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November 3, 2015

ADDENDUM NO.2
to the
Iowa Department of Transportation
Proposal No. 15285
For: New Construction for Des Moines North Maintenance Facility , Brine, Pole and Hoop Buildings
Letting Date: December 2, 2015

Notice To Bidders:
This Addendum is issued to incorporate the following additions, deletions, corrections, and/or clarifications to the terms or specifications and shall hereby be considered a part of the final contract documents. This Addendum shall supersede, modify and/or change all statements to the contrary in the bid proposal and shall take precedence over previous terms or specifications.

CHANGE: Changes to the Drawings:

Sheet SD-1: Add the following note to drawing:

Phase 2 and Phase 3 demolition of existing utilities and buildings to be done only after completion and acceptance of new buildings and site work by the Iowa Department of Transportation. The Iowa Department of Transportation will issue Notice to Proceed to contractor allowing the start of Phase 2 and Phase 3 Demolition. Demolition Completion date to be no later than April 30, 2017.

Sheet SP-1: Add the following notes to "Class 10 Suitable Grading Detail":

Main Building (Garage) below Concrete Pad: Over excavate and backfill with 3' thick granular material under floor slab. The upper 6" shall consist of material having less than 5" particles passing the number 200 sieve. The lower 2''-6" shall consist of material having less than 12% particles passing the number 200 sieve.

Office Area: Overexcavate and backfill with 2' thick granular material under floor slab. The upper 6" shall consist of material having less than 5% particles passing the number 200 sieve. The lower 1'-6" shall consist of material having less than 12% particles passing the number 200 sieve.

Sheet SP-4: Clarification; the 9" thick concrete approach and 6" thick concrete drive noted on the drawing is new concrete should be included in the base bid. The removal of existing concrete approach and drive and installation of new concrete will need to be completed near end of New Buildings and Site Work Construction. Contractor to coordinate with garage staff when access to site will be blocked so they can make the necessary arrangements to move equipment off site during time that approach and driveway is not accessible.

Sheet S001: Replace the notes for the floor slab in the Footing Plan with the following notes:

Main Building (Garage) below Concrete Pad: Overexcavate and backfill with 3' thick granular material under floor slab. The upper 6" shall consist of material having less than 5" particles passing the number 200 sieve. The lower 2''-6" shall consist of material having less than 12% particles passing the number 200 sieve.

Office Area: Overexcavate and backfill with 2' thick granular material under floor slab. The upper 6" shall consist of material having less than 5% particles passing the number 200 sieve. The lower 1'-6" shall consist of

material having less than 12% particles passing the number 200 sieve.

Changes to Specifications:

Section 00 0110: Replace Table of Contents with new Table of Contents (Revised 10/30/2015)

Section 01 1000, Paragraph 1.02.C: Add the following to the Project Description:

Phase 2 and Phase 3 demolition of existing utilities and buildings to be done only after completion and acceptance of new buildings and site work by the Iowa Department of Transportation. The Iowa Department of Transportation will issue Notice to Proceed to contractor allowing the start of Phase 2 and Phase 3 Demolition. Demolition Completion date to be no later than April 30, 2017.

Section 01 4000, Paragraph 1.06.A: Revise Paragraph to read as follows: Iowa Department of Transportation will perform Compressive strength testing of concrete testing and associated lab testing. The contractor is responsible for hiring a third party testing agency to cast cylinders on-site and perform the on-site slump measurement, air content measurement, and concrete temperature.

Section 01 4000, Paragraph 3.03.A.4: Add the following the sentence: The Electrical Contractor is responsible for applying and paying for the electrical permit and for notifying electrical inspection agency for required stage inspections.

Section 02 3100, Paragraph 1.01.A: Insert the attached Geotechnical Report from Chosen Valley to Specifications.

Section 02 4100, Paragraph 1.05 Quality Assurance. Add the following paragraph:

General Contractor is responsible for overseeing the Demolition of the existing buildings and disposal of the debris to appropriate landfills for the type of debris as required by Section 01 7419.

Section 03 3000, Paragraph 3.16.A: Replace the paragraph with the following:

Testing Agency: Engage a qualified testing agency to cast cylinders on-site and perform the on-site slump measurement, air content measurement, and concrete temperature. The Iowa Department of Transportation will perform Compressive strength testing of concrete testing and associated lab testing.

Section 03 3000, Paragraph 3.16.C: Remove Paragraph 3.16.C from specification section. Floor Flatness and Levelness testing is not required for project.

Section 03 3511: Replace section with revised Section 03 3511 dated 10/30/2015

Section 03 4100, Paragraph 3.4.A: Replace Paragraph with the following:

Testing Agency: Engage a qualified testing agency to visually inspect the welded connections made in field on the precast panels.

Section 07 2126 – Blown Insulation for Brine Building: Add this specification to the Project Manual.

Section 31 6000, Paragraph 1.01: Add the following Paragraph "B":

B. Contractor's Option to use the following Common methods and sequence for installing the Geopiers.

1. Install the Geopiers through the existing Soil. Then over excavate the area, install footings and backfill.
2. Over excavate and backfill the entire area. Install the Geopiers and then excavate as required to install the footings. Some contractors don't like this method because the finished backfill becomes disturbed where the Geopiers are drilled.
3. Over excavate the entire area. Then install the Geopiers and footings. Finish with backfilling the entire area. This option would not be good if the work were going to be done in colder months where the subgrade could freeze under the new footings before the backfill is in place.

Substitutions Requests:

Section 22 1316, Paragraph 2.3.C.1: New Age Casting is approved as an acceptable manufacturer for above grade only.

Section 22 3400, Paragraph 2.1.A.1: LAARS Boilers is approved as an acceptable manufacturer.

Section 22 4213.13, Paragraph 2.2.A.1: Moen Commercial Flush Valve Model 8311 is approved as an acceptable manufacturer.

Section 22 4213.16, Paragraph 2.2.A.1: Moen Commercial Flush Valve Model 8316 approved as an acceptable manufacturer.

Section 23 2123, Paragraph 2.2.A.2: Patterson Inline Pumps is approved as acceptable manufacturer.

Section 23 3723, Paragraph 2.2.A.2: Soler & Palau Gravity Ventilators is approved as an acceptable manufacturer.

ADDITIONS:

All Bidders must sign and return this Addendum for the bid opportunity referenced above. Failure to do so may subject the Bidder to disqualification. If a bid response has already been submitted, this Addendum shall be signed and emailed or faxed to the Purchasing Section prior to the scheduled Letting Date.

_____ _____
Company Name *(please print)* Date

_____
Signature

Sincerely,

Jody McNaughton, Purchasing Agent III
Phone No. 515-239-1298 Fax No. 515-239-1538
Jody.McNaughton@dot.iowa.gov

SECTION 00 0110

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SECTION 03 3511

CONCRETE FLOOR FINISHES (REVISED 10/30/2015)

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface treatments for concrete floors and slabs.

B. Bond abrasive polished concrete

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Finishing of concrete surface to tolerance; floating, troweling, and similar operations; curing.

