RockSol
Consulting Group, Inc.

July 10, 2013

J.F. Sato and Associates
5878 South Rapp Street
Littleton, CO 80120

Attention: Mr. Gaurav Vasisht, PE, PTOE

Subject: Soil Investigation Report, US 50 Preliminary Design, Purcell Boulevard to Wills Boulevard, CDOT Project No. STA 050A-022 (19056), Task Order No.4, Pueblo County, Colorado, RockSol Project Number 302.01

Dear Mr. Vasisht:

RockSol Consulting Group, Inc. (RockSol) has performed a geotechnical investigation for the US 50 Preliminary Design Project in Pueblo County, Colorado (See Figure 1, Site Vicinity Map). This Soil Investigation Report presents information on the subsurface soil, groundwater, and bedrock conditions obtained from soil borings performed within the project limits from Purcell Boulevard (western project limit) to Wills Boulevard (eastern project limit). A brief discussion of local geologic conditions and the subsurface conditions encountered are presented in this report. Also presented is a summary of the lab testing performed on recovered soil and bedrock samples recovered from the project site. RockSol has also prepared, under separate cover, a Foundation Investigation Report and a Pavement Design Report for this project.

Surface and groundwater hydrology, hydraulic engineering, and environmental studies including contaminant characterization were not included in RockSol's scope of work. RockSol understands that additional geotechnical investigations will be performed at a later time for the ultimate build out design phase of the US 50 West Corridor Improvements from Swallows Road to Baltimore Avenue.

Project Description

Project descriptions are based on information provided in the Colorado Department of Transportation (CDOT) *Scope of Work Task Order 4* Memorandum dated October 3, 2012 and preliminary plan sheets (File Name:19056DES_US50-01 through 09, Print Date: 4/9/2013) provided by J.F.Sato and Associates (J.F. Sato) with preliminary and ultimate configuration improvements detailed.

CDOT and J.F. Sato recently completed a Planning and Environmental Linkage (PEL) Study for the US 50 West Corridor Improvements Project from Swallows Road to Baltimore Avenue. The purpose of Task Order No. 4 is to develop a preliminary level design for the first improvement phase of the PEL Preferred Alternative which includes widening eastbound US 50, adding a temporary connection between the new westbound lanes and the existing westbound lanes of US 50, widening the eastbound US 50 bridge over Wild Horse Creek, extending the Williams Creek concrete box culvert (CBC) under the proposed westbound US 50 alignment, and modifying both of the existing US 50 intersections with Pueblo Boulevard. The limits of Task Order No. 4 are from Purcell Boulevard to Wills Boulevard, a length of approximately 3.4 miles. The project is proposed to proceed under two phases, preliminary and ultimate build out.

The preliminary improvements include widening eastbound US 50 from two lanes to three lanes from Purcell Boulevard to Wills Boulevard, widening the existing eastbound US 50 bridge over Wild Horse Creek to accommodate the additional lane and shoulder, extending the Williams Creek CBC structure for the future realignment of westbound US 50, and constructing a short retaining wall system (possibly a Type 7 barrier) to accommodate the eastbound US 50 widening near the bottom of the embankment slope at the BNSF railroad bridge crossing over

US 50. The eastbound US 50 bridge over Wild Horse Creek bridge structure will be widened approximately 40 feet to allow for two travel lanes to carry eastbound US 50 traffic during improvements to the existing portion of the bridge.

The ultimate improvements include widening westbound US 50 from 2 lanes to 3 lanes from Purcell Boulevard to Wills Boulevard, realigning westbound US 50 to be parallel to the eastbound lanes to a point west of Pueblo Boulevard, constructing a new westbound US 50 bridge structure over Wild Horse Creek and constructing a diverging diamond interchange at Pueblo Boulevard. Approximately 3,500 linear feet of Pueblo Boulevard is planned for improvements for the reconfiguration and alignment of the US 50 entrance and exit ramps at Pueblo Boulevard. In addition, a pedestrian/bike path is also planned on the south side of US 50 and on the east side of Pueblo Boulevard and a short retaining wall system (possibly a Type 7 barrier) to accommodate the westbound US 50 widening is proposed near the bottom of the embankment slope at the BNSF railroad bridge crossing over US 50.

The new westbound US 50 bridge over Wild Horse Creek is proposed as a three span structure with approximate 70 foot span lengths and will be a multi-lane bridge approximately 60 feet in width. Construction for the new westbound US 50 bridge over Wild Horse Creek will also include placement of approximately 2 feet to 8 feet of embankment fill material within the existing center median area to match the existing eastbound US 50 roadway elevation. The eastbound US 50 bridge over Wild Horse Creek bridge structure will be widened approximately 18 feet to allow for the proposed additional lane and shoulder areas.

Existing Site Conditions

Undeveloped land and a mix of commercial and residential development borders the project area and includes a CDOT maintenance facility located near the northwest corner of westbound US 50 and Pueblo Boulevard and a wastewater treatment plant located south of US 50, between Pueblo Boulevard and Purcell Boulevard. Topography at the site generally consists of flat to mild slopes with a general trend of decreasing elevation toward Wild Horse Creek and Williams Creek. Moderate to steep bank slopes were noted along both Wild Horse Creek and Williams Creek. Low water flow conditions were noted within both Wild Horse Creek and Williams Creek during our field work.

The current alignment of westbound US 50 was the original route for both eastbound and westbound US 50 until two new lanes were constructed for eastbound US 50 in the mid 1970's, diverging from westbound US 50 approximately 3,000 feet to the east and west of Pueblo Boulevard. The existing eastbound US 50 bridge over Wild Horse Creek is a three span structure consisting of a continuous concrete girder and slab (poured in place) with two continuous concrete wall center piers. The existing bridge carries two lanes of traffic over Wild Horse Creek and is approximately 42 feet in width. The existing approach embankments (fill placement) are approximately 16 to 18 feet in height at the bridge abutments. Rip-rap is present at each abutment with embankment side slopes approximately 2H:1V.

Geologic Conditions

The project area lies between the High Plains and the Colorado Piedmont, east of the eastern foothills of the Front Range of the Southern Rocky Mountains. The eastern project site limit is located approximately two miles west of the geologic floodplain of the Arkansas River. The western project site limit is located approximately twelve miles east of the Front Range foothills. Based on the 1964 USGS *Geology Map of the Northwest and Northeast Pueblo Quadrangles, Colorado* by Glenn R. Scott (See Figure 2, Site Geology Map), the site is underlain by surficial soils and sedimentary bedrock.

The surficial soils encountered and mapped within the project generally consist of sandy clay and silty to clayey sand fill material with gravel associated with US 50 roadway construction and native soils consisting of Piney Creek Alluvium (Qp), Slocum Alluvium (Qs), Broadway Alluvium (Qb) deposits of generally consisting of silt, clay and sand with pebbles and limestone fragments, gravel and cobbles in parts. Colluvium (Qc) deposits are also mapped within the project limits and generally consist of silt and clay with pebbles and blocks of limestone and sandstone in parts. The surficial soils at the project comprise a relatively thin cover, typically less than 20 feet, over bedrock.

Bedrock of the Pierre Shale (Kpt) Formation and the seven members of the Niobrara (Ksus, Ksuc, Ksmc, Ksll, Ksls, Kssl, and Kf) Formation (both formations are Upper Cretaceous in age) are mapped at or near the surface within portions of the project limits. The Pierre Shale Formation generally consists of shale, siltstone sandstone and claystone and appears to be located near the eastern limits of the project. The Niobrara Formation generally consists of silty to chalky shale and chalky to fossiliferous limestone and appears to be under the majority of the project. Bentonite lenses within the bedrock formations have potential for swelling which can pose a risk to structures, roadways and utilities.

The sedimentary bedrock contained calcareous and/or gypsum minerals/crystals in parts. A slight hydrocarbon odor was also noted within the shale bedrock, where encountered during drilling operations. This odor is believed to be from a naturally occurring process associated with the organic content of the shale, primarily comprised of marine organisms, algae, and plant material deposited millions of years ago in an inland seaway.

Subsurface Investigation

RockSol drilled 37 boreholes to evaluate the subsurface conditions for the US 50 Improvements Project. The borehole locations are identified as B-1 through B-10, C-1, C-2, RW-1, RW-2 and P-1 through P-23, as shown on Figures 3A through 3K, Borehole Location Plans. Boreholes B-1 through B-8 were drilled at the approximate location of the proposed US 50 bridge structures over Wild Horse Creek, Boreholes B-9 and B-10 were drilled at the approximate location of the proposed culvert extension at Williams Creek for the future realignment of westbound US 50, Boreholes RW-1 and RW-2 were drilled to assist with retaining wall foundation recommendations at the BNSF railroad bridge structure over US 50, and Boreholes P-1 through P-23 were drilled to assist with pavement thickness recommendations. Boreholes C-1 and C-2 were hand augered within Wild Horse Creek. The boreholes were located by field survey provided by CDOT. Horizontal and vertical locations were then provided to RockSol for inclusion on the Borehole Location Plan and on the borehole logs.

A truck mounted CME-45 drill rig was used for drilling and sampling. The boreholes were advanced using 4-inch and 6-inch outside diameter solid stem augers to maximum depths ranging from approximately 5 feet to 50 feet below existing grades. The boreholes were logged in the field by a representative of RockSol then backfilled at the completion of drilling and groundwater level checks. Boreholes drilled within existing pavement were patched with concrete and/or asphalt patch mixes.

Subsurface materials were sampled using modified California barrel and standard split spoon samplers. The modified California barrel sampler has an outside diameter of approximately 2.5 inches and an inside diameter of 2 inches. The standard split spoon sampler used had an outside diameter of 2 inches and an inside diameter of 1⅜-inches. Brass tube liners are used with the modified California barrel sampler to retain samples for density, swell, and unconfined compressive strength testing. Sample retaining liners are not used with the standard split spoon sampler.

Penetration Tests were performed at selected intervals using an automatic lift system with a hammer weighing 140 pounds and falling 30 inches. The standard split spoon sampling method is the Standard Penetration Test (SPT) described by ASTM Method D-1586. Penetration Tests were performed using the modified California barrel sampler with a standard hammer weighing 140 pounds falling 30 inches per ASTM D3550.The modified California Barrel sampling method is similar to the SPT test with the difference being the sampler dimensions and the number of 6-inch intervals driven with the hammer. Correlation of blow counts obtained from a modified California sampler to blow counts obtained from a standard split spoon sampler is not available. However, it is RockSol's experience that blow counts obtained with the modified California sampler tend to be slightly greater than a standard split spoon sampler. Penetration resistance values (blow counts) were recorded for each sampling event. Blow counts, when properly evaluated, indicate the relative density or consistency of the soils. Depths at which the samples were taken, the type of sampler used, and the blow counts that were obtained are shown on the Boring Logs for each borehole.

Subsurface Conditions

Where flexible hot mix asphalt (HMA) roadway pavement was encountered along eastbound US 50 between Purcell Boulevard to the bridge over Wild Horse Creek, the pavement section thickness generally averaged 8 inches of HMA over 8 inches of aggregate base course (ABC) within the existing outside shoulder and 9 inches of HMA over 8 inches of ABC within the outside travel lane. The pavement section thickness generally averaged 5.5 inches of HMA over 8.0 inches of ABC within the existing outside shoulder and 9 inches of HMA over 11 inches of ABC within the outside travel lane along eastbound US 50 between the bridge over Wild Horse Creek and Wills Boulevard. On Pueblo Boulevard, measured thicknesses of the existing asphalt pavement were 9 inches of HMA over 4 inches of ABC and 9.5 inches of HMA within the center median of Pueblo Boulevard to the south and north of US 50. Aggregate base course material was not noted below the pavement sections at some of the borehole locations.

Topsoil was encountered at the ground surface at several borehole locations. The topsoil encountered was generally lightly organic silty to clayey sand which supported a sparse covering of grasses and weeds. A topsoil thickness of approximately 3 inches was estimated based on field observations.

Beneath the pavement and topsoil, subsurface conditions encountered generally consisted of fill material to approximate depths ranging from 2 feet to 13 feet below existing grades and appears to be associated with roadway embankment for the construction of US 50. The fill material encountered generally consisted of medium dense to very dense silty to clayey sand with gravel and sandy clay in parts, stiff to very stiff sandy clay with silty to clayey sand and gravel in parts, and loose to dense silty to gravelly sand with sandy clay in parts.

Native soils encountered below the fill material or ground surface generally included soft to very hard sandy clay with silty to clayey sand and gravel in parts, loose to medium dense silty to gravelly sand, medium dense clayey to silty sand with gravel, sandy clay and rock fragments in parts, and medium dense silty to sandy gravel. The majority of the fill and native soils tested were classified as sandy clay and clayey sand soils (AASHTO A-6) with an average Plasticity Index of 14. AASHTO A-2-4 and A-2-6 soils were also encountered within the project limits.

Sedimentary bedrock was encountered beneath the fill material and native soils at depths varying from approximately 1 foot to 33 feet below existing grades. Sedimentary bedrock consisting of very hard claystone, sandstone and shale was encountered in Boreholes B-1 through B-8 (Wild Horse Creek and US 50) at elevations ranging from 4,758 feet to 4,773 feet (approximate depths ranging from 8 feet to 33 feet below existing grades) during drilling

operations. The bedrock generally consisted of very hard silty to clayey shale. Very hard shale was also encountered in Boreholes B-9 and B-10 (Williams Creek and US 50) at elevations of 4,786 feet and 4,800 feet (approximate depths of 1 foot to 7 feet below existing grades). Sedimentary bedrock consisting of very hard claystone, sandstone and shale was encountered in Boreholes RW-1 and RW-2 (BNSF and US 50) at elevations of 4,787 feet to 4,800 feet (approximate depths of 1 foot to 7 feet below existing grades). Sedimentary bedrock consisting of very hard claystone, sandstone and shale was encountered in pavement Boreholes P-3, P-6, P-8, P-14, and P-21 through P-23 (US 50 between Purcell Boulevard and Wills Boulevard) at elevations ranging from 4,785 feet to 4,935 feet (approximate depths ranging from 1 foot to 9 feet below the top of pavement grades).

Groundwater was encountered at Wild Horse Creek and US 50 in Boreholes B-1 through B-8 at elevations ranging from 4,763 feet to 4,765 feet (approximate depths ranging from 3 feet to 28 feet below existing grades) perched above the shale bedrock within the sandy native soils and sandstone bedrock. Groundwater was encountered at Williams Creek and eastbound US 50 in Borehole B-10 at an elevation of 4,786 feet (approximate depth of 7 feet below existing grade) perched above the shale bedrock within the clayey sand native soils. Groundwater was encountered at the BNSF railroad crossing with US 50 in Boreholes RW-1 and RW-2 at elevations of 4,785 feet and 4,787 feet (approximate depths of 9 feet and 14 feet below existing grades) within the bedrock formations. Groundwater was also noted in two of the pavement boreholes (P-4 and P-20) at elevations of 4,770 feet and 4,790 feet (approximate depths of 2 feet and 12 feet below existing grades) within the sandy clay soils.

Groundwater generally appears to be at an elevation consistent with the water elevations of Wild Horse Creek and Williams Creek. However, it should be noted that groundwater elevations are subject to change depending on climatic conditions, stream stages, local irrigation practices, changes in local topography, and changes in surface storm water management. A summary of the bedrock and groundwater elevations encountered is presented in Table 1. The approximate groundwater and bedrock elevations are rounded to the nearest foot and are based on the depth to groundwater and bedrock noted during drilling and sampling operations (except at Borehole RW-8), and the ground surface elevations provided by the project surveyor.

Table 1 – Approximate Groundwater and Bedrock Elevations

Borehole	Ground Elevation (feet)	Groundwater Elevation (feet)	Bedrock Elevation (feet)
B-1	4,786.4	4,763	4,773
B-2	4,767.1	4,763	4,758
B-3	4,765.9	4,764	4,759
B-4	4,791.5	4,764	4,759
B-5	4,782.9	4,765	4,760
B-6	4,766.1	4,763	4,758
B-7	4,767.7	4,764	4,759
B-8	4,781.3	4,763	4,759
B-9	4,801.2	NE	4,800
B-10	4,792.5	4,786	4,786
RW-1	4,800.8	4,787	4,800
RW-2	4,794.1	4,785	4,787
P-3	4,792.7	NE	4,785

Table 1 – Approximate Groundwater and Bedrock Elevations (Continued)

Borehole	Ground Elevation (feet)	Groundwater Elevation (feet)	Bedrock Elevation (feet)
P-4	4,792.1	4,790	NE
P-6	4,821.4	NE	4,816
P-8	4,826.9	NE	4,812.5
P-14	4,944.2	NE	4,935
P-20	4,981.5	4,970	NE
P-21	4,842.0	NE	4,841
P-22	4,831.4	NE	4,827
P-23	4,824.9	NE	4,824

Note: NE indicates not encountered.

Individual logs are included in Appendix A. A summary of laboratory test results is presented in Appendix B.

Wild Horse Creek and Williams Creek Soil Classification (Scour Analysis Information)

AASHTO soil classification was performed on bulk samples and discrete samples obtained at various depths within the boreholes located adjacent to Wild Horse Creek and Williams Creek. Based on laboratory test results and the borehole logs, soils encountered near the Wild Horse Creek and Williams Creek water surface elevations and extending approximately 5 feet to 8 feet below existing grades, vary from AASHTO A-1-b, A-2-4, A-4 and A-6 soil types. Gradation size distribution plots are included in Appendix B.

In general, the D95 size ranged from 4.155 mm to 11.785 mm and less than 0.075 mm to 3.777 mm for the D50 size. Gradation size distribution summaries applicable for scour analysis, including D95 and D50 sizes are outlined in Appendix C.

Expansive Soil Discussion

Swell potential in the subgrade soils obtained within the upper 5 feet below existing grades ranged from -1.8 percent (consolidation) to 8.1 percent (swell), when tested with a 200 pound per square foot (psf) surcharge. The average swell potential in the subgrade soils obtained within the upper 5 feet below existing grades is 1.3 percent and the average consolidation potential is 0.4 percent, based on the samples tested. Three samples exhibited swell potentials greater than two percent, when tested with a 200-psf surcharge, within the upper 5 feet of existing grades (3.8 percent at Borehole B-5, 2.5 percent at Borehole B-8, and 8.1 percent at Borehole P-22). A sample of clayey sandstone bedrock encountered at an approximate depth of 9 feet below the existing grade at Borehole P-14 exhibited a swell potential of 3.1 percent, when tested with a 500-psf surcharge.

Forty-two samples obtained within the upper 5 feet below existing grades were tested for plasticity (Atterberg Limits) and all samples resulted in a plasticity index (PI) of less than 20, with an average PI of 11, including six samples that were non-plastic.

Based on the swell test data and plasticity index test data, the majority of the subgrade soils appear to possess low swell potential and low consolidation potential. However, moderate to high swell risk is present within portions of the project limits, which may require some form of swell mitigation.

Cement Type Discussion

Cementitious material requirements for concrete in contact with site soils or groundwater are based on the percentage of water soluble sulfate in either soil or groundwater that will be in contact with concrete constructed for this project. Mix design requirements for concrete exposed to water soluble sulfates in soils or water is considered by CDOT as shown in Table 2 and in the Standard Specifications for Road and Bridge Construction, dated 2011 (CDOT Table 601-2).

Table 2 - Requirements to Protect Against Damage to Concrete by Sulfate Attack from External Sources of Sulfate

Severity of sulfate exposure	Water-soluble sulfate (SO_4), in dry soil, percent	Sulfate (SO_4), in water, ppm	Water Cementitious Ratio, maximum	Cementitious Material Requirements
Class 0	0.00 to 0.10	0 to 150	0.45	Class 0
Class 1	0.11 to 0.20	151 to 1,500	0.45	Class 1
Class 2	0.21 to 2.0	1,500 to 10,000	0.45	Class 2
Class 3	2.01 or greater	10,001 or greater	0.40	Class 3

The average concentration of water soluble sulfates measured in 40 soil samples obtained from RockSol's exploratory boreholes was 1.0 percent by weight. The water soluble sulfate concentrations ranged from 0.02 percent by weight to 2.07 percent by weight. Only one test result exceeded 2 percent. Based on the results of the water soluble sulfate testing, Exposure Class 2 is considered appropriate for concrete in contact with subgrade materials for this project. Additional testing is recommended for future phases of the ultimate design.

Subgrade Support Testing

R-Value tests are being performed on samples of A-6 (8) soil (Borehole P-2), A-2-4 (0) soil (composite bulk sample from Boreholes P-5 and P-6), A-6 (5) soil (Borehole P-11), A-6 (2) soil (Borehole P-14), A-6 (4) soil (Borehole P-17), A-6 (9) soil (Borehole P-22) and on A-6 (3) soil (Borehole P-23). R-Value test results will be included under separate cover in the Pavement Investigation Report currently being prepared by RockSol.

Corrosion Resistance Discussion

Water soluble chloride content, and pH tests were performed on bulk samples obtained from selected boreholes and are summarized below in Table 3. Comparison of the results of the chloride, sulfate and pH testing performed with *Table 1 - Guidelines for Selection of Corrosion Resistance Levels as presented in the CDOT Pipe Materials Selection Policy,* dated May 7, 2012, suggests corrosion resistance (CR) levels ranging from CR 0 to CR 5 are present within the project limits. Corrosion resistance level testing was performed at 23 borehole locations.

Table 3 - Soil Corrosion Resistance Levels

Borehole	Sample Depth (feet)	AASHTO Soil Classification	Water Soluble Sulfate (%)	Water Soluble Chloride (%)	pH	CR Level
B-10	0 – 4	A-6(3)	0.40	-	7.6	3
P-1	1.5 – 5	A-6(5)	0.88	0.04	7.3	4
P-2	1 – 5	A-6(8)	1.42	0.02	7.3	5
P-4	1.9 – 5	A-6(5)	0.16	0.09	7.8	2
P-5	1.9 – 5	A-2-4(0)	0.02	0.01	8.0	0
P-6	0.75 – 5	A-2-4(0)	0.54	0.02	7.7	4
P-7	1.5 – 5	A-6(5)	1.16	0.05	7.3	5
P-8	1 – 5	A-6(3)	0.10	-	7.2	2

Table 3 - Soil Corrosion Resistance Levels (Continued)

Borehole	Sample Depth (feet)	AASHTO Soil Classification	Water Soluble Sulfate (%)	Water Soluble Chloride (%)	pH	CR Level
P-9	1 – 5	A-6(3)	1.62	0.02	7.5	5
P-10	0 – 5	A-2-6(0)	0.12	0.05	6.7	2
P-11	1.25 – 5	A-6(5)	1.32	0.04	6.9	5
P-12	0 – 5	A-6(3)	0.61	0.04	6.7	4
P-13	1.5 – 5	A-6(1)	1.16	0.03	7.6	5
P-15	0 – 5	A-6(5)	0.66	0.05	7.3	4
P-16	1.5 – 5	A-6(7)	1.10	0.01	7.8	5
P-17	1.5 – 5	A-6(4)	0.78	0.03	7.3	4
P-18	0 – 5	A-2-6(1)	0.39	0.13	6.6	3
P-19	0.75 – 5	A-6(4)	1.44	0.03	7.0	5
P-20	0.75 – 4	A-6(1)	0.54	0.03	7.7	4
P-21	0.75 – 5	A-6(6)	1.56	0.01	7.6	5
P-22	0 – 5	A-6(9)	1.28	0.07	7.7	5
P-23	0 – 5	A-6(3)	1.5	0.10	7.3	5
RW-2	0 – 4	A-6(9)	0.16	-	7.6	2

Of the three variables (water soluble sulfate, water soluble chloride, and pH) that are used in determining the CR level, the water soluble sulfate content appears to be the predominant component affecting the CR level selection. The water soluble chloride and pH components do not appear to contribute to an elevated CR level selection.

In addition, two electrical resistivity analyses were performed in the RockSol laboratory using the soil box method (ASTM G-187). Electrical resistivity testing was performed on bulk samples obtained within the upper 4 feet at borehole locations B-10 and RW-2. Comparison of the results of the electrical resistivity testing (900 ohm-cm at 23 percent moisture content and 800 ohm-cm at 34.8 percent moisture content) and pH testing (7.6) performed with *Table 2 – Minimum Pipe Thickness For Metal Pipes Based On The Resistivity And pH Of The Adjacent Soil* as presented in the *CDOT Pipe Materials Selection Policy,* effective May 7, 2012*,* suggests the minimum required gauge thickness for metal pipe material, if used, for this project is *0.052 inches (18 Gauge) Polymer Coated*.

Limitations

This geotechnical field investigation and laboratory results were conducted in general accordance with the scope of work. The testing was performed to provide preliminary design level information. Additional testing is suggested for final design. The geotechnical practices are similar to that used in the Colorado Front Range area with similar soil conditions and our understanding of the proposed work. This report has been prepared by RockSol for use by J.F. Sato and CDOT for the US 50 Preliminary Design project. RockSol understands that additional boreholes and geotechnical evaluation will be performed for the final design phase. The information presented is based on our exploratory boreholes and does not take into account variations in the subsurface conditions that may exist between boreholes. Additional investigation is required to address such variation. RockSol is not responsible for liability associated with interpretation of subsurface data by others.

Prepared by RockSol Consulting Group, Inc.:

Ryan Lepro
Geological Engineer

Donald G. Hunt, P.E.
Senior Geotechnical Engineer

Attachments:

Figure 1 - Site Vicinity Map
Figure 2 – Site Geology Map
Figure 3 – Borehole Location Figure Index
Figures 3A through 3K – Borehole Location Plans

Appendix A – Legend and Individual Borehole Logs
Appendix B – Laboratory Test Results
Appendix C – Summary of Gradation Size Distributions Applicable for Scour Analysis

IMAGE COURTESY OF THE U.S. GEOLOGICAL SURVEY, NORTHWEST PUEBLO, COLORADO QUADRANGLE, 2010

Print Date: 7/9/2013	US-50 PRELIMINARY DESIGN PURCELL BLVD TO WILLS BLVD SITE VICINITY MAP	Project No./Code
File Name: 19056 F1 Site Vicinity Map.dgn		STA 050A-022
Horiz. Scale: 1:12		
RockSol Consulting Group, Inc. 6510 W 91st Ave, Ste 130 Westminster, CO 80031	0 2000 4000 6000 (FEET)	Designer: R. LEPRO Detailer: S. MCKANNA-KOON Sheet Subset:
		19056
		Figure 1

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EXPLANATION

af — Artificial fill
Reworked gray silt and clay, concrete waste, and rubbish

Qpp, Qpp$_1$ — Post-Piney Creek alluvium
Yellowish-gray poorly sorted cobbles, pebbles, sand, and silt forming floodplain and lowest terrace deposits along major streams. Generally less than 10 feet thick. Surface lies 0-10 feet above modern streams. Qpp$_1$ indicates terrace deposit intermediate between Piney Creek Alluvium and post-Piney Creek alluvium.

Qc — Colluvium
Yellowish-gray silt and clay containing pebbles, angular blocks of limestone, and sandstone derived from underlying bedrock and surficial deposits. Locally includes small increments of older colluvium

Qp — Piney Creek Alluvium
Yellowish-gray silt and clay along most valleys in area. Contains lenses of sand and pebbles in lower part. Locally 25 feet thick. Surface lies about 10 feet above modern streams

Qes — Eolian sand
Yellowish-brown fine to coarse sand in rounded knolls east of Fountain Creek and south of the Arkansas River. Locally stony where mixed with colluvium. Locally more than 20 feet thick. Calcium carbonate-enriched early Recent Brown soil moderately developed in upper part of sand

Qb, Qba — Broadway Alluvium
About 10-25 feet thick. Surface lies about 10 feet above modern streams.
Qb, *grayish-brown coarse sand along Fountain Creek; yellowish-gray calcareous silt containing pieces of limestone along Dry and other creeks.*
Qba, *coarse cobble gravel along Arkansas River*

Ql, Qla, Qlla — Louviers Alluvium
About 20 feet thick. Surface lies 70-80 feet above modern streams. Calcium carbonate-enriched Wisconsin Brown soil strongly developed in upper part of alluvium.
Ql, *calcareous silt containing small pieces of limestone deposited by local streams; yellowish-brown coarse pebbly sand along Fountain Creek.*
Qla, *yellowish-brown coarse cobble gravel of Arkansas River origin.*
Qlla, *gravel of Arkansas River origin overlain by calcareous silt of local origin*

Qs, Qsa, Qsla — Slocum Alluvium
About 35 feet thick. Surface lies 110-120 feet above modern streams. Calcium carbonate-enriched pre-Wisconsin Brown soil very strongly developed in upper part of alluvium.
Qs, *calcareous silt containing small pieces of limestone deposited by local streams.*
Qsa, *yellowish-brown coarse cobble gravel of Arkansas River origin.*
Qsla, *gravel of Arkansas River origin overlain by calcareous silt of local origin*

Qv — Verdos Alluvium
Grayish-brown calcareous coarse sand or calcareous silt with small pieces of limestone on pediments. Present only in northeast corner of map. About 20 feet thick. Surface lies 200-220 feet above modern streams.

Qrf — Rocky Flats Alluvium
Grayish-brown silty pebble gravel along east side of Baculite Mesa. About 10 feet thick. Surface lies 150-200 feet above modern streams

Qn — Nussbaum Alluvium
Moderate yellowish-brown well sorted pebble gravel on Baculite Mesa. Thickness as much as 100 feet. Surface lies 320-360 feet above modern streams

QUATERNARY: Recent; Upper Recent; Lower Recent; Pleistocene; Upper Wisconsin; Lower Wisconsin; Illinoian or Sangamon; Kansan or Yarmouth; Nebraskan or Aftonian; Pleistocene(?); Upper Cretaceous

Kptb — Pierre Shale
Kptb, *Tepee zone of Gilbert (1897).*
Kpr, *Rusty zone of Gilbert (1897).*
Kps, *Sharon Springs Member.*
Kpa, *Apache Creek Sandstone Member.*
Kpt, *transition member*

Kf — Niobrara Formation
Smoky Hill shale Member:
Ksuc, *upper chalk unit.*
Ksus, *upper chalky shale unit.*
Ksmc, *middle chalk unit.*
Ksms, *middle shale unit.*
Ksll, *lower limestone unit.*
Ksls, *lower shale unit.*
Kssl, *shale and limestone unit.*
Kf, *Fort Hays Limestone Member*

CRETACEOUS

N

0' 500' 1000' 2000'

GEOLOGY MAP COMPILED FROM THE USGS GEOLOGY OF THE NORTHWEST AND NORTHEAST PUEBLO QUADRANGLES, COLORADO BY GLENN R. SCOTT, DATED 1964 AND MODIFIED BY ROCKSOL

Print Date: 7/9/2013
File Name: 19056 F2 Site Geology Map.dgn
Horiz. Scale: 1:12 Vert. Scale: As Noted
Unit Information Unit Leader Initials

RockSol Consulting Group, Inc.
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Westminster, CO 80031
Ph: 303-962-9300
Fax: 303-962-9350

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US-50 PRELIMINARY DESIGN
PURCELL BLVD TO WILLS BLVD
SITE GEOLOGY MAP

Designer: R. LEPRO
Detailer: S. MCKANNA-KOON
Sheet Subset:
Structure Numbers
Subset Sheets: of

Project No./Code
STA 050A-022
19056
Figure 2

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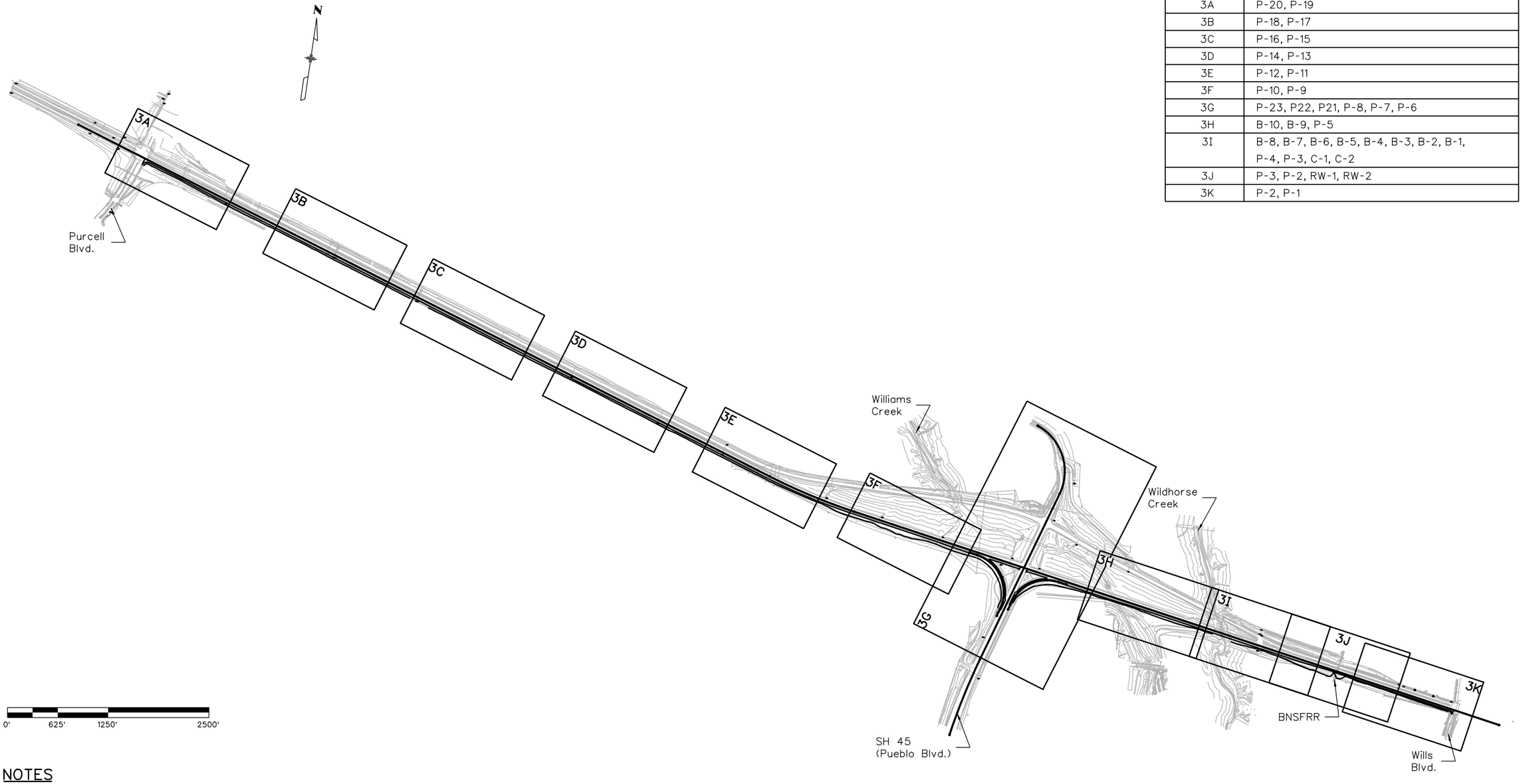
FIGURE NO.	INDEX OF BOREHOLES
3A	P-20, P-19
3B	P-18, P-17
3C	P-16, P-15
3D	P-14, P-13
3E	P-12, P-11
3F	P-10, P-9
3G	P-23, P22, P21, P-8, P-7, P-6
3H	B-10, B-9, P-5
3I	B-8, B-7, B-6, B-5, B-4, B-3, B-2, B-1, P-4, P-3, C-1, C-2
3J	P-3, P-2, RW-1, RW-2
3K	P-2, P-1



NOTES

3A — Indicates Borehole Location Plan - Figure 3A

Computer File Information		Sheet Revisions		
Creation Date:		Date:	Comments	Init.
Last Mod. Date: 8/12/2013				
File Name: 19056 F3 Borehole Key Index.dgn				
Msta Ver. 08.11.07				
Units: English				

RockSol Consulting Group, Inc.

As Constructed	US-50 PRELIMINARY DESIGN PURCELL BLVD TO WILLS BLVD			Project No./Code
No Revisions:	BOREHOLE LOCATION FIGURE INDEX			STA 050A-022
Revised:	Designer: R. LEPRO	Structure Numbers		19056
Void:	Detailer: S. MCKANNA-KOON			Figure 3
	Subset:	Subset Sheets: of		

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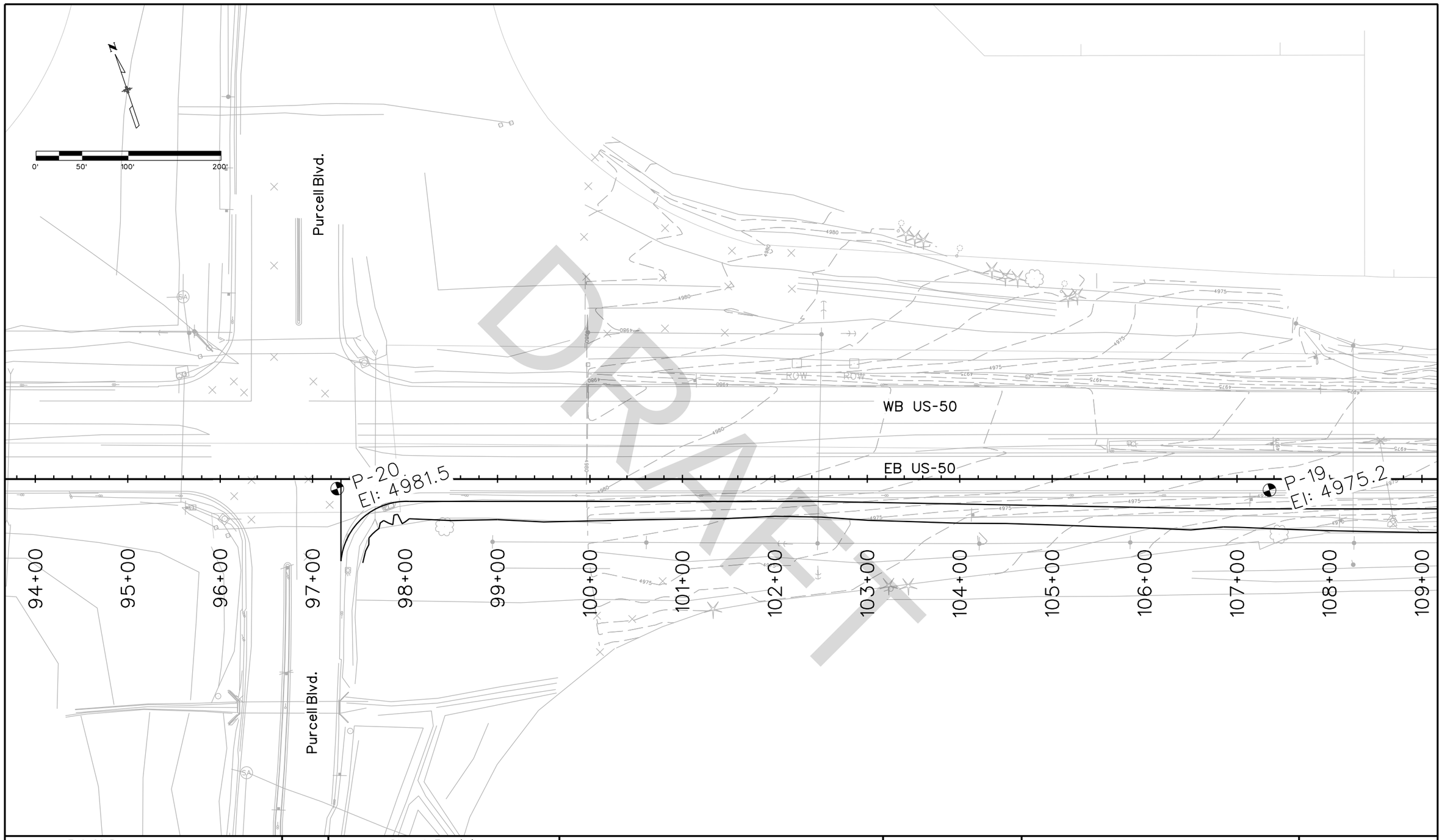

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US-50 PRELIMINARY DESIGN
PURCELL BLVD TO WILLS BLVD
BOREHOLE LOCATION PLAN

Designer: D. Hunt
Detailer: D. Knight
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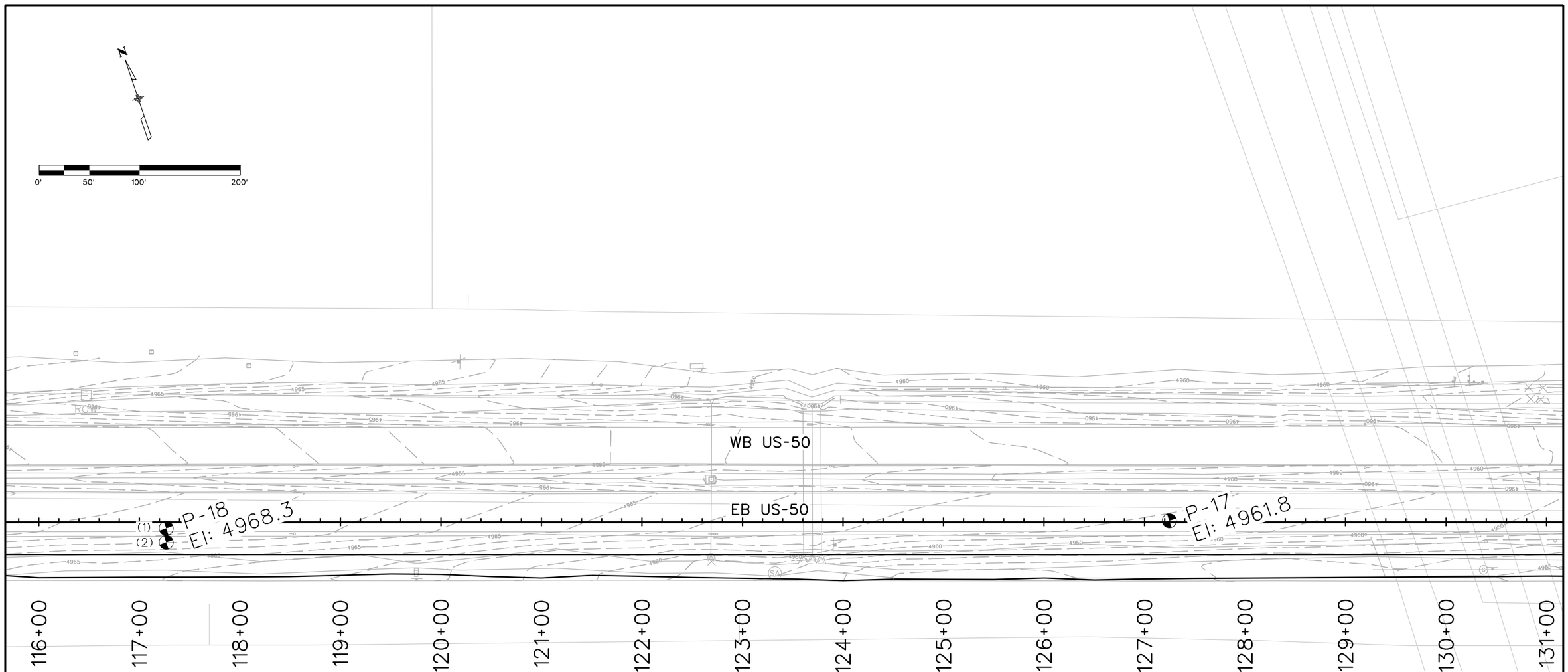
Structure Numbers
Subset Sheets: of

