Sta. 271+86 25' RT and will need to be adjusted to grade by Kirkwood Water during construction in coordination with the contractor.
- Valve falls in roadway at Sta. 275+16 25' RT and will need to be adjusted to grade by Kirkwood Water during construction in coordination with the contractor.

**Kirkwood Water has Fire Hydrants that will require adjustment:**

- Fire hydrant falls in proposed sidewalk at Sta. 239+02 27' RT. Kirkwood Water will relocate this facility during construction in coordination with the contractor.
- Fire hydrant falls in proposed sidewalk at Sta. 246+14 27' RT. Kirkwood Water will relocate this facility during construction in coordination with the contractor.
- Fire hydrant falls in proposed sidewalk at Sta. 249+66 38' RT. Kirkwood Water will relocate this facility during construction in coordination with the contractor.
- Fire hydrant falls in proposed sidewalk at Sta. 249+84 30' LT. Kirkwood Water will relocate this facility during construction in coordination with the contractor.
- Fire hydrant falls in proposed sidewalk at Sta. 259+14 51' RT. Kirkwood Water will relocate this facility during construction in coordination with the contractor.
- Fire hydrant falls in proposed sidewalk at Sta. 276+55 35' RT. Kirkwood Water will relocate this facility during construction in coordination with the contractor.

**Kirkwood Water has Fire Hydrant Leads Crossing Rt. 100:**

- Fire hydrant lead crossing shoulder and proposed curb at Sta. 246+14 26' RT.
  - Proposed drainage pipe conflicts with hydrant lead at Sta. 246+14 26' RT. Kirkwood Water will relocate lead during construction in coordination with the contractor.
- Fire hydrant lead crossing shoulder of Rt. 100 and curb at Sta. 249+66 31' RT. No impact to this facility is anticipated.

- Fire hydrant lead crossing shoulder and curb on Rt. 100 at Sta. 253+66 50' RT. No impact to this facility is anticipated.
- Fire hydrant lead at Sta. 263+35 32' LT. No impact to this facility is anticipated.
- Fire hydrant lead crossing northernmost westbound lane of Rt. 100 at Sta. 269+37 28' RT. No impact to this facility is anticipated.
- Fire hydrant lead crossing curb on north side of Rt. 100 at Sta. 276+55 25' RT. No impact to this facility is anticipated.

**Fire Hydrant Lead Valves within project limits:**

- Valve on hydrant lead falls in proposed curb at Sta. 239+02 27' RT and will need to be adjusted to grade by Kirkwood Water during construction in coordination with the contractor.
- Proposed drainage pipe conflicts with valve on hydrant lead at Sta. 246+14 26' RT. Kirkwood Water will relocate valve during construction in coordination with the contractor.
- Valve on hydrant lead falls in roadway at Sta. 246+29 38' LT and will need to be adjusted to grade by Kirkwood Water during construction in coordination with the contractor.
- Valve on hydrant lead falls in roadway at Sta. 246+37 37' LT and will need to be adjusted to grade by Kirkwood Water during construction in coordination with the contractor.
- Valve on hydrant lead falls in roadway at Sta. 246+29 38' LT and will need to be adjusted to grade by Kirkwood Water during construction in coordination with the contractor.
- Valve on hydrant lead falls in proposed sidewalk at Sta. 249+66 37' RT and will need to be adjusted to grade by Kirkwood Water during construction in coordination with the contractor.
- Valve on hydrant lead falls in proposed sidewalk at Sta. 249+83 31' LT and will need to be adjusted to grade by Kirkwood Water during construction in coordination with the contractor.
- Valve on hydrant lead falls in proposed curb/gutter at Sta. 253+66 53' RT and will need to be adjusted to grade by Kirkwood Water during construction in coordination with the contractor.

- Valve on hydrant lead falls in roadway at Sta. 263+33 23' RT and will need to be adjusted to grade by Kirkwood Water during construction in coordination with the contractor.
- Valve on hydrant lead falls in proposed curb/gutter at Sta. 269+37 27' RT and will need to be adjusted to grade by Kirkwood Water during construction in coordination with the contractor.
- Valve on hydrant lead falls in roadway at Sta. 276+55 24' RT and will need to be adjusted to grade by Kirkwood Water during construction in coordination with the contractor.

**The following Water Service Lines are attached to Kirkwood Water's Mains** (stations below are approximate):

- Service line of unknown size and material crossing Sturgis Drive at Sta. 238+76 92' RT. No conflict with this facility is anticipated.
- 3/4" copper service line running east off existing 6" main running along west side of Sturgis Drive starting at Sta. 238+79 72' RT. No conflict with this facility is anticipated.
- 3/4" copper service line crossing Rt. 100 at Sta. 239+65. No conflict with this facility is anticipated.
- 3/4" copper service line crossing Rt. 100 at Sta. 240+33. No conflict with this facility is anticipated.
- Service line of unknown size/material crossing Rt. 100 at Sta. 241+12. No conflict with this facility is anticipated.
- 1" copper service line crossing Rt. 100 at Sta. 241+67. No conflict with this facility is anticipated.
- 1" copper service line crossing Rt. 100 at Sta. 243+70. No conflict with this facility is anticipated.
- Service line of unknown size/material crossing Rt. 100 at Sta. 247+39. No conflict with this facility is anticipated.
- 3/4" copper service line running north from main along north side of Rt. 100 at Sta. 247+52. No conflict with this facility is anticipated.
- Service line of unknown size/material running north from main along north side of Rt. 100 at Sta. 248+57. No conflict with this facility is anticipated.
- Service line of unknown size/material crossing shoulder and curb from Sta. 250+26 to Sta. 250+34. No conflict with this facility is anticipated.

- 1" copper service line crossing Rt. 100 at Sta. 250+65. No conflict with this facility is anticipated.
- Service line of unknown size/material crossing Rt. 100 at Sta. 253+49. No conflict with this facility is anticipated.
- 6" cast iron service line crossing Rt. 100 at Sta. 259+06. No conflict with this facility is anticipated.
- 4" cast iron service line running north from main parallel to Rt. 100 in the westbound lanes at Sta. 259+23. No conflict with this facility is anticipated.
- Service line of unknown size/material running north from main parallel to Rt. 100 in the westbound lanes at Sta. 266+71. No conflict with this facility is anticipated.
- Service line of unknown size/material crossing Rt. 100 at Sta. 267+51
  - Proposed drainage pipe conflicts with service line at Sta. 267+51 25' LT. Contractor will be responsible for relocation of this service line.
- Service line of unknown size/material running north from main parallel to Rt. 100 in the westbound lanes at Sta. 269+82. No conflict with this facility is anticipated.
- Service line of unknown size/material crossing Rt. 100 at Sta. 269+85. No conflict with this facility is anticipated.
- Service line of unknown size/material crossing Rt. 100 at Sta. 270+73. No conflict with this facility is anticipated.
- ¾" copper service line running north from main parallel to Rt. 100 in the westbound lanes at Sta. 271+15. No conflict with this facility is anticipated.
- ¾" copper service line running north from main parallel to Rt. 100 in the westbound lanes at Sta. 272+67. No conflict with this facility is anticipated.
- Service line of unknown size/material running north from main parallel to Rt. 100 on the north side at Sta. 272+67. No conflict with this facility is anticipated.
- Service line of unknown size/material crossing Rt. 100 at Sta. 276+80. No conflict with this facility is anticipated.
- Service line of unknown size/material running north from main parallel to Rt. 100 in the westbound lanes at Sta. 279+73. No conflict with this facility is anticipated.
- Service line of unknown size/material crossing the northbound lanes of Lindbergh Blvd. at starting at Sta. 282+15 110' LT. No conflict with this facility is anticipated.

- 1" copper service line crossing the northbound lanes of Lindbergh Blvd. starting at Sta. 282+07 70' LT. No conflict with these facilities is anticipated.
- Service line of unknown size/material crossing Rt. 100 at Sta. 283+02. No conflict with this utility is anticipated.

**Kirkwood Water has Service Line Valves and Meters throughout the project that will require adjustment:**

- Service meter falls in proposed sidewalk at Sta. 243+69 31' LT. The contractor will be responsible for adjusting this facility to grade.
- Service valve falls in proposed sidewalk at Sta. 247+42 33' LT. The contractor will be responsible for adjusting this facility to grade.
- Service meter at falls in proposed curb at Sta. 247+42 37' LT. The contractor will be responsible for adjusting this facility to grade.
- Service valve at falls in proposed sidewalk at Sta. 250+34 48' RT. The contractor will be responsible for adjusting this facility to grade.
- Service valve at falls in proposed sidewalk at Sta. 259+06 29' RT. The contractor will be responsible for adjusting this facility to grade.
- Service valve at falls in proposed curb at Sta. 259+23 47' RT. The contractor will be responsible for adjusting this facility to grade.
- Service meter falls in proposed sidewalk at Sta. 271+15 33' RT. The contractor will be responsible for adjusting this facility to grade.

The contractor shall coordinate with Kirkwood Water as necessary and take measures to protect in place their existing facilities during construction.

The contractor shall directly contact Kirkwood Water to verify the locations of their facilities.

The Commission cannot warrant the information above which was provided by Kirkwood Water.

**12.0 MISSOURI AMERICAN WATER.**

**Missouri American Water has the following existing facilities along Rt. 100 within the project limits:**

- 8" cast iron main running in the westbound lanes of Rt. 100 from eastern project limits (Sta. 00+00) to Sta. 24+00. No conflict with this facility is anticipated.
- 8" cast iron main crossing the east bound lanes of Rt. 100 between Sta. 24+00 and Sta. 25+00 and then running along the south side of Rt. 100 from Sta. 25+00 to 29+07. No conflict with this facility is anticipated.

- 8" ductile iron main running along the south side of Rt. 100 from Sta. 29+07 to 30+66. This main crosses South Hanley and the Bear Creek Bridge and runs under the turn lane of Rt. 100 until Sta. 34+31. The main runs along the south side of Rt. 100 from Sta. 34+31 to 36+06.
  - Proposed bridge replacement over the Black Creek conflicts with buried main from Sta. 31+70 41' LT to Sta. 32+93 38' LT. MAWC will relocate this facility during construction in coordination with the contractor.
- 8" cast iron main running in the westbound lanes of Rt. 100 from Sta. 36+15 to Sta. 41+72. No conflict with this facility is anticipated.
- 8" cast iron main running under the curb and sidewalk on the north side of Rt. 100 from Sta. 41+72 to 44+76. No conflict with this facility is anticipated.
- 8" cast iron main running in the westbound lanes of Rt. 100 between Sta. 44+76 to Sta. 79+26.
  - Proposed drainage pipe conflicts with main at Sta. 47+53 14' RT. MAWC will relocate this facility during construction in coordination with the contractor.
  - Proposed drainage crosses and parallels main from Sta. 51+61 12' Rt to 54+91 13' RT. MAWC will relocate this facility during construction in coordination with the contractor.
  - Proposed tunnel conflicts with main from Sta. 65+10 12' RT to 66+04 12' RT. MAWC will relocate this facility during construction in coordination with the contractor.
  - Proposed drainage pipe conflicts with main at Sta. 65+67 13' RT. MAWC will relocate this facility during construction in coordination with the contractor.
  - Proposed drainage pipe conflicts with main at Sta. 71+27 13' RT. MAWC will relocate this facility during construction in coordination with the contractor.
- 6" ductile iron main running along the south side of Rt. 100 between Sta. 69+90 and 73+83. No conflict with this facility is anticipated.
- 6" ductile iron main running under the curb and sidewalk on the south side of Rt. 100 between Sta. 73+15 and Sta. 75+16. No conflict with this facility is anticipated.
- 8" cast iron main running under the curb and sidewalk on the north side of Rt. 100 from Sta. 79+26 to 81+12. No conflict with this facility is anticipated.
- 8" cast iron main running under the westbound lanes of Rt. 100 from Sta. 81+12 to 81+63.
  - Proposed drainage structure conflicts with main from Sta. 81+23 22' Rt and Sta. 81+34 22' RT. MAWC will relocate this facility during construction in coordination with the contractor.
- 12" cast iron main running under the westbound lanes of Rt. 100 from Sta. 81+63 to Sta. 197+71.
  - Proposed drainage pipe conflicts with main at Sta. 82+56 20' RT. MAWC will relocate this facility during construction in coordination with the contractor.

- Proposed drainage falls on and parallels main from Sta. 83+06 19' RT to Sta. 121+92 1' RT. MAWC will relocate this facility during construction in coordination with the contractor.
- Proposed drainage structure conflicts with main between Sta. 131+24 19' RT and 131+31 19' RT. MAWC will relocate this facility during construction in coordination with the contractor.
- Proposed drainage structure conflicts with main between Sta. 131+66 18' RT and 131+72 18' RT. MAWC will relocate this facility during construction in coordination with the contractor.
- Proposed drainage structure conflicts with main between Sta. 133+96 19' RT and Sta. 134+01 01' RT. MAWC will relocate this facility during construction in coordination with the contractor.
- Proposed drainage pipe crosses and parallels main from Sta. 169+85 15' Rt to 170+24 15' RT. MAWC will relocate this facility during construction in coordination with the contractor.
- Proposed drainage structure conflicts with main between Sta. 184+71 16' RT and Sta. 185+61 16' RT. MAWC will relocate this facility during construction in coordination with the contractor.
- 20" cast iron main running under the westbound lanes of Rt. 100 from Sta. 197+71 to Sta. 231+79.
  - Proposed drainage structure conflicts with main from Sta. 224+03 23' Rt to 224+17 23' RT. MAWC will relocate this facility during construction in coordination with the contractor.
  - Proposed drainage pipe conflicts with main at Sta. 226+64 26' RT. MAWC will relocate this facility during construction in coordination with the contractor.
  - Proposed drainage structure conflicts with main at Sta. 229+57 29' RT. MAWC will relocate this facility during construction in coordination with the contractor.
  - Proposed drainage structure conflicts with main at Sta. 230+38 21' RT to Sta. 230+27 28' RT. MAWC will relocate this facility during construction in coordination with the contractor.
  - Proposed drainage structure conflicts with main from Sta. 232+63 21' RT to 232+71 21' RT. MAWC will relocate this facility during construction in coordination with the contractor.
- 6" cast iron main running under the curb on the north side of Rt. 100 from Sta. 231+79 to Sta. 237+25.
  - Proposed drainage pipe conflicts with main at Sta. 231+86 39' RT. MAWC will relocate this facility during construction in coordination with the contractor.
  - Proposed drainage pipe conflicts with main at Sta. 231+96 34' RT. MAWC will relocate this facility during construction in coordination with the contractor.
  - Proposed drainage structure and pipe conflict with main from Sta. 233+00 25' RT to 233+59 26' RT. MAWC will relocate this facility during construction in coordination with the contractor.
  - Proposed drainage structure conflicts with main from Sta. 236+60 22' RT to 236+64 22' RT. MAWC will relocate this facility during construction in coordination with the contractor.

**Missouri American Water has the following existing facilities crossing Rt. 100 within the project limits:**

- 8" cast iron main crossing Rt. 100 at Sta. 00+01 and continuing south along the west side of Big Bend. No conflict with these facilities is expected.
- Water line crossing westbound lane of Rt. 100 at Sta. 11+67 and continuing north under southbound lanes of Bredell Ave. through project limits. No conflict with this facility is anticipated.
- 16" cast iron main crossing Rt. 100 at Sta. 15+27 on east side of Laclede Station Rd. No conflict with this facility is anticipated.
- 6" cast iron main crossing eastbound lanes of Rt. 100 at Sta. 15+82 and continuing south along west side of Laclede Station Rd. No conflict with this facility is anticipated.
- 6" cast iron main crossing westbound lanes of Rt. 100 at Sta. 15+95 and continuing north along west side of Laclede Station Rd through the project limits. No conflict with this facility is anticipated.
- 6" cast iron main crossing westbound lanes of Rt. 100 at Sta. 19+12 and continuing north along the west side of Circle Drive through the project limits. No conflict with this facility is anticipated.
- 12" ductile iron main crossing Rt. 100 at Sta. 20+89. No conflict with this facility is anticipated.
- Lateral off south side of Rt. 100 at Sta. 29+07. No conflict with this facility is anticipated.
- 8" ductile iron main crossing Rt. 100 at 31+12 and running through the western half the intersection with S. Hanley Rd. No conflict with this facility is anticipated.
- 8" ductile iron main crossing the eastbound lanes of Rt. 100 at Sta. 31+40 and continuing south under southbound lanes of S. Hanley Rd. through the project limits. No conflict with this facility is anticipated.
- 8" ductile iron main crossing Rt. 100 at Sta. 36+05. No conflict with this facility is anticipated.
- 8" cast iron main crossing westbound lane of Rt. 100 at Sta. 36+16. No conflict with this facility is anticipated.
- 6" ductile iron main crossing Rt. 100 at Sta. 44+14.
  - Proposed drainage pipe conflicts with main at Sta. 44+14 17' RT. MAWC will relocate this facility during construction in coordination with the contractor.

- 8" ductile iron main crossing Rt. 100 at Sta. 45+48 and continuing along the west side of Mercantile Drive.
  - Proposed drainage pipe conflicts with main at Sta. 45+49 37' LT. MAWC will relocate this facility during construction in coordination with the contractor.
- 8" ductile iron main crossing westbound lanes of Rt. 100 at Sta. 47+97 and continuing along the west side of Louis Ave.
  - Proposed drainage pipe conflicts with main at Sta. 47+96 36' RT. MAWC will relocate this facility during construction in coordination with the contractor.
- Water line crossing the westbound lane of Rt. 100, curb, and sidewalk at Sta. 51+05. No conflict with this facility is anticipated.
- 6" cast iron main crossing westbound lane of Rt. 100 at Sta. 51+74 and continuing north along west side of Salem Rd. No conflict with this facility is anticipated.
  - Proposed drainage pipe conflicts with main at Sta. 51+82 15' RT. MAWC will relocate this facility during construction in coordination with the contractor.
- 8" ductile iron main crossing Rt. 100 at Sta. 53+44. No conflict with this facility is anticipated.
- 8" PVC main crossing westbound lane of Rt. 100 at Sta. 55+29 and continuing north along the west side of Cecelia Ave.
  - Proposed drainage pipe and structure conflict with main from Sta. 55+30 32' RT to 55+30 53' RT. MAWC will relocate this facility during construction in coordination with the contractor.
- 6" cast iron main crossing westbound lane of Rt. 100 at Sta. 59+88 and continuing north along the west side of Helen Ave. No conflict with this facility is anticipated.
- 6" ductile iron main crossing westbound lane of Rt. 100 at Sta. 62+03 and continuing north along the west side of Ruth Ave. No conflict with this facility is anticipated.
- Buried water (unknown size/material) along south side of Rt. 100 from Sta. 65+58 to 66+15.
  - Proposed drainage pipe and tunnel conflicts with water line from Sta. 65+57 22' LT to Sta. 66+14 21' LT. MAWC will relocate this facility during construction in coordination with the contractor.
- 6" cast iron main crossing westbound lane of Rt. 100 at Sta. 65+20 and continuing north along the west side of Dorthy Ave.
  - Proposed drainage pipe conflicts with main at Sta. 65+14 45' RT. MAWC will relocate this facility during construction in coordination with the contractor.
- 6" cast iron main crossing Rt. 100 at Sta. 66+12 and continuing south along Mary Avenue.

- Proposed tunnel and drainage pipe conflicts with main from Sta. 66+12 174' LT to 66+12 12' RT. MAWC will relocate this facility during construction in coordination with the contractor.
- 6" ductile iron main crossing Rt. 100 at Sta. 73+01. No conflict with this facility is anticipated.
- 8" main crossing westbound lanes of Rt. 100 at Sta. 77+35 and continuing north along the center of Brentwood Blvd. through the project limits. No conflict with this facility is anticipated.
- 6" main crossing eastbound lanes of Rt. 100 at Sta. 77+52 and continuing south along the southbound lanes of Brentwood Blvd. through the project limits. No conflict with this facility is anticipated.
- 12" ductile iron main crossing Rt. 100 at Sta. 81+66 and continuing south along the east side of Collier Ave.
  - Proposed drainage pipe conflicts with main at Sta. 81+63 14' RT. MAWC will relocate this facility during construction in coordination with the contractor.
- 6" cast iron main crossing Rt. 100 at Sta. 81+97 and continuing south under southbound lane of Collier Ave.
  - Proposed drainage pipe conflicts with main at Sta. 81+95 14' RT. MAWC will relocate this facility during construction in coordination with the contractor.
- 8" PVC main crossing Rt. 100 at Sta. 123+47 and continuing south under southbound lane of Manderly Drive. No conflict with this facility is anticipated.
- 8" PVC main crossing westbound shoulder and curb of Rt. 100 at Sta. 127+11. And continuing north along southbound High School Drive.
  - Proposed drainage pipe conflicts with main at Sta. 127+06 39' RT. MAWC will relocate this facility during construction in coordination with the contractor.
- Water line crossing shoulder and curb of westbound Rt. 100 at Sta. 130+21 and continuing north along the west side of Bremerton Rd.
  - Proposed drainage pipe conflicts with main at Sta. 131+18 31' RT. MAWC will relocate this facility during construction in coordination with the contractor.
- 6" cast iron main crossing Rt. 100 at Sta. 131+52 and continuing south along the west side of Bremerton Rd.
  - Proposed drainage pipe conflicts with main at Sta. 131+52 29' LT. MAWC will relocate this facility during construction in coordination with the contractor.
- 6" main crossing shoulder and curb of westbound Rt. 100 at Sta. 137+16 and continuing north along the east side of Creve Coeur Dr.
  - Proposed drainage pipe conflicts with main at Sta. 137+16 25" RT. MAWC will relocate this facility during construction in coordination with the contractor.

