
**ROADWAY GEOTECHNICAL REPORT
US 52 IOWA SECTION
FROM STATION 1546+00 to STATION 1560+65
IDOT PROJECT P-92-001-11
SECTION 104B-2, CONTRACT No. 64G59
JACKSON COUNTY, IOWA**

**for
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11. Abstract <p>Between Stations 1546+00 and 1560+65, the US 52 roadway will be realigned, widened, and reconstructed to accommodate the construction of the new US 52 Bridge over Mississippi River. The reconstructed roadway will have 12-foot wide traffic lane, 8-foot wide shoulder and guardrail in each direction. The embankments on both sides are proposed to be with a maximum slope of 1:2 (H:V). The improvements will run on either existing fill or new embankment. The preliminary pavement structure design shows 9.5 inches of asphalt over 12 inches of aggregate subgrade along the lanes, and 8.0 inches of asphalt over 12 inches of aggregate subbase along the shoulders.</p> <p>Along the improvement, the roadway slopes are covered by rip-rap and discontinuous vegetation. Existing lane pavement structure includes up to 7-inch thick asphalt over granular base. Beneath the surface the soil consists of up to 12.0 feet of fill, up to 7.5 feet of very loose to loose sand to sandy loam, up to 16.3 feet of very soft to stiff silty clay to silty clay loam, and more than 95.0 feet of loose to dense sand to gravelly sand.</p> <p>For the entire project length, 6 inches of existing pavement should be considered for stripping estimates. Vegetation and rip-rap should be cleared and stripped. Temporary drainage ditches should be constructed to maintained positive drainage during construction. We do not anticipate detrimental settlement will occur under the new embankment loads, and we do not foresee global slope stability problems.</p> <p>The proposed exposed subgrade should be proofrolled and Geogrid should be placed. Areas identified as unstable during the course of construction should be disked, aerated, and recompactd and/or removed and replaced with granular fill use of a geotextile or combination thereof. Subgrade stabilization material needed should consist of aggregate and geotextile that meets the requirements of Iowa DOT Standard Specifications.</p>		
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US ROUTE 52 IOWA SECTION
FROM STATION 1546+00 to STATION 1560+65
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JACKSON COUNTY, IOWA
FOR
PARSONS

1.0 INTRODUCTION

This roadway geotechnical report presents the results of Wang Engineering, Inc. (Wang) subsurface investigation, laboratory testing, groundwater conditions, and geotechnical evaluations performed to support the design and construction of a section of US Route 52 (US 52) in Jackson County, Iowa. A *Site Location Map* is presented as Exhibit 1. The purpose of our geotechnical work was to evaluate the subsurface soil and groundwater conditions within this project area that would form a basis for design and construction recommendations and provide a report summarizing the results of our studies, conclusions, and recommendations.

1.1 Project Description

The US 52/IL 64/IL 84 project includes the replacement of the existing US 52 Bridge over the Mississippi River and reconstruction of the IL 84 from approximately Randolph Street to approximately 1290 feet north of US 52 Bridge. The new bridge will be wider and will be on a new alignment to the south of the existing location to eliminate the need for an excessive detour route. The IL 84 work includes widening of shoulders, which requires, on the east side of the roadway, deep cut into the bluff and retaining wall, upgrading existing guardrail, culvert replacement, and roadway resurfacing. The existing bridge will remain in service until the new bridge is open to the traffic. A connection will be made from the old Iowa's causeway to the new Iowa approach.

According to plans and cross sections provided by Parsons Transportation Group (Parsons), Wang understands that approximately 1500 feet of US 52 Iowa section roadway will be reconstructed just west of the US 52 Bridge over the Mississippi River between Station 1546+00 and Station 1560+65. The improvement consists of realigning, widening, and full reconstruction of this section of the roadway to accommodate the construction of the new US 52 Bridge over

Mississippi River. The reconstructed roadway will have 12-foot wide traffic lane, 8-foot wide shoulder and guardrail in each direction. The embankments on both the sides are proposed to be with a maximum slope of 1(V): 2(H).

1.2 Other Reports

Geotechnical Reports

Structure Geotechnical Reports (SGR) for the US 52 Bridge over Mississippi River and IL 84 retaining wall were completed by Wang. Wang also prepared a separate Roadway Geotechnical Report (RGR) for IL 84 roadway.

Iowa DOT Reports

Iowa Department of Transportation District 6 prepared three reports dated November 14, 2012, January 14, 2014 and March 21, 2014 for US 52 Causeway related to the original construction and existing condition of the roadway pavement and embankment.

2.0 GEOLOGIC SETTING

The project area is located just north of Savanna, Carroll County, Illinois, and two miles north of Sabula, Jackson County, Iowa. On the USGS *Savanna Quadrangle 7.5 Minute Series* map, the proposed roadway improvement is in the NE $\frac{1}{4}$ of Section 8 of Tier 84 N, Range 7 E of the Fifth Principal Meridian.

The following review of published geologic data, with emphasis on factors that might influence the design and construction of the proposed engineering works, is meant to place the project area within a geological framework and, thus, to confirm the dependability and consistency of the present subsurface investigation results. For the study of the regional geologic framework, Wang considered northwestern Illinois and northeastern Iowa area in general and Carroll and Jackson Counties in particular. Exhibit 3 illustrates the *Site and Regional Geology*.

2.1 Physiography

Northwestern Carroll County and a slice of northeastern Jackson County are part of the Wisconsin Driftless Section, which lacks a cover of tills and erratics. It is a low plateau area dissected by the

outwash-filled valley of the upper Mississippi River (Leighton et al. 1948). On the Iowa side, west of the main river channel, forested, marshy lowlands make up a more than 1.5-mile wide floodplain having elevations lower than 600 feet. At the time of our investigation, the Mississippi River water elevation measured 582.5 feet.

2.2 Pedological Features

In Jackson County, Iowa the soil types were surveyed by the USDA (2013). Summaries of the USDA soil types along the project area, including their relevant geotechnical index properties and suitability as subgrade and road fill are shown in the *Site Pedological Map and Table* (Exhibits 2-1 and 2-2). The soil information provided by USDA is meant to be used as a general reference in the absence of a site-specific investigation. In this instance, our findings regarding soil features affecting suitability for highway and street construction are not necessarily consistent with the information presented in Exhibit 2. Though a useful guide to general surficial soil conditions within the county, the USDA ratings for soil frost susceptibility and suitability as road subgrade seem overly critical and are probably based on different criteria than those applied in roadway engineering works.

2.3 Surficial Cover

The surficial cover is made up of stratified sand, silt, and clay of the Cahokia Alluvium, which makes up the modern floodplain and channel deposits, and sand and gravel outwash deposits of the Henry Formation that probably fills most of the valley (Grimley 1997). Along the new roadway alignment the surficial cover thickness is more than 120 feet.

2.4 Bedrock

The project lies on the southwestern flank of the gently sloping Wisconsin Arch. The bedrock outcrops along the Illinois side of the Mississippi River known as the Mississippi Palisades. Westward, across the river valley, the bedrock surface elevation becomes gradually deeper; on the Iowa side of the main river channel bedrock lies at approximately 120 feet below the water surface. The general lithological profile includes Ordovician shale and dolostones of the Glena Group and Platteville Formation (Witzke et al. 1998, Frankie 2001).

The existing and proposed US 52 roadway and bridge alignments are located within the up to 4,000-foot wide, east-west trending Plum River Fault Zone. The fault is considered inactive, but

the near vertical fault lines with a strike-slip component of movement have resulted in a structure with horsts and grabens and zones of breccia with rotated blocks. The Silurian dolostones that crop out in the Mississippi Palisades are part of the down-through fault block, whereas the up-thrown block south of Savanna is made up of Ordovician rocks. Just west of the existing bridge, the vertical displacement along the fault plane likely measures 100 to 150 feet (Kolata and Buschbach 1976).

Our subsurface investigation results fit into the local geologic context. The borings drilled in the project area revealed the native sediments consists of gravelly sand, sand, and silt (Cahokia Alluvium and the Henry Formation). Along the Iowa side of the proposed US 52, borings drilled for the proposed bridge over Mississippi River encountered the bedrock at depths ranging from 58.0 to 132.0 feet below ground surface (bgs), that is, at elevations of 524.2 to 455.0 feet.

2.5 Climatological Data

The main subsurface investigation was performed from October to November 2013. To assess the possible effects of temperature and precipitation on water table data and soil moisture, the climatic conditions for the investigation period and three months prior to the start of the investigation are summarized graphically in Figures 1 and 2. The precipitation and temperature data for the investigation period are compared against thirty-year monthly data (1981 to 2010) in box-and-whiskers format to illustrate deviations from “normal” climate conditions during the current investigation. Local climatologic data were obtained from the Mount Carroll, Illinois Station (NCDC 2013).

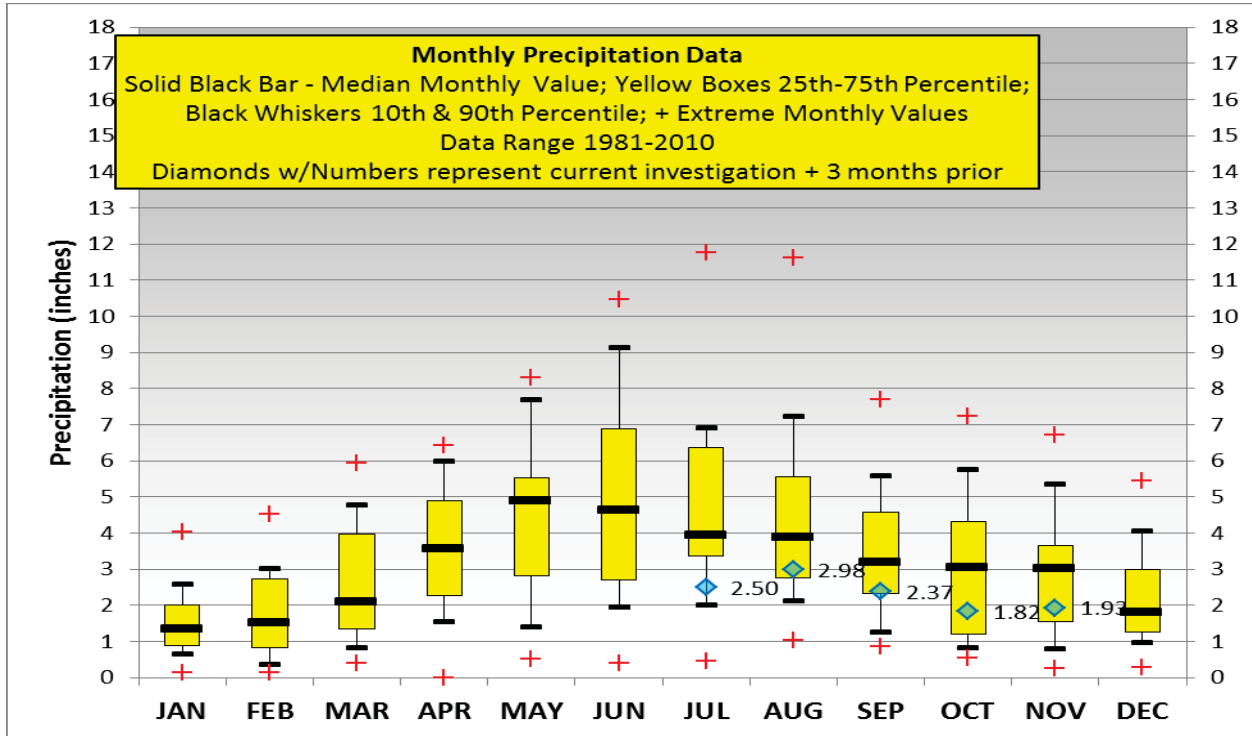


Figure 1: Monthly Precipitation Data

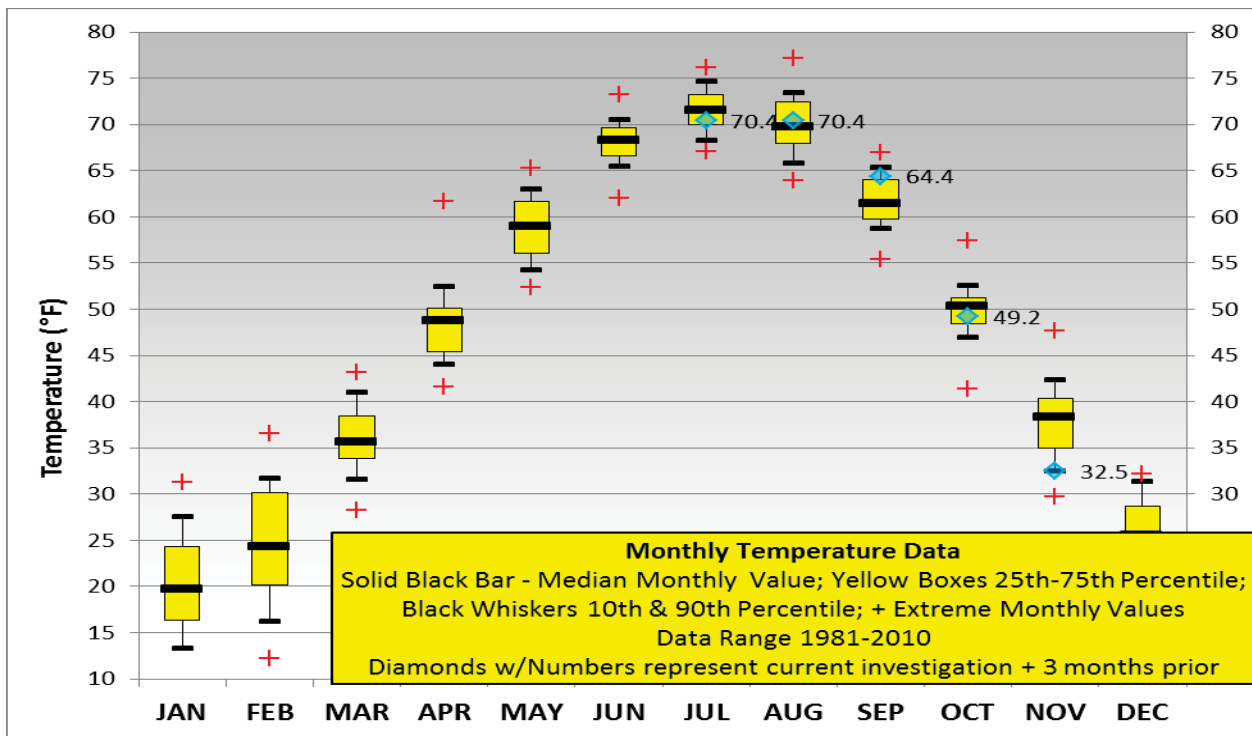


Figure 2: Monthly Temperature Data

No significant precipitation and temperature deviations from the historical 30-year climate data were recorded during our soil investigation period and the three month before it. However, groundwater level may be influenced by seasonal water level fluctuations.

3.0 METHODS OF INVESTIGATION

The following sections outline the subsurface and laboratory investigations.

3.1 Subsurface Exploration

To characterize the subgrade and groundwater conditions along the investigated US 52 alignment, we utilized a combination of SGB (subgrade) and BSB (bridge) borings. Wang drilled 12 subgrade borings designated as 52-SGB-01 through 52-SGB-12 and also considered bridge boring BSB-24.

The borings were advanced to depths ranging from 29.5 to 120.0 feet bgs. The boring locations were marked in the field by Wang based on approved plans. The as-drilled northing, easting, and elevation were acquired with a mapping-grade GPS unit. Stations and offsets were determined from design drawings provided by Parsons. Boring location data are included in the *Boring Logs* (Appendix A) and in the *Soil Boring Locations Plans and Soil Profiles* (Appendix E).

The boring were completed using truck-mounted drilling rigs. The drilling rigs were equipped with hollow stem augers to advance and maintain an open borehole. Soil sampling was performed according to AASHTO T 206, "*Penetration Test and Split Barrel Sampling of Soils.*" The soil was continuously sampled to 10 feet, at 2.5 feet intervals 10 to 30 feet, and at 5 feet thereafter in the subgrade/embankment borings, whereas soil was sampled at 2.5 feet intervals to 30 feet and at 5 feet thereafter in the structure boring. Samples collected from each sampling interval were placed in sealed jars. A total of seven Shelby tube samples were obtained from selected locations shown in the *Soil Boring Locations Plans and Soil Profiles* (Appendix E).

Field boring logs, prepared and maintained by Wang soil inspectors and geologists, included lithological descriptions, visual-manual classifications, Rimac and pocket penetrometer unconfined compressive strength test results. Results of Standard Penetration Tests (SPT) are recorded on the boring logs as blows per 6 inches of penetration.

Groundwater levels were measured while drilling and at completion of each boring. For safety considerations each boreholes was backfilled upon completion with soil cuttings and/or bentonite chips and, where necessary, the pavement surface was restored to its original condition.

3.2 Laboratory Testing

The laboratory testing program included water content determination (AASHTO T 265) on all samples and particle size (T 88), and Atterberg limits (T 89 and T 90) tests on selected soil samples. Tested samples were classified according to the IDH and AASHTO classification systems. Field visual-manual classifications were also verified in the laboratory. The results of the laboratory testing program are shown in the attached *Boring Logs* (Appendix A), IDOT form BMPR 508A (Appendix B), and *Laboratory Test Results* (Appendix C).

4.0 RESULTS OF SUBSURFACE INVESTIGATIONS

Detailed descriptions of the lithological units encountered by the borings are presented in the attached *Boring Logs* (Appendix A) and in the *Soil Boring Locations Plans and Soil Profiles* (Appendix D). Please note that the strata contact lines shown on logs and profiles represent approximate boundaries between soil types; the actual transition between soil types might be gradual in horizontal and vertical directions.

Beneath surface, the general lithological succession includes 1) man-made ground (fill) and 2) sand and gravelly sand.

4.1 Surface Characterization

Existing US 52 roadway is flanked by riprap covered slopes and discontinuous vegetation. The proposed roadway alignment will be established over both existing riprap slopes and pavement and water covered land.

Borings 52-SGB-04, 52-SGB-07, 52-SGB-09, 52-SGB-11, and 52-SGB-12 were performed at the water covered base of the existing roadway embankment. At the time of our investigation, the depth of water measured 4 to 7 feet.

Borings 52-SGB-01, 52-SGB-02, 52-SGB-03, 52-SGB-05, 52-SGB-06, 52-SGB-08, and 52-SGB-10 were performed through the existing roadway and show the pavement structures consist of 4- to 7-inch thick asphalt over aggregate base. The aggregate base consists of gravelly sandy loam and its thickness ranges from 8 to more than 29 inches.

4.2 Soil Conditions

The following sections present the soils conditions encountered during our subsurface investigation along the proposed roadway alignment. Beneath surface, in descending order, the borings encountered 1) man-made ground (fill); 2) very loose to loose sand to sandy loam; 3) very soft to stiff silty clay loam to silty loam; 4) very loose to medium dense sand to gravelly sand.

(1) Man-made ground (fill)

Borings drilled through the roadway embankment encountered up to 12-foot thick granular and cohesive fill. The fill, likely made up of local borrow materials, closely resembles the surrounding natural soils. The granular fill consists of loose to very dense, black and brown gravelly sand, sand, and loam and has SPT N-values of 3 to more than 50 blows/foot and moisture content (MC) values of 1 to 17%. The cohesive fill is made up of medium stiff to very stiff, brown silty clay loam to clay loam and has unconfined compressive strength (Q_u) values of 0.5 to 2.0 tsf and MC values of 9 to 33%.

(2) Very loose to loose sandy loam to sand

Below the fill, borings advanced through alternating layers of sands, silts, and clays. Up to 7.5-foot thick very loose to loose sandy loam to sand with N-values of 1 to 4 blows/foot and MC values of 4 to 25% was encountered. Within the sand layer, lenses of soft silty loam with Q_u values of 0.4 to 0.5 tsf and MC values of 31 to 33% are present. According to the AASHTO soil classification, this soil belongs to A-4 and A-2-4 groups. Boring 52-SGB-12, drilled at the toe of the existing embankment, encountered 5 feet of soft organic clay with Q_u values of 0.25 tsf and MC values of 52 to 57%.

(3) Very soft to stiff silty clay loam to silty loam

At elevations ranging from 583.3 to 592.9 feet, borings encountered up to 16.3-foot thick of very soft to stiff silty clay loam to silty loam with Q_u values of 0.16 to 1.15 tsf with an

average of 0.6 tsf and MC values of 20 to 48% with an average of 29%. Liquid limit (L_L) values range from 33 to 42%, and plastic limit (P_L) values range from 19 to 21%. According to the AASHTO soil classification, the soils belong to the A-4, A-6 and A-7-6 groups.

(4) Very loose to medium dense sand to gravelly sand

At elevations ranging from 570.5 to 579.7 feet, borings advanced in more than 95-foot thick very loose to medium dense sand to gravelly sand with N-values of 1 to 20 blows/foot. According to the AASHTO soil classification, the soils belong to the A-3 and A-1-b groups.

4.3 Groundwater Conditions

During drilling, groundwater was encountered between 0.0 and 23.0 feet bgs. At the drilling completion, water level as measured at 0.0 to 22.0 feet bgs. Mississippi River water level at the time of drilling was recorded at 582.45 feet elevation.

5.0 Existing Causeway Construction and Condition

There are no plans available for the original construction of the causeway. As per Iowa DOT reports, it appears that the causeway was this area was a land with trees when it was constructed in 1932. The existing dams were not in place on the Mississippi River so the area was not flooded as it is today.. After removal of trees, soil (basically sand) from each side of the causeway was excavated and piled along the centerline of the causeway. After the soil was piled, bull dozers levelled off the top of the piled soil creating driving surface and side slopes. It appears that this created embankments in different conditions within the central portion and outside the central portion on each side of the roadway. No other information is available such as placement in layers, compaction and period of time soil pile was left in place before levelling off by bulldozer.

Iowa DOT personnel performed field inspection to determine condition of the causeway in November 2012, and in January and March 2014. Longitudinal cracks were observed along most of the roadway. These cracks appear to be at the third points of the original soil pile the way embankment was graded. Iowa DOT reports describe condition of side slopes and pavement condition. Iowa DOT found the integrity of the causeway to be in good condition.

6.0 ANALYSES AND RECOMMENDATIONS

Based on the project information provided by Parsons and the subsurface soil conditions revealed during investigations, recommendations are presented in the following sections for the design and construction of the proposed improvements. The results of the field and laboratory data were utilized to evaluate the engineering properties of the soils encountered during site investigation.

US 52 Iowa section roadway will be reconstructed from Station 1546+00 to Station 1560+65 and supported by adding new fill to the existing embankment, creating 1:2 (V:H) slopes. Most of the widening will be on the south side of the existing embankment.

We considered field observations and conclusions mentioned in Iowa reports in our analysis and recommendations. We agree that the existing subgrade is in varying soil conditions with low bearing capacity and proper surface drainage should be provided along with proper side slope treatment to deter undermining of sandy subsurface soil. We also agree that after reconstruction of roadway, inspection and maintenance such as pavement cracks sealing on a regular basis should be performed.

