REPORT OF GEOTECHNICAL INVESTIGATION
SITE DEVELOPMENT
SDSU MISSION VALLEY
SAN DIEGO, CALIFORNIA

Prepared for

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Attention: Mr. Michael Masterson

SUBJECT: REPORT OF GEOTECHNICAL INVESTIGATION
Site Development
SDSU Mission Valley
San Diego, California

Mr. Masterson:

Group Delta Consultants (Group Delta) is submitting this geotechnical investigation report for the grading and civil works (*Site Development*) that is part of the redevelopment of the former SDCCU site (overall site) into the San Diego State University Mission Valley (SDSU MV) campus. The ultimate development of the site (*Full Build Out*) will consist of a Stadium, Campus Expansion, Tailgate Park, Hotel and Conference Center, Residential, and Park Space.

Group Delta prepared this report per our Agreement for Consulting Services dated January 23rd, 2019. This issue of the report is the first draft of the Report of Geotechnical Investigation. The purpose of this report is to provide preliminary information to support the collaborative design-build procurement of the Site Development package. Revisions may be needed for design development and to obtain construction permits.

This report provides interpretations of the geologic and geotechnical conditions observed and preliminary recommendations for design and construction of the grading and civil works for Phases 1B to 4. Group Delta is submitting a separate geotechnical report for the Stadium along with another report for subsurface environmental conditions of the overall site. This report does not provide geotechnical recommendations for the Full Build Out, but it does discuss mitigation of geotechnical conditions that could be included in the Site Development package.

We appreciate this opportunity to be of continued professional service. Please contact us with questions or comments, or if you need anything else.

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1.0 INTRODUCTION

This report presents the results of a geotechnical investigation by Group Delta Consultants (Group Delta) for the grading and civil works (referred to as the *Site Development* package) to redevelop the former SDCCU stadium site (overall site) into the San Diego State University Mission Valley (SDSU MV) campus. Figure 1, Site Location, shows the location of the project. Figure 2, Proposed Development, shows the plan layout of the project.

The purpose of this report is to provide preliminary information to support the collaborative design-build procurement of the Site Development package. This report provides interpretations of the geologic and geotechnical conditions observed and preliminary recommendations for design and construction the grading and civil works for Phases 1B to 4. Revisions may be needed for design development and to obtain construction permits.

This report does not provide geotechnical recommendations for the buildings and parking structures planned for the ultimate development of the overall site (referred to as *Full Build Out*). However, this report discusses potential mitigation of geotechnical conditions that could be included in the Site Development package to facilitate construction of these structures.

Group Delta (2019b) submitted a separate geotechnical investigation report for the Stadium, the Phase 1A Grading, and the portion of Phase 1B Grading, that are the responsibility of Stadium Contractor. Group Delta (2019c) also submitted a report for subsurface environmental conditions of the overall site.

Group Delta developed the recommendations from reviewing the referenced previous studies, recent subsurface exploration and laboratory testing, geologic and geotechnical engineering interpretation and analyses, and our previous experience with similar geologic conditions.

1.1 Scope of Services

This report was prepared in general accordance with the provisions of the referenced proposal (GDC, 2019a). In summary, we provided the following scope of services.

- Review of the previous geologic and geotechnical studies referenced in this report. Plate 1, Geotechnical Map, shows the locations of relevant prior exploratory borings. Appendix A provides the records from these explorations.
- Subsurface exploration consisting of 29 exploratory borings, 10 Cone Penetration Tests (CPTs) and three infiltration tests at the approximate locations shown on Plate 1, Geotechnical Map. Appendix B provides records from these explorations and Appendix D provides the results of the infiltration testing.
- Laboratory testing of soil samples collected from the borings. Laboratory tests included sieve analysis, Plasticity Index, Expansion Index, corrosion (pH, resistivity,

soluble sulfate and chloride), shear strength (direct shear) and compressibility (consolidation). Appendix C provides the laboratory test results.

- Engineering analysis of the field and laboratory data to develop geotechnical parameters and preliminary recommendations for design and construction.
- Preparation of this report with our findings, conclusions and recommendations.

1.2 Site Description

The former SDCCU stadium site occupies about 170 acres in the Mission Valley area of the City of San Diego as shown on Figure 1, Site Location. The existing stadium is in the center of the site. Asphalt paved surface parking covers the remainder of site. The Mission Valley West Light Rail Transit runs east-west near the southern perimeter of the site.

Surface elevations vary from about 45 to 100 feet NAVD 88 from southeast to northwest. The basis of elevations stated further in this report is NAVD 88, unless noted otherwise.

1.3 Proposed Development

We have based our understanding of the project on information in the San Diego State University 100% Design Development Architectural and Landscape Plans (Carrier Johnson, 2019), and the 100% Design Development Civil Plans and the Conceptual Phasing Plan (Rick Engineering, 2019a,b). Figure 2, Proposed Development, shows the plan layout of the project. Plate 1, Geotechnical Map uses the “Opening Day” cut/fill exhibit as the base map.

The site will be developed in two main phases referred to as *Opening Day* and *Full Build Out*. The Opening Day configuration comprises the new Aztec Stadium (Stadium), temporary surface parking surrounding the Stadium and Park Space along the southern and eastern perimeter of the overall site. Full Build Out replaces the temporary surface parking with a Campus Expansion, Tailgate Park, Hotel & Conference Center, and Residential areas.

The grading and civil works to prepare the site and planned for in the Site Development package will be completed in the following phases:

Phase 1A: Initial grading of Stadium pad (by Stadium Contractor, not part of this report).

Phase 1B: Demolition of the western portion of SDCCU stadium (by Stadium Contractor) and rough grading of the western half of site.

Phase 2: Construct Stadium (not part of this report)

Phase 3: Demolition of the eastern portion of SDCCU stadium and rough grading for the residential pads.

Phase 4: Precise grading of residential pads.

1.3.1 Cut and Fill Earthwork

Cut and fill earthwork will reform the site to create new streets and building pads and raise it above the 100-year floodplain. Cut and fill volumes are estimated to be 750,000 cubic yards (CY) and 1,065,000 CY with a net import of 315,000 CY, exclusive of shrinkage and bulkage, and remedial grading.

Cut will remove some of the fill placed to create the SDCCU stadium pad, form the Stadium lower seating bowl and field level, and form the eastern half of the Stadium Zone of the Campus Expansion (this area will be a designated borrow area for the Stadium grading). The Stadium Contractor will complete all the earthwork in the Stadium site and demolish the southeast portion of the SDCCU stadium.

Fill will raise grades within the former SDCCU stadium field level and create large level areas across the northern and southwest portion of the site. The table below summarizes approximate grading data for the various development areas.

GRADING DATA

Development Area	Finished Subgrade Elevation, feet	Maximum Cut Thickness, feet	Maximum Fill Thickness, feet
Campus Expansion – Campus Zone	55	10	20
Campus Expansion – Stadium Zone	75	10	20
Tailgate Park	80 to 85	10	25
Hotel & Conference Center	85	10	20
Residential – North (R1 to R9)	70 to 75	20	15
Residential – South (R10 to R15)	65	25	20
Park Space (Southwest)	55	5	5
Park Space (Southeast to Northeast)	55	10	10

A fill slope inclined at 3:1 provides a separation between the eastern portion of the building pads for the Residential areas and Park Space. Cut and fill slopes formed at 2:1 will create new interior streets and the temporary surface parking in the areas west and south of the Stadium.

1.3.2 Civil Site Work

Surface parking covered with asphalt concrete or gravel is planned for Opening Day in areas north, west and south of the Stadium. Above- and below-ground parking structures for the Campus Expansion and Hotel & Conference Center will ultimately replace the Opening Day surface parking.

New interior streets will be 6-Lane Major, 4-Lane Major and 2-Lane Collectors covered with asphalt concrete pavement constructed according to City of San Diego Standard Drawings, Schedule J, Pavement Design Standards. There are multiple paving types for roads, parking lots and trails. This report provides recommendations for Paving Type 2, Asphalt Concrete with Aggregate Base.

The existing Friars Road, Mission Village Drive (including the bridge over Friars Road) and San Diego Mission Road will be widened or reconstructed. A new connection to Fenton Parkway will be needed as well. This report only provides recommendations for new interior streets.

Existing sewer, storm drain, water and dry utilities will be abandoned. There will be new sewer, storm drain, water, dry utilities, and fireline. A new 30-foot wide box culvert will be constructed in the northeast portion of the site extending under the proposed Murphy Creek Road. Gravity flow utilities have a minimum gradient of 0.5 percent.

Storm water improvements include several new infiltration basins in the Park Space area along the southern and eastern portions of the property.

1.3.3 Full Build Out

Full Build Out will consist of the development areas listed below.

- Campus Expansion
- Hotel & Conference Center
- Residential
- Tailgate Park and Park Space

The following sections describe the structures planned for in these areas (except for Stadium that is a separate Group Delta report).

1.3.3.1 Campus Expansion

The Campus Expansion will occupy about 28 acres, and it consists of a *Campus Zone* south of the Stadium and a *Stadium Zone* east of the Stadium. The Campus Zone will have 14 buildings that range from 3 to 5 stories with plan areas ranging from 17,000 to 28,000 square feet. The Stadium Zone will have two 5-story buildings with plan areas of 31,000 square feet each. Most of the Campus Zone will have two levels of partially underground parking and most of the Stadium Zone will have a ground level and an underground level of parking.

1.3.3.2 Hotel & Conference Center

The Hotel & Conference Center parcel will occupy about 7 acres north of the Stadium. It will have a 9-story steel and concrete tower, a 3-story wood framed building and a 4-level above ground concrete parking structure.

1.3.3.3 Residential

The 15 Residential parcels will occupy 44 acres of the eastern portion of the overall site. The buildings range from two at 3-stories, eight at 5-stories and five at 21- to 24-stories. The taller structures are steel and concrete construction. The shortest structures are wood-frame construction. Most of the structures use: 1) a "wrap" configuration that consists of a central, above ground multi-story concrete parking structure surrounded by multiple stories of wood-frame construction living units, 2) a concrete podium parking structure with multiple levels of wood-framed living units above the podium, or 3) combinations of these types of construction.

1.3.3.4 Tailgate and Park Space

The Tailgate and Park Space will provide 84 acres of open space. The Tailgate is two active parks that will occupy 8 acres west of the Stadium. The Park Space will be a 34-acre Community River Park along the southern and eastern perimeter of the site. It will consist of active and passive park and green spaces with hiking and biking trails.

1.4 Previous Site Use and Development

AECOM (2015) prepared a Geotechnical and Geologic Evaluation Report for a proposed National Football League stadium to the replace the SDCCU stadium that opened in 1967. This report summarized the prior use and development of the site. Salient information is provided below.

- There were two previous quarries. They were located near the northeast and western perimeters of SDCCU stadium. We noted an anomalously thick clay layer in Group Delta explorations S-2 and CPT-2 that may be related to prior mining.

- About 35 feet of fill, or more in localized areas, was placed around the perimeter of SDCCU stadium. The fill was placed to raise the stadium site above the floodplain and to establish a field level at +50 feet Mean Sea Level (MSL). The fill was sourced from hillsides located north and northwest of the overall site in areas mapped as underlain by the Stadium Conglomerate (Kennedy and Tan, 2008). The Stadium Conglomerate possesses a relatively high percent of gravel, cobbles and boulders.

- Steel H-Piles (HP 8X36, 12X53, 12X74 and 14X102) support the original stadium. AECOM indicated that based on as-built drawings, the piles were driven to refusal and they extend 10 to 20 feet into formational materials. Recorded pile tip elevations on the south side of the stadium ranged from +1 to +9 feet MSL (66 to 77 feet long) and recorded pile tip elevations on the north site of the stadium ranged from -12 to -24 feet MSL (70 to 100 feet long). Tip levels varied because the formational materials were shallower on the south side of the stadium. Batter piles support lateral loads.

- Cast-in-Drilled-Hole (CIDH) piles support the enclosure of the southeast side of the stadium that opened in 1997. AECOM indicated that based on the geotechnical report and structural drawings, the piles were designed considering end bearing and they extend 5 feet into formational materials, or the basal gravels that overlies this formation. Pile diameters ranged from 36 to 72 inches and specified pile tip levels ranged +12.6 to -9 feet MSL (70 to 95 feet long). As-built or construction records were not available.

1.5 Previous Geotechnical Studies

AECOM (2015) and Geocon (2016) completed prior geotechnical and geologic evaluations for the redevelopment of the SDCCU stadium site. These evaluations reviewed existing geotechnical and geologic information and did not include any additional subsurface exploration. Relevant information from these evaluations is included in this report.

It is important to note these evaluations provided different opinions regarding the potential for liquefaction. Geocon made a qualitative evaluation by assuming that most of the alluvial soils are geologically old, and therefore should not be susceptible to liquefaction. AECOM made a quantitative evaluation by using the few geotechnical test borings completed at the site with soil resistance data (Standard Penetration Test blow counts) to estimate about 2 to 6 inches of liquefaction-induced settlement. AECOM therefore concluded there was “moderate to high” potential for liquefaction. Note also that Geocon’s assessment was for the entire site, while AECOM’s assessment was limited to a stadium located in the northeast portion of the site, and an alternate stadium located in the northwest portion of the site. The assessment of liquefaction in this report using site specific subsurface data supersedes these desk study type evaluations.

Additional data is available from the geotechnical studies completed for the Mission Valley West Light Rail Transit (LRT) that runs east-west near the southern perimeter of the overall stadium site. The As-Built Log of Test Borings (dated 1999, as referenced in Gillingham Water and CH2M, 2018) for the portion of the alignment within the site includes 21 geotechnical explorations. The records from these explorations indicate subsurface conditions similar to those interpreted from Group Delta’s current explorations and described in the report.

Large diameter Cast-In-Drilled (CIDH) piles support this segment of the LRT that derive support in the underlying gravels and formational materials. We understand from anecdotal construction information (Curt Scheyhing, 2019 personal communication) that construction of some of these piles experienced unusual difficulties with soft soils that may have been the remnants of prior local mining operations. CIDH pile construction was able to remove gravels with some difficultly using conventional rock drilling and excavating equipment and tooling.

1.6 Previous Environmental Subsurface Explorations

Since 1992, numerous groundwater monitoring wells have been constructed within the overall site. These wells are part of on-going investigation and remediation activities for petroleum hydrocarbon impacts to soil and groundwater resulting from operations at an adjacent tank farm. The records from these well installations include descriptions of soil and rock types and layers observed from drilling cuttings. Most of the well installations did not collect samples of the soil and rock and they did not obtain geotechnical sampler resistance data, such as Standard Penetration Tests. Plate 1, Geotechnical Map, shows the locations of relevant prior exploratory borings. Appendix A provides the records from these explorations. We have used the data from some of these installations to help develop the Geologic Cross Sections.

2.0 FIELD AND LABORATORY INVESTIGATION

2.1 Current Subsurface Exploration

The current subsurface exploration for the Site Development consisted of 16 exploratory borings (designated as B-) and three infiltration tests that were advanced using a combination of hollow stem auger, rotary wash, casing advancement, and rock coring drilling methods to depths ranging from 30 to 85 feet. The 13 explorations from the Stadium (designated a S-) are included in the interpretation and analyses for this report. The borings were completed during February and March 2019.

Ten Cone Penetrometer Tests (CPTs) were also completed. Downhole seismic data were recorded for three of the CPTs, which are further designated as Seismic CPTs (SCPTs). CPT-2 and CPT-26 initially encountered refusal at depths of about 25 feet due to gravel and cobbles causing resistance to further advancement and flexure of the CPT rods. CPT-2 and CPT-26 were reattempted by locating a second CPT location a few feet away from the original location, which was able to be advanced to a depth of about 45 and 40 feet, respectively, where refusal on gravel and cobbles was encountered. SCPT-7 and CPT-11 both encountered relatively shallow refusal on gravel and cobbles at about 17 feet. The CPTs were advanced on March 18 and April 8, 2019.

Note the SDCCU stadium precluded exploration within a large area of the site. The stadium occupies about 20 acres of the overall 170-acre site. Plate 1, Geotechnical Map, shows the approximate locations of the explorations. Appendix B provides records from these explorations.

2.2 Laboratory Testing

Soil samples were collected from the borings for laboratory testing. The geotechnical testing program included sieve analyses and Plasticity Index testing to aid in soil classification using the ASTM Unified Soil Classification System (USCS). Index tests were also conducted to help evaluate the soil expansion potential and corrosivity. Direct shear and consolidation tests were conducted on relatively intact samples to evaluate soil strength and compressibility. The laboratory test results are shown on the Current Exploration Records in Appendix B and in Appendix C.

3.0 GEOLOGY AND SUBSURFACE CONDITIONS

The site is located within the Peninsular Ranges geomorphic province of southern California. This province stretches from the Los Angeles basin to the tip of Baja California. It is characterized as a series of northwest trending mountain ranges separated by subparallel fault zones. The site is located within the coastal plain transected by the west-flowing San Diego River drainage known as Mission Valley and it is underlain at depth by Eocene-age sedimentary deposits mapped as the Friars Formation (Map Symbol Tf).

The Friars Formation consists of six intertonguing, depositionally time-equivalent facies ranging from deep-marine, fine-grained siltstone and claystone to the southwest and continental, coarse-grained sandstone and conglomerate to the northeast. The Friars Formation are nonmarine and near-shore deposits of lagoonal sandstone, siltstone, and claystone. The Friars Formation is found in Mission Valley at elevations below approximately 160 feet Mean Sea Level. Regionally, the Friars Formation dips gently to the southwest between 3 and 5 degrees.

Thick deposits of poorly consolidated, mostly granular alluvium associated with the San Diego River and Murphy Creek drainages, local deposits of slopewash and colluvium, and fill soils associated with the original stadium construction overlies the Friars Formation. These materials are collectively referred to as Surficial Soils - Undifferentiated (Map Symbol su).

Figure 3, Geologic Map depicts the general geology in the site. Plates 2A through 2G are geologic cross sections through the site. The sections below describe the geologic units encountered.

3.1 Friars Formation

As encountered in the explorations completed for this investigation and those conducted for the previous environmental monitoring well installations, the elevation of the top of Friars Formation ranges from 25 feet in the northwest portion of the overall site to less than 0 feet in the central portion of the overall site (including the SDCCU stadium footprint). The elevation of the top of the Friars Formation rises in the southeast portion of the overall site to about 25 feet. Plate 4, Estimated Settlements Summary, provides these elevations for each exploration.

The overall site is located at the confluence of two major drainages - the San Diego River and Murphy Creek. We interpret that the variability of the elevation of the top of Friars Formation occurs from erosion of the San Diego River and Murphy Canyon paleochannels into this formation below the SDCCU stadium. Significant and abrupt declines in elevation occur northwest to southeast from transitions at the margins of the paleochannels. Geologic Cross Sections B-B' (Plate 2B) and C-C' (Plate 2C) depicts this paleochannel as the significant drop in the elevation of the Friars Formation across a short horizontal distance. Note the eastern margin of the paleochannel is inferred because we were unable to conduct subsurface exploration in the existing stadium.

As observed in all our deep borings, the Friars Formation generally consists of gray to yellowish brown, interbedded, fine- to coarse-grained silty sandstone with some fine gravel and gray, sandy siltstone with minor amounts of gray claystone. Auger cuttings and drive samples obtained from these materials were observed to be sand with silt (SP-SM), silty and clayey sand (SM, SC), and lean to fat clay (CL, CH). The apparent density was dense to very dense considering SPT blow counts and the consistency was very stiff to hard considering the undrained shear strength obtained from hand-held Pocket Penetration and Torvane tests.

3.2 Surficial Soils - Undifferentiated

The thickness of the soils in the Surficial Soils - Undifferentiated unit varies across the overall site based on the elevation of the top of Friars Formation. The thickness of these materials ranged from an average of 25 to 60 feet in the northwest portion of the overall site, to more than 50 to 75 feet in the central portion of the overall site. The table below summarizes the thickness within the development areas.

THICKNESS OF SURFICIAL SOILS - UNDIFFERENTIATED

Development Area	Thickness, feet
Campus Expansion – Campus Zone	25 to 80 (deepening to the east)
Campus Expansion – Stadium Zone	70 to 75
Hotel & Conference Center	40 to 60 (deepening to the east)
Residential – North (R1 to R9)	50 to 70 (deepening to the northwest)
Residential – South (R10 to R15)	30 to 65 (deepening to the west)

The soils in this unit are subdivided into *Surface Gravel/Fill*, *Middle Sand/Fine-Grained Soils*, and *Basal Gravel*. These units are described in more detail in the following sections.

3.2.1 Surface Gravel/Fill

Historical topographic maps indicate that at least three separate active river channels existed through the overall site with the broadest U-shaped meander near Murphy Canyon extending north almost to the current Friars Road alignment (U.S Department of the Interior, 1903). The Murphy Canyon drainage empties into the site from the north. Deposition of coarse-grained alluvium within these river and stream channels has created locally discontinuous gravel layers across the site in the near surface elevations.

Various amounts of fill placed during previous quarrying activities and the original stadium and parking lot construction also cover the site. Historical records indicate that up to 35 feet of fill, or more in localized areas, was placed around the perimeter of the stadium to raise grades above the floodplain. The fill materials were apparently imported from nearby excavations.

These soils were observed in the borings to mostly consist of poorly to well graded sand (SP, SW), silty and clayey sand (SM, SC), silty to clayey gravel (GM, GC) and gravel and cobbles. The apparent density ranged from loose to dense considering SPT blow counts, some of which were erroneously impacted by gravel and cobbles.

3.2.2 Middle Sand/Fine-Grained Soils

Sea level transgressions in the last 10,000 years backfilled the San Diego River channels with finer grained alluvial deposits including silt, clay, sand, and finer gravel. The Middle Sand/Fine-Grained Soils unit was encountered in all the explorations.

These soils were observed in the borings to mostly consist of poorly to well graded sand (SP, SW), silty and clayey sand (SM, SC), silty to clayey gravel (GM, GC) and gravel and cobbles. The clay soils observed in the borings were mostly medium plasticity lean clay (CL). The apparent density ranged from loose to dense and the consistency ranged medium stiff to stiff, considering SPT blow counts and hand-held Pocket Penetration and Torvane tests. Some of the SPT test were erroneously impacted by flowing sands or gravel and cobbles.

3.2.3 Basal Gravel

The Basal Gravel consists of San Diego River alluvium deposited unconformably on the erosional contact with the Friars Formation. The Basal Gravel appears to be located within the old San Diego River paleochannels that formed from sea level changes and regional uplift over the past several hundred thousand years.

These soils were observed in the borings to mostly consist of sandy coarse gravel and boulders up to two feet in diameter. Since the subsurface exploration used small diameter drilling methods (augers and drill bits less than 8-inches in diameter) maximum clast sizes were not directly observed. However, historical documents, nearby riverbed exposures, and our experience with construction projects in Mission Valley provide us with these data. The apparent density ranged from dense to very dense considering SPT blow counts, most of which were erroneously impacted by the gravel and cobbles.

3.3 Groundwater

Groundwater was measured during drilling in the subsurface explorations completed for this investigation (except S-9, S-13, B-14, B-19, B-26, B-29 and B-32 where the drilling method, depth and/or conditions did not allow for measurement) at elevations of 47 to 49 feet along the northern portion of the overall site and at elevations of 37 to 40 feet in the southwest portion of the overall site.

Local variations in groundwater elevation up to 7 feet were measured in adjacent explorations. This variation may be due to: 1) groundwater measurements were conducted when the drilling was finished, and the groundwater level may not have stabilized; 2) groundwater may be locally perched on less-permeable, fine grained soils; or 3) a combination of the two. The apparent gradient across the site from northwest to southwest is approximately 7 degrees as measured in the explorations.

Groundwater was also measured in select existing monitoring wells constructed by others at the site following our site investigation. Groundwater was measured at elevations ranging from approximately 41 to 49 feet. Plate 3 shows an interpretation of the groundwater elevations using groundwater measurements from: 1) select explorations by Group Delta and 2) select environmental monitoring wells constructed by others.

The table below summarizes groundwater levels within the development areas.

MEASURED GROUNDWATER LEVELS

Development Area	Average Finished Subgrade Elevation, Feet	Measured Elevation of Groundwater, Feet
Campus Expansion – Campus Zone	55 (Cut)	43 to 45
Campus Expansion – Stadium Zone	75 (Cut)	45 to 48
Hotel & Conference Center	85 (Fill)	43 to 49
Residential – North (R1 to R9)	70 (Cut)	44 to 49
Residential – South (R10 to R15)	65 (Cut)	44 to 52

4.0 GEOLOGIC HAZARDS

We anticipate the primary geologic hazards to be strong ground shaking from earthquakes and the associated soil liquefaction. As shown in Figure 4, Seismic Safety Map, the site is within Geologic Hazard Category 31, which is characterized as having high potential for liquefaction due to "shallow groundwater, major drainages, or hydraulic fills". Geologic hazards for the site are described below.

4.1 Strong Ground Motion

The site could be subject to moderate to strong ground shaking from a nearby or more distant, large magnitude earthquakes occurring during the expected life span of the project. This hazard is managed by structural design of the buildings per the latest edition of the California Building Code (CBC, 2016) and California State University requirements. Seismic design parameters are provided in the Recommendations section.

4.2 Earthquake Induced Ground Failure

Potentially liquefiable soils underlie the site. Liquefaction is the sudden loss of soil shear strength within saturated, loose to medium dense, sands and non-plastic silts. Liquefaction is caused by the build-up of pore water pressure during strong ground shaking from an earthquake.

We interpret liquefaction-induced settlement to be the most likely secondary effect to occur given the site surface and subsurface conditions. The secondary effects of liquefaction are sand boils, settlement, and instabilities within sloping ground (lateral spreading, seismic deformation and flow sliding). Associated with earthquake-induced ground failure is seismic compaction, which is the densification of loose to medium dense granular soils that are above groundwater.

4.2.1 Results of Liquefaction Analyses

Based on the results of analyses to evaluate the triggering of liquefaction, the potential for liquefaction is widespread throughout the Surficial Soils - Undifferentiated that are below groundwater. Significant variations in the estimated liquefaction-induced settlement occur from differences in the thickness of these soils and the depth to groundwater, which varies with changes in surface elevations. In addition, there are local zones of relatively thick non-liquefiable clayey soils. Provided below is a summary of the main findings of the analyses.

- Total settlement is estimated to range from 1 to 5 inches.
- The estimates of total settlement could increase by about one-third, ranging from 1.5 to 6.5 inches, depending on the assumptions used in the analyses.
- The estimates of total settlement increase by 0.5 inches using seismic design inputs from expected Building Code revisions (ASCE 7-16: PGAM = 0.58g, Mw = 6.89).
- The largest settlements are estimated to occur within the Campus Expansions and the Residential North areas.

The table below provides estimated total dynamic (liquefaction and seismic compaction) settlement within each development area. A summary of these estimated settlements is also included on Plate 4.

ESTIMATED DYNAMIC SETTLEMENT

Exploration	Location	Thickness of Liquefiable Soils, Feet	Total Settlement, Inches
B-14	Campus Expansion – Campus Zone	15	2
B-15		25	4
B-16		20	1
B-17		25	4

ESTIMATED DYNAMIC SETTLEMENT

Exploration	Location	Thickness of Liquefiable Soils, Feet	Total Settlement, Inches
B-27	Campus Expansion – Stadium Zone	25	1
S-8		25	5
S-5		25	4
S-13		20	4
B-20	Residential - South	10	1
B-21		15	2
B-23		20	3
B-24		25	4
B-26	Residential - North	30	4
B-27		20	1
B-28		25	3
B-30		35	3
B-31	Hotel	20	1
S-1		10	1
S-2		10	2

1. Settlement is the combination of liquefaction-induced and seismic compaction. Estimated magnitude of seismic compaction insignificant.
2. Settlement is a "free-field" estimate that does not consider: a) the shear strain due to foundation loading, b) contribution of ejecta-related settlement and c) the ability of thick non-liquefiable soils above groundwater to attenuate the estimated settlement.

Differential settlement over a horizontal distance of 30 to 40 feet may be estimated to be two-thirds of the total settlement. Consequently, differential settlement in some areas exceed thresholds that allow for conventional shallow foundations, such as 1 to 2 inches over 30 feet for multistory structures and 2 to 4 inches over 30 feet for single story structures (ASCE 7-16, Risk Category III). The thickness of non-liquefiable soils at the surface, removal and recompaction of this material, and the placement of fill could attenuate differential settlement to the extent that conventional shallow foundations could be suitable in some areas for certain structures.

Silt and clay soils should not be susceptible to liquefaction or have the potential to lose shear strength from strong ground shaking considering the plasticity characteristics obtained from Plasticity Index testing (Boulanger and Idriss, 2006; Bray and Sancio, 2006).

4.2.2 Methodology

The liquefaction triggering calculations used Standard Penetration Test data (blow counts per foot) and laboratory test data on the percentage of fines (silt and clay) to obtain the resistance of the soil to liquefaction, as recommended by the NCEER Workshops (Youd and Idriss, 2001) and Boulanger and Idriss (2014). Free-field volumetric settlement was estimated using Tokimatsu and Seed (1987) and Pradel (1998). The analyses adopted the following ASCE 7-10 input parameters:

Peak Ground Acceleration (PGA_M): 0.46g
Earthquake Magnitude (Mw): 6.7
Groundwater Level: .... + 50 feet NAVD 88

The PGA_M was developed using the maximum considered earthquake geometric mean (MCE_G) peak ground acceleration adjusted for Site Class effects obtained from the SEAOC/OSHPD Seismic Design Maps Tool in accordance with the 2016 CBC (as referenced in SEAOC/OSHPD, 2019). The controlling magnitude used in the liquefaction evaluation was selected by reviewing deaggregation results obtained from the USGS Unified Hazard Tool (2018b).

4.3 Landslides and Slope Stability

Based on the relatively flat topography of the site and proximity to nearby hillsides, landslides are not design considerations. Cut and fill slopes planned to form the site should possess adequate surface and overall stability if designed and constructed as recommended in this report.

4.4 Tsunami, Seiche, and Flooding

The site is above the mapped tsunami inundation line and it is outside of the mapped tsunami inundation area (CalEMA et al, 2009). The site is not located below any lakes or confined bodies of water so there is no potential for seiches or earthquake induced flooding. The site is outside of mapped high-risk dam inundation areas on the County of San Diego draft dam failure hazard map (County of San Diego, 2018).

We understand that a Conditional Letter of Map Revision (CLOMR) prepared by others is revising the Federal Emergency Management Agency (FEMA) 100-year floodplain in consideration of site grading and elevations changes.

4.5 Subsidence

Subsidence is customarily associated with long term groundwater extraction. The City of San Diego (City) is assessing the feasibility of developing the Mission Valley groundwater basin as a sustainable source of water (Gillingham Water and CH2M, 2018). The City is considering installing three groundwater extraction wells south and southwest of the Stadium site. The City's consultants should address the potential for subsidence considering the proposed SDSU MV redevelopment. Group Delta should review the assessment made by the City's consultant.

5.0 GEOTECHNICAL CONDITIONS

Fill and thick alluvium underlies the Stadium site. We have not differentiated the fill soils from alluvial soils as discussed in Section 3.0 (Geology and Subsurface Conditions). A northeast to southwest trending paleochannel (ancient buried stream or river channel) causes the thickness of these undifferentiated soils to increase from 45 to 55 feet in the northwest portion of the overall site to more than 65 to 75 feet in the southeast portion of the overall site. Formational materials (geologically mapped as Friars Formation) underlie these soils.

The Surficial Soils - Undifferentiated unit is predominately coarse-grained soils with apparent densities that vary from loose to dense with a corresponding variable shear strength and stiffness. However, there are also significant zones of gravel and clay. Relatively thick (ranging from 5 to 20 feet) layers of gravel were encountered near the ground surface, at an intermediate depth, or above the formational material in 14 of the 18 explorations. In addition, a relatively thick (ranging from 5 to 10 feet) layer of clay was observed at an intermediate depth in nine of the 18 explorations. Therefore, for geotechnical engineering purposes we subdivided the Surficial Soils - Undifferentiated into *Surface Gravel/Fill*, *Middle Sand/Fine-Grained Soils*, and *Basal Gravel* to emphasize the distribution of the gravel and clay soils, as summarized below.

- The gravel in the Surface Gravel/Fill is not widespread (encountered in 5 of 18 explorations) and it was observed to range from 10 to 15 feet thick. This gravel was observed mostly in explorations located in the western portion of the site.

- The gravel in the Middle Sand/Fine-Grained Soil is not widespread (encountered in 2 of 18 explorations) and it was observed to range from 5 to 10 feet thick. This gravel was observed mostly in explorations located the western portion of the site. There are also zones of clay (encountered in 8 of 18 explorations) that were observed to be 5 to 10 feet thick.

- The Basal Gravel is found along the bottom of the channels eroded into the underlying formational materials. This gravel is more widespread (encountered in 11 of 18 explorations) and it was observed to be 10 to 20 feet thick.

Note that gravel can possess relatively high shear strength and stiffness relative to the other soils, even with the low apparent densities that may exist within the Surface Gravel/Fill. Overburden stresses and confinement should substantially increase the shear strength and stiffness of the Basal Gravel. However, the amount of gravel, cobbles and boulders, the distribution of these sizes, and their roundness or angularity influences their geotechnical engineering characteristics. Apart from the thickness, the current subsurface data only allows for qualitative, rather than quantitative assessment of these properties.

The formational materials are intermediate geomaterials (informally referred to as soft rock) consisting mostly of sandstone with localized, strongly cemented concretions (sediment that hardened into rock) and some thin layers of claystone. We interpret the formational materials to have geotechnical engineering characteristics similar to a very dense sand , or where there is claystone, a clay with a hard consistency, all with a corresponding relatively high shear strength and stiffness.

Plates 2A through 2G, Geologic Cross Sections A-A' through G-G' depicts the interpreted subsurface conditions. Figures 6A through D, Parameter Plots, provides Standard Penetration Test blow counts (N, corrected for sampler type only with depth) and the Undrained Shear Strength measures from hand-held Pocket Penetration and Torvane tests.

5.1 Expansive Soils

Laboratory tests indicate the soils in proposed cut and borrow areas should have a "Very Low" to "Medium" Potential Expansion. The results of 17 Expansion Index (EI) tests conducted on bulk soils samples obtained from the surface to a depth of about 5 feet below existing surface levels in the proposed cut and borrow areas ranged from 6 to 75, averaging 40 (Low Potential Expansion) with a median of 36 (Low Potential Expansion). Appendix C provides this data.

5.2 Compressible Soils

Compressible soils underlie the site. Most of these soils are sands and gravels that should settle elastically with the initial fill and structure loading. However, there are local zones of thick clay that should experience some time dependent consolidation settlement. The clay has a medium plasticity and we interpret it to be relatively stiff and slightly overconsolidated from Plasticity Index data. The insitu moisture contents are near the Plastic Limit and the Liquidity Indices are less than 0.7, which indicate relatively stiff and low compressibility soils. Most of the long-term settlement should occur in a relatively short time following initial loading. The zones of clay are usually surrounded by sand, which allows horizontal drainage to more quickly dissipate the excess porewater pressures that develop from loading. However, there are local variations in the estimated duration where this condition does not exist.

Provided below is a summary of the main findings of the analyses.

- Total long-term settlement is estimated to range from 1 to 5.5 inches.
- The estimated duration for settlement to be substantially complete in most areas is 1 to 3 months.
- The largest settlements and durations are estimated to occur within the Campus Expansion – South and the Residential North areas. An anomalously high settlement and duration was estimated using data from boring S-2 within the Hotel area.

The table below provides the estimated settlement and durations where new fill will be placed. A summary of these estimated settlements is also included on Plate 4.

ESTIMATED STATIC SETTLEMENT

Exploration	Location	New Fill Thickness, Feet	Depth to Formation, Feet	Saturated Clay Thickness, Feet	Short-Term Settlement, Inches	Long-Term Settlement, Inches	Duration for Substantial Completion, Months
B-14	Campus Expansion – Campus Zone	5	26	NA	0.5	NA	NA
B-15		5	28	NA	0.5	NA	NA
B-16		CUT					
B-17		5	50	NA	1.0	NA	NA
B-27	Campus Expansion – Stadium Zone	5	70	10	1.0	1.0	1 - 3
S-5		25	59	10	4.0	5.5	1 - 3
S-8		20	73	5	4.0	2.0	0.5 - 1
S-13		10	75	NA	2.5	NA	NA
B-20	Residential – South	CUT					
B-21		CUT					
B-23		10	40	NA	1.0	NA	NA
B-24		CUT					
B-26	Residential - North	10	48	NA	1.5	NA	NA
B-27		5	70	10	1.0	1.0	1 – 3
B-28		10	52	10	1.5	3.5	4 – 12
B-30		15	54	NA	2.5	NA	NA
B-31	Hotel	5	61	10	1.0	1.0	1 – 3
S-1		5	57	NA	1.0	NA	NA
S-2		20	43	15	2.0	4.5	8 -24

The assessment of settlement and duration is based on engineering analyses using data obtained from widely spaced explorations, where subsurface conditions could vary significantly across the site. Due to these uncertainties, the estimated settlement and duration could vary across relatively short distances.

Note also that higher long-term settlement was estimated in the Stadium site when compared to the Site Development area, and the extent of this possible trend of higher potential settlement to the east is not known. Much of the Site Development area to east was inaccessible for subsurface exploration due the SDCCU stadium that occupies about 20 acres of the overall 170-acre site. The eastern margin of a north to south trending paleochannel underlies the stadium.

Settlement analyses were conducted using the soil profiles and groundwater conditions encountered in the recent explorations and laboratory test data. The settlement magnitude and areal distribution was estimated with conventional elastic and consolidation soil mechanics methods that used SPT correlations to elastic modulus and index property correlations to consolidation parameters.

Settlement monitoring is recommended to confirm these estimates and to plan the timing for construction of settlement sensitive improvements.

5.3 Reactive Soils

Thirteen suites of corrosion tests were completed on bulk soil samples obtained from proposed cut and borrow areas. Appendix C provides the test results.

To assess the sulfate exposure of concrete in contact with the site soils, samples were tested for water-soluble sulfate content. The test results suggest the site soils have a negligible potential for sulfate attack based on commonly accepted criteria. The sulfate content of the finish grade soils should be established at the completion of earthwork.

The pH, resistivity and chloride contents were estimated to assess the reactivity of the site soils with buried metals. The test results suggest the on-site soils are moderately corrosive to very corrosive to buried metals. A Corrosion Consultant should be contacted for specific recommendations.

5.4 Reuse of Onsite Soils

Most of the soils from proposed cut and borrow areas at the site should be sand, sand and gravel and gravel that should require minimal processing and generally possess good geotechnical engineering characteristics when used for fill. The On-Site Soils and Materials Management section provide recommendations for processing.

5.5 Storm Water Infiltration

Based on the preliminary test results in the table below, the site should support a partial infiltration condition. However, the storm water BMP design will need to consider:

- The depth to groundwater and potential for mounding;
- The potential for future groundwater pumping for the Pure Water San Diego project;
- The potential for flooding at the site, which could inundate the proposed basins;
- Other factors or conditions that arise as the project design develops.

SUMMARY OF PRELIMINARY INFILTRATION TEST RESULTS

Test No. (Exploration No.)	Test Method	Corrected Percolation Rate, inches/hour	Unfactored Infiltration Rate, inches/hour	Factored Infiltration Rate, inches/hour
I-1 (B-19)	Borehole Percolation	0.20	0.02	0.01
I-2 (B-32)	Borehole Percolation	13.5	1.1	0.49
I-3 (B-29)	Borehole Percolation	9.9	0.79	0.34

If remedial grading results in different soil conditions in the proposed infiltration zones, further testing may be warranted. The results should only be considered valid for the design assumptions used for testing, including the location and elevation of the soils tested, and the amount of pressure head in the test. The test results performed at this time are preliminary, and final design of the infiltration basins may require additional field testing and exploration in accordance with the applicable Design Manual and/or comments from the governing agency. These results may not be applicable if significant changes to the design occur.

Our field testing considers the guidance provided in the City of San Diego Storm Water Standards (City of San Diego, 2018; referred to as the *Design Manual*). The Borehole Percolation Test method was performed in general accordance with the *Design Manual* to approximate infiltration rates of the soils near the proposed infiltration basins. The preliminary testing was conducted at a depth of ranging from 2½ to 5 feet below existing surface levels to approximate the likely infiltration zone above the groundwater table. The factor of safety applied for planning phase feasibility screening is two. A temperature correction factor is also used to account for the difference in water viscosity of rain water (assumed to be 50°F) and the test water (measured to be approximately 60°F).

6.0 CONCLUSIONS

In our opinion, the grading and civil works for the Site Development will need to manage the substantial geotechnical variability observed in the subsurface materials. In addition, the Site Development construction should consider mitigation of static and dynamic settlement to economically manage the low gradient and settlement tolerances of gravity fed utilities and to facilitate the construction of the structures for the Full Build Out.

The site is within a broad east-west trending valley that is part of the San Diego River floodplain and it is located at the confluence of the large Murphy Canyon drainage basin. Consequently, geologically young alluvial soils with variable physical characteristics have filled the valley and there is shallow groundwater. The thickness of these soils can fluctuate substantially across the site. Prior episodes of fill placement and quarrying operations in local areas adds to this variability. Competent geotechnical materials occur at depths ranging from 25 to 80 feet. Specific conclusions are provided below.

- The soils in the Surficial Soils - Undifferentiated unit consist mostly of sand with significant zones of gravel and clay. A north to south trending paleochannel causes large variations of the thickness of this unit at the margins of the channel. The gravel is pervasive while the clay occurs locally. Sandstone with local concretions and thin layers of claystone are below these soils.
- The soils in the Surficial Soils - Undifferentiated unit are mostly coarse-grained with apparent densities that vary from loose to dense with a corresponding variable soil shear strength and stiffness. When excavated, these materials should generally be a good source of fill. There may be some processing of wet soils.
- Gravels within the Surficial Soils - Undifferentiated unit have a higher shear strength and stiffness compared to the other soils. The gravels are resistant to the installation of ground improvement columns and piles, but they provide a high geotechnical resistance. When excavated, they should be a good source of fill with some processing of oversize material.
- There are local zones of thick clay that will experience time dependent settlement that exceeds thresholds that would allow for shallow foundations. Most of the settlement should occur in a relatively short time following initial loading. However, there are local variations where the estimated duration could impact the construction schedule.
- The potential for liquefaction is widespread and there are significant variations in the estimated liquefaction-induced settlement. Consequently, differential settlement is likely to exceed thresholds that would allow for shallow foundations.
- Groundwater will influence deep construction activities, such as CIDH piling and installation of deeper underground utilities. It may also need to be managed during construction of the underground parking for the Campus Expansion – Campus Zones since it was measured to be about 15 feet below the deepest cut.
- New and existing underground utilities below new fill will experience time dependent settlement locally depending on the timing of their installation following grading.

7.0 RECOMMENDATIONS

The remainder of this report presents recommendations for earthwork and the design and construction of the proposed improvements. These recommendations are based on empirical and analytical methods typical of the standards of practice in southern California and San Diego area construction methods and practice. They are provided for preliminary design and may need to be updated for design development, the results of field testing (e.g., pile load testing) or actual subsurface conditions encountered during construction. If these recommendations do not address a specific feature of the project, please contact Group Delta for additions or revisions.

7.1 General

7.1.1 Design Groundwater Level

We preliminarily recommend a design groundwater level of 3 feet higher than the groundwater elevation shown on Plate 3, which is estimated to range between +44 to +52 feet.

Note that changes in rainfall, irrigation, site drainage may produce seepage or perched groundwater at any location within the Surficial Soils - Undifferentiated underlying the site. Such conditions are difficult to predict and are typically mitigated if and where they occur.

7.1.2 Seismic Design

Seismic design parameters should be evaluated by the Structural Engineer per the California State University Seismic Design Requirements (CSU, 2016). For reference, seismic design parameters were also developed in accordance with the 2016 CBC and ASCE 7-10 using the online SEAOC/OSHPD Seismic Design Maps tool (SEAOC/OSHPD, 2019). They are based on: 1) an estimated average shear wave velocity (V_{s30}) of about 900 feet per second, 2) an assumed structure fundamental period of less than 0.5 seconds and 3) Risk Category = III (Populous, 2018). Our office should be contacted if the structure fundamental period is 0.5 seconds or greater, as the applicable classification would be Site Class F per Section 20.3.1 of ASCE 7-10 due to the liquefiable soils at the site, which requires site-specific ground motion analysis. The table below provides the parameters.

2016 CBC SEISMIC DESIGN PARAMETERS

Latitude: 32.7843°N Longitude: 117.1224°W	
Site Class	D*
MCE_R Spectral Response Acceleration for Short Periods, S_s	1.017 g
MCE_R Spectral Response Acceleration at 1-second Period, S_1	0.390 g
Site Coefficient F_a	1.093
Site Coefficient F_v	1.621

2016 CBC SEISMIC DESIGN PARAMETERS

Latitude: 32.7843°N Longitude: 117.1224°W	
Adjusted MCE_R Spectral Response Acceleration at Short Periods, S_{MS}	1.112 g
Adjusted MCE_R Spectral Response Acceleration at 1-second Period, S_{M1}	0.632 g
Design Spectral Response Acceleration at Short Periods, S_{DS}	0.741 g
Design Spectral Response Acceleration at 1-second Period, S_{D1}	0.421 g
MCE Geometric Mean Peak Ground Acceleration, PGA_M	0.456 g

*Assumes structure fundamental period is 0.5 seconds or less. Subject to change for longer structure periods.

7.1.3 Surface Drainage

Foundation and slab performance depend on how well surface runoff drains from the site. The ground surface should be graded so that water flows rapidly away from the structures and tops of slopes without ponding. The surface gradient needed to achieve this may depend on the planned landscaping. Planters should be built so that water will not seep into the foundation, slab, or pavement areas. If roof drains are used, the drainage should be channeled by pipe to storm drains or discharged 10 feet or more from buildings. Irrigation should be limited to that needed to sustain landscaping. Excessive irrigation, surface water, water line breaks, or rainfall may cause perched groundwater to develop within the underlying soil.

7.2 Ground Improvement

7.2.1 Purpose and Need

Ground improvement could reduce static and dynamic settlement to economically facilitate construction of the structures for the Full Build Out and mitigate potentially adverse settlement of utilities. Group improvement is typically completed within the footprint of the more lightly loaded buildings to reduce settlement or within the footprint of the heavier loaded to reduce liquefaction-induced loads on the piling used to support these structures. Ground improvement can also be completed to protect Lifelines, which are structures that are critical for communities and must remain operational following an earthquake. They are typically selected major roadways, inflexible essential pipelines, powerlines and communications facilities.

The purposes of ground improvement are to increase the allowable bearing pressure and to reduce the static and dynamic (liquefaction-induced) settlement. The improved ground will often support allowable bearing pressures up to 4,000 pounds per square foot (psf) and provide settlement tolerances ranging from ½ to 1 inch over a horizontal distance of 30 to 40 feet.

The following types of ground improvement may be suitable considering the subsurface conditions at the site.

- Deep Dynamic Compaction
- Vibro-Replacement
- Deep Soil Mixing
- Vertical Drains

Note the variability of the soil physical characteristics, the pervasive gravel, and the observation of the mineral mica and its corresponding structure in the soil can complicate the use of these methods at the site. Therefore, an evaluation of their applicability should consider the following factors:

- Schedule and cost implications associated with a pilot study program with a large upfront equipment mobilization fee.
- Additional evaluation and design period following the pilot study program.
- Difficulty conducting pre-and post-improvement subsurface exploration for quality control where there are pervasive gravels.
- Additional construction costs associated with penetrating through pervasive gravels.

The following sections provide additional discussions of the above ground improvement methods. There is a summary evaluation of their effectiveness at this site, followed by details regarding the specifics of each of the methods. Note Vertical Drains are included mainly to decrease the duration of the time-dependent settlement, or as a secondary measure to increase the effectiveness of the other methods.

7.2.2 Summary Assessment of Effectiveness

To assess the effectiveness of these methods, Group Delta undertook a matrix evaluation of the geotechnical conditions at the locations of 26 subsurface explorations. The evaluation focused on conditions observed in the explorations, such as: a) the depth and thickness of potentially liquefiable soils; b) the depth and thickness of gravel, and c) the depth, thickness and saturation of the clay, that could hinder the various methods of ground improvement in mitigating liquefaction-induced settlement.

Provided below is a summary of the evaluation of the effectiveness of Deep Dynamic Compaction (DDC) in terms of Potentially, Marginal and Ineffective:

- Potentially effective at 25% of the locations, mostly in the eastern portion of Residential site.
- Marginally effective at 45% of the locations, mostly in Stadium site (improvement mainly needed in eastern portion of this site).
- Ineffective at 30% of the locations, mostly in Hotel and southern portions of the Campus Extension – Campus and Residential sites.

Since the “Marginally Effective to Ineffective” rankings predominated, this evaluation also indicates the need for a carefully thought out and planned pilot study program to further assess the effectiveness of DDC within the marginally effective areas, along with its ability to manage and consistently improve the soil (i.e., meet performance objectives) given the variability of subsurface conditions interpreted at the site. An additional method of ground improvement may need to be planned for and used where DDC does not entirety meet the performance objectives. FHWA (2017) reports that DDC has been combined with Aggregate Columns (stone columns and rammed aggregate piers).

Vibro-Replacement and Deep Soil Mixing should be feasible to mitigate liquefaction. However, the gravels could substantially impede installation of these methods. Since this is a constructability concern, further feasibility evaluation should include preliminary consultation with reputable geotechnical contractors that specialize in the methods of these methods of ground improvement.

If feasible, the Geotechnical and Structural Engineer will develop a performance specification for design by a specialist geotechnical contractor. The design is often further evaluated by pilot studies along with pre-and post-improvement subsurface exploration (typically Cone Penetration Testing), which is also used for production ground improvement quality control.

7.2.3 Deep Dynamic Compaction

Deep Dynamic Compaction (DDC) uses a crane to drop a static weight from a defined height in a grid pattern over the treatment area to improve soils to a depth ranging from 10 to 35 feet. There is typically more than one pass of compaction over the treatment area to improve the deeper zones first. The design develops the static weight and drop height to determine the applied energy needed to increase the apparent density of the soils to meet the performance objectives.

This method is mostly suitable for coarse grained soils (fines content less 15%) that are not saturated (depth to groundwater is 6 feet or more) and possess a relatively high permeability (SHRP2, 2012). DDC can produce unacceptable levels of noise and vibration and therefore it has not been used in urban areas of San Diego.

7.2.4 Vibro-Replacement

Vibro-Replacement systems install “stone columns” that are typically 24 to 36 inches in diameter and filled with compacted gravel, spaced at 6 to 10 feet (center to center) and installed uniformly over the entire treatment area to depths ranging from 30 to 50 feet. The design uses an area replacement ratio over a treatment area and depth to meet the required performance objectives.

This method is suitable for coarse grained soils that are saturated that do not have thick gravel, cobble or boulder obstructions. It has commonly been used to mitigate liquefaction in San Diego. However, the extensive gravels at the site would require predrilling that could substantially increase the cost. Micaceous soils encountered in our some of our explorations may also reduce the effectiveness of this method.

7.2.5 Deep Soil Mixing

Deep Soil Mixing (DSM) mixes a binder (typically cement) with the soils to create a column or panel (an element) with increased shear strength and stiffness and reduced compressibility. Typically, the elements overlap to create a block or cellular structure in the ground that uniformly improves a large volume of soil supporting a foundation or creates cellular structures that confine the soil to mitigate the potential for liquefaction. The design uses an area replacement ratio over a treatment area and depth to meet the required performance objectives.

The method is suitable for most soil types that are saturated and do not have thick gravel, cobble or boulder obstructions. The cross-sectional area and depth of the element is a function of the equipment used and the area replacement ratio. This method has recently been used to mitigate liquefaction in San Diego. The extensive gravels at the site could preclude this method entirely or substantially increase installation costs, which could also limit using this method.

7.2.6 Vertical Drains

Vertical drains may be prefabricated and pushed in the ground with a mandrel or be corrugated pipe installed with a vibrating mandrel. They are installed in triangular or gird patterns with a horizontal spacing ranging from 3 to 8 feet. They can: a) increase the effectiveness of DDC and Vibro-Replacement methods in certain soil types, b) partially mitigate the shear strength loss associated with liquefaction and/or c) decrease the duration for substantial completion of long-term settlement by providing a drainage path to more quickly dissipate the excess porewater pressures that develop from dynamic and static loading.

7.3 Earthwork

Earthwork should be conducted per applicable requirements of The California State University, the current California Building Code and the project specifications. This report provides the following recommendations for specific aspects of earthwork, which may need to be revised based on the conditions observed during construction.

7.3.1 Site Preparation

General site preparation should begin with the removal of deleterious materials and demolition debris from the site, such as asphalt pavements, concrete slabs and pavements, existing structures, remnant foundations, landscaping and topsoil and any expansive (EI>50) located within 36 inches of the planned finished subgrade elevations. Areas disturbed by demolition should be restored with a subgrade that is stabilized to the satisfaction of the Geotechnical Engineer.

Existing subsurface utilities that will be abandoned should be removed and the excavations backfilled and compacted as described in the Fill Compaction section. Alternatively, abandoned pipes may be grouted using a two-sack sand-cement slurry under the observation of the Geotechnical Engineer.

Areas to receive fill should be scarified 12 inches and recompacted to 90 percent of the maximum dry density based on ASTM D1557. In areas of saturated or “pumping” subgrade, a geogrid such as Tensar BX-1200, Terragrid RX1200 or Mirafi BXG120 may be placed directly on the excavation bottom, and then covered with at least 12 inches of ¾-inch Aggregate Base (AB). Once the subgrade is firm enough to attain compaction within the AB, the remainder of the excavation may be backfilled. It may be necessary to place additional AB to stabilize the subgrade sufficiently to place fill.

7.3.2 Remedial Grading

For planning purposes, we recommend removing the existing soils to a depth of 2 feet below existing surface levels (following removal of asphalt paving) across the site to provide a uniform surface for additional fill placement, a uniform fill surface in cut areas and to allow for observation of unsuitable soils (clayey, wet, loose) in the exposed subgrade. Plate 5, Remedial Grading Exhibit, illustrates this recommendation. The recommendation does not consider the following factors that could increase the depth of the remedial grading:

- Some areas may require additional remedial grading based on demolition activities.
- The period of placement for the existing fill (1960s) and the lack of documentation regarding placement may increase its physical variability and consequently increase the need for remedial grading.
- The variability inherent in native subgrades where there may be loose and/or soft areas.
- The findings from additional subsurface exploration and/or observations by the Geotechnical Engineer during earthwork.
- The residential development building areas may require additional remedial grading depending on final product and foundation designs.
- Planned hardscape, graded paths, pavements, concrete slabs, and structural improvements in the park sites could require some remedial grading for subgrade preparation.

The fill may be recompacted provided it is processed as recommended in the On-Site Soils and Materials Management section.

7.3.3 Fill Compaction

All fill and backfill should be placed at slightly above optimum moisture content using equipment that can produce a uniformly compacted product. The loose lift thickness should be 8 inches, unless performance observed and testing during earthwork indicates a thinner loose lift is needed, or a thicker loose lift is possible, up to a loose lift thickness of 12 inches. The recommended relative compaction is 90 percent or more, or 95 percent or more where specified, of the maximum dry density based on ASTM D1557.

A two-sack sand and cement slurry may also be used for structural fill as an alternative to compacted soil. It has been our experience that slurry is often useful in confined areas which may be difficult to access with typical compaction equipment. Samples of the slurry should be fabricated and tested for compressive strength during construction. A 28-day compressive strength of 100 pounds per square inch (psi) or more is recommended for the sand and cement slurry. Gravel (¾-inch) completely wrapped in filter fabric (Mirafi 140N, or approved equivalent) may also be used as backfill in confined areas.

7.3.4 On-Site Soils and Materials Management

The following existing soils and materials are available for processing and reuse.

- Soil
- Asphalt Concrete (AC)
- Portland Cement Concrete (PCC)

The following sections provide recommendations for processing and reuse as fill.

7.3.4.1 Soil

Most of the existing soils above groundwater should be suitable for reuse. They should be processed to produce fill soil with a well graded particle distribution with a suitable moisture content for compaction. Some processing of wet soils should be anticipated. Soil with an EI > 50 should be removed and disposed of offsite. Rocks or concrete fragments greater than 3 inches in maximum dimension should not be reused. They could be stockpiled on site for processing as part of the stadium demolition.

7.3.4.2 Asphalt Concrete

Existing AC should be crushed to less than 1 inch in maximum dimension and blended with approved fill soils. Existing AC can be recycled, reprocessed, and reused as a base course for new AC paving. City of San Diego personnel have anecdotally observed paving fabric in portions of the AC. We did not observe this fabric in the explorations.

7.3.4.3 Portland Cement Concrete

Concrete may be crushed to less than 1 inch in maximum dimension for use as fill. It should be added to other soils to create a well graded fill material. Reinforcing steel should be removed prior to crushing the concrete. Properly crushed concrete will often meet the gradation and quality criteria from Section 200-2.4 of the Standard Specifications for Public Works Construction for use as Crushed Miscellaneous Base (CMB).

7.3.5 Import Soil

The project proposes to import approximately 315,000 CY of soil for use as fill. Imported fill sources should be observed and tested by the Geotechnical Engineer prior to hauling onto the site to determine the suitability for use. Imported soil for common fill should consist of granular soil that is free of organic materials, with an Expansion Index less than 50 based on ASTM D4829, and a gradation that meets the criteria shown in the table below.

RECOMMENDED GRADATION FOR IMPORT SOIL

Sieve Size	(% Passing)
3 inches	100
3/4 inch	100 - 80
No. 4	100 - 65
No. 200	0 - 35

Soils should also have a minimum resistivity value greater than 1,000 ohm-centimeters, chloride content of less than 500 ppm and sulfate content of less than 1,000 ppm and pH greater than 5.5.

Additional testing per the guidelines provided by the Department of Toxic Substances Control (DTSC, 2001) is required by the Owner prior to accepting soil for import. Test results should meet the most stringent State and Federal residential screening levels including the most up-to-date DTSC-Modified Screening Levels (DTSC-SLs) and United States Environmental Protection Agency Regional Screening Level (RSL).

During earthwork, soil types may be encountered by the Contractor that do not appear to conform to those discussed within this report. The Geotechnical Engineer should evaluate the suitability of these soils for their proposed use.

For each proposed fill source, the Contractor should provide a submittal to the Geotechnical Engineer demonstrating the proposed site and materials meet the geotechnical and environmental guidelines for import. Prior to import of the proposed materials, samples of all proposed import should be tested by the Geotechnical Engineer to evaluate the suitability of these soils for their proposed use. The following screening tests should be performed for every 1,000 cubic yards of import, with a minimum of two sets of screening tests for each proposed import site.

- Particle Size Distribution (ASTM D6913)
- Maximum Density (ASTM D1557)
- Expansion Index (ASTM D4829)
- Sulfate Content (ASTM D516)
- Chloride Content (ASTM D512)
- pH & Resistivity (CT 643)

If a long-term, steady source of import material is utilized that consistently meets the import soil recommendations described above, the import material testing frequency may be reduced at the discretion of the Geotechnical Engineer and SDSU.

7.3.6 Cut and Fill Slope Construction

Cut and fill slopes should be formed at inclinations no steeper than 2:1 (horizontal to vertical). Fill slopes above cut slopes or natural slopes with gradient steeper than 5:1 should be formed with a keyway at the base and benches into competent materials as fill is placed according to the following dimensions, or as recommended by the Geotechnical Engineer.

- Minimum width of keyway should be 15 feet.
- Base of the keyway should tilt back 2 percent, or a minimum of 1 vertical foot.
- Minimum depth and height for benches should be 4 feet.
- Minimum horizontal thickness of the fill from the face to the forward edge of the bench should be 10 feet.

The face of fill slopes should be thoroughly compacted and tested for in-place density after each 4-foot increase in slope height. When finished pad grade is achieved, the face of the fill slope should be further compacted along a vertical grid that overlaps with appropriate equipment, such as a cable-lowered “sheepsfoot” pad roller, or similar.

7.3.7 Grading Factors

Fill soils derived from cut areas should consist of a heterogeneous mixture of sand, gravel and clay. The grading factors (shrinkage or swell) of these materials will also vary from their in-situ to compacted condition. We estimate soils derived from onsite excavations and cuts that are ultimately placed as compacted fill (at 90 to 95 percent relative compaction per ASTM D1557) will have a net shrink of about five to ten percent by volume. Existing fill soils near the ground surface that are moderately to well compacted should have a grading factor of about 1 (plus or minus five percent shrink/swell).

7.4 Asphalt Concrete Pavements

New interior streets will be 6-Lane Major, 4-Lane Major and 2-Lane Collectors with Traffic Indices of 9.0, 10.5 and 11.0 that are covered with asphalt concrete pavement and constructed according to City of San Diego Standard Drawings, Schedule J, Pavement Design Standards. Temporary surface parking covered with asphalt concrete or gravel is planned for Opening Day in areas north, west and south of the Stadium.

An R-Value of 20 should be assumed for preliminary assessment of Asphalt Concrete surfaced pavements or landscaping type of surfaces. Based on our review of the available geotechnical information, the subgrade R-Value within the upper 36 inches of subgrade could range from 20 to 40 or more, assuming some selective placement of fill to from the subgrade. The design subgrade R-Value should be confirmed by R-Value testing of the actual pavement subgrade soils during fine grading operations within the pavement areas.

Schedule J provides the standard sections for the range of subgrade R-Values for Traffic Indices representative of the planned streets and surface parking. Alternative pavement sections designed in accordance with the Caltrans Design Method, Topic 633.1 (Caltrans, 2018b) that use aggregate base rather than the cement treated base used in the Schedule J are summarized in the table below. A 20-year pavement design life was assumed for the analyses.

PRELIMINARY ASPHALT CONCRETE PAVEMENT SECTIONS

Traffic Index	Asphalt Section	Base Section (R-Value ~20)
9.0	5 Inches	17 Inches
10.5	7 Inches	20 Inches
11.0	7 Inches	22 Inches

7.5 Underground Utilities

Civil site works include new sewer (8- to 18-inch diameter PVC and temporary 30-inch CMP), storm drain (18- to 36-inch diameter RCP), water and fireline (12-inch diameter), and dry utilities. Gravity flow utilities mostly have a minimum gradient of 0.5 percent. The following sections provide preliminary geotechnical recommendations for design and construction.

7.5.1 Settlement

New and existing underground utilities below new fill will experience time dependent consolidation settlement depending on the timing of their installation following grading. Some form of mitigation will be needed if the utility cannot tolerate the total and differential settlement estimated in the Compressible Soils section. Mitigation could be delaying the installation until the settlement is substantially complete, preloading the utility alignment area (prior to utility installation) with a fill surcharge or the various forms of Ground improvement discussed in this report.

7.5.2 Soil Loads

A soil unit weight of 130 pounds per cubic (pcf) may be used to evaluate soil loads for pipe above groundwater. The permissible depth of cover should be checked were new fill will be placed over underground utilities that will remain.

7.5.3 Thrust Blocks

Lateral resistance for thrust blocks may be determined by a passive pressure value of 200 pounds per square foot (psf) per foot of embedment, assuming a triangular distribution. This value may be used for thrust blocks embedded into the soils in the Surficial Soils - Undifferentiated unit described in this report that are above groundwater.

7.5.4 Modulus of Soil Reaction

The modulus of soil reaction (E’) is used to characterize the stiffness of soil backfill placed along the sides of buried flexible pipelines. To evaluate deflection due to the load associated with trench backfill over the pipe, we recommend using 1,000 pounds per square inch (psi) assuming granular bedding material is placed around the pipe.

7.5.5 Pipe Bedding

Typical pipe bedding as specified in the *Standard Specifications for Public Works Construction* or *City of San Diego Standard Drawings* may be used. We recommend using a filter fabric separator (such as Mirafi 140N or an approved similar product) between the soil and open graded rock used for bedding and/or backfill where the alignment is within roadways or near settlement sensitive improvements. The use of a filter fabric separator may be waived by the Geotechnical Engineer based on site specific soil conditions observed in the trench excavation.

7.5.6 Existing Utilities

The permissible depth of cover and settlement tolerances should be checked were new fill will be placed over underground utilities that will remain, particularly the existing fuel pipeline that is 3 feet deep in the eastern portion of the site. The permissible depth of cover and settlement tolerances for construction traffic and equipment loads should also be evaluated.

8.0 CONSTRUCTION CONSIDERATIONS

Construction of the project will need to manage substantial variability within the subsurface materials. Summarized below are the primary geotechnical-related construction considerations known at this time.

- The materials encountered in construction excavations could vary significantly across the site. Excavations should be prepared to encounter thick layers of gravel and cohesionless soils that are prone to caving and/or sloughing.

- Subgrade stabilization may be needed anywhere in the project area. The Contractor should anticipate the need for stabilization of the subgrade using geotextiles or gravel as recommended in the Site Preparation section of this report.

- Settlement monuments should be installed in all fill areas where construction needs to be delayed. Settlement instrumentation and monitoring can be conducted per the latest version of California Test Method 112 (Caltrans, 2012). Figures 7A and 7B (*to follow*), Settlement Monument Details – Surface Monument and Riser Plate provide details for the instrumentation.

- The variability of the soil physical characteristics, the pervasive gravel, and the observation of the mineral mica and its corresponding structure in the soil can complicate the use of ground improvement at the site, as outlined in the Ground Improvement section of this report.

- Existing piles obstruct underground construction, such as ground improvement and new piling within the footprint of the SDCCU stadium.

- Shallow fuel lines in the eastern portion of the overall site may need to be protected from construction traffic and new fill loads.

9.0 LIMITATIONS

The recommendations in this report are preliminary and subject to revision from changes that occur during design development or from the results of field testing or actual subsurface conditions encountered during construction. Group Delta needs to continue to be part of the project design and construction for these recommendations to remain valid. If another geotechnical consultant provides these services, they should prepare a letter indicating their intent to assume the responsibilities of the project Geotechnical Engineer-of-Record. This letter should also indicate their concurrence with the recommendations in the report or revise them as needed to assume the role of the project Geotechnical Engineer-of-Record.

This report was prepared using the degree of care and skill ordinarily exercised, under similar circumstances, by reputable geotechnical consultants practicing in similar localities. No warranty, express or implied, is made as to the conclusions and professional opinions included in this report.

The findings of this report are valid as of the present date. However, changes in the condition of a property can occur with the passage of time, whether due to natural processes or the work of humans on this or adjacent properties. In addition, changes in applicable or appropriate standards of practice may occur from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated wholly or partially by changes outside our control. Therefore, this report is subject to review and should not be relied upon after a period of three years.