- 6" cast iron main crossing Rt. 100 at Sta. 138+79. No conflict with this facility is anticipated.
- 8" cast iron main crossing shoulder and curb of westbound Rt. 100 at Sta. 140+73 and continuing north along the east side of Rock Hill Industrial Dr. No conflict with this facility is anticipated.
- 6" cast iron main crossing shoulder and curb of westbound Rt. 100 at Sta. 146+05 and continuing north along west side of Raritan Drive. No conflict with this facility is anticipated.
- 6" ductile main crossing shoulder and curb of westbound Rt.100 at Sta. 148+52 and continuing north along the east side of the commercial entrance.
  - Proposed drainage pipe conflicts with main at Sta. 148+52 32' RT. MAWC will relocate this facility during construction in coordination with the contractor.
- 12" ductile iron main crossing westbound lanes of Rt. 100 at Sta.153+27 and continuing north along the east side of S. McKnight Rd. No conflict with this facility is anticipated.
- 6" ductile iron main crossing Rt. 100 at Sta. 154+35 and continuing southwest along the southbound lane of N. Rock Hill Rd. No conflict with this facility is anticipated.
- 12" cast iron main crossing the westbound lane and shoulder of Rt. 100 at Sta. 159+52 and continuing north under the southbound lane of N. Rock Hill Rd. No conflict with this facility is anticipated.
- 6" cast iron main crossing Rt.100 at Sta. 160+74. No conflict with this facility is anticipated.
- 6" cast iron main crossing westbound lane of Rt. 100 at Sta. 169+55 and continuing north along the west side of McKinley Avenue. No conflict with this facility is anticipated.
- 8" PVC main crossing shoulder and curb of Rt. 100 at Sta. 172+58 and continuing north along the west side of Leonard Ave. No conflict with this facility is anticipated.
- 6" cast iron main crossing westbound lane of Rt. 100 at Sta. 176+93 and continuing north along east side of Hudson Ave. No conflict with this facility is anticipated.
- 4" cast iron main crossing Rt. 100 at Sta. 177+11 and continuing southwest under the northbound lane of Mueck Terrace Dr.
  - Proposed drainage pipe conflicts with main at Sta. 177+09 25' LT. MAWC will relocate this facility during construction in coordination with the contractor.
- 8" PVC main crossing Rt. 100 at Sta. 184+83 and continuing south along west side of Blossom Avenue.
  - Proposed drainage structure conflicts with main at Sta. 184+83 25' LT. MAWC will relocate this facility during construction in coordination with the contractor.
- 6" cast iron main crossing Rt. 100 at Sta. 186+91 and turning southeast at Sta. 186+81 and continuing south along the west side of Manitou Drive following that stationing.

- Proposed drainage pipe conflicts with main at Sta. 186+81 27' LT. MAWC will relocate this facility during construction in coordination with the contractor.
- 8" PVC crossing shoulder and curb of westbound Rt. 100 at Sta. 188+37 and continuing northeast along the west side of O'Day Ave.
  - Proposed drainage pipe conflicts with main at Sta. 188+34 27' RT. MAWC will relocate this facility during construction in coordination with the contractor.
  - Proposed drainage structure conflicts with main between Sta. 189+31 47' RT and Sta. 189+32 42' RT. MAWC will relocate this facility during construction in coordination with the contractor.
- 6" cast iron main crossing Rt. 100 at Sta. 190+33 and continuing south along the west side of Tavalon Ave.
  - Proposed drainage pipe and structure conflict with main at Sta. 191+34 31' LT. MAWC will relocate this facility during construction in coordination with the contractor.
- 6" cast iron main crossing Rt. 100 at Sta. 194+40 and continuing south along the west side of Fairdale Ave.
  - Proposed drainage pipe and structure conflict with main at Sta. 191+40 27' LT. MAWC will relocate this facility during construction in coordination with the contractor.
- 20" cast iron main crossing Rt. 100 at Sta. 197+74 under the southbound lane of N. Berry Rd. to the north and south of Rt. 100. No conflict with this facility is anticipated.
- 4" cast iron main crossing Rt. 100 at Sta. 200+35 and continuing south along the west side of Monier Place. No conflict with this facility is anticipated.
- 6" ductile iron main crossing the westbound lane and curb of Rt. 100 at Sta. 202+41 and continuing north along the west side of Salem Hills Dr.
  - Proposed drainage pipe conflicts with main at Sta. 201+41 31' RT. MAWC will relocate this facility during construction in coordination with the contractor.
- Main of unknown size/material crossing shoulder of westbound Rt. 100 at Sta. 204+51.
  - Proposed drainage pipe conflicts with main at Sta. 204+51 32' RT. MAWC will relocate this facility during construction in coordination with the contractor.
  - MAWC will relocate this facility during construction in coordination with the contractor.
- 6" cast iron main crossing Rt. 100 at Sta. 211+01. No conflict with this facility is anticipated.
- 6" cast iron main crossing Rt. 100 at Sta. 218+34 and continuing south along the west side of Andrew Drive.
  - Proposed drainage pipe conflicts with main at Sta. 218+33 38' LT. MAWC will relocate this facility during construction in coordination with the contractor.

- 6" cast iron main crossing Rt. 100 at Sta. 223+62 and continuing south along the west side of N. Sappington Rd.
  - Proposed drainage structure conflicts with main at Sta. 223+81 84' LT. MAWC will relocate this facility during construction in coordination with the contractor.
- 20" cast iron main crossing Rt. 100 at Sta. 223+65 and continuing south along the west side of N. Sappington Rd.
  - Proposed drainage structure conflicts with main at Sta. 223+83 84' LT. MAWC will relocate this facility during construction in coordination with the contractor.
- 8" PVC line crossing Rt. 100 at Sta. 237+23 and continuing south along the center of Kenmore Dr.
  - Proposed drainage pipe conflicts with main at Sta. 237+28 21' LT. MAWC will relocate this facility during construction in coordination with the contractor.
- 12' cast iron main crossing Rt. 100 and running along the centerline of Lindbergh Blvd. from the northern project limits through the southern project limits. No conflict with this facility is anticipated.

**Missouri American Water has the following existing facilities on and along side streets throughout the project limits:**

- 6" cast iron main at Sta. 44+14 along the west side of Melvin Ave. No conflict with this facility is anticipated.
- 6" cast iron main running along the east side of Bompert Avenue at Sta. 62+59. No conflict with this facility is anticipated.
- 6" PVC line running north along southbound lane of Andrew Drive starting at Sta. 217+50. 217+50. No conflict with this facility is anticipated.
- 20" cast iron main running along the west side of Bennett Ave. at Sta. 231+79.
  - Proposed drainage structure conflicts with main at Sta. 231+77 50' RT. MAWC will relocate this facility during construction in coordination with the contractor.

**Missouri American Water has Existing Fire Hydrants throughout the project that will require adjustment:**

- Existing fire hydrant falls in the proposed sidewalk at Sta. 21+68 24' RT. MAWC to adjust to grade during construction in coordination with the contractor.
- Existing fire hydrant falls in area of proposed widening at Sta. 35+59 32' LT. MAWC to relocate during construction in coordination with the contractor.
- Existing fire hydrant falls 0.4' from the new curb at Sta. 48+14 23' RT. MAWC to relocate during construction in coordination with the contractor.

- Existing fire hydrant falls in the new entrance at Sta. 53+44 40' LT. MAWC to relocate during construction in coordination with the contractor.
- Existing fire hydrant falls in the new entrance at Sta. 53+49 34' LT. MAWC to relocate during construction in coordination with the contractor.
- Existing fire hydrant falls in the new curb at Sta. 55+26 38' RT. MAWC to relocate during construction in coordination with the contractor.
- Existing fire hydrant falls in the proposed sidewalk at Sta. 55+81 35' LT. MAWC to relocate during construction in coordination with the contractor.
- Existing fire hydrant falls in proposed sidewalk at Sta. 70+09 29' RT. MAWC to relocate during construction in coordination with the contractor.
- Existing fire hydrant falls in proposed sidewalk at Sta. 73+83 53' LT. MAWC to relocate during construction in coordination with the contractor.
- Existing fire hydrant falls in proposed sidewalk at Sta. 76+52 44' RT. MAWC to relocate during construction in coordination with the contractor.
- Existing fire hydrant falls in the proposed roadway at Sta. 82+10 64' RT. MAWC to relocate during construction in coordination with the contractor.
- Existing fire hydrant falls in proposed sidewalk at Sta. 121+36 25' RT. MAWC to relocate during construction in coordination with the contractor.
- Existing fire hydrant falls in proposed sidewalk at Sta. 127+08 39' RT. MAWC to relocate during construction in coordination with the contractor.
- Existing fire hydrant falls in sidewalk at Sta. 131+25 26' RT. MAWC to relocate during construction in coordination with the contractor.
- Existing fire hydrant falls in sidewalk at Sta. 136+35 26' RT. MAWC to relocate during construction in coordination with the contractor.
- Existing fire hydrant falls in proposed sidewalk at Sta. 140+09 38' RT. MAWC to relocate during construction in coordination with the contractor.
- Existing fire hydrant falls in sidewalk at Sta. 146+09 38' RT. MAWC to relocate during construction in coordination with the contractor.
- Existing fire hydrant falls in sidewalk at Sta. 153+29 55' RT. MAWC to relocate during construction in coordination with the contractor.

- Existing fire hydrant falls on the proposed drainage structure at Sta. 165+05 27' RT. MAWC to relocate during construction in coordination with the contractor.
- Existing fire hydrant falls in sidewalk at Sta. 169+54 31' RT. MAWC to relocate during construction in coordination with the contractor.
- Existing fire hydrant falls in new roadway at Sta. 181+51 28' RT. MAWC to relocate during construction in coordination with the contractor.
- Existing fire hydrant falls within 0.2' of the proposed sidewalk at Sta. 184+63 35' RT. MAWC to relocate during construction in coordination with the contractor.
- Existing fire hydrant falls in the proposed sidewalk at Sta. 194+07 29' RT. MAWC to relocate during construction in coordination with the contractor.
- Existing fire hydrant falls between curb and proposed sidewalk at Sta. 197+93 42' RT. No impact to this facility is anticipated.
- Existing fire hydrant falls in proposed sidewalk at Sta. 208+29 35' RT. MAWC to relocate during construction in coordination with the contractor.
- Existing fire hydrant falls in proposed sidewalk at Sta. 211+05 29' LT. MAWC to relocate during construction in coordination with the contractor.
- Existing fire hydrant falls in proposed sidewalk at Sta. 223+87 53' LT. MAWC to relocate during construction in coordination with the contractor.
- Existing fire hydrant falls in proposed sidewalk at Sta. 226+47 27' RT. MAWC to relocate during construction in coordination with the contractor.
- Existing fire hydrant falls in proposed sidewalk at Sta. 228+61 30' LT. MAWC will need to adjust to grade during construction in coordination with the contractor.
- Existing fire hydrant falls in proposed sidewalk at Sta. 231+00 28' RT. MAWC to relocate during construction in coordination with the contractor.

**Missouri American Water has Existing Fire Hydrant Leads throughout the project:**

- Hydrant lead at Sta. 01+73 14' RT. No conflict with this facility is anticipated.
- Hydrant lead at Sta. 09+38 15' RT. No conflict with this facility is anticipated.
- Hydrant lead at Sta. 11+69 38' RT. No conflict with this facility is anticipated.
- Hydrant lead at Sta. 21+69 16' RT. No conflict with this facility is anticipated.
- Hydrant lead at Sta. 25+66 29' LT. No conflict with this facility is anticipated.

- Hydrant lead at Sta. 28+95 39' RT. No conflict with this facility is anticipated.
- Hydrant lead at Sta. 38+34 18' RT. No conflict with this facility is anticipated.
- Hydrant lead at Sta. 40+46 22' RT. No conflict with this facility is anticipated.
- Hydrant lead at Sta. 48+14 14' RT. No conflict with this facility is anticipated.
- Hydrant lead at Sta. 55+31 43' RT.
  - Proposed drainage structure conflicts with lead at Sta. 55+31 43' RT. MAWC to relocate during construction in coordination with the contractor.
- Hydrant lead at Sta. 62+03 36' RT. No conflict with this facility is anticipated.
- Hydrant lead at Sta. 70+05 30' RT. No conflict with this facility is anticipated.
- Hydrant lead at Sta. 73+83 49' LT. No conflict with this facility is anticipated.
- Hydrant lead at Sta. 76+56 15' RT. No conflict with this facility is anticipated.
- Hydrant lead at Sta. 73+83 49' RT. No conflict with this facility is anticipated.
- Hydrant lead at Sta. 82+05 50' LT. No conflict with this facility is anticipated.
- Hydrant lead at Sta. 121+37 17' RT.
  - Proposed drainage structure conflicts with lead at Sta. 121+37 17' RT. MAWC to relocate during construction in coordination with the contractor.
- Hydrant lead at Sta. 127+06 37' RT.
  - Proposed drainage pipe conflicts with lead at Sta. 127+06 37' RT. MAWC to relocate during construction in coordination with the contractor.
- Hydrant lead at Sta. 131+20 28' RT.
  - Proposed drainage pipe conflicts with lead at Sta. 131+20 28' RT. MAWC to relocate during construction in coordination with the contractor.
- Hydrant lead at Sta. 136+35 25' RT.
  - Proposed drainage structure conflicts with lead at Sta. 136+35 25' RT. MAWC to relocate during construction in coordination with the contractor.
- Hydrant lead at Sta. 146+06 33' RT. No conflict with this facility is anticipated.
- Hydrant lead at Sta. 150+21 14' RT. No conflict with this facility is anticipated.
- Hydrant lead at Sta. 153+28 55' RT. No conflict with this facility is anticipated.

- Hydrant lead at Sta. 159+53 38' RT. No conflict with this facility is anticipated.
- Hydrant lead at Sta. 161+06 44' LT. No conflict with this facility is anticipated.
- Hydrant lead at Sta. 165+5 21' RT. No conflict with this facility is anticipated.
- Hydrant lead at Sta. 169+52 31' RT. No conflict with this facility is anticipated.
- Hydrant lead at Sta. 172+58 42' RT. No conflict with this facility is anticipated.
- Hydrant lead at Sta. 177+39 14' RT. No conflict with this facility is anticipated.
- Hydrant lead at Sta. 181+51 20' RT. No conflict with this facility is anticipated.
- Hydrant lead at Sta. 184+64 18' RT. No conflict with this facility is anticipated.
- Hydrant lead at Sta. 194+08 18' RT. No conflict with this facility is anticipated.
- Hydrant lead at Sta. 197+88 36' RT. No conflict with this facility is anticipated.
- Hydrant lead at Sta. 202+41 41' RT. No conflict with this facility is anticipated.
- Hydrant lead at Sta. 210+02 26' LT. No conflict with this facility is anticipated.
- Hydrant lead at Sta. 223+74 46' LT. No conflict with this facility is anticipated.
- Hydrant lead at Sta. 226+47 28' RT. No conflict with this facility is anticipated.
- Hydrant lead at Sta. 230+99 28' RT. No conflict with this facility is anticipated.
- Hydrant lead at Sta. 237+33 46' LT. No conflict with this facility is anticipated.

**Missouri American Water has Existing Main Line Water Meters throughout the project that will require adjustment:**

- Water meter at Sta. 52+11 23' LT falls in proposed curb and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Water meter at Sta. 63+23 39' LT falls in proposed sidewalk/curb and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Water meter at Sta. 82-17 40' LT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.

- Water meter at Sta. 82-19 40' LT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Water meter at Sta. 129+90 28' LT falls in proposed curb and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Water meter at Sta. 141+46 43' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Water meter at Sta. 144+05 42' LT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Water meter at Sta. 145+33 falls in proposed sidewalk and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Water meter at Sta. 150+66 44' LT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Water meter at Sta. 161+47 45' RT falls within 1' from proposed sidewalk. Meter will need to be adjusted to new grade.
- Water meter at Sta. 162+46 31' RT falls in proposed roadway. and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Water meter at Sta. 174+16 29' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Water meter at Sta. 183+01 47' RT falls in proposed curb and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Water meter at Sta. 183+05 47' RT falls in proposed curb and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Water meter at Sta. 226+04 38' LT falls in proposed sidewalk and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Water meter at Sta. 226+06 38' LT falls in proposed sidewalk and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.

**Missouri American Water has Existing Main Line Water Valves throughout the project that will require adjustment:**

- Valve at Sta. 18+91 11' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.

- Valve at Sta. 020+39 14' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 020+89 13' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 021+69 14' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 024+80 16' LT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 025+66 29' LT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 029+07 45' LT falls in proposed sidewalk and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 031+12 34' LT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 031+15 46' LT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 031+40 46' LT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 036+15 43' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 036+26 18' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 038+34 18' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 040+45 14' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 040+46 22' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 044+14 39' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.

- Valve at Sta. 045+47 16' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 047+97 30' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 047+97 14' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 048+11 12' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 048+14 14' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 050+79 22' LT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 051+12 22' LT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 051+17 28' LT falls in proposed sidewalk and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 051+18 35' LT falls in proposed sidewalk and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 051+73 14' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 051+89 10' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 051+91 25' LT falls in proposed curb and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 053+42 25' LT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 053+45 25' LT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 053+48 34' LT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.

- Valve at Sta. 055+30 28' RT falls in proposed sidewalk and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 055+32 43' RT falls in proposed sidewalk and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 055+49 35' LT falls in proposed sidewalk and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 055+81 38' LT falls in proposed sidewalk and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 057+54 25' LT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 058+89 33' RT falls in proposed sidewalk and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 062+03 37' RT falls in proposed sidewalk and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 062+05 40' RT falls in proposed curb and will need to be adjusted to grade during by MAWC during construction in coordination with the contractor.
- Valve at Sta. 063+24 30' LT falls in proposed sidewalk and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 065+09 11' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 065+19 28' RT falls in proposed sidewalk and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 065+23 22' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 065+81 12' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 070+03 13' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.

- Valve at Sta. 070+08 30' RT falls in proposed sidewalk and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 073+15 48' LT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 073+83 52' LT falls in proposed sidewalk and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 076+55 16' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 076+73 14' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 077+36 15' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 077+51 13' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 079+76 24' RT falls in proposed sidewalk and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 080+80 25' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 080+81 34' RT falls in proposed roadway and will need to be adjusted to grade during construction in coordination with the contractor.
- Valve by MAWC at Sta. 081+63 21' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 082+03 38' LT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 082+04 40' LT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 082+05 48' LT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 084+40 24' LT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.

- Valve at Sta. 09+38 15' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 11+67 14' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 121+36 15' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 121+39 27' LT falls in proposed sidewalk and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 123+18 29' RT falls in proposed sidewalk and will need to be adjusted to grade during construction in coordination with the contractor.
- Valve at Sta. 123+47 14' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 124+82 26' RT falls in proposed curb and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 126+44 29' LT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 126+95 23' LT falls in proposed roadway and will need to be adjusted to grade during construction in coordination with the contractor.
- Valve at Sta. 126+98 52' RT falls in proposed curb and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 127+07 37' RT falls in proposed curb and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 127+08 31' RT falls in proposed sidewalk and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 127+11 18' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 127+55 32' LT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.

- Valve at Sta. 129+89 24' LT falls in proposed sidewalk and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 131+10 44' RT falls in proposed sidewalk and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 131+19 28' RT falls in proposed sidewalk and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 131+22 19' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 131+53 18' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 132+42 26' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 135+58 26' RT falls in proposed sidewalk and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- The valve at Sta. 136+33 25' LT falls in proposed sidewalk and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 136+36 20' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 137+16 18' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 137+26 17' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 137+40 18' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 137+63 41' RT falls in proposed sidewalk and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 138+74 18' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 138+79 20' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.

- Valve at Sta. 140+10 20' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 140+60 36' LT falls in proposed sidewalk and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 140+73 25' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 141+05 22' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 141+46 39' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 144+05 38' LT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 144+62 29' RT falls in proposed sidewalk and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 144+63 23' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 145+26 17' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 145+30 35' LT falls in proposed sidewalk and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 145+33 34' LT falls in proposed sidewalk and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 146+06 18' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 146+38 13' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 148+51 16' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 148+85 11' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.

- Valve at Sta. 149+76 34' LT falls in proposed curb and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 150+32 14' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 152+06 26' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 153+27 42' RT falls in proposed sidewalk and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 154+36 12' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 155+91 17' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 159+48 55' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 159+48 50' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 160+74 26' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 161+47 39' RT falls in proposed sidewalk and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 163+43 17' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 165+05 18' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 167+20 26' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 167+20 14' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.

- Valve at Sta. 167+56 40' RT falls within 1' of new curb within slope limits and will need to be relocated/adjusted by MAWC during construction in coordination with the contractor.
- Valve at Sta. 169+51 31' RT falls in proposed sidewalk and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 169+55 16' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 172+75 16' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 176+75 13' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 176+93 13' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 177+12 10' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 177+39 12' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 181+51 19' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 182+98 18' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 183+00 42' RT falls in proposed sidewalk and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 183+05 44' RT falls in proposed sidewalk and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 183+07 43' RT falls in proposed sidewalk and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 183+59 40' LT falls in proposed curb and will need to be adjusted to grade during construction in coordination with the contractor.
- Valve at Sta. 184+64 18' RT falls in proposed roadway and will need to be adjusted to grade during construction in coordination with the contractor.

- Valve at Sta. 184+79 15' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 186+90 15' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 189+34 19' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 191+33 18' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 192+19 25' LT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 193+86 28' LT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 194+08 17' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 194+39 17' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 195+70 36' RT falls in proposed sidewalk and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 195+70 38' RT falls in proposed sidewalk and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 197+38 67' LT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 197+71 21' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 197+79 40' LT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 197+87 34' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.

- Valve at Sta. 197+96 23' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 200+34 14' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 202+41 21' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 204+51 22' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 204+51 31' RT falls in proposed sidewalk and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 205+77 31' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 208+30 26' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 210+81 26' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 211+00 22' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 211+02 26' LT falls in proposed sidewalk and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 211+60 27' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 212+75 39' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 212+99 35' LT falls in proposed sidewalk and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 213+65 36' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 215+79 30' LT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.