6.1 Existing Pavement Stripping

Prior to embankment construction, exiting pavement should be stripped. Record plans for this location indicate that the existing pavement was constructed using HMA materials. No pavement cores were performed. However, based on borings measurements, for quantity estimating purposes, the average pavement thickness to be stripped is seven (7) inches. The actual depth of stripping should be determined in the field during construction. The roadway was last paved in 1994 as per Iowa report dated November 14, 2012.

6.2 Subgrade Preparation and Treatment

All vegetation, pavement, debris and riprap should be cleared and stripped from the existing roadway construction areas and where embankment fills are to be placed. After stripping of pavement, to provide stable subgrade and to increase bearing capacity two options can be considered. Following stripping of exiting pavement and excavating to the proposed subgrade, 2 feet of existing embankment material can be removed and replaced with compacted fill as per Iowa DOT embankment specifications requirements. Another option is to place Geogrid after stripping

existing pavement and excavating to the proposed subgrade. We recommend providing Geogrid considering required earthwork, construction and cost. We recommend TriAx TX5 Geogrid manufactured by Tensar or equivalent. . With the inclusion of the Geogrid at the proposed subgrade level, it will provide uniformity in subgrade strength. The addition of the Geogrid will also improve the performance of the pavement section. The exposed subgrade should be proofrolled and observed under construction equipment. Proofrolling aids in providing a firm base for compaction of new fill and identifying soft or unstable soil conditions that may exist at or near the exposed subgrade level. It is recommended that the proofrolling be accomplished with a fully-loaded, 25-ton dump truck or other equipment providing an equivalent loading such as heavy vibratory roller. A minimum of 4 passes should be made over the entire subgrade areas in both the direction. In confined areas and in areas where a dump truck or a roller cannot be used effectively, such as at edges of the excavation bottom, proofrolling/compaction may be performed with hand-operated heavy vibratory equipment with enough number of passes so that unstable subgrade can be detected. The exposed subgrade should be observed for the amount of deflection or rutting.

Remedial work for unstable subgrade should consist of disking, aerating, and recompacting exposed subgrade soils. Solutions to a persistent pumping problem may include removal of unsuitable soils and replacement with granular fill, use of a subgrade stabilization material or a combination thereof. Removal and replacements should extend to at least one foot beyond outside edge of new shoulders. Subgrade stabilization material needed should consist of Geogrid mentioned previously.

The stability of prepared roadway subgrade will depend upon such factors as surface drainage provided by the contractor as well as prevailing temperature and precipitation experienced during construction. The amount of construction traffic and subgrade disturbance created by heavy vehicles will also have an influence on subgrade stability. The contractor should try to make full use of ditches in order to maintain positive drainage for subgrade areas. Temporary drainage ditches or pumping from depressed areas should be provided as needed during construction in order to prevent ponded water from affecting the stability of the roadway.

6.3 Subgrade Support Rating

Based on the soil types and conditions encountered in boring, we recommend an estimated California Bearing Ratio (CBR) value of 2 and Resilient Modulus of Subgrade (M_{RSG}) value of 3,000 psi for the pavement design purposes.

6.4 Pavement Design

Wang understand that the new pavement structure based on 20-year pavement design will be as follow for the traffic lanes:

- 1.5-inch thick Surface Hot Mix Asphalt (HMA)
- 1.5-inch thick Intermediate HMA
- 6.5-inch thick Base HMA
- 12-inch thick Iowa Modified Subbase

For HMA shoulders, a thickness of 8 inches will be used on 12-inch thick aggregate subbase.

6.5 Drainage Considerations

The proposed subgrade and pavement should have proper surface grading to remove water accumulations and prevent the pooling of water. Since the surface drainage will not be provided by an enclosed system consisting of curb and gutter, we do not see any need for transverse or longitudinal underdrain. We recommend the granular subbase be daylighted to the outside of the embankment to provide proper drainage. If the subbase is not daylighted, a combination of longitudinal and transverse underdrains should be considered within the subgrade.

6.6 Embankment Material and Stability

The material to be used for the roadway embankment construction should be in accordance with Sections 2102 and 2107 the Iowa DOT Standard Specifications. A shrinkage factor of 15% should be used to measure the borrowed and furnished excavation quantities.

The computer program, SLIDE Version 5.0, was used to calculate the factors of safety against global slope stability. The Simplified Bishop Method was used for slope stability analyses. Details of stability analysis with the critical failure surface and results are shown in Appendix D.

Slope stability analyses were performed for the embankment side slopes at sections where soil borings were performed at the top and at the toe of existing embankment. These sections are at Stations 1554+50, 11557+50 and 1559+50. The estimated soil parameters considered and results of stability analysis are shown in appendix D. The calculated minimum factor of safety (FOS) is greater than minimum required by Illinois DOT and Iowa DOT. The minimum FOS required by Illinois DOT is 1.5 and by Iowa DOT is 1.3 for embankment slopes.

The slopes will require permanent protection to prevent erosion due to precipitation and storm water runoff. A layer of riprap designed similar to end slope protection at the bridge west abutment can be used from the paved shoulder to the bottom of the embankment at all locations.

6.7 Embankment Settlement

Settlement of the embankment will occur due to consolidation of the foundation soils and within the new embankment mass. The immediate (elastic) settlement is expected to occur from the underlying granular soil layers.

We performed settlement evaluations for the new embankment at Station 1560+00 where embankment thickness is estimated to be approximately 20 feet. A computer program FoSSA v2.0 (Foundation Stress and Settlement Analysis) was used for assessing stresses and settlements under embankment. Soil parameters required for elastic settlement evaluation were estimated from the borings and other published data.

We estimate initial settlement on the order of 3.2 inches after placement of riprap to one foot above normal river level (normal river elevation 582.3 feet). We estimate additional settlement on the order of 2.8 inches after constructing embankment from top of riprap to the proposed subgrade level. Most of the elastic settlement in the granular soils is expected to be occurring at the same rate as construction. Settlement from within the cohesive embankment is expected to be on the order of 1.5 inches.

7.0 CONSTRUCTION CONSIDERATIONS

7.1 Excavation

Temporary excavations should have a slope as required to provide a stable side slopes. Excavation slopes should be sloped at no greater than 1:2 (V:H). All temporary cut excavation should be analyzed individually for excavation of more than 4 feet deep or slope steeper than 1:2 (V:H). Excavations should be performed in accordance with local, state, and federal regulations. The potential effect of ground movements upon open roadway and utilities should also be taken into consideration.

7.2 Reuse of Excavated Materials

Excavated riprap materials free of miscellaneous debris can be reused below river level. Reuse of existing riprap should be approved by the Engineer. Excavated soil material from IL 84 retaining wall is expected to be suitable for reuse as embankment fill.

7.3 Dewatering

The near surface granular soils may exhibit perched groundwater conditions. These layers may be intercepted during cut slope excavation; however, the water flow will likely be temporary and could be controlled and diverted away from the proposed subgrade area or pumped out. Seepage water that does accumulate in open excavations above groundwater level can be removed using the sump pump method. Surface runoff and ditches should be directed away from the excavation to facilitate dewatering operations.

7.4 Embankment Construction

Embankment should be constructed as early as possible in the project construction period in order to allow the embankments to adjust or settle under its own weight as much as possible prior to pavement construction. We recommend delaying pavement construction for at least two weeks after completion of embankment to the proposed subgrade level.

Most of the roadway widening will be over the exiting embankment slope and river bed. We recommend removing exiting debris, vegetation and riprap from the existing embankment without destabilizing the slopes before placement of new fill. Riprap should be placed from the bottom of river bed to one foot above normal river level. The exiting salvaged clean riprap can

be reused. A 12-inch thick capping layer of aggregate meeting the requirements for Gradation No. 4 of Iowa DOT Standard Specification should be placed on top of riprap. On top of capping layer a geotextile fabric meeting the requirements of Article 4196.01.B.5 should be placed. Embankment soil material can be placed after placement of fabric. Embankment should be constructed in accordance with Section 2107 *Embankment* of Iowa Standard Specifications.

The new fill should be benched into the side slopes of the existing embankment to provide interlocking between the old and new fill. During benching, any water seeped from the existing embankment should be removed or placement of new fill should be postponed until the area is dry enough. We recommend benching the slopes according to Article 2107.01.C.2 and placement according to Article 2127.03.B of Iowa DOT Standard Specifications.

Maintenance of the slope during the construction will be required for localized areas of cut slopes where erosion prone soils (silt and sand) are encountered. These soils will develop minor sloughing however; major sloughing may develop if these soils are saturated with perched groundwater. These conditions should be observed during construction and corrective measure should be taken. Heavy construction equipment and material should not be placed near the top of the slope, unless the stability of slope is acceptable.

We recommend showing the following or similar note on the plan.

“Proper construction including quality control and inspection during construction is vital for the overall stability of the embankment even for a short time period. The failure of widened embankment may result due to sub-standard compaction of fill, inadequate benching into the existing embankment and no proper drainage control. Earthwork procedures should include provisions to minimize soil disturbance and exposure. Earth moving operations should be scheduled not to coincide with excessive cold or wet weather (early spring, late fall or winter). Wet sand exposed to cold weather should be protected from freezing. Any soil allowed to freeze or soften due to the standing water should be removed from the subgrade. Wet weather can cause problems with subgrade compaction.”

7.5 Earthwork Operations

The required earthwork can be accomplished with conventional construction equipment. Precautions should be taken by the Contractor to prevent water erosion of the exposed subgrade. A compacted subgrade will minimize water runoff erosion. Silt and fine sands are sensitive to

mechanical disturbance such as traffic and construction crew and will cause deterioration of exposed subgrade soils.

7.6 Construction Monitoring

There is no need for a special construction monitoring for the earthwork except normally required by the Iowa DOT Standard Specifications, Special Provisions and Contract Plans.

During construction, an experienced geotechnical engineer or soil technician should be retained to perform the following tasks:

- Monitor earthwork operations;
- Evaluate the suitability of the soils for subgrade support and embankment construction;
- Observe excavation including cut slopes;
- Check soil materials and compaction for project specifications compliance;
- Monitor locations and depths of undercuts; and
- Advise the IDOT/Iowa DOT/Resident Engineer of any conditions not apparent during the subsurface exploration.

8.0 QUALIFICATIONS

The analysis and recommendations submitted in this report are based upon the data obtained from borings by Wang during previous and current investigations. This report does not reflect any variations that may occur between the borings or elsewhere on the site, variations whose nature and extent may not become evident until the course of construction. In the event that any changes in the design are planned, we should be timely informed so that changes can be reviewed, modified, and approved in writing by the geotechnical engineer.

It has been a pleasure to assist Parsons Transportation Group and Illinois Department of Transportation on this project. Please call if there are any questions, or if we can be of further service.

Respectfully Submitted,

WANG ENGINEERING, INC.

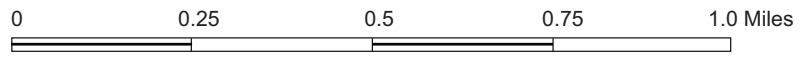
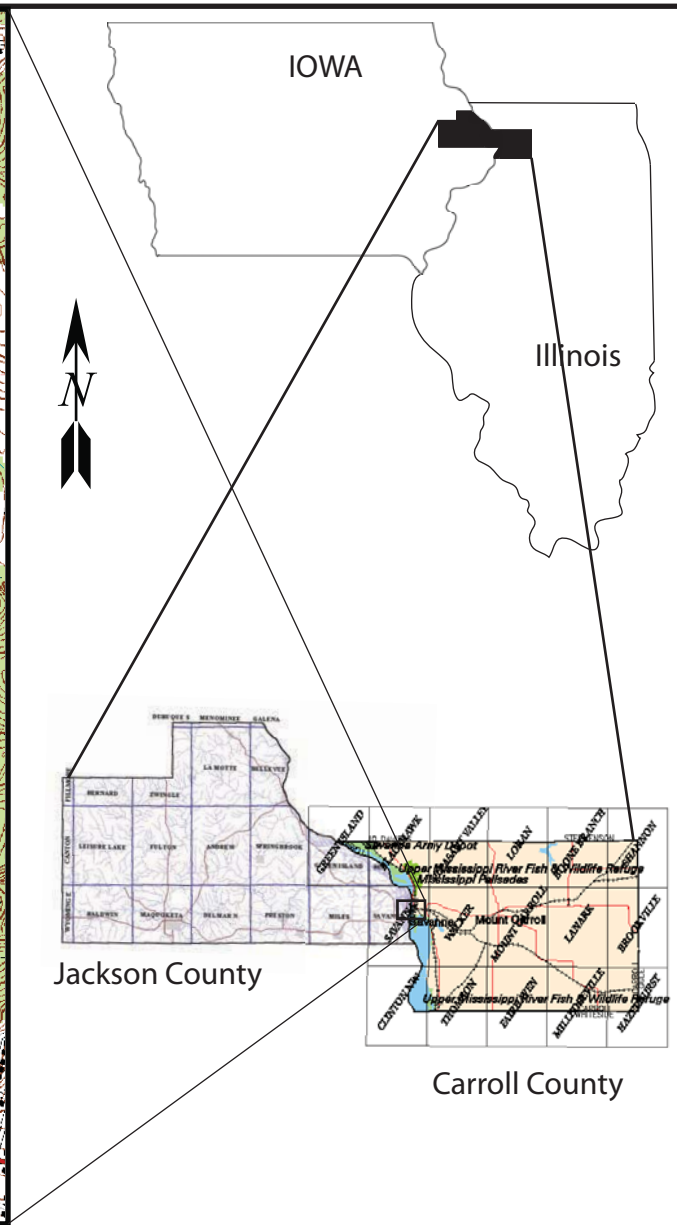
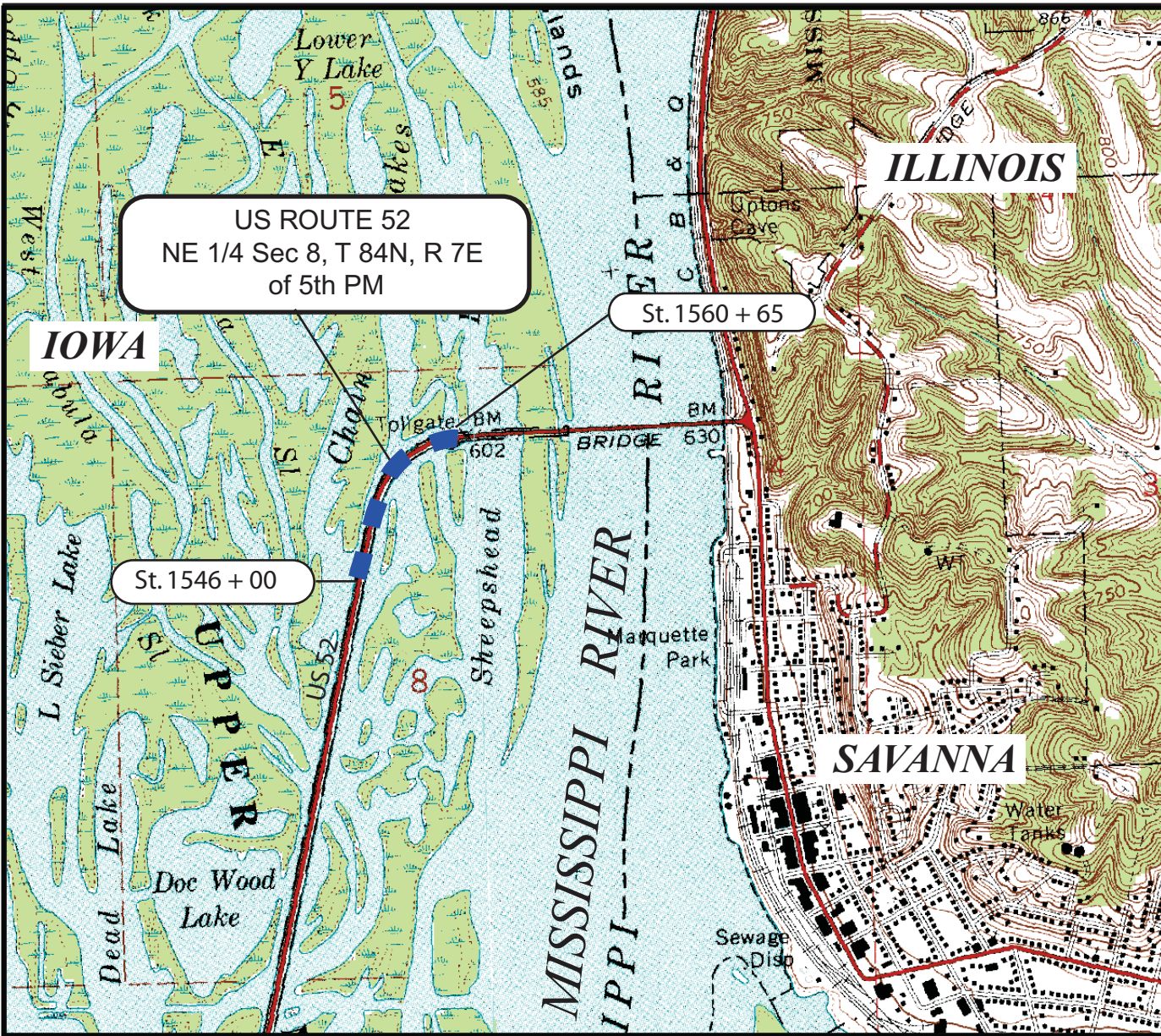
Mohammed (Mike) Kothawala, P.E., D.GE
Sr. Project Manager/Sr. Geotechnical Engineer

Jerry W.H. Wang, Ph.D., P.E.
Principal

REFERENCES

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- WITZKE, B.J., G.A. LUDVIGSON, R.M. MCKAY, R.R. ANDERSON, B.J. BUNKER, J.D. GIGLIERANO, J.P. POPE, A.E. GEOTTEMOELLER, M.K. SLAUGHTER (1998), Bedrock Geology of Northeast Iowa, Produced by STATEMAP program with USGS, Department of Interior, Award No. 1434-HO-97-AG-01719, 1:250,000.

EXHIBITS

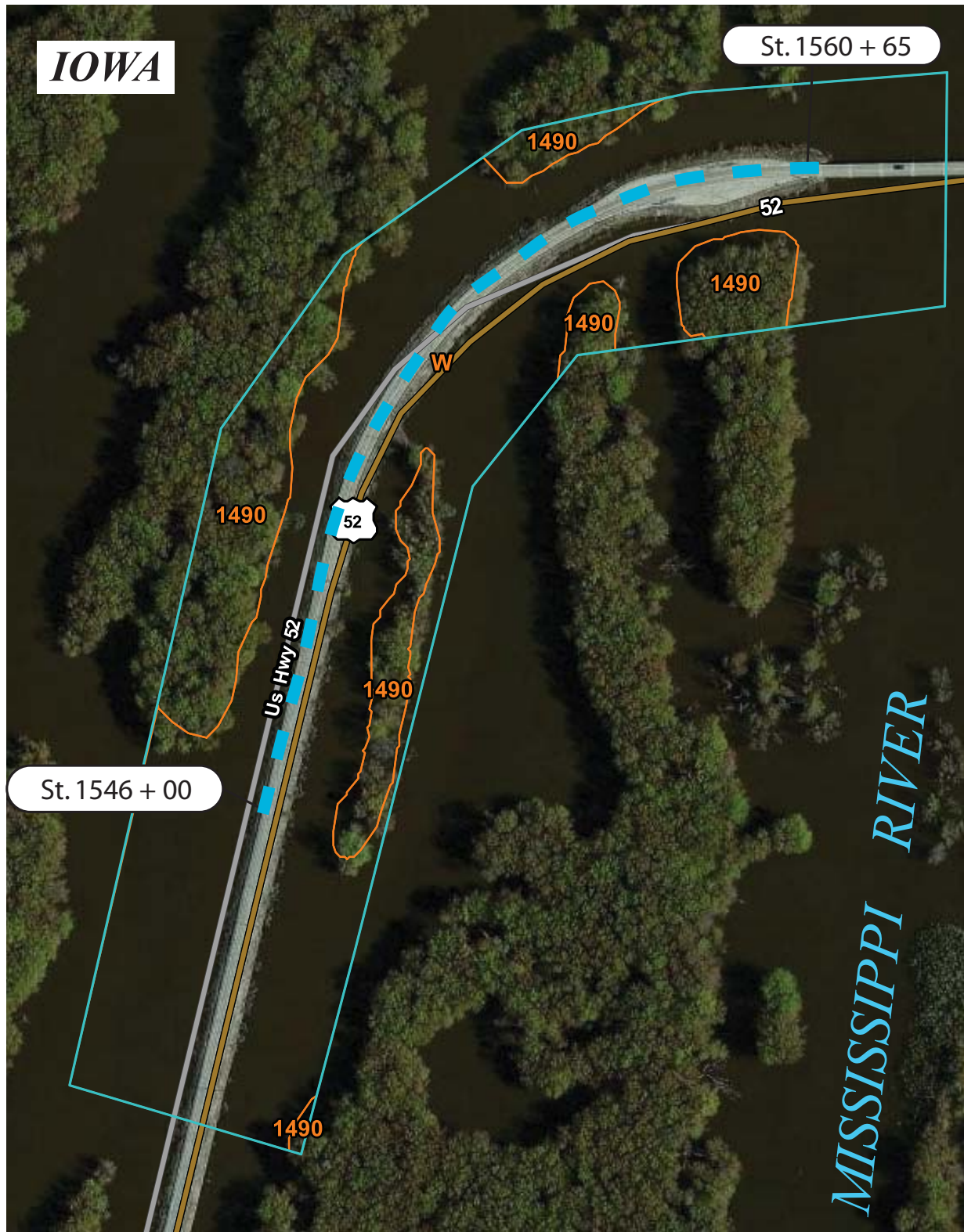


SITE LOCATION MAP: US 52 ROADWAY RECONSTRUCTION
 JACKSON COUNTY, IOWA

SCALE: GRAPHICAL	EXHIBIT 1	DRAWN BY: A. Happel CHECKED BY: C. Marin
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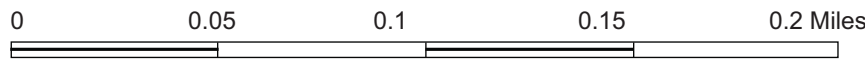


ILLINOIS




Map unit symbol and soil name	Depth	USDA texture	Classification			Moist bulk density	Saturated hydraulic conductivity	Liquid limit	Plasticity index	Organic matter	
			AASHTO	Sand	Silt						Clay
	<i>In</i>			%	%	%	<i>g/cc</i>	<i>micro m/sec</i>	%	%	
1490—Caneek silt loam, channeled, 0 to 2											
Caneek, frequently flooded, channeled	0-28	Silt loam	A-4	-15-	-64-	18-21- 24	1.20-1.30	1.00-10.00	25-35	5-10	0.7-1.7
	28-60	Silty clay loam, silt loam	A-6, A-7	-10-	-68-	18-23- 28	1.25-1.40	1.00-10.00	35-45	10-20	0.0-0.5