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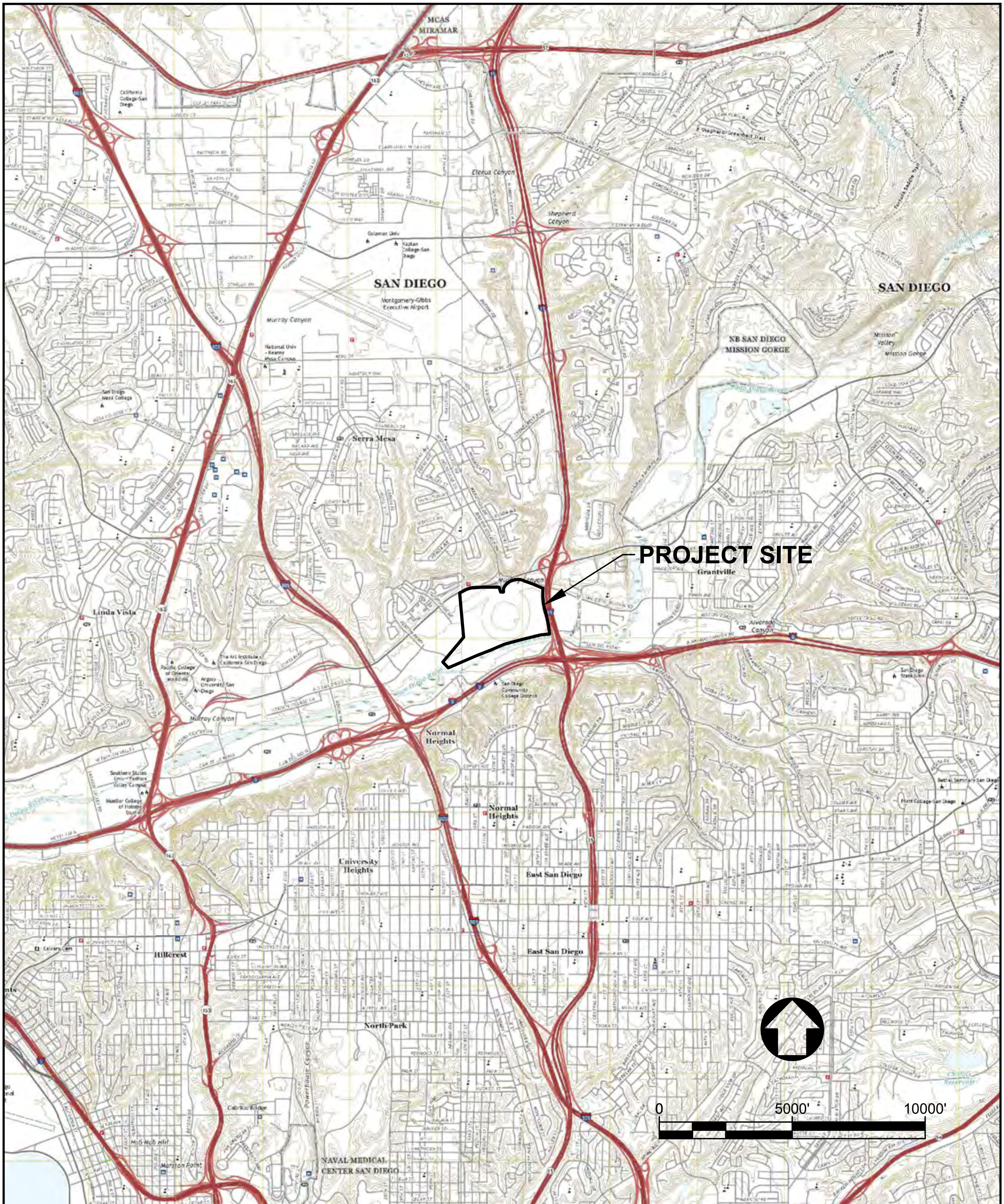
FIGURES



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SDSU MISSION VALLEY SAN DIEGO, CALIFORNIA	SITE LOCATION	GROUP DELTA	
		PROJECT NUMBER: SD605	FIGURE NUMBER: 1

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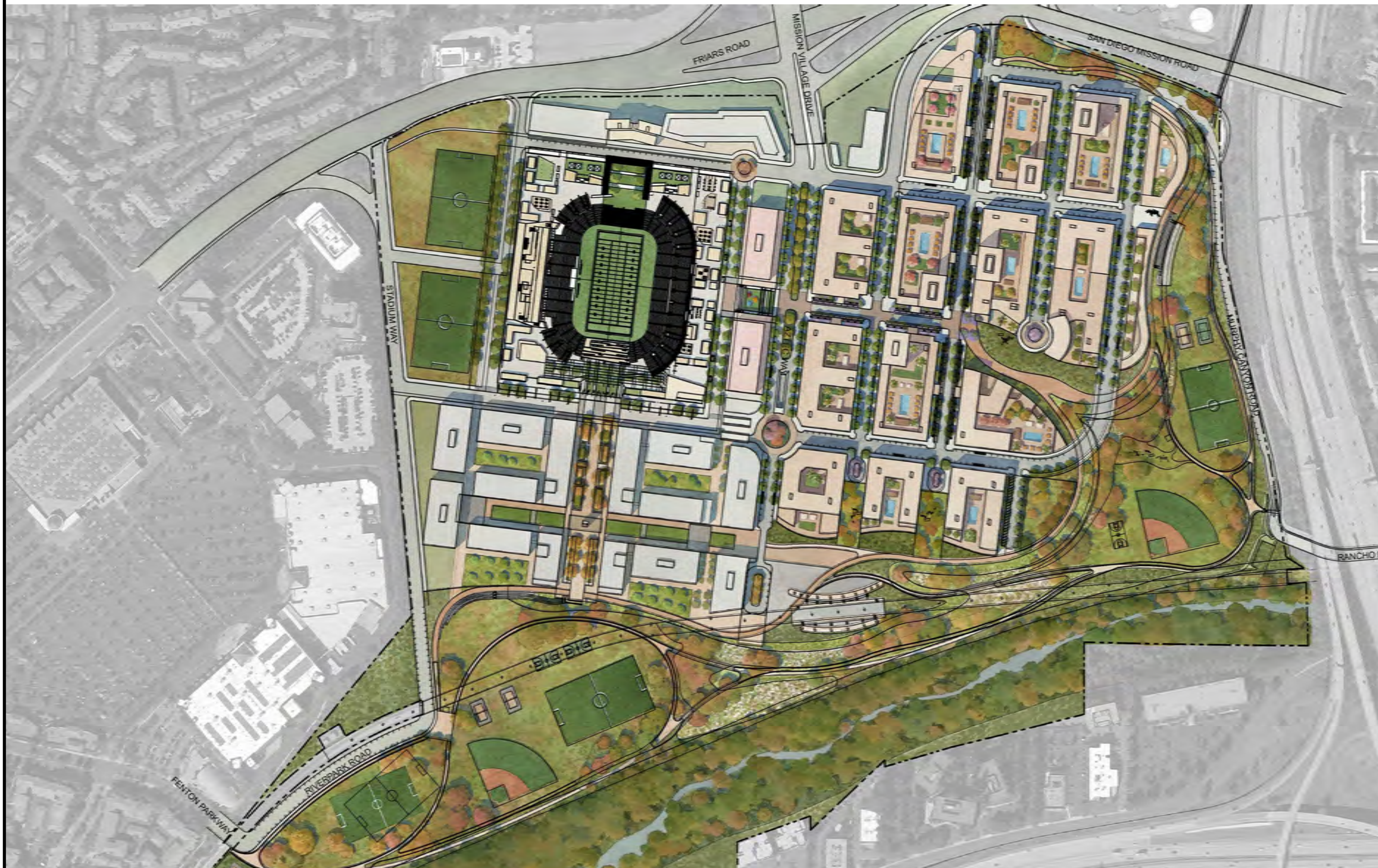

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0 500' 1000'

SDSU MISSION VALLEY
SAN DIEGO, CALIFORNIA

PROPOSED DEVELOPMENT

GROUP DELTA

PROJECT NUMBER: SD605

FIGURE NUMBER: 2

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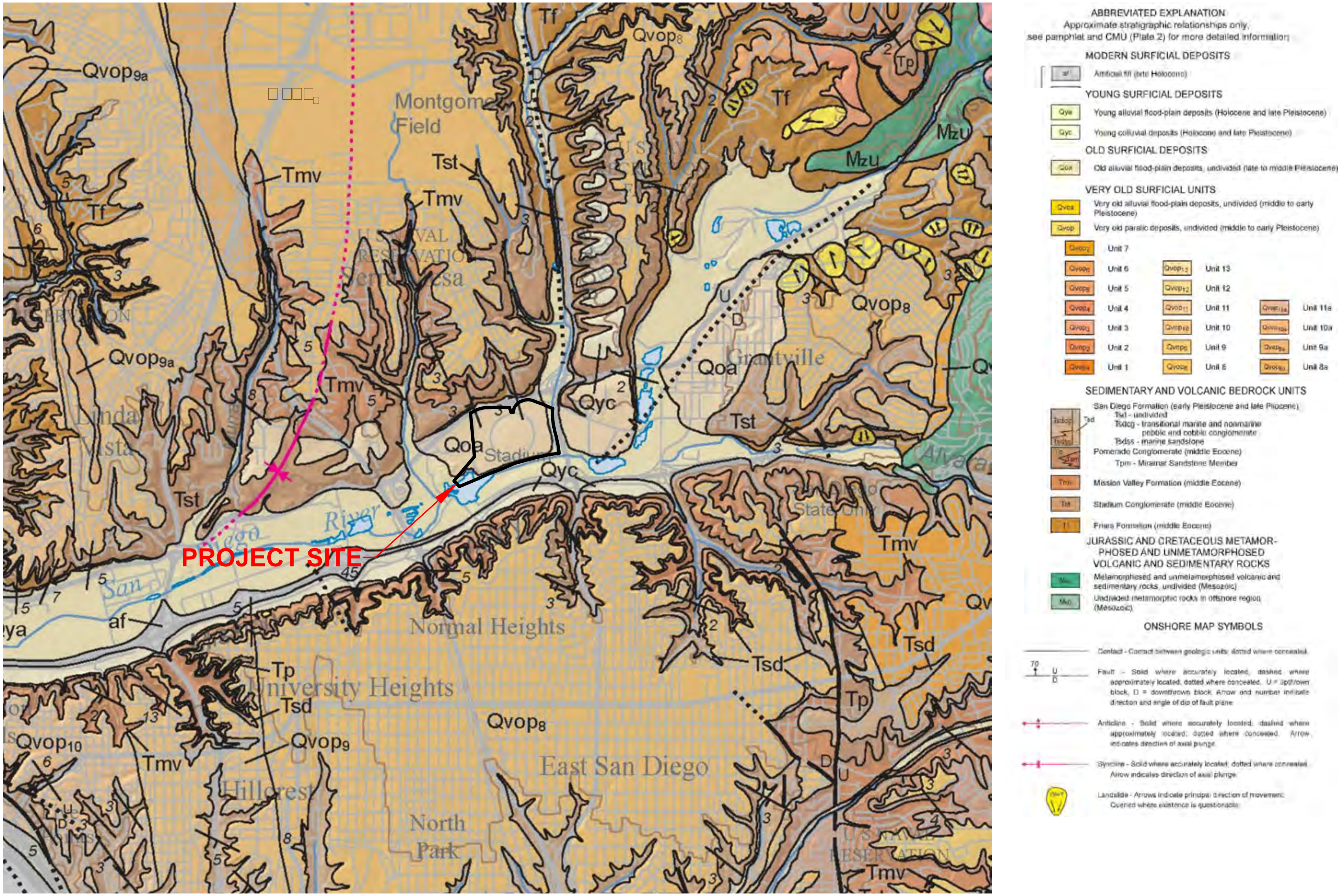

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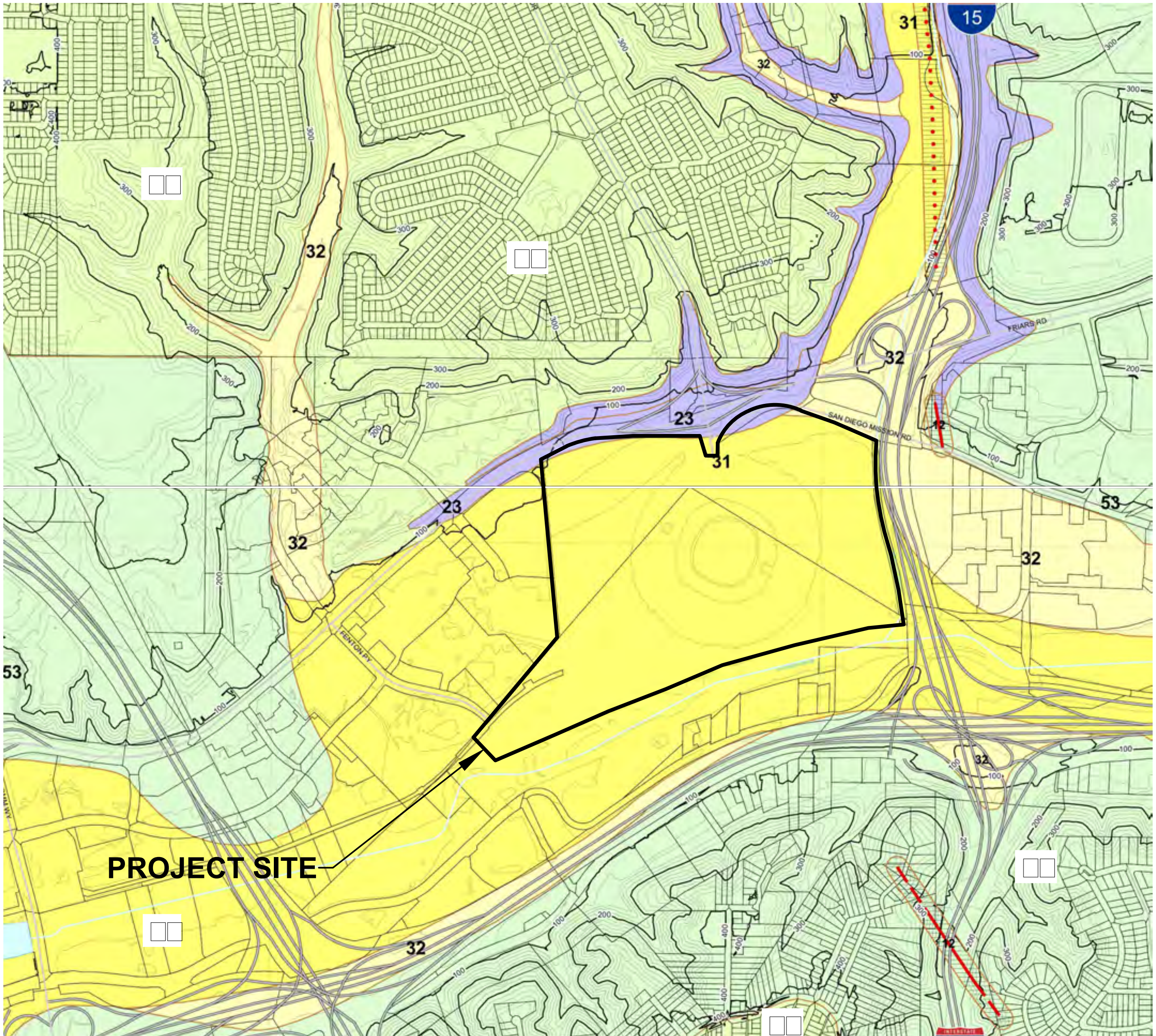
SDSU MISSION VALLEY
SAN DIEGO, CALIFORNIA

GEOLOGIC MAP

GROUP DELTA

PROJECT NUMBER: SD605

FIGURE NUMBER: 3



REFERENCE: CITY OF SAN DIEGO SEISMIC SAFETY STUDY GEOLOGIC HAZARDS AND FAULTS, 04/03/2008

LEGEND

Geologic Hazard Categories

FAULT ZONES

12 Potentially Active, Inactive, Presumed Inactive, or Activity Unknown

SLIDE-PRONE FORMATIONS

23 Friars: neutral or favorable geologic structure

LIQUEFACTION

31 High Potential -- shallow groundwater major drainages, hydraulic fills

32 Low Potential -- fluctuating groundwater minor drainages

OTHER TERRAIN

52 Other level areas, gently sloping to steep terrain, favorable geologic structure, Low risk

53 Level or sloping terrain, unfavorable geologic structure, Low to moderate risk

Water (Bays and Lakes)

FAULTS

Fault

Inferred Fault

Concealed Fault

Shear Zone

0 1500' 3000'

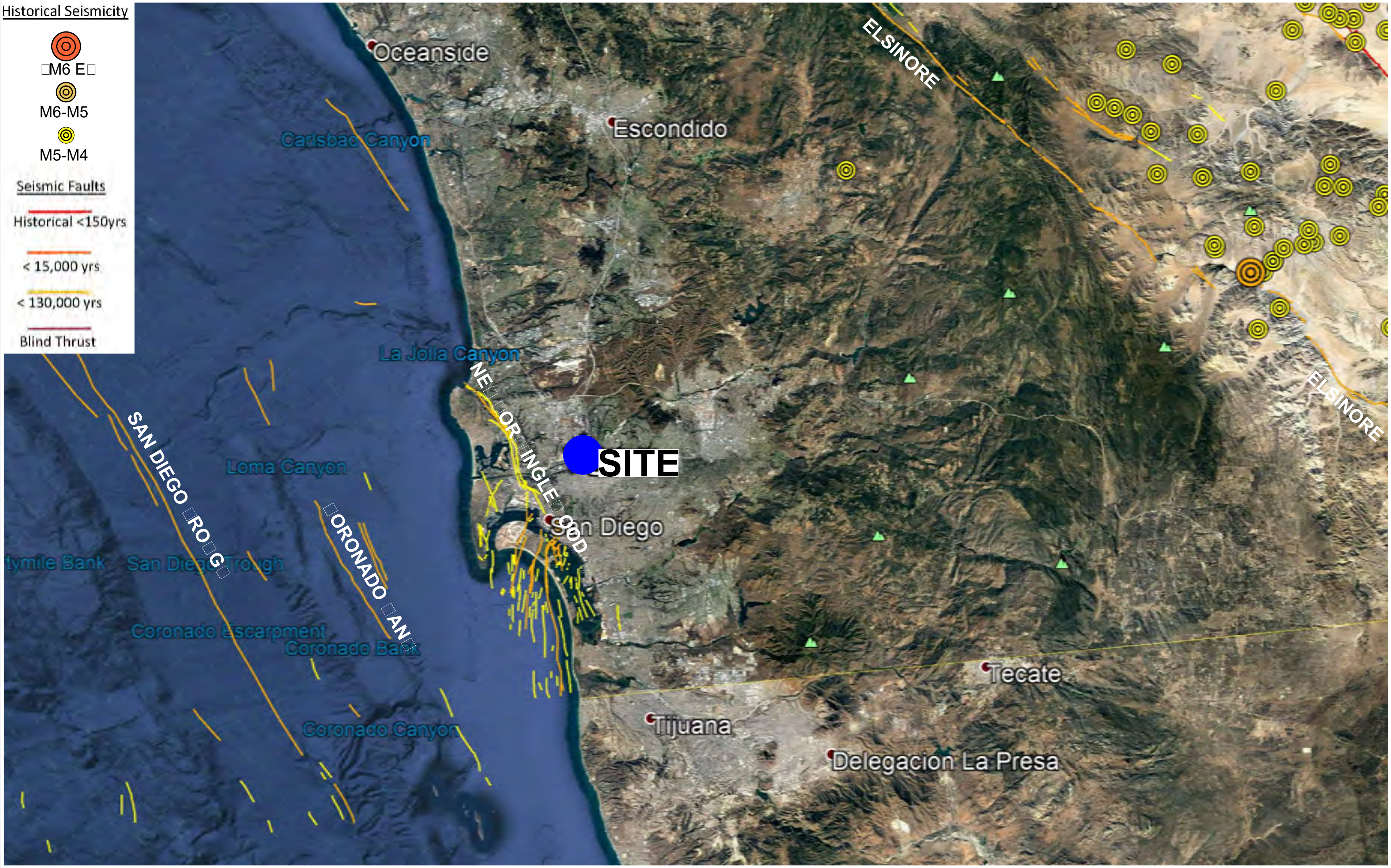
SDSU MISSION VALLEY
SAN DIEGO, CALIFORNIA

SEISMIC SAFETY MAP

GROUP DELTA

PROJECT NUMBER: SD605

FIGURE NUMBER: 4



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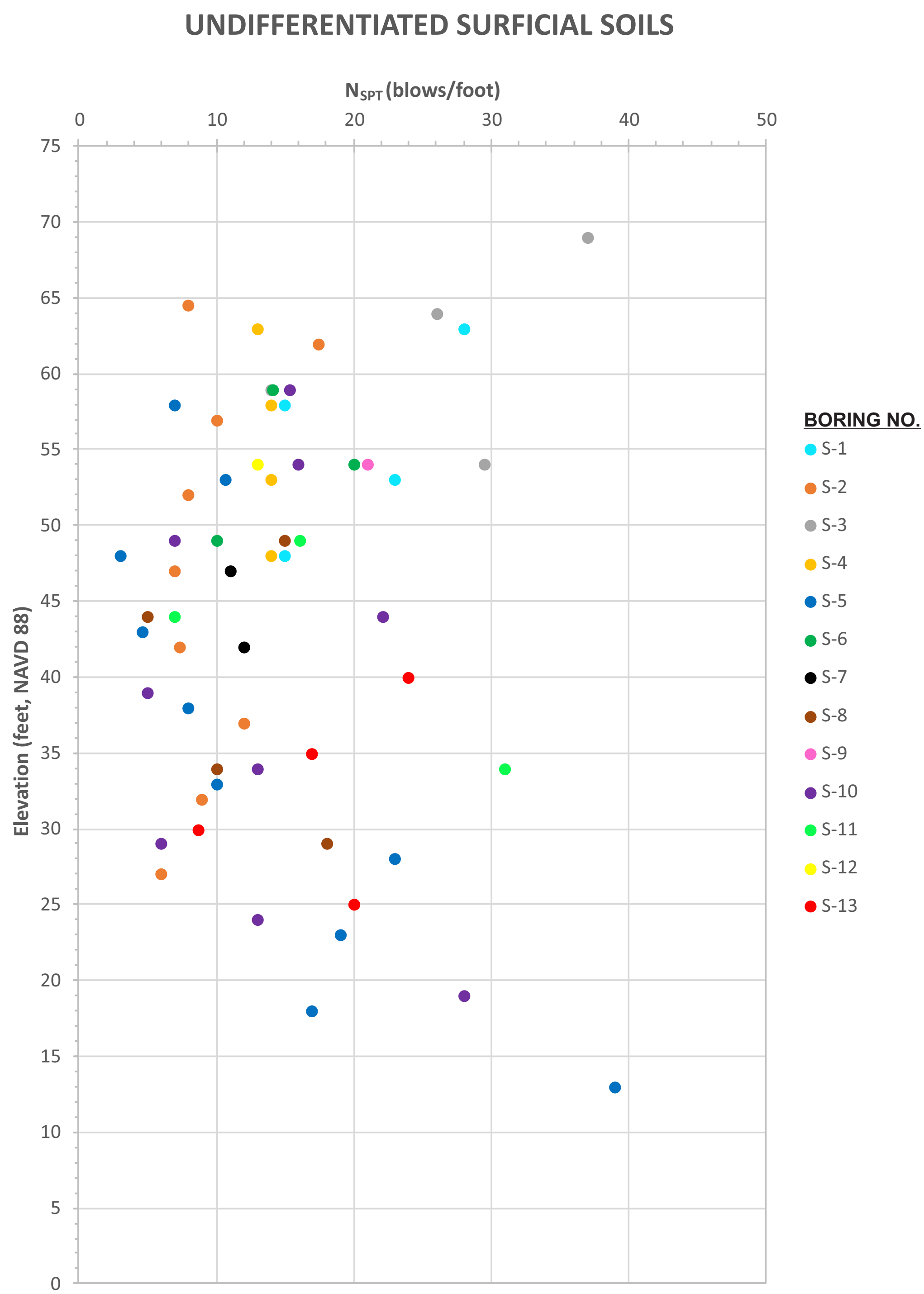

PROJECT NAME	FIGURE NAME	GROUP DELTA	
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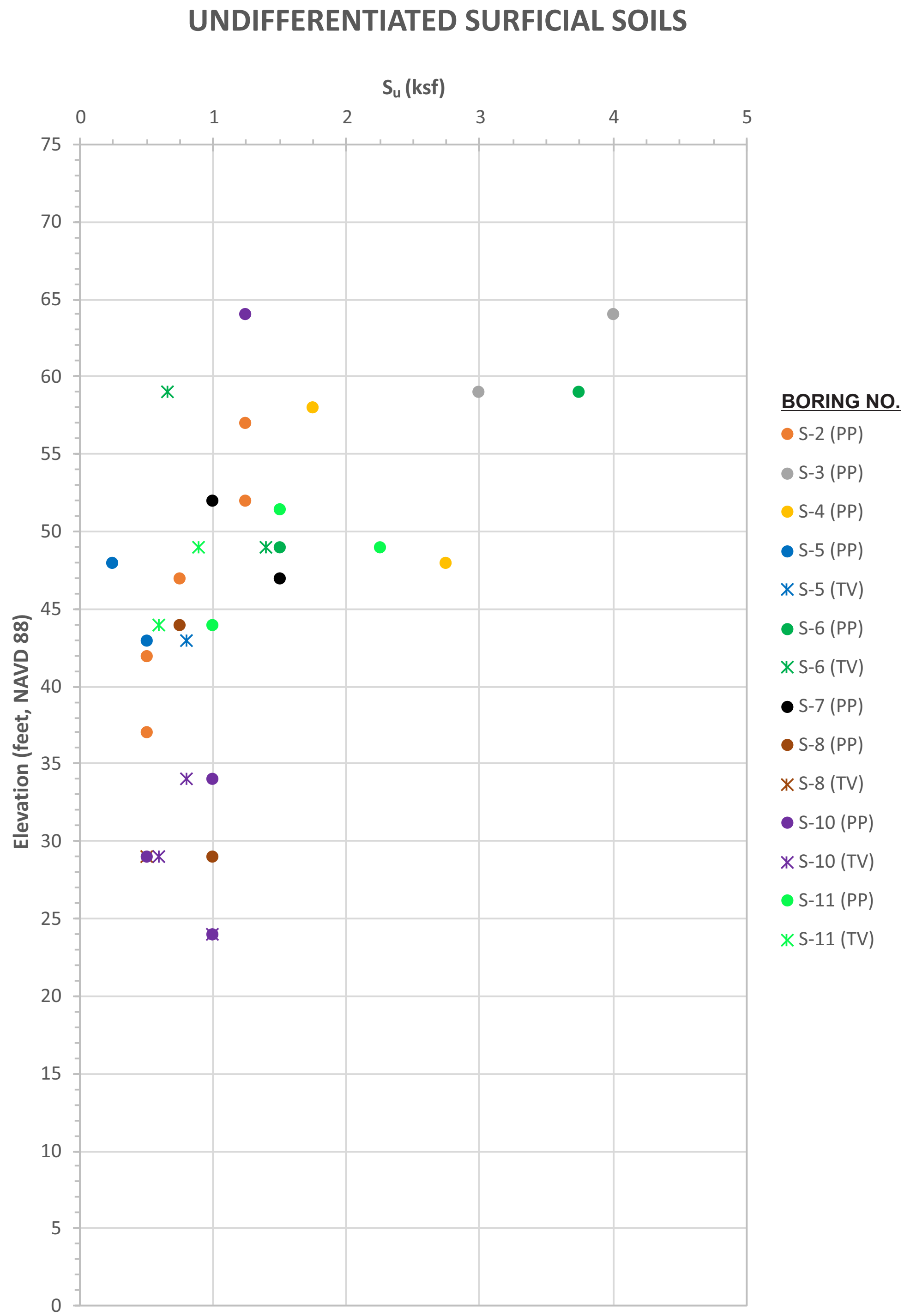

PROJECT NAME	FIGURE NAME	GROUP DELTA	
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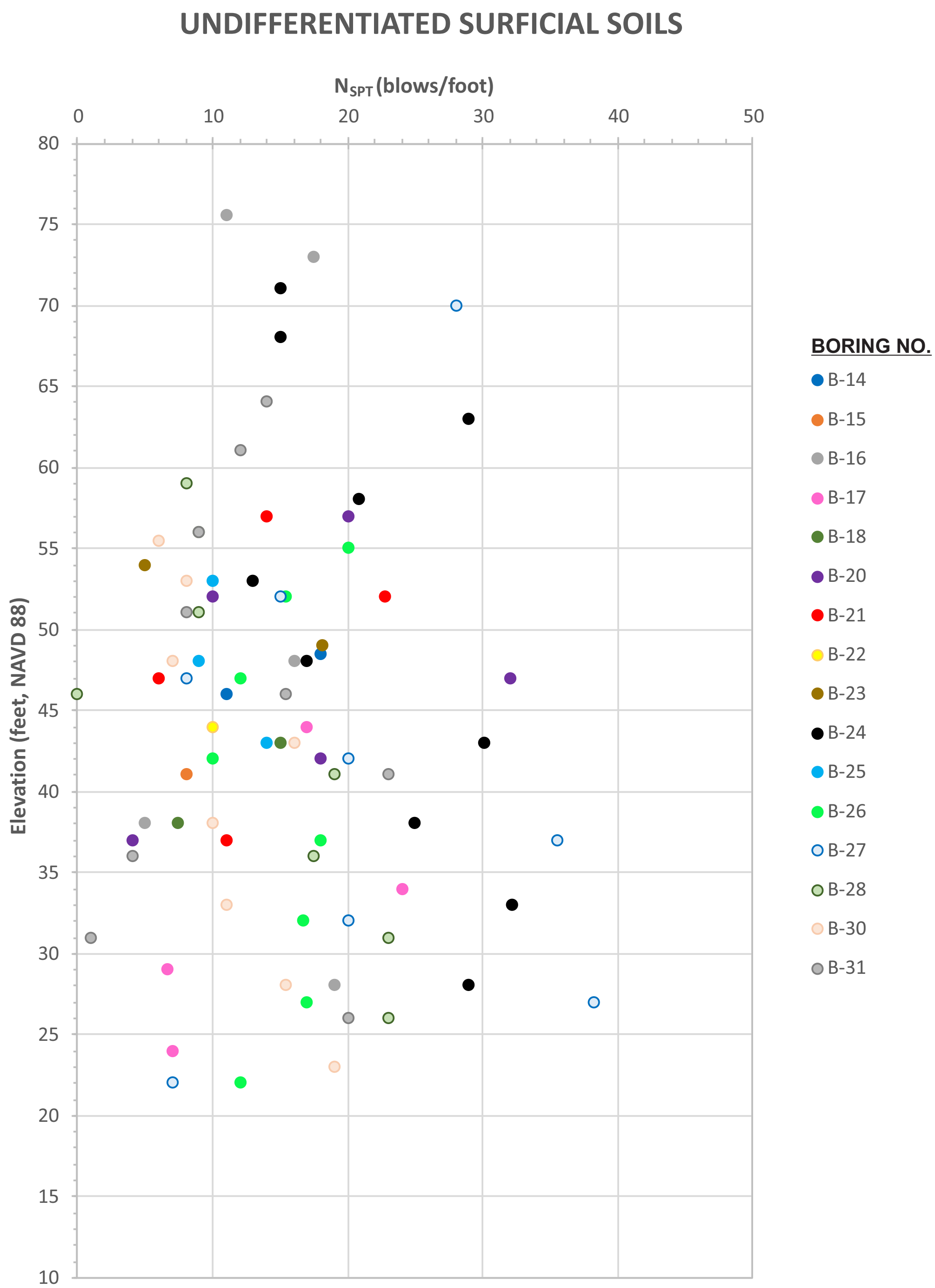

PROJECT NAME	FIGURE NAME	GROUP DELTA	
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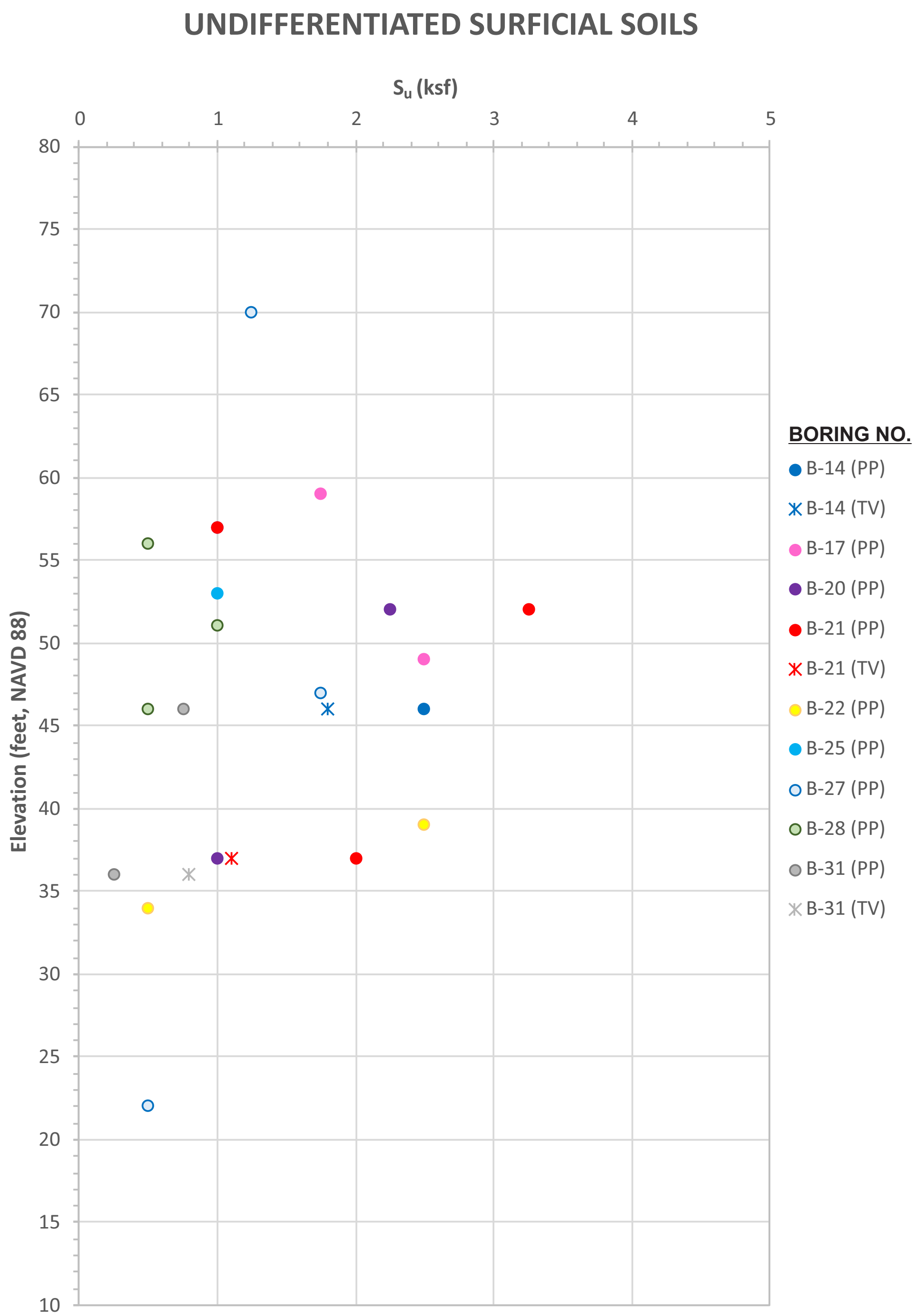


PROJECT NAME	FIGURE NAME	GROUP DELTA	
SDSU MISSION VALLEY SAN DIEGO, CALIFORNIA	**PARAMETER PLOTS**	PROJECT NUMBER SD605	FIGURE NUMBER **6D**

PLATES

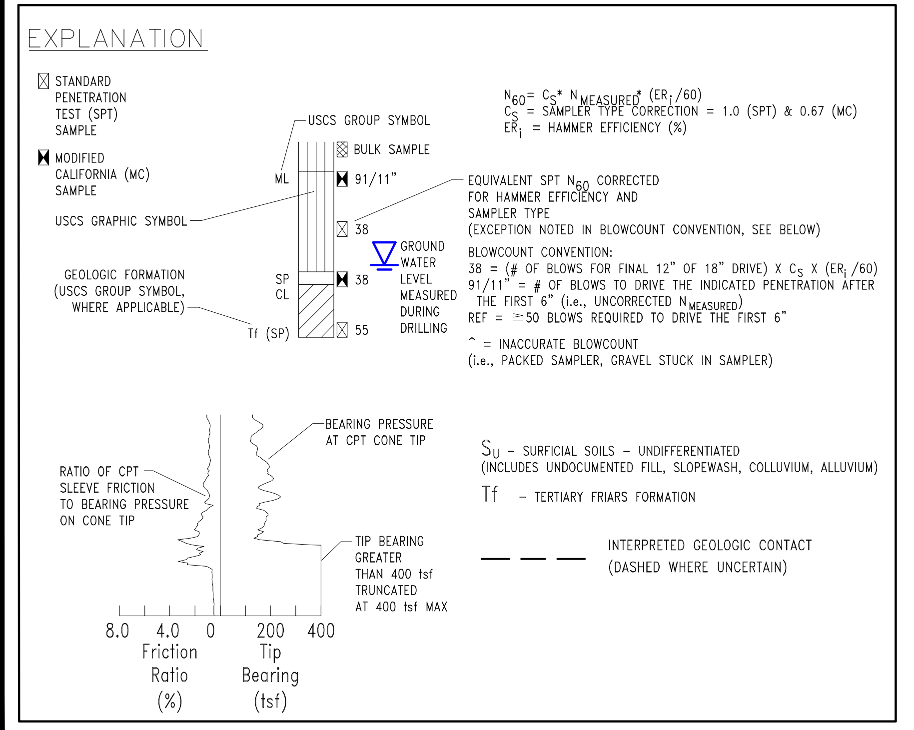
EXPLANATION

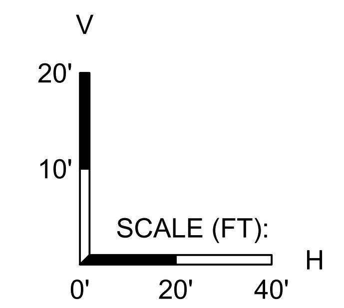
▲	SCPT-13	APPROXIMATE LOCATION OF SEISMIC CONE PENETRATION TEST
▲	CPT-31	APPROXIMATE LOCATION OF CONE PENETRATION TEST
	S-13	APPROXIMATE LOCATION OF AZTEC STADIUM GEOTECHNICAL BORING
	B-17	APPROXIMATE LOCATION OF SITE DEVELOPMENT GEOTECHNICAL BORING
●	RW-111/R-81AD	APPROXIMATE LOCATION OF PREVIOUS ENVIRONMENTAL BORING OR MONITORING WELL DATA USED IN THIS REPORT (ALL BORINGS/WELLS NOT INCLUDED)
	B-32	APPROXIMATE LOCATION OF INFILTRATION TEST BORING
G G'		APPROXIMATE LOCATION AND LETTER DESIGNATION OF GEOLOGIC CROSS SECTION
S_u		SURFICIAL SOILS - UNDIFFERENTIATED

0 200' 400'

REFERENCE: TOPO MAP AND OVERALL SITE, PROVIDED BY RICK ENGINEERING, 03/04/2019

SDSU MISSION VALLEY SAN DIEGO, CALIFORNIA	GEOTECHNICAL MAP	GROUP DELTA PROJECT NUMBER: SD605 PLATE NUMBER: 1



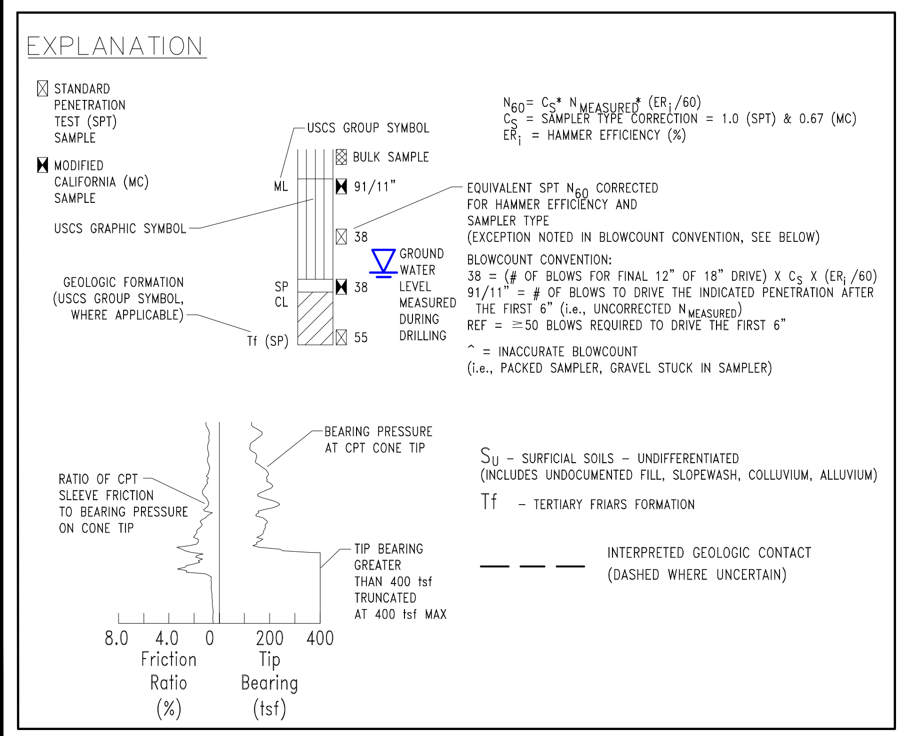


SDSU MISSION VALLEY
SAN DIEGO, CALIFORNIA

GEOLOGIC
CROSS SECTION A1-A1'

GROUP DELTA

PROJECT NUMBER:	PLATE NUMBER:
SD605	2A1



SDSU MISSION VALLEY
SAN DIEGO, CALIFORNIA

GEOLOGIC
CROSS SECTION A2-A2'

GROUP DELTA

PROJECT NUMBER:	PLATE NUMBER:
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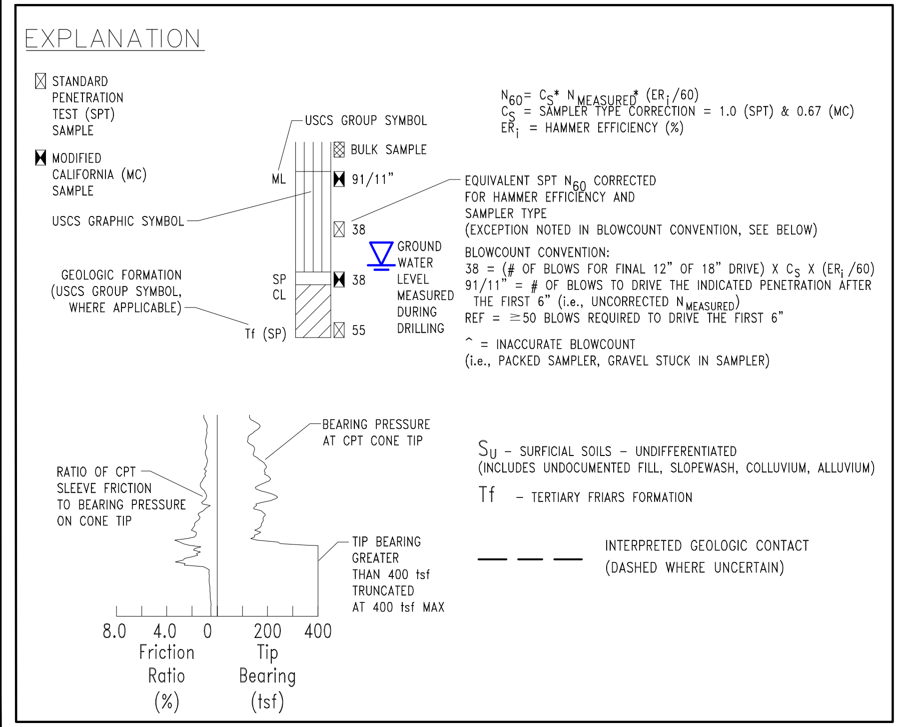


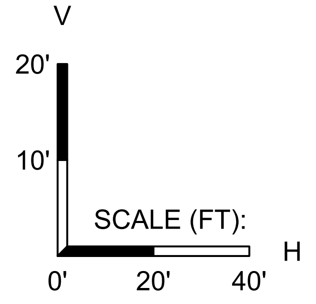
SCALE (FT):
V 20' 10'
H 0' 20' 40'

SDSU MISSION VALLEY
SAN DIEGO, CALIFORNIA

GEOLOGIC
CROSS SECTION B-B'

GROUP DELTA

PROJECT NUMBER:	PLATE NUMBER:
SD605	2B

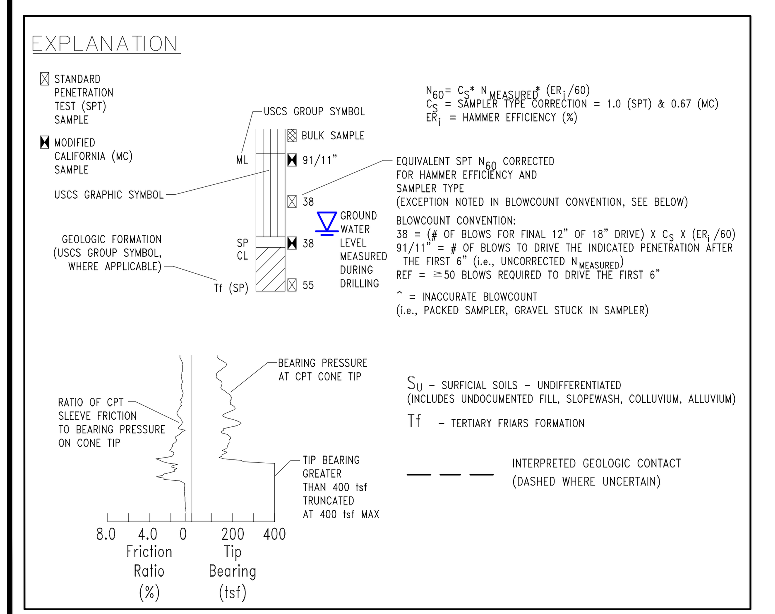


SDSU MISSION VALLEY
SAN DIEGO, CALIFORNIA

GEOLOGIC
CROSS SECTION C-C'

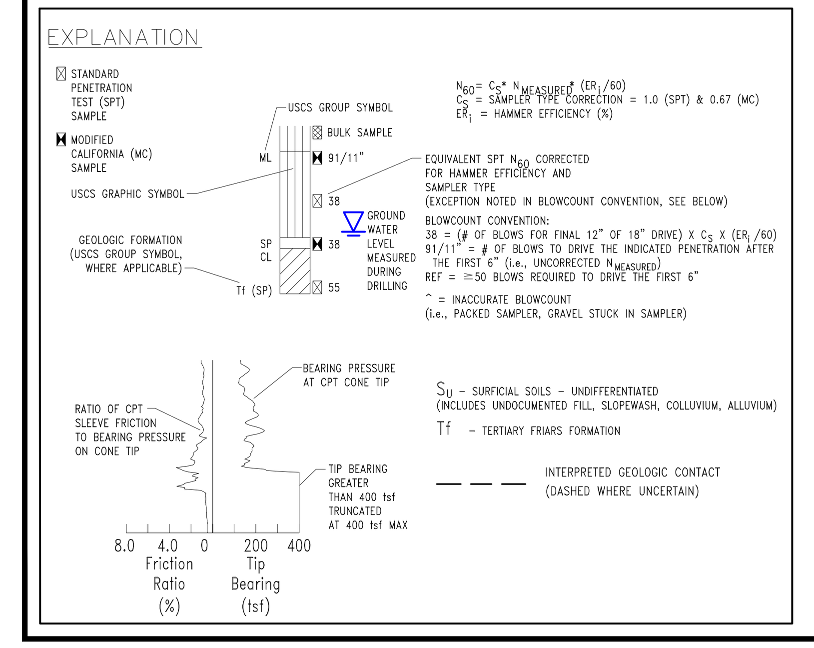
GROUP DELTA

PROJECT NUMBER:	PLATE NUMBER:
SD605	2C



SCALE (FT):

SDSU MISSION VALLEY SAN DIEGO, CALIFORNIA	GEOLOGIC CROSS SECTION D-D'	GROUP DELTA	
		PROJECT NUMBER:	PLATE NUMBER:
		SD605	2D



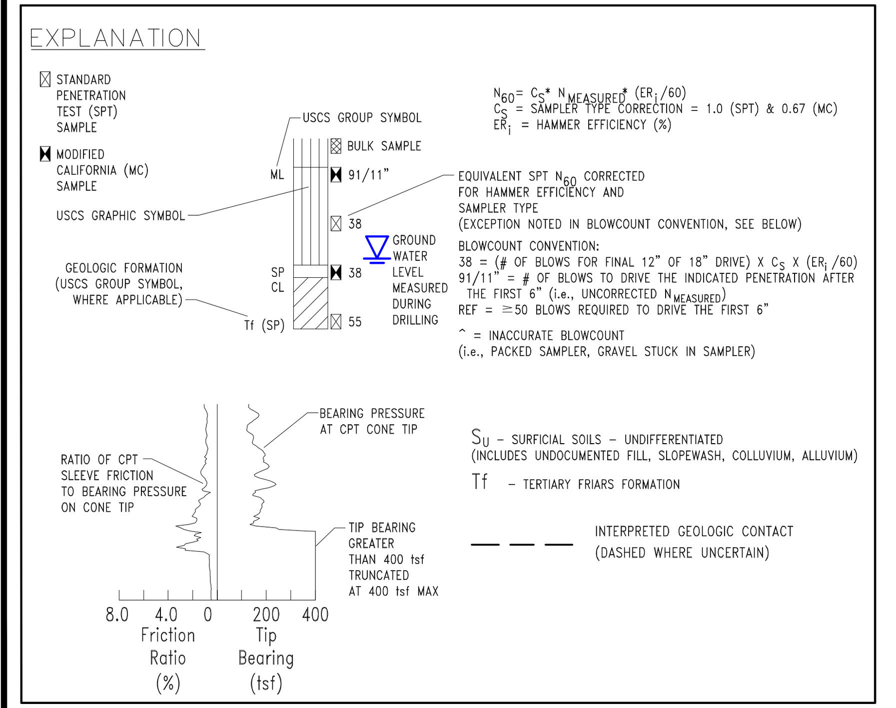
SCALE (FT):
0' 20' 40'
V
H

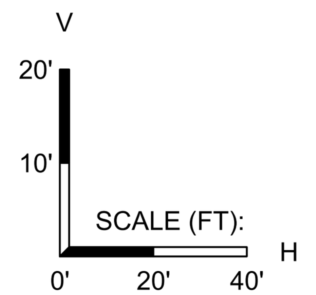
SDSU MISSION VALLEY
SAN DIEGO, CALIFORNIA

GEOLOGIC
CROSS SECTION E-E'

GROUP DELTA

PROJECT NUMBER:	PLATE NUMBER:
SD605	2E



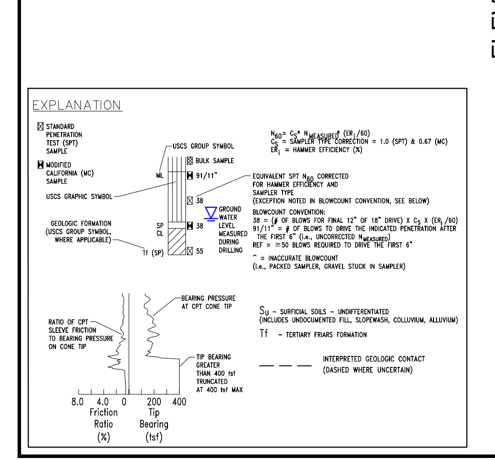


SDSU MISSION VALLEY
SAN DIEGO, CALIFORNIA

GEOLOGIC
CROSS SECTION F-F'

GROUP DELTA

PROJECT NUMBER:	PLATE NUMBER:
SD605	2F

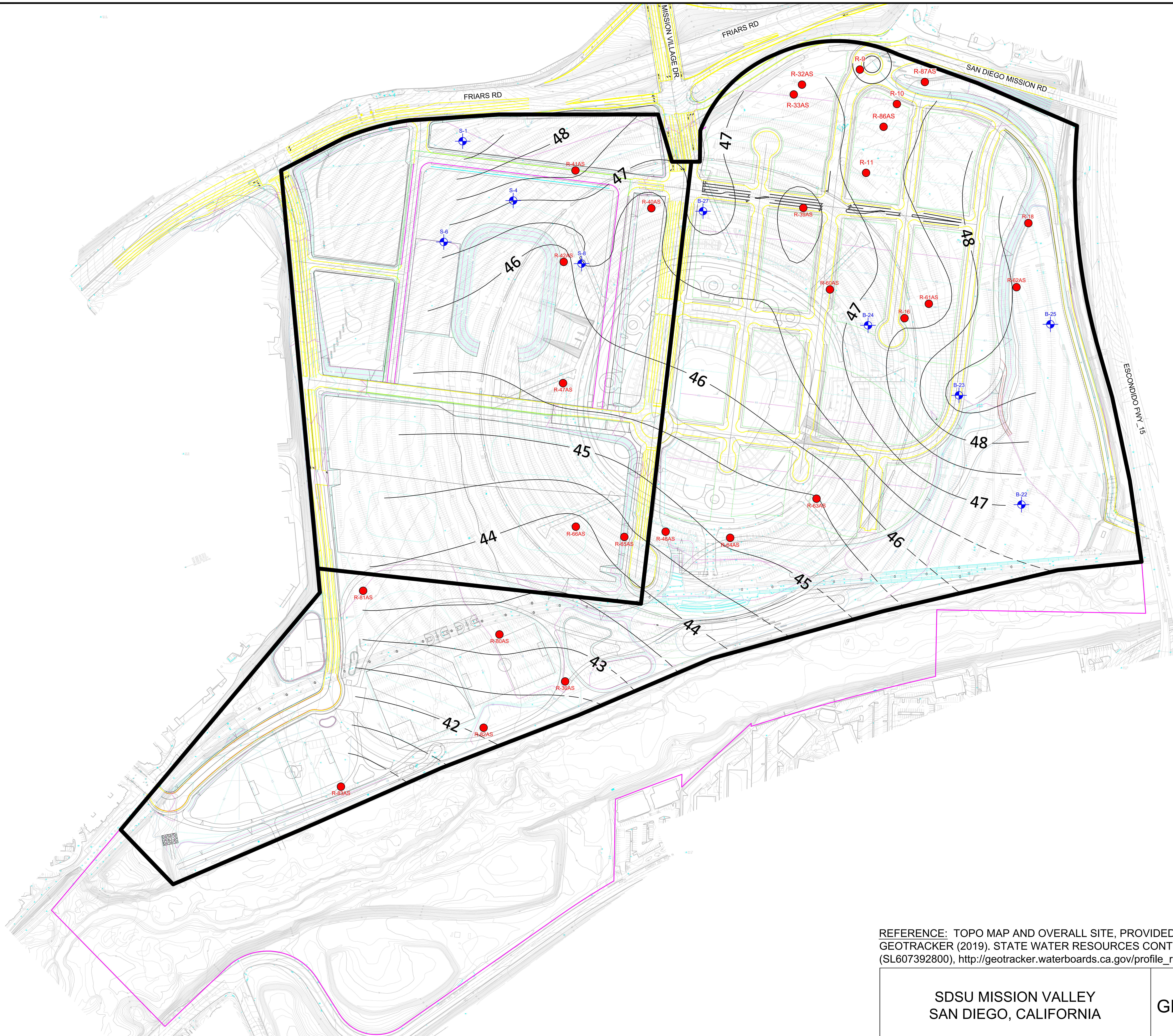


SDSU MISSION VALLEY
SAN DIEGO, CALIFORNIA

GEOLOGIC
CROSS SECTION G-G'

GROUP DELTA

PROJECT NUMBER	PLATE NUMBER
SD605	2G



EXPLANATION

S-13 — APPROXIMATE LOCATION OF AZTEC STADIUM GEOTECHNICAL BORING (ALL BORINGS NOT INCLUDED)

B-17 — APPROXIMATE LOCATION OF SITE DEVELOPMENT GEOTECHNICAL BORING (ALL BORINGS NOT INCLUDED)

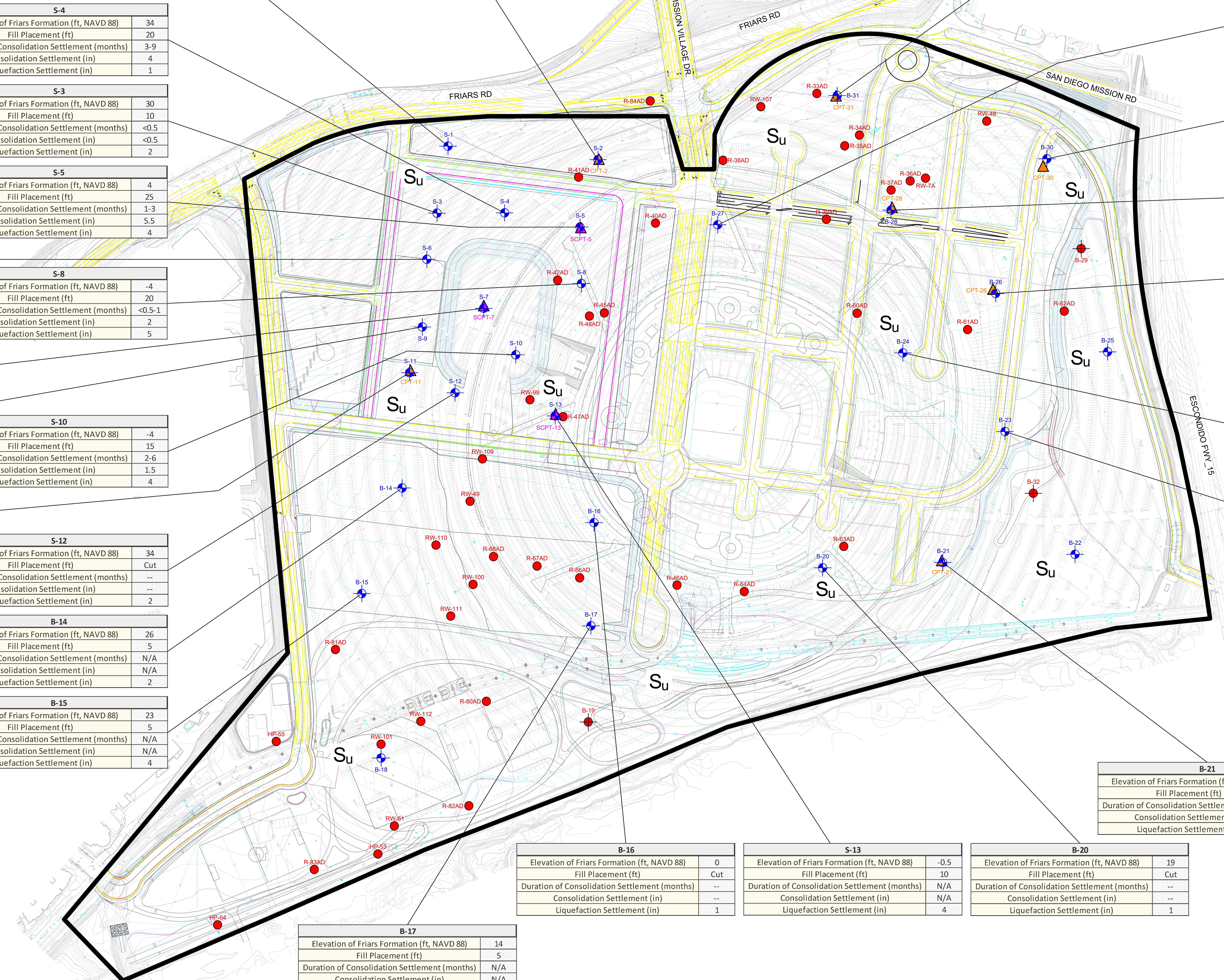
RW-111/R-81AD — APPROXIMATE LOCATION OF PREVIOUS ENVIRONMENTAL BORING OR MONITORING WELL DATA USED IN THIS REPORT (ALL BORINGS/WELLS NOT INCLUDED)

— —46— — GROUNDWATER ELEVATION CONTOUR (DASHED WHERE UNCERTAIN)

0 200' 400'

REFERENCE: TOPO MAP AND OVERALL SITE, PROVIDED BY RICK ENGINEERING, 03/04/2019.
GEOTRACKER (2019). STATE WATER RESOURCES CONTROL BOARD, GEOTRACKER, MISSION VALLEY TERMINAL (SL607392800), http://geotracker.waterboards.ca.gov/profile_report.asp?global_id=SI607392800, ACCESSED 4/16/2019

SDSU MISSION VALLEY SAN DIEGO, CALIFORNIA	GROUNDWATER ELEVATIONS	GROUP DELTA PROJECT NUMBER: SD605	PLATE NUMBER: 3



S-1	
Elevation of Friars Formation (ft, NAVD 88)	26
Fill Placement (ft)	5
Duration of Consolidation Settlement (months)	N/A
Consolidation Settlement (in)	N/A
Liquefaction Settlement (in)	1

S-2	
Elevation of Friars Formation (ft, NAVD 88)	23
Fill Placement (ft)	20
Duration of Consolidation Settlement (months)	8-24
Consolidation Settlement (in)	4.5
Liquefaction Settlement (in)	2

B-31	
Elevation of Friars Formation (ft, NAVD 88)	5
Fill Placement (ft)	5
Duration of Consolidation Settlement (months)	1-3
Consolidation Settlement (in)	1
Liquefaction Settlement (in)	1

B-27	
Elevation of Friars Formation (ft, NAVD 88)	2
Fill Placement (ft)	5
Duration of Consolidation Settlement (months)	1-3
Consolidation Settlement (in)	1
Liquefaction Settlement (in)	1

S-4	
Elevation of Friars Formation (ft, NAVD 88)	34
Fill Placement (ft)	20
Duration of Consolidation Settlement (months)	3-9
Consolidation Settlement (in)	4
Liquefaction Settlement (in)	1

S-3	
Elevation of Friars Formation (ft, NAVD 88)	30
Fill Placement (ft)	10
Duration of Consolidation Settlement (months)	<0.5
Consolidation Settlement (in)	<0.5
Liquefaction Settlement (in)	2

B-30	
Elevation of Friars Formation (ft, NAVD 88)	4
Fill Placement (ft)	15
Duration of Consolidation Settlement (months)	N/A
Consolidation Settlement (in)	N/A
Liquefaction Settlement (in)	3

S-5	
Elevation of Friars Formation (ft, NAVD 88)	4
Fill Placement (ft)	25
Duration of Consolidation Settlement (months)	1-3
Consolidation Settlement (in)	5.5
Liquefaction Settlement (in)	4

B-28	
Elevation of Friars Formation (ft, NAVD 88)	9
Fill Placement (ft)	10
Duration of Consolidation Settlement (months)	4-12
Consolidation Settlement (in)	3.5
Liquefaction Settlement (in)	3

S-6	
Elevation of Friars Formation (ft, NAVD 88)	34
Fill Placement (ft)	Cut
Duration of Consolidation Settlement (months)	--
Consolidation Settlement (in)	--
Liquefaction Settlement (in)	--

B-26	
Elevation of Friars Formation (ft, NAVD 88)	9
Fill Placement (ft)	10
Duration of Consolidation Settlement (months)	N/A
Consolidation Settlement (in)	N/A
Liquefaction Settlement (in)	4

S-8	
Elevation of Friars Formation (ft, NAVD 88)	-4
Fill Placement (ft)	20
Duration of Consolidation Settlement (months)	<0.5-1
Consolidation Settlement (in)	2
Liquefaction Settlement (in)	5

S-7	
Elevation of Friars Formation (ft, NAVD 88)	32
Fill Placement (ft)	Cut
Duration of Consolidation Settlement (months)	--
Consolidation Settlement (in)	--
Liquefaction Settlement (in)	1

B-24	
Elevation of Friars Formation (ft, NAVD 88)	8
Fill Placement (ft)	Cut
Duration of Consolidation Settlement (months)	--
Consolidation Settlement (in)	--
Liquefaction Settlement (in)	1

S-9	
Elevation of Friars Formation (ft, NAVD 88)	29.5
Fill Placement (ft)	5
Duration of Consolidation Settlement (months)	N/A
Consolidation Settlement (in)	N/A
Liquefaction Settlement (in)	2

S-10	
Elevation of Friars Formation (ft, NAVD 88)	-4
Fill Placement (ft)	15
Duration of Consolidation Settlement (months)	2-6
Consolidation Settlement (in)	1.5
Liquefaction Settlement (in)	4

B-23	
Elevation of Friars Formation (ft, NAVD 88)	28
Fill Placement (ft)	10
Duration of Consolidation Settlement (months)	N/A
Consolidation Settlement (in)	N/A
Liquefaction Settlement (in)	3

S-11	
Elevation of Friars Formation (ft, NAVD 88)	24
Fill Placement (ft)	5
Duration of Consolidation Settlement (months)	4-12
Consolidation Settlement (in)	1.5
Liquefaction Settlement (in)	2

S-12	
Elevation of Friars Formation (ft, NAVD 88)	34
Fill Placement (ft)	Cut
Duration of Consolidation Settlement (months)	--
Consolidation Settlement (in)	--
Liquefaction Settlement (in)	2

B-14	
Elevation of Friars Formation (ft, NAVD 88)	26
Fill Placement (ft)	5
Duration of Consolidation Settlement (months)	N/A
Consolidation Settlement (in)	N/A
Liquefaction Settlement (in)	2

B-15	
Elevation of Friars Formation (ft, NAVD 88)	23
Fill Placement (ft)	5
Duration of Consolidation Settlement (months)	N/A
Consolidation Settlement (in)	N/A
Liquefaction Settlement (in)	4

B-21	
Elevation of Friars Formation (ft, NAVD 88)	23
Fill Placement (ft)	Cut
Duration of Consolidation Settlement (months)	--
Consolidation Settlement (in)	--
Liquefaction Settlement (in)	2

B-16	
Elevation of Friars Formation (ft, NAVD 88)	0
Fill Placement (ft)	Cut
Duration of Consolidation Settlement (months)	--
Consolidation Settlement (in)	--
Liquefaction Settlement (in)	1

S-13	
Elevation of Friars Formation (ft, NAVD 88)	-0.5
Fill Placement (ft)	10
Duration of Consolidation Settlement (months)	N/A
Consolidation Settlement (in)	N/A
Liquefaction Settlement (in)	4

B-20	
Elevation of Friars Formation (ft, NAVD 88)	19
Fill Placement (ft)	Cut
Duration of Consolidation Settlement (months)	--
Consolidation Settlement (in)	--
Liquefaction Settlement (in)	1

B-17	
Elevation of Friars Formation (ft, NAVD 88)	14
Fill Placement (ft)	5
Duration of Consolidation Settlement (months)	N/A
Consolidation Settlement (in)	N/A
Liquefaction Settlement (in)	4

0 200' 400'

REFERENCE: TOPO MAP AND OVERALL SITE, PROVIDED BY RICK ENGINEERING, 03/04/2019

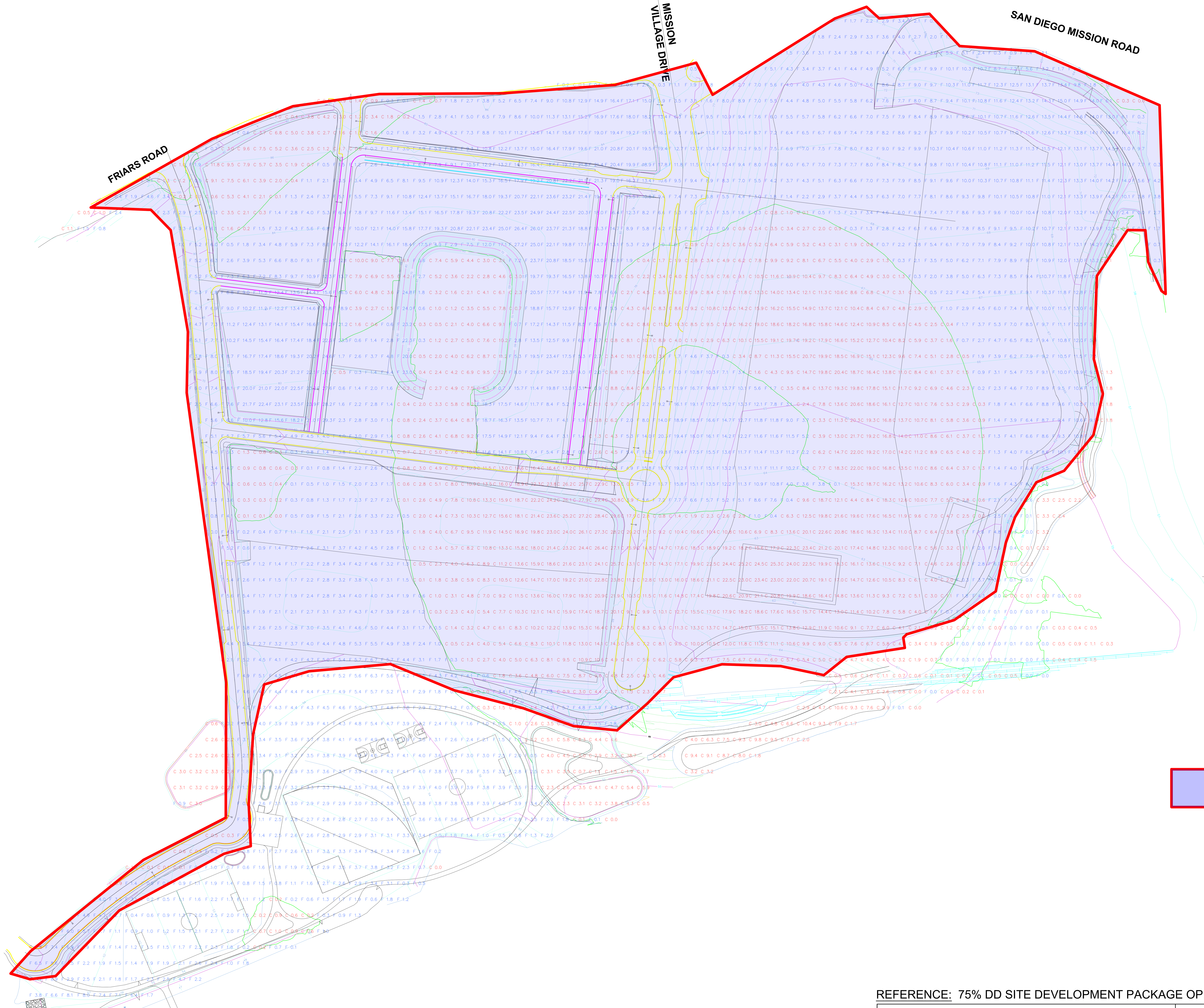
SDSU MISSION VALLEY
SAN DIEGO, CALIFORNIA

ESTIMATED
SETTLEMENTS SUMMARY

GROUP DELTA

PROJECT NUMBER: SD605

PLATE NUMBER: 4



APPROXIMATE REMEDIAL GRADING QUANTITIES

ESTIMATED LIMITS OF 2 FOOT REMEDIAL EXCAVATION = 5,364,993 SF (397,406 CY)

0 175' 350'

REFERENCE: 75% DD SITE DEVELOPMENT PACKAGE OPENING DAY CUT/FILL EXHIBIT, JANUARY 18, 2019

SDSU MISSION VALLEY SAN DIEGO, CALIFORNIA	REMEDIAL GRADING EXHIBIT	GROUP DELTA	
		PROJECT NUMBER:	PLATE NUMBER:
		SD605	5

APPENDIX A
PREVIOUS BORING RECORDS

PROJECT NO.: 51-5690-00	LOG OF BORING HP-53		SHEET 1 of 4
DRILLING METHOD: Hollow Stem Auger	PROJECT NAME: MISSION VALLEY TERMINAL	LOCATION: Western Portion of Site Maintenance Yard	
DRILLING EQUIPMENT: CME-85	SAMPLING METHOD: California Sampler	SURFACE ELEVATION:	TOTAL DEPTH OF BOREHOLE: 131 ft

DATE				GROUNDWATER DEPTH/*ELEV.* (ft)	MEASUREMENT DATE and TIME
STARTED: 9/27/00	DRILLING COMPANY: West Hazmat Drilling	BOREHOLE DIAMETER: 8" (O.D.)			
COMPLETED: 9/28/00	SURFACE CONDITIONS: Dirt/Sand			▼ 15.0 / *na*	9/27/2000
BACKFILLED: 9/28/00	LOGGED BY: B. Breitenbach	REVIEWED BY: J. Stock		▽ na / *na*	
				▼ na / *na*	

DEPTH (ft)	SAMPLE: BLOW COUNTS (BLOWS/FOOT)	SAMPLE: TYPE	SAMPLE: ID	TPHg, TPHd (mg/kg)	PID/OVA (ppm)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
							ARTIFICIAL FILL:
							CLAYEY SAND with COBBLES (SC), dark brown, moist, dense, medium-grained, no hydrocarbon odor or stains
5	50		HP53-5				No recovery (rock)
10	50/7"		HP53-10				Same
							Very moist Pushed hydropunch rods 15' to 17', not enough water - extremely clayey
							ALLUVIUM:
15						▼	SAND (SP), light brown, very moist, medium-grained, no hydrocarbon odor or stains
20	27		HP53-20				CLAYEY SAND with COBBLES (SC), olive gray, very moist, medium dense, no hydrocarbon odor or stains
25	35		HP53-25				SAND (SP), gray, wet, dense, coarse-grained, no hydrocarbon odor or stains Pushed rods 25' to 27' Collected water sample Sand plug in hole
30	27		HP53-30				Same

LOG OF BORING HP-53

PROJECT NO.: 51-5690-00			
DRILLING METHOD: Hollow Stem Auger	PROJECT NAME: MISSION VALLEY TERMINAL	LOCATION: Western Portion of Site Maintenance Yard	
DRILLING EQUIPMENT: CME-85	SAMPLING METHOD: California Sampler	SURFACE ELEVATION:	TOTAL DEPTH OF BOREHOLE: 131 ft

DATE					
STARTED: 9/27/00	DRILLING COMPANY: West Hazmat Drilling	BOREHOLE DIAMETER: 8" (O.D.)		GROUNDWATER DEPTH/*ELEV.* (ft)	MEASUREMENT DATE and TIME
COMPLETED: 9/28/00	SURFACE CONDITIONS: Dirt/Sand			15.0 / *na*	9/27/2000
				na / *na*	
BACKFILLED: 9/28/00	LOGGED BY: B. Breitenbach	REVIEWED BY: J. Stock		na / *na*	

DEPTH (ft)	SAMPLE: BLOW COUNTS (BLOWS/FOOT)	SAMPLE: TYPE	SAMPLE: ID	TPHg, TPHd (mg/kg)	PID/OVA (ppm)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
	29		HP53-35				Same
40	20		HP53-40				Same
45	50/5"		HP53-45				Same
50	100		HP53-50				Same Pushed hydropunch rods 55' to 57' Collected water sample
55	63		HP53-55				Same
60	50/5"		HP53-60				**FRIARS FORMATION:** CLAYEY SAND (SC), gray with red, (some silt), moist, very dense, coarse
65	100/3"		HP53-65				Same

KLEINFELDER
5015 SHOREHAM PLACE
SAN DIEGO, CALIFORNIA 92122

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED.

FIGURE
C5

LOG OF BORING HP-53

PROJECT NO.: 51-5690-00			
DRILLING METHOD: Hollow Stem Auger	PROJECT NAME: MISSION VALLEY TERMINAL	LOCATION: Western Portion of Site Maintenance Yard	
DRILLING EQUIPMENT: CME-85	SAMPLING METHOD: California Sampler	SURFACE ELEVATION:	TOTAL DEPTH OF BOREHOLE: 131 ft

DATE					
STARTED: 9/27/00	DRILLING COMPANY: West Hazmat Drilling	BOREHOLE DIAMETER: 8" (O.D.)	GROUNDWATER DEPTH/*ELEV.* (ft)	MEASUREMENT DATE and TIME
COMPLETED: 9/28/00	SURFACE CONDITIONS: Dirt/Sand		15.0 / *na*	9/27/2000
			na / *na*	
BACKFILLED: 9/28/00	LOGGED BY: B. Breitenbach	REVIEWED BY: J. Stock	na / *na*	

DEPTH (ft)	SAMPLE: BLOW COUNTS (BLOWS/FOOT)	SAMPLE: TYPE	SAMPLE: ID	TPHg, TPHd (mg/kg)	PID/OVA (ppm)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
	50/4"		HP53-70				Same
75	50/5"		HP53-75				Same Pushed hydropunch rods 75' Collected water sample
80	100/4"		HP53-80				Same
85	100/4"		HP53-85				CLAYEY SAND (SC), gray, very moist, very dense, coarse-grained, pieces of shell
90	100/4"		HP53-90				SANDY CLAY (CL), gray, moist, very dense, fine-grained, with shell fragments, cobbles
95	100/4"		HP53-95				Same
100	100/4"		HP53-100				Same Pushed hydropunch rods 100' to 101' Collected groundwater sample

KLEINFELDER
5015 SHOREHAM PLACE
SAN DIEGO, CALIFORNIA 92122

PROJECT NO.: 51-5690-00	LOG OF BORING HP-53	SHEET 4 of 4

DRILLING METHOD: Hollow Stem Auger	PROJECT NAME: MISSION VALLEY TERMINAL	LOCATION: Western Portion of Site Maintenance Yard	
DRILLING EQUIPMENT: CME-85	SAMPLING METHOD: California Sampler	SURFACE ELEVATION:	TOTAL DEPTH OF BOREHOLE: 131 ft

DATE				GROUNDWATER DEPTH/*ELEV.* (ft)	MEASUREMENT DATE and TIME
STARTED: 9/27/00	DRILLING COMPANY: West Hazmat Drilling	BOREHOLE DIAMETER: 8" (O.D.)			
COMPLETED: 9/28/00	SURFACE CONDITIONS: Dirt/Sand			15.0 / *na*	9/27/2000
				na / *na*	
BACKFILLED: 9/28/00	LOGGED BY: B. Breitenbach	REVIEWED BY: J. Stock		na / *na*	

DEPTH (ft)	SAMPLE: BLOW COUNTS (BLOWS/FOOT)	SAMPLE: TYPE	SAMPLE: ID	TPHg, TPHd (mg/kg)	PID/OVA (ppm)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
	120/2"		HP53-105				SANDY CLAY (CL), dark brown, wet, stiff, appears to contain up to 50% fine sand, no hydrocarbon odor or stains, with occasional gravels and cobbles Pocket penetrometer - 1.0 tsf
							SANDSTONE: CLAYEY SAND (SC), gray, moist, very dense, fine-grained, contains up to 40% lean clay
110	50/??		HP53-110				Frequent interbedding with lean sandy clay seams
115			HP53-115				Grades very fine to fine Has some cementation
120			HP53-120				
							CLAYSTONE: CLAY with SAND (CL), dark gray, moist, hard
125			HP53-125				Less moisture, mild cementation, very low permeability Contains some shell fragments Hydropunch set at 131' to 132' Let set for 70 min, no recovery of water
130			HP53-130				Boring backfilled with bentonite grout Note: Driller out of HP rod - hole terminated
135							

KLEINFELDER
5015 SHOREHAM PLACE
SAN DIEGO, CALIFORNIA 92122

FIGURE C5

PROJECT NO.: 51-5690-00	LOG OF BORING HP-54		SHEET 1 of 3
DRILLING METHOD: Hollow Stem Auger	PROJECT NAME: MISSION VALLEY TERMINAL	LOCATION: Practice Field	
DRILLING EQUIPMENT: CME-75 w/DH Hammer	SAMPLING METHOD: California Sampler	SURFACE ELEVATION:	TOTAL DEPTH OF BOREHOLE: 80 ft

DATE				GROUNDWATER DEPTH/*ELEV.* (ft)	MEASUREMENT DATE and TIME
STARTED: 10/3/00	DRILLING COMPANY: West Hazmat Drilling	BOREHOLE DIAMETER: 8" (O.D.)			
COMPLETED: 10/3/00	SURFACE CONDITIONS: Grass			▼ 15.0 / *na*	10/3/2000
				▽ na / *na*	
BACKFILLED: 10/3/00	LOGGED BY: K. Wells	REVIEWED BY: J. Stock		▼ na / *na*	

DEPTH (ft)	SAMPLE: BLOW COUNTS (BLOWS/FOOT)	SAMPLE: TYPE	SAMPLE: ID	TPHg, TPHd (mg/kg)	PID/OVA (ppm)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
							Topsoil - 6" thick
							ARTIFICIAL FILL:
							CLAYEY SAND (SC), brown, moist, dense, fine to medium grained, with fine to coarse gravel and small cobble
5	50/4"		HP54-5				
10	100		HP54-10				
15	55		HP54-15				▼ Wet
							ALLUVIUM:
							SAND with SILT (SP/SM), dark gray, wet, medium dense, fine to medium grained, no hydrocarbon odor, hydropunch at 21 - 23 ft.
20	55		HP54-20				Large gravel and cobble noted at auger
25	53		HP54-25				Frequent interbeds with seams of fine grained silty sand
							Heaving sands
30	44		HP54-30				

WELL LOG 5690LOG.GPJ TROLLEY.GDT 2/26/01

KLEINFELDER
5015 SHOREHAM PLACE
SAN DIEGO, CALIFORNIA 92122

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED.

FIGURE
C6

PROJECT NO.: 51-5690-00	LOG OF BORING HP-54	SHEET 2 of 3

DRILLING METHOD: Hollow Stem Auger	PROJECT NAME: MISSION VALLEY TERMINAL	LOCATION: Practice Field	
DRILLING EQUIPMENT: CME-75 w/DH Hammer	SAMPLING METHOD: California Sampler	SURFACE ELEVATION:	TOTAL DEPTH OF BOREHOLE: 80 ft

DATE				
STARTED: 10/3/00	DRILLING COMPANY: West Hazmat Drilling	BOREHOLE DIAMETER: 8" (O.D.)	GROUNDWATER DEPTH/*ELEV.* (ft)	MEASUREMENT DATE and TIME
COMPLETED: 10/3/00	SURFACE CONDITIONS: Grass		15.0 / *na*	10/3/2000
			na / *na*	
BACKFILLED: 10/3/00	LOGGED BY: K. Wells	REVIEWED BY: J. Stock	na / *na*	

DEPTH (ft)	SAMPLE BLOW COUNTS (BLOWS/FOOT)	SAMPLE TYPE	SAMPLE ID	TPHg, TPHd (mg/kg)	PID/OVA (ppm)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
			HP54-35				
							SILTY SAND (SM), dark gray, wet, dense, fine to medium grained (predominately fine), no hydrocarbon odor, silt content 15%
40			HP54-40				
45			HP54-45				Hydropunch at 46 to 47.5 ft.
							SAND with SILT (SP/SM), dark gray, wet, dense, fine to medium grained, with mica, no hydrocarbon odor
50			HP54-50				
							SILTY SAND (SM), gray, wet, dense, fine to medium grained, no hydrocarbon odor, has little plasticity
55			HP54-55				
60			HP54-60				FRIARS FORMATION: SANDSTONE consisting of CLAYEY SANDS, gray, moist, very dense, fine to medium grained, no hydrocarbon odor or stains Very dense, with interbedding clayey sands (SC)
65							Attempt at hydropunch failed due to inability to drive hydropunch beyond 6", hydropunch no yield, due to very dense sands Second attempt at hydropunch failed at 70 ft., sands are very dense, no yield, no drive beyond ~4" Note: Soils are still wet

KLEINFELDER
5015 SHOREHAM PLACE
SAN DIEGO, CALIFORNIA 92122

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED.

