



**ADDENDUM NO. 1
TO SPECIFICATIONS AND PLANS FOR THE
CITY OF BLOOMFIED HILLS CHESTER FIELD ROAD
CULVERT REHABILITATION**

ISSUED: March 16, 2026.

HRC Job No. 20220655

This Addendum is issued prior to receipt of bids to provide for certain changes and clarifications to the Specifications and/or the Drawings, as herein specified, and is hereby made as part of the Contract Documents and shall be taken into consideration in preparing the bids. All other conditions remain the same.

The Bidder shall acknowledge the receipt of this Addendum by signing below, including this Addendum with their bids, and writing in the requested Addendum information in the Addenda section on the Bid Form. Failure to acknowledge the Addenda Section of the Bid Form in the submission of the bid may be justification for the bid being rejected as non-responsive.

The following lists the extent of this Addendum No. 1. Descriptions of the changes or clarifications are given within the heading.

DRAWINGS REVISED

- ≡ Structural sheets S-1 to S-2 (RE-ISSUED)

SPECIAL PROVISIONS REVISED

- ≡ Special Provision 401 – Geopolymer Structural Liner

End of Addendum No. 1

Received and Acknowledged By:

Company: _____

Signature: _____

Printed Name: _____

Title: _____

Date: _____

CITY OF BLOOMFIELD HILLS

SPECIAL PROVISION
FOR
GEOPOLYMER STRUCTURAL LINER

HRC

1 of 6

03/16/2026

a. Description. This work consists of the design, load rating, providing and installation of a spray applied geopolymer liner to structurally rehabilitate a pair of existing twin corrugated metal pipes, and providing stream diversion system as necessary for installation. The manufacturer of the geopolymer system must provide the design, load rating, installation and inspection of the liner and must have an authorized representative on site during installation. Furnishing of all labor, materials, and equipment as necessary to complete the work shall be included.

b. Materials. Furnish a geopolymer mortar composed of a minimum 70 percent Pozzolanic material selected from the list of silicon dioxide (SiO_2), magnesium oxide (MgO), aluminum oxide (Al_2O_3), and ferric oxide (Fe_2O_3) and has the minimal properties as shown in Table 1. Verify geopolymer composition by X-Ray Fluorescence (XRF) testing in accordance with ASTM C114.

Table 1: Properties of Geopolymer Mortar

Property	Value	Test Method
Compressive Strength	2,500 psi (1 Day) 8,000 psi (28 day)	ASTM C109/C109M
Flexural Strength	750 psi (7 Day) 1,500 psi (28 Day)	ASTM C78/C78M
Tensile Strength	800 psi (28 Day)	ASTM C496/C496M
Shrinkage	0 %	ASTM C1090/C1090M at 65% Relative Humidity
Freeze Thaw Durability	0% loss at 300 cycles	ASTM C666/C666M
Set Time	Initial < 75 min Final < 120 min	ASTM C807

Provide Test Data Certification in accordance with the MQAP Manual to the Engineer to verify that all materials meet the requirements specified herein.

Acceptable manufacturers and products:

1. GeoSpray®;

GreenTree Solutions
David Keaffaber, Midwest Region Manager
(317) 306-6595
www.dkeaffaber@cs-nri.com

2. Or Engineer and Owner approved equal.

Additional materials including chemical grouts and hydraulic cement necessary to stop infiltration and create a surface for the geopolymer lining shall be applied as necessary. Specific materials must be compatible with the geopolymer lining and the Owner reserves the right to require preapproval of such materials.

c. Design. The Contractor performing the work shall be fully qualified, experienced, and equipped to complete this work expeditiously and in a satisfactory manner and shall be an approved installer of the geopolymer lining system as certified and licensed by the Manufacturer.

The Contractor shall be a certified and licensed applicator by the geopolymer product manufacturer. The Contractor must have a minimum of five (5) years of experience in successfully lining culverts using that geopolymer liner.

The Manufacturer shall submit documentation and verifiable reference for installation of the proposed lining system in a minimum of 5000 linear feet of large diameter (>48 inch) horizontal pipe for pipeline qualifications.

The Contractor shall submit a certified statement from the manufacturer that he/she is certified and a licensed installer of the liner.

The Contractor's Geopolymer Installer must submit a work plan showing how the work shall be scheduled and coordinated.

The Owner reserves the right to approve or disapprove the Contractor, based on the submitted qualifications without legal recourse.

Structural design should be based on physical properties of materials and should use the more conservative ASTM C78 values for flexural strength not values obtained from ASTM C293.