Project No./Code
STA 050A-022
19056
Figure 3A



NOTE FOR P-18:
(1) = SHOULDER CORE
(2) = OFF SHOULDER BOREHOLE APPROXIMATE LOCATION

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US-50 PRELIMINARY DESIGN
PURCELL BLVD TO WILLS BLVD
BOREHOLE LOCATION PLAN

Designer:	D. Hunt	Structure Numbers	
Detailer:	D. Knight		
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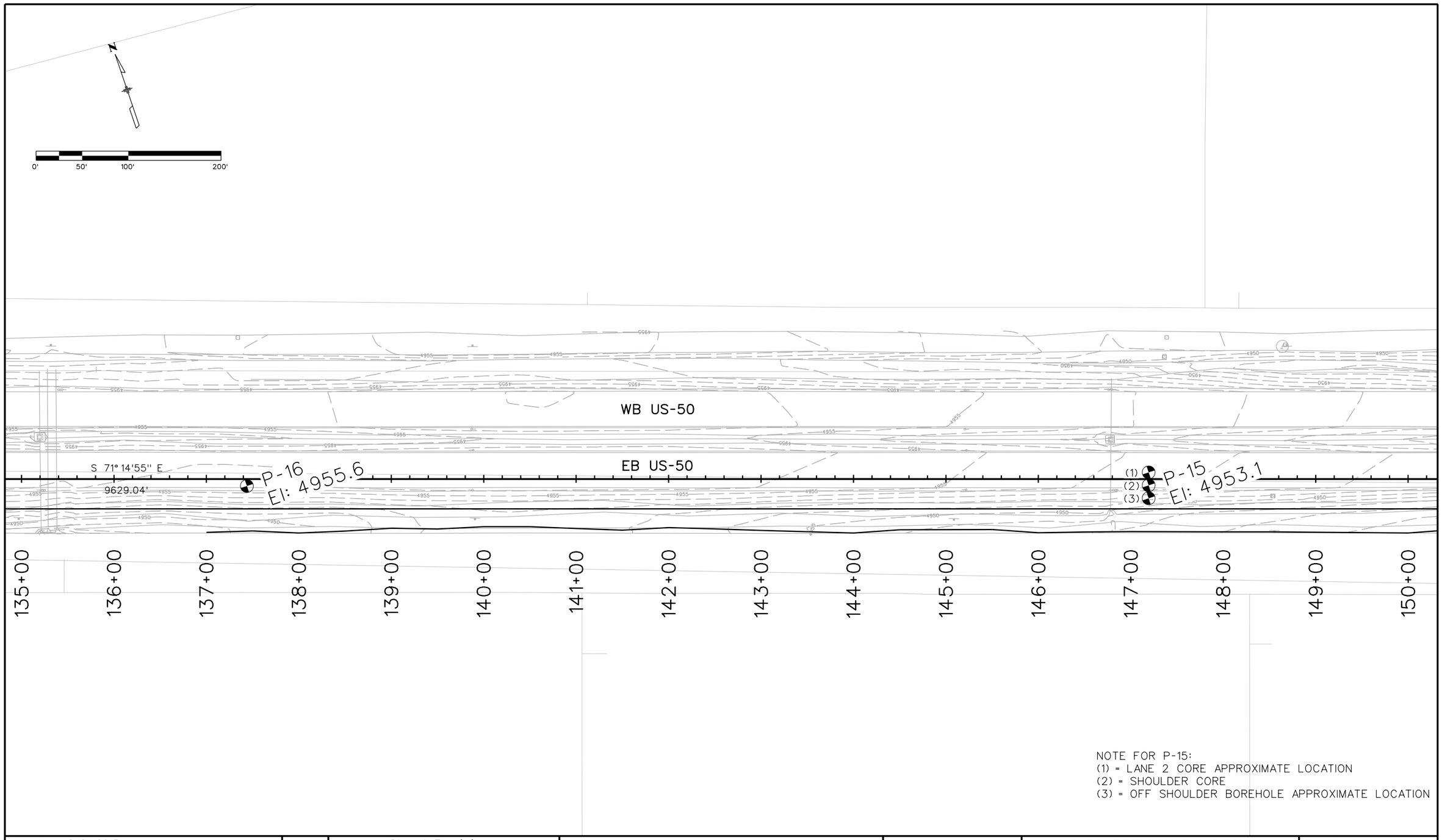
Project No./Code	
STA 050A-022	
19056	
Figure	3B



NOTE FOR P-15:
(1) = LANE 2 CORE APPROXIMATE LOCATION
(2) = SHOULDER CORE
(3) = OFF SHOULDER BOREHOLE APPROXIMATE LOCATION

Print Date: 8/21/2013
File Name: 19056 F3C BorePlan.dgn
Horiz. Scale: As Noted Vert. Scale: As Noted
Unit Information Unit Leader Initials

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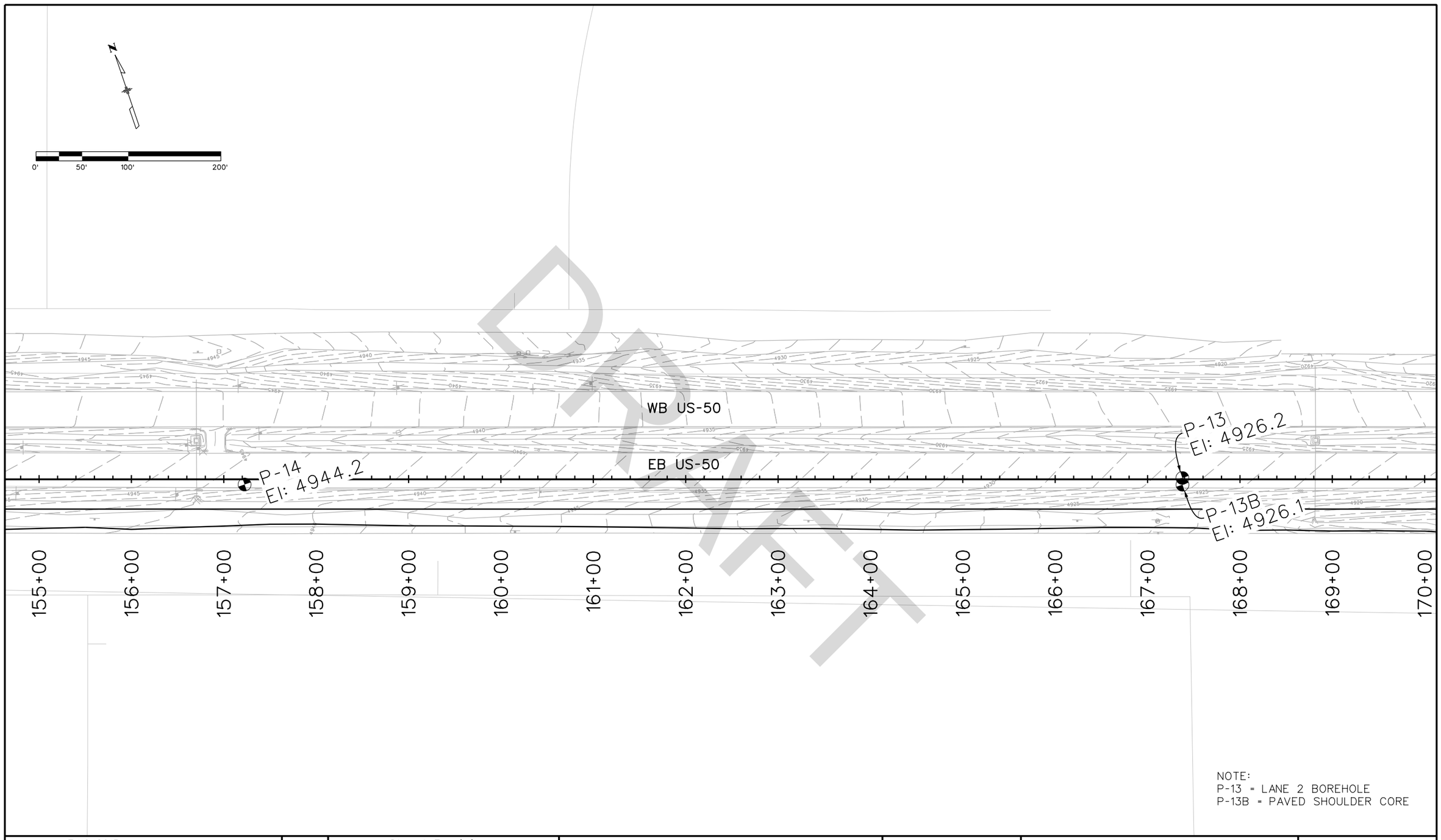
US-50 PRELIMINARY DESIGN
PURCELL BLVD TO WILLS BLVD
BOREHOLE LOCATION PLAN

Designer: D. Hunt
Detailer: D. Knight
Sheet Subset:
Structure Numbers
Subset Sheets: of

Project No./Code
STA 050A-022
19056
Figure 3C



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Horiz. Scale: 1:1200 Vert. Scale: As Noted				
Unit Information Unit Leader Initials				
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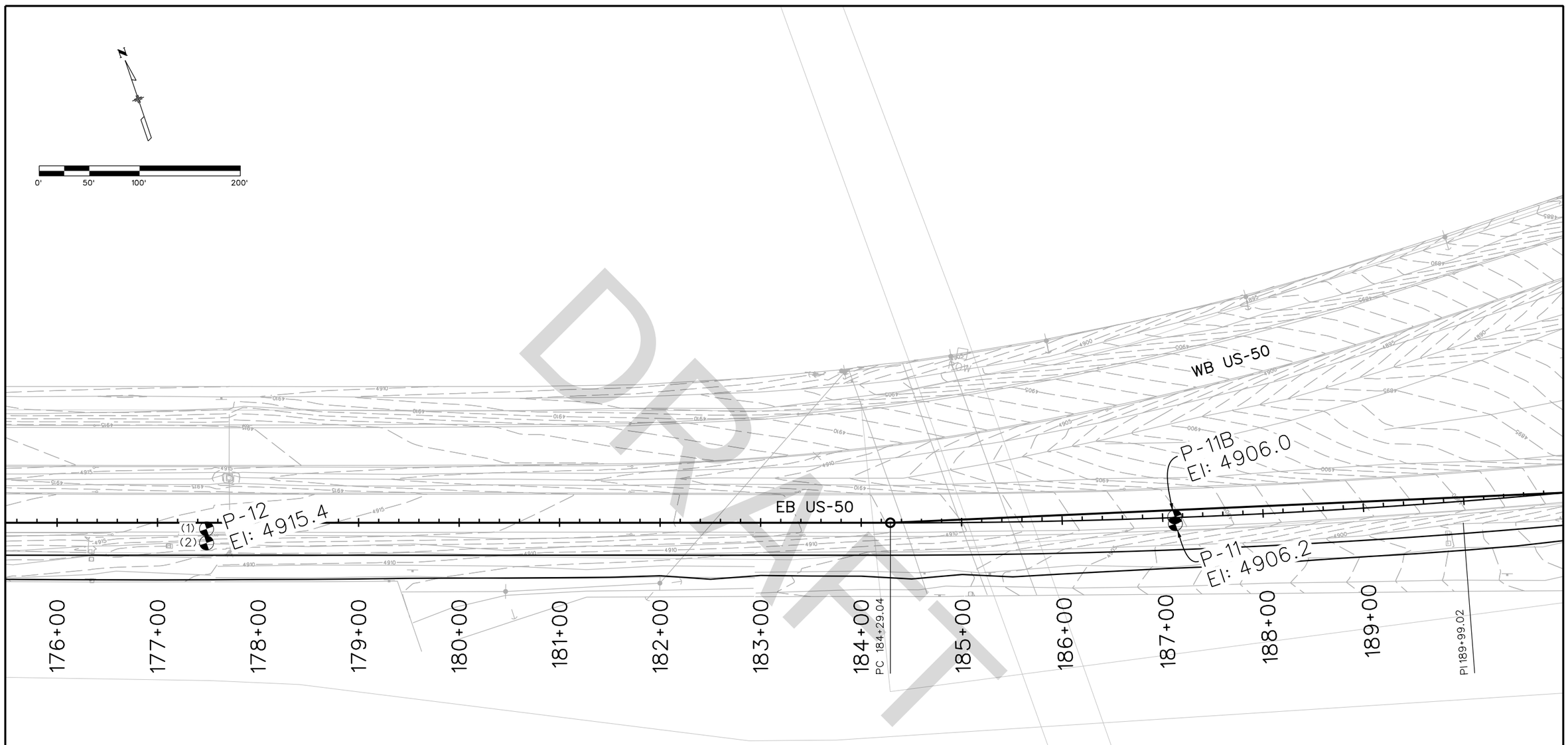
No Revisions:			STA 050A-022
Revised:	Designer: D. Hunt	Structure Numbers	19056
Void:	Detailer: D. Knight		Figure 3D
	Sheet Subset:	Subset Sheets: of	



NOTE FOR P-12:
(1) = PAVED SHOULDER CORE
(2) = OFF SHOULDER BOREHOLE APPROXIMATE LOCATION

NOTE:
P-11B = LANE 2 CORE
P-11 = PAVED SHOULDER BOREHOLE

Print Date: 7/10/2013
File Name: 19056 F3E BorePlan.dgn
Horiz. Scale: 1:1200 Vert. Scale: As Noted
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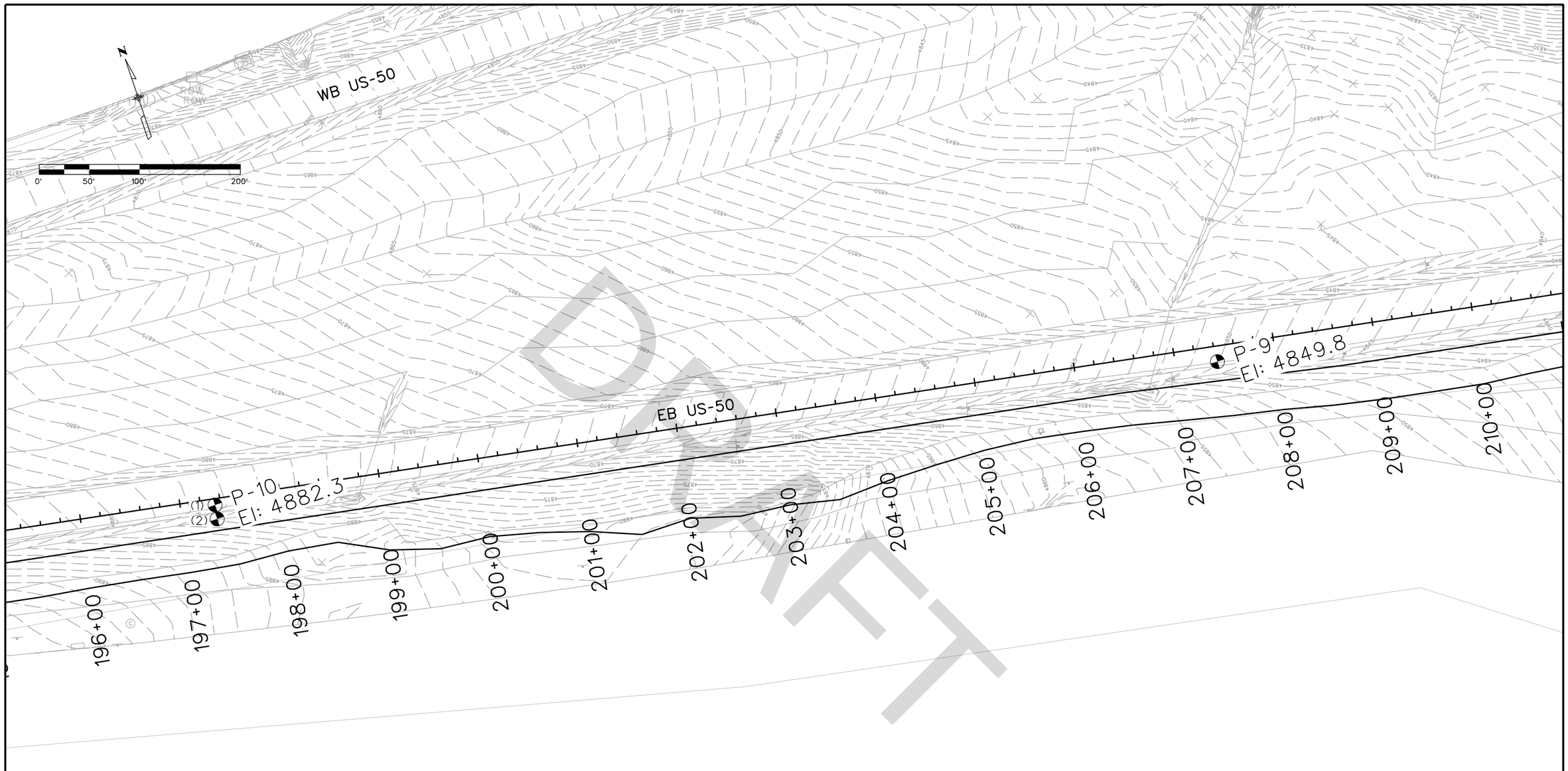
US-50 PRELIMINARY DESIGN
PURCELL BLVD TO WILLS BLVD
BOREHOLE LOCATION PLAN

Designer: D. Hunt
Detailer: D. Knight
Sheet Subset:
Structure Numbers
Subset Sheets: of

Project No./Code
STA 050A-022
19056
Figure 3E



NOTE FOR P-10:
(1) = SHOULDER CORE
(2) = OFF SHOULDER BOREHOLE APPROXIMATE LOCATION

Print Date: 7/10/2013		Sheet Revisions				As Constructed	US-50 PRELIMINARY DESIGN PURCELL BLVD TO WILLS BLVD BOREHOLE LOCATION PLAN	Project No./Code
File Name: 19056 F3F BorePlan.dgn		Date:	Comments	Init.		No Revisions:		STA 050A-022
Horiz. Scale: 1:1200 Vert. Scale: As Noted	R-X					Revised:	Designer: D. Hunt / Structure Numbers	19056
Unit Information Unit Leader Initials						Void:	Detailer: D. Knight	Figure 3F
RockSol Consulting Group, Inc. 6510 W 91st Ave, Ste 130 Westminster, CO 80031 Ph: 303-962-9300 Fax: 303-962-9350							Sheet Subset: / Subset Sheets: of	

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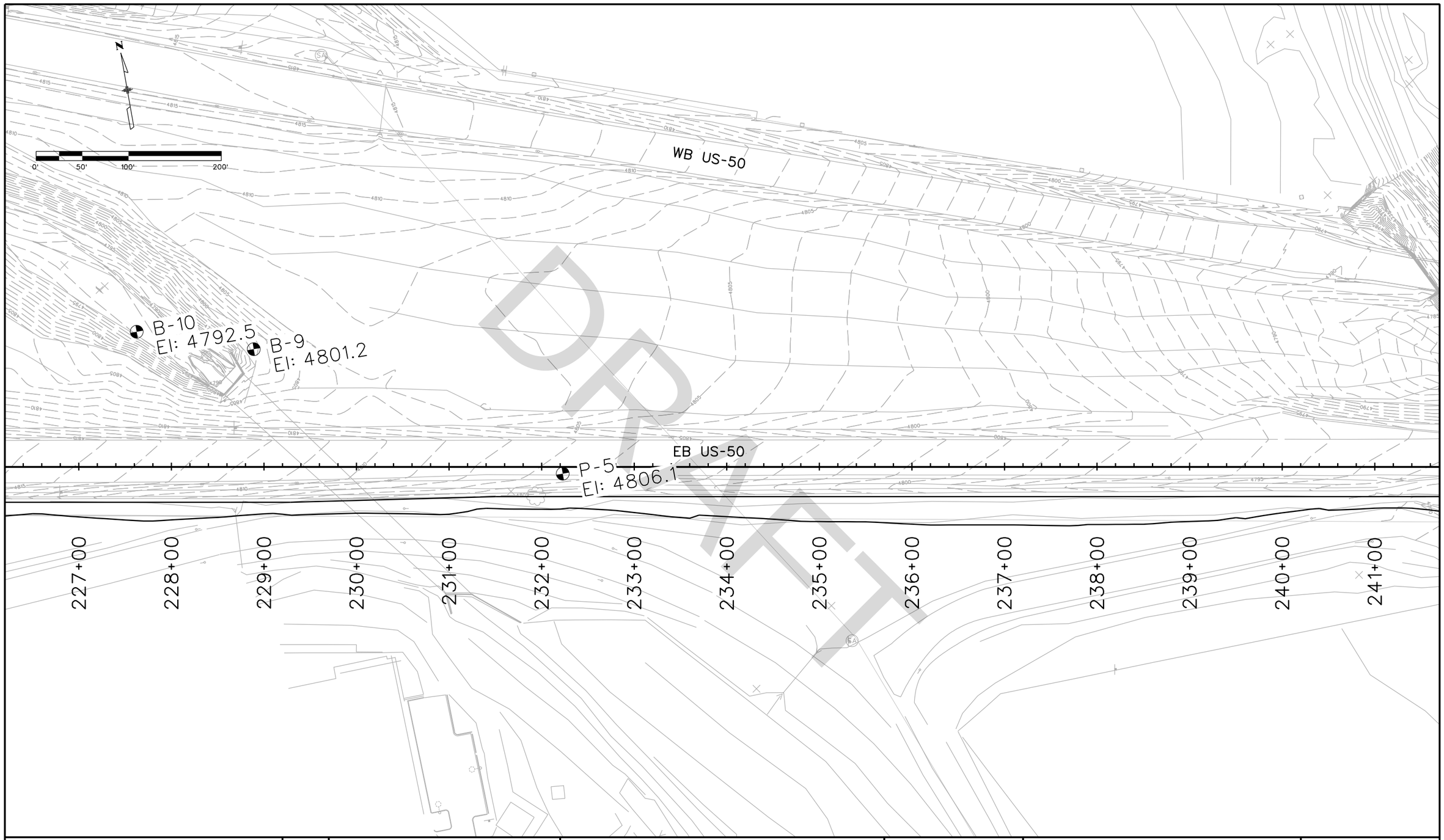
No Revisions:		STA 050A-022
Revised:	Designer: D. Hunt / Detailer: D. Knight / Structure Numbers	19056
Void:	Sheet Subset: / Subset Sheets: of	Figure 3G



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BOREHOLE LOCATION PLAN

Designer: D. Hunt
Detailer: D. Knight
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19056
Figure 3H

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US-50 PRELIMINARY DESIGN
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BOREHOLE LOCATION PLAN

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Detailer:	D. Knight		
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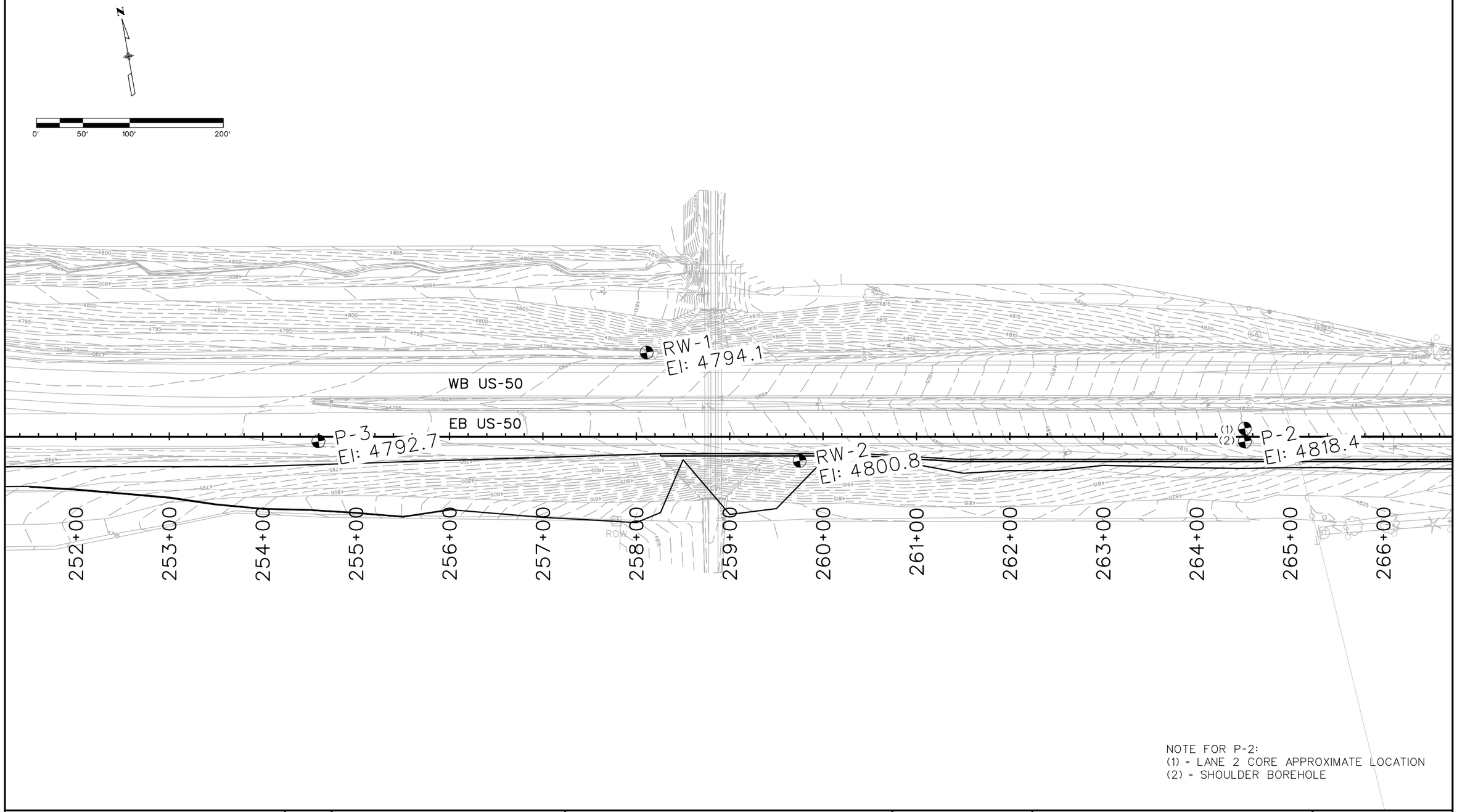
Project No./Code	
STA 050A-022	
19056	
Figure	3I



NOTE FOR P-2:
(1) = LANE 2 CORE APPROXIMATE LOCATION
(2) = SHOULDER BOREHOLE

Print Date: 8/12/2013	R-X	Sheet Revisions			As Constructed
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Horiz. Scale: 1:1200 Vert. Scale: As Noted					Revised:
Unit Information Unit Leader Initials					Void:
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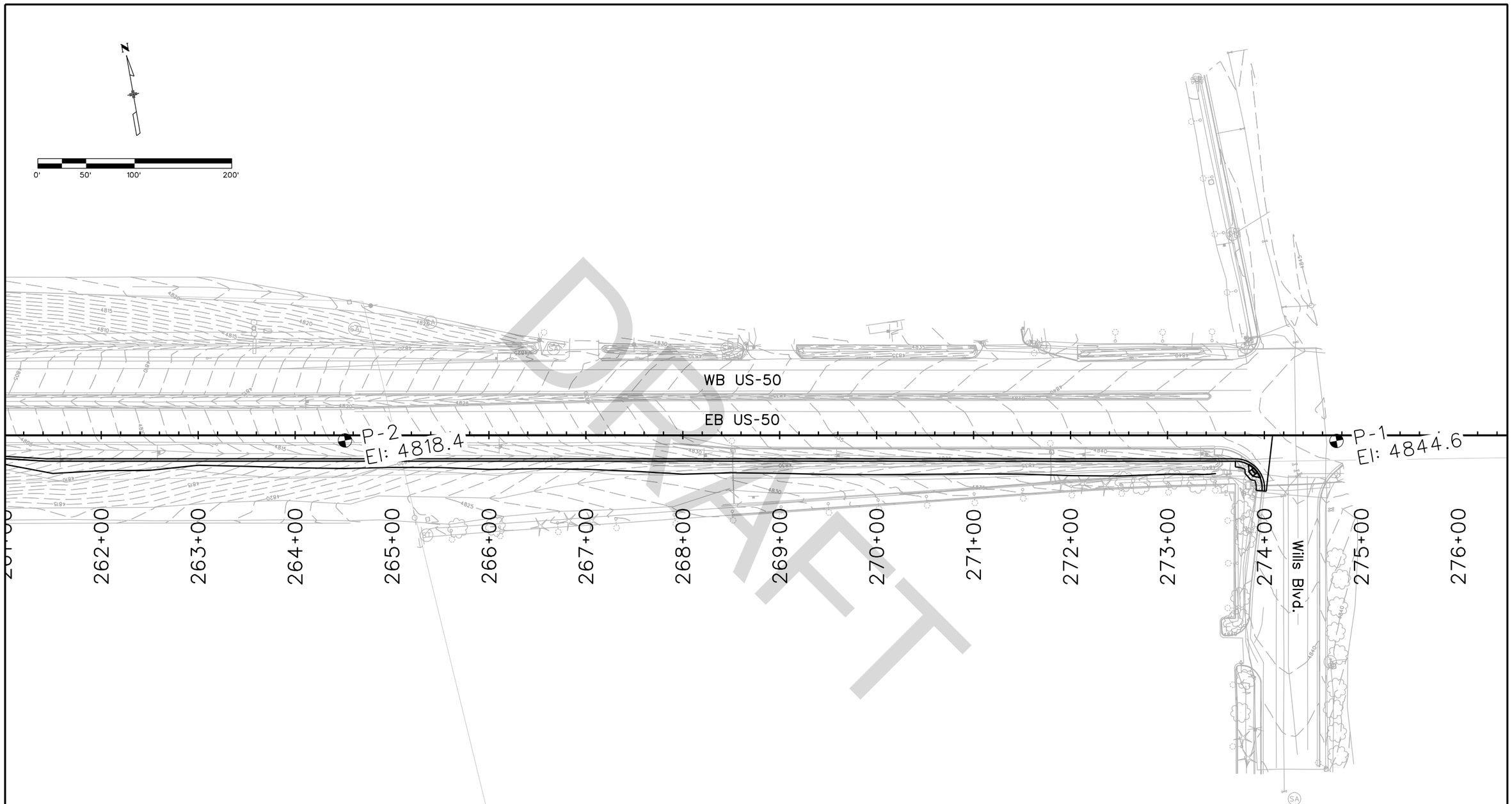
US-50 PRELIMINARY DESIGN
PURCELL BLVD TO WILLS BLVD
BOREHOLE LOCATION PLAN

Designer:	D. Hunt	Structure Numbers	
Detailer:	D. Knight		
Sheet Subset:		Subset Sheets:	of

Project No./Code	
STA 050A-022	
19056	
Figure	3J



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Unit Information Unit Leader Initials					Void:
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US-50 PRELIMINARY DESIGN
PURCELL BLVD TO WILLS BLVD
BOREHOLE LOCATION PLAN

Designer:	D. Hunt	Structure Numbers	
Detailer:	D. Knight		
Sheet Subset:		Subset Sheets:	of

Project No./Code	
STA 050A-022	
19056	
Sheet Number	3K

APPENDIX A

LEGEND
AND
INDIVIDUAL BOREHOLE LOGS

B-1 through B-10, C-1, C-2, RW-1, RW-2, and P-1 through P-23

RockSol Consulting Group, Inc.

LEGEND

CLIENT J.F. Sato & Associates **PROJECT NAME** US50 West - Task Order 4

PROJECT NUMBER 302.01 **PROJECT LOCATION** Purcell to Wills, Pueblo, CO

LITHOLOGY

- Asphalt Pavement
- Fill - Aggregate Base Course
- Fill - CLAY, with sand to sandy
- Fill - SAND, silty to gravelly
- Fill - SAND, silty to clayey
- Fill - CLAY, very sandy
- Native - TOPSOIL
- Native - SAND, silty
- Native - SAND, gravelly
- Native - SAND, clayey
- Native - CLAY
- Fill - CLAY, gravelly
- Native - CLAY, sandy
- Native - GRAVEL, silty
- Bedrock - CLAYSTONE
- Bedrock - SANDSTONE
- Bedrock - SHALE

SAMPLE TYPE

MODIFIED CALIFORNIA SAMPLER
2.5" O.D. AND 2" I.D.
WITH BRASS LINERS INCLUDED

SPLIT SPOON SAMPLER
2" O.D. AND 1 3/8" I.D.
NO LINERS

15/12 Indicates 15 blows of a 140 pound hammer falling 30 inches was required to drive the sampler 12 inches.

50/11 Indicates 50 blows of a 140 pound hammer falling 30 inches was required to drive the sampler 11 inches.

5,5,5 Indicates 5 blows, 5 blows, 5 blows of a 140 pound hammer falling 30 inches was required to drive the sampler 18 inches.

▼ GROUND WATER LEVEL NOTED AT THE TIME OF DRILLING

RockSol Consulting Group, Inc.

BORING : B-1

CLIENT J.F. Sato & Associates
PROJECT NAME US50 West - Task Order 4
PROJECT NUMBER 302.01
PROJECT LOCATION Purcell to Wills, Pueblo, CO
DATE STARTED 5/16/13 **COMPLETED** 5/16/13
GROUND ELEVATION 4786.4 ft **STATION NO.**
DRILLING CONTRACTOR Old Dirt Drilling
NORTH 600825.7 **EAST** 244151.9
DRILLING METHOD Solid Stem Auger **HOLE SIZE** 4.25"
BORING LOCATION: EB US50 Bridge over Wildhorse Creek
LOGGED BY R. Lepro
GROUND WATER LEVELS:
NOTES Automatic Hammer/SE Corner of E. Abutments
WATER DEPTH 23.0 ft on 5/16/13

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	BLOW COUNTS	SWELL POTENTIAL (%)	SULFATE (%)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
4786	0		(Fill) SAND, silty to clayey with gravel, slightly moist to moist, brown, medium dense to dense										
			(Fill) CLAY, very sandy with silty sand and gravel, moist, brown, very stiff										
4781	5			MC	27/12		0.34	117.8	12.1	30	16	14	
4776	10			MC	29/12			124.6	13.3				
			(Native) CLAY, sandy (weathered claystone), moist, brown, very stiff										
			(Bedrock) SANDSTONE, silty to clayey, moist, light brown, very hard										
4771	15			MC	50/7			119.7	16.0	32	21	11	
4766	20			MC	50/6		1.56	116.1	15.6				
			(Bedrock) SHALE, silty to clayey, slightly moist to moist, dark grey, very hard										
4761	25			SS	50/3				10.5				
4756	30			SS	50/0.5				7.5				
			Bottom of hole at 34.1 feet.	SS	50/0.5				7.0				

RockSol Consulting Group, Inc.

BORING : B-2

CLIENT J.F. Sato & Associates
PROJECT NAME US50 West - Task Order 4
PROJECT NUMBER 302.01
PROJECT LOCATION Purcell to Wills, Pueblo, CO
DATE STARTED 5/13/13 **COMPLETED** 5/13/13
EXISTING ELEVATION 4767.1 ft **PROPOSED ELEVATION** ft
DRILLING CONTRACTOR Old Dirt Drilling
NORTH 600928.8 **EAST** 244030.8
DRILLING METHOD Solid Stem Auger **HOLE SIZE** 4.25"
BORING LOCATION: Center Pier EB US50 Bridge Over Wildhorse Creek
LOGGED BY R. Lepro
GROUND WATER LEVELS: ▼ **1ST DEPTH** 4.5 ft on 5/13/13
NOTES Automatic Hammer/ W. Side of Creek
▼ **2ND DEPTH** 4.0 ft on 5/14/13 **3RD DEPTH** --- on

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	SWELL POTENTIAL (%)	SULFATE (%)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
4767	0		(Native) SAND, silty, trace clay, light brown, medium dense, moist							26	17	9	50.6
			(Native) SAND, with gravel, very moist to wet, brown, medium dense										
4762	5			MC	14/12			125.9	11.2				
			(Native) SAND, clayey, very moist to wet, brown, medium dense										
4757	10		(Bedrock) SHALE, silty to clayey, slightly moist to moist, dark grey, very hard	SS	60/3				12.1	24	16	8	21.7
4752	15			SS	50/1				12.6				
4747	20			SS	50/1				9.4				
4742	25			SS	50/1				10.6				
			Bottom of hole at 29.1 feet.	SS	50/1								

RockSol Consulting Group, Inc.

BORING : B-3

CLIENT J.F. Sato & Associates
PROJECT NAME US50 West - Task Order 4
PROJECT NUMBER 302.01
PROJECT LOCATION Purcell to Wills, Pueblo, CO
DATE STARTED 5/14/13 **COMPLETED** 5/14/13
GROUND ELEVATION 4765.9 ft **STATION NO.**
DRILLING CONTRACTOR Old Dirt Drilling
NORTH 600856.8 **EAST** 244045.6
DRILLING METHOD Solid Stem Auger **HOLE SIZE** 4.25"
BORING LOCATION: EB US50 Bridge over Wildhorse Creek
LOGGED BY R. Lepro
GROUND WATER LEVELS:
NOTES Automatic Hammer/S. side of EB US50
WATER DEPTH 3.0 ft on 5/14/13

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	BLOW COUNTS	SWELL POTENTIAL (%)	SULFATE (%)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
4766	0		(Fill) SAND, silty to clayey with gravel and rock fragments							23	14	9	13.6
			(Native) CLAY, sandy, very moist to wet, stiff to very stiff, brown										
4761	5		(Native) SAND, silty to gravelly, clayey in parts, wet, brown, medium dense	MC	15/12								
4756	10		(Bedrock) SHALE, silty to clayey, slightly moist to moist, dark grey, very hard	MC	50/1.5				11.9				
4751	15			MC	50/.75				12.0				
4746	20			SS	50/1				8.1				
4741	25			SS	50/1				13.1				
			Bottom of hole at 29.1 feet.	SS	50/5				9.9				

RockSol Consulting Group, Inc.

BORING : B-4

CLIENT J.F. Sato & Associates
PROJECT NAME US50 West - Task Order 4
PROJECT NUMBER 302.01
PROJECT LOCATION Purcell to Wills, Pueblo, CO
DATE STARTED 5/16/01 **COMPLETED** 5/16/13
GROUND ELEVATION 4791.5 ft **STATION NO.**
DRILLING CONTRACTOR Old Dirt Drilling
NORTH 600938.8 **EAST** 243929.2
DRILLING METHOD Solid Stem Auger **HOLE SIZE** 4.25"
BORING LOCATION: EB US50 Bridge over Wildhorse Creek
LOGGED BY R. Lepro
GROUND WATER LEVELS:
NOTES Automatic Hammer/E. Abutment E. Side of Creek S. Side of US50 (EB) **WATER DEPTH** 28.0 ft on 5/16/13

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	BLOW COUNTS	SWELL POTENTIAL (%)	SULFATE (%)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
4792	0		(Fill) SAND, clayey, slightly moist to moist, brown, loose to medium dense										
			(Fill) CLAY, sandy with gravel and silty SAND, moist, brown, hard										
4787	5			MC	31/12	-0.4		124.0	10.7				
4782	10			MC	33/12			128.5	11.2	30	14	16	54.0
			(Native) SAND, silty with gravel and sandy CLAY in parts, moist, brown, medium dense										
4777	15			MC	18/12			125.9	11.3				47.0
			(Native) CLAY, with sand to sandy and silty, brown and grey, very stiff to stiff										
4772	20			MC	16/12		1.74	110.8	18.2	35	15	20	94.5
4767	25			MC	14/12			107.4	20.6				
			(Native) SAND, silty to gravelly, wet, brown, loose										
4762	30			SS	5/5/3				13.9				25.3
			(Native) CLAY, sandy with gravel and silty sand, very moist to wet, brown and grey, soft to medium stiff										
			(Bedrock) SHALE, silty to clayey, slightly moist to moist, dark grey, very hard										
4757	35			SS	50/1.25				10.3				

RockSol Consulting Group, Inc.

BORING : B-4

CLIENT J.F. Sato & Associates **PROJECT NAME** US50 West - Task Order 4

PROJECT NUMBER 302.01 **PROJECT LOCATION** Purcell to Wills, Pueblo, CO

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	BLOW COUNTS	SWELL POTENTIAL (%)	SULFATE (%)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
4757	35		(Bedrock) SHALE, silty to clayey, slightly moist to moist, dark grey, very hard *(continued)*										
4752	40			SS	50/0.75				15.8				
4747	45			SS	50/0.50				10.9				
			Bottom of hole at 49.1 feet.	SS	50/0.5				5.0				

RockSol Consulting Group, Inc.