Map symbol and soil name	Potential as a source of roadfill	Potential as a source of topsoil
	Rating class and limiting features	Rating class and limiting features
1490—Caneek silt loam, channeled, 0 to 2 percent slopes		
Caneek, frequently flooded, channeled	Poor, Wetness, Low strength, Dusty, Shrink-sw ell	Poor, Wetness



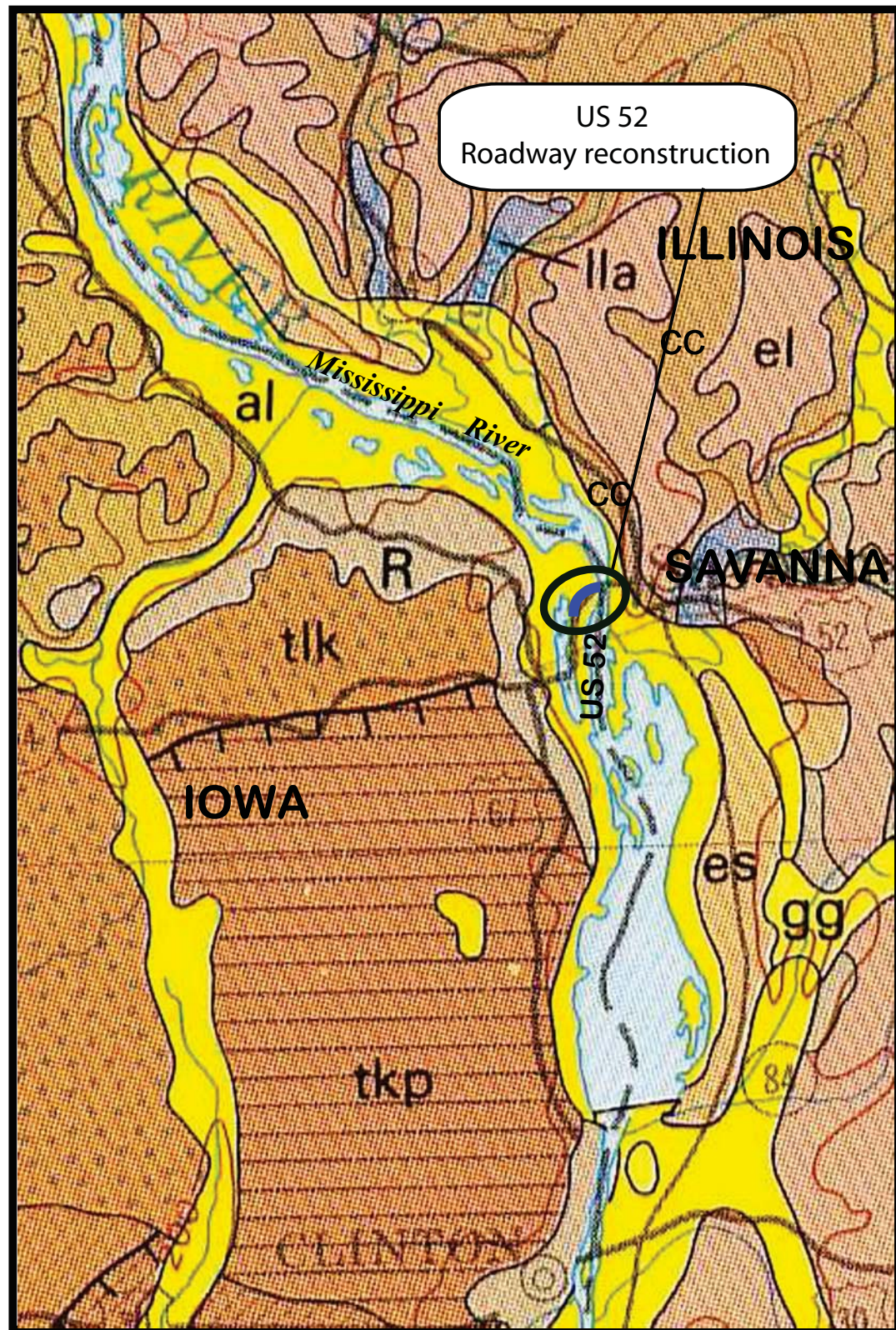
SITE PEDOLOGY: US 52 ROADWAY RECONSTRUCTION
JACKSON COUNTY, IOWA

SCALE: GRAPHICAL **EXHIBIT 2** DRAWN BY: A. Happel
CHECKED BY: C. Marin



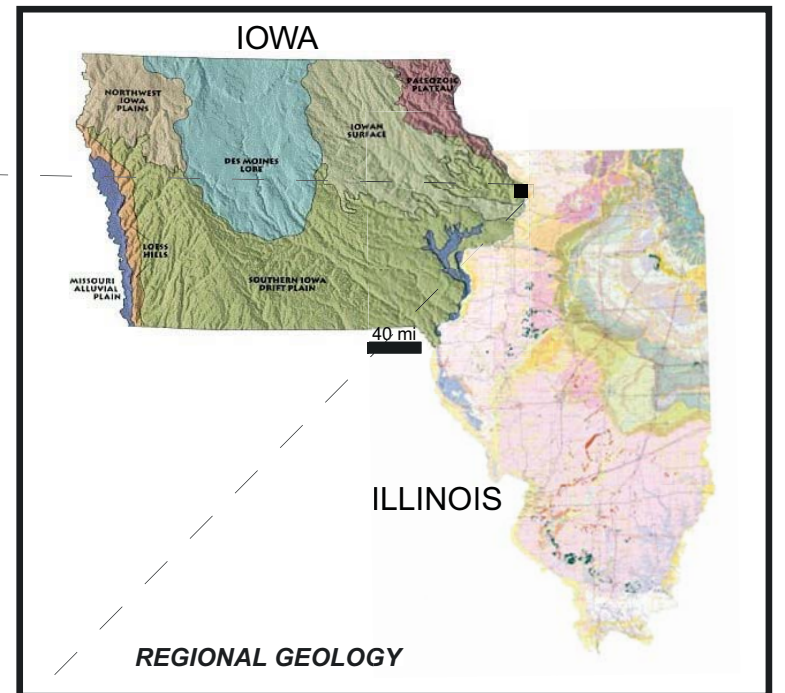
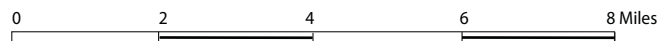
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US 52
Roadway reconstruction

Modified after Richmond et al. (1991)



LEGEND	
al	Cahokia Alluvium, Deposits in flood plains and channels of modern rivers and streams; stratified silt, clay and sand with wood and shell fragments;
es	Parkland Sand, Eolian sheet sand, brown, well-sorted, medium to fine sand; blanketlike deposits and dune overlies the lake deposits;
el	Peoria Loess, Gray to yellowish-brown windblown silt and silt loam; mapped only in Illinois and where its thickness is more than 6 m;
cc	Colluvium, Material transported and deposited by mass-wasting processes; brown or reddish-brown to gray clay, sandy caly, or clayey sand contains angular and subangular clasts of dolostone, chert, minor limestone and sandstone; thin discontinuous patches, mapped only in Illinois;
lla	Equality Formation, Slackwater lake deposits; stratified silt, clay and sand; yellowish-brown to brown and gray, massive to thinly laminated silty clay and silt;
gg	Henry Formation, Outwash sand and gravel deposits; yellowish-brown to gray pebble to cobble gravel in fine to coarse sand matrix; mapped only in Illinois;
tkp	Glasford Formation, Ground moraine; loamy till, reddish-brown to bluish-gray clay lom and loam; texture from sany loam to clay loam, massive and compact with clasts of limestone and dolostone, occasionally shale, sandstone, granite, coal;
tlc	Walf Creek Formation, Pre-Illinoian loamy till; light- to dark-gray sandy to silty loam; nonsorted to poorly sorted; compact calcareous; clasts of pebble and gravel size, most are granite and fine-grained igneous and metamorphis rocks.
R	Bedrock, Silurian dolstone and Ordovician Maquoketa shale and Galena dolostone

Modified after Richmond et al. (1991)

SITE AND REGIONAL GEOLOGY: US 52 ROADWAY RECONSTRUCTION
JACKSON COUNTY, IOWA

SCALE: GRAPHICAL | EXHIBIT 3 | DRAWN BY: A. Happel
CHECKED BY: C. Marin

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FOR PARSONS | 342-06-01

APPENDIX A

LEGEND FOR BORING LOG

Relative Density of Non-Cohesive Soils	
N-Blows/ 12 inches	Relative Density Term
0-3	Very Loose
4-9	Loose
10-29	Medium Dense
30-49	Dense
50-80+	Very Dense

Consistency of Cohesive Soils	
Unconfined Compressive Strength Q_u , tsf	Consistency Term
<0.25	Very Soft
0.25-0.49	Soft
0.50-0.99	Medium Stiff
1.00-1.99	Stiff
2.00-3.99	Very Stiff
>4.00	Hard

Proportional Terms		Percent of Dry Weight
Trace	1-9	
Little	10-19	
Some	20-34	
And	35-50	
Gradation Terminology		
Boulders	>200mm	
Cobbles	200mm to 75mm	
Gravel	75mm to 2mm	
Sand	2-0mm to 0.074mm	
Silt	0.074mm to 0.002mm	
Clay	<0.002mm	

SS = Split Spoon
 ST = Shelby Tube
 SPT = Standard Penetration Test
 Q_u = Unconfined Compressive Strength
 P = Pocket Penetrometer
 S = Shear failure of sample, Rimac test
 B = Bulge failure of sample, Rimac test
 SSA = Solid Stem Augers,
 HSA = Hollow Stem Augers,

Sample Type Symbols



Split Spoon



Rock Core



In-situ Vane Shear Test



No Recovery



Shelby Tube



Geoprobe



Auger Cuttings

SPT = Standard Penetration Test
 N Value is the sum of the second
 and the third numbers



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BORING LOG 52-SGB-01

WEI Job No.: 342-06-01

Client: **PARSONS**
 Project: **US 52 / IL 64 Over the Mississippi River**
 Location: **Carroll County, IL and Jackson County, IA**

Datum: NAVD 88
 Elevation: 597.40 ft
 North: 1979606.33 ft
 East: 2295584.75 ft
 Station: 1546+94.20
 Offset: 5.61 LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)	Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)	
	596.8	7-inch thick, ASPHALT																
	596.2	--PAVEMENT--																
		Black and brown SILTY LOAM, trace gravel			1	6 5 5 5 5	1.48 B	19						12	1 2 4		NP	17
		--FILL--																
	593.9	Stiff, gray SILTY CLAY, trace gravel			2	3 4 4 4	NP	5						13	2 4 6		NP	22
	592.9	--FILL--																
		Loose, brown, medium SAND			5	1 1 2 1	0.25 P	25		567.4								
		--FILL--																
		Soft, gray SILTY CLAY, trace gravel			3	1 1 1 3	0.41 B	28										
		--FILL--																
	587.9	Very loose, brown, medium SAND	10		5	1 1 2	NP	7										
	586.7	--FILL--																
		Soft to medium stiff, gray SILTY CLAY LOAM to SILTY LOAM, trace gravel			6	2 2 2	0.25 P	26										
			15		7	1 1 1	0.79 B	38										
					8	1 2 2	0.51 B	27										
		--L _L (%)=34, P _L (%)=20-- --%Gravel=0.1-- --%Sand=17.3--20 --%Silt=61.1-- --%Clay=21.5-- --A-6 (11)--			9		P C U S H	0.37 S	28									
	576.7	Very loose to medium dense, gray, medium SAND			10	0 1 1	NP	25										
					11	1 2 3	NP	15										
			25															

GENERAL NOTES				WATER LEVEL DATA			
Begin Drilling	11-12-2013	Complete Drilling	11-12-2013	While Drilling	▽	21.00 ft	
Drilling Contractor	Wang Testing Services	Drill Rig	D-50 TMR	At Completion of Drilling	▼	17.00 ft	
Driller	R&N	Logger	A. Tomaras	Time After Drilling		NA	
Drilling Method	3.25" HSA, boring backfilled upon completion			Depth to Water	▽	NA	
The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.							

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BORING LOG 52-SGB-02

WEI Job No.: 342-06-01

Client: **PARSONS**
 Project: **US 52 / IL 64 Over the Mississippi River**
 Location: **Carroll County, IL and Jackson County, IA**

Datum: NAVD 88
 Elevation: 597.26 ft
 North: 1979895.00 ft
 East: 2295653.49 ft
 Station: 1549+90.80
 Offset: 5.28 LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)	Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)	
	596.7	7-inch thick, ASPHALT --PAVEMENT--								571.8								
	595.5	Black and brown GRAVELLY SANDY LOAM									Loose to medium dense, gray, medium SAND, trace gravel							
	594.9	--FILL-- Stiff, brown SILTY CLAY			1	8 13 9 6	NP	1						11	3 2 3			
	593.0	--FILL-- Medium dense, brown SAND			2	2 2 3 3	1.23 B	26						12	1 3 6			
		--FILL-- Stiff, brown and gray SILTY CLAY LOAM, trace gravel			3	2 3 3 4	1.50 P	33										
	589.0	Very loose to loose, brown, medium SAND, trace gravel --FILL--			4	3 2 2 3	NP	11						13	6 5 6			
					5	3 2 1	NP	4			Boring terminated at 35.00 ft							
	583.3	Soft, gray SILTY CLAY LOAM, trace organic matter			6	2 1 1	NP	16										
		--L _I (%)=42, P _L (%)=21-- --%Gravel=0.0-- --%Sand=6.0-- --%Silt=70.6-- --%Clay=23.3-- --A-7-6 (21)--			7	P U S H	0.77 B	31										
					8	0 1 2	0.25 P	24										
	576.8	Very loose, SANDY LOAM, trace organic matter			9	1 0 1	NP	23										
					10	0 1 2	NP	23										

GENERAL NOTES

Begin Drilling **11-12-2013** Complete Drilling **11-12-2013**
 Drilling Contractor **Wang Testing Services** Drill Rig **D-50 TMR**
 Driller **R&N** Logger **A. Tomaras** Checked by **C. Marin**
 Drilling Method **3.25" HSA, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling ∇ **21.00 ft**
 At Completion of Drilling \blacktriangledown **22.00 ft**
 Time After Drilling **NA**
 Depth to Water ∇ **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.



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BORING LOG 52-SGB-03

WEI Job No.: 342-06-01

Client: **PARSONS**
 Project: **US 52 / IL 64 Over the Mississippi River**
 Location: **Carroll County, IL and Jackson County, IA**

Datum: NAVD 88
 Elevation: 597.40 ft
 North: 1980117.59 ft
 East: 2295766.60 ft
 Station: 1552+41.46
 Offset: 5.56 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)	Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	596.7	8-inch thick ASPHALT --PAVEMENT--															
	595.9	Black and gray GRAVELLY SANDY LOAM --FILL--			1	5 3 3 4	NP	17						11	2 5 8	NP	16
		Loose, brown LOAM --FILL-- --%Gravel=0.0-- --%Sand=49.0-- --%Silt=38.0-- --%Clay=13.0-- --A-4 (0)--	5		2	4 2 2 2	NP	6		567.4		30		12	2 6 6	NP	15
	591.9	Very loose to loose, gray SANDY LOAM --FILL--			3	3 2 2 2	NP	18			Boring terminated at 30.00 ft						
			10		4	3 1 2 1	NP	16									
					5	0 1 1	NP	23									
	584.4	Soft, gray SILTY CLAY LOAM to SILTY LOAM, trace organic matter	15		6	0 1 2	0.33 B	34									
		--L _L (%)=33, P _L (%)=19-- --%Gravel=0.0-- --%Sand=20.8-- --%Silt=58.2-- --%Clay=21.0-- --A-6 (10)--			7	P U S H	0.63 B	29									
			20		8	0 1 2	0.41 B	28									
	576.9	Very loose, gray, fine SAND			9	1 1 2	NP	27									
	573.4	Medium dense, gray, medium to coarse SAND, trace gravel	25		10	0 2 5	NP	19									

GENERAL NOTES

Begin Drilling **11-12-2013** Complete Drilling **11-12-2013**
 Drilling Contractor **Wang Testing Services** Drill Rig **D-50 TMR**
 Driller **R&N** Logger **A. Tomaras** Checked by **C. Marin**
 Drilling Method **3.25" HSA, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling ∇ **21.00 ft**
 At Completion of Drilling \blacktriangledown **18.00 ft**
 Time After Drilling **NA**
 Depth to Water ∇ **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

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BORING LOG 52-SGB-04

WEI Job No.: 342-06-01

Client: **PARSONS**
 Project: **US 52 / IL 64 Over the Mississippi River**
 Location: **Carroll County, IL and Jackson County, IA**

Datum: NAVD 88
 Elevation: 582.45 ft
 North: 1980089.00 ft
 East: 2295819.66 ft
 Station: 1552+48.06
 Offset: 65.50 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)	Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)	
		--WATER--																
	578.5	Very soft (0.25 P), gray CLAY LOAM, trace roots and shells Loose to medium dense, brown, poorly graded, fine to medium SAND	5	X	1	0 0 2 2	NP	18		553.0	Boring terminated at 29.50 ft	10	X	10	6 6 10	NP	18	
	577.8		10	X	2	5 7 9	NP	19					11	X	11	5 7 9	NP	24
	572.5		Loose to medium dense, brown to gray, medium to coarse SAND, trace gravel	15	X	3	3 4 5	NP	28				35					
				20	X	4	3 2 4	NP	21				40					
				25	X	5	2 2 3	NP	20				45					
				30	X	6	3 3 3	NP	26				50					
				35	X	7	2 4 3	NP	17									
				40	X	8	3 2 3	NP	20									
				45	X	9	4 7 7	NP	27									

GENERAL NOTES

WATER LEVEL DATA

Begin Drilling **10-10-2013** Complete Drilling **10-10-2013**
 Drilling Contractor **Wang Testing Services** Drill Rig **CME 55 TMR**
 Driller **R&J** Logger **A. Tomaras** Checked by **C. Marin**
 Drilling Method **4" Casing, mud rotary, boring backfilled upon completion**

While Drilling ∇ **0.00 ft**
 At Completion of Drilling \blacktriangledown **0.00 ft**
 Time After Drilling **NA**
 Depth to Water ∇ **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

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BORING LOG 52-SGB-05

WEI Job No.: 342-06-01

Client: **PARSONS**
 Project: **US 52 / IL 64 Over the Mississippi River**
 Location: **Carroll County, IL and Jackson County, IA**

Datum: NAVD 88
 Elevation: 597.83 ft
 North: 1980208.96 ft
 East: 2295820.81 ft
 Station: 1553+46.72
 Offset: 8.15 LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)	Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	597.45	1/4-inch thick ASPHALT --PAVEMENT--															
	595.8	Brown GRAVELLY SANDY LOAM												11	1 3 4	NP	17
	594.3	Stiff, brown SILTY CLAY LOAM, little gravel			1	7 6 5 4	1.56 B	13						12	2 4 4	NP	17
		Very loose, brown and gray SANDY LOAM	5		2	3 1 2 2	NP	20				30					
					3	2 1 1 1	NP	26									
					4	1 1 1 1	NP	23						13	3 7 11	NP	16
	587.3	Medium stiff, gray SILTY CLAY LOAM								562.8		35					
	584.8	Soft to stiff, gray SILTY CLAY LOAM, trace to little organic matter															
		--L _L (%)=39, P _L (%)=20--			6	P U S H	0.81 B	29									
		--%Gravel=0.0--			7	1 1 2	0.66 B	31									
		--%Sand=13.3--			8	0 2 3	1.15 B	30									
		--%Silt=60.4--			9	1 2 2	0.49 B	30									
		--%Clay=26.3--			10	0 2 4	NP	23									
	574.8	Loose to medium dense, gray, medium SAND, trace gravel															

GENERAL NOTES				WATER LEVEL DATA			
Begin Drilling	11-13-2013	Complete Drilling	11-13-2013	While Drilling	▽	23.00 ft	
Drilling Contractor	Wang Testing Services	Drill Rig	D-50 TMR	At Completion of Drilling	▼	20.00 ft	
Driller	R&N	Logger	A. Tomaras	Time After Drilling		NA	
Drilling Method	3.25" HSA, boring backfilled upon completion			Depth to Water	▽	NA	
The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.							

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BORING LOG 52-SGB-06

WEI Job No.: 342-06-01

Client: **PARSONS**
 Project: **US 52 / IL 64 Over the Mississippi River**
 Location: **Carroll County, IL and Jackson County, IA**

Datum: NAVD 88
 Elevation: 596.81 ft
 North: 1980270.12 ft
 East: 2295897.22 ft
 Station: 1554+43.77
 Offset: 1.28 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)	Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	596.54	1/2-inch thick ASPHALT --PAVEMENT--								571.3	Very loose to medium dense, gray, medium SAND						
	595.1	Brown GRAVELLY SANDY LOAM --FILL--			1	6 5 6 6	2.00 P	13						11	0 0 1	NP	21
	592.4	Stiff to very stiff, brown and gray CLAY LOAM, little gravel --FILL--			2	2 2 3 3	1.00 P	25						12	0 1 2	NP	19
	591.3	Loose, brown SAND --FILL--	5		3	1 1 2 2	0.41 B	31									
		Soft to medium stiff, gray SILTY LOAM, trace organic matter --FILL--			4	P U S H	0.50 P	33						13	10 6 7	NP	16
		--%Gravel=0.0-- --%Sand=26.4-- --%Silt=59.2-- --%Clay=14.4-- --A-4 (0)--10								561.8	Boring terminated at 35.00 ft	35					
	586.3	Very loose, gray, medium SAND --FILL--			5	1 0 1	NP	25									
	583.8	Very soft to medium stiff, gray SILTY CLAY LOAM, trace to little organic matter	15		6	1 1 1	0.49 B	21									
					7	1 1 1	0.82 B	35									
			20		8	1 2 2	0.90 B	30									
					9	0 1 1	0.16 B	29									
			25		10	0 2 1	0.90 B	48									

GENERAL NOTES

Begin Drilling **11-13-2013** Complete Drilling **11-13-2013**
 Drilling Contractor **Wang Testing Services** Drill Rig **D-50 TMR**
 Driller **R&N** Logger **A. Tomaras** Checked by **C. Marin**
 Drilling Method **3.25" HSA, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling ∇ **11.00 ft**
 At Completion of Drilling \blacktriangledown **22.00 ft**
 Time After Drilling **NA**
 Depth to Water ∇ **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.