- Valve at Sta. 217+15 27' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 218+35 26' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 220+94 46' LT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 221+23 30' RT falls in proposed sidewalk and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 221+26 30' RT falls in proposed sidewalk and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 222+82 26' RT falls in proposed curb and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 223+28 59' LT falls in proposed sidewalk and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 223+61 20' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 223+72 45' LT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 226+05 30' LT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 226+06 30' LT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 226+47 27' RT falls in proposed sidewalk and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 226+70 29' LT new drainage structure falls on top of valve. Contractor will be responsible for relocation/adjustment of this facility.
- Valve at Sta. 226+70 29' LT New drainage structure falls on top of valve. Contractor will be responsible for relocation/adjustment of this facility.

- Valve at Sta. 228+62 22' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 230+98 27' RT falls in proposed sidewalk and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 231+00 26' RT falls in proposed sidewalk and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 231+79 39' RT falls in proposed sidewalk and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 234+70 28' RT falls in proposed sidewalk and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 237+25 23' RT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.
- Valve at Sta. 237+37 43' LT falls in proposed roadway and will need to be adjusted to grade by MAWC during construction in coordination with the contractor.

**SERVICE LINES, SERVICE LEADS & HYDRANTS, SERVICE METERS, SERVICE VALVES:**

**Missouri American Water has the following Service Lines Crossing Rt. 100:**

- Service line of unknown size/material crossing the westbound lane of Rt. 100 at Sta. 01+02 and exiting the project limits to the north. No conflict with this facility is anticipated.
- ¾" service line of unknown size/material crossing Rt. 100 at Sta. 01+53. No conflict with this facility is anticipated.
- ¾" service line of unknown size/material crossing Rt. 100 at Sta. 02+26. No conflict with this facility is anticipated.
- 2" copper service line of unknown size/material crossing Rt. 100 at Sta. 04+02. No conflict with this facility is anticipated.
- ¾" copper service line of unknown size/material crossing Rt.100 at Sta 05+64. No conflict with this facility is anticipated.
- 5/8" lead service line of unknown size/material crossing Rt. 100 at Sta. 06+18. No conflict with this facility is anticipated.
- Service line crossing Rt. 100 at Sta. 08+48. No conflict with this facility is anticipated.

- Service line crossing Rt. 100 at Sta. 10+42. No conflict with this facility is anticipated.
- Service line of unknown size/material crossing Rt. 100 at Sta. 11+01. No conflict with this facility is anticipated.
- Service line of unknown size/material crossing Rt. 100 at Sta. 16+90. No conflict with this facility is anticipated.
- 1" copper service line crossing Rt. 100 at Sta. 17+80. No conflict with this facility is anticipated.
- 5/8" lead service line crossing Rt. 100 at Sta. 18+15. No conflict with this facility is anticipated.
- 1" copper service line crossing Rt. 100 at Sta. 18+90. No conflict with this facility is anticipated.
- Service line of unknown size/material crossing Rt. 100 at Sta. 19+81. No conflict with this facility is anticipated.
- Service line of unknown size/material crossing Rt. 100 at Sta. 25+63. No conflict with this facility is anticipated.
- Service line of unknown size/material crossing Rt. 100 at Sta. 28+68. No conflict with this facility is anticipated.
- Service line of unknown size/material crossing curb and right turn lane of Rt. 100 at S Hanley at Sta. 34+20 43' LT. No conflict with this facility is anticipated.
- Service line of unknown size/material crossing Rt. 100 at Sta. 34+71. No conflict with this facility is anticipated.
- Service line of unknown size/material crossing Rt. 100 at Sta. 38+13. No conflict with this facility is anticipated.
- Service line of unknown size/material crossing westbound lane and curb at Sta. 38+73. No conflict with this facility is anticipated.
- 1" service line crossing westbound lane and curb at Sta. 40+12. No conflict with this facility is anticipated.
- Service line of unknown size/material crossing Rt. 100 at Sta. 40+99. No conflict with this facility is anticipated.
- Service line of unknown size/material crossing Rt. 100 at Sta. 42+27. No conflict with this facility is anticipated.

- ¾" service line crossing westbound lane and curb at Sta. 42+64. No conflict with this facility is anticipated.
- Service line of unknown size/material crossing Rt. 100 at Sta. 44+15. No conflict with this facility is anticipated.
- ¾" service line crossing westbound lane and curb at Sta. 44+83. No conflict with this facility is anticipated.
- 5/8" service line crossing westbound lane and curb at Sta. 45+33. No conflict with this facility is anticipated.
- 5/8" service line crossing westbound lane at Sta. 45+80. No conflict with this facility is anticipated.
- Service line of unknown size/material crossing Rt. 100 at Sta. 47+64. No conflict with this facility is anticipated.
- 1" service line crossing westbound lane at Sta. 49+33. No conflict with this facility is anticipated.
- ¾" service line crossing Rt. 100 at Sta. 50+91. No conflict with this facility is anticipated.
- 5/8" service line crossing westbound lane and curb at Sta. 51+05. No conflict with this facility is anticipated.
- 2" service line crossing Rt. 100 at Sta. 52+15.
  - Proposed drainage pipe conflicts with service at Sta. 52+15 14' RT. Contractor will be responsible for relocation/adjustment of this facility.
- Service line of unknown size/material crossing westbound lane and curb at Sta. 52+94. No conflict with this facility is anticipated.
- ¾" lead service line crossing Rt. 100 at Sta. 54+ 27. No conflict with this facility is anticipated.
- 6" copper service line crossing Rt. 100 at Sta. 55+94. No conflict with this facility is anticipated.
- Service line of unknown size/material crossing Rt. 100 at Sta. 56+96. No conflict with this facility is anticipated.
- ¾" galvanized service line crossing westbound lanes and curb of Rt. 100 at Sta. 57+62. No conflict with this facility is anticipated.
- 1" copper service line crossing Rt. 100 at Sta. 57+62. No conflict with this facility is anticipated.

- Service line crossing westbound lane and curb/sidewalk at Sta. 60+54. No conflict with this facility is anticipated.
- $\frac{3}{4}$ " copper service line crosses westbound lanes at Sta. 61+20. No conflict with this facility is anticipated.
- $\frac{3}{4}$ " copper service line crossing Rt. 100 at Sta. 62+59. No conflict with this facility is anticipated.
- $\frac{3}{4}$ " copper service line crossing Rt. 100 at Sta. 63+18. No conflict with this facility is anticipated.
- $\frac{3}{4}$  copper service line at Sta. 63+32. No conflict with this facility is anticipated.
- Service line of unknown size/material crossing Rt. 100 at Sta. 64+01. No conflict with this facility is anticipated.
- Service line of unknown size/material crossing westbound Rt. 100 at Sta. 64+29. No conflict with this facility is anticipated.
- 1  $\frac{1}{2}$ " copper service line crossing Rt. 100 at Sta. 65+20. No conflict with this facility is anticipated.
- Service line of unknown size/material crossing Rt. 100 at Sta. 65+75. No conflict with this facility is anticipated.
- Service line of unknown size/material crossing Rt. 100 at Sta. 66+85. No conflict with this facility is anticipated.
- Service line of unknown size/material crossing Rt. 100 at Sta. 67+79. No conflict with this facility is anticipated.
- Service line of unknown size/material crossing westbound Rt. 100 into commercial entrance at Sta. 70+44. No conflict with this facility is anticipated.
- Service line of unknown size/material crossing Rt. 100 at Sta. 74+92 ends in SW. No conflict with this facility is anticipated.
- Service line of unknown size/material crossing SW off north side Rt. 100 at Sta. 79+76 25' RT. No conflict with this facility is anticipated.
- Service line of unknown size/material crossing SW off north side Rt. 100 at Sta. 80+44 25' RT. No conflict with this facility is anticipated.
- $\frac{5}{8}$ " lead service line crossing shoulder and curb of westbound Rt. 100 at Sta. 81+95. No conflict with this facility is anticipated.

- 1" copper service line crossing shoulder and curb of westbound Rt. 100 at Sta. 82+37.
  - Proposed drainage pipe conflicts with service line at Sta. 82+37 20' RT. Contractor will be responsible for relocation/adjustment of this facility.
- Service line of unknown size/material crossing shoulder and curb of westbound Rt. 100 at Sta. 83+07, and turning northwest at Sta. 83+07 43' RT.
  - Proposed drainage pipe conflicts with service line at Sta. 83+07 20' RT. Contractor will be responsible for relocation/adjustment of this facility.
- 3/4" copper service line crossing Rt. 100 at Sta. 84+37 [118+18\* Sta. overlap here].
  - This connects to a main at Sta 84+35 15' RT that is in conflict. Contractor will be responsible for reconnection of this facility after the main is relocated.
- 1" copper service line crossing Rt. 100 at Sta. 119+08.
  - Proposed drainage pipe conflicts with service line at Sta. 119+08 17' RT. Contractor will be responsible for relocation/adjustment of this facility.
- 5/8" lead copper service line crossing westbound lanes of Rt. 100 at Sta. 119+61.
  - Proposed drainage pipe conflicts with service line at Sta. 119+61 17' RT. Contractor will be responsible for relocation/adjustment of this facility.
- 1 1/4" copper service line crossing westbound lanes of Rt. 100 at Sta. 120+45 17' RT.
  - Proposed drainage pipe conflicts with service line at Sta. 120+45 17' RT. Contractor will be responsible for relocation/adjustment of this facility.
- Service line crossing westbound lanes of Rt. 100 at 120+77.
  - Proposed drainage pipe conflicts with service line at Sta. 120+77 17' RT. Contractor will be responsible for relocation/adjustment of this facility.
- 1 1/2" copper service line crossing westbound lane and curb of Rt. 100 at Sta. 123+73. No conflict with this facility is anticipated.
- Service line of unknown size/material crossing Rt. 100 at Sta. 124+30. No conflict with this facility is anticipated.
- 3/4" copper service line crossing westbound lane and curb of Rt. 100 at Sta. 124+81. No conflict with this facility is anticipated.
- 3/4" copper service line crossing Rt. 100 at Sta. 125+35. No conflict with this facility is anticipated.
- 5/8" lead service line crossing westbound lane and curb of Rt. 100 at 125+45. No conflict with this facility is anticipated.
- 3/4" copper service line crossing Rt. 100 at Sta. 127+48.

- Proposed drainage crosses service line at Sta. 127+48 26' LT. Contractor will be responsible for relocation/adjustment of this facility.
- Service line of unknown size/material crossing Rt. 100 at Sta. 129+86.
  - Proposed drainage crosses service line at Sta. 126+86 25' LT. Contractor will be responsible for relocation/adjustment of this facility.
- ¾" galvanized service crossing westbound lane of Rt. 100 and commercial entrance at Sta. 131+87. No conflict with this facility is anticipated.
- ¾" galvanized service crossing westbound lane of Rt. 100 and commercial entrance at Sta. 132+44. No conflict with this facility is anticipated.
- Service line of unknown size/material crossing westbound Rt. 100 and curb/sidewalk at Sta. 133+63. No conflict with this facility is anticipated.
- 1 ½" copper service line crossing Rt. 100 at Sta. 134+18.
  - Proposed drainage crosses service line at Sta. 134+18 25' LT. Contractor will be responsible for relocation/adjustment of this facility.
- Service line of unknown size/material crossing Rt. 100 at Sta. 134+35 25' LT.
  - Proposed drainage crosses service line at Sta. 134+25 LT. Contractor will be responsible for relocation/adjustment of this facility.
- 2" copper service line crossing westbound lane and curb of Rt. 100 at Sta. 134+70 RT.
  - Proposed drainage crosses service line at Sta. 134+70 25' RT. Contractor will be responsible for relocation/adjustment of this facility.
- 5/8" lead service crossing westbound lane and curb of Rt. 100 at Sta. 135+58.
  - Proposed drainage crosses service line at Sta. 135+58 24' RT. Contractor will be responsible for relocation/adjustment of this facility.
- Service line crossing eastbound lanes of Rt. 100 at Sta. 135+94.
  - Proposed drainage crosses service line at Sta. 135+94 23' LT. Contractor will be responsible for relocation/adjustment of this facility.
- 5/8" lead service line crossing Rt. 100 at Sta. 136+41 25' RT.
  - Proposed drainage crosses service line at Sta. 136+41 25' RT. Contractor will be responsible for relocation/adjustment of this facility.
- 5/8" lead service line crossing Rt. 100 at Sta. 140+74. No conflict with this facility is anticipated.
- ¾" copper service line crossing Rt. westbound lane of Rt. 100 and commercial entrance at Sta. 140+46. No conflict with this facility is anticipated.

- Service line of unknown size/material crossing Rt. 100 at Sta. 143+95. No conflict with this facility is anticipated.
- 1 ½" inch copper service line crossing Rt. 100 at Sta. 144+89. No conflict with this facility is anticipated.
- ¾" copper service line crossing westbound lane of Rt. 100 and commercial entrance at Sta. 145+71. No conflict with this facility is anticipated.
- Service line of unknown size/material crossing westbound lane of Rt. 100 and curb at Sta.147+44.
  - Proposed drainage structure crosses service line at Sta. 147+44 29' RT. Contractor will be responsible for relocation/adjustment of this facility.
- 1 ½" copper service line crossing westbound lane of Rt. 100 and curb at Sta. 148+96.
  - Proposed drainage crosses service line at Sta. 148+96 29' RT' LT. Contractor will be responsible for relocation/adjustment of this facility.
- Service line of unknown size/material crossing Rt. 100 at Sta. 150+65. No conflict with this facility is anticipated.
- Service line of unknown size/material crossing westbound lane and curb of Rt. 100 at Sta.156+4. No conflict with this facility is anticipated.
- Service line of unknown size/material crossing Rt. 100 at Sta. 157+80. No conflict with this facility is anticipated.
- 5/8" copper service line crossing westbound lane and curb of Rt. 100 at Sta. 158+49.
- Service line of unknown size/material crossing shoulder and curb of eastbound Rt. 100 at Sta. 160+95. No conflict with this facility is anticipated.
- Service line crossing westbound lane of Rt. 100 and curb at Sta. 161+47. No conflict with this facility is anticipated.
- ¾" copper service crossing westbound lane of Rt. 100 and commercial entrance at Sta. 162+46. No conflict with this facility is anticipated.
- 2" service line crossing westbound lane of Rt. 100 and commercial entrance at Sta. 163+14. No conflict with this facility is anticipated.
- Service line of unknown size/material crossing Rt. 100 at Sta.163+44. No conflict with this facility is anticipated.
- ¾" copper crossing westbound lane of Rt. 100 and curb/sidewalk at Sta. 165+73. No conflict with this facility is anticipated.

- ¾" copper crossing sidewalk off westbound Rt. 100 at Sta.166+90. No conflict with this facility is anticipated.
- 8" private service of unknown size/material crossing Rt. 100 diagonally at Sta. 166+98. No conflict with this facility is anticipated.
- ¾" copper service crossing westbound lane of Rt. 100 and curb/sidewalk at Sta.167+56. No conflict with this facility is anticipated.
- ¾" copper service crossing westbound lane of Rt. 100 and curb/sidewalk at Sta.167+90. No conflict with this facility is anticipated.
- Service line of unknown size/material crossing westbound lane of Rt. 100 and curb/sidewalk at Sta. 170+74.
  - Proposed drainage crosses service line at Sta. 170+74 22' RT. Contractor will be responsible for relocation/adjustment of this facility.
- ¾" copper service crossing Rt. 100 at Sta. 172+21. No conflict with this facility is anticipated.
- Service line of unknown size/material crossing westbound lane of Rt. 100 and curb/sidewalk at Sta.174+10. No conflict with this facility is anticipated.
- Service line of unknown size/material crossing Rt. 100 at Sta. 175+20.
  - Proposed drainage crosses service line at Sta. 175+28 27' LT. Contractor will be responsible for relocation/adjustment of this facility.
- ¾" copper service line crossing Rt. 100 diagonally at Sta. 175+49.
  - Proposed drainage crosses service line at Sta. 175+49 27' LT. Contractor will be responsible for relocation/adjustment of this facility.
- ¾" copper service line crossing Rt. 100 at Sta. 176+87.
  - Proposed drainage crosses service line at Sta. 176+86 25' LT. Contractor will be responsible for relocation/adjustment of this facility.
- 1 ½" copper service line crossing Rt. 100 at Sta. 179+95. No conflict with this facility is anticipated.
- Service line of unknown size/material crossing Rt. 100 at Sta. 185+44.
  - Proposed drainage crosses service line at Sta.185+44 17' RT. Contractor will be responsible for relocation/adjustment of this facility.
  - Proposed drainage crosses service line at Sta. 185+43 26' LT. Contractor will be responsible for relocation/adjustment of this facility.
- Service line of unknown size/material crossing westbound lane of Rt. 100 and curb/sidewalk at Sta. 185+54.

- Proposed drainage crosses service line from Sta. 185+54 17' RT to 185+54 29' RT. Contractor will be responsible for relocation/adjustment of this facility.
- Service line of unknown size/material crossing Rt. 100 at Sta.188+29.
  - Proposed drainage crosses service line at Sta. 188+29 31' LT. Contractor will be responsible for relocation/adjustment of this facility. Contractor will be responsible for relocation/adjustment of this facility.
- Service line of unknown size/material crossing Rt. 100 at Sta. 189+90.
  - Proposed drainage crosses service line at Sta. 189+90 33' LT. Contractor will be responsible for relocation/adjustment of this facility.
- Service line of unknown size/material crossing Rt. 100 at Sta.191+70.
  - Proposed drainage crosses service line at Sta. 191+70 31' LT. Contractor will be responsible for relocation/adjustment of this facility.
- Service line of unknown size/material crossing westbound lane of Rt. 100 and curb/sidewalk at Sta. 192+09. No conflict with this facility is anticipated.
- ¾" copper service line crossing Rt. 100 at Sta. 192+19. 32' LT
  - Proposed drainage crosses service line at Sta. 192+19 32' LT. Contractor will be responsible for relocation/adjustment of this facility.
- 1" copper service line crossing Rt. 100 at Sta. 192+93.
  - Proposed drainage crosses service line at Sta. 192+93 32' LT. Contractor will be responsible for relocation/adjustment of this facility.
- Service line of unknown size/material crossing Rt. 100 at Sta.193+86 33' LT
  - Proposed drainage crosses service line at Sta. 193+86 33' LT. Contractor will be responsible for relocation/adjustment of this facility.
- 5/8" lead service line crossing Rt. 100 at Sta. 195+37. No conflict with this facility is anticipated.
- 5/8" lead service line crossing Rt. 100 at Sta. 195+49. No conflict with this facility is anticipated.
- 1" copper service line crossing westbound lanes of Rt. 100 and curb/sidewalk at Sta. 196+32. No conflict with this facility is anticipated.
- ¾" lead service line crossing Rt. 100 at Sta. 202+85.
  - Proposed drainage crosses service line at Sta. 202+85 21' LT. Contractor will be responsible for relocation/adjustment of this facility.
- Service line of unknown size/material crossing sidewalk and heading diagonally to the northwest on the north side of Rt. 100 at Sta. 204+51.

- Proposed drainage crosses service line at Sta. 204+52 32' RT. Contractor will be responsible for relocation/adjustment of this facility.
- Service line of unknown size/material crossing Rt. 100 at Sta. 207+14.
  - Proposed drainage crosses service line at Sta. 207+14 22' LT. Contractor will be responsible for relocation/adjustment of this facility.
- Service line of unknown size/material crossing westbound lanes of Rt. 100 and curb/sidewalk at Sta. 211+57. No conflict with this facility is anticipated.
- Service line of unknown size/material crossing curb and sidewalk off north side of Rt. 100 at Sta. 214+73. No conflict with this facility is anticipated.
- ¾" copper service line crossing Rt. 100 at Sta. 215+79. No conflict with this facility is anticipated.
- Service line of unknown size/material crossing curb and sidewalk off north side of Rt. 100 at Sta. 216+59. No conflict with this facility is anticipated.
- Service line of unknown size/material crossing Rt. 100 at Sta. 219+42. No conflict with this facility is anticipated.
- Service line of unknown size/material crossing westbound lanes of Rt. 100 and curb/sidewalk at Sta. 221+85. No conflict with this facility is anticipated.
- Service line of unknown size/material crossing westbound lanes of Rt. 100 and curb/sidewalk at Sta. 224+15.
  - Proposed drainage crosses service line at Sta. 224+15 27' RT. Contractor will be responsible for relocation/adjustment of this facility.
- Service line of unknown size/material crossing Rt. 100 at Sta. 226+80.
  - Proposed drainage crosses service line at Sta. 226+80 31' LT. Contractor will be responsible for relocation/adjustment of this facility.
- ¾" copper service line crossing Rt. 100 at Sta. 227+54.
  - Proposed drainage crosses service line at Sta. 227+54 33' LT. Contractor will be responsible for relocation/adjustment of this facility.
- Service line of unknown size/material crossing curb and sidewalk off north side of Rt. 100 at Sta. 228+20.
  - Proposed drainage crosses service line from Sta. 228+20 33' RT to 228+21 33' RT. Contractor will be responsible for relocation/adjustment of this facility.
- ¾" copper service line crossing Rt. 100 at Sta. 228+24.
  - Proposed drainage crosses service line at Sta. 228+24 25' LT. Contractor will be responsible for relocation/adjustment of this facility.

- Service line of unknown size/material crossing curb and sidewalk off north side of Rt. 100 at Sta. 230+94 24' RT. No conflict with this facility is anticipated.
- 2" copper service line crossing Rt. 100 at Sta. 232+08.
  - Proposed drainage crosses service line at Sta. 232+08 56' RT. Contractor will be responsible for relocation/adjustment of this facility.
- 2" copper service line exiting proposed sidewalk on north side of Rt. 100 at Sta. 232+97.
  - Service line attaches to a main that is in conflict at Sta. 232+97 28' RT. Contractor will be responsible for reconnection of this facility to relocated main.
- ¾" copper service line exiting proposed sidewalk on the north side of Rt. 100. 233+72 30' RT. No conflict with this facility is anticipated.
- 1 1/2" copper service line exiting proposed sidewalk on the north side of Rt. 100. 234+74 25' RT. No conflict with this facility is anticipated.
- Service line of unknown size/material crossing Rt. 100 at Sta. 235+90. No conflict with this facility is anticipated.

