Midwest Engineering
Associates, Inc.

May 12th, 2022

RE: City of Peoria
Department of Public Works
Culvert Replacement for East Branch Dry Run Creek at W. Merle Lane
Peoria, Illinois
Midwest Engineering Associates, Inc. Job Number 20210102

ADDENDUM NO. _002__

This Addendum supplements and amends the original Drawings and Specifications and shall be taken into account in preparing proposals, and shall become a part of the Contract Documents. In case of conflict between the Drawings, Specifications and this Addendum, this Addendum will govern. Careful note of this Addendum shall be taken and all trades affected shall be fully advised for performance of the work.

Contract Documents

1. Geotechnical Report for Box Culvert Replacement has been revised to include additional information for the design of a three-sided structure. Refer to enclosed revised Appendix C.

Drawings

A. Sheet 8; Utility Plan. The East Branch of Dry Run Creek's hydraulic gradient has been revised such that it is level (0.0%) through the structure. Refer to enclosed revised Sheet 8.

B. Sheet 20; Precast Structure Details. The East Branch of Dry Run Creek's hydraulic gradient has been revised such that it is level (0.0%) through the structure. Refer to enclosed revised Sheet 20.

The following are answers to questions and/or clarifications that have been submitted from May 5th through May 11th, 2022:

None.

Sincerely,

Robert D. Culp, P.E., C.F.M.
Sr. Project Manager

Addendum No. 002 –

Appendix C

Geotechnical Report for Box Culvert Replacement

(Total Pages – 32 including Title Page)

Geotechnical Exploration for Pipe Culvert Replacement

W. Merle Lane over E. Branch Dry Run Creek
Peoria, Illinois

May 10, 2022 (REV 1)
Lab No. 21002430.04

IMEG

May 10, 2022 (REV 1)

Midwest Engineering Associates, Inc.
140 East Washington Street
East Peoria, IL 61611

ATTN: Mr. Philip Lane
P: 309.222.8630
E: plane@mweainc.com

RE: Geotechnical Exploration for Pipe Culvert Replacement
W. Merle Lane over E. Branch Dry Run Creek
Peoria, Illinois
IMEG Project No. 21002430.04

Dear Philip:

The recently completed geotechnical study for planning, design, and future construction of a New Culvert near the above intersection is submitted herewith. The report presents results of field and laboratory testing of soils and geotechnical recommendations for the planned construction. We hope the findings and recommendations are helpful with planning, design, and construction activities. We invite you to call if you require clarification or further discussion of any items presented herein.

Respectfully Submitted,

IMEG, Corp.

LICENSED PROFESSIONAL ENGINEER MATTHEW A. DOTSON 062-067498 OF ILLINOIS	I hereby certify that this report was prepared by me or under my direct supervision and that I am a duly licensed Professional Engineer under the laws of the State of Illinois. Signature: [signature] Date: 05.10.2022 Matthew A. Dotson License No. 062-067498 My license renewal date is November 30, 2021 Pages covered by this seal: Geotechnical Report Appendices A to D

GEOTECHNICAL STUDY

Pipe Culvert Replacement
W. Merle Lane over E. Branch Dry Run Creek
Peoria, Illinois

May 10, 2022 (REV 1)
Lab No. 21002430.04

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GEOTECHNICAL STUDY

Pipe Culvert Replacement
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1.0 INTRODUCTION

1.1 AGREEMENT AND SCOPE OF SERVICES

This report presents results of our geotechnical exploration for planning, design, and future construction of a New Culvert near the above intersection in Peoria, Illinois. The report is in general accordance with correspondence between Mr. Philip Lane (Midwest Engineering Associates) and Mr. Scott Osmulski (IMEG-Peoria). Notice to proceed was provided on July 21st and our geotechnical exploration services were executed thereafter.

Work included a review of available subsurface data for the project area, completion of two exploratory borings to depths of forty feet below existing ground surface, testing of soil in the field and laboratory, analyses of results, development and presentation of geotechnical recommendations based on our observations and our current understanding of the project. Appendix A of the report provides a Boring Location Plan showing approximate locations of borings performed for this study.

1.2 DOCUMENT REVISION HISTORY

As new design information has surfaced or upon request, revisions to the parent geotechnical engineering report have been made. The following table provides the revision history and descriptions of the noted changes.

Table A. Document Revision History

Revision No.	Date	Description of Changes
0	08.27.2021	Parent document created and distributed to stakeholders.
1	05.10.2022	In addition to pre-bid questions, additional design information from Contech was provided. Report revisions are included in Sections 4.2, 4.4, 4.7, and 5.2.

Please note, document revisions pertaining to the current revision number have been identified by red text. Previous revision documents may be examined by clicking HERE.

2.0 EXPLORATION AND TESTING PROCEDURES

Exploratory borings were advanced with a Deidrich-D50 track-mounted rotary drill rig. At preselected intervals throughout the boring depths, soil samples were recovered with two-inch diameter split spoon samplers (SPT) driven by a 140-pound automatic hammer. Resulting SPT blow counts obtained in the field were recorded and provide an index of the soil relative density and strength as shown by Table B.

Table B. Consistency and Relative Density by Blow Counts

Cohesive (Clayey) Soils			Cohesionless (Sandy) Soils	
N-Value (blows/ft.)	Consistency	Approximate Unconfined Compressive Strength, psf.	N-Value (blows/foot)	Relative Density
0 - 2	Very Soft	0 - 500	0 - 4	Very Loose
2 - 4	Soft	500 - 1000	4 - 10	Loose
4 - 8	Medium Stiff	1000 - 2000	10 - 30	Medium Dense
8 - 15	Stiff	2000 - 4000	30 - 50	Dense
15 - 30	Very Stiff	4000 - 8000	50+	Very Dense
30+	Hard	8000+		

Recovered soil samples were removed from the sampler, placed in glass soil jars, sealed, and labeled according to the appropriate boring number and depth of the specimen. Then, samples were protected and prepared for transport to our laboratory for density measurement, moisture content determination, and strength testing in unconfined compression. ASTM test methods D2216 and D2166 were closely followed.

Test results were recorded on the final boring logs of Appendix B. Columns displayed the penetrometer resistance (Qp) as determined with a hand-held spring penetrometer in tons per square foot, approximate unconfined compressive strength (UCS), the moisture content in percent of soil dry weight (%M), dry unit weight of soil in pounds per cubic foot (DD), and the remolded strength as determined with hand-held dial pocket penetrometer (0 to 6 tsf useable range) in tons per square foot (Qr).

3.0 SUBSURFACE CONDITIONS

3.1 SOILS DESCRIPTIONS METHODS

Soil sample grain size, plasticity and consistency were evaluated by visual-manual methods and the Unified Soil Classification System as outlined in Appendix C. The resulting descriptions were recorded on the logs in conjunction with soil colors evident at the time of sample examination. The descriptions were separated by stratification lines but, in place, the change between them is usually more gradual.

3.2 SUMMARY OF SUBSURFACE CONDITIONS

The site occupies a predominantly glaciated region of Illinois overlain by a varying depth of wind-deposited loess and some existing fill. Beneath the wind-deposited loess, the glacial till is comprised of weathered horizons with sand seams and granular deposits distributed throughout. The subsurface conditions encountered in the project borings are summarized by the following sections.

Existing FILL - beneath a thin mantle of hot-mix asphalt, existing fill was encountered. The existing fill was comprised of dark brown and brown mixed clays, silty fine sand, and fine sand, with roots, cinders, brick fragments, and gravel. In-place moisture contents within the fill ranged from 3 to about 28 percent. Physical examination of the samples in the laboratory revealed damp to moist samples (often indicative of existing fill). SPT N-values observed in the fill varied from 2 to 8 blows per foot and, generally, decreased with increasing depth. The existing fill extended to depths of about 8.5 feet in the respective borings and gradually transitioned to silty clay (loess).

Silty Clay (Loess) - beneath the existing fill, olive-brown, brown-gray and brown silty clay (loess) was discovered. In-place moisture contents within the silty clay (loess) ranged from 22 to 27 percent. SPT N-values observed within the silty clay (loess) varied from 2 to 6 blows per foot and, generally, increased with increasing depth. Laboratory determination unconfined compressive strengths within the silty clay (loess) were on the order of 0.56 to 1.70 tons per square foot. The silty clay (loess) extended to depths of about 13.5 or fourteen feet in the borings and transitioned to silty clay with sand and sandy silty clay (highly weathered glacial till).

Silty Clay with Sand and Sandy Silty Clay (Highly Weathered Glacial Till) - beneath the wind-deposited loess, brown and light brown silty clay with sand and sandy silty clay (highly weathered glacial till) was encountered. In-place moisture contents within the highly weathered glacial till were about 13 to 18 percent. SPT N-values ranged upward from 4 to 9 blows per foot. Laboratory determined unconfined compressive strengths for intact samples varied from 1.49 to 3.68 tons per square foot. The highly weathered glacial till was underlain by lean clay with sand (weathered glacial till). The transition occurred about 16.5 to 23.5 feet below ground surface in the respective borings.

Lean Clay with Sand trace Gravel (Weathered Glacial Till) - beneath the highly weathered glacial till, olive-brown and brown-gray lean clay with sand (weathered glacial till) was discovered. In-place moisture contents within the weathered glacial till were about 11 to 16 percent. SPT N-values varied from seven to twenty blows per foot. Laboratory determined unconfined compressive strengths for intact samples ranged upward from 1.64 to 3.39 tons per square foot. The weathered glacial till extended to the boring termination depth in B-1. However, in boring B-2 the weathered glacial till was underlain by a glacial deposit near 38.5 feet below ground surface.