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BORING LOG 52-SGB-07

WEI Job No.: 342-06-01

Client: **PARSONS**
 Project: **US 52 / IL 64 Over the Mississippi River**
 Location: **Carroll County, IL and Jackson County, IA**

Datum: NAVD 88
 Elevation: 582.45 ft
 North: 1980226.38 ft
 East: 2295936.49 ft
 Station: 1554+45.35
 Offset: 60.04 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)	Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
		--WATER--															
	577.5	Very soft, dark gray LOAM to SANDY LOAM, trace shells and organic matter	5		1	0 0 0 0	NP	33				30		9	7 9 11	NP	14
		--%Gravel=0.0-- --%Sand=58.0-- --%Silt=29.4-- --%Clay=12.7-- --A-4 (0)--			2	0 0 0	NP	34						10	9 6 10	NP	15
	572.5	Very loose to loose, gray, medium SAND	10		3	3 2 2	NP	26						11	2 5 9	NP	17
					4	1 2 3	NP	20						12	9 10 10	NP	23
			15		5	5 4 4	NP	22						13	7 7 6	NP	26
	564.5	Medium dense, gray, medium to coarse SAND, trace gravel	20		6	4 5 5	NP	18		543.0	Boring terminated at 39.50 ft	40					
		--%Gravel=2.2-- --%Sand=96.0-- --%Silt=1.5-- --%Clay=0.3-- --A-1-b (0)--			7	4 5 6	NP	24									
			25		8	7 7 8	NP	21									

GENERAL NOTES

WATER LEVEL DATA

Begin Drilling **10-10-2013** Complete Drilling **10-10-2013**
 Drilling Contractor **Wang Testing Services** Drill Rig **CME 55 TMR**
 Driller **R&J** Logger **A. Tomaras** Checked by **C. Marin**
 Drilling Method **4" Casing, mud rotary, boring backfilled upon completion**

While Drilling ∇ **0.00 ft**
 At Completion of Drilling ∇ **0.00 ft**
 Time After Drilling **NA**
 Depth to Water ∇ **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

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BORING LOG 52-SGB-09

WEI Job No.: 342-06-01

Client: **PARSONS**
 Project: **US 52 / IL 64 Over the Mississippi River**
 Location: **Carroll County, IL and Jackson County, IA**

Datum: NAVD 88
 Elevation: 582.45 ft
 North: 1980369.08 ft
 East: 2296188.70 ft
 Station: 1557+61.19
 Offset: 53.83 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)	Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
		--WATER--									Medium dense, gray, medium to coarse SAND, trace gravel						
	575.5													8	4 5 8	NP	16
	574.3	Very soft (0.25 P), brown SILTY CLAY, trace shells and roots												9	7 7 7	NP	15
		Very loose to loose, brown, medium SAND, trace gravel			1	0 0 0	NP	32									
		--%Gravel=0.1-- --%Sand=98.4-- --%Silt=1.2-- --%Clay=0.4-- --A-3 (0)--			2	1 2 3	NP	26									
					3	2 3 2	NP	18									
					4	2 2 2	NP	18									
	563.6	Very soft (0.25 P), brown CLAY LOAM			5	2 1 1	NP	19									
	562.5	Medium dense, brown, medium SAND, trace gravel			6	5 5 5	NP	26									
	558.6	Gray LOAM			7	3 1 4	NP	23									
	557.5																
										545.5	Boring terminated at 37.00 ft						

GENERAL NOTES

Begin Drilling **10-10-2013** Complete Drilling **10-10-2013**
 Drilling Contractor **Wang Testing Services** Drill Rig **CME 55 TMR**
 Driller **R&J** Logger **A. Tomaras** Checked by **C. Marin**
 Drilling Method **4" Casing, mud rotary, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling ∇ **0.00 ft**
 At Completion of Drilling ∇ **0.00 ft**
 Time After Drilling **NA**
 Depth to Water ∇ **NA**

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BORING LOG 52-SGB-10

WEI Job No.: 342-06-01

Client: **PARSONS**
 Project: **US 52 / IL 64 Over the Mississippi River**
 Location: **Carroll County, IL and Jackson County, IA**

Datum: NAVD 88
 Elevation: 597.58 ft
 North: 1980462.75 ft
 East: 2296357.35 ft
 Station: 1559+48.16
 Offset: 12.52 LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)	Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	597.25	inch thick ASPHALT															
	595.6	Medium dense, brown and black GRAVELLY SANDY LOAM			1	6 8 7	NP	6						12	1 1 2	NP	19
		--FILL-- Stiff, brown SILTY CLAY, little gravel			2	7 6 6	1.64 B	9									
		--FILL--			3	5 4 4	1.15 S	16		567.8	Very soft to stiff, gray SILTY CLAY LOAM, some organic matter	30		13	2 1 1	NP	18
	590.8	Very dense, gray CRUSHED STONE			4	2 2 2 3	1.00 P	20									
		--FILL-- --HARD DRILLING 7 to 10 ft--			5	5 0 4	NA										
	587.6	Soft to stiff, gray CLAY LOAM, some sand lenses	10		6	4 2 2	1.00 P	24		563.1	Medium dense, gray, medium SAND	35		14	4 6 9	1.07 B	42
		--FILL--			7	2 2 1	0.25 P	20			--%Gravel=0.4-- --%Sand=95.4-- --%Silt=3.6-- --%Clay=0.5-- --A-3 (0)--			15	4 6 6	NP	16
	582.1	Stiff to medium stiff, gray SILTY CLAY LOAM to SILTY LOAM, little to trace plants	15		8	0 2 2	1.07 B	28		557.6	Boring terminated at 40.00 ft	40					
		--L _L (%)=36, P _L (%)=21-- --%Gravel=1.0-- --%Sand=11.6-- --%Silt=65.7-- --%Clay=22.7-- --A-6 (13)--			9	P U S H	0.40 S	26				45					
	574.6	Very loose, poorly-graded, medium SAND	25		10	1 1 1	0.41 S	28									
					11	0 1 2	NP	21				50					

GENERAL NOTES

WATER LEVEL DATA

Begin Drilling **11-14-2013** Complete Drilling **11-14-2013**
 Drilling Contractor **Wang Testing Services** Drill Rig **D-50 TMR**
 Driller **R&N** Logger **A. Tomaras** Checked by **C. Marin**
 Drilling Method **3.25" HSA, boring backfilled upon completion**

While Drilling ∇ **23.00 ft**
 At Completion of Drilling ∇ **20.00 ft**
 Time After Drilling **NA**
 Depth to Water ∇ **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.



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BORING LOG 52-SGB-10

WEI Job No.: 342-06-01

Client **PARSONS**
 Project **US 52 / IL 64 Over the Mississippi River**
 Location **Carroll County, IL and Jackson County, IA**

Datum: NAVD 88
 Elevation: 597.58 ft
 North: 1980462.75 ft
 East: 2296357.35 ft
 Station: 1559+48.16
 Offset: 12.52 LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)	Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	597.25	inch thick ASPHALT															
	595.6	Medium dense, brown and black GRAVELLY SANDY LOAM --FILL--			1	6 8 7	NP	6						12	1 1 2	NP	19
		Stiff, brown SILTY CLAY, little gravel --FILL--			2	7 6 6	1.64 B	9						13	2 1 1	NP	18
			5		3	5 4 4	1.15 S	16		567.8	Very soft to stiff, gray SILTY CLAY LOAM, some organic matter	30					
	590.8	Very dense, gray CRUSHED STONE --FILL-- --HARD DRILLING 7 to 10 ft--			4	2 2 2 3	1.00 P	20						14	4 6 9	1.07 B	42
	587.6	Soft to stiff, gray CLAY LOAM, some sand lenses --FILL--	10		6	4 2 2	1.00 P	24		563.1	Medium dense, gray SAND	35					
					7	2 2 1	0.25 P	20			--%Gravel=0.4-- --%Sand=95.4-- --%Silt=3.6-- --%Clay=0.5-- --A-3 (0)--			15	4 6 6	NP	16
	582.1	Medium stiff to stiff, gray SILTY CLAY LOAM to SILTY LOAM, little to trace plants --L _L (%)=36, P _L (%)=21-- --%Gravel=1.0-- --%Sand=11.6-- --%Silt=65.7-- --%Clay=22.7-- --A-6 (13)--	15		8	0 2 2	1.07 B	28		557.6	Boring terminated at 40.00 ft	40					
					9	P U S H	0.40 S	26				45					
					10	1 1 1	0.41 S	28									
	574.6	Very loose, gray SAND			11	0 1 2	NP	21									
			25									50					

GENERAL NOTES

WATER LEVEL DATA

Begin Drilling **11-14-2013** Complete Drilling **11-14-2013**
 Drilling Contractor **Wang Testing Services** Drill Rig **D-50 TMR**
 Driller **R&N** Logger **A. Tomaras** Checked by **C. Marin**
 Drilling Method **3.25" HSA, boring backfilled upon completion**

While Drilling **23.00 ft**
 At Completion of Drilling **20.00 ft**
 Time After Drilling **NA**
 Depth to Water **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

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BORING LOG 52-SGB-11

WEI Job No.: 342-06-01

Client: **PARSONS**
 Project: **US 52 / IL 64 Over the Mississippi River**
 Location: **Carroll County, IL and Jackson County, IA**

Datum: NAVD 88
 Elevation: 582.45 ft
 North: 1980395.05 ft
 East: 2296369.01 ft
 Station: 1559+58.25
 Offset: 55.48 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)	Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
		--WATER--															
	577.5	Soft, dark gray SILT CLAY LOAM, trace organic matter and sand lenses	5		1	0 0 0 0	0.25 B	24		555.0	Very soft (0.25 P), gray SILTY CLAY	30		9	5 3 4	NP	21
	574.2	Loose, gray SAND			2	0 1 3	NP	25		554.1	Loose to medium dense, gray, medium to coarse SAND, trace gravel			10	4 5 4	NP	19
	572.5	Loose, gray, medium to coarse SAND --%Gravel=0.0-- --%Sand=98.6-- --%Silt=1.0-- --%Clay=0.4-- --A-3 (0)--	10		3	3 3 5	NP	25						11	6 7 8	NP	15
					4	2 5 4	NP	20						12	8 10 7	NP	24
					5	3 4 4	NP	29		548.0	Boring terminated at 34.50 ft	35					
					6	4 5 4	NP	20									
	562.5	Very soft (0.25 P), gray SILTY CLAY, trace organics	20		7	2 4 4	NP	21									
	561.7	Loose, gray SAND															
	560.0	Very soft (0.25 P), gray SILTY CLAY, trace organics			8	6 7 8	NP	21									
	559.2	Loose to medium dense, gray, medium SAND	25														

GENERAL NOTES

Begin Drilling **10-09-2013** Complete Drilling **10-10-2013**
 Drilling Contractor **Wang Testing Services** Drill Rig **CME 55 TMR**
 Driller **R&J** Logger **A. Tomaras** Checked by **C. Marin**
 Drilling Method **4" Casing, mud rotary, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling ∇ **0.00 ft**
 At Completion of Drilling ∇ **0.00 ft**
 Time After Drilling **NA**
 Depth to Water ∇ **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

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BORING LOG BSB-24

WEI Job No.: 342-06-01

Client: **PARSONS**
 Project: **US 52 / IL 64 Over the Mississippi River**
 Location: **Carroll County, IL and Jackson County, IA**

Datum: NAVD 88
 Elevation: 598.94 ft
 North: 1980482.42 ft
 East: 2296444.64 ft
 Station: 1560+58.13
 Offset: 37.04 LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)	Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	598.64	5-inch thick, ASPHALT --PAVEMENT--															
	597.7	Medium dense, brown LOAM, little gravel --FILL--			1	9 9 4	NP	2			medium SAND, trace gravel			11	6 8 10	NP	23
		Very loose to medium dense, brown, medium to coarse SAND, trace gravel --FILL--	5		2	2 3 2	NR				--%Gravel=0.1-- --%Sand=96.3-- --%Silt=3.5-- --%Clay=0.2-- --A-3 (0)--			12	4 6 7	NP	23
					3	2 2 1	NP	10									
	590.9	Very soft (<0.25P), brown CLAY LOAM --FILL--			4	2 2 1	NP	3						13	3 4 5	NP	22
		Very loose to loose, brown, medium to coarse SAND, trace organic matter --FILL--	10		5	2 2 4	0.33 B	16									
	587.8	Very soft to soft, brown and gray SILTY LOAM, trace sand lenses --FILL--			6									14	2 3 2	NP	22
	584.9	--L _L (%)=36, P _L (%)=20-- --%Gravel=0.0-- --%Sand=16.5-- --%Silt=67.4-- --%Clay=16.0-- --A-6 (13)--			7												
	583.4	Brown and gray SANDY LOAM Medium stiff, brown and gray SILTY CLAY, trace organic matter			8	1 2 3	0.74 B	29		557.2	Medium dense, gray, coarse SAND, trace to some gravel			15	6 6 6	NP	21
			20														
	577.4	Loose, gray, medium SAND			9	1 2 3	0.82 B	36			--%Gravel=0.8-- --%Sand=96.3-- --%Silt=2.6-- --%Clay=0.3-- --A-3 (0)--						
	575.9	Medium stiff (0.5P), gray SILTY CLAY			10	6 11 10	NP	20						16	10 10 10	NP	19
	575.2	Loose to medium sense, gray,	25														

GENERAL NOTES

WATER LEVEL DATA

Begin Drilling **11-11-2013** Complete Drilling **11-15-2013**
 Drilling Contractor **Wang Testing Service** Drill Rig **D-50 TMR**
 Driller **R&N** Logger **A. Tomaras** Checked by **C. Marin**
 Drilling Method **3.25" HSA to 18', 4" Casing, mud rotary thereafter,
 boring backfilled upon completion**

While Drilling ∇ **14.00 ft**
 At Completion of Drilling ∇ **NA**
 Time After Drilling **NA**
 Depth to Water ∇ **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

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BORING LOG BSB-24

WEI Job No.: 342-06-01

Client **PARSONS**
 Project **US 52 / IL 64 Over the Mississippi River**
 Location **Carroll County, IL and Jackson County, IA**

Datum: NAVD 88
 Elevation: 598.94 ft
 North: 1980482.42 ft
 East: 2296444.64 ft
 Station: 1560+58.13
 Offset: 37.04 LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)	Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
		Medium dense, gray, coarse SAND, trace to some gravel															
			55	X	17	7 10 9	NP	17					X	22	5 6 7	NP	16
			60	X	18	9 11 10	NP	15					X	23	6 5 6	NP	15
	537.2	Medium dense to dense, gray GRAVELLY SAND															
			65	X	19	8 6 6	NP	16					X	24	11 12 15	NP	18
			70	X	20	7 7 8	NP	18					X	25	10 11 13	NP	18
			75	X	21	8 8 9	NP	15					X	26	7 8 10	NP	16

--%Gravel=3.5--
 --%Sand=94.7--
 --%Silt=1.5--
 --%Clay=0.3--80
 --A-1-b (0)--

GENERAL NOTES

WATER LEVEL DATA

Begin Drilling **11-11-2013** Complete Drilling **11-15-2013**
 Drilling Contractor **Wang Testing Service** Drill Rig **D-50 TMR**
 Driller **R&N** Logger **A. Tomaras** Checked by **C. Marin**
 Drilling Method **3.25" HSA to 18', 4" Casing, mud rotary thereafter, boring backfilled upon completion**

While Drilling ∇ **14.00 ft**
 At Completion of Drilling \blacktriangledown **NA**
 Time After Drilling **NA**
 Depth to Water ∇ **NA**
 The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

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BORING LOG BSB-24

WEI Job No.: 342-06-01

Client: **PARSONS**
 Project: **US 52 / IL 64 Over the Mississippi River**
 Location: **Carroll County, IL and Jackson County, IA**

Datum: NAVD 88
 Elevation: 598.94 ft
 North: 1980482.42 ft
 East: 2296444.64 ft
 Station: 1560+58.13
 Offset: 37.04 LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)	Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
		Medium dense to dense, gray GRAVELLY SAND															
			105		27	11 12 13	NP	17									
		--%Gravel=10.8-- --%Sand=86.2-- --%Silt=2.6-- --%Clay=0.3-10 --A-1-b (0)--			28	10 12 15	NP	14									
			115		29	10 7 8	NP	16									
			120		30	17 21 19	NP	15									
	478.9	Boring terminated at 120.00 ft															
			125														

GENERAL NOTES

Begin Drilling **11-11-2013** Complete Drilling **11-15-2013**
 Drilling Contractor **Wang Testing Service** Drill Rig **D-50 TMR**
 Driller **R&N** Logger **A. Tomaras** Checked by **C. Marin**
 Drilling Method **3.25" HSA to 18', 4" Casing, mud rotary thereafter, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling ∇ **14.00 ft**
 At Completion of Drilling \blacktriangledown **NA**
 Time After Drilling **NA**
 Depth to Water ∇ **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

APPENDIX B

SOIL TEST DATA

ROUTE
US 52

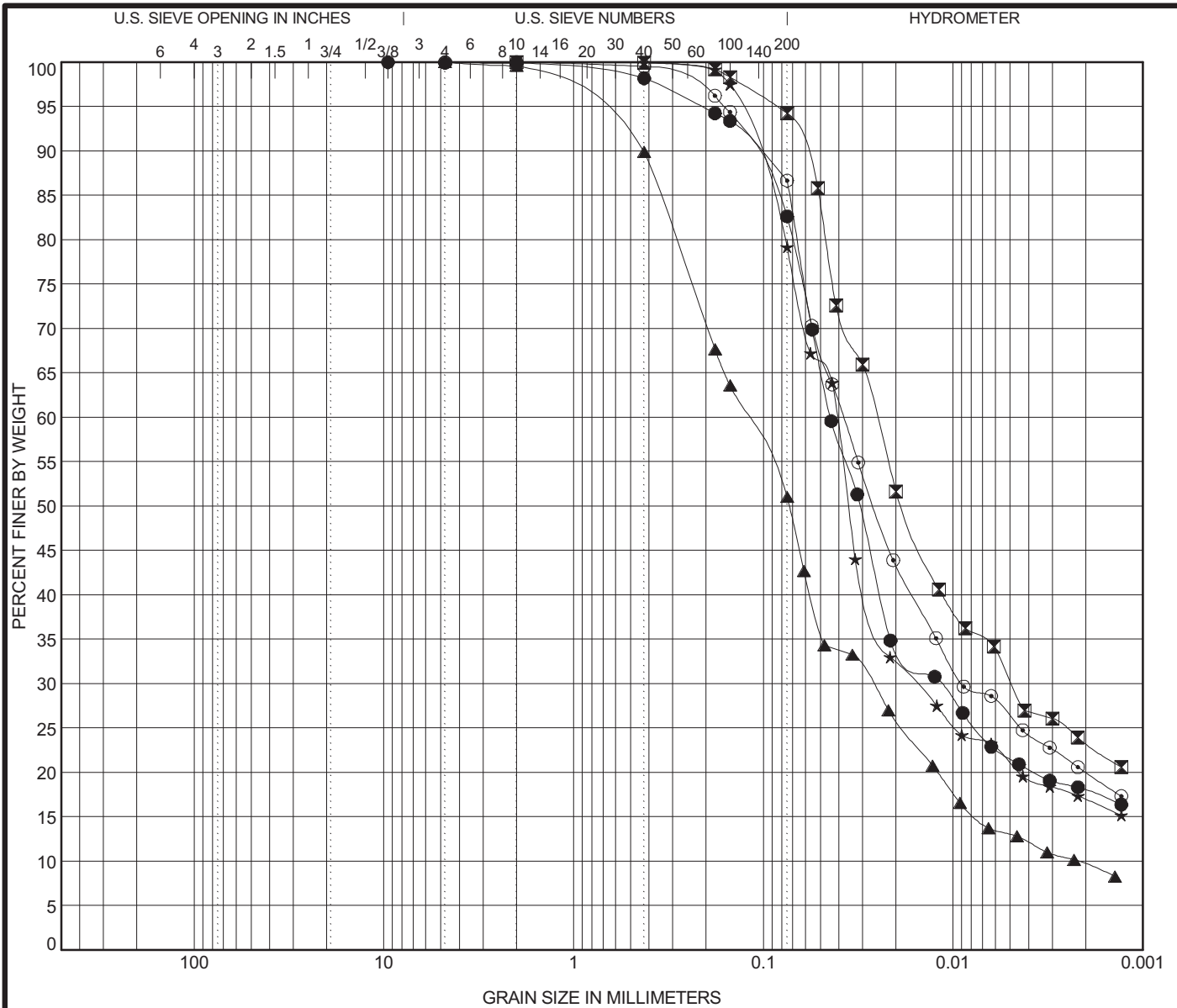
PROJECT
P-92-001-11

SECTION
US 25 (Sta. 1546+00 to 1560+65)

COUNTY
Jackson County, Iowa

Lab. No.	52-SGB-03 No.1
Station ft)	1552+41.46
Offset (ft)	5.56 RT
Depth (ft)	2
AASHTO M 145 Classification and Group Index	A-4 (0)
Illinois Textural Classification (Illinois Method)	Loam
Gradation--Passing 1" Sieve %	
--" 3/4" Sieve %	
--" 1/2" Sieve %	
--" No.4 Sieve %	100.0
--" No.10 Sieve %	99.6
--" No.4 0 Sieve %	89.9
--" No.100 Sieve %	63.6
--" No.200 Sieve %	50.5
Sand % (AASHTO T 88)	49.1
Silt % (AASHTO T 88)	40.8
Clay % (AASHTO T 88)	9.6
Liquid limit % (AASHTO T 89)	0.0
Plasticity index % (AASHTO T 90)	0.0
IBR % (Illinois Method)	
Standard Dry Density % (AASHTO T 99)	
Optimum Moisture % (AASHTO T 99)	
Subgrade Support Rating	POOR
Insitu Moisture % (AASHTO T 99)	17

APPENDIX C



COBBLES	GRAVEL	SAND		SILT AND CLAY
		coarse	fine	

Specimen Identification			IDH Classification					LL	PL	PI	Cc	Cu
●	52-SGB-01#9	18.5 ft	Silty Loam					34	20	14		
☒	52-SGB-02#7	16.0 ft	Silty Clay Loam					42	21	21		
▲	52-SGB-03#1	2.0 ft	Loam					NP	NP	NP	2.70	56.03
★	52-SGB-03#7	16.0 ft	Silty Loam					33	19	14		
⊙	52-SGB-05#6	13.5 ft	Silty Clay Loam					39	20	19		
Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay		
●	52-SGB-01#9	18.5 ft	9.5	0.044	0.012		0.1	17.8	64.1	18.0		
☒	52-SGB-02#7	16.0 ft	2	0.025	0.005		0.0	6.0	70.6	23.3		
▲	52-SGB-03#1	2.0 ft	4.75	0.123	0.027	0.002	0.4	49.1	40.8	9.6		
★	52-SGB-03#7	16.0 ft	2	0.041	0.016		0.0	21.4	61.7	17.0		
⊙	52-SGB-05#6	13.5 ft	4.75	0.038	0.009		0.0	14.1	65.9	20.0		