**Missouri American Water has the following Service Lines that are crossing or are on or along Side Streets and Entrances to Homes and Businesses:**

- 2" copper service line crossing the northbound lane of Laclede Station Rd. at Sta. 14+82 to Sta. 15+35. No conflict with this facility is anticipated.
- Service line of unknown size/material at Sta. 25+89 in northbound lane of Bartold Ave. No conflict with this facility is anticipated.
- 2" service line of unknown size/material along west side of entrance at Sta. 36+02. No conflict with this facility is anticipated.
- Service line of unknown size/material in west side of entrance at Sta. 36+22. No conflict with this facility is anticipated.
- Service line of unknown size/material on west side of Cecelia Avenue at Sta. 55+33 53' RT.
  - This connects to a main at Sta 55+33 53' RT that is in conflict. Contractor will be responsible for reconnection of this facility after the main is relocated.
- ¾" copper service line crossing Manderly Drive at between Sta. 122+73 56' LT and 123+46' 55' LT. No conflict with this facility is anticipated.
- ¾" copper service on west side of Bremerton Rd. 131+14 45' RT. No conflict with this facility is anticipated.

- 2" copper service at north end of project limits off east side of South McKnight at 153+01 120' RT. No conflict with this facility is anticipated.
- 2" copper service line off west side of Kortwright Ave. at Sta. 181+92. No conflict with this facility is anticipated.
- ¾" copper service line crossing Tavalon at Sta. 191+22 47' LT. No conflict with this facility is anticipated.
- 5/8" lead service line crossing N. Berry Rd. at Sta. 197+60 67' LT. No conflict with this facility is anticipated.
- ¾" lead service line crossing southbound lane of N. Berry Rd. at Sta. 197+80 95' LT. No conflict with this facility is anticipated.
- 1 ½" copper service line crossing southbound lane of N. Berry Rd. at Sta. 197+67 99' LT. No conflict with this facility is anticipated.
- 1" copper service line crossing Andrew Drive at Sta. 218+25 56' LT. No conflict with this facility is anticipated.
- 1 ½" service line crossing N. Sappington Rd. at Sta. 223+61 88' LT.
  - Proposed drainage structure conflicts with service line at Sta. 223+61' LT. Contractor will be responsible for relocation/adjustment of this facility.
- Service line of unknown size/material crossing N. Sappington Rd. at Sta. 223+64 98' LT. No conflict with this facility is anticipated.

**Missouri American Water has Service Hydrant Leads throughout the project that will require adjustment:**

- Hydrant lead to Private Hydrant at Sta. 204+50 31' RT.
  - Proposed drainage structure conflicts with hydrant lead at Sta. 204+50 31' LT. Contractor will be responsible for the relocation/adjustment of this facility.

**Missouri American Water has Service Line Water Meters throughout the project that will require adjustment:**

- Water meter at Sta. 47+64 33' LT falls in proposed sidewalk. The contractor will be responsible for adjusting this facility to grade.
- Water meter at Sta. 61+21 36' RT falls in proposed roadway/entrance. The contractor will be responsible for adjusting this facility to grade.
- Water meter at Sta. 83+10 44' RT falls within 1' of proposed curb. The contractor will be responsible for the relocation/adjustment of this facility.

- Water meter at Sta. 133+62 32' RT falls in proposed curb. The contractor will be responsible for adjusting this facility to grade.
- Water meter at Sta. 148+96 32' RT falls in proposed sidewalk. The contractor will be responsible for adjusting this facility to grade.
- Water meter at Sta. 192+09 33' RT falls in proposed curb. The contractor will be responsible for adjusting this facility to grade.
- Water meter at Sta. 228+24 33' LT falls in proposed roadway. The contractor will be responsible for adjusting this facility to grade.

**MAWC has Service Line Valves throughout the project that will require adjustment:**

- Valve at Sta. 18+14 23' RT falls in proposed roadway. The contractor will be responsible for adjusting this facility to grade.
- Valve at Sta. 18+15 24' RT falls in proposed roadway. The contractor will be responsible for adjusting this facility to grade.
- Valve at Sta. 25+81 45' LT falls in proposed roadway. The contractor will be responsible for adjusting this facility to grade.
- Valve at Sta. 25+81 42' LT falls in proposed roadway. The contractor will be responsible for adjusting this facility to grade.
- Valve at Sta. 51+05 30' RT falls in proposed sidewalk. The contractor will be responsible for adjusting this facility to grade.
- Valve at Sta. 61+20 27' RT falls in proposed roadway.
- The contractor will be responsible for adjusting this facility to grade.
- Valve at Sta. 64+29 25' RT falls in proposed curb. The contractor will be responsible for adjusting this facility to grade.
- Valve at Sta. 81+93 29' RT falls in proposed sidewalk. The contractor will be responsible for adjusting this facility to grade.
- Valve at Sta. 82+36 29' RT falls in proposed roadway. The contractor will be responsible for adjusting this facility to grade.
- Valve at Sta. 83+07 43' RT falls in proposed curb. The contractor will be responsible for adjusting this facility to grade.

- Valve at Sta. 119+08 25' RT falls in proposed curb. The contractor will be responsible for adjusting this facility to grade.
- Valve at Sta. 120+45 26' RT falls in proposed curb. The contractor will be responsible for adjusting this facility to grade.
- Valve at Sta. 120+47 27' RT falls in proposed curb. The contractor will be responsible for adjusting this facility to grade.
- Valve at Sta. 121+77 32' RT falls in proposed sidewalk. The contractor will be responsible for adjusting this facility to grade.
- Valve at Sta. 123+73 30' RT falls in proposed sidewalk. The contractor will be responsible for adjusting this facility to grade.
- Valve at Sta. 131+87 43' RT falls in proposed roadway. The contractor will be responsible for adjusting this facility to grade.
- Valve at Sta. 133+62 28' RT falls in proposed sidewalk. The contractor will be responsible for adjusting this facility to grade.
- Valve at Sta. 144+89 35' LT falls in proposed sidewalk. The contractor will be responsible for adjusting this facility to grade.
- Valve at Sta. 148+97 29' RT falls in proposed sidewalk. The contractor will be responsible for adjusting this facility to grade.
- Valve at Sta. 163+15 29' RT falls in proposed roadway. The contractor will be responsible for adjusting this facility to grade.
- Valve at Sta. 166+90 26' RT falls in proposed curb. The contractor will be responsible for adjusting this facility to grade.
- Valve at Sta. 168+48 18' RT falls in proposed roadway. The contractor will be responsible for adjusting this facility to grade.
- Valve at Sta. 168+49 10' RT falls in proposed roadway. The contractor will be responsible for adjusting this facility to grade.
- Valve at Sta. 170+74 15' RT falls in proposed roadway. The contractor will be responsible for adjusting this facility to grade.
- Valve at Sta. 176+86 23' LT falls in proposed roadway. The contractor will be responsible for adjusting this facility to grade.
- Valve at Sta. 189+90 27' LT falls in proposed roadway. The contractor will be responsible for adjusting this facility to grade.

- Valve at Sta. 192+92 26' LT falls in proposed roadway. The contractor will be responsible for adjusting this facility to grade.
- Valve at Sta. 193+40 24' LT falls in proposed roadway. The contractor will be responsible for adjusting this facility to grade.
- Valve at Sta. 193+85 28' LT falls in proposed roadway. The contractor will be responsible for adjusting this facility to grade.
- Valve at Sta. 221+86 29' RT falls in proposed sidewalk. The contractor will be responsible for adjusting this facility to grade.
- Valve at Sta. 228+24 27' LT falls in proposed roadway. The contractor will be responsible for adjusting this facility to grade.
- Valve at Sta. 232+97 30' RT falls in proposed roadway. The contractor will be responsible for adjusting this facility to grade.

If the contractor encounters any existing water services that utilize lead piping, the contractor shall notify Dave Pruitt at Missouri American Water (314.996.2396, [dave.pruitt@amwater.com](mailto:dave.pruitt@amwater.com)). Missouri American Water will coordinate with the property owner to replace the lead service. This has the potential to be a lengthy process. In order to mitigate potential adverse impact to the project schedule related to this, Missouri American Water suggests that the contractor identify services that could be impacted by the project as soon as possible and investigate to determine whether or not any of them are lead.

If the contractor encounters any mainline valves or fire hydrant lead valves that require adjustment to proposed grade, the contractor shall contact Dan Stewart at Missouri American Water (314.996.2459) at least 3 weeks ahead of need for adjustment.

The contractor shall coordinate with Missouri American Water as necessary and take measures to protect in place their existing facilities during construction.

The contractor shall directly contact Missouri American Water to verify location of facilities.

The Commission cannot warrant the information above which was provided by Missouri American Water.

### **13.0 MCI/Verizon**

MCI/Verizon has the following existing facilities within the project limits:

- Underground facilities along the south side of Rt. 100 between Hanley Rd and Brentwood Blvd.
  - Handhole at Sta. 34+92, 28' LT falls in proposed pavement. This facility will be relocated by MCI/Verizon during construction in coordination with the contractor.

- Existing fiber will conflict with proposed storm drainage manhole at Sta. 43+00, 24' LT. This facility will be relocated by MCI/Verizon during construction in coordination with the contractor.
- Existing fiber parallels proposed drainage from Sta. 43+00, 24' RT to Sta. 43+48, 25' RT. This facility will conflict with proposed drainage. This facility will be relocated by MCI/Verizon during construction in coordination with the contractor.
- Proposed pipe crosses fiber at Sta 43+48, 25' LT. This facility will conflict with proposed drainage. Facility will be relocated by MCI/Verizon during construction in coordination with the contractor.
- Proposed drainage structure falls on top of fiber at Sta. 45+59, 25' LT. This facility will conflict with proposed drainage. Facility will be relocated by MCI/Verizon during construction in coordination with the contractor.
- Handhole at Sta. 56+26, 28' LT falls in proposed entrance. This facility will be relocated by MCI/Verizon during construction in coordination with the contractor.
- Proposed drainage structure falls on top of fiber at Sta. 59+28, 26' LT. This facility will conflict with proposed drainage. Facility will be relocated by MCI/Verizon during construction in coordination with the contractor.
- Proposed drainage structure falls on top of fiber at Sta. 60+37, 25' LT. This facility will conflict with proposed drainage. Facility will be relocated by MCI/Verizon during construction in coordination with the contractor.
- Proposed drainage structure falls on top of fiber at Sta. 60+80, 24' LT. This facility will conflict with proposed drainage. Facility will be relocated by MCI/Verizon during construction in coordination with the contractor.
- Proposed drainage structure falls on top of fiber at Sta. 61+20, 24' LT. This facility will conflict with proposed drainage. Facility will be relocated by MCI/Verizon during construction in coordination with the contractor.
- Proposed pedestrian tunnel crosses fiber from Sta. 65+33, 21' LT to Sta. 66+77, 21' LT. This facility will conflict with proposed tunnel. Facility will be relocated by MCI/Verizon during construction in coordination with the contractor.
- Proposed drainage pipe parallels fiber from Sta. 67+10, 22' LT to Sta. 68+23, 23' LT. This facility will conflict with proposed drainage. Facility will be relocated by MCI/Verizon during construction in coordination with the contractor.
- Proposed drainage pipe parallels fiber from Sta. 69+72, 30' LT to Sta. 71+29, 28' LT. This facility will conflict with proposed drainage. Facility will be relocated by MCI/Verizon during construction in coordination with the contractor.

- Underground facilities along the south side of Rt. 100 from Creve Coeur Dr. to N. Sappington Rd.
  - Handhole at Sta. 181+76, 28' LT falls in proposed entrance. This facility will be relocated by MCI/Verizon during construction in coordination with the contractor.
  - Proposed drainage structure falls on top of fiber at Sta. 194+05, 24' LT. This facility will conflict with proposed drainage. Facility will be relocated by MCI/Verizon during construction in coordination with the contractor.
  - Handhole at Sta. 223+30, 66' LT conflicts with proposed pedestrian signal base. This facility will be relocated by MCI/Verizon during construction in coordination with the contractor.

The contractor shall coordinate with MCI as necessary and take measures to protect in place their existing facilities during construction.

The contractor shall directly contact MCI to verify location of facilities.

The Commission cannot warrant the information above which was provided by MCI.

#### **14.0 METROLINK.**

MetroLink has the following existing facilities within the project limits:

- Underground facilities along the north side of Rt. 100 from Sta. 22+70 to Sta. 35+14
  - Buried fiber conflicts with proposed Rt. 100 bridge over Black Creek at Sta. 31+58, 32' Rt. Metro will relocate this facility during construction in coordination with the contractor.
  - Buried fiber conflicts with proposed Rt. 100 bridge over Black Creek at Sta. 32+68, 31' Rt. Metro will relocate this facility during construction in coordination with the contractor.
- Underground facilities crossing Rt. 100 at Sta. 35+75. No conflict with these facilities is anticipated.
- Underground facilities along the south side of Rt. 100 from Sta. 36+20 to 76+82
  - Buried fiber conflicts with proposed drainage structure at Sta. 43+00, 22' LT. Metro will relocate this facility during construction in coordination with the contractor.
  - Handhole at Sta. 45+49, 28' LT conflicts with proposed ADA ramp. Metro will relocate this facility during construction in coordination with the contractor.
  - Buried fiber conflicts with proposed drainage pipe at Sta. 45+57, 28' LT. Metro will relocate this facility during construction in coordination with the contractor.
  - Handhole at Sta. 56+26, 31' LT will conflict with proposed entrance. Metro will relocate this facility during construction in coordination with the contractor.

- Buried fiber conflicts with proposed drainage structure at Sta. 59+28, 31' LT. Metro will relocate this facility during construction in coordination with the contractor.
- Buried fiber conflicts with proposed drainage structure at Sta. 60+37, 30' LT. Metro will relocate this facility during construction in coordination with the contractor.
- Buried fiber conflicts with proposed drainage structure at Sta. 60+80, 30' LT. Metro will relocate this facility during construction in coordination with the contractor.
- Buried fiber conflicts with proposed drainage structure at Sta. 61+38, 31' LT. Metro will relocate this facility during construction in coordination with the contractor.
- Handhole at Sta. 63+12, 28' LT will fall in proposed sidewalk. Metro will adjust this facility to grade during construction in coordination with the contractor.
- Buried fiber conflicts with proposed drainage and pedestrian tunnel from Sta. 65+45, 26' LT to Sta. 70+10, 34' LT. Metro will relocate this facility during construction in coordination with the contractor.

The contractor shall coordinate with MetroLink as necessary and take measures to protect in place their existing facilities during construction.

The contractor shall directly contact MetroLink to verify location of facilities.

The Commission cannot warrant the information above which was provided by MetroLink.

## **15.0 SPIRE ENERGY**

Spire Energy has the following existing facilities along Rt. 100 within the project limits:

### **Underground Facilities along the North Side of Rt. 100 throughout Project**

- 10" steel main running along north side of Rt. 100 from Sta. 15+66 to Sta. 24+33.
  - Proposed drainage pipe and structure conflict with this facility from Sta. 21+71 27' RT to Sta. 21+78 29' RT. Spire to relocate main during construction in coordination with contractor.
- 12" steel main running along north side of Rt. 100 from Sta. 24+33 to Sta. 30+97. No conflict with this facility is anticipated.
- 2" steel main running along north side of Rt. 100 from Sta. 33+63 to 35+28. No conflict with this facility is anticipated.
- 2" steel main running under the westbound lanes of Rt. 100 from Sta. 40+49 to Sta. 42+85. No conflict with this facility is anticipated.

- 2" plastic main running along the north side of Rt. 100 from Sta. 42+85 to Sta. 45+76.
  - Proposed drainage structure conflicts with this facility from Sta. 42+93 24' RT to 43+02 24' RT. Spire to relocate main during construction in coordination with contractor.
  - Proposed drainage structure conflicts with this facility from Sta. 43+36 24' RT to 43+47 24' RT. Spire to relocate main during construction in coordination with contractor.
  - Proposed drainage structure and pipe conflicts with this facility between Sta. 45+04 26' RT and Sta. 45+30 26' RT. Spire to relocate main during construction in coordination with contractor.
  
- 2" steel main running along the north side of Rt. 100 from Sta. 65+35 to Sta. 66+97.
  - Proposed pedestrian tunnel conflicts with this facility between Sta. 65+09 21' RT to Sta. 66+03 22' RT. Spire to relocate main during construction in coordination with contractor.
  
- 4" plastic main running along the north side of Rt. 100 from Sta. 66+62 to Sta. 74+55.
  - Proposed drainage structures and pipe conflict with this facility from Sta. 71+23 26' RT to Sta. 71+81 26' RT. Spire to relocate main during construction in coordination with contractor.
  - Proposed drainage pipe conflicts with this facility from Sta. 72+95 38' RT to Sta. 73+33 23' RT. Spire to relocate main during construction in coordination with contractor.
  
- 2" steel main crossing shoulder and curb of westbound Rt. 100 starting at Sta. 65+76 21' RT and continuing north along Mary Ave. through project limits.
  - Proposed wall and drainage conflict with this facility between Sta. 65+64 166' RT and 65+72 36' RT. Spire to relocate main during construction in coordination with contractor.
  
- 2" stainless steel main on the north side of Rt. 100 running north off existing 4" plastic main at Sta. 68+57 28' RT. No conflict with this facility is anticipated.
  
- 6" steel main running along the north side of Rt. 100 from Sta. 74+55 to Sta. 76+82. No conflict with this facility is anticipated.
  
- 2" plastic main running along the north side of Rt. 100 from Sta. 144+06 to Sta. 145+74. No conflict with this facility is anticipated.
  
- 2" steel main running along north side of Rt. 100 from Sta. 157+43 to Sta. 159+40. No conflict with this facility is anticipated.
  
- 2" steel main running along north side of Rt. 100 from Sta. 161+89 to Sta. 169+28. No conflict with this facility is anticipated.
  
- 2" plastic main under westbound lanes of Rt. 100 from Sta. 170+45 to Sta. 175+94. No conflict with this facility is anticipated.

- 1 ¼" plastic main running along the north side of Rt. 100 from Sta. 182+19 to Sta. 183+55. No conflict with this facility is anticipated.
- 2" steel main running along the north side of Rt. 100 from Sta. 185+61 to Sta. 187+05.
  - Proposed drainage structure and pipe conflict with this facility between Sta. 186+23 24' RT and 186+97 24' RT. Spire to relocate main during construction in coordination with contractor.
- 6" steel main running under the sidewalk along the north side of Rt. 100 from Sta. 197+05 to 197+42.
  - Proposed signal base conflicts with this facility at Sta. 197+42 49' RT. Spire to relocate main during construction in coordination with contractor.
- 8" steel main running along north side of Rt. 100 from Sta. 221+70 to Sta. 224+10.
  - Proposed drainage structure conflicts with this facility from Sta. 222+18 27' RT to Sta. 222+29 27' RT. Spire to relocate main during construction in coordination with contractor.
- 6" steel main running along north side of Rt. 100 from Sta. 224+10 to Sta. 247+89.
  - Proposed drainage pipe conflicts with this facility at Sta. 224+71 29' RT. Spire to relocate main during construction in coordination with contractor.
  - Proposed drainage pipe conflicts with this facility at Sta. 226+61 26' RT. Spire to relocate main during construction in coordination with contractor.
  - Proposed drainage structure and pipe conflict with this facility between Sta. 233+48 23' Rt and 233+60 23' RT. Spire to relocate main during construction in coordination with contractor.
  - Proposed drainage structure conflicts with this facility at Sta. 236+60 23' RT and Sta. 236+64 23' RT. Spire to relocate main during construction in coordination with contractor.
  - Proposed drainage pipe conflicts with this facility at Sta. 242+11 33' RT. Spire to relocate main during construction in coordination with contractor.
  - Proposed drainage pipe conflicts with this facility between Sta. 242+71 26' RT and Sta. 242+82 26' RT. Spire to relocate main during construction in coordination with contractor.
  - Proposed drainage structure conflicts with this facility at Sta. 246+27 21' RT. Spire to relocate main during construction in coordination with contractor.
  - Proposed drainage structure and pipe conflict with this facility between Sta. 244+92 24' RT and 245+26 21' RT. Spire to relocate main during construction in coordination with contractor.
- 8" steel main running along the north side of Rt. 100 from Sta. 247+89 to Sta. 254+33. No conflict with this facility is anticipated.
- Gas line of unknown size/material on north side of Rt. 100 running north off existing 6" main at approximately Sta. 249+64 32' RT. No conflict with this facility is anticipated.

- 8" steel main running along north side of Rt. 100 from Sta. 255+01 to 260+86.
  - Proposed wall conflicts with this facility between Sta. 255+03 102' RT and Sta. 255+55 59' RT. Spire to relocate main during construction in coordination with contractor.
- 8" steel main running under the westbound lanes of Rt. 100 from Sta. 260+86 to 266+00. No conflict with this facility is anticipated.
- Gas line of unknown size/material on north side of Rt. 100 running north off existing 8" main at approximately Sta. 264+85 16' RT. No conflict with this facility is anticipated.
- 6" steel main running under the westbound lanes of Rt. 100 from Sta. 266+00 to 281+81. No conflict with this facility is anticipated.
- 20" steel supply feeder running along the north side of Rt. 100 from Sta. 278+38 to Sta. 281+31. No conflict with this facility is anticipated.