Coarse Sand and Gravel (Glacial Deposit) - beneath the weathered glacial till, gray coarse sand and gravel (glacial deposit) was encountered. In-place moisture content and SPT N-value observed in the glacial deposit were 9 percent and 21 blows per foot, respectively. In boring B-2, the glacial deposit continued to the boring termination depth of forty feet below ground surface.

The above paragraphs are intended to provide the reader with a summary of subsurface conditions encountered within the respective borings. Please refer to the Appendix B boring logs for more targeted information.

3.3 COMMENTS ON SOIL STRATIGRAPHY

The above subsurface descriptions are summarized to highlight the major subsurface stratification features and material characteristics. The boring logs included in Appendix B should be reviewed for specific information at respective boring locations and at depths within the borings. These records include soil descriptions, stratifications, penetration resistances and depths of the respective samples and laboratory test data.

The stratifications shown on the boring logs represent the conditions only at the actual boring locations. Variations often occur and should be expected in between boring locations. The stratifications represent the approximate boundary between subsurface materials and the actual transition may be more abrupt or gradual. Water level information obtained during field operations is also provided on these boring logs and is discussed in the following section.

3.4 WATER LEVEL OBSERVATIONS

The soil test borings were monitored for water upon completion of drilling and backfilled shortly after the monitoring period. Resulting depths to groundwater accumulations at the time of exploration are provided in Table C. Please refer to the Appendix B boring logs for additional information.

Table C. Observed Groundwater Accumulations

Boring	Seepage Encountered During Drilling	Depth at Completion
B-1	N/A	N/A
B-2	14.0 feet	N/A

The presence of groundwater may depend on the season, year, and surface drainage patterns. It could vary for reasons not evident at the time of drilling. If more accurate determination of groundwater levels is desired, we recommend that piezometers be installed so that long-term ground water observations may be obtained. Water can collect in trench backfill new construction grading fill depending on the backfill classification and compaction. The effects of water should be carefully considered.

4.0 ANALYSIS AND RECOMMENDATIONS

The subsurface conditions are analyzed in conjunction with the available project information and the geotechnical recommendations depend on the amount of project information provided. You are invited to discuss the project with us. This will enable us to apply available knowledge of soils conditions to actual design problems, convey impressions and offer suggestions.

4.1 PROJECT INFORMATION

It is our understanding that construction of a new crossing over the East Branch of Dry Run Creek is planned. The new crossing is intended to replace an existing box culvert. Based on preliminary design information, a 16-foot wide by 8-foot tall precast or cast-in-place concrete box culvert is currently being considered. In addition, the possibility of a three-sided precast structure designed by a specialty contractor such as Contech is also being evaluated by the design team. In both cases, some manner of cast-in-place concrete wing walls will be required to accommodate the slopes adjacent to the planned crossing.

If any of the above information is not well aligned with the final design or construction documents, please contact us as our recommendations may be affected.

4.2 GEOTECHNICAL CONSIDERATIONS

The project brings discovered existing fill that will extend near the lower limits of the planned crossing structure. Without uniform compaction of fill, strength loss over time, non-uniform subsidence, and increased lateral earth pressures may develop. These factors require special attention in design, construction, and on-going preventative maintenance.

We do not possess construction materials test reports showing the results of compaction tests during construction of the existing box culvert. Therefore, it is necessary to base our evaluation on limited data from the current geotechnical study which seem to indicate that an uncontrolled level of compaction was likely provided, and material quality control was not maintained during placement.

For example, at ASTM D698 optimum moisture content the resulting unconfined compressive strength of cohesive samples is on the order of 9000 pounds per square foot. While soil strength on the wet side of optimum or approaching saturation as in-place fill may over time, varies by soil type our experience has demonstrated that at 95% ASTM D698 compaction strength should be on the order of 5000 or 6000 pounds per square foot. Thus, SPT N-resistances on the order of 15 to 20 blows per foot would be expected in cohesive compacted controlled fill. SPT N-resistance averages within the fill at borings B-1 and B-2 were 5 blows per foot.

With respect to construction of the replacement box culvert option, it will likely be necessary to provide an aggregate working platform to facilitate construction activities and to accommodate in-place soil strengths observed in the borings. With unconfined compressive strengths on the order of about 1.5 tons per square foot approximately eighteen feet below existing ground surface, at least a 6-inch thickness of compacted clean crushed stone (Illinois Gradation CA-7) should be provided. Additionally, a precast or cast-in-place box culvert will occupy the space of some existing fill and will likely result in no net increase in stress beneath the box culvert.

Controlled Fill will also be necessary for excavation backfill. Section 4.3 provides the recommendations.

4.3 CONTROLLED FILL

Controlled fill should consist of sand, crushed stone, lean clay, silty clay or clayey silt having Unified Soil Classifications SM, SW, SP, SC, GM, GW, GC, CL, CL-ML or ML. To inhibit shrinking and swelling, it should have a maximum liquid limit of 45, and its plasticity index should be 20 or less.

Fill should be free of fat clay and organic soil (Unified Soil Classification CH, OL, OH, MH, or PT), frozen material, rubble, degradable material, chemical contaminants and stones that interfere with compaction or compaction testing. In general, at least 70% of the fill should pass a 3/4-inch sieve, the over-size limit for the ASTM D698 maximum density test. Fill should be placed on stable, unfrozen surfaces and in nearly horizontal lifts that have thicknesses that are compatible with the compaction equipment used, but generally not over eight inches.

All fill should be compacted to at least 95% of its maximum dry density determined by ASTM D698, *Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/cu.ft.).* Compaction usually requires adjustment of fill moisture contents to within two or three percentage points of the ASTM D698 optimum moisture.

4.4 SHALLOW FOUNDATIONS

It is our understanding that cast-in-place wingwalls abutting the new box culvert are being considered. In our opinion, a shallow foundation system could be considered to support the cast-in-place wingwalls. In accordance with the IDOT Culvert Manual, Type L walls should bear 3 feet below finished grade and Type T walls should bear 4 feet below finished grade.

For foundations bearing on the medium stiff and stiff native lean clay with sand (weathered glacial till) and sandy silty clay (highly weathered glacial till) encountered in the borings at about eighteen below existing ground surface, a maximum net allowable bearing pressure of 3250 pounds per square foot may be used for design.

The above net pressure is the pressure in excess of that generated by the lowest final grade adjacent to the footings. That is, the new added pressure over and above the pre-existing pressures that is added by newly applied loads. For reference, the existing overburden was estimated using a soil unit weight of 110 pounds per cubic foot while the new overburden was estimated using a soil unit weight of 120 pounds per cubic foot.

For wingwall spread footings, if the pressure permits continuous footing widths of less than 16 or 24 inches, these minimum widths should be provided. Probing and testing of foundation soils by the Geotechnical Engineer during construction is recommended.

If soft or otherwise unsuitable soils are found at some locations during construction over-excavation can be performed. Footings should bear on firmer underlying soils or upon backfill (Controlled Fill) material that restores the design elevation. Backfill may be selected from alternatives listed in the following table.

Table D. Over Excavation Backfill Materials

Backfill Material	Requirement
1" Clean Stone (CA7)	70% Relative Density [(1)]
Flowable Fill (CLSM)	500 psi 28 day Strength
Lean Concrete	1,500 psi 28 day Strength

Table Note:

1.) Compacted until the particles interlock.

When backfill is clean one-inch nominal size crushed stone (Illinois Gradation CA-7), it should extend outside of all footing edges by at least 8 inches per foot of backfill thickness beneath the footings. This is illustrated by Figure 1. If lean concrete or flowable fill backfill are selected to restore the over-excavation, then the over-excavation width may match that of the planned footing dimensions.

Footing bearing surfaces need to be protected from loosening, water-softening or freezing during construction. If soils become disturbed, they should be replaced with lean concrete or Controlled Fill. If trenches encounter groundwater, they should be dewatered and soils should be protected by expedient placement of concrete or by a clean stone working mat.

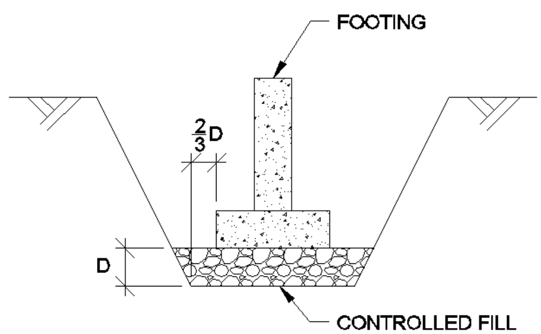


Figure 1. Over-Excavation Sketch

When using the recommended pressure and following the recommendations herein it is our opinion, consolidation settlements should be approximately one inch or less. Differential settlements should be about one-half of the predicted total settlement.

4.5 WALLS BELOW GRADE

Any walls constructed to retain soil should be designed to accommodate unbalanced lateral earth pressures. Estimated lateral earth pressures for cohesive and cohesionless backfill materials are presented in Table E.