FIGURE C6

PROJECT NO.: 51-5690-00	LOG OF BORING HP-54	SHEET 3 of 3

DRILLING METHOD: Hollow Stem Auger	PROJECT NAME: MISSION VALLEY TERMINAL	LOCATION: Practice Field	
DRILLING EQUIPMENT: CME-75 w/DH Hammer	SAMPLING METHOD: California Sampler	SURFACE ELEVATION:	TOTAL DEPTH OF BOREHOLE: 80 ft

DATE				GROUNDWATER DEPTH/*ELEV.* (ft)	MEASUREMENT DATE and TIME
STARTED: 10/3/00	DRILLING COMPANY: West Hazmat Drilling	BOREHOLE DIAMETER: 8" (O.D.)			
COMPLETED: 10/3/00	SURFACE CONDITIONS: Grass			15.0 / *na*	10/3/2000
				na / *na*	
BACKFILLED: 10/3/00	LOGGED BY: K. Wells	REVIEWED BY: J. Stock		na / *na*	

DEPTH (ft)	SAMPLE: BLOW COUNTS (BLOWS/FOOT)	SAMPLE: TYPE	SAMPLE: ID	TPHg, TPHd (mg/kg)	PID/OVA (ppm)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
75	100/5.5"		HP54-75				
80	100/5"		HKP54-80				Boring stopped at 80 ft. Groundwater observed at 15 ft. Borehole backfilled with bentonite grout Hydropunch water sample taken at 21 to 23 ft. and 46 to 47.5 ft. Hydropunch refusal at greater depths than ~55 to 60 ft.
85							
90							
95							
100							

KLEINFELDER
5015 SHOREHAM PLACE
SAN DIEGO, CALIFORNIA 92122

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED.

FIGURE C6

PROJECT NO.: 51-5690-00	LOG OF BORING HP-55		
DRILLING METHOD: Hollow Stem Auger	PROJECT NAME: MISSION VALLEY TERMINAL	LOCATION: Qualcomm Service Station	
DRILLING EQUIPMENT: CME-75 w/Autohammer	SAMPLING METHOD: California Sampler	SURFACE ELEVATION:	TOTAL DEPTH OF BOREHOLE: 81 ft

DATE					
STARTED: 12/19/00	DRILLING COMPANY: Tri-County Drilling	BOREHOLE DIAMETER: 8" (O.D.)		GROUNDWATER DEPTH/*ELEV.* (ft)	MEASUREMENT DATE and TIME
COMPLETED: 12/21/00	SURFACE CONDITIONS: Concrete			▼ 11.5 / *na*	12/19/2000
				▽ na / *na*	
BACKFILLED: 12/21/00	LOGGED BY: K. Wells	REVIEWED BY: J. Stock		▼ na / *na*	

DEPTH (ft)	SAMPLE: BLOW COUNTS (BLOWS/FOOT)	SAMPLE: TYPE	SAMPLE: ID	TPHg, TPHd (mg/kg)	PID/OVA (ppm)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
							Concrete - 4" thick
							ARTIFICIAL FILL: CLAYEY SAND (SC), brown, moist, dense, fine to medium grained, with fine to coarse gravel and cobble (gravel and cobble content approximately 20%)
							SAND with some SILT (SP-SM), olive brown, moist, fine to medium dense, fine to medium grained, with mica
5	8		1				No hydrocarbon staining
							ALLUVIUM: CLAYEY SAND (SC), brown, moist, medium dense, fine grained
10	16		2				▼
15	50/2"		3				SAND with some SILT (SP-SM), olive brown, dense, wet, fine to medium grained (with some coarse), with some large gravel with mica
							Hydropunch water sample at 10 to 18 ft.
20	43		4				Note: minor heaving
25	50/2"		5				Note: sampler driver on rock
							Flowing fine to coarse sands with gravel and occasional cobbles
							FRIARS FORMATION: SANDSTONE (SC), light brown (pale), moist to wet, very dense, fine to medium grained, lightly cemented, sands are clayey when reworked
30	50/6"		6				

KLEINFELDER
5015 SHOREHAM PLACE
SAN DIEGO, CALIFORNIA 92122

LOG OF BORING HP-55

PROJECT NO.: 51-5690-00	PROJECT NAME: MISSION VALLEY TERMINAL	LOCATION: Qualcomm Service Station	
DRILLING METHOD: Hollow Stem Auger	SAMPLING METHOD: California Sampler	SURFACE ELEVATION:	TOTAL DEPTH OF BOREHOLE: 81 ft
DRILLING EQUIPMENT: CME-75 w/Autohammer	DRILLING COMPANY: Tri-County Drilling	BOREHOLE DIAMETER: 8" (O.D.)	
DATE STARTED: 12/19/00	SURFACE CONDITIONS: Concrete		
DATE COMPLETED: 12/21/00	LOGGED BY: K. Wells	REVIEWED BY: J. Stock	
DATE BACKFILLED: 12/21/00			

GROUNDWATER DEPTH/*ELEV.* (ft)	MEASUREMENT DATE and TIME
11.5 / *na*	12/19/2000
na / *na*	
na / *na*	

DEPTH (ft)	SAMPLE BLOW COUNTS (BLOWS/FOOT)	SAMPLE TYPE	SAMPLE ID	TPHg, TPHd (mg/kg)	PID/OVA (ppm)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
	50/4"		7				
40	66		8				Color change to light gray Hydropunch water sample at 41 ft. to 42 ft. Clay fraction is very lean
45							Interbedded with very dense silty sand (as reworked)
50	50/5"		9				
55	50/5"		10				
60	50/2"		11				Large gravels and cobbles from 61 ft. to 62.5 ft. (up to 30% gravels and cobbles)
65	60/0"		12				Note: hydropunch water sample was refused due to hard formation

KLEINFELDER
5015 SHOREHAM PLACE
SAN DIEGO, CALIFORNIA 92122

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED.

FIGURE C7

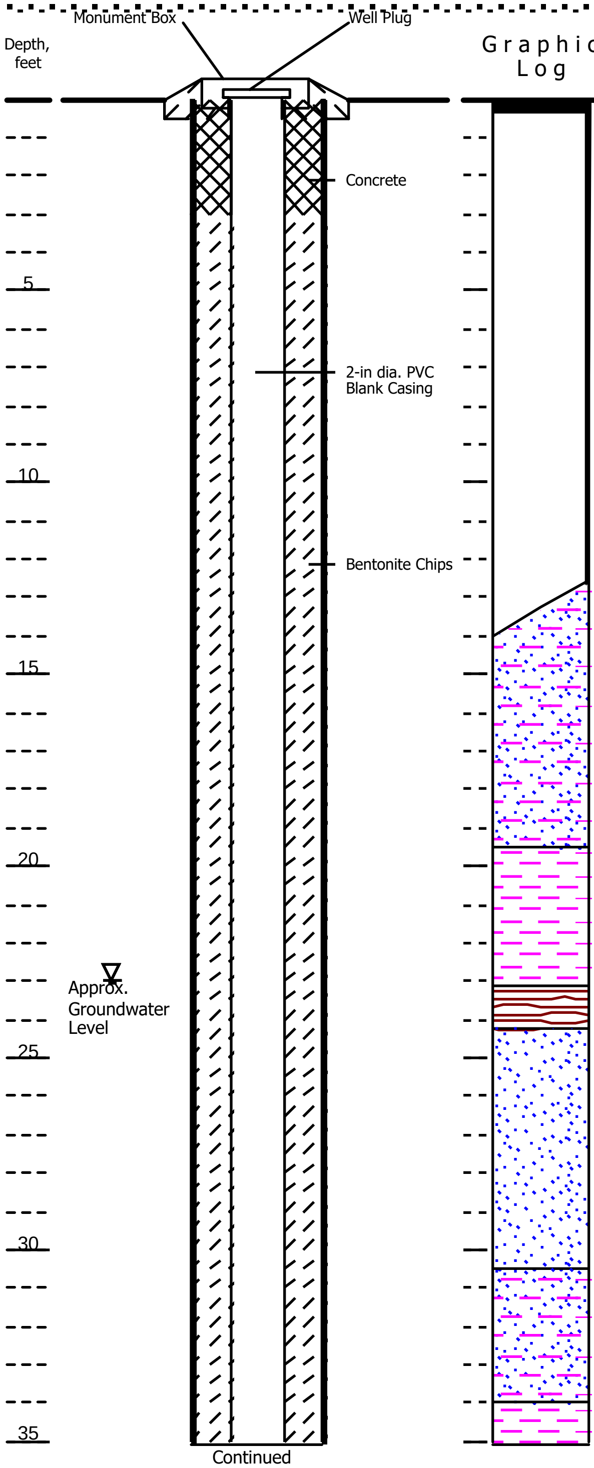
WELL LOG 5690LOG.GPJ TROLLEY.GDT 2/26/01

PROJECT NO.: 51-5690-00	LOG OF BORING HP-55		SHEET 3 of 3
DRILLING METHOD: Hollow Stem Auger	PROJECT NAME: MISSION VALLEY TERMINAL	LOCATION: Qualcomm Service Station	
DRILLING EQUIPMENT: CME-75 w/Autohammer	SAMPLING METHOD: California Sampler	SURFACE ELEVATION:	TOTAL DEPTH OF BOREHOLE: 81 ft

DATE						GROUNDWATER DEPTH/*ELEV.* (ft)	MEASUREMENT DATE and TIME
STARTED:	12/19/00	DRILLING COMPANY:	Tri-County Drilling	BOREHOLE DIAMETER:	8" (O.D.)		
COMPLETED:	12/21/00	SURFACE CONDITIONS:	Concrete			▼ 11.5 / *na*	12/19/2000
						▽ na / *na*	
BACKFILLED:	12/21/00	LOGGED BY:	K. Wells	REVIEWED BY:	J. Stock	▼ na / *na*	

DEPTH (ft)	SAMPLE: BLOW COUNTS (BLOWS/FOOT)	SAMPLE: TYPE	SAMPLE: ID	TPHg, TPHd (mg/kg)	PID/OVA (ppm)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
75							Sandstone contains up to 50% lean clay fraction
80							
81							Bottom of excavation at 81 ft. Borehole reamed to 10" for well construction (nested well)
85							
90							
95							
100							

WELL CONSTRUCTION — LITHOLOGY — SAMPLING DATA



Visual Description

Depth, feet	Visual Description	ID of Samples Analyzed	P I D (ppm)/ Penetration Rate (blows/ft.)
0	Asphalt.		
5	Straight drilled to 15 feet bgs.		
14	**GRAVELLY SILTY SAND (SM)**, very dark brown (10YR-2/2), moist, medium grained, 20-30% low plastic fines, 10-20% fine subangular gravel.		
19.5	-medium sand stringer.		
20	**SILT (ML)**, very dark grayish brown (2.5Y-3/2), moist, soft, medium to high plasticity, micaceous.		40/
23.3	-medium sand stringer.		
24	**CLAY (CH)**, very dark grayish brown (2.5Y-3/2), moist, medium stiff, medium plasticity.		
25	**SAND (SP)**, very dark grayish brown (2.5Y-3/2), wet, fine grained, trace fines, micaceous.		19/
29	-increasing grain size, some stratification, trace fine gravel.		
31	**SILTY SAND (SM)**, dark grayish brown (10YR-4/2), wet, very fine grained, ~15-20% fines, trace clay.		
34.5	**SANDY SILT (ML)**, dark gray (10YR-4/1), wet, slight		

Continued

Permit #:
Casing elevation:
Date well drilled: 6/10/02
LFR Field Staff: Adelo Derilo
Approved by:

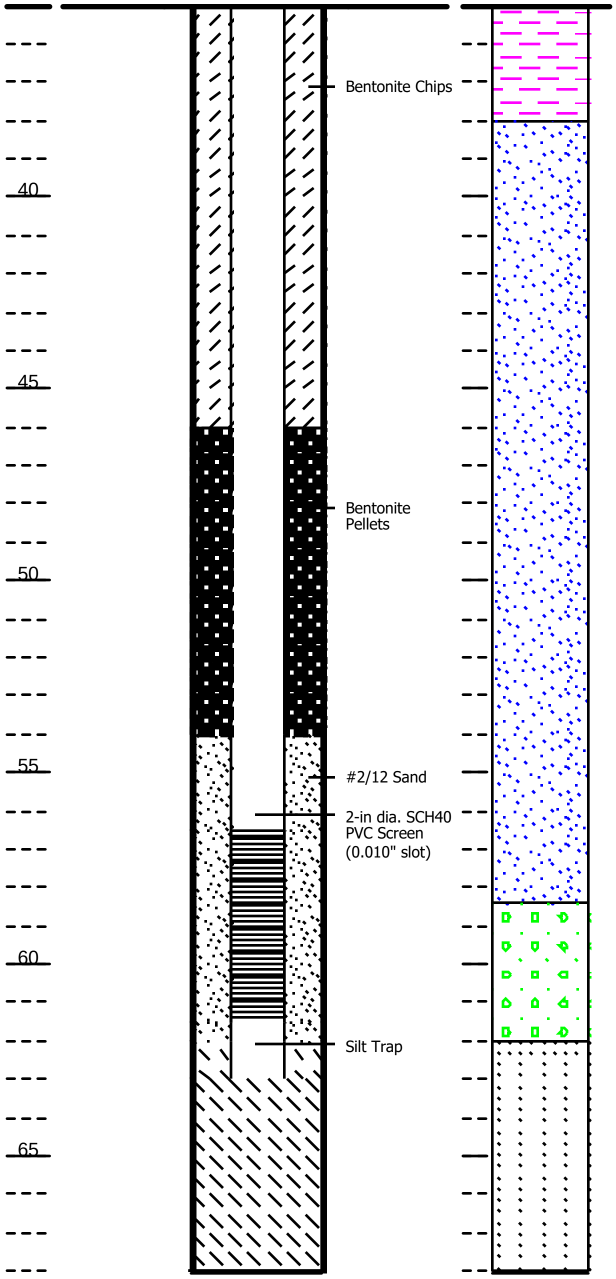
EXPLANATION

- Clay
- Silt
- Sand
- Gravel
- Interval Sampled
- Sample Retained

WELL CONSTRUCTION AND LITHOLOGY FOR WELL R-33AD

WELL CONSTRUCTION | **LITHOLOGY** | **SAMPLING DATA**

Depth, feet — Continued — Graphic Log — Visual Description — ID of Samples Analyzed — P I D (ppm)/ Penetration Rate (blows/ft.)



to medium plastic, trace clay.

SAND (SP), dark grayish brown (10YR-4/2), wet, fine to medium grained, trace fines.

-same as above.

-same as above.

SILTY SANDY GRAVEL (GW), olive brown (2.5Y-4/4), wet, fine to coarse, subrounded to rounded gravel, 10-20% fine to medium sand, 1-5% low plastic fines.

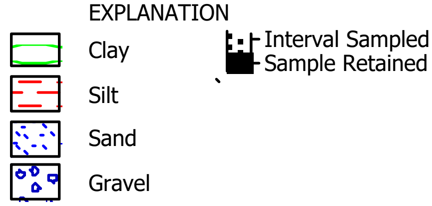
FRIARS SANDSTONE (SS), gray (5/N), wet, very hard, fine to medium grained, very friable.

-less friable.

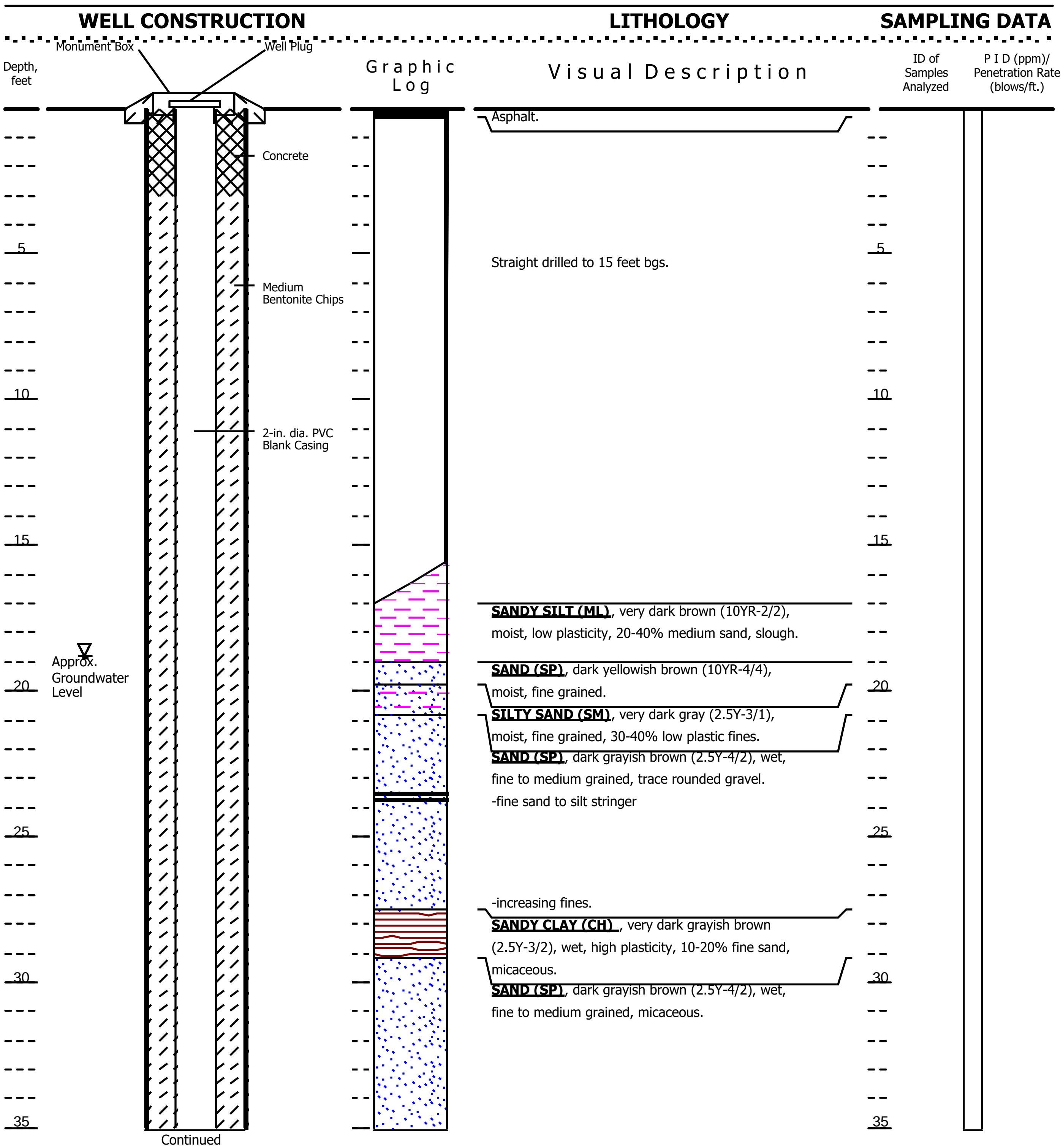
Bottom of well at 63 feet bgs.
Bottom of boring at 68 feet bgs.

Permit #:
Casing elevation:
Date well drilled: 6/10/02
LFR Field Staff: Adelo Derilo
Approved by:

EXPLANATION



WELL CONSTRUCTION AND LITHOLOGY FOR WELL R-33AD (CONTINUED)



Permit #:
Casing elevation:
Date well drilled: 6/20/02
LFR Field Staff: Rodney Crother
Approved by:

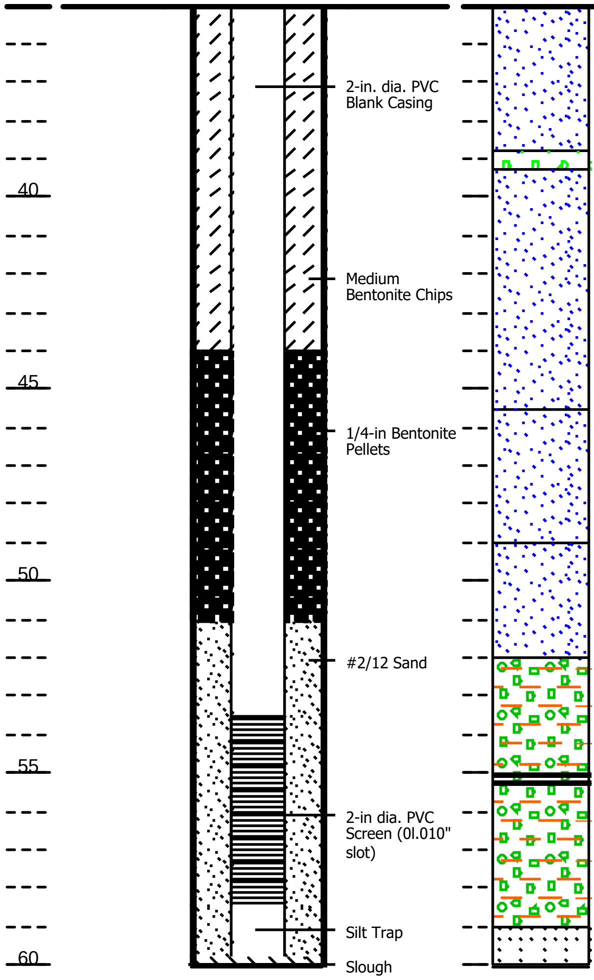
EXPLANATION

- Clay
- Silt
- Sand
- Gravel
- Interval Sampled
- Sample Retained

WELL CONSTRUCTION AND LITHOLOGY FOR WELL R-34AD

WELL CONSTRUCTION	LITHOLOGY	SAMPLING DATA

Depth, feet — Continued — Graphic Log — Visual Description — ID of Samples Analyzed — P I D (ppm)/ Penetration Rate (blows/ft.)



-gravel layer.

-gray (7.5YR-3/1), medium grained.

GRAVELLY SAND (SP), gray (7.5YR-3/1), medium grained, 10-20% fine to medium rounded gravel.

SAND (SP), gray (7.5YR-3/1), medium grained, trace gravels.

SILTY SANDY GRAVEL (GM), very dark grayish brown (2.5Y-3/2), wet, subangular to rounded, fine to large gravel, 20-30% medium to coarse sand, 10-20% medium plastic fines.

-more sand, less fines.

-more sand, less fines.

-more sand, less fines.

FRIARS SANDSTONE (SS), gray (6N), moist, very dense, fine to medium grained.

Bottom of well at 59.7 feet bgs.

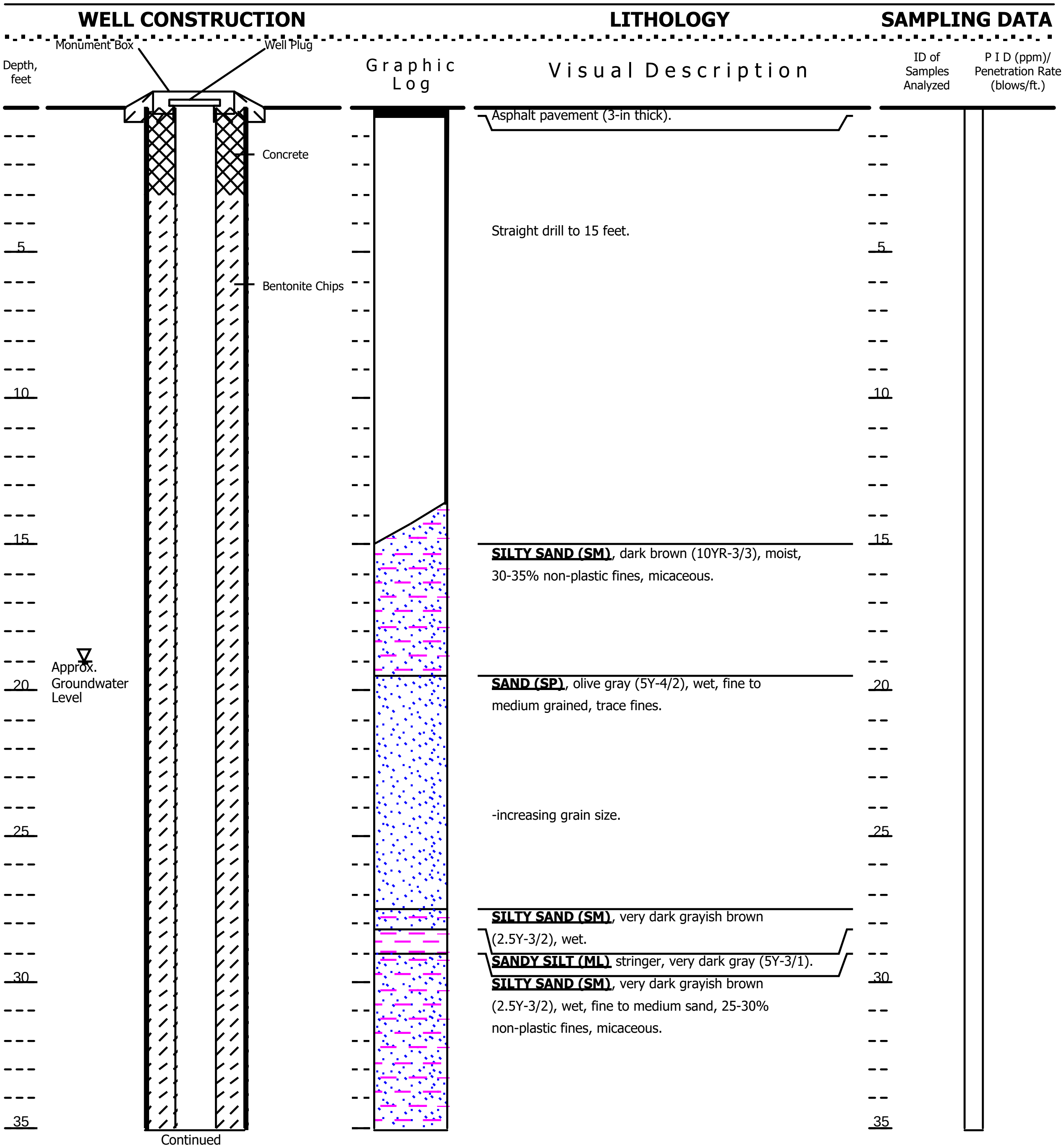
Bottom of boring at 60 feet bgs.

Permit #:
Casing elevation:
Date well drilled: 6/20/02
LFR Field Staff: Rodney Crother
Approved by:

EXPLANATION

- Clay
- Silt
- Sand
- Gravel
- Interval Sampled
- Sample Retained

WELL CONSTRUCTION AND LITHOLOGY FOR WELL R-34AD (CONTINUED)



Permit #:
Casing elevation:
Date well drilled: 6/13/02
LFR Field Staff: Adelo Derilo

Approved by:

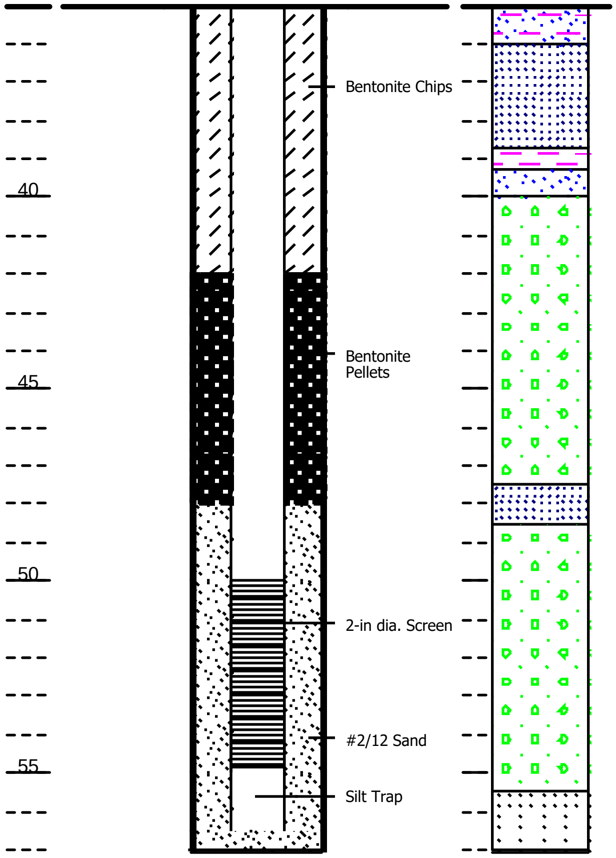
EXPLANATION

🟩	Clay	▨	Interval Sampled
🟥	Silt	■	Sample Retained
▨	Sand		
●	Gravel		

WELL CONSTRUCTION AND LITHOLOGY FOR WELL R-35AD

WELL CONSTRUCTION	LITHOLOGY	SAMPLING DATA

Depth, feet — Continued — Graphic Log — Visual Description — ID of Samples Analyzed — P I D (ppm)/ Penetration Rate (blows/ft.)



GRAVELLY SAND (SW), olive brown (2.5Y-4/3), wet, fine to coarse sand.
-trace fine gravel.

SANDY SILT (ML) stringer, very dark gray (5Y-3/1), wet, 20-25% fine sand, trace clay.

SAND (SP) stringer, olive brown (2.5Y-4/3), wet, fine to medium sand, trace coarse sand.

SILTY SAND GRAVEL (GW), olive brown (2.5Y-4/4), wet, fine to coarse, rounded to subrounded gravel, 10-20% fine to medium sand, 5-10% non-plastic fines.

GRAVELLY SAND (SW), dark grayish brown (2.5Y-4/2), wet, fine to coarse grained, trace fine gravel.

SANDY GRAVEL (GW), olive brown (2.5Y-4/4), wet, 30-35% fine to coarse sand, fine to coarse rounded to subrounded gravel to ~3-in diameter.

FRIAR SANDSTONE (SS), gray (5N), wet, fine to medium grained, friable, becomes very hard.

Bottom of well at 56.5 feet bgs.
Bottom of boring at 57 feet bgs.

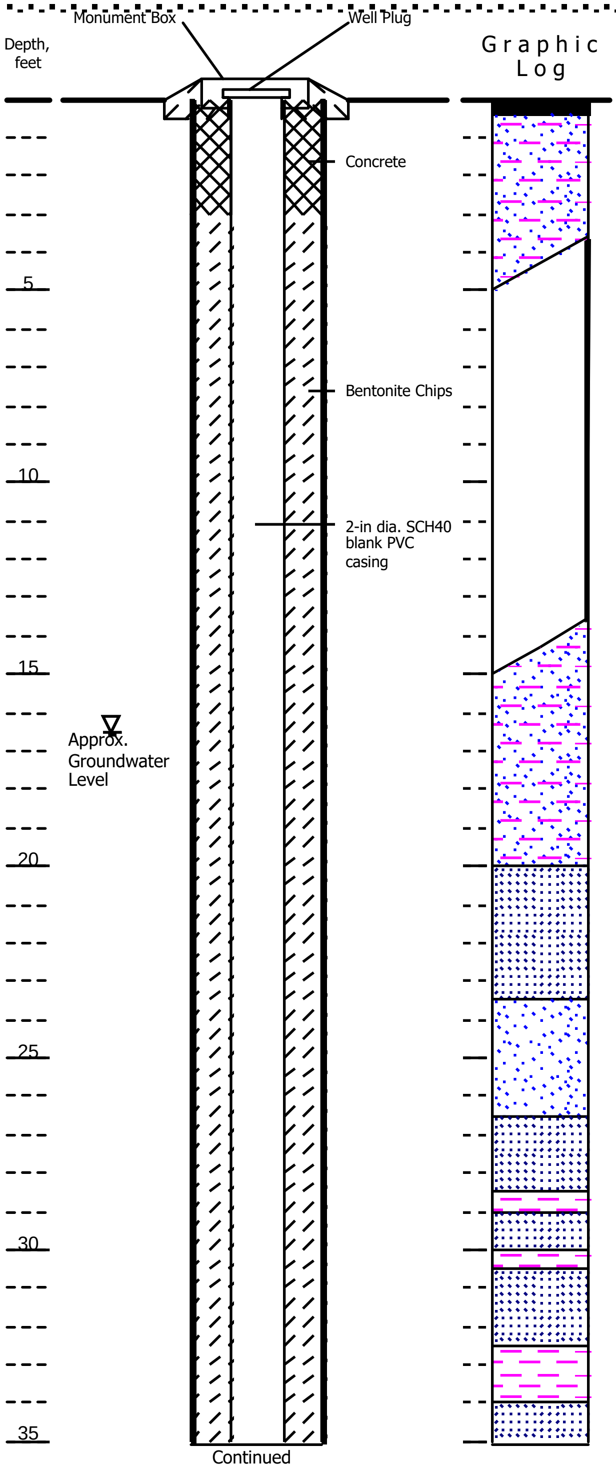
Permit #:
Casing elevation:
Date well drilled: 6/13/02
LFR Field Staff: Adelo Derilo
Approved by:

EXPLANATION

- Clay
- Silt
- Sand
- Gravel
- Interval Sampled
- Sample Retained

WELL CONSTRUCTION AND LITHOLOGY FOR WELL R-35AD (CONTINUED)

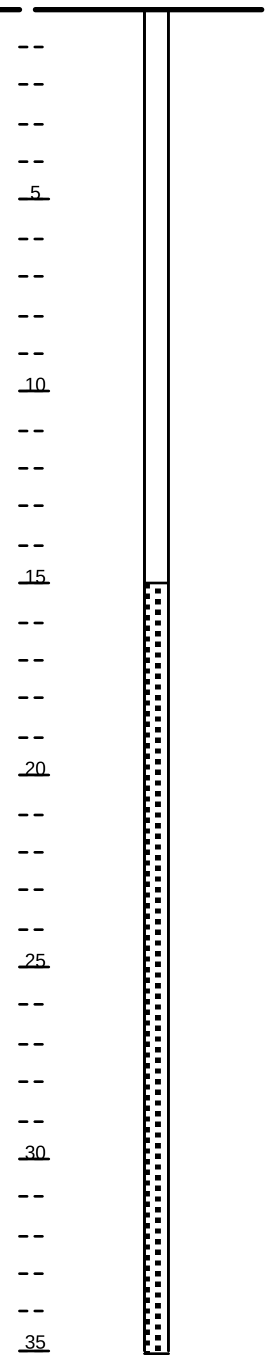
WELL CONSTRUCTION	LITHOLOGY	SAMPLING DATA



Visual Description

Depth (feet)	Visual Description
0	Asphalt pavement (~4-in thick).
0–5	**SILTY SAND (SM)**, dark brown (10YR-3/3), moist, fine to very fine grained, 25-30% fines, micaceous.
5–15	Straight drilled to 15 feet bgs.
15–20	**SILTY SAND (SM)**, dark grayish brown (2.5Y-4/2), very moist to wet, fine to very fine sand, 15-20% fines, trace clay.
20–23.5	**GRAVELLY SAND (SW)**, brown (10YR-4/3), wet, fine to coarse sand, well graded, trace rounded to sub-rounded, fine gravels to ~2-in diameter.
23.5–26.5	**SAND (SP)**, very dark grayish brown (10YR-3/2), wet, fine to medium grained.
26.5–28.5	**GRAVELLY SAND (SW)**, fine to coarse grained.
28.5–30	**SANDY SILT (ML)** very dark grayish brown (2.5Y-3/2), wet.
30	**GRAVELLY SAND (SW)**, fine to coarse sand.
30–31	**SANDY SILT (ML)**, same as above.
31–32.5	**GRAVELLY SAND (SW)**, dark yellowish brown (10YR-4/4), wet, fine to coarse sand.
32.5–34	**SILT (ML)**, very dark gray (5Y-3/1), wet, soft consistency, trace clay, micaceous.

Sampling Data: ID of Samples Analyzed; P I D (ppm)/ Penetration Rate (blows/ft.)



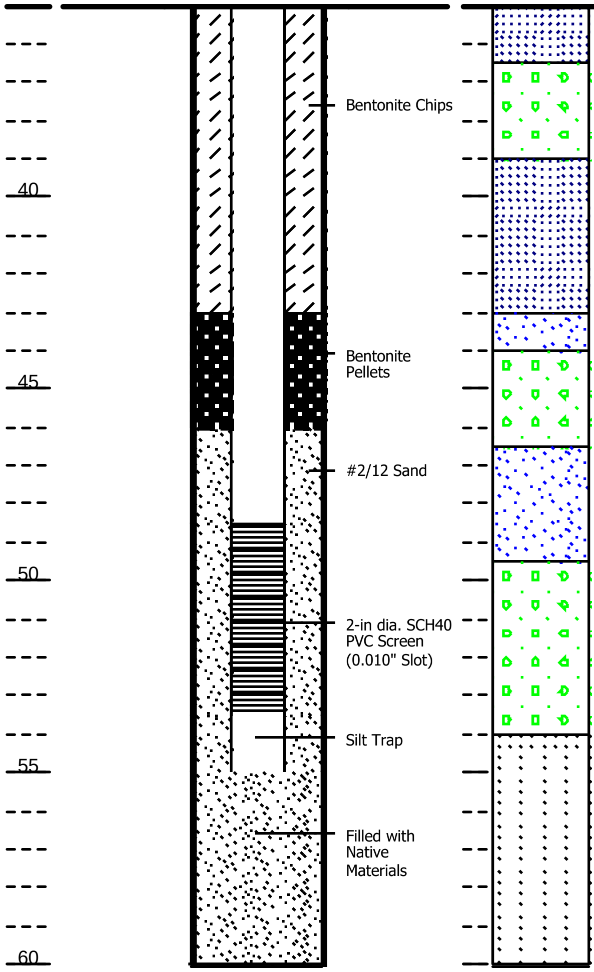
EXPLANATION
Clay
Silt
Sand
Gravel
Interval Sampled
Sample Retained

Permit #:
Casing elevation:
Date well drilled: 5/24/02
LFR Field Staff: Adelo Derilo
Approved by:

WELL CONSTRUCTION AND LITHOLOGY FOR WELL R-36AD

WELL CONSTRUCTION | LITHOLOGY | SAMPLING DATA

Depth, feet | Continued | Graphic Log | Visual Description | ID of Samples Analyzed | P I D (ppm)/ Penetration Rate (blows/ft.)



GRAVELLY SAND (SW), dark grayish brown (2.5Y-4/2), wet, fine to coarse grained, fine gravels to ~2-in diameter.

GRAVEL (GW), brown (10YR-4/3), wet, rounded to sub-rounded, fine gravels to 3-in. diameter, fine to coarse sand.

GRAVELLY SAND (SW), dark grayish brown (2.5Y-4/2), wet, fine to coarse sand, fine gravels to ~2-in diameter.

SAND (SP), very dark grayish brown (10YR-3/2), wet, fine to medium grained.

GRAVEL (GW), brown (10YR-4/3), wet, rounded to sub-rounded, fine gravels to ~3-in diameter, fine to coarse sand, trace fines.

SAND (SP), olive gray (5Y-3/2), wet, fine to medium grained, trace fine gravels and pebbles, trace fines.

GRAVEL (GW), brown (10YR-4/3), wet, rounded to sub-rounded fine gravels to ~3-in diameter, fine to coarse sand, well graded.

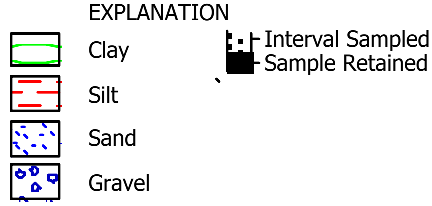
FRIAR SANDSTONE (SS), dark gray (5Y-4/1), moist, fine to very fine cemented sand.

-becomes harder.

Bottom of well at 55 feet bgs.
Bottom of boring at 60 feet bgs.

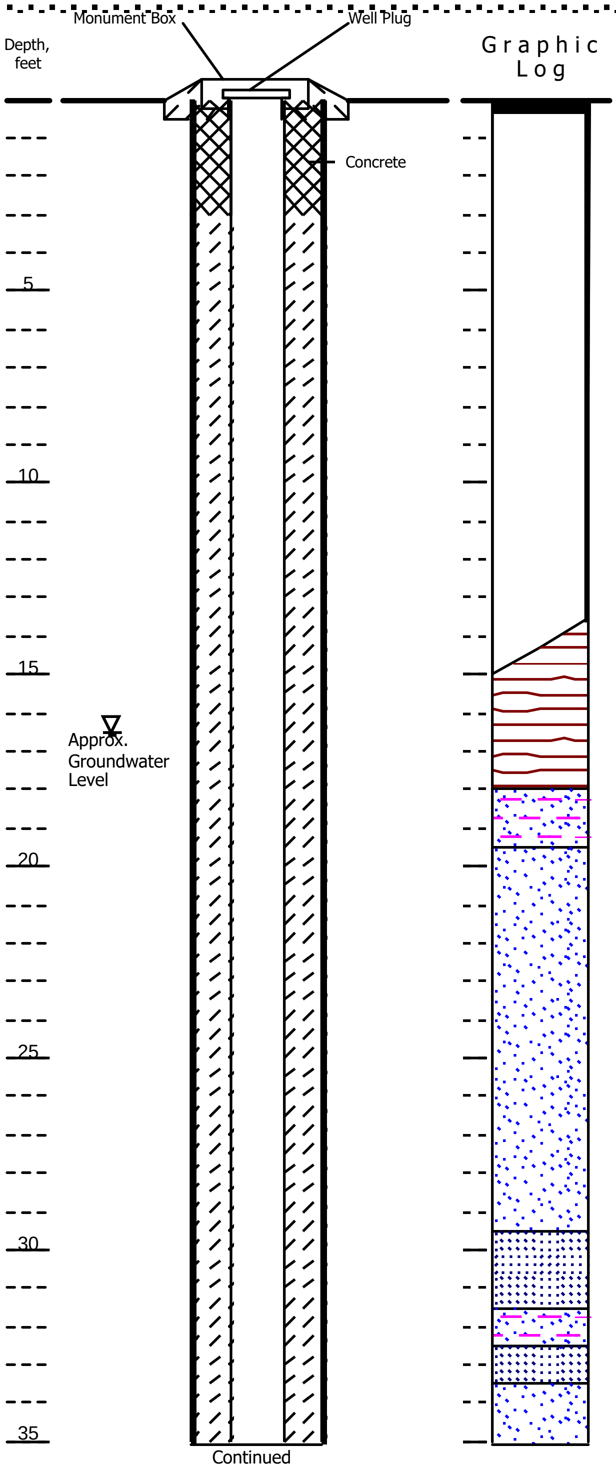
Permit #:
Casing elevation:
Date well drilled: 5/24/02
LFR Field Staff: Adelo Derilo
Approved by:

EXPLANATION



WELL CONSTRUCTION AND LITHOLOGY FOR WELL R-36AD (CONTINUED)

WELL CONSTRUCTION	LITHOLOGY	SAMPLING DATA



Visual Description

Asphalt pavement (3-in thick).

Straight drill to 15 feet.

SANDY CLAY (CL), brown (10YR-4/3), very moist, 15-20% fine sand, 10% silt.

SILTY SAND (SM), very dark grayish brown (2.5Y-4/2), wet, 25-30% non plastic fines.

SAND (SP), olive brown (2.5Y), fine to medium grained.

-iron staining, increase in coarse grained sand.
-mostly fine to medium grained.

WELL GRADED SAND (SW)

SILTY SAND (SM), very dark gray (5Y-3/1), wet, 30-40% medium plastic fines, micaceous.

WELL GRADED SAND (SW)

SAND (SP), olive brown (2.5Y-4/4), wet, fine to

ID of Samples Analyzed	P I D (ppm)/ Penetration Rate (blows/ft.)

EXPLANATION

Clay
Silt
Sand
Gravel

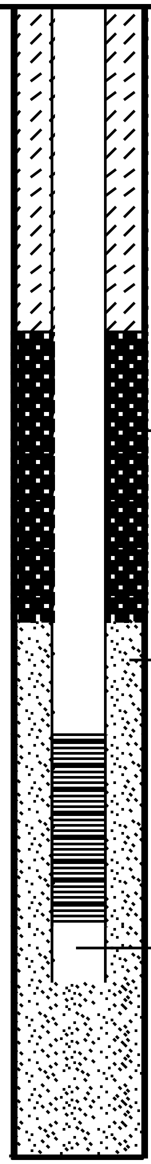
Interval Sampled
Sample Retained

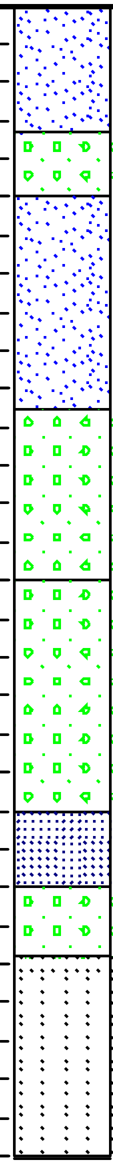
Permit #:
Casing elevation:
Date well drilled: 6/12/02
LFR Field Staff: Adelo Derilo
Approved by:

WELL CONSTRUCTION AND LITHOLOGY FOR WELL R-37AD

WELL CONSTRUCTION | LITHOLOGY | SAMPLING DATA

Depth, feet | Continued | Graphic Log | Visual Description | ID of Samples Analyzed | P I D (ppm)/ Penetration Rate (blows/ft.)





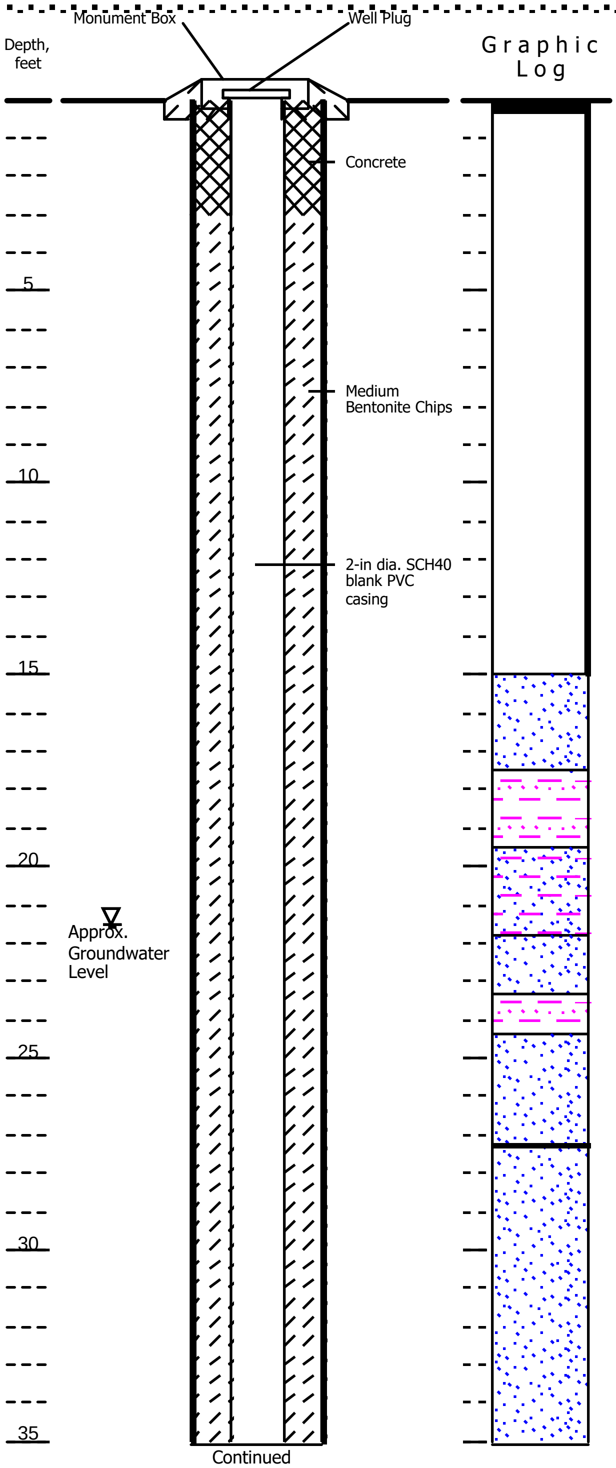
Depth, feet	Visual Description
	medium grained sand, some coarse sand.
	SANDY GRAVEL (GW) , dark grayish brown (2.5Y-4/2), wet, 30-35% fne to coarse sand, fine to coarse gravel (up to 3").
40	**SAND (SP)**, olive brown (2.5Y-4/4), wet, fine to medium grained sand, trace coarse grained.
45	**SILTY SANDY GRAVEL (GW)** , olive brown (2.5Y-4/4), ?????, fine to coarse sand, 10-15% fines, fine to coarse, rounded to subrounded sand, to ~3-in diameter.
50	**SANDY GRAVEL (GW)** , mostly fine to medium sand, fine round to subrounded gravel to ~1.5-in diameter. -olive brown (2.5Y-4/4), wet, 25-30% fine to coarse sand, fine to coarse rounded to subrounded gravel to ~3-in diameter.
55	**GRAVELLY SAND (SW)** , dark grayish brown (2.5Y-4/2), wet, fine to coarse sand.
	SANDY GRAVEL (GW) , olive brown (2.5Y-4/4), wet, 25-30% fine to coarse sand, fine to coarse rounded to subrounded gravel to ~4-in dia., trace fines.
60	**FRIAR SANDSTONE (SANDSTONE)**, gray (5N), wet, fine to medium grained, friable. -very hard, less friable.
65	Bottom of well at 62.5 feet bgs. Bottom of boring at 65 feet bgs.

Permit #:
Casing elevation:
Date well drilled: 6/12/02
LFR Field Staff: Adelo Derilo
Approved by:

EXPLANATION
- Clay
- Silt
- Sand
- Gravel
- Interval Sampled
- Sample Retained

WELL CONSTRUCTION AND LITHOLOGY FOR WELL R-37AD (CONTINUED)

WELL CONSTRUCTION | LITHOLOGY | SAMPLING DATA



Depth, feet	Visual Description	ID of Samples Analyzed	P I D (ppm)/ Penetration Rate (blows/ft.)
0	Asphalt (3-in).		
	Straight drilled to 15 feet.		
15	**SAND (SP)**, yellowish brown (10YR-5/4), moist, medium grained, trace gravel, fines.		
	SILT (MH), very dark grayish brown (10YR-3/2), moist, high plasticity.		
20	**SILTY SAND (SM)**, very dark grayish brown (10YR-3/2), moist, fine to medium grained, 30-40% medium plastic fines.		
	SAND (SP), dark yellowish brown (10YR-4/6), wet, medium grained.		
	SILT (MH), very dark grayish brown (10YR-3/2), wet, high plasticity.		
25	**SAND (SP)**, very dark grayish brown (10YR-3/2), wet, fine to medium grained.		
	-gravelly sand lense.		
30	-trace gravel.		
35			

Permit #:
Casing elevation:
Date well drilled: 6/21/02
LFR Field Staff: Rodney Crother
Approved by:

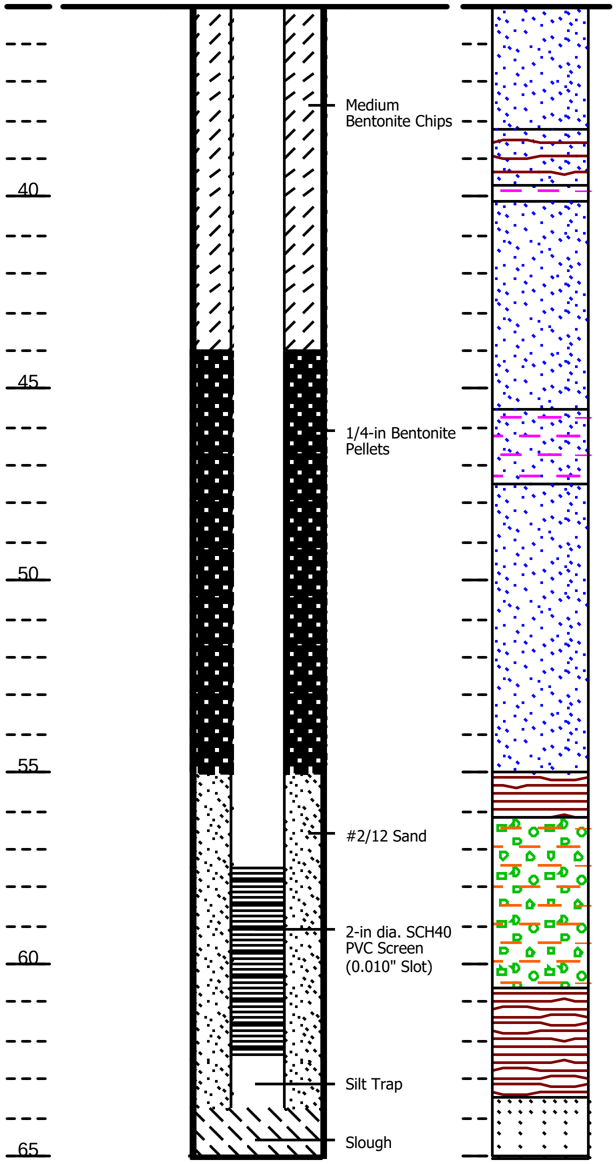
EXPLANATION

- Clay
- Silt
- Sand
- Gravel
- Interval Sampled
- Sample Retained

WELL CONSTRUCTION AND LITHOLOGY FOR WELL R-38AD

WELL CONSTRUCTION	LITHOLOGY	SAMPLING DATA

Depth, feet | Continued | Graphic Log | Visual Description | ID of Samples Analyzed | P I D (ppm)/ Penetration Rate (blows/ft.)



CLAYEY GRAVELLY SAND (SC), very dark gray (2.5Y-3/1), wet, medium to coarse grained, 10-20% fine to medium gravel, 20-30% high plastic fines, multiple layers ranging from **SAND (SW)**, to gravelly sand, to clayey gravel.

SILT (ML), to **FINE SAND (SP)**, olive brown (2.5Y-4/4), wet, low plastic, very fine grained.

SAND (SP), very dark grayish brown (2.5Y-3/2), wet, fine to medium grained, trace fine to medium gravels.

SILT WITH SAND (SM), dark grayish brown (2.5Y-4/2), wet, medium plastic, fine grained.

SAND (SP), very dark grayish brown (2.5Y-3/2), wet, fine to medium grained.

-trace fine to medium gravel.

-increasing gravel.

GRAVELLY CLAY (CH), dark gray (2.5Y-4/1), wet, high plastic, 20-30% medium gravel, some very weathered.

SILTY SANDY GRAVEL (GM), olive brown (2.5Y-4/3), wet, subrounded to rounded, fine to coarse gravel, 20-30% fine to coarse sand, 10-20% medium plastic fines.

-clay stringer.

GRAVELLY CLAY (CH), olive brown (2.5Y-4/3), wet, high plastic, 30-40% fine to coarse gravel, trace fine sand.

FRIARS SANDSTONE (SS), light bluish gray (5YB-7/1), moist, very hard, dense, fine grained, trace high plastic fines.

Bottom of well at 63.7 feet bgs.

Bottom of boring at 65 feet bgs.

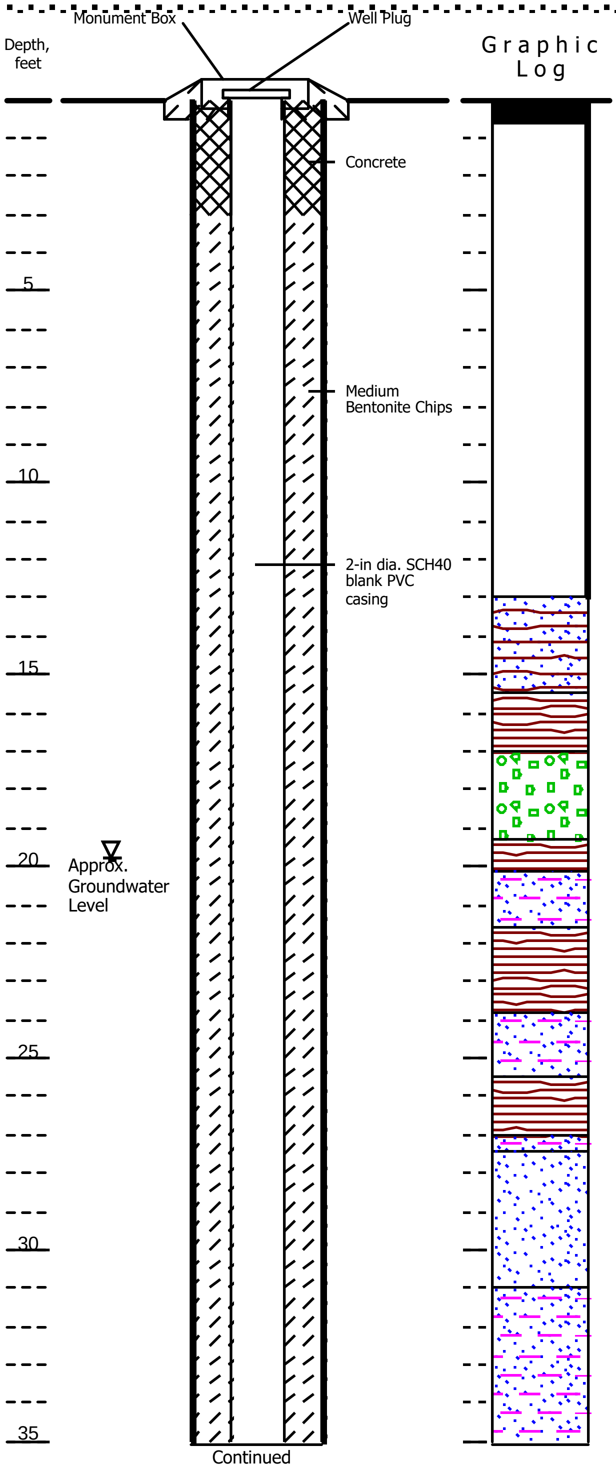
EXPLANATION

- Clay
- Silt
- Sand
- Gravel
- Interval Sampled
- Sample Retained

Permit #:
Casing elevation:
Date well drilled: 6/21/02
LFR Field Staff: Rodney Crother
Approved by:

WELL CONSTRUCTION AND LITHOLOGY FOR WELL R-38AD (CONTINUED)

WELL CONSTRUCTION	LITHOLOGY	SAMPLING DATA



Visual Description

Asphalt.

CLAYEY SAND (SC), very dark gray (3/1-7.5YR), moist, loose, medium to fine sand, 10-20% medium plastic fines.
-trace fine gravel (slough).

SANDY CLAY (CH), very dark gray (3/1-5Y), moist, medium plastic, 20-30% fine to medium sand.

SANDY GRAVEL (GP), gray (6/1-7.5YR), moist, 1-2 in. subrounded to rounded gravel, 40-50% medium grained sand, trace red staining.

GRAVELLY SANDY CLAY (CH), brown (10YR-3/3), moist, hard, medium plastic, 10-20% fine to medium rounded gravel, 10-20% fine to medium sand.

SILTY SAND (SM), black (2.5/1-5Y), wet, fine to medium grained, 20-30% low plastic fines.

CLAY (CH), black (5Y-2.5/1), wet, moderately hard, high plastic, trace organic pieces.

SILTY SAND (SM), black (2.5/1-5Y), wet, fine to medium grained, 20-30% low plastic fines.

CLAY (CH), black (5Y-2.5/1), wet, moderately hard, high plastic, trace organic pieces.

SILTY SAND (SM), black (2.5/1-5Y), wet, fine to medium grained, 20-30% low plastic fines.

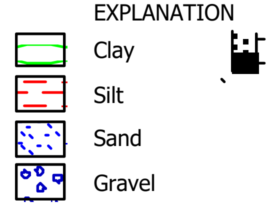
SAND (SP), grayish brown (10YR-5/2), wet, medium grained, trace orange mottling.

SILTY SAND (SM) grading to **SAND (SP)**, very dark grayish brown (2.5Y-3/2), wet, medium grained, 10-20% low plastic fines, trace large (3-5") rounded cobbles.

ID of Samples Analyzed	P I D (ppm)/ Penetration Rate (blows/ft.)

Permit #:
Casing elevation:
Date well drilled: 6/6/02
LFR Field Staff: Rodney Crother
Approved by:

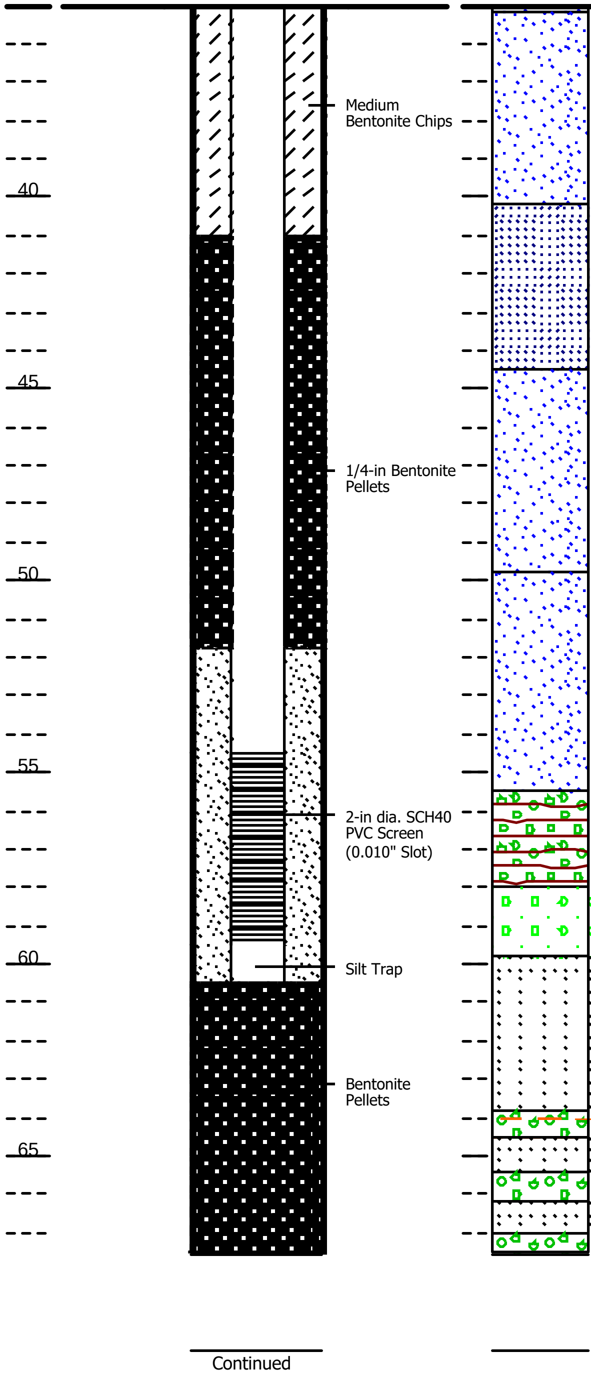
EXPLANATION



WELL CONSTRUCTION AND LITHOLOGY FOR WELL R-39AD

WELL CONSTRUCTION	LITHOLOGY	SAMPLING DATA

Depth, feet — Continued — Graphic Log — Visual Description — ID of Samples Analyzed — P I D (ppm)/ Penetration Rate (blows/ft.)



SAND (SP), grayish brown (10YR-5/2), wet, hard, fine to medium grained.

-black (5Y-2.5/1), wet, fine grained, trace fines, trace medium cobbles (2-in).

SAND (SW), very dark grayish brown (10YR-3/2), wet, loose, fine to coarse sand.

SAND (SP), brown (10YR-5/3), wet, loose, fine grained.

SAND (SP), very dark grayish brown (10YR-3/2), wet, medium dense, medium grained, trace coarse sand, trace fine rounded gravel.

CLAYEY SANDY GRAVEL (GC), very dark grayish brown (2.5Y-3/2), wet, fine to medium, subrounded to rounded gravel, 10-20% fine to medium sand, 10-20% medium plastic fines.

SANDY GRAVEL (GW), very dark grayish brown (10YR-3/2), wet, fine to medium, subrounded to rounded gravel, 20-30% medium to coarse sand.

FRIARS SANDSTONE (SS), gray (10YR-6/1), moist, fine grained, friable.

SILTY GRAVEL (GM), light gray (10YR-7/1), slightly moist, fine to large, subangular to subrounded gravel, 10-30% low plastic fines, red mottling.

FRIARS SANDSTONE (SS), gray (7/N), slightly moist, very hard, medium grained.

SANDY GRAVEL (GP), gray (7/N), slightly moist, hard, fine to medium, subangular to subrounded gravel, 30-40% medium sand, trace fines.

Permit #:
Casing elevation:
Date well drilled: 6/6/02
LFR Field Staff: Rodney Crother
Approved by:

EXPLANATION

- Clay
- Silt
- Sand
- Gravel
- Interval Sampled
- Sample Retained

WELL CONSTRUCTION AND LITHOLOGY FOR WELL R-39AD (CONTINUED)

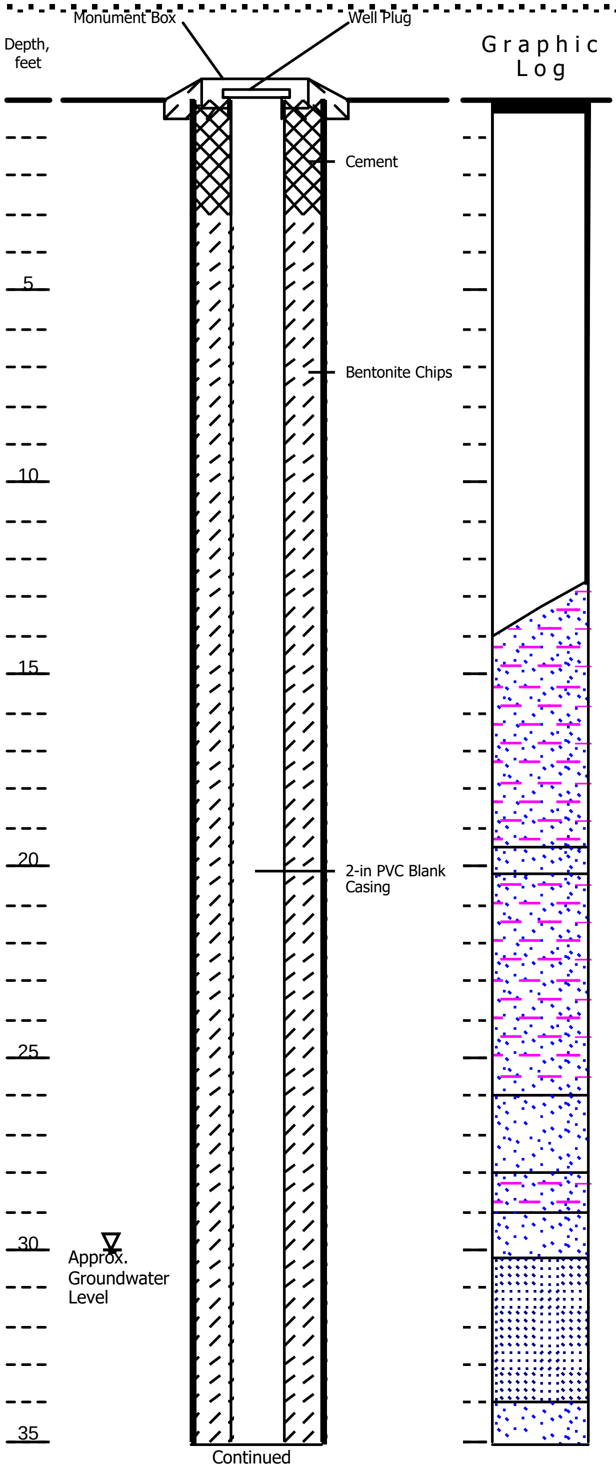
WELL CONSTRUCTION		LITHOLOGY		SAMPLING DATA	
Depth, feet	Continued	Graphic Log	Visual Description	ID of Samples Analyzed	P I D (ppm)/ Penetration Rate (blows/ft.)
			FRIARS SANDSTONE (SS), gray (7/N), slightly moist, very hard, medium grained.		
			SANDY GRAVEL (GP) , gray (7/N), slightly moist, hard, fine to medium subangular to subrounded gravel, 30-40% medium sand, trace fines.		
			Bottom of well at 60.5 feet bgs.		
			Bottom of boring at 67.5 feet bgs.		

Permit #:
Casing elevation:
Date well drilled: 6/6/02
LFR Field Staff: Rodney Crother
Approved by:

EXPLANATION
Clay
Silt
Sand
Gravel
Interval Sampled
Sample Retained

WELL CONSTRUCTION AND LITHOLOGY FOR WELL R-39AD (CONTINUED)

WELL CONSTRUCTION	LITHOLOGY	SAMPLING DATA



Visual Description

Asphalt pavement (~4-in thick).

Straight drilled to 15 feet bgs.

SILTY SAND (SM), very dark grayish brown (2.5Y-3/2), moist, 20-25% non-plastic fines.

FINE SAND (SP) stringer, moist, fine to very fine.

SILTY FINE SAND (SM), dark grayish brown (2.5Y-4/2), moist, 25-30% non-plastic fines.

FINE SAND (SP), dark grayish brown (2.5Y-4/2), moist, mostly fine sand.

SILTY SAND (SM), olive brown (2.5Y-4/3), moist to very moist, trace clay, 25-30% fines.

SAND (SP), dark grayish brown (2.5Y-4/20, very moist to wet, fine to medium grained.

GRAVELLY SAND (SW) , brown (10YR-4/3), wet, fine to coarse sand.

SAND (SP), dark grayish brown (2.5Y-4/2), wet, fine

ID of Samples Analyzed | P I D (ppm)/ Penetration Rate (blows/ft.)

Depth: 5, 10, 15, 20, 25, 30, 35

EXPLANATION

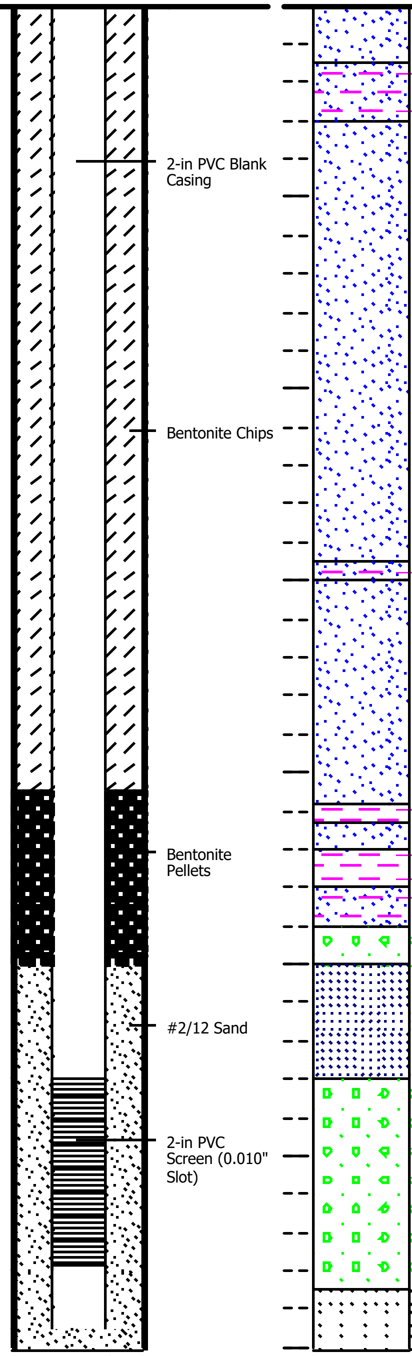
- Clay
- Silt
- Sand
- Gravel
- Interval Sampled
- Sample Retained

Permit #:
Casing elevation:
Date well drilled: 6/11/02
LFR Field Staff: Adelo Derilo
Approved by:

WELL CONSTRUCTION AND LITHOLOGY FOR WELL R-40AD

WELL CONSTRUCTION	LITHOLOGY	SAMPLING DATA

Depth, feet | Continued | Graphic Log | Visual Description | ID of Samples Analyzed | P I D (ppm)/ Penetration Rate (blows/ft.)



Depth, feet	Visual Description
	to medium sand, some fines.
	SILTY FINE SAND (SM), dark grayish brown (2.5Y-4/2), wet, fine to very fine sand, 25-30% non-plastic fines, micaceous.
	SAND (SP), dark grayish brown (2.5Y-4/2), wet,
40	fine to medium grained.
45	-same as above.
	-same as above.
50	**SILTY SAND (SM)** stringer, dark gray (5Y-4/1),
	SAND (SP) very dark grayish brown (10YR-3/2), wet, fine to medium grained.
	-increase amount of coarse sand.
55	
	SILT (ML) stringer.
	SAND (SP) stringer.
	SILT (ML), very dark gray (5Y-3/1), trace fine sand, low to medium plastic, trace fine gravel.
	SILTY SAND (SM), olive gray (2.5Y-4/2), wet,
60	20-25% fines, micaceous.
	SANDY GRAVEL (GW)
	GRAVELLY SAND (GW), dark grayish brown (2.5Y-4/2), wet, fine to coarse sand, trace fine gravels and pebbles.
	SANDY GRAVEL (GW), olive brown (2.5Y-4/4), wet, fine to coarse, rounded to subrounded gravel to
65	~4-in dia., 20-30% fine to coarse sand, trace fines, well graded.
	FRIAR SANDSTONE (SS), dark gray (5Y-4/1), wet,
70	

Permit #:
Casing elevation:
Date well drilled: 6/11/02
LFR Field Staff: Adelo Derilo
Approved by:

EXPLANATION

- Clay
- Silt
- Sand
- Gravel
- Interval Sampled
- Sample Retained

WELL CONSTRUCTION AND LITHOLOGY FOR WELL R-40AD (CONTINUED)

WELL CONSTRUCTION		LITHOLOGY		SAMPLING DATA	
Depth, feet	Continued	Graphic Log	Visual Description	ID of Samples Analyzed	P I D (ppm)/ Penetration Rate (blows/ft.)
			fine to medium grained friable.		
			Bottom of well at 69.5 feet bgs.		
			Bottom of boring at 71 feet bgs.		