#### **Underground Facilities along the South Side of Rt. 100 throughout the Project**

- 6" steel main running along south side of Rt. 100 from Sta. 00+06 to Sta. 15+38. No conflict with this facility is anticipated.
- Gas line of unknown size/material on south side of Rt. 100 running south off existing 6" main at approximately Sta. 02+49 29'LT. No conflict with this facility is anticipated.
- Gas line of unknown size/material on south side of Rt. 100 running south off existing 6" main at approximately Sta. 03+71 30'LT. No conflict with this facility is anticipated.
- Gas line of unknown size/material on south side of Rt. 100 running south off existing 6" main at approximately Sta. 05+74 28'LT. No conflict with this facility is anticipated.
- Gas line of unknown size/material on south side of Rt. 100 running south off existing 6" main at approximately Sta. 05+91 28'LT. No conflict with this facility is anticipated.
- Gas line of unknown size/material on south side of Rt. 100 running south off existing 6" main at approximately Sta. 07+18 27'LT. No conflict with this facility is anticipated.
- Gas line of unknown size/material on south side of Rt. 100 running south off existing 6" main at approximately Sta. 10+83 30'LT. No conflict with this facility is anticipated.
- Gas line of unknown size/material on south side of Rt. 100 running south off existing 6" main at approximately Sta. 13+46 30'LT. No conflict with this facility is anticipated.

- 2" steel main running along south side of Rt. 100 from Sta. 18+81 to Sta. 20+94. No conflict with this facility is anticipated.
- 4" steel main running along the south side of Rt. 100 from Sta. 27+89 to Sta. 30+99.
  - Proposed signal base conflicts with this facility at Sta. 30+31 42' LT. Spire to relocate main during construction in coordination with contractor.
- 12" steel main running along the south side of Rt. 100 from Sta. 30+99 to 33+87.
  - Proposed bridge replacement over Black Creek conflicts with this facility from Sta. 31+70 39' RT to 32+93 35' LT. Spire to relocate main during construction in coordination with contractor.
- 6" steel main running along south side of Rt. 100 from Sta. 33+87 to Sta. 40+68.
  - Proposed drainage structure conflicts with this facility from Sta. 34+80 24' LT and Sta. 34+84 24' LT. Spire to relocate main during construction in coordination with contractor.
- 4" plastic main running along the south side of Rt. 100 from Sta. 40+68 to Sta. 55+99.
  - Proposed drainage structure conflicts with this facility at Sta. 40+94 27' LT. Spire to relocate main during construction in coordination with contractor.
  - Proposed drainage pipe and structure conflict with main between Sta. 43+00 26' LT and 43+52 26' LT.
  - Proposed drainage structure conflicts with this facility between Sta. 45+57 27' RT to Sta. 45+61 26' LT. Spire to relocate main during construction in coordination with contractor.
  - Proposed drainage structure conflicts with this facility between Sta. 47+47 24' LT to Sta. 47+54 24' LT. Spire to relocate main during construction in coordination with contractor.
- 4" steel main on the south side of Rt. 100 running south off existing 4" plastic main starting at Sta. 44+88 28' LT. and continuing south along the east side of Mercantile Drive.
  - Proposed drainage structure conflicts with this facility at Sta. 44+88 38' LT. Spire to relocate main during construction in coordination with contractor.
- 6" steel main running along the south side of Rt. 100 from Sta. 55+99 to 66+62.
  - Proposed drainage structure conflicts with this facility between Sta. 59+23 28' LT and Sta. 59+32 28' LT. Spire to relocate main during construction in coordination with contractor.
  - Proposed drainage structure conflicts with this facility between Sta. 60+35 27' LT and Sta. 60+40 27' LT. Spire to relocate main during construction in coordination with contractor.
  - Proposed drainage structure conflicts with this facility between Sta. 60+78 27' LT and Sta. 60+83 27' LT. Spire to relocate main during construction in coordination with contractor.

- Proposed drainage structure conflicts with this facility between Sta. 61+18 27' LT and Sta. 61+23 27' LT. Spire to relocate main during construction in coordination with contractor.
- Proposed pedestrian tunnel and drainage conflict with this facility between Sta. 65+12 24' LT and 66+62 28' LT. Spire to relocate main during construction in coordination with contractor.
- 1 ¼" gas main on south side of Rt. 100 running south off existing 6" steel main at Sta. 59+60 27" LT. No conflict with this facility is anticipated.
- Gas line of unknown size/material on the south side of Rt. 100 running south off existing 6" steel main at approximately Sta. 65+58 28' LT. No conflict with this facility is anticipated.
- Gas line of unknown size/material on the south side of Rt. 100 running south off existing 6" steel main at approximately Sta. 65+91 27' LT. No conflict with this facility is anticipated.
- 2" steel main on the south side of Rt. 100 running south off existing 6" steel main at approximately Sta. 66+55 28' LT. No conflict with this facility is anticipated.
- 2" steel main on the south side of Rt. 100 starting at Sta. 76+75 76' LT and continuing south along west side of Hanley through project limits. No conflict with this facility is anticipated.
- 2" steel main running along the south side of Rt. 100 from Brentwood Blvd. starting at Sta. 77+75 76' LT and ending at Sta. 121+23.
  - Proposed wall conflicts with this facility from Sta. 78+32 58' LT and 78+45 58' LT. Spire to relocate main during construction in coordination with contractor.
- Gas line of unknown size/material on south side of Rt. 100 running west from approximately Sta. 82+23 40' LT to Sta. 82+40 39' LT. No conflict with this facility is anticipated.
- 4" plastic main running along the south side of Rt. 100 from Sta. 121+23 to Sta. 129+34.
  - Proposed drainage structures and pipe conflict with this facility from Sta. 127+07 27' LT to Sta. 128+67 27' LT. Spire to relocate main during construction in coordination with contractor.
  - Proposed drainage structure conflicts with this facility from Sta. LT to Sta. 128+86 28' LT to Sta. 129+05 28' LT. Spire to relocate main during construction in coordination with contractor.
- 4" steel main running along the south side of Rt. 100 from Sta. 129+34 to Sta. 130+71. No conflict with this facility is anticipated.
- 8" steel main running along the south side of Rt. 100 from Sta. 130+71 to Sta. 131+16.
  - Proposed drainage structure and pipe conflict with this facility from Sta. 130+80 25' LT and Sta. 131+16 28' LT.

- 6" steel main running along the south side of Rt. 100 from Sta. 131+16 to Sta. 145+40.
  - Proposed drainage structure and pipe conflict with this facility from Sta. 131+16 28' LT to Sta. 132+86 27' LT. Spire to relocate main during construction in coordination with contractor.
  - Proposed drainage structure conflicts with this facility at Sta. 135+45 27' LT. Spire to relocate main during construction in coordination with contractor.
- Gas line of unknown size/material on south side of Rt. 100 running south off existing 6" main at approximately Sta. 144+01 37' LT. No conflict with this facility is anticipated.
- 6" stainless steel main running along the south side of Rt. 100 from Sta. 145+40 to Sta. 153+87.
  - Proposed drainage structure and pipe conflicts with this facility from Sta. 146+14 33' LT and Sta. 146+20 32' LT. Spire to relocate main during construction in coordination with contractor.
  - Proposed drainage structure conflicts with this facility from Sta. 148+50 25' LT to Sta. 148+56 25' LT. Spire to relocate main during construction in coordination with contractor.
  - Proposed drainage structure conflicts with this facility from Sta. 148+85 24' LT to Sta. 148+90 24' LT. Spire to relocate main during construction in coordination with contractor.
  - Proposed drainage structure conflicts with this facility from Sta. 152+11 32' LT and Sta. 152+16 32' LT. Spire to relocate main during construction in coordination with contractor.
- 6" steel main running along the south side of Rt. 100 from Sta. 153+87 to Sta. 155+34. No conflict with this facility is anticipated.
- 4" plastic main running along the south side of Rt. 100 from Sta. 155+34 to 169+80. No conflict with this facility is anticipated. No conflict with this facility is anticipated.
- Gas line of unknown size/material on south side of Rt. 100 running south off existing 4" main at approximately Sta. 156+71 39' LT. No conflict with this facility is anticipated.
- Gas line of unknown size/material under eastbound lanes of Rt. 100 branching off existing 4" main that crosses Rt. 100 at Sta. 161+53 and continuing west to Sta. 165+01. No conflict with this facility is anticipated.
- 4" plastic main in 6" steel running under eastbound lanes of Rt. 100 from Sta. 169+35 to 181+35. No conflict with this facility is anticipated.
- 6" steel main running along south side of Rt. 100 from Sta. 181+35 to Sta. 198+14.
  - Proposed signal base conflicts with this facility at Sta. 181+56 33' LT. Spire to relocate main during construction in coordination with contractor.
  - Proposed drainage pipe conflicts with this facility at Sta. 186+48 38'LT. Spire to relocate main during construction in coordination with contractor.

- Proposed drainage pipe conflicts with this facility at Sta. 188+97 38' LT. Spire to relocate main during construction in coordination with contractor.
- Proposed drainage pipe conflicts with this facility at Sta. 189+60 33' LT. Spire to relocate main during construction in coordination with contractor.
- Proposed drainage structure conflicts with this facility at Sta. 191+04 29' LT. Spire to relocate main during construction in coordination with contractor.
- Proposed drainage structure and pipe conflict with this facility from Sta. 194+04 28' LT to Sta. 195+20 28' LT. Spire to relocate main during construction in coordination with contractor.
- 16" steel main/supply feeder running under eastbound lanes of Rt. 100 from Sta. 197+68 to Sta. 212+ 95. No conflict with this facility is anticipated.
- 16" steel main/supply feeder running along south side of Rt. 100 from Sta. 212+95 to Sta. 218+11.
  - Proposed drainage structures and pipe conflict with this facility from Sta. 201+27 21' LT to 210+64 21' LT. Spire to relocate main during construction in coordination with contractor.
  - Proposed drainage structures and pipe conflict with this facility from Sta. 216+74 25' LT to 217+76 26' LT. Spire to relocate main during construction in coordination with contractor.
- 16" steel main/supply feeder running under eastbound lanes of Rt. 100 from Sta. 218+11 to Sta. 227+00.
  - Proposed drainage structure conflicts with this facility from Sta. 221+30 29' LT to 221+35 29' LT. Spire to relocate main during construction in coordination with contractor.
- 16" steel main/supply feeder running along the south side of Rt. 100 from Sta. 227+00 to 274+78.
  - Proposed drainage pipe conflicts with this facility at Sta. 237+08 28' LT. Spire to relocate main during construction in coordination with contractor.
  - Proposed drainage structure conflicts with this facility between Sta. 237+74 25' LT and 237+87 26' LT. Spire to relocate main during construction in coordination with contractor.
  - Proposed drainage structures conflict with this facility between Sta. 255+65 26' LT and Sta. 255+98 26' LT. Spire to relocate main during construction in coordination with contractor.
  - Proposed drainage structure conflicts with this facility between Sta. 263+16 22' LT and Sta. 263+25 22' LT. Spire to relocate main during construction in coordination with contractor.
  - Proposed drainage structure conflicts with this facility between Sta. 266+30 21' LT and Sta. 266+35 21' LT. Spire to relocate main during construction in coordination with contractor.

- Proposed drainage structure conflicts with this facility between Sta. 266+88 22' LT and 268+88 22' LT. Spire to relocate main during construction in coordination with contractor.
- Proposed wall conflicts with this facility between Sta. 272+15 36' LT and Sta. 274+59 33' LT. Spire to relocate main during construction in coordination with contractor.
- 8" steel main running along south side of Rt. 100 from Sta. 198+14 to 200+08.
  - Proposed signal base conflicts with this facility at Sta. 198+18 32' LT. Spire to relocate main during construction in coordination with contractor.
- 4" plastic main in 6" steel running along south side of Rt. 100 from Sta. 200+08 to 212+00.
  - Proposed curb wall conflicts with this facility from Sta. 199+37 28' RT to 200+00 28' LT. Spire to relocate main during construction in coordination with contractor.
  - Proposed drainage structure conflicts with this facility at Sta. 208+77 28' LT. Spire to relocate main during construction in coordination with contractor.
- 8" steel main running along south side of Rt. 100 from Sta. 212+00 to Sta. 222+89.
  - Proposed drainage pipe conflicts with this facility from Sta. 217+66 25' LT to Sta. 217+76 28' LT. Spire to relocate main during construction in coordination with contractor.
  - Proposed drainage structure conflicts with this facility at Sta. 218+51 28' LT. Spire to relocate main during construction in coordination with contractor.
  - Proposed drainage structure conflicts with this facility from Sta. 221+28 37' LT to 221+37 37' LT. Spire to relocate main during construction in coordination with contractor.
  - Proposed drainage structure conflicts with this facility at Sta. 222+29 40' LT. Spire to relocate main during construction in coordination with contractor.
- 2" stainless steel main running along the south side of Rt. 100 from Sta. 222+87 to Sta. 223+11 and turning south and running along the east side of N. Sappington Rd. from Sta. 223+11 41' LT through the project limits.
  - Proposed drainage structure conflicts with this facility from 223+08 41' LT and 223+19 46' LT. Spire to relocate main during construction in coordination with contractor.
- 2" stainless steel main running along south side of Rt. 100 from Sta. 237+25 to 240+86. No conflict with this facility is anticipated.
- 8" steel main running along the south side of Rt. 100 from Sta. 253+53 to Sta. 254+33. No conflict with this facility is anticipated.
- 2" steel main running along the south side of Rt. 100 from Sta. 262+94 to Sta. 268+49.
  - Proposed drainage structure and pipe conflict with this facility between Sta. 263+13 27' LT and 263+28 26' LT. Spire to relocate main during construction in coordination with contractor.

- Proposed drainage structure and pipe conflict with this facility between Sta. 264+91 27' LT and Sta. 266+45 24' LT. Spire to relocate main during construction in coordination with contractor.
- Gas line of unknown size/material on south side of Rt. 100 running south off existing 2" main at approximately Sta. 263+29 27' LT. This line continues south along the east side of Wood Avenue. No conflict with this facility is anticipated.
- Gas line of unknown size/material on south side of Rt. 100 running south off existing 2" main at approximately Sta. 265+74 25' LT. This line continues south along the east side of Sylvan Place. No conflict with this facility is anticipated.
- 20" steel main running along south side of Rt. 100 from Sta. 274+78 to 278+36. No conflict with this facility is anticipated.
- 6" steel main running under the east bound lanes of Rt. 100 from Sta. 281+81 through the western project limits. No conflict with this facility is anticipated.

#### **Underground Facilities Crossing Rt. 100 throughout Project**

- 2" stainless steel main crossing Rt. 100 at Sta. 11+41 and continuing north along west side of Bredell Ave. through end of project limits. No conflict with this facility is anticipated.
- 12" steel main crossing Rt. 100 under northbound lanes of Laclede Station Rd. from Sta. 15+38 138' LT to 16+22 138' RT. No conflict with this facility is anticipated.
- 2" stainless steel main crossing westbound lane of Rt. 100 at starting at Sta. 18+90 19' RT and continuing north along northbound Circle Drive to end of project limits. No conflict with this facility is anticipated.
- 4" steel main crossing Rt. 100 at Sta. 20+94. No conflict with this facility is anticipated.
- 6" plastic main crossing Rt. 100 at Sta. 26+32. No conflict with this facility is anticipated.
- 8" steel main crossing Rt. 100 under intersection with Hanley Rd. from Sta. 31+03 41' LT to Sta. 31+04 74' RT. No conflict with this facility is anticipated.
- 2" steel main crossing Rt. 100 at Sta. 33+63. No conflict with this facility is anticipated.
- 2" steel main crossing Rt. 100 at Sta. 43+92. No conflict with this facility is anticipated.
  - Proposed drainage pipe conflicts with this facility from Sta. 43+92 17' RT. Spire to relocate main during construction in coordination with contractor.
- 2" stainless steel main crossing Rt. 100 at Sta. 47+70 and continuing north along east side of Louis Ave. through end of project limits.
  - Proposed drainage pipe conflicts with this facility at Sta. 47+65 36' RT. Spire to relocate main during construction in coordination with contractor.

- 2" steel main crossing Rt. 100 at Sta. 51+46 and continuing north along the east side of Salem Ave. through project limits.
  - Proposed drainage pipe conflicts with this facility at Sta. 51+46 15' RT. Spire to relocate main during construction in coordination with contractor.
- 2" steel main crossing Rt. 100 from Sta. 62+13 28' LT to 62+13 14' LT. This main runs east to west under eastbound Rt. 100 from Sta. 62+13 14' RT to Sta. 61+84 15' LT. The main turns north at Sta. 61+84 15' LT crossing Rt. 100 and continuing north along the east side of Ruth Ave. through project limits.
  - Proposed drainage structure conflicts with this facility at Sta. 61+83 38' RT. Spire to relocate service line during construction in coordination with contractor.
- 2" steel main crossing Rt. 100 at Sta. 64+61 and continuing north along the east side of Dorothy Ave. No conflict with this facility is anticipated.
- 6" steel main crossing Rt. 100 at Sta. 66+62. No conflict with this facility is anticipated.
- 6" steel main crossing Rt. 100 at Sta. 76+82. This main runs under the east side of S. Brentwood Blvd. throughout project limits. No conflict with this facility is anticipated.
- 2" stainless steel main crossing Rt. 100 at Sta. 82+64 and continuing north along the east side of Annalee Ave. through project limits.
  - Proposed drainage pipe conflicts with this facility at Sta. 82+65 23' RT. Spire to relocate main during construction in coordination with contractor.
- 2" plastic main crossing Rt. 100 at Sta. 126+17 and continuing north along the east side of High School Drive through project limits. No conflict with this facility is anticipated.
- 6" plastic main crossing Rt. 100 at Sta. 130+70 and continuing north along the east side of Bremerton Road through project limits.
  - Proposed drainage pipe conflicts with this facility at Sta. 130+65 25' LT. Spire to relocate main during construction in coordination with contractor.
  - Proposed drainage structure conflicts with this facility at Sta. 130+70 40' RT. Spire to relocate main during construction in coordination with contractor.
- Gas line of unknown size/material crossing Rt. 100 at Sta. 136+85. No conflict with this facility is anticipated.
- 4" stainless steel main crossing Rt. 100 at Sta. 141+04. No conflict with this facility is anticipated.
- 6" steel main crossing Rt. 100 at Sta. 145+72 and continuing north along west side of Raritan Drive through project limits. No conflict with this facility is anticipated.

- 2" steel main crossing westbound Rt. 100 at Sta. 159+43 and continuing north along the east side of North Rock Hill Rd through project limits. No conflict with this facility is anticipated.
- 4" plastic main crossing Rt. 100 at Sta. 161+53. No conflict with this facility is anticipated.
- 2" steel main crossing Rt. 100 at Sta. 169+28 and continuing north along the east side of McKinley Ave. through project limits. No conflict with this facility is anticipated.
- 2" plastic main crossing Rt. 100 at Sta. 172+48 and continuing north along the west side of Leonard Ave. No conflict with this facility is anticipated.
- 2" stainless steel main crossing Rt. 100 at Sta. 176+81 and continuing north along the east side of Hudson Avenue. No conflict with this facility is anticipated.
- 1 ¼" plastic main crossing eastbound Rt. 100 at Sta. 177+13 and continuing south along the east side of Mueck Terrace Drive through project limits.
  - Proposed drainage pipe conflicts with this facility at Sta. 177+14 25' LT. Spire to relocate main during construction in coordination with contractor.
- 2" stainless steel main crossing Rt. 100 at Sta. 182+42 and continuing north along the west side of Kortwright Ave. No conflict with this facility is anticipated.
- 2" steel main crossing Rt. 100 at Sta. 186+97.
  - Proposed drainage pipe conflicts with this facility at Sta. 186+96 26' LT. Spire to relocate main during construction in coordination with contractor.
- 2" stainless steel main crossing Rt. 100 at Sta. 188+64 and continuing north along east side of O'Day Avenue through project limits.
  - Proposed drainage structure conflicts with this facility from Sta. 183+32 49' RT to Sta. 188+35 43' RT. Spire to relocate main during construction in coordination with contractor.
  - Proposed drainage pipe conflicts with this facility at Sta. 188+35 27' RT. Spire to relocate main during construction in coordination with contractor.
  - Proposed drainage pipe conflicts with this facility at Sta. 188+87 33' LT. Spire to relocate main during construction in coordination with contractor.
- 6" steel main crossing Rt. 100 at Sta. 197+05. No conflict with this facility is anticipated.
- 2" steel main crossing Rt. 100 at Sta. 202+02 and continuing north along the east side of Salem Hills Drive through project limits.
  - Proposed drainage pipe conflicts with this facility at Sta. 202+03 31' RT. Spire to relocate main during construction in coordination with contractor.

- 2" stainless steel main crossing Rt. 100 at Sta. 212+66. No conflict with this facility is anticipated.
- 4" steel main crossing Rt. 100 at Sta. 212+91. No conflict with this facility is anticipated.
- 2" stainless steel main crossing Rt. 100 at Sta. 217+19 and continuing north along the east side of Andrew Drive.
  - Proposed drainage pipe conflicts with this facility at Sta. 217+19 22' LT. Spire to relocate main during construction in coordination with contractor.
- 8" steel main crossing Rt. 100 at Sta. 222+88. No conflict with this facility is anticipated.
- Gas line of unknown size/material crossing Rt 100 at Sta. 225+67. (This line appears to connect the 16" supply feeder on the south with the 6" steel main on the north side of Rt. 100.)
- 2" stainless steel main crossing the shoulder of Rt. 100 starting at Sta. 231+48 23' RT and continuing north along the east side of Bennett Avenue through project limits. No conflict with this facility is anticipated.
- 2" steel main crossing Rt. 100 at Sta. 237+22.
  - Proposed drainage pipe conflicts with this facility at Sta. 237+24 21' LT. Spire to relocate main during construction in coordination with contractor.
- Gas line of unknown size/material crossing Rt 100 at Sta. 245+99. No conflict with this facility is anticipated. 2" stainless steel main crossing Rt. 100 at Sta. 249+16.
- 8" steel main crossing Rt. 100 at Sta. 253+69. No conflict with this facility is anticipated.
- 8" steel main crossing Rt. 100 at Sta. 253+83. No conflict with this facility is anticipated.
- 2" steel main crossing Rt. 100 at Sta. 255+11. No conflict with this facility is anticipated.
- Gas line of unknown size/material crossing Rt 100 at Sta. 262+95. No conflict with this facility is anticipated.
- 2" steel main crossing westbound lane and shoulder of Rt. 100 at Sta. 269+01 19' RT and continuing north along east side of 14' roadway through project limits. No conflict with this facility is anticipated.
- 1 ¼" plastic main in 2" steel crossing Rt. 100 at Sta. 274+81 and continuing south along the east side of Taylor Avenue. No conflict with this facility is anticipated.
- 20" steel supply feeder crossing Rt. 100 at Sta. 278+39. No conflict with this facility is anticipated.