B. Section 03 3000 - Cast-in-Place Concrete: Curing compounds that also function as sealers.

1.03 REFERENCE STANDARDS

A. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2006.

B. ASTM D2370 - Standard Test Method for Tensile Properties of Organic Coatings; 1998 (Reapproved 2010).

C. ASTM E1155 - Standard Test Method for Determining F(F) Floor Flatness and F(L) Floor Levelness Numbers; 1996 (Reapproved 2008).

D. SSPC-Paint 36 - Two-Component Weatherable Aliphatic Polyurethane Topcoat, Performance-Based; 2006.

E. CPPA - Concrete Polishing Association of America

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with concrete floor placement and concrete floor curing.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's published data on each finishing product, including information on compatibility of different products and limitations.

1.06 MOCK-UP

A. For coatings, construct mock-up area under conditions similar to those that will exist during application, with coatings applied.

B. Mock-Up Size: 10 feet square.

C. Locate where directed.

D. Mock-up may remain as part of the work.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's sealed packaging, including application instructions.

1.08 QUALITY ASSURANCE

A. Manufacturing Qualifications: Company specializing in manufacturing the products specified, with minimum 3 years documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum 5 years documented experience. Contractor must provide minimum of two locations for review by owner to verify contractors ability to deliver desired results.

1.09 FIELD CONDITIONS

A. Maintain light level equivalent to a minimum 200 W light source at 8 feet above the floor surface over each 20 foot square area of floor being finished.

B. Maintain ambient temperature of 50 degrees F minimum.

PART 2 PRODUCTS

2.01 DENSIFIERS AND HARDENERS

A. Liquid Densifier/Hardener: Penetrating chemical compound that reacts with concrete, filling the pores and dustproofing; for application to concrete prior to set.
   1. VOC-free, penetrating, semi-transparent liquid.
   2. Composition: Lithium silicate.

2.02 COATINGS

A. High Gloss Clear Sealer: Transparent, non-yellowing, water- or solvent-based coating.
   1. Composition: Acrylic polymer-based.
   2. Nonvolatile Content: 40 percent, minimum, when measured by volume.

2.03 POLISHED CONCRETE SYSTEM

A. Polished Concrete System: Materials, equipment, and procedures designed and furnished by a single manufacturer to produce dense polished concrete of the specified sheen.
   1. Penetrating, solvent-borne acrylic concentrate diluted with acetone and applied to ground or polished floors. Local sand is acceptable.
   2. Acceptable Systems:
      a. L&M Construction Chemicals, Inc: www.lmcc.com.
      b. W.R. Meadows, Inc; Induroshine and Bellatrix Concrete Enhancer: www.wrmeadows.com.
      c. Scofield: Formula One Guard S: www.scofield.com.
      d. Substitutions: See Section 01 6000 - Product Requirements.

2.04 TIE DOWN FIXTURES

A. Provide Buske #527 hold down device in floor as shown on drawings with Buske #526 cover.
   1. Provide drainage through concrete sub-base aggregate to drain water out of tie-down device.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that floor surfaces are acceptable to receive the work of this section.

B. Verify that flaws in concrete have been patched and joints filled with methods and materials suitable for further finishes.

3.02 GENERAL

A. Apply materials in accordance with manufacturer's instructions.

B. Grinding: typical grit sequence.
   1. 50/70 Metal
   2. 100/120 Metal
   3. 30/50 Resin

C. Repairs to surface imperfections.

D. Application of densifier.

E. Honing: typical grit sequence
   1. 100/120 Resin
   2. 200/220 Resin
   3. 400 Resin

F. Polishing: typical grit sequence
   1. 800 Resin
   2. 1500 Resin
   3. 3000 Resin

G. Application of an impregnating microfilming product

3.03 COATING APPLICATION

A. Verify that surface is free of previous coatings, sealers, curing compounds, water repellents, laitance, efflorescence, fats, oils, grease, wax, soluble salts, residues from cleaning agents, and other impediments to adhesion.

B. Protect adjacent non-coated areas from drips, overflow, and overspray; immediately remove excess material.

3.04 CONCRETE POLISHING

A. Execute using materials, equipment, and procedures specified by manufacturer, using manufacturer approved installer.
   1. Final Polished Sheen: High-gloss finish; other sheens are included as comparison to illustrate required sheen; final sheen is before addition of any sealer or coating, regardless of whether that is also specified or not. Reflective clarity : 10, Reflective sheen: 80, Grit range: 800 or higher, Minimum number of abrasive passes: 7
   2. High Gloss Finish: Finish that looks wet and shows mirror-like reflections of side and overhead images.

B. Protect finished surface as required and as recommended by manufacturer of polishing system.

3.05 SCHEDULE

ROOM NO.	ROOM NAME	FINISH	SEALER
100	Vestibule	Smooth	Polished Concrete System
101	Office	Smooth	Polished Concrete System
102	Corridor	Smooth	Polished Concrete System
103	Office	Smooth	Polished Concrete System
104	Conference Room	Smooth	Polished Concrete System
105	Closet	Smooth	Polished Concrete System
106	Mens Restroom	Smooth	Polished Concrete System
107	Womens Restroom	Smooth	Polished Concrete System
108	Corridor	Smooth	Polished Concrete System
109	Mech/Utility Room	Light Broom	Clear Sealer
110	Janitor's Closet	Light Broom	Clear Sealer
111	Storage Closet	Light Broom	Clear Sealer
112	Storage Bays	Light Broom	Liquid Densifier/Hardener
113	Mechanics Bay	Light Broom	Liquid Densifier/Hardener
114	Parts Room	Light Broom	Clear Sealer
115	Mechanical Room	Light Broom	Clear Sealer
116	Hallway	Light Broom	Clear Sealer
117	Wash Bays	Light Broom	Liquid Densifier/Hardener
118	Electrical Rm #2	Light Broom	Clear Sealer
119	Unisex Restroom	Smooth	Clear Sealer
120	Electrical Room	Light Broom	Clear Sealer
Approach Aprons		Medium Broom	
Sidewalks		Medium Broom	

A. Brine Building

Brine Building Pad	Light Broom	Liquid Densifier/Hardener
Brine Tank Storage Pad	Medium Broom	Clear Sealer

B.	**POLE BUILDING PAD**	**MEDIUM BROOM**	**CLEAR SEALER**

END OF SECTION

SECTION 07 2126

BLOWN INSULATION FOR BRINE BUILDING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Ceiling: Loose insulation pneumatically placed through access holes.

1.02 RELATED REQUIREMENTS

A. Section 07 2100 - Thermal Insulation.

1.03 REFERENCE STANDARDS

A. ASTM C764 - Standard Specification for Mineral Fiber Loose-Fill Thermal Insulation; 2011.

B. ASTM C1015 - Standard Practice for Installation of Cellulosic and Mineral Fiber Loose-Fill Thermal Insulation; 2006 (Reapproved 2011)e1.

1.04 SYSTEM DESCRIPTION

A. Materials of This Section: Provide continuity of thermal barrier at building enclosure elements, in conjunction with Section 07 2100.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on product characteristics, performance criteria, limitations .