Permit #:
Casing elevation:
Date well drilled: 6/11/02
LFR Field Staff: Adelo Derilo
Approved by:

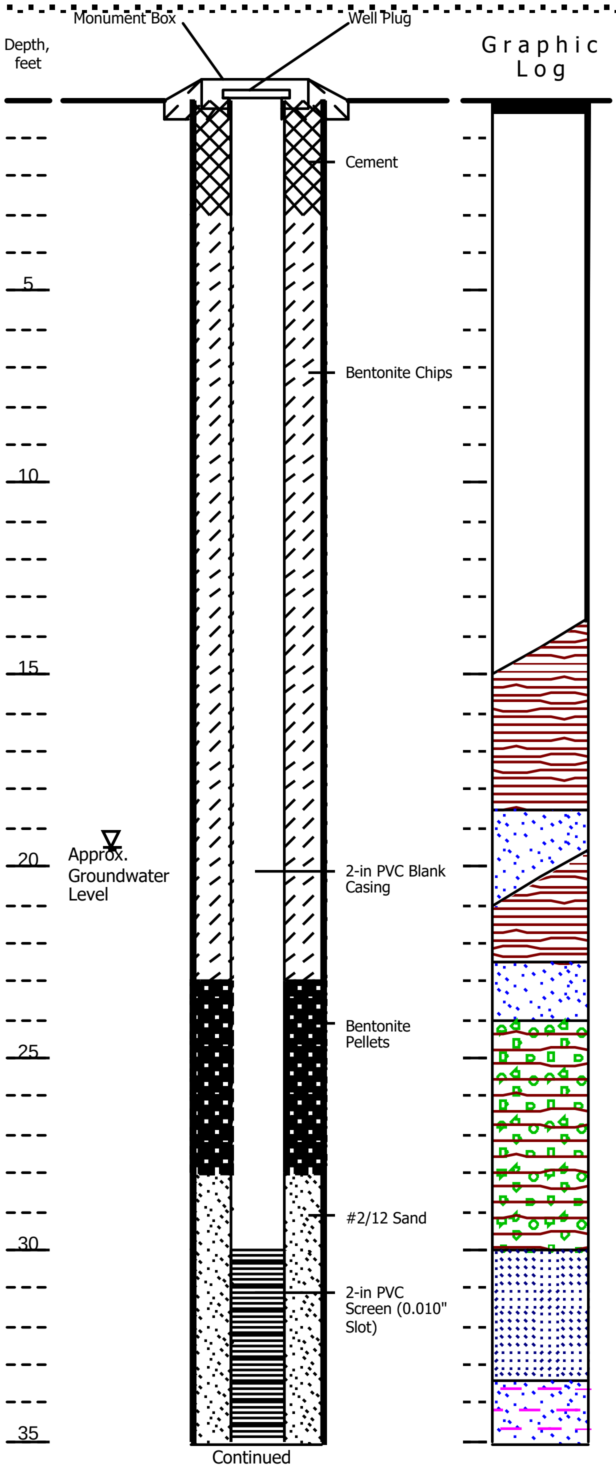
EXPLANATION

Clay
Silt
Sand
Gravel

Interval Sampled
Sample Retained

WELL CONSTRUCTION AND LITHOLOGY FOR WELL R-40AD (CONTINUED)

WELL CONSTRUCTION	LITHOLOGY	SAMPLING DATA



Visual Description

Asphalt.

Straight drilled to 15 feet.

SANDY GRAVELLY CLAY (CH), dark brown (7.5YR-3/3), moist, medium plastic, 10-20% fine to medium, subrounded gravel, 5-10% fine to coarse sand.

SAND (SP), dark yellowish brown (10YR-4/4), moist, fine grained.
-increasing grain size.

SANDY CLAY (CH), strong brown (7.5YR-4/6), moist, medium to high plasticity, 10-20% fine sand.

SAND (SP), dark yellowish brown (10YR-3/6), wet, fine to medium grained.

SANDY CLAYEY GRAVEL (GC), strong brown (7.5YR-4/6), wet, fine to medium, subrounded to rounded gravel, 10-20% medium plastic fines, 5-10% fine to medium sand.
-decreasing sand.

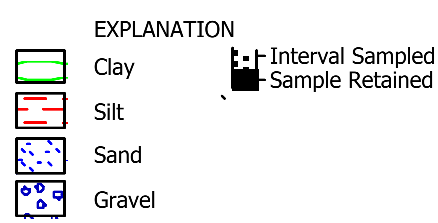
-increasing gravel size.

GRAVEL/SAND (SW), gray (7.5Y-6/1), wet, medium to coarse sand, 20-30% fine rounded gravel.
-decreasing gravel.
-fine to medium sand, trace gravel.

SILTY GRAVELLY SAND (SM), olive brown

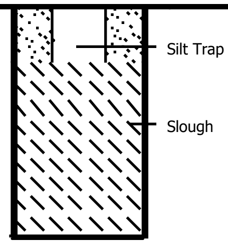
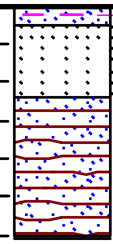
ID of Samples Analyzed	P I D (ppm)/ Penetration Rate (blows/ft.)

Permit #:
Casing elevation:
Date well drilled: 6/8/02
LFR Field Staff: Rodney Crother
Approved by:



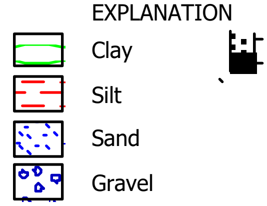
WELL CONSTRUCTION AND LITHOLOGY FOR WELL R-41AD

WELL CONSTRUCTION	LITHOLOGY	SAMPLING DATA

Depth, feet	Continued	Graphic Log	Visual Description	ID of Samples Analyzed	P I D (ppm)/ Penetration Rate (blows/ft.)
40			(2.5Y-4/3), wet, fine to medium sand, 30-40% medium subrounded to rounded gravel, 5-10% low plastic fines. **FRIARS SANDSTONE (SS)**, light brownish gray (10YR-6/2), moist, hard, fine grained, friable. **CLAYEY GRAVELLY SAND (SC)**, gray (5Y-6/1), moist, hard, fine grained, 20-30% rounded, weathered gravel, 5-10% high plastic fines, some dark red staining. -increasing fines. -siltstone, gray (2.5Y-5/1), dry, very hard, low plasticity, trace orange mottling. -silt and sandstone, gray (2.5Y-5/1), dry, very hard, very fine sand, 50% low plastic fines, some orange mottling. Bottom of well at 36.5 feet bgs. Bottom of boring at 41 feet bgs.	40	

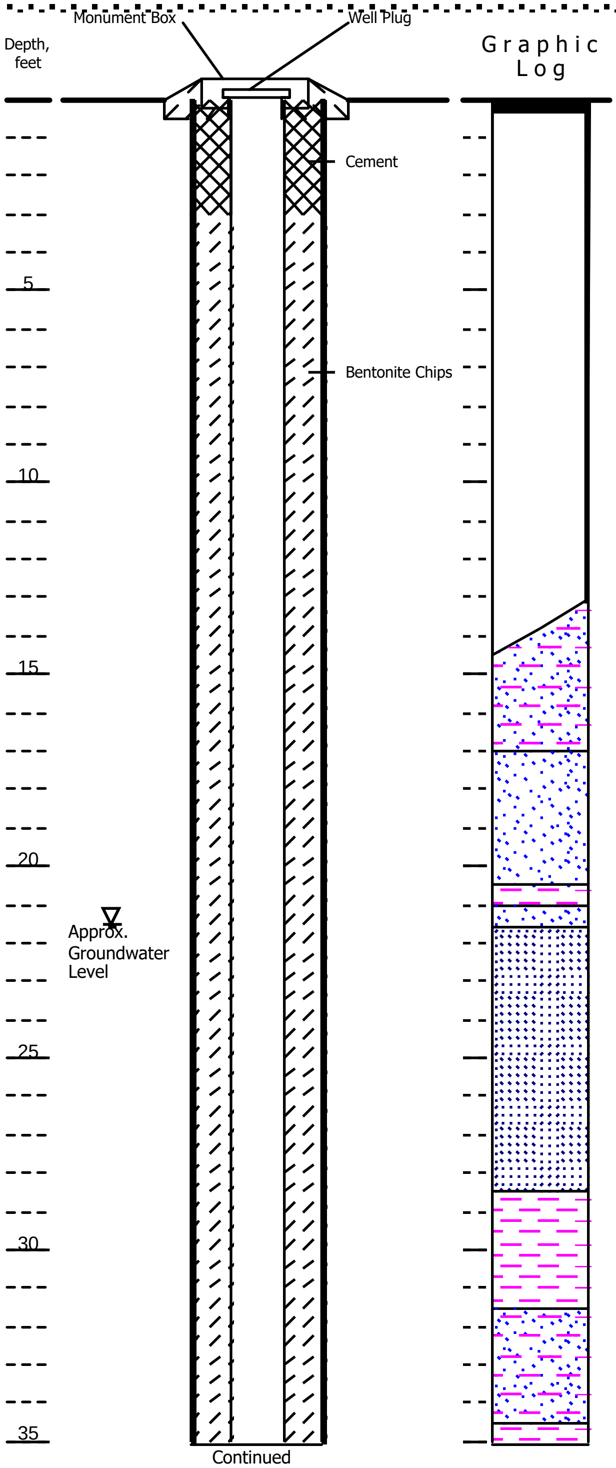
Permit #:
Casing elevation:
Date well drilled: 6/8/02
LFR Field Staff: Rodney Crother
Approved by:

EXPLANATION



WELL CONSTRUCTION AND LITHOLOGY FOR WELL R-41AD (CONTINUED)

WELL CONSTRUCTION — LITHOLOGY — SAMPLING DATA



Visual Description
Asphalt.
Straight Drill to 15 feet bgs.
SILTY SAND (SM), very dark gray (5Y-3/1), moist, 30-35% non-plastic fines, micaceous.
SAND (SP), gray (10YR-6/1), fine to very fine grained, trace fines.
SANDY SILT (ML) stringer.
SAND (SP)
GRAVELLY SAND (SW) , brown (10YR-4/3), wet, fine to coarse sand. -color grades to dark grayish brown (2.5Y-4/2), wet. -increase in grain size, trace fine gravels.
SANDY CLAYEY SILT (ML) , dark olive gray (5Y-3/2), wet, 10-15% fine sand, 5-10% clay, low to medium plastic, micaceous.
SILTY SAND (SM), dark olive gray (5Y-3/2), wet, 25-30% fines, micaceous.

ID of Samples Analyzed	P I D (ppm)/ Penetration Rate (blows/ft.)

Permit #:
Casing elevation:
Date well drilled: 6/17/02
LFR Field Staff: Adelo Derilo
Approved by:

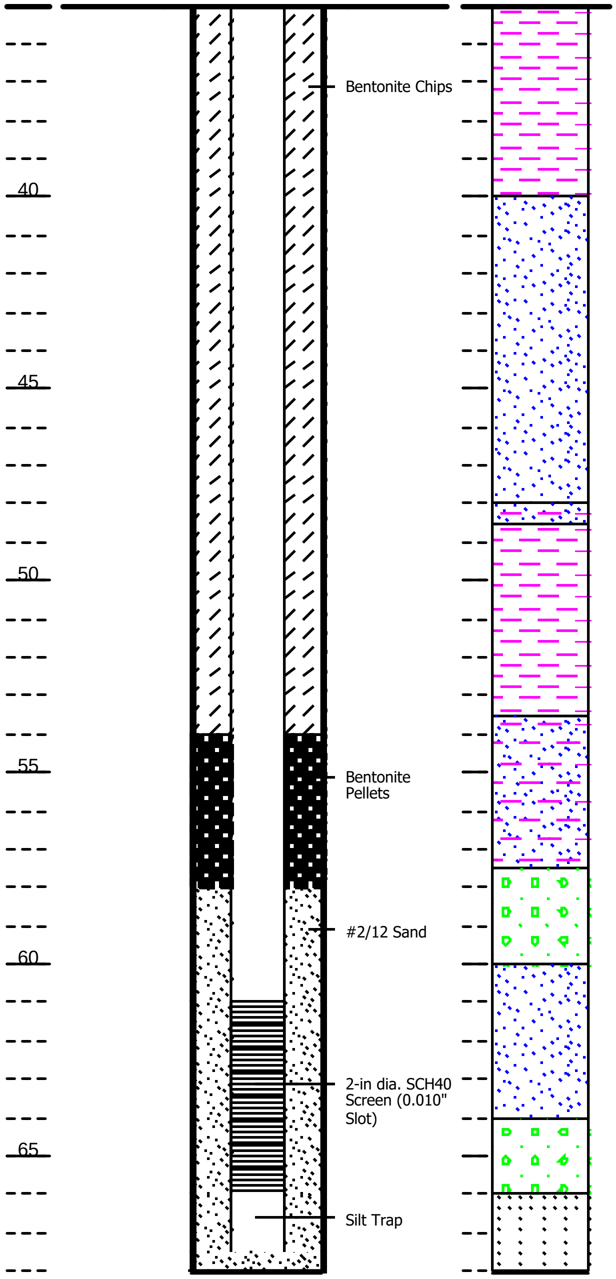
EXPLANATION

- Clay
- Silt
- Sand
- Gravel
- Interval Sampled
- Sample Retained

WELL CONSTRUCTION AND LITHOLOGY FOR WELL R-42AD

WELL CONSTRUCTION	LITHOLOGY	SAMPLING DATA

Depth, feet — Continued — Graphic Log — Visual Description — ID of Samples Analyzed — P I D (ppm)/ Penetration Rate (blows/ft.)



SANDY SILT (ML), very dark grayish brown (2.5Y-3/2), wet, 25-30% fine sand, micaceous.

SAND (SP), very dark grayish brown (2.5Y-3/2), wet, fine to medium sand, 5-10% non-plastic fines.

-trace fine gravels to ~2-in diameter.

SILTY SAND (SM) stringer.

SANDY CLAYEY SILT (ML) , very dark grayish brown (2.5Y-3/2), wet, 25-30% fine sand, 10-15% clay, slight to medium plastic.

SILTY SAND (SM), very dark grayish brown (2.5Y-3/2), wet, 25-30% fines, ~5% clay.

SANDY GRAVEL (GW) , olive brown (2.5Y-4/4), wet, 25-30% fine to coarse sand, fine to coarse rounded to subrounded gravel to ~4-in diameter.

SAND (SP), dark olive gray (5Y-3/2), wet, fine to medium grained, trace fine gravel.

SANDY GRAVEL (GW)

FRIAR SANDSTONE (SS), wet, very hard, fine to medium sand.

Bottom of well at 67.5 feet bgs.
Bottom of boring at 68 feet bgs.

EXPLANATION

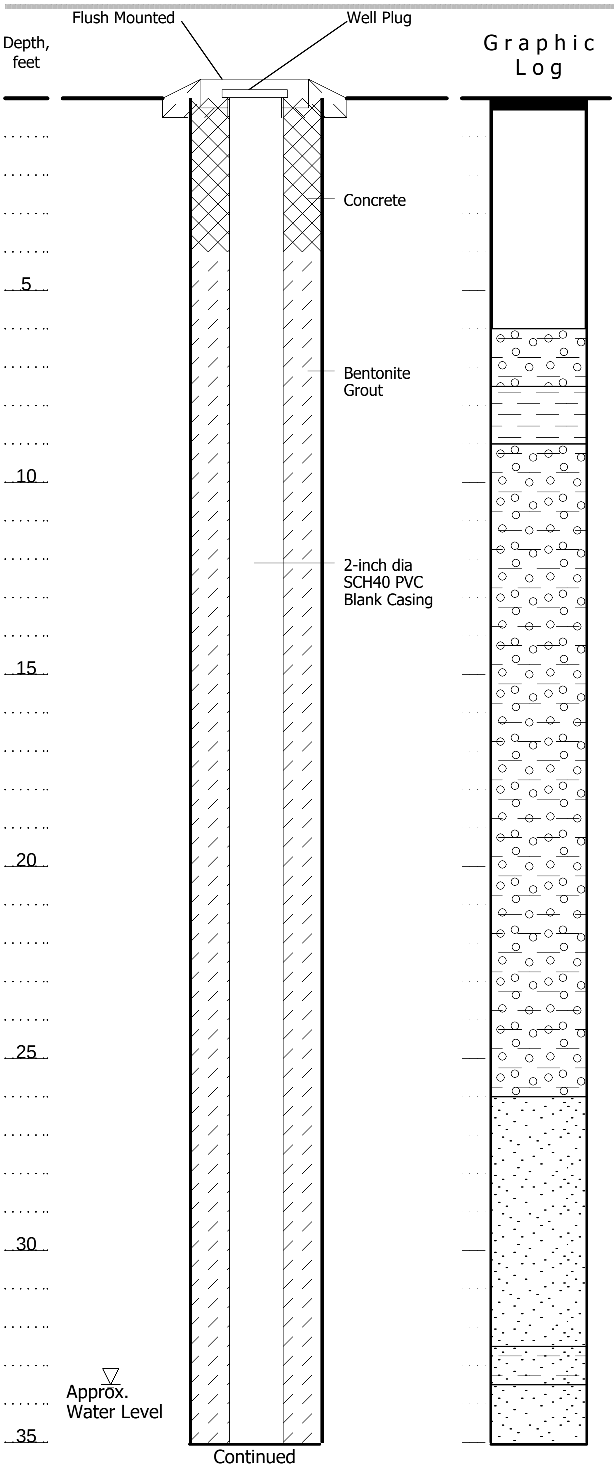
Clay
Silt
Sand
Gravel

Interval Sampled
Sample Retained

Permit #:
Casing elevation:
Date well drilled: 6/17/02
LFR Field Staff: Adelo Derilo
Approved by:

WELL CONSTRUCTION AND LITHOLOGY FOR WELL R-42AD (CONTINUED)

WELL CONSTRUCTION	LITHOLOGY	SAMPLING DATA



Visual Description

Asphalt pavement (~3 inches).

Straight drilled to 6 feet bgs. Air vacuum cleared to approximately 5 feet bgs.

SILTY GRAVEL WITH SAND (GM), olive gray (5Y-5/2), moist, fine gravel/cobble to ~4-in diameter, fine to coarse sand.

SANDY SILT (ML), very dark gray (10YR-3/1), moist, 15-20% fine sand, trace fine gravel.

SILTY GRAVEL WITH SAND (GM), mottled brownish gray to olive gray, fine to coarse, rounded to sub-rounded gravel/cobbles to ~3-inch diameter.

-color grades to dark brown to reddish brown.

POORLY GRADED SAND (SP), olive gray (5Y-4/2), moist, fine grained, micaceous, trace non-plastic fines.

-gray (10YR-6/1), dry, trace fine gravel.

-grades to dark grayish brown (10YR-4/2), moist, fine to medium grained.

SILTY SAND (SM), olive gray (5Y-4/2), moist, fine grained, 15-20% non-plastic fines, micaceous.

POORLY GRADED SAND (SP), dark grayish brown

ID of Samples Analyzed | P I D (ppm)/ Penetration Rate (blows/ft.)

EXPLANATION

- Clay
- Silt
- Sand
- Gravel
- Interval Sampled
- Sample Retained

Date well drilled: 2/16/03 - 2/17/03

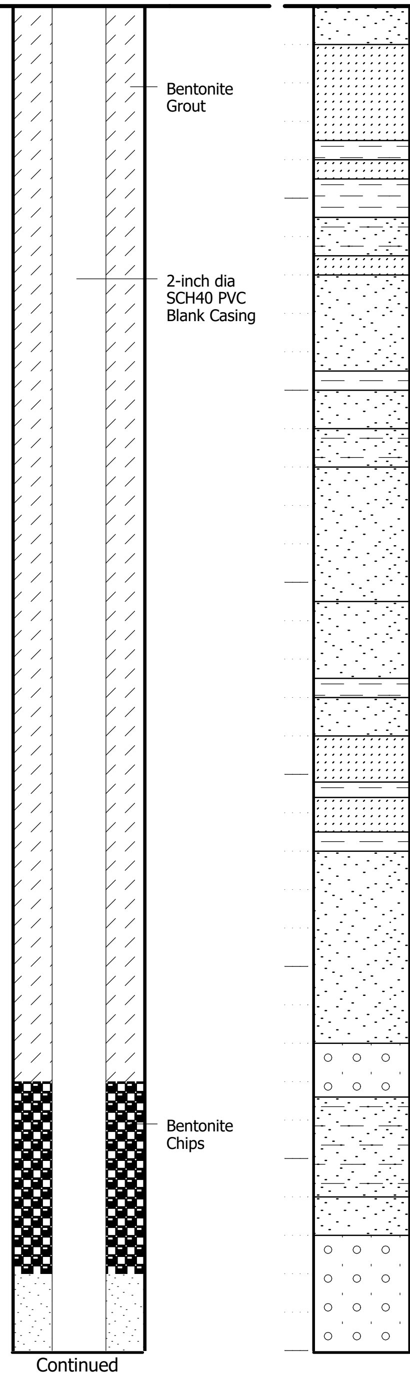
LFR Field Staff: Adelo Derilo

Approved by:

WELL CONSTRUCTION AND LITHOLOGY FOR WELL R-45 AD

WELL CONSTRUCTION	LITHOLOGY	SAMPLING DATA

Depth, feet | Continued | Graphic Log | Visual Description | ID of Samples Analyzed | P I D (ppm)/ Penetration Rate (blows/ft.)



Depth markers: 40, 45, 50, 55, 60, 65, 70

Visual Description

(2.5Y-4/2), wet, fine grained, micaceous, trace non-plastic fines.

WELL GRADED SAND (SW), grayish brown (2.5Y-5/4), wet, fine to coarse gravel.

SANDY SILT (ML) stringer, very dark gray (10YR-3/1), wet, soft, 15-20% fine sand, micaceous, slightly plastic.

WELL GRADED SAND (SW), same as SW above.

CLAYEY SILT (ML), very dark gray (10YR-3/1), wet, trace fine sand, slightly plastic, micaceous.

SILTY SAND (SM), dark grayish brown (2.5Y-4/2), wet, 15-25% non-plastic fines, micaceous.

WELL GRADED SAND (SW), dark gray (10YR-4/2), fine to coarse grained.

POORLY GRADED SAND (SP), dark olive gray (5Y-3/2), fine grained, trace fines.

ELASTIC SILT (MH), very dark gray (10YR-3/1), high plasticity, trace fine sand.

POORLY GRADED SAND (SP), dark grayish brown (2.5Y-4/2), wet, fine to medium grained, micaceous.

SILTY SAND (SM), very dark gray (10YR-3/1), wet, fine grained, 25-30% fines, slightly plastic.

POORLY GRADED SAND (SP), dark olive gray (5Y-3/2), wet, fine grained, trace fine gravel at ~50.5 feet bgs.

- fine to medium graineed.

ELASTIC SILT (ML) stringer, medium to high plasticity.

POORLY GRADED SAND (SP), fine to medium grained.

WELL GRADED SAND (SW), light olive brown (2.5Y-5/3), wet, fine to coarse grained, trace fine gravels.

SANDY SILT (ML) stringer, 10-15% fine sand, slightly plastic.

WELL GRADED SAND (SW), same as SW above.

SANDY SILT (ML) stringer, same as ML above.

POORLY GRADED SAND (SP), olive brown (2.5Y-4/3), fine to medium grained.

WELL GRADED GRAVEL WITH SAND (GW), olive brown (2.5Y-4/4), wet, rounded to subrounded, fine gravel to ~3-inch diameter, 30-40% fine to coarse sand.

SILTY SAND (SM), olive gray (5Y-4/2), fine grained, 25-30% non-plastic fines.

POORLY GRADED SAND (SP), olive (5Y-4/3), fine to

EXPLANATION

Clay
Silt
Sand
Gravel

Interval Sampled
Sample Retained

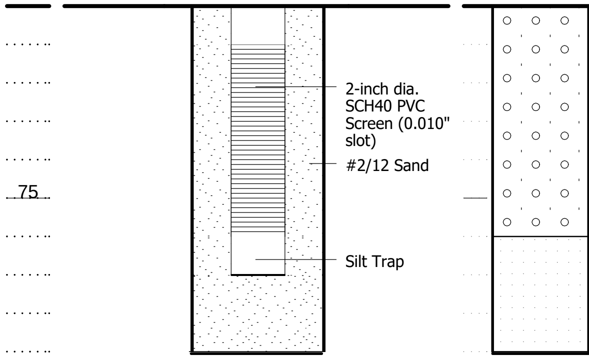
Date well drilled: 2/16/03 - 2/17/03
LFR Field Staff: Adelo Derilo

Approved by:

WELL CONSTRUCTION AND LITHOLOGY FOR WELL R-45 AD (CONTINUED)

WELL CONSTRUCTION	LITHOLOGY	SAMPLING DATA

Depth, feet | Continued | Graphic Log | Visual Description | ID of Samples Analyzed | P I D (ppm)/ Penetration Rate (blows/ft.)



medium grained.

WELL GRADED GRAVEL WITH SAND (GW), rounded to subrounded fine gravel to ~5-inches diameter, increased amount and size of gravel from ~69 to 76 feet bgs.

FRIAR SANDSTONE (SS), dark gray (4/N), moist, fine grained, friable.

Bottom of well at 77 feet bgs.
Bottom of boring at 79 feet bgs.

Materials used:
Filter Pack
- 2 1/2 bags #2/12 sand

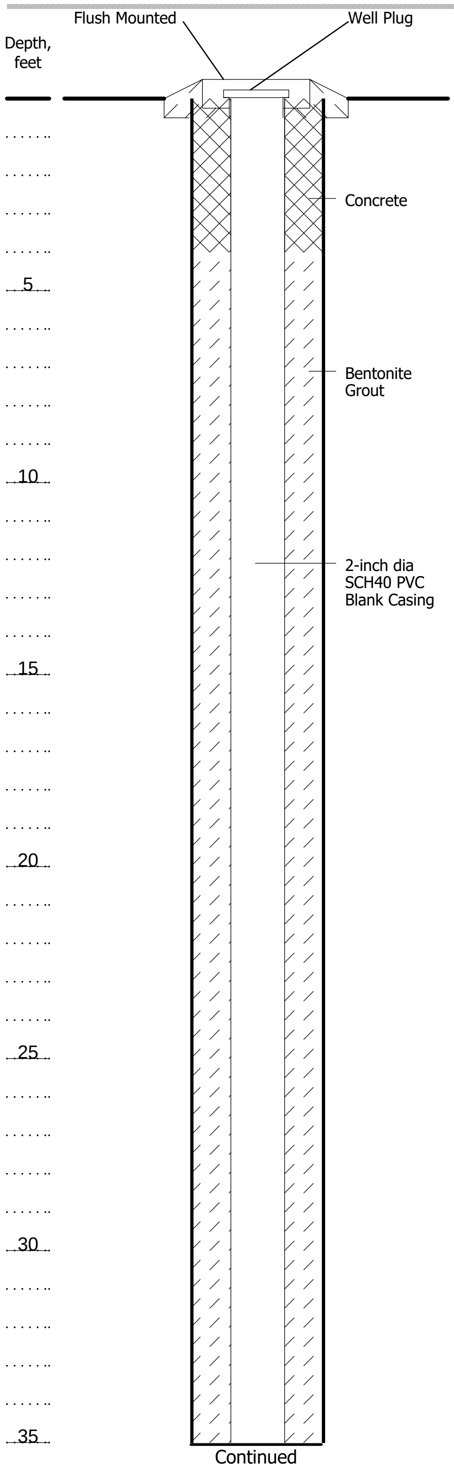
Annular Seal
- 1 1/2 bags bentonite chips
- 6 bags bentonite grout

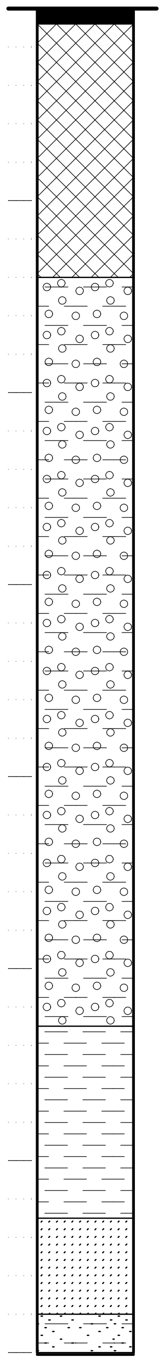
Date well drilled: 2/16/03 - 2/17/03
LFR Field Staff: Adelo Derilo
Approved by:

EXPLANATION
Clay
Silt
Sand
Gravel
Interval Sampled
Sample Retained

WELL CONSTRUCTION AND LITHOLOGY FOR WELL R-45 AD (CONTINUED)

WELL CONSTRUCTION	LITHOLOGY	SAMPLING DATA





Visual Description

Asphalt pavement (~3-inches).

FILL materials, sand and gravel, mottled.

-brown to gray with red streak.

SILTY GRAVEL WITH SAND (GM), mottled, dark brown to grayish brown, rounded to subrounded, fine gravel to ~2-in diameter.

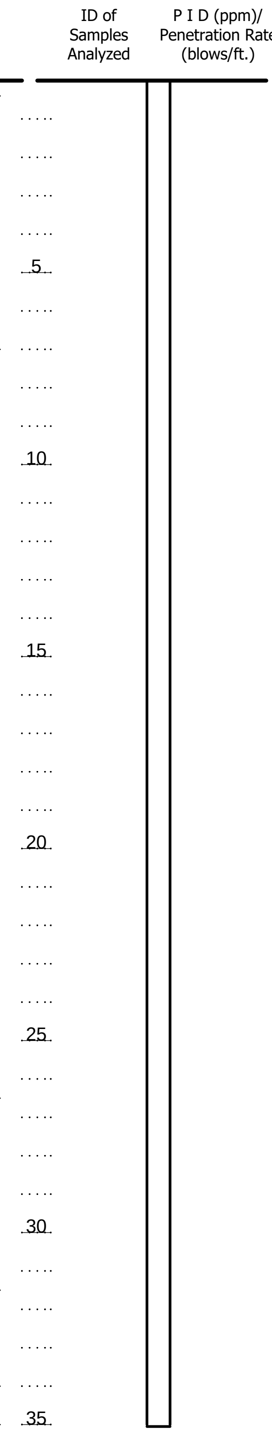
-reddish brown.

-yellowish mottling, cobbles to ~5-inch diameter.

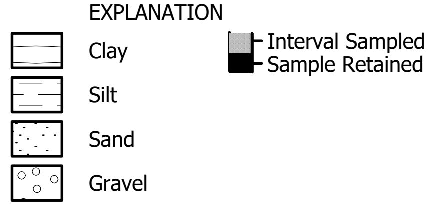
SANDY SILT (ML), dark grayish brown (10YR-4/2), moist, 25-30% fine to medium grained sand.
-very dark gray (10YR-3/1), moist, 15-20% fine sand.
-micaceous.

WELL GRADED SAND (SW), gray (10YR-6/1), dry, fine to medium sand, 10-15% fine gravel.

SILTY SAND (SM), very dark grayish brown



EXPLANATION



Date well drilled: 2/18/03
LFR Field Staff: Adelo Derilo
Approved by:

WELL CONSTRUCTION AND LITHOLOGY FOR WELL R-46 AD

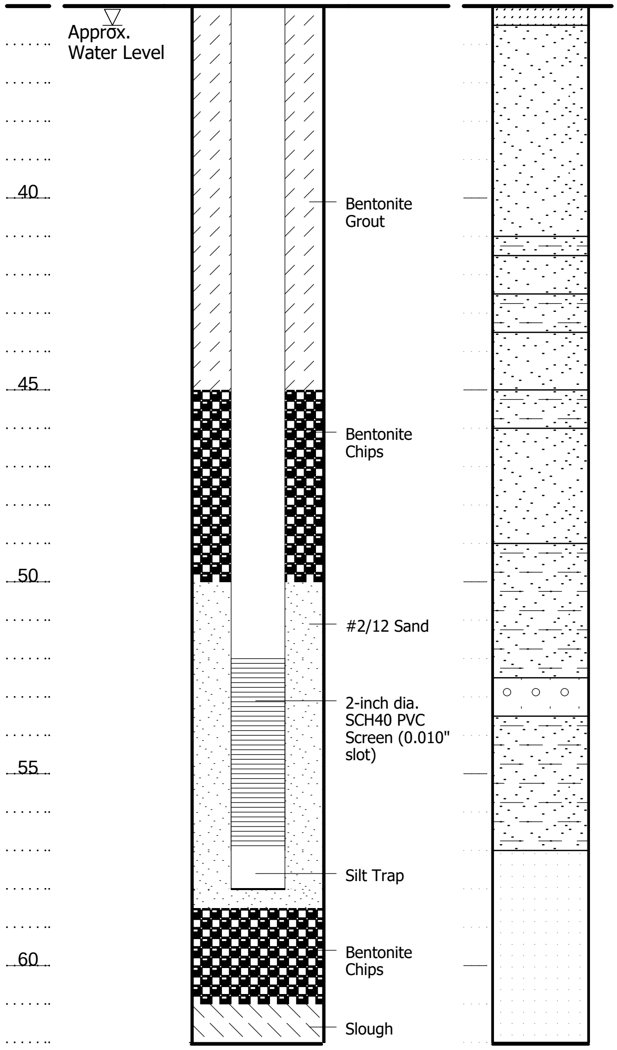
LFR
Levine•Fricke
Project No. 10180

Mission Valley Terminal

030303AID/tpf

WELL CONSTRUCTION	LITHOLOGY	SAMPLING DATA

Depth, feet — Continued — Graphic Log — Visual Description — ID of Samples Analyzed — P I D (ppm)/ Penetration Rate (blows/ft.)



(2.5Y-3/2), moist, fine gravel, 15-20% non-plastic fines, micaceous.

WELL GRADED SAND (SW), very dark grayish brown (2.5Y-3/2), grayish mottling, fine to coarse grained, trace fine gravel.

POORLY GRADED SAND (SP), dark olive gray (5Y-3/2), wet, fine to medium grained, micaceous.

SILTY SAND (SM), very dark gray (5Y-3/1), wet, fine grained, 15-20% non-plastic fines, micaceous.

POORLY GRADED SAND (SP), very dark gray (5Y-3/1), wet, fine to medium grained, micaceous.

SILTY SAND (SM), dark grayish brown (2.5Y-3/2).

POORLY GRADED SAND (SP), dark olive gray (5Y-3/2), wet, fine to medium grained.

SILTY SAND (SM), dark brown (7.5YR-3/2), wet, fine grained, 20-25% non-plastic fines.

POORLY GRADED SAND (SP), dark olive gray (5Y-3/2), wet, fine to medium grained.

SILTY SAND (SM), dark brown (7.5YR-3/2), wet, fine grained, 20-25% non-plastic fines.

-trace cobbles to ~3 inch diameter.

WELL GRADED GRAVEL WITH SAND (GW), brown (10YR-4/3), wet, fine gravel to ~3-inch diameter.

SILTY SAND WITH GRAVEL (SM), dark brown (7.5YR-3/2), wet, fine grained, 20-25% non-plastic fines, fine gravel/cobbles to ~5-inch diameter.

FRIAR SANDSTONE (SS), mottled gray and brown, highly weathered, moist, fine to medium grained.

Bottom of well at 58 feet bgs.
Bottom of boring at 62 feet bgs.

Materials used:
- Filter Pack
  - 2 bags #2/12 sand
- Annular Seal
  - 2 bags bentonite chips
  - 3 1/2 bags bentonite grout

EXPLANATION

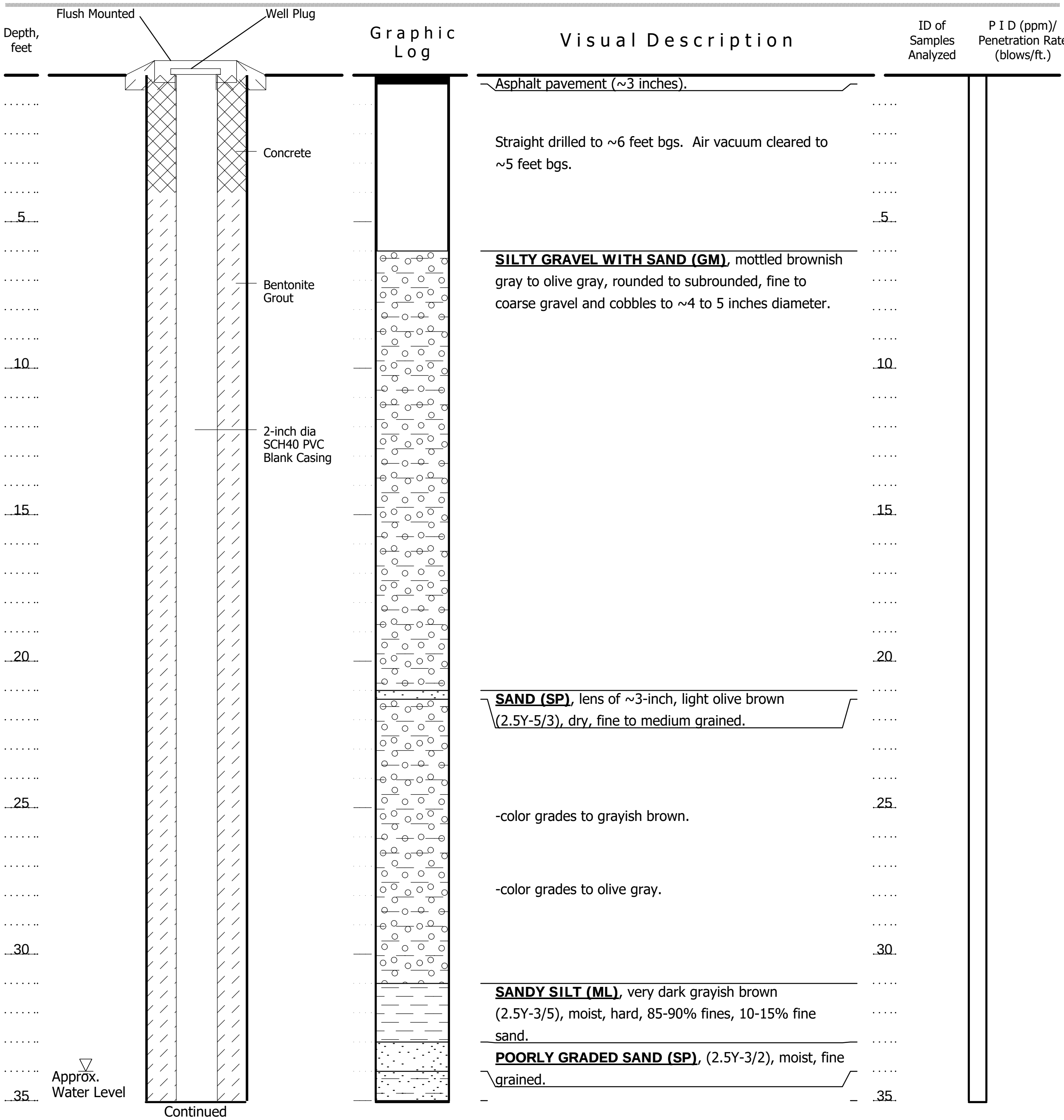
Clay
Silt
Sand
Gravel

Interval Sampled
Sample Retained

Date well drilled: 2/18/03
LFR Field Staff: Adelo Derilo
Approved by:

WELL CONSTRUCTION AND LITHOLOGY FOR WELL R-46 AD (CONTINUED)

WELL CONSTRUCTION | LITHOLOGY | SAMPLING DATA



Visual Description

Asphalt pavement (~3 inches).

Straight drilled to ~6 feet bgs. Air vacuum cleared to ~5 feet bgs.

SILTY GRAVEL WITH SAND (GM), mottled brownish gray to olive gray, rounded to subrounded, fine to coarse gravel and cobbles to ~4 to 5 inches diameter.

SAND (SP), lens of ~3-inch, light olive brown (2.5Y-5/3), dry, fine to medium grained.

-color grades to grayish brown.

-color grades to olive gray.

SANDY SILT (ML), very dark grayish brown (2.5Y-3/5), moist, hard, 85-90% fines, 10-15% fine sand.

POORLY GRADED SAND (SP), (2.5Y-3/2), moist, fine grained.

EXPLANATION

- Clay
- Silt
- Sand
- Gravel
- Interval Sampled
- Sample Retained

Date well drilled: 2/19/03 - 2/20/03

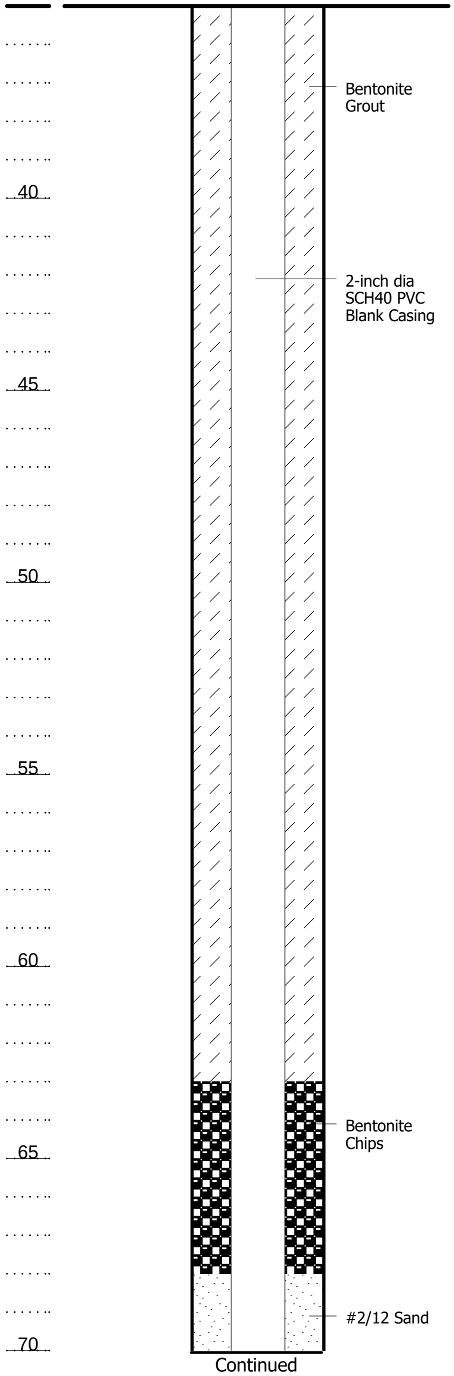
LFR Field Staff: Adelo Derilo

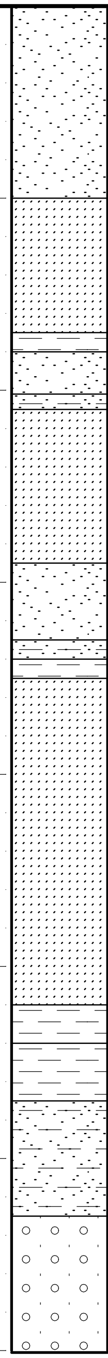
Approved by:

WELL CONSTRUCTION AND LITHOLOGY FOR WELL R-47 AD

WELL CONSTRUCTION | LITHOLOGY | SAMPLING DATA

Depth, feet | Continued | Graphic Log | Visual Description | ID of Samples Analyzed | P I D (ppm)/ Penetration Rate (blows/ft.)





SILTY SAND (SM), dark gray (10YR-4/1), wet, 70-75% fine grained sand, 25-30% non-plastic fines.

POORLY GRADED SAND (SP), dark gray (10YR-4/1), wet, fine to medium grained, micaceous.

WELL GRADED SAND (SW), olive gray (5Y-4/2), wet, fine to coarse grained sand, rounded to subrounded fine gravel.

SANDY SILT (ML), very dark gray (10YR-3/1), wet, 10-15% fine sand, slightly plastic.

POORLY GRADED SAND (SP), olive gray (5Y-4/2), wet, fine to medium grained, micaceous.

SILTY SAND (SM) lens stringer.

WELL GRADED SAND (SW), olive gray (5Y-4/2), wet, fine to coarse grained, fine gravel to ~2-inch diameter.

POORLY GRADED SAND (SP), olive gray (5Y-4/2), wet, fine to medium grained, fine gravel to ~2-inch diameter, rounded to subrounded.

SILTY SAND (SM), very dark gray (5Y-3/1), wet, 20-25% non-plastic fines, micaceous.

SANDY SILT (ML), (5Y-3/1), wet, 15-20% fine sand.

WELL GRADED SAND (SW), dark olive gray (5Y-3/2), wet, fine to coarse grained, rounded to subrounded, fine gravel to ~2-inches diameter.

CLAYEY SILT (ML), very dark grayish brown (2.5Y-3/2), wet, trace fine sand, slightly plastic, rounded to subrounded, trace fine gravel to ~2-inch diameter.

SANDY SILT (ML), dark grayish brown (2.5Y-4/2), wet, 10-15% fine sand, micaceous, slightly plastic.

SILTY SAND (SM), dark olive gray (5Y-3/2), wet, 10-15% non-plastic fines, fine grained, micaceous.

WELL GRADED GRAVEL WITH SAND (GW), olive brown (2.5Y-4/3), wet, fine gravel to ~4-inches diameter, rounded to subrounded, fine to coarse sand, trace fines.

EXPLANATION

Clay

Silt

Sand

Gravel

Interval Sampled

Sample Retained

Date well drilled: 2/19/03 - 2/20/03

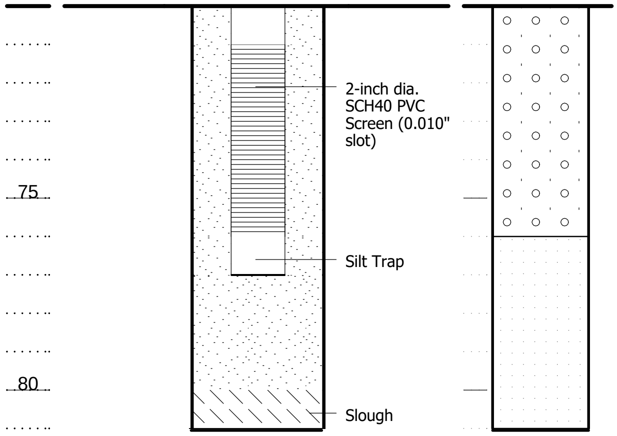
LFR Field Staff: Adelo Derilo

Approved by:

WELL CONSTRUCTION AND LITHOLOGY FOR WELL R-47 AD (CONTINUED)

WELL CONSTRUCTION	LITHOLOGY	SAMPLING DATA

Depth, feet | Continued | Graphic Log | Visual Description | ID of Samples Analyzed | P I D (ppm)/ Penetration Rate (blows/ft.)



FRIAR SANDSTONE (SS), gray (5Y-6/1), moist, fine grained, friable.

Bottom of well at 77 feet bgs.
Bottom of boring at 81 feet bgs.

Materials used:
- Filter Pack
  - 3 bags #2/12 sand
- Annular Seal
  - 2 bags bentonite chips
  - 6 bags bentonite grout

Date well drilled: 2/19/03 - 2/20/03
LFR Field Staff: Adelo Derilo

Approved by:

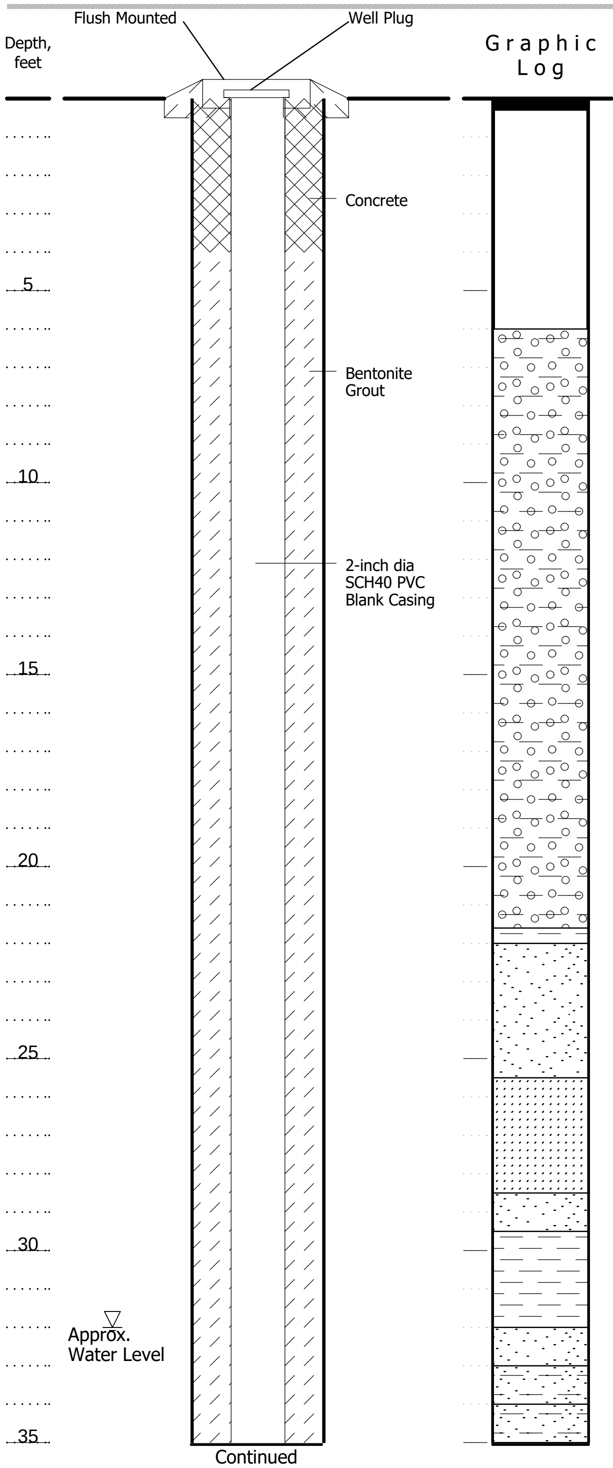
EXPLANATION

Clay
Silt
Sand
Gravel

Interval Sampled
Sample Retained

WELL CONSTRUCTION AND LITHOLOGY FOR WELL R-47 AD (CONTINUED)

WELL CONSTRUCTION | LITHOLOGY | SAMPLING DATA



Visual Description

Asphalt pavement (~3 inches).

Straight Drilled to ~6 feet bgs. Air vacuum cleared to ~5 feet bgs.

SILTY GRAVEL WITH SAND (GM), mottled gray to reddish brown, rounded to subrounded fine gravels and cobbles to ~4-inches diameter.

-grades to dark brown, increased amount of fine to coarse grained sand.

SANDY SILT (ML) stringer, dark gray (5Y-4/1), moist, 15-20% fine sand, micaceous.

POORLY GRADED SAND (SP), very dark grayish brown (2.5Y-3/2), moist, fine grained, micaceous.

WELL GRADED SAND (SW), gray (10YR-6/1), dry, fine to coarse grained.

POORLY GRADED SAND (SP), olive brown (2.5Y-4/4), moist, fine to medium grained.

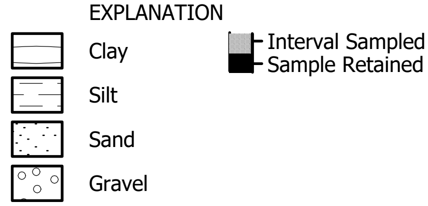
SANDY SILT (ML), very dark gray (10Y-3/1), moist, 60-70% low plastic fines, 30-40% fine sand, micaceous.

POORLY GRADED SAND (SP), dark grayish brown (2.5Y-3/2), wet, fine to medium grained sand, micaceous.

SILTY SAND (SM), dark grayish brown (2.5Y-3/2),

ID of Samples Analyzed	P I D (ppm)/ Penetration Rate (blows/ft.)

EXPLANATION

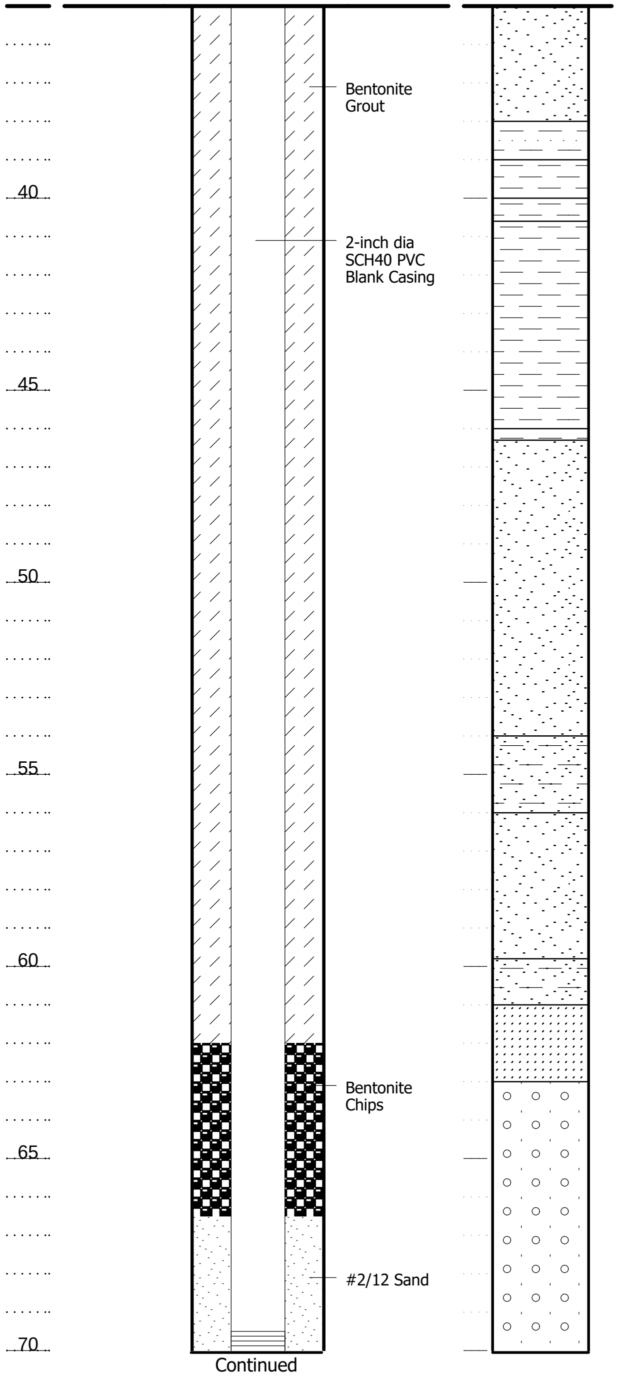


Date well drilled: 2/21/03 - 2/22/03
LFR Field Staff: Adelo Derilo/Charlotte Berghoffer
Approved by:

WELL CONSTRUCTION AND LITHOLOGY FOR WELL R-48 AD

WELL CONSTRUCTION	LITHOLOGY	SAMPLING DATA

Depth, feet | Continued | Graphic Log | Visual Description | ID of Samples Analyzed | P I D (ppm)/ Penetration Rate (blows/ft.)



wet, 60-70% fine sand, 30-40% medium plastic fines, micaceous.

SILTY SAND (SM), dark grayish brown (2.5Y-3/2), wet, 70-80% fine to medium sand, 20-30% low plastic fines, micaceous.

POORLY GRADED SAND WITH GRAVEL (SP), olive gray (5Y-4/2), wet, medium to coarse sands, slightly micaceous, with some gravels.

ELASTIC SILT (MH), black (5Y-2.5/1), moist, trace fine sand.

SANDY SILT (ML), very dark gray (5Y-3/1), moist, 40-60% non-plastic fines, 40-50% fine sand, micaceous.

SILT WITH SAND (ML), very dark gray (5Y-3/1), moist, 75-85% plastic fines, 15-25% fine sand, slightly micaceous.

SANDY SILT (ML), very dark gray (5Y-3/1), moist, 50-60% non-plastic fines, 40-50% fine sands, micaceous.

ELASTIC SILT (MH) stringer, black (5Y-2.5/1), moist, trace fine sand.

POORLY GRADED SAND (SP), dark gray (2.5Y-4/1), wet, medium grained, micaceous.

SILTY SAND (SM), very dark gray (5Y-3/1), moist, 80-90% fine sand, 10-20% non-plastic fines, micaceous.

POORLY GRADED SAND (SP), olive gray (5Y-4/2), wet, medium to coarse sand.

SILTY SAND (SM), very dark gray (5Y-3/1), moist, 60-70% fine to medium sand, 30-40% non-plastic fines, slightly micaceous.

WELL GRADED SAND WITH GRAVEL (SW), olive gray (5Y-4/2), wet, 80-90% medium to coarse sands, 10-20% gravels 1 to 2 inches diameter.

WELL GRADED GRAVEL WITH SAND (GW), olive (5Y-4/3), wet, 70-80% gravels, 10-20% coarse sands, gravels up to 6 inch diameter.

EXPLANATION

Clay

Silt

Sand

Gravel

Interval Sampled

Sample Retained

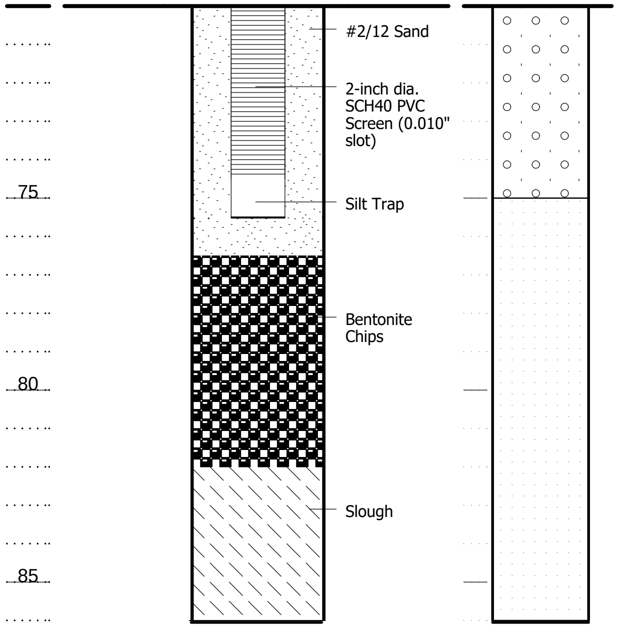
Date well drilled: 2/21/03 - 2/22/03

LFR Field Staff: Adelo Derilo/Charlotte Berghoffer

Approved by:

WELL CONSTRUCTION AND LITHOLOGY FOR WELL R-48 AD (CONTINUED)

WELL CONSTRUCTION		LITHOLOGY	SAMPLING DATA	
Depth, feet	Continued	Graphic Log / Visual Description	ID of Samples Analyzed	P I D (ppm)/ Penetration Rate (blows/ft.)



FRIAR SANDSTONE (SS), dark gray (5Y-4/1), moist, fine grained sand.

Bottom of well at 75.5 feet bgs.
Bottom of boring at 86 feet bgs.

Materials used:
Filter Pack
- 3 bags #2/12 sand

Annular Seal
- 2 bags bentonite chips
- 6 bags bentonite grout

EXPLANATION

Clay
Silt
Sand
Gravel

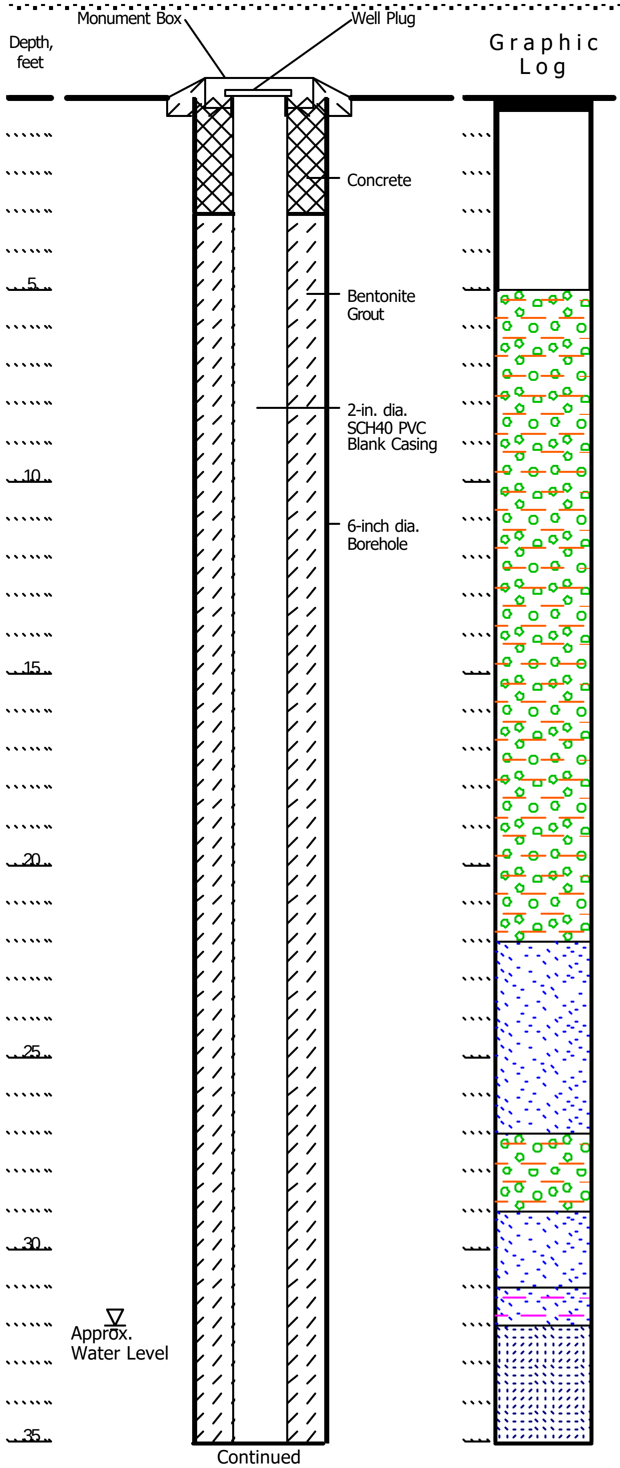
Interval Sampled
Sample Retained

Date well drilled: 2/21/03 - 2/22/03
LFR Field Staff: Adelo Derilo/Charlotte Berghoffer

Approved by:

WELL CONSTRUCTION AND LITHOLOGY FOR WELL R-48 AD (CONTINUED)

WELL CONSTRUCTION | LITHOLOGY | SAMPLING DATA



Visual Description

Asphalt pavement (~4 in. thick).
Cleared by air-knife to ~5 feet bgs.

SILTY GRAVEL (GM), mottled reddish brown to gray, moist, fine to coarse gravel with cobbles to ~5 in. diameter, trace fine sand.

POORLY GRADED SAND (SP), dark grayish brown (2.5Y-4/2), moist, fine to medium grained, micaceous.

-trace fine gravels.

SILTY GRAVEL (GM), brown (10YR-4/3), moist, fine gravel with trace fine sand.

POORLY GRADED SAND (SP), grayish brown (10YR-5/2), moist, fine to medium grained, trace fine gravels.

SILTY SAND (SM) lens.

WELL GRADED SAND (SW), brown (10YR-5/3), wet, fine to coarse grained, trace fine gravels.

ID of Samples Analyzed | P I D (ppm)/ Penetration Rate (blows/ft.)

EXPLANATION

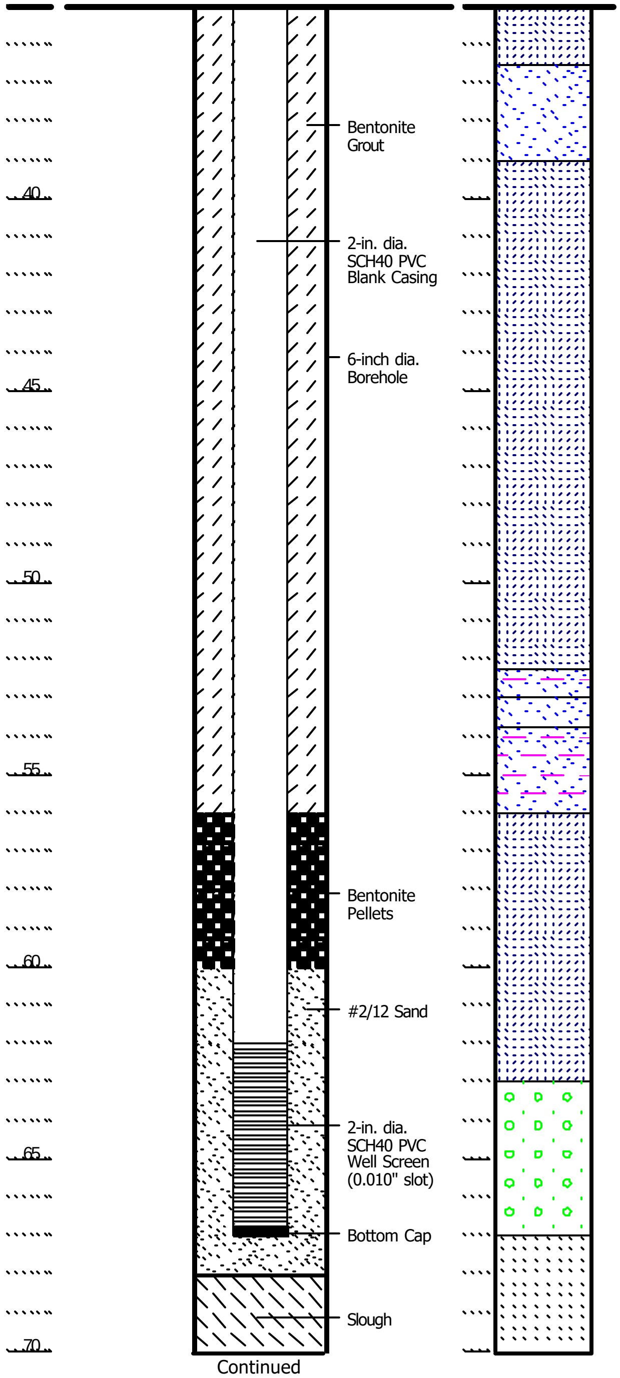
- Clay
- Silt
- Sand
- Gravel
- Interval Sampled
- Sample Retained

Date well drilled: 5/4/05
LFR Field Staff: Adelo Derilo
Approved by: C. Weld CA RCE C-66471

WELL CONSTRUCTION AND LITHOLOGY FOR WELL R-60AD

WELL CONSTRUCTION	LITHOLOGY	SAMPLING DATA

Depth, feet | Continued | Graphic Log | Visual Description | ID of Samples Analyzed | P I D (ppm)/ Penetration Rate (blows/ft.)



POORLY GRADED SAND (SP), olive brown (2.5Y-4/3), wet, fine to medium grained, micaceous.

WELL GRADED SAND (SW), dark grayish brown (2.5Y-4/2), wet, fine to coarse grained, trace coarse gravel to ~2.5 in. diameter.

SILTY SAND (SM) lens.

POORLY GRADED SAND (SP) lens.

SILTY SAND (SM), very dark gray (2.5Y-3/1), wet, fine sand with silt.

WELL GRADED SAND WITH GRAVEL (SW), very dark gray (2.5Y-3/1), wet, fine to coarse sand, trace fines, fine to coarse gravel.

WELL GRADED GRAVEL WITH SAND (GW), very dark grayish brown (2.5Y-3/2), wet, fine to coarse gravel, fine to coarse sand, trace cobbles.

FRIAR SANDSTONE (SS), mottled yellow to gray, soft, highly weathered.

-dark gray (GLEY1-4/N), less weathered.

40 | 45 | 50 | 55 | 60 | 65 R-60AD-65' | 70

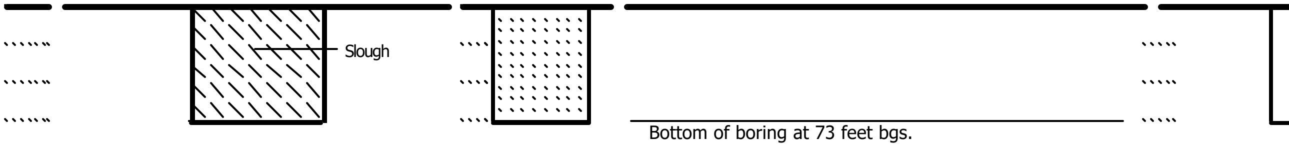
EXPLANATION

Clay
Silt
Sand
Gravel
Interval Sampled
Sample Retained

Date well drilled: 5/4/05
LFR Field Staff: Adelo Derilo
Approved by: C. [signature] CARCE C-66471

WELL CONSTRUCTION AND LITHOLOGY FOR WELL R-60AD (CONTINUED)

WELL CONSTRUCTION		LITHOLOGY		SAMPLING DATA	
Depth, feet	Continued	Graphic Log	Visual Description	ID of Samples Analyzed	P I D (ppm)/ Penetration Rate (blows/ft.)



Bottom of boring at 73 feet bgs.
Bottom of well at 67 feet bgs.

Materials used:
- Filter Pack
  - 1.42 cubic feet of #2/12 sand
- Annular Seal
  - 0.875 cubic feet of bentonite pellets transition seal
  - 9.275 cubic feet of bentonite grout
  - 0.525 cubic feet of concrete surface seal

Drilling Method - Sonic Drilling
Drilling Company - Prosonic Corporation

EXPLANATION

- Clay
- Silt
- Sand
- Gravel
- Interval Sampled
- Sample Retained

Date well drilled: 5/4/05
LFR Field Staff: Adelo Derilo
Approved by: C Wall CAEG C-66471

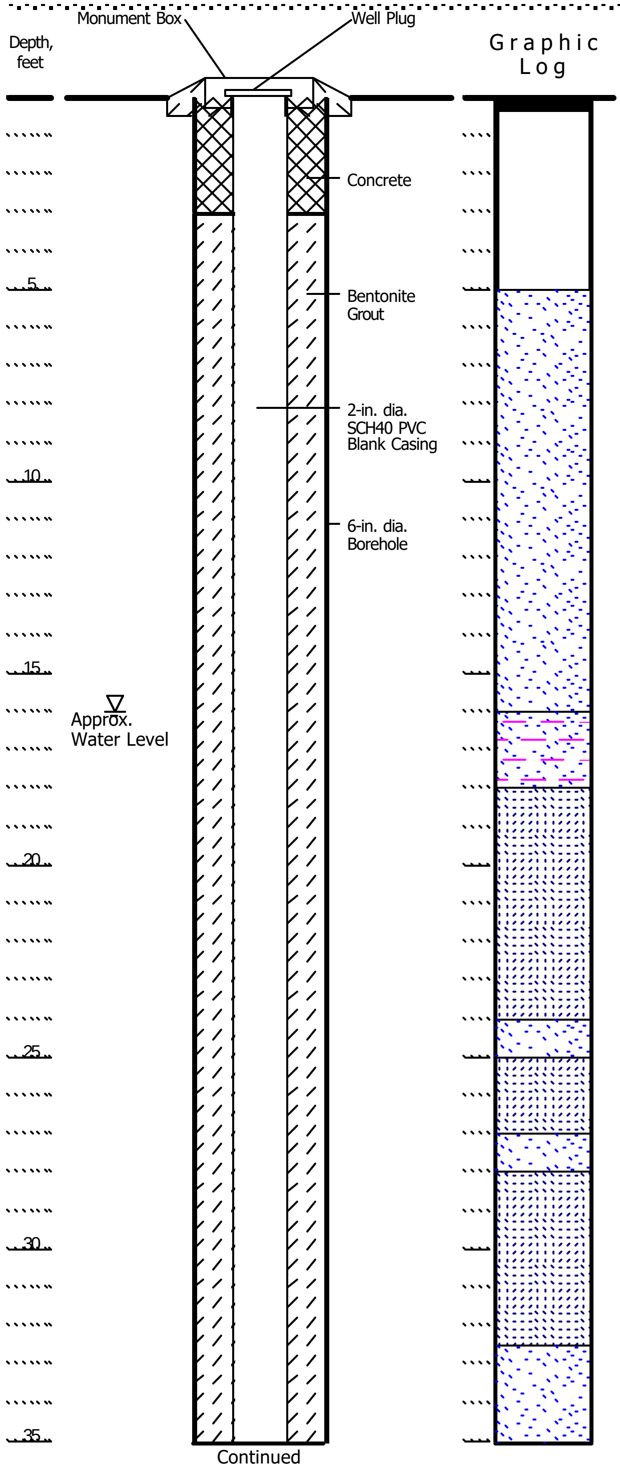
WELL CONSTRUCTION AND LITHOLOGY FOR WELL R-60AD (CONTINUED)

LFR
Levine Fricke
Project No. 002-10180-32

Mission Valley Terminal - Qualcomm Stadium

052405AID/sco

WELL CONSTRUCTION	LITHOLOGY	SAMPLING DATA



Visual Description

Asphalt pavement (~4 in. thick).
Cleared by air-knife to 5 feet bgs.

POORLY GRADED SAND (SP), brown (10YR-4/3), moist, fine to medium grained, micaceous.

-same.

SILTY SAND (SM), very dark grayish brown (2.5Y-3/2), wet, fine sand with silt, micaceous.

WELL GRADED SAND (SW), olive brown (2.5Y-4/3), wet, fine to coarse grained, micaceous.

-trace coarse gravels and cobbles to ~4-in. diameter.

POORLY GRADED SAND (SP), very dark grayish brown (2.5Y-3/2), wet, fine to medium grained, micaceous.

WELL GRADED SAND (SW), dark grayish brown (10YR-4/2), wet, fine to coarse grained, trace fine gravels.

POORLY GRADED SAND (SP), very dark grayish brown (2.5Y-3/2), wet, fine to medium grained, micaceous.

WELL GRADED SAND (SW), very dark grayish brown (10YR-3/2), wet, fine to coarse grained, trace fine gravel.

POORLY GRADED SAND (SP), very dark gray (5Y-3/1), wet, mostly fine sand, trace fines, micaceous.

ID of Samples Analyzed | P I D (ppm)/ Penetration Rate (blows/ft.)

EXPLANATION

Clay
Silt
Sand
Gravel

Interval Sampled
Sample Retained

Date well drilled: 5/3/05
LFR Field Staff: Adelo Derilo
Approved by: C Wall CA RCE C-66471

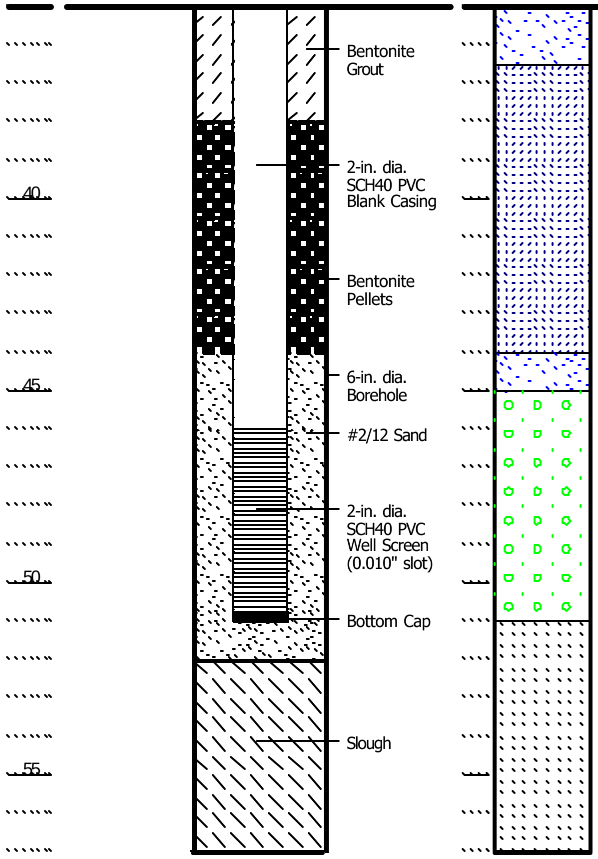
WELL CONSTRUCTION AND LITHOLOGY FOR WELL R-61AD

LFR
Levine Fricke
Project No. 002-10180-32

Mission Valley Terminal - Qualcomm Stadium

WELL CONSTRUCTION	LITHOLOGY	SAMPLING DATA

Depth, feet | Continued | Graphic Log | Visual Description | ID of Samples Analyzed | P I D (ppm)/ Penetration Rate (blows/ft.)