- Gas line of known size/type crossing westbound lanes of Rt. 100 starting at Sta. 281+46 22' RT and continuing north along the northbound lanes of Lindbergh Blvd. through project limits. No conflict with this facility is anticipated.

**Underground Facilities on Side Streets along Rt. 100 throughout Project.**

- 6" steel main running under the southbound lanes of Big Bend Blvd. from Sta. 00+01 201' LT to 00+07 48' LT. No conflict with this facility is anticipated.
- 2" stainless steel main running along the west side of Oakland Ave. from Sta. 08+33 32' LT to 08+36 91' LT. No conflict with this facility is anticipated.
- 8" steel main running along west side of S. Hanley Rd. from Sta. 31+04 74' RT to end of project limits. No conflict with this facility is anticipated.
- 2" steel main running along the west side of Breckenridge Industrial Ct. from Sta. 40+00 66' LT to 40+03 1' LT. No conflict with this facility is anticipated.
- 2" steel main running north under northbound Melvin Ave. from Sta. 43+96 25' RT through project limits. No conflict with this facility is anticipated.
- 2" stainless steel main running north under northbound Cecelia Ave. from Sta. 55+04 28' RT through northern project limits.
  - Proposed drainage pipes conflict with this facility between Sta. 55+04 29' RT and 55+04 Sta. 42' RT. Spire to relocate main during construction in coordination with contractor.
- 1 ¼" plastic main running south under northbound lane of commercial entrance from Sta. 59+60 27' LT through project limits.
- Gas line of unknown size/material north of Rt. 100 on the west side of Mary Ave. running west off existing 2" main at approximately Sta. 65+32 147' RT. No conflict with this facility is anticipated.
- 2" steel main on the south side of Rt. 100 running south along the west side of Mary Avenue starting at Sta. 66+55 28' LT and continuing south through project limits.
  - Proposed drainage pipe conflicts with this facility at Sta. 66+58 41' LT. Spire to relocate main during construction in coordination with contractor.
- 2" steel main running south along west side of Brentwood Blvd. starting at Sta. 77+75 76' LT through project limits. No conflict with this facility is anticipated.
- 2" steel main running south under northbound lane of Collier Ave. from Sta. 81+78 34' LT through project limits. No conflict with this facility is anticipated.

- 2" stainless steel main running south along east side of Manderly Drive starting at Sta. 123+13 31' LT and continuing through project limits. No conflict with this facility is anticipated.
- 8" steel main on the south side of Rt. 100 running along the east side of Bremerton Rd. starting at Sta. 131+16 28' LT and continuing south through project limits. No conflict with this facility is anticipated.
- 2" plastic main running along west side of Raritan Avenue starting at Sta. 144+06 28' RT and continuing north through project limits. No conflict with this facility is anticipated.
- 6" steel main on the south side of Rt. 100 running along the east side Raritan Drive starting at Sta. 146+13 34' RT and continuing south through project limits.
  - Proposed drainage structure and pipe conflict with this facility between Sta. 146+12 50' LT and Sta. 146+13 34' LT. Spire to relocate main during construction in coordination with contractor.
- 2" plastic main running along the east side of Dunkirk Dr. starting at Sta. 148+38 and continuing south through project limits. No conflict with this facility is anticipated.
- 6" stainless steel main running along the east side of N. Rock Hill Rd. starting at Sta. 153+88 51' LT and continuing south through project limits. No conflict with this facility is anticipated.
- 2" stainless steel main south of Rt. 100 running along the east side of Blossom Ave. starting at Sta. 184+47 38' LT and continuing south through project limits.
  - Proposed drainage structure conflicts with this facility from Sta. 184+47 42' LT to Sta. 148+47 47' LT. Spire to relocate main during construction in coordination with contractor.
- 2" stainless steel main running along the east side of Manitou Drive starting at Sta. 186+43 38' LT and continuing south through project limits. No conflict with this facility is anticipated.
- 2" steel main running along the east side of Tavalon Ave. starting at Sta. 191+05 29' LT and continuing south through project limits.
  - Proposed drainage structure conflicts with this facility from Sta. 191+05 29' LT to Sta. 191+05 34' LT. Spire to relocate main during construction in coordination with contractor.
- 2" steel main on the south side of Rt. 100 running along the east side of Fairdale Ave. starting at Sta. 194+14 28' LT and continuing south through project limits.
  - Proposed drainage structure conflicts with this facility from Sta. 194+14 35' LT to 194+14 45'. Spire to relocate main during construction in coordination with contractor.

- 6" steel main running along the east side of N. Berry starting at Sta. 197+05 47' LT and continuing south through project limits. No conflict with this facility is anticipated.
- 6" steel main running along east side of North Berry Rd. starting at Sta. 197+42 58' RT and continuing north through project limits. No conflict with this facility is anticipated.
- 16" supply feeder running along center of North Berry Rd. from Sta. 197+68 34' LT and continuing south through project limits. No conflict with this facility is anticipated.
- 1 ¼" steel main running along east side of Monier Place starting at Sta. 200+02 29' LT and continuing south through project limits. No conflict with this facility is anticipated.
- 2" steel main running along east side of Frederick Lane North from Sta. 205+27 27' LT and continuing south through project limits. No conflict with this facility is anticipated.
- Gas line of unknown size/material running along the east side of Mary Ave. starting at Sta. 218+06 27' RT and continuing south through project limits. No conflict with this facility is anticipated.
- 2" stainless steel main running along the east side of Andrew Drive starting at Sta. 218+06 27' LT and continuing south through project limits.
  - Proposed drainage structures conflict with this facility from Sta. 218+06 27' LT to Sta. 218+07 46' LT. Spire to relocate main during construction in coordination with contractor.
- 2" plastic main running along the east side of Kenmore Dr. starting at Sta. 237+25 35' LT and continuing south through project limits. No conflict with this facility is anticipated.
- 1 1/4" plastic main running along east side of Sturgis Drive starting at Sta. 238+37 24' RT and continuing north through the project limits.
- 1 1/4" plastic main in 2" steel running along east side of Mariedale Ct. starting at Sta. 242+11 26" RT and continuing north through the project limits. No conflict with this facility is anticipated.
- Gas line of unknown size/material running along the east side of Dickson Street starting at Sta. 245+99 26' LT and continuing south through the project limits. No conflict with this facility is anticipated.
- 8" steel main running along the east side of Woodlawn Ave. starting at 254+33 53' LT and continuing south through project limits. No conflict with this facility is anticipated.
- 8" steel main crossing Woodlawn Ave. north of Rt. 100 from Sta. 254+33 108' RT to Sta. 255+01 108' RT. No conflict with this facility is anticipated.

- 12" steel main running along the northbound lanes of Woodlawn Ave. starting at Sta. 254+52 108' RT and continuing north to Sta. 254+46 RT. No conflict with this facility is anticipated.
- Gas line of unknown size/material running south along the east side of Wood Ave. starting at Sta. 263+29 27' LT and continuing south through project limits.
  - Proposed drainage pipe conflicts with this facility at Sta. 263+29 30' LT. Spire to relocate main during construction in coordination with contractor.
- 2" steel main running along the west side of Bernice Avenue starting at Sta. 268+50 and continuing south along the west side of Bernice Avenue through the project limits. No conflict with this facility is anticipated.
- 2" stainless steel main running along the south side of Rt. 100 outside of the right of way line from Sta. 268+51 to Sta. 271+47. This main enters the project limits at Curren Ave. from the east at Sta. 271+30 62' LT and continues west to Sta. 271+47 62' LT. There it turns south and runs along the east side of Curren Ave. through project limits. No conflict with this facility is anticipated.
- 16" steel supply feeder running south along the west side of Taylor Avenue starting at Sta. 275+02 38' RT and continuing south through project limits. No conflict with this facility is anticipated.
- Gas line of unknown size/material running south along the east side of Lindbergh Blvd. starting at Sta. 281+66 122' LT and continuing south through project limits. No conflict with this facility is anticipated.
- 20" steel supply feeder running along the east side of Lindbergh Blvd. starting at Sta. 281+31 59' RT and continuing north through project limits. No conflict with this facility is anticipated.

**Spire Energy has Existing At-Grade Access Points (Valves, Drips, etc.) throughout the project that will require adjustment:**

- At-grade access point at Sta. 00+07 49' RT. No conflict with this utility is anticipated.
- At-grade access point at Sta. 06+25 30' LT. No conflict with this utility is anticipated.
- At-grade access point at Sta. 11+77 29' LT. No conflict with this utility is anticipated.
- At-grade access point at Sta. 13+46 30' LT. No conflict with this utility is anticipated.
- At-grade access point at Sta. 15+39 30' LT falls in proposed roadway and will need to be adjusted to grade by Spire during construction in coordination with the contractor.

- At-grade access point at Sta. 15+56 19' RT falls in proposed roadway and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 18+27 22' RT falls in proposed roadway and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 20+71 24' LT. No conflict with this utility is anticipated.
- At-grade access point at Sta. 20+94 43' LT. No conflict with this utility is anticipated.
- At-grade access point at Sta. 21+09 24' RT. No conflict with this utility is anticipated.
- At-grade access point at Sta. 24+33 19' RT falls in proposed roadway and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 23+24 28' RT falls in proposed sidewalk and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 27+88 32' LT. No conflict with this utility is anticipated.
- At-grade access point at Sta. 27+89 35' LT. No conflict with this utility is anticipated.
- At-grade access point at Sta. 31+02 35' LT falls in proposed roadway and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 31+03 36' LT falls in proposed roadway and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 30+43 72' RT falls in proposed roadway and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 30+44 71' RT falls in proposed roadway and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 34+91 26' LT falls in proposed roadway and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 35+28 48' RT. No conflict with this utility is anticipated.
- At-grade access point at Sta. 40+03 35' LT falls in proposed roadway and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 40+68 25' LT falls in proposed sidewalk and will need to be adjusted to grade by Spire during construction in coordination with the contractor.

- At-grade access point at Sta. 42+81 24' RT falls in proposed curb and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 42+85 25' RT falls in proposed curb and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 42+87 22' RT falls in proposed roadway and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 43+24 22' RT falls in proposed curb and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 43+92 28' LT falls in proposed sidewalk and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 43+96 42' RT falls in proposed roadway and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 44+23 26' RT falls in proposed sidewalk and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 44+32 25' RT falls in proposed roadway and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 44+87 36' LT falls in proposed sidewalk and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 45+65 26' RT falls in proposed curb and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 47+70 29' LT falls in proposed sidewalk and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 47+72 29' LT falls in proposed sidewalk and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 51+24 26' LT falls in proposed curb and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 51+47 28' LT falls in proposed sidewalk and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 51+82 27' LT falls in proposed sidewalk and will need to be adjusted to grade by Spire during construction in coordination with the contractor.

- At-grade access point at Sta. 55+93 28' LT falls in proposed sidewalk and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 55+99 25' LT falls in proposed curb and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 56+64 26' LT falls in proposed curb and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 57+83 21' RT falls in proposed sidewalk and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 58+30 30' LT falls in proposed sidewalk and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 61+83 42' RT falls in proposed roadway and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 61+83 43' RT falls in proposed roadway and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 63+48 24' RT falls in proposed roadway and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 64+19 24' RT falls in proposed curb and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 64+89 25' LT falls in sidewalk/roadway where the new tunnel will be constructed. Spire to relocate during construction in coordination with the contractor.
- At-grade access point at Sta. 64+98 21' LT falls in sidewalk/roadway where the new tunnel will be constructed. Spire to relocate during construction in coordination with the contractor.
- At-grade access point at Sta. 65+58 34' LT falls in sidewalk/roadway where the new tunnel will be constructed. Spire to relocate during construction in coordination with the contractor.
- At-grade access point at Sta. 65+58 34' LT falls in sidewalk/roadway where the new tunnel will be constructed. Spire to relocate during construction in coordination with the contractor.

- At-grade access point at Sta. 65+58 21' RT falls in sidewalk/roadway where the new tunnel will be constructed. Spire to relocate during construction in coordination with the contractor.
- At-grade access point at Sta. 66+58 47' LT falls in sidewalk/roadway where the new tunnel will be constructed. Spire to relocate during construction in coordination with the contractor.
- At-grade access point at Sta. 66+78 21' RT falls in sidewalk/roadway where the new tunnel will be constructed. Spire to relocate during construction in coordination with the contractor.
- At-grade access point at Sta. 66+97 23' RT falls in sidewalk/roadway where the new tunnel will be constructed. Spire to relocate during construction in coordination with the contractor.
- At-grade access point at Sta. 73+55 37' RT falls in proposed sidewalk and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 75+52 42' RT falls in proposed sidewalk and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 76+95 31' LT falls in proposed roadway and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 76+95 32' LT falls in proposed roadway and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 76+97 31' LT falls in proposed roadway and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 80+32 25' RT falls in proposed sidewalk and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 80+32 27' RT falls in proposed sidewalk and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 81+01 23' RT falls in proposed curb and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 81+38 28' RT falls in proposed curb and will need to be adjusted to grade by Spire during construction in coordination with the contractor.

- At-grade access point at Sta. 83+06 35' LT falls in proposed curb and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 118+60 29' LT falls in proposed sidewalk and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 118+29 38' LT falls in proposed sidewalk and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 121+23 26' LT falls in proposed sidewalk and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 121+12 24' RT falls in proposed curb and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 121+20 25' RT falls in proposed sidewalk and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 121+21 23' RT falls in proposed curb and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 123+13 31' LT falls in proposed roadway and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 123+56 36' RT falls in proposed roadway and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 126+36 24' LT falls in proposed roadway and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 126+36 28' LT falls in proposed roadway and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 129+34 29' LT falls in proposed curb and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 130+71 27' LT falls in proposed roadway and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 130+79 26' LT falls in proposed roadway and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 131+15 40' LT falls in proposed sidewalk and will need to be adjusted to grade by Spire during construction in coordination with the contractor.

- At-grade access point at Sta. 131+77 27' LT falls in proposed sidewalk and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 134+27 27' LT falls in proposed roadway and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 135+17 27' LT falls in proposed roadway and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 135+60 25' RT falls in proposed sidewalk and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 141+04 34' LT falls in proposed sidewalk and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 141+33 40' LT falls in proposed sidewalk/curb and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 144+93 28' RT falls in proposed curb and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 145+39 38' LT falls in proposed sidewalk and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 153+56 36' LT falls in proposed sidewalk and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 155+24 37' LT falls in proposed roadway and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 155+58 40' LT falls in proposed sidewalk and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 157+86 27' RT falls in proposed curb and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 161+53 21' RT falls in proposed roadway and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 166+34 24' RT falls in proposed roadway and will need to be adjusted to grade by Spire during construction in coordination with the contractor.

- At-grade access point at Sta. 167+58 27' RT falls in proposed curb and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 167+58 25' RT falls in proposed curb and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 170+61 27' LT falls in proposed roadway and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 172+63 37' RT falls in proposed roadway and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 176+89 43' RT falls in proposed roadway and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 181+35 25' LT falls in proposed curb and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 186+42 25' RT falls in proposed sidewalk and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 186+97 24' RT falls in proposed sidewalk and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 188+45 33' RT falls in proposed roadway and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 192+02 24' LT falls in proposed roadway and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 192+76 27' LT falls in proposed roadway and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 193+49 27' LT falls in proposed roadway and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 197+14 47' LT falls in proposed curb and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 197+04 28' LT falls in proposed sidewalk and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 197+50 60' LT falls in proposed roadway and will need to be adjusted to grade by Spire during construction in coordination with the contractor.

- At-grade access point at Sta. 197+41 58' RT falls in proposed sidewalk and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 198+13 33' LT falls in proposed sidewalk and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 202+03 39' RT falls in proposed sidewalk and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 202+07 40' RT falls in proposed sidewalk/curb and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 204+11 35' RT falls in proposed roadway and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 212+88 29' LT falls in proposed sidewalk and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 213+00 27' LT falls in proposed sidewalk and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 213+10 27' LT falls in proposed sidewalk and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 213+11 31' LT falls in proposed sidewalk and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 213+11 24' LT falls in proposed roadway and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 215+69 30' LT falls in proposed roadway and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 218+59 26' LT falls in proposed sidewalk and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 221+89 27' RT falls in proposed sidewalk and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 221+90 27' RT falls in proposed sidewalk and will need to be adjusted to grade by Spire during construction in coordination with the contractor.

- At-grade access point at Sta. 222+67 24' RT falls in proposed curb and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 222+90 39' LT falls in proposed sidewalk and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 224+10 30' RT falls in proposed sidewalk and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 225+41 27' RT falls in proposed sidewalk and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 225+84 38' LT falls in proposed sidewalk and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 226+67 27' RT falls in proposed sidewalk/curb and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 230+77 27' LT falls in proposed sidewalk and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 231+40 40' RT falls in proposed sidewalk and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 231+49 29' RT falls in proposed roadway and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 236+55 26' LT falls in proposed sidewalk and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 236+55 26' LT falls in proposed sidewalk and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 236+81 22' RT falls in proposed roadway and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 237+19 25' RT falls in proposed roadway and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 240+90 29' LT falls in proposed sidewalk and will need to be adjusted to grade by Spire during construction in coordination with the contractor.

- At-grade access point at Sta. 244+01 27' LT falls in proposed curb and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 245+02 36' LT falls in proposed sidewalk and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 247+86 22' RT falls in proposed roadway and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 249+18 28' LT falls in proposed curb and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 251+59 31' LT falls in proposed sidewalk and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 253+21 55' RT. No conflict with this utility is anticipated.
- At-grade access point at Sta. 253+89 29' LT falls in proposed curb and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 254+05 28' LT falls in proposed roadway and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 254+09 28' LT falls in proposed roadway and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 254+12 31' LT falls in proposed roadway and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 254+14 26' LT falls in proposed roadway and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 255+64 51' RT falls in proposed sidewalk and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 259+19 50' RT falls in proposed sidewalk and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 259+00 30' LT falls in proposed sidewalk and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 260+86 44' RT falls in proposed curb and will need to be adjusted to grade by Spire during construction in coordination with the contractor.

- At-grade access point at Sta. 262+94 25' LT falls in proposed curb and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 264+65 21' LT falls in proposed roadway and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 264+65 22' LT falls in proposed roadway/curb and will need to be adjusted to grade by Spire during construction in coordination with the contractor
- At-grade access point at Sta. 265+32 25' LT falls in proposed curb and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 266+45 29' LT falls in proposed roadway and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 269+00 53' RT falls in proposed roadway and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 274+68 40' LT falls in proposed sidewalk and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 274+72 35' LT falls in proposed sidewalk and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 274+78 39' LT falls in proposed roadway and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 275+18 24' RT falls in proposed roadway and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 277+56 36' RT falls in proposed sidewalk and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 278+38 41' RT falls in proposed sidewalk and will need to be adjusted to grade by Spire during construction in coordination with the contractor.
- At-grade access point at Sta. 278+52 47' RT. No conflict with this utility is anticipated.
- At-grade access point at Sta. 279+78 44' RT. No conflict with this utility is anticipated.
- At-grade access point at Sta. 281+32 22' RT. No conflict with this utility is anticipated.

### **Underground Service Lines along the North side of Rt. 100 throughout Project**

- 3/4" steel service line on the north side of Rt. 100 running south off existing 10" steel main at approximately Sta. 17+27 27' RT. No conflict with this facility is anticipated.
- 3/4" steel service line on the north side of Rt. 100 running north off existing 10" main at approximately Sta. 20+53 24' RT. No conflict with this facility is anticipated.
- 3/4" steel service line of unknown size/material on north side of Rt. 100 running north off existing 2" main at approximately Sta. 41+28 17' RT. No conflict with this facility is anticipated. 1" plastic service line on north side of Rt. 100 running north off existing 2" main at approximately Sta. 42+67 18' RT. No conflict with this facility is anticipated.
- 1" plastic service line on north side of Rt. 100 running north off existing 2" main at approximately Sta. 44+73 26'. No conflict with this facility is anticipated.
- 1" plastic service line on north side of Rt. 100 running north off existing 2" main at approximately Sta. 45+65 26' RT.
  - Proposed drainage structure conflicts with this facility at Sta. 45+65 36' RT. Spire to relocate service line during construction in coordination with contractor.
- Service line of unknown size/material on north side of Rt. 100 running north off existing 4" main at approximately Sta. 68+40 28' RT. No conflict with this facility is anticipated.
- Service line of unknown size/material on north side of Rt. 100 running north off existing 2" main at approximately 145+57 28' RT. No conflict with this facility is anticipated.
- Service line of unknown size/material on north side of Rt. 100 running north off existing 2" main at approximately 157+46 25' RT. No conflict with this facility is anticipated.
- 1 1/2" plastic service line on north side of Rt. 100 running north off existing 2" main at approximately Sta. 161+95 24' RT. No conflict with this facility is anticipated.
- 3/4" steel service line on north side of Rt. 100 running north off existing 2" main at approximately Sta. 162+75 24' RT. No conflict with this facility is anticipated. 1 1/4" plastic service line on north side of Rt. 100 running north off existing 2" main at approximately Sta. 164+48 43' RT. No conflict with this facility is anticipated.
- 1" plastic service line on north side of Rt. 100 running north off existing 2" main at approximately Sta. 165+97 25' RT. No conflict with this facility is anticipated.
- 1" plastic service line on north side of Rt. 100 running north off existing 2" main at approximately Sta. 166+51 24' RT. No conflict with this facility is anticipated.
- 1/2" plastic service line on north side of Rt. 100 running north off existing 2" main at approximately Sta. 167+81 24' RT. No conflict with this facility is anticipated.