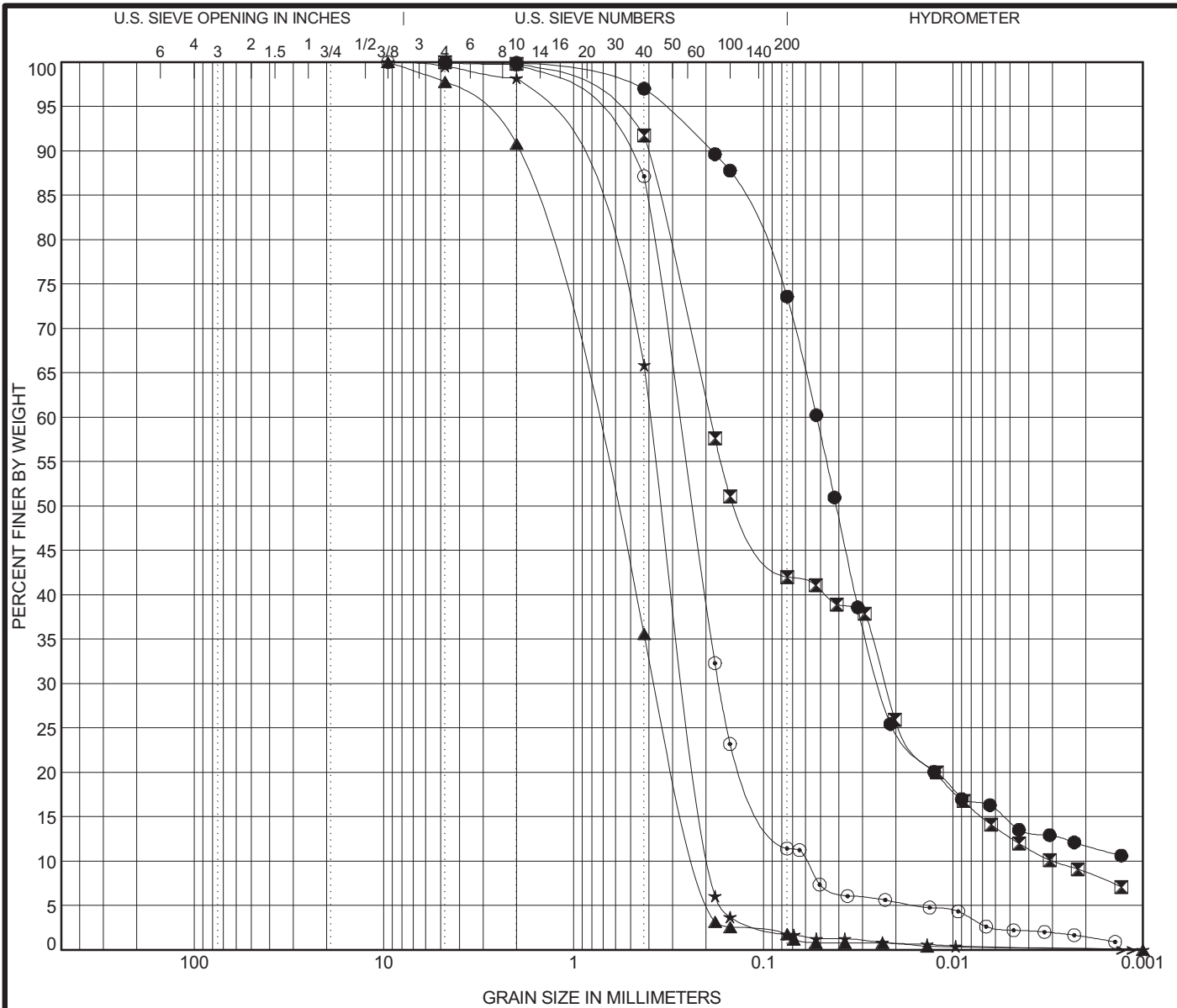
WEI GRAIN SIZE IDH 3420601.GPJ US LAB.GDT 2/21/14



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GRAIN SIZE DISTRIBUTION

Project: US 52 / IL 64 Over the Mississippi River
 Location: Carroll County, IL and Jackson County, IA
 Number: 342-06-01



COBBLES	GRAVEL	SAND		SILT AND CLAY
		coarse	fine	

Specimen Identification			IDH Classification					LL	PL	PI	Cc	Cu
●	52-SGB-06#4	8.0 ft	Silty Loam					NP	NP	NP		
☒	52-SGB-07#2	8.0 ft	Sandy Loam					NP	NP	NP	0.93	64.09
▲	52-SGB-07#7	20.5 ft	Sand					NP	NP	NP	0.74	3.91
★	52-SGB-07#11	30.5 ft	Sand					NP	NP	NP	0.87	2.05
⊙	52-SGB-08#6	10.0 ft	Sand					NP	NP	NP	1.78	4.66

Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	52-SGB-06#4	8.0 ft	4.75	0.052	0.025		0.1	26.8	61.3	11.8
☒	52-SGB-07#2	8.0 ft	4.75	0.191	0.023	0.003	0.2	57.9	33.2	8.7
▲	52-SGB-07#7	20.5 ft	9.5	0.843	0.366	0.216	9.2	89.1	1.4	0.3
★	52-SGB-07#11	30.5 ft	9.5	0.391	0.254	0.19	1.8	96.5	1.4	0.3
⊙	52-SGB-08#6	10.0 ft	9.5	0.278	0.172	0.06	0.3	88.3	10.0	1.5

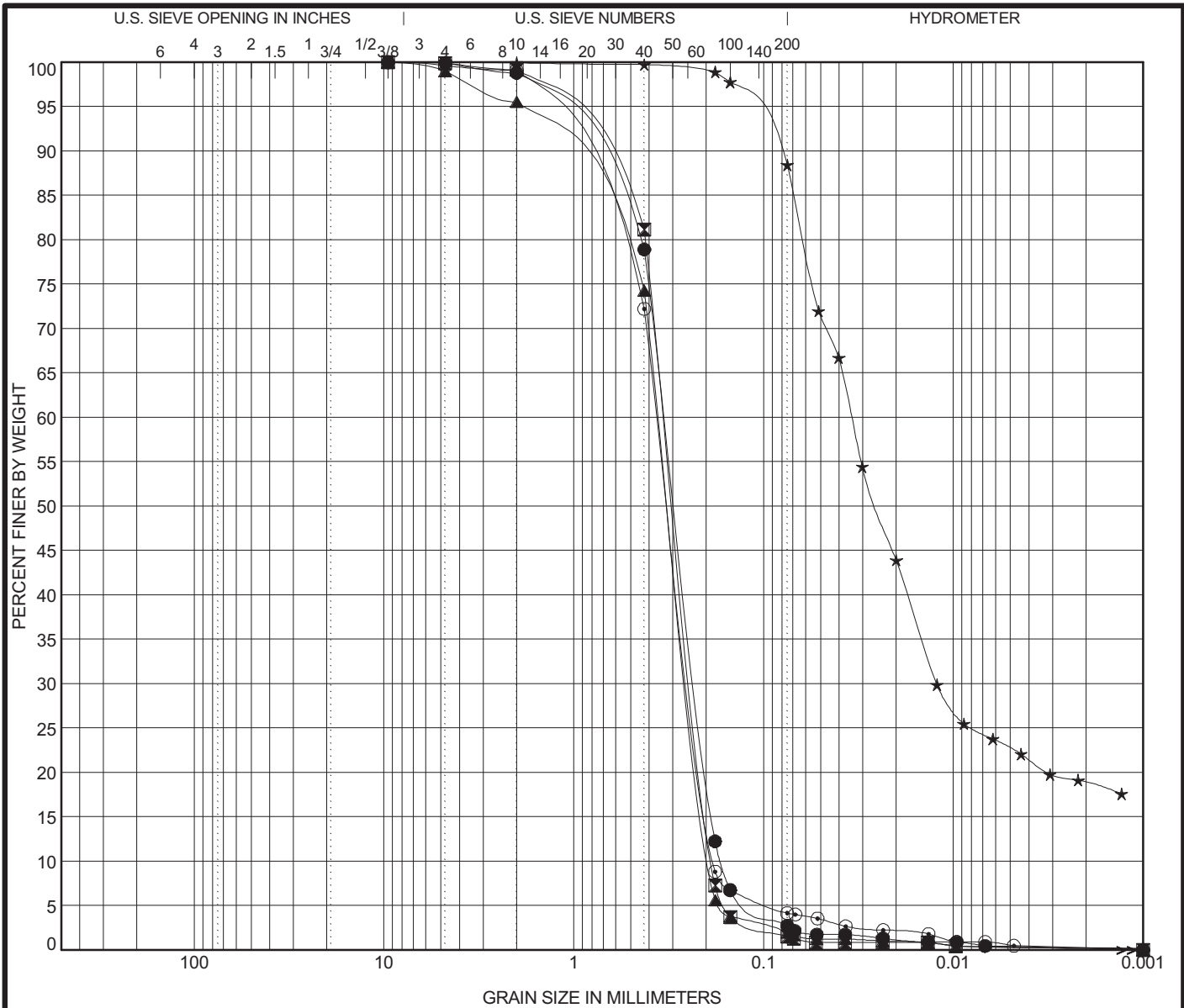


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GRAIN SIZE DISTRIBUTION

Project: US 52 / IL 64 Over the Mississippi River
 Location: Carroll County, IL and Jackson County, IA
 Number: 342-06-01

WEI GRAIN SIZE IDH 3420601.GPJ US LAB.GDT 2/21/14



COBBLES	GRAVEL	SAND		SILT AND CLAY
		coarse	fine	

Specimen Identification			IDH Classification					LL	PL	PI	Cc	Cu
●	52-SGB-08#13	28.5 ft	Sand					NP	NP	NP	0.92	1.99
☒	52-SGB-09#2	10.5 ft	Sand					NP	NP	NP	0.89	1.79
▲	52-SGB-09#10	30.5 ft	Sand					NP	NP	NP	0.88	1.87
★	52-SGB-10#9	18.0 ft	Silty Loam					36	21	15		
◎	52-SGB-10#15	38.5 ft	Sand					NP	NP	NP	0.87	1.97
Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay		
●	52-SGB-08#13	28.5 ft	9.5	0.333	0.226	0.167	1.2	96.2	2.3	0.3		
☒	52-SGB-09#2	10.5 ft	9.5	0.332	0.234	0.186	0.8	97.7	1.2	0.3		
▲	52-SGB-09#10	30.5 ft	9.5	0.355	0.244	0.19	4.5	93.6	1.7	0.3		
★	52-SGB-10#9	18.0 ft	4.75	0.034	0.012		0.1	12.1	69.0	18.9		
◎	52-SGB-10#15	38.5 ft	9.5	0.36	0.24	0.183	0.9	95.0	3.7	0.4		

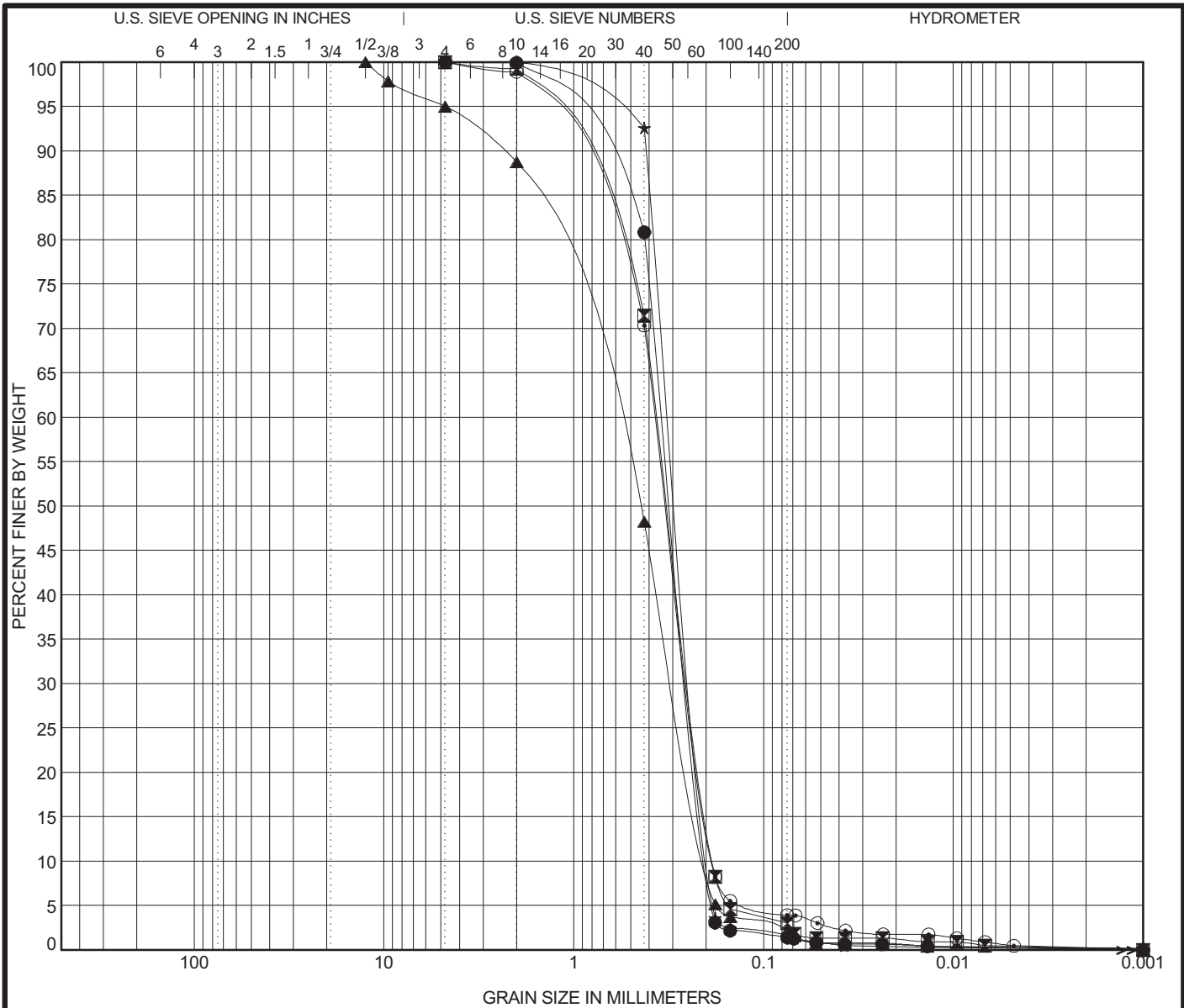
WEI GRAIN SIZE IDH 3420601.GPJ US LAB.GDT 2/21/14



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GRAIN SIZE DISTRIBUTION

Project: US 52 / IL 64 Over the Mississippi River
 Location: Carroll County, IL and Jackson County, IA
 Number: 342-06-01



COBBLES	GRAVEL	SAND		SILT AND CLAY
		coarse	fine	

Specimen Identification			IDH Classification					LL	PL	PI	Cc	Cu
●	52-SGB-11#3	10.5 ft	Sand					NP	NP	NP	0.90	1.74
☒	52-SGB-11#4	13.0 ft	Sand					NP	NP	NP	0.87	1.97
▲	52-SGB-11#11	30.5 ft	Sand					NP	NP	NP	0.66	3.36
★	52-SGB-12#4	15.5 ft	Sand					NP	NP	NP	0.91	1.62
⊙	52-SGB-12#5	18.0 ft	Sand					NP	NP	NP	0.87	2.00
Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay		
●	52-SGB-11#3	10.5 ft	4.75	0.338	0.242	0.194	0.1	98.6	1.1	0.3		
☒	52-SGB-11#4	13.0 ft	4.75	0.364	0.242	0.184	0.8	96.4	2.5	0.3		
▲	52-SGB-11#11	30.5 ft	12.5	0.666	0.295	0.198	11.2	86.7	1.8	0.3		
★	52-SGB-12#4	15.5 ft	2	0.31	0.232	0.191	0.0	98.4	1.3	0.3		
⊙	52-SGB-12#5	18.0 ft	4.75	0.368	0.243	0.184	1.1	95.0	3.5	0.4		

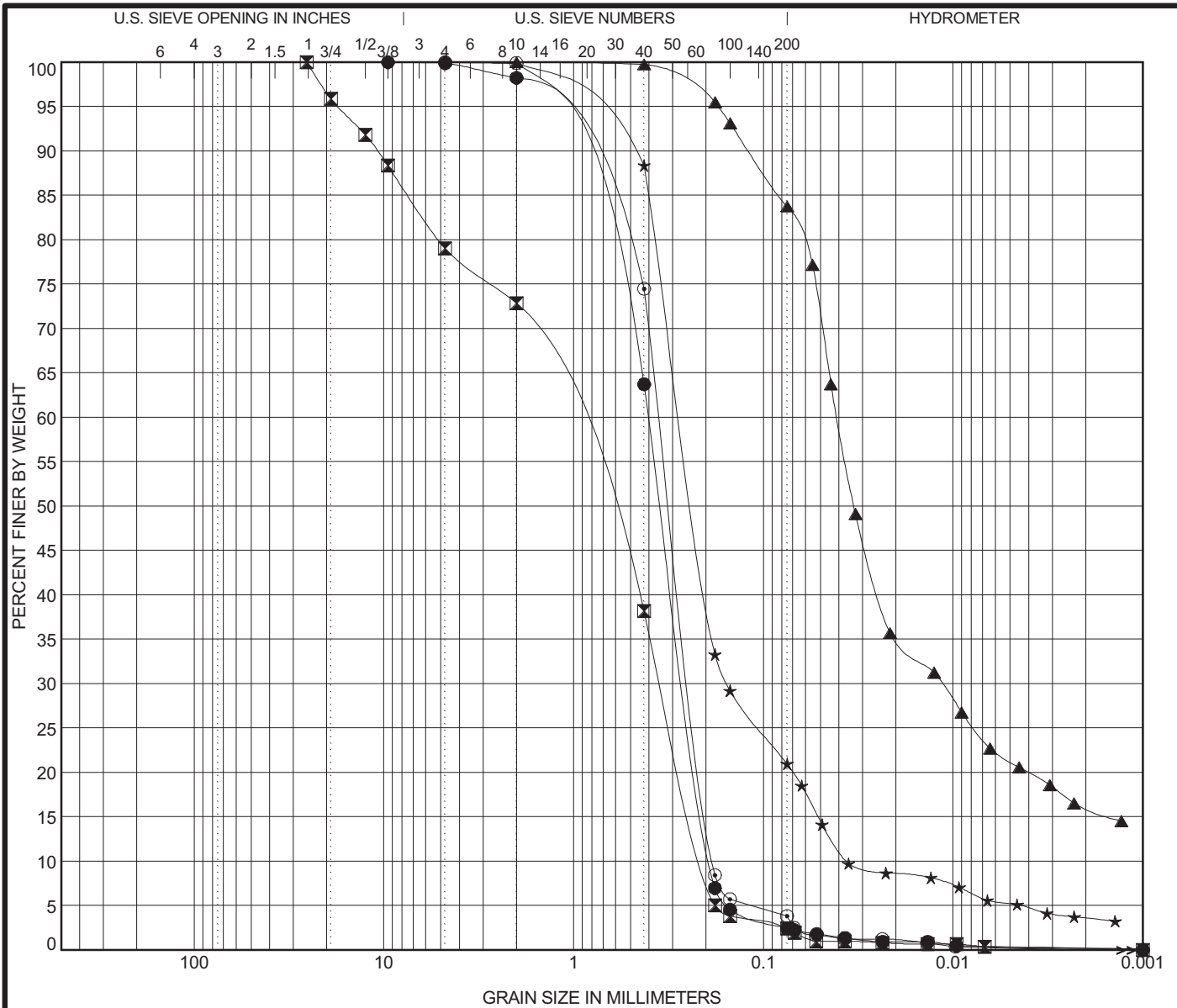
WEI GRAIN SIZE IDH 3420601.GPJ US LAB.GDT 2/21/14



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GRAIN SIZE DISTRIBUTION

Project: US 52 / IL 64 Over the Mississippi River
 Location: Carroll County, IL and Jackson County, IA
 Number: 342-06-01



COBBLES	GRAVEL	SAND		SILT AND CLAY
		coarse	fine	

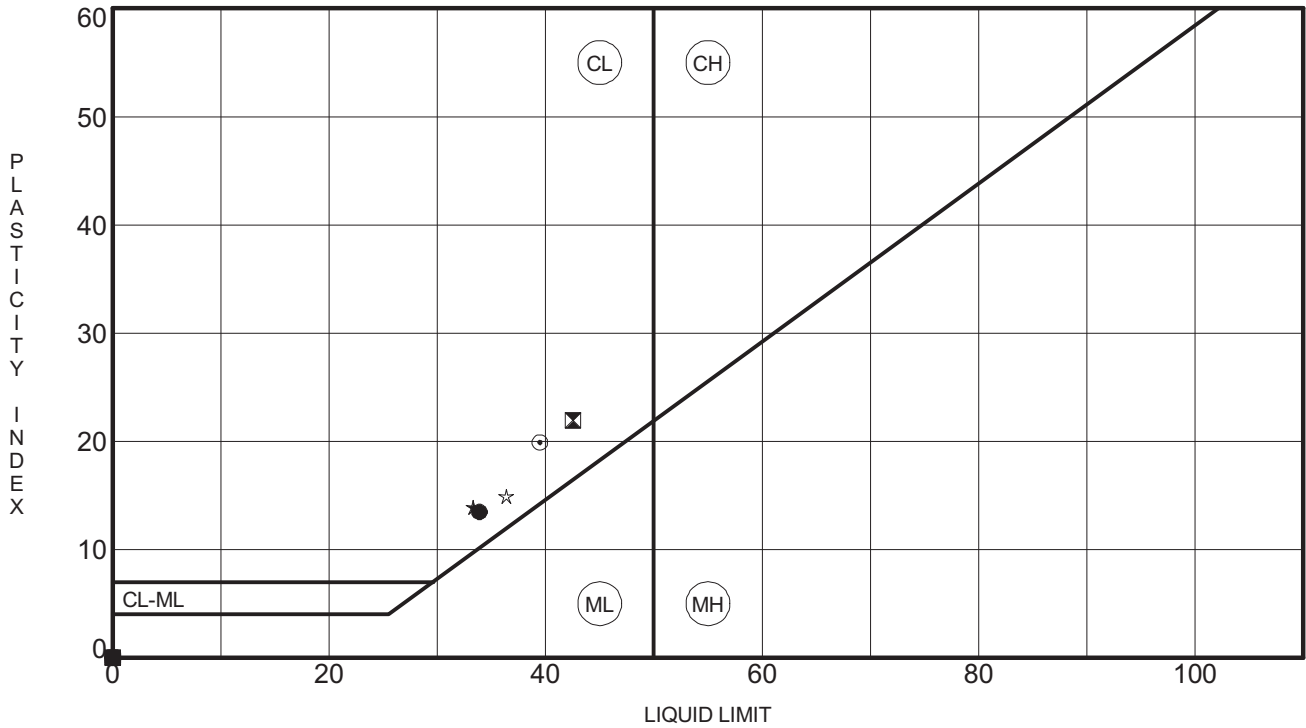
Specimen Identification			IDH Classification					LL	PL	PI	Cc	Cu
●	52-SGB-12#12	35.5 ft	Sand					NP	NP	NP	0.86	2.13
☒	52-SGB-12#14	45.5 ft	Gravelly Sand					NP	NP	NP	0.51	5.50
▲	BSB-24#6	13.0 ft	Silty Loam					36	20	16		
★	BSB-24#	13.5 ft	Sandy Loam					NP	NP	NP	2.44	7.52
⊙	BSB-24#12	28.5 ft	Sand					NP	NP	NP	0.88	1.92
Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay		
●	52-SGB-12#12	35.5 ft	9.5	0.402	0.255	0.188	1.8	95.8	2.1	0.3		
☒	52-SGB-12#14	45.5 ft	25.4	1.127	0.344	0.205	27.1	70.5	2.1	0.2		
▲	BSB-24#6	13.0 ft	2	0.041	0.011		0.0	16.5	67.4	16.0		
★	BSB-24#	13.5 ft	4.75	0.273	0.155	0.036	0.1	79.1	17.2	3.6		
⊙	BSB-24#12	28.5 ft	4.75	0.352	0.238	0.184	0.1	96.3	3.5	0.2		