BORING : B-5

CLIENT J.F. Sato & Associates
PROJECT NAME US50 West - Task Order 4
PROJECT NUMBER 302.01
PROJECT LOCATION Purcell to Wills, Pueblo, CO
DATE STARTED 5/16/13 **COMPLETED** 5/16/13
GROUND ELEVATION 4782.9 ft **STATION NO.**
DRILLING CONTRACTOR Old Dirt Drilling
NORTH 600952.3 **EAST** 244120.4
DRILLING METHOD Solid Stem Auger **HOLE SIZE** 4.25"
BORING LOCATION: Center Median US50 East Side of Wildhorse Creek
LOGGED BY R. Lepro
GROUND WATER LEVELS:
NOTES Automatic Hammer/Proposed WB US50 Bridge over Wild Horsecreek **WATER DEPTH** 18.0 ft on 5/16/13

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	BLOW COUNTS	SWELL POTENTIAL (%)	SULFATE (%)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
4783	0		(Fill) SAND, silty to gravelly, with sandy clay in parts, slightly moist to moist, brown, loose to dense										
4778	5			MC	44/12	3.8		131.0	9.3				
			(Native) CLAY, sandy with silty sand in parts, very moist to wet, brown, medium stiff to hard										
4773	10			MC	19/12		2.07	120.1	13.4	30	13	17	72.0
4768	15			MC	19/12			112.5	17.7	32	15	17	80.0
4763	20			SS	3/3/3				21.8				
			(Native) SAND, gravelly, wet, brown, loose to medium dense										
4758	25		(Bedrock) SHALE, silty to clayey, slightly moist to moist, dark grey, very hard	SS	50/1.5				8.7				
4753	30			SS	50/0.75				6.4				
4748	35			SS	50/1				10.2				

RockSol Consulting Group, Inc.

BORING : B-5

CLIENT J.F. Sato & Associates **PROJECT NAME** US50 West - Task Order 4

PROJECT NUMBER 302.01 **PROJECT LOCATION** Purcell to Wills, Pueblo, CO

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	BLOW COUNTS	SWELL POTENTIAL (%)	SULFATE (%)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
4748	35		(Bedrock) SHALE, silty to clayey, slightly moist to moist, dark grey, very hard *(continued)*										
4743	40			SS	50/0.75								
			Bottom of hole at 44.1 feet.	SS	50/0.75				1.9				

RockSol Consulting Group, Inc.

BORING : B-6

CLIENT J.F. Sato & Associates
PROJECT NAME US50 West - Task Order 4
PROJECT NUMBER 302.01
PROJECT LOCATION Purcell to Wills, Pueblo, CO
DATE STARTED 5/14/13 **COMPLETED** 5/14/13
GROUND ELEVATION 4766.1 ft **STATION NO.**
DRILLING CONTRACTOR Old Dirt Drilling
NORTH 600997.0 **EAST** 244023.4
DRILLING METHOD Solid Stem Auger **HOLE SIZE** 4.25"
BORING LOCATION: Proposed WB US50 Over Wildhorse Creek
LOGGED BY R. Lepro
GROUND WATER LEVELS:
NOTES Automatic Hammer/ Center Median E. Side of Creek Center Pier
WATER DEPTH 3.0 ft on 5/14/13

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	BLOW COUNTS	SWELL POTENTIAL (%)	SULFATE (%)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
4766	0		(Native) SAND, clayey, brown, moist, medium dense							29	14	15	60.2
4761	5		(Native) Gravel, silty to sandy with rock fragments, sandy clay in parts, wet, brown, medium dense	MC	11/12			125.9	12.5				4.9
4756	10		(Bedrock) SHALE, silty to clayey, slightly moist to moist, dark grey, very hard	MC	50/1								
4751	15			SS	50/1				7.2				
4746	20			SS	50/1				9.3				
4741	25			SS	50/1				13.8				
			Bottom of hole at 29.1 feet.	SS	50/1				5.7				

RockSol Consulting Group, Inc.

BORING : B-7

CLIENT J.F. Sato & Associates
PROJECT NAME US50 West - Task Order 4
PROJECT NUMBER 302.01
PROJECT LOCATION Purcell to Wills, Pueblo, CO
DATE STARTED 5/13/13 **COMPLETED** 5/13/13
GROUND ELEVATION 4767.7 ft **STATION NO.**
DRILLING CONTRACTOR Old Dirt Drilling
NORTH 600963.8 **EAST** 244000.7
DRILLING METHOD Solid Stem Auger **HOLE SIZE** 4.25"
BORING LOCATION: Center Pier WB US50 Bridge over Wildhorse Creek
LOGGED BY R. Lepro
GROUND WATER LEVELS:
NOTES Automatic Hammer/W. side fo Creek in Dirt trail Aprrox. 50' N.
WATER DEPTH 3.5 ft on 5/13/13

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	BLOW COUNTS	SWELL POTENTIAL (%)	SULFATE (%)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
4768	0		(Native) SAND, clayey with gravel and rock fragments, moist, brown and grey, medium dense										
4763	5			MC	12/12			128.9	9.3				
4758	10		(Bedrock) SHALE, silty to clayey, clayey SANDSTONE in parts, slightly moist to moist, dark grey, very hard	MC	50/3			128.9	8.4				
4753	15			SS	50/1				6.5				
4748	20			SS	50/1				15.2				
4743	25			MC	50/0.75		0.44			24	14	10	46.6
			Bottom of hole at 29.1 feet.	SS	50/0.50				14.2				

RockSol Consulting Group, Inc.

BORING : B-8

CLIENT J.F. Sato & Associates
PROJECT NAME US50 West - Task Order 4
PROJECT NUMBER 302.01
PROJECT LOCATION Purcell to Wills, Pueblo, CO
DATE STARTED 5/13/13 **COMPLETED** 5/13/13
GROUND ELEVATION 4781.3 ft **STATION NO.**
DRILLING CONTRACTOR Old Dirt Drilling
NORTH 601012.5 **EAST** 243884.6
DRILLING METHOD Solid Stem Auger **HOLE SIZE** 4.25"
BORING LOCATION: Center Median US50, WB Bridge, West Abutment
LOGGED BY R. Lepro
GROUND WATER LEVELS:
NOTES Automatic Hammer/Top of Embankment
WATER DEPTH 18.0 ft on 5/13/13

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	BLOW COUNTS	SWELL POTENTIAL (%)	SULFATE (%)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
4781	0		Topsoil, SAND, clayey to silty, slightly moist to moist, brown, loose to medium dense										
			(Native) CLAY, sandy, moist, brown, very stiff										
4776	5			MC	16/12	2.5		115.8	13.4				
			(Native) SAND, clayey, sandy clay in parts, moist, brown to grey, medium dense										
4771	10			MC	19/12		1.26	114.6	11.7	23	15	8	63.2
			(Native) CLAY, sandy, moist, brown, stiff to very stiff										
4766	15		(Native) SAND, clayey, sandy clay in parts, moist, brown and grey, medium dense	MC	14/12					27	15	12	56.4
4761	20		(Native) CLAY, sandy with silty SAND in parts, very moist to wet, brown and grey, stiff	MC	8/12								
			(Bedrock) SHALE, silty to clayey, clayey SANDSTONE in parts, slightly moist, grey, very hard										
4756	25			MC	100/1								
4751	30			SS	100/1		0.39		15.2				
4746	35			SS	100/1.5				14.6	25	16	9	40.6
			Bottom of hole at 39.1 feet.	SS	50/1				9.2				

RockSol Consulting Group, Inc.

BORING : B-9

CLIENT J.F. Sato & Associates
PROJECT NAME US50 West - Task Order 4
PROJECT NUMBER 302.01
PROJECT LOCATION Purcell to Wills, Pueblo, CO
DATE STARTED 5/17/13 **COMPLETED** 5/17/13
GROUND ELEVATION 4801.2 ft **STATION NO.**
DRILLING CONTRACTOR Old Dirt Drilling
NORTH 601262.8 **EAST** 242597.8
DRILLING METHOD Solid Stem Auger **HOLE SIZE** 4.25"
BORING LOCATION: Eastern End of Proposed Culvert Extention, Willow Creek
LOGGED BY R. Lepro
GROUND WATER LEVELS:
NOTES Automatic Hammer/N. Side of Williams Creek, Top of Existing Culvert
WATER DEPTH None Encountered on 5/17/13

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	BLOW COUNTS	SWELL POTENTIAL (%)	SULFATE (%)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
4801	0		(Native) SAND, silty to clayey, slightly moist, light brown, loose to medium dense										
			(Bedrock) SHALE, silty, clayey SANDSTONE in parts, slightly moist to moist, light grey, very hard										
4796	5			MC	50/8		0.92		8.0	25	16	9	36.6
4791	10			MC	50/5				8.3				
4786	15			MC	50/4				7.9				
			Bottom of hole at 19.1 feet.	MC	50/0.5				4.3				

RockSol Consulting Group, Inc.

BORING : B-10

CLIENT J.F. Sato & Associates
PROJECT NAME US50 West - Task Order 4
PROJECT NUMBER 302.01
PROJECT LOCATION Purcell to Wills, Pueblo, CO
DATE STARTED 5/17/13 **COMPLETED** 5/17/13
EXISTING ELEVATION 4792.5 ft **PROPOSED ELEVATION** ft
DRILLING CONTRACTOR Old Dirt Drilling
NORTH 601303.4 **EAST** 242476.6
DRILLING METHOD Solid Stem Auger **HOLE SIZE** 4.25"
BORING LOCATION: West End of Proposed Culvert at Williams Creek
LOGGED BY R. Lepro
GROUND WATER LEVELS: ▼ **1ST DEPTH** 7.0 ft on 5/17/13
NOTES Automatic Hammer/Proposed WB US50 Re-allignment
▼ **2ND DEPTH** 11.0 ft on 5/17/13 **3RD DEPTH** --- on

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	SWELL POTENTIAL (%)	SULFATE (%)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
4793	0		(Native) SAND, clayey with sandy clay and silty sand, very moist, brown, medium dense				0.40			29	14	15	45.6
4788	5			MC	11/12			113.3	20.3	26	15	11	57.9
			(Native) SHALE, silty to clayey, slightly moist to moist, grey to dark grey, very hard										
4783	10			MC	60/1								
4778	15			SS	50/.075								
			Bottom of hole at 19.1 feet.	SS	50/0.75								

RockSol Consulting Group, Inc.

BORING : C-1

CLIENT J.F. Sato & Associates
PROJECT NAME US50 West - Task Order 4
PROJECT NUMBER 302.01
PROJECT LOCATION Purcell to Wills, Pueblo, CO
DATE STARTED 6/6/13 **COMPLETED** 6/6/13
GROUND ELEVATION 4764.0 ft **STATION NO.**
DRILLING CONTRACTOR N/A
NORTH **EAST**
DRILLING METHOD Hand Auger **HOLE SIZE** 2"
BORING LOCATION: In Wild Horse Creek N. Side of EB US50 Bridge
LOGGED BY J. Biller
GROUND WATER LEVELS:
NOTES
WATER DEPTH See Note Below on 6/6/13

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	BLOW COUNTS	SWELL POTENTIAL (%)	SULFATE (%)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
4764	0		(Native) SAND, clayey to gravelly with sandy clay in parts, wet, brown and grey, medium dense							23	15	8	15.5
			(42 Inches)										
			(Native) CLAY, with sand to sandy, very moist to wet, brown, very stiff to hard							35	17	18	69.6
			Bottom of hole at 3.8 feet.										

Note: Zero (0) depth is the creek bed surface with approximately 6 inches of flowing water in the creek bed at the time of sampling. Creek bed surface approximately 4,764 feet based on topographic survey of bridge site provided by CDOT.

RockSol Consulting Group, Inc.

BORING : C-2

CLIENT J.F. Sato & Associates
PROJECT NAME US50 West - Task Order 4
PROJECT NUMBER 302.01
PROJECT LOCATION Purcell to Wills, Pueblo, CO
DATE STARTED 6/6/13 **COMPLETED** 6/6/13
GROUND ELEVATION 4763.0 ft **STATION NO.**
DRILLING CONTRACTOR N/A
NORTH **EAST**
DRILLING METHOD Hand Auger **HOLE SIZE** 2"
BORING LOCATION: In Wild Horse Creek, South Side of EB US50 Bridge
LOGGED BY J. Biller
GROUND WATER LEVELS:
NOTES
WATER DEPTH See Note Below on 6/6/13

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	BLOW COUNTS	SWELL POTENTIAL (%)	SULFATE (%)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT	ATTERBERG LIMITS PLASTIC LIMIT	ATTERBERG LIMITS PLASTICITY INDEX	FINES CONTENT (%)
4763	0		(Native) SAND, silty to gravelly, wet, brown, medium dense to loose (0-6 inches)							NP	NP	NP	21.8
			(Native) CLAY, sandy with silty gravelly sand in parts, very moist to wet, brown, stiff to very stiff (6 to 19 inches)							31	17	14	96.4
			(Native) SAND, silty to gravelly, wet, brown, medium dense (19 to 25 inches)							NP	NP	NP	18.3
			Bottom of hole at 2.0 feet.										

Note: Zero (0) depth is the creek bed surface with approximately 6 inches of flowing water in the creek bed at the time of sampling. Creek bed surface approximately 4,763 feet based on topographic survey of the bridge site provided by CDOT.

RockSol Consulting Group, Inc.

BORING : P-1

CLIENT J.F. Sato & Associates
PROJECT NAME US50 West - Task Order 4
PROJECT NUMBER 302.01
PROJECT LOCATION Purcell to Wills, Pueblo, CO
DATE STARTED 5/14/13 **COMPLETED** 5/14/13
GROUND ELEVATION 4844.6 ft **STATION NO.** 275+00
DRILLING CONTRACTOR Old Dirt Drilling
NORTH 600328.8 **EAST** 247089.1
DRILLING METHOD Solid Stem Auger **HOLE SIZE** 4.25"
BORING LOCATION: EB US50 and Willis Blvd.
LOGGED BY R. Lepro
GROUND WATER LEVELS:
NOTES Automatic Hammer/E. Side of Wills Blvd. Approx 20' E. of X-Walk
WATER DEPTH None Encountered on 5/14/13

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	BLOW COUNTS	SWELL POTENTIAL (%)	SULFATE (%)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
4845	0		Asphalt Pavement, Approximately 4.5"							NP	NP	NP	9.7
			Aggregate Base Course, Approximately 12"				0.88			30	16	14	56.9
			(Fill) CLAY, sandy, very moist, brown, medium stiff	MC	7/12	-0.2		118.6	11.4				
			(Native) CLAY, sandy to very sandy, very moist, brown, medium stiff to stiff										
4840	5			MC	10/12	0.6		109.4	20.0				
4835	10			MC	7/12			102.8	20.7				
4830	15			MC	10/12			105.9	19.9				
			Bottom of hole at 15.0 feet.										

RockSol Consulting Group, Inc.

BORING : P-2

CLIENT J.F. Sato & Associates
PROJECT NAME US50 West - Task Order 4
PROJECT NUMBER 302.01
PROJECT LOCATION Purcell to Wills, Pueblo, CO
DATE STARTED 5/14/13 **COMPLETED** 5/14/13
GROUND ELEVATION 4818.4 ft **STATION NO.** 265+00
DRILLING CONTRACTOR Old Dirt Drilling
NORTH 600508.5 **EAST** 246082.0
DRILLING METHOD Solid Stem Auger **HOLE SIZE** 4.25"
BORING LOCATION: EB US50 Shoulder
LOGGED BY R. Lepro
GROUND WATER LEVELS:
NOTES Automatic Hammer/W. of Wills Blvd. Cut Area
WATER DEPTH None Encountered on 5/14/13

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	BLOW COUNTS	SWELL POTENTIAL (%)	SULFATE (%)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
4818	0		Asphalt Pavement, approximately 6.5"				1.42			32	16	16	65.5
			Aggregate Base Course, approximately 6"										
			(Native) CLAY, sandy, moist to very moist, brown, stiff	MC	8/12	-0.4		102.5	22.2				
4813	5			MC	10/12			106.9	20.4				
4808	10			MC	12/12			104.9	21.0				
			Bottom of hole at 10.0 feet.										

RockSol Consulting Group, Inc.

BORING : P-3

CLIENT J.F. Sato & Associates
PROJECT NAME US50 West - Task Order 4
PROJECT NUMBER 302.01
PROJECT LOCATION Purcell to Wills, Pueblo, CO
DATE STARTED 5/14/13 **COMPLETED** 5/14/13
GROUND ELEVATION 4792.7 ft **STATION NO.** 255+00
DRILLING CONTRACTOR Old Dirt Drilling
NORTH 600682.4 **EAST** 245105.6
DRILLING METHOD Solid Stem Auger **HOLE SIZE** 4.25"
BORING LOCATION: EB US50 Shoulder
LOGGED BY R. Lepro
GROUND WATER LEVELS:
NOTES Automatic Hammer/W. Side of RR Tracks Cut Area
WATER DEPTH None Encountered on 5/14/13

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	BLOW COUNTS	SWELL POTENTIAL (%)	SULFATE (%)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
4793	0		Asphalt Pavement, approximately 5"				1.30			38	19	19	77.0
			Aggregate Base Course, approximately 6"										
			(Native) CLAY, very silty to sandy, moist, brown, very stiff to hard	MC	21/12	1.4	1.36	107.8	20.7				
4788	5			MC	30/12	0.9	1.72	111.0	18.5				
			(Bedrock) CLAYSTONE, with gypsum crystals, slightly moist, light brown, hard										
4783	10			MC	42/12			108.8	21.7				
			Bottom of hole at 10.0 feet.										

RockSol Consulting Group, Inc.

BORING : P-4

CLIENT J.F. Sato & Associates
PROJECT NAME US50 West - Task Order 4
PROJECT NUMBER 302.01
PROJECT LOCATION Purcell to Wills, Pueblo, CO
DATE STARTED 5/14/13 **COMPLETED** 5/14/13
GROUND ELEVATION 4792.1 ft **STATION NO.** 242+50
DRILLING CONTRACTOR Old Dirt Drilling
NORTH 600905.2 **EAST** 243874.4
DRILLING METHOD Solid Stem Auger **HOLE SIZE** 4.25"
BORING LOCATION: EB US50 Lane 2
LOGGED BY R. Lepro
GROUND WATER LEVELS:
NOTES Automatic Hammer/W. Side Wild Horse Creek Bridge
WATER DEPTH 2.0 ft on 5/14/13

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	BLOW COUNTS	SWELL POTENTIAL (%)	SULFATE (%)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
4792	0		Asphalt Pavement, approximately 9.5"							NP	NP	NP	9.7
			Aggregate Base Course, approximately 14.5"				0.16			28	14	14	58.0
			(Fill) CLAY, with sand to sandy, very moist, grey, brown, stiff	MC	14/12	0.0		108.7	18.7				
4787	5			MC	14/12			118.7	13.2				
			(Native) CLAY, sandy, moist, brown, medium stiff										
4782	10			MC	6/12			117.5	11.7				
			Bottom of hole at 10.0 feet.										

RockSol Consulting Group, Inc.

BORING : P-5

CLIENT J.F. Sato & Associates
PROJECT NAME US50 West - Task Order 4
PROJECT NUMBER 302.01
PROJECT LOCATION Purcell to Wills, Pueblo, CO
DATE STARTED 5/14/13 **COMPLETED** 5/14/13
GROUND ELEVATION 4806.1 ft **STATION NO.** 233+00
DRILLING CONTRACTOR Old Dirt Drilling
NORTH 601071.9 **EAST** 242902.9
DRILLING METHOD Solid Stem Auger **HOLE SIZE** 4.25"
BORING LOCATION: EB US50 Shoulder Pavement
LOGGED BY R. Lepro
GROUND WATER LEVELS:
NOTES Automatic Hammer
WATER DEPTH None Encountered on 5/14/13

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	BLOW COUNTS	SWELL POTENTIAL (%)	SULFATE (%)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT	ATTERBERG LIMITS PLASTIC LIMIT	ATTERBERG LIMITS PLASTICITY INDEX	FINES CONTENT (%)
4806	0		Asphalt Pavement, approximately 8.5"							NP	NP	NP	14.2
			Aggregate Base Course, approximately 15.5"				0.02			19	12	7	20.2
			(Fill) CLAY, sandy with gravel, moist, brown, very stiff	MC	16/12			133.9	7.4				
4801	5		(Native) SAND, silty to gravelly, trace clay, slightly moist to moist, loose to medium dense	MC	12/12			119.6	5.1				
4796	10			MC	6/12			103.0	7.9				
			Bottom of hole at 10.0 feet.										

RockSol Consulting Group, Inc.

BORING : P-6

CLIENT J.F. Sato & Associates
PROJECT NAME US50 West - Task Order 4
PROJECT NUMBER 302.01
PROJECT LOCATION Purcell to Wills, Pueblo, CO
DATE STARTED 5/14/13 **COMPLETED** 5/14/13
GROUND ELEVATION 4821.4 ft **STATION NO.** 223+00
DRILLING CONTRACTOR Old Dirt Drilling
NORTH 601236.6 **EAST** 241897.1
DRILLING METHOD Solid Stem Auger **HOLE SIZE** 4.25"
BORING LOCATION: EB US50 On-Ramp From NB Pueblo Blvd.
LOGGED BY R. Lepro
GROUND WATER LEVELS:
NOTES Automatic Hammer/In Shoulder Cut Area
WATER DEPTH None Encountered on 5/14/13

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	BLOW COUNTS	SWELL POTENTIAL (%)	SULFATE (%)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
										LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
4821	0		Asphalt Pavement, approximately 9"										
			(Fill) SAND, silty				0.54			24	14	10	17.3
			(Fill) CLAY, silty to sandy with gravel in parts, slightly moist to moist, grey to dark grey, stiff to very hard	MC	50/9			110.7	7.5				
4816	5			MC	14/12				4.8				3.3
			(Bedrock) SHALE, clayey, slightly moist, grey, very hard										
			Auger Refusal at 8'										
			Bottom of hole at 8.0 feet.										

RockSol Consulting Group, Inc.

BORING : P-7

CLIENT J.F. Sato & Associates
PROJECT NAME US50 West - Task Order 4
PROJECT NUMBER 302.01
PROJECT LOCATION Purcell to Wills, Pueblo, CO
DATE STARTED 5/14/13 **COMPLETED** 5/14/13
GROUND ELEVATION 4828.8 ft **STATION NO.** 217+00
DRILLING CONTRACTOR Old Dirt Drilling
NORTH 601339.9 **EAST** 241398.4
DRILLING METHOD Solid Stem Auger **HOLE SIZE** 4.25"
BORING LOCATION: EB US50 North Shoulder
LOGGED BY R. Lepro
GROUND WATER LEVELS:
NOTES Automatic Hammer/Approx. 50' W. of Pueblo Blvd.
WATER DEPTH None Encountered on 5/14/13

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	BLOW COUNTS	SWELL POTENTIAL (%)	SULFATE (%)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
4829	0		Asphalt pavement, approximately 13.5"										
			Aggregate Base Course, approximately 4"				1.16			28	15	13	57.5
			(Fill) CLAY, sandy with rock fragments, moist, brown, very stiff	MC	17/12	0.3		123.7	11.9				
			(Native) CLAY, silty to sandy, slightly moist to moist, light brown to brown, stiff to very hard										
4824	5			MC	9/12			114.3	13.8				
				MC	50/8			123.7	13.7				
			Bottom of hole at 9.7 feet.										

RockSol Consulting Group, Inc.

BORING : P-8

CLIENT J.F. Sato & Associates
PROJECT NAME US50 West - Task Order 4
PROJECT NUMBER 302.01
PROJECT LOCATION Purcell to Wills, Pueblo, CO
DATE STARTED 5/15/13 **COMPLETED** 5/15/13
GROUND ELEVATION 4826.9 ft **STATION NO.** 29+00
DRILLING CONTRACTOR Old Dirt Drilling
NORTH 601994.4 **EAST** 241706.8
DRILLING METHOD Solid Stem Auger **HOLE SIZE** 4.25"
BORING LOCATION: Center Median of Pueblo Blvd. N. side fo WB US50
LOGGED BY R. Lepro
GROUND WATER LEVELS:
NOTES Automatic Hammer/Approx. 20' N. of US50
WATER DEPTH None Encountered on 5/15/13

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	BLOW COUNTS	SWELL POTENTIAL (%)	SULFATE (%)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
4827	0		Asphalt Pavement, approximately 9"										
			Aggregate Base Course, approximately 4"				0.10			31	14	17	43.7
			(Fill) CLAY, with sand, SHALE rock fragments in parts, clayey sand with gravel in parts, moist, brown and grey, very stiff	MC	26/12	-0.2		121.2	9.3				
4822	5		(Native) CLAY, sandy, moist to very moist, brown, medium stiff to stiff	MC	6/12			110.1	16.2				
4817	10			MC	14/12			102.7	21.8				
4812	15		(Bedrock) CLAYSTONE, very silty to sandy, brown, hard	MC	48/12			120.6	14.5				
			Bottom of hole at 15.0 feet.										

RockSol Consulting Group, Inc.

BORING : P-9

CLIENT J.F. Sato & Associates
PROJECT NAME US50 West - Task Order 4
PROJECT NUMBER 302.01
PROJECT LOCATION Purcell to Wills, Pueblo, CO
DATE STARTED 5/14/13 **COMPLETED** 5/14/13
GROUND ELEVATION 4849.8 ft **STATION NO.** 207+50
DRILLING CONTRACTOR Old Dirt Drilling
NORTH 601498.1 **EAST** 240458.8
DRILLING METHOD Solid Stem Auger **HOLE SIZE** 4.25"
BORING LOCATION: EB US50 Shoulder 2' N. of pavement edge
LOGGED BY R. Lepro
GROUND WATER LEVELS:
NOTES Automatic Hammer
WATER DEPTH None Encountered on 5/14/13

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	BLOW COUNTS	SWELL POTENTIAL (%)	SULFATE (%)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
4850	0		Asphalt Pavement, approximately 11"				1.62			26	14	12	52.6
			(Fill) CLAY, sandy with gravel, moist, brown, very stiff	MC	25/12	-0.2		124.1	12.3				
			(Native) CLAY, sandy, moist, brown, medium stiff to stiff										
4845	5			MC	6/12			103.4	18.8				
4840	10			MC	14/12			101.2	21.9				
			Bottom of hole at 10.0 feet.										

RockSol Consulting Group, Inc.

BORING : P-10

CLIENT J.F. Sato & Associates
PROJECT NAME US50 West - Task Order 4
PROJECT NUMBER 302.01
PROJECT LOCATION Purcell to Wills, Pueblo, CO
DATE STARTED 5/13/13 **COMPLETED** 5/13/13
GROUND ELEVATION 4882.3 ft **STATION NO.** 197+50
DRILLING CONTRACTOR Old Dirt Drilling
NORTH 601683.6 **EAST** 239468.7
DRILLING METHOD Solid Stem Auger **HOLE SIZE** 4.25"
BORING LOCATION: EB US50 off shoulder 10' S.
LOGGED BY R. Lepro
GROUND WATER LEVELS:
NOTES Automatic Hammer/Cut Area for New Lane (Ditch)
WATER DEPTH None Encountered on 5/13/13

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	BLOW COUNTS	SWELL POTENTIAL (%)	SULFATE (%)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
4882	0		Topsoil, SAND, clayey to silty, slightly moist to moist, brown, loose to medium dense, approximately 3" thick				0.12			26	13	13	22.5
			(Native) SAND, silty to clayey with gravel and sandy clay in parts, slightly moist to moist, brown, medium dense	MC	25/12			112.0	4.1				
4877	5			MC	14/12			113.8	11.6				
			(Native) CLAY, sandy to very sandy with silty SAND in parts, moist to very moist, brown, very stiff										
4872	10			MC	17/12			122.5	12.2				
			Bottom of hole at 10.0 feet.										

RockSol Consulting Group, Inc.

BORING : P-11

CLIENT J.F. Sato & Associates
PROJECT NAME US50 West - Task Order 4
PROJECT NUMBER 302.01
PROJECT LOCATION Purcell to Wills, Pueblo, CO
DATE STARTED 5/13/13 **COMPLETED** 5/13/13
GROUND ELEVATION 4906.2 ft **STATION NO.** 187+50
DRILLING CONTRACTOR Old Dirt Drilling
NORTH 601910.4 **EAST** 238472.0
DRILLING METHOD Solid Stem Auger **HOLE SIZE** 4.25"
BORING LOCATION: EB US50 Shoulder
LOGGED BY R. Lepro
GROUND WATER LEVELS:
NOTES Automatic Hammer
WATER DEPTH None Encountered on 5/13/13

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	BLOW COUNTS	SWELL POTENTIAL (%)	SULFATE (%)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
4906	0		Asphalt Pavement, approximately 8"										
			Aggregate Base Course, approximately 8"				1.32			29	15	14	55.0
			(Fill) SAND, silty to clayey, moist, brown, dense	MC	31/12	0.4		127.9	11.7				
4901	5		(Native) CLAY, sandy to silty (calcareous in parts), moist, brown, stiff	MC	8/12			107.7	14.9				
4896	10			MC	10/12		1.68	100.2	14.4				
			Bottom of hole at 10.0 feet.										

RockSol Consulting Group, Inc.

BORING : P-12

CLIENT J.F. Sato & Associates
PROJECT NAME US50 West - Task Order 4
PROJECT NUMBER 302.01
PROJECT LOCATION Purcell to Wills, Pueblo, CO
DATE STARTED 5/13/13 **COMPLETED** 5/13/13
GROUND ELEVATION 4915.4 ft **STATION NO.** 177+50
DRILLING CONTRACTOR Old Dirt Drilling
NORTH 602215.4 **EAST** 237557.8
DRILLING METHOD Solid Stem Auger **HOLE SIZE** 4.25"
BORING LOCATION: Off Shoulder EB US50
LOGGED BY R. Lepro
GROUND WATER LEVELS:
NOTES Automatic Hammer/ Approx. 5'-6' Fill for New Lane
WATER DEPTH None Encountered on 5/13/13

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	BLOW COUNTS	SWELL POTENTIAL (%)	SULFATE (%)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
4915	0		Topsoil, SAND, silty to clayey, moist, brown, loose, approximately 3" thick				0.61			26	13	13	52.4
			(Fill) CLAY, sandy with gravel in parts, moist, brown, very stiff	MC	25/12	-0.2		124.7	11.9				
4910	5		(Native) SAND, silty to clayey with gravel, moist, brown, medium dense to dense	MC	30/12			131.5	6.7				
			Bottom of hole at 5.0 feet.										

RockSol Consulting Group, Inc.

BORING : P-13

CLIENT J.F. Sato & Associates
PROJECT NAME US50 West - Task Order 4
PROJECT NUMBER 302.01
PROJECT LOCATION Purcell to Wills, Pueblo, CO
DATE STARTED 5/13/13 **COMPLETED** 5/13/13
GROUND ELEVATION 4926.2 ft **STATION NO.** 167+50
DRILLING CONTRACTOR Old Dirt Drilling
NORTH 602547.5 **EAST** 236602.8
DRILLING METHOD Solid Stem Auger **HOLE SIZE** 4.25"
BORING LOCATION: Lane 2 EB US50
LOGGED BY R. Lepro
GROUND WATER LEVELS:
NOTES Automatic Hammer
WATER DEPTH None Encountered on 5/13/13

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	BLOW COUNTS	SWELL POTENTIAL (%)	SULFATE (%)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
4926	0		Asphalt Pavement, approximately 9"										
			Aggregate Base Course, approximately 9"				1.16			25	13	12	41.2
			(Fill) SAND, silty to clayey with gravel, slightly moist to moist, brown and grey, dense to medium dense	MC	34/12			127.4	8.8				
4921	5			MC	16/12			128.5	9.3				
			(Native) CLAY, sandy, moist, brown, medium stiff										
4916	10			MC	7/12			111.7	15.5				
			Bottom of hole at 10.0 feet.										

RockSol Consulting Group, Inc.

BORING : P-14

CLIENT J.F. Sato & Associates
PROJECT NAME US50 West - Task Order 4
PROJECT NUMBER 302.01
PROJECT LOCATION Purcell to Wills, Pueblo, CO
DATE STARTED 5/13/13 **COMPLETED** 5/13/13
GROUND ELEVATION 4944.2 ft **STATION NO.** 157+50
DRILLING CONTRACTOR Old Dirt Drilling
NORTH 602867.2 **EAST** 235639.2
DRILLING METHOD Solid Stem Auger **HOLE SIZE** 4.25"
BORING LOCATION: EB US50 Shoulder
LOGGED BY R. Lepro
GROUND WATER LEVELS:
NOTES Automatic Hammer
WATER DEPTH None Encountered on 5/13/13

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	BLOW COUNTS	SWELL POTENTIAL (%)	SULFATE (%)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
4944	0		Asphalt Pavement, approximately 9"										
			Aggregate Base Course, approximately 10"				1.18			25	13	12	43.7
			(Fill) SAND, silty to gravelly, clayey sand in parts, moist, brown, medium dense to dense	MC	Bounce								
4939	5		(Native) CLAY, sandy to silty with silty SAND in parts, moist, brown, stiff	MC	9/12	0.1		110.3	18.3				
			(Bedrock) SANDSTONE, silty to clayey, slightly moist, light brown, very hard	MC	50/11	3.1		121.8	14.3				
			Bottom of hole at 9.9 feet.										

RockSol Consulting Group, Inc.

BORING : P-15

CLIENT J.F. Sato & Associates
PROJECT NAME US50 West - Task Order 4
PROJECT NUMBER 302.01
PROJECT LOCATION Purcell to Wills, Pueblo, CO
DATE STARTED 5/13/13 **COMPLETED** 5/13/13
GROUND ELEVATION 4953.1 ft **STATION NO.** 147+50
DRILLING CONTRACTOR Old Dirt Drilling
NORTH 603188.6 **EAST** 234688.9
DRILLING METHOD Solid Stem Auger **HOLE SIZE** 4.25"
BORING LOCATION: Off Shoulder EB US50
LOGGED BY R. Lepro
GROUND WATER LEVELS:
NOTES Automatic Hammer/Approx. 5-8' Fill for New Lane
WATER DEPTH None Encountered on 5/13/13

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	BLOW COUNTS	SWELL POTENTIAL (%)	SULFATE (%)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
4953	0		Topsoil, SAND, silty to clayey, moist, brown, loose, approximately 3" thick				0.66			28	14	14	56.2
			(Fill) CLAY, sitly to clayey, sand in parts, slightly moist to moist, brown, very stiff	MC	26/12	-0.3		130.9	10.0				
4948	5			MC	19/12			131.0	7.5				
			Bottom of hole at 5.0 feet.										

RockSol Consulting Group, Inc.

BORING : P-16

CLIENT J.F. Sato & Associates
PROJECT NAME US50 West - Task Order 4
PROJECT NUMBER 302.01
PROJECT LOCATION Purcell to Wills, Pueblo, CO
DATE STARTED 5/13/13 **COMPLETED** 5/13/13
GROUND ELEVATION 4955.6 ft **STATION NO.** 137+50
DRILLING CONTRACTOR Old Dirt Drilling
NORTH 603501.5 **EAST** 233764.9
DRILLING METHOD Solid Stem Auger **HOLE SIZE** 4.25"
BORING LOCATION: EB US50 Shoulder
LOGGED BY R. Lepro
GROUND WATER LEVELS:
NOTES Automatic Hammer
WATER DEPTH None Encountered on 5/13/13

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	BLOW COUNTS	SWELL POTENTIAL (%)	SULFATE (%)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
4956	0		Asphalt Pavement, approximately 9"							NP	NP	NP	13.7
			Aggregate Base Course, approximately 8"				1.10			30	15	15	63.7
			(Fill) CLAY, sandy with silty sand and gravel in parts, moist, brown, very stiff	MC	29/12	0.2		119.4	15.4				
4951	5			MC	19/12			122.7	12.8				
			(Native) SAND, silty with gravel, moist, brown, medium dense to very dense	MC	50/8								
			Bottom of hole at 9.7 feet.										

RockSol Consulting Group, Inc.

BORING : P-17

CLIENT J.F. Sato & Associates
PROJECT NAME US50 West - Task Order 4
PROJECT NUMBER 302.01
PROJECT LOCATION Purcell to Wills, Pueblo, CO
DATE STARTED 5/13/13 **COMPLETED** 5/13/13
GROUND ELEVATION 4961.8 ft **STATION NO.** 127+50
DRILLING CONTRACTOR Old Dirt Drilling
NORTH 603837.6 **EAST** 232802.7
DRILLING METHOD Solid Stem Auger **HOLE SIZE** 4.25"
BORING LOCATION: Lane 2 EB US50
LOGGED BY R. Lepro
GROUND WATER LEVELS:
NOTES Automatic Hammer
WATER DEPTH None Encountered on 5/13/13

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	BLOW COUNTS	SWELL POTENTIAL (%)	SULFATE (%)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
4962	0		Asphalt Pavement, approximately 10"							19	14	5	16.0
			Aggregate Base Course, approximately 8"				0.78			30	14	16	45.5
			(Fill) CLAY, sandy with silty to clayey, sand in parts, moist, brown, very stiff	MC	17/12	-0.4		113.2	17.9				
4957	5		(Native) SAND, clayey with sandy clay in parts, brown, medium dense to dense	MC	16/12			121.5	12.8				
4952	10			MC	30/12		1.34	113.0	15.3				
			Bottom of hole at 10.0 feet.										

RockSol Consulting Group, Inc.

BORING : P-18

CLIENT J.F. Sato & Associates
PROJECT NAME US50 West - Task Order 4
PROJECT NUMBER 302.01
PROJECT LOCATION Purcell to Wills, Pueblo, CO
DATE STARTED 5/13/13 **COMPLETED** 5/13/13
GROUND ELEVATION 4968.3 ft **STATION NO.** 117+50
DRILLING CONTRACTOR Old Dirt Drilling
NORTH 604151.3 **EAST** 231855.3
DRILLING METHOD Solid Stem Auger **HOLE SIZE** 4.25"
BORING LOCATION: Off Shoulder, 5' South
LOGGED BY R. Lepro
GROUND WATER LEVELS:
NOTES Automatic Hammer/EB US50
WATER DEPTH None Encountered on 5/13/13

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	BLOW COUNTS	SWELL POTENTIAL (%)	SULFATE (%)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
4968	0		Topsoil, SAND, silty, moist, brown, loose to medium dense, approximately 3" thick				0.39			27	14	13	35.3
			(Fill) SAND, clayey with gravel, moist, brown, medium dense	MC	22/12			125.6	6.5				
4963	5		(Native) CLAY, sandy with silty SAND in parts, moist, brown, stiff	MC	8/12	-0.1		107.7	18.0				
			(Native) SAND, clayey with rock fragments in parts, moist, brown, loose to medium dense										
4958	10		(Native) CLAY, sandy to very sandy with silty SAND in parts, moist, brown, stiff	MC	8/12			113.1	11.6				
			Bottom of hole at 10.0 feet.										

RockSol Consulting Group, Inc.

BORING : P-19

CLIENT J.F. Sato & Associates
PROJECT NAME US50 West - Task Order 4
PROJECT NUMBER 302.01
PROJECT LOCATION Purcell to Wills, Pueblo, CO
DATE STARTED 5/13/13 **COMPLETED** 5/13/13
GROUND ELEVATION 4975.2 ft **STATION NO.** 107+50
DRILLING CONTRACTOR Old Dirt Drilling
NORTH 604464.5 **EAST** 230914.5
DRILLING METHOD Solid Stem Auger **HOLE SIZE** 4.25"
BORING LOCATION: Lane 3 Acceleration Lane
LOGGED BY R. Lepro
GROUND WATER LEVELS:
NOTES Automatic Hammer/EB US50
WATER DEPTH None Encountered on 5/13/13

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	BLOW COUNTS	SWELL POTENTIAL (%)	SULFATE (%)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
4975	0		Asphalt Pavement, approximately 9.25"				1.44			27	13	14	50.5
			Aggregate Base Course, approximately 6"										
			(Fill) SAND, clayey with gravel, sandy clay in parts, moist, brown and light grey, medium dense to dense	MC	29/12			133.3	7.6				
4970	5		(Native) CLAY, sandy with silty SAND in parts, moist, brown, stiff	MC	9/12	-0.2		111.1	17.3				
			(Native) SAND, clayey with rock fragments in parts, moist, brown, loose										
4965	10			MC	7/12			118.1	9.8				
			Bottom of hole at 10.0 feet.										

RockSol Consulting Group, Inc.

BORING : P-20

CLIENT J.F. Sato & Associates
PROJECT NAME US50 West - Task Order 4
PROJECT NUMBER 302.01
PROJECT LOCATION Purcell to Wills, Pueblo, CO
DATE STARTED 5/13/13 **COMPLETED** 5/13/13
GROUND ELEVATION 4981.5 ft **STATION NO.** 97+00
DRILLING CONTRACTOR Old Dirt Drilling
NORTH 604790.2 **EAST** 229960.0
DRILLING METHOD Solid Stem Auger **HOLE SIZE** 4.25"
BORING LOCATION: S. Side of EB US 50 in Gore Area on Purcell Blvd.
LOGGED BY R. Lepro
GROUND WATER LEVELS:
NOTES Automatic Hammer
WATER DEPTH 12.0 ft on 5/13/13

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	BLOW COUNTS	SWELL POTENTIAL (%)	SULFATE (%)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
4982	0		Asphalt Pavement, approximately 8"				0.54			24	11	13	38.8
			Aggregate Base Course, approximately 6"										
			(Fill) Clay, gravelly, clayey sand in parts, slightly moist, brown and grey, very stiff to very hard	MC	50/12			139.3	5.9				
4977	5		(Native) CLAY, sandy with rock fragments, very moist to wet, brown and light grey, soft to hard	MC	13/12	0.5		111.0	17.3				
			Note: Groundwater level may be present at 8 feet below grade based on water content of sample.										
4972	10			MC	3/12			91.8	29.8				
4967	15			MC	34/12			136.5	8.8				
			Bottom of hole at 15.0 feet.										

RockSol Consulting Group, Inc.

BORING : P-21

CLIENT J.F. Sato & Associates
PROJECT NAME US50 West - Task Order 4
PROJECT NUMBER 302.01
PROJECT LOCATION Purcell to Wills, Pueblo, CO
DATE STARTED 5/15/13 **COMPLETED** 5/15/13
GROUND ELEVATION 4842.0 ft **STATION NO.** 12+00
DRILLING CONTRACTOR Old Dirt Drilling
NORTH 600359.7 **EAST** 241186.4
DRILLING METHOD Solid Stem Auger **HOLE SIZE** 4.25"
BORING LOCATION: Center Median Over Pueblo Blvd.
LOGGED BY R. Lepro
GROUND WATER LEVELS:
NOTES Automatic Hammer/1000' S. of EB US50
WATER DEPTH None Encountered on 5/15/13

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	BLOW COUNTS	SWELL POTENTIAL (%)	SULFATE (%)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
										LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
4842	0		Asphalt Pavement, approximately 9.5"										
			(Bedrock) CLAYSTONE, silty to sandy, slightly moist to moist, grey and brown, hard, weathered				1.56			29	17	12	69.1
				MC	40/12	1.0		124.2	11.7				
4837	5		(Bedrock) SHALE, silty to clayey, slightly moist to moist, dark grey, hard to very hard	MC	50/12			125.1	7.0				
			Bottom of hole at 5.0 feet.										