Table E. Lateral Earth Pressure Design Parameters

Condition	Cohesive Soil (non-expansive clay)	Cohesionless Soil (granular)
Assumed Backfill Characteristics		
Approximate Total Density	130 pcf	120 pcf
Approximate Friction Angle	15° to 20°	30° to 35°
Active Pressure Coefficient, Ka	0.5	0.3
At-Rest Pressure Coefficient, Ko	0.7	0.5
Passive Pressure Coefficient, Kp	2.0	3.3
Estimated Lateral Earth Pressure[1] (Equivalent Fluid Pressures)		
Active - Drained Active - Undrained[2]	65 pcf 95 pcf	35 pcf 80 pcf
At-Rest - Drained At-Rest - Undrained[2]	90 pcf 110 pcf	60 pcf 90 pcf
Passive - Drained Passive - Undrained[3]	260 pcf 135 pcf	400 pcf 190 pcf

Table Notes:

(1) Assumes no safety factor, negligible wall friction, vertical wall, level backfill, zero surcharge load and ignores soil cohesion.
(2) Combined buoyant backfill unit weight and hydrostatic loading (water = 62.4 pcf).
(3) Excludes hydrostatic loading.

The granular backfill should have a minimum width of 2 feet and be wide enough to accommodate the back-slope limit line of 2:1 (vertical to horizontal) or flatter. The area between the required minimum zone of granular material and the actual limits of excavation may be backfilled with either compacted cohesive or compacted granular soils meeting the requirements of Section 4.3 of this report.

Active earth pressure design assumes that the wall can rotate and deflect at the top. If the wall is rigidly fixed, higher lateral earth pressures will develop against the wall and at-rest pressure parameters should be used for design. Increased earth pressures may also develop from restricted soil drainage, surcharge loads adjacent to the wall and compaction of the adjacent backfill. Expansive soils should not be placed within 3 feet of any retaining walls or used as backfill beneath floor slabs.

Walls retaining fine-grained soils, and subjected to seasonally depressed temperatures, may experience long-term accumulative movement due to soil creep and freeze-thaw action. It is desirable to use free draining granular backfill behind walls to minimize this movement. We recommend that clean granular material be placed directly against the back of the retaining walls and convey water to an acceptable drain system. The drain system may be constructed using perforated pipe encased in clean granular material and sloped to a suitable outlet.

4.6 SEISMIC SITE CLASSIFICATION

Based on the soil conditions encountered in the project borings and guidance provided by the International Building Code, Seismic Site Class "D" should be used for seismic design of the structure. It should be noted that this area is not considered a high-risk seismic zone and the general area has experienced minimal seismic events. A site-specific seismic evaluation, such as Refraction Microtremor (ReMi) survey, could be considered to further evaluate the seismic site class.

4.7 PRECAST CONCRETE BRIDGE UNIT

It is our understanding that construction of a three-sided precast concrete bridge unit is also being consideration. Past project experience with Contech has demonstrated that a precast concrete bridge unit bearing on cast-in-place spread footings with a cast-in-place concrete mat or crushed stone mat within the drainageway to protect against scour is commonly provided. Additional Contech design information is provided by Appendix D.

For foundations bearing on the medium stiff and stiff native lean clay with sand (weathered glacial till) and sandy silty clay (highly weathered glacial till) encountered in the borings at about eighteen feet or more below existing ground surface, a maximum net allowable bearing pressure of 3250 pounds per square foot may be used for design. If necessary, a design subgrade reaction modulus of 60 pci is recommended.

The above net pressure is the pressure in excess of that generated by the lowest final grade adjacent to the footings. That is, the new added pressure over and above the pre-existing pressures that is added by newly applied loads. For reference, the existing overburden was estimated using a soil unit weight of 110 pounds per cubic foot while the new overburden was estimated using a soil unit weight of 120 pounds per cubic foot.

Probing and testing of foundation soils by the Geotechnical Engineer during construction is recommended.

Regarding future settlement beneath the new spread footings and new overlying fill material replacing the loose existing fill, settlement was estimated using both consolidation and elastic analysis methods and considering that the existing loose fill is compacted in accordance with Section 4.3. Since existing fill appears to be lightly rolled in, we assume the fill is compacted to about 90% ASTM D698 while the new fill will be compacted to at least 95% ASTM D698. We estimate this will result in an increase in the fill unit weight of about ten to 15 percent.

Both methods of analysis yielded similar settlement estimates. For possible examination of settlement by Contech, Young's modulus design inputs beneath the new foundations are provided in the following table.

Table F. Young's Modulus for Bearing Soils

Approximate Depth (feet bgs)	Layer Description	Young's Modulus (ksf)
18 to 24	Sandy Silty Clay	280
24 to 38	Lean Clay with Sand	350
38+	Coarse Sand and Gravel	420

When using the recommended pressure and following the recommendations herein it is our opinion, consolidation settlements should be less than one inch. Differential settlements should be about one-half of the predicted total settlement.

5.0 CLOSING REMARKS

5.1 EXCAVATIONS

Excavations may stand with 3- or 4-foot-tall vertical banks for short periods of time but they should not be considered stable. Banks of deeper excavations are not as reliable and may slump or flow especially where fill, sand, or groundwater are encountered.

Excavations should be sloped, stepped, braced, or shored to provide protection of workers and portions of below grade structures under construction. As a minimum, trenching and excavating should conform to local, state, and federal requirements including OSHA 29 CFR Part 1926.

5.2 CONSTRUCTION INSPECTION

Due to the possibility of variation in subsurface conditions at locations not observed by the current geotechnical study, it is recommended that the Geotechnical Engineer observe all subgrades and excavations to verify suitability of the bearing materials. The Geotechnical Engineer should confirm that the bearing surfaces are clean, well prepared, and contain no soft, wet, or otherwise deleterious materials.

In the interest of completeness and to provide a comprehensive contact list to elevate report questions and to schedule future construction materials testing services, applicable IMEG contact information is provided by Table G.

Table G. IMEG Contact Information

IMEG Contact	Organizational Role	Phone	Email
Ruth Arnold	Proposals & Billing	309.605.0145	Ruth.M.Arnold@imegcorp.com
Scott Osmulski	Field Testing Services	309.645.5574	Scott.M.Osmulski@imegcorp.com
Matt Dotson, P.E.	Engineering Questions	563.271.3575	Matt.A.Dotson@imegcorp.com

5.3 STUDY LIMITATIONS

The purpose of this study was to provide limited subsurface information for the site. The borings should assist in prediction of conditions present when executing construction activities. The borings may not reflect all variations that occur across the site and careful construction observations will be necessary to identify conditions requiring adjustments in grading, further excavation, or design. Remedial funds should be available to accommodate changes encountered during construction.

This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No other warranty is expressed or implied.

In the event that any changes in the nature, design or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed, and the conclusions of this report modified in writing by the Geotechnical Engineer.

The borings and report do not assess site environmental conditions or determine presence of pollutants in the soil, rock, and groundwater. Such work is beyond the scope of this study.

*****

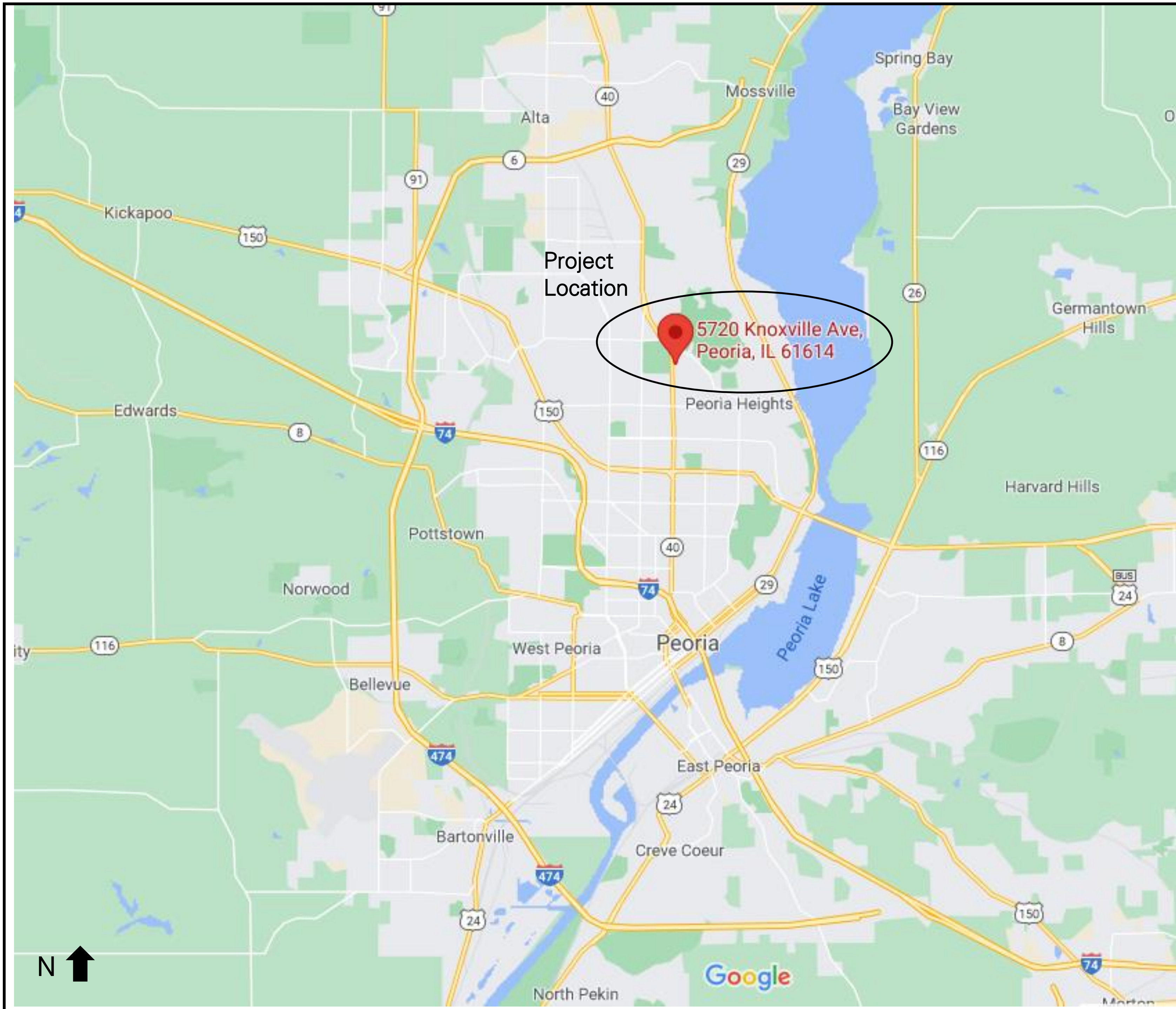
The following figures and appendices are attached and complete this report.