C. Manufacturer's Installation Instructions: Indicate procedure for preparation and installation.

D. Certificates: Certify that products of this section meet or exceed speciifcations and attach certification to trusses next to attic access..

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Blown Insulation:
   1. CertainTeed Corporation: www.certainteed.com.
   2. Johns Manville Corporation: www.jm.com.
   3. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MATERIALS

A. Loose Fill Insulation: ASTM C764, glass fiber type, bulk for pneumatic placement.
   1. Thermal Conductivity: 0.27 BTU in/(hr sq ft deg F).
   2. Total Thermal Resistance: 11.0 (deg F hr sq ft)/Btu.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation are dry and ready to receive insulation.

B. Verify that light fixtures have thermal cut-out device to restrict over-heating in soffit or ceiling spaces.

C. Verify spaces are unobstructed to allow placement of insulation.

3.02 INSTALLATION

A. Install insulation and ventilation baffle in accordance with ASTM C1015 and manufacturer's instructions.

B. Place insulation pneumatically to completely fill rafter spaces .

C. Completely fill intended spaces. Leave no gaps or voids.

D. Repair and reseal insulation access ports. Refinish to match disturbed work.

3.03 CLEANING

A. Remove loose insulation residue.

3.04 SCHEDULES

A. Exterior Walls: Pneumatically placed into wall stud spaces .

B. Attic Spaces: Pour insulation between ceiling joists to achieve an R value of 38.

END OF SECTION

C V T

Chosen Valley Testing

Design Phase Geotechnical Evaluation:

Proposed Maintenance Facility

Iowa Department of Transportation

Des Moines, Iowa

Prepared for:

Mr. Jerry Burnes

Iowa Department of Transportation

December 23 2014

6600.14.IAM

Chosen Valley Testing, Inc.

Geotechnical Engineering and Testing • 225 North Jackson Avenue • Mason City, Iowa 50401 • Telephone (641) 201-1050• Fax (641) 201-1012

Mr. Jerry Burnes
Iowa Department of Transportation
800 Lincoln Way
Ames, Iowa 50010
jerry.burnes @dot.iowa.gov

December 23, 2014

Re: Design Phase Geotechnical Evaluation
Proposed Maintenance Facility
NE 54th Ave and NE 15th St
Des Moines, Iowa
CVT Project Number: 6600.14.IAM

Dear Mr. Burnes:

We have completed the geotechnical evaluation authorized for the proposed maintenance facility for the Iowa Department of Transportation in Des Moines, Iowa. This letter briefly summarizes the findings and analysis detailed in the attached report.

Summary of Boring Results

At the surface, the western building borings and the parking lot boring encountered about 7 inches of bituminous. The bituminous was underlain by about 4 inches of aggregate base. Aggregate base was encountered at the surface in the northwestern building boring, to a depth of about 3 feet.

Clay fill was encountered below the surface layer of the western building borings and the parking lot boring as well as at the surface in the remaining borings. The clay fill was encountered to depths of about 4 to 13 feet below the surface.

Below the bituminous, aggregate base, and clay fill, all of the building area borings except one encountered slightly organic sandy lean clays. This material was encountered to depths of about 6½ to 22½ feet. We did not encountered a vegetative matt, so this appears to represent "B-Horizon" topsoil or possibly alluvial soil.

Glacial till consisting mostly of sandy lean clay was encountered below the dark clay layer as well as below the fill layer in the stormwater boring, parking lot boring as well as in one of the building area borings. All of the borings terminated in glacial sandy clay approximately 11 to 26 feet below the surface.

Water was observed in the southeastern boring at a depth of about 14 feet. Elevated moisture contents were also recorded in some of the upper glacial till layers. This is likely due to water becoming perched above the low permeable clay layers.

Summary of Analysis and Recommendations

Foundation Support Options: The bituminous, aggregate base and clay fill is not considered suitable for support of the assumed loads. These materials should be completely removed from the building areasand were encountered to depths of about 4 to 13 feet at the locations explored.

The slightly organic clay layer is not suitable for direct support of foundations, but is not highly organic and total removal is not considered warranted. That being said, we recommend providing a cushion of engineered fill between footings and these materials. Based on the data, we recommend that this cushion be at least equal to the width of overlying strip footing or half the width of the associated column footing.

We recommend that geotechnical personnel from Chosen Valley Testing be on hand during construction in order to review the bearing soils when they are better exposed during construction, and to evaluate the conditions and grading with regard to the analyses and recommendations in this report.

After earthwork corrections are implemented, frost-depth footings are expected to bear on engineered fill overlying buried topsoil and glacial till. With the understood foundation loads and implementation of the earthwork recommendations, we are of the opinion that foundations may be designed to exert a bearing pressures up to 3,000 pounds per square foot (psf). Total settlements of footings are expected to be on the order of 1 inch or less. Differential settlement is expected to be on the order of ½ inch or less between similarly loaded footings.

Because of the depth of corrections, alternative foundation systems, such as Geopiers or piling, may be more economically feasible than standard soil correction and should be considered. We believe that Geopiers would likely be the most cost effective alternative, and this type of system would likely allow use of higher capacity spread footing foundations.

Slab Support Options: We recommend the paving layers and clay fill be removed from below all building slabs. If required due to project economics, the owner could consider a partial removal option – which could also apply to the deep foundation/Geopier options. With this approach, we recommend providing 2 feet of engineered fill between slabs and the existing fill. The existing fill could be used for this purpose, provided any highly organic, debris laden or otherwise unsuitable materials are used. Otherwise, to produce a higher quality subgrade and potentially allow a thinner pavement section, we recommend using granular material. A 3-foot engineered fill cushion is recommended below the maintenance building bays and a 2-foot cushion below all other interior slabs not receiving heavy-truck traffic.

Remarks

For more details of our analysis and recommendations, please see the attached report. We appreciate the opportunity to help you on this project. If you have any questions or need additional information, please contact us at (641) 201-1050.

Sincerely,
Chosen Valley Testing, Inc.

Matt Reisdorfer, PE
Geotechnical Engineer

Colby T. Verdegan, PE
Sr. Geotechnical and Materials Engineer

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APPENDIX **11**

Design Phase Geotechnical Evaluation
Proposed Maintenance Facility
Iowa Department of Transportation
NE 54th Ave and NE 15th St
Des Moines, Iowa

CVT Project Number: 6600.14.IAM
December 23, 2014

A. Introduction

The intent of this report is to present our findings and describe the means used to collect the data. The data was collected for a specific purpose and may not be suitable for other purposes. We should be consulted before attempting to use the data for other uses. A complete and thorough review of the entire document, including its assumptions and its appendices, should be undertaken immediately upon receipt.

A.1. Purpose

This geotechnical report was prepared to aid design and construction of the proposed maintenance facility for the Iowa Department of Transportation (Iowa DOT) in Des Moines, Iowa. Our services were authorized by Mr. Jerry Burnes of the Iowa DOT.