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GRAIN SIZE DISTRIBUTION
 Project: US 52 / IL 64 Over the Mississippi River
 Location: Carroll County, IL and Jackson County, IA
 Number: 342-06-01

WEI GRAIN SIZE IDH 3420601.GPJ US LAB.GDT 2/21/14



Specimen Identification	LL	PL	PI	Fines	IDH Classification	
● 52-SGB-01#9	18.5 ft	34	20	14	83	Silty Loam
⊠ 52-SGB-02#7	16.0 ft	42	21	21	94	Silty Clay Loam
▲ 52-SGB-03#1	2.0 ft	NP	NP	NP	51	Loam
★ 52-SGB-03#7	16.0 ft	33	19	14	79	Silty Loam
⊙ 52-SGB-05#6	13.5 ft	39	20	19	87	Silty Clay Loam
⊕ 52-SGB-06#4	8.0 ft	NP	NP	NP	74	Silty Loam
○ 52-SGB-07#2	8.0 ft	NP	NP	NP	42	Sandy Loam
△ 52-SGB-07#7	20.5 ft	NP	NP	NP	2	Sand
⊗ 52-SGB-07#11	30.5 ft	NP	NP	NP	2	Sand
⊕ 52-SGB-08#6	10.0 ft	NP	NP	NP	11	Sand
□ 52-SGB-08#13	28.5 ft	NP	NP	NP	3	Sand
⊕ 52-SGB-09#2	10.5 ft	NP	NP	NP	2	Sand
⊕ 52-SGB-09#10	30.5 ft	NP	NP	NP	2	Sand
☆ 52-SGB-10#9	18.0 ft	36	21	15	88	Silty Loam
⊗ 52-SGB-10#15	38.5 ft	NP	NP	NP	4	Sand
■ 52-SGB-11#3	10.5 ft	NP	NP	NP	1	Sand
◆ 52-SGB-11#4	13.0 ft	NP	NP	NP	3	Sand
◇ 52-SGB-11#11	30.5 ft	NP	NP	NP	2	Sand
× 52-SGB-12#4	15.5 ft	NP	NP	NP	2	Sand
⊗ 52-SGB-12#5	18.0 ft	NP	NP	NP	4	Sand

WEI ATTERBERG LIMITS IDH 3420601.GPJ US LAB.GDT 2/21/14

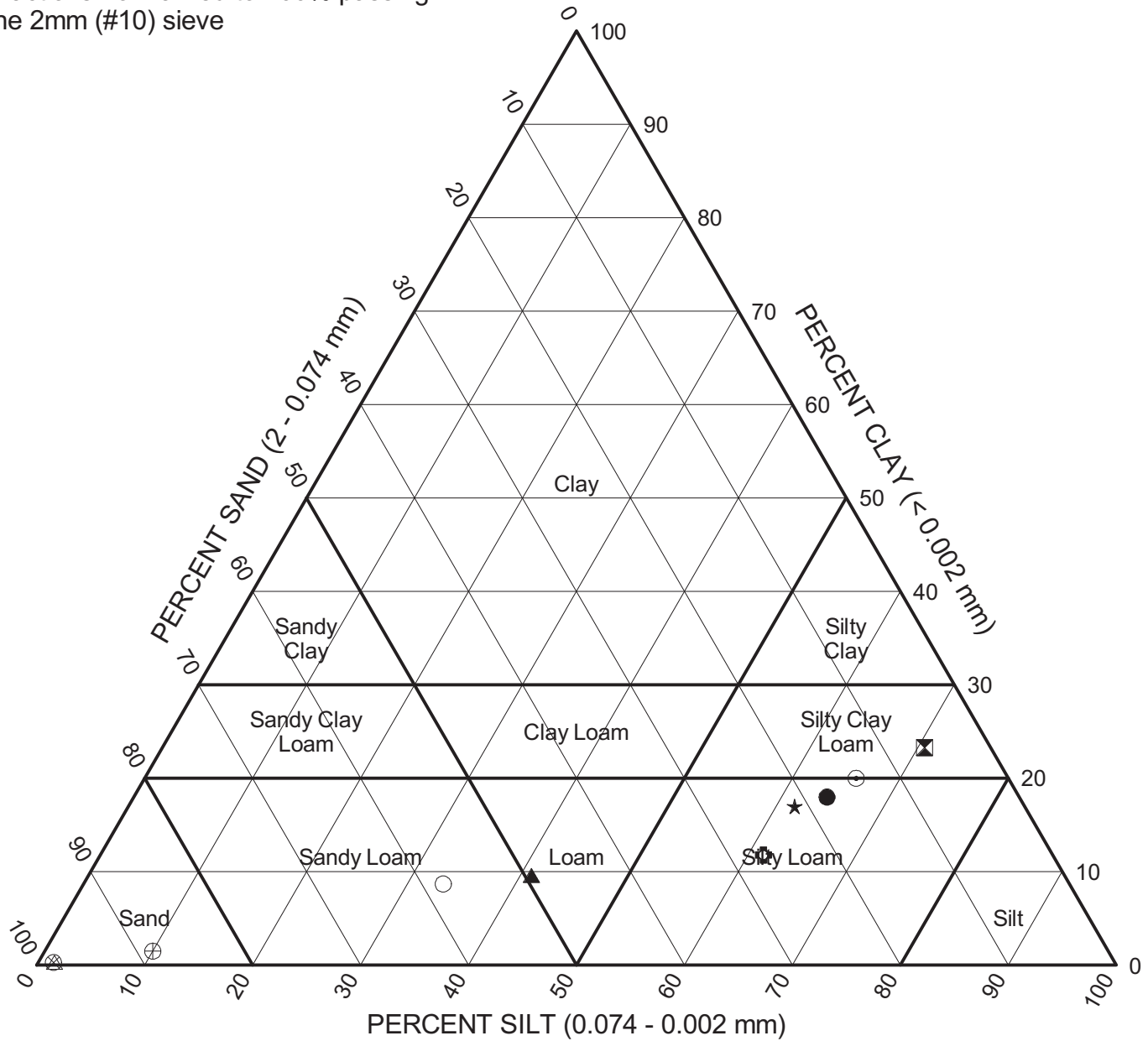


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ATTERBERG LIMITS' RESULTS

Project: US 52 / IL 64 Over the Mississippi River
 Location: Carroll County, IL and Jackson County, IA
 Number: 342-06-01

Fractions normalized to 100% passing the 2mm (#10) sieve



Sample	Depth (ft)	Sand (%)	Silt (%)	Clay (%)	Classification		
					IL DOT	AASHTO	ASTM
● 52-SGB-01#9	18.5	17.8	64.2	18.0	Silty Loam	A-6 (11)	CL
⊠ 52-SGB-02#7	16.0	6.0	70.6	23.3	Silty Clay Loam	A-7-6 (21)	CL
▲ 52-SGB-03#1	2.0	49.3	41.0	9.6	Loam	A-4 (0)	ML
★ 52-SGB-03#7	16.0	21.4	61.7	17.0	Silty Loam	A-6 (10)	CL
⊙ 52-SGB-05#6	13.5	14.1	65.9	20.0	Silty Clay Loam	A-6 (17)	CL
⊕ 52-SGB-06#4	8.0	26.8	61.4	11.8	Silty Loam	A-4 (0)	ML
○ 52-SGB-07#2	8.0	58.0	33.3	8.7	Sandy Loam	A-4 (0)	SM
△ 52-SGB-07#7	20.5	98.1	1.5	0.3	Sand	A-1-b (0)	SP
⊗ 52-SGB-07#11	30.5	98.3	1.4	0.3	Sand	A-3 (0)	SP
⊕ 52-SGB-08#6	10.0	88.6	10.0	1.5	Sand	A-2-4 (0)	SP-SM

WEI IDH 3420601.GPJ WANGENG_GDT 6/23/14



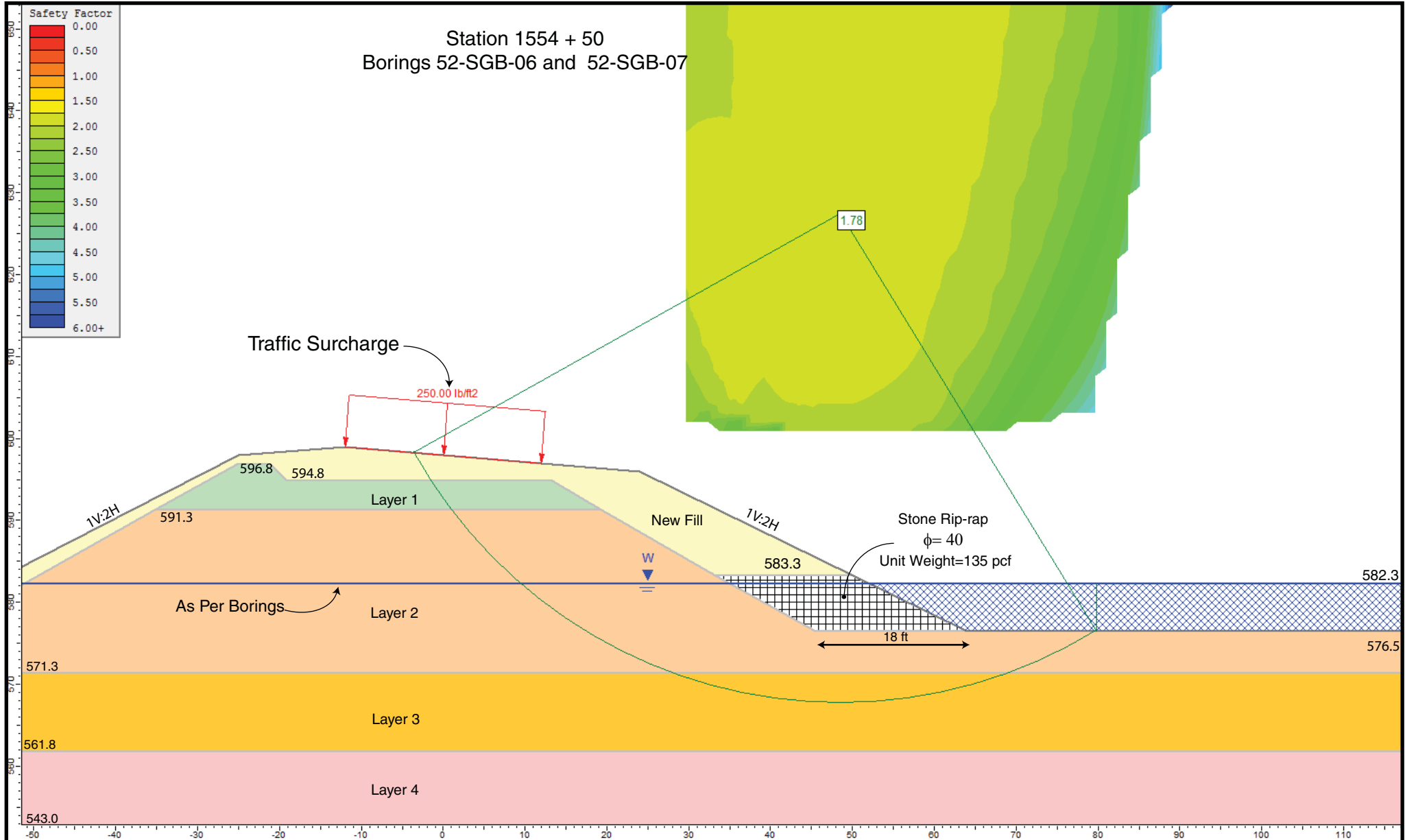
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IDH Textural Classification Chart

Project: US 52 / IL 64 Over the Mississippi River
Location: Carroll County, IL and Jackson County, IA
Number: 342-06-01

APPENDIX D

Station 1554 + 50
 Borings 52-SGB-06 and 52-SGB-07



Soil Properties

Layer ID	Soil Type	Undrained Parameter		
		Unit Weight (pcf)	C_u (psf)	ϕ (deg.)
Fill	New Cohesive FILL	125	1000	0
1	Stiff to Very Stiff CLAY LOAM	120	1500	0
2	Soft to Medium Stiff SILTY LOAM to SILTY CLAY LOAM	115	600	0
3	Very Loose to Medium Dense SAND	110	0	28
4	Medium Dense SAND	115	0	32

SLOPE STABILITY ANALYSIS: US 52/ ROADWAY RECONSTRUCTION, JACKSON COUNTY, IOWA

July 10, 2014

APPENDIX D-1

DRAWN BY: A. Hamad
 CHECKED BY: M. Kothawala

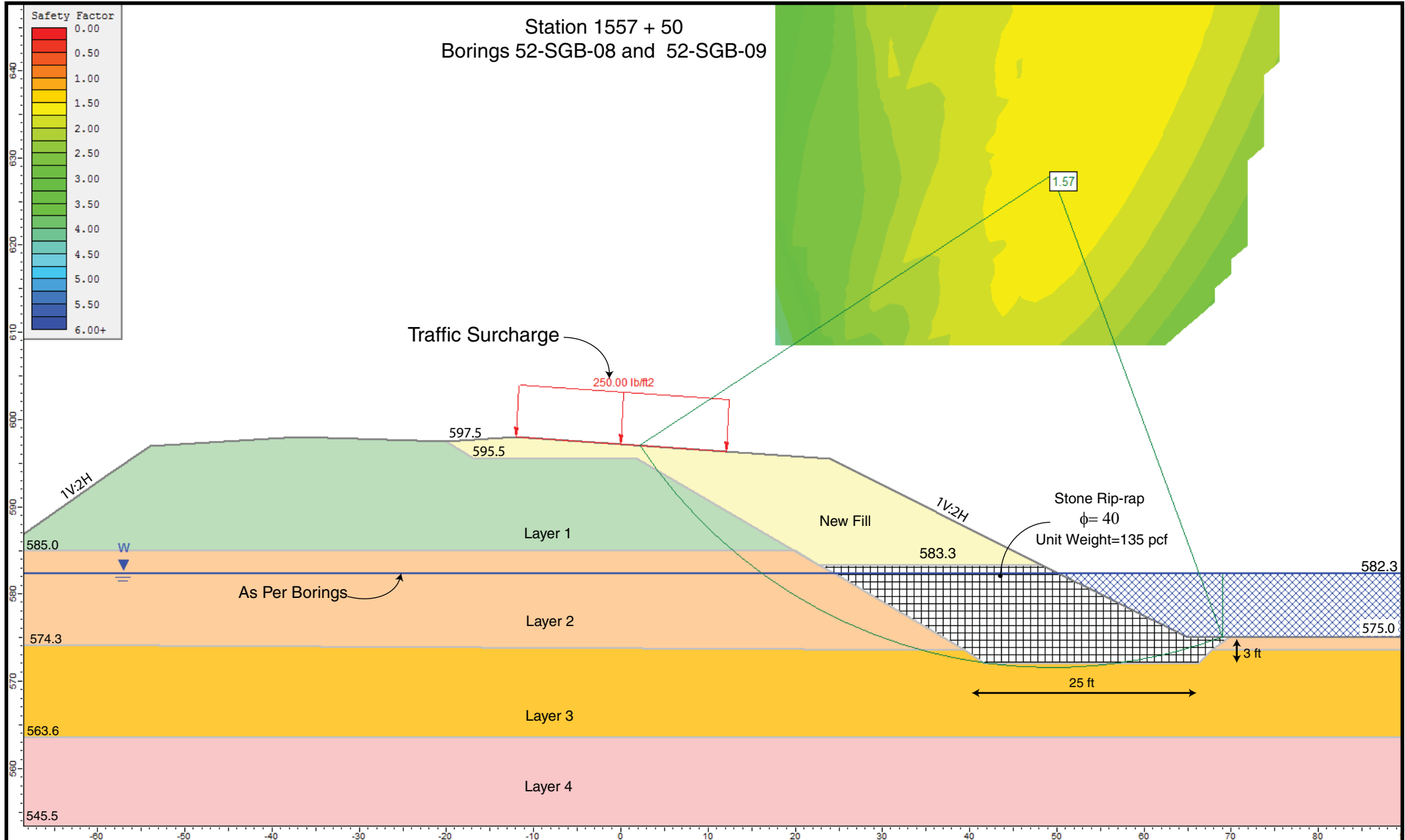


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FOR PARSONS

342-06-01

Station 1557 + 50
 Borings 52-SGB-08 and 52-SGB-09



Soil Properties

Layer ID	Soil Type	Unit Weight	Undrained Parameter	
		(pcf)	C_u (psf)	ϕ (deg.)
Fill	New Cohesive FILL	125	1000	0
1	Very Loose to Loose SAND	110	0	28
2	Soft to Medium Stiff SILTY CLAY	115	540	0
3	Very Loose to Loose SAND	110	0	28
4	Medium Dense SAND	115	0	32

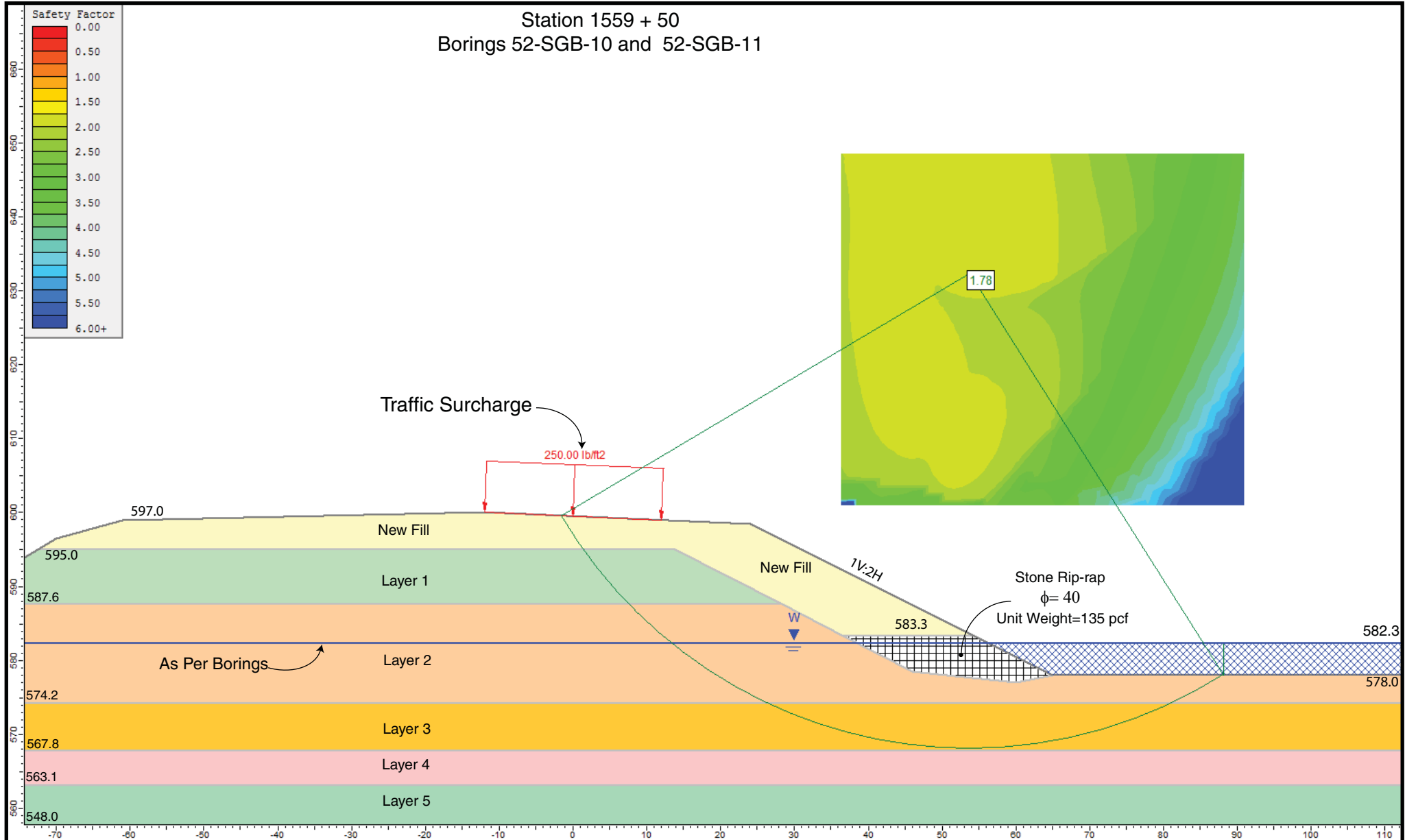
SLOPE STABILITY ANALYSIS: US 52/ ROADWAY RECONSTRUCTION,
 JACKSON COUNTY, IOWA

July 10, 2014 **APPENDIX D-2** DRAWN BY: A. Hamad
 CHECKED BY: M. Kothawala

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FOR PARSONS **342-06-01**

Station 1559 + 50
 Borings 52-SGB-10 and 52-SGB-11



Soil Properties

Layer ID	Soil Type	Undrained Parameter		
		Unit Weight (pcf)	C_u (psf)	ϕ (deg.)
Fill	New Cohesive FILL	125	1000	0
1	Stiff SILTY CLAY FILL	120	1300	0
2	Medium Stiff Silty CLAY LOAM	115	600	0
3	Very Loose to Loose SAND	110	0	28
4	Stiff SILTY CLAY LOAM	120	1100	0
5	Loose to Medium Dense SAND	115	0	32