APPENDIX	DESCRIPTION
A	Boring Location Diagram
B	Logs for Borings
C	Soil Description Charts
D	Available Project Information

Appendix A
Boring Location Map

W. Merle Lane over E. Branch Dry Run Creek
Peoria, Illinois

May 10, 2022 (REV 1)
Lab No. 21002430.04



REVISIONS		
No	DESCRIPTION	DATE

IMEG

2406 WEST NEBRASKA AVENUE
PEORIA, ILLINOIS 61604

W. MERLE LANE OVER E.
BRANCH DRY RUN CREEK
PEORIA, ILLINOIS

PROJECT LOCATION MAP

IMEG Project No.
21002430.04

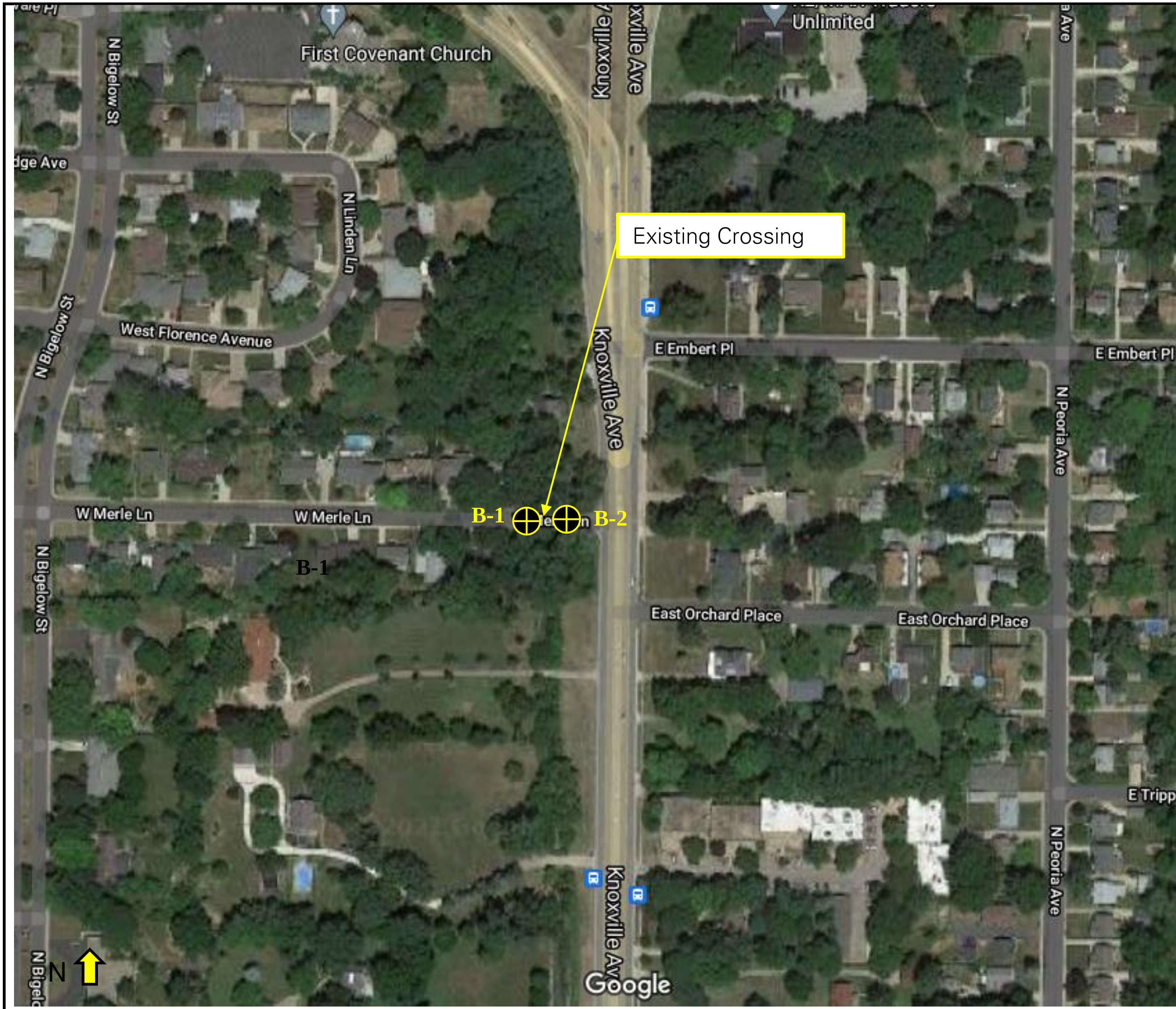
Drawn By: MAD

Checked By: MAD

Date: 2021.08.24

A-1

Sheet 1 of 2



REVISIONS

No	DESCRIPTION	DATE

2406 WEST NEBRASKA AVENUE
PEORIA, ILLINOIS 61604

W. MERLE LANE OVER E. BRANCH DRY RUN CREEK
PEORIA, ILLINOIS

BORING LOCATION PLAN

IMEG Project No. 21002430.04

Drawn By: MAD

Checked By: MAD

Date: 2021.08.24

A-2

Sheet 2 of 2

Appendix B
Logs for Borings

W. Merle Lane over E. Branch Dry Run Creek
Peoria, Illinois

May 10, 2022 (REV 1)
Lab No. 21002430.04

Illinois Department of Transportation
Division of Highways
IMEG Corp

SOIL BORING LOG

Date 08/02/21

ROUTE Merle Lane **DESCRIPTION** Merle Lane Culvert Replacement **LOGGED BY** Fehl

SECTION ______ **LOCATION** Peoria, IL, **SEC.** 28, **TWP.** 9N, **RNG.** 8E, 4th **PM**, **Latitude** , **Longitude**

COUNTY Peoria **DRILLING METHOD** Hollow-Stem Augers **HAMMER TYPE** D-50 Automatic

STRUCT. NO. ______
Station ______

BORING NO. B-01
Station ______
Offset ______
Ground Surface Elev. 0.00 ft

Surface Water Elev. ______ ft
Stream Bed Elev. ______ ft

Groundwater Elev.:
First Encounter None ft
Upon Completion None ft
After - **Hrs.** - ft

Description	Elev./PP	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
3.5-INCH HMA	-0.29				
FILL: Dark Brown, Silty Fine Sand and Gravel, Dry			Grab		3
			Grab		5
Brown, Fine Sand and Gravel, Dry			2		5
Yellow-Brown and Gray-Brown Silty and Lean Clay Trace Gravel, Moist	PP - 1.30		2		27
			3		12
With Dark Brown Cinders and Roots, Damp			3		
			4		14
Gray-Brown Clayey Sand, Moist			4		
		-5			
			1		
Olive-Brown and Brown, Moist			1		20
			1		
	-8.50		2		
SILTY CLAY (LOESS): Olive-Brown and Brown Moist, Medium Stiff	PP = 1.60		2		23
			2		
		-10			
			2		
			3		22
			3		
	PP = 1.70		DD = 101 PCF		
			2		
	-14.00		2		18
SILTY CLAY WITH SAND (HIGHLY WEATHERED GLACIAL TILL): Brown Moist Soft			2		
		-15			
	-16.50		3		
LEAN CLAY WITH SAND (WEATHERED GLACIAL TILL): Brown and Brown-Gray Moist Medium Stiff			4		14
	PP = 2.40		3		
			DD = 121 PCF		
			3		
			6		16
	PP = 1.70		7		
	-20.00	-20	DD = 122 PCF		

Description	Elev./PP	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Trace Pebbles					
Gray-Brown			8		
	PP = 2.20		6		14
			6		
			8		
			7		13
	PP = 2.25		6		
		-25	DD = 124 PCF		
			6		
			7		13
	PP = 2.60		8		
			DD = 131 PCF		
			7		
			8		13
	PP = 2.10		8		
		-30	DD = 123 PCF		
Olive-Brown					
			8		
			9		11
	PP = 3.10		11		
		-35	DD = 127 PCF		
			6		
	PP = 2.50		7		13
	-40.00	-40	9		

End of Boring

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
IMEG Corp

SOIL BORING LOG

Date 08/02/21

ROUTE Merle Lane **DESCRIPTION** Merle Lane Culvert Replacement **LOGGED BY** Fehl

SECTION **LOCATION** Peoria, IL, **SEC.** 28, **TWP.** 9N, **RNG.** 8E, 4th **PM**, **Latitude** , **Longitude**