RockSol Consulting Group, Inc.

BORING : P-22

CLIENT J.F. Sato & Associates
PROJECT NAME US50 West - Task Order 4
PROJECT NUMBER 302.01
PROJECT LOCATION Purcell to Wills, Pueblo, CO
DATE STARTED 5/15/13 **COMPLETED** 5/15/13
GROUND ELEVATION 4831.4 ft **STATION NO.** 104+00
DRILLING CONTRACTOR Old Dirt Drilling
NORTH 601235.1 **EAST** 241186.6
DRILLING METHOD Solid Stem Auger **HOLE SIZE** 4.25"
BORING LOCATION: EB US50 Off-ramp to Pueblo Blvd.
LOGGED BY R. Lepro
GROUND WATER LEVELS:
NOTES Automatic Hammer/Off Shoulder
WATER DEPTH None Encountered on 5/15/13

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	BLOW COUNTS	SWELL POTENTIAL (%)	SULFATE (%)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
4831	0		Topsoil, SAND, silty to clayey, sightly moist to moist, light brown, medium dense, approximately 3" thick				1.28			29	15	14	78.0
			(Native) CLAY, sandy with gravel in parts, moist, brown, stiff	MC	12/12	-1.8		111.1	8.3				
4826	5		(Bedrock) CLAYSTONE (weathered), silty to sandy, slightly moist to moist, grey, hard	MC	46/12	8.1		124.2	12.7				
			(Bedrock) SANDSTONE, silty to clayey, slightly moist to moist, light brown, very hard	MC	50/9			114.9	10.1				
			Bottom of hole at 9.8 feet.										

RockSol Consulting Group, Inc.

BORING : P-23

CLIENT J.F. Sato & Associates
PROJECT NAME US50 West - Task Order 4
PROJECT NUMBER 302.01
PROJECT LOCATION Purcell to Wills, Pueblo, CO
DATE STARTED 5/15/13 **COMPLETED** 5/15/13
GROUND ELEVATION 4824.9 ft **STATION NO.** 505+00
DRILLING CONTRACTOR Old Dirt Drilling
NORTH 601164.1 **EAST** 241619.6
DRILLING METHOD Solid Stem Auger **HOLE SIZE** 4.25"
BORING LOCATION: NB Pueblo Blvd. On-Ramp to EB US50
LOGGED BY R. Lepro
GROUND WATER LEVELS:
NOTES Automatic Hammer/Off Outside Shoulder
WATER DEPTH None Encountered on 5/15/13

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	BLOW COUNTS	SWELL POTENTIAL (%)	SULFATE (%)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
4825	0		Topsoil, SAND, silty to clayey, slightly moist to moist, brown, loose to medium dense, approximately 3" thick				1.50			29	17	12	52.9
			(Native) SAND, clayey, slightly moist to moist, brown, medium dense	MC	35/12	0.3		127.3	8.1				
			(Bedrock) SHALE, silty to clayey, slightly moist to moist, brown and grey, hard to very hard										
4820	5			MC	46/12	0.2		126.1	10.4				
				MC	50/7			128.7	9.1				
			Bottom of hole at 9.6 feet.										

RockSol Consulting Group, Inc.

BORING : RW-1

CLIENT J.F. Sato & Associates
PROJECT NAME US50 West - Task Order 4
PROJECT NUMBER 302.01
PROJECT LOCATION Purcell to Wills, Pueblo, CO
DATE STARTED 5/15/13 **COMPLETED** 5/15/13
GROUND ELEVATION 4800.8 ft **STATION NO.** 268+00
DRILLING CONTRACTOR Old Dirt Drilling
NORTH 600571.6 **EAST** 245609.2
DRILLING METHOD Solid Stem Auger **HOLE SIZE** 4.25"
BORING LOCATION: Proposed Retaining Wall EB US50
LOGGED BY R. Lepro
GROUND WATER LEVELS:
NOTES Automatic Hammer/E. Side of RR Bridge 60' E. on Cut Slope
WATER DEPTH 14.0 ft on 5/15/13

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	BLOW COUNTS	SWELL POTENTIAL (%)	SULFATE (%)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
4801	0		Topsoil, SAND, silty to clayey, approximately 3"										
			(Native) SAND, clayey, moist, brown, medium dense										
			(Bedrock) SANDSTONE, clayey, CLAYSTONE in parts, slightly moist to moist, light brown, hard to very hard	MC	44/12		1.44	121.5	12.1	30	21	9	70.2
4796	5			MC	50/7	0.1		110.0	14.8				
4791	10			MC	40/12			103.9	23.2				
			(Bedrock) CLAYSTONE, with gypsum crystals in parts, moist, dark grey and brown, hard										
4786	15			MC	46/12			101.6	26.1				
			Bottom of hole at 15.0 feet.										

RockSol Consulting Group, Inc.

BORING : RW-2

CLIENT J.F. Sato & Associates
PROJECT NAME US50 West - Task Order 4
PROJECT NUMBER 302.01
PROJECT LOCATION Purcell to Wills, Pueblo, CO
DATE STARTED 5/15/13 **COMPLETED** 5/15/13
GROUND ELEVATION 4794.1 ft **STATION NO.** 262+00
DRILLING CONTRACTOR Old Dirt Drilling
NORTH 600714.5 **EAST** 245468.2
DRILLING METHOD Solid Stem Auger **HOLE SIZE** 4.25"
BORING LOCATION: Proposed Retaining Wall WB US50
LOGGED BY R. Lepro
GROUND WATER LEVELS:
NOTES Automatic Hammer/W. Side of RR Bridge 60' W. in Drainage Ditch
WATER DEPTH 9.0 ft on 5/15/13

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	BLOW COUNTS	SWELL POTENTIAL (%)	SULFATE (%)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
4794	0		(Fill) SAND, silty with gravel, cobbles/boulders in parts, loose to medium dense, brown, moist				0.16			39	21	18	62.9
			(Native) SAND, clayey (weathered bedrock), moist, brown, medium dense, calcareous/gypsum crystals in parts										
4789	5			MC	22/12	1.1	1.40	105.3	23.2				
			(Bedrock) SANDSTONE, clayey, silty in parts, moist, brown, hard										
4784	10			MC	34/12			108.3	21.4	38	23	15	60.5
			(Bedrock) SHALE, silty to clayey, slightly moist to moist, dark grey, very hard										
			Bottom of hole at 14.1 feet.	MC	50/0.5								

APPENDIX B

LABORATORY TEST RESULTS

RockSol Consulting Group, Inc.

SUMMARY OF PHYSICAL & CHEMICAL TEST RESULTS

CLIENT J.F. Sato & Associates

PROJECT NAME US50 West - Task Order 4

PROJECT NUMBER 302.01

PROJECT LOCATION Purcell to Wills, Pueblo, CO

Borehole	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	Swell Potential (%)	%<#200 Sieve	Classification		Water Content (%)	Dry Density (pcf)	Unconfined Compressive Strength (psi)	Sulfate (%)	Resistivity (ohm-cm)	pH	Chlorides (%)	Proctor S=Standard M=Modified		
							USCS	AASHTO								MDD	OMC	S/M
B-1	4	30	16	14				A-6 (13)	12.1	117.8		0.34						
B-1	9								13.3	124.6								
B-1	14	32	21	11				A-6 (11)	16.0	119.7								
B-1	19								15.6	116.1		1.56						
B-1	24								10.5									
B-1	29								7.5									
B-1	34								7.0									
B-2	0-4	26	17	9		51	CL	A-4 (2)										
B-2	4								11.2	125.9								
B-2	9								12.1									
B-2	9.5	24	16	8		22	SC	A-2-4 (0)										
B-2	14								12.6									
B-2	19								9.4									
B-2	24								10.6									
B-3	0-4	23	14	9		14	SC	A-2-4 (0)										
B-3	9								11.9									
B-3	14								12.0									
B-3	19								8.1									
B-3	24								13.1									
B-3	29								9.9									
B-4	0-15																	
B-4	4				-0.4				10.7	124.0								
B-4	9	30	14	16		54	CL	A-6 (5)	11.2	128.5								
B-4	14					47			11.3	125.9								
B-4	19	35	15	20		94	CL	A-6 (18)	18.2	110.8		1.74						
B-4	24								20.6	107.4								
B-4	29					25			13.9									
B-4	34								10.3									
B-4	39								15.8									
B-4	44								10.9									

RockSol Consulting Group, Inc.

SUMMARY OF PHYSICAL & CHEMICAL TEST RESULTS

CLIENT J.F. Sato & Associates

PROJECT NAME US50 West - Task Order 4

PROJECT NUMBER 302.01

PROJECT LOCATION Purcell to Wills, Pueblo, CO

Borehole	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	Swell Potential (%)	%<#200 Sieve	Classification		Water Content (%)	Dry Density (pcf)	Unconfined Compressive Strength (psi)	Sulfate (%)	Resistivity (ohm-cm)	pH	Chlorides (%)	Proctor S=Standard M=Modified		
							USCS	AASHTO								MDD	OMC	S/M
B-4	49								5.0									
B-5	4				3.8				9.3	131.0								
B-5	9	30	13	17		72	CL	A-6 (10)	13.4	120.1		2.07						
B-5	14	32	15	17		80	CL	A-6 (12)	17.7	112.5								
B-5	19								21.8									
B-5	24								8.7									
B-5	29								6.4									
B-5	34								10.2									
B-5	44								1.9									
B-6	0-4	29	14	15		60	CL	A-6 (6)										
B-6	4								12.5	125.9								
B-6	5-8					5	SW											
B-6	14								7.2									
B-6	19								9.3									
B-6	24								13.8									
B-6	29								5.7									
B-7	0-4																	
B-7	4								9.3	128.9								
B-7	9								8.4	128.9								
B-7	14								6.5									
B-7	19								15.2									
B-7	24	24	14	10		47	SC	A-4 (1)				0.44						
B-7	29								14.2									
B-8	4				2.5				13.4	115.8								
B-8	9	23	15	8		63	CL	A-4 (2)	11.7	114.6		1.26						
B-8	14	27	15	12		56	CL	A-6 (4)										
B-8	29								15.2			0.39						
B-8	34	25	16	9		41	SC	A-4 (0)	14.6									
B-8	39								9.2									
B-9	4	25	16	9		37	SC	A-4 (0)	8.0			0.92						

RockSol Consulting Group, Inc.

SUMMARY OF PHYSICAL & CHEMICAL TEST RESULTS

CLIENT J.F. Sato & Associates

PROJECT NAME US50 West - Task Order 4

PROJECT NUMBER 302.01

PROJECT LOCATION Purcell to Wills, Pueblo, CO

Borehole	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	Swell Potential (%)	%<#200 Sieve	Classification		Water Content (%)	Dry Density (pcf)	Unconfined Compressive Strength (psi)	Sulfate (%)	Resistivity (ohm-cm)	pH	Chlorides (%)	Proctor S=Standard M=Modified		
							USCS	AASHTO								MDD	OMC	S/M
B-9	9								8.3									
B-9	14								7.9									
B-9	19								4.3									
B-10	0-4	29	14	15		46	SC	A-6 (3)				0.40	900 Ohm-cm @ 23.00%	7.6				
B-10	4	26	15	11		58	CL	A-6 (3)	20.3	113.3								
C-1	0-42"	23	15	8		15	SC	A-2-4 (0)										
C-1	3																	
C-1	3.5-4	35	17	18		70	CL	A-6 (11)										
C-2	0-0.5	NP	NP	NP		22	SM	A-1-b (0)										
C-2	0.5-1.5	31	17	14		96	CL	A-6 (13)										
C-2	1.5-2	NP	NP	NP		18	SM	A-1-b (0)										
P-1	0.5-1.5	NP	NP	NP		10	GW-GM	A-1-a (0)										
P-1	1.5-5	30	16	14		57	CL	A-6 (5)				0.88		7.3	0.0428%			
P-1	2				-0.2				11.4	118.6								
P-1	4				0.6				20.0	109.4								
P-1	9								20.7	102.8								
P-1	14								19.9	105.9								
P-2	1-5	32	16	16		66	CL	A-6 (8)				1.42		7.3	0.02			
P-2	2				-0.4				22.2	102.5								
P-2	4								20.4	106.9								
P-2	9								21.0	104.9								
P-3	1-5	38	19	19		77	CL	A-6 (14)				1.30						
P-3	2				1.4				20.7	107.8		1.36						
P-3	4				0.9				18.5	111.0		1.72						
P-3	9								21.7	108.8								
P-4	0.75-2	NP	NP	NP		10	SP-SM	A-1-a (0)										
P-4	1.9-5	28	14	14		58	CL	A-6 (5)				0.16		7.8	0.09			
P-4	2				0.0				18.7	108.7								
P-4	4								13.2	118.7								
P-4	9								11.7	117.5								

RockSol Consulting Group, Inc.

SUMMARY OF PHYSICAL & CHEMICAL TEST RESULTS

CLIENT J.F. Sato & Associates

PROJECT NAME US50 West - Task Order 4

PROJECT NUMBER 302.01

PROJECT LOCATION Purcell to Wills, Pueblo, CO

Borehole	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	Swell Potential (%)	%<#200 Sieve	Classification		Water Content (%)	Dry Density (pcf)	Unconfined Compressive Strength (psi)	Sulfate (%)	Resistivity (ohm-cm)	pH	Chlorides (%)	Proctor S=Standard M=Modified		
							USCS	AASHTO								MDD	OMC	S/M
P-5	0.75-2	NP	NP	NP		14	SM	A-1-b (0)										
P-5	1.9-5	19	12	7		20	GC-GM	A-2-4 (0)				0.02		8.0	0.01			
P-5	2								7.4	133.9								
P-5	4								5.1	119.6								
P-5	9								7.9	103.0								
P-6	0.75-5	24	14	10		17	GC	A-2-4 (0)				0.54		7.7	0.02			
P-6	2								7.5	110.7								
P-6	4					3			4.8									
P-7	1																	
P-7	1.5-5	28	15	13		58	CL	A-6 (5)				1.16		7.3	0.05			
P-7	2				0.3				11.9	123.7								
P-7	4								13.8	114.3								
P-7	9								13.7	123.7								
P-8	1-5	31	14	17		44	SC	A-6 (3)				0.10		7.2				
P-8	2				-0.2				9.3	121.2								
P-8	4								16.2	110.1								
P-8	9								21.8	102.7								
P-8	14								14.5	120.6								
P-9	1-5	26	14	12		53	CL	A-6 (3)				1.62		7.5	0.02			
P-9	2				-0.2				12.3	124.1								
P-9	4								18.8	103.4								
P-9	9								21.9	101.2								
P-10	0-5	26	13	13		22	SC	A-2-6 (0)				0.12		6.7	0.0499%			
P-10	2								4.1	112.0								
P-10	4								11.6	113.8								
P-10	9								12.2	122.5								
P-11	1.25-5	29	15	14		55	CL	A-6 (5)				1.32		6.9	0.0401%			
P-11	2				0.4				11.7	127.9								
P-11	4								14.9	107.7								
P-11	9								14.4	100.2		1.68						

RockSol Consulting Group, Inc.

SUMMARY OF PHYSICAL & CHEMICAL TEST RESULTS

CLIENT J.F. Sato & Associates

PROJECT NAME US50 West - Task Order 4

PROJECT NUMBER 302.01

PROJECT LOCATION Purcell to Wills, Pueblo, CO

Borehole	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	Swell Potential (%)	%<#200 Sieve	Classification		Water Content (%)	Dry Density (pcf)	Unconfined Compressive Strength (psi)	Sulfate (%)	Resistivity (ohm-cm)	pH	Chlorides (%)	Proctor S=Standard M=Modified		
							USCS	AASHTO								MDD	OMC	S/M
P-12	0-5	26	13	13		52	CL	A-6 (3)				0.61		6.7	0.0401%			
P-12	2				-0.2				11.9	124.7								
P-12	4								6.7	131.5								
P-13	1.5-5	25	13	12		41	SC	A-6 (1)				1.16		7.6	0.0272%			
P-13	2								8.8	127.4								
P-13	4								9.3	128.5								
P-13	9								15.5	111.7								
P-14	1.5-5	25	13	12		44	SC	A-6 (2)				1.18						
P-14	4				0.1				18.3	110.3								
P-14	9				3.1				14.3	121.8								
P-15	0-5	28	14	14		56	CL	A-6 (5)				0.66		7.3	0.0472%			
P-15	2				-0.3				10.0	130.9								
P-15	4								7.5	131.0								
P-16	0.75-1.5	NP	NP	NP		14	SM	A-1-a (0)										
P-16	1.5-5	30	15	15		64	CL	A-6 (7)				1.10		7.8	0.0118%			
P-16	2				0.2				15.4	119.4								
P-16	4								12.8	122.7								
P-17	0.75-1.5	19	14	5		16	GC-GM	A-1-b (0)										
P-17	1.5-5	30	14	16		46	SC	A-6 (4)				0.78		7.3	0.0303%			
P-17	2				-0.4				17.9	113.2								
P-17	4								12.8	121.5								
P-17	9								15.3	113.0		1.34						
P-18	0-5	27	14	13		35	SC	A-2-6 (1)				0.39		6.6	0.1296%			
P-18	2								6.5	125.6								
P-18	4				-0.1				18.0	107.7								
P-18	9								11.6	113.1								
P-19	0.75-5	27	13	14		51	CL	A-6 (4)				1.44		7.0	0.0244%			
P-19	2								7.6	133.3								
P-19	4				-0.2				17.3	111.1								
P-19	9								9.8	118.1								

RockSol Consulting Group, Inc.

SUMMARY OF PHYSICAL & CHEMICAL TEST RESULTS

CLIENT J.F. Sato & Associates

PROJECT NAME US50 West - Task Order 4

PROJECT NUMBER 302.01

PROJECT LOCATION Purcell to Wills, Pueblo, CO

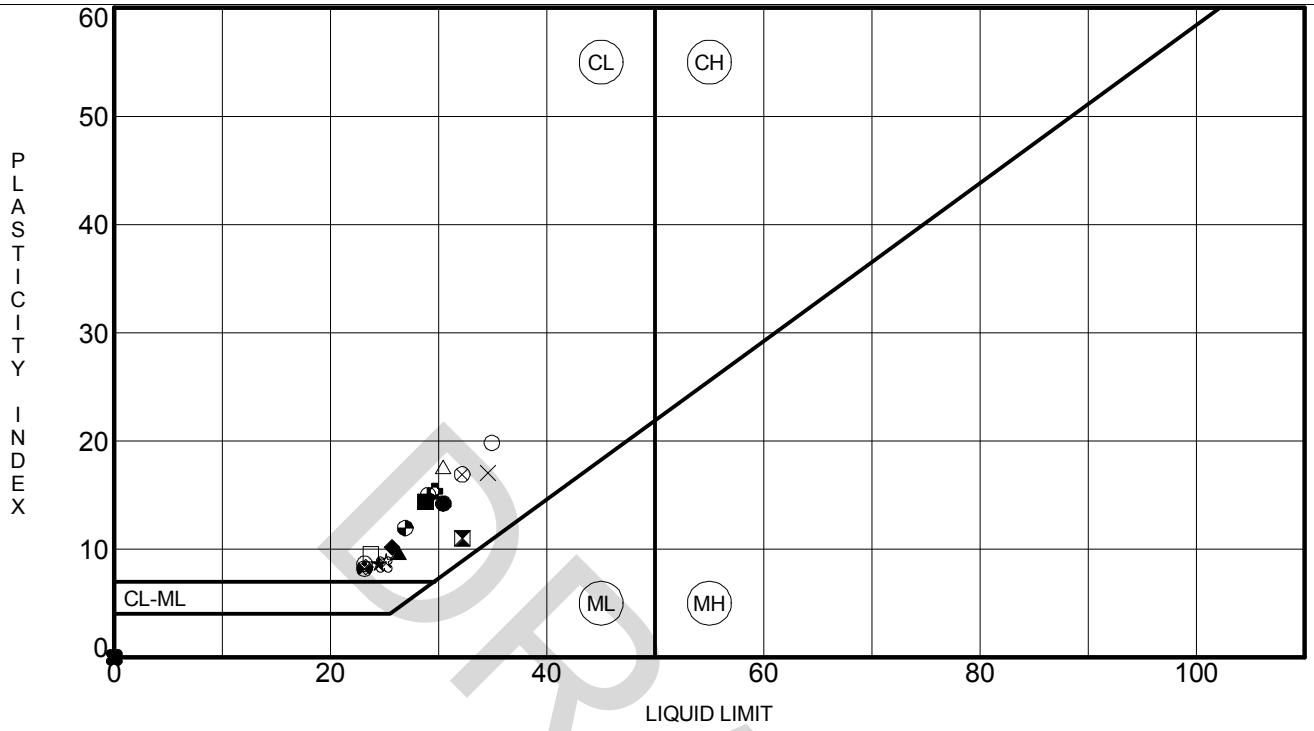
Borehole	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	Swell Potential (%)	%<#200 Sieve	Classification		Water Content (%)	Dry Density (pcf)	Unconfined Compressive Strength (psi)	Sulfate (%)	Resistivity (ohm-cm)	pH	Chlorides (%)	Proctor S=Standard M=Modified		
							USCS	AASHTO								MDD	OMC	S/M
P-20	0.75-4	24	11	13		39	SC	A-6 (1)				0.54		7.7	0.0253%			
P-20	2								5.9	139.3								
P-20	4				0.5				17.3	111.0								
P-20	9								29.8	91.8								
P-20	14								8.8	136.5								
P-21	0.75-5	29	17	12		69	CL	A-6 (6)				1.56		7.6	0.01			
P-21	2				1.0				11.7	124.2								
P-21	4								7.0	125.1								
P-22	0-5	29	15	14		78	CL	A-6 (9)				1.28		7.7	0.07			
P-22	2				-1.8				8.3	111.1								
P-22	4				8.1				12.7	124.2								
P-22	9								10.1	114.9								
P-23	0-5	29	17	12		53	CL	A-6 (3)				1.50		7.3	0.10			
P-23	2				0.3				8.1	127.3								
P-23	4				0.2				10.4	126.1								
P-23	9								9.1	128.7								
RW-1	2	30	21	9		70	CL	A-4 (5)	12.1	121.5		1.44						
RW-1	4				0.1				14.8	110.0								
RW-1	9								23.2	103.9								
RW-1	14								26.1	101.6								
RW-2	0-4	39	21	18		63	CL	A-6 (9)				0.16		7.6				
RW-2	4				1.1				23.2	105.3		1.40	800 Ohm-cm @ 34.75%					
RW-2	9	38	23	15		60	CL	A-6 (7)	21.4	108.3								

RockSol Consulting Group, Inc.

ATTERBERG LIMITS RESULTS
AASHTO T89 Method A/T90

CLIENT J.F. Sato & Associates **PROJECT NAME** US50 West - Task Order 4

PROJECT NUMBER 302.01 **PROJECT LOCATION** Purcell to Wills, Pueblo, CO



	Specimen Identification		LL	PL	PI	Fines	Classification
●	B-1	4.0	30	16	14		(Fill) very sandy CLAY
⊠	B-1	14.0	32	21	11		(Bedrock) clayey SANDSTONE
▲	B-2	0.0-4.0	26	17	9	50.6	SANDY LEAN CLAY (CL)
★	B-2	9.5	24	16	8	21.7	(Bedrock) clayey SANDSTONE (SC)
⊙	B-3	0.0-4.0	23	14	9	13.6	CLAYEY SAND with GRAVEL (SC)
✿	B-4	9.0	30	14	16	54.0	SANDY LEAN CLAY (CL)
○	B-4	19.0	35	15	20	94.5	LEAN CLAY (CL)
△	B-5	9.0	30	13	17	72.0	LEAN CLAY with SAND (CL)
⊗	B-5	14.0	32	15	17	80.0	LEAN CLAY with SAND (CL)
⊕	B-6	0.0-4.0	29	14	15	60.2	SANDY LEAN CLAY (CL)
□	B-7	24.0	24	14	10	46.6	(Bedrock) clayey SANDSTONE (SC)
⊛	B-8	9.0	23	15	8	63.2	SANDY LEAN CLAY (CL)
◒	B-8	14.0	27	15	12	56.4	SANDY LEAN CLAY (CL)
☆	B-8	34.0	25	16	9	40.6	(Bedrock) clayey SANDSTONE (SC)
⊠	B-9	4.0	25	16	9	36.6	(Bedrock) clayey SANDSTONE (SC)
■	B-10	0.0-4.0	29	14	15	45.6	CLAYEY SAND (SC)
◆	B-10	4.0	26	15	11	57.9	SANDY LEAN CLAY (CL)
◇	C-1	0.0-42"	23	15	8	15.5	CLAYEY SAND with GRAVEL (SC)
×	C-1	3.5-4.0	35	17	18	69.6	SANDY LEAN CLAY (CL)
✖	C-2	0.0-0.5	NP	NP	NP	21.8	SILTY SAND with GRAVEL (SM)

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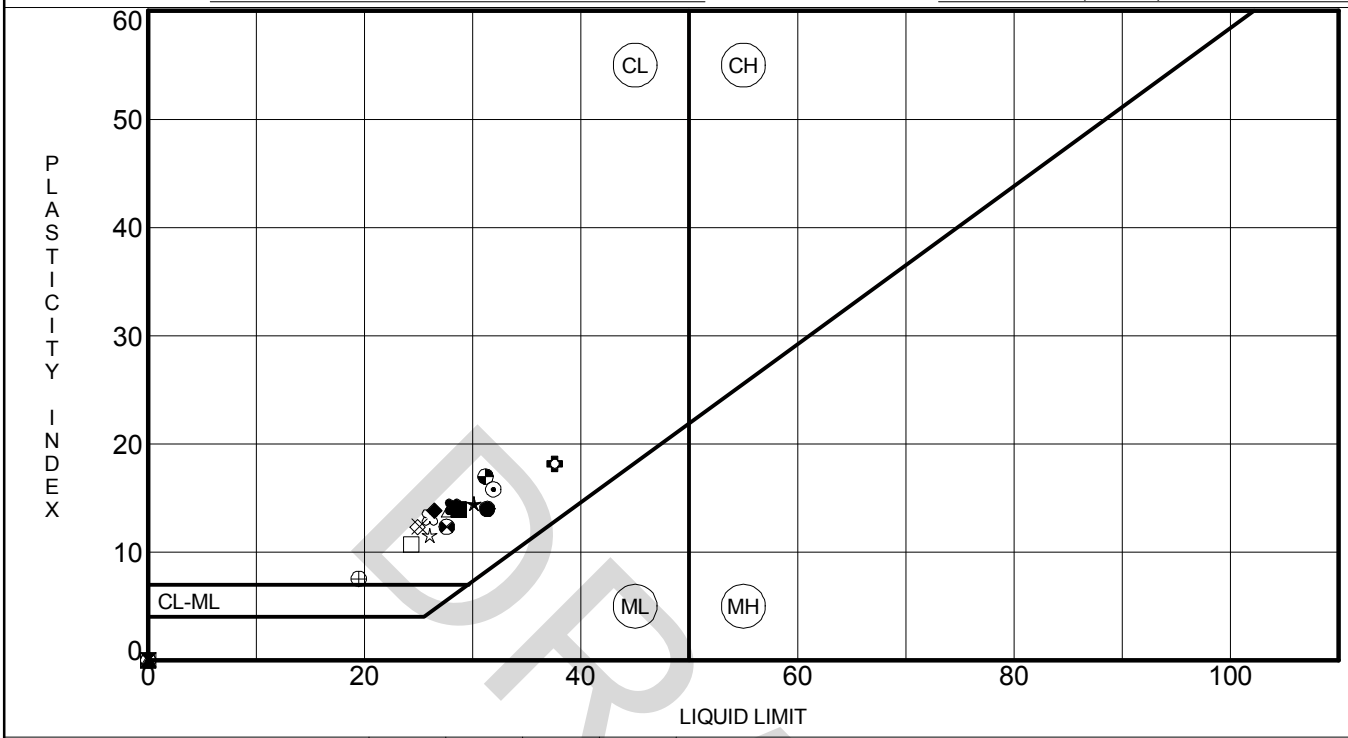
ATTERBERG LIMITS RESULTS
AASHTO T89 Method A/T90

CLIENT J.F. Sato & Associates **PROJECT NAME** US50 West - Task Order 4

PROJECT NUMBER 302.01 **PROJECT LOCATION** Purcell to Wills, Pueblo, CO



	Specimen Identification		LL	PL	PI	Fines	Classification
●	C-2	0.5-1.5	31	17	14	96.4	LEAN CLAY (CL)
⊠	C-2	1.5-2.0	NP	NP	NP	18.3	SILTY SAND with GRAVEL (SM)
▲	P-1	0.5-1.5	NP	NP	NP	9.7	WELL-GRADED GRAVEL with SILT and SAND (GW-GM)
★	P-1	1.5-5.0	30	16	14	56.9	SANDY LEAN CLAY (CL)
⊙	P-2	1.0-5.0	32	16	16	65.5	SANDY LEAN CLAY (CL)
✿	P-3	1.0-5.0	38	19	19	77.0	LEAN CLAY with SAND (CL)
○	P-4	0.8-2.0	NP	NP	NP	9.7	POORLY GRADED SAND with SILT and GRAVEL (SP-SM)
△	P-4	1.9-5.0	28	14	14	58.0	SANDY LEAN CLAY (CL)
⊗	P-5	0.8-2.0	NP	NP	NP	14.2	SILTY SAND with GRAVEL (SM)
⊕	P-5	1.9-5.0	19	12	7	20.2	SILTY, CLAYEY GRAVEL with SAND (GC-GM)
□	P-6	0.8-5.0	24	14	10	17.3	CLAYEY GRAVEL with SAND (GC)
⊛	P-7	1.5-5.0	28	15	13	57.5	SANDY LEAN CLAY (CL)
◒	P-8	1.0-5.0	31	14	17	43.7	CLAYEY SAND with GRAVEL (SC)
☆	P-9	1.0-5.0	26	14	12	52.6	SANDY LEAN CLAY (CL)
⊠	P-10	0.0-5.0	26	13	13	22.5	CLAYEY SAND with GRAVEL (SC)
■	P-11	1.3-5.0	29	15	14	55.0	SANDY LEAN CLAY (CL)
◆	P-12	0.0-5.0	26	13	13	52.4	SANDY LEAN CLAY (CL)
◇	P-13	1.5-5.0	25	13	12	41.2	CLAYEY SAND (SC)
×	P-14	1.5-5.0	25	13	12	43.7	CLAYEY SAND (SC)
✖	P-15	0.0-5.0	28	14	14	56.2	SANDY LEAN CLAY (CL)

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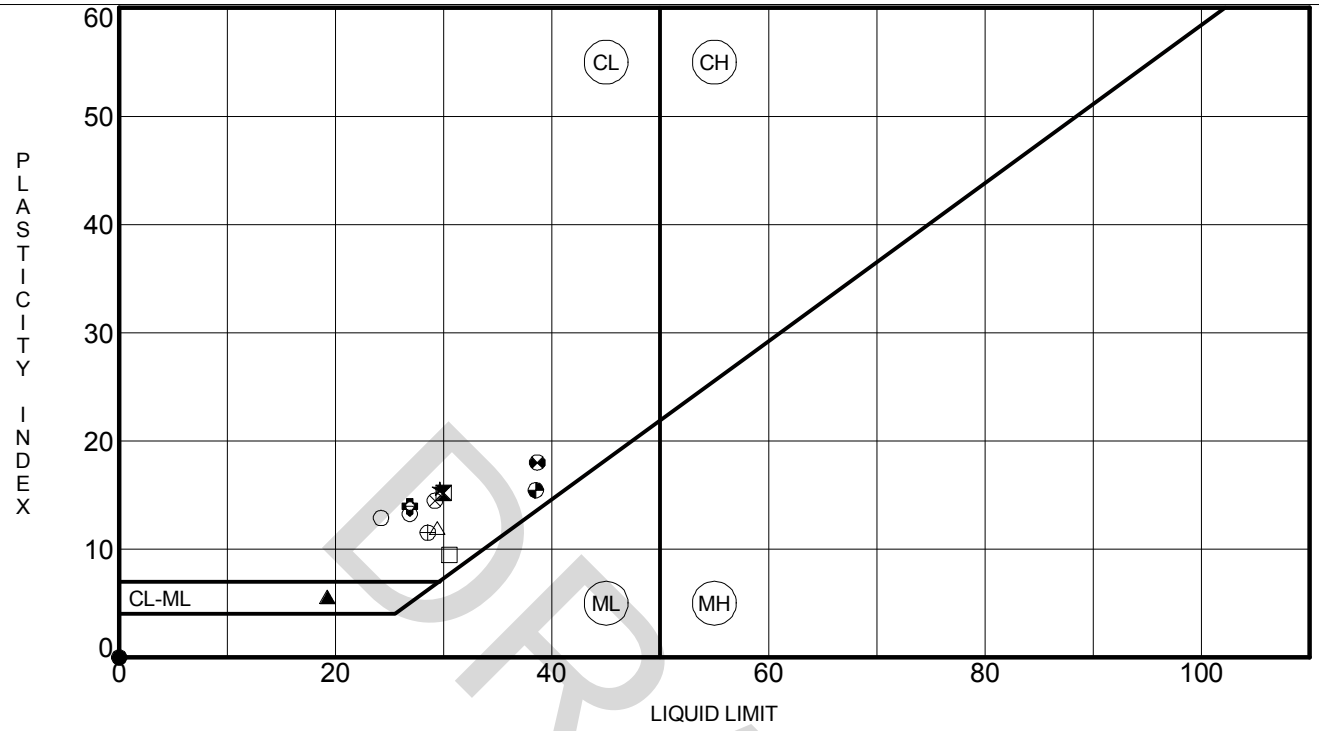
ATTERBERG LIMITS RESULTS
AASHTO T89 Method A/T90

CLIENT J.F. Sato & Associates **PROJECT NAME** US50 West - Task Order 4

PROJECT NUMBER 302.01 **PROJECT LOCATION** Purcell to Wills, Pueblo, CO



	Specimen Identification		LL	PL	PI	Fines	Classification
●	P-16	0.8-1.5	NP	NP	NP	13.7	SILTY SAND with GRAVEL (SM)
⊠	P-16	1.5-5.0	30	15	15	63.7	SANDY LEAN CLAY (CL)
▲	P-17	0.8-1.5	19	14	5	16.0	SILTY, CLAYEY GRAVEL with SAND (GC-GM)
★	P-17	1.5-5.0	30	14	16	45.5	CLAYEY SAND (SC)
⊙	P-18	0.0-5.0	27	14	13	35.3	CLAYEY SAND with GRAVEL (SC)
✿	P-19	0.8-5.0	27	13	14	50.5	SANDY LEAN CLAY (CL)
○	P-20	0.8-4.0	24	11	13	38.8	CLAYEY SAND (SC)
△	P-21	0.8-5.0	29	17	12	69.1	(Bedrock) sandy CLAYSTONE (CL)
⊗	P-22	0.0-5.0	29	15	14	78.0	LEAN CLAY with SAND (CL)
⊕	P-23	0.0-5.0	29	17	12	52.9	SANDY LEAN CLAY (CL)
□	RW-1	2.0	30	21	9	70.2	(Bedrock) CLAYSTONE (CL)
⊛	RW-2	0.0-4.0	39	21	18	62.9	SANDY LEAN CLAY (CL)
◒	RW-2	9.0	38	23	15	60.5	SANDY LEAN CLAY (CL)

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GRAIN SIZE DISTRIBUTION

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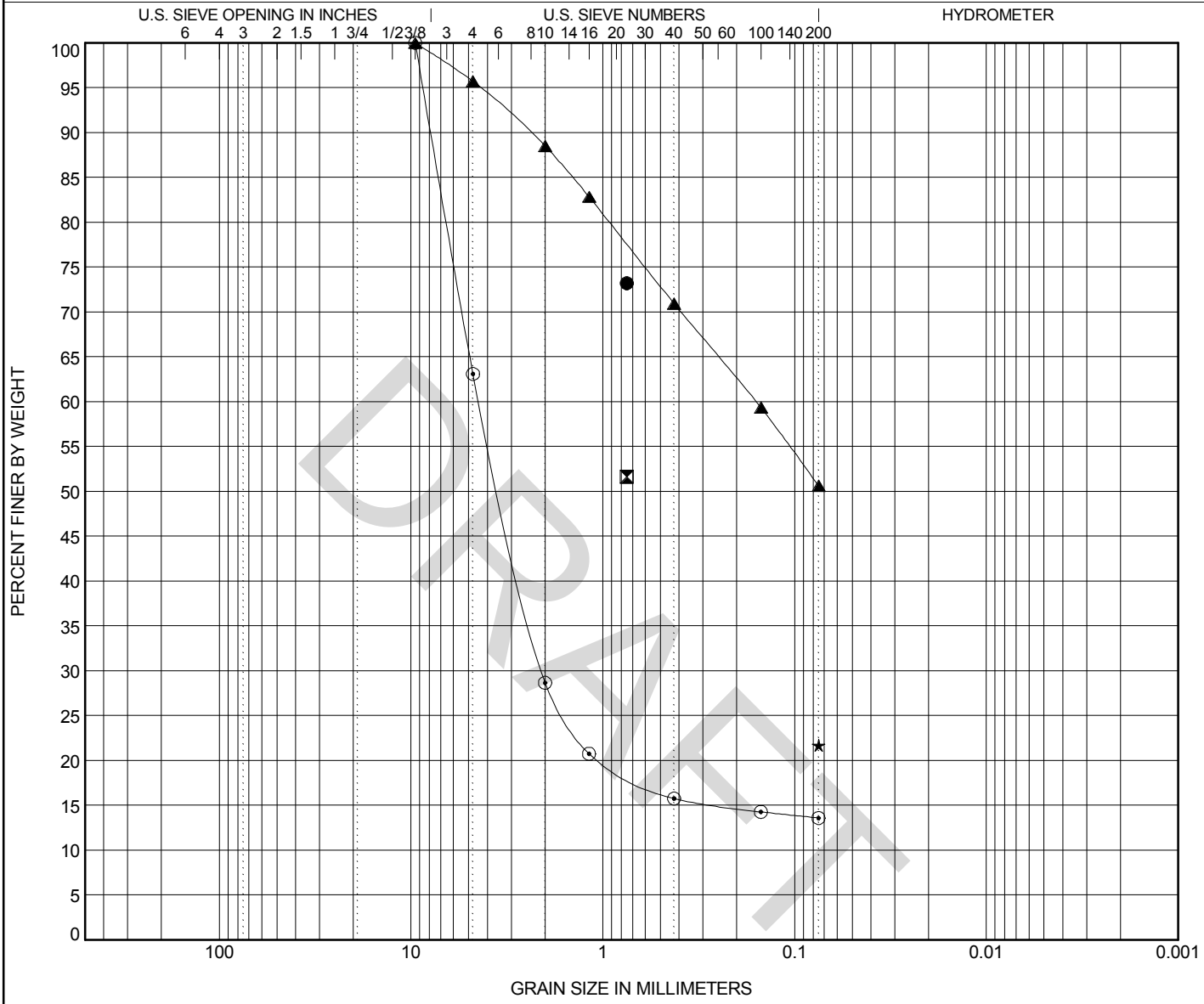
PROJECT NUMBER 302.01 **PROJECT LOCATION** Purcell to Wills, Pueblo, CO



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	B-1	4	(Fill) very sandy CLAY	30	16	14		
⊠	B-1	14	(Bedrock) clayey SANDSTONE	32	21	11		
▲	B-2	0-4.0	SANDY LEAN CLAY (CL)	26	17	9		
★	B-2	10	(Bedrock) clayey SANDSTONE (SC)	24	16	8		
⊙	B-3	0-4.0	CLAYEY SAND with GRAVEL (SC)	23	14	9		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-1	4	0.75							
⊠	B-1	14	0.75							
▲	B-2	0-4.0	9.5	0.159			4.3	45.1	50.6	
★	B-2	10	0.075						21.7	
⊙	B-3	0-4.0	9.5	4.395	2.068		36.9	49.5	13.6	

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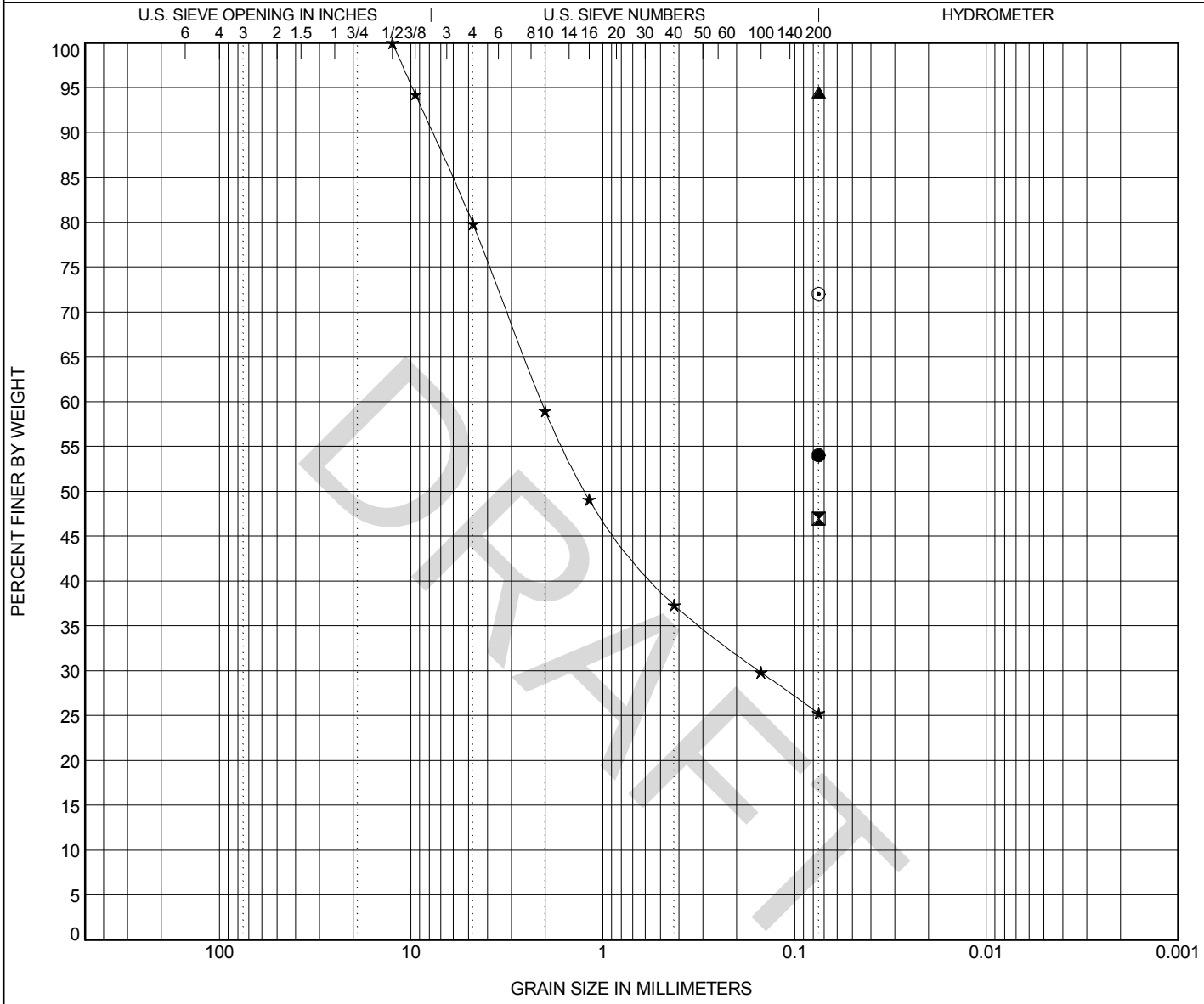