A.2. Scope

To provide data for analysis, a total of seven penetration test borings were performed, with five of the borings performed in the area of the proposed maintenance building, one boring performed in the proposed parking lot and one boring performed in the proposed stormwater pond. The borings for the proposed structures were originally planned to be drilled to depths of about 20 feet, with the stormwater boring and parking lot boring planned to be drilled to depths of about 15 feet. Boring B-2 was extended to a depth of about 25 feet due to a thick layer of slightly organic soils still present at 20 feet. To offset the additional footage, Boring B-6 was drilled to a reduced depth of about 10 feet. Our scope included recommendations for design of foundations, slabs as well as recommendations for earthwork corrections.

A.3. Boring Locations

The desired boring locations were indicated to Chosen Valley Testing (CVT) by the Iowa DOT on a provided site plan. These boring locations were determined by overlaying the site plan on Google Earth Software to obtain GPS coordinates. The boring locations were located in the field using a handheld GPS device. Borings B-2 and B-6 were offset due to utility constraints on-site. The soil boring location sketch in the Appendix shows the locations of the soil borings as drilled. These locations should be considered very approximate.

The ground surface elevations at the borings were estimated using a laser level. The finished floor of the existing building, which has a known elevation of 912.60 feet, was used as a benchmark.

A.4. Geologic Background

A geotechnical report is based on subsurface data collected for the specific structure or problem. Available geologic data from the region can help interpretation of the data and is briefly summarized in this section.

Geologic maps suggest that the project is in a wide area known to have been the subject of extensive filling in the past. The natural soils in the area are primarily glacial till deposits of clay, silt, and sand mixtures. Bedrock is likely 100 to 200 feet below the surface.

B. Exploration Results

The borings were performed using penetration test procedures (Method of Test D1586 of the American Society for Testing and Materials). This procedure allows for the extraction of intact soil specimen from deep in the ground. With this method, a hollow-stem auger is drilled to the desired sampling depth. A 2-inch OD sampling tube is then screwed onto the end of a sampling rod, inserted through the hole in the auger's tip, and then driven into the soil with a 140-pound hammer dropped repeatedly from a height of 30 inches above the sampling rod. The sampler is driven 18 inches into the soil, unless the material is too hard. The samples are generally taken at 2½ to 5-foot intervals. The core of soil obtained is classified and logged by the driller and a representative portion is then sealed and delivered to the soils engineer for review.

B.1. Stratification

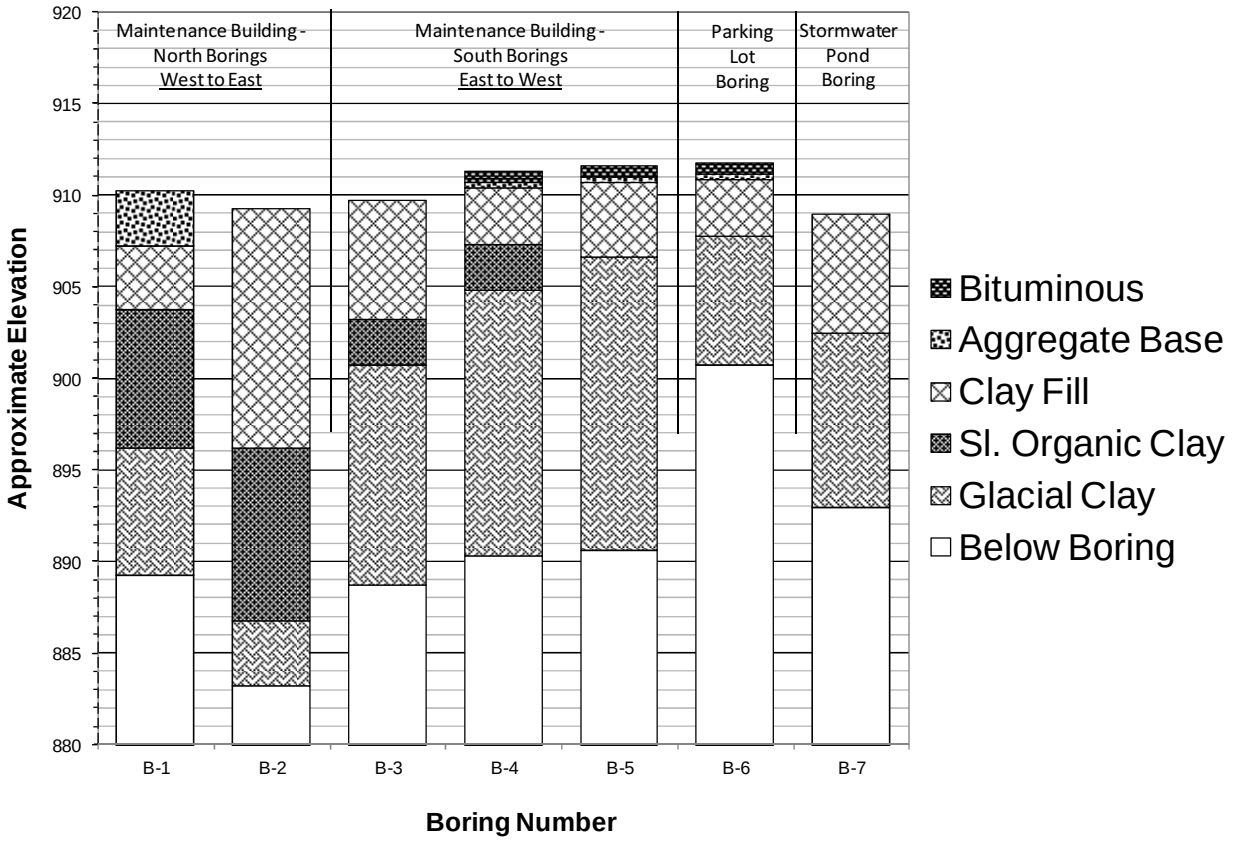
At the surface, the western building borings (Borings B-4 and B-5) and the parking lot boring (Boring B-6) encountered about 7 inches of bituminous. The bituminous was underlain by about 4 inches of aggregate base. Aggregate base was encountered at the surface in the northwestern building boring (Boring B-1), to a depth of about 3 feet.

Clay fill was encountered below the surface layer of the western building borings and the parking lot boring as well as at the surface in the remaining borings. The clay fill was encountered to depths of about 4 to 13 feet below the surface.

Below the bituminous, aggregate base, and clay fill, all of the building area borings except Boring B-5 encountered slightly organic sandy lean clays. This material was encountered to depths of about 6½ to 22½ feet. We did not encountered a vegetative matt, so this appears to represent “B-Horizon” topsoil or possibly alluvial soil.

Glacial till consisting mostly of sandy lean clay was encountered below the dark clay layer as well as below the fill layer in the stormwater boring (Boring B-7), parking lot boring (Boring B-6) as well as Boring B-5. All of the borings terminated in glacial sandy clay approximately 11 to 26 feet below the surface.

The soil boring data has been summarized in the following cross-section, and also labeled and configured in a northwest to southeast manner. Please refer to the individual log of boring sheets for more detailed information.



B.2. Penetration and Laboratory Test Data

The number of blows needed for the hammer to advance the penetration test sampler is an indicator of soil characteristics. The number of blows to advance the sampler 1 foot is called the penetration resistance or "N"-value. The results tend to be more meaningful for natural mineral soils, than for fill soils. In fill soils, compaction tests are more meaningful.