COUNTY Peoria **DRILLING METHOD** Hollow-Stem Augers **HAMMER TYPE** D-50 Automatic

STRUCT. NO.
Station

BORING NO. B-02
Station
Offset
Ground Surface Elev. 0.00 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter -14.0 Feet ft ▼
Upon Completion None ft
After - **Hrs.** - ft

Description	Elev. / Depth (ft)	PP	Blows (/6")	UCS Qu (tsf)	Moist (%)
4-INCH HMA	-0.33				
FILL: Dark Brown Silty Fine Sand, Gravel and HMA Fragments			Grab		3
			2		15
Very Dark Brown Silty, Fine Sand		PP = 1.30	3		28
Trace Clay			4		19
Brown Lean Clay With Dark Brown Mottles, Very Moist			4		16
Very Dark Brown Cinders, Damp With Red Brick Fragments			2, 3, 1		18
Dark Brown Clayey Sand and Gravel, Damp To Moist	-5				
			2, 2, 1		15
	-8.50				
SILTY CLAY WITH DARK BROWN MOTTLES (LOESS): Brown-Gray, Moist, Soft		PP = 0.55	1, 1, 1	0.56	27
	-10		DD = 98 PCF		
Olive-Brown		PP = 0.60	1, 1, 3	0.45	22
			DD = 103 PCF		
	-13.50				
SANDY SILTY CLAY (HIGHLY WEATHERED GLACIAL TILL): Light Brown, Wet, Medium Stiff	▼	PP = 3.25	2, 3, 4	3.68	14
	-15		DD = 126 PCF		
		PP = 1.20	3, 4, 5	1.66	13
			DD = 125 PCF		
Olive-Brown		PP = 1.75	3, 4, 5	1.52	13
	-20		DD = 124 PCF		

Description	Elev. / Depth (ft)	PP	Blows (/6")	UCS Qu (tsf)	Moist (%)
		PP = 1.50	3, 4, 4	1.49	13
			DD = 126 PCF		
	-23.50				
LEAN CLAY WITH SAND TRACE GRAVEL (WEATHERED GLACIAL TILL): Olive-Brown and Brown, Very Moist, Stiff		PP = 1.55	3, 4, 5	1.64	14
	-25		DD = 122 PCF		
		PP = 2.50	5, 5, 7	2.13	13
			DD = 123 PCF		
		PP = 2.05	4, 5, 9	2.47	14
	-30		DD = 123 PCF		
		PP = 3.40	5, 6, 10	3.39	13
	-35		DD = 124 PCF		
	-38.50				
COARSE SAND AND GRAVEL (GLACIAL DEPOSIT): Gray, Wet, Medium Dense	-40.00 / -40		7, 10, 11		9

End of Boring

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

Appendix C
Soil Description Charts

W. Merle Lane over E. Branch Dry Run Creek
Peoria, Illinois

May 10, 2022 (REV 1)
Lab No. 21002430.04

Soils Descriptions

Soils descriptions are based on the Unified Soil Classification System and ASTM D2488 (visual-manual procedure) unless otherwise indicated. Coarse-grained soils (sands and larger) have more than 50% of dry weight retained on a #200 sieve. They are described as boulders, cobbles, gravel or sand. Fine-grained soils have less than 50% of their dry weight retained on a #200 sieve. They are described as clays or silts depending on their liquid and plastic limits. There can be some sand content in the clays and can be some silt or clay content in the sands. Adjectives are used to further describe these materials. For example:

Lean clay with sand is a clay of low plasticity, thus lean, having 15% to 29% sand grains mixed into it. Sandy lean clay is a clay of low plasticity having 30% to 50% sand grains mixed into it.

Relative Properties of Sand or Gravel in Clay	
Descriptive Term	Percent of Dry Weight
Trace Sand*	Less than 15
With Sand*	15 to 30
Sandy	30 to 50

*or Gravel, Gravelly

Relative Amount of Fines Passing #200 Sieve in Sand or Gravel	
Descriptive Term	Percent of Dry Weight
Trace Clay*	Less than 5
With Clay	5 to 12
Clayey	12 to 50

*or Silt, Silty

Grain-Size Terminology	
Descriptive Term	Diameter (inches)
Boulders	> 12
Cobbles	3 to 12
Gravel	#4 Sieve to 3
Sand	#200 to #4 Sieve
Silt or Clay	< #200 Sieve

Description of Fine-Grained Soils	
For Liquid Limits Less Than 50	
PI > 7	Lean Clay
4 < PI < 7	Silty Clay
PI < 4*	Silt
For Liquid Limits of 50 and Higher	
Plots on or Above A-Line	Fat Clay
Plots Below A-Line	Elastic Silt

*or below A-Line

Definitions	
Liquid Limit (LL)	Moisture content where soil changes from plastic to liquid state as determined by ASTM D4318
Plastic Limit (PL)	Moisture content where soil changes from plastic to semi-solid state as determined by ASTM D4318
Plasticity Index (PI)	Numerical difference between liquid limit and plastic limit (PI = LL - PL)

Consistency of Cohesive (Clayey) Soils				
Description	UCS (psf)	$N^{blows/foot}$	CBR*	Appearance
Very Soft	0 to 500	0 to 2	0.0 to 0.4	Extruded through fingers when squeezed
Soft	500 to 1000	2 to 4	0.4 to 0.8	Molded by very light finger pressure
Medium	1000 to 2000	4 to 8	0.8 to 1.6	Molded by light finger pressure
Stiff	2000 to 4000	8 to 15	1.6 to 3.2	Readily indented by thumb
Very Stiff	4000 to 8000	15 to 30	3.2 to 6.4	Readily indented by thumbnail
Hard	8000+	30+	6.4+	Hard to indent by thumbnail
*California Bearing Ratio (CBR) = subgrade support value for paving expressed as a percent of value for standard crushed stone				

Relative Density of Cohesionless (Sand) Soils		
Description	$N^{blows/foot}$	Friction Angle (degrees)
Very Loose	0 to 4	26 to 30
Loose	4 to 10	28 to 34
Medium	10 to 30	30 to 40
Dense	30 to 50	33 to 45
Very Dense	50+	50+

Note: Lower limits are for fine, clean sand and should be reduced by up to 5 degrees for silty sands. The upper limits are for coarse clean sands.

Grain-Size Terminology	
Descriptive Term	Diameter (inches)
Boulders	> 12
Cobbles	3 to 12
Gravel	#4 Sieve to 3
Sand	#200 to #4 Sieve
Silt or Clay	< #200 Sieve

Comments on Soil Color Descriptions	
Dark Gray, Blue, or Green	Constant submergence with a total absence of available oxygen
Gray with Concretions	Saturation with water of limited oxygen supply
Red-Brown, Yellow-Brown, and Olive-Brown	Abundant supply of oxygen under good condition of drainage
Red-Brown, Yellow-Brown, and Olive-Brown with Gray Mottles	Abundant supply of oxygen under poor drainage conditions (occasional to frequent saturation)

UNIFIED SOIL CLASSIFICATION SYSTEM

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]					Soil Classification	
					Group Symbol	Group Name [B]
Coarse-Grained Soils More than 50% retained on No. 200 sieve	Gravels More than 50% of coarse fraction retained on No. 4 sieve	Clean Gravels Less than 5% fines[C]	$C_u \geq 4$ and $C_c \leq 3$ [E]		GW	Well-graded gravel [F]
			$C_u < 4$ and/or $1 > C_c > 3$ [E]		GP	Poorly graded gravel [F]
		Gravels with Fines More than 12% fines[C]	Fines classify as ML or MH		GM	Silty gravel [F, G, H]
			Fines classify as CL or MH		GC	Clayey gravel [F, G, H]
	Sands 50% or more of coarse fraction passes No. 4 sieve	Clean Sands Less than 5% fines[D]	$C_u \leq 4$ and $1 \leq C_c \leq 3$ [E]		SW	Well-graded sand [I]
			$C_u < 6$ and/or $1 > C_c > 3$ [E]		SP	Poorly graded sand [I]
		Sands with Fines More than 12% fines[D]	Fines classify as ML or MH		SM	Silty sand [G, H, I]
			Fines classify as CL or CH		SC	Clayey sand [G, H, I]
Fine-Grained Soils 50% or more passes the No. 200 sieve	Silts and Clays Liquid limits less than 50	inorganic	PI > 7 and plots on or above "A" line [J]		CL	Lean clay [K, L, M]
			PI < 4 and plots below "A" line [J]		ML	Silt [K, L, M]
		organic	Liquid limit - oven dried	< 0.75	OL	Organic clay [K, L, M, N]
			Liquid limit - not dried			Organic silt [K, L, M, O]
	Silts and Clays Liquid limit 50 or more	inorganic	PI plots on or above "A" line [J]		CH	Fat clay [K, L, M]
			PI plots below "A" line [J]		MH	Elastic silt [K, L, M]
		organic	Liquid limit - oven dried	< 0.75	OH	Organic clay [K, L, M, P]
			Liquid limit - not dried			Organic silt [K, L, M, Q]
Highly Organic Soils	Primarily organic matter, dark in color, and organic odor				PT	Peat

Table Notes:

[A] Based on the material passing the 3-in. (75 mm) sieve.

[B] If field sample contained cobbles or boulders, or both, add "with cobbles" or "boulders", or "both" to group name.

[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

[D] Sands with 5 to 12 % fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay.