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	B-4	9	SANDY LEAN CLAY (CL)	30	14	16		
⧓	B-4	14	clayey SAND					
▲	B-4	19	LEAN CLAY (CL)	35	15	20		
★	B-4	29	silty to gravelly SAND					
⊙	B-5	9	LEAN CLAY with SAND (CL)	30	13	17		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-4	9	0.075						54.0	
⧓	B-4	14	0.075						47.0	
▲	B-4	19	0.075						94.5	
★	B-4	29	12.5	2.087	0.153		20.2	54.5	25.3	
⊙	B-5	9	0.075						72.0	

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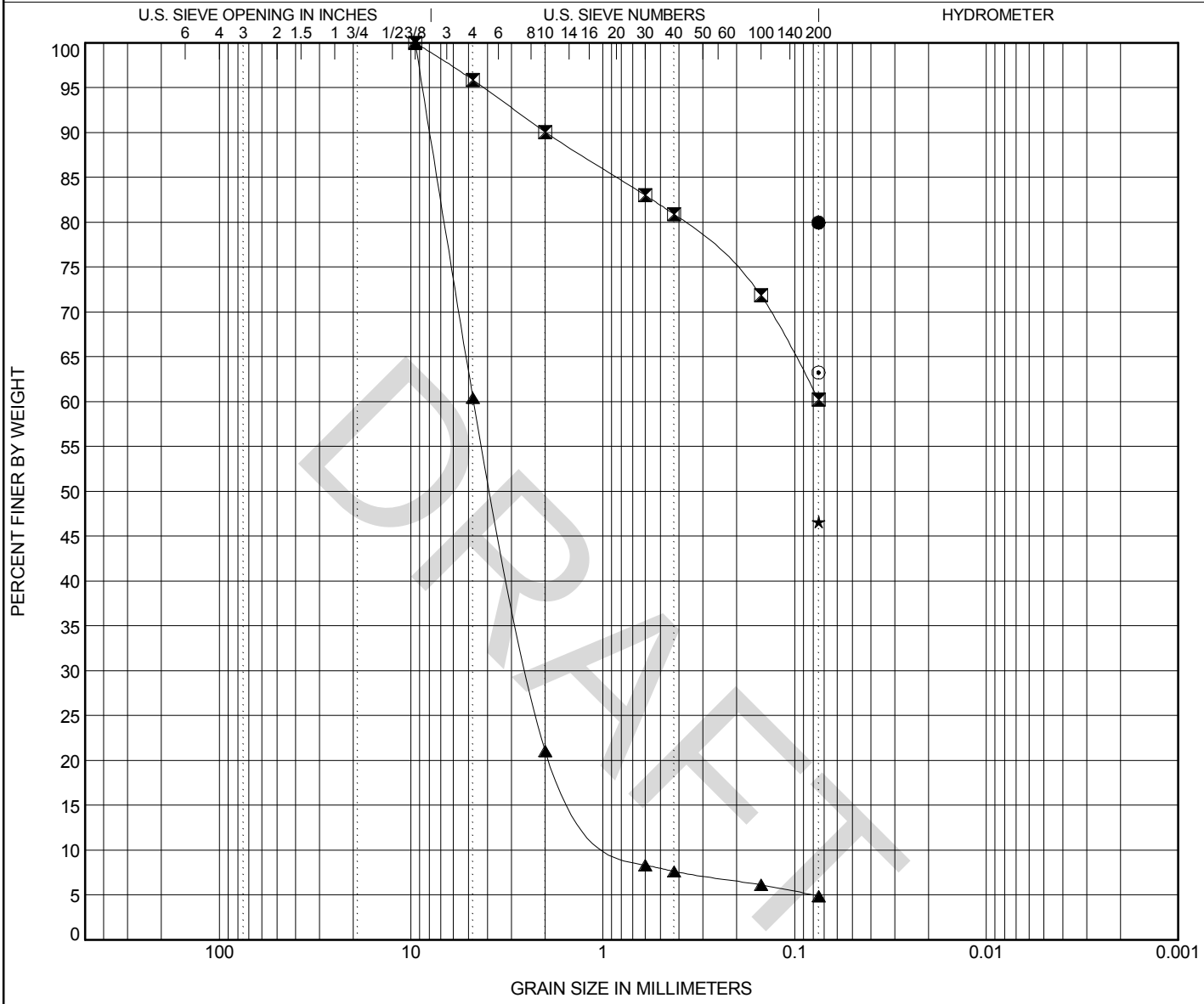

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	B-5	14	LEAN CLAY with SAND (CL)	32	15	17		
⊠	B-6	0-4.0	SANDY LEAN CLAY (CL)	29	14	15		
▲	B-6	5-8.0	WELL-GRADED SAND with GRAVEL (SW)				1.79	6.70
★	B-7	24	(Bedrock) clayey SANDSTONE (SC)	24	14	10		
⊙	B-8	9	SANDY LEAN CLAY (CL)	23	15	8		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-5	14	0.075						80.0	
⊠	B-6	0-4.0	9.5				4.1	35.7	60.2	
▲	B-6	5-8.0	9.5	4.706	2.433	0.702	39.6	55.5	4.9	
★	B-7	24	0.075						46.6	
⊙	B-8	9	0.075						63.2	

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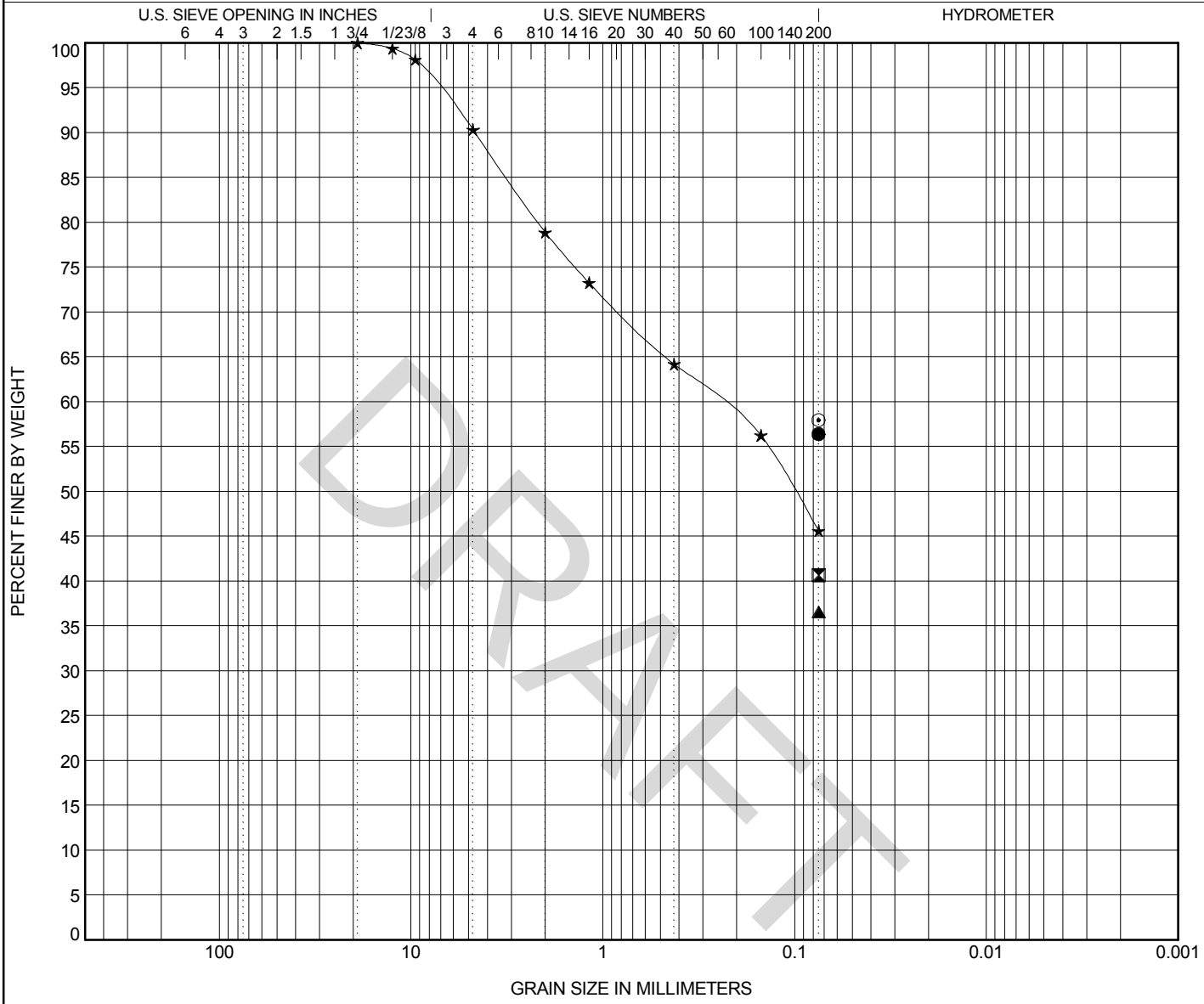

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	B-8	14	SANDY LEAN CLAY (CL)	27	15	12		
⧓	B-8	34	(Bedrock) clayey SANDSTONE (SC)	25	16	9		
▲	B-9	4	(Bedrock) clayey SANDSTONE (SC)	25	16	9		
★	B-10	0-4.0	CLAYEY SAND (SC)	29	14	15		
⊙	B-10	4	SANDY LEAN CLAY (CL)	26	15	11		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-8	14	0.075						56.4	
⧓	B-8	34	0.075						40.6	
▲	B-9	4	0.075						36.6	
★	B-10	0-4.0	19	0.245			9.7	44.7	45.6	
⊙	B-10	4	0.075						57.9	

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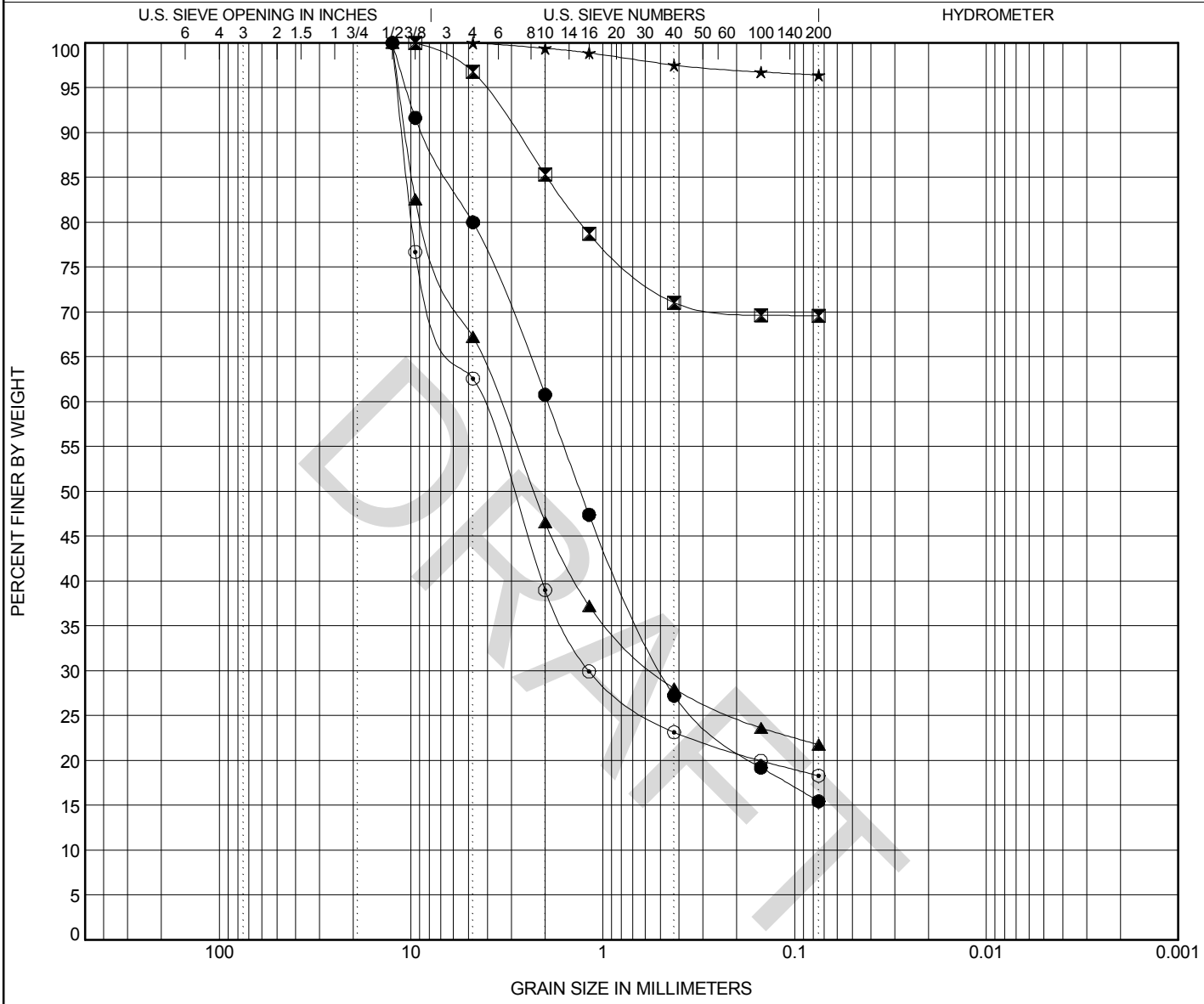

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification			Classification	LL	PL	PI	Cc	Cu
●	C-1	0-42"	CLAYEY SAND with GRAVEL (SC)	23	15	8		
⊠	C-1	4-4.0	SANDY LEAN CLAY (CL)	35	17	18		
▲	C-2	0-0.5	SILTY SAND with GRAVEL (SM)	NP	NP	NP		
★	C-2	1-1.5	LEAN CLAY (CL)	31	17	14		
⊙	C-2	2-2.0	SILTY SAND with GRAVEL (SM)	NP	NP	NP		

Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	C-1	0-42"	12.5	1.94	0.489		20.0	64.5	15.5	
⊠	C-1	4-4.0	9.5				3.2	27.2	69.6	
▲	C-2	0-0.5	12.5	3.508	0.529		32.8	45.5	21.8	
★	C-2	1-1.5	4.75				0.0	3.6	96.4	
⊙	C-2	2-2.0	12.5	4.322	1.185		37.4	44.3	18.3	

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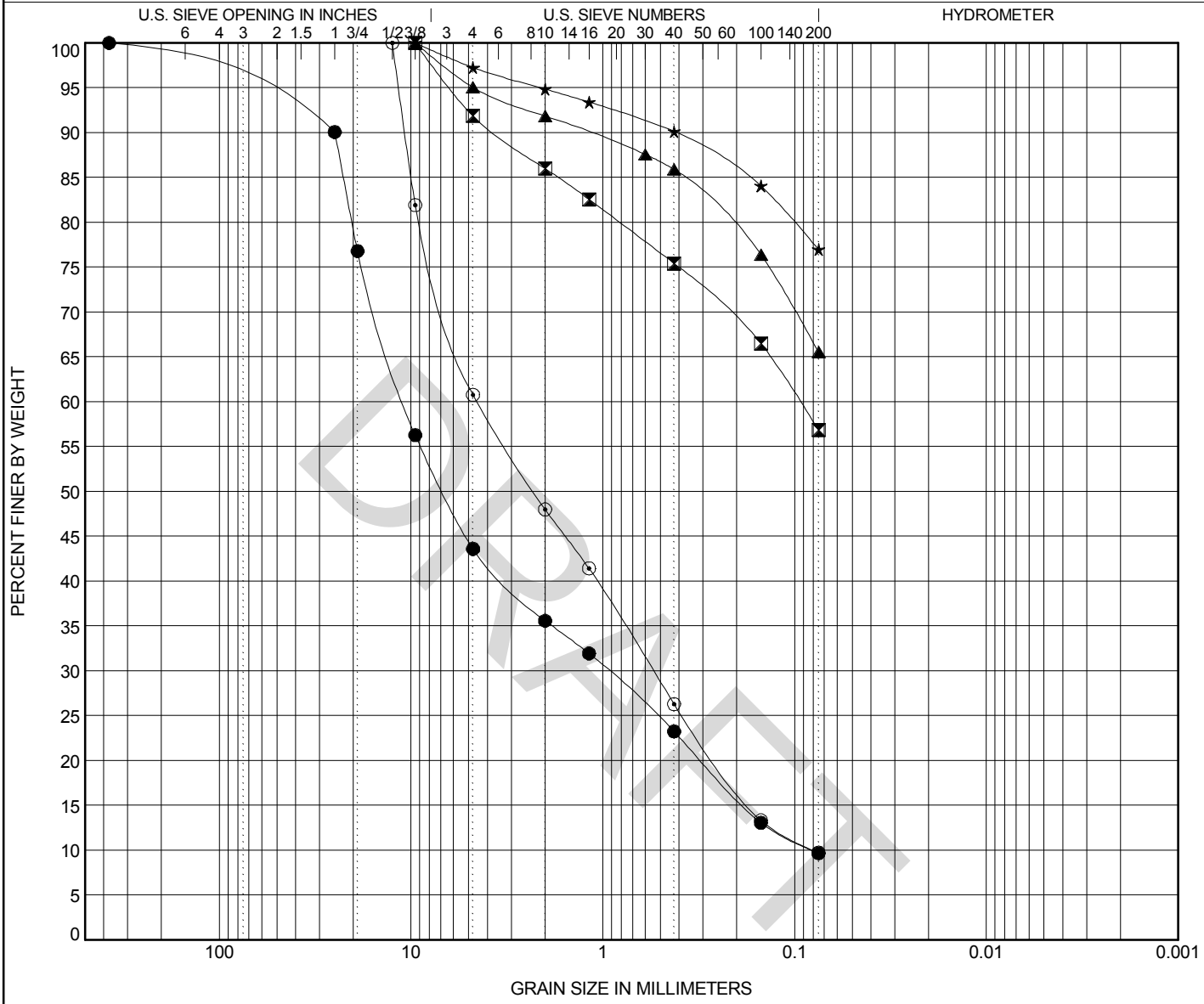

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification			Classification	LL	PL	PI	Cc	Cu
●	P-1	1-1.5	**WELL-GRADED GRAVEL with SILT and SAND (GW-GM)**	**NP**	**NP**	**NP**	**1.02**	**133.98**
⊠	P-1	2-5.0	**SANDY LEAN CLAY (CL)**	**30**	**16**	**14**		
▲	P-2	1-5.0	**SANDY LEAN CLAY (CL)**	**32**	**16**	**16**		
★	P-3	1-5.0	**LEAN CLAY with SAND (CL)**	**38**	**19**	**19**		
⊙	P-4	1-2.0	**POORLY GRADED SAND with SILT and GRAVEL (SP-SM)**	**NP**	**NP**	**NP**	**0.84**	**57.09**

Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	P-1	1-1.5	**375**	**10.773**	**0.94**	**0.08**	**50.5**	**33.9**	**9.7**	
⊠	P-1	2-5.0	**9.5**	**0.094**			**8.1**	**35.0**	**56.9**	
▲	P-2	1-5.0	**9.5**				**5.0**	**29.5**	**65.5**	
★	P-3	1-5.0	**9.5**				**2.7**	**20.3**	**77.0**	
⊙	P-4	1-2.0	**12.5**	**4.512**	**0.546**	**0.079**	**39.2**	**51.0**	**9.7**	

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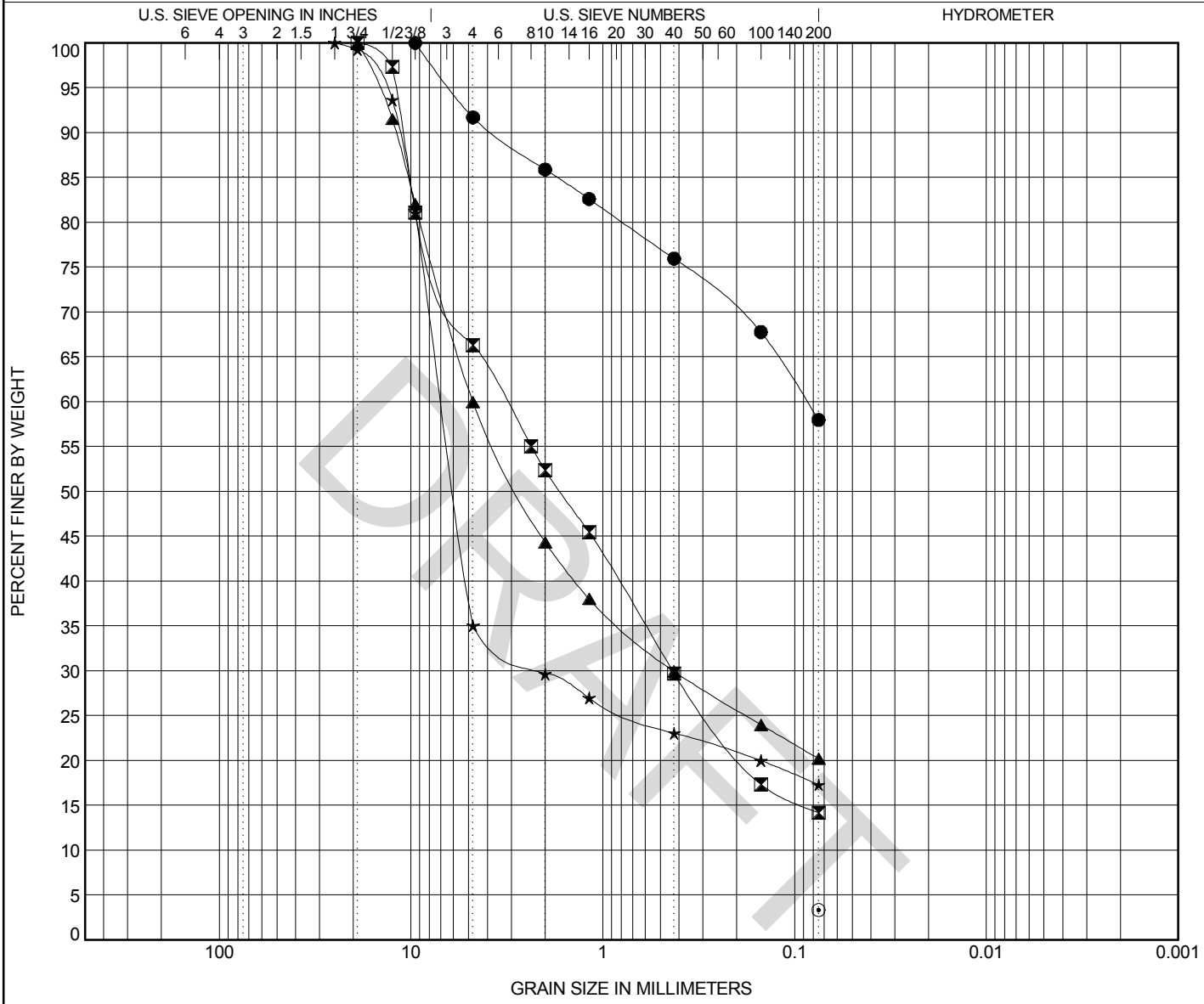

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	P-4	2-5.0	SANDY LEAN CLAY (CL)	28	14	14		
⊠	P-5	1-2.0	SILTY SAND with GRAVEL (SM)	NP	NP	NP		
▲	P-5	2-5.0	SILTY, CLAYEY GRAVEL with SAND (GC-GM)	19	12	7		
★	P-6	1-5.0	CLAYEY GRAVEL with SAND (GC)	24	14	10		
⊙	P-6	4	(Fill) silty to sandy CLAY with gravel					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	P-4	2-5.0	9.5	0.087			8.3	33.7	58.0	
⊠	P-5	1-2.0	19	3.211	0.433		33.7	52.1	14.2	
▲	P-5	2-5.0	19	4.756	0.43		40.0	39.8	20.2	
★	P-6	1-5.0	25	6.919	2.114		65.0	17.7	17.3	
⊙	P-6	4	0.075						3.3	

GRADATION - STANDARD 302.01 US50.GPJ ROCKSOL TEMPLATE.GDT 7/9/13

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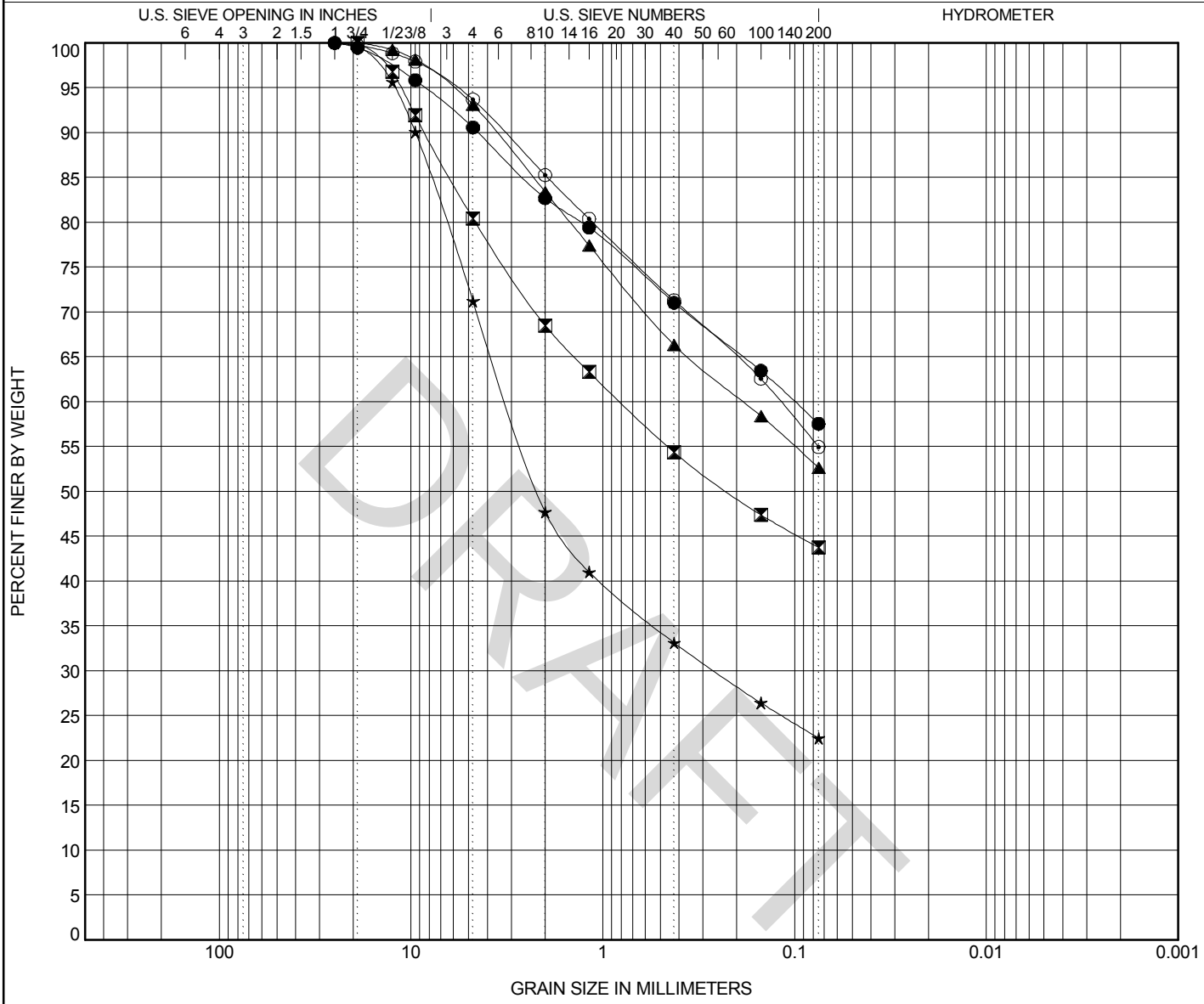

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification			Classification	LL	PL	PI	Cc	Cu
●	P-7	2-5.0	SANDY LEAN CLAY (CL)	28	15	13		
⊠	P-8	1-5.0	CLAYEY SAND with GRAVEL (SC)	31	14	17		
▲	P-9	1-5.0	SANDY LEAN CLAY (CL)	26	14	12		
★	P-10	0-5.0	CLAYEY SAND with GRAVEL (SC)	26	13	13		
⊙	P-11	1-5.0	SANDY LEAN CLAY (CL)	29	15	14		

Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	P-7	2-5.0	25	0.1			9.4	33.0	57.5	
⊠	P-8	1-5.0	19	0.809			19.6	36.7	43.7	
▲	P-9	1-5.0	19	0.185			6.9	40.5	52.6	
★	P-10	0-5.0	25	3.144	0.261		28.8	48.7	22.5	
⊙	P-11	1-5.0	25	0.119			6.3	38.7	55.0	

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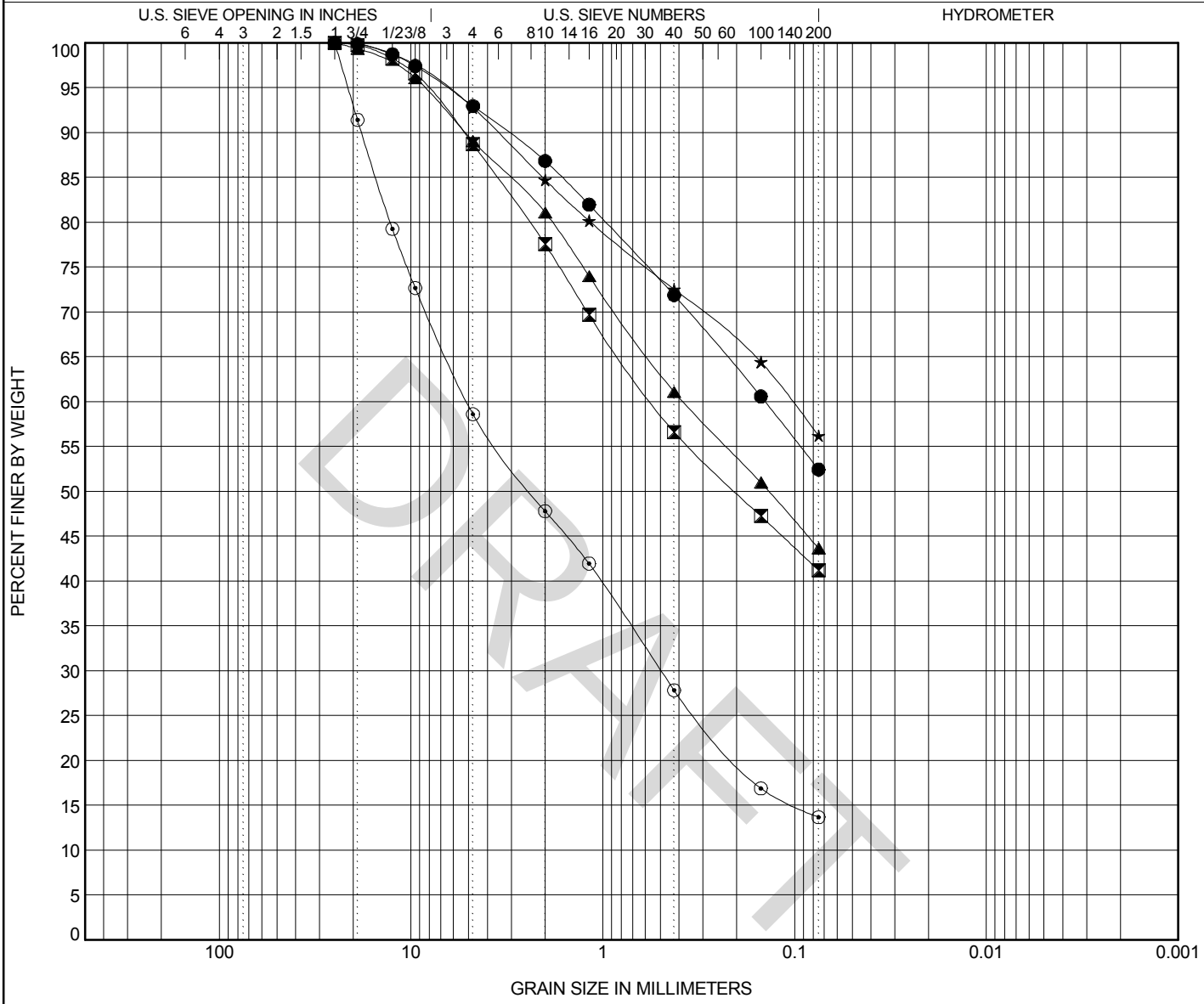

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification			Classification	LL	PL	PI	Cc	Cu
●	P-12	0-5.0	SANDY LEAN CLAY (CL)	26	13	13		
⊠	P-13	2-5.0	CLAYEY SAND (SC)	25	13	12		
▲	P-14	2-5.0	CLAYEY SAND (SC)	25	13	12		
★	P-15	0-5.0	SANDY LEAN CLAY (CL)	28	14	14		
⊙	P-16	1-1.5	SILTY SAND with GRAVEL (SM)	NP	NP	NP		

Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	P-12	0-5.0	25	0.143			7.0	40.5	52.4	
⊠	P-13	2-5.0	25	0.554			11.3	47.5	41.2	
▲	P-14	2-5.0	25	0.38			10.9	45.4	43.7	
★	P-15	0-5.0	19	0.103			7.2	36.6	56.2	
⊙	P-16	1-1.5	25	5.091	0.497		41.4	44.9	13.7	

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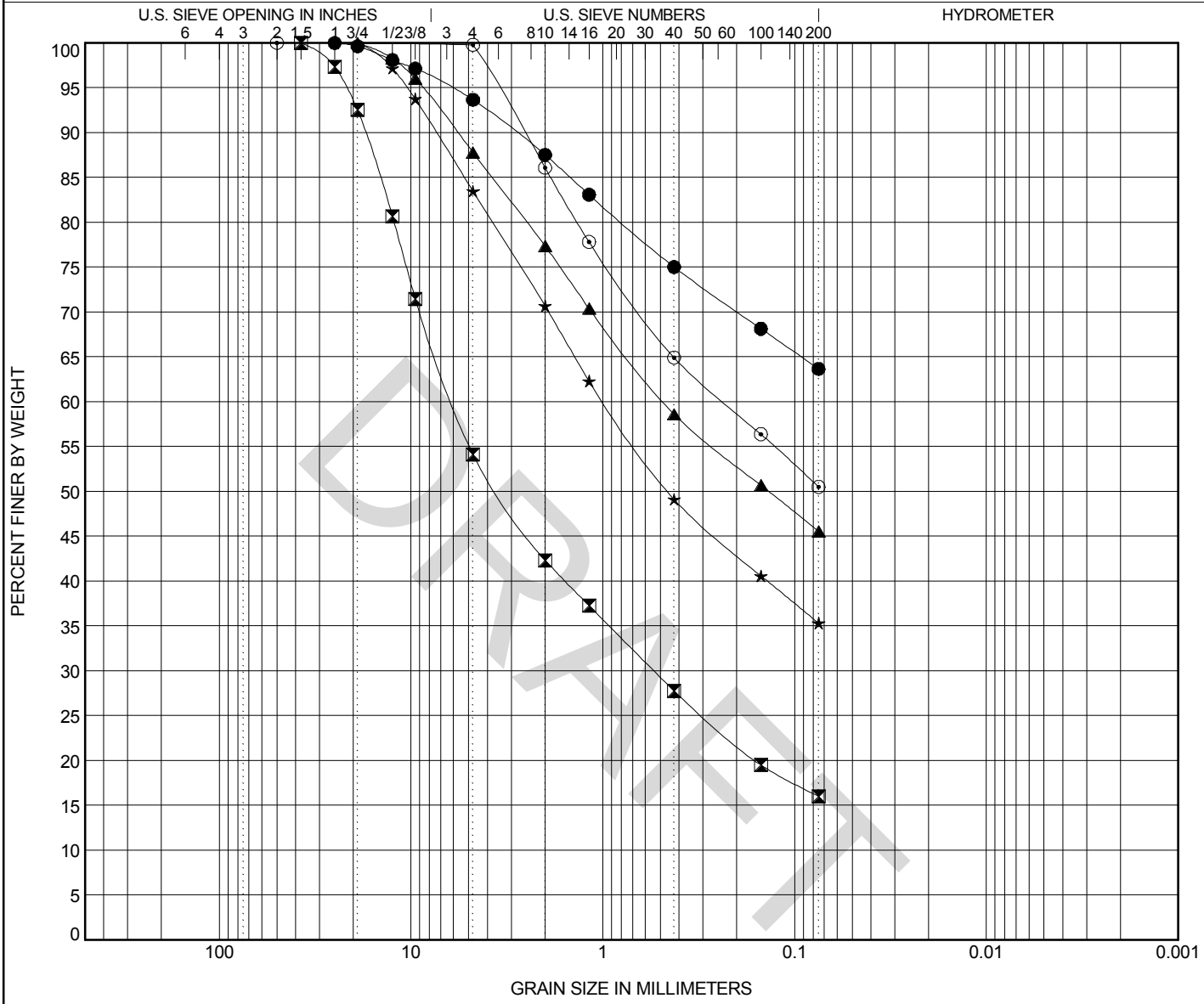

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	P-16	2-5.0	SANDY LEAN CLAY (CL)	30	15	15		
⊠	P-17	1-1.5	SILTY, CLAYEY GRAVEL with SAND (GC-GM)	19	14	5		
▲	P-17	2-5.0	CLAYEY SAND (SC)	30	14	16		
★	P-18	0-5.0	CLAYEY SAND with GRAVEL (SC)	27	14	13		
⊙	P-19	1-5.0	SANDY LEAN CLAY (CL)	27	13	14		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	P-16	2-5.0	25				6.3	30.0	63.7	
⊠	P-17	1-1.5	37.5	6.003	0.541		45.9	38.1	16.0	
▲	P-17	2-5.0	19	0.48			12.2	42.3	45.5	
★	P-18	0-5.0	25	0.988			16.5	48.2	35.3	
⊙	P-19	1-5.0	50	0.233			0.2	49.3	50.5	

RockSol Consulting Group Inc.
6510 W 91st Ave, Ste 130
Westminster, CO, 80031
Telephone: 303-962-9300

GRAIN SIZE DISTRIBUTION

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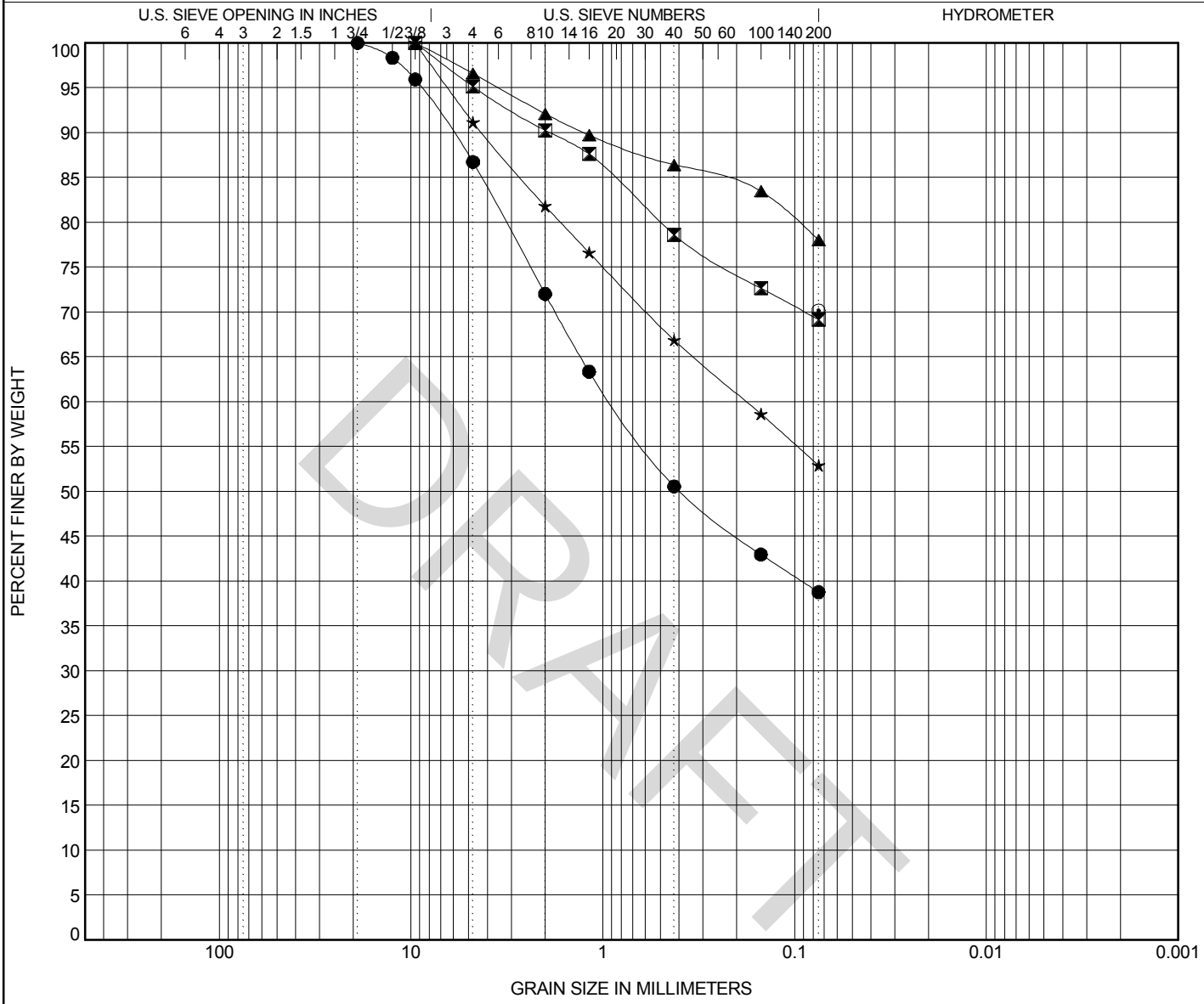
PROJECT NUMBER 302.01 **PROJECT LOCATION** Purcell to Wills, Pueblo, CO