- 1 ¼" plastic service line on north side of Rt. 100 running north off existing 2" main at approximately Sta. 168+82 33' RT. No conflict with this facility is anticipated.
- ¾" steel service line on north side of Rt. 100 running north off existing 2" main at approximately Sta. 185+69 29' LT. No conflict with this facility is anticipated.
- 2" steel service line on north side of Rt. 100 running north off existing 8" main at approximately Sta. 221+99 25' RT. No conflict with this facility is anticipated.
- 1" plastic service line on north side of Rt. 100 running north off existing 8" main at approximately Sta. 223+95 28' RT. No conflict with this facility is anticipated.
- Service line of unknown size/material on north side of Rt. 100 running north off existing 6" main at approximately Sta. 228+16 20' RT.
  - Proposed drainage structure conflicts with this facility from Sta. 228+16 30' RT to Sta. 228+16 35' RT. Spire to relocate service line during construction in coordination with contractor.
- Service line of unknown size/material on north side of Rt. 100 running north off existing 6" main at approximately Sta. 232+93 23' RT.
  - Proposed drainage structure conflicts with this facility at Sta. 232+92 27' RT. Spire to relocate service line during construction in coordination with contractor.
- ¾" steel service line on north side of Rt. 100 running north off existing 6" main at approximately Sta. 233+69 23' RT. No conflict with this facility is anticipated.
- ¾" steel service line on north side of Rt. 100 running north off existing 6" main at approximately Sta. 235+72 21' RT. No conflict with this facility is anticipated.
- 1" plastic service line on north side of Rt. 100 running north off existing 6" main at approximately Sta. 243+73 14' RT. No conflict with this facility is anticipated.
- 2" steel service line on north side of Rt. 100 running north off existing 6" main at approximately Sta. 249+64 23' RT.
  - Proposed drainage structure conflicts with this facility at Sta. 2343+69 35' RT. Spire to relocate service line during construction in coordination with contractor.
- 1" plastic service line on north side of Rt. 100 running north off existing 6" main at approximately Sta. 248+16 22' RT. No conflict with this facility is anticipated.
- 2" steel service line on north side of Rt. 100 running north off existing 8" main at approximately Sta. 258+87 51' RT. No conflict with this facility is anticipated.

- Service line of unknown size/material on north side of Rt. 100 running north off existing 6" main at approximately Sta. 266+03 23' RT. No conflict with this facility is anticipated.
- 3/4" steel service line on north side of Rt. 100 running north off existing 6" main at approximately Sta. 267+95 22' RT. No conflict with this facility is anticipated.
- 1" plastic service line on north side of Rt. 100 running north off existing 6" main at approximately Sta. 272+68 14' RT. No conflict with this facility is anticipated.
- Service line of unknown size/material on north side of Rt. 100 running north off existing 6" main at approximately Sta. 277+06 35' RT. No conflict with this facility is anticipated.
- Service line of unknown size/material on north side of Rt. 100 running north off existing 6" main at approximately Sta. 279+51 28' RT. No conflict with this facility is anticipated.

#### **Underground Service Lines along the South Side of Rt. 100 throughout Project**

- 1 1/2" plastic service line on south side of Rt. 100 running south off existing 6" main at approximately Sta. 02+49 29' LT. No conflict with this facility is anticipated.
- 3/4" steel service line on south side of Rt. 100 running south off existing 6" main at approximately Sta. 03+71 30' LT. No conflict with this facility is anticipated.
- 3/4" steel service line on south side of Rt. 100 running south off existing 6" main at approximately Sta. 05+74 28' LT. No conflict with this facility is anticipated.
- 3/4" steel service line on south side of Rt. 100 running south off existing 6" main at approximately Sta. 05+91 28' LT. No conflict with this facility is anticipated.
- Service line of unknown size/material on south side of Rt. 100 running south off existing 6" main at approximately Sta. 10+83 30' LT. No conflict with this facility is anticipated.
- Service line of unknown size/material on south side of Rt. 100 running south off existing 6" main at approximately Sta. 07+18 27' LT. No conflict with this facility is anticipated.
- Service line of unknown size/material on south side of Rt. 100 running south off existing 6" main at approximately Sta. 14+33 31' LT. No conflict with this facility is anticipated.
- 1/2" plastic service line on the south side of Rt. 100 running south off existing 2" steel main at approximately Sta. 19+48 24' LT. No conflict with this facility is anticipated.
- Service line of unknown size/material on south side of Rt. 100 running diagonally southwest off existing 6" main at approximately Sta. 33+99 27' LT. No conflict with this facility is anticipated.

- Service line of unknown size/material on south side of Rt. 100 running south off existing 6" main at approximately Sta. 36+15 24' LT. No conflict with this facility is anticipated.
- Service line of unknown size/material on south side of Rt. 100 running south off existing 6" main at approximately Sta. 38+20 21' LT. No conflict with this facility is anticipated.
- Service line of unknown size/material on south side of Rt. 100 running south off existing 4" main at approximately Sta. 40+91 28' LT. No conflict with this facility is anticipated.
- Service line of unknown size/material on south side of Rt. 100 running south off existing 4" main at approximately Sta. 42+30 27' LT. No conflict with this facility is anticipated.
- 1 ¼" plastic service line on south side of Rt. 100 running south off existing 4" main at approximately Sta. 43+93 28' LT.
  - Proposed drainage structure conflicts with this facility at Sta. 43+93 33' LT. Spire to relocate service line during construction in coordination with contractor.
- 1" plastic service line on south side of Rt. 100 running south off existing 4" main at approximately Sta. 47+32 30' LT. No conflict with this facility is anticipated.
- 1/2" plastic service line on south side of Rt. 100 running south off existing 4" main at approximately Sta. 51+03 29' LT. No conflict with this facility is anticipated.
- 1" plastic service line on south side of Rt. 100 running south off existing 4" main at approximately Sta. 55+93 29' LT. No conflict with this facility is anticipated.
- 2" steel service line on south side of Rt. 100 running south off existing 6" main at approximately Sta. 56+90 26' LT. No conflict with this facility is anticipated.
- 3/4" steel service line on south side of Rt. 100 running south off existing 6" main at approximately Sta. 57+38 27' LT. No conflict with this facility is anticipated.
- 3/4" steel service line on south side of Rt. 100 running south off existing 6" main at approximately Sta. 58+19 29' LT. No conflict with this facility is anticipated.
- 1" plastic service line on south side of Rt. 100 running south off existing 6" main at approximately Sta. 59+07 28' LT. No conflict with this facility is anticipated.
- Service line of unknown size/material on south side of Rt. 100 running south off existing 6" main at approximately Sta. 61+57 28' LT. No conflict with this facility is anticipated.
- 1/2" plastic service line on south side of Rt. 100 running south off existing 6" main at approximately Sta. 63+47 25' LT. No conflict with this facility is anticipated.

- 1/2" plastic service line on south side of Rt. 100 running south off existing 6" main at approximately Sta. 64+11 25' LT. No conflict with this facility is anticipated.
- 1 1/4" plastic service line on south side of Rt. 100 running south off existing 6" main at approximately Sta. 64+88 25' LT. No conflict with this facility is anticipated.
- 3/4" steel service line on south side of Rt. 100 running south off existing 2" main at approximately Sta. 118+77 29' LT. No conflict with this facility is anticipated.
- 3/4" plastic service line on south side of Rt. 100 running south off existing 4" main at approximately 119+44 28' LT. No conflict with this facility is anticipated.
- 3/4" steel service line on south side of Rt. 100 running south off existing 4" main at approximately 120+57 26' LT. No conflict with this facility is anticipated.
- Service line of unknown size/material on south side of Rt. 100 running south off existing 4" main at approximately 124+18 29' LT. No conflict with this facility is anticipated.
- 1/2" plastic service line on south side of Rt. 100 running south off existing 4" main at approximately 126+36 27' LT. No conflict with this facility is anticipated.
- 1" plastic service line on south side of Rt. 100 running south off existing 4" main at approximately 127+00 27' LT. No conflict with this facility is anticipated.
- 1" plastic service line on south side of Rt. 100 running south off existing 4" main at approximately 127+74 27' LT. No conflict with this facility is anticipated.
  - Proposed drainage pipe conflicts with this facility at Sta. 127+74 26' LT. Spire to relocate service line during construction in coordination with contractor.
- Service line of unknown size/material on south side of Rt. 100 running south off existing 4" main at approximately 130+17 28' LT. No conflict with this facility is anticipated.
- 3/4" steel service line on south side of Rt. 100 running south off existing 6" main at approximately 134+75 27' LT. No conflict with this facility is anticipated.
- Service line of unknown size/material on south side of Rt. 100 running south off existing 6" main at approximately 136+77 27' LT. No conflict with this facility is anticipated.
- 3/4" steel service line on south side of Rt. 100 running south off existing 6" main at approximately 140+15 29' LT. No conflict with this facility is anticipated.
- 1 1/4" plastic service line on south side of Rt. 100 running south off existing 6" main at approximately 145+39 35' LT. No conflict with this facility is anticipated.

- 1" plastic service line on south side of Rt. 100 running south off existing 6" main at approximately 145+57 36' LT. No conflict with this facility is anticipated.
- 3/4" steel service line on south side of Rt. 100 running south off existing 6" main at approximately 147+27 25' LT. No conflict with this facility is anticipated.
- Service line of unknown size/material on south side of Rt. 100 running south off existing 6" main at approximately Sta. 151+20 33' LT. No conflict with this facility is anticipated.
- Service line of unknown size/material on south side of Rt. 100 running south off existing 4" main at approximately Sta. 158+68' 42' LT. No conflict with this facility is anticipated.
- Service line of unknown size/material on south side of Rt. 100 running south off existing 4" main at approximately Sta. 160+24 43' LT. No conflict with this facility is anticipated.
- Service line of unknown size/material on south side of Rt. 100 running south off existing 4" main at approximately Sta. 165+16 44' LT. No conflict with this facility is anticipated.
- 2" plastic service line on south side of Rt. 100 running south off existing 2" main at approximately Sta. 167+91 33' RT. No conflict with this facility is anticipated.
- 2" plastic service line on south side of Rt. 100 running south off existing 4" main at approximately Sta. 169+77 29' LT. No conflict with this facility is anticipated.
- 1" plastic service line on south side of Rt. 100 running south off existing 4" main at approximately Sta. 173+14 16' LT. No conflict with this facility is anticipated.
- 1" plastic service line on south side of Rt. 100 running south off existing 4" main at approximately Sta. 174+72 15' LT. No conflict with this facility is anticipated.
  - Proposed drainage structure conflicts with this facility at Sta. 174+77 27' LT. Spire to relocate service line during construction in coordination with contractor.
- 1/2" plastic service line on south side of Rt. 100 running south off existing 4" main at approximately Sta. 176+06 16' LT.
  - Proposed drainage structure conflicts with this facility at Sta. 176+11' 27' LT. Spire to relocate service line during construction in coordination with contractor.
- 1 1/4" steel service line on south side of Rt. 100 running south off existing 4" main at approximately Sta. 160+28 15' LT. No conflict with this facility is anticipated.
- 1" plastic service line on south side of Rt. 100 running south off existing 6" main at approximately Sta. 181+64 39' LT. No conflict with this facility is anticipated.

- 1" plastic service line on south side of Rt. 100 running south off existing 6" main at approximately Sta. 184+19 39' LT. No conflict with this facility is anticipated.
- 3/4" steel service line on south side of Rt. 100 running south off existing 6" main at approximately Sta. 189+46 37' LT. No conflict with this facility is anticipated.
- 3/4" steel service line on south side of Rt. 100 running south off existing 6" main at approximately Sta. 190+15 27' LT.
  - Proposed drainage structure conflicts with this facility at Sta. 190+15 33' LT. Spire to relocate service line during construction in coordination with contractor.
- 3/4" steel service line on south side of Rt. 100 running south off existing 6" main at approximately Sta. 192+16 25' LT.
  - Proposed drainage structure conflicts with this facility at Sta. 192+16 32' LT. Spire to relocate service line during construction in coordination with contractor.
- 1" plastic service line on south side of Rt. 100 running south off existing 6" main at approximately Sta. 193+33 27' LT.
  - Proposed drainage structure conflicts with this facility at Sta. 193+33 33' LT. Spire to relocate service line during construction in coordination with contractor.
- 1" plastic service line on south side of Rt. 100 running south off existing 6" main at approximately Sta. 195+46 28' LT. No conflict with this facility is anticipated.
- 1 1/4" plastic service line on south side of Rt. 100 running south off existing 6" main at approximately Sta. 196+04 28' LT. No conflict with this facility is anticipated.
- 1" plastic service line on south side of Rt. 100 running west off existing 6" main on east side of N. Berry Rd. at approximately station 197+51 118' LT. No conflict with this facility is anticipated.
- 1/2" copper service line on south side of Rt. 100 running south off existing 4" main at approximately Sta. 200+87 27' LT. No conflict with this facility is anticipated.
- 1/2" plastic service line on south side of Rt. 100 running south off existing 4" main at approximately Sta. 202+73 28' LT. No conflict with this facility is anticipated.
- 1/2" copper service line on south side of Rt. 100 running south off existing 4" main at approximately Sta. 207+11 27' LT. No conflict with this facility is anticipated.
- 3/4" steel service line on south side of Rt. 100 running south off existing 4" main at approximately Sta. 208+18 28' LT. No conflict with this facility is anticipated.
- 3/4" steel service line on south side of Rt. 100 running south off existing 4" main at approximately Sta. 209+17 28' LT. No conflict with this facility is anticipated.

- Service line of unknown size/material on south side of Rt. 100 running south off existing 4" main at approximately Sta. 210+41 28' LT. No conflict with this facility is anticipated.
- 3/4" steel service line on south side of Rt. 100 running south off existing 8" main at approximately Sta. 211+39 28' LT. No conflict with this facility is anticipated.
- Service line of unknown size/material on south side of Rt. 100 running south off existing 8" main at approximately Sta. 213+10 31' LT. No conflict with this facility is anticipated.
- 1" plastic service line on south side of Rt. 100 running south off existing 8" main at approximately Sta. 215+02 32' LT. No conflict with this facility is anticipated.
- 1" plastic service line on south side of Rt. 100 running south off existing 8" main at approximately Sta. 216+45 29' LT. No conflict with this facility is anticipated.
- 1" plastic service line on south side of Rt. 100 running south off existing 8" main at approximately Sta. 217+11 29' LT. No conflict with this facility is anticipated.
- 1" steel service line on south side of Rt. 100 running south off existing 8" main at approximately Sta. 220+06 28' LT. No conflict with this facility is anticipated.
- Service line of unknown size/material on south side of Rt. 100 running south off existing 16" main at approximately Sta. 225+15 27' LT.
  - Proposed drainage structure conflicts with this facility at Sta. 225+17 34' LT. Spire to relocate service line during construction in coordination with contractor.
- Service line of unknown size/material on south side of Rt. 100 running south off existing 16" main at approximately Sta. 226+47 25' LT.
  - Proposed drainage structure conflicts with this facility at Sta. 226+48 31' LT. Spire to relocate service line during construction in coordination with contractor.
- 3/4" steel service line on south side of Rt. 100 running south off existing 16" main at approximately Sta. 228+00 25' LT.
  - Proposed drainage structure conflicts with this facility at Sta. 228+00 29' LT. Spire to relocate service line during construction in coordination with contractor.
- 1 1/4" steel service line on south side of Rt. 100 running south off existing 16" main at approximately Sta. 234+33 28' LT. No conflict with this facility is anticipated.
- Service line of unknown size/material on south side of Rt. 100 running south off existing 16" main at approximately Sta. 235+82 27' LT. No conflict with this facility is anticipated.
- 3/4" steel service line on south side of Rt. 100 running south off existing 2" main at approximately Sta. 237+78 27' LT. No conflict with this facility is anticipated.

- ¾" steel service line on south side of Rt. 100 running south off existing 2" main at approximately Sta. 239+58 29' LT. No conflict with this facility is anticipated.
- ¾" steel service line on south side of Rt. 100 running south off existing 2" main at approximately Sta. 240+42 29' LT. No conflict with this facility is anticipated.
- ¾" steel service line on south side of Rt. 100 running south off existing 2" main at approximately Sta. 241+17 28' LT. No conflict with this facility is anticipated.
- ¾" steel service line on south side of Rt. 100 running south off existing 2" main at approximately Sta. 241+51 28' LT. No conflict with this facility is anticipated.
- 2" steel service line on south side of Rt. 100 running south off existing 2" main at approximately Sta. 250+57 29' LT. No conflict with this facility is anticipated.
- Service line of unknown size/material on south side of Rt. 100 running south off existing 2" main at approximately Sta. 257+70 28' LT. No conflict with this facility is anticipated.
- 2" steel service line on south side of Rt. 100 running south off existing 2" main at approximately Sta. 259+68 29' LT. No conflict with this facility is anticipated.
- 1/2" plastic service line on south side of Rt. 100 running south off existing 2" main at approximately Sta. 266+45 29' LT. No conflict with this facility is anticipated.
- 1" plastic service line on south side of Rt. 100 running east off existing 2" steel main on west side of Bernice Avenue at approximately station 268+51 83' LT. No conflict with this facility is anticipated.
- 1 1/4" plastic service line on south side of Rt. 100 running south off existing 16" main at approximately Sta. 272+19 33' LT. No conflict with this facility is anticipated.
- Service line of unknown size/material on south side of Rt. 100 running northeast approximately Sta. 281+66 97' RT. No conflict with this facility is anticipated.

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### **Underground Service Lines Crossing Rt. 100 throughout Project**

- 2" plastic service line crossing Rt. 100 at Sta. 05+17 running north off existing 6" main on south side of Rt. 100. No conflict with this facility is anticipated.
- 1" plastic service line crossing Rt. 100 running south off existing 10" main at approximately Sta. 18+22 23' RT. No conflict with this facility is anticipated.

- Service line of unknown size/material crossing Rt. 100 running north off existing 6" main at approximately Sta. 38+53 22' LT. No conflict with this facility is anticipated.
- 3/4" steel service line running north crossing Rt. 100 off existing 6" main on south side of Rt. 100 at approximately Sta. 59+70 27' LT. No conflict with this facility is anticipated.
- Service line of unknown size/material running north crossing Rt. 100 off existing 6" main on south side of Rt. 100 at approximately Sta. 60+47 27' LT. No conflict with this facility is anticipated.
- 1 1/4" plastic service line running south crossing Rt. 100 off existing 4" main on north side of Rt. 100 at approximately Sta. 69+62 27' RT. No conflict with this facility is anticipated.
- Service line of unknown size/material running north crossing Rt. 100 off existing 2" main on south side of Rt. 100 at approximately Sta. 79+54 44' LT. No conflict with this facility is anticipated.
- 3/4" steel service line running north crossing Rt. 100 off existing 2" main on south side of Rt. 100 at approximately Sta. 80+30 41' LT. No conflict with this facility is anticipated.
- 3/4" steel service line running north crossing Rt. 100 off existing 2" main on south side of Rt. 100 at approximately Sta. 81+40 35' LT. No conflict with this facility is anticipated.
- 3/4" steel service line of unknown size/material running north crossing Rt. 100 off existing 2" main on south side of Rt. 100 at approximately Sta. 81+83 33' LT. No conflict with this facility is anticipated.
- 1" plastic service line on south side of Rt. 100 running crossing Rt. 100 at Sta. off existing 2" main at approximately Sta. 119+03 28' LT. No conflict with this facility is anticipated.
- 1" plastic service line crossing Rt. 100 running north off existing 4" main at approximately 119+89 27' LT.
  - Proposed drainage structure conflicts with this facility at Sta. 119+84 18' RT. Spire to relocate service line during construction in coordination with contractor.
- 1" plastic service line crossing Rt. 100 running north off existing 4" main at approximately 120+78 26' LT. No conflict with this facility is anticipated.
- Service line of unknown size/material running north crossing Rt. 100 off existing 4" main on south side of Rt. 100 at approximately Sta. 122+29 28" LT. No conflict with this facility is anticipated.
- Service line of unknown size/material running north crossing Rt. 100 off existing 4" main on south side of Rt. 100 at approximately Sta. 123+76 29' LT. No conflict with this facility is anticipated.

- 1" plastic service line crossing Rt. 100 running north off existing 4" main at approximately 125+09 28' LT. No conflict with this facility is anticipated.
- 1" plastic service line running north crossing Rt. 100 off existing 6" main on south side of Rt. 100 at approximately Sta. 131+78 27" LT.
  - Proposed drainage structure conflicts with this facility at Sta. 131+78 28' RT. Spire to relocate service line during construction in coordination with contractor.
- Service line of unknown size/material running north crossing Rt. 100 off existing 6" main on south side of Rt. 100 at approximately Sta. 132+31 27" LT.
  - Proposed drainage pipe conflicts with this facility at Sta. 132+32 26' LT. Spire to relocate service line during construction in coordination with contractor.
- Service line of unknown size/material running north crossing Rt. 100 off existing 6" main on south side of Rt. 100 at approximately Sta. 133+40 27' LT.
  - Proposed drainage pipe conflicts with this facility at Sta. 133+40 27' LT. Spire to relocate service line during construction in coordination with contractor.
- ½" plastic service line running north crossing Rt. 100 off existing 6" main on south side of Rt. 100 at approximately Sta. 134+82 27' LT.
  - Proposed drainage pipe conflicts with this facility at Sta. 134+82 24' LT. Spire to relocate service line during construction in coordination with contractor.
- Service line of unknown size/material running north crossing Rt. 100 off existing 6" main on south side of Rt. 100 at approximately Sta. 135+60 27' LT.
  - Proposed drainage structure conflicts with this facility at Sta. 135+60 24' LT. Spire to relocate service line during construction in coordination with contractor.
- Service line of unknown size/material running north crossing Rt. 100 off existing 6" main on south side of Rt. 100 at approximately Sta. 136+85 26' LT.
  - Proposed drainage structure conflicts with this facility at Sta. 136+85 25' LT. Spire to relocate service line during construction in coordination with contractor.
- Service line of unknown size/material running north crossing Rt. 100 off existing 6" main on south side of Rt. 100 at approximately Sta. 137+74 30' LT. No conflict with this facility is anticipated.
- Service line of unknown size/material running north crossing Rt. 100 off existing 6" main on south side of Rt. 100 at approximately Sta. 147+94 25' LT.
  - Proposed drainage structure conflicts with this facility at Sta. 147+94 31' RT. Spire to relocate service line during construction in coordination with contractor.
- 1" plastic service line running north crossing Rt. 100 off existing 6" main on south side of Rt. 100 at approximately Sta. 149+40 23' LT. No conflict with this facility is anticipated.