[E] $C_u = D_{60} / D_{10}$ $\quad$ $C_C = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains ≥ 15% sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add "with organic fines" to group name.

[I] If soil contains ≥ 15% gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel", whichever is predominant.

[L] If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.

[M] If soil contains ≥ 30% plus No. 200 predominantly gravel, add "gravelly" to group name.

[N] PI ≥ 4 and plots on or above "A" line.

[O] PI < 4 or plots below "A" line.

[P] PI plots on or above "A" line.

[Q] PI plots below "A" line.

Appendix D
Available Project Information

W. Merle Lane over E. Branch Dry Run Creek
Peoria, Illinois

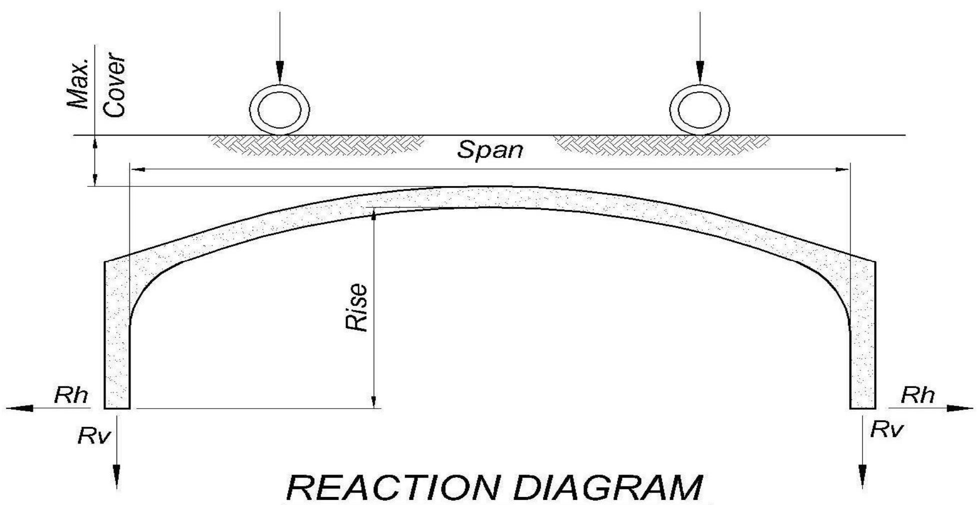
May 10, 2022 (REV 1)
Lab No. 21002430.04

LRFD CULVERT REACTIONS

JOB #: 686636
NAME: East Branch Dry Run Creek
DATE: 9-May-22
BY: MJD

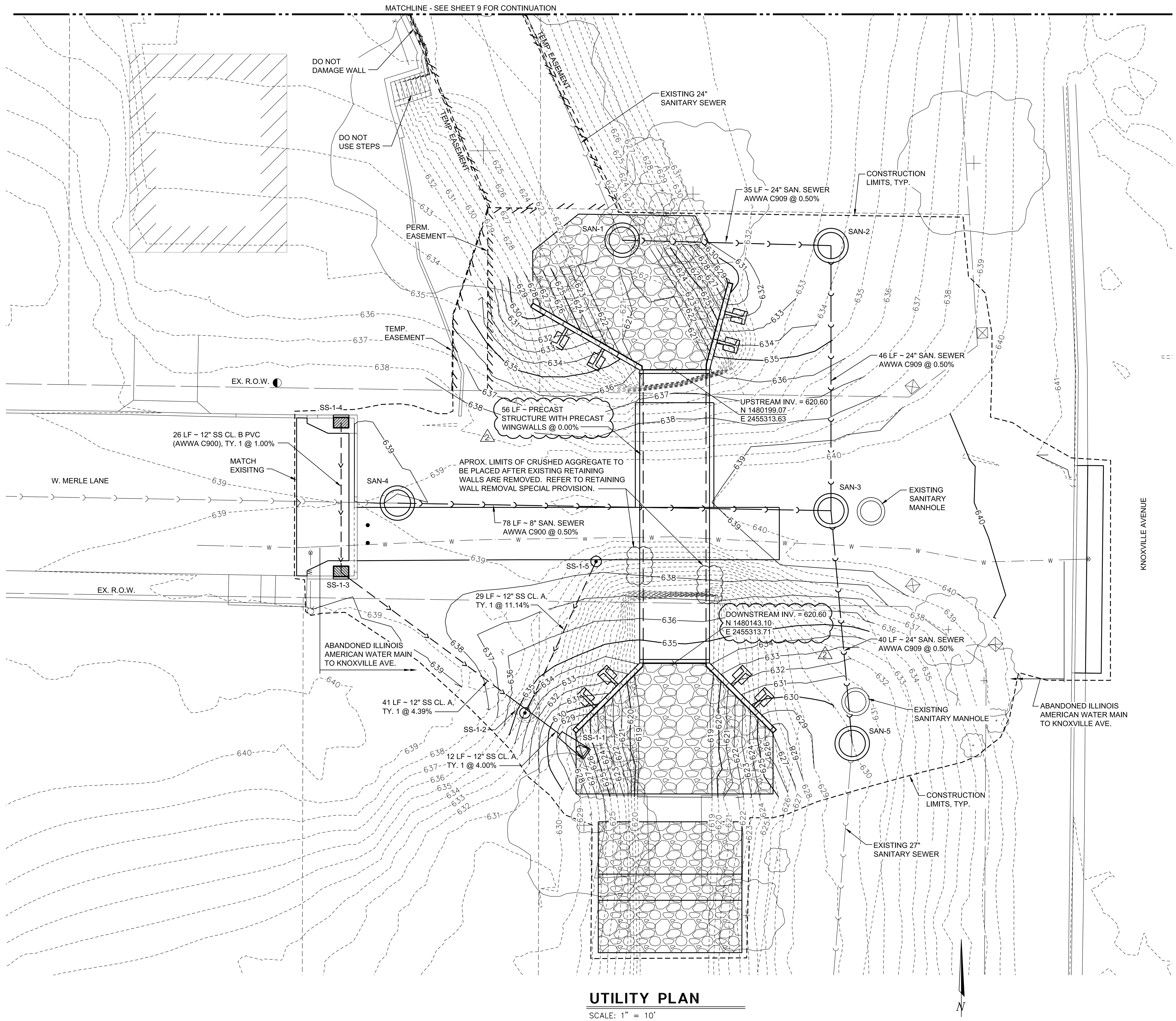
LOADS:

cover, at structure center	**9.5 ft, max**	Vertical load, per leg, R_v (Self Weight), DC	**5.40 k/f**
bridge span	**12 ft**	Vertical load, per leg, R_v (Self Weight + Earth Cover), DC+EV	**16.89 k/f**
bridge rise	**9.2 ft**	Vertical load, per leg, R_v (Self Weight + Earth Cover + LL), DC+EV+LL	**22.24 k/f**
live load	**HL-93**	Vertical load, per leg, R_h (Future Wearing Surface, if applicable), DW	**0.00 k/f**
		Horizontal load, per leg, R_h (Self Weight), DC	**2.90 k/f**
		Horizontal load, per leg, R_h (Self Weight + Earth Cover), DC+EH	**5.51 k/f**
		Horizontal load, per leg, R_h (Self Weight + Earth Cover + LL), DC+EH+LL	**9.43 k/f**
		Horizontal load, per leg, R_h (Future Wearing Surface, if applicable), DW	**0.00 k/f**



REACTION DIAGRAM

Notes:
1) Axle load positions are varied to produce critical reactions shown here.
2) Reactions are unfactored loads.
3) Impact is not included.
4) Units are kips/ft.
5) Soil Weight = 120 pcf.
6) Reactions are based on spread foundations.



STORM STRUCTURE SCHEDULE

SS-1-1	PRECAST REINFORCED CONCRETE FLARED END-SECTION, 12" N 1480125.85 E 2455296.69 INV. = 626.36
SS-1-2	MANHOLE, TY. A, 4' Ø TY. 1 FRAME, CLOSED LID N 1480134.12 E 2455285.54 RIM = 633.92 N.W. INV. = 631.10 (12" RCP) N.E. INV. = 631.10 (12" RCP) S.E. INV. = 626.84 (12" RCP)
SS-1-3	INLET, TY. G-1 N 1480161.64 E 2455250.02 RIM = 638.39 N. INV. = 635.44 (12" AWWA C900) S.E. INV. = 632.90 (12" RCP) (REFER TO INLETS SPECIAL PROVISION FOR BACKFILLING REQUIREMENTS)
SS-1-4	INLET, TY. G-1 N 1480187.98 E 2455250.02 RIM = 638.20 S. INV. = 635.70 (12" AWWA C900) (REFER TO INLETS SPECIAL PROVISION FOR BACKFILLING REQUIREMENTS)
SS-1-5	INLET, TY. A W/ TY. 1 F&G N 1480162.49 E 2455298.71 RIM = 638.33 S.W. INV. = 634.33 (12" RCP)