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification			Classification	LL	PL	PI	Cc	Cu
●	P-20	1-4.0	CLAYEY SAND (SC)	24	11	13		
⊠	P-21	1-5.0	(Bedrock) sandy CLAYSTONE (CL)	29	17	12		
▲	P-22	0-5.0	LEAN CLAY with SAND (CL)	29	15	14		
★	P-23	0-5.0	SANDY LEAN CLAY (CL)	29	17	12		
⊙	RW-1	2	(Bedrock) CLAYSTONE (CL)	30	21	9		

Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	P-20	1-4.0	19	0.903			13.3	48.0	38.8	
⊠	P-21	1-5.0	9.5				4.9	26.0	69.1	
▲	P-22	0-5.0	9.5				3.4	18.6	78.0	
★	P-23	0-5.0	9.5	0.178			8.8	38.2	52.9	
⊙	RW-1	2	0.075						70.2	

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GRAIN SIZE DISTRIBUTION

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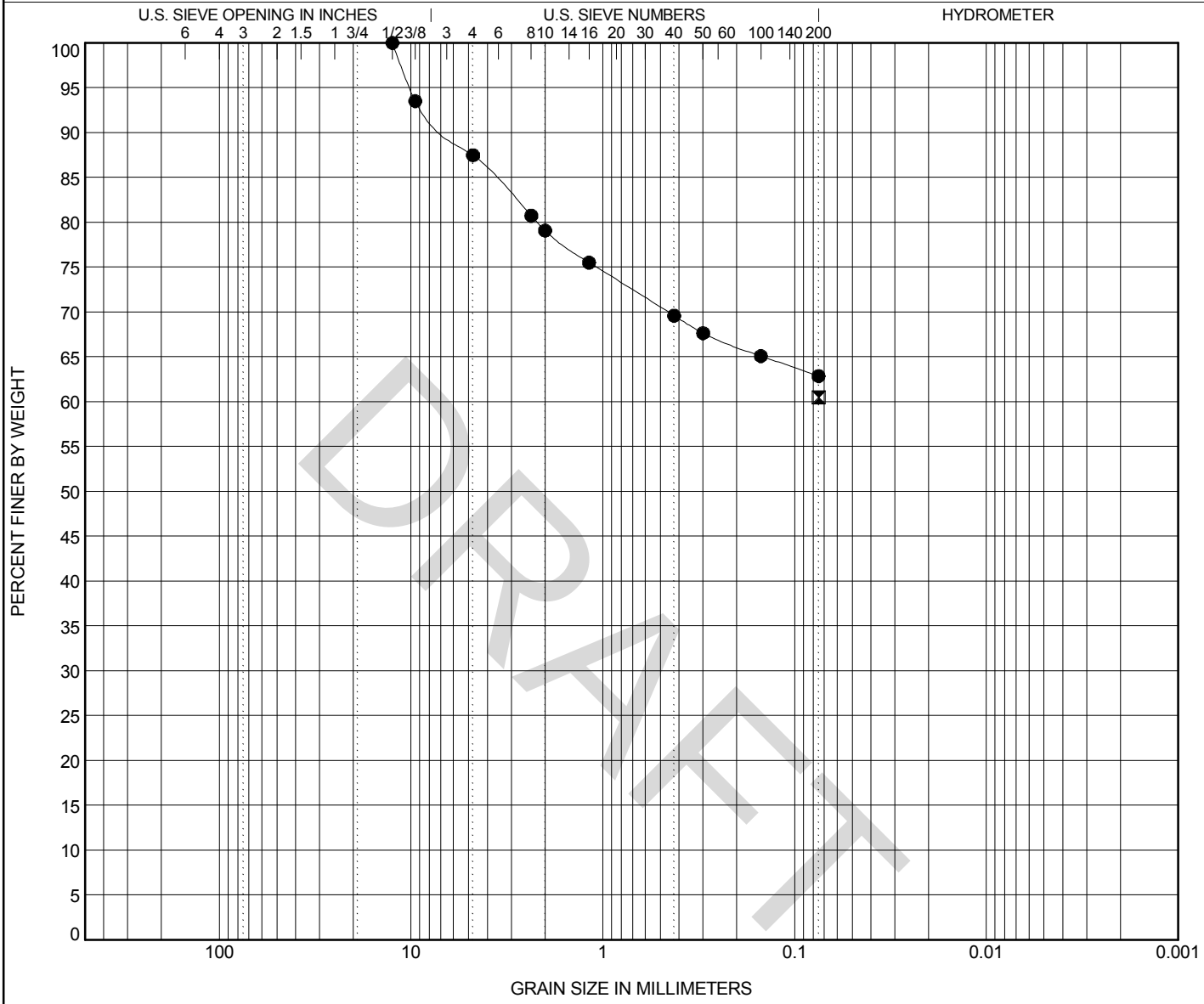
PROJECT NUMBER 302.01 **PROJECT LOCATION** Purcell to Wills, Pueblo, CO



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	RW-2	0-4.0	SANDY LEAN CLAY (CL)	39	21	18		
⊠	RW-2	9	SANDY LEAN CLAY (CL)	38	23	15		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	RW-2	0-4.0	12.5				12.5	24.6	62.9	
⊠	RW-2	9	0.075						60.5	

SWELL - CONSOLIDATION TEST

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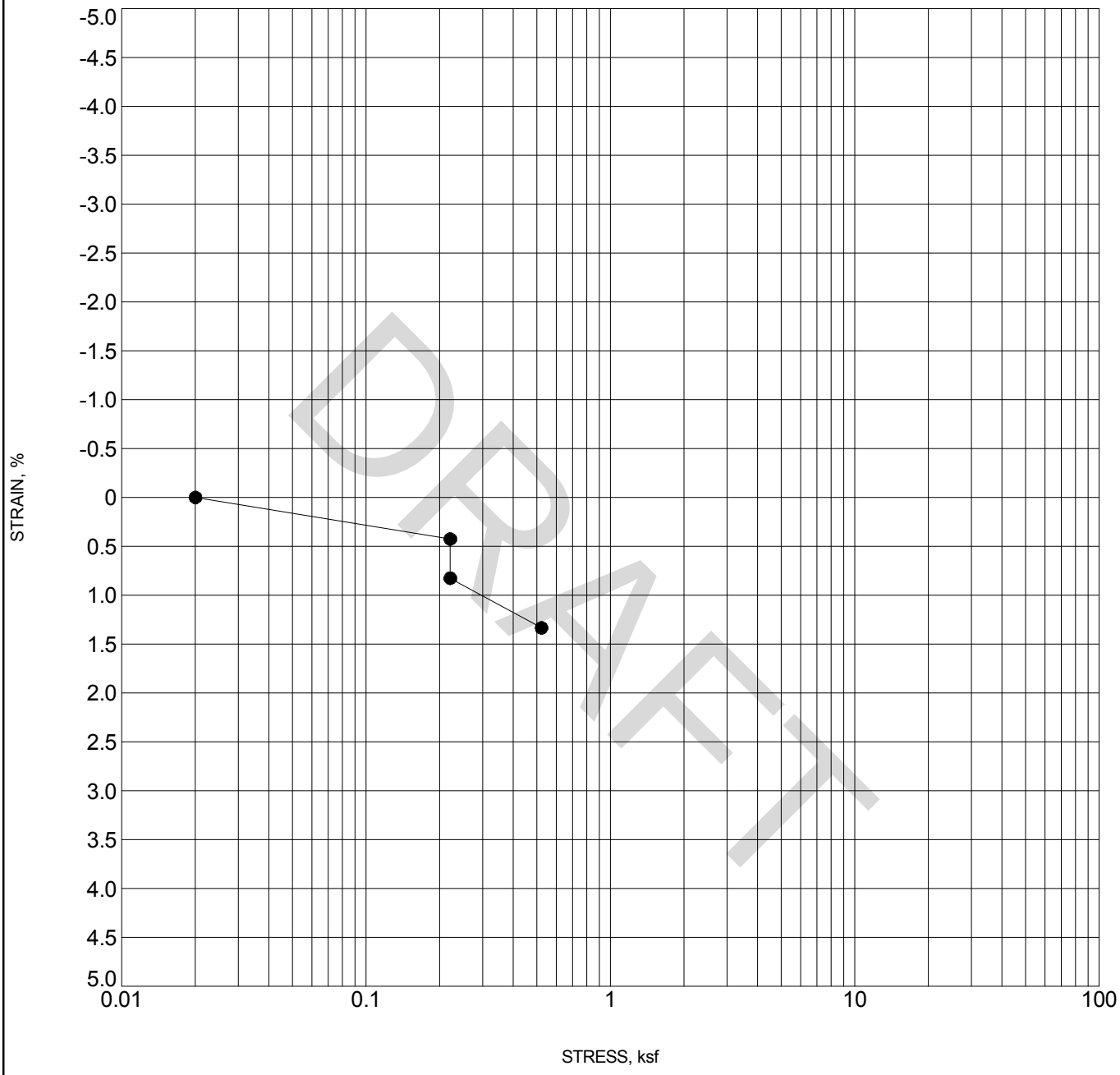

Specimen Identification	Classification	Swell/Consol. (%)	γ_d (pcf)	MC%
● **B-4 4**	**(Fill) sandy CLAY with silty SAND**	**-0.4**	**124.0**	**10.7**

SWELL - CONSOLIDATION TEST

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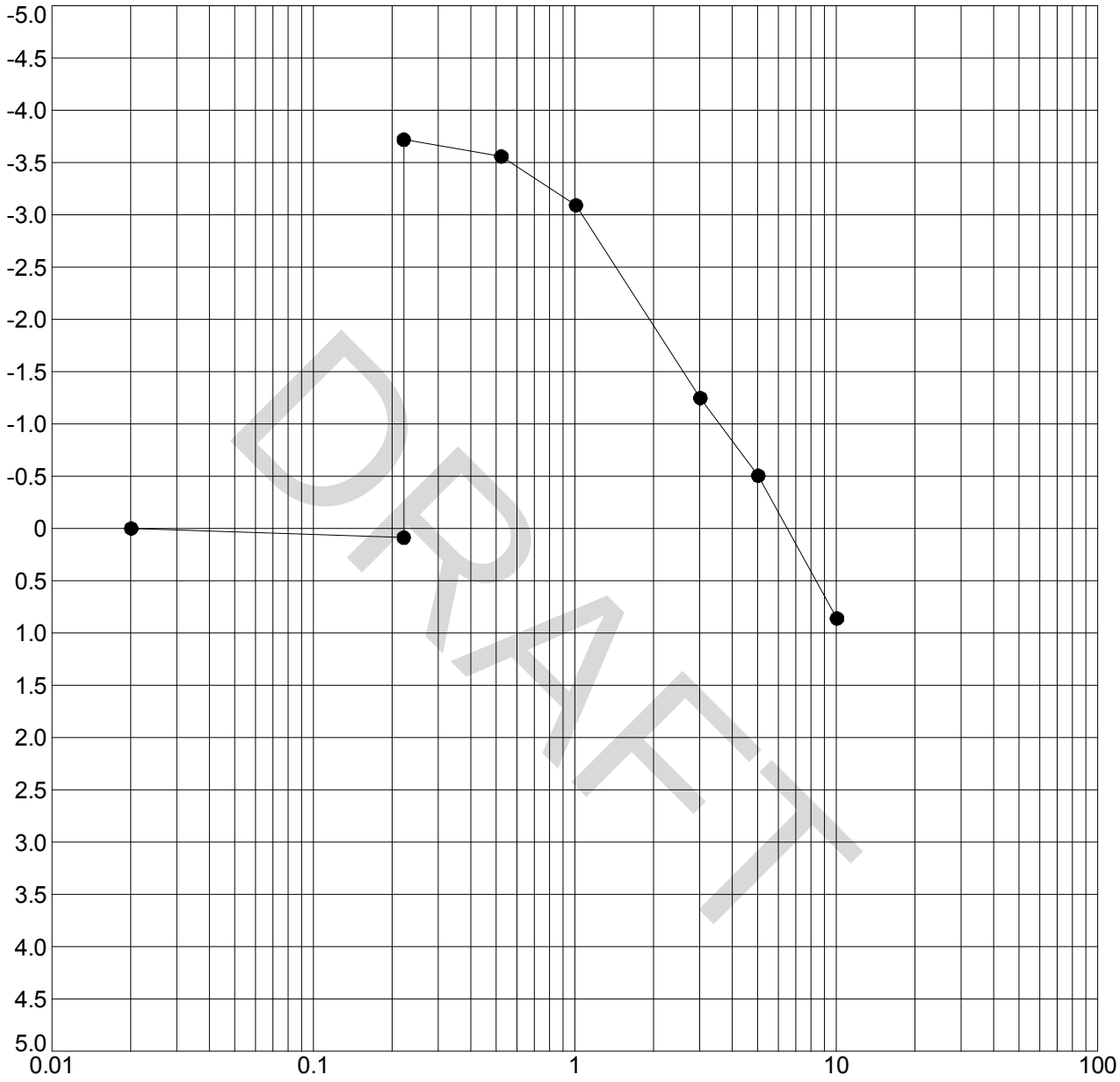

Specimen Identification	Classification	Swell/Consol. (%)	γ_d (pcf)	MC%
● B-5 4	(Fill) sandy CLAY with silty SAND	3.8	131.0	9.3

SWELL - CONSOLIDATION TEST

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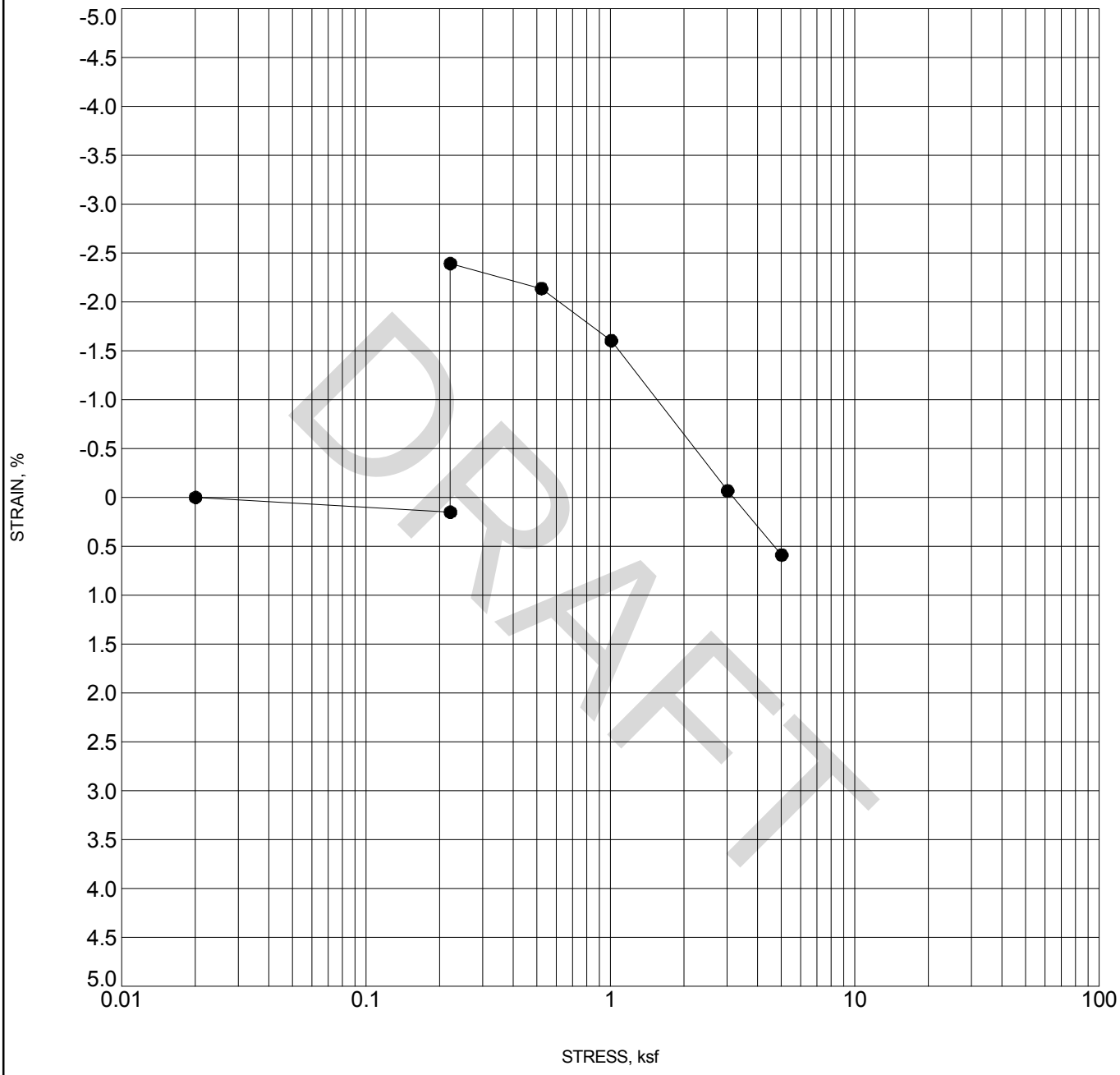

Specimen Identification	Classification	Swell/Consol. (%)	γ_d (pcf)	MC%
● **B-8 4**	**sandy CLAY**	**2.5**	**115.8**	**13.4**

SWELL - STANDARD 302.01 US50.GPJ ROCKSOL TEMPLATE.GDT 7/9/13

SWELL - CONSOLIDATION TEST

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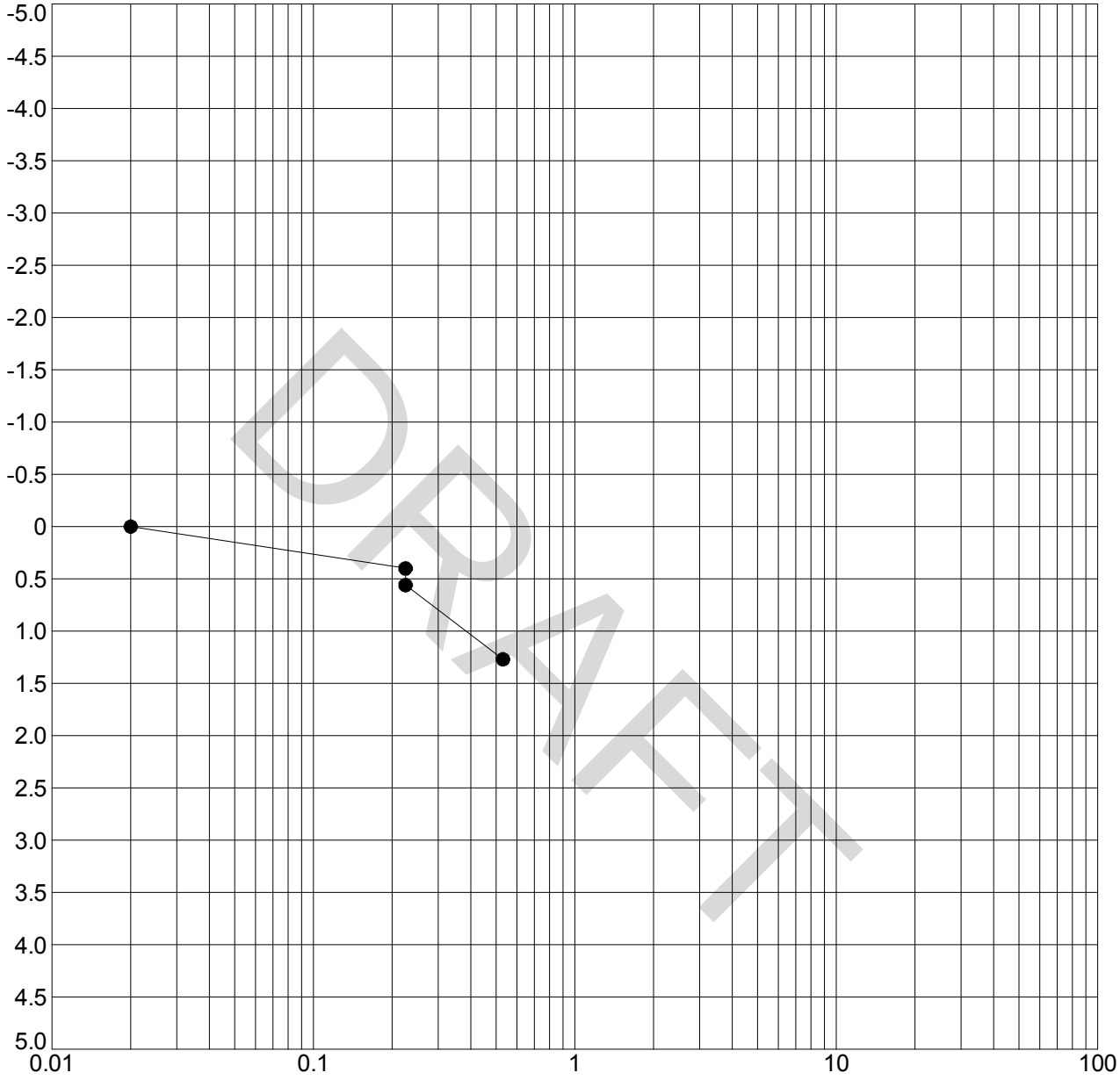

Specimen Identification	Classification	Swell/Consol. (%)	γ_d (pcf)	MC%
● **P-1 2**	**(Fill) sandy CLAY**	**-0.2**	**118.6**	**11.4**

SWELL - CONSOLIDATION TEST

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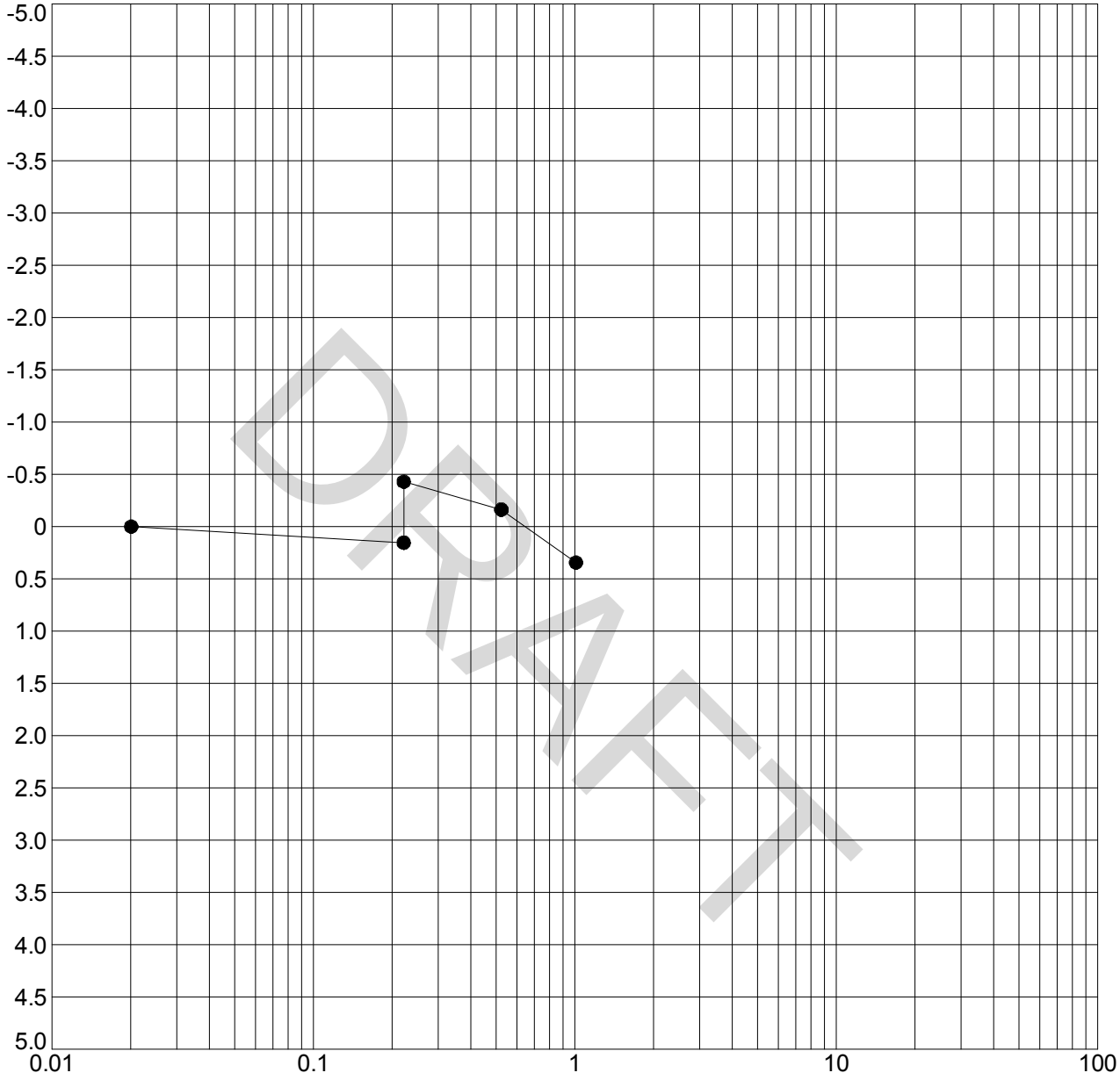

Specimen Identification	Classification	Swell/Consol. (%)	γ_d (pcf)	MC%
● **P-1** **4**	**sandy CLAY**	**0.6**	**109.4**	**20.0**

SWELL - CONSOLIDATION TEST

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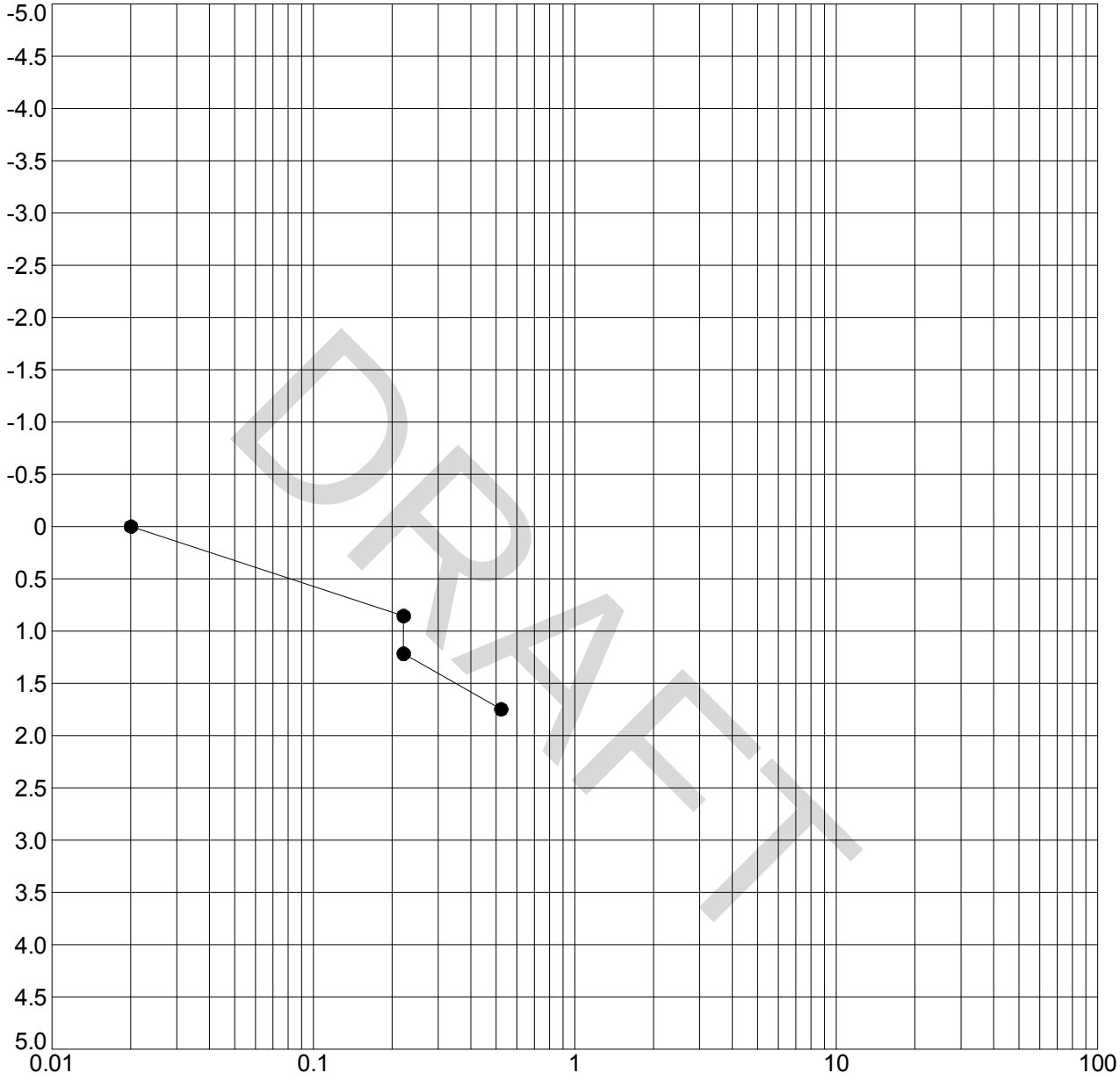

Specimen Identification		Classification	Swell/Consol. (%)	γ_d (pcf)	MC%
● **P-2**	**2**	**sandy CLAY**	**-0.4**	**102.5**	**22.2**

SWELL - CONSOLIDATION TEST

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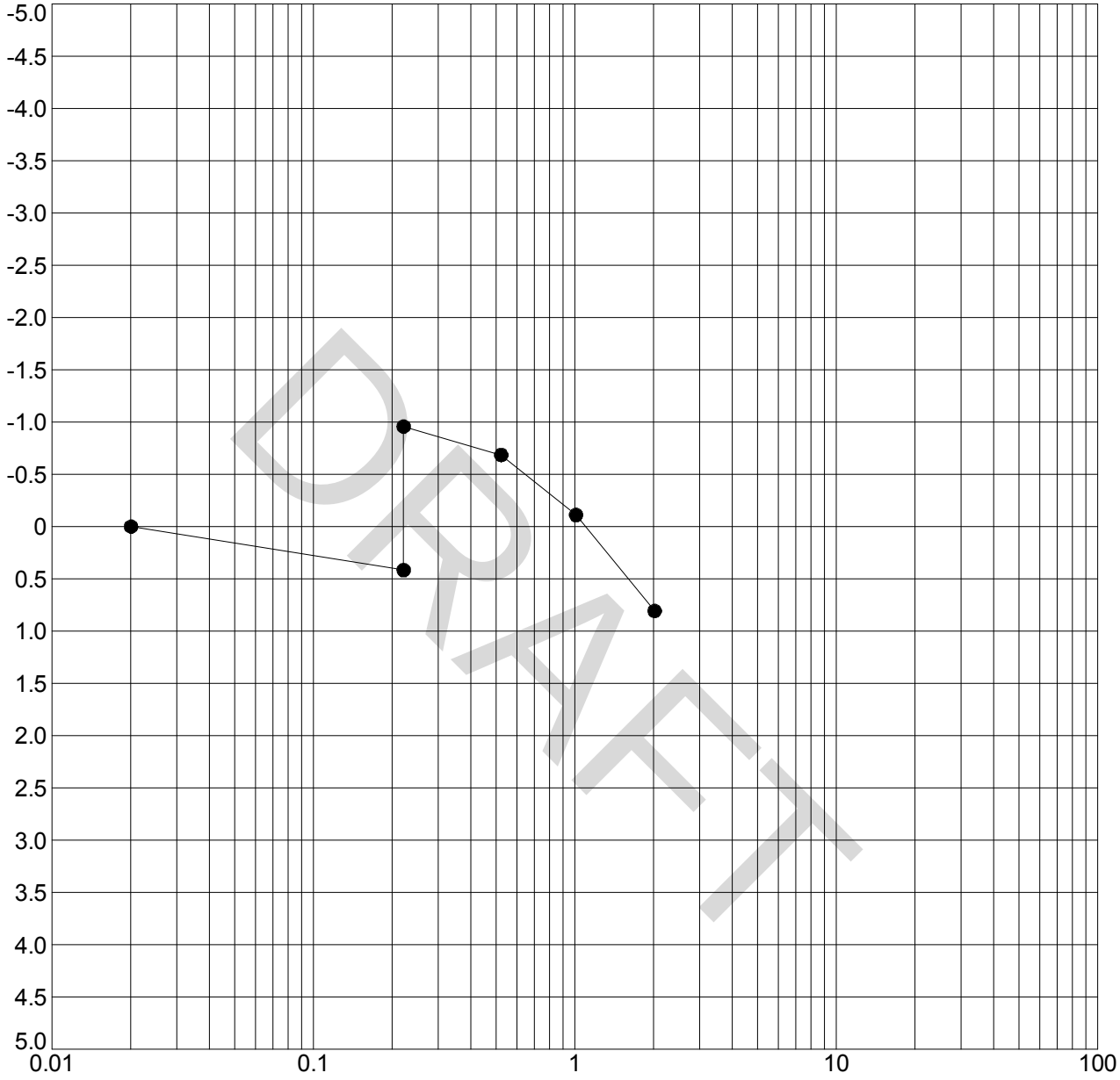

Specimen Identification	Classification	Swell/Consol. (%)	γ_d (pcf)	MC%
● **P-3 2**	**sandy CLAY**	**1.4**	**107.8**	**20.7**

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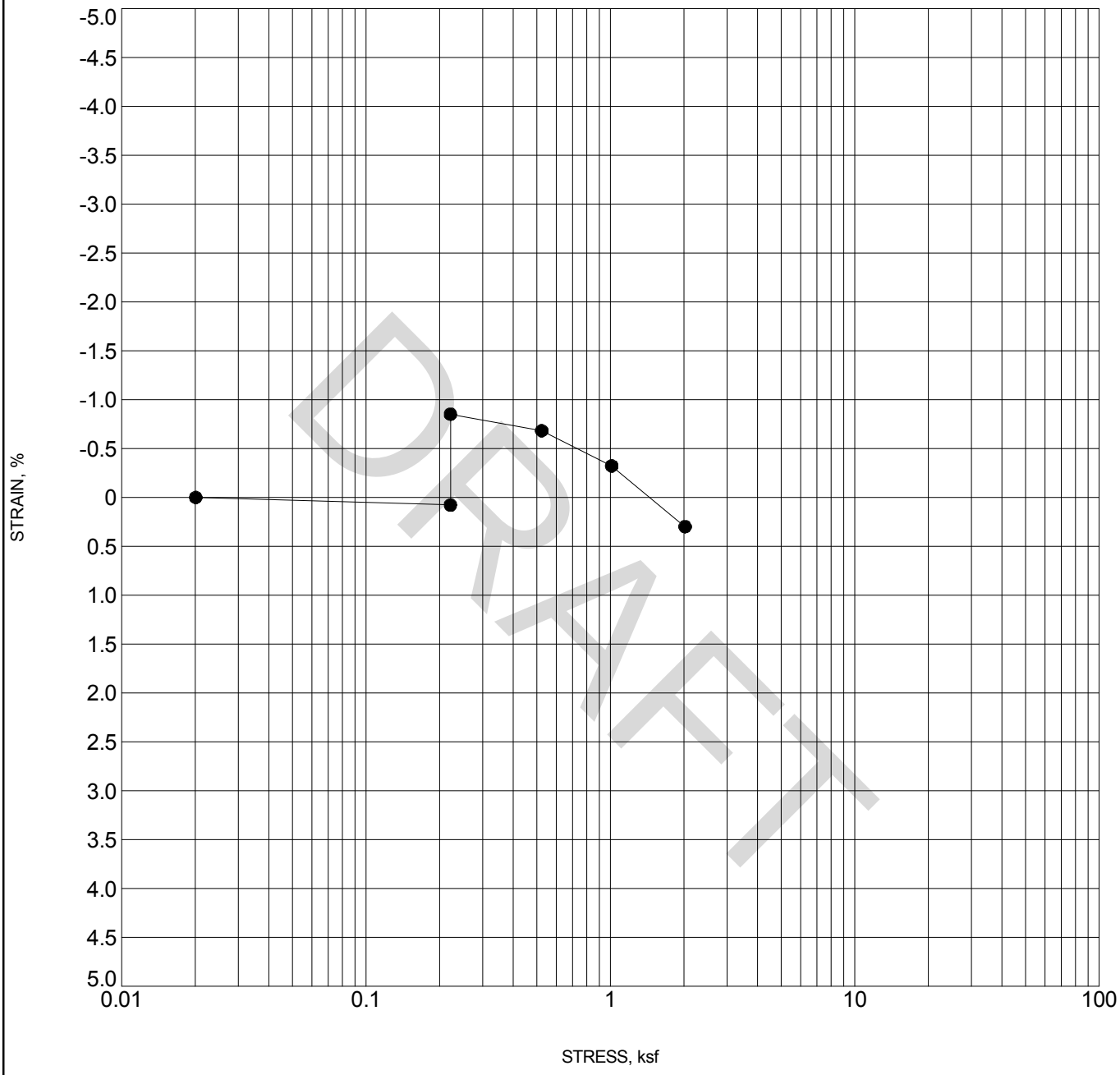

Specimen Identification	Classification	Swell/Consol. (%)	γ_d (pcf)	MC%
● **P-3 4**	**sandy CLAY**	**0.9**	**111.0**	**18.5**

SWELL - STANDARD 302.01 US50.GPJ ROCKSOL TEMPLATE.GDT 7/9/13

SWELL - CONSOLIDATION TEST

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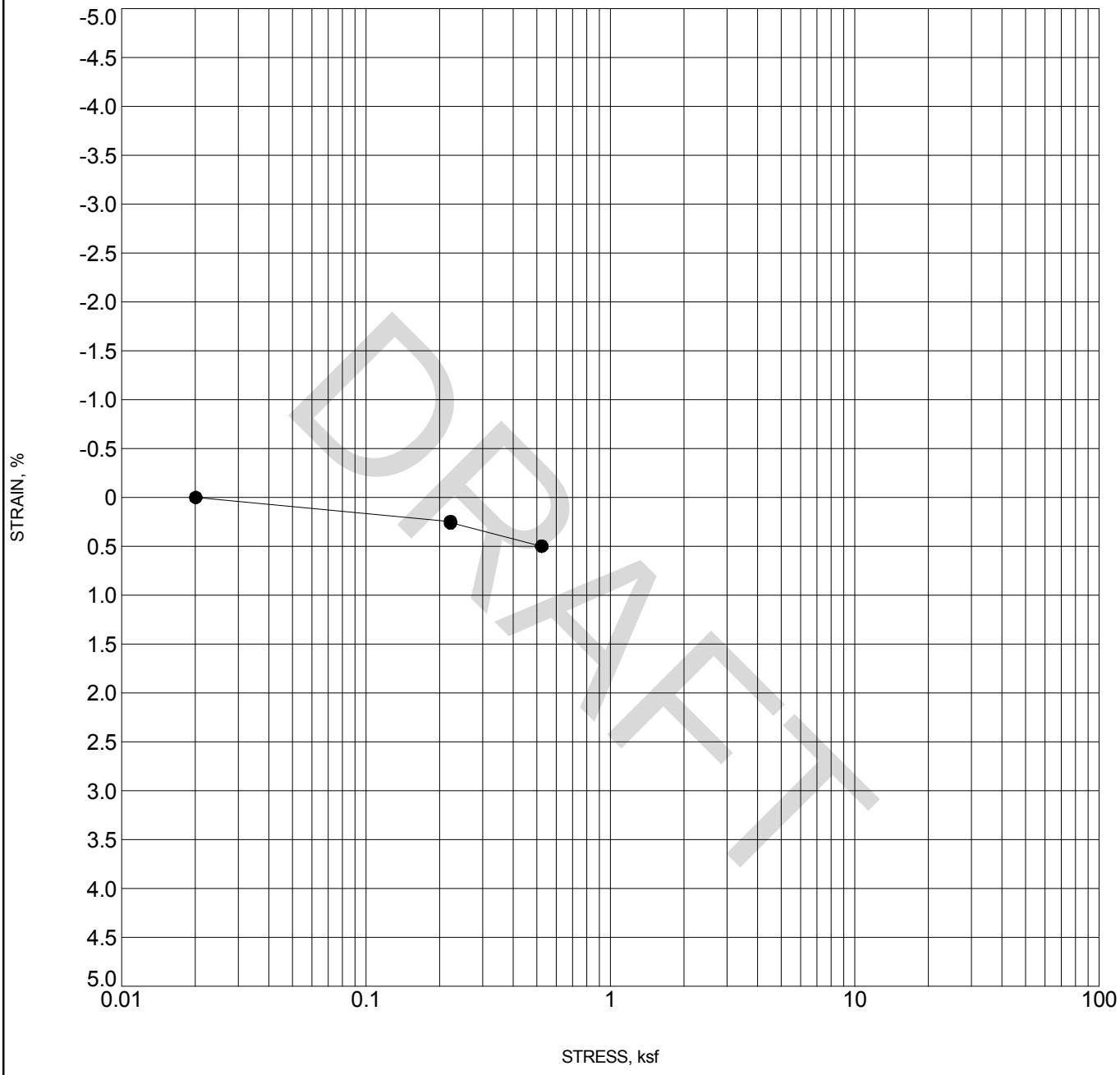