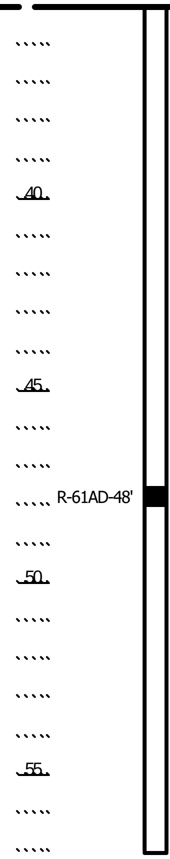
WELL GRADED SAND (SW), very dark grayish brown (10YR-3/2), wet, fine to coarse grained, trace fine gravels.

-trace coarse gravels and cobbles to ~3-in. diameter.

POORLY GRADED SAND (SP), very dark gray (5Y-3/1), wet, mostly fine grained, trace fines, micaceous.

WELL GRADED GRAVEL WITH SAND (GW), very dark grayish brown (2.5Y-3/2), wet, fine to coarse gravel, fine to coarse sand, cobbles to ~4-in. diameter, trace fines.

FRIAR SANDSTONE (SS), gray (5Y-6/1), moist, traces of fine to coarse gravels and pulvarized fines, slightly weathered.



Bottom of boring at 57 feet bgs.
Bottom of well at 51 feet bgs.

Materials used:
Filter Pack
- 1.42 cubic feet of #2/12 sand

Annular Seal
- 1.05 cubic feet of bentonite pellets transition seal
- 6.125 cubic feet of bentonite grout
- 0.525 cubic feet of concrete surface seal

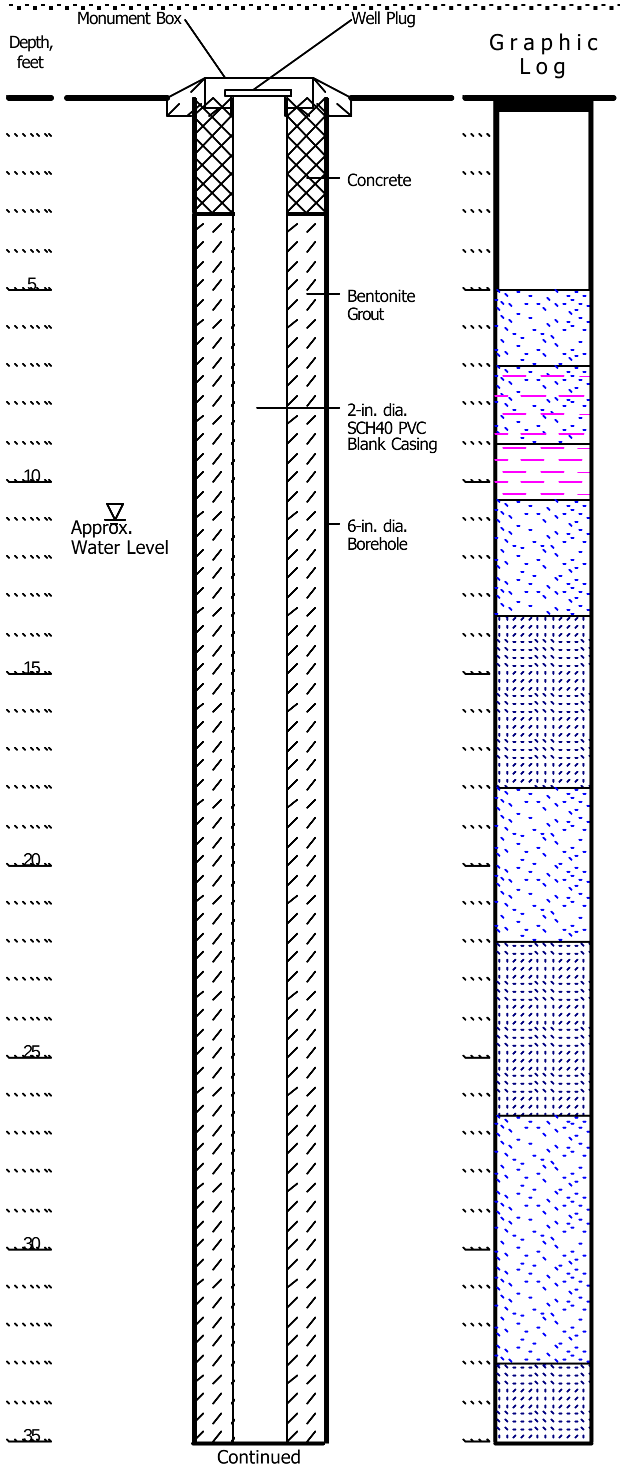
Drilling Method - Sonic Drilling
Drilling Company - Prosonic Corporation

EXPLANATION
Clay
Silt
Sand
Gravel
Interval Sampled
Sample Retained

Date well drilled: 5/3/05
LFR Field Staff: Adelo Derilo
Approved by: C Well CARCE C-66471

WELL CONSTRUCTION AND LITHOLOGY FOR WELL R-61AD (CONTINUED)

WELL CONSTRUCTION	LITHOLOGY	SAMPLING DATA



Visual Description

ID of Samples Analyzed | P I D (ppm)/ Penetration Rate (blows/ft.)

Asphalt pavement (~4-in. thick).

Cleared by air-knife to ~5 feet bgs.

POORLY GRADED SAND (SP), brown (10YR-5/3), moist, fine to medium grained, micaceous.

SILTY SAND (SM), dark brown (10YR-3/3), moist, fine sand with silt.

SANDY SILT (ML), very dark grayish brown (10YR-3/2), moist, trace clay, medium plasticity.

POORLY GRADED SAND (SP), dark olive gray (5Y-3/2), wet, fine to medium grained, trace fines, micaceous.

WELL GRADED SAND (SW), olive gray (5Y-4/2), wet, fine to coarse grained, trace fine gravels, micaceous.

POORLY GRADED SAND (SP), olive gray (5Y-4/2), wet, fine to medium grained, micaceous.

WELL GRADED SAND (SW), olive gray (5Y-4/2), wet, fine to coarse grained, trace fine gravels, micaceous.

POORLY GRADED SAND (SP), olive gray (5Y-4/2), wet, fine to medium grained, micaceous.

WELL GRADED SAND (SW), olive gray (5Y-4/2), wet, fine to coarse grained, trace fine gravels, micaceous.

EXPLANATION

- Clay
- Silt
- Sand
- Gravel
- Interval Sampled
- Sample Retained

Date well drilled: 5/2/05
LFR Field Staff: Adelo Derilo
Approved by: CA RCE C-66471

WELL CONSTRUCTION AND LITHOLOGY FOR WELL R-62AD

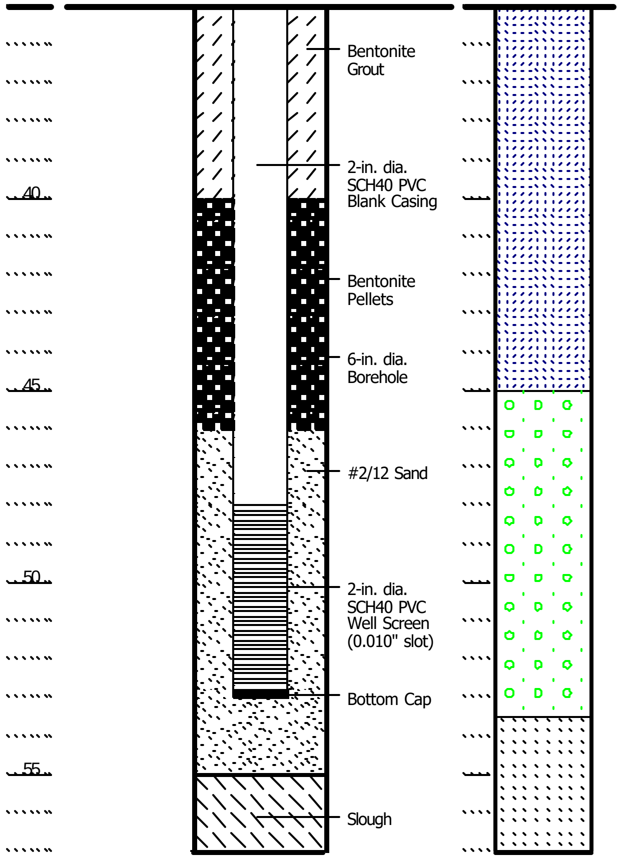
LFR Levine·Fricke
Project No. 002-10180-32

Mission Valley Terminal - Qualcomm Stadium

052605AID/sco

WELL CONSTRUCTION | LITHOLOGY | SAMPLING DATA

Depth, feet | Continued | Graphic Log | Visual Description | ID of Samples Analyzed | P I D (ppm)/ Penetration Rate (blows/ft.)



-trace fine to coarse gravel.

-same.

WELL GRADED GRAVEL WITH SAND (GW), dark olive gray (5Y-3/2), wet, fine to coarse gravel with cobbles to ~5 in. diameter, trace fines.

R-62AD-50'

FRIAR SANDSTONE (SS), light gray (5Y-7/1).

Bottom of boring at 57 feet bgs.
Bottom of well at 53 feet bgs.

Materials used:
- Filter Pack
  - 1.617 cubic feet of #2/12 sand
- Annular Seal
  - 1.05 cubic feet of bentonite pellets transition seal
  - 6.475 cubic feet of bentonite grout
  - 0.525 cubic feet of concrete surface seal

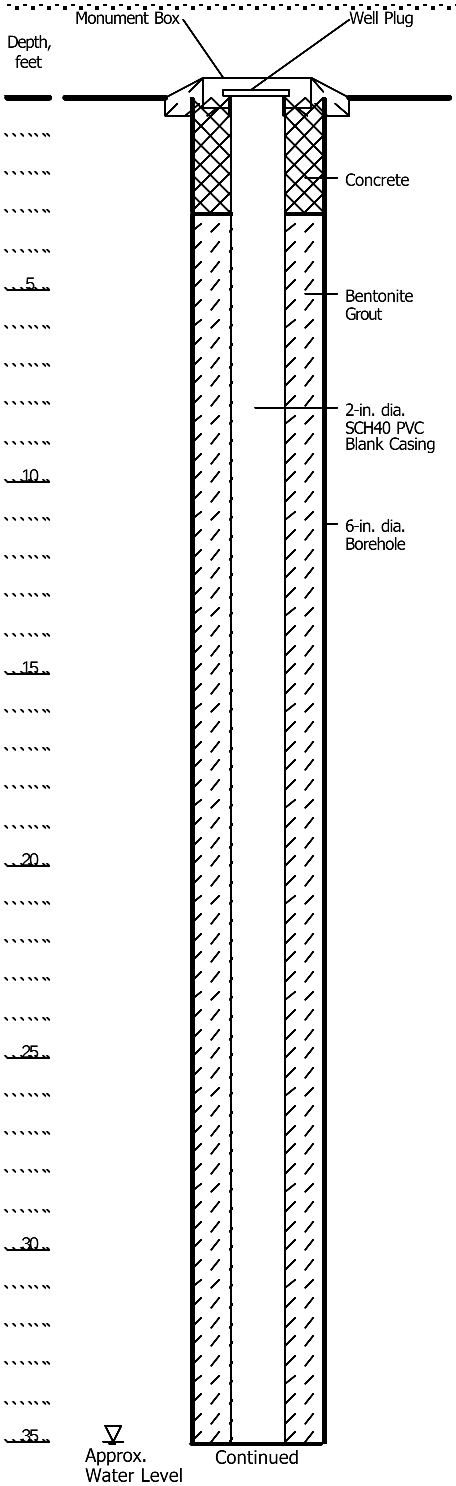
Drilling Method - Sonic Drilling
Drilling Company - Prosonic Corporation

EXPLANATION
- Clay
- Silt
- Sand
- Gravel
- Interval Sampled
- Sample Retained

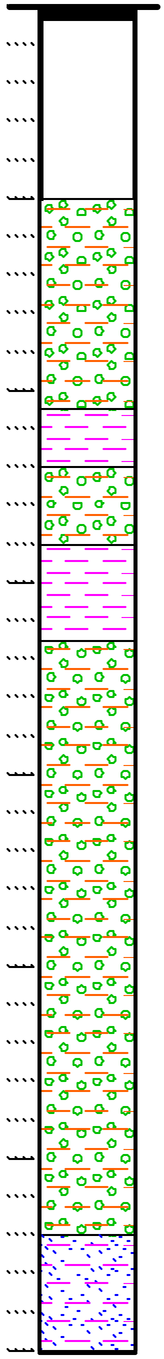
Date well drilled: 5/2/05
LFR Field Staff: Adelo Derilo
Approved by: C. [signature] CA RCE C-66471

WELL CONSTRUCTION AND LITHOLOGY FOR WELL R-62AD (CONTINUED)

WELL CONSTRUCTION	LITHOLOGY	SAMPLING DATA



Graphic Log



Visual Description

Asphalt pavement (~4-in. thick).

Cleared by air-knife to ~5 feet bgs.

SILTY GRAVEL (GM), mottled brown to gray, moist, fine to coarse gravel, trace sand.

SANDY SILT (ML), very dark grayish brown (10YR-3/2), moist, low plasticity.

SILTY GRAVEL (GM), mottled brown to gray, moist, fine to coarse gravel, trace sand.

SANDY SILT (ML), dark grayish brown (10YR-4/2), moist.

SILTY GRAVEL (GM), mottled brown to gray, moist, fine to coarse gravel, trace sand with cobbles to ~5-in. diameter.

SILTY SAND (SM), dark olive gray (5Y-3/2), moist, fine sand with silt and some fine to coarse gravel.

ID of Samples Analyzed	P I D (ppm)/ Penetration Rate (blows/ft.)

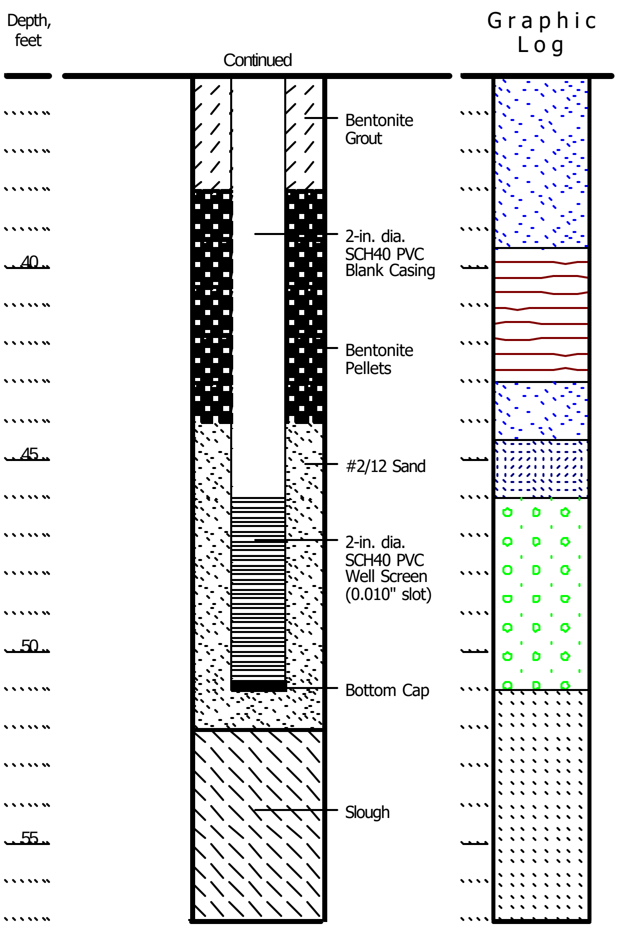
EXPLANATION

- Clay
- Silt
- Sand
- Gravel
- Interval Sampled
- Sample Retained

Date well drilled: 5/5/05
LFR Field Staff: Adelo Derilo
Approved by: C. Fricke CARCE C-66471

WELL CONSTRUCTION AND LITHOLOGY FOR WELL R-63AD

WELL CONSTRUCTION	LITHOLOGY	SAMPLING DATA



Visual Description

POORLY GRADED SAND (SP), dark olive gray (5Y-3/2), wet, fine to medium sand, micaceous.

SILTY CLAY (CL), very dark gray (5Y-3/1), wet, soft, highly plastic.

POORLY GRADED SAND (SP), dark olive gray (5Y-3/2), wet, fine to medium sand, micaceous.

WELL GRADED SAND (SW), dark olive gray (5Y-3/2), wet, fine to coarse grained.

WELL GRADED GRAVEL (GW), dark grayish brown (2.5Y-4/2), wet, fine to coarse gravel with cobbles to ~6-in. diameter.

FRIAR SANDSTONE (SS), light gray (5Y-7/1), friable, highly weathered.
-color grades to reddish brown.

-hard, color grades to light gray (5Y-7/1).

Bottom of boring at 57 feet bgs.
Bottom of well at 51 feet bgs.

Materials used:
Filter Pack
- 1.42 cubic feet of #2/12 sand

Annular Seal
- 1.05 cubic feet of bentonite pellets
- 6.125 cubic feet of bentonite grout
- 0.525 cubic feet of concrete surface seal

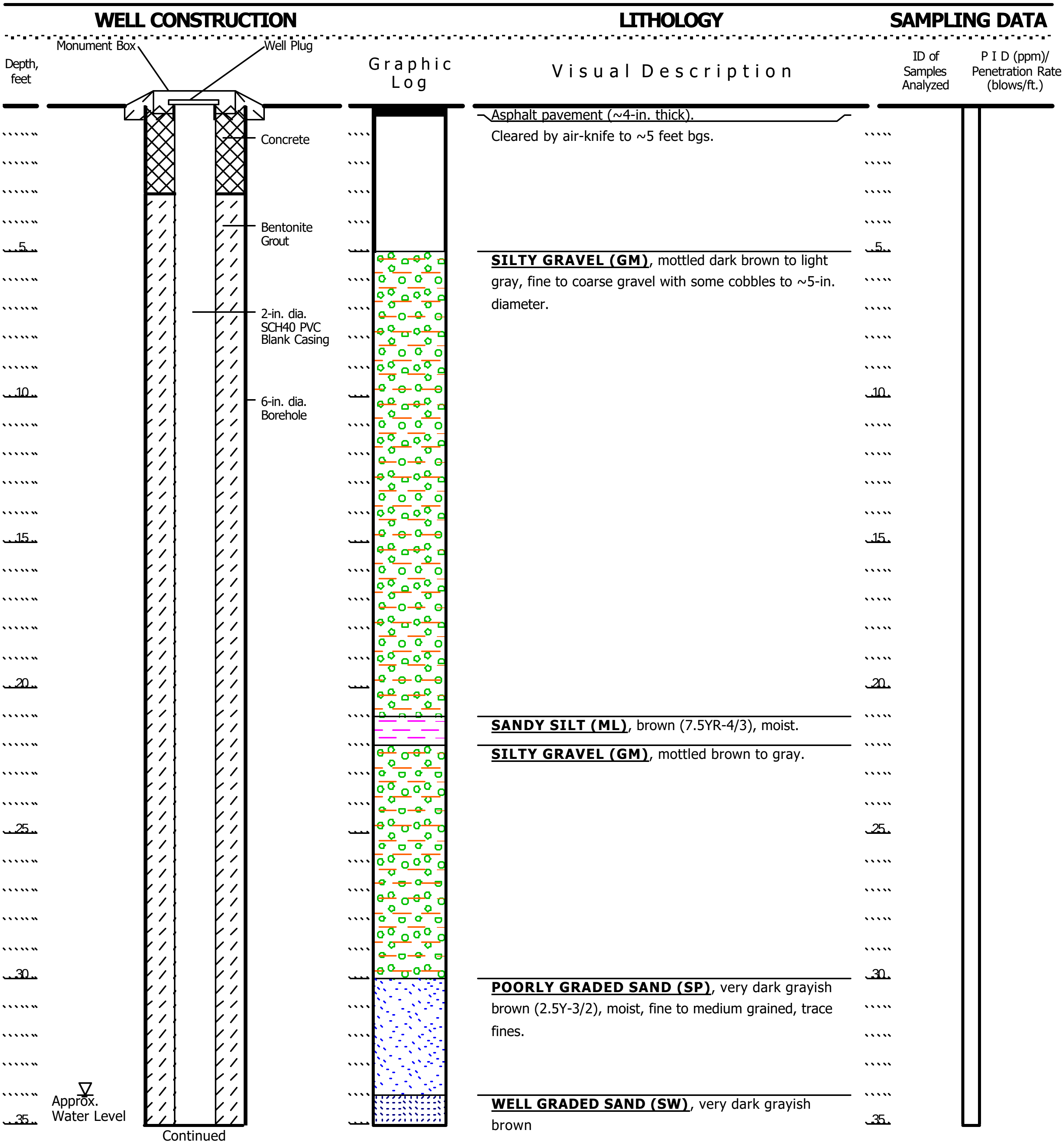
Drilling Method - Sonic Drilling
Drilling Company - Prosonic Corporation

ID of Samples Analyzed	P I D (ppm)/ Penetration Rate (blows/ft.)
R-63AD-48'	

Date well drilled: 5/5/05
LFR Field Staff: Adelo Derilo
Approved by:

EXPLANATION
Clay
Silt
Sand
Gravel
Interval Sampled
Sample Retained

WELL CONSTRUCTION AND LITHOLOGY FOR WELL R-63AD (CONTINUED)



EXPLANATION

Clay

Silt

Sand

Gravel

Interval Sampled

Sample Retained

Date well drilled: 4/29/05

LFR Field Staff: Adelo Derilo

Approved by: C Will CAKCE C-66471

WELL CONSTRUCTION AND LITHOLOGY FOR WELL R-64AD

LFR Levine Fricke

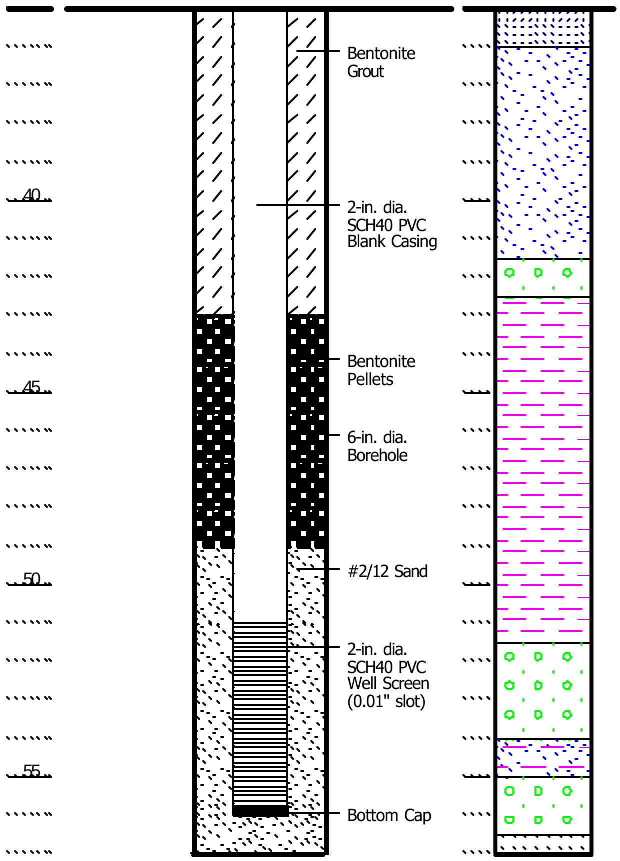
Project No. 002-10180-32

Mission Valley Terminal - Qualcomm Stadium

052605AID/sco

WELL CONSTRUCTION	LITHOLOGY	SAMPLING DATA

Depth, feet | Continued | Graphic Log | Visual Description | ID of Samples Analyzed | P I D (ppm)/ Penetration Rate (blows/ft.)



(2.5Y-3/2), wet, fine to coarse grained.

POORLY GRADED SAND (SP), very dark grayish brown (2.5Y-3/2), wet, fine to medium grained, micaceous.

WELL GRADED GRAVEL (GW).

SANDY SILT (ML), very dark brown (10YR-2/2), very moist, medium plasticity, trace clay.

WELL GRADED GRAVEL WITH SAND (GW), olive brown (2.5Y-4/4), wet, fine to coarse gravel, fine to coarse sand.

R-64AD-53'

SILTY SAND (SM), dark olive gray (5Y-3/2), wet, micaceous.

WELL GRADED GRAVEL (GW).

FRIAR SANDSTONE (SS), mottled yellowish brown to light gray, highly weathered.

Bottom of boring at 57 feet bgs.
Bottom of well at 56 feet bgs.

Materials used:
- Filter Pack
  - 1.42 cubic feet of #2/12 sand
- Annular Seal
  - 1.05 cubic feet of bentonite pellets transition seal
  - 7.0 cubic feet of bentonite grout
  - 0.525 cubic feet of concrete surface seal

Drilling Method - Sonic Drilling
Drilling Company - Prosonic Corporation

EXPLANATION

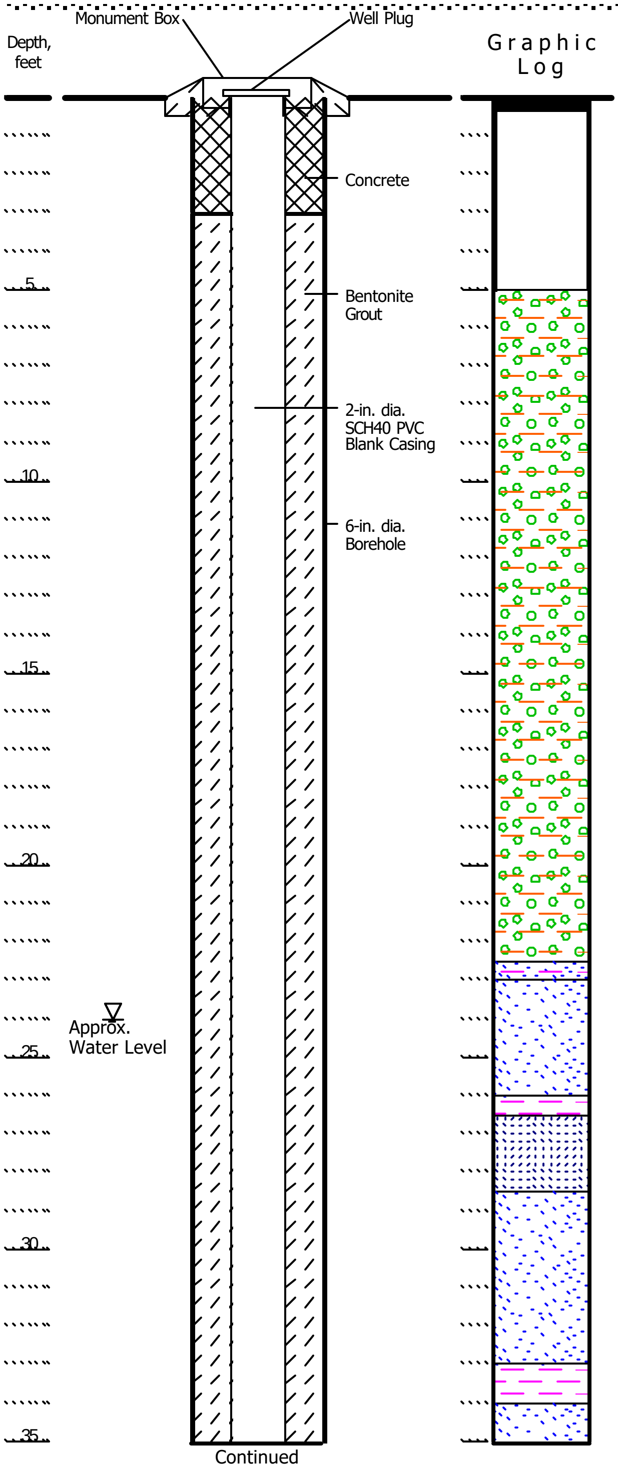
Clay
Silt
Sand
Gravel

Interval Sampled
Sample Retained

Date well drilled: 4/29/05
LFR Field Staff: Adelo Derilo
Approved by: C. Wall CA RCE C-66471

WELL CONSTRUCTION AND LITHOLOGY FOR WELL R-64AD (CONTINUED)

WELL CONSTRUCTION	LITHOLOGY	SAMPLING DATA



Visual Description

ID of Samples Analyzed | P I D (ppm)/ Penetration Rate (blows/ft.)

Asphalt pavement (~4-in. thick).

Cleared by air-knife to ~5 feet bgs.

SILTY GRAVEL (GM), mottled grayish to brownish, moist, fine to coarse gravel with trace of cobbles to ~4-in. diameter.

SILTY SAND (SM), very dark grayish brown (2.5Y-3/2), moist, fine sand with silt.

POORLY GRADED SAND (SP), dark grayish brown (2.5Y-4/2), wet, fine to medium grained, trace fine gravel.

SANDY SILT (ML) lens.

WELL GRADED SAND (SW), very dark grayish brown (2.5Y-3/2), wet, fine to coarse grained, trace fine gravels, micaceous.

POORLY GRADED SAND (SP), very dark grayish brown (2.5Y-3/2), wet, fine to medium grained, micaceous.

SANDY SILT (ML), very dark gray (5Y-3/1), wet, non-plastic, micaceous.

POORLY GRADED SAND (SP), very dark grayish

EXPLANATION

Clay
Silt
Sand
Gravel
Interval Sampled
Sample Retained

Date well drilled: 4/28/05
LFR Field Staff: Adelo Derilo
Approved by: C Wall CA RCE C-66471

WELL CONSTRUCTION AND LITHOLOGY FOR WELL R-66AD

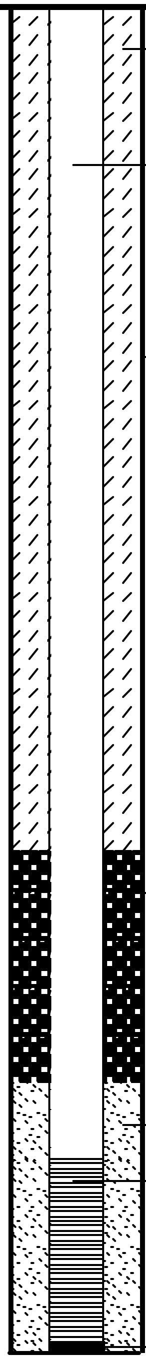
LFR Levine·Fricke
Project No. 002-10180-32

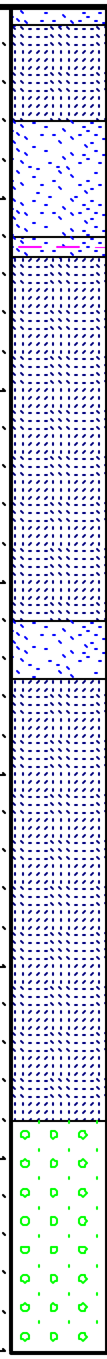
Mission Valley Terminal - Qualcomm Stadium

052705AID/sco

WELL CONSTRUCTION — LITHOLOGY — SAMPLING DATA

Depth, feet | Continued | Graphic Log | Visual Description | ID of Samples Analyzed | P I D (ppm)/ Penetration Rate (blows/ft.)





brown (2.5Y-3/2), wet, fine to medium grained, micaceous.

WELL GRADED SAND (SW), dark grayish brown (2.5Y-4/2), wet, fine to coarse grained, trace fine gravels, micaceous.

POORLY GRADED SAND (SP), very dark gray (5Y-3/1), wet, fine to medium grained, micaceous.

SILTY SAND (SM) lens.

WELL GRADED SAND (SW), dark grayish brown (2.5Y-4/2), fine to coarse grained, micaceous.

-trace fine gravels.

POORLY GRADED SAND (SP), very dark gray (5Y-3/1), fine to medium grained, micaceous.

WELL GRADED SAND (SW), very dark gray (5Y-3/1), wet, fine to coarse grained, trace fines.

-gravels.

-trace fine to coarse gravels.

-trace cobbles to ~4-in. diameter.

WELL GRADED GRAVEL (GW), fine to coarse gravels, some cobbles to ~4-in. diameter.

R-66AD-66'

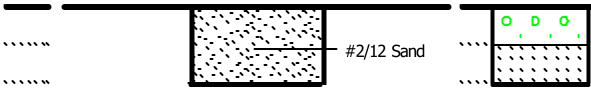
EXPLANATION

- Clay
- Silt
- Sand
- Gravel
- Interval Sampled
- Sample Retained

Date well drilled: 4/28/05
LFR Field Staff: Adelo Derilo
Approved by: CARCE C-66471

WELL CONSTRUCTION AND LITHOLOGY FOR WELL R-66AD (CONTINUED)

WELL CONSTRUCTION		LITHOLOGY	SAMPLING DATA	
Depth, feet	Continued	Graphic Log / Visual Description	ID of Samples Analyzed	P I D (ppm)/ Penetration Rate (blows/ft.)



FRIAR SANDSTONE (SS), weathered, mottled orange-gray.

Bottom of boring at 72 feet bgs.
Bottom of well at 71 feet bgs.

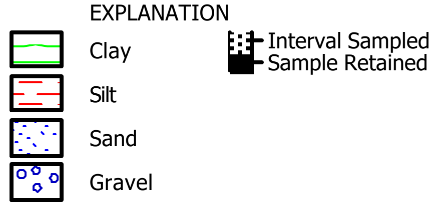
Materials used:
Filter Pack
- 1.519 cubic feet of #2/12 sand

Annular Seal
- 1.05 cubic feet of bentonite pellets transition seal
- 9.45 cubic feet of bentonite grout
- 0.525 cubic feet of concrete surface seal

Drilling Method - Sonic Drilling
Drilling Company - Prosonic Corporation

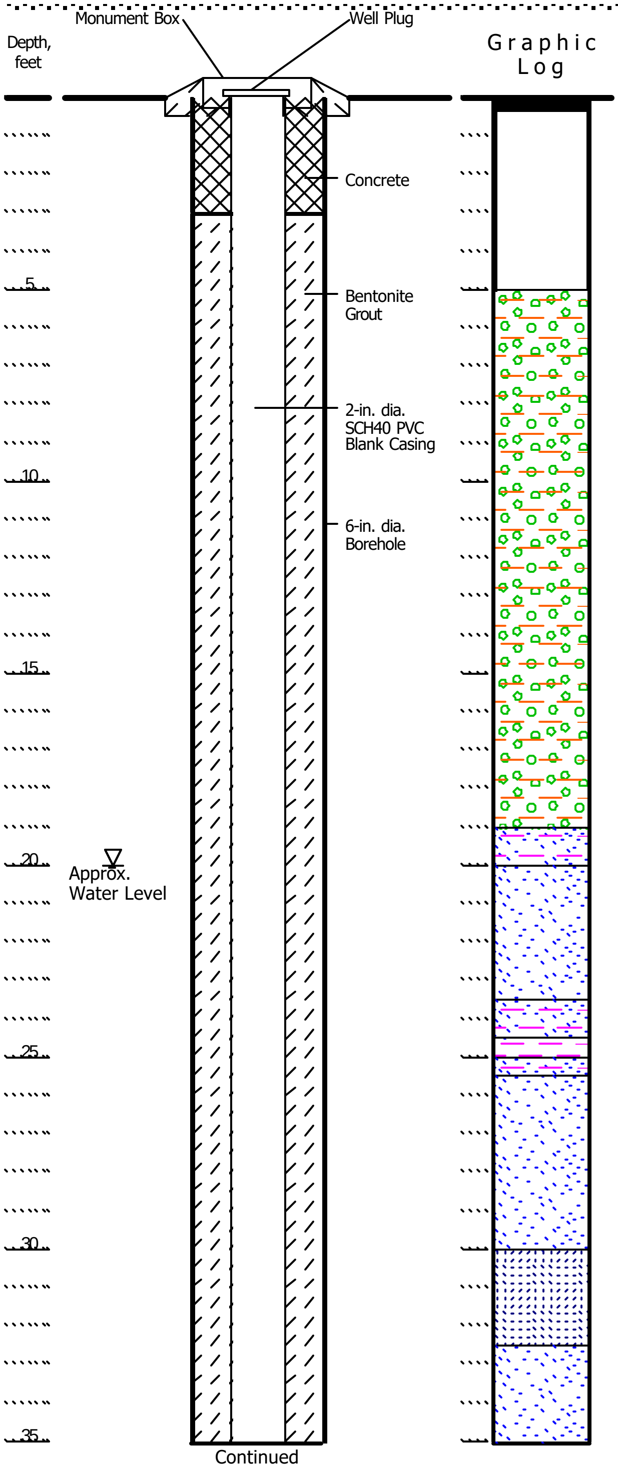
Date well drilled: 4/28/05
LFR Field Staff: Adelo Derilo
Approved by: CA RCE C-66471

EXPLANATION



WELL CONSTRUCTION AND LITHOLOGY FOR WELL R-66AD (CONTINUED)

WELL CONSTRUCTION	LITHOLOGY	SAMPLING DATA



Visual Description

Asphalt pavement (~4-in. thick).
Cleared by air-knife to ~5 feet bgs.

SILTY GRAVEL WITH SAND (GM), mottled gray to reddish brown, moist, fine to coarse grained, some cobbles to ~ 5-in. diameter, trace clay.

SILTY SAND (SM), dark olive gray (5Y-3/2), moist, fine sand with silt, trace clay, low plasticity.

POORLY GRADED SAND (SP), very dark grayish brown (10YR-3/2), wet, fine to medium grained, trace fine gravel.

SILTY SAND (SM), dark olive gray (5Y-3/2), wet, fine sand with silt, trace clay, low plasticity.

SANDY SILT (ML) lens, micaceous.

SILTY SAND (SM), dark grayish brown (2.5Y-4/2), wet, fine sand with silt, micaceous.

POORLY GRADED SAND (SP), very dark grayish brown (10YR-3/2), wet, fine to medium grained, trace fine gravel.

WELL GRADED SAND (SW), very dark gray (2.5Y-3/1), wet, fine to coarse grained, trace fines, micaceous.

POORLY GRADED SAND (SP), very dark grayish brown (10YR-3/2), wet, fine to medium grained, trace fine gravel.

ID of Samples Analyzed | P I D (ppm)/ Penetration Rate (blows/ft.)

EXPLANATION

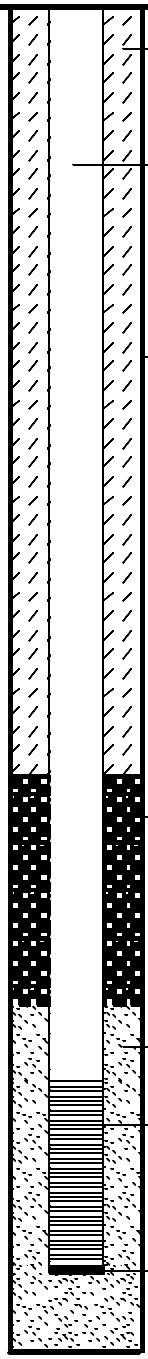
- Clay
- Silt
- Sand
- Gravel
- Interval Sampled
- Sample Retained

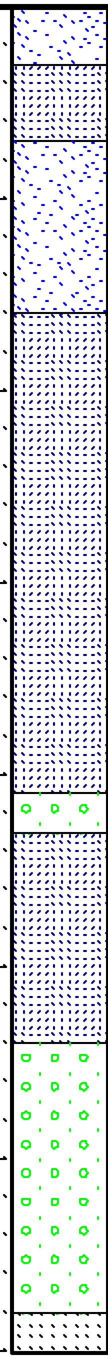
Date well drilled: 4/27/05
LFR Field Staff: Adelo Derilo
Approved by: C. Will CA RCE C-66471

WELL CONSTRUCTION AND LITHOLOGY FOR WELL R-67AD

WELL CONSTRUCTION	LITHOLOGY	SAMPLING DATA

Depth, feet | Continued | Graphic Log | Visual Description | ID of Samples Analyzed | P I D (ppm)/ Penetration Rate (blows/ft.)





Depth, feet	Visual Description	ID of Samples Analyzed
	WELL GRADED SAND (SW), very dark gray (2.5Y-3/1), wet, fine to coarse grained, trace fines, trace fine gravel, micaceous.	
40	**POORLY GRADED SAND (SP)**, very dark grayish brown (10YR-3/2), wet, fine to medium grained, trace fine gravel. -fine gravels.	
45	**WELL GRADED SAND (SW)**, very dark gray (2.5Y-3/1), wet, fine to coarse grained, trace fines, trace fine gravels to ~3-in. diameter, micaceous.	
50		
55	-trace gravels.	
	WELL GRADED GRAVEL (GW) lens.	
60	**WELL GRADED SAND (SW)**, very dark gray (2.5Y-3/1), wet, fine to coarse grained, trace fines, trace fine gravels to ~3-in. diameter, micaceous.	
65	**WELL GRADED GRAVEL (GW)**, very dark grayish brown (2.5Y-3/2), wet, fine to coarse gravel, some cobbles to ~5-in. diameter.	
		R-67AD-67'
	-orange mottling.	
70	**FRIAR SANDSTONE (SS)**, gray (5Y-6/1).	

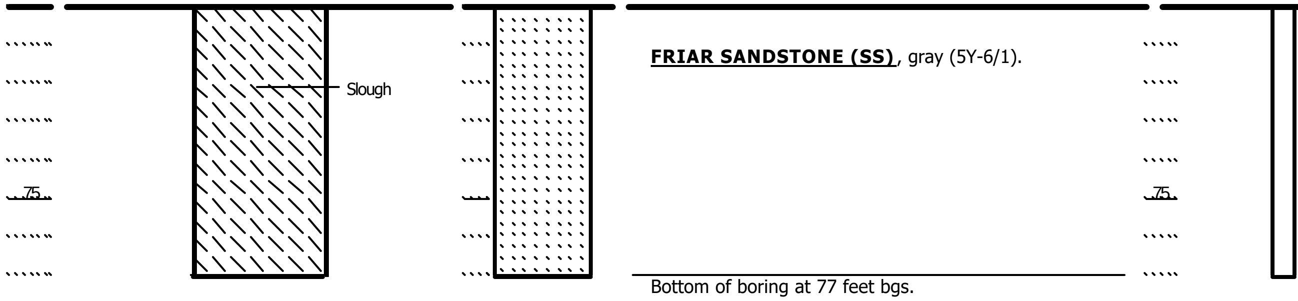
EXPLANATION

- Clay
- Silt
- Sand
- Gravel
- Interval Sampled
- Sample Retained

Date well drilled: 4/27/05
LFR Field Staff: Adelo Derilo
Approved by: C. Well CA RCE C-66471

WELL CONSTRUCTION AND LITHOLOGY FOR WELL R-67AD (CONTINUED)

WELL CONSTRUCTION		LITHOLOGY		SAMPLING DATA	
Depth, feet	Continued	Graphic Log	Visual Description	ID of Samples Analyzed	P I D (ppm)/ Penetration Rate (blows/ft.)



FRIAR SANDSTONE (SS), gray (5Y-6/1).

Bottom of boring at 77 feet bgs.
Bottom of well at 68 feet bgs.

Materials used:
Filter Pack
- 1.519 cubic feet of #2/12 sand

Annular Seal
- 1.05 cubic feet of bentonite pellets transition seal
- 9.1 cubic feet of bentonite grout
- 0.525 cubic feet of concrete surface seal

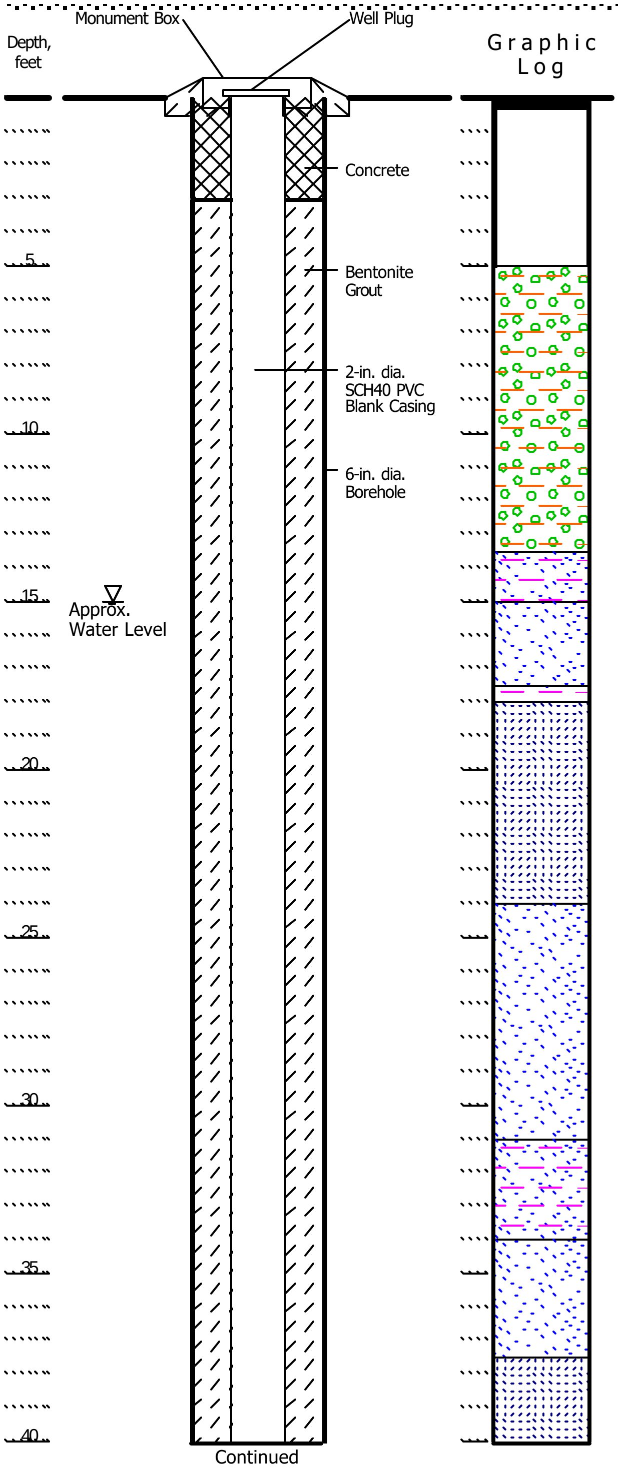
Drilling Method - Sonic Drilling
Drilling Company - Prosonic Corporation

Date well drilled: 4/27/05
LFR Field Staff: Adelo Derilo
Approved by: C [signature] CARCE C-66471

EXPLANATION
Clay
Silt
Sand
Gravel
Interval Sampled
Sample Retained

WELL CONSTRUCTION AND LITHOLOGY FOR WELL R-67AD (CONTINUED)

WELL CONSTRUCTION	LITHOLOGY	SAMPLING DATA



Visual Description

Asphalt pavement (~4-in. thick).
Cleared by air-knife to ~5 feet bgs.

SILTY GRAVEL WITH SAND (GM), mottled brownish gray to reddish brown, moist, fine to coarse gravel, fine sand, trace cobbles to ~4-in. diameter.

SILTY SAND (SM), very dark gray (2.5Y-3/1), moist, fine sand with silt.

POORLY GRADED SAND (SP), very dark gray (2.5Y-3/1), wet, fine to medium grained, trace fines, micaceous.

SANDY SILT (ML) lens, micaceous.

WELL GRADED SAND (SW), very dark gray (2.5Y-3/1), wet, fine to coarse grained, trace fines, micaceous.

-trace fine gravel.

POORLY GRADED SAND (SP), very dark gray (2.5Y-3/1), wet, fine to medium grained, trace fines, micaceous.

SILTY SAND (SM), very dark gray (2.5Y-3/1), wet, fine sand with silt, low plasticity, micaceous.

POORLY GRADED SAND (SP), very dark gray (2.5Y-3/1), wet, fine to medium grained, trace fines, micaceous.

WELL GRADED SAND (SW), very dark gray (2.5Y-3/1), wet, fine to coarse grained, trace fine gravel, micaceous.

ID of Samples Analyzed

P I D (ppm)/ Penetration Rate (blows/ft.)

EXPLANATION

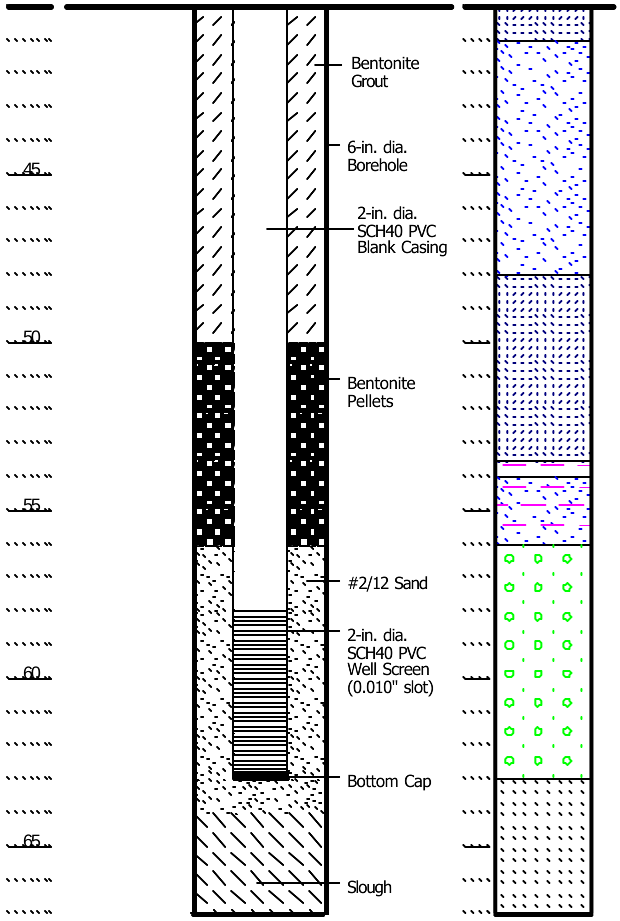
Clay
Silt
Sand
Gravel

Interval Sampled
Sample Retained

Date well drilled: 4/26/05
LFR Field Staff: Adelo Derilo
Approved by: C. Weil CA RCE C-66471

WELL CONSTRUCTION AND LITHOLOGY FOR WELL R-68AD

WELL CONSTRUCTION	LITHOLOGY	SAMPLING DATA
Depth, feet / Continued / Graphic Log	Visual Description	ID of Samples Analyzed / P I D (ppm)/ Penetration Rate (blows/ft.)



POORLY GRADED SAND (SP), very dark gray (2.5Y-3/1), wet, fine to medium grained, trace fines, micaceous.

-cobbles.

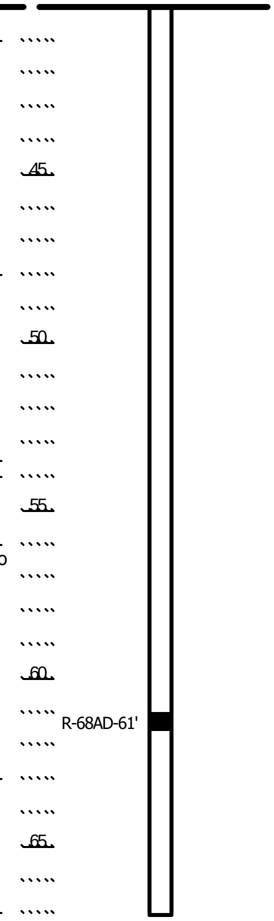
WELL GRADED SAND (SW), very dark gray (2.5Y-3/1), wet, fine to coarse grained, trace fine gravel, micaceous.

SANDY SILT (ML) lens.

SILTY SAND (SM), very dark gray (2.5Y-3/1), wet, fine sand with silt, low plasticity, micaceous.

WELL GRADED GRAVEL WITH SAND (GW), fine to coarse gravel, trace cobbles.

FRIAR SANDSTONE (SS), gray (5Y-6/1).



Bottom of boring at 67 feet bgs.
Bottom of well at 63 feet bgs.

Materials used:
Filter Pack
- 1.42 cubic feet of #2/12 sand

Annular Seal
- 1.05 cubic feet of bentonite pellets transition seal
- 8.225 cubic feet of bentonite grout
- 0.525 cubic feet of concrete surface seal

Drilling Method - Sonic Drilling
Drilling Company - Prosonic Corporation

EXPLANATION
Clay
Silt
Sand
Gravel
Interval Sampled
Sample Retained

Date well drilled: 4/26/05
LFR Field Staff: Adelo Derilo
Approved by: C. Wall CARCE C-66471

WELL CONSTRUCTION AND LITHOLOGY FOR WELL R-68AD (CONTINUED)

PROJECT NAME Mission Valley Terminal
CLIENT KMEP

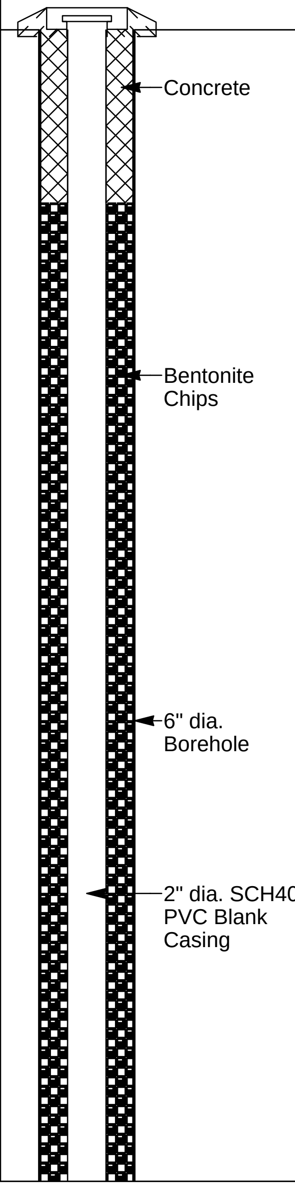
WELL NUMBER R-80AD

PROJECT LOCATION Qualcomm Stadium
PROJECT NUMBER 002-10180-92
LOCATION Qualcomm - SW Parking Lot
OVA EQUIPMENT Mini Rae 2000
GROUND ELEVATION 48.91 ft-msl **HOLE DIAMETER** 6 inches
TOP OF CASING ELEVATION 48.38 ft-msl **HOLE DEPTH** 62.0 ft
∇ **FIRST ENCOUNTERED WATER** 8.0 ft bgs/ Elev 40.9 ft
▼ **STABILIZED WATER** 9.71 ft TOC
LOGGED BY Dana Brodie **DATE** 4/25/08

DRILLING CONTRACTOR Boart Longyear
DRILLING METHOD Sonic Drilling
STAMP (IF APPLICABLE) AND/OR NOTES
Developed on 5/8/08 using Smeal Development rig.
Purged approximately 49 gallons.

DEPTH (feet)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	DEPTHS	LITHOLOGIC DESCRIPTION	ELEVATIONS	PID (ppm)
					Asphalt (~4" thick). Air knife to 5 feet bgs.		
5				5.0		43.9	
		CL			GRAVELLY CLAY (CL), dark yellowish brown (10YR 3/4) and very dark grayish brown (10YR 3/2), moist, low to moderate plasticity, trace cobble (~4" dia.).		
				6.5		42.4	
		SP			POORLY GRADED SAND (SP), very dark gray (10YR 3/1), moist, fine to medium grained.		
				∇	-as above, wet.		
				▼			
10							3.5
				13.0		35.9	
		SW			WELL GRADED SAND (SW), olive gray (5Y 4/2), wet, fine to coarse grained.		
15							4.1
				18.5		30.4	
		SP			POORLY GRADED SAND (SP), very dark gray (10YR 3/1), wet, fine to medium grained, trace coarse grained, trace gravel.		
20							

WELL DIAGRAM



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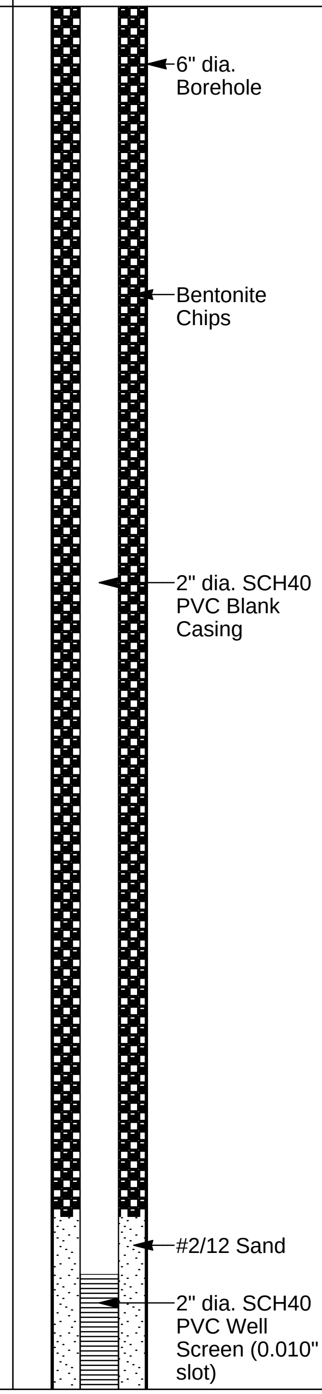
APPROVED BY: C Wall CHRCE C-66471 **DATE:** 8/6/08

LFR

DEPTH (feet)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	DEPTHS	LITHOLOGIC DESCRIPTION	ELEVATIONS	PID (ppm)
		SP			POORLY GRADED SAND (SP), very dark gray (10YR 3/1), wet, fine to medium grained, trace coarse grained, trace gravel.		2.1
25					-as above, cobbles (1 to 2" dia.).		8.0
30					-as above, few gravel, trace cobbles.		5.9
35							15.5
					-as above, fine to coarse grained.		
		SW		39.0	GRAVELLY SAND (SW), very dark gray (10YR 3/1), wet, fine grained to gravel, well graded, cobbles (1 to 4" dia.).	9.9	
40							16.9

WELL DIAGRAM



MATERIALS USED

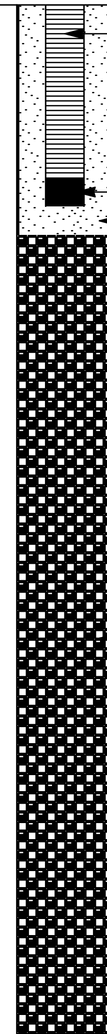
(Continued Next Page)

APPROVED BY: C Wall CA RCE C-66471 **DATE:** 8/6/08

LFR

DEPTH (feet)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	DEPTHS	LITHOLOGIC DESCRIPTION	ELEVATIONS	PID (ppm)
45		SW			GRAVELLY SAND (SW), very dark gray (10YR 3/1), wet, fine grained to gravel, well graded, cobbles (1 to 4" dia.). *(continued)*		15.4
				47.0	-as above.	1.9	
50		SS		54.0	FRIARS FORMATION (SS), light gray (2.5Y 5/1) to dark gray (2.5Y 4/1), weathered interface, fine to medium grained.	-5.1	
				55.0	SILTSTONE, dark gray, wood pieces.	-6.1	
55–60		SS		62.0	FRIARS FORMATION (SS), light gray (2.5Y 5/1) to dark gray (2.5Y 4/1), weathered interface, fine to medium grained.	-13.1	
					Bottom of boring at 62 feet bgs. Bottom of well at 47.5 feet bgs.		

WELL DIAGRAM



MATERIALS USED

Filter Pack - 1.2 cubic feet of #2/12 Sand
Annular Seal - 6.5 cubic feet of bentonite chips
Surface Seal - 0.5 cubic foot of concrete
Bottom Plug - 2.7 cubic feet of bentonite pellets

APPROVED BY: C [illegible] CA RCE C-66471 **DATE:** 8/6/08

LFR

PROJECT NAME Mission Valley Terminal
CLIENT KMEP

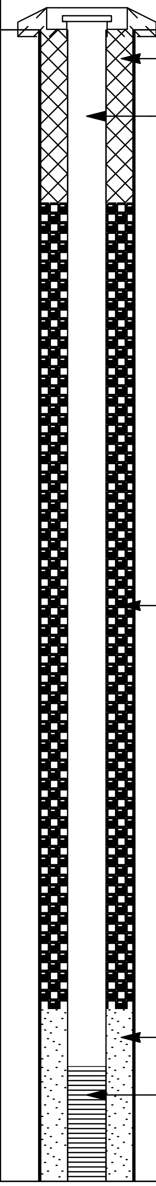
WELL NUMBER R-81AD

PROJECT LOCATION Qualcomm Stadium
PROJECT NUMBER 002-10180-92
LOCATION Qualcomm - SW Parking Lot
OVA EQUIPMENT Mini Rae 2000
GROUND ELEVATION 48.63 ft-msl **HOLE DIAMETER** 6 inches
TOP OF CASING ELEVATION 48.17 ft-msl **HOLE DEPTH** 32.0 ft
▽ **FIRST ENCOUNTERED WATER** 7.0 ft bgs/ Elev 41.6 ft
▼ **STABILIZED WATER** 8.85 ft TOC
LOGGED BY Tania Alarcon **DATE** 4/28/08

DRILLING CONTRACTOR Boart Longyear
DRILLING METHOD Sonic Drilling
STAMP (IF APPLICABLE) AND/OR NOTES
Developed on 5/8/08 using Smeal Development rig.
Purged approximately 30 gallons.

DEPTH (feet)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	DEPTHS	LITHOLOGIC DESCRIPTION	ELEVATIONS	PID (ppm)
					Air knife to 5 feet bgs.		
5				5.0		43.6	
		SP		6.5	POORLY GRADED SAND (SP), very dark gray (10YR 3/1), moist, loose, fine to medium grained, some silt, some subangular to subrounded gravel (up to 1.5" dia). -as above, dark gray (10YR 4/1), moderately graded.	42.1	
		SM		7.0 ▽	SILTY SAND (SM), dark brown (10YR 3/3), moist, loose to dense, fine grained, poorly graded.	41.6	3.8
		SP		8.0	POORLY GRADED SAND (SP), very dark grayish brown (10YR 3/2), wet, medium to coarse grained, trace clay.	40.6	
10		CH		▼ 14.0	CLAY (CH), dark brown (7.5YR 3/3), moist, hard, trace fine grained sand, high plasticity. -as above, very hard. -as above, hard. -as above, brown (10YR 5/3), some fine grained sand. -as above, trace fine gravel (up to 1" dia.).	34.6	3.7
15		SM		15.0	SILTY SAND (SM), brown (10YR 5/3), wet, loose, fine grained with subrounded gravel (up to 2" dia.).	33.6	0.0
20		GP			GRAVEL WITH SAND (GP), brown (10YR 4/3), wet, loose, subangular to subrounded gravel (up to 3" dia.), trace silt, fine to coarse grained sand, cobbles (up to 4" dia.). -as above, medium to coarse grained sand.		

WELL DIAGRAM



(Continued Next Page)

APPROVED BY: C [signature] CARCE C-66471 **DATE:** 8/6/08

LFR

PROJECT NAME Mission Valley Terminal
CLIENT KMEP

WELL NUMBER R-81AD

DEPTH (feet)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	DEPTHS	LITHOLOGIC DESCRIPTION	ELEVATIONS	PID (ppm)	WELL DIAGRAM	DEPTH (feet)
		GP			-as above.		0.2	2" dia SCH40 PVC Well Screen (0.010" slot)	
				23.0	FRIARS FORMATION (SS), highly weathered sandstone, iron staining, moderate induration.	25.6		Bottom Cap; #2/12 Sand	
25					-as above, light gray (5Y 7/2).		0.0		25
					-as above, strong induration.			Bentonite Chips	
30					-as above, some iron staining.		0.0		30
				32.0	Bottom of boring at 32 feet bgs. Bottom of well at 23.5 feet bgs.	16.6			

MATERIALS USED

Filter Pack - 1.2 cubic feet of #2/12 Sand
Annular Seal - 2.4 cubic feet of bentonite chips
Surface Seal - 0.5 cubic foot of concrete
Bottom Plug - 1.6 cubic feet of bentonite chips

APPROVED BY: C. Wall CARCE C-66471 **DATE:** 8/6/08

LFR

WELL NUMBER R-82AD

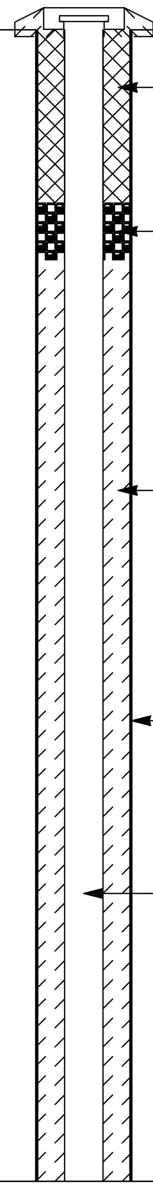
PROJECT NAME Mission Valley Terminal
CLIENT KMEP

PROJECT LOCATION Qualcomm Stadium
PROJECT NUMBER 002-10180-92
LOCATION Qualcomm - SW Parking Lot
OVA EQUIPMENT Mini Rae 2000
GROUND ELEVATION 47.16 ft-msl **HOLE DIAMETER** 6 inches
TOP OF CASING ELEVATION 46.98 ft-msl **HOLE DEPTH** 47.0 ft
∇ **FIRST ENCOUNTERED WATER** 9.5 ft bgs/ Elev 37.7 ft
▼ **STABILIZED WATER** 8.90 ft TOC
LOGGED BY Tania Alarcon **DATE** 4/29/08

DRILLING CONTRACTOR Boart Longyear
DRILLING METHOD Sonic Drilling
STAMP (IF APPLICABLE) AND/OR NOTES
Developed on 5/8/08 using Smeal Development rig.
Purged approximately 45 gallons.

DEPTH (feet)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	DEPTHS	LITHOLOGIC DESCRIPTION	ELEVATIONS	PID (ppm)
0–5					Air knife to 5 feet bgs.		
5		CH		5.0	CLAY (CH), very dark grayish brown (10YR 3/2), moist, hard, high plasticity, some fine grained sand, trace subrounded gravel (up to 2"dia.).	42.2	
		CL		6.0	SANDY CLAY (CL), dark brown to grayish brown mottling, moist, soft to firm, medium plasticity, fine to coarse grained sand.	41.2	
				7.0	No core recovery. ▼ ∇ (Tagged from open hole.)	40.2	
10		CL		11.0	SANDY CLAY (CL), dark grayish brown (10YR 4/2), wet, soft to firm, medium plasticity, fine to medium grained sand, trace fine to coarse gravel, subangular to subrounded cobbles (up to 4" dia.). -as above, olive gray (5Y 3/2), cobbles (up to 5" dia.). -as above, olive gray to dark greenish gray mottling, cobbles (up to 4.5" dia.). -as above, black staining. -as above, low to medium plasticity. -as above, very dark greenish gray (GLEY1 3/10Y), increase sand with depth.	36.2	0.0 (at 15)
15–20		SP		18.0	POORLY GRADED SAND (SP), very dark gray (10YR 3/1), wet, loose, medium to coarse grained, some fine to coarse gravel (up to 2" dia.), cobbles (up to 4" dia.).	29.2	

WELL DIAGRAM



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APPROVED BY: CARCE C-66471 **DATE:** 8/6/08

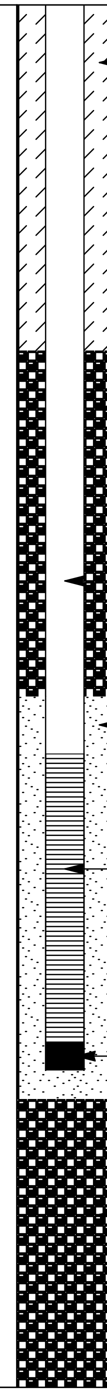
LFR

PROJECT NAME Mission Valley Terminal
CLIENT KMEP

WELL NUMBER R-82AD

U.S.C.S.	DEPTHS	LITHOLOGIC DESCRIPTION	ELEVATIONS	PID (ppm)
SP	21.0		26.2	0.7
CL	22.0	SANDY CLAY (CL), very dark gray (10YR 3/1), very soft, medium plasticity, trace gravel (up to 2" dia.).	25.2	
SM	24.0	SILTY SAND (SM), black (10YR 2/1), loose, fine to medium grained. -as above, dark gray (10YR 4/1), medium to coarse grained. -as above, black (10YR 2/1), loose, fine to medium grained.	23.2	
SP	26.5	POORLY GRADED SAND (SP), dark gray (10YR 4/1), loose, fine to medium grained. -as above, medium to coarse grained.	20.7	1.6
SM	27.0	SILTY SAND (SM), dark gray (10YR 4/1), loose.	20.2	
SP	29.5	POORLY GRADED SAND (SP), dark gray (10YR 4/1), loose, fine grained, increasing grain size with depth. -as above, fine to medium grained, some fines.	17.7	
ML	30.5	SILT (ML), very dark gray (10YR 3/1), very soft, low plasticity.	16.7	2.1
CH	32.0	SANDY CLAY (CH), very dark gray (10YR 3/1), soft to firm, high plasticity, increasing sand with depth.	15.2	
SP	33.0	POORLY GRADED SAND (SP), dark gray (10YR 4/1), loose, medium to coarse grained.	14.2	
SM	34.0	SILTY SAND (SM), very dark gray (10YR 3/1), fine grained.	13.2	
SP	35.0	POORLY GRADED SAND (SP), dark gray (10YR 4/1), loose, medium to coarse grained.	12.2	0.0
GP	38.0	GRAVEL WITH SAND (GP), very dark gray (10YR 3/1), fine to coarse gravel (up to 3" dia.), medium to coarse grained sand.	9.2	
SS		FRIARS FORMATION (SS), weathered, light gray to brown mottling. -as above, some iron staining.		

WELL DIAGRAM



MATERIALS USED

(Continued Next Page)

APPROVED BY: C Wall CARCE C-66471 **DATE:** 8/6/08

LFR

DEPTH (feet)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	DEPTHS	LITHOLOGIC DESCRIPTION	ELEVATIONS	PID (ppm)	WELL DIAGRAM	DEPTH (feet)
45		SS		47.0	-as above, light gray (10YR 7/1).	0.2		Bentonite Chips	45
					Bottom of boring at 47 feet bgs. Bottom of well at 38.5 feet bgs.				

MATERIALS USED

Filter Pack - 1.2 cubic feet of #2/12 Sand
Transition Seal - 1.0 cubic foot of bentonite pellets
Annular Seal - 3.9 cubic feet of bentonite grout
Surface Seal - 0.5 cubic foot of concrete
Bottom Plug - 1.4 cubic feet of bentonite chips

APPROVED BY: C Wall CARCE C-66471 DATE: 8/6/08

LFR

PROJECT NAME Mission Valley Terminal
CLIENT KMEP

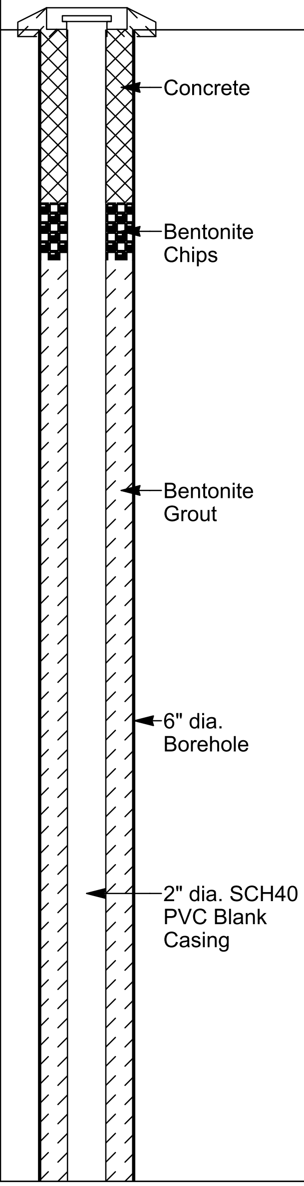
WELL NUMBER R-83AD

PROJECT LOCATION Qualcomm Stadium
PROJECT NUMBER 002-10180-92
LOCATION Maintenance Yard - Qualcomm
OVA EQUIPMENT Mini Rae 2000
GROUND ELEVATION 49.51 ft-msl **HOLE DIAMETER** 6 inches
TOP OF CASING ELEVATION 49.06 ft-msl **HOLE DEPTH** 67.0 ft
▽ **FIRST ENCOUNTERED WATER** 16.5 ft bgs/ Elev 33.0 ft
▼ **STABILIZED WATER** 12.05 ft TOC
LOGGED BY Dana Brodie **DATE** 4/29/08

DRILLING CONTRACTOR Boart Longyear
DRILLING METHOD Sonic Drilling
STAMP (IF APPLICABLE) AND/OR NOTES
Developed on 5/8/08 using Smeal Development rig.
Purged approximately 60 gallons.