SANITARY STRUCTURE SCHEDULE

SAN-1	SADDLE-TYPE MANHOLE, 5'Ø PER GPSD STD. 095-50 W/ WATERPROOF MANHOLE CASTING RECESSED PER GPSD STD. 095-38 N 1480223.86 E 2455303.69 RIM = 621.15 EX. N.W. INV. = 617.07 (EX. 24") E. INV. = 616.97 (24")
SAN-2	FLAT TOP MANHOLE, 5'Ø PER GPSD STD. 095-1 W/ STANDARD MANHOLE CASTINGS PER GPSD STD. 095-4 N 1480222.82 E 2455343.58 RIM = 633.60 W. INV. = 616.80 (24") S. INV. = 616.70 (24")
SAN-3	STANDARD DROP MANHOLE, 5'Ø PER GPSD STD. 095-2 W/ STANDARD MANHOLE CASTINGS PER GPSD STD. 095-4 N 1480172.19 E 2455343.58 RIM = 639.40 N. INV. = 616.47(24") S. INV. = 616.37 (24") W. INV. = 631.84 (8") W. INV. INTERNAL DROP = 617.09 (8")
SAN-4	SADDLE-TYPE MANHOLE, 5'Ø PER GPSD STD. 095-1 W/ STANDARD MANHOLE CASTINGS PER GPSD STD. 095-4 N 1480173.63 E 2455260.77 RIM = 638.90 EX. W. INV. = 632.33 (EX. 8") E. INV. = 632.23 (8")
SAN-5	SADDLE-TYPE MANHOLE, 5'Ø PER GPSD STD. 095-50 W/ STANDARD MANHOLE CASTINGS PER GPSD STD. 095-4 N 1480127.72 E 2455347.63 RIM = 630.25 N. INV. = 616.17 (24") EX. S. INV. = 616.03 (EX. 27")

MW
Midwest Engineering
Associates, Inc.
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Peoria, IL 61603
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IL Design Firm Reg. No. 184-005896

UTILITY PLAN

CITY OF PEORIA
DEPARTMENT OF PUBLIC WORKS
CULVERT REPLACEMENT FOR
EAST BRANCH DRY RUN CREEK
AT W. MERLE LANE

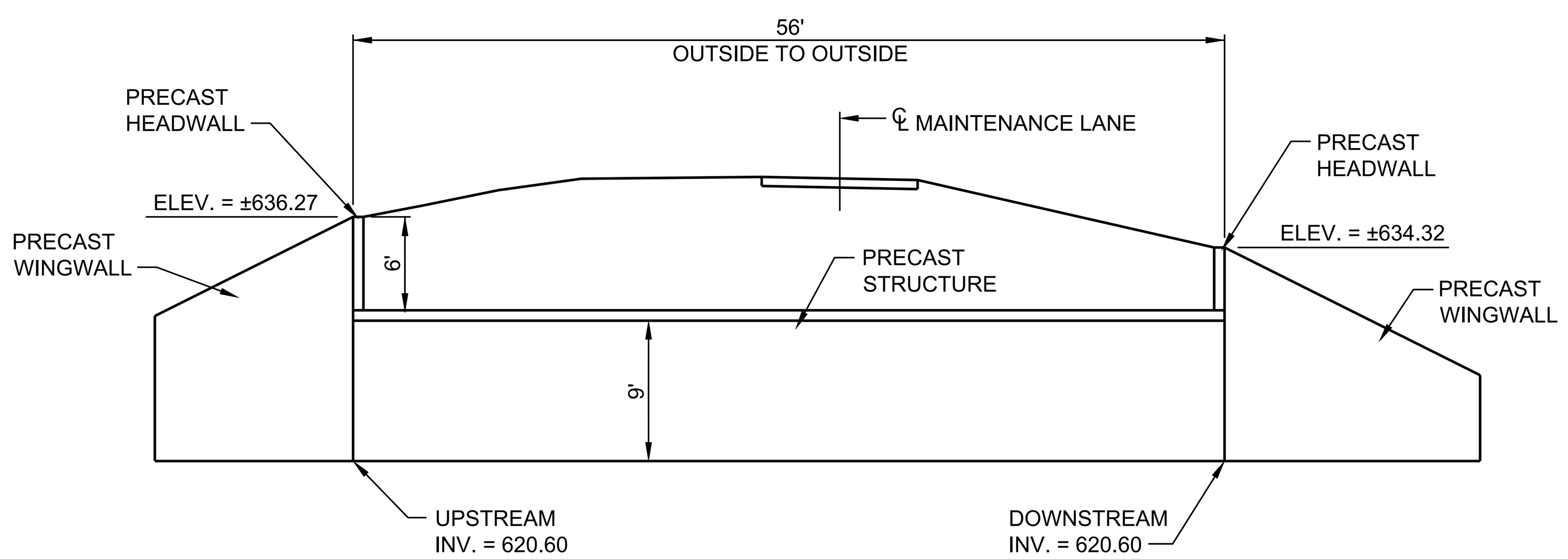
Issued

Rev	Date	Description
2	05/11/22	ADDENDUM NO.2

Designed:	NHP	12/22/2021
Drawn:	CJD	12/22/2021
Checked:	RDC	12/22/2021
Approved:		