Specimen Identification	Classification	Swell/Consol. (%)	γ_d (pcf)	MC%
● **P-4 2**	**(Fill) sandy CLAY**	**0.0**	**108.7**	**18.7**

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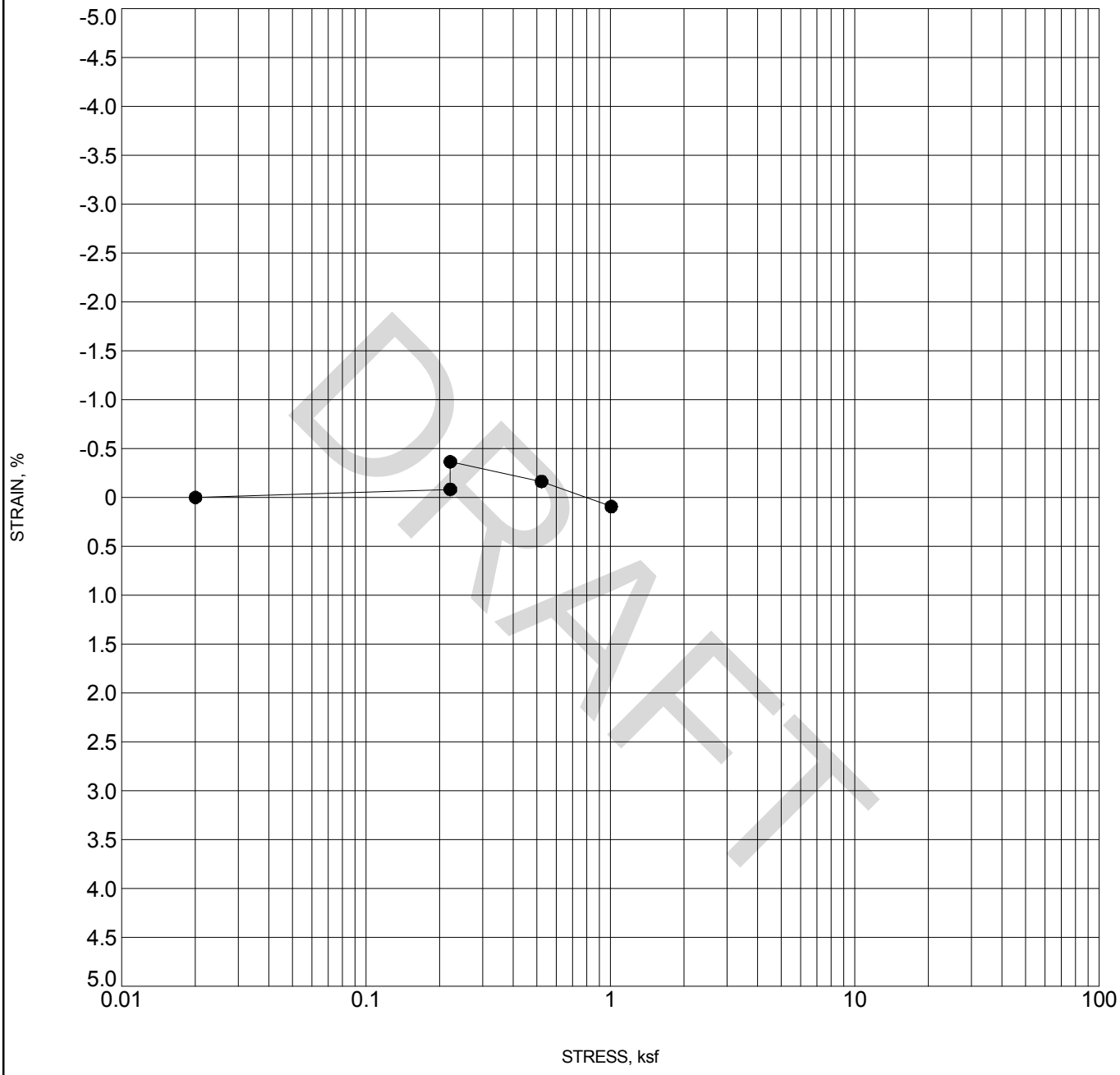

Specimen Identification	Classification	Swell/Consol. (%)	γ_d (pcf)	MC%
● **P-7 2**	**(Fill) sandy CLAY**	**0.3**	**123.7**	**11.9**

SWELL - STANDARD 302.01 US50.GPJ ROCKSOL TEMPLATE.GDT 7/9/13

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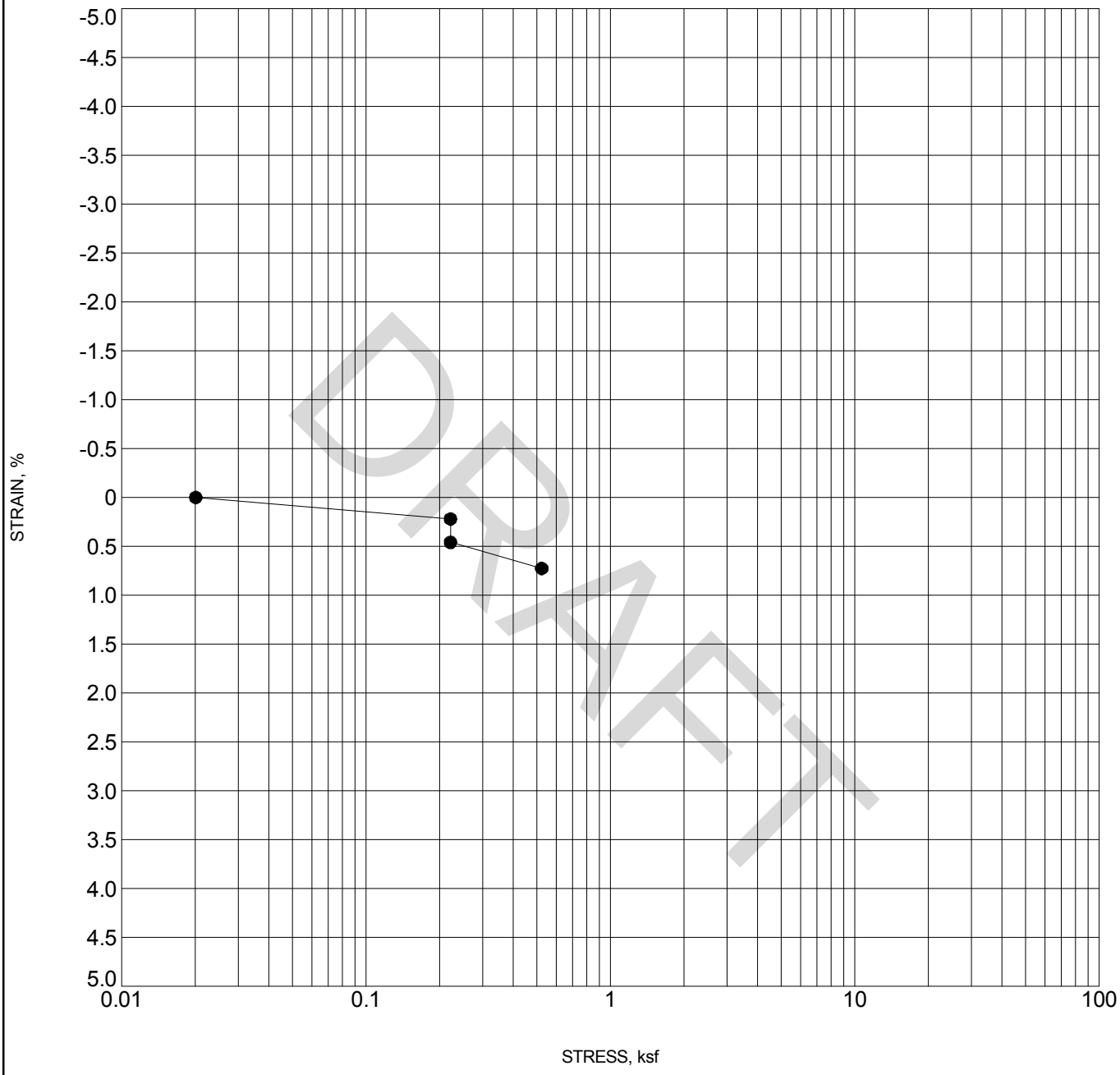

Specimen Identification	Classification	Swell/Consol. (%)	γ_d (pcf)	MC%
● P-8 2	**(Fill) sandy CLAY**	**-0.2**	**121.2**	**9.3**

SWELL - CONSOLIDATION TEST

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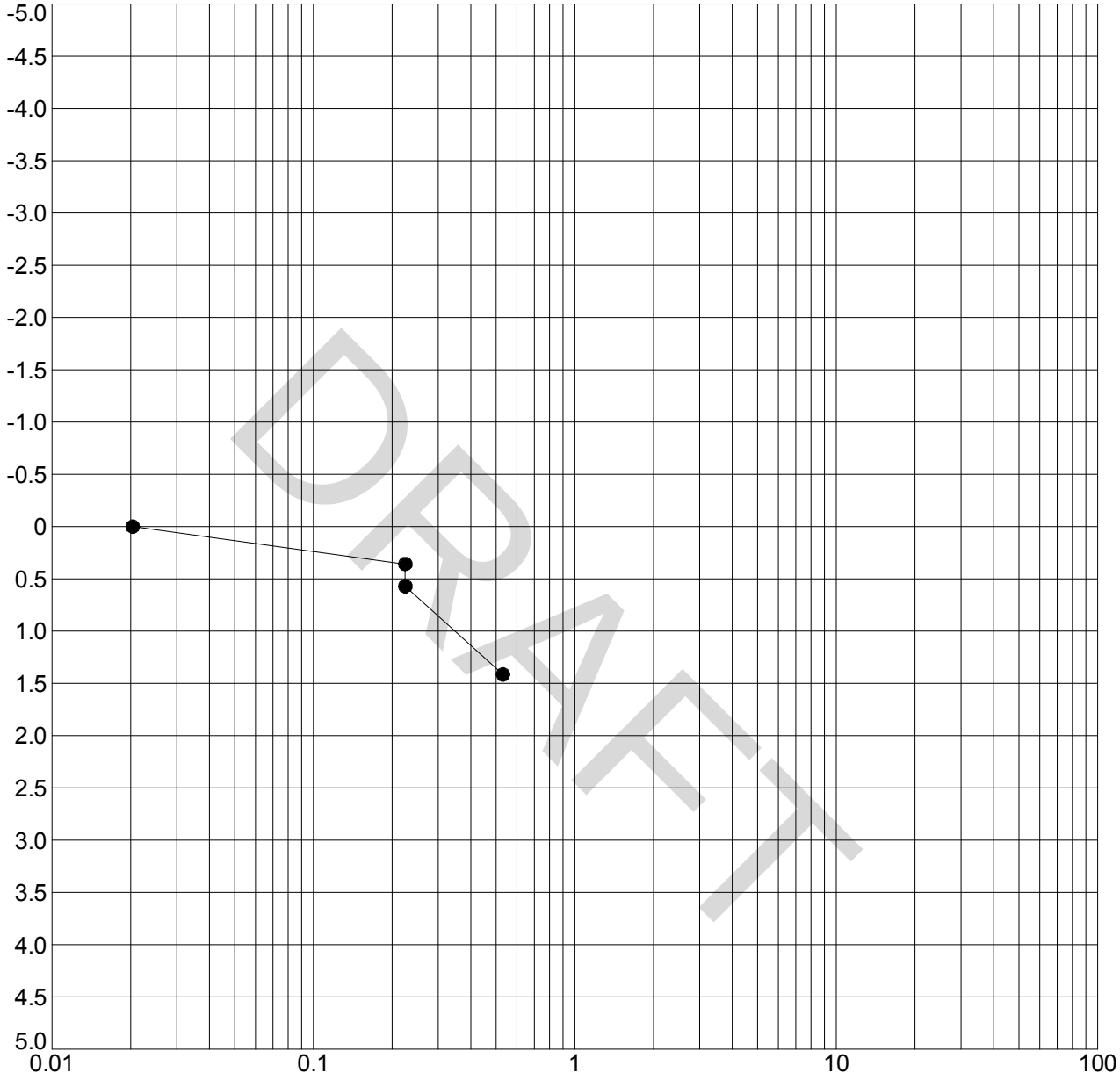

Specimen Identification	Classification	Swell/Consol. (%)	γ_d (pcf)	MC%
● **P-9 2**	**(Fill) sandy CLAY**	**-0.2**	**124.1**	**12.3**

SWELL - CONSOLIDATION TEST

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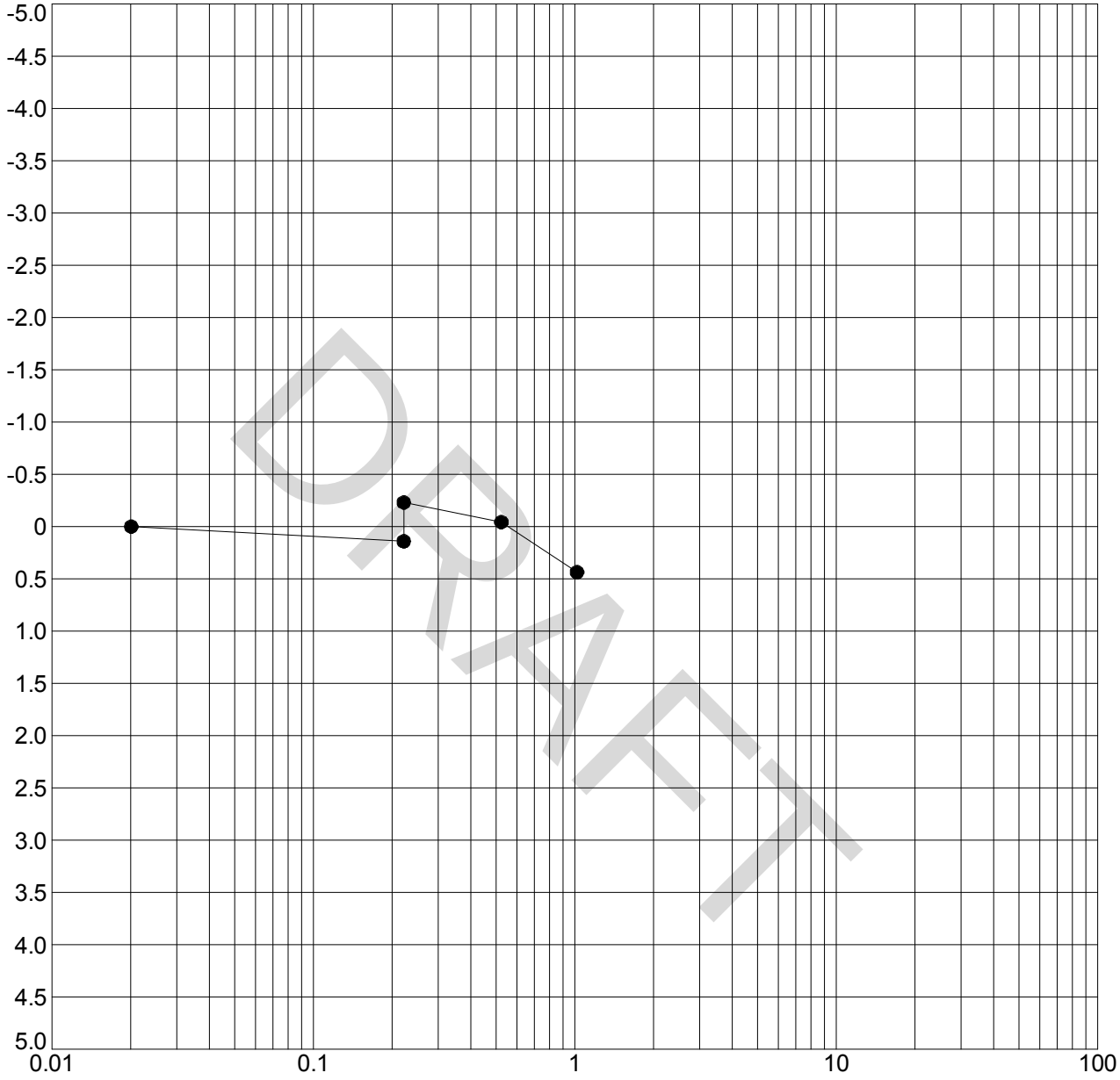

Specimen Identification	Classification	Swell/Consol. (%)	γ_d (pcf)	MC%
● **P-11 4**	**sandy CLAY**		**107.7**	**14.9**

SWELL - CONSOLIDATION TEST

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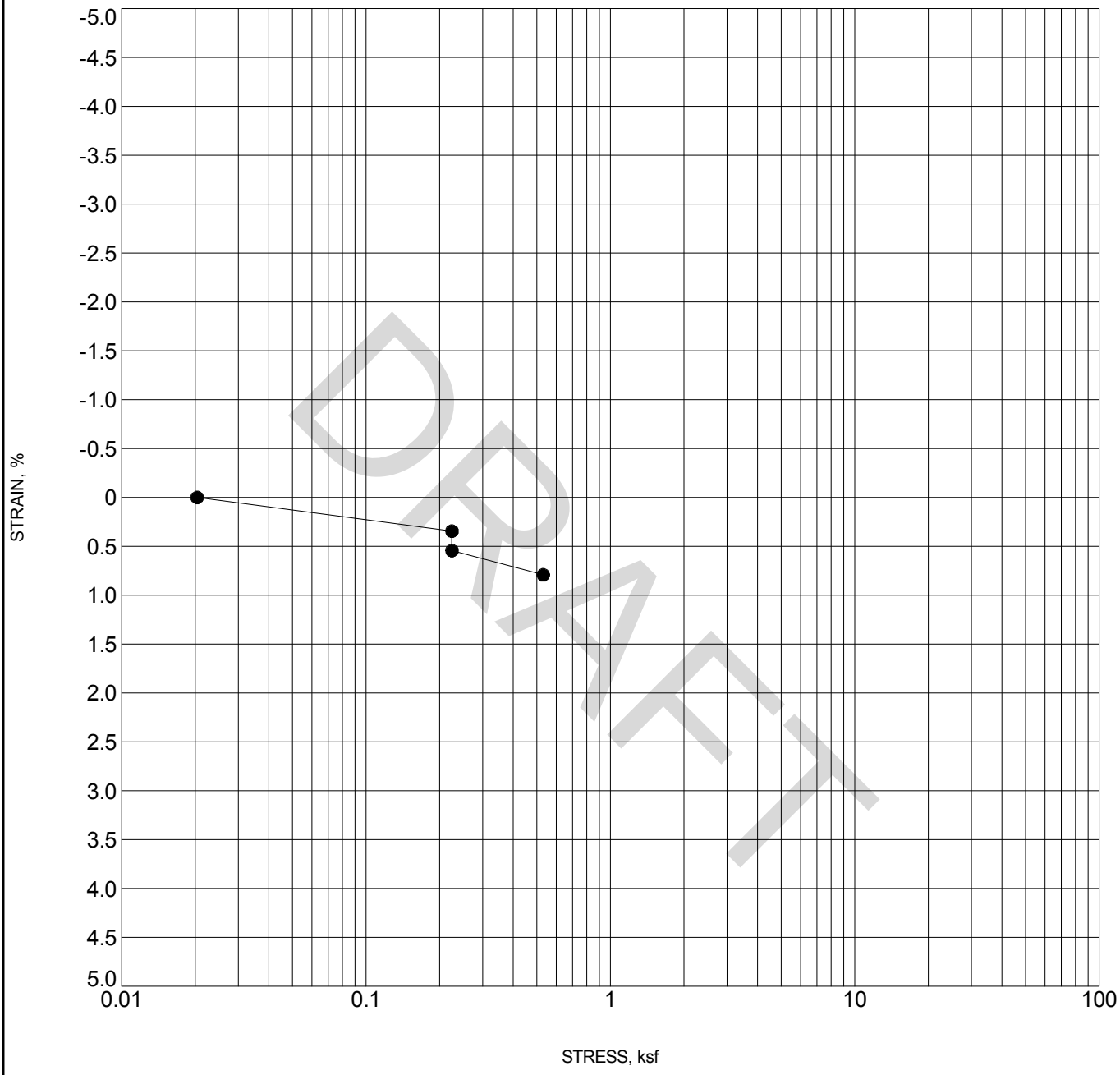

Specimen Identification	Classification	Swell/Consol. (%)	γ_d (pcf)	MC%
● **P-12 2**	**(Fill) silty SAND**	**-0.2**	**124.7**	**11.9**

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SWELL - CONSOLIDATION TEST

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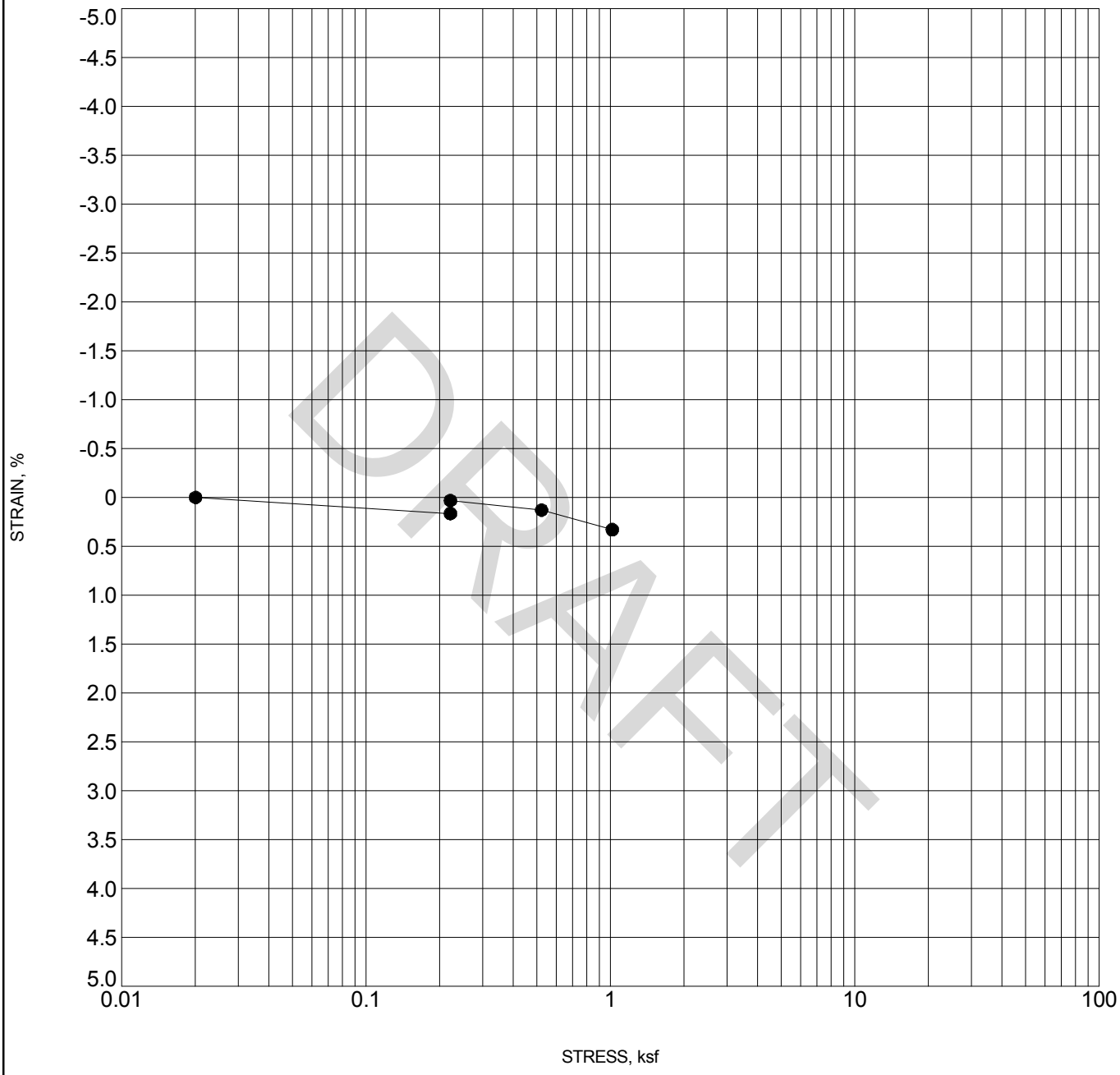

Specimen Identification	Classification	Swell/Consol. (%)	γ_d (pcf)	MC%
● **P-14 4**	**sandy, CLAY**	**0.1**	**110.3**	**18.3**

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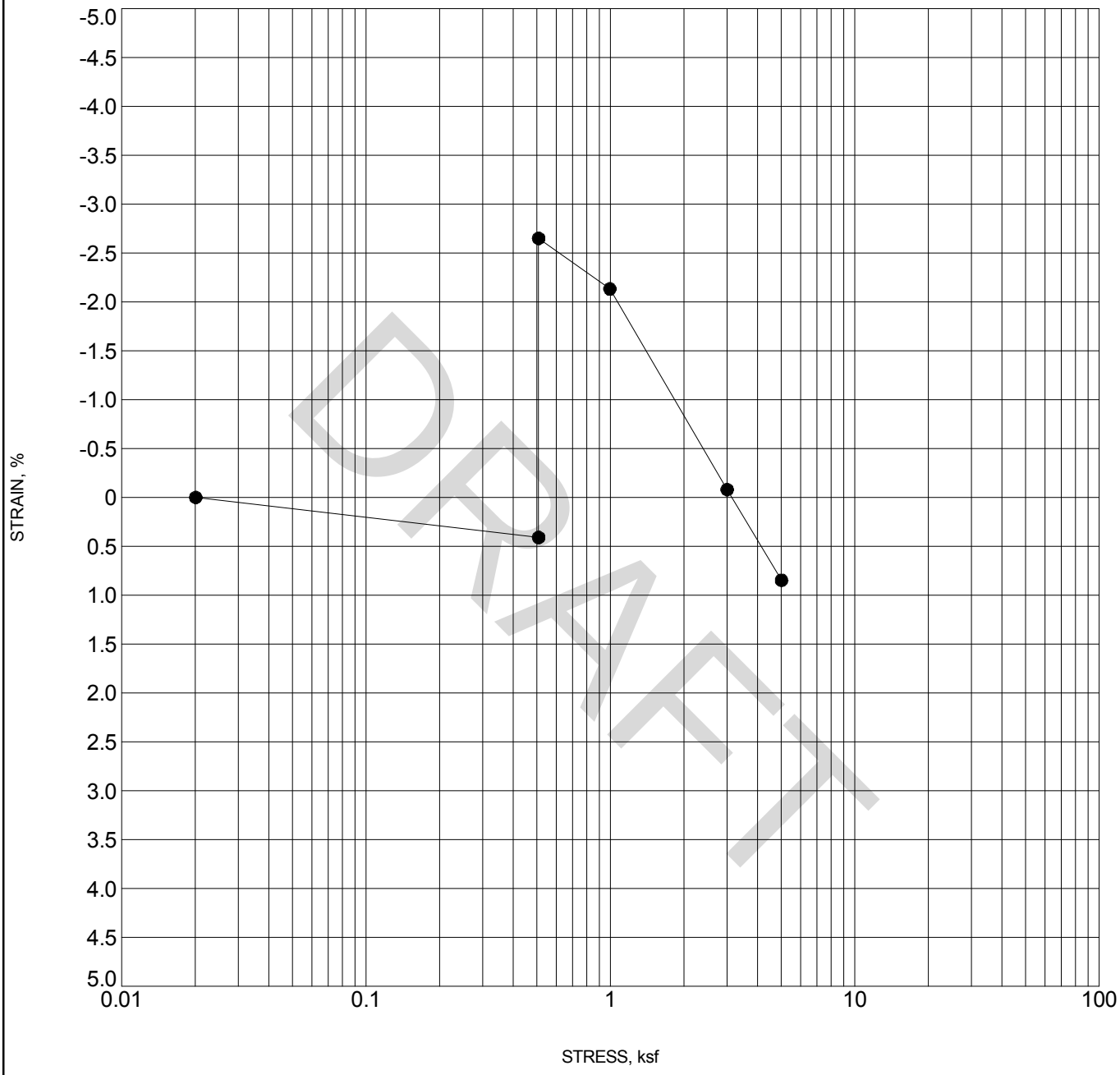

Specimen Identification	Classification	Swell/Consol. (%)	γ_d (pcf)	MC%
● P-14 9	(Bedrock) clayey SANDSTONE	3.1	121.8	14.3

SWELL - CONSOLIDATION TEST

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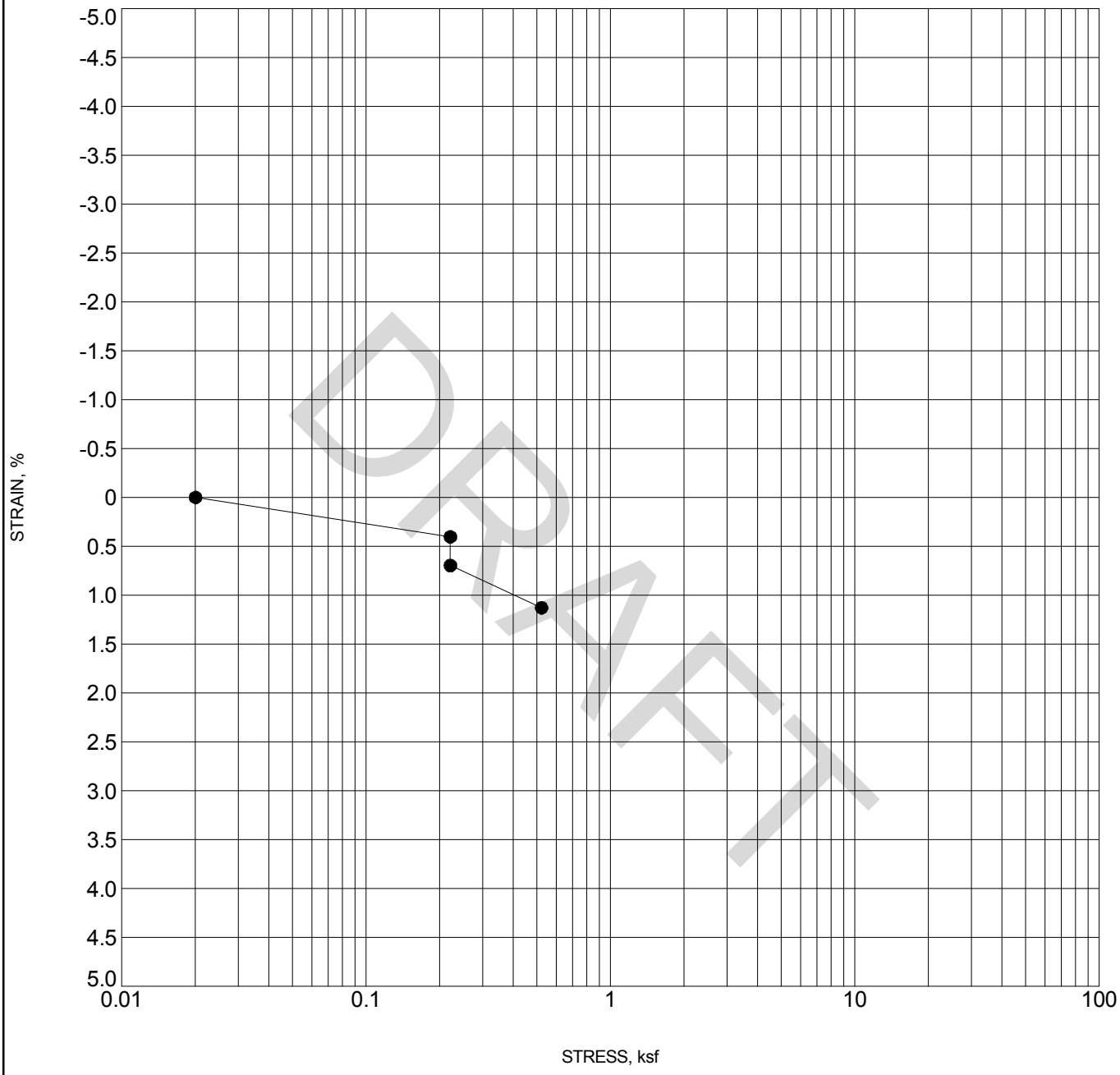

Specimen Identification	Classification	Swell/Consol. (%)	γ_d (pcf)	MC%
● **P-15 2**	**(Fill) silty SAND**	**-0.3**	**130.9**	**10.0**

SWELL - STANDARD 302.01 US50.GPJ ROCKSOL TEMPLATE.GDT 7/9/13

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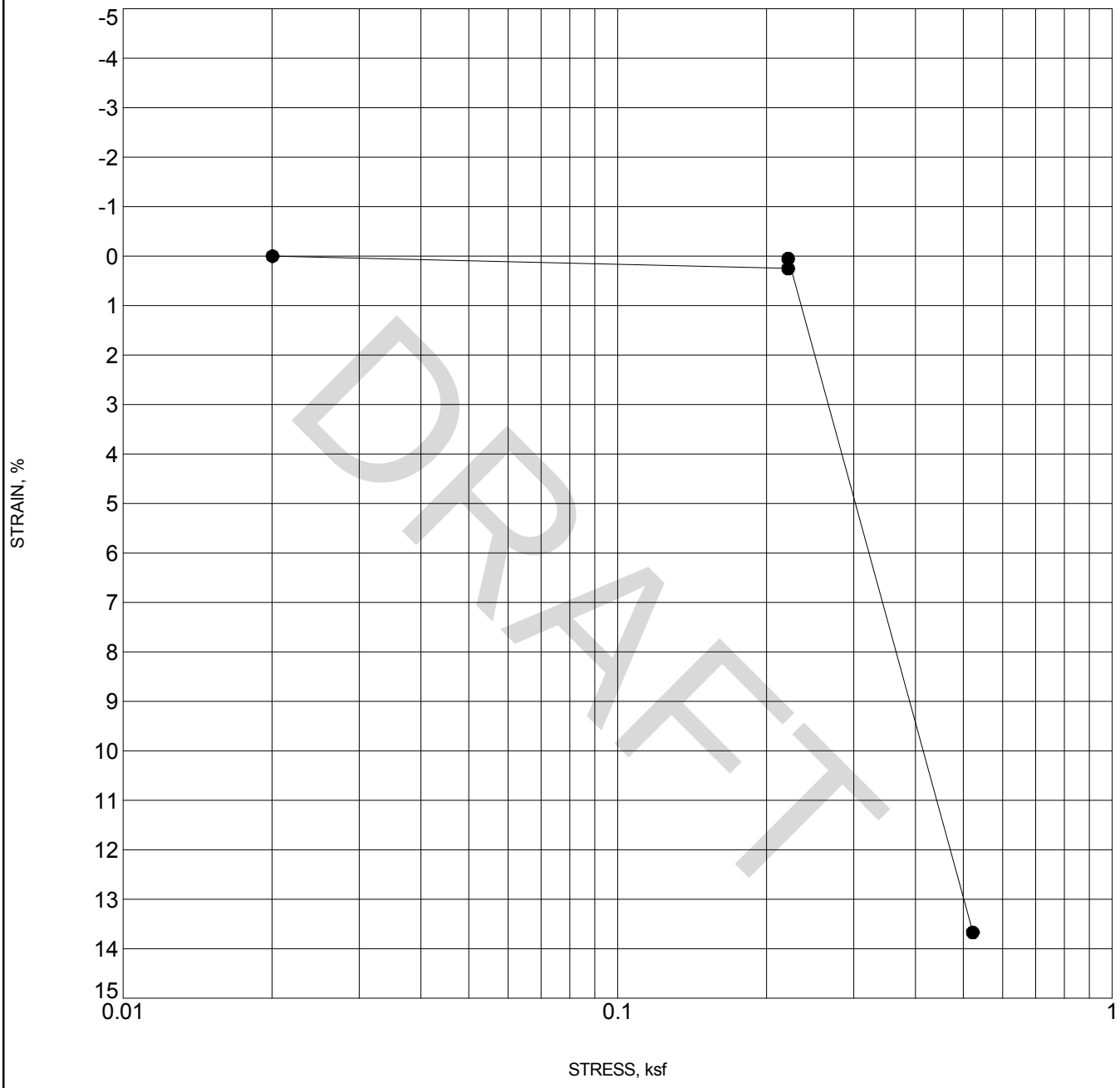

Specimen Identification	Classification	Swell/Consol. (%)	γ_d (pcf)	MC%
● P-16 2	(Fill) sandy CLAY wiht silty SAND	0.2	119.4	15.4

SWELL - CONSOLIDATION TEST

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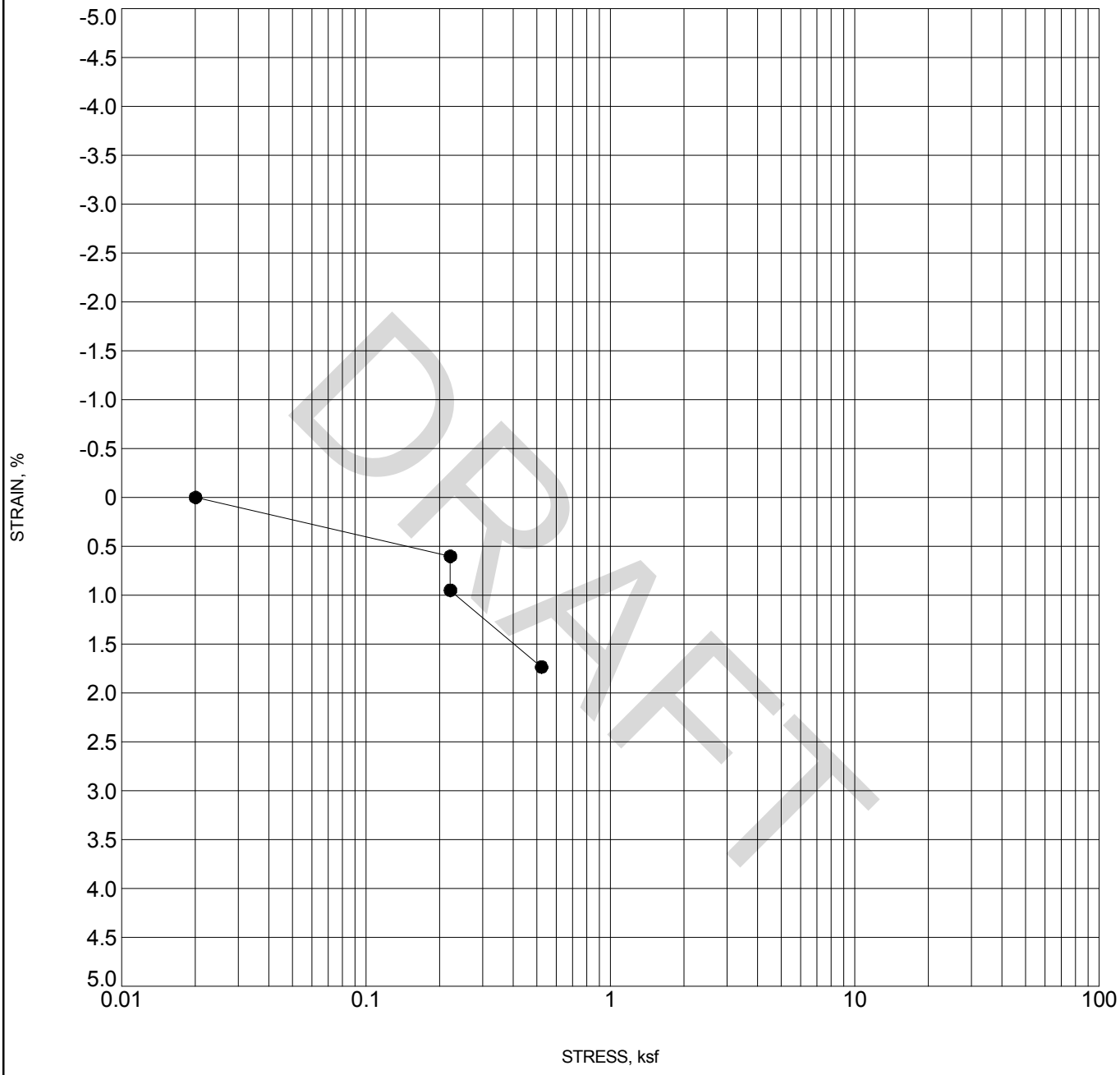

Specimen Identification	Classification	Swell/Consol. (%)	γ_d (pcf)	MC%
● **P-17 2**	**(Fill) sandy CLAY**	**-0.4**	**113.2**	**17.9**