DEPTH (feet)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	DEPTHS	LITHOLOGIC DESCRIPTION	ELEVATIONS	PID (ppm)
					Air knife to 5 feet bgs.		
5		SC		5.0	CLAYEY SAND WITH GRAVEL (SC), very dark grayish brown (10YR 3/2), moist, fine to medium grained sand, trace coarse grained sand, poorly graded, gravel to cobbles (up to 3" dia.).	44.5	9.5
				7.0	No core recovery.	42.5	
10		SC		9.5	CLAYEY SAND WITH GRAVEL (SC), dark grayish brown (10YR 4/2), moist, fine to coarse grained sand, well graded.	40.0	5.8
		CL		10.5	SANDY GRAVELLY CLAY (CL), dark grayish brown (10YR 4/2), moist, firm, low to no plasticity, fine grained sand, trace medium to coarse grained sand, gravel to cobbles (up to 4" dia.). ▼ -as above, olive gray (5Y 4/2), soft, low to medium plasticity, fine grained sand to cobbles (up to 4" dia.).	39.0	
15							6.5
		SP		16.5 ▽	POORLY GRADED SAND (SP), dark gray (2.5Y 4/1), wet, fine to medium grained, trace coarse grained.	33.0	
		SC		17.0	CLAYEY SAND WITH GRAVEL (SC), dark grayish brown (10YR 4/2), wet, fine to medium grained sand, poorly graded.	32.5	
20		SP		17.5	POORLY GRADED SAND (SP), dark gray (2.5Y 4/1), wet, fine to medium grained, trace coarse grained, trace clay, trace gravel.	32.0	

WELL DIAGRAM



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APPROVED BY: C Wall CARCE C-66471 **DATE:** 8/6/08

LFR

DEPTH (feet)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	DEPTHS	LITHOLOGIC DESCRIPTION	ELEVATIONS	PID (ppm)	WELL DIAGRAM
		SP			POORLY GRADED SAND (SP), dark gray (2.5Y 4/1), wet, fine to medium grained, trace coarse grained, trace clay, trace gravel. *(continued)*		5.6	Bentonite Grout
					-as above, trace gravel and cobbles (4" dia.).			6" dia. Borehole
25							7.9	
				28.0	-as above, gravel.	21.5		
		SM			SILTY SAND (SM), very dark gray (2.5Y 3/1), wet, fine to medium grained, poorly graded.			
30							7.5	2" dia. SCH40 PVC Blank Casing
35							6.5	
					-as above, trace gravel.			
40							15.4	

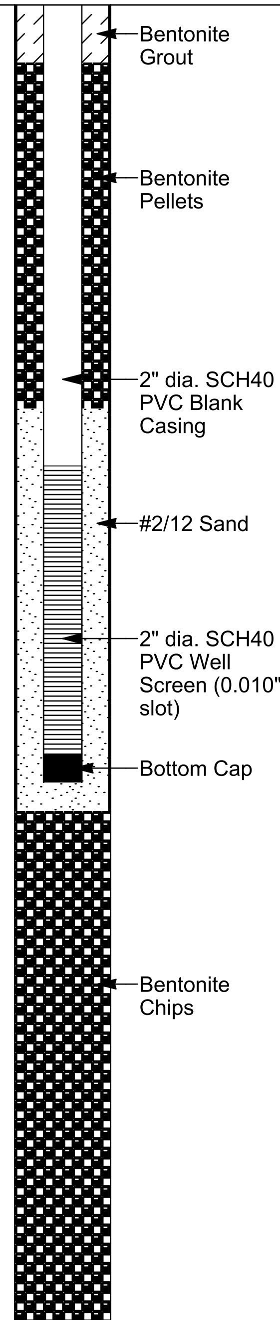
MATERIALS USED

(Continued Next Page)

APPROVED BY: C Wall CARCE C-66471 DATE: 8/6/08

WELL NUMBER R-83AD

DEPTH (feet)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	DEPTHS	LITHOLOGIC DESCRIPTION	ELEVATIONS	PID (ppm)	WELL DIAGRAM	DEPTH (feet)
45		SM		46.0	SILTY SAND (SM), very dark gray (2.5Y 3/1), wet, fine to medium grained, poorly graded. *(continued)*	3.5	8.5		45
		SM		47.0	SILTY SAND WITH GRAVEL (SM), dark gray (2.5Y 4/1), wet, medium to coarse grained sand, moderately graded, gravel to cobble (4" dia.).	2.5			
50		SM		54.5	SILTY SAND (SM), very dark gray (2.5Y 3/1), wet, fine to medium grained, poorly graded. -as above, few gravel (1 to 2" dia.).	-5.0	21.7		50
55		SC		57.0	CLAYEY SAND WITH GRAVEL (SC), dark gray (2.5Y 4/1), wet, fine to medium grained sand, poorly graded, low plasticity fines, gravel to cobbles (5" dia.).	-7.5	15.0		55
60 65		SS		67.0	FRIARS FORMATION (SS), gray (7.5YR 5/1), weathered sandstone.	-17.5			60 65
					Bottom of boring at 67 feet bgs. Bottom of well at 57.5 feet bgs.				



MATERIALS USED

Filter Pack - 1.2 cubic feet of #2/12 Sand
Transition Seal - 1.0 cubic foot of bentonite pellets
Annular Seal - 7.1 cubic feet of bentonite grout
Surface Seal - 0.5 cubic foot of concrete
Bottom Plug - 1.8 cubic feet of bentonite chips

APPROVED BY: C Wall CA RCE C-66471 **DATE:** 8/6/08

LFR

WELL NUMBER R-84AD

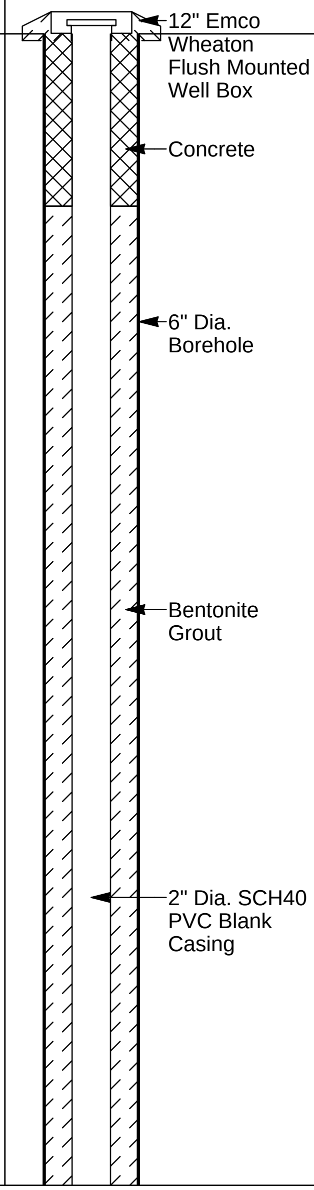
PROJECT NAME Mission Valley Terminal - Qualcomm Stadium
CLIENT Kinder Morgan Energy Partners

PROJECT LOCATION 9449 Friars Rd, San Diego, CA
PROJECT NUMBER 002-10143-41
LOCATION Friars Road Off-ramp
OVA EQUIPMENT Micro FID
GROUND ELEVATION 83.19 ft   **HOLE DIAMETER** 6 inches
TOP OF CASING ELEVATION 82.86 ft   **HOLE DEPTH** 85.0 ft
▽ **FIRST ENCOUNTERED WATER** 57.0 ft / Elev 26.2 ft
▼ **STABILIZED WATER** 46.0 ft / Elev 37.2 ft
LOGGED BY James Gonzales   **DATE** 8/24/09 to 8/25/09

DRILLING CONTRACTOR Boart Longyear
DRILLING METHOD Sonic Drilling
STAMP (IF APPLICABLE) AND/OR NOTES

DEPTH (feet)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	DEPTHS	LITHOLOGIC DESCRIPTION	ELEVATIONS	FID (ppm)
				0.5	Asphalt at surface.	82.7	
					Air knife to 5 feet bgs.		
5				5.0		78.2	
		SM			SILTY SAND WITH GRAVEL (SM), brown (10YR 4/3) to gray (N4) mottled coloring, dry, loose, fine to coarse subrounded sand, appreciable silt, subrounded to subangular fine to coarse gravel, some pulverized cobbles.		0.0
							0.0
10					-as above.		0.0
					-as above.		0.0
				14.0		69.2	
15		GM			SILTY GRAVEL WITH SAND (GM), brown (10YR 4/3) to gray (N4) mottled coloring, dry, loose, 50% fine gravel, 30% fine to coarse subrounded sand, 20% silt, pulverized cobbles.		0.0
							0.0
20							

WELL DIAGRAM



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APPROVED BY: Steven C Beadle PG 6129   **DATE:** 10/1/2009

DEPTH (feet)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	DEPTHS	LITHOLOGIC DESCRIPTION	ELEVATIONS	FID (ppm)	WELL DIAGRAM	DEPTH (feet)
		GM		22.0	SILTY GRAVEL WITH SAND (GM), brown (10YR 4/3) to gray (N4) mottled coloring, dry, loose, 50% fine gravel, 30% fine to coarse subrounded sand, 20% silt, pulverized cobbles.	61.2	0.0		
		SM			SILTY SAND WITH GRAVEL (SM), black organic material, trace plant roots, organic smell.		24.6		
25					SILTY SAND WITH GRAVEL (SM), brown (10YR 4/3) to gray (N4) mottled coloring, loose, soft, 40% silt, 30% fine to coarse subrounded sand, 30% fine gravel and pulerized cobbles.		0.0	6" Dia. Borehole	25
							0.0		
30							0.0	Bentonite Grout	30
							0.0		
					-as above, dry.				
35							0.0	2" Dia. SCH40 PVC Blank Casing	35
							0.0		
					-as above.		0.0		
				39.0		44.2	0.0		
		GM			SILTY GRAVEL WITH SAND (GM), 50% fine gravel and pulverized cobbles, 25% fine to coarse subrounded sand, 25% silt.		0.0		
40							0.0		40
							45.4		
							655.5		
				44.0		39.2	2,290		

MATERIALS USED

(Continued Next Page)

APPROVED BY: Steve C Beadle PG 6129

DATE: 10/1/2009

PROJECT NAME Mission Valley Terminal - Qualcomm Stadium

CLIENT Kinder Morgan Energy Partners

WELL NUMBER R-84AD

DEPTH (feet)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	DEPTHS	LITHOLOGIC DESCRIPTION	ELEVATIONS	FID (ppm)	WELL DIAGRAM
45		GM		48.0	SILTY GRAVEL WITH SAND (GM), dry, loose, soft, 40% fine gravel and pulverized cobbles, 30% silt, 30% fine to coarse sand.	35.2	4,246 5,291 3,604 507	6" Dia. Borehole
				49.0	No recovery.	34.2		
50		GM		52.0	SILTY GRAVEL WITH SAND (GM), dry, loose, soft, 40% fine gravel and pulverized cobbles, 30% silt, 30% fine to coarse sand.	31.2	88.9 47.8 26.3	Bentonite Grout
55		GM		56.0	SILTY GRAVEL (GM), damp, loose, soft, predominantly fine to coarse gravel with pulverized cobbles.	27.2	134.8 173.2 67.5 235.5	2" Dia. SCH40 PVC Blank Casing
60		SM		61.0	SILTY SAND (SM), brown (10YR 4/3), wet, loose, soft, 60% fine to coarse subrounded sand, 40% silt.	22.2	109.3 0.0 0.0 0.0 0.0	
65		ML		66.0	SANDY SILT (ML), brown (10YR 4/3), wet, dense, firm, 75% silt, 25% fine sand. -as above.	17.2	0.0 0.0 0.0 0.0	
		SM			SILTY SAND (SM), brown (10YR 4/3), wet, loose, soft, fine to coarse sand with appreciable silt.		0.0	Bentonite Pellets

MATERIALS USED

(Continued Next Page)

APPROVED BY: Steven C Beadle PG 6129 **DATE:** 10/1/2009

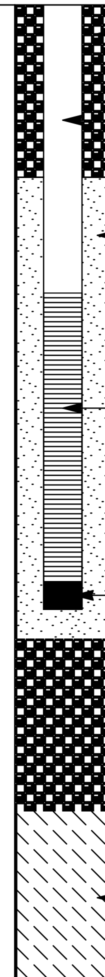
LFR an ARCADIS company

PROJECT NAME Mission Valley Terminal - Qualcomm Stadium
CLIENT Kinder Morgan Energy Partners

WELL NUMBER R-84AD

DEPTH (feet)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	DEPTHS	LITHOLOGIC DESCRIPTION	ELEVATIONS	FID (ppm)	DEPTH (feet)
70		SM			SILTY SAND (SM), brown (10YR 4/3), wet, loose, soft, fine to coarse sand with appreciable silt.		0.0	70
					-as above.		0.0	
75					SILTY SAND WITH GRAVEL (SM), brown (10YR 4/3), wet, loose, soft, fine to coarse sand with appreciable silt, increase fine gravel and pulverized cobbles.		0.0	75
				78.0		5.2	0.0	
80					FRIARS FORMATION (SS), gray, friable sandstone.		0.0	80
					-as above.		0.0	
85				85.0		-1.8	0.0	85
					Bottom of boring at 85 feet bgs. Bottom of well at 78.5 feet bgs.			

WELL DIAGRAM



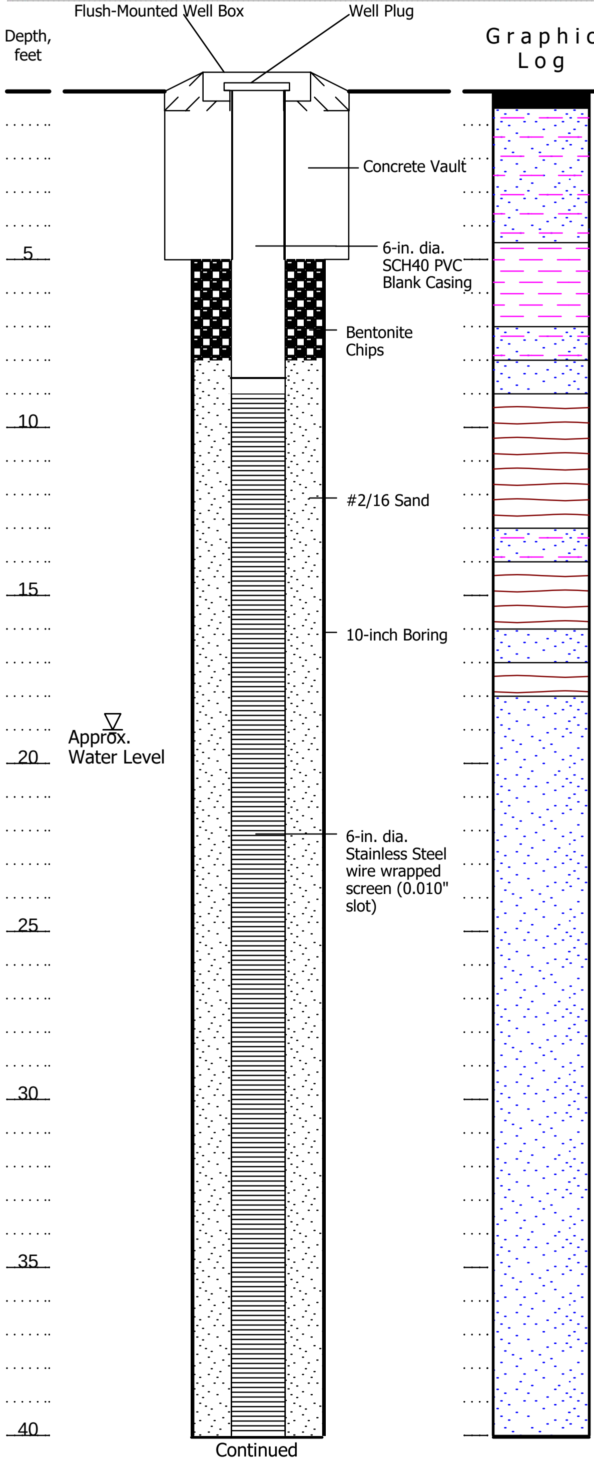
MATERIALS USED

16.33 cubic feet of Bentonite grout
1.25 cubic feet of Bentonite pellets transition seal
1.75 cubic feet of #2/12 Monterey Sand
1.00 cubic foot of concrete surface seal

APPROVED BY: Steven C Beadle PG 6129 **DATE:** 10/1/2009

LFR an ARCADIS company

WELL CONSTRUCTION	LITHOLOGY	SAMPLING DATA



Visual Description

Asphalt (6").

SILTY SAND (SM), dark brown (10YR-3/3), moist, fine to medium grained.

SANDY SILT (ML), brown (10YR-4/3), moist, very fine grained, low plasticity.

SILTY SAND (SM), yellowish brown (10YR-5/4), moist, very fine to medium grained.

POORLY GRADED SAND (SP), yellowish brown (10YR-5/4), moist, medium grained.

SANDY CLAY (CL), dark brown (10YR-3/3), moist, fine to medium grained sand, high plasticity.

SILTY SAND (SM), dark yellowish brown (10YR-4/4), moist, very fine to medium grained.

SANDY CLAY (CL), dark brown (10YR-3/3), moist, high plasticity.

POORLY GRADED SAND (SP), yellowish brown (10YR-5/6), medium grained.

SANDY CLAY (CL), dark brown (10YR-3/3), moist, high plasticity.

POORLY GRADED SAND (SP), light yellowish brown (10YR-6/4), wet, fine to medium grained.

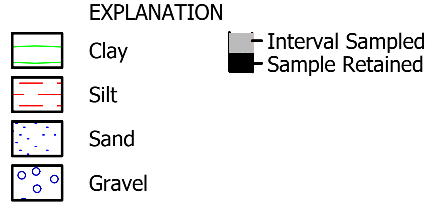
-as above, occassional cobbles.

-as above, dark yellowish brown (10YR-6/4).

Sampling Data

Sample ID	P I D (ppm)/ Penetration Rate (blows/ft.)
	0/NM
	0/NM
	1.6/NM
	2.4/NM
	3.3/NM
	2.5/NM
	4.4/NM
	3.0/NM
	1.2/NM

EXPLANATION



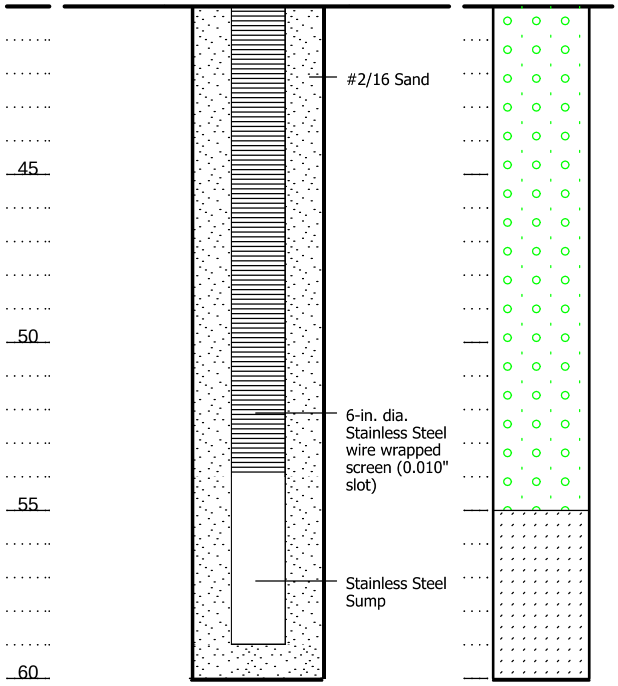
Date well drilled: 8/28/06

LFR Field Staff: Craig Burnett

Approved by: C [signature] CARCE C-66471

WELL CONSTRUCTION AND LITHOLOGY FOR WELL RW-7A

WELL CONSTRUCTION	LITHOLOGY	SAMPLING DATA



Visual Description

WELL GRADED GRAVEL WITH SAND (GW), dark yellowish brown (10YR-3/4), wet, medium to coarse sand with cobbles.

FRIAR FORMATION (SS), reddish gray (2.5YR-5/1), moist, fine to medium grained, slightly cemented.

Bottom of boring at 60 feet bgs.
Bottom of well at 59 feet bgs.

Materials used:
- 18.3 cubic feet of #2/13 sand
- 1.05 cubic feet of annular seal

Drilling Company: Prosonic Corporation
Drilling Method: Sonic
Sampling Method: Continous Core

Sample ID | P I D (ppm)/ Penetration Rate (blows/ft.)

NM = Not Measured

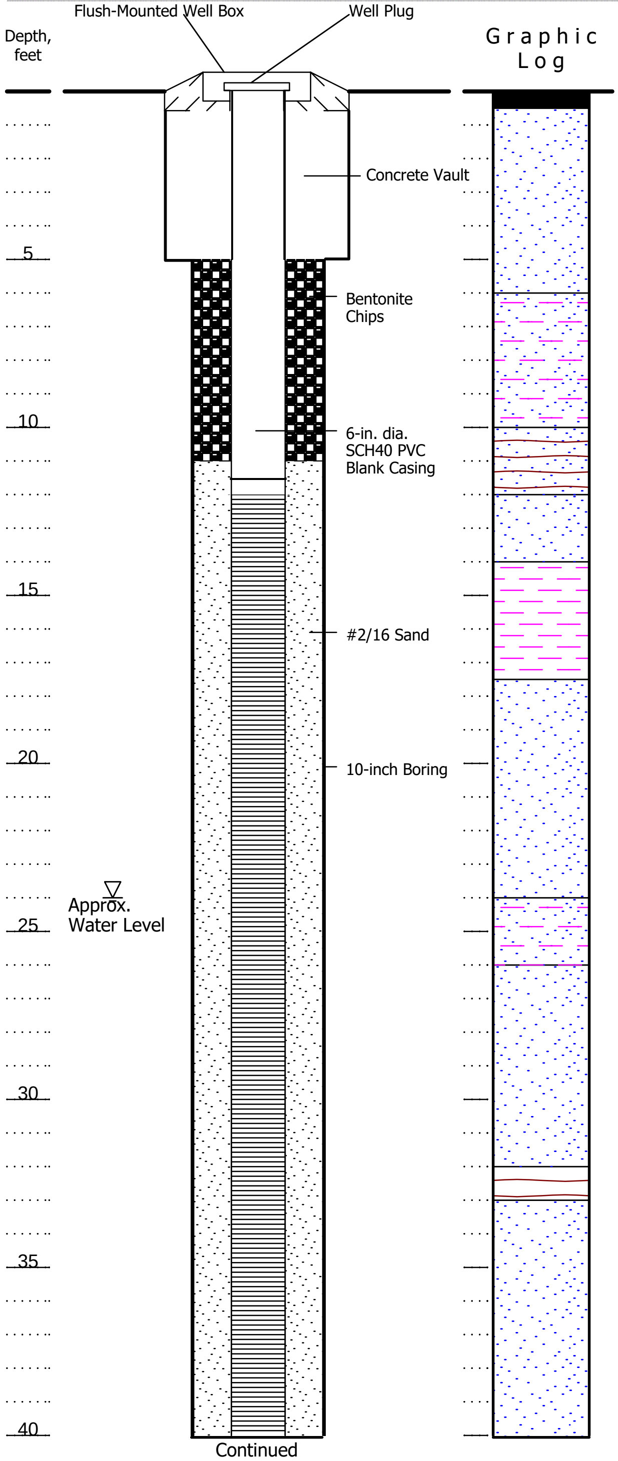
EXPLANATION

Clay
Silt
Sand
Gravel
Interval Sampled
Sample Retained

Date well drilled: 8/28/06
LFR Field Staff: Craig Burnett
Approved by: C Wall CA RCE C-66471

WELL CONSTRUCTION AND LITHOLOGY FOR WELL RW-7A (CONTINUED)

WELL CONSTRUCTION	LITHOLOGY	SAMPLING DATA



Visual Description

Asphalt (6").

POORLY GRADED SAND (SP), brown (10YR-4/3), dry, medium grained.

SILTY SAND (SM), very dark brown (10YR-2/2), moist, fine to medium grained, no plasticity.

CLAYEY SAND (SC), brown (10YR-4/3), moist, very fine grained with medium grained sand, moderate plasticity.

POORLY GRADED SAND (SP), dark yellowish brown (10YR-3/6), dry, medium grained.

SANDY SILT (ML), very dark brown (10YR-2/2), moist, fine grained, moderate plasticity.

POORLY GRADED SAND (SP), dark yellowish brown (10YR-4/4), moist, fine to medium grained.

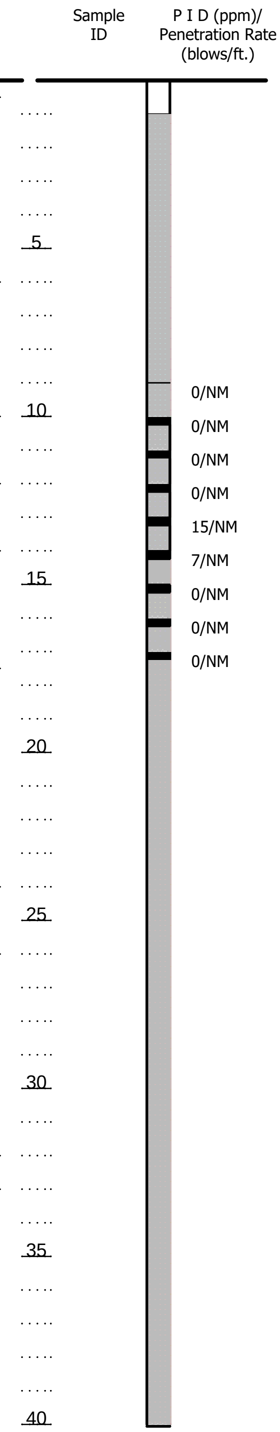
-as above, increase in grain size.

SILTY SAND (SM), dark grayish brown (10YR-4/2), moist, fine grained.

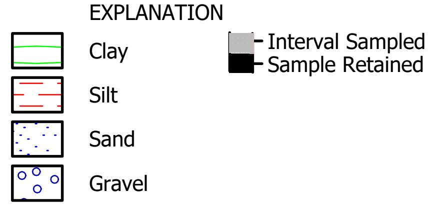
POORLY GRADED SAND (SP), brown (10YR-4/3), moist, medium grained.

CLAY (CL), very dark brown (10YR-2/2), moist, high plasticity, occasional mica flakes.

POORLY GRADED SAND (SP), dark yellowish brown (10YR-3/4), moist, medium to coarse grained.



EXPLANATION



Date well drilled: 7/19/06

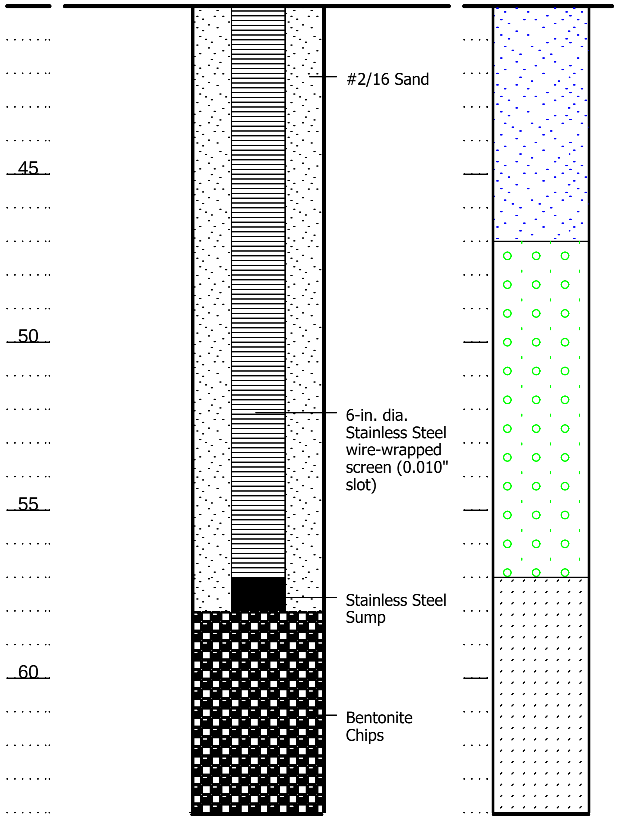
LFR Field Staff: Craig Burnett

Approved by: C. [signature] CARCE C-66471

WELL CONSTRUCTION AND LITHOLOGY FOR WELL RW-48

WELL CONSTRUCTION	LITHOLOGY	SAMPLING DATA

Depth, feet | Continued | Graphic Log | Visual Description | Sample ID | P I D (ppm)/ Penetration Rate (blows/ft.)



WELL GRADED GRAVEL (GW), dark yellowish brown (10YR-4/4), wet, rounded to subrounded medium to coarse sand.

-as above, dark grayish brown (10YR-4/2).

FRIAR FORMATION (SS), reddish gray (2.5YR-5/1), moist, fine to medium grained, slightly cemented.

Bottom of boring at 64 feet bgs.
Bottom of well at 57 feet bgs.

NM = Not Measured

Materials used:
- 3.27 cubic feet of bottom plug bentonite chips
- 16.4 cubic feet of #2/16 sand
- 2.1 cubic feet of annular bentonite seal

Drilling Company: Prosonic Corporation
Drilling Method: Sonic
Sampling Method: Continous Core

EXPLANATION
Clay
Silt
Sand
Gravel
Interval Sampled
Sample Retained

Date well drilled: 7/19/06
LFR Field Staff: Craig Burnett
Approved by: C [signature] CARCE C-66471

WELL CONSTRUCTION AND LITHOLOGY FOR WELL RW-48 (CONTINUED)

WELL NUMBER RW-49

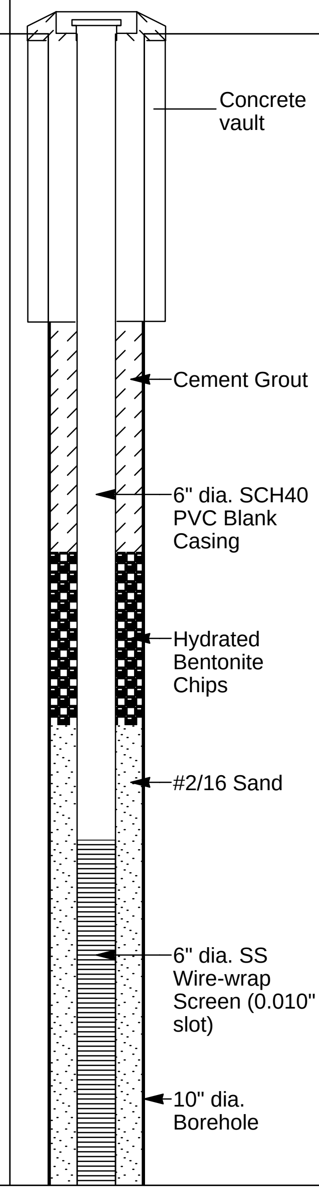
PROJECT NAME Mission Valley Terminal - Qualcomm Stadium
CLIENT Kinder Morgan Energy Partners

PROJECT LOCATION 9449 Friars Rd, San Diego, CA
PROJECT NUMBER 002-10180-78-001
LOCATION Southwest Parking Lot
OVA EQUIPMENT Mini Rae 2000
GROUND ELEVATION 56.56 ft-msl **HOLE DIAMETER** 10 inches
TOP OF CASING ELEVATION NA **HOLE DEPTH** 66.0 ft
∇ **FIRST ENCOUNTERED WATER** 17.0 ft bgs/ Elev 39.6 ft
▼ **STABILIZED WATER** 17.67 ft bgs/ Elev 38.9 ft
LOGGED BY James Gonzales **DATE** 2/6/08

DRILLING CONTRACTOR Boart Longyear
DRILLING METHOD Sonic Drilling
STAMP (IF APPLICABLE) AND/OR NOTES
Developed on 5/6/08 using Smeal Development rig.
Purged approximately 475 gallons.

DEPTH (feet)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	DEPTHS	LITHOLOGIC DESCRIPTION	ELEVATIONS	PID (ppm)
					Air knife to 5 feet bgs.		
5		GM		5.0	WELL GRADED GRAVEL (GM), dark brown (10YR 3/3), moist, some areas damp, no dry strength, loose, coarse gravel (up to 5" dia.), some silt, very low plasticity, gray to brown mottled gravel, subrounded to subangular cobbles.	51.6	6.7
10							5.1
15		SP		15.0	POORLY GRADED SAND (SP) with silt and gravel, dark brown to gray mottled, moist, no dry strength, soft, loose, fine to medium subrounded sand with trace coarse sand, non-plastic, non-cohesive, quartz and micas.	41.6	3.1
				∇ ▼			
20							

WELL DIAGRAM



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APPROVED BY: C Wall CA RCE C-66471 **DATE:** 8/6/08

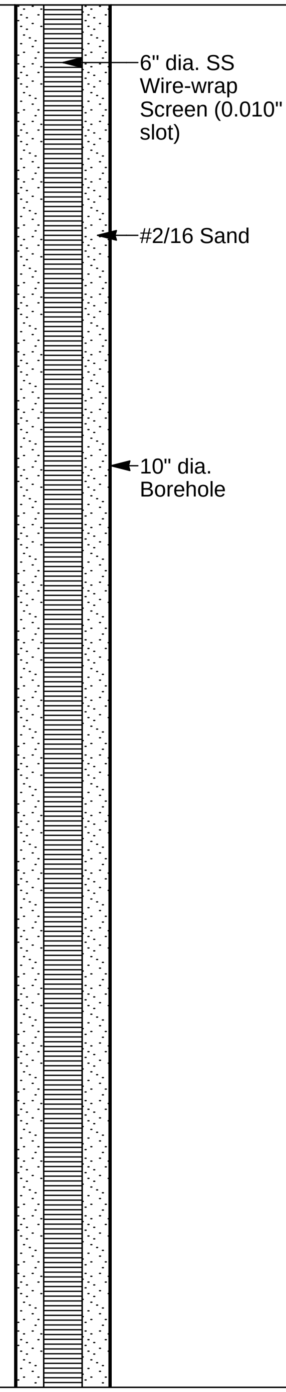
LFR

PROJECT NAME Mission Valley Terminal - Qualcomm Stadium
CLIENT Kinder Morgan Energy Partners

WELL NUMBER RW-49

DEPTH (feet)	SAMPLE TYPE NUMBER	U.S.C.S.	DEPTHS	LITHOLOGIC DESCRIPTION	ELEVATIONS	PID (ppm)
		SP		POORLY GRADED SAND (SP) with silt and gravel, dark brown to gray mottled, moist, no dry strength, soft, loose, fine to medium subrounded sand with trace coarse sand, non-plastic, non-cohesive, quartz and micas.		5.8
25						9.7
			26.0		30.6	
		SM		SILTY SAND (SM), black (10YR 2/2) to brown mottled, wet, medium soft, loose, fine to medium subrounded sand, some coarse sand, very low plasticity to no plasticity, poorly graded, micas and quartz.		
30						12.1
			32.0		24.6	
		SP		POORLY GRADED SAND (SP) with silt and gravel (up to 6" dia.), dark brown to gray mottled, wet, no dry strength, soft, loose, fine to medium subrounded sand with trace coarse sand, non-plastic, non-cohesive.		
35						11.0
40						7.9
			41.5		15.1	
		SM		SILTY SAND (SM), black (10YR 2/2) to brown mottled, wet, medium soft, loose, fine to medium subrounded sand, some coarse sand, very low plasticity to no plasticity, poorly graded, micas and quartz.		

WELL DIAGRAM



MATERIALS USED

(Continued Next Page)

APPROVED BY: C Mall CA RCE C-66471 **DATE:** 8/6/08

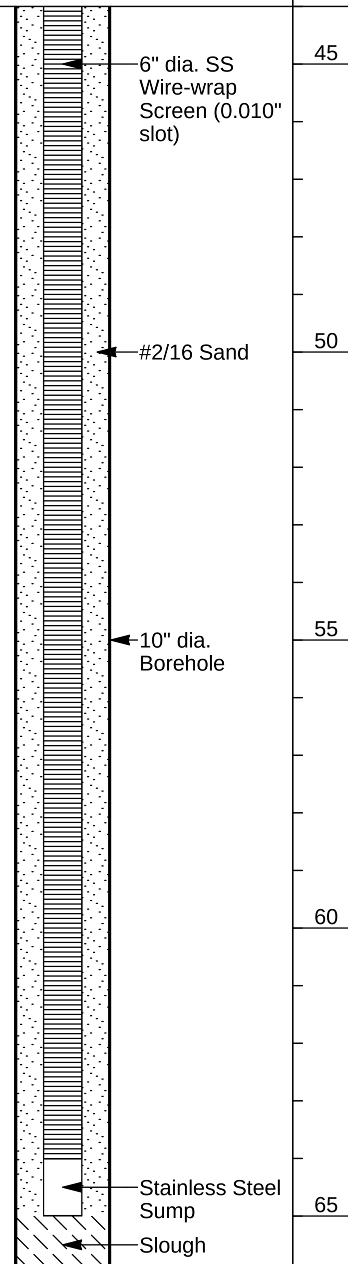
LFR

PROJECT NAME Mission Valley Terminal - Qualcomm Stadium
CLIENT Kinder Morgan Energy Partners

WELL NUMBER RW-49

DEPTH (feet)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	DEPTHS	LITHOLOGIC DESCRIPTION	ELEVATIONS	PID (ppm)
45–50		SM		50.0	SILTY SAND (SM), black (10YR 2/2) to brown mottled, wet, medium soft, loose, fine to medium subrounded sand, some coarse sand, very low plasticity to no plasticity, poorly graded, micas and quartz. *(continued)* -as above, with trace gravel.	6.6	
50–64		SW		64.0	WELL GRADED SAND WITH GRAVEL (SW), brown to gray mottling, wet, soft, loose, no dry strength, medium to coarse subrounded sand, trace silt, cobbles (6 to 7" dia.), micas and quartz. -as above, increase gravel with depth.	-7.4	
64–66		SS		66.0	FRIARS FORMATION (SS), gray sandstone, hard, arenite, cemented, weathered interface.	-9.4	
					Bottom of boring at 66 feet bgs. Bottom of well at 65 feet bgs.		

WELL DIAGRAM



MATERIALS USED

Filter pack - 18.5 cubic feet of #2/16 sand
Annular Seal - 1.0 cubic foot of bentonite chips
1.5 cubic feet of cement grout

APPROVED BY: C Wall CARCE C.66471 **DATE:** 8/6/08

LFR

PROJECT NAME Mission Valley Terminal - Qualcomm Stadium

CLIENT Kinder Morgan Energy Partners

WELL NUMBER RW-51

PROJECT LOCATION 9449 Friars Rd, San Diego, CA

PROJECT NUMBER 002-10180-78-001

LOCATION Southwest Parking Lot

OVA EQUIPMENT Mini Rae 2000

GROUND ELEVATION 46.53 ft-msl **HOLE DIAMETER** 10 inches

TOP OF CASING ELEVATION NA **HOLE DEPTH** 66.0 ft

∇ **FIRST ENCOUNTERED WATER** 15.0 ft bgs/ Elev 31.5 ft

▼ **STABILIZED WATER** 8.9 ft bgs/ Elev 37.6 ft

LOGGED BY James Gonzales **DATE** 2/13/08

DRILLING CONTRACTOR Boart Longyear

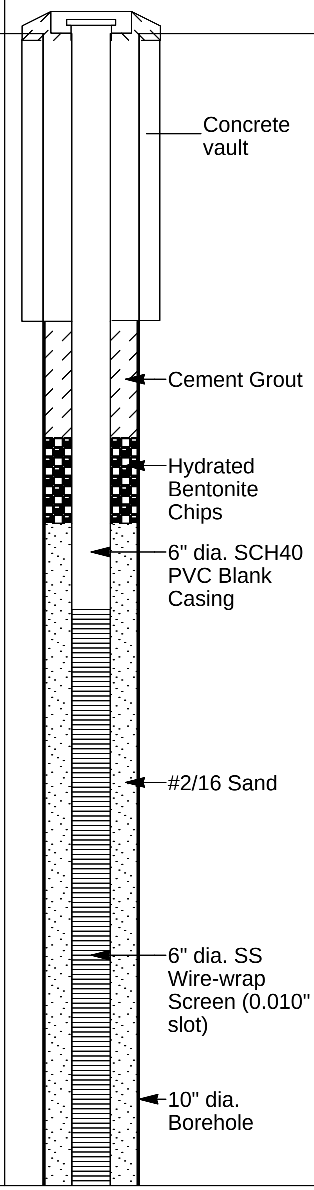
DRILLING METHOD Sonic Drilling

STAMP (IF APPLICABLE) AND/OR NOTES

Developed on 5/7/08 using Smeal Development rig.
Purged approximately 490 gallons.

DEPTH (feet)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	DEPTHS	LITHOLOGIC DESCRIPTION	ELEVATIONS	PID (ppm)
0–5					Air knife to 5 feet bgs.		
5				5.0		41.5	8.5
5–15.5		SW			WELL GRADED SAND (SW) with silt and gravel, light reddish brown (5YR 6/3) to dark gray (5YR 4/1) mottling, damp, inconsistent dry strength, fine to medium subrounded sand, subangular fine to coarse gravel with trace cobbles (up to 5cm), low plasticity fines, micas.		
8.9				▼			
10							4.7
15				∇			14.8
15.5				15.5		31.0	
15.5–20		SP			POORLY GRADED SAND (SP), light brown to black mottling, wet, loose, soft, no dry strength, fine to medium subrounded sand, no plasticity, micas, quartz, and feldspar.		
20							

WELL DIAGRAM



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APPROVED BY: C [signature] CARCE C-66471 **DATE:** 8/6/08

LFR

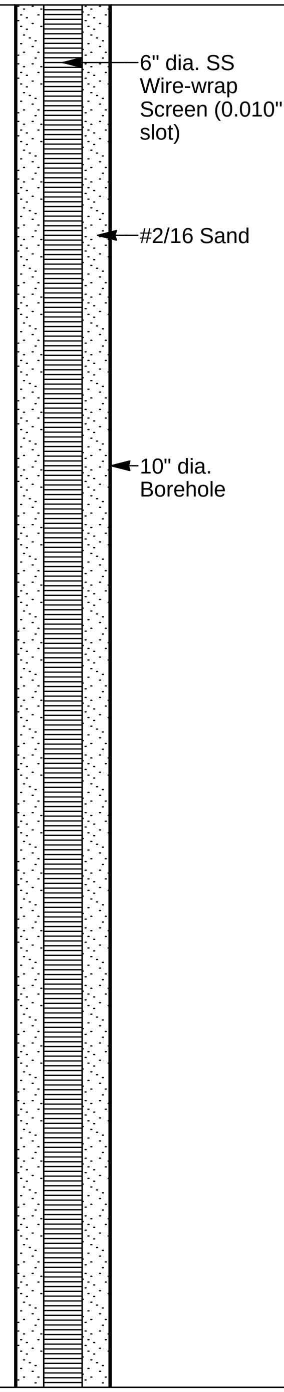
PROJECT NAME Mission Valley Terminal - Qualcomm Stadium

CLIENT Kinder Morgan Energy Partners

WELL NUMBER RW-51

DEPTH (feet)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	DEPTHS	LITHOLOGIC DESCRIPTION	ELEVATIONS	PID (ppm)
25		SP		27.5	POORLY GRADED SAND (SP), light brown to black mottling, wet, loose, soft, no dry strength, fine to medium subrounded sand, no plasticity, micas, quartz, and feldspar.	19.0	
30		SM		31.0	SILTY SAND (SM), black (2.5Y 2.5/1), wet, fine to medium subrounded sand, appreciable amounts of silt and clay, low plasticity, micas.	15.5	
		SP		33.0	POORLY GRADED SAND (SP), light brown to black mottling, wet, loose, soft, no dry strength, fine to medium subrounded sand, no plasticity, micas, quartz, and feldspar.	13.5	
35, 40		SW			WELL GRADED SAND (SW) with silt and gravel, dark grayish brown (10YR 3/2), loose, soft, fine to coarse subrounded sand, fine to coarse gravel, trace cobbles (up to 2.5 inches), trace silt, no plasticity, micas, quartz, and feldspar.		

WELL DIAGRAM



MATERIALS USED

(Continued Next Page)

APPROVED BY: C Scall CARCE C-66471 **DATE:** 8/6/08

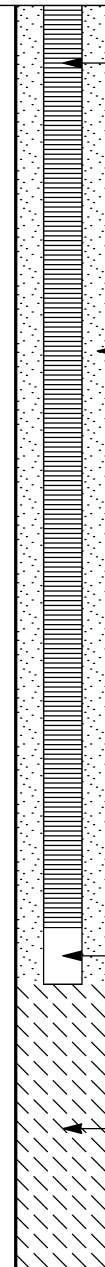
LFR

PROJECT NAME Mission Valley Terminal - Qualcomm Stadium
CLIENT Kinder Morgan Energy Partners

WELL NUMBER RW-51

DEPTH (feet)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	DEPTHS	LITHOLOGIC DESCRIPTION	ELEVATIONS	PID (ppm)
45		SW		46.0	WELL GRADED SAND (SW) with silt and gravel, dark grayish brown (10YR 3/2), loose, soft, fine to coarse subrounded sand, fine to coarse gravel, trace cobbles (up to 2.5 inches), trace silt, no plasticity, micas, quartz, and feldspar.	0.5	
50, 55				56.0	No soil/core recovery.	-9.5	
		SW		60.0	WELL GRADED SAND (SW) with silt and gravel, dark grayish brown (10YR 3/2), loose, soft, fine to coarse subrounded sand, fine to coarse gravel, trace cobbles (up to 2.5 inches), trace silt, no plasticity, micas, quartz, and feldspar.	-13.5	
60, 65		SS		66.0	FRIARS FORMATION (SS), dark gray (10YR 4/1), no cementation, fine to coarse grained sand. -increasing clay and fines with depth.	-19.5	
					Bottom of boring at 66 feet bgs. Bottom of well at 61 feet bgs.		

WELL DIAGRAM



MATERIALS USED

Filter pack - 18 cubic feet of #2/16 sand
Annular seal - 0.5 cubic foot of bentonite chips
0.7 cubic foot of cement grout

APPROVED BY: C Wall CA RCE C-66471 **DATE:** 8/6/08

LFR

WELL NUMBER RW-99

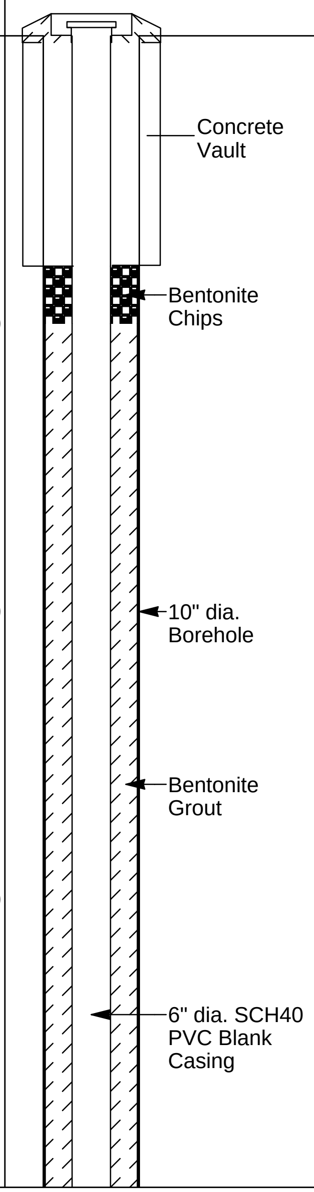
PROJECT NAME Mission Valley Terminal
CLIENT KMEP

PROJECT LOCATION Qualcomm Stadium
PROJECT NUMBER 002-10180-92
LOCATION Qualcomm - West Parking Lot
OVA EQUIPMENT Mini Rae 2000
GROUND ELEVATION 67.90 ft-msl **HOLE DIAMETER** 10 inches
TOP OF CASING ELEVATION NA **HOLE DEPTH** 87.0 ft
∇ **FIRST ENCOUNTERED WATER** 33.0 ft bgs/ Elev 34.9 ft
▼ **STABILIZED WATER** 29.3 ft bgs/ Elev 38.6 ft
LOGGED BY Dana Brodie **DATE** 5/1/08

DRILLING CONTRACTOR Boart Longyear
DRILLING METHOD Sonic Drilling
STAMP (IF APPLICABLE) AND/OR NOTES
Developed on 5/7/08 using Smeal Development rig. Purged approximately 500 gallons.

DEPTH (feet)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	DEPTHS	LITHOLOGIC DESCRIPTION	ELEVATIONS	PID (ppm)
0–5					Air knife to 5 feet bgs.		
5				5.0		62.9	>9999
5–16.5		CL			SANDY GRAVELLY CLAY (CL), mottled brown (10YR 5/3) and olive gray (5Y 5/2), moist, hard, no plasticity, fine to coarse grained sand, gravel to cobbles (4" dia.).		
					-as above, dark grayish brown (10YR 4/2), more coarse grained sand.		
					-as above, mottled very dark grayish brown (2.5Y 3/2), very dark brown (10YR 2/2) and dark olive gray (5Y 3/2).		
10							>9999
15							>9999
				16.5		51.4	
16.5–20		CL			GRAVELLY SANDY CLAY (CL), mottled dark brown (10YR 3/3) and dark olive gray (5Y 3/2), moist, hard, no plasticity, fine to medium grained sand.		
					-as above, pale yellow (2.5Y 8/2), moist, no plasticity, fine to coarse grained sand, gravel to cobbles (4" dia.).		
20							

WELL DIAGRAM



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APPROVED BY: [illegible] CARCE C-66471 **DATE:** 8/6/08

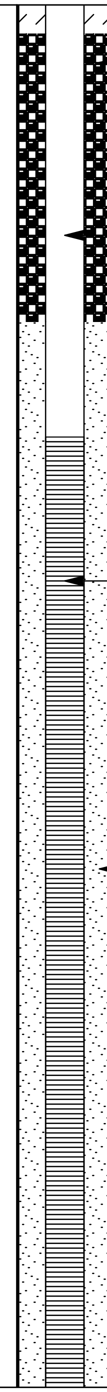
LFR

PROJECT NAME Mission Valley Terminal
CLIENT KMEP

WELL NUMBER RW-99

DEPTH (feet)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	DEPTHS	LITHOLOGIC DESCRIPTION	ELEVATIONS	PID (ppm)
		CL		24.0	GRAVELLY SANDY CLAY (CL), pale yellow (2.5Y 8/2), moist, no plasticity, fine to coarse grained sand, gravel to cobbles (4" dia.).	43.9	
25		SC		29.5	CLAYEY SAND (SC), dark olive gray (5Y 3/2), moist, fine grained, trace medium grained, poorly graded.	38.4	>9999
					-as above, trace coarse grained.		
30		SM		38.5	SILTY SAND (SM), gray (2.5Y 6/1), moist, fine to medium grained, poorly graded.	29.4	5115
					-as above, olive gray (5Y 5/2), wet.		
35							>9999
					-as above, more coarse grained, trace gravel.		
		SP			POORLY GRADED SAND (SP), gray (10YR 5/1), wet, fine to medium grained, few coarse grained.		
40					-as above, more coarse grained.		2134
					-as above, gravel (1" dia.).		

WELL DIAGRAM



DEPTH (feet): 25, 30, 35, 40

MATERIALS USED

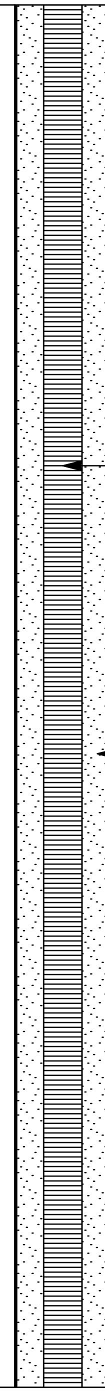
(Continued Next Page)

APPROVED BY: C. Wall CA RCE C-66471 **DATE:** 8/6/08

LFR

DEPTH (feet)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	DEPTHS	LITHOLOGIC DESCRIPTION	ELEVATIONS	PID (ppm)
45		SP			POORLY GRADED SAND (SP), very dark gray (5Y 3/1), wet, fine to medium grained, trace clay.		853
		CL		47.0	SANDY CLAY (CL), dark gray (10YR 4/1), wet, soft, moderate plasticity, fine to medium grained sand.	20.9	
50							8.0
		SM		54.0	SILTY SAND (SM), very dark gray (10YR 3/1), wet, fine grained, poorly graded.	13.9	
		SW		54.2	WELL GRADED SAND (SW), gray (10YR 5/1), wet, fine to coarse grained.	13.7	
55		SM		55.0	SILTY SAND (SM), dark gray (10YR 3/1), fine to medium grained sand, poorly graded, trace cobbles.	12.9	14.4
					-as above, fine to medium grained.		
		SW		58.5	GRAVELLY SAND (SW), dark gray (10YR 3/1), fine to medium grained sand, few coarse grained sand, moderately graded, gravel (1 to 3" dia.), trace fines.	9.4	
60							6.7
					-as above, more coarse grained sand.		
65							20.3

WELL DIAGRAM



MATERIALS USED

(Continued Next Page)

APPROVED BY: C. Wall CARCE C-66471 **DATE:** 8/6/08

LFR

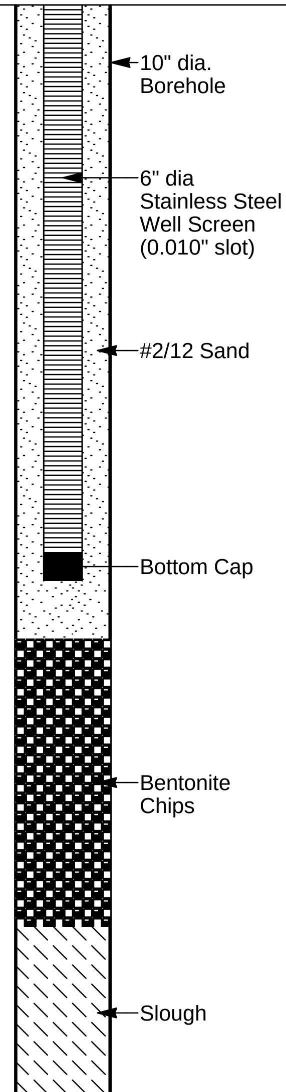
PROJECT NAME Mission Valley Terminal

CLIENT KMEP

WELL NUMBER RW-99

DEPTH (feet)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	DEPTHS	LITHOLOGIC DESCRIPTION	ELEVATIONS	PID (ppm)
70		SW		72.0	GRAVELLY SAND (SW), dark gray (10YR 3/1), fine to medium grained sand, more coarse grained sand, moderately graded, gravel (1 to 3" dia.).	-4.1	
		SM		73.5	SILTY SAND (SM), gray (10YR 5/1), wet, medium to coarse grained sand, few fine grained sand, poorly graded, trace gravel.	-5.6	
75		SW		77.5	GRAVELLY SAND (SW), gray (10YR 5/1), wet, fine to coarse grained, gravel (up to 3" dia.), trace fines. -as above, gravel to cobbles (6" dia.).	-9.6	
80, 85		SS		87.0	FRIARS FORMATION (SS), gray (10YR 5/1), weathered sandstone.	-19.1	
					Bottom of boring at 87 feet bgs. Bottom of well at 78 feet bgs.		

WELL DIAGRAM



MATERIALS USED

Filter Pack - 18.7 cubic feet of #2/12 Sand
Transition Seal - 1.8 cubic foot of bentonite chips
Annular Seal - 5.8 cubic feet of bentonite grout
Bottom Plug - 2.7 cubic feet of bentonite chips

APPROVED BY: C Wall CARCE C-66471 **DATE:** 8/6/08

LFR

PROJECT NAME Mission Valley Terminal
CLIENT KMEP

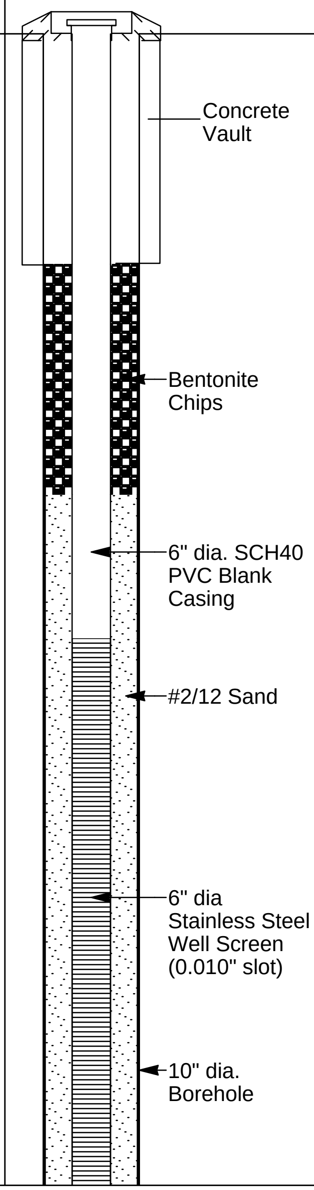
WELL NUMBER RW-100

PROJECT LOCATION Qualcomm Stadium
PROJECT NUMBER 002-10180-92
LOCATION Qualcomm - SW Parking Lot
OVA EQUIPMENT Mini Rae 2000
GROUND ELEVATION 53.14 ft-msl **HOLE DIAMETER** 10 inches
TOP OF CASING ELEVATION NA **HOLE DEPTH** 67.0 ft
▽ **FIRST ENCOUNTERED WATER** 15.0 ft bgs/ Elev 38.1 ft
▼ **STABILIZED WATER** 14.3 ft bgs/ Elev 38.9 ft
LOGGED BY Tania Alarcon **DATE** 5/5/08

DRILLING CONTRACTOR Boart Longyear
DRILLING METHOD Sonic Drilling
STAMP (IF APPLICABLE) AND/OR NOTES
Developed on 5/8/08 using Smeal Development rig.
Purged approximately 490 gallons.

DEPTH (feet)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	DEPTHS	LITHOLOGIC DESCRIPTION	ELEVATIONS	PID (ppm)
					Air knife to 5 feet bgs.		
5		GC		5.0	CLAYEY GRAVEL WITH SAND (GC), brown (10YR 5/3), moist, coarse to subrounded gravel, cobbles (up to 3.5" dia.), some fine to medium grained sand.	48.1	
		GM		7.0	SILTY GRAVEL WITH SAND (GM), light olive brown (2.5Y 5/4), moist, fine to coarse gravel, angular to subrounded (up to 3" dia.), fine to medium grained sand, some fines. -as above, brown to light olive gray (5Y 6/2) mottled, cobbles (up to 4" dia.).	46.1	3.8
10		CL		9.5	SANDY CLAY (CL), dark brown (10YR 3/3), moist, hard, medium plasticity, fine grained sand with gravel (up to 1.5" dia.). -as above, dark brown to dark gray mottled, cobbles (up to 5" dia.), with some medium grained sand. -as above, dark brown (10YR 3/3), moist, hard, medium plasticity, fine grained sand with gravel (up to 1.5" dia.).	43.6	1.1
		SM		12.5	SILTY SAND (SM), dark gray (10YR 4/1), moist, fine to medium grained sand, poorly graded, some clay, some gravel (up to 3" dia.).	40.6	
		CL		13.5	▼ SANDY CLAY (CL), dark brown to dark gray mottled, moist, firm, medium plasticity, fine to coarse grained sand, with gravel and cobbles (up to 5" dia.).	39.6	
15		SP		15.0 ▽	POORLY GRADED SAND (SP), very dark gray (10YR 3/1), wet, fine to medium grained, some fines, trace gravel and cobbles (up to 5" dia.). -as above, dark gray (10YR 4/1), fine to coarse grained, pocket of clay at 16.5 feet bgs, black (10YR 2/1), plastic. -as above, less fines and more coarse grained sand with depth, some gravel (up to 2" dia.).	38.1	0.0
20							

WELL DIAGRAM



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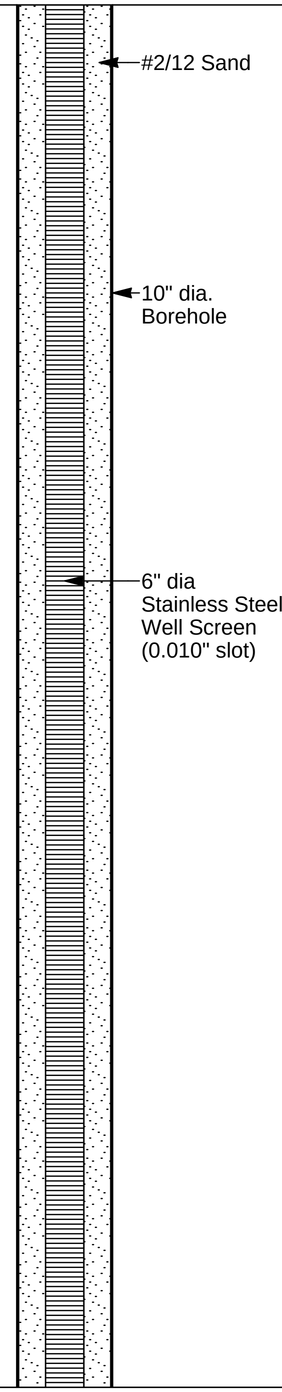
APPROVED BY: C. Udall CARCE C-66471 **DATE:** 8/6/08

LFR

DEPTH (feet)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	DEPTHS	LITHOLOGIC DESCRIPTION	ELEVATIONS	PID (ppm)
		SP		21.0	-as above, trace fine gravel.	32.1	3.4
		ML		22.0	SILT (ML), very dark gray (10YR 3/1), very soft, low plasticity, some clay, trace fine grained sand.	31.1	
		CL		22.5	CLAY (CL), black (10YR 2/1), firm, medium plasticity.	30.6	
		SW		24.5	WELL GRADED SAND (SW), light gray to light brown mottled, fine to coarse grained.	28.6	
25		ML		29.5	SILT (ML), very dark gray (10YR 3/1), firm, medium plasticity, trace clay. -as above, very soft, some fine grained sand, trace clay, less sand with depth. -as above, with fine to medium grained sand.	23.6	31.4
30		SP		35.0	POORLY GRADED SAND (SP), dark gray (10YR 4/1), fine to medium grained, trace coarse sand, trace fines. -as above, no fines. -as above, fine to medium grained.	18.1	1.2
35		ML		36.0	SILT (ML), very dark gray (10YR 3/1), soft, medium plasticity, some clay.	17.1	36.6
		SW		37.0	GRAVELLY SAND (SW), dark gray (10YR 4/1), fine to coarse grained, trace subrounded gravel (up to 1.5" dia.), some fines.	16.1	
		SM		39.5	SILTY SAND WITH GRAVEL (SM), very dark to dark gray, fine to coarse grained, trace gravel (up to 2" dia.), low plasticity. -as above, fine to medium grained sand, gravel (up to 3" dia.).	13.6	
40		GW		41.0	WELL GRADED GRAVEL WITH SAND (GW) mixture, very dark grayish brown (10YR 3/2), fine to coarse subangular to rounded cobbles (up to 6" dia.).	12.1	1.3
		SW			WELL GRADED SAND (SW), very dark grayish brown (10YR 3/2), fine to coarse grained, trace angular to subrounded gravel (up to 2" dia.). -as above, trace rounded gravel (up to 1" dia.). -as above, increase coarse grained sand with depth, gravel (up to 3" dia.).		

WELL DIAGRAM



MATERIALS USED

(Continued Next Page)

APPROVED BY: C Wall CARCE C-66471 **DATE:** 8/6/08

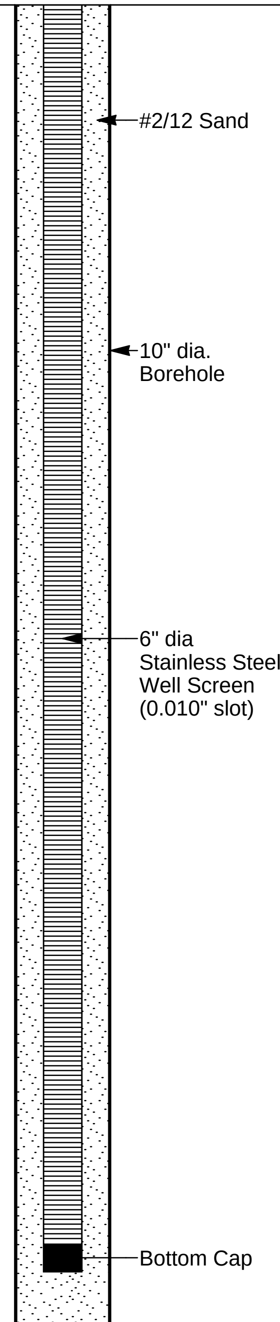
LFR

PROJECT NAME Mission Valley Terminal
CLIENT KMEP

WELL NUMBER RW-100

DEPTH (feet)	SAMPLE TYPE NUMBER	U.S.C.S.	DEPTHS	LITHOLOGIC DESCRIPTION	ELEVATIONS	PID (ppm)
45		SW	46.0	-as above, cobbles (up to 3.5" dia.).	7.1	2.8
		SM	47.0	SILTY SAND (SM), very dark gray (10YR 3/1), fine grained sand.	6.1	
		SW	50.0	GRAVELLY SAND (SW), very dark grayish brown (10YR 3/2), fine to coarse grained, with gravel (up to 3" dia.), increasing gravel with depth.	3.1	
50		GW		WELL GRADED GRAVEL WITH SAND (GW), very dark grayish brown (10YR 3/2), increasing gravel and cobble size with depth, fine to coarse grained sand.		2.7
				-as above, cobbles (up to 6.5" dia.).		
55				-as above, cobbles (up to 6" dia.).		2.0
				-as above, gravel (up to 3" dia.), increasing gravel and cobble size with depth.		
60				-as above, cobbles (up to 4" dia.).		5.4
				-as above, cobbles (up to 4" dia.).		
65			65.5	-as above, cobbles (up to 5" dia.).	-12.4	3.5
		SS	67.0	FRIARS FORMATION (SS), gray (10YR 5/1), iron staining at 66 feet bgs.	-13.9	
				Bottom of boring at 67 feet bgs. Bottom of well at 66 feet bgs.		

WELL DIAGRAM



MATERIALS USED

Filter Pack - 20.7 cubic feet of #2/12 Sand
Annular Seal - 1.4 cubic feet of bentonite chips

APPROVED BY: C [signature] CARCE C-66471 **DATE:** 8/6/08

PROJECT NAME Mission Valley Terminal
CLIENT KMEP

WELL NUMBER RW-101

PROJECT LOCATION Qualcomm Stadium
PROJECT NUMBER 002-10180-92
LOCATION Qualcomm - SW Parking Lot
OVA EQUIPMENT Mini Rae 2000
GROUND ELEVATION 45.70 ft-msl **HOLE DIAMETER** 10 inches
TOP OF CASING ELEVATION NA **HOLE DEPTH** 57.0 ft
FIRST ENCOUNTERED WATER 7.5 ft bgs/ Elev 38.2 ft
STABILIZED WATER 7.5 ft bgs/ Elev 38.2 ft
LOGGED BY Tania Alarcon **DATE** 4/30/08

DRILLING CONTRACTOR Boart Longyear
DRILLING METHOD Sonic Drilling
STAMP (IF APPLICABLE) AND/OR NOTES
Developed on 5/7/08 using Smeal Development rig.
Purged approximately 495 gallons.

DEPTH (feet)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	DEPTHS	LITHOLOGIC DESCRIPTION	ELEVATIONS	PID (ppm)	WELL DIAGRAM	DEPTH (feet)
0–5					Air knife to 5 feet bgs.			Concrete Vault	
5		GM		5.0	SILTY GRAVEL WITH SAND (GM), brown (10YR 5/3), moist, fine to coarse angular to subrounded gravel, fine to coarse grained sand, cobbles (up to 3.5" dia.), some silt.	40.7		Bentonite Chips	5
					-as above, dark gray (5Y 4/1), wet.				
		SP		8.0	POORLY GRADED SAND (SP), very dark gray (10YR 3/1), fine to coarse grained, increasing grain size with depth, trace gravel (up to 1" dia.), trace fines.	37.7		2" dia. SCH40 PVC Blank Casing	
10					-as above, dark gray (5Y 4/1), medium to coarse grained.		2.9		10
					-as above, very dark gray (10YR 3/1), fine to coarse grained, no gravel.			6" dia. Borehole	
15					-as above, dark gray (5Y 4/1), medium to coarse grained.		1.2	2" dia SCH40 PVC Well Screen (0.010" slot)	15
					-as above, very dark gray (10YR 3/1), fine to coarse grained, increasing coarse grained sand with depth, no gravel.				
		SW		16.5	WELL GRADED SAND (SW), dark gray (10YR 4/1), fine to coarse grained, trace fine gravel.	29.2		#2/12 Sand	
20									20

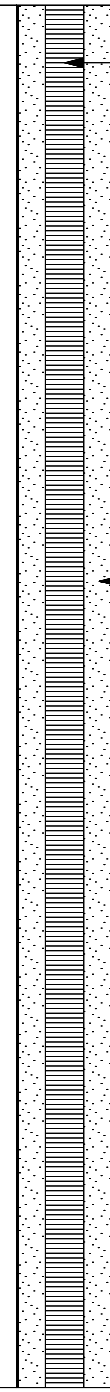
(Continued Next Page)

APPROVED BY: C. Wall CARCE C-66471 **DATE:** 8/6/08

LFR

DEPTH (feet)	SAMPLE TYPE NUMBER	U.S.C.S.	DEPTHS	LITHOLOGIC DESCRIPTION	ELEVATIONS	PID (ppm)
		SW		-as above, fine to coarse grained, some gravel (up to 3" dia.).		1.6
25			25.0		20.7	4.1
		SP		POORLY GRADED SAND (SP), very dark gray (10YR 3/1), fine to medium grained.		
			29.0		16.7	
30		SW		WELL GRADED SAND (SW), fine to coarse grained, trace fine gravel.		0.8
				-as above, fine to medium grained, trace fines, cobble (3.5" dia.).		
				-as above, black (10YR 2/1), some clay.		
35				-as above, very dark gray (10YR 3/1), fine to coarse grained, gravel (up to 2.5" dia.), increasing gravel with depth.		0.0
			35.5		10.2	
		GW		WELL GRADED GRAVEL WITH SAND (GW), very dark gray (10YR 3/1), subangular to subrounded, fine to coarse gravel, cobbles (up to 6" dia.), fine to coarse grained sand.		
40						0.6
				-as above, trace clay.		
				-as above, dark gray (10YR 4/1), cobbles (up to 7" dia.).		

WELL DIAGRAM



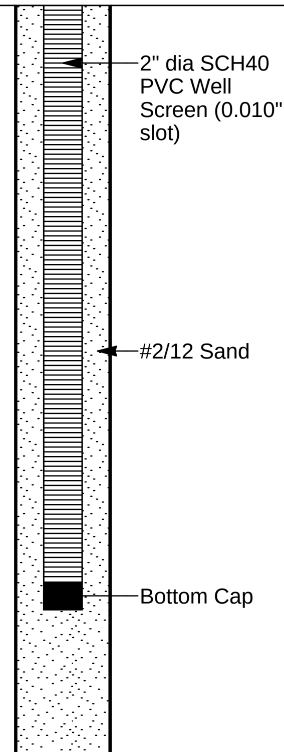
MATERIALS USED

(Continued Next Page)

APPROVED BY: C Wall CARCE C-66471 **DATE:** 8/6/08

LFR

DEPTH (feet)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	DEPTHS	LITHOLOGIC DESCRIPTION	ELEVATIONS	PID (ppm)	WELL DIAGRAM	DEPTH (feet)
45		GW			-as above, cobbles (up to 7" dia.), well graded.				45
					-as above, increasing gravel with depth.		4.1		
					-as above, mostly gravel.				
50									50
				52.0		-6.3			
55		SS			FRIARS FORMATION (SS), gray (10YR 6/1), weathered.				55
				57.0		-11.3			
					Bottom of boring at 57 feet bgs. Bottom of well at 54.5 feet bgs.				



MATERIALS USED

Filter Pack - 17.2 cubic feet of #2/12 Sand
Annular Seal - 1.4 cubic feet of Bentonite chips

APPROVED BY: C [signature] CARCE C-66471 **DATE:** 8/6/08

LFR

PROJECT NAME Mission Valley Terminal - Qualcomm Stadium
CLIENT Kinder Morgan Energy Partners

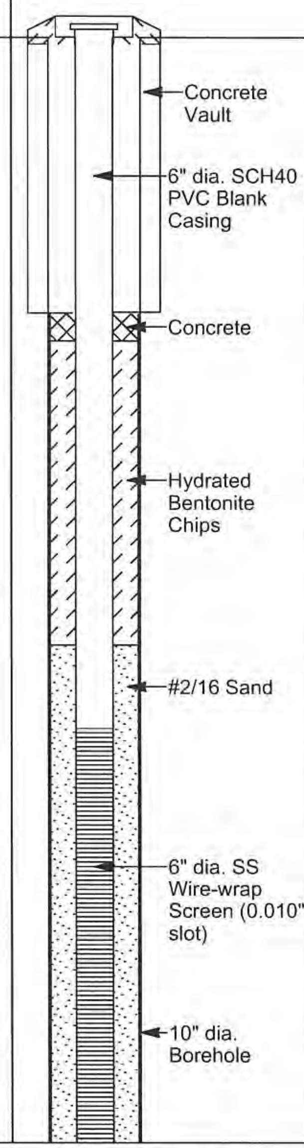
WELL NUMBER RW-107

PROJECT LOCATION 9449 Friars Rd, San Diego, CA
PROJECT NUMBER 002-10143-24
LOCATION NE Parking Lot
OVA EQUIPMENT FID
GROUND ELEVATION 64.93 ft-msl **HOLE DIAMETER** 10 inches
TOP OF CASING ELEVATION --- **HOLE DEPTH** 66.5 ft
▽ **FIRST ENCOUNTERED WATER** 29.0 ft / Elev 35.9 ft
▼ **STABILIZED WATER** 26.7 ft / Elev 38.2 ft
LOGGED BY Darren Burgett **DATE** 2/16/09 - 2/17/09

DRILLING CONTRACTOR Boart Longyear
DRILLING METHOD Sonic
STAMP (IF APPLICABLE) AND/OR NOTES
FID did not work properly due to heavy rain and high humidity.
Developed on 2/26/09 using Smeal Development rig.
Purged approximately 535 gallons.

DEPTH (feet)	SAMPLE TYPE NUMBER	U.S.C.S.	DEPTHS	LITHOLOGIC DESCRIPTION	ELEVATIONS	FID (ppm)
0			0.3	Asphalt (3" thick).	64.7	
				Air knife to 5 feet bgs.		
5			5.0	No soil recovery.	59.9	
		SM	7.0	SILTY SAND (SM), dark brown (10YR 3/3), moist, fine sand, 15% silt.	57.9	0.0
10		ML	11.0	SANDY SILT (ML), dark brown (10YR 3/3), moist, firm, low plasticity, 20% fine sand, 5% clay, trace coarse sand.	53.9	
		SW	12.5	WELL GRADED SAND (SW), dark yellowish brown (10YR 3/4), moist, fine grained, some gravel.	52.4	
15		ML	16.0	SANDY SILT (ML), dark brown (10YR 3/3), moist firm, low plasticity, 20% fine sand, 10% clay, 5% coarse sand. -as above, with roots. -as above, no roots, increasing clay.	48.9	
20						

WELL DIAGRAM



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APPROVED BY: Steve Beadle PG 6129 **DATE:** 4/22/2009

LFR

PROJECT NAME Mission Valley Terminal - Qualcomm Stadium
CLIENT Kinder Morgan Energy Partners

WELL NUMBER RW-107

DEPTH (feet)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	DEPTHS	LITHOLOGIC DESCRIPTION	ELEVATIONS	FID (ppm)	WELL DIAGRAM	DEPTH (feet)
		ML			-as above, decreasing clay, increasing fine sand.			#2/16 Sand	
				23.5		41.4			
25		SP			POORLY GRADED SAND (SP), dark yellowish brown (10YR 3/4), moist, fine grained, 15% silt, micaceous.			6" dia. SS Wire-wrap Screen (0.010" slot)	25
					-clayey silt lens at 28.5 feet bgs.				
30					-as above, increasing silt and clay, wet.				30
				32.0		32.9			
		ML			SANDY SILT (ML), brown (10YR 5/3), wet, fine sand, 5% clay, micaceous.				
35				35.0		29.9			35
		SP			POORLY GRADED SAND (SP), dark yellowish brown (10YR 3/4), wet, fine grained, 20% silt, micaceous.				
				36.0		28.9			
		ML			SILT (ML), brown (10YR 5/3), wet, soft, non-plastic, micaceous.				
40					-as above, increasing fine sand. -clay lens at 40 feet bgs.				40
				41.0		23.9			
		SP			POORLY GRADED SAND (SP), dark yellowish brown (10YR 3/4), wet, fine grained, 10% silt, micaceous.				