- 1" plastic service line running north crossing Rt. 100 off existing 6" main on south side of Rt. 100 at approximately Sta. 150+51 23' LT. No conflict with this facility is anticipated.
  - 1 ¼" plastic service line on south side of Rt. 100 running south off existing 2" main at approximately Sta. 163+12 43' LT. No conflict with this facility is anticipated.
  - 1" plastic service line running north crossing westbound Rt. 100 off existing 2" main in center of Rt. 100 at approximately Sta. 170+56 4' RT
    - Proposed drainage structure conflicts with this facility at Sta. 170+56 20' RT. Spire to relocate service line during construction in coordination with contractor.
  - 1" plastic service line running north crossing westbound Rt. 100 off existing 2" main in center of Rt. 100 at approximately Sta. 173+93 7' RT. No conflict with this facility is anticipated.
  - Service line of unknown size/material running north crossing Rt. 100 off existing 6" main on south side of Rt. 100 at approximately Sta. 191+93 24' LT. No conflict with this facility is anticipated.
  - ¾" steel service line crossing Rt. 100 off existing 6" main on south side of Rt. 100 at approximately Sta. 195+42 28' LT. No conflict with this facility is anticipated.
  - 1 ¼" steel service line crossing Rt. 100 coming off existing 6" main on north side of Rt. 100 at approximately Sta. 243+67 24' RT. No conflict with this facility is anticipated.
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## **SIDE STREETS**

- Service line of unknown size/material running east off the east side of Bredell Avenue at approximately Sta. 11+43 80' RT. No conflict with this facility is anticipated.
- Service line of unknown size/material running east off the east side of Bredell Avenue at approximately Sta. 11+43 80' RT. 1 ¼" plastic service line running west off the east side of Bredell Avenue at approximately Sta. 11+46 140' RT. No conflict with this facility is anticipated.
- ¾" steel service line running west off the east side of Circle Drive at approximately Sta. 18+90 62' RT. No conflict with this facility is anticipated.
- Service line of unknown size/material on north side of Rt. 100 running east off existing 2" main on east side of Dorthy Ave. at approximately Sta. 64+42 131 RT. No conflict with this facility is anticipated.
- Service line of unknown size/material on north side of Rt. 100 running west off existing 2" main on west side of Mary Ave. at approximately Sta. 65+09 269' RT. No conflict with this facility is anticipated.

- Service line of unknown size/material on south side of Rt. 100 running west off existing 2" main on west side of Mary Ave. at approximately Sta. 65+18 194' RT.
  - Proposed drainage pipe conflicts with this facility at Sta. 65+23 195' RT. Spire to relocate service line during construction in coordination with contractor.
- Service line of unknown size/material on south side of Rt. 100 running west off existing 2" main on west side of Mary Ave. at approximately Sta. 65+33 146' RT.
  - Proposed drainage structure and wall conflicts with this facility from Sta. 65+38 150' RT and Sta. 65+54 147' RT. Spire to relocate service line during construction in coordination with contractor.
- 2" plastic service line on south side of Rt. 100 running west off existing 2" main on east side of Collier Ave. at approximately Sta. 81+87 104' LT. No conflict with this facility is anticipated.
- 1/2" plastic service line on south side of Rt. 100 running west off existing 4" main on east side of Manderly Dr. at approximately Sta. 123+13 68' LT. No conflict with this facility is anticipated.
- 3/4" steel service line on north side of Rt. 100 running west off existing 2" main on east side of High School Drive at approximately Sta. 125+60 80' RT. No conflict with this facility is anticipated.
- 1/2" copper service line on north side of Rt.100 running west off existing 6" main on east side of Bremerton Road at approximately station 130+53 80' RT. No conflict with this facility is anticipated.
- Service line of unknown size/material on south side of Rt.100 running east off existing 6" main on east side of N. Rock Hill Rd. at approximately station 154+65 216' LT. No conflict with this facility is anticipated.
- 1 1/2" plastic service line on south side of Rt.100 running east off existing 2" main on east side of N. Sappington Rd. at approximately station 223+50 124' LT. No conflict with this facility is anticipated.
- 1/2" copper service line on south side of Rt.100 running west off existing 1 1/4" plastic main in 2" steel main on east side of Sturgis Drive at approximately station 238+46 78' RT. No conflict with this facility is anticipated.
- 3/4" steel service line on south side of Rt.100 running east off existing 8" steel main on east side of Woodlawn Avenue at approximately station 254+39 132' LT. No conflict with this facility is anticipated.

- 3/4" steel service line on south side of Rt.100 running east off existing main east side of Lindbergh Blvd. at approximately station 281+70 122' RT. No conflict with this facility is anticipated.

Spire has at-grade access points for its facilities at various locations throughout the project. Some of these access points may need to be adjusted to new grades. In addition, Spire has services for properties at various locations throughout the project. These lines may be impacted by proposed improvements. The contractor shall coordinate directly with Spire for any necessary adjustments to at-grade access points or service lines. Spire's representatives for this will be as follows:

- Brian Langenbacher (ph: 314.768.7767, email: [Brian.Langenbacher@spireenergy.com](mailto:Brian.Langenbacher@spireenergy.com))

The contractor shall contact Spire a minimum of 3 weeks ahead of need for adjustment.

The contractor shall coordinate with Spire as necessary and take measures to protect in place their existing facilities during construction.

The contractor shall directly contact Spire Energy to verify location of facilities.

The Commission cannot warrant the information above which was provided by Spire Energy.

#### **16.0 St. Louis County – Department of Transportation**

St. Louis County has the following existing facilities along Rt. 100 within the project limits:

##### **Underground Facilities at Big Bend Blvd.**

- Buried cable along the east side of Big Bend crossing Rt. 100. No conflict with this facility is anticipated.
- Buried cable crossing Big Bend on along the south side of Rt. 100. No conflict with this facility is anticipated.
- Buried cable along the west side of Big Bend from Rt. 100 to the south. No conflict with this facility is anticipated.

##### **Underground Facilities at Hanley Rd.**

- Buried cable along the east side of Hanley Rd. crossing Rt. 100. No conflict with this facility is anticipated.

##### **Underground Facilities at Brentwood Blvd.**

- Buried cable along the west side of Brentwood Blvd. crossing Rt. 100. No conflict with this facility is anticipated.

##### **Underground Facilities at McKnight/Rock Hill Rd.**

- Buried cable crossing McKnight along the north side of Rt. 100. No conflict with this facility is anticipated.

- Buried cable along the east side of McKnight from north of Rt. 100 up to Rt. 100. No conflict with this facility is anticipated.

It is the responsibility of the contractor to contact St. Louis County Department of Transportation, Operations Division (Signal Section) at (314) 615-0215 a minimum of 48 hours in advance of construction work for locating and marking existing underground traffic signal conduit. One-Call does not locate County underground facilities.

The contractor is advised to email Signal [locates@stlouisco.com](mailto:locates@stlouisco.com) with each Mo1Call ticket number needing St. Louis County facilities located in the project limits.

Questions about St. Louis County facilities should be directed to Martin Koeller ( [mkoeller2@stlouisco.com](mailto:mkoeller2@stlouisco.com) , (314) 615-0210).

#### **17.0 EXISTING UTILITY FACILITIES LOCATED IN CLOSE PROXIMITY TO PROPOSED WORK**

The contractor is advised there are existing utility facilities located in close proximity to proposed work. The contractor may need to use shoring to avoid conflicts with utility facilities. The contractor is advised that the cost for this shoring is incidental. No direct payment will be made to the contractor to recover the cost of equipment, labor, materials or time required to fulfill the above provision.

#### **18.0 UTILITY COORDINATION BY CONTRACTOR AND ANY NECESSARY POT-HOLING OF UTILITY FACILITIES**

Utility Companies with utility adjustments advised they anticipate completing their relocation work during construction in coordination with the contractor. The contractor shall take an active role in verifying that the utility work is complete. The contractor shall directly contact each utility company about the status of their relocation work. The contractor shall submit/coordinate one call tickets early enough at specific locations of planned work to verify everything is marked and if there are questions about old and relocated facilities, so the issues can be addressed in field by utility locators in a timely manner.

The contractor shall also pothole any necessary buried utility facilities in the project limits to verify the buried facilities are deep enough for the roadway improvements and not damage the utility facility. Any utilities determined to be in conflict or that appear to be in conflict with construction shall be brought to the attention of the Engineer immediately. The Engineer shall determine course of action to remedy the situation. It may be necessary to shallow up rock lining, rock blanket or shift pipe installation to avoid a utility relocation.

No direct payment will be made to the contractor to recover the cost of equipment, labor, materials or time required to fulfill the above provision.

**JOB SPECIAL PROVISIONS  
FOR  
TRAFFIC SIGNAL CONSTRUCTION**

**HANLEY ROAD**

**ST. LOUIS COUNTY PROJECT NO. AR-1595**

**MoDOT PROJECT NOS. J6S1718 / J6S1718B**

**ST. LOUIS COUNTY, MISSOURI**

**4/14/2021**

Prepared By:  
SAINT LOUIS COUNTY  
DEPARTMENT OF TRANSPORTATION

**THESE JOB SPECIAL PROVISIONS  
(PREPARED BY ST. LOUIS COUNTY)**



Date: 4/14/2021

**Brian J. Gettinger**  
Missouri Professional Engineer  
License Number **2007032757**

Pursuant to the requirements of 20 CSR 2030-3.060, the above professional seal and signature pertain to this bound document wholly consisting of the title page and the Special Provisions to the General Specifications, all as attached.

**HANLEY ROAD / MANCHESTER ROAD & BRENTWOOD BLVD. / MANCHESTER ROAD  
INTERSECTIONS**

**100.10.1 STANDARD SPECIFICATIONS & STANDARD DRAWINGS**

- A. Unless otherwise noted, all signal work at the Hanley Road/Manchester Road and Brentwood Boulevard/Manchester Road intersections shall be covered by St. Louis County Standard Specifications for Road and Bridge Construction. The Contractor shall have a copy of said specifications on the job site at all times for the duration of this project.
1. The specifications are available on our Internet website at <https://stlouiscountymo.gov/st-louis-county-departments/transportation-and-public-works/transportation-publications-and-manuals/dot-construction-manual-current/standard-specifications-for-road-and-bridge-construction-manual/> or through our Publications website at <https://stlouiscountymo.gov/st-louis-county-departments/transportation-and-public-works/transportation-publications-and-manuals/>.
  2. The Standard Specifications in effect for this project will be those available for viewing and download on the first day of advertising for bids.
- B. St. Louis County does not publish its manuals in hard copy form. The most current "Publications" information will be available online in "portable document format" (PDF) files, and can be viewed and/or printed through various PDF file viewers. All St. Louis County publications are available in PDF files.
- C. Unless otherwise noted, all signal work at the Hanley Road/Manchester Road and Brentwood Boulevard/Manchester Road intersections shall be covered by applicable St. Louis County Standard Drawings. The Contractor shall have a copy of said drawings on the job site at all times for the duration of this project.
1. A copy of these standard drawings are available on the St. Louis County Web Site at <https://stlouiscountymo.gov/st-louis-county-departments/transportation-and-public-works/transportation-publications-and-manuals/dot-standard-drawings-current/st-louis-county-standard-drawings/>
  2. The Contractor shall be responsible for checking the Standard Drawings Errata Sheet to ensure his/her set of drawings are current. The Standard Drawings in effect for this project will be those drawings available for viewing and download on the first day of advertising for bids.
- D. Updates made to the Standard Specifications and/or the Standard Drawings after this contract is awarded will not be enforceable for this project unless a Change Order is issued to the Contractor.

### **100.10.3 WORKING RESTRICTIONS**

- A. On each of the project sites, the Contractor shall confine his operations and restrict the storage of equipment and materials to the easement areas shown on the plans. The Contractor will not be permitted to operate equipment or store material on roadways or drives that are normally in use by the public.
- B. The Contractor shall use every precaution to prevent damage to private and public utility lines, conduits, and other improvements. The Contractor will be responsible for all damage to any utility or other such improvement due to his operations, and shall repair or replace as necessary any such damaged facility or make payment to the owner for repair or replacement. Trees and shrubs in the easement areas not specifically marked To Be Removed (TBR) shall be carefully preserved.
- C. The Contractor shall notify St. Louis County Traffic Operations at (314) 615-0233 a minimum of two (2) working days in advance of any traffic signal work being conducted on this project.
- D. No direct payment will be made for compliance with this provision.

### **900.30.6 CONTRACTOR TO OBTAIN PERMIT PRIOR TO PERFORMING ELECTRICAL WORK AT TRAFFIC SIGNAL POWER SUPPLY**

Prior to performing any electrical work at the traffic signal power supply, the Contractor shall obtain a permit from St. Louis County. The permit can be acquired at the following location:

41 South Central Avenue  
6th Floor  
Clayton, Missouri 63105

The Contractor shall be responsible for covering the cost of the permit. There will be no direct payment for complying with this provision.

### **900.30.7 DAMAGED TRAFFIC SIGNAL CONDUIT**

In the event that any existing traffic signal conduit that is indicated or shown on the plans to have new cable added or existing cable removed and replaced, is discovered to be broken and/or damaged, the Engineer shall determine, at each and every occurrence, whether the Contractor shall repair the existing conduit or bore a new conduit between existing pull boxes.

- A. If the Engineer orders new conduit to be bored between pull boxes, then the size of the new conduit shall be determined by the Engineer. Payment for authorized work will be as follows (the applicable portion of the following provisions shall apply):
  - 1. Payment for all labor, material and equipment necessary to bore new 4" conduit will be paid for at the contract unit price for bid Item No. 904-54.00 Conduit, 4".

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2. Payment for all labor, material and equipment necessary to bore new 2" conduit will be paid for at a unit price of \$10.00 per linear foot as a contingency item.
  3. Payment for all labor, material and equipment necessary to drill an opening into an existing concrete pull box will be paid for at a unit price of \$200.00 per opening as a contingency item.
  4. Mobilization will be paid as a Lump Sum at \$1,000.00. Mobilization for this work will only be paid one time per project.
- B. If the Engineer orders the existing conduit to be repaired, then this work will be accomplished in accordance with specification 904.5.9.6 and paid for at the contract unit price for bid Item No. 904-74.99 "Conduit Repair".

**900.30.16 AS-BUILT DRAWINGS FOR TRAFFIC SIGNAL AND PEDESTRIAN SIGNAL INSTALLATIONS AND MODIFICATIONS**

Description of Work

For all new traffic signal and pedestrian signal installations, and modifications to existing installations (including, but not limited to, underground conduit, wiring, pull boxes, concrete bases, signal heads, detectors, posts, poles, and mast arms; including relocation and/or removal), Contractor shall provide As-Built Drawings for each and every location, as defined below.

As-built drawings shall reflect all changes made in the specifications and working drawings during the construction process, and show the exact dimensions, geometry, and location of all elements of the signal work completed under the contract.

- A. Prepare and maintain one (1) set of as-built drawings using an unaltered set of original project plans, to show all as-constructed information, including:
  - 1) Any plan clarifications or Change Order changes.
  - 2) Locations of any new underground installations.
  - 3) Location, size, and type, of products or components used/constructed in the work.
- B. Neatly prepare as-built drawings as follows:
  - 1) Place markings on the project record drawings using red ink or red pencil.
  - 2) Do not eradicate or write over original figures.
  - 3) Line out superseded material.

- 4) Submit additional drawings if the required information cannot be clearly shown on the original set of project plans. The additional drawings must be at least 11 by 17 inches and at most 24 by 36 inches.
  - 5) Sign and date each sheet verifying that all as-built information shown on the drawings is correct.
- C. Review the as-built drawings with the Engineer during the progress of the work to assure that all changes and other required information are being recorded.
- D. Upon completion of the work, Contractor shall submit as-built drawings to the Engineer for review to determine completeness and adequacy of the drawings. If the as-built drawings are unacceptable, Contractor must inspect, measure, and survey the work as necessary to record the required additional information.

#### Basis of Payment

- A. No direct payment will be made for compliance with this specification.

#### **900.30.17 WARRANTIES AND GUARANTEES**

Section 904.10 Guarantee of the St. Louis County *Standard Specifications for Road and Bridge Construction* shall be removed and replaced with the following:

- 1) All electrical equipment and related components shall be warranted by the manufacturer to be free from defects in workmanship and material for at least one (1) year from the date of project acceptance. Any components found to be defective during the warranty period shall be replaced free of charge. All warranties provided shall be transferred to St. Louis County upon project acceptance.
- 2) The Contractor shall guarantee satisfactory in-service operation of all Contractor supplied and installed electrical equipment and related components for a period of six (6) months from the date of final acceptance of the entire project.
  - a) Upon notice from the Engineer of unsatisfactory in-service operation of Contractor supplied and installed electrical equipment and/or related components, the Contractor shall immediately begin the correction, repair or replacement process. This notice from the Engineer may be given anytime within the guarantee period specified in Section 904.10(1). The Contractor shall be responsible for having the defective work, materials or equipment corrected, repaired or replaced within three (3) working days after notification by the Engineer. Unless otherwise approved by the Engineer, if defective materials or equipment cannot be repaired or replaced within this time, the Contractor shall make arrangements for their temporary replacement with similar materials or equipment. In any event, if in the opinion of the Director and at his sole discretion, immediate repairs and/or adjustments are determined to be necessary to provide for the safe and efficient movement of

traffic, and the Contractor is not capable of making such repairs and/or adjustments to the satisfaction of the Director; the Director will order County personnel or other qualified Engineers or technicians to make immediate repairs and/or adjustments. The Contractor will be charged the entire cost of the work performed by County or other qualified personnel (if paid by the County). The Contractor will be charged for all labor (including benefits and indirect overhead), materials, and equipment furnished by the County in making immediate repairs and/or adjustments. There will be a three (3) hour minimum call-up time for overtime. The work performed by County or other qualified personnel will in no way jeopardize any part of this guarantee.

### **1200.90.18 REMOVAL OF EXISTING SIGNAL EQUIPMENT - SALVAGE**

#### Description:

The Contractor shall carefully remove and salvage all existing signal equipment at the Hanley Road/Manchester Road and Brentwood Boulevard/Manchester Road intersections. The salvaged signal equipment will become the property of St. Louis County.

#### Construction Requirements:

The Contractor shall deliver the removed signal equipment to the St. Louis County Operations Headquarters located at 2688 Adie Road, Maryland Heights, MO 63043. The Contractor shall load and stack the signal equipment on timbers or other means to facilitate removal from the vehicle by St. Louis County personnel. The Contractor shall notify Mr. Scott Halter at (314) 615-0202, a minimum of 48 hours prior to delivery. The Contractor will be required to dispose of any signal equipment which has been deemed unsalvageable by Mr. Halter or other designated St. Louis County Operations personnel.

#### Payment:

All costs for removal of the existing signal equipment and delivery to the above address; and/or disposal of unsalvageable signal equipment, shall be considered inclusive to the project contract. No additional payment will be provided.

### **1200.90.19 MODIFICATION OF PROPOSED TRAFFIC SIGNAL CONCRETE BASES**

#### Description:

This work consists of constructing the following proposed traffic signal concrete bases according to the St. Louis County Standard Specifications for Road and Bridge Construction and any applicable St. Louis County Standard Drawing(s); with the following noted modifications. All other proposed traffic signal concrete bases shall be constructed according to the St. Louis County Standard Specifications for Road and Bridge Construction and any applicable St. Louis County Standard Drawings (refer to Job Special Provision No. 100.10.1 for information

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regarding use of the St. Louis County Standard Specifications and Standard Drawings on this project).

Construction Requirements:

The Contractor shall construct the following proposed traffic signal concrete bases according to the St. Louis County Standard Specifications for Road and Bridge Construction and any applicable St. Louis County Standard Drawing(s); with the following noted modifications:

<u>St. Louis County Standard Drawing No.</u>	<u>Base Type</u>	<u>Modification(s)</u>
C904.50	B-9	Base Depth "X" shall be increased to 10'

Measurement:

Measurement for modifications to the proposed traffic signal concrete bases listed above will be made on a per each basis and considered inclusive to the appropriate applicable pay item.

Payment:

The accepted quantities for installation of the modified traffic signal concrete bases will be paid for at the contract unit price for each of the following pay items:

<u>Item No.</u>	<u>Description</u>
904-91.59	Base, Type B-9, Concrete

**1200.90.20 RELOCATION OF EXISTING VIDEO DETECTION SYSTEM**

Description:

- A. This item shall consist of relocating an existing video detection system at the Hanley Road/Manchester Road intersection.

Construction Requirements:

- A. The Contractor shall carefully relocate an existing Aldis video detection system at the Hanley Road/Manchester Road intersection. All existing video detection equipment shall be handled with caution and all existing equipment, mounting hardware (mounting brackets, poles, etc.) and cables shall be carefully removed, safely stored, and carefully reinstalled.
- B. The Contractor shall notify Mr. Scott Halter at (314) 615-0202, a minimum of 48 hours prior to relocation of the said video detection system.
- C. St. Louis County Operations personnel will re-program the vehicle detection zones upon completion of the relocation process.

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Measurement:

- A. Measurement for relocation of the video detection system will be made on a per each basis; including the removal, storage, and reinstallation of all existing equipment, mounting hardware and cables.

Payment:

- A. The accepted quantities for the relocation of the video detection system will be paid for at the contract unit price for each of the following pay items:

<u>Item No.</u>	<u>Description</u>
902-49.80	Relocate Video Detection System