SWELL - STANDARD 302.01 US50.GPJ ROCKSOL TEMPLATE.GDT 7/9/13

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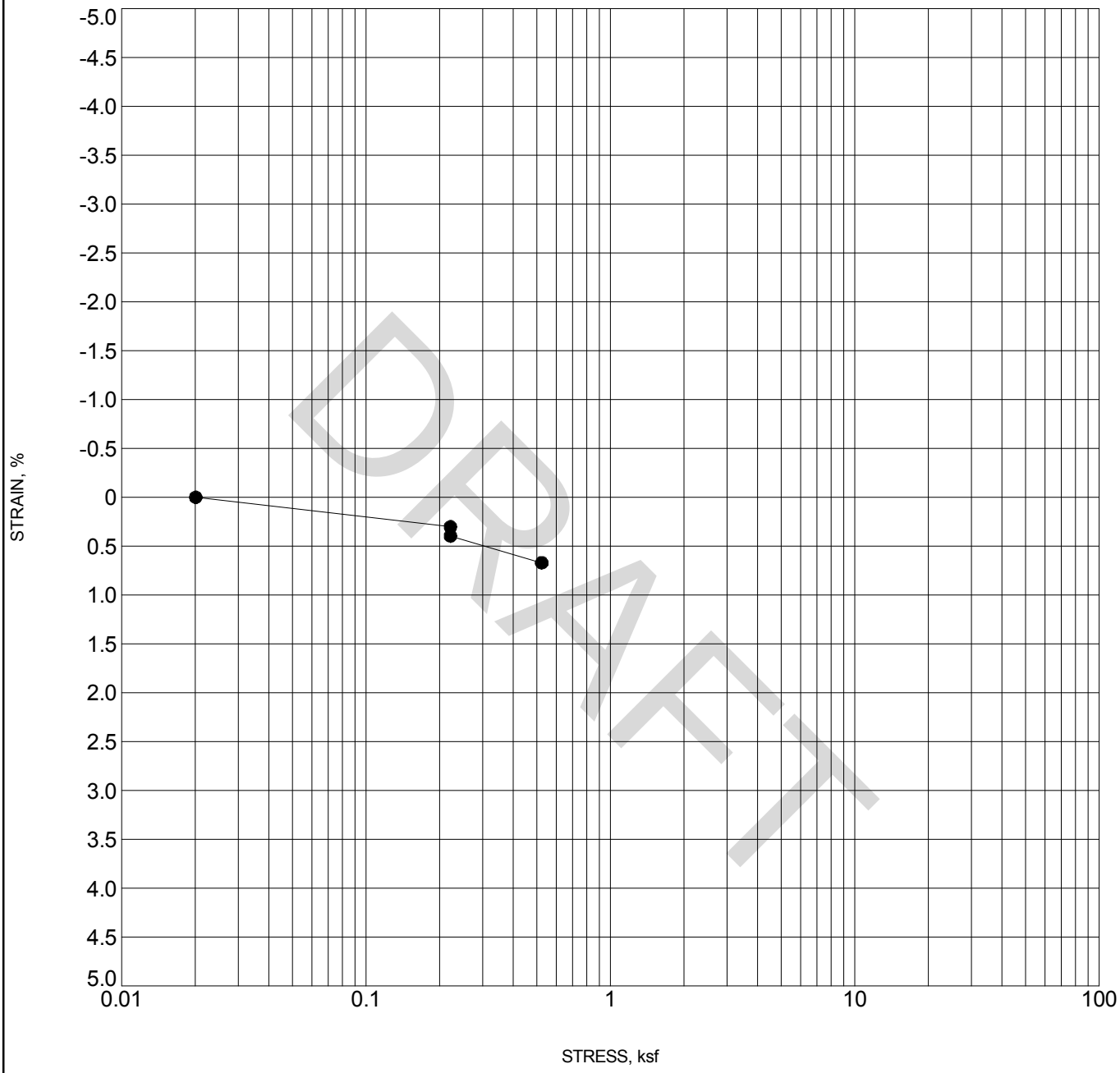

Specimen Identification	Classification	Swell/Consol. (%)	γ_d (pcf)	MC%
● **P-18 4**	**sandy CLAY**	**-0.1**	**107.7**	**18.0**

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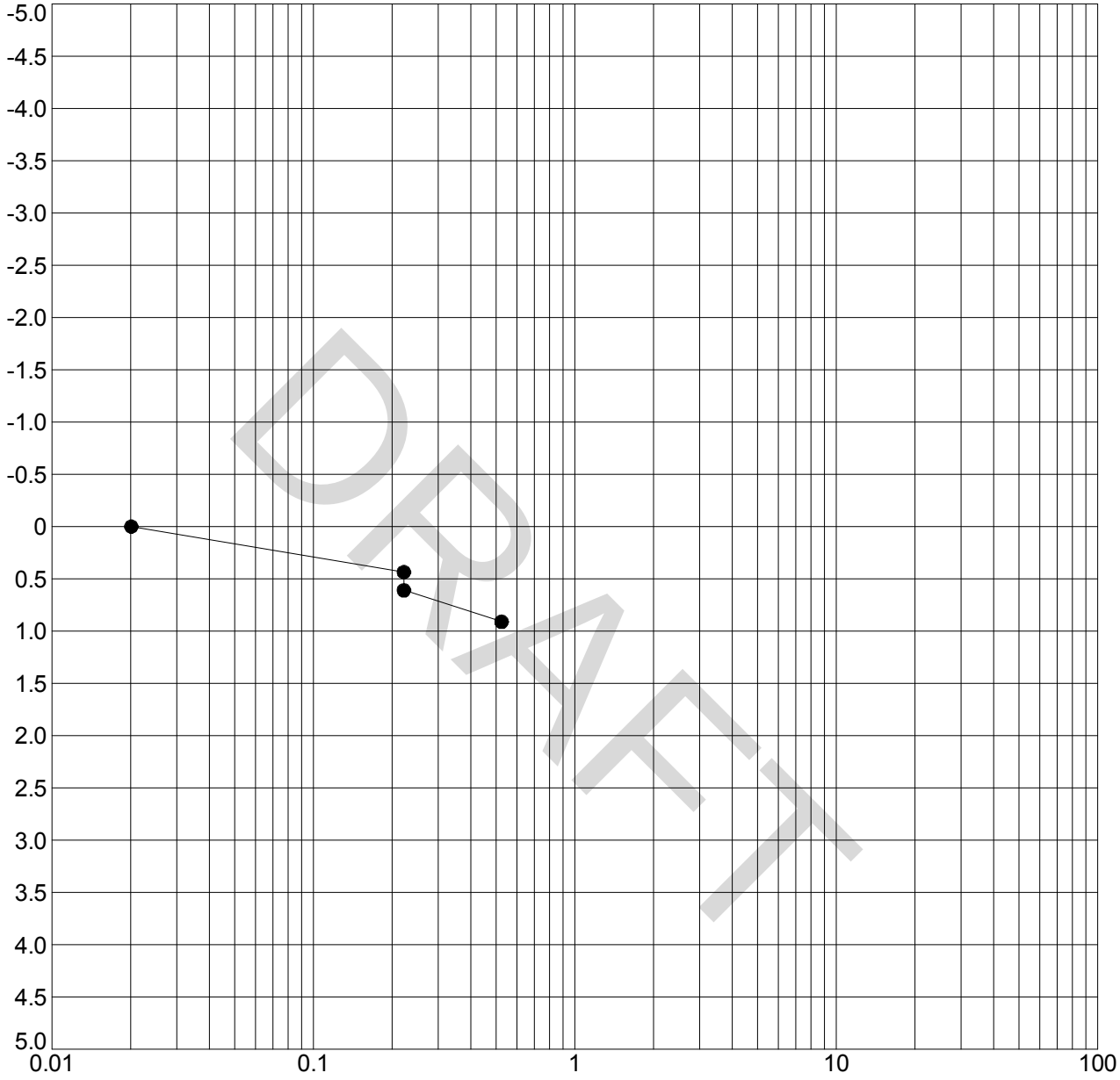

Specimen Identification	Classification	Swell/Consol. (%)	γ_d (pcf)	MC%
● **P-19 4**	**sandy CLAY**	**-0.2**	**111.1**	**17.3**

SWELL - CONSOLIDATION TEST

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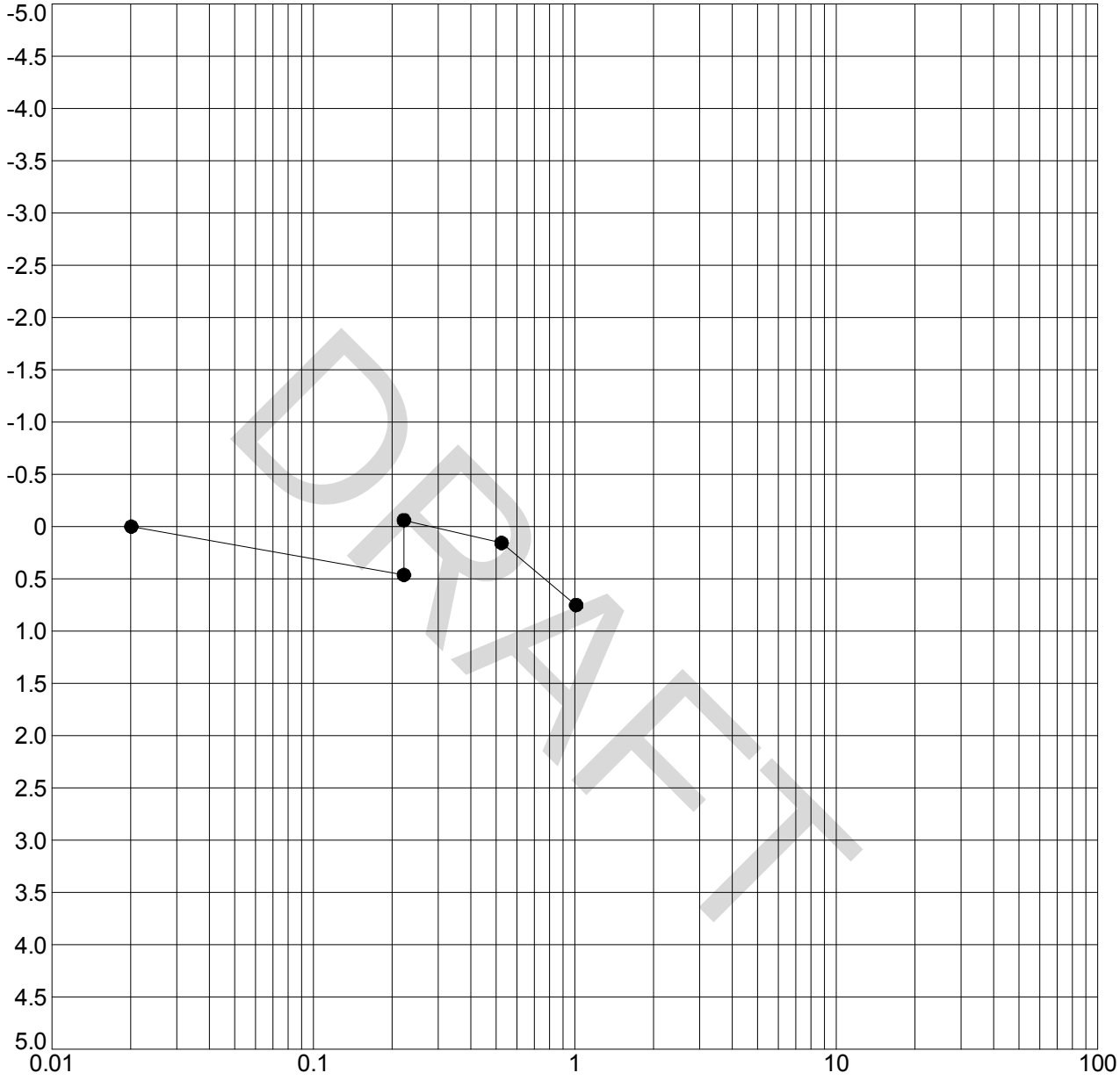

Specimen Identification		Classification	Swell/Consol. (%)	γ_d (pcf)	MC%
● **P-20**	**4**	**sandy CLAY**	**0.5**	**111.0**	**17.3**

SWELL - CONSOLIDATION TEST

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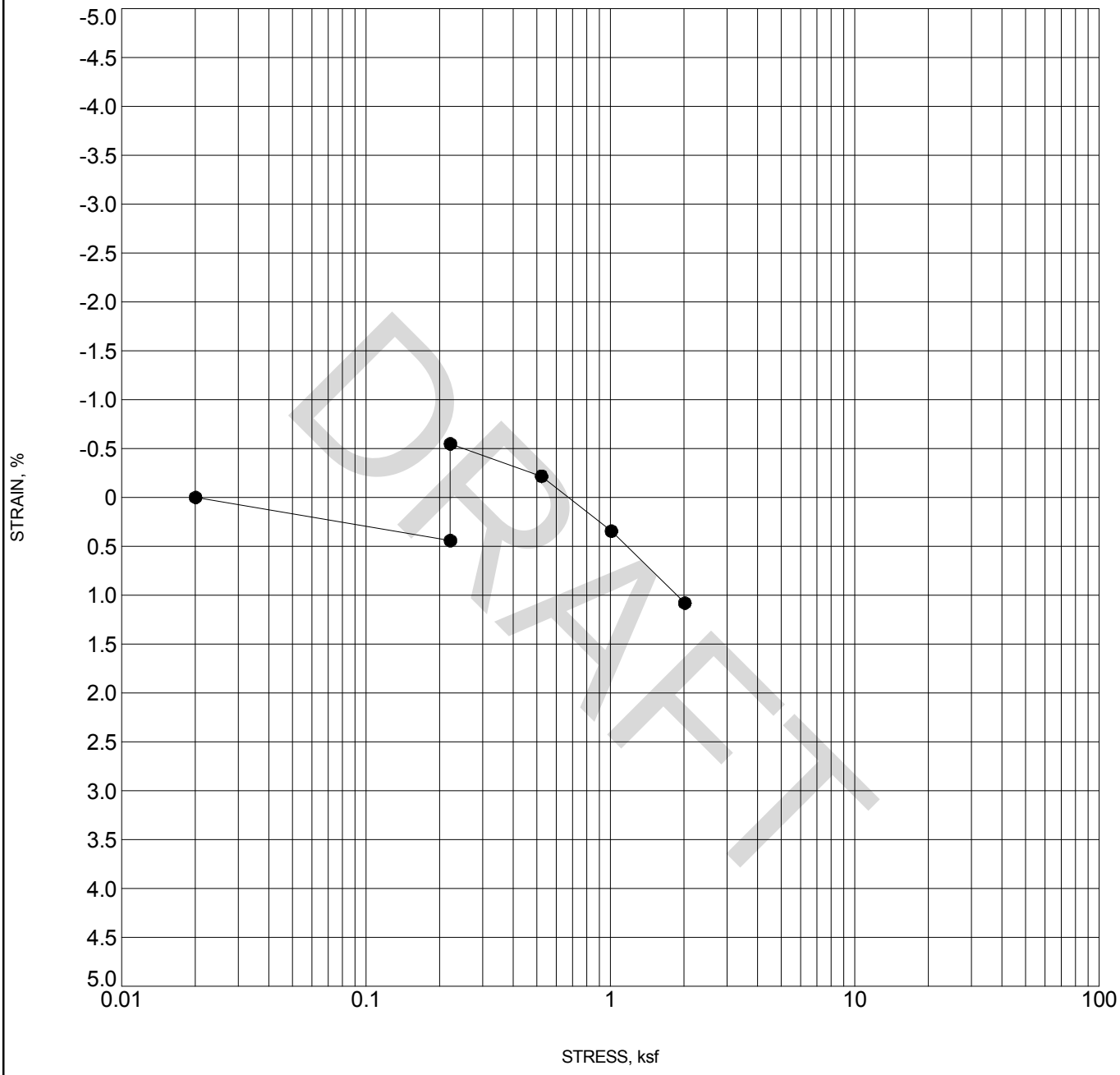

Specimen Identification	Classification	Swell/Consol. (%)	γ_d (pcf)	MC%
● P-21 2	**(Bedrock) CLAYSTONE**	**1.0**	**124.2**	**11.7**

SWELL - CONSOLIDATION TEST

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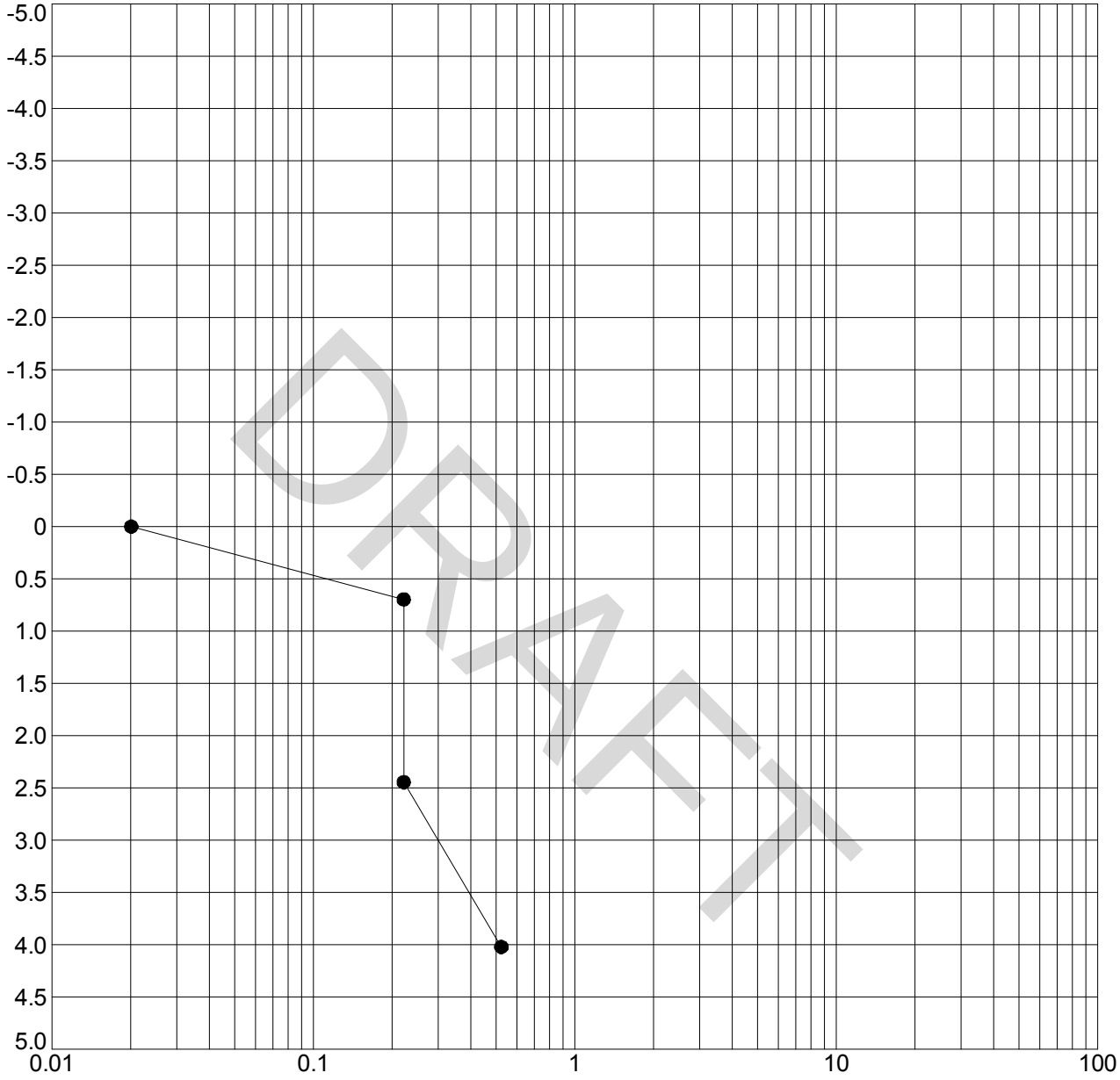


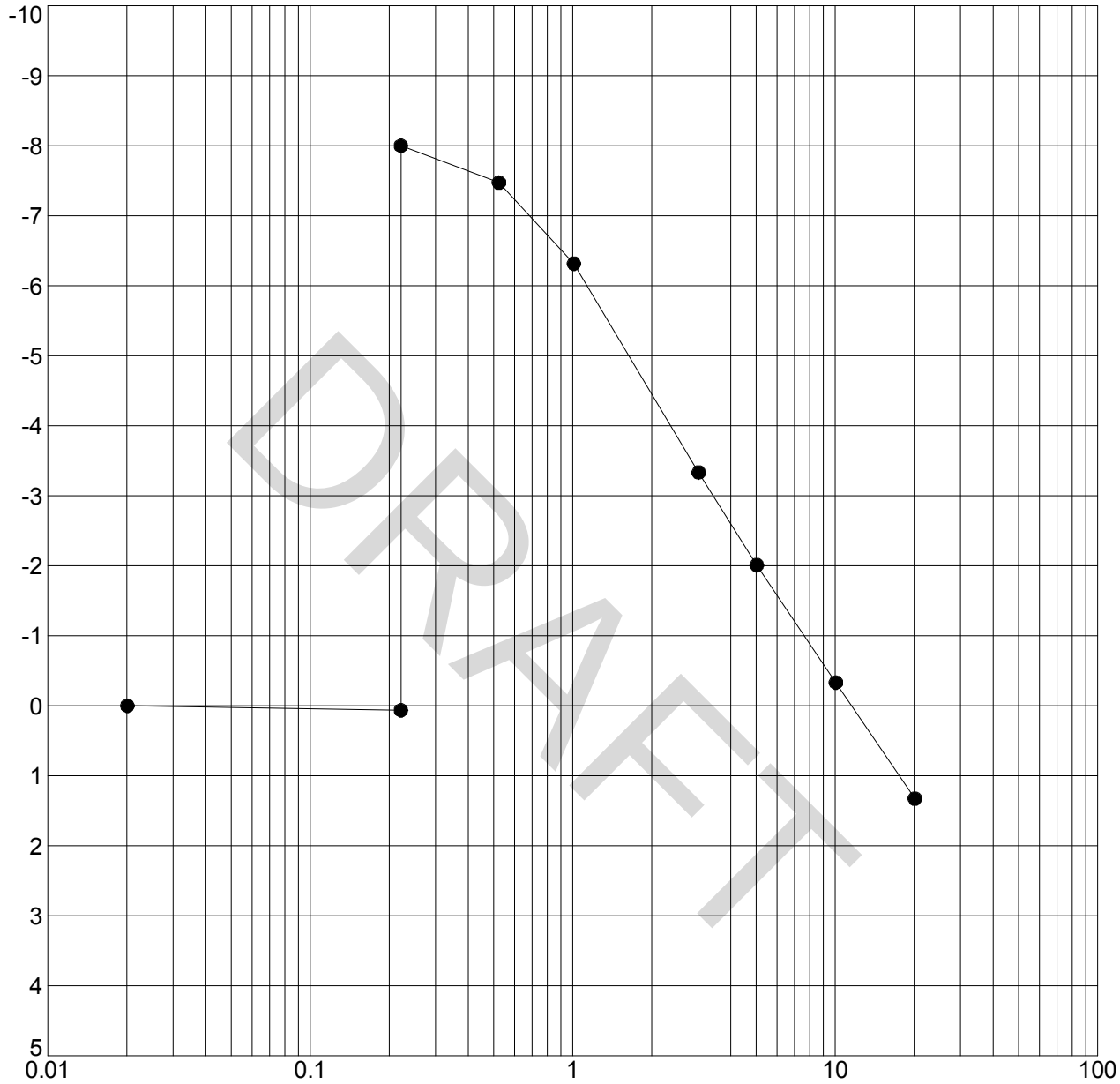
Specimen Identification	Classification	Swell/Consol. (%)	γ_d (pcf)	MC%
● **P-22 2**	**sandy CLAY**	**-1.8**	**111.1**	**8.3**

SWELL - CONSOLIDATION TEST

RockSol Consulting Group, Inc.

CLIENT J.F. Sato & Associates **PROJECT NAME** US50 West - Task Order 4

PROJECT NUMBER 302.01 **PROJECT LOCATION** Purcell to Wills, Pueblo, CO



Specimen Identification	Classification	Swell/Consol. (%)	γ_d (pcf)	MC%
● **P-22 4**	**(Bedrock) CLAYSTONE**	**8.1**	**124.2**	**12.7**

SWELL - CONSOLIDATION TEST

RockSol Consulting Group, Inc.

CLIENT J.F. Sato & Associates **PROJECT NAME** US50 West - Task Order 4

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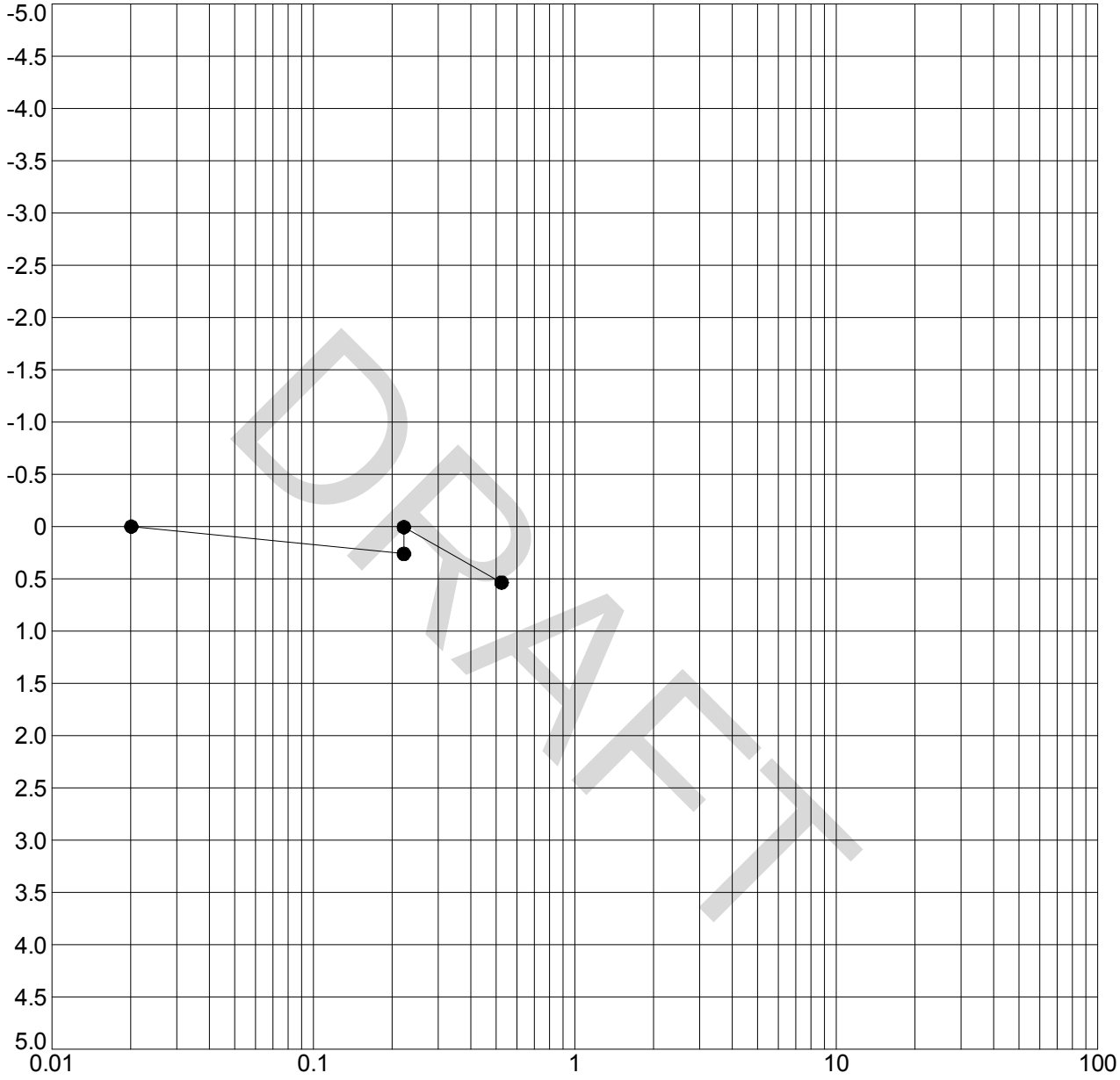


Specimen Identification	Classification	Swell/Consol. (%)	γ_d (pcf)	MC%
● **P-23 2**	**(Bedrock) SHALE**	**0.3**	**127.3**	**8.1**

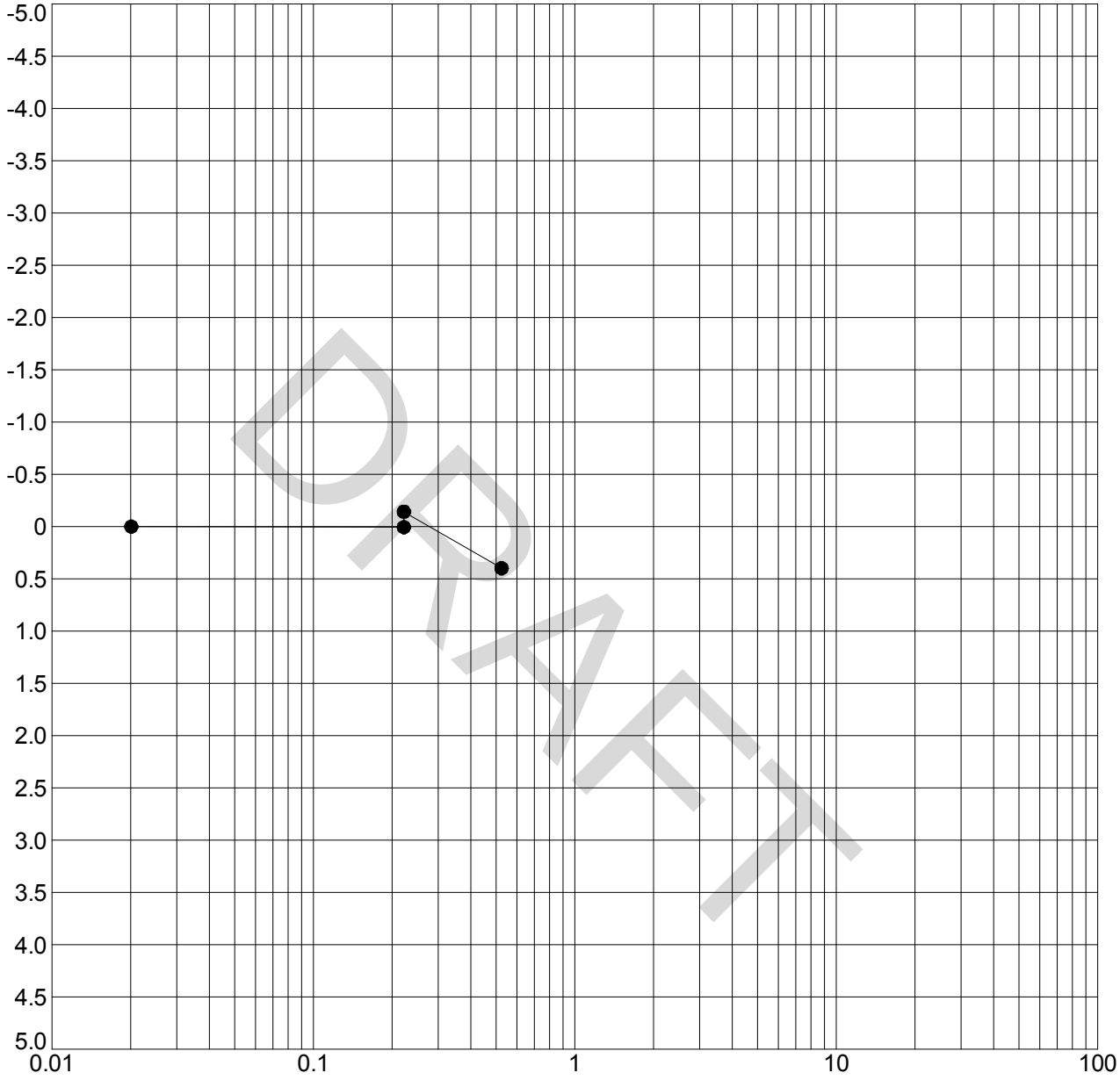
SWELL - STANDARD 302.01 US50.GPJ ROCKSOL TEMPLATE.GDT 7/9/13

SWELL - CONSOLIDATION TEST

RockSol Consulting Group, Inc.

CLIENT J.F. Sato & Associates **PROJECT NAME** US50 West - Task Order 4

PROJECT NUMBER 302.01 **PROJECT LOCATION** Purcell to Wills, Pueblo, CO



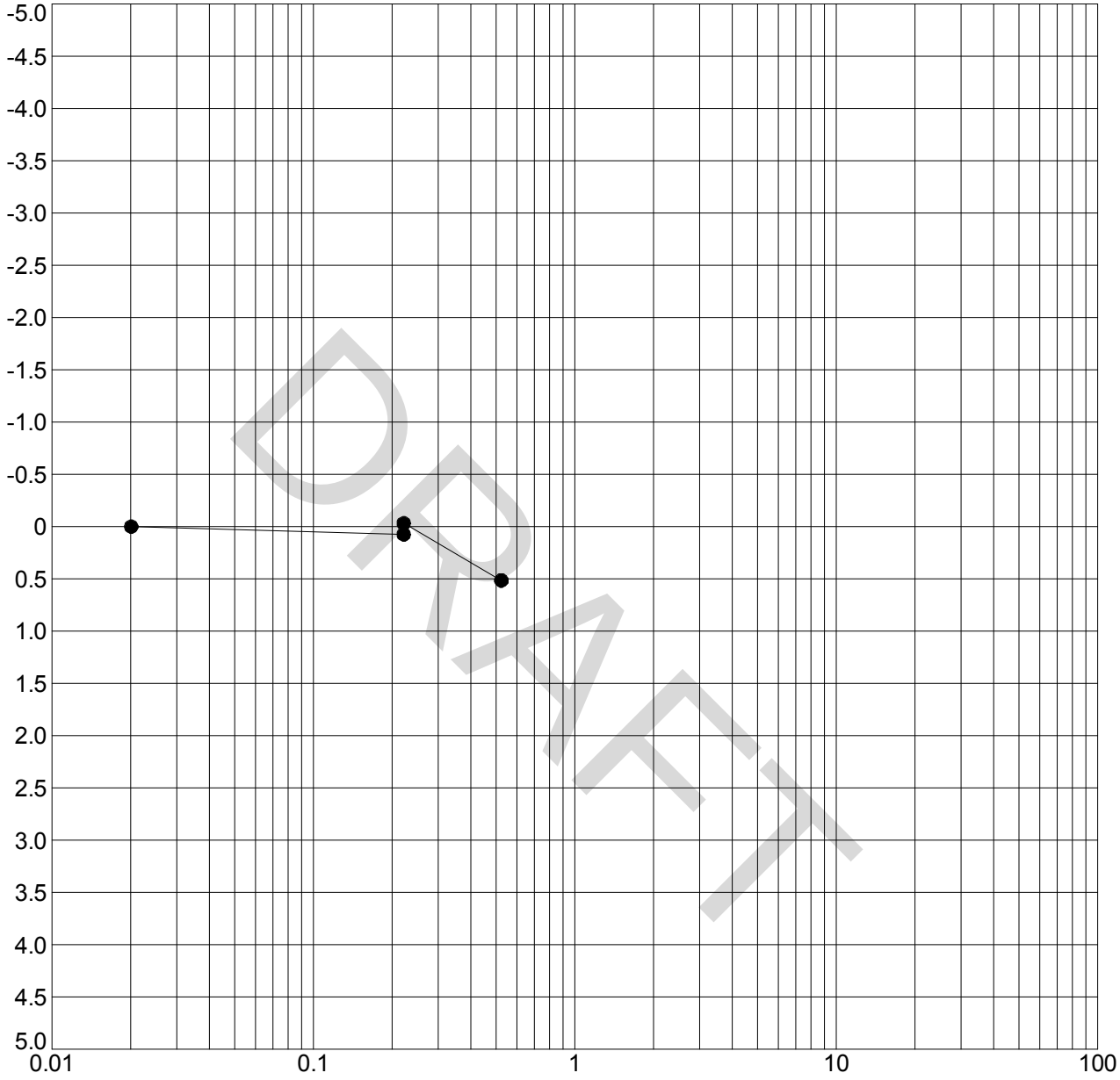
Specimen Identification	Classification	Swell/Consol. (%)	γ_d (pcf)	MC%
● **P-23 4**	**(Bedrock) SHALE**	**0.2**	**126.1**	**10.4**

SWELL - CONSOLIDATION TEST

RockSol Consulting Group, Inc.

CLIENT J.F. Sato & Associates **PROJECT NAME** US50 West - Task Order 4

PROJECT NUMBER 302.01 **PROJECT LOCATION** Purcell to Wills, Pueblo, CO



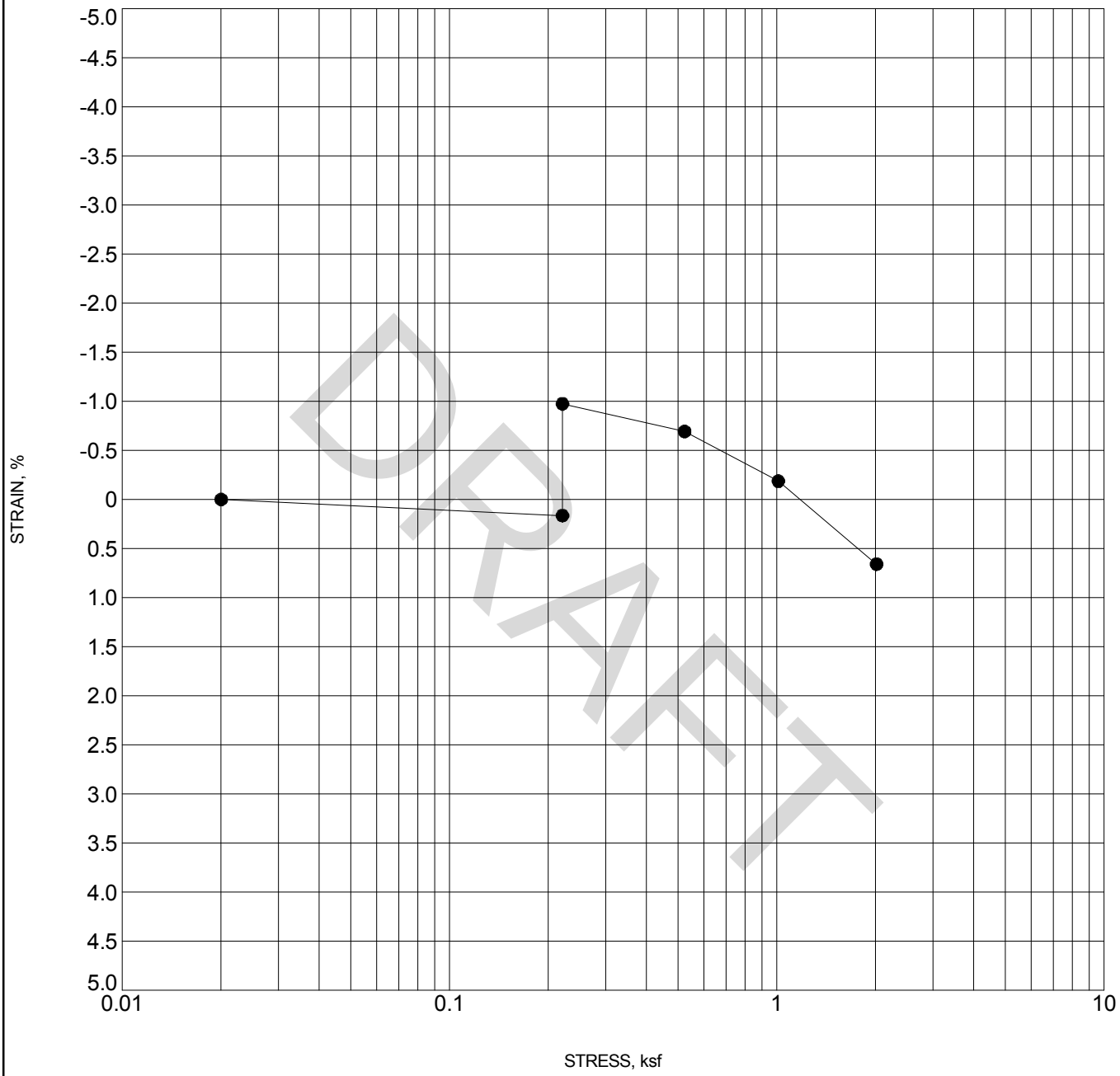
Specimen Identification	Classification	Swell/Consol. (%)	γ_d (pcf)	MC%
● **RW-1 4**	**(Bedrock) clayey SANDSTONE**	**0.1**	**110.0**	**14.8**

SWELL - CONSOLIDATION TEST

RockSol Consulting Group, Inc.

CLIENT J.F. Sato & Associates **PROJECT NAME** US50 West - Task Order 4

PROJECT NUMBER 302.01 **PROJECT LOCATION** Purcell to Wills, Pueblo, CO



Specimen Identification	Classification	Swell/Consol. (%)	γ_d (pcf)	MC%
● **RW-2 4**	**SAND, clayey**	**1.1**	**105.3**	**23.2**

SWELL - STANDARD 302.01 US50.GPJ ROCKSOL TEMPLATE.GDT 7/9/13

APPENDIX C

SUMMARY OF GRADATION SIZE DISTRIBUTIONS APPLICABLE FOR SCOUR ANALYSIS

RockSol Consulting Group, Inc.

SUMMARY OF PHYSICAL & CHEMICAL TEST RESULTS

CLIENT J.F. Sato & Associates

PROJECT NAME US50 West - Task Order 4

PROJECT NUMBER 302.01

PROJECT LOCATION Purcell to Wills, Pueblo, CO

Borehole	Depth (ft)	Elevation (ft)	Liquid Limit	Plastic Limit	Plasticity Index	%<#200 Sieve	Classification		D95 (mm)	D60 (mm)	D50 (mm)	D30 (mm)
							USCS	AASHTO				
B-2	0-4	4767.1	26	17	9	51	SANDY LEAN CLAY (CL)	A-4 (2)	4.357	0.159	Note 1	Note 1
B-3	0-4	4765.9	23	14	9	14	CLAYEY SAND with GRAVEL (SC)	A-2-4 (0)	8.649	4.395	3.419	2.068
B-6	0-4	4766.1	29	14	15	60	SANDY LEAN CLAY (CL)	A-6 (6)	4.169	Note 1	Note 1	Note 1
B-6	5-8	4761.1	NP	NP	NP	5	WELL-GRADED SAND with GRAVEL (SW)	A-1-a (0)	8.703	4.706	3.777	2.433
B-10	0-4	4792.5	29	14	15	46	CLAYEY SAND (SC)	A-6 (3)	7.184	0.245	0.1	Note 1
C-1	0-42"	4764.0	23	15	8	15	CLAYEY SAND with GRAVEL (SC)	A-2-4 (0)	10.605	1.94	1.307	0.489
C-1	3.5-4	4760.5	35	17	18	70	SANDY LEAN CLAY (CL)	A-6 (11)	4.155	Note 1	Note 1	Note 1
C-2	0-0.5	4763.0	NP	NP	NP	22	SILTY SAND with GRAVEL (SM)	A-1-b (0)	11.554	3.508	2.307	0.529
C-2	0.5-1.5	4762.5	31	17	14	96	LEAN CLAY (CL)	A-6 (13)	Note 1	Note 1	Note 1	Note 1
C-2	1.5-2	4761.5	NP	NP	NP	18	SILTY SAND with GRAVEL (SM)	A-1-b (0)	11.785	4.322	2.995	1.185

Note 1: Diameter less than 0.075 mm (<#200 Sieve).