MATERIALS USED

(Continued Next Page)

APPROVED BY: Steven Beadle PG 6124 **DATE:** 4/22/2009

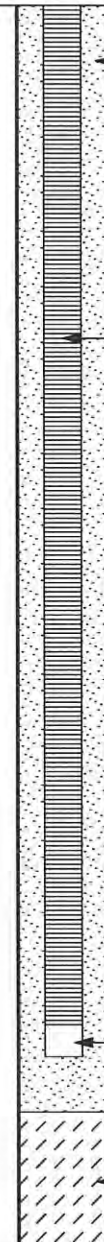
LFR

PROJECT NAME Mission Valley Terminal - Qualcomm Stadium
CLIENT Kinder Morgan Energy Partners

WELL NUMBER RW-107

DEPTH (feet)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	DEPTHS	LITHOLOGIC DESCRIPTION	ELEVATIONS	FID (ppm)
45		SP		48.0	POORLY GRADED SAND (SP), dark yellowish brown (10YR 3/4), wet, fine grained, 10% silt, micaceous. -as above, 10% gravel.	16.9	
		GW		50.0	WELL GRADED GRAVEL (GW), dark yellowish brown (10YR 3/4), wet, subrounded gravel, fine to coarse sand, micaceous.	14.9	
50		SP		54.0	POORLY GRADED SAND (SP), dark yellowish brown (10YR 3/4), wet, fine to medium grained, trace coarse grained.	10.9	
55		GW		58.0	WELL GRADED GRAVEL (GW), dark yellowish brown (10YR 3/4), wet, subrounded gravel, fine to medium sand, few cobbles, micaceous.	6.9	
		SM		60.0	SILTY SAND (SM), dark grayish brown (10YR 4/2), wet, fine to medium sand, low plasticity, micaceous.	4.9	
60		GM		62.5	SILTY GRAVEL (GM), dark yellowish brown (10YR 3/4), wet, fine to medium sand, subrounded gravel, micaceous, rhyolite, dacite, quartzite clasts, few cobbles.	2.4	
65		SS		66.5	FRIARS SANDSTONE (SS), bluish gray (5/3 5/1), moist, weak, fine sand, 35% silt, 5% clay, weak foliation.	-1.6	
					Bottom of boring at 66.5 feet bgs. Bottom of well at 63 feet bgs.		

WELL DIAGRAM



MATERIALS USED

Filter Pack - ~18 cubic feet of #2/16 Sand
Annular Seal - ~1 cubic foot of Bentonite chips

APPROVED BY: Steve Beadle PG 6129 **DATE:** 4/22/2009

LFR

Date Start/Finish: 4/14/11 **Drilling Company:** Cascade Drilling **Driller's Name:** Val Godoy **Drilling Method:** Rotary Sonic **Sampling Method:** 10' x 6" Dia. Sonic Core Barrell **Rig Type:** Sonic Drill	**Northing:** 1865761.16 **Easting:** 6293593.55 **Casing Elevation:** NA **Borehole Depth:** 74' bgs **Borehole Diameter:** 8.5" **Surface Elevation:** 63.11' MSL **Descriptions By:** James Gonzales	**Well/Boring ID:** **RW-109P (Pilot Boring)** **Client:** Kinder Morgan Energy Partners **Location:** Mission Valley Terminal - Qualcomm Stadium 9950 San Diego Mission Rd San Diego, CA 92108 **Reviewed By:** Steven C Beadle PG 6129

DEPTH	ELEVATION	Sample ID	Recovery (feet)	PID/FID (ppm)	Sieve Analysis Sample	USCS Code	Geologic Column	Stratigraphic Description	Well/Boring Construction
0				0.0/NA		GM		Air knife to 5' bgs on 4/12/11. Soil logged from air knife cuttings. SILTY GRAVEL (GM), fine to coarse subangular gravel, subrounded cobbles (up to 5" dia.), some fine grained sand with trace medium to coarse grained sand, poorly sorted, trace clay, low plasticity silt, no dilatancy, dry, medium dense, mottled gray to brown coloring.	
	60								
5									
				0.3/0.0					
	55								Borehole backfilled with Bentonite Grout / Chips
10				0.4/0.0				No recovery from 10' to 16' bgs.	
	50								
15									
						GM		Slough from 16' to 18' bgs, interpreted as SILTY GRAVEL (GM) with cobbles.	
	45			0.2/0.0				SILTY GRAVEL (GM), mostly fine to coarse subangular gravel, subrounded cobbles (up to 5" dia.), some fine grained sand with trace medium to coarse grained sand, poorly sorted, trace clay, low plasticity silt, no dilatancy, dry, medium dense, mottled	

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Remarks: ft bgs = feet below ground surface; NA = Not Applicable/Available; MSL = Mean Sea Level; ATD = At Time of Drilling

Drilled approximately 66 feet NE of well RW-109.

Material Used: 59 cubic feet of Bentonite Grout / Chips. Surface capped with cold asphalt.

Water Level Data

Date	Depth	Elev.
4/14/11	27' ATD	NA

Depth measured from top of casing

Client: Kinder Morgan Energy Partners

Well/Boring ID: **RW-109P (Pilot Boring)**

Site Location:
Mission Valley Terminal - Qualcomm Stadium
9950 San Diego Mission Rd
San Diego, CA 92108

Borehole Depth: 74' bgs

DEPTH	ELEVATION	Sample ID	Recovery (feet)	PID/FID (ppm)	Sieve Analysis Sample	USCS Code	Geologic Column	Stratigraphic Description	Well/Boring Construction
20				1.4/0.0		GM		gray to brown coloring.	
								No recovery from 20' to 22' bgs.	
	40					GM		SILTY GRAVEL (GM) as above, moist.	
25				0.0/0.0		SP		POORLY GRADED SAND WITH GRAVEL (SP), mostly fine to coarse grained, subrounded, some fine to coarse subrounded gravel, trace subrounded gravel, trace silt, dry, gray (2.5Y 5/1) sand, brown to gray gravel and cobbles. -as above, wet.	▽
	35			0.0/0.0		SP-SW		Slough from 28' to 30' bgs, interpreted as POORLY GRADED SAND WITH GRAVEL (SP) to WELL GRADED SAND (SW).	Borehole backfilled with Bentonite Grout / Chips
30				0.0/0.0		SM		SILTY SAND (SM), mostly fine sand, low plasticity silt, medium dense, olive brown (2.5Y 4/3).	
35	30			1.3/2.4		SW		WELL GRADED SAND (SW), mostly fine to coarse grained, subrounded, poorly sorted, trace silt, trace subangular fine gravel, wet, loose, soft, olive brown (2.5Y 4/3), micaceous.	
						SM		SILTY SAND (SM), low plasticity silt, no dilatency, fine subrounded sand, olive brown (2.5Y 4/3).	
	25							No recovery from 38' to 44' bgs.	

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Remarks: ft bgs = feet below ground surface; NA = Not Applicable/Available; MSL = Mean Sea Level; ATD = At Time of Drilling

Drilled approximately 66 feet NE of well RW-109.

Material Used: 59 cubic feet of Bentonite Grout / Chips. Surface capped with cold asphalt.

Water Level Data

Date	Depth	Elev.
4/14/11	27' ATD	NA

Depth measured from top of casing

Client: Kinder Morgan Energy Partners

Well/Boring ID: **RW-109P (Pilot Boring)**

Site Location:
Mission Valley Terminal - Qualcomm Stadium
9950 San Diego Mission Rd
San Diego, CA 92108

Borehole Depth: 74' bgs

DEPTH	ELEVATION	Sample ID	Recovery (feet)	PID/FID (ppm)	Sieve Analysis Sample	USCS Code	Geologic Column	Stratigraphic Description	Well/Boring Construction
40								No recovery from 38' to 44' bgs.	
	20								
45		RW-109-46		0.9/1.1	X	SW		WELL GRADED SAND (SW), fine to coarse grained, subrounded, poorly sorted, trace silt, trace subangular fine gravel, wet, loose, soft, olive brown (2.5Y 4/3), micaceous.	
	15	RW-109-50		0.1/0.9	X	SM		SILTY SAND (SM), low plasticity silt and fine to medium subrounded sand, low density, loose, dark olive brown (2.5Y 3/3).	Borehole backfilled with Bentonite Grout / Chips
50						SM-SW		Slough from 50' to 52' bgs, interpreted as SILTY SAND (SM) to WELL GRADED SAND WITH GRAVEL (SW).	
55	10	RW-109-56		0.0/0.0	X	SW		WELL GRADED SAND WITH GRAVEL (SW), fine to coarse subrounded sand, some subangular to subrounded fine to coarse gravel (up to 2" dia.), wet, loose, soft, dark olive brown (2.5Y 3/3), brown to gray mottled coloring.	
	5								

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Remarks: ft bgs = feet below ground surface; NA = Not Applicable/Available; MSL = Mean Sea Level; ATD = At Time of Drilling

Drilled approximately 66 feet NE of well RW-109.

Material Used: 59 cubic feet of Bentonite Grout / Chips. Surface capped with cold asphalt.

Water Level Data

Date	Depth	Elev.
4/14/11	27' ATD	NA

Depth measured from top of casing

Client: Kinder Morgan Energy Partners

Well/Boring ID: **RW-109P (Pilot Boring)**

Site Location:
Mission Valley Terminal - Qualcomm Stadium
9950 San Diego Mission Rd
San Diego, CA 92108

Borehole Depth: 74' bgs

DEPTH	ELEVATION	Sample ID	Recovery (feet)	PID/FID (ppm)	Sieve Analysis Sample	USCS Code	Geologic Column	Stratigraphic Description	Well/Boring Construction
						SW		-as above, wet.	Borehole backfilled with Bentonite Grout / Chips
60								WELL GRADED SAND (SW), fine to coarse grained sand, subrounded, trace silt, wet, loose, soft, micaceous.	
				0.4/1.3					
		RW-109-62			X				
	0								
65								WELL GRADED SAND WITH GRAVEL (SW), fine to coarse grained sand, subrounded, some fine to coarse subangular gravel, trace cobbles (up to 3.5" dia.), trace silt, loose, soft.	
		RW-109-67			X				
	-5								
70				2.2/1.9				-as above, wet.	
	-10	RW-109-73			X				
						SS		FRIARS SANDSTONE (SS), gray.	
75									
	-15								

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Remarks: ft bgs = feet below ground surface; NA = Not Applicable/Available; MSL = Mean Sea Level; ATD = At Time of Drilling

Drilled approximately 66 feet NE of well RW-109.

Material Used: 59 cubic feet of Bentonite Grout / Chips. Surface capped with cold asphalt.

Water Level Data

Date	Depth	Elev.
4/14/11	27' ATD	NA

Depth measured from top of casing

Date Start/Finish: 6/3/11 - 6/4/11
Drilling Company: Cascade Drilling
Driller's Name: Val Godoy
Drilling Method: Rotary Sonic
Sampling Method: 10' x 6" Dia. Sonic Core Barrell
Rig Type: Sonic Drill

Northing: 1865726.60
Easting: 6293537.80
Casing Elevation: NA

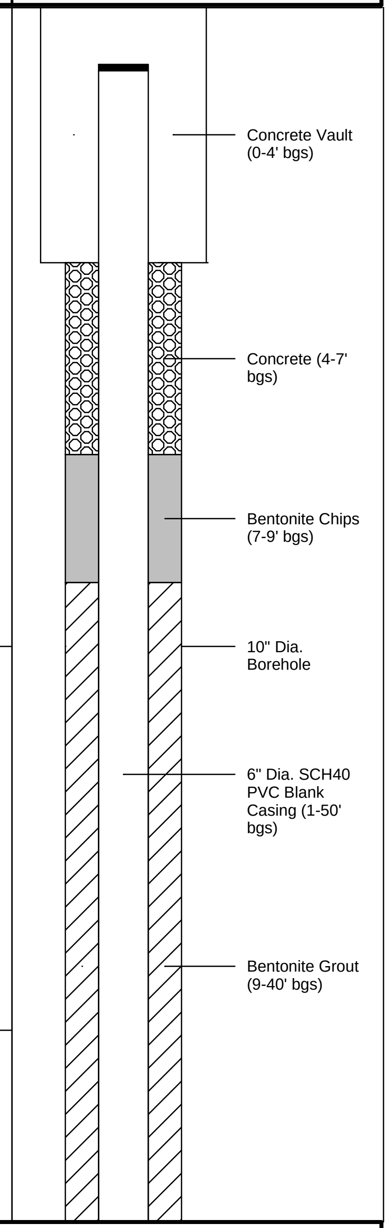
Borehole Depth: 71' bgs
Borehole Diameter: 10"
Surface Elevation: 60.15' MSL
Descriptions By: James Gonzales

Well/Boring ID: **RW-109 (GWE Well)**
Client: Kinder Morgan Energy Partners
Location: Mission Valley Terminal - Qualcomm Stadium
9950 San Diego Mission Rd
San Diego, CA 92108

Reviewed By: Steven C Beadle PG 6129

DEPTH	ELEVATION	Sample ID	Recovery (feet)	PID/FID (ppm)	Sieve Analysis Sample	USCS Code	Geologic Column	Stratigraphic Description
0	60					GM		Air knife to 5' bgs on 4/12/11. Soil logged from air knife cuttings. SILTY GRAVEL (GM) with cobbles, mostly silt and fine grained sand, mostly fine to coarse subangular gravel, subrounded cobbles (up to 5" dia.), trace medium to coarse grained sand, poorly sorted, trace clay, low plasticity, no dilatancy, dry, medium dense, mottled gray to brown coloring.
5	55							
10	50							No recovery from 10' to 16' bgs.
15	45							
						GM		Slough from 16' to 18' bgs, interpreted as SILTY GRAVEL (GM) with cobbles. SILTY GRAVEL (GM) with cobbles, mostly silt and fine grained sand, mostly fine to coarse subangular gravel, subrounded cobbles (up to 5" dia.), trace medium to coarse grained sand, poorly sorted, trace clay, low plasticity, no dilatancy, dry,

Well/Boring Construction



Remarks: ft bgs = feet below ground surface; NA = Not Applicable/Available; MSL = Mean Sea Level

Drilled approximately 66 feet SW of pilot boring RW-109P. Lithology determined from pilot boring RW-109P. Actual Friars Sandstone contact determined from well RW-109.

Material Used: 18 cubic ft of Sand, 27 cubic ft of Bentonite Grout/Chips, 2 cubic ft of Concrete Seal.

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DEPTH	ELEVATION	Sample ID	Recovery (feet)	PID/FID (ppm)	Sieve Analysis Sample	USCS Code	Geologic Column	Stratigraphic Description	Well/Boring Construction
						GM		medium dense, mottled gray to brown coloring.	
20	40							No recovery from 20' to 22' bgs.	10" Dia. Borehole
						GM		SILTY GRAVEL (GM) as above, moist.	
						SP		POORLY GRADED SAND WITH GRAVEL (SP), mostly fine to coarse grained, subrounded, some fine to coarse subrounded gravel, trace subrounded gravel, trace silt, dry, gray (2.5Y 5/1) sand, brown to gray gravel and cobbles.	
25	35								Bentonite Grout (9-40' bgs)
								-as above, wet.	
						SP-SW		Slough from 28' to 30' bgs, interpreted as POORLY GRADED SAND WITH GRAVEL (SP) to WELL GRADED SAND (SW).	
30	30					SM		SILTY SAND (SM), mostly fine sand and silt, low plasticity, medium dense, olive brown (2.5Y 4/3).	6" Dia. SCH40 PVC Blank Casing (1-50' bgs)
						SW		WELL GRADED SAND (SW), mostly fine to coarse grained, subrounded, poorly sorted, trace silt, trace subangular fine gravel, wet, loose, soft, olive brown (2.5Y 4/3), micaceous.	
35	25								
						SM		SILTY SAND (SM), mostly low plasticity silt, no dilatency, some fine subrounded sand, olive brown (2.5Y 4/3).	
								No recovery from 38' to 44' bgs.	

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Remarks: ft bgs = feet below ground surface; NA = Not Applicable/Available; MSL = Mean Sea Level

Drilled approximately 66 feet SW of pilot boring RW-109P. Lithology determined from pilot boring RW-109P. Actual Friars Sandstone contact determined from well RW-109.

Material Used: 18 cubic ft of Sand, 27 cubic ft of Bentonite Grout/Chips, 2 cubic ft of Concrete Seal.

Client: Kinder Morgan Energy Partners

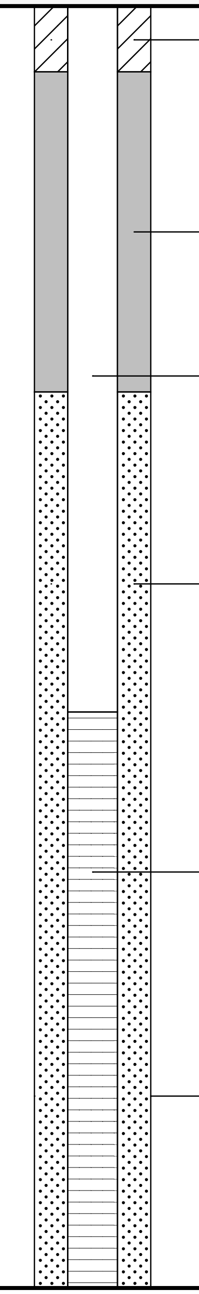
Well/Boring ID: **RW-109 (GWE Well)**

Borehole Depth: 71' bgs

Site Location:
Mission Valley Terminal - Qualcomm Stadium
9950 San Diego Mission Rd
San Diego, CA 92108

DEPTH	ELEVATION	Sample ID	Recovery (feet)	PID/FID (ppm)	Sieve Analysis Sample	USCS Code	Geologic Column	Stratigraphic Description
								No recovery from 38' to 44' bgs.
40	20							
45	15					SW		WELL GRADED SAND (SW), mostly fine to coarse grained, subrounded, poorly sorted, trace silt, trace subangular fine gravel, wet, loose, soft, olive brown (2.5Y 4/3), micaceous.
						SM		SILTY SAND (SM), low plasticity silt and fine to medium subrounded sand, low density, loose, dark olive brown (2.5Y 3/3).
50	10					SM-SW		Slough from 50' to 52' bgs, interpreted as SILTY SAND (SM) to WELL GRADED SAND WITH GRAVEL (SW).
						SW		WELL GRADED SAND WITH GRAVEL (SW), mostly fine to coarse subrounded sand, some subangular to subrounded fine to coarse gravel (up to 2" dia.), wet, loose, soft, dark olive brown (2.5Y 3/3), brown to gray mottled coloring.
55	5							

Well/Boring Construction



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Remarks: ft bgs = feet below ground surface; NA = Not Applicable/Available; MSL = Mean Sea Level

Drilled approximately 66 feet SW of pilot boring RW-109P. Lithology determined from pilot boring RW-109P. Actual Friars Sandstone contact determined from well RW-109.

Material Used: 18 cubic ft of Sand, 27 cubic ft of Bentonite Grout/Chips, 2 cubic ft of Concrete Seal.

Client: Kinder Morgan Energy Partners

Well/Boring ID: **RW-109 (GWE Well)**

Borehole Depth: 71' bgs

Site Location:
Mission Valley Terminal - Qualcomm Stadium
9950 San Diego Mission Rd
San Diego, CA 92108

DEPTH	ELEVATION	Sample ID	Recovery (feet)	PID/FID (ppm)	Sieve Analysis Sample	USCS Code	Geologic Column	Stratigraphic Description	Well/Boring Construction
								-as above, wet.	
60	0							WELL GRADED SAND (SW), fine to coarse grained sand, subrounded, trace silt, wet, loose, soft, micaceous.	10" Dia. Borehole
									6" Dia. SS Wire-wrapped Well Screen 0.030" Slot (50-70' bgs)
						SW		WELL GRADED SAND WITH GRAVEL (SW) and cobbles, fine to coarse grained sand, subrounded, some fine to coarse subangular gravel, trace cobbles (up to 3.5" dia.), trace silt, loose, soft.	
65	-5								#3 Sand (45-71' bgs)
70	-10							-as above, wet.	Integrated Bottom Cap
								FRIARS SANDSTONE (SS) at 71' bgs, gray.	Slough
75	-15								

Remarks: ft bgs = feet below ground surface; NA = Not Applicable/Available; MSL = Mean Sea Level

Drilled approximately 66 feet SW of pilot boring RW-109P. Lithology determined from pilot boring RW-109P. Actual Friars Sandstone contact determined from well RW-109.

Material Used: 18 cubic ft of Sand, 27 cubic ft of Bentonite Grout/Chips, 2 cubic ft of Concrete Seal.

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Date Start/Finish: 4/15/11 **Drilling Company:** Cascade Drilling **Driller's Name:** Val Godoy **Drilling Method:** Rotary Sonic **Sampling Method:** 10' x 6" Dia. Sonic Core Barrell **Rig Type:** Sonic Drill	**Northing:** 1865429.40 **Easting:** 6293489.21 **Casing Elevation:** NA **Borehole Depth:** 68' bgs **Borehole Diameter:** 8.5" **Surface Elevation:** 54.56' MSL **Descriptions By:** James Gonzales	**Well/Boring ID: RW-110P (Pilot Boring)** **Client:** Kinder Morgan Energy Partners **Location:** Mission Valley Terminal - Qualcomm Stadium 9950 San Diego Mission Rd San Diego, CA 92108 **Reviewed By:** Steven C Beadle PG 6129

DEPTH	ELEVATION	Sample ID	Recovery (feet)	PID/FID (ppm)	Sieve Analysis Sample	USCS Code	Geologic Column	Stratigraphic Description	Well/Boring Construction
0						GM		Air knife to 5' bgs on 4/12/11. Soil logged from air knife cuttings. SILTY GRAVEL (GM), fine to coarse subangular gravel, cobbles (up to 3-4" dia.), some fine grained sand with some medium and coarse grained sand, low plastic silt, dry to moist, brown to gray mottled coloring.	Borehole backfilled with Bentonite Grout / Chips
5	50								
10	45			0.9/0.0				No recovery from 10' to 14' bgs, interpreted as SILTY GRAVEL (GM).	
15	40			6.3/0.2		GM		SILTY GRAVEL (GM) as above.	

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Remarks: ft bgs = feet below ground surface; NA = Not Applicable/Available; MSL = Mean Sea Level; ATD = At Time of Drilling

Drilled approximately 115 ft east of well RW-110.

Material Used: 54 cubic feet of Bentonite Grout / Chips. Surface capped with cold asphalt.

Water Level Data

Date	Depth	Elev.
4/15/11	19' ATD	NA

Depth measured from top of casing

Client: Kinder Morgan Energy Partners

Well/Boring ID: RW-110P (Pilot Boring)

Borehole Depth: 68' bgs

Site Location:
Mission Valley Terminal - Qualcomm Stadium
9950 San Diego Mission Rd
San Diego, CA 92108

DEPTH	ELEVATION	Sample ID	Recovery (feet)	PID/FID (ppm)	Sieve Analysis Sample	USCS Code	Geologic Column	Stratigraphic Description	Well/Boring Construction
20	35					SW		WELL GRADED SAND (SW), fine to coarse grained, subrounded, trace silt, moderate dilatancy, wet, low density, loose, dark olive brown (2.5Y 3/3), micaceous.	
25	30			0.3/0.0		SP		POORLY GRADED SAND (SP), mostly medium to coarse grained sand, some fine grained sand, subrounded, rapid dilatancy, wet, low density, dark olive brown (2.5Y 3/3), micaceous.	Borehole backfilled with Bentonite Grout / Chips
30	25			0.5/0.0				No recovery from 30' to 37' bgs.	
35	20								
		RW-110-39				SW		WELL GRADED SAND (SW), mostly fine to medium grained sand, subrounded, some coarse subrounded sand, moderate dilatancy, trace silt, trace subangular gravel.	

Remarks: ft bgs = feet below ground surface; NA = Not Applicable/Available; MSL = Mean Sea Level; ATD = At Time of Drilling

Drilled approximately 115 ft east of well RW-110.

Material Used: 54 cubic feet of Bentonite Grout / Chips. Surface capped with cold asphalt.

Water Level Data

Date	Depth	Elev.
4/15/11	19' ATD	NA

Depth measured from top of casing

Client: Kinder Morgan Energy Partners

Well/Boring ID: **RW-110P (Pilot Boring)**

Borehole Depth: 68' bgs

Site Location:
Mission Valley Terminal - Qualcomm Stadium
9950 San Diego Mission Rd
San Diego, CA 92108

DEPTH	ELEVATION	Sample ID	Recovery (feet)	PID/FID (ppm)	Sieve Analysis Sample	USCS Code	Geologic Column	Stratigraphic Description	Well/Boring Construction
	15								
40				0.7/0.0		SW			
		RW-110-42						-decreasing fines, increasing coarse grained sand with depth, increasing subangular and subrounded gravel.	
								-as above, wet.	
		RW-110-44		0.2/0.0				SILTY SAND (SM), fine subrounded sand, slow dilatancy, low plastic silt, well sorted, medium to low density, black (2.5Y 2.5/1).	
	10								
45						SM			
		RW-110-47		0.3/0.0				-as above, decreasing fines.	
								WELL GRADED SAND (SW), fine to medium grained sand, subrounded, moderate to rapid dilatancy.	
								-as above, mostly medium to coarse grained sand, subrounded, rapid dilatancy, trace subangular fine gravel, low density, black (2.5Y 2.5/1).	Borehole backfilled with Bentonite Grout / Chips
	5								
50									
								-as above, wet.	
						SW			
								Poor recovery from 54' to 56' bgs.	
	0								
55									
		RW-110-56		0.2/0.0					
		RW-110-58						-as above, fine to coarse grained, moderate to rapid dilatancy, non-cohesive, loose, soft, black (2.5Y 2.5/1).	

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Remarks: ft bgs = feet below ground surface; NA = Not Applicable/Available; MSL = Mean Sea Level; ATD = At Time of Drilling

Drilled approximately 115 ft east of well RW-110.

Material Used: 54 cubic feet of Bentonite Grout / Chips. Surface capped with cold asphalt.

Water Level Data

Date	Depth	Elev.
4/15/11	19' ATD	NA

Depth measured from top of casing

Client: Kinder Morgan Energy Partners

Well/Boring ID: **RW-110P (Pilot Boring)**

Site Location:
Mission Valley Terminal - Qualcomm Stadium
9950 San Diego Mission Rd
San Diego, CA 92108

Borehole Depth: 68' bgs

DEPTH	ELEVATION	Sample ID	Recovery (feet)	PID/FID (ppm)	Sieve Analysis Sample	USCS Code	Geologic Column	Stratigraphic Description	Well/Boring Construction
	-5					SW			
60						SS		FRIARS SANDSTONE (SS), weathered gray sandstone, weakly cemented, moist, light to dark gray.	Borehole backfilled with Bentonite Grout / Chips
	-10								
65									
	-15								
70									
	-20								
75									

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Remarks: ft bgs = feet below ground surface; NA = Not Applicable/Available; MSL = Mean Sea Level; ATD = At Time of Drilling

Drilled approximately 115 ft east of well RW-110.

Material Used: 54 cubic feet of Bentonite Grout / Chips. Surface capped with cold asphalt.

Water Level Data

Date	Depth	Elev.
4/15/11	19' ATD	NA

Depth measured from top of casing

Date Start/Finish: 6/1/11 - 6/2/11 **Drilling Company:** Cascade Drilling **Driller's Name:** Val Godoy **Drilling Method:** Rotary Sonic **Sampling Method:** 10' x 6" Dia. Sonic Core Barrell **Rig Type:** Sonic Drill	**Northing:** 1865424.21 **Easting:** 6293374.76 **Casing Elevation:** NA **Borehole Depth:** 63' bgs **Borehole Diameter:** 10" **Surface Elevation:** 50.48' MSL **Descriptions By:** James Gonzales	**Well/Boring ID: RW-110 (GWE Well)** **Client:** Kinder Morgan Energy Partners **Location:** Mission Valley Terminal - Qualcomm Stadium 9950 San Diego Mission Rd San Diego, CA 92108 **Reviewed By:** Steven C Beadle PG 6129	

DEPTH	ELEVATION	Sample ID	Recovery (feet)	PID/FID (ppm)	Sieve Analysis Sample	USCS Code	Geologic Column	Stratigraphic Description	Well/Boring Construction
0	50					GM		Air knife to 5' bgs on 4/12/11. Soil logged from air knife cuttings. SILTY GRAVEL (GM) with cobbles, mostly low plastic silt and fine grained sand, fine to coarse subangular gravel, cobbles (up to 3-4" dia.), some medium and coarse grained sand, dry to moist, brown to gray mottled coloring.	Concrete Vault (0-4' bgs)
5	45								Concrete (4-7' bgs) Bentonite Chips (7-9' bgs)
10	40							No recovery from 10' to 14' bgs, interpreted as SILTY GRAVEL (GM).	6" Dia. SCH40 PVC Blank Casing (1-40' bgs)
15	35					GM		SILTY GRAVEL (GM) with cobbles as above.	Bentonite Grout (9-30' bgs) 10" Dia. Borehole

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Remarks: ft bgs = feet below ground surface; NA = Not Applicable/Available; MSL = Mean Sea Level

Drilled approximately 115 ft west of pilot boring RW-110P. Lithology determined from pilot boring RW-110P. Actual Friars Sandstone contact determined from well RW-110.

Material Used: 21 cubic ft of #8 Sand, 20 cubic ft of Bentonite Grout/Chips, 2 cubic ft of Concrete Seal.

Client: Kinder Morgan Energy Partners

Well/Boring ID: **RW-110 (GWE Well)**

Borehole Depth: 63' bgs

Site Location:
Mission Valley Terminal - Qualcomm Stadium
9950 San Diego Mission Rd
San Diego, CA 92108

DEPTH	ELEVATION	Sample ID	Recovery (feet)	PID/FID (ppm)	Sieve Analysis Sample	USCS Code	Geologic Column	Stratigraphic Description	Well/Boring Construction
20	30					SW		WELL GRADED SAND (SW), fine to coarse grained, subrounded, trace silt, moderate dilatancy, wet, low density, loose, dark olive brown (2.5Y 3/3), micaceous.	10" Dia. Borehole; Bentonite Grout (9-30' bgs)
25	25					SP		POORLY GRADED SAND (SP), mostly medium to coarse grained sand, some fine grained sand, subrounded, rapid dilatancy, wet, low density, dark olive brown (2.5Y 3/3), micaceous.	6" Dia. SCH40 PVC Blank Casing (1-40' bgs)
30	20							No recovery from 30' to 37' bgs.	Bentonite Chips (30-35' bgs)
35	15								#8 Mesh Sand (35-63' bgs)
						SW		WELL GRADED SAND (SW), mostly fine to medium grained sand, subrounded, some coarse subrounded sand, moderate dilatancy, trace silt, trace subangular gravel.	

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Remarks: ft bgs = feet below ground surface; NA = Not Applicable/Available; MSL = Mean Sea Level

Drilled approximately 115 ft west of pilot boring RW-110P. Lithology determined from pilot boring RW-110P. Actual Friars Sandstone contact determined from well RW-110.

Material Used: 21 cubic ft of #8 Sand, 20 cubic ft of Bentonite Grout/Chips, 2 cubic ft of Concrete Seal.

Client: Kinder Morgan Energy Partners

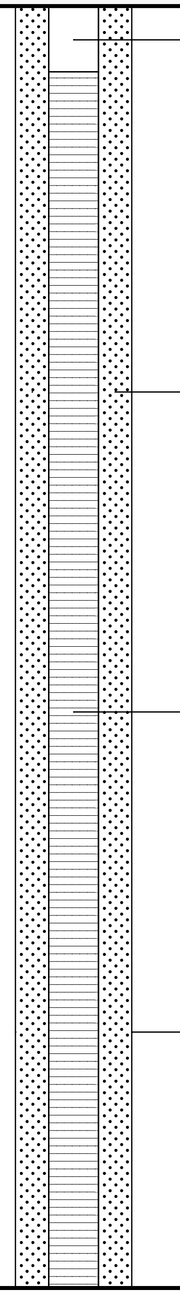
Well/Boring ID: **RW-110 (GWE Well)**

Borehole Depth: 63' bgs

Site Location:
Mission Valley Terminal - Qualcomm Stadium
9950 San Diego Mission Rd
San Diego, CA 92108

DEPTH	ELEVATION	Sample ID	Recovery (feet)	PID/FID (ppm)	Sieve Analysis Sample	USCS Code	Geologic Column	Stratigraphic Description
40	10					SW		-decreasing fines, increasing coarse grained sand with depth, increasing subangular and subrounded gravel. -as above, wet.
45	5					SM		SILTY SAND (SM), fine subrounded sand, slow dilatancy, low plastic silt, well sorted, medium to low density, black (2.5Y 2.5/1). -as above, decreasing fines.
50	0					SW		WELL GRADED SAND (SW), fine to medium grained sand, subrounded, moderate to rapid dilatancy. -as above, mostly medium to coarse grained sand, subrounded, rapid dilatancy, trace subangular fine gravel, low density, black (2.5Y 2.5/1). -as above, wet. Poor recovery from 54' to 56' bgs.
55	-5							WELL GRADED SAND (SW), fine to coarse grained, moderate to rapid dilatancy, non-cohesive, loose, soft, black (2.5Y 2.5/1).

Well/Boring Construction



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Remarks: ft bgs = feet below ground surface; NA = Not Applicable/Available; MSL = Mean Sea Level

Drilled approximately 115 ft west of pilot boring RW-110P. Lithology determined from pilot boring RW-110P. Actual Friars Sandstone contact determined from well RW-110.

Material Used: 21 cubic ft of #8 Sand, 20 cubic ft of Bentonite Grout/Chips, 2 cubic ft of Concrete Seal.

Client: Kinder Morgan Energy Partners

Well/Boring ID: **RW-110 (GWE Well)**

Borehole Depth: 63' bgs

Site Location:
Mission Valley Terminal - Qualcomm Stadium
9950 San Diego Mission Rd
San Diego, CA 92108

DEPTH	ELEVATION	Sample ID	Recovery (feet)	PID/FID (ppm)	Sieve Analysis Sample	USCS Code	Geologic Column	Stratigraphic Description	Well/Boring Construction
60	-10					SW		WELL GRADED SAND (SW), fine to coarse grained, moderate to rapid dilatancy, non-cohesive, loose, soft, black (2.5Y 2.5/1).	Integrated Bottom Cap
						SS		FRIARS SANDSTONE (SS), weathered gray sandstone, weakly cemented, moist, light to dark gray.	#8 Mesh Sand (35-63' bgs)
65	-15								
70	-20								
75	-25								

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Remarks: ft bgs = feet below ground surface; NA = Not Applicable/Available; MSL = Mean Sea Level

Drilled approximately 115 ft west of pilot boring RW-110P. Lithology determined from pilot boring RW-110P. Actual Friars Sandstone contact determined from well RW-110.

Material Used: 21 cubic ft of #8 Sand, 20 cubic ft of Bentonite Grout/Chips, 2 cubic ft of Concrete Seal.

Date Start/Finish: 4/19/11 **Drilling Company:** Cascade Drilling **Driller's Name:** Val Godoy **Drilling Method:** Rotary Sonic **Sampling Method:** 10' x 6" Dia. Sonic Core Barrell **Rig Type:** Sonic Drill	**Northing:** 1865177.82 **Easting:** 6293419.52 **Casing Elevation:** NA **Borehole Depth:** 65' bgs **Borehole Diameter:** 8.5" **Surface Elevation:** 49.61' MSL **Descriptions By:** James Gonzales	**Well/Boring ID: RW-111P (Pilot Boring)** **Client:** Kinder Morgan Energy Partners **Location:** Mission Valley Terminal - Qualcomm Stadium 9950 San Diego Mission Rd San Diego, CA 92108 **Reviewed By:** Steven C Beadle PG 6129

DEPTH	ELEVATION	Sample ID	Recovery (feet)	PID/FID (ppm)	Sieve Analysis Sample	USCS Code	Geologic Column	Stratigraphic Description	Well/Boring Construction
0						GM		Air knife to 5' bgs on 4/14/11. Soil logged from air knife cuttings. Asphalt at surface. SILTY GRAVEL (GM), low to medium plastic silt, no dilatancy, subrounded to subangular fine to coarse gravel, some subrounded to subangular cobbles (up to 3-4" dia.), poorly sorted, moist, dense, mottled gray to brown coloring.	
5	45			1.4/0.1				-as above, moist. -as above, dark yellowish brown (10YR 4/4).	
						GW		WELL GRADED GRAVEL WITH SAND (GW), fine to coarse grained sand, subrounded, moderate dilatancy, fine to coarse subangular gravel, some silt, trace subrounded cobbles, poorly sorted, wet, very dark brown (10YR 2/2).	Borehole backfilled with Bentonite Grout / Chips
10	40			1.7/0.3				-as above, moist.	
						SP		POORLY GRADED SAND (SP), fine to medium grained sand, subrounded, moderate dilatancy, some coarse subrounded sand, some non-plastic silt, moderately sorted, very dark brown (10YR 2/2), micaceous.	
15	35			0.2/0.0		SW		WELL GRADED SAND (SW), fine to coarse grained sand, subrounded, rapid dilatancy, trace subrounded fine to coarse gravel, trace silt, moderately sorted, wet, loose, soft, dark yellowish brown (10YR 3/4). -as above, increasing silt content.	

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Remarks: ft bgs = feet below ground surface; NA = Not Applicable/Available; MSL = Mean Sea Level; ATD = At Time of Drilling

Drilled approximately 7 ft east of well RW-111.

Material Used: 52 cubic feet of Bentonite Grout / Chips. Surface capped with cold asphalt.

Water Level Data

Date	Depth	Elev.
4/19/11	13-17' ATD	NA

Depth measured from top of casing

Client: Kinder Morgan Energy Partners

Well/Boring ID: RW-111P (Pilot Boring)

Site Location:
Mission Valley Terminal - Qualcomm Stadium
9950 San Diego Mission Rd
San Diego, CA 92108

Borehole Depth: 65' bgs

DEPTH	ELEVATION	Sample ID	Recovery (feet)	PID/FID (ppm)	Sieve Analysis Sample	USCS Code	Stratigraphic Description	Well/Boring Construction
20	30			0.0/0.0		SW		
						SM	SILTY SAND (SM), fine to medium subrounded sand, slow to moderate dilatancy, non-plastic silt, moderately sorted, wet, medium dense, medium loose, very dark brown (10YR 2/2).	
						SP	POORLY GRADED SAND (SP), fine to medium grained sand, subrounded, moderate dilatancy, some non-plastic silt, moderately to well sorted, wet, low density, loose, very dark brown (10YR 2/2).	
25	25			0.0/0.0		SM	SILTY SAND (SM), fine to medium subrounded sand, slow to moderate dilatancy, non-plastic silt, moderately sorted, wet, medium dense, very dark brown (10YR 2/2), micaceous.	
						SP	POORLY GRADED SAND (SP), fine to medium grained sand, subrounded, moderate dilatancy, trace coarse sand, some non-plastic silt, moderately to well sorted, loose, soft, dark brown (10YR 3/3).	Borehole backfilled with Bentonite Grout / Chips
30	20			0.0/0.0		SM	SILTY SAND (SM), fine to medium subrounded sand, slow to moderate dilatancy, non-plastic silt, moderately sorted, dark brown.	
						SW	WELL GRADED SAND (SW), fine to coarse grained sand, subrounded, rapid dilatancy, some fine to coarse subrounded gravel, trace silt, dark brown.	
						SM	SILTY SAND (SM), non-plastic silt and fine sand, no dilatancy, well sorted, wet, dense, very dark brown (10YR 2/2).	
35	15			1.9/0.0		SW	WELL GRADED SAND (SW), fine to coarse grained sand, subrounded, rapid dilatancy, some fine to coarse subrounded to subangular gravel, trace subrounded cobbles (up to 2-3" dia.), wet, loose, dark yellowish brown (10YR 3/4), micaceous.	
		RW-111-37			X			

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Remarks: ft bgs = feet below ground surface; NA = Not Applicable/Available; MSL = Mean Sea Level; ATD = At Time of Drilling

Drilled approximately 7 ft east of well RW-111.

Material Used: 52 cubic feet of Bentonite Grout / Chips. Surface capped with cold asphalt.

Water Level Data

Date	Depth	Elev.
4/19/11	13-17' ATD	NA

Depth measured from top of casing

Client: Kinder Morgan Energy Partners

Well/Boring ID: **RW-111P (Pilot Boring)**

Borehole Depth: 65' bgs

Site Location:
Mission Valley Terminal - Qualcomm Stadium
9950 San Diego Mission Rd
San Diego, CA 92108

DEPTH	ELEVATION	Sample ID	Recovery (feet)	PID/FID (ppm)	Sieve Analysis Sample	USCS Code	Geologic Column	Stratigraphic Description	Well/Boring Construction
40	10			0.5/0.0					
		RW-111-42			X	SW			
45	5			0.0/0.0				-as above, increasing cobbles. -as above, some fine gravel, soft, dark yellowish brown (10YR 3/4).	
		RW-111-47			X				
50	0			0.0/0.0		GW		WELL GRADED GRAVEL WITH SAND (GW), fine to coarse grained sand, subrounded, moderate dilatancy, fine to coarse subrounded to subangular gravel, some subrounded cobbles (up to 3-4" dia.), trace to some non-plastic silt, very poorly sorted, wet, loose, mottled gray to brown coloring.	Borehole backfilled with Bentonite Grout / Chips
55	-5	RW-111-55			X			No recovery from 55' to 60' bgs.	

Remarks: ft bgs = feet below ground surface; NA = Not Applicable/Available; MSL = Mean Sea Level; ATD = At Time of Drilling

Drilled approximately 7 ft east of well RW-111.

Material Used: 52 cubic feet of Bentonite Grout / Chips. Surface capped with cold asphalt.

Water Level Data

Date	Depth	Elev.
4/19/11	13-17' ATD	NA

Depth measured from top of casing

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Client: Kinder Morgan Energy Partners

Well/Boring ID: RW-111P (Pilot Boring)

Borehole Depth: 65' bgs

Site Location:
Mission Valley Terminal - Qualcomm Stadium
9950 San Diego Mission Rd
San Diego, CA 92108

DEPTH	ELEVATION	Sample ID	Recovery (feet)	PID/FID (ppm)	Sieve Analysis Sample	USCS Code	Geologic Column	Stratigraphic Description	Well/Boring Construction
	-10							No recovery from 55' to 60' bgs.	Borehole backfilled with Bentonite Grout / Chips
60				0.0/0.0		SS		FRIARS SANDSTONE (SS), partially cemented siltstone to sandstone, weathered gray.	
	-15								
65									
	-20								
70									
	-25								
75									

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Remarks: ft bgs = feet below ground surface; NA = Not Applicable/Available; MSL = Mean Sea Level; ATD = At Time of Drilling

Drilled approximately 7 ft east of well RW-111.

Material Used: 52 cubic feet of Bentonite Grout / Chips. Surface capped with cold asphalt.

Water Level Data

Date	Depth	Elev.
4/19/11	13-17' ATD	NA

Depth measured from top of casing

Project: CM010143.0091
Data File:RW-111P.dat
Template:G:\Rockware\LogPlot 2001\LogFiles\Templates\boring_well geoprobe 2007 analytical USCS WL.ldfx
Date:8/4/2011 Created/Edited by:SCO

Date Start/Finish: 5/25/11
Drilling Company: Cascade Drilling
Driller's Name: Val Godoy
Drilling Method: Rotary Sonic
Sampling Method: 10' x 6" Dia. Sonic Core Barrell
Rig Type: Sonic Drill

Northing: 1865175.32
Easting: 6293426.34
Casing Elevation: NA

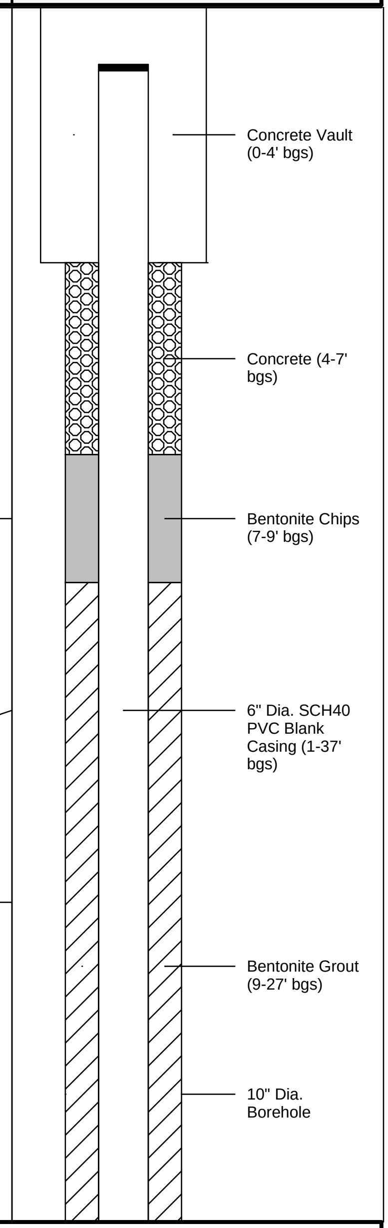
Borehole Depth: 57.5' bgs
Borehole Diameter: 10"
Surface Elevation: 49.73' MSL
Descriptions By: James Gonzales

Well/Boring ID: RW-111 (GWE Well)
Client: Kinder Morgan Energy Partners
Location: Mission Valley Terminal - Qualcomm Stadium
9950 San Diego Mission Rd
San Diego, CA 92108

Reviewed By: Steven C Beadle PG 6129

DEPTH	ELEVATION	Sample ID	Recovery (feet)	PID/FID (ppm)	Sieve Analysis Sample	USCS Code	Geologic Column	Stratigraphic Description
0						GM		Air knife to 5' bgs on 4/14/11. Soil logged from air knife cuttings. Asphalt at surface. SILTY GRAVEL (GM), low to medium plastic silt, no dilatancy, subrounded to subangular fine to coarse gravel, some subrounded to subangular cobbles (up to 3-4" dia.), poorly sorted, moist, dense, mottled gray to brown coloring.
5	45							-as above, moist.
								-as above, dark yellowish brown (10YR 4/4).
						GW		WELL GRADED GRAVEL WITH SAND (GW), fine to coarse grained sand, subrounded, moderate dilatancy, fine to coarse subangular gravel, some silt, trace subrounded cobbles, poorly sorted, wet, very dark brown (10YR 2/2).
10	40							-as above, moist.
						SP		POORLY GRADED SAND (SP), fine to medium grained sand, subrounded, moderate dilatancy, some coarse subrounded sand, some non-plastic silt, moderately sorted, very dark brown (10YR 2/2), micaceous.
15	35					SW		WELL GRADED SAND (SW), fine to coarse grained sand, subrounded, rapid dilatancy, trace subrounded fine to coarse gravel, trace silt, moderately sorted, wet, loose, soft, dark yellowish brown (10YR 3/4).
								-as above, increasing silt content.

Well/Boring Construction



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Remarks: ft bgs = feet below ground surface; NA = Not Applicable/Available; MSL = Mean Sea Level

Drilled approximately 7 ft west of pilot boring RW-111P. Lithology determined from pilot boring RW-111P. Actual Friars Sandstone contact determined from well RW-111.

Material Used: 18 cubic ft of #8 Sand, 18 cubic ft of Bentonite Grout/Chips, 2 cubic ft of Concrete Seal.

Client: Kinder Morgan Energy Partners

Well/Boring ID: **RW-111 (GWE Well)**

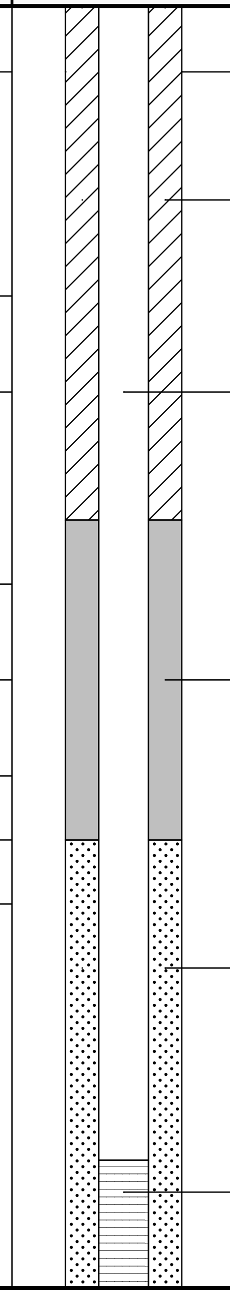
Borehole Depth: 57.5' bgs

Site Location:
Mission Valley Terminal - Qualcomm Stadium
9950 San Diego Mission Rd
San Diego, CA 92108

DEPTH: 20, 25, 30, 35
ELEVATION: 30, 25, 20, 15

Sample ID	Recovery (feet)	PID/FID (ppm)	Sieve Analysis Sample	USCS Code	Stratigraphic Description
				SW	
				SM	SILTY SAND (SM), fine to medium subrounded sand, slow to moderate dilatancy, non-plastic silt, moderately sorted, wet, medium dense, medium loose, very dark brown (10YR 2/2).
				SP	POORLY GRADED SAND (SP), fine to medium grained sand, subrounded, moderate dilatancy, some non-plastic silt, moderately to well sorted, wet, low density, loose, very dark brown (10YR 2/2).
				SM	SILTY SAND (SM), fine to medium subrounded sand, slow to moderate dilatancy, non-plastic silt, moderately sorted, wet, medium dense, very dark brown (10YR 2/2), micaceous.
				SP	POORLY GRADED SAND (SP), fine to medium grained sand, subrounded, moderate dilatancy, trace coarse sand, some non-plastic silt, moderately to well sorted, loose, soft, dark brown (10YR 3/3).
				SM	SILTY SAND (SM), fine to medium subrounded sand, slow to moderate dilatancy, non-plastic silt, moderately sorted, dark brown.
				SW	WELL GRADED SAND (SW), fine to coarse grained sand, subrounded, rapid dilatancy, some fine to coarse subrounded gravel, trace silt, dark brown.
				SM	SILTY SAND (SM), non-plastic silt and fine sand, no dilatancy, well sorted, wet, dense, very dark brown (10YR 2/2).
				SW	WELL GRADED SAND (SW), fine to coarse grained sand, subrounded, rapid dilatancy, some fine to coarse subrounded to subangular gravel, trace subrounded cobbles (up to 2-3" dia.), wet, loose, dark yellowish brown (10YR 3/4), micaceous.

Well/Boring Construction



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Remarks: ft bgs = feet below ground surface; NA = Not Applicable/Available; MSL = Mean Sea Level

Drilled approximately 7 ft west of pilot boring RW-111P. Lithology determined from pilot boring RW-111P. Actual Friars Sandstone contact determined from well RW-111.

Material Used: 18 cubic ft of #8 Sand, 18 cubic ft of Bentonite Grout/Chips, 2 cubic ft of Concrete Seal.

Client: Kinder Morgan Energy Partners

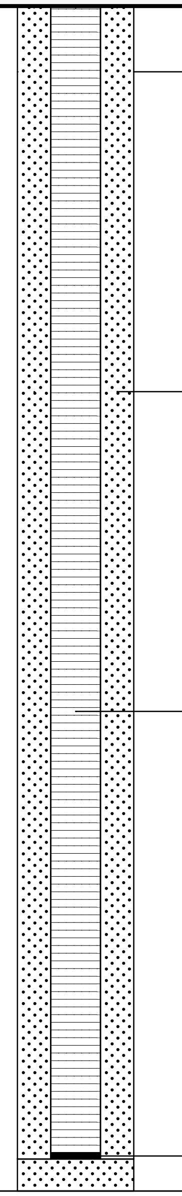
Well/Boring ID: **RW-111 (GWE Well)**

Borehole Depth: 57.5' bgs

Site Location:
Mission Valley Terminal - Qualcomm Stadium
9950 San Diego Mission Rd
San Diego, CA 92108

DEPTH	ELEVATION	Sample ID	Recovery (feet)	PID/FID (ppm)	Sieve Analysis Sample	USCS Code	Geologic Column	Stratigraphic Description
40	10					SW		-as above, increasing cobbles.
45	5							-as above, some fine gravel, soft, dark yellowish brown (10YR 3/4).
50	0					GW		WELL GRADED GRAVEL WITH SAND (GW), fine to coarse grained sand, subrounded, moderate dilatancy, fine to coarse subrounded to subangular gravel, some subrounded cobbles (up to 3-4" dia.), trace to some non-plastic silt, very poorly sorted, wet, loose, mottled gray to brown coloring.
55	-5							No recovery from 55' to 57' bgs.
						SS		FRIARS SANDSTONE (SS), weathered, gray.

Well/Boring Construction



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Remarks: ft bgs = feet below ground surface; NA = Not Applicable/Available; MSL = Mean Sea Level

Drilled approximately 7 ft west of pilot boring RW-111P. Lithology determined from pilot boring RW-111P. Actual Friars Sandstone contact determined from well RW-111.

Material Used: 18 cubic ft of #8 Sand, 18 cubic ft of Bentonite Grout/Chips, 2 cubic ft of Concrete Seal.

Date Start/Finish: 4/18/11 **Drilling Company:** Cascade Drilling **Driller's Name:** Val Godoy **Drilling Method:** Rotary Sonic **Sampling Method:** 10' x 6" Dia. Sonic Core Barrell **Rig Type:** Sonic Drill	**Northing:** 1864912.57 **Easting:** 6293271.05 **Casing Elevation:** NA **Borehole Depth:** 60' bgs **Borehole Diameter:** 8.5" **Surface Elevation:** 45.35' MSL **Descriptions By:** James Gonzales	**Well/Boring ID: RW-112P (Pilot Boring)** **Client:** Kinder Morgan Energy Partners **Location:** Mission Valley Terminal - Qualcomm Stadium 9950 San Diego Mission Rd San Diego, CA 92108 **Reviewed By:** Steve C Beadle PG 6129

DEPTH	ELEVATION	Sample ID	Recovery (feet)	PID/FID (ppm)	Sieve Analysis Sample	USCS Code	Geologic Column	Stratigraphic Description	Well/Boring Construction
0	45					GW		Air knife to 5' bgs on 4/15/11. Soil logged from air knife cuttings. Asphalt at surface. WELL GRADED GRAVEL WITH SAND (GW), fine to medium grained sand, trace coarse grained sand, fine to coarse gravel and cobbles (up to 2-3" dia.).	
5	40			0.5/0.0		SP		POORLY GRADED SAND (SP), mostly fine to medium grained sand, subrounded, moderate to rapid dilatancy, trace fine gravel, trace silt, moist, very dark grayish brown (2.5Y 3/2). -as above, rapid dilatancy, trace coarse grained sand, subrounded, trace silt, no plasticity, loose, soft, very dark grayish brown (10YR 3/3).	Borehole backfilled with Bentonite Grout / Chips
10	35			0.9/0.0		SW		WELL GRADED SAND (SW), fine to coarse grained sand, subrounded to subangular, moderate to rapid dilatancy, trace non-plastic silt, trace subrounded to subangular fine to coarse gravel, trace subrounded cobbles (up to 2-3" dia.), wet, loose, soft, very dark brown (10YR 2/2).	
15	30			0.0/0.0				-as above, increasing gravel and cobbles, none to very trace fine sand matrix, rapid dilatancy.	

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Remarks: ft bgs = feet below ground surface; NA = Not Applicable/Available; MSL = Mean Sea Level; ATD = At Time of Drilling

Drilled approximately 120 ft NW of well RW-112.

Material Used: 48 cubic feet of Bentonite Grout / Chips. Surface capped with cold asphalt.

Water Level Data

Date	Depth	Elev.
4/18/11	9-12' ATD	NA

Depth measured from top of casing

Client: Kinder Morgan Energy Partners

Well/Boring ID: **RW-112P (Pilot Boring)**

Borehole Depth: 60' bgs

Site Location:
Mission Valley Terminal - Qualcomm Stadium
9950 San Diego Mission Rd
San Diego, CA 92108

DEPTH	ELEVATION	Sample ID	Recovery (feet)	PID/FID (ppm)	Sieve Analysis Sample	USCS Code	Stratigraphic Description	Well/Boring Construction
20	25			0.2/0.0		SW	WELL GRADED SAND (SW), mostly fine to coarse grained sand, subrounded to subangular, moderate to rapid dilatancy, trace non-plastic silt, non-cohesive, wet, loose, soft, very dark gray (10YR 3/1), micaceous.	
25	20	RW-112-26		0.0/0.0	X	ML	SILT (ML), mostly low plastic silt, no dilatancy, some fine subrounded sand, trace medium and coarse sand, moist to wet, black (10YR 2/1).	
						SW	WELL GRADED SAND (SW), fine to coarse grained sand, subrounded, with trace gravel.	Borehole backfilled with Bentonite Grout / Chips
						ML	SILT (ML) as above.	
30	15			0.0/0.0		SW	WELL GRADED SAND (SW), mostly fine to coarse grained sand, subrounded, rapid dilatancy, no plasticity, some subrounded fine to coarse gravel and cobbles, dark brown (10YR 3/3).	
		RW-112-34			X	SP	POORLY GRADED SAND (SP), mostly fine to medium grained sand, subrounded, moderate dilatancy, some non-plastic silt, trace coarse grained sand, wet, medium dense, loose, dark brown (10YR 3/3).	
35	10			0.0/0.0		SW	WELL GRADED SAND (SW), mostly fine to coarse grained sand, subrounded, rapid dilatancy, some fine to coarse subrounded gravel, trace subounded cobbles, wet, loose, soft, dark brown (10YR 3/3).	
		RW-112-38			X	ML	SILT (ML), medium plastic silt, no dilatancy, firm, dense, stiff, dark brown.	
						SW	WELL GRADED SAND (SW), fine to coarse subrounded sand, rapid dilatancy,	

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Remarks: ft bgs = feet below ground surface; NA = Not Applicable/Available; MSL = Mean Sea Level; ATD = At Time of Drilling

Drilled approximately 120 ft NW of well RW-112.

Material Used: 48 cubic feet of Bentonite Grout / Chips. Surface capped with cold asphalt.

Water Level Data

Date	Depth	Elev.
4/18/11	9-12' ATD	NA

Depth measured from top of casing

Client: Kinder Morgan Energy Partners

Well/Boring ID: **RW-112P (Pilot Boring)**

Borehole Depth: 60' bgs

Site Location:
Mission Valley Terminal - Qualcomm Stadium
9950 San Diego Mission Rd
San Diego, CA 92108

DEPTH	ELEVATION	Sample ID	Recovery (feet)	PID/FID (ppm)	Sieve Analysis Sample	USCS Code	Geologic Column	Stratigraphic Description	Well/Boring Construction
						SW		some cobbles (up to ~4" dia.), loose, soft, dark brown (10YR 3/3).	
40	5			0.0/0.0				-as above, moderate to rapid dilatancy, trace non-plastic silt, trace subangular fine gravel, wet.	
		RW-112-43			X				
45	0			0.0/0.0		GW		WELL GRADED GRAVEL WITH SAND (GW), fine to coarse grained sand, subrounded, rapid dilatancy, fine to coarse subrounded gravel, trace cobbles (up to 2" dia.), loose, soft, dark brown (10YR 3/3).	
		RW-112-48			X			-as above, increasing cobbles (up to 3" dia.).	
								-as above, increasing cobbles (up to 4" dia.).	Borehole backfilled with Bentonite Grout / Chips
50	-5					SS		FRIARS SANDSTONE (SS), weathered, partially cemented silt and sand, wet, dense, gray (10YR 5/1).	
55	-10								

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Remarks: ft bgs = feet below ground surface; NA = Not Applicable/Available; MSL = Mean Sea Level; ATD = At Time of Drilling

Drilled approximately 120 ft NW of well RW-112.

Material Used: 48 cubic feet of Bentonite Grout / Chips. Surface capped with cold asphalt.

Water Level Data

Date	Depth	Elev.
4/18/11	9-12' ATD	NA

Depth measured from top of casing

Client: Kinder Morgan Energy Partners

Well/Boring ID: RW-112P (Pilot Boring)

Borehole Depth: 60' bgs

Site Location:
Mission Valley Terminal - Qualcomm Stadium
9950 San Diego Mission Rd
San Diego, CA 92108

DEPTH	ELEVATION	Sample ID	Recovery (feet)	PID/FID (ppm)	Sieve Analysis Sample	USCS Code	Geologic Column	Stratigraphic Description	Well/Boring Construction
						SS		FRIARS SANDSTONE (SS), weathered, partially cemented silt and sand, wet, dense, gray (10YR 5/1).	
60	-15								
65	-20								
70	-25								
75	-30								

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Remarks: ft bgs = feet below ground surface; NA = Not Applicable/Available; MSL = Mean Sea Level; ATD = At Time of Drilling

Drilled approximately 120 ft NW of well RW-112.

Material Used: 48 cubic feet of Bentonite Grout / Chips. Surface capped with cold asphalt.

Water Level Data

Date	Depth	Elev.
4/18/11	9-12' ATD	NA

Depth measured from top of casing

Date Start/Finish: 5/31/11 - 6/1/11
Drilling Company: Cascade Drilling
Driller's Name: Val Godoy
Drilling Method: Rotary Sonic
Sampling Method: 10' x 6" Dia. Sonic Core Barrell
Rig Type: Sonic Drill

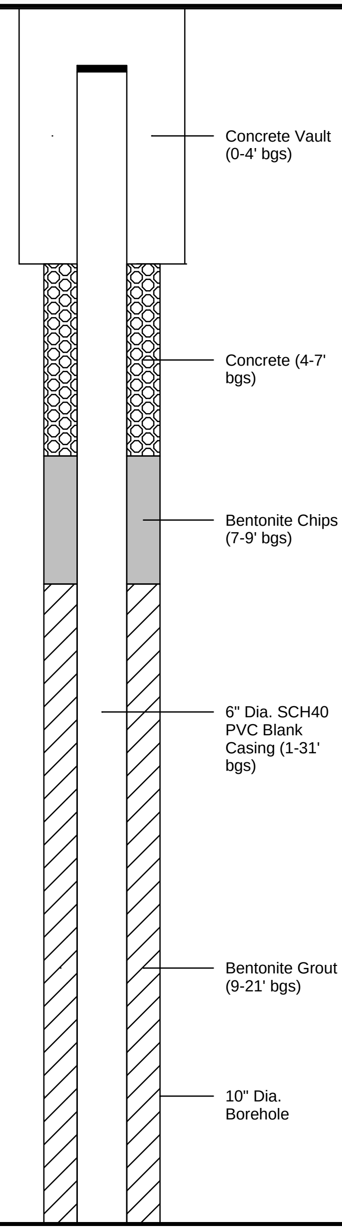
Northing: 1864806.32
Easting: 6293321.53
Casing Elevation: NA

Borehole Depth: 53' bgs
Borehole Diameter: 10"
Surface Elevation: 44.79' MSL
Descriptions By: James Gonzales

Well/Boring ID: **RW-112 (GWE Well)**
Client: Kinder Morgan Energy Partners
Location: Mission Valley Terminal - Qualcomm Stadium
9950 San Diego Mission Rd
San Diego, CA 92108

Reviewed By: Steven C Beadle PG 6129

DEPTH	ELEVATION	Sample ID	Recovery (feet)	PID/FID (ppm)	Sieve Analysis Sample	USCS Code	Geologic Column	Stratigraphic Description	Well/Boring Construction
0						GW		Air knife to 5' bgs on 4/15/11. Soil logged from air knife cuttings. Asphalt at surface. WELL GRADED GRAVEL WITH SAND (GW), fine to medium grained sand, trace coarse grained sand, some fine to coarse gravel and cobbles (up to 2-3" dia.).	
5	40					SP		POORLY GRADED SAND (SP), mostly fine to medium grained sand, subrounded, moderate to rapid dilatancy, trace fine gravel, trace silt, moist, very dark grayish brown (2.5Y 3/2). -as above, rapid dilatancy, trace coarse grained sand, subrounded, trace silt, no plasticity, loose, soft, very dark grayish brown (10YR 3/3).	
10	35					SW		WELL GRADED SAND (SW), fine to coarse grained sand, subrounded to subangular, moderate to rapid dilatancy, trace non-plastic silt, trace subrounded to subangular fine to coarse gravel, trace subrounded cobbles (up to 2-3" dia.), wet, loose, soft, very dark brown (10YR 2/2).	
15	30							-as above, increasing gravel and cobbles, none to very trace fine sand matrix, rapid dilatancy.	



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Remarks: ft bgs = feet below ground surface; NA = Not Applicable/Available; MSL = Mean Sea Level

Drilled approximately 120 ft SE of pilot boring RW-112P. Lithology determined from pilot boring RW-112P. Actual Friars Sandstone contact determined from well RW-112.

Material Used: 20 cubic ft of #8 Sand, 13 cubic ft of Bentonite Grout/Chips, 2 cubic ft of Concrete Seal.

Client: Kinder Morgan Energy Partners

Well/Boring ID: **RW-112 (GWE Well)**

Site Location:
Mission Valley Terminal - Qualcomm Stadium
9950 San Diego Mission Rd
San Diego, CA 92108

Borehole Depth: 53' bgs

DEPTH	ELEVATION	Sample ID	Recovery (feet)	PID/FID (ppm)	Sieve Analysis Sample	USCS Code	Geologic Column	Stratigraphic Description	Well/Boring Construction
20	25					SW		WELL GRADED SAND (SW), mostly fine to coarse grained sand, subrounded to subangular, moderate to rapid dilatancy, trace non-plastic silt, non-cohesive, wet, loose, soft, very dark gray (10YR 3/1), micaceous.	Bentonite Grout (9-21' bgs); Bentonite Chips (21-26' bgs)
25	20					ML		SILT (ML), mostly low plastic silt, no dilatancy, some fine subrounded sand, trace medium and coarse sand, moist to wet, black (10YR 2/1).	6" Dia. SCH40 PVC Blank Casing (1-31' bgs)
						SW		WELL GRADED SAND (SW), fine to coarse grained sand, subrounded, with trace gravel.	
						ML		SILT (ML) as above.	
30	15					SW		WELL GRADED SAND (SW), mostly fine to coarse grained sand, subrounded, rapid dilatancy, no plasticity, some subrounded fine to coarse gravel and cobbles, dark brown (10YR 3/3).	#8 Mesh Sand (26-53' bgs)
						SP		POORLY GRADED SAND (SP), mostly fine to medium grained sand, subrounded, moderate dilatancy, some non-plastic silt, trace coarse grained sand, wet, medium dense, loose, dark brown (10YR 3/3).	
35	10					SW		WELL GRADED SAND (SW), mostly fine to coarse grained sand, subrounded, rapid dilatancy, some fine to coarse subrounded gravel, trace subounded cobbles, wet, loose, soft, dark brown (10YR 3/3).	6" Dia. SS Wire-wrapped Well Screen 0.040" Slot (31-51' bgs)
						ML		SILT (ML), medium plastic silt, no dilatancy, firm, dense, stiff, dark brown.	10" Dia. Borehole
						SW		WELL GRADED SAND (SW), fine to coarse subrounded sand, rapid dilatancy,	

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Remarks: ft bgs = feet below ground surface; NA = Not Applicable/Available; MSL = Mean Sea Level

Drilled approximately 120 ft SE of pilot boring RW-112P. Lithology determined from pilot boring RW-112P. Actual Friars Sandstone contact determined from well RW-112.

Material Used: 20 cubic ft of #8 Sand, 13 cubic ft of Bentonite Grout/Chips, 2 cubic ft of Concrete Seal.

Client: Kinder Morgan Energy Partners

Well/Boring ID: RW-112 (GWE Well)

Site Location:
Mission Valley Terminal - Qualcomm Stadium
9950 San Diego Mission Rd
San Diego, CA 92108

Borehole Depth: 53' bgs

DEPTH	ELEVATION	Sample ID	Recovery (feet)	PID/FID (ppm)	Sieve Analysis Sample	USCS Code	Geologic Column	Stratigraphic Description	Well/Boring Construction
40	5					SW		some cobbles (up to ~4" dia.), loose, soft, dark brown (10YR 3/3). -as above, moderate to rapid dilatancy, trace non-plastic silt, trace subangular fine gravel, wet.	10" Dia. Borehole
45	0					GW		WELL GRADED GRAVEL WITH SAND (GW), fine to coarse grained sand, subrounded, rapid dilatancy, fine to coarse subrounded gravel, trace cobbles (up to 2" dia.), loose, soft, dark brown (10YR 3/3). -as above, increasing cobbles (up to 3" dia.). -as above, increasing cobbles (up to 4" dia.).	#8 Mesh Sand (26-53' bgs) 6" Dia. SS Wire-wrapped Well Screen 0.040" Slot (31-51' bgs)
50	-5					SS		FRIARS SANDSTONE (SS), weathered, partially cemented silt and sand, wet, dense, gray (10YR 5/1).	Integrated Bottom Cap
55	-10								

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Remarks: ft bgs = feet below ground surface; NA = Not Applicable/Available; MSL = Mean Sea Level

Drilled approximately 120 ft SE of pilot boring RW-112P. Lithology determined from pilot boring RW-112P. Actual Friars Sandstone contact determined from well RW-112.

Material Used: 20 cubic ft of #8 Sand, 13 cubic ft of Bentonite Grout/Chips, 2 cubic ft of Concrete Seal.

APPENDIX B
CURRENT EXPLORATION RECORDS

APPENDIX B

CURRENT EXPLORATION RECORDS

Field exploration included a visual reconnaissance of the site, the drilling of 32 exploratory borings, and the advancement of 10 cone penetration tests (CPTs). The borings were drilled between February 11 and March 16, 2019 and the CPTs were advanced on March 18 and April 8, 2019. The maximum depth of exploration was about 101½ feet below surrounding grades. The approximate exploration locations are shown in Plate 1. Logs of the explorations are provided in Figures B-01 through B-42, immediately after the Boring Record Legends.

The exploratory borings were advanced by Pacific Drilling and Tri-County Drilling using several truck mounted drill rigs. Disturbed samples were collected from the borings using a 2-inch outside diameter unlined Standard Penetration Test (SPT) sampler. Less disturbed samples were collected using a 3-inch outside diameter ring lined sampler (a modified California sampler). Bulk samples were also collected. The samples were sealed in plastic bags, labeled, and returned to the laboratory for testing. A summary of the exploratory boring locations, elevations and depths is shown on the following page.

The drive samples were collected from the exploratory borings using several different automatic hammers with average Energy Transfer Ratios (ETR) ranging from approximately 79 to 89 percent. For each sample, the 6-inch incremental blow counts was recorded on the logs. The field blow counts (N) were normalized to approximate the standard 60 percent ETR, as shown on the logs (N_{60}). The California ring samples were also corrected for the 3-inch sampler diameter using Burmister's correction factor. Blowcounts that were influenced by flowing/heaving sands, gravel and cobbles are noted on the logs with a caret (^) as being inaccurate. Where sampler refusal was encountered (i.e., unable to drive the sampler more than the first six inches with 50 hammer blows), the blowcount is denoted as "REF".

The exploratory borings were logged using the Caltrans Soil and Rock Logging, Classification and Presentation Manual (2010) as a guideline. The Friars Formation materials are described in general accordance with Section 2.6.1.3 (i.e., Description of Poorly Indurated Rock) of the Caltrans Manual (2010).

The CPT soundings were advanced by Kehoe Testing and Engineering in general accordance with ASTM D5778. The CPT soundings were carried out by KTE using an integrated electronic cone system manufactured by Vertek. The CPTs were advanced using a 30-ton CPT rig. The cone used during the program was a 15 cm^2 cone and recorded the following parameters at approximately 2.5 cm depth intervals:

- Cone Resistance (q_c)
- Sleeve Friction (f_s)
- Dynamic Pore Pressure (u)
- Inclination
- Penetration Speed

APPENDIX B

CURRENT EXPLORATION RECORDS (Continued)

CPT-2 and CPT-26 initially encountered refusal at depths of about 25 feet due to gravel and cobbles causing resistance to further advancement and flexure of the CPT rods. CPT-2 and CPT-26 were reattempted by locating a second CPT location a few feet away from the original location, which was able to be advanced to a depth of about 45 and 40 feet, respectively, where refusal on gravel and cobbles was encountered. SCPT-7 and CPT-11 both encountered relatively shallow refusal on gravel and cobbles at about 17 feet.

At locations SCPT-5, SCPT-7 and SCPT-13, shear wave velocity measurements were obtained at various depths. The shear wave was generated using an air-actuated hammer located inside the front jack of the CPT rig. The cone was equipped with a triaxial geophone, which recorded the shear wave signal generated by the air hammer. The above parameters were recorded and viewed in real time using a laptop computer. A summary of the collected shear wave measurements is presented in Figure B-42. Note: SCPT-13 was intentionally advanced through the previously grouted borehole of boring S-13 to obtain shear wave velocity measurements. Therefore, the CPT parameters (q_c, f_s and u) are not representative of the actual soil conditions at that location and are not presented in this report.

Note: the exploration locations were measured in the field using a Garmin GPSMAP 64st Global Positioning System (GPS) receiver and by visually estimating, pacing or taping distances from nearby landmarks, if available. The exploration elevations were estimated by interpolation using the referenced plans provided by Rick Engineering (see Plate 1). The locations and elevations provided should not be considered more accurate than is implied by the scale of the map and the accuracy of the equipment used to locate the explorations. The lines designating the interface between differing soil materials on the logs may be abrupt or gradational. Further, soil conditions at locations between the explorations may be substantially different from those at the specific locations we explored. The Boring Records are part of a geotechnical report which must be considered in its entirety.