Design and Load Ratings:

1. Truck Live Load: Standard Specification for Highway Bridges, 17th edition HS-20-44 or alternate military loading of two axles four feet apart with each axle weighing 25,000 pounds, whichever produces the greatest stress.
2. The geopolymer thickness - assumes a fully deteriorated pipe condition with no bonding to the original pipe wall.
3. The water table is assumed to be at the ground surface above the pipe.
4. The design for the geopolymer liner requires a factor of safety of at least 2.0 for all loading conditions.
5. Liner design life of 50 years.
6. All design calculations and load ratings shall be signed and sealed by the Contractor's licensed Professional Engineer currently registered in the State of Michigan.
7. Once installation is complete and liner thickness is verified, provide load ratings. The load rating must be performed by the Contractor's licensed Professional Engineer currently registered in the State of Michigan. The load rating procedure and documentation shall be in accordance with the 2020 Standard Specifications for Construction for LRFR as issued by the Michigan Department of Transportation, Section 406.03.B.

d. Construction. Obtain from the manufacturer the design for the geopolymer liner, that meets the following conditions:

Submittals and Certifications:

Electronically submit the following required documentation for the Engineers review a minimum of 10 workdays prior to starting the work.

1. All design calculations and load ratings shall be signed and sealed by the Contractor's licensed Professional Engineer currently registered in the State of Michigan.
2. Chemical analysis report and/or Manufacturer's product data and installation instructions. Include required substrate preparation, on-site quality assurance recommendations and a list of all materials to be used.
3. Written installation plan approved by the manufacturer.
4. Method to verify applied thickness during installation.
5. Verification that applicators are certified by the manufacturer for installation of the geopolymer liner on large diameter corrugated metal pipes of similar size. Applicators must have worked on at least five projects of similar scope and complexity.
6. Certifications:
 - a. Certification that the proposed liner will have a design life of at least 50 years.
 - b. The Manufacturer shall submit a letter of certification that the product meets or exceeds all technical and packaging requirements.
 - c. The Manufacturer shall submit original third-party verification that materials meet physical properties specified for design at 1 day and 28 day, minimally ASTM C-78, ASTM C-109, ASTM C-882, and ASTM C-1090. Further Manufacturer shall submit original third-party verification of test data for ASTM C-666 testing for samples cured 28 days and subjected to 300 cycles.
 - d. The Manufacture shall submit original third-party verification of material formulation via XRF (X-ray Fluorescence) data as detailed in the materials section above.
 - e. Submit the Manufacturer's certification that materials have been approved for the installation conditions shown on the Drawings and as specified herein.
 - f. Submit the Manufacturer's materials warranty certificate.
 - g. Submit Installer's warranty certificate.
 - h. Submit Installer's job history and reference certificate.
7. A stream diversion bypass plan for the stream throughout liner installation.
8. Provide a certification, signed and sealed by the Contractor's licensed Professional Engineer currently registered in the State of Michigan, verifying that the geopolymer liner has been designed and installed in accordance with the applicable ASTM standards and this Special Provision.

Do not begin work until approval is received from the Engineer.

Stream Diversion:

1. Provide the design, operation, maintenance and removal of temporary stream diversion system during construction.
2. The Contractor shall field verify construction methodology including stream diversion

flow requirements prior to installation of any diversion equipment or system.

3. The stream diversion system shall provide provisions for maintaining stream flow, avoiding damage to existing trees and adjacent properties, preventing leakage from hoses, and minimizing noise from any pumps used. If pumps are used for stream diversions any noise greater than 70 decibels at any time shall not be allowed.
4. It shall be the responsibility of the Contractor to provide protection for the entire stream diversion system including but not limited to temporary dams, piping, piping connections, pumps and ancillary equipment. Materials utilized for the stream diversion shall be appropriate for use for the intended operation and service. Protection for the stream diversion system shall be performed through positive protection means, including but not limited to burial. The Contractor shall be responsible for any damage caused by the Contractor's failure to provide adequate protection to the stream diversion system.
5. Working drawings shall be submitted to the Owner at least seven (7) days prior to commencement of the stream diversion system installation, for information purposes only. Prior to submission of Working Drawings, the seals and signatures of a registered professional engineer currently licensed in the State of Michigan (applies to both the design Engineer and design-checking Engineer) shall be affixed on the Working Drawings verifying that the drawings are consistent with the Contract Documents.
6. One person shall not perform both the design Engineer and design-checking Engineer roles for the system.
7. It is the Contractor's responsibility to ensure a safe working environment for their staff and the public. The stream diversion system shall have sufficient capacity to divert the peak flows indicated and as verified by the Contractor. It shall be the Contractor's responsibility to verify or measure flows and design the stream diversion system adequately. The Contractor shall provide all temporary dams, pipeline, pumps of adequate size to handle peak flow and temporary discharge piping to ensure that the total flow of the stream can be safely diverted around the section of work. Stream diversion system if utilizing pumps shall be manned at all times while operating.
8. The Contractor shall have adequate standby equipment available and ready for immediate operation and use in the event of emergency or high rainfall event. One standby pump for each pump utilized, providing 100% redundancy.
9. The stream diversion system shall meet the requirements of all codes and regulatory agencies having jurisdiction.
10. It shall be the responsibility of the Contractor to schedule and perform his/her work in a manner that does not cause or contribute to an incidence of flooding upstream or downstream of the work, The Contractor shall immediately take appropriate action to contain or stop any upstream or downstream flooding or overflow to work.
11. The Contractor is responsible for locating any existing utilities in the area that the Contractor selects to locate the stream diversion system. The Contractor shall locate the stream diversion system to minimize any disturbance to existing utilities and shall obtain approval of the locations by the Owner.