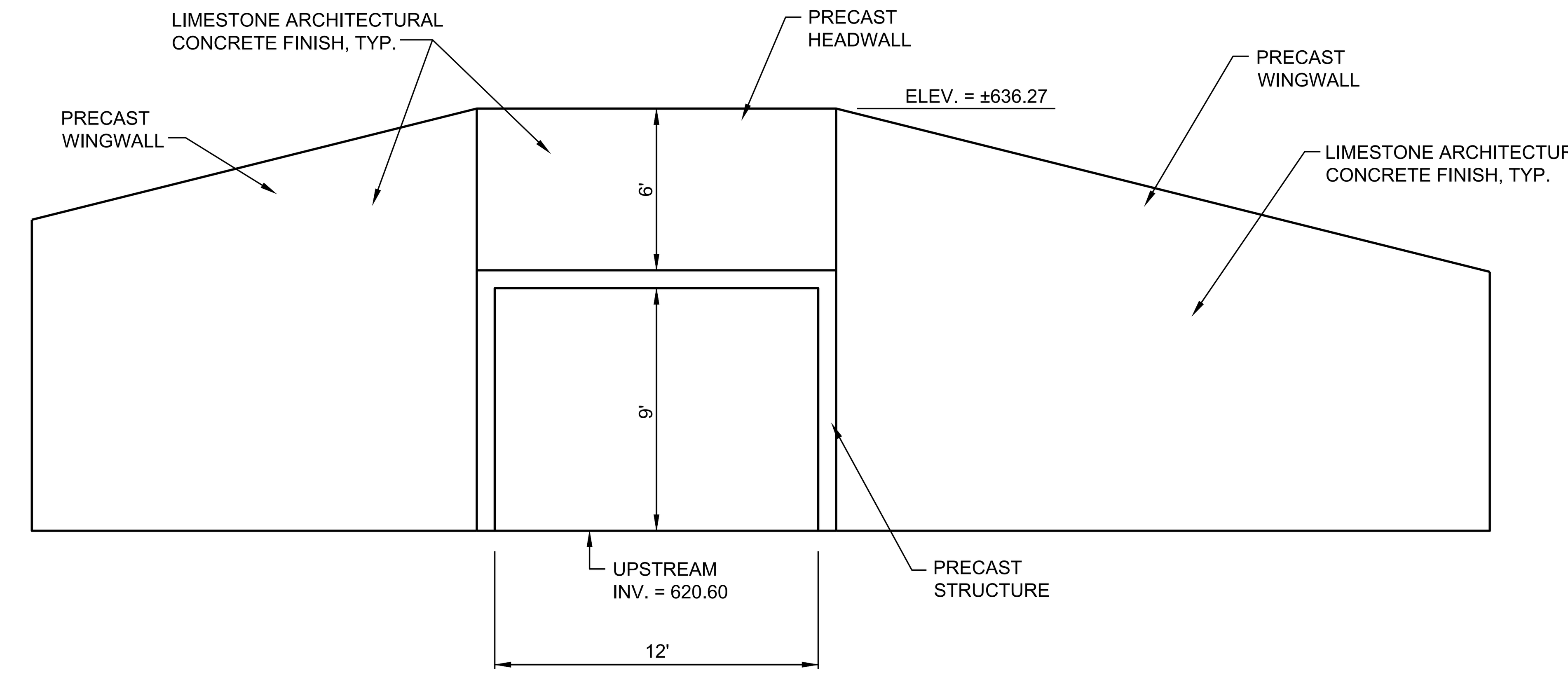
PROJECT NUMBER
20210102

SHEET REFERENCE NUMBER
8



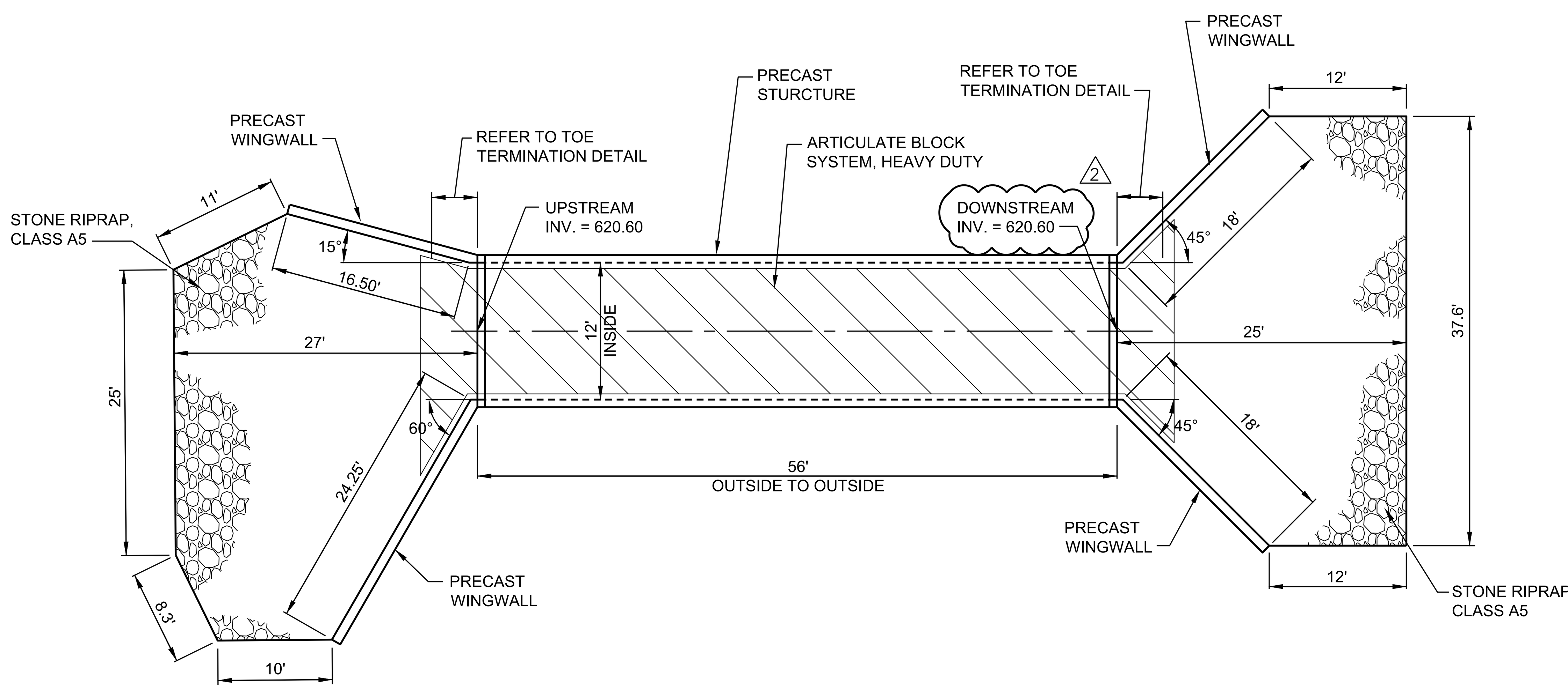
SECTION

SCALE: N.T.S.



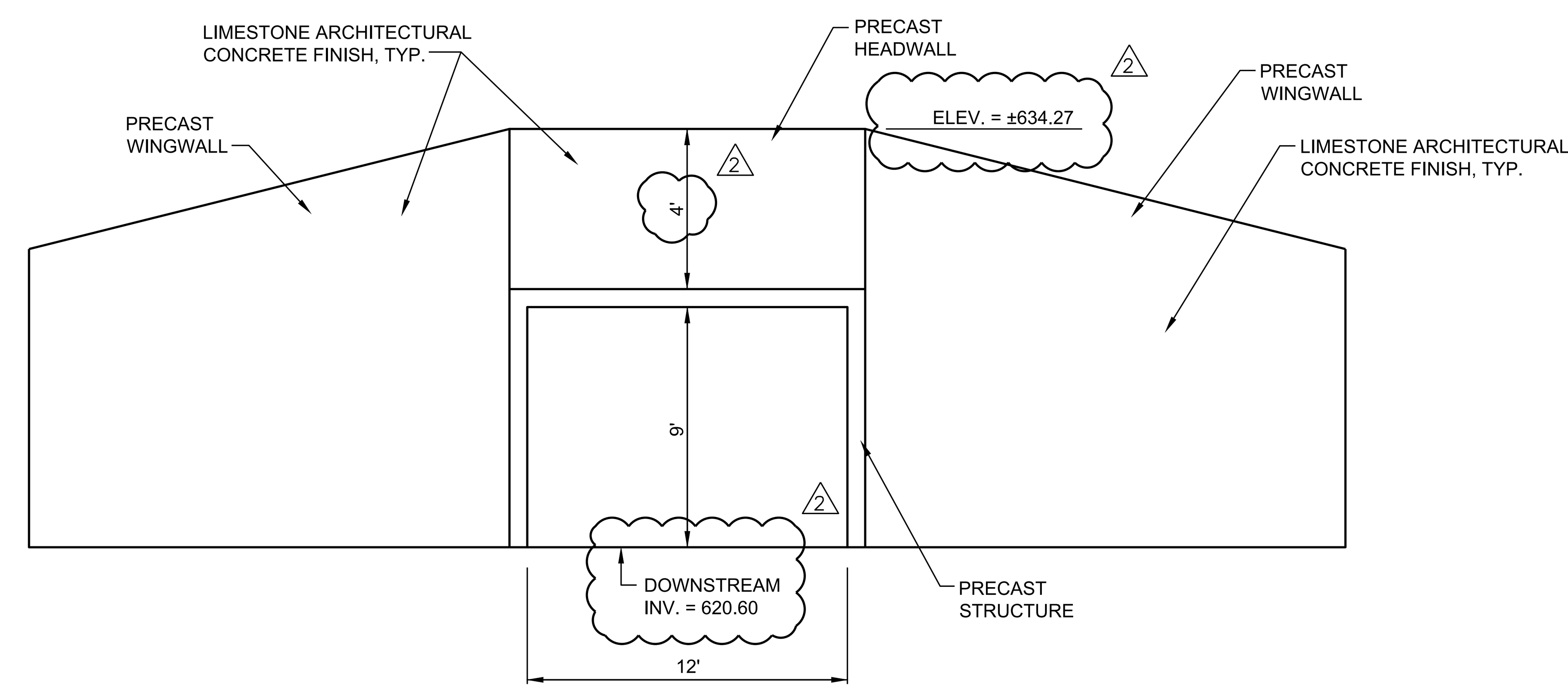
UPSTREAM ELEVATION

SCALE: N.T.S.



PLAN

SCALE: N.T.S.



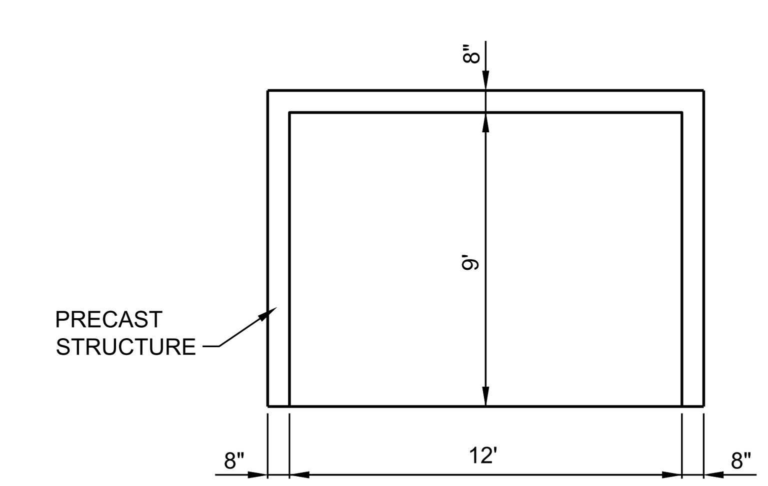
DOWNSTREAM ELEVATION

SCALE: N.T.S.

NOTES:

1. 3-SIDED STRUCTURE SHALL HAVE A MINIMUM OPEN AREA OF 102 SQ.FT. AND A MAXIMUM OPEN AREA OF 108 SQ FT.
2. CHANNEL SLOPE THROUGH STRUCTURE SHALL HAVE A MINIMUM SLOPE OF 0% AND A MAXIMUM SLOPE OF 1%.
3. HEIGHT AND WIDTH DIMENSIONS DEPICT MAXIMUM HORIZONTAL AND VERTICAL DIMENSIONS ONLY. STRUCTURE GEOMETRY MAY DIFFER FROM DETAIL SHOWN AS APPROVED BY ENGINEER.
4. PROVIDED HYDRAULIC INFORMATION IS BASED ON A 12' SPAN BY 9' RISE CONSPAN ARCH MODELED IN HEC-RAS VERSION 5.0.7.
5. SCOUR CALCULATIONS ARE BASED ON A D50 OF 3.829 MM.

NOTE:
THE PRECAST CONCRETE STRUCTURE WORK SHALL CONFORM TO THE SPECIAL PROVISIONS "THREE SIDED PRECAST CONCRETE STRUCTURE (SPECIAL)"



CULVERT ELEVATION

SCALE: N.T.S.

STRUCTURE INFORMATION TABLE

		EXISTING			PROPOSED			
DRAINAGE AREA = 1.45 SQ. MI.		OVERTOPPING ELEVATION = 639.69			OVERTOPPING ELEVATION = 638.56			
FLOOD EVENT	FREQUENCY	DISCHARGE	WATERWAY OPENING	HEADWATER ELEVATION	DISCHARGE	WATERWAY OPENING	HEADWATER ELEVATION	HEAD
	YEAR	CFS	SQ. FT.	FT (NAVD88)	CFS	SQ. FT.	FT (NAVD88)	FT (NAVD88)
DESIGN	25	903	102	632.74	905	102	630.26	-2.48
	50	1,094	102	634.22	1,100	102	631.55	-2.67
BASE	100	1,315	102	635.70	1,317	102	633.44	-2.26
SCOUR DESIGN CHECK	200	1,404	102	636.54	1,411	102	634.51	-2.03

DESIGN SCOUR ELEVATIONS	
FLOOD EVENT	FT
Q25	616.34
Q50	614.23
Q100	611.97
Q200	610.55

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PRECAST STRUCTURE DETAILS

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