Exploratory Borings Summary (see Plate 1)

Exploration ID	Latitude [°]	Longitude [°]	Top Elevation NAVD 88 [FT]	Exploration Depth [FT]	Bottom Elevation NAVD 88 [FT]	Figure No.
S-1	32.78583	-117.12281	83	60	23	B-1
S-2	32.78575	-117.12112	66	61	5	B-2
S-3	32.78518	-117.12293	74	46.5	28	B-3
S-4	32.78519	-117.12216	68	40.5	28	B-4
S-5	32.78506	-117.12130	63	61	2	B-5
S-6	32.78473	-117.12305	69	41.5	28	B-6
S-7	32.78427	-117.12239	57	100.9	-44	B-7

Exploratory Borings Summary (see Plate 1)						
Exploration ID	Latitude [°]	Longitude [°]	Top Elevation NAVD 88 [FT]	Exploration Depth [FT]	Bottom Elevation NAVD 88 [FT]	Figure No.
S-8	32.78454	-117.12129	69	75.5	-7	B-8
S-9	32.78409	-117.12310	59	36.5	23	B-9
S-10	32.78382	-117.12202	66	71.3	-5	B-10
S-11	32.78364	-117.12323	54	36.5	18	B-11
S-12	32.78345	-117.12271	58	41.5	17	B-12
S-13	32.78324	-117.12156	75	101.5	-27	B-13
B-14	32.78253	-117.12331	51	31.5	20	B-14
B-15	32.78151	-117.12375	51	36.3	15	B-15
B-16	32.78221	-117.12111	78	85	-7	B-16
B-17	32.78121	-117.12114	64	71.5	-8	B-17
B-18	32.77992	-117.12352	48	20	28	B-18
B-19	32.78029	-117.12116	54	4.4	49	B-19
B-20	32.78179	-117.11850	77	61.5	16	B-20
B-21	32.78185	-117.11713	62	45.9	16	B-21
B-22	32.78194	-117.11562	54	21.5	33	B-22
B-23	32.78312	-117.11643	58	70.4	-12	B-23
B-24	32.78387	-117.11760	73	66.5	7	B-24
B-25	32.78390	-117.11527	58	20	38	B-25
B-26	32.78445	-117.11655	57	51.5	6	B-26
B-27	32.78509	-117.11973	72	70.6	1	B-27
B-28	32.78525	-117.11775	61	60.8	0	B-28
B-29	32.78489	-117.11558	58	4.8	53	B-29
B-30	32.78575	-117.11598	58	55.8	2	B-30
B-31	32.78635	-117.11838	66	65.9	0	B-31
B-32	32.78253	-117.11610	54	5	49	B-32

Exploratory Cone Penetration Test Soundings Summary (see Plate 1)						
Exploration ID	Latitude	Longitude	Top Elevation NAVD 88 [FT]	Exploration Depth [FT]	Bottom Elevation NAVD 88 [FT]	Figure No.
CPT-2	32.78570	-117.12109	67	45.5	21	B-33
SCPT-5	32.78504	-117.12129	63	57.4	6	B-34
SCPT-7	32.78428	-117.12239	57	17.5	40	B-35
CPT-11	32.78365	-117.12322	54	17.5	36	B-36
SCPT-13	32.78324	-117.12156	75	66.8	8	--
CPT-21	32.78186	-117.11714	61	35.2	26	B-37
CPT-26	32.78448	-117.11658	57	39.8	17	B-38
CPT-28	32.78526	-117.11774	61	45.0	16	B-39
CPT-30	32.78567	-117.11602	58	42.8	15	B-40
CPT-31	32.78633	-117.11839	66	43.0	23	B-41

SOIL IDENTIFICATION AND DESCRIPTION SEQUENCE

Sequence	Identification Components	Refer to Section: Field	Refer to Section: Lab	Required	Optional
1	Group Name	2.5.2	3.2.2	●	
2	Group Symbol	2.5.2	3.2.2	●	
	Description Components				
3	Consistency of Cohesive Soil	2.5.3	3.2.3	●	
4	Apparent Density of Cohesionless Soil	2.5.4		●	
5	Color	2.5.5		●	
6	Moisture	2.5.6		●	
7	Percent or Proportion of Soil	2.5.7	3.2.4	●	◉
	Particle Size	2.5.8	2.5.8	●	◉
	Particle Angularity	2.5.9			○
	Particle Shape	2.5.10			○
8	Plasticity (for fine-grained soil)	2.5.11	3.2.5		○
9	Dry Strength (for fine-grained soil)	2.5.12			○
10	Dilatency (for fine-grained soil)	2.5.13			○
11	Toughness (for fine-grained soil)	2.5.14			○
12	Structure	2.5.15			○
13	Cementation	2.5.16		●	
14	Percent of Cobbles and Boulders	2.5.17		●	
	Description of Cobbles and Boulders	2.5.18		●	
15	Consistency Field Test Result	2.5.3		●	
16	Additional Comments	2.5.19			○

Describe the soil using descriptive terms in the order shown

Minimum Required Sequence:

USCS Group Name (Group Symbol); Consistency or Density; Color; Moisture; Percent or Proportion of Soil; Particle Size; Plasticity (optional).

◉ = optional for non-Caltrans projects

Where applicable:

Cementation; % cobbles & boulders; Description of cobbles & boulders; Consistency field test result

REFERENCE: Caltrans Soil and Rock Logging, Classification, and Presentation Manual (2010).

HOLE IDENTIFICATION

Holes are identified using the following convention:

H – YY – NNN

Where:

H: Hole Type Code

YY: 2-digit year

NNN: 3-digit number (001-999)

Hole Type Code and Description

Hole Type Code	Description
A	Auger boring (hollow or solid stem, bucket)
R	Rotary drilled boring (conventional)
RC	Rotary core (self-cased wire-line, continuously-sampled)
RW	Rotary core (self-cased wire-line, not continuously sampled)
P	Rotary percussion boring (Air)
HD	Hand driven (1-inch soil tube)
HA	Hand auger
D	Driven (dynamic cone penetrometer)
CPT	Cone Penetration Test
O	Other (note on LOTB)

Description Sequence Examples:

SANDY lean CLAY (CL); very stiff; yellowish brown; moist; mostly fines; some SAND, from fine to medium; few gravels; medium plasticity; PP=2.75.

Well-graded SAND with SILT and GRAVEL and COBBLES (SW-SM); dense; brown; moist; mostly SAND, from fine to coarse; some fine GRAVEL; few fines; weak cementation; 10% GRANITE COBBLES; 3 to 6 inches; hard; subrounded.

Clayey SAND (SC); medium dense, light brown; wet; mostly fine sand,; little fines; low plasticity.

GROUP DELTA

Project No. SD605

SDSU Mission Valley
Site Development

BORING RECORD LEGEND #1

GROUP SYMBOLS AND NAMES

Graphic / Symbol	Group Names	Graphic / Symbol	Group Names
GW	Well-graded GRAVEL Well-graded GRAVEL with SAND	CL	Lean CLAY Lean CLAY with SAND Lean CLAY with GRAVEL SANDY lean CLAY SANDY lean CLAY with GRAVEL GRAVELLY lean CLAY GRAVELLY lean CLAY with SAND
GP	Poorly graded GRAVEL Poorly graded GRAVEL with SAND		
GW-GM	Well-graded GRAVEL with SILT Well-graded GRAVEL with SILT and SAND	CL-ML	SILTY CLAY SILTY CLAY with SAND SILTY CLAY with GRAVEL SANDY SILTY CLAY SANDY SILTY CLAY with GRAVEL GRAVELLY SILTY CLAY GRAVELLY SILTY CLAY with SAND
GW-GC	Well-graded GRAVEL with CLAY (or SILTY CLAY) Well-graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)		
GP-GM	Poorly graded GRAVEL with SILT Poorly graded GRAVEL with SILT and SAND	ML	SILT SILT with SAND SILT with GRAVEL SANDY SILT SANDY SILT with GRAVEL GRAVELLY SILT GRAVELLY SILT with SAND
GP-GC	Poorly graded GRAVEL with CLAY (or SILTY CLAY) Poorly graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)		
GM	SILTY GRAVEL SILTY GRAVEL with SAND	OL	ORGANIC lean CLAY ORGANIC lean CLAY with SAND ORGANIC lean CLAY with GRAVEL SANDY ORGANIC lean CLAY SANDY ORGANIC lean CLAY with GRAVEL GRAVELLY ORGANIC lean CLAY GRAVELLY ORGANIC lean CLAY with SAND
GC	CLAYEY GRAVEL CLAYEY GRAVEL with SAND		
GC-GM	SILTY, CLAYEY GRAVEL SILTY, CLAYEY GRAVEL with SAND	OL	ORGANIC SILT ORGANIC SILT with SAND ORGANIC SILT with GRAVEL SANDY ORGANIC SILT SANDY ORGANIC SILT with GRAVEL GRAVELLY ORGANIC SILT GRAVELLY ORGANIC SILT with SAND
SW	Well-graded SAND Well-graded SAND with GRAVEL		
SP	Poorly graded SAND Poorly graded SAND with GRAVEL	CH	Fat CLAY Fat CLAY with SAND Fat CLAY with GRAVEL SANDY fat CLAY SANDY fat CLAY with GRAVEL GRAVELLY fat CLAY GRAVELLY fat CLAY with SAND
SW-SM	Well-graded SAND with SILT Well-graded SAND with SILT and GRAVEL		
SW-SC	Well-graded SAND with CLAY (or SILTY CLAY) Well-graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL)	MH	Elastic SILT Elastic SILT with SAND Elastic SILT with GRAVEL SANDY elastic SILT SANDY elastic SILT with GRAVEL GRAVELLY elastic SILT GRAVELLY elastic SILT with SAND
SP-SM	Poorly graded SAND with SILT Poorly graded SAND with SILT and GRAVEL		
SP-SC	Poorly graded SAND with CLAY (or SILTY CLAY) Poorly graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL)	OH	ORGANIC fat CLAY ORGANIC fat CLAY with SAND ORGANIC fat CLAY with GRAVEL SANDY ORGANIC fat CLAY SANDY ORGANIC fat CLAY with GRAVEL GRAVELLY ORGANIC fat CLAY GRAVELLY ORGANIC fat CLAY with SAND
SM	SILTY SAND SILTY SAND with GRAVEL		
SC	CLAYEY SAND CLAYEY SAND with GRAVEL	OH	ORGANIC elastic SILT ORGANIC elastic SILT with SAND ORGANIC elastic SILT with GRAVEL SANDY elastic ELASTIC SILT SANDY ORGANIC elastic SILT with GRAVEL GRAVELLY ORGANIC elastic SILT GRAVELLY ORGANIC elastic SILT with SAND
SC-SM	SILTY, CLAYEY SAND SILTY, CLAYEY SAND with GRAVEL		
PT	PEAT	OL/OH	ORGANIC SOIL ORGANIC SOIL with SAND ORGANIC SOIL with GRAVEL SANDY ORGANIC SOIL SANDY ORGANIC SOIL with GRAVEL GRAVELLY ORGANIC SOIL GRAVELLY ORGANIC SOIL with SAND
	COBBLES COBBLES and BOULDERS BOULDERS		

FIELD AND LABORATORY TESTING

C	Consolidation (ASTM D 2435)
CL	Collapse Potential (ASTM D 5333)
CP	Compaction Curve (CTM 216)
CR	Corrosion, Sulfates, Chlorides (CTM 643, CTM 417, CTM 422)
CU	Consolidated Undrained Triaxial (ASTM D 4767)
DS	Direct Shear (ASTM D 3080)
EI	Expansion Index (ASTM D 4829)
M	Moisture Content (ASTM D 2216)
OC	Organic Content (ASTM D 2974)
P	Permeability (CTM 220)
PA	Particle Size Analysis (ASTM D 422)
PI	Liquid Limit, Plastic Limit, Plasticity Index (AASHTO T 89, AASHTO T 90)
PL	Point Load Index (ASTM D 5731)
PM	Pressure Meter
R	R-Value (CTM 301)
SE	Sand Equivalent (CTM 217)
SG	Specific Gravity (AASHTO T 100)
SL	Shrinkage Limit (ASTM D 427)
SW	Swell Potential (ASTM D 4546)
UC	Unconfined Compression - Soil (ASTM D 2166) Unconfined Compression - Rock (ASTM D 2938)
UU	Unconsolidated Undrained Triaxial (ASTM D 2850)
UW	Unit Weight (ASTM D 4767)
-200	Passing No. 200 Sieve (ASTM D 1140)

SAMPLER GRAPHIC SYMBOLS

Standard Penetration Test (SPT)

Standard California Sampler

Modified California Sampler (2.4" ID, 3" OD)

Shelby Tube

Piston Sampler

NX Rock Core

HQ Rock Core

Bulk Sample

Other (see remarks)

DRILLING METHOD SYMBOLS

Auger Drilling

Rotary Drilling

Dynamic Cone or Hand Driven

Diamond Core

WATER LEVEL SYMBOLS

First Water Level Reading (during drilling)

Static Water Level Readin (after drilling, date)

Definitions for Change in Material

Term	Definition	Symbol
Material Change	Change in material is observed in the sample or core and the location of change can be accurately located.	
Estimated Material Change	Change in material cannot be accurately located either because the change is gradational or because of limitations of the drilling and sampling methods.	
Soil / Rock Boundary	Material changes from soil characteristics to rock characteristics.	

REFERENCE: Caltrans Soil and Rock Logging, Classification, and Presentation Manual (2010).

GROUP DELTA

Project No. SD605

SDSU Mission Valley
Site Development

BORING RECORD LEGEND #2

CONSISTENCY OF COHESIVE SOILS

Description	Shear Strength (tsf)	Pocket Penetrometer, PP Measurement (tsf)	Torvane, TV, Measurement (tsf)	Vane Shear, VS, Measurement (tsf)
Very Soft	Less than 0.12	Less than 0.25	Less than 0.12	Less than 0.12
Soft	0.12 - 0.25	0.25 - 0.5	0.12 - 0.25	0.12 - 0.25
Medium Stiff	0.25 - 0.5	0.5 - 1	0.25 - 0.5	0.25 - 0.5
Stiff	0.5 - 1	1 - 2	0.5 - 1	0.5 - 1
Very Stiff	1 - 2	2 - 4	1 - 2	1 - 2
Hard	Greater than 2	Greater than 4	Greater than 2	Greater than 2

APPARENT DENSITY OF COHESIONLESS SOILS

Description	SPT N_{60} (blows / 12 inches)
Very Loose	0 - 5
Loose	5 - 10
Medium Dense	10 - 30
Dense	30 - 50
Very Dense	Greater than 50

MOISTURE

Description	Criteria
Dry	No discernable moisture
Moist	Moisture present, but no free water
Wet	Visible free water

PERCENT OR PROPORTION OF SOILS

Description	Criteria
Trace	Particles are present but estimated to be less than 5%
Few	5 - 10%
Little	15 - 25%
Some	30 - 45%
Mostly	50 - 100%

PARTICLE SIZE

Description		Size (in)
Boulder		Greater than 12
Cobble		3 - 12
Gravel	Coarse	3/4 - 3
	Fine	1/5 - 3/4
Sand	Coarse	1/16 - 1/5
	Medium	1/64 - 1/16
	Fine	1/300 - 1/64
Silt and Clay		Less than 1/300

CEMENTATION

Description	Criteria
Weak	Crumbles or breaks with handling or little finger pressure.
Moderate	Crumbles or breaks with considerable finger pressure.
Strong	Will not crumble or break with finger pressure.

REFERENCE: Caltrans Soil and Rock Logging, Classification, and Presentation Manual (2010), with the exception of consistency of cohesive soils vs. N_{60}.

Plasticity

Description	Criteria
Nonplastic	A 1/8-in. thread cannot be rolled at any water content.
Low	The thread can barely be rolled and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.

CONSISTENCY OF COHESIVE SOILS

Description	SPT N_{60} (blows/12 inches)
Very Soft	0 - 2
Soft	2 - 4
Medium Stiff	4 - 8
Stiff	8 - 15
Very Stiff	15 - 30
Hard	Greater than 30

Ref: Peck, Hansen, and Thornburn, 1974, "Foundation Engineering," Second Edition.

Note: Only to be used (with caution) when pocket penetrometer or other data on undrained shear strength are unavailable. Not allowed by Caltrans Soil and Rock Logging and Classification Manual, 2010.

GROUP DELTA

Project No. SD605

SDSU Mission Valley
Site Development

BORING RECORD LEGEND #3

BORING RECORD

PROJECT NAME	PROJECT NUMBER	BORING
SDSU Mission Valley	SD605	**S-1**

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	3/8/2019	3/8/2019	1 of 3

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Tri-County Drilling	Hollow Stem Auger	J. Sanders	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GROUNDWATER (ft)
Diedrich D120	8	60	83	▼ 34.0 / *49.0*

SAMPLING METHOD	NOTES
Hammer: 140 lbs., Drop: 30 in. (Automatic)	ETR ~ 89%, N_{60} = 1.48N_{SPT} = 0.99N_{MC}

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
0	83											**PAVEMENT:** Approximately 4 inches of ASPHALT CONCRETE.
												UNDIFFERENTIATED SURFICIAL SOILS: CLAYEY SAND (SC); brown; moist; mostly fine sand; some fines; trace gravel; low to medium plasticity. (2% Gravel; 52% Sand; 46% Fines)
	80	Bulk	B1				12.2	-	PA			
												Poorly-graded SAND with silt and gravel (SP-SM); light brown; moist; mostly fine to medium sand; few fines; little gravel and cobbles; nonplastic; trace mica. (10% fines) Gravel stuck in sampler shoe.
5		SPT	S1	7 18 50^	^	^	4.2	-	-200	5		
	75											Slow and difficult drilling on GRAVELS and COBBLES (Estimated 20 to 30% COBBLES).
10										10		
	70											
15										15		
	65											
20										20		Sandy SILT (ML); dense; brown to dark brown; moist; mostly fines; some fine to medium sand; few gravel. (55% Fines)
		SPT	S2	7 13 15	28	42	18.3	-	-200			
	60											

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San Diego, California 92126

BORING RECORD

PROJECT NAME SDSU Mission Valley				**PROJECT NUMBER** SD605	**BORING** S-1
SITE LOCATION 9449 Friars Road, San Diego, California			**START** 3/8/2019	**FINISH** 3/8/2019	**SHEET NO.** 2 of 3
DRILLING COMPANY Tri-County Drilling	**DRILLING METHOD** Hollow Stem Auger			**LOGGED BY** J. Sanders	**CHECKED BY** C. Vonk
DRILLING EQUIPMENT Diedrich D120	**BORING DIA. (in)** 8	**TOTAL DEPTH (ft)** 60	**GROUND ELEV (ft)** 83	**DEPTH/*ELEV.* GROUNDWATER (ft)** 34.0 / *49.0*	
SAMPLING METHOD Hammer: 140 lbs., Drop: 30 in. (Automatic)	**NOTES** ETR ~ 89%, N_{60} = 1.48N_{SPT} = 0.99N_{MC}				

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
			S3	4 6 9	15	22	19.4	-	PA			**UNDIFFERENTIATED SURFICIAL SOILS (continued):** Clayey SAND (SC); medium dense; dark brown; moist; mostly fine to medium sand; some fines; medium to high plasticity; some iron oxide staining. (52% Sand; 48% Fines)
	55											
30			S4	3 8 15	23	34	18.3	-	-200	30		Silty SAND (SM); medium dense; dark brown; moist; mostly fine sand; some fines; nonplastic; trace mica; no bedding. (43% Fines)
	50											
35			S5	5 7 8	15	22	25.6	-	-200	35		Wet; micaceous. (30% Fines)
	45											
40			S6	26 50/3"	^	^	16.7	-	PA	40		Well-graded SAND with silt and gravel (SW-SM); brown; wet; mostly fine to coarse sand; little coarse gravel; few fines; nonplastic; trace mica. (16% Gravel; 78% Sand; 6% Fines)
	40											Slow and difficult drilling on GRAVELS and COBBLES (Estimated 20% COBBLES)
45										45		
	35											

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THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED.

FIGURE B-1 b

BORING RECORD

PROJECT NAME	PROJECT NUMBER	BORING
SDSU Mission Valley	SD605	S-1

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	3/8/2019	3/8/2019	3 of 3

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Tri-County Drilling	Hollow Stem Auger	J. Sanders	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GROUNDWATER (ft)
Diedrich D120	8	60	83	▼ 34.0 / *49.0*

SAMPLING METHOD	NOTES
Hammer: 140 lbs., Drop: 30 in. (Automatic)	ETR ~ 89%, $N_{60} = 1.48N_{SPT} = 0.99N_{MC}$

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DESCRIPTION AND CLASSIFICATION
50–55	33–28									**UNDIFFERENTIATED SURFICIAL SOILS (continued):** Slow and difficult drilling on GRAVELS and COBBLES (Estimated 20% COBBLES)
55	28	☒	S7	75/6"	REF	REF	17.5	-	-200	Silty SAND with gravel (SM); very dense; brown; wet; mostly fine to coarse sand; little fines and coarse gravel; low plasticity; trace mica. Sampler refusal. (14% Fines)
57–60	26–23	☒	S8	40 50/3"	50/3"	>100	17.3	-	-200	**FRIARS FORMATION:** *Poorly-indurated SANDSTONE; fine to medium grained; massive; yellowish brown; moist; moderately weathered; very soft; unfractured (Silty SAND (SM); very dense; mostly fine to medium sand; little fines; low plasticity; mottled; weakly cemented). (18% Fines)

Total Depth = 60 feet (Target depth reached).

Groundwater measured during drilling at a depth of 34 feet.

Boring backfilled on 3/8/19 shortly after drilling with bentonite grout and capped with black-dyed rapid set concrete.

This Boring Record is part of a geotechnical report which must be considered in its entirety.

^ = Inaccurate blowcounts.

All soils encountered may include up to 10% COBBLES (subrounded, 3- to 12-inch diameter), estimated based on drill rig chatter, excessive auger inclination, and visual evaulation of drill cuttings. Percent COBBLES greater than 10% are noted in the boring record description and classification, where encountered. Cobble-rich layers encountered in this exploration were approximately 10 to 15 feet thick.

*Geologic Description; (Disturbed Soil Description).

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BORING RECORD

PROJECT NAME	PROJECT NUMBER	BORING
SDSU Mission Valley	SD605	**S-2**

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	2/19/2019	2/19/2019	1 of 3

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Pacific Drilling	Hollow Stem Auger	S. Narveson	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GROUNDWATER (ft)
Diedrich D50	8	61	66	▼ 23.8 / *42.2*

SAMPLING METHOD
Hammer: 140 lbs., Drop: 30 in. (Automatic)

NOTES
ETR ~ 79%, $N_{60} = 1.32N_{SPT} = 0.88N_{MC}$

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
	65											**PAVEMENT:** Approximately 3 inches of ASPHALT CONCRETE.
			B1									**UNDIFFERENTIATED SURFICIAL SOILS:** Clayey SAND (SC); medium dense; brown (10YR 4/3); moist; mostly fine to coarse sand; some fines; few gravel; medium plasticity; micaceous. PID=0.6 ppm (10% Gravel; 56% Sand; 34% Fines)
			S2	2 2 6	8	11	16.2	-	PA EI CR			
			B1									
5										5		PID= 0.5 ppm
	60		R3	10 10 16	26	23						
10										10		
	55		S4	3 5 5	10	13	19.8	-	-200 PI			Sandy lean CLAY (CL); stiff; dark grayish brown (2.5Y 4/2); moist; mostly fines; some fine to medium sand; trace fine gravel; medium plasticity. PP=1.25 tsf; PID=0.5 ppm (51% Fines)
15										15		No gravel; micaceous. PP=1.25 tsf; PID=0.6 ppm
	50		S5	2 3 5	8	11	21.3	-				
20										20		Medium stiff; trace fine gravel; iron oxide staining. PP=0.75 tsf; PID=0.4 ppm
	45		S6	2 3 4	7	9	19.7	-				
											▼	

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BORING RECORD

PROJECT NAME	PROJECT NUMBER	BORING
SDSU Mission Valley	SD605	S-2

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	2/19/2019	2/19/2019	2 of 3

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Pacific Drilling	Hollow Stem Auger	S. Narveson	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GROUNDWATER (ft)
Diedrich D50	8	61	66	▼ 23.8 / *42.2*

SAMPLING METHOD	NOTES
Hammer: 140 lbs., Drop: 30 in. (Automatic)	ETR ~ 79%, N_{60} = $1.32N_{SPT}$ = $0.88N_{MC}$

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
	40		R7	3 4 7	11	10	22.8	-	-200 PI			**UNDIFFERENTIATED SURFICIAL SOILS (continued):** Sandy lean CLAY (CL); soft to medium stiff; dark grayish brown (2.5Y 4/2); wet; mostly fines; some fine to medium sand; trace fine gravel; medium plasticity; sample disturbed. PP=0.5 tsf; PID=0.3 ppm (58% Fines)
30	35		S8	4 5 7	12	16	19.0	-		30		Lean CLAY with sand (CL); medium stiff; dark grayish brown (10YR 4/2); mostly fines; little fine to medium sand; trace fine gravel; medium plasticity. PP=0.5 tsf; PID=0.8 ppm
35	30		S9	15 4 5	9	12	15.8	-	-200	35		Clayey SAND (SC); medium dense; dark grayish brown (10YR 4/2); wet; mostly fine to medium sand; some fines; trace fine gravel; medium plasticity. PID=0.3 ppm (35% Fines)
40	25		S10	5 3 3	6	8	24.7	-	-200	40		Loose; grayish brown (10YR 5/2); mostly medium to coarse sand; low to medium plasticity. PID=0.3 ppm (38% Fines)
												FRIARS FORMATION: *Poorly-indurated SANDSTONE; fine to coarse grained; massive; gray (2.5YR 5/1); highly weathered; very soft; unfractured; (poorly graded SAND with silt (SP-SM); medium dense; wet; mostly fine to coarse sand; few to little fines; trace gravel; nonplastic; weakly cemented; iron oxide staining).
45	20		R11-1 R11-2	12 14 15	29	26	22.4	102	DS	45		

BORING RECORD

PROJECT NAME	PROJECT NUMBER	BORING
SDSU Mission Valley	SD605	S-2

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	2/19/2019	2/19/2019	3 of 3

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Pacific Drilling	Hollow Stem Auger	S. Narveson	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GROUNDWATER (ft)
Diedrich D50	8	61	66	▼ 23.8 / *42.2*

SAMPLING METHOD	NOTES
Hammer: 140 lbs., Drop: 30 in. (Automatic)	ETR ~ 79%, N_{60} = 1.32N_{SPT} = 0.88N_{MC}

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DESCRIPTION AND CLASSIFICATION
	15		S12-1 S12-2	25 35 50/5"	85/11"	>100	17.5	-	PI	**FRIARS FORMATION (continued):** *Poorly-indurated CLAYSTONE; fine grained; massive; gray (2.5Y 5/1); moderately weathered; very soft; unfractured (fat CLAY with sand (CH); hard; moist; mostly fines; few to little fine sand; high plasticity). PID=0.1 ppm
										*POORLY INDURATED SANDSTONE; fine to coarse grained; massive; gray (2.5YR 5/1); moderately weathered; very soft; unfractured; (silty SAND (SM); very dense; wet; mostly fine sand; some fines; nonplastic, weakly to moderatly cemented).
55	10		S13	20 28 50/3"	78/9"	>100	17.4	-		PID=0 ppm
60	5		S14	30 50/6"	50/6"	>100	17.3	-	-200	(Little fines.) (18% Fines)
65	0									
70	-5									

Total Depth = 61 feet (Target depth reached).

Groundwater measured during drilling at a depth of 23.8 feet.

Boring backfilled on 2/19/19 shortly after drilling with bentonite grout and capped with black-dyed rapid set concrete.

This Boring Record is part of a geotechnical report which must be considered in its entirety.

All soils encountered may include up to 10% COBBLES (granitic, subrounded, 3- to 12-inch diameter), estimated based on drill rig chatter, excessive auger inclination, and visual evaluation of drill cuttings.

*Geologic Description; (Disturbed Soil Description).

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BORING RECORD

PROJECT NAME	PROJECT NUMBER	BORING
SDSU Mission Valley	SD605	S-3

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	2/26/2019	3/1/2019	1 of 3

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Pacific Drilling	HSA (0-36') / Casing Advance (36-45')	S. Narveson	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GROUNDWATER (ft)
Diedrich D50	8	46.5	74	▼ 28.2 / *45.8*

SAMPLING METHOD	NOTES
Hammer: 140 lbs., Drop: 30 in. (Automatic)	ETR ~ 79%, N_{60} = $1.32N_{SPT}$ = $0.88N_{MC}$

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
												PAVEMENT: Approximately 4 inches of ASPHALT CONCRETE.
			B1				11.1	-	PA			**UNDIFFERENTIATED SURFICIAL SOILS:** Clayey SAND (SC); dark yellowish brown (10YR 4/4); moist; mostly fine to coarse sand; some fines; trace gravel; low plasticity. (0% Gravel; 68% Sand; 32% Fines).
	70											Slow and difficult drilling on GRAVELS and COBBLES.
5			S2	15 14 23	37	49	10.1	-		5		Silty SAND (SM); dense; yellowish brown (10YR 5/4); moist; mostly fine to coarse sand; little fines; trace gravel; nonplastic. PID=0.6 ppm
	65											Sandy lean CLAY (CL); brown (10YR 5/3); moist; mostly fines; some fine sand; trace gravel; medium plasticity; trace iron oxide staining.
10			R3-1 R3-2	9 16 23	39	34	18.3	107	-200 PI	10		Hard. PP=4.0 tsf (59% Fines)
	60											
15			S4	4 5 9	14	18	18	-		15		Very stiff; very dark grayish brown (10YR 3/2); micaceous. PP=3.0 tsf; PID=0.5 ppm
	55											
20			R5-1 R5-2	9 8 36	44	39	16.6	113	-200	20		Clayey SAND (SC); dense; dark yellowish brown (10YR 4/4); moist; mostly fine sand; some fines; low plasticity. (44% Fines)
												Slow and difficult drilling on GRAVEL and COBBLES. (Estimated 10-20% COBBLES). Equipment failure (sheared drive cap).
	50											

BORING RECORD

PROJECT NAME	PROJECT NUMBER	BORING
SDSU Mission Valley	SD605	S-3

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	2/26/2019	3/1/2019	2 of 3

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Pacific Drilling	HSA (0-36') / Casing Advance (36-45')	S. Narveson	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GROUNDWATER (ft)
Diedrich D50	8	46.5	74	▼ 28.2 / *45.8*

SAMPLING METHOD	NOTES
Hammer: 140 lbs., Drop: 30 in. (Automatic)	ETR ~ 79%, N_{60} = 1.32N_{SPT} = 0.88N_{MC}

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DESCRIPTION AND CLASSIFICATION
	45									**UNDIFFERENTIATED SURFICIAL SOILS (continued):** Slow and difficult drilling on GRAVEL and COBBLES. (Estimated 10 to 20% COBBLES).
30			S6	22^ 25^ 47^	^	^			PA	Silty SAND with gravel (SM); grayish brown (10YR 5/2); wet; mostly fine to coarse sand; some gravel; little fines; nonplastic. (34% Gravel; 52% Sand; 14% Fines). Gravel in sampler; PID=0
35	40		B10						-200 PI	Sandy lean CLAY (CL); dark yellowish brown (10YR 4/4); wet; mostly fines; some fine to coarse sand; trace gravel; medium plasticity. (59% Fines).
			S7	100/6"	REF	REF				Clayey GRAVEL with sand (GC); wet; dark yellowish brown (10YR 4/4); mostly gravel; some fine to coarse sand and fines; low plasticity. Equipment failure (sheared drive cap at 36 ft). Switch to casing advancement with tri-cone drill bit. (Estimated 30-40% COBBLES).
40	35		S8	100/6"	REF	REF				
45	30		S9	23 37 34	71	>100			-200	**FRIARS FORMATION:** *Poorly-indurated SANDSTONE; fine to medium grained; massive; gray (2.5Y 6/1); wet; moderately weathered; very soft; unfractured (Clayey SAND (SC); very dense; mostly fine to medium sand; little fines; trace fine gravel; low plasticity; weakly cemented). (16% Fines).
	25									Total Depth = 46.5 feet (Target Depth Reached). Hollow stem auger (0 to 36 ft); Casing advancement (36 to 46.5 ft).

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BORING RECORD	PROJECT NAME SDSU Mission Valley		PROJECT NUMBER SD605	BORING **S-3**
SITE LOCATION 9449 Friars Road, San Diego, California	START 2/26/2019	FINISH 3/1/2019		SHEET NO. 3 of 3
DRILLING COMPANY Pacific Drilling	DRILLING METHOD HSA (0-36') / Casing Advance (36-45')	LOGGED BY S. Narveson	CHECKED BY C. Vonk	
DRILLING EQUIPMENT Diedrich D50	BORING DIA. (in) 8	TOTAL DEPTH (ft) 46.5	GROUND ELEV (ft) 74	DEPTH/*ELEV.* GROUNDWATER (ft) ▼ 28.2 / *45.8*
SAMPLING METHOD Hammer: 140 lbs., Drop: 30 in. (Automatic)	NOTES ETR ~ 79%, $N_{60} = 1.32N_{SPT} = 0.88N_{MC}$			

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
	20											
55										55		
	15											
60										60		
	10											
65										65		
	5											
70										70		
	0											

Groundwater measured during drilling at a depth of 28.2 feet.

Boring backfilled on 3/1/19 shortly after drilling with bentonite grout and capped with black-dyed rapid set concrete.

This Boring Record is part of a geotechnical report which must be considered in its entirety.

^ = Inaccurate blowcounts.

All soils encountered may include up to 10% COBBLES (granitic, subrounded, 3- to 12-inch diameter), estimated based on drill rig chatter, excessive auger inclination, and visual evaulation of drill cuttings. Percent COBBLES greater than 10% are noted in the boring record description and classification, where encountered. Cobble-rich layers encountered in this exploration were approximately 5 to 10 feet thick.

*Geologic Description; (Disturbed Soil Description).

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THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED.

BORING RECORD

PROJECT NAME	PROJECT NUMBER	BORING
SDSU Mission Valley	SD605	**S-4**

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	3/8/2018	3/8/2019	1 of 3

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Tri-County Drilling	Hollow Stem Auger	J. Sanders	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GROUNDWATER (ft)
Diedrich D120	8	40.5	68	▼ 21.0 / *47.0*

SAMPLING METHOD	NOTES
Hammer: 140 lbs., Drop: 30 in. (Automatic)	ETR ~ 89%, N_{60} = 1.48N_{SPT} = 0.99N_{MC}

DEPTH (feet)	ELEVATION (feet)	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DESCRIPTION AND CLASSIFICATION
0	68								**PAVEMENT:** Approximately 4 inches of ASPHALT CONCRETE.
		B1				15.6	-	PA	**UNDIFFERENTIATED SURFICIAL SOILS:** Clayey SAND (SC); brown; moist; mostly fine sand; little fines; trace fine gravel; low plasticity. (1% Gravel; 78% Sand; 21% Fines)
5		S1	4 6 7	13	19	19.5	-		Medium dense; trace mica.
	60								Lean CLAY with sand (CL); brown; moist; mostly fines; little to some sand; medium to high plasticity.
10		S2	4 6 8	14	21	20.2	-	-200 PI	Stiff; brown; interbedded. PP=1.75 tsf (71% Fines)
15		S3	2 7 7	14	21	18.8	-	PA	Sandy lean CLAY (CL); stiff to very stiff; brown; moist; mostly fines; some sand; medium plasticity; thin layers; trace mica; some mottling. (0% Gravel; 41% Sand; 59% Fines)
20		S4	3 7 7	14	21	19.8	-	-200 PI	Very stiff; dark brown; low to medium plasticity; no bedding; organics present. PP=2.75 tsf (59% Fines)

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FIGURE B-2 a

BORING RECORD

PROJECT NAME: SDSU Mission Valley			PROJECT NUMBER: SD605		BORING: **S-4**
SITE LOCATION: 9449 Friars Road, San Diego, California		START: 3/8/2018	FINISH: 3/8/2019		SHEET NO. 2 of 3
DRILLING COMPANY: Tri-County Drilling	DRILLING METHOD: Hollow Stem Auger		LOGGED BY: J. Sanders		CHECKED BY: C. Vonk
DRILLING EQUIPMENT: Diedrich D120	BORING DIA. (in): 8	TOTAL DEPTH (ft): 40.5	GROUND ELEV (ft): 68	DEPTH/*ELEV.* GROUNDWATER (ft): ▼ 21.0 / *47.0*	
SAMPLING METHOD: Hammer: 140 lbs., Drop: 30 in. (Automatic)	NOTES: ETR ~ 89%, $N_{60} = 1.48N_{SPT} = 0.99N_{MC}$				

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
			S5	18^ 50/2" ^	^	^	11.9	-				**UNDIFFERENTIATED SURFICIAL SOILS (continued):** Poorly-graded SAND with gravel and cobbles (SP); brown; wet; mostly medium to coarse sand; little to some gravel and cobbles; trace mica; sampler refusal on cobbles.
	40											Slow and difficult drilling on GRAVEL and COBBLES. Water and polymer added to hole to mitigate caving soils. (Estimated 20% COBBLES)
30										30		
	35											
35										35		**FRIARS FORMATION:** *Poorly-indurated SANDSTONE; fine to medium grained; massive; yellow brown; wet; moderately weathered; very soft; unfractured; *(Silty SAND (SM); very dense; mostly fine to medium sand; little fines; nonplastic; moderately cemented).
			S6	17 34 50	84	>100	16.6	-	PA			(0% Gravel; 82% Sand; 18% Fines)
	30											
40			S7	50/6"	REF	REF	17.8	-		40		
	25											Total Depth = 40.5 feet (Target depth reached).
45										45		
	20											

Total Depth = 40.5 feet (Target depth reached).

Groundwater measured after drilling at a depth of 21 feet.

Polymer/water mixture added down hollow stem for heaving sand.

Boring backfilled on 3/8/19 with bentonite grout and capped with black dyed rapid set concrete.

^ = Inaccurate blowcount.

This Boring Record is part of a geotechnical report which must be considered in its entirety.

All soils encountered may include up to 10% COBBLES (granitic, subrounded, 3- to 12-inch diameter), estimated

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BORING RECORD

PROJECT NAME	PROJECT NUMBER	BORING
SDSU Mission Valley	SD605	**S-4**

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	3/8/2018	3/8/2019	3 of 3

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Tri-County Drilling	Hollow Stem Auger	J. Sanders	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GROUNDWATER (ft)
Diedrich D120	8	40.5	68	▼ 21.0 / *47.0*

SAMPLING METHOD	NOTES
Hammer: 140 lbs., Drop: 30 in. (Automatic)	ETR ~ 89%, N_{60} = $1.48N_{SPT}$ = $0.99N_{MC}$

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
												based on drill rig chatter, excessive auger inclination, and visual evaluation of drill cuttings. Percent COBBLES greater than 10% are noted in the boring record description and classification, where encountered. Cobble-rich layers encountered in this exploration were approximately 5 to 10 feet thick.
	15											*Geologic Description; (Disturbed Soil Description).
55										55		
	10											
60										60		
	5											
65										65		
	0											
70										70		
	-5											

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BORING RECORD

PROJECT NAME	PROJECT NUMBER	BORING
SDSU Mission Valley	SD605	**S-5**

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	3/8/2019	3/8/2019	1 of 3

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Pacific Drilling	HSA (0-40') / Mud Rotary (40-61')	S. Narveson	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GROUNDWATER (ft)
Diedrich D50	8/4	61	63	▼ 21.0 / *42.0*

SAMPLING METHOD	NOTES
Hammer: 140 lbs., Drop: 30 in. (Automatic)	ETR ~ 79%, N_{60} = $1.32N_{SPT}$ = $0.88N_{MC}$

DEPTH (feet)	ELEVATION (feet)	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DESCRIPTION AND CLASSIFICATION
0	63								**PAVEMENT:** Approximately 4 inches of ASPHALT CONCRETE.
									UNDIFFERENTIATED SURFICIAL SOILS: Clayey SAND with gravel (SC); yellowish brown (10YR 5/4); moist; mostly fine to coarse sand; some fines; little gravel; medium plasticity.
	60	B1				11.0	-	PA PI	(19% Gravel; 46% Sand; 35% Fines) Rig chatter at 3.5 ft on gravel and potential cobble layer.
5		S2	4 3 4	7	9				Loose; trace organics (plant roots).
	55								
10		R3	5 7 9	16	14	12.2	95	-200	Silty SAND (SM); medium dense; brown (7.5 YR 5/2); moist; mostly fine sand; few to little fines; nonplastic; grading to poorly-graded SAND. (20% Fines)
	50								Poorly-graded SAND (SP); medium dense; brown (7.5YR 5/2); moist; mostly fine sand; trace fines; nonplastic.
15		S4	1 1 2	3	4	34.5	-		Lean CLAY with sand (CL); soft; dark grayish brown (10YR 4/2); moist; mostly fines; little fine sand; medium to high plasticity. PP=0.25 tsf; PID=0.6 ppm
	45								
20		R5-1 R5-2	2 3 4	7	6	41.6	79	-200 PI C	▼ Medium stiff; dark gray (Gley 4/N); wet; medium plasticity. PP=0.5 tsf; TV=0.4 tsf PID=0.2 ppm (75% fines)
	40								

BORING RECORD

PROJECT NAME	PROJECT NUMBER	BORING
SDSU Mission Valley	SD605	**S-5**

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	3/8/2019	3/8/2019	2 of 3

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Pacific Drilling	HSA (0-40') / Mud Rotary (40-61')	S. Narveson	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GROUNDWATER (ft)
Diedrich D50	8/4	61	63	▼ 21.0 / *42.0*

SAMPLING METHOD	NOTES
Hammer: 140 lbs., Drop: 30 in. (Automatic)	ETR ~ 79%, N_{60} = 1.32N_{SPT} = 0.88N_{MC}

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS
			S6	2 3 5	8	11	24.0	-	-200
	35								
30			S7	1 2 8	10	13	21.9	-	-200
	30								
35			S8	9 11 12	23	30	21.6	-	-200
	25								
40			S9	10 10 9	19	25	14.5	-	PA
	20								
45			S10	8 8 9	17	22	21.0	-	-200
	15								

DESCRIPTION AND CLASSIFICATION

UNDIFFERENTIATED SURFICIAL SOILS (continued):
Poorly-graded SAND (SP); medium dense; gray (10YR 5/1); wet; mostly fine to medium sand; trace fines; nonplastic; micaceous.
PID=0.8 ppm
(1% Fines)

Poorly-graded SAND with silt (SP-SM); medium dense; gray (10YR 5/1); wet; mostly fine to medium sand; few to little fines; nonplastic; trace mica.
PID=5.2 ppm
(12% Fines)

Difficult drilling on GRAVEL and COBBLES from 32 to 34 ft.
(Estimated 10-20% COBBLES)

Well-graded SAND with silt (SW-SM); dense; very dark gray (7.5YR 3/1); wet; mostly fine to medium sand; few to little fines; nonplastic; trace mica.
(12% Fines)
PID=0.3 ppm

Heaving sands. Switch to mud rotary (Tricone rotary drill bit)
Medium dense; yellowish brown (10YR 5/4); few to little fine to medium gravel; few fines.
(14% Gravel; 76% Sand; 10% Fines)

No gravel; micaceous; trace oxide staining.
(9% Fines)

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BORING RECORD

PROJECT NAME	PROJECT NUMBER	BORING
SDSU Mission Valley	SD605	S-5

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	3/8/2019	3/8/2019	3 of 3

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Pacific Drilling	HSA (0-40') / Mud Rotary (40-61')	S. Narveson	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GROUNDWATER (ft)
Diedrich D50	8/4	61	63	▼ 21.0 / *42.0*

SAMPLING METHOD	NOTES
Hammer: 140 lbs., Drop: 30 in. (Automatic)	ETR ~ 79%, $N_{60} = 1.32N_{SPT} = 0.88N_{MC}$

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
			S11	13 18 21	39	51	16.0	-				**UNDIFFERENTIATED SURFICIAL SOILS (continued):** Well-graded SAND with silt (SW-SM); very dense; gray (75YR 5/1); wet; mostly fine to medium sand; few gravel; trace fines; nonplastic; trace mica.
	10											Slow and difficult drilling on GRAVEL and COBBLES from 53 to 59 ft. (Estimated 10 to 20% COBBLES)
55										55		
	5											
60			S12	24 50/6"	50/6"	>100	20.2	-	-200	60		**FRIARS FORMATION:** *Poorly-indurated SANDSTONE; fine to medium grained; massive; gray (2.5YR 6/1); moderately weathered; very soft; unfractured (Silty SAND (SM); mostly fine to medium sand; some fines; low plasticity; weakly to moderately cemented). (48% Fines)
	0											
65										65		
	-5											
70										70		
	-10											

Total Depth = 61.0 feet (Target depth reached).

Groundwater measured during drilling at a depth of 21 feet.

Boring backfilled on 3/8/19 shortly after drilling with bentonite grout and capped with black-dyed rapid set concrete.

This Boring Record is part of a geotechnical report which must be considered in its entirety.

^ = Inaccurate blowcount.

All soils encountered may include up to 10% COBBLES (granitic, subrounded, 3- to 12-inch diameter), estimated based on drill rig chatter, excessive auger inclination, and visual evaluation of drill cuttings. Percent COBBLES greater than 10% are noted in the boring record description and classification, where encountered. Cobble-rich layers encountered in this exploration were approximately 2 to 10 feet thick.

*Geologic Description; (Disturbed Soil Description).

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BORING RECORD

PROJECT NAME	PROJECT NUMBER	BORING
SDSU Mission Valley	SD605	S-6

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	3/7/2019	3/7/2019	1 of 3

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Pacific Drilling	Hollow Stem Auger	S. Narveson	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GROUNDWATER (ft)
Diedrich D50	8	41.5	69	▼ 22.3 / *46.7*

SAMPLING METHOD	NOTES
Hammer: 140 lbs., Drop: 30 in. (Automatic)	ETR ~ 79%, N_{60} = $1.32N_{SPT}$ = $0.88N_{MC}$

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
												PAVEMENT: Approximately 4 inches of ASPHALT CONCRETE.
	65		B1				19.5	-	PA CR EI			**UNDIFFERENTIATED SURFICIAL SOILS:** Lean CLAY with sand (CL); dark yellowish brown (10YR 4/6); moist; mostly fines; some fine sand; low plasticity. (0% Gravel; 28% Sand; 72% Fines) PID= 0.6 ppm Few gravel.
5	60		R2	9 15 26	41	36				5		Sandy SILT (ML); dense; dark yellowish brown (10YR 4/5); moist; mostly fines; some fine sand; nonplastic. PID= 0.3 ppm
10	55		R3-1 R3-2	5 8 13	21	19	29.0	93	-200	10		Lean CLAY (CL); medium stiff to very stiff; dark yellowish brown (10YR 4/4); moist; mostly fines; few to little fine sand; low plasticity. PP=3.75 tsf; TV=0.33 tsf; PID=0 (87% Fines)
15	50		S5	4 9 11	20	26	6.7	-	PA	15		Silty SAND (SM); medium dense; grayish brown (10YR 5/2); moist; mostly fine to medium sand; few to little fine; trace fine gravel; nonplastic; trace mica. PID=0 (0% Gravel; 87% Sand; 13% Fines)
20			S6	3 4 6	10	13	20.3	-	-200 PI	20		Sandy lean CLAY (CL); stiff; very dark grayish brown (10YR 3/2); moist; mostly fines; little to some fine sand; trace gravel; medium plasticity; trace mica. PP=1.5 tsf; TV=0.70 tsf PID=0.3 ppm (66% Fines)
	45											Slow and difficult drilling on GRAVEL and COBBLES from 22 to 35 feet. (Estimated 10-20% COBBLES)

BORING RECORD

PROJECT NAME	PROJECT NUMBER	BORING
SDSU Mission Valley	SD605	**S-6**

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	3/7/2019	3/7/2019	2 of 3

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Pacific Drilling	Hollow Stem Auger	S. Narveson	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GROUNDWATER (ft)
Diedrich D50	8	41.5	69	▼ 22.3 / *46.7*

SAMPLING METHOD	NOTES
Hammer: 140 lbs., Drop: 30 in. (Automatic)	ETR ~ 79%, N_{60} = $1.32N_{SPT}$ = $0.88N_{MC}$

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
			S7	39^ 22^ 30^	^	^	12.3	-	-200			**UNDIFFERENTIATED SURFICIAL SOILS (continued):** Silty GRAVEL with sand (GM); yellowish brown (10YR 5/4); wet; mostly fine to coarse gravel; some fine to coarse sand; little fines; nonplastic. (Estimated 10 to 20% COBBLES)
	40											
30			S8	50/5" ^	REF	REF				30		Sampler refusal on gravel and cobbles.
	35											
35			S9	19 25 50	75	99	7.5	-	-200	35		**FRIARS FORMATION:** *Poorly-indurated SANDSTONE; fine to medium grained; massive; grayish brown (10YR 5/2); wet; moderately weathered; very soft; unfractured; (Silty SAND (SM); very dense; mostly fine to medium sand; some fines; nonplastic; weakly cemented; Iron oxide staining.) (32% Fines)
	30											Gray (7.5YR 5/1); little fines. (26% Fines)
40			S10	19 25 50	75	99	18.5	-	-200	40		
	25											Total Depth = 41.5 feet (Target depth reached). Groundwater measured during drilling at a depth of 22.3 feet. Boring backfilled on 3/7/19 shortly after drilling with bentonite grout and capped with black-dyed rapid set concrete.
45										45		This Boring Record is part of a geotechnical report which must be considered in its entirety. ^ = Inaccurate blowcount.
	20											All soils encountered may include up to 10% COBBLES (granitic, subrounded, 3- to 12-inch diameter), estimated

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FIGURE
B-6 b

BORING RECORD

PROJECT NAME	PROJECT NUMBER	BORING
SDSU Mission Valley	SD605	**S-6**

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	3/7/2019	3/7/2019	3 of 3

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Pacific Drilling	Hollow Stem Auger	S. Narveson	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GROUNDWATER (ft)
Diedrich D50	8	41.5	69	▼ 22.3 / *46.7*

SAMPLING METHOD	NOTES
Hammer: 140 lbs., Drop: 30 in. (Automatic)	ETR ~ 79%, N_{60} = 1.32N_{SPT} = 0.88N_{MC}

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
												based on drill rig chatter, excessive auger inclination, and visual evaluation of drill cuttings. Percent COBBLES greater than 10% are noted in the boring record description and classification, where encountered. Cobble-rich layers encountered in this exploration were approximately 10 to 13 feet thick. *Geologic Description; (Disturbed Soil Description).
	15											
55										55		
	10											
60										60		
	5											
65										65		
	0											
70										70		
	-5											

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THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED.

FIGURE B-6 c

BORING RECORD

PROJECT NAME SDSU Mission Valley		**PROJECT NUMBER** SD605		**BORING** S-7
SITE LOCATION 9449 Friars Road, San Diego, California		**START** 3/11/2019	**FINISH** 3/11/2019	**SHEET NO.** 1 of 5
DRILLING COMPANY Pacific Drilling	**DRILLING METHOD** Hollow Stem Auger	**LOGGED BY** S. Narveson		**CHECKED BY** C. Vonk
DRILLING EQUIPMENT Diedrich D50	**BORING DIA. (in)** 8	**TOTAL DEPTH (ft)** 100.9	**GROUND ELEV (ft)** 57	**DEPTH/*ELEV.* GROUNDWATER (ft)** ▼ 16.8 / *40.2*
SAMPLING METHOD Hammer: 140 lbs., Drop: 30 in. (Automatic)	**NOTES** ETR ~ 79%, $N_{60} = 1.32N_{SPT} = 0.88N_{MC}$			

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
0	57											**PAVEMENT:** Approximately 3 inches of ASPHALT CONCRETE.
	55											**UNDIFFERENTIATED SURFICIAL SOILS:** Sandy lean CLAY (CL); dark brown (7.5YR 3/2); moist; mostly fines; some fine to coarse sand; trace gravel; low plasticity; grades finer with depth. (1% Gravel; 34% Sand; 65% Fines) Little gravel.
			B1				12.9	-	PA PI CR EI			
5			R2	2^ 11^ 23^	^	^	17.8	-		5		Stiff to very stiff; trace iron oxide staining; gravel in sampler. PP=1.0 tsf
	50											
10			S3	6 5 6	11	14	17.8	-		10		Sandy lean CLAY (CL); stiff; dark yellowish brown (10YR 4/6); moist; mostly fines; some fine sand; trace gravel; low plasticity; trace mica. PP=1.5 tsf
	45											
15			S4	15 6 6	12	16	19.6	-	-200	15		Silty SAND (SM); medium dense; yellowish brown (10YR 5/4); moist; mostly fine sand; little to some fines; nonplastic; trace mica. (28% Fines)
	40										▼	
20			R5	50/6"	REF	REF				20		No recovery; wet.
	35											

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THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED.

FIGURE B-7 a

BORING RECORD

PROJECT NAME	PROJECT NUMBER	BORING
SDSU Mission Valley	SD605	S-7

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	3/11/2019	3/11/2019	2 of 5

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Pacific Drilling	Hollow Stem Auger	S. Narveson	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GROUNDWATER (ft)
Diedrich D50	8	100.9	57	▼ 16.8 / *40.2*

SAMPLING METHOD	NOTES
Hammer: 140 lbs., Drop: 30 in. (Automatic)	ETR ~ 79%, N_{60} = $1.32N_{SPT}$ = $0.88N_{MC}$

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
	30		S6	8 18 24	42	55	18.7	-	PA			**FRIARS FORMATION:** *Poorly-indurated SANDSTONE; fine to medium grained; massive; brownish gray (10Y 5/2); wet; moderately to highly weathered; very soft; unfractured (Silty SAND (SM); very dense; mostly fine to medium sand; few to little fines; nonplastic; trace mica; weakly cemented). (86% Sand; 14% Fines)
30	25		R7	50/6"	REF	REF				30		No recovery; possible moderately to strongly cemented material.
35	20		S8	18 27 34	61	80	18.0	-	-200	35		Little fines; weakly to moderately cemented. (17% Fines)
40	15		S9	40 50/3"	50/3"	>100	11.5	-		40		Gray (10YR 5/1); (Clayey SAND with gravel (SC); little gravel; low plasticity).
45	10		S10	25 37 50/4"	87/10"	>100	18.0	-		45		Thinly bedded.

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BORING RECORD	PROJECT NAME: SDSU Mission Valley	PROJECT NUMBER: SD605	BORING: S-7
SITE LOCATION: 9449 Friars Road, San Diego, California	START: 3/11/2019	FINISH: 3/11/2019	SHEET NO.: 3 of 5
DRILLING COMPANY: Pacific Drilling	DRILLING METHOD: Hollow Stem Auger	LOGGED BY: S. Narveson	CHECKED BY: C. Vonk
DRILLING EQUIPMENT: Diedrich D50	BORING DIA. (in): 8	TOTAL DEPTH (ft): 100.9 / GROUND ELEV (ft): 57	DEPTH/*ELEV.* GROUNDWATER (ft): ▼ 16.8 / *40.2*
SAMPLING METHOD: Hammer: 140 lbs., Drop: 30 in. (Automatic)	NOTES: ETR ~ 79%, $N_{60} = 1.32N_{SPT} = 0.88N_{MC}$		

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
	5		R11	43 50/5"	50/5"	>100			-200			**FRIARS FORMATION, (continued):** *Poorly-indurated SANDSTONE; fine to coarse grained; massive; gray (10YR 5/1); wet; moderately weathered; very soft; unfractured; (Clayey SAND (SC); very dense; wet; mostly fine sand; few to little fines; nonplastic; weakly to moderately cemented). (17% Fines)
55	0		S12	17 50/1"	50/1"	>100	20.7	-		55		Friable.
60	-5		R13	50/4"^	REF^	REF				60		Sampler refusal on strongly cemented concretion (3 inch diameter concretion stuck in sampler).
65	-10									65		
70	-15		S14	35 50/3"	50/3"	>100				70		No recovery; possible moderately to strongly cemented material.

GDC_LOG_BORING_MMX_SOIL_SD SD605 LOGS - PHASE 01 - STADIUM.GPJ GDCLOG.GDT 5/9/19

BORING RECORD

PROJECT NAME: SDSU Mission Valley		PROJECT NUMBER: SD605		BORING: **S-7**
SITE LOCATION: 9449 Friars Road, San Diego, California		START: 3/11/2019	FINISH: 3/11/2019	SHEET NO.: 4 of 5
DRILLING COMPANY: Pacific Drilling	DRILLING METHOD: Hollow Stem Auger		LOGGED BY: S. Narveson	CHECKED BY: C. Vonk
DRILLING EQUIPMENT: Diedrich D50	BORING DIA. (in): 8	TOTAL DEPTH (ft): 100.9	GROUND ELEV (ft): 57	DEPTH/*ELEV.* GROUNDWATER (ft): ▼ 16.8 / *40.2*
SAMPLING METHOD: Hammer: 140 lbs., Drop: 30 in. (Automatic)	NOTES: ETR ~ 79%, $N_{60} = 1.32N_{SPT} = 0.88N_{MC}$			

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
	-20											**FRIARS FORMATION (continued):** *Poorly-indurated SANDSTONE; fine to coarse grained; massive; gray (Gley 6/N); wet; moderately weathered; very soft; unfractured; (Clayey SAND (SC); very dense; mostly fine sand; little fines; low plasticity; weakly cemented).
		X	S15	23 30 40	70	92	22.6	-				
80										80		
	-25											
85										85		
	-30											
		X	S16	37 40 50	90	>100	16.2	-				(Trace gravel; laminated.)
90										90		
	-35											
95										95		
	-40											

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BORING RECORD

PROJECT NAME	PROJECT NUMBER	BORING
SDSU Mission Valley	SD605	**S-7**

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	3/11/2019	3/11/2019	5 of 5

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Pacific Drilling	Hollow Stem Auger	S. Narveson	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV*. GROUNDWATER (ft)
Diedrich D50	8	100.9	57	▼ 16.8 / *40.2*

SAMPLING METHOD	NOTES
Hammer: 140 lbs., Drop: 30 in. (Automatic)	ETR ~ 79%, $N_{60} = 1.32N_{SPT} = 0.88N_{MC}$

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
		⊠	S17	45 50/5"	50/5"	>100	26.5	-				**FRIARS FORMATION, (continued):** *Poorly-indurated SANDSTONE; fine to coarse grained; laminated; gray (Gley 6/N); wet; moderately weathered; very soft; unfractured; (Clayey SAND (SC); very dense; mostly fine sand; little fines; low plasticity; weakly to moderately cemented).
	-45											
												Total Depth = 100.9 feet (Target depth reached).
105										105		Groundwater measured during drilling at a depth of 16.8 feet.
	-50											Boring backfilled on 3/11/19 with bentonite grout and capped with cold patch asphalt.
												This Boring Record is part of a geotechnical report which must be considered in its entirety.
												^ = Inaccurate blowcount.
110										110		All soils encountered may include up to 10% COBBLES (granitic, subrounded, 3- to 12-inch diameter), estimated based on drill rig chatter, excessive auger inclination, and visual evaluation of drill cuttings.
	-55											*Geologic Description; (Disturbed Soil Description).
115										115		
	-60											
120										120		
	-65											

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BORING RECORD

PROJECT NAME	PROJECT NUMBER	BORING
SDSU Mission Valley	SD605	**S-8**

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	3/14/2019	3/14/2019	1 of 4

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Pacific Drilling	Hollow Stem Auger	S. Narveson	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GROUNDWATER (ft)
Diedrich D50	8	75.5	69	▼ 22.4 / *46.6*

SAMPLING METHOD	NOTES
Hammer: 140 lbs., Drop: 30 in. (Automatic)	ETR ~ 79%, N_{60} = $1.32N_{SPT}$ = $0.88N_{MC}$

SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS
Bulk	B1						
SPT	S2	17^ 25^ 30^	^	^	7.8	-	PA
SPT	S3-1 S3-2	6 12 17^	^	^	10.4	-	-200
SPT	S4	5^ 14^ 15^	^	^			
Ring	R5	14 13 26	39	34			
Bulk	B6				15.6	-	
SPT	S7	3 6 9	15	20	2	-	PA

DEPTH (feet): 5, 10, 15, 20
ELEVATION (feet): 65, 60, 55, 50, 45

DESCRIPTION AND CLASSIFICATION

PAVEMENT: Approximately 5 inches of ASPHALT CONCRETE.

UNDIFFERENTIATED SURFICIAL SOILS: Clayey SAND with gravel (SC); dark yellowish brown (10YR 4/4); moist; mostly sand; some fines; little gravel; low plasticity.
(18% Gravel; 55% Sand; 27% Fines).
PID=1.2 ppm
Some GRAVEL and COBBLES from 3ft to 5ft.

Clayey SAND (SC); reddish brown (5YR 4/3); moist; mostly sand; some fines; low plasticity; gravel lodged in sampler.
(41% Fines).
PID=1.0 ppm

Silty GRAVEL with sand (GM); yellowish brown (10YR 5/4); moist; mostly gravel; little sand; little fines; nonplastic.
Gravel stuck in sampler shoe.
PID=0.8 ppm
Slow and difficult drilling on GRAVEL and COBBLES from 6ft to 14ft.

Clayey GRAVEL with sand (GC); brown (10YR 4/3); moist; mostly gravel; little fines and sand; low plasticity.

No recovery; dense; spoils are clayey SAND (SC).

Clayey SAND (SC); dark gray (7.5YR 4/1); moist; mostly fine sand; some fines; low plasticity; organic odor.
PID=2.5 ppm

Poorly-graded SAND (SP); medium dense; very pale brown (10YR 7/3); moist; mostly fine to medium sand; trace fines; nonplastic; trace mica.
Thinly bedded felsic and mafic minerals from 20ft to 20.5ft in sample.
PID=1.6 ppm
(95% Sand; 5% Fines).

BORING RECORD

PROJECT NAME: SDSU Mission Valley			**PROJECT NUMBER**: SD605		**BORING**: S-8	
SITE LOCATION: 9449 Friars Road, San Diego, California		**START**: 3/14/2019	**FINISH**: 3/14/2019		**SHEET NO.**: 2 of 4	
DRILLING COMPANY: Pacific Drilling	**DRILLING METHOD**: Hollow Stem Auger		**LOGGED BY**: S. Narveson		**CHECKED BY**: C. Vonk	
DRILLING EQUIPMENT: Diedrich D50	**BORING DIA. (in)**: 8	**TOTAL DEPTH (ft)**: 75.5	**GROUND ELEV (ft)**: 69		**DEPTH/*ELEV.* GROUNDWATER (ft)**: ▼ 22.4 / *46.6*	
SAMPLING METHOD: Hammer: 140 lbs., Drop: 30 in. (Automatic)	**NOTES**: ETR ~ 79%, N_{60} = $1.32N_{SPT}$ = $0.88N_{MC}$					

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
			S8-1 S8-2	3 2 3	5	7	12.7 35.2	- -	-200			**UNDIFFERENTIATED SURFICIAL SOILS (continued):** Well graded SAND (SW); loose; grayish brown (10YR 5/2); wet; mostly fine to coarse sand; trace fines; nonplastic; trace mica. PID=0.6 ppm (4% Fines).
	40											Sandy lean CLAY (CL); medium stiff; very dark gray (10YR 3/2); wet; mostly fines; some fine sand; medium plasticity; micaceous. PID=0.4 ppm; PP=0.75 tsf
30			S9	5^ 8^ 12^	^	^	13.4	-	PA	30		Poorly-graded SAND (SP); gray (10YR 5/1); wet; mostly fine to medium sand; few gravel; trace fines; nonplastic; trace mica. Packed sampler. PID=6.7 ppm (9% Gravel; 87% Sand; 4% Fines).
	35											
35			S10	7 6 4	10	13	21.4	-	-200	35		Medium dense; trace mica. PID=24.1 ppm (5% Fines)
	30											Fat CLAY (CH); medium stiff; dark gray (10YR 4/1); wet; mostly fines; little fine sand; hight plasticity; grading to silty sand. PP=1 tsf; TV= 0.25 tsf (86% Fines)
40			R11-1 R11-2	6 7 20	27	24	34.4 20.8	86 106	-200 PI	40		Silty SAND (SM); medium dense; dark gray (10YR 4/1); wet; mostly fine sand; some fines; nonplastic; grading to sand with silt.
	25											
45			S12	8^ 8^ 11^	^	^	24.1	-	-200	45		Poorly-graded SAND with silt (SP-SM); dark gray (10YR 5/1); wet; mostly fine to medium sand; few fines; nonplastic; micaceous. Packed sampler. PID=1.0 ppm (6% Fines)
	20											

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FIGURE
B-8 b

BORING RECORD

PROJECT NAME	PROJECT NUMBER	BORING
SDSU Mission Valley	SD605	**S-8**

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	3/14/2019	3/14/2019	3 of 4

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Pacific Drilling	Hollow Stem Auger	S. Narveson	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GROUNDWATER (ft)
Diedrich D50	8	75.5	69	▼ 22.4 / *46.6*

SAMPLING METHOD	NOTES
Hammer: 140 lbs., Drop: 30 in. (Automatic)	ETR ~ 79%, N_{60} = $1.32N_{SPT}$ = $0.88N_{MC}$

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
			S13	8 15 22	37	49	15.0	-	-200		**UNDIFFERENTIATED SURFICIAL SOILS (continued):** Clayey SAND (SC); dense; dark gray (10YR 5/1); wet; mostly fine to medium sand; little fines; trace gravel; low plasticity; micaceous. PID=0.3 ppm (19% Fines)
	15										
55			S14	8^ 12^ 14^	^	^	13.6	-	-200		Silty SAND (SM); dark gray (10YR 5/1); wet; mostly fine to medium sand; few fines and gravel; low plasticity; micaceous. Sampler packed. PID=0.8 ppm (12% Fines)
											Moderately difficult drilling on GRAVELS and COBBLES from 56ft to 62ft. Poorly-graded GRAVEL (GP); dark grayish brown (2.5YR 4/2); wet; mostly gravel; few sand; trace fines; nonplastic; trace mica. (Estimated 10 to 20% COBBLES).
	10										
60			S15	19^ 18^ 12^	^	^	9.1	-			
	5										Slow and difficult drilling on GRAVELS and COBBLES from 62ft to 73ft. (Estimated 20 to 30% COBBLES)
65											
	0										
70			S16	50/3"	REF	REF					No recovery; sampler refusal on gravel and cobbles.
	-5										**FRIARS FORMATION:** *Poorly indurated SANDSTONE; (see next page)

BORING RECORD

PROJECT NAME	PROJECT NUMBER	BORING
SDSU Mission Valley	SD605	S-8

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	3/14/2019	3/14/2019	4 of 4

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Pacific Drilling	Hollow Stem Auger	S. Narveson	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GROUNDWATER (ft)
Diedrich D50	8	75.5	69	▼ 22.4 / *46.6*

SAMPLING METHOD	NOTES
Hammer: 140 lbs., Drop: 30 in. (Automatic)	ETR ~ 79%, N_{60} = 1.32N_{SPT} = 0.88N_{MC}

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
		⊠	S17	50/6"	REF	REF	20.5	-	-200			**FRIARS FORMATION (continued):** *Poorly-indurated SANDSTONE; fine grained; massive; gray (7.5YR 5/1); moderately weathered; very soft; unfractured (Silty SAND (SM); very dense; wet; mostly fine sand; few fines; nonplastic; weakly to moderately cemented). (46% Fines)
	-10											
80										80		
	-15											
85										85		
	-20											
90										90		
	-25											
95										95		
	-30											

Total Depth = 75.5 feet (Target depth reached).

Groundwater measured during drilling at a depth of 22.4 feet.

Boring backfilled on 3/14/19 shortly after drilling with bentonite grout and capped with black-dyed rapid set concrete.

This Boring Record is part of a geotechnical report which must be considered in its entirety.

^ = Inaccurate blowcounts.

*Geologic Description; (Disturbed Soil Description).

All soils encountered may include up to 10% COBBLES (granitic, subrounded, 3- to 12-inch diameter), estimated based on drill rig chatter, excessive auger inclination, and visual evaulation of drill cuttings. Percent COBBLES greater than 10% are noted in the boring record description and classification, where encountered. Cobble-rich layers encountered in this exploration were approximately 10 to 20 feet thick.

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FIGURE

B-8 d

BORING RECORD

PROJECT NAME	PROJECT NUMBER	BORING
SDSU Mission Valley	SD605	S-9

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	3/4/2019	3/5/2019	1 of 2

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Pacific Drilling	HSA (0-13') / Casing Advance (13-36.5')	S. Narveson	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GROUNDWATER (ft)
Diedrich D50	8/4	36.5	59	▼ NM / *na*

SAMPLING METHOD	NOTES
Hammer: 140 lbs., Drop: 30 in. (Automatic)	ETR ~ 79%, $N_{60} = 1.32N_{SPT} = 0.88N_{MC}$

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS
0.3-5	58.7-54	Bulk	B1						
5-6.5	54-52.5	Drive	S2	3 8^ 13^	^	^	7.7	-	PA
10-11.5	49-47.5	Drive	S3	15^ 29^ 29^	^	^			
20-21.5	39-37.5	Drive	S4	6^ 15^ 39^	^	^			

Elevation scale: 55, 50, 45, 40, 35

Depth scale: 5, 10, 15, 20

DESCRIPTION AND CLASSIFICATION

PAVEMENT: Approximately 4 inches of ASPHALT CONCRETE.

UNDIFFERENTIATED SURFICIAL SOILS: Clayey SAND with gravel (SC); brown (7.5YR 4/4); moist; mostly fine to coarse sand; some fines; little gravel; low plasticity.
PID=1.3 ppm
(17% Gravel; 48% Sand; 35% Fines)
Increasing gravel content; difficult drilling from 3 to 4 feet on GRAVELS and COBBLES.
Medium plasticity; gravel in sampler.
PID=0.6 ppm

Slow and difficult drilling from 7 to 19 feet on GRAVEL and COBBLES from 7 to 19 ft.
Clayey GRAVEL (GC); brown (7.5 YR 4/2); moist; mostly gravel; little sand; little fines; nonplastic.
(Estimated 20 to 30% COBBLES).

Equipment failure- sheared drive cap at 11 ft.

Switch to rotary casing advancement due to slow and difficult drilling.

Poorly graded SAND with silt (SP-SM); wet; gray (7.5 YR 6/1); mostly fine sand; few fines; trace fine gravel; nonplastic.
Packed sampler.
PID=0.4 ppm

BORING RECORD

PROJECT NAME	PROJECT NUMBER	BORING
SDSU Mission Valley	SD605	S-9

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	3/4/2019	3/5/2019	2 of 2

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Pacific Drilling	HSA (0-13') / Casing Advance (13-36.5')	S. Narveson	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GROUNDWATER (ft)
Diedrich D50	8/4	36.5	59	▼ NM / *na*

SAMPLING METHOD	NOTES
Hammer: 140 lbs., Drop: 30 in. (Automatic)	ETR ~ 79%, N_{60} = 1.32N_{SPT} = 0.88N_{MC}

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
			S5	18^ 25^ 32^	^	^	19.0	-	PA			**UNDIFFERENTIATED SURFICIAL SOILS (continued):** Silty SAND (SM); brown (7.5Y 5/4); wet; mostly fine to medium sand; little fines; nonplastic; trace mica; iron oxide staining throughout sample. (0% Gravel; 78% Sand; 22% Fines)
30	30									30		**FRIARS FORMATION:** *Poorly-indurated CLAYSTONE; fine grained; massive; dark gray (10YR 4/1); wet; moderately weathered; very soft; unfractured (FAT CLAY (CH); hard; mostly fines; trace sand; highly plastic). PP>4 tsf; PID=1.8 ppm (95% Fines)
			S6-1 S6-2	19 20 34	54	71	24.3 18.6	- -	-200 PI			
	25											*Poorly-indurated SANDSTONE; fine to coarse grained; massive; gray (10YR 5/1); wet; moderately weathered; very soft; unfractured (Poorly-graded SAND with silt (SP-SM); very dense; mostly fine sand; few fines; nonplastic; weakly cemented). PID=1.4 ppm
35			S7	20 26 35	61	80	20.6	-		35		
	20											Total Depth = 36.5 feet (Target depth reached).
40										40		
	15											
45										45		
	10											

Total Depth = 36.5 feet (Target depth reached).

Groundwater was not measured during drilling because fluid was added to the hole prior to encountering groundwater.

Boring backfilled on 3/6/19 with bentonite grout and capped with black-dyed rapid set concrete.

This Boring Record is part of a geotechnical report which must be considered in its entirety.

^ = Inaccurate blowcount.

All soils encountered may include up to 10% COBBLES (granitic, subrounded, 3- to 12-inch diameter), estimated based on drill rig chatter, excessive auger inclination, and visual evaluation of drill cuttings. Percent COBBLES greater than 10% are noted in the boring record description and classification, where encountered. Cobble-rich layers encountered in this exploration were approximately 10 to 13 feet thick.

*Geologic Description; (Disturbed Soil Description).

GDC_LOG_BORING_MMX_SOIL_SD SD605 LOGS - PHASE 01 - STADIUM.GPJ GDCLOG.GDT 5/9/19

BORING RECORD

PROJECT NAME	PROJECT NUMBER	BORING
SDSU Mission Valley	SD605	**S-10**

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	3/12/2019	3/12/2019	1 of 4

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Pacific Drilling	Hollow Stem Auger	S. Narveson	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GROUNDWATER (ft)
Diedrich D50	8	71.3	66	▼ 22.1 / *43.9*

SAMPLING METHOD	NOTES
Hammer: 140 lbs., Drop: 30 in. (Automatic)	ETR ~ 79%, N_{60} = $1.32N_{SPT}$ = $0.88N_{MC}$

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
0	65											**PAVEMENT:** Approximately 4 inches of ASPHALT CONCRETE.
												UNDIFFERENTIATED SURFICIAL SOILS: Clayey SAND with gravel (SC); yellowish brown (10YR 5/4); moist; mostly fine to coarse sand; some fines; few to little gravel; low to medium plasticity.
			B1						PA PI CR EI			(19% Gravel; 47% Sand; 34% Fines) Dark gray (7.5YR 4/1).
5	60		S2	23^ 22^ 14^	^	^	11.9	-		5		Light brownish gray (10YR 6/2); gravel in sampler. PP=1.25 tsf; PID=1.5 ppm
10	55		R3	10 12 11	23	20	7.8	107		10		Poorly-graded SAND with silt (SP-SM); medium dense; gray (10YR 5/1); moist; mostly fine sand; few fines; nonplastic. PID=1.4 ppm
15	50		S4	9 8 8	16	21				15		No recovery.
20	45		S5	3 3 4	7	9	19.5	-	PA	20		Poorly-graded SAND (SP); loose; grayish brown (10YR 5/2); moist; mostly fine to medium sand; trace fines; nonplastic; micaceous. PID=6.2 ppm (0% Gravel; 97% Sand; 3% Fines)

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FIGURE B-10 a

BORING RECORD

PROJECT NAME	PROJECT NUMBER	BORING
SDSU Mission Valley	SD605	**S-10**

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	3/12/2019	3/12/2019	2 of 4

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Pacific Drilling	Hollow Stem Auger	S. Narveson	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GROUNDWATER (ft)
Diedrich D50	8	71.3	66	▼ 22.1 / *43.9*

SAMPLING METHOD	NOTES
Hammer: 140 lbs., Drop: 30 in. (Automatic)	ETR ~ 79%, $N_{60} = 1.32N_{SPT} = 0.88N_{MC}$

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
	40		R6	7 13 20	33	29	16.7	-	-200			**UNDIFFERENTIATED SURFICIAL SOILS (continued):** Poorly-graded SAND with silt (SP-SM); medium dense; grayish brown (10YR 5/2); wet; mostly fine sand; few fines; nonplastic. 9% Fines
30	35		S7	3 2 3	5	7	19.7	-	-200	30		Well-graded SAND (SW); loose; grayish brown (10YR 6/1); wet; mostly fine to coarse sand; trace fines and fine gravel; nonplastic; trace mica. PID=1.9 ppm (1% Fines)
35	30		S8	15 7 6	13	17	22.7	-	-200 PI	35		Sandy lean CLAY (CL); medium stiff to stiff; very dark gray (2.5Y 3/1); wet; mostly fines; little sand; few gravel; medium plasticity; trace mica. PP=1.0 tsf; TV=0.4 tsf; PID=1.1 ppm (62% Fines)
40	25		S9	3 3 3	6	8	24.1	-		40		Medium Stiff. PP=0.5 tsf; TV=0.3 tsf; PID=1.3 ppm
45	20		S10	P 6 7	13	17	24.9	-	-200 PI	45		Medium stiff to stiff; no gravel; trace mica. PP=1.0 tsf; TV=0.5 tsf; PID=1.2 ppm (62% Fines)

BORING RECORD

PROJECT NAME	PROJECT NUMBER	BORING
SDSU Mission Valley	SD605	**S-10**

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	3/12/2019	3/12/2019	3 of 4

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Pacific Drilling	Hollow Stem Auger	S. Narveson	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GROUNDWATER (ft)
Diedrich D50	8	71.3	66	▼ 22.1 / *43.9*

SAMPLING METHOD	NOTES
Hammer: 140 lbs., Drop: 