SLOPE STABILITY ANALYSIS: US 52/ ROADWAY RECONSTRUCTION, JACKSON COUNTY, IOWA

July 10, 2014 **APPENDIX D-3** DRAWN BY: A. Hamad
 CHECKED BY: M. Kothawala

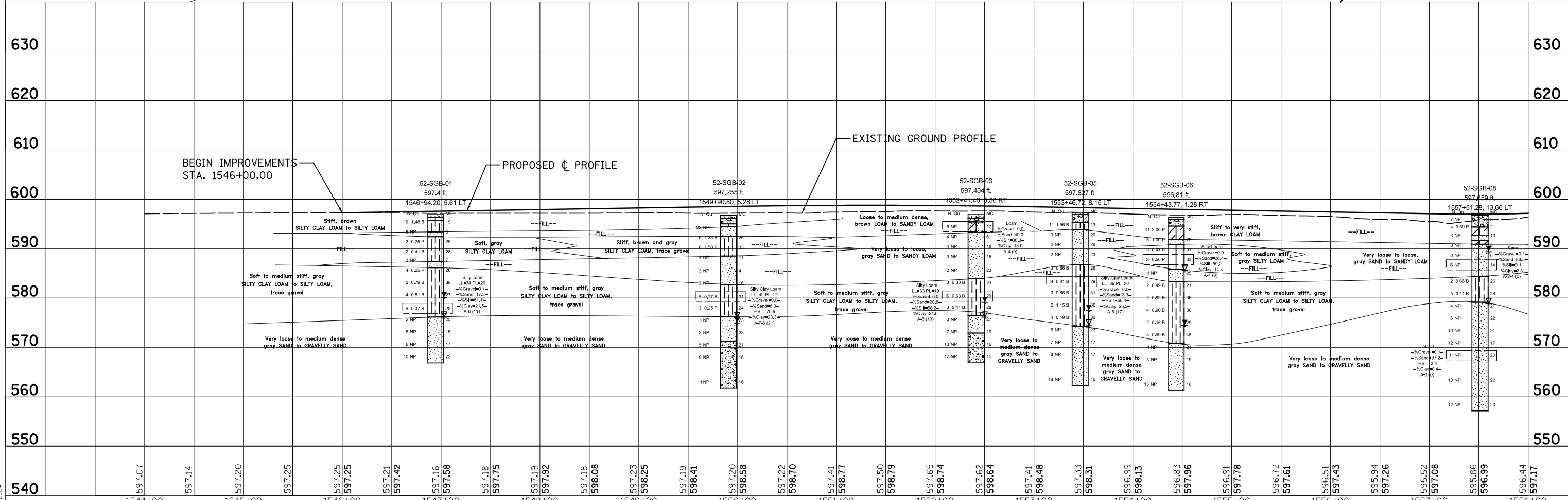
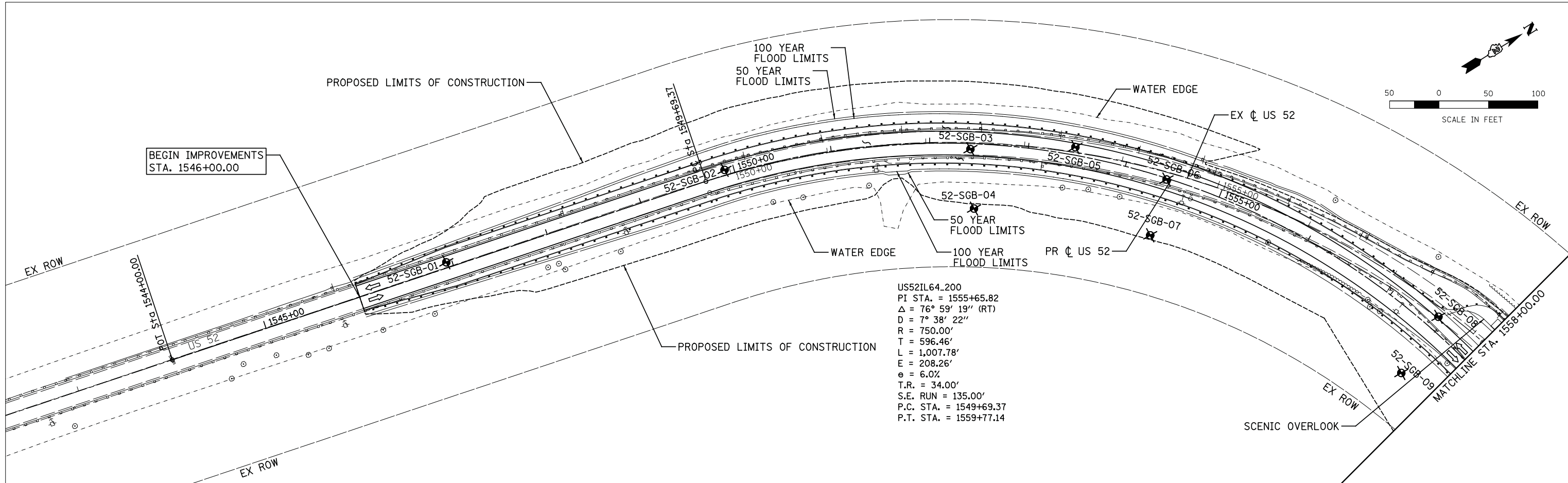
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FOR PARSONS **342-06-01**

APPENDIX E

PLAN	SURVEYED	DATE
	PLOTTED	BY
	GRADES CHECKED	
	STRUCTURE NOTATIONS CHECKED	
	NOTE BOOK NO.	
	CADD FILE NAME	

PROFILE	SURVEYED	DATE
	PLOTTED	BY
	GRADES CHECKED	
	STRUCTURE NOTATIONS CHECKED	
	NOTE BOOK NO.	
	CADD FILE NAME	



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	DRAWN - OCS	REVISED -
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STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

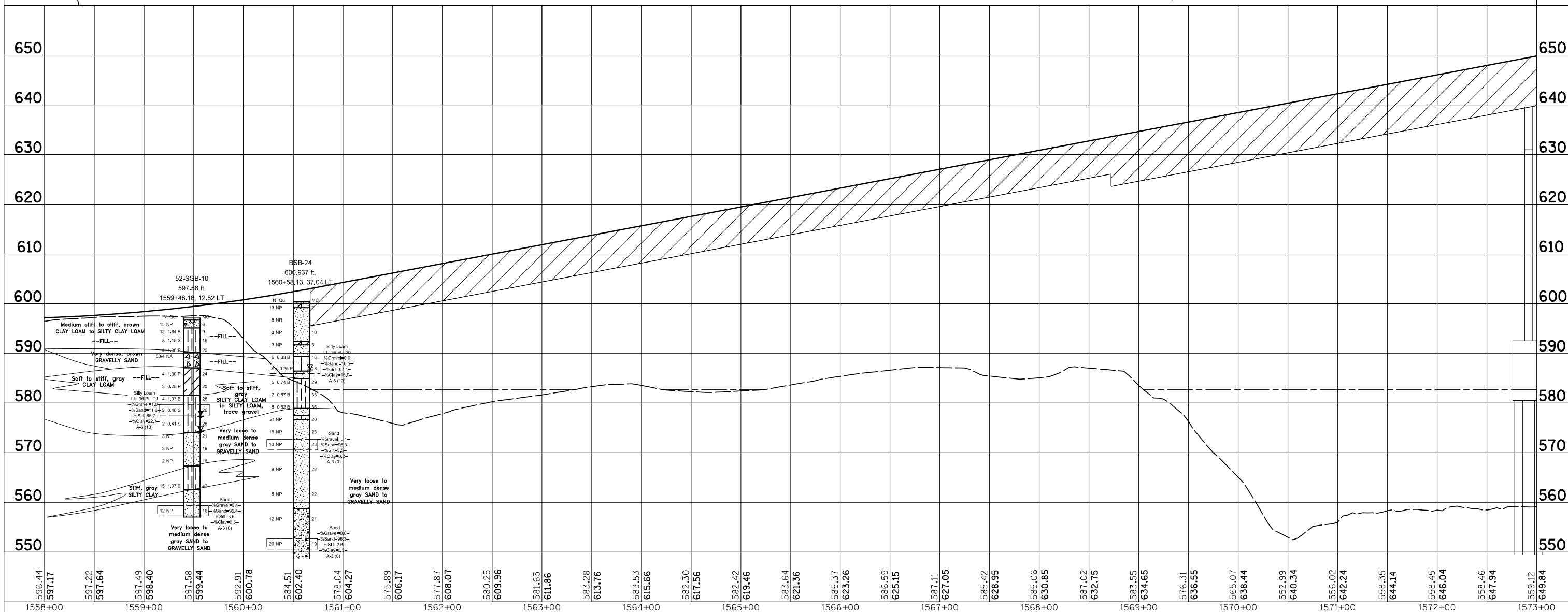
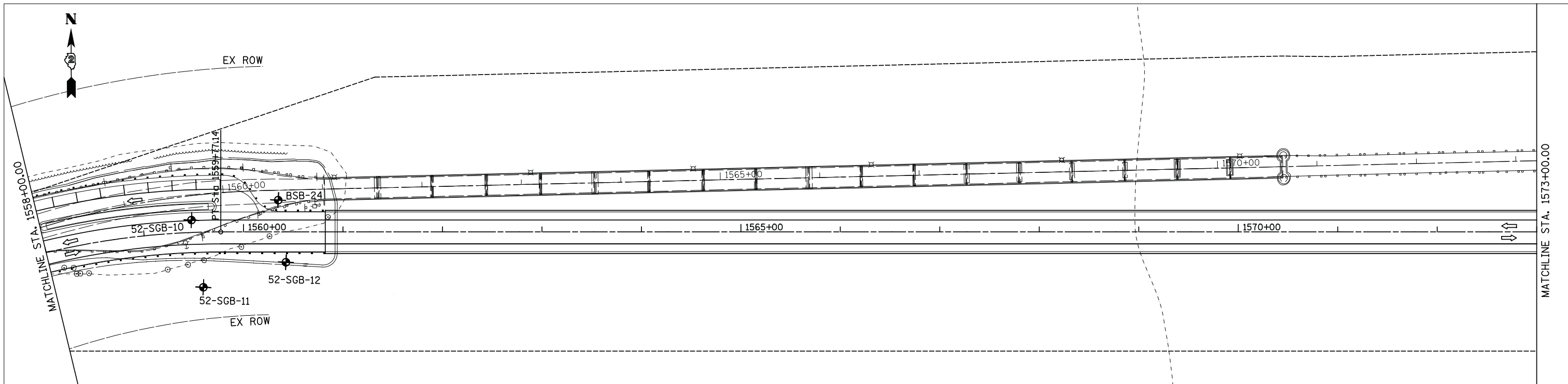
PLAN AND PROFILE	
SCALE: 1"=100'	SHEET NO. 01 OF 16 SHEETS
STA. 1546+00.00 TO STA. 1558+00.00	

F.A.P. RT. 308/17	SECTION 104B-2	COUNTY JACKSON	TOTAL SHEETS 02	SHEET NO. 02
FIGURE 3		CONT. NO. P-92-001-11		
FED. ROAD DIST. NO.		ILLINOIS FED. AID PROJECT		

PRELIMINARY

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	PLOTTED		
	CHECKED		
	ALIGNED		
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	NO.		

PROFILE	SURVEYED	BY	DATE
	PLOTTED		
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	GRADES		
	STRUCTURE		
	NOTATIONS		
	CHFD		
	NO.		



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STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

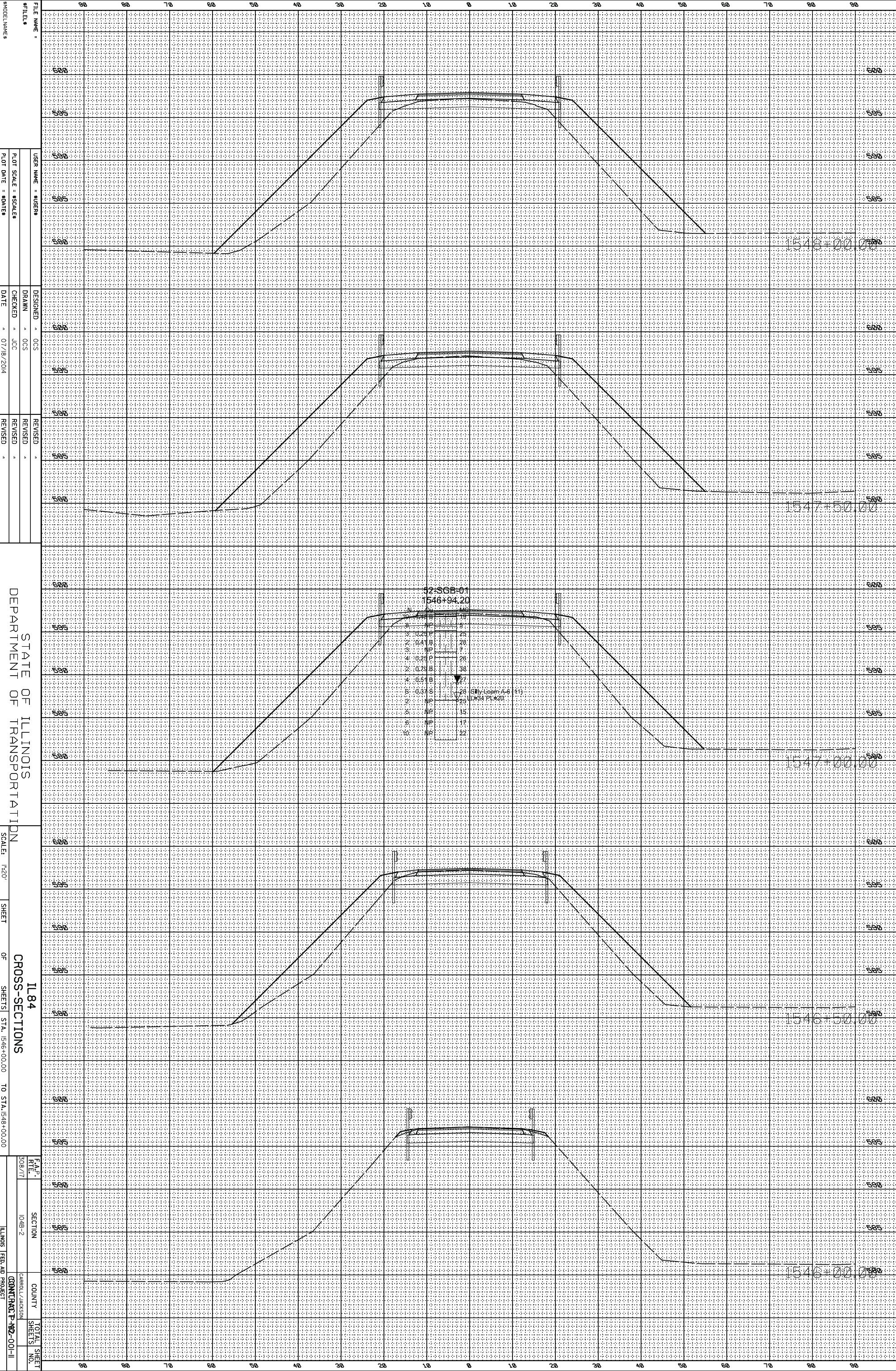
PLAN AND PROFILE
SCALE: 1"=100'
SHEET NO. 02 OF 16 SHEETS
STA. 1558+00.00 TO STA. 1573+00.00

F.A.P. RT.	SECTION	COUNTY	TOTAL SHEETS
308/17	104B-2	JACKSON	02 03
FIGURE 3		CONT. NO. P-92-001-11	
FED. ROAD DIST. NO.	ILLINOIS	FED. AID PROJECT	

PRELIMINARY

ORIGINAL SURVEY	SURVEYED	BY	DATE
NOTE BOOK	PLOTTED		
	TEMPLATE		
	AREAS		
	AREAS CHECKED		
NO.			

FINAL SURVEY	SURVEYED	BY	DATE
NOTE BOOK	PLOTTED		
	TEMPLATE		
	AREAS		
	AREAS CHECKED		
NO.			



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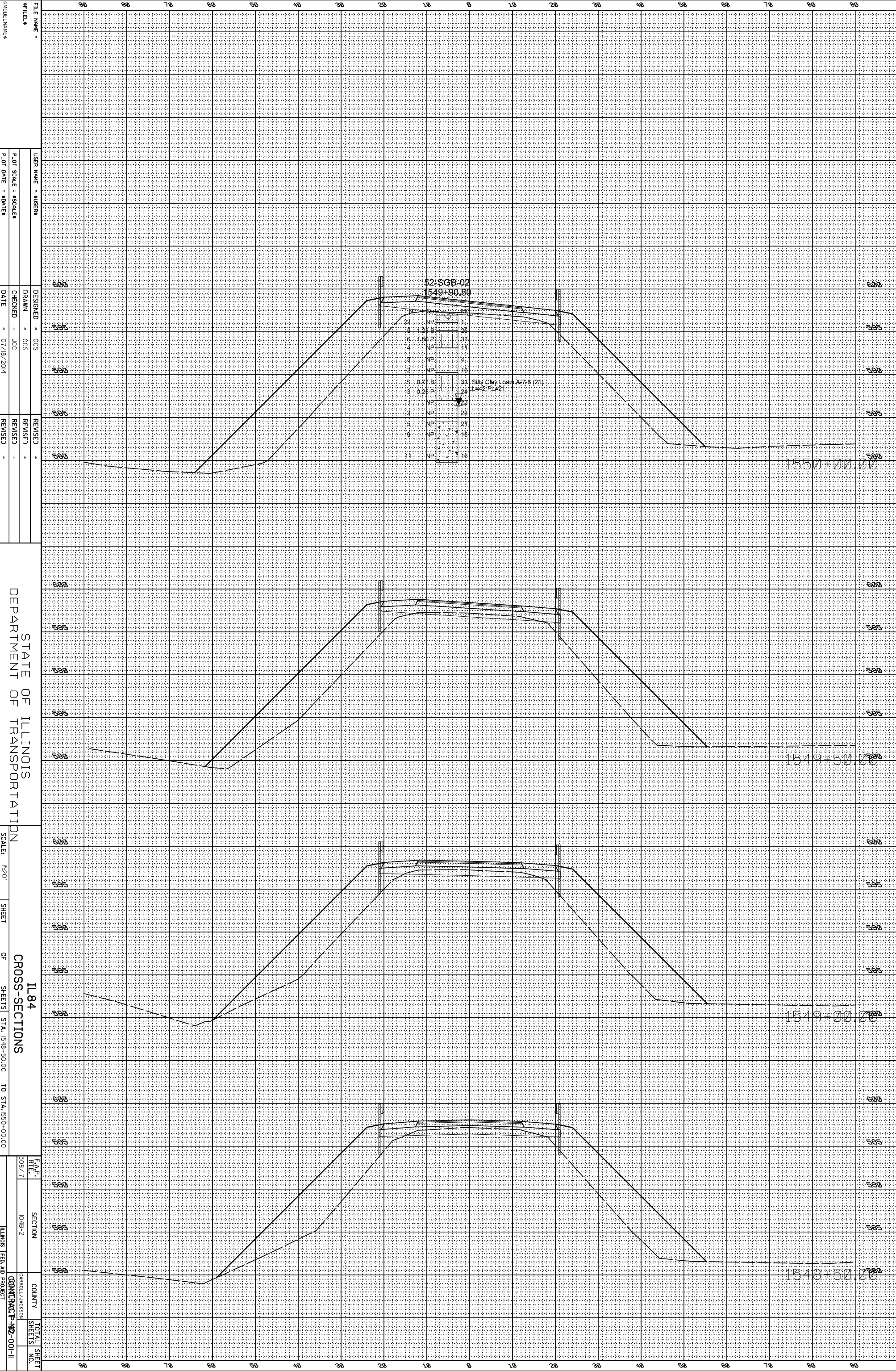
STATE OF ILLINOIS
 DEPARTMENT OF TRANSPORTATION

SCALE: 1"=20'
 SHEET OF SHEETS
 IL 84
 CROSS-SECTIONS
 STA. 1546+00.00 TO STA. 1548+00.00

PRELIMINARY
 ILLINOIS FED. AID PROJECT
 COUNTY: CARROLL/JACKSON
 SECTION: 104B-2
 TOTAL SHEET NO.: 001-01-11

ORIGINAL SURVEY	SURVEYED	BY	DATE
NOTE BOOK	PLOTTED		
	TEMPLATE		
	AREAS		
	AREAS CHECKED		

FINAL SURVEY	SURVEYED	BY	DATE
NOTE BOOK	PLOTTED		
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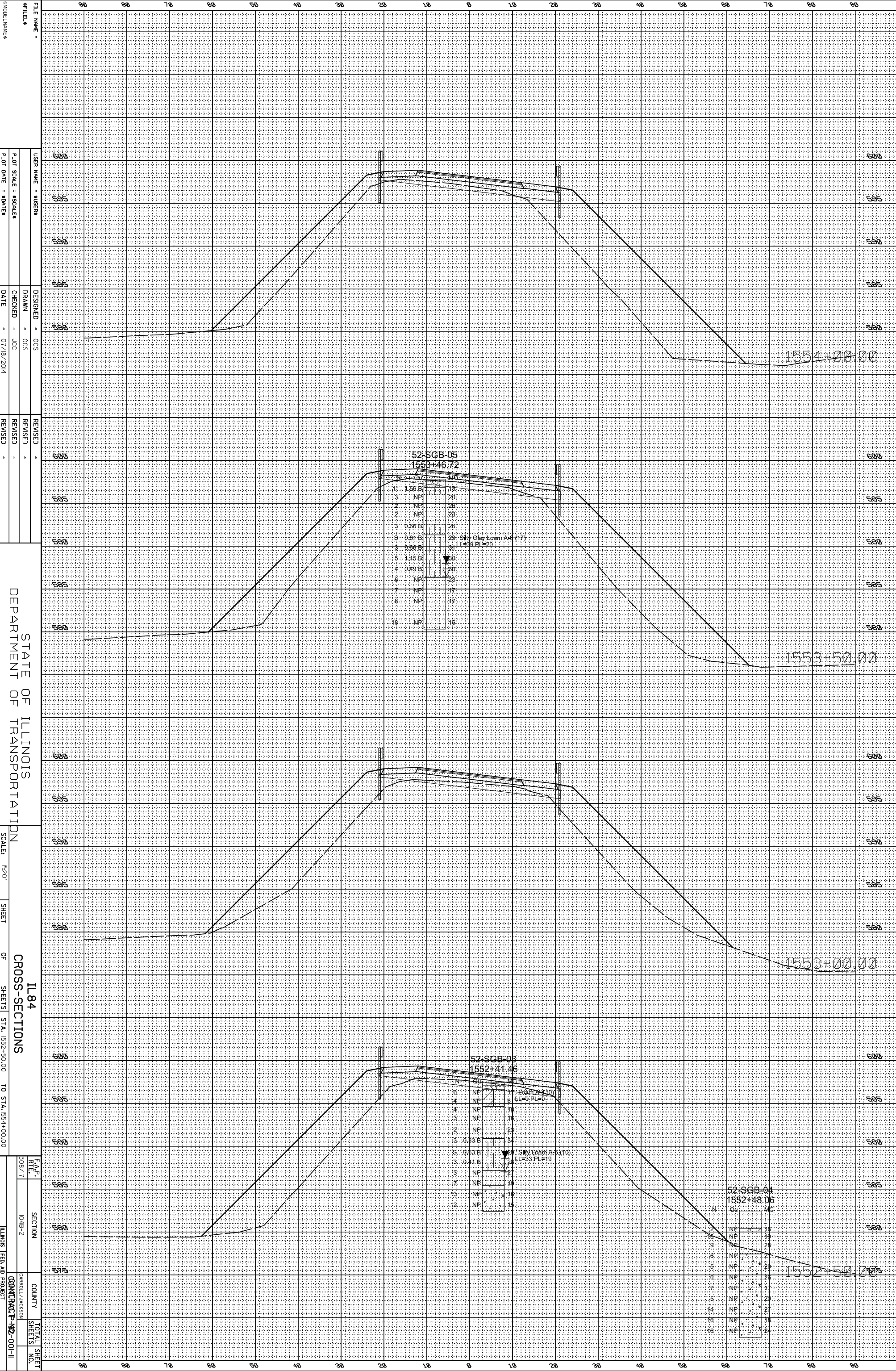
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STATE OF ILLINOIS
 DEPARTMENT OF TRANSPORTATION
 SCALE: 1"=20'
 SHEET OF SHEETS
 IL 84
 CROSS-SECTIONS
 STA. 1548+50.00 TO STA. 1550+00.00
 PRELIMINARY