Penetration resistance values ("N" Values) of 10 to 20 blows per foot (BPF) were recorded in the clay fill. Resistance values of 8 to 18 BPF were returned in the slightly organic clay, indicating it was medium to very stiff. The glacial till returned values of 7 to 18 BPF, indicating it was medium to very stiff.

Pocket penetrometer tests were performed on the cohesive materials to determine the shear strength of the soil. The glacial till returned values of ¾ to 2¼ tsf.

A key to the descriptors used to qualify the relative density of soil (such as *soft, stiff, loose,* and *dense,*) can be found on the Legend to Soil Description in the Appendix.

B.3. Ground Water Data

Methods: During drilling, the drillers may note the presence of moisture on the sampler, in the cuttings, or in the borehole itself. These findings are reported on the boring logs. Because water levels vary with weather, time of year, and other factors, the presence or lack of water during exploration is subject to interpretation and is not always conclusive.

Water was observed in the southeastern boring (Boring B-3), at a depth of about 14 feet. This corresponds to an elevation of about 83 feet on the datum used to locate the borings. Elevated moisture contents were also recorded in some of the upper glacial till layers. This is likely due to water becoming perched above the low permeable clay layers. Groundwater levels are expected to fluctuate with seasonal weather patterns along with water levels of nearby streams and rivers.

C. Design Information

Each structure has a different loading configuration and intensity, different grades, and different structural and performance tolerances. Therefore, the geotechnical exploration will be construed differently from one structure to another. If the initial structure should change design, we should be engaged to review these conditions with respect to the prevailing soil conditions. Without the opportunity to review any such changes, the recommendations may no longer be valid or appropriate.

The project consists of a single-story, slab-on-grade maintenance building. The maintenance building is expected to consist of cast-in-place concrete footings, precast wall panels and precast double-tees.

Estimated design loads were not available at the time of this report, but we assumed maximum strip footing loads will be on the order of about 6 to 15 kips per lineal foot. The column loads were assumed to be on the order of about 160 kips.

The finished floor elevation of the of the maintenance building is understood to be near elevation 912.6 feet and is expected to receive about 1 to 3 ½ feet of fill to obtain finished floor elevations. Frost depth footings are assumed to bear near elevation 908 feet.

D. Analysis

D.1. Foundation Support Options

The bituminous, aggregate base and clay fill is not considered suitable for support of the assumed loads. These materials should be completely removed from the building and oversize areas. The bituminous was about 7 inches thick at the locations explored. The aggregate base was about 4 inches to 3 feet thick. The clay fill was encountered to depths of about 4 to 13 feet at the locations explored.

The slightly organic clay layer is not suitable for direct support of foundations, but is not highly organic and total removal is not considered warranted. That being said, we recommend providing a cushion of engineered fill between footings and these materials. Based on the data, we recommend that this cushion be at least equal to the width of overlying strip footing or half the width of the associated column footing.

We recommend that geotechnical personnel from Chosen Valley Testing be on hand during construction in order to review the bearing soils when they are better exposed during construction, and to evaluate the conditions and grading with regard to the analyses and recommendations in this report.

After earthwork corrections are implemented, frost-depth footings are expected to bear on engineered fill overlying buried topsoil and glacial till. With the understood foundation loads and implementation of the earthwork recommendations, we are of the opinion that foundations may be designed to exert a bearing pressures up to 3,000 pounds per square foot (psf). Total settlements of footings are expected to be on the order of 1 inch or less. Differential settlement is expected to be on the order of ½ inch or less between similarly loaded footings.

Because of the depth of corrections, alternative foundation systems, such as Geopiers or piling, may be more economically feasible than standard soil correction and should be considered. We believe that Geopiers would likely be the most cost effective alternative, and this type of system would likely allow use of higher capacity spread footing foundations.

D.2. Slab Support Alternatives

We recommend the paving layers and clay fill be removed from below all building slabs. If required due to project economics, the owner could consider a partial removal option – which would also apply to the deep foundation/Geopier options. With this approach, we recommend providing 2 feet of engineered fill between slabs and the existing fill. The existing fill could be used for this purpose, provided any highly organic, debris laden or otherwise unsuitable materials are used. Otherwise, to produce a higher quality subgrade and potentially allow a thinner pavement section, we recommend using granular material. A 3-foot engineered fill cushion is recommended below the maintenance building bays and a 2-foot cushion below all other interior slabs not receiving heavy-truck traffic.

D.3. Remarks

The remainder of this report provides recommendations for a soil correction alternative. Geopiers are a patented design-build foundation option, and designs of those foundations are provided by the installer. At the designer's request, we have contacted Ground Improvement Engineering with regard to this option. If this option will be pursued, some additional exploration would likely be needed to facilitate their design, and deeper borings would be needed to evaluate other deep foundation options. These additional services were beyond our initial work scope.

E. Building Recommendations

E.1. General Grading Recommendations

E.1.a. Removal of Paving Materials and Fill from Building Area: The bituminous, aggregate base and clay fill is not considered suitable for support of the assumed loads. These materials should be completely removed from the building and oversize areas. The bituminous was about 7 inches thick at the locations explored. The aggregate base was about 4 inches to 3 feet thick. The clay fill was encountered to depths of about 4 to 13 feet at the locations explored.

E.1.b. Removal of Dark, Slightly Organic Natural Clays from Below Foundations: The slightly organic clay layer is not suitable for direct support of foundations. We recommend removing these materials as needed to provide a cushion of engineered fill between footings and these materials. Based

on the data, we recommend that this cushion be at least equal to the width of overlying strip footing or half the width of the associated column footing. As an example, no dark clays should be present within 4 feet below any 4-foot wide strip footings, nor within 2 feet below any 4-foot by 4-foot square footings.

The following table presents the apparent depth from footings to the top of the slightly organic clay layer at the locations explored.

Boring Location	Approx. Ground Surface Elevation (feet)	Approx. Depth Paving Materials and Fill (feet)	Approx. Top Elevation of Sl. Organic Clay, if present (feet)	Assumed Footing Elevation (feet)	Approx. Depth from Bottom of Footing to Top of Sl. Organic Clays (feet)
B-1	910	6 ½	903 ½	908	4 ½
B-2	909	13	896	908	8
B-3	909 ½	6 ½	903	908	5
B-4	911 ½	4	907 ½	908	½
B-5	911 ½	6 ½	905	908	3

E.1.b. Slab Support Alternative: As mentioned in Section D.2., we recommend the paving layers and clay fill be removed from below all building slabs. If required due to project economics, the owner could consider a partial removal option – which would also apply to the deep foundation/Geopier options. With this approach, we recommend providing 2 feet of engineered fill between slabs and the existing fill. The existing fill could be used for this purpose, provided any highly organic, debris laden or otherwise unsuitable materials are used. Otherwise, to produce a higher quality subgrade and potentially allow a thinner pavement section, we recommend using granular material. A 3-foot engineered fill cushion is recommended below the maintenance building bays and a 2-foot cushion below all other interior slabs not receiving heavy-truck traffic.

E.1.c. Excavation Review: We also recommend that Chosen Valley Testing be retained to evaluate the suitability of the bearing soils and their consistency with our expectations based on the soil boring data.

E.1.d. Oversizing: Any corrective excavations should be oversized at least 1 foot beyond the foundations for each foot of fill needed below footing grade. This over-sizing can be reduced by up to 50% if rather precise staking is present during grading, and the excavation limits can be rather precisely confirmed relative to the foundations.

E.1.e. Filling and Compaction: For ease in compaction, we recommend using imported sand or gravel having less than 12% particles passing a number 200 sieve, as engineered structural fill below all foundations. Aggregate base, limestone screenings, or similar materials could also be considered, but will require more stringent moisture control during compaction.

We understand a retention pond is planned in the vicinity of Boring B-7. We understand the client intends to use the excavated clays from the retention pond as borrow material on-site. Because of the

variation in fill depths on the site, we do not recommend using clay backfill in the support zone below the footings. As noted in Section E.1.b. clay fill can be considered below slab areas for the building, provided it is free of organics and debris and subject to use of lower design support values for the slabs.

The upper 6 inches of fill placed directly below slabs is recommended to have less than 5% particles passing the number 200 sieve.

All fill below building and oversizing areas should be compacted to a minimum of 95% of its maximum standard Proctor density (ASTM D 698).

E.2. Building Design

E.2.a. Foundation Depth: For frost protection, we recommend that exterior foundations for heated structures bear on soils at least 42 inches below the exposed ground surface. Interior footings for heated structures can be placed directly below slabs. Footings for unheated structures should be placed 60 inches below the surface.

E.2.b. Bearing Capacity and Settlement: With the understood foundation loads and implementation of the earthwork recommendations, we are of the opinion that foundations may be designed to exert bearing pressures up to 3,000 psf. This capacity includes a safety factor of at least 3 against shear failure.

Based on a bearing pressure of 3,000 psf, total settlement of footings are expected to be on the order of 1 inch or less. Differential settlement is expected to be on the order of ½ inch or less between similarly loaded footings.

E.2.c. Vapor Barrier and Drainage: If the slab will receive coverings that are less permeable than concrete, a vapor barrier should be placed below the slab. Some contractors prefer to place this barrier below sand, to limit the potential for curling.

E.2.d. Slab Design: The completed slab subgrade is expected to consist of either clay fill or a thick layer of sand over the existing clay fill. We recommend using a modulus of subgrade reaction of up to 125 pounds per cubic inch for the all clay subgrade and 200 pci for a subgrade with the thick sand cushion.

F. Paved Areas

F.1. Stripping and Grading

The boring performed in the proposed parking lot and driveway encountered bituminous surfacing overlying aggregate base. These materials will likely need to be removed, as the project plans indicate the pavement at this location is to consist of concrete.

Below the surface layers, fill clay was encountered. Seeing that the fill clay has been under the bituminous and aggregate base layer for numerous years, this material is likely suitable for use under the

proposed pavement sections. We recommend that the fill clay layer be scarified and compacted, and then test-rolled to delineate any zones of soft or unsuitable soils. Unstable areas should be moisture conditioned and recompacted as needed to pass a test roll. The top surface should be shaped to drain, to prevent localized soft spots or frost boils in the subgrade.

F.2. Pavement Design

The majority of the parking and driveways on-site are to have of granular surfacing. Some areas of driveways and parking lots are planned to receive 6 inches of PCC overlying 6 inches of aggregate base. We are of the opinion that the clay subgrade native soils as well as engineered fill are capable of supporting the planned concrete pavement sections.

At the writing of this report, no traffic loads were available. The pavement sections should be considered preliminary, subject to review by the project civil engineering consultant, and their experience with pavement design and performance in the area of the project, and considerations of more detailed traffic loading.

G. Construction Recommendations

G.1. Excavation

Stripping can likely be performed with a variety of equipment, provided the soils are not overly wet. A backhoe is recommended for deep excavations. A smooth-lipped bucket is recommended to limit disturbance to underlying soil layers.

G.2. Groundwater/De-watering

Water was encountered in the southeast boring at a depth of about 14 feet, but is not expected to be encountered during construction. Due to the fine-grained nature of the soils that dominate the site, we would expect that sump pits would likely be adequate to control any moisture in the excavations, if encountered.

G.3. Filling and Compacting

Fill should be placed in lifts adjusted to the compactor being used and the material being compacted. We recommend limiting lifts to no more than 12 inches for sand fill materials and 8 inches of clay fill materials – assuming large, self-propelled or tow behind compactors are used.

If site grading is anticipated during cold weather, we recommend that good winter construction practices be observed. All snow and ice should be removed from cut and fill areas prior to additional grading. No fill should be placed on soils that have frozen or contain frozen material. Frozen soils should not be used as fill.

G.4. Construction Testing and Documentation

The bottom of all excavations should be evaluated and documented by geotechnical personnel, after the unsuitable soils are removed from the building site, and before filling. Fill placed below building and paved areas should be evaluated for conformance to the project gradation recommendations and should be tested for compaction. If the filling proceeds during periods of freezing weather, full-time testing should be considered to help confirm that imported fill is thawed prior to and during compaction, and that all snow has been removed before placement of the fill.

Although our firm offers testing services relating to civil and structural components of the building (such as concrete testing, reinforcement observations, etc.) specification of such services is beyond our work scope and the designer should be consulted as to such requirements.

H. Level of Care

The services provided for this project have been conducted in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in this area, under similar budget and time constraints. This is our professional responsibility. No other warranty, expressed or implied, is made.

I. Certification

I hereby certify that this report was prepared by me or under my direct supervision, and that I am a duly registered engineer under the laws of the State of Iowa.

Matthew J. Reisdorfer, PE
Geotechnical Engineer
Registration Number 22234
Date: December 23, 2014

Appendix

Boring Location Sketch

Log of Boring # 1-7

Legend to Soil Description

C V T

Chosen Valley Testing, Inc.

Legend

Boring Locations

Benchmark

N

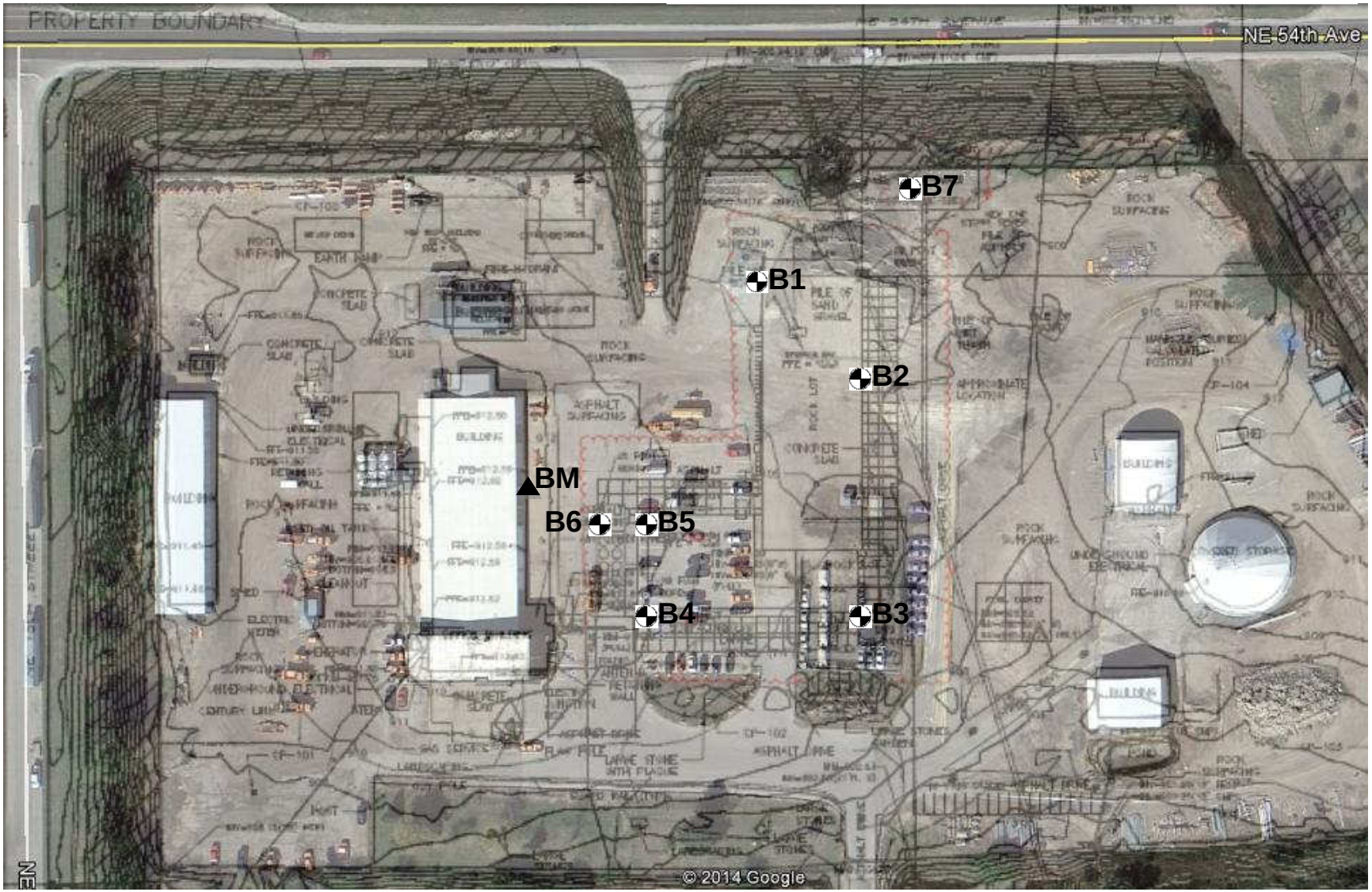
Soil Boring Location Sketch

Proposed Iowa DOT Maintenance Facility

NE 54th Ave and NE 15th St

Des Moines, Iowa

6600.14.IAM



LOG OF BORING

CHOSEN VALLEY TESTING

PROJECT: 6600.14.IAM Design Phase Geotechnical Evaluation Proposed Maintenance Facility NE 54th Ave and NE 15th St Des Moines, Iowa	BORING: **B-1** LOCATION: Matt / DevinSee attached sketch. DATE: 12/16/14 SCALE: 1" = 4'

Elev.	Depth	ASTM D2487 Symbol	Description of Materials (ASTM D2488)	BPF	WL	Tests or Notes
910.2	0.0		**AGGREGATE BASE**			Benchmark: Finished floor of existing building, located west of borings. Assigned elevation 100.0 feet.
907.7	2.5	CL	**SANDY LEAN CLAY** black to brown to gray, mix, wet, stiff. (Fill)	14		
				13		PP = 3.0 tsf MC = 19.8%
903.7	6.5	CL OL	**Organic to Slightly Organic LEAN CLAY with SAND** trace pin roots and organic fibers, black, wet, rather stiff to very stiff. (B-Horizon/Alluvium)	18		PP = 2.0 tsf MC = 27.7%
				11		PP = 1.75 tsf MC = 33.4%
				12		PP = 1.0 tsf MC = 25.6%
896.2	14.0	CL	**SANDY LEAN CLAY** brown to gray, mottled, wet, medium to very stiff. (Glacial Till)	8		PP = 1.75 tsf MC = 19.5%
				18		No sample returned.
889.2	21.0		End of boring. Boring sealed upon completion.			

LOB 6600.14.IAM (IOWA DOT DES MOINES NORTH) (SEE REPORT AND STANDARD PLATES FOR EVALUATION AND DESCRIPTIVE TERMINOLOGY.)

LOG OF BORING

CHOSEN VALLEY TESTING

PROJECT: 6600.14.IAM Design Phase Geotechnical Evaluation Proposed Maintenance Facility NE 54th Ave and NE 15th St Des Moines, Iowa	BORING: **B-2** LOCATION: Matt / DevinOffset south approximately 85 feet. See attached sketch. DATE: 12/16/14 SCALE: 1" = 4'

Elev.	Depth	ASTM D2487 Symbol	Description of Materials (ASTM D2488)	BPF	WL	Tests or Notes
909.2	0.0	CL	**SANDY LEAN CLAY** with brick debris, black to brown to gray, mix, wet, very stiff. (Fill)	20		
				18		MC = 22.4%
				14		PP = 1.25 tsf
				12		Poor sample return. MC = 17.3%
896.2	13.0			9		PP = 1.75 tsf MC = 23.6%
		CL OL	**Slightly Organic LEAN CLAY with SAND** trace pin roots and organic fibers, black, wet, medium to stiff. (B-Horizon/Alluvium)	8		PP = 1.0 tsf MC = 30.8%
				13		Poor sample return. MC = 25.3%
886.7	22.5	CL	**SANDY LEAN CLAY** trace of gravel, gray, wet, stiff. (Glacial Till)	14		PP = 1.75 tsf MC = 16.9%
883.2	26.0		End of boring. Boring sealed upon completion.			

LOB 6600.14.IAM (IOWA DOT DES MOINES NORTH) (SEE REPORT AND STANDARD PLATES FOR EVALUATION AND DESCRIPTIVE TERMINOLOGY.)

LOG OF BORING

CHOSEN VALLEY TESTING

PROJECT: 6600.14.IAM Design Phase Geotechnical Evaluation Proposed Maintenance Facility NE 54th Ave and NE 15th St Des Moines, Iowa	BORING: **B-3** LOCATION: Matt / DevinSee attached sketch. DATE: 12/16/14 SCALE: 1" = 4'

Elev.	Depth	ASTM D2487 Symbol	Description of Materials (ASTM D2488)	BPF	WL	Tests or Notes
909.7	0.0	CL	**SANDY LEAN CLAY** with gravel, black to brown to gray, mix, wet, rather stiff. (Fill)	12 10		MC = 22.4%
903.2	6.5	CL OL	**Slightly Organic SANDY LEAN CLAY** black, wet, stiff. (B-Horizon/Alluvium)	15		PP = 2.5 tsf MC = 22.5%
900.7	9.0	CL	**LEAN CLAY with SAND** grayish brown, wet, medium. (Glacio-Fluvium)	7		PP = 0.75 tsf MC = 26.1%
898.2	11.5	SC	**SANDY LEAN CLAY to POORLY-GRADED SAND** Alternating layers, fine to medium-grained, trace gravel, light brown to light gray, wet to water bearing, medium to rather stiff or loose to medium dense. (Glacio-Fluvium)	7 11	▽	PP = 0.75 tsf Water encountered around 14 feet during drilling. MC = 21.4%
891.7	18.0	CL	**SANDY LEAN CLAY** gray, wet, rather stiff. (Glacial Till)	12		PP = 1.5 tsf MC = 18.2%
888.7	21.0		End of boring. Boring sealed upon completion.			

LOB 6600.14.IAM (IOWA DOT DES MOINES NORTH) (SEE REPORT AND STANDARD PLATES FOR EVALUATION AND DESCRIPTIVE TERMINOLOGY.)

LOG OF BORING

CHOSEN VALLEY TESTING

PROJECT: 6600.14.IAM Design Phase Geotechnical Evaluation Proposed Maintenance Facility NE 54th Ave and NE 15th St Des Moines, Iowa	BORING: **B-4** LOCATION: Matt / DevinSee attached sketch. DATE: 12/16/14 SCALE: 1" = 4'

Elev.	Depth	ASTM D2487 Symbol	Description of Materials (ASTM D2488)	BPF	WL	Tests or Notes
911.3	0.0					
910.7	0.6		**7" ASPHALT**			
910.4	0.9		**4" AGGREGATE BASE**			
		CL	**SANDY LEAN CLAY** trace gravel, black to brown, mix, wet, stiff. (Fill)	14		MC = 20.1%
907.3	4.0					
		CL OL	**Slightly Organic to Organic SANDY LEAN CLAY** trace pin roots and organic fibers, black, wet, very stiff. (B-Horizon/Alluvium)	18		PP = 2.75 tsf MC = 20.4%
904.8	6.5					
		CL	**SANDY LEAN CLAY** trace gravel, light gray, medium to rather stiff. (Glacio-Fluvium)	10		PP = 0.75 tsf MC = 24.9%
				7		PP = 0.75 tsf
899.8	11.5					
		CL	**SANDY LEAN CLAY** gray, wet, medium to stiff. (Glacial Till)	12		PP = 1.5 tsf
				7		PP = 1.25 tsf MC = 18.0%
				14		PP = 2.25 tsf MC = 17.1%
890.3	21.0					
			End of boring. Boring sealed upon completion.			

(SEE REPORT AND STANDARD PLATES FOR EVALUATION AND DESCRIPTIVE TERMINOLOGY.)

LOB 6600.14.IAM (IOWA DOT DES MOINES NORTH) 6/5/12

LOG OF BORING

CHOSEN VALLEY TESTING

PROJECT: 6600.14.IAM Design Phase Geotechnical Evaluation Proposed Maintenance Facility NE 54th Ave and NE 15th St Des Moines, Iowa	BORING: **B-5** LOCATION: Matt / DevinSee attached sketch. DATE: 12/17/14 SCALE: 1" = 4'

Elev.	Depth	ASTM D2487 Symbol	Description of Materials (ASTM D2488)	BPF	WL	Tests or Notes
911.6	0.0					
911.0	0.6		**7" ASPHALT**			
910.7	0.9		**4" AGGREGATE BASE**			
		CL	**SANDY LEAN CLAY to CLAYEY SAND** fine to medium-grained, trace of gravel, black to brown, mix, wet, stiff. (Fill)	15		MC = 14.9%
				14		
905.1	6.5					
		CL	**SANDY LEAN CLAY** trace gravel, gray to brown, mottled, wet, rather stiff to stiff. (Glacial Till)	9		MC = 21.9%
			Seam of sand encountered around 10 feet.	11		PP = 1.0 tsf
				14		PP = 1.0 tsf MC = 19.4%
			Seam of sand encountered around 15 feet.	14		PP = 1.25 tsf
			Gray around 20 feet.	15		PP = 2.0 tsf MC = 17.1%
890.6	21.0					
			End of boring. Boring sealed upon completion.			

LOB 6600.14.IAM (IOWA DOT DES MOINES NORTH) 6/5/2012

(SEE REPORT AND STANDARD PLATES FOR EVALUATION AND DESCRIPTIVE TERMINOLOGY.)

LOG OF BORING

CHOSEN VALLEY TESTING

PROJECT: 6600.14.IAM Design Phase Geotechnical Evaluation Proposed Maintenance Facility NE 54th Ave and NE 15th St Des Moines, Iowa	BORING: **B-6** LOCATION: Matt / DevinSee attached sketch. DATE: 12/17/14 SCALE: 1" = 4'

Elev.	Depth	ASTM D2487 Symbol	Description of Materials (ASTM D2488)	BPF	WL	Tests or Notes
911.7	0.0					
911.1	0.6		**7" ASPHALT**			
910.8	0.9	CL	**4" AGGREGATE BASE** **SANDY LEAN CLAY** trace of gravel, black to brown to gray, wet, medium. (Fill)	8		MC = 17.3%
907.2	4.5	CL	**SANDY LEAN CLAY** trace gravel, brown to gray, mottled, wet, medium to rather stiff. (Glacial Till)	9		PP = 1.0 tsf MC = 15.1%
				8		PP = 1.0 tsf
				11		PP = 1.25 tsf
900.7	11.0		End of boring. Boring sealed upon completion.			

LOB 6600.14.IAM (IOWA DOT DES MOINES NORTH) 6-12-13 (SEE REPORT AND STANDARD PLATES FOR EVALUATION AND DESCRIPTIVE TERMINOLOGY.)

LOG OF BORING

CHOSEN VALLEY TESTING

PROJECT: 6600.14.IAM Design Phase Geotechnical Evaluation Proposed Maintenance Facility NE 54th Ave and NE 15th St Des Moines, Iowa	BORING: **B-7** LOCATION: Matt / DevinSee attached sketch. DATE: 12/16/14 SCALE: 1" = 4'

Elev.	Depth	ASTM D2487 Symbol	Description of Materials (ASTM D2488)	BPF	WL	Tests or Notes
908.9	0.0	CL	**SANDY LEAN CLAY** trace gravel, black to brown, mix, wet, rather stiff to stiff. (Fill)	16		MC = 18.8%
				11		
902.4	6.5	CL	**SANDY LEAN CLAY** trace seams of sand in upper 12 feet, brown to gray, mottled, wet, rather stiff to stiff. (Glacial Till)	13		PP = 2.0 tsf MC = 18.5%
				12		
			Gray below 12 feet.	9		PP = 1.25 tsf MC = 18.0%
				11		PP = 1.25 tsf
892.9	16.0		End of boring. Boring sealed upon completion.			

LOB 6600.14.IAM (IOWA DOT DES MOINES NORTH) 6/5/2013 (SEE REPORT AND STANDARD PLATES FOR EVALUATION AND DESCRIPTIVE TERMINOLOGY.)