Iowa Department of Transportation

SPECIAL PROVISIONS
FOR
BASELINE SUBSURFACE CONDITIONS SUMMARY FOR TUNNELING

Woodbury County
IM-NHS-029-6(257)147--03-97

Effective Date
March 18, 2014

THE STANDARD SPECIFICATIONS, SERIES 2012, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE SPECIAL PROVISIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

120139.01 DESCRIPTION.

A. Summary.
Baseline subsurface conditions expected during the construction of the tunnels and shafts for the Project. The baseline subsurface conditions described in this Special Provision will be used in the evaluation of quantities associated with unit prices and in the determination of differing site conditions during tunnel and shaft construction. Actual conditions could vary from those described herein, but the Contractor shall use representations of this Special Provision in preparation of his bid.

B. References.
The following documents contain geotechnical information which was used in evaluating the baseline subsurface conditions for the Project.

- "Geotechnical Engineering Report, I-29 Utility Relocation, Sioux City, Iowa" prepared by Terracon Consultants, Inc, Omaha, Nebraska, March 16, 2013 (GER #1).
- "Geotechnical Engineering Report [I-29 Utility Relocation] Floyd River Siphon Crossing, Floyd Boulevard, Sioux City, Iowa" prepared by Terracon Consultants, Inc, Sioux City, Iowa, November 5, 2013 (GER#2).

C. Definitions.
Tunneling areas are shown in the Contract Drawing Plan and Profile.

120139.02 CONSTRUCTION.

This Article describes the soil conditions at the tunnels.

A. Based on the project soil borings the unconsolidated materials in the Project area are predominantly FILL (lean clay, lean to fat clay, silt, sand) (Note: rubble materials such as rubber, wood, slag, brick and gravel were encountered in the FILL at Borings B-9, B-12, B-18, B-21, B-22, B-27, B-28, B-29, B-43, and B-44 at depths ranging from 3 to 13 feet below ground surface; overlying ALLUVIUM (lean clay, lean to fat clay, silt, sand). Reference GER #1 page 4. In general

the soils that will be encountered will be sensitive to disturbance from construction activity and water seepage. The boring logs indicate the proposed trenchless installation sections will be formed primarily in soft clay and sand, possibly below the water table. Even with appropriate dewatering or depressurizing of the sands, these soils will be susceptible to caving and sloughing. Trenchless techniques used should not rely on these soils standing open beyond the tunnel face or on vertical cuts. If complete dewatering cannot be provided for the entire length of installation, a shield or compensating pressure will be required to prevent running of the sands and squeezing of the soft clays.

B. Based on the project soil borings the unconsolidated materials at the vicinity of the Floyd River Sanitary Siphon Crossing are predominately FILL (fat clay, sand); overlying ALLUVIUM consisting of medium dense SAND, hard to soft fat CLAY, loose to medium dense SAND – CLAYEY SAND. Reference GER #2 page 2. In general the soils that will be encountered will be sensitive to disturbance from construction activity and water seepage. The boring logs indicate the proposed trenchless installation sections will be formed primarily in soft clay and sand, possibly below the water table. Even with appropriate dewatering or depressurizing of the sands, these soils will be susceptible to caving and sloughing. Trenchless techniques used should not rely on these soils standing open beyond the tunnel face or on vertical cuts.. I complete dewatering cannot be provided for the entire length of installation, a shield or compensating pressure will be required to prevent running of the sands and squeezing of the soft clays.

C. Densities, consistencies, and compressive strengths of the soils are as indicated on the project borings. Sieve analyses performed on selected soil samples are included in GER #1 Appendix B, and GER#2 Appendix B.

D. Tunneling Conditions.

1. 54 inch Sanitary Sewer, approximate Station 138+35 to 140+27; 24 inch Sanitary Sewer, approximate Station 604+55 to 614+95; 12 inch Sanitary Sewer, approximate Station 615+17 to 616+68; 36 inch Sanitary Sewer; approximate Station 800+05 to 803+80:

- **a.** The tunnel shall be constructed using a trenchless technique selected by the Contractor subject to review.
- **b.** The tunnel will be constructed in a combination of man-made fill, and alluvial deposits of clay and sand. The majority of the tunnel will be constructed in the underlying clay strata. Tunneling methods should not rely on these soils standing open beyond the tunnel face or on vertical cuts. These soils will be susceptible to caving and sloughing. The clay will behave as squeezing if dewatered and flowing if wet. Volatile Organic Compound (VOC) contaminates are not anticipated but could be encountered while tunneling.
- **c.** Groundwater – The tunneling methods and equipment must be designed to account for groundwater above the tunnel elevation. Design is based on a groundwater elevation at ground surface.

2. 54 inch Sanitary Sewer Carrier Pipe installed in an 84 inch Casing; approximate Station 129+80 to 134+14:

- **a.** The tunnel shall be constructed using a remotely controlled, steerable, guided Microtunnel Boring Machine (MTBM) that fully supports the excavated face with either slurry or earth pressure at all times. Lubrication of the MTBM and casing during installation will be required.
- **b.** The tunnel will be constructed in a combination of man-made fill, and alluvial deposits of clay and sand. Tunneling methods should not rely on these soils standing open beyond the tunnel face or on vertical cuts. These soils will be susceptible to caving and sloughing. VOC contaminates are not anticipated but could be encountered while tunneling.

c. Groundwater – The tunneling methods and equipment must be designed to account for groundwater above the tunnel elevation. Design is based on a groundwater elevation at 1071 feet.

d. There will be a tendency to lose slurry or grout in sand layers. Lubricating slurry will need to be thick enough to prevent this from occurring.

3. 24 inch and 30 inch Two Barrel Sanitary Sewer Siphon each installed in a separate 36 inch casing; approximate Station 802+57 to 813+80:

a. The tunnels shall be constructed using Horizontal Directional Drilling (HDD) techniques.

b. The tunnel will be constructed in a combination of man-made fill, and alluvial deposits of clay and sand overlying sand. The majority of the tunnel will be constructed in the underlying sand strata. Tunneling methods should not rely on these soils standing open beyond the tunnel face or on vertical cuts. These soils will be susceptible to caving and sloughing. The sand will behave as running if dewatered and flowing if wet. VOC contaminates are not anticipated but could be encountered while tunneling.

c. Groundwater – The tunneling methods and equipment must be designed to account for groundwater above the tunnel elevation. Design is based on a groundwater elevation at elevation 1094 feet.

d. There will be a tendency to lose slurry or grout in the sand layers. Lubricating slurry will need to be thick enough to prevent this from occurring.

E. Pit Construction.

1. Pit excavation and support associated with the tunneling shall be designed to support sands, silts, clays and hydraulic loading.

2. Dewatering using a remote system of well points or deep well(s) extending into the sands shall be installed to control groundwater in pit excavations.

a. The dewatering system shall include open standpipe piezometers allowing measurement of groundwater levels by the CONTRACTOR during dewatering.

b. The dewatering system shall be installed and operating prior to the start of excavation and shall be designed to lower and maintain the water level at least 5 feet below the lowest level of excavation at all times during construction.

120139.03 METHOD OF MEASUREMENT AND BASIS OF PAYMENT.

Baseline Subsurface Conditions Summary for Tunneling: Incidental to trenchless technique used and will not be paid for separately.