F.A.P. RITE 508/17	SECTION 104B-2	COUNTY CARROLL/JACKSON	TOTAL SHEETS NO.
		CONTRACT # 02-001-II	
		ILLINOIS FED. AID PROJECT	

ORIGINAL SURVEY	SURVEYED	BY	DATE
NOTE BOOK	PLOTTED		
	TEMPLATE		
	AREAS		
	AREAS CHECKED		

FINAL SURVEY	SURVEYED	BY	DATE
NOTE BOOK	PLOTTED		
	TEMPLATE		
	AREAS		
	AREAS CHECKED		



52-SGB-05
1553+46.72

N	Gr	MC
1	1.56 B	15
2	NP	20
3	NP	25
4	NP	28
5	0.86 B	26
6	0.89 B	29
7	0.88 B	30
8	1.15 B	30
9	0.49 B	20
10	NP	23
11	NP	17
12	NP	17
13	NP	16

29- Silty Clay Loam A&E (17)
1.5-3.1 PL=20

52-SGB-03
1552+41.46

N	Gr	MC
1	NP	15
2	NP	20
3	NP	25
4	NP	28
5	NP	29
6	NP	34
7	0.83 B	34
8	0.41 B	24
9	NP	27
10	NP	19
11	NP	19
12	NP	15

1- Silty Loam A&E (10)
2- Silty Clay Loam A&E (19)

52-SGB-04
1552+48.06

N	Gr	MC
1	NP	15
2	NP	20
3	NP	25
4	NP	28
5	NP	31
6	NP	34
7	NP	34
8	NP	20
9	NP	20
10	NP	18
11	NP	18
12	NP	15

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STATE OF ILLINOIS
 DEPARTMENT OF TRANSPORTATION

SCALE: 1"=20'

SHEET OF SHEETS

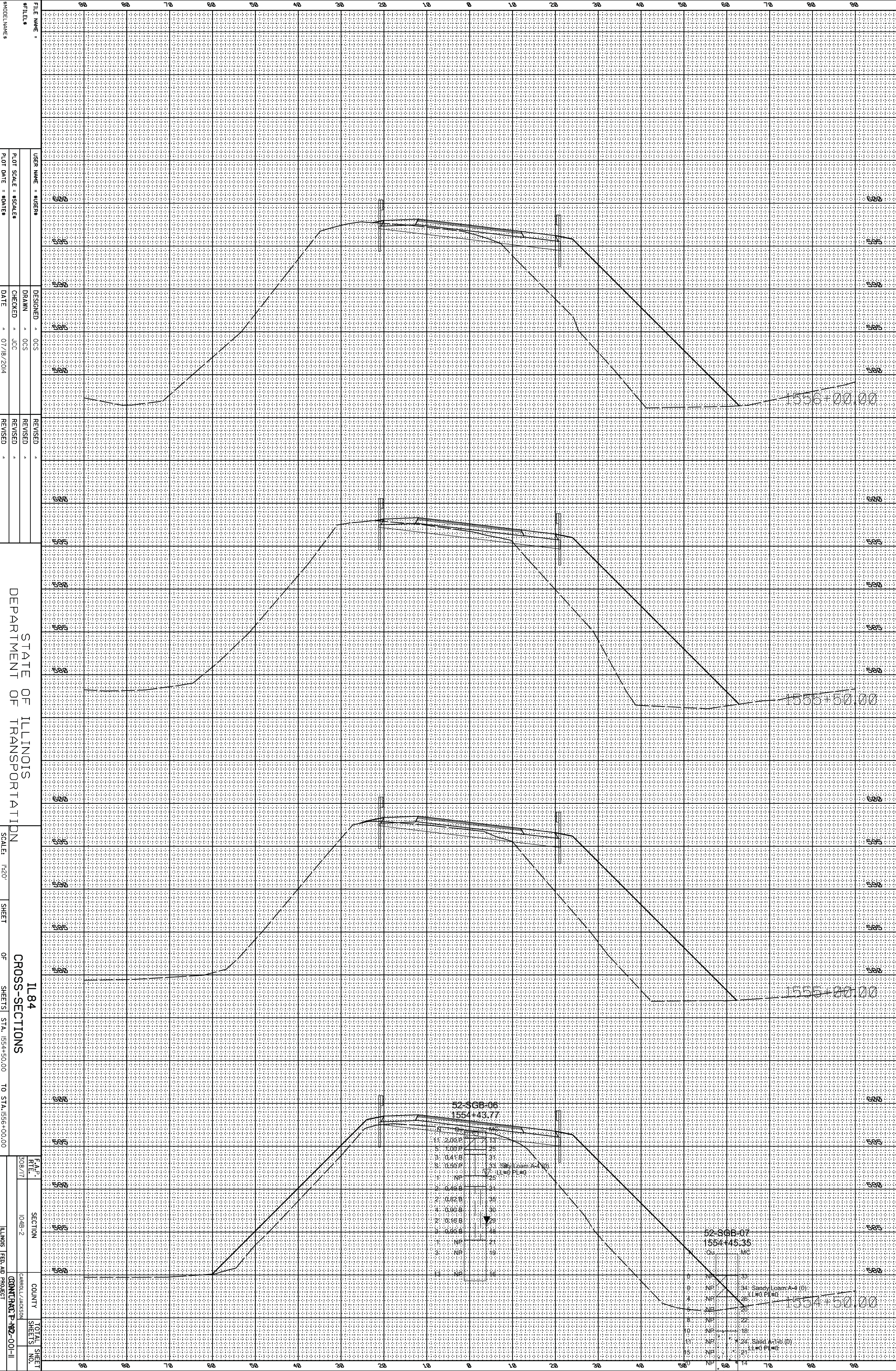
IL 84
 CROSS-SECTIONS
 STA. 1552+50.00 TO STA. 1554+00.00

PRELIMINARY

SECTION 104B-2
 COUNTY CARROLL/JACKSON
 TOTAL SHEETS 10-01-11

ORIGINAL SURVEY	SURVEYED	BY	DATE
NOTE BOOK	PLOTTED		
	TEMPLATE		
	AREAS		
	AREAS CHECKED		

FINAL SURVEY	SURVEYED	BY	DATE
NOTE BOOK	PLOTTED		
	TEMPLATE		
	AREAS		
	AREAS CHECKED		



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STATE OF ILLINOIS
 DEPARTMENT OF TRANSPORTATION

SCALE: 1"=20'
 SHEET 11 OF 11
 IL 84
 CROSS-SECTIONS
 STA. 1554+50.00 TO STA. 1556+00.00

FEAP. RITE. SECTION COUNTY TOTAL SHEET NO.
 208/17 104B-2 CARROLL JACOBSON 11
 ILLINOIS FED. AID PROJECT
 COUNTY ROAD P-492-001-II

52-SGB-06
 1554+43.75

1	NP	25
2	0.41B	31
3	0.16B	38
4	0.02B	40
5	NP	42
6	NP	44
7	NP	46
8	NP	48
9	NP	50
10	NP	52
11	NP	54
12	NP	56
13	NP	58
14	NP	60

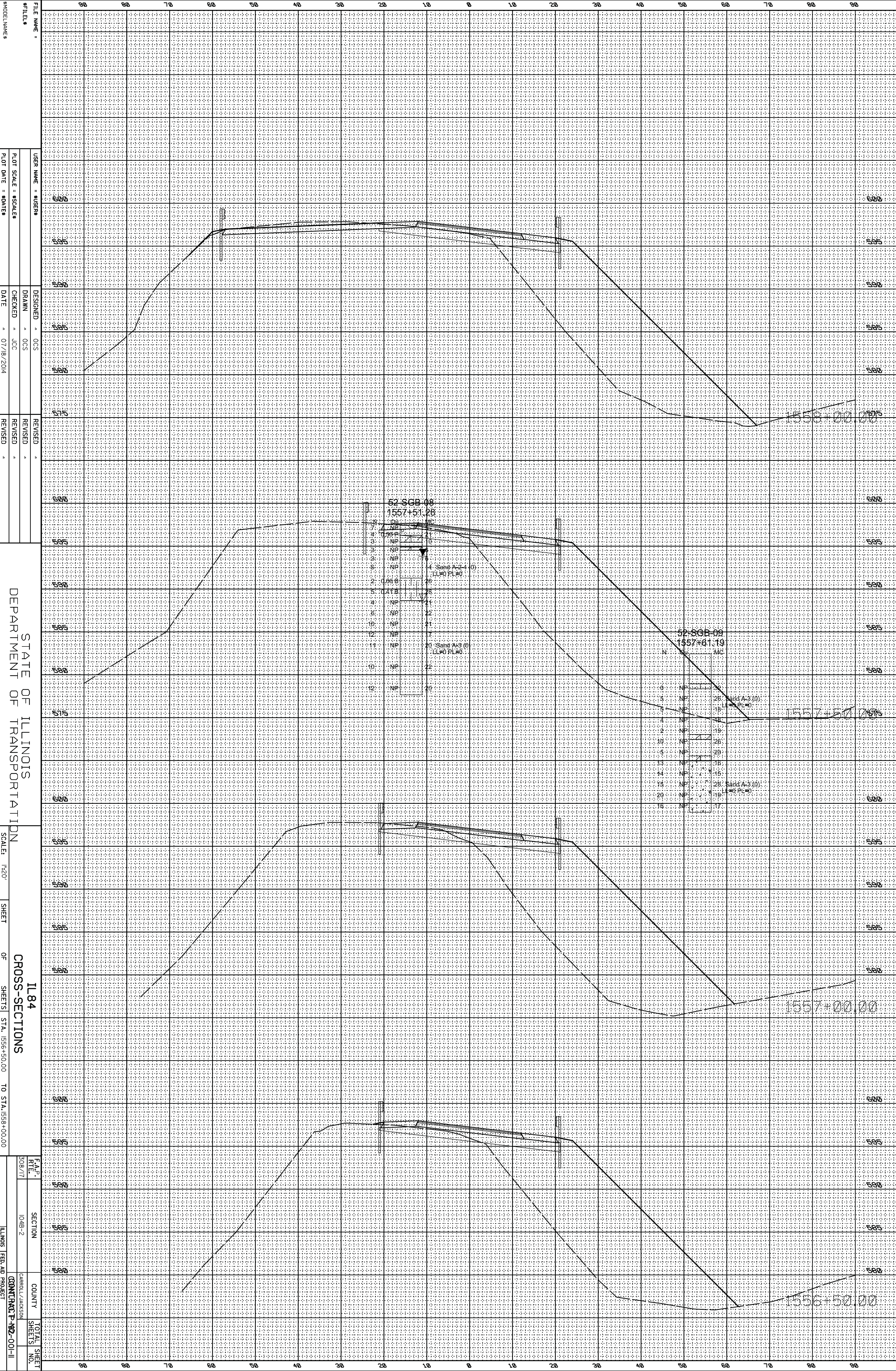
52-SGB-07
 1554+45.35

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3	0.16B	38
4	0.02B	40
5	NP	42
6	NP	44
7	NP	46
8	NP	48
9	NP	50
10	NP	52
11	NP	54
12	NP	56
13	NP	58
14	NP	60
15	NP	62
16	NP	64
17	Sand A-3 (0)	66

PRELIMINARY

ORIGINAL SURVEY	SURVEYED	BY	DATE
NOTE BOOK	PLOTTED		
	TEMPLATE		
	AREAS		
	AREAS CHECKED		

FINAL SURVEY	SURVEYED	BY	DATE
NOTE BOOK	PLOTTED		
	TEMPLATE		
	AREAS		
	AREAS CHECKED		



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STATE OF ILLINOIS
 DEPARTMENT OF TRANSPORTATION

SCALE: 1"=20'
 SHEET OF SHEETS
 STA. 1556+50.00 TO STA. 1558+00.00

IL 84
 CROSS-SECTIONS
 COUNTY: CARROLL/JACKSON
 SECTION: 104B-2
 TOTAL SHEETS: 11
 SHEET NO.: 11
 PROJECT: COUNTY ROAD P-492-001-II

52 SCB-08
 1557+51.28

7	NP	0
6	NP	0
5	NP	0
4	NP	0
3	NP	0
2	NP	0
1	NP	0
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1	NP	0
2	NP	0
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7	NP	0

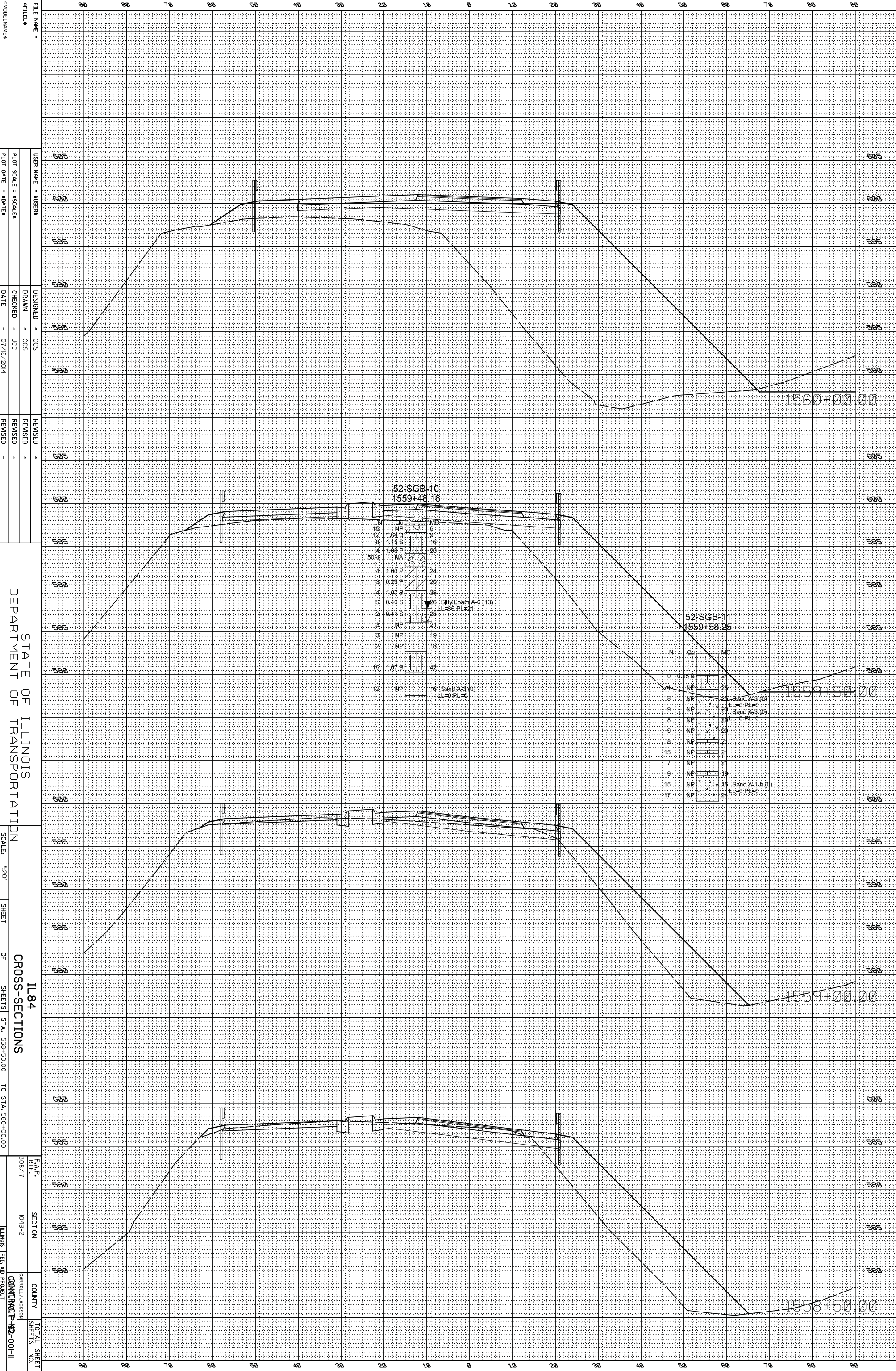
52 SCB-09
 1557+61.19

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3	NP	0
4	NP	0
5	NP	0
6	NP	0
7	NP	0
8	NP	0
9	NP	0
10	NP	0
11	NP	0
12	NP	0

PRELIMINARY

ORIGINAL SURVEY	SURVEYED	BY	DATE
NOTE BOOK	PLOTTED		
	TEMPLATE		
	AREAS		
	CHECKED		

FINAL SURVEY	SURVEYED	BY	DATE
NOTE BOOK	PLOTTED		
	TEMPLATE		
	AREAS		
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STATE OF ILLINOIS
 DEPARTMENT OF TRANSPORTATION

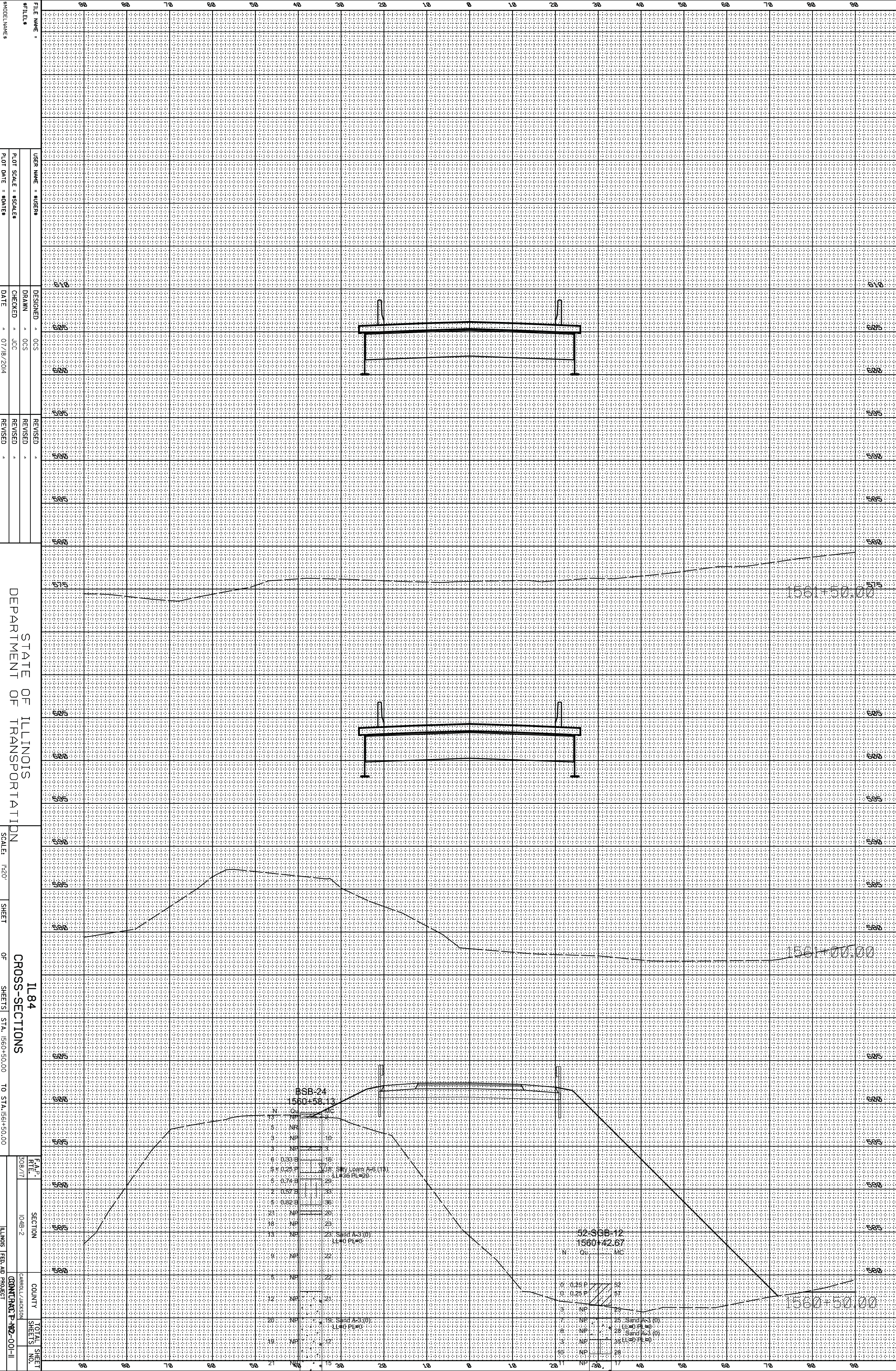
SCALE: 1"=20'
 SHEET 1184
 OF 1184 SHEETS
 STA. 1558+50.00 TO STA. 1560+00.00

IL 84
 CROSS-SECTIONS
 CARROLL COUNTY
 COUNTY PROJECT

PRELIMINARY

ORIGINAL SURVEY	SURVEYED	BY	DATE
NOTE BOOK	PLOTTED		
	TEMPLATE		
	AREAS		
	AREAS CHECKED		

FINAL SURVEY	SURVEYED	BY	DATE
NOTE BOOK	PLOTTED		
	TEMPLATE		
	AREAS		
	AREAS CHECKED		



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STATE OF ILLINOIS
 DEPARTMENT OF TRANSPORTATION

SCALE: 1"=20'
 SHEET OF SHEETS
 STA. 1560+50.00 TO STA. 1561+50.00

IL 84
 CROSS-SECTIONS
 COUNTY: CARROLL/JACKSON
 PROJECT: COUNTY ROAD P-492-001-II
 TOTAL SHEETS: 17
 SHEET NO.: 11

PRELIMINARY