Installation:

Clean and prepare the surface of the existing corrugated metal pipe in accordance with the manufacturer's recommendations. After cleaning and before beginning the lining process,

inspect the existing corrugated metal pipe for holes or obstructions that would hinder the lining process. Patch holes and gaps in the existing corrugated metal pipe with an approved hydraulic cement or the same geopolymer based material to be used for the liner to provide a solid continuous surface on which to spray. Eliminate water infiltration into the host pipe by applying dry hydraulic cement, filling holes with polyurethane foam, injecting chemical acrylamide grout or other methods approved by the Engineer.

Utilizing a color video inspection system (CCTV) with data recording capabilities, the entire culvert to be lined shall be recorded and two (2) copies produced. The interior of the pipe shall be carefully inspected to determine the location of any conditions which may prevent the proper installation of the geopolymer liner, and it shall be noted so that these conditions can be corrected. A CD, DVD or other digital recording and suitable log shall be submitted to the Owner.

Install the geopolymer liner in accordance with the manufacturer’s guidelines. Protect plants at the entrance and exit of the existing corrugated metal pipe from overspray. Apply the geopolymer lining to the prepared surface using methods that provide a uniform surface following the manufacturer’s installation plan. Use only equipment recommended by the manufacturer.

The Contractor shall mix the geopolymer material to the Manufacturer’s recommended water cement ratio. Precision metering of water in the continuous mixing chamber is required to maintain the strict water to material ratio of the geopolymer material. It is important to maintain the specified water to geopolymer ratio throughout the application process. Uniform water to polymer ratio equates to consistent strength. The ability to closely adjust and monitor the addition of water using a sight tube system is required.

Liner shall have a uniform thickness throughout and a smooth brush or broomed finish. Verify the applied thickness using plastic or metal indicator tabs / gauge screws at random locations as determined by the Engineer and Installer at least once every 5 feet longitudinally and every 3 feet circumferentially. Indicator tabs shall be placed along both the peaks and valleys of the corrugations. The tab lengths shall be just shorter than the specified thickness and are left in place when sprayed over. Apply additional material to any areas found to be less than design thickness.

Ensure the finished geopolymer liner is continuous over the entire length of pipe and is free from visual defects, such as foreign inclusions and cracks no larger than 0.01 inches wide. Correct any deficiency noted by the Engineer utilizing a method approved by the Manufacturer. Ensure required corrective actions are conducted at no cost to the contract.

Follow Manufacturer’s recommended cure schedule in curing of the geopolymer liner. The material must be allowed to cure for a minimum of 2 hours or until the material has reached an initial set condition whichever is longer prior to the release of the stream flow through the culvert. Refer to ACI350R-99 Hot Weather Concreting and ACI 306R-88 Cold Weather Concreting as applicable for ambient temperatures during installation and curing.

d. Measurement and Payment. The completed work, as described, will be measured along the length of each culvert barrel and paid for at the contract unit price using the following pay item:

Pay Item	Pay Unit
Geopolymer Structural Liner.....	Foot

Geopolymer Structural Liner includes all work items described above and any minor complications and/or delays, cleaning (and re-cleaning), and preparing (and re-preparing)

surfaces, patching and/or grouting, reapplying geopolymer liner damaged as a result of reinstating flow too soon on uncured material, testing and all labor, materials, tools, fees, equipment and unanticipated items needed to complete work specified above and as shown on the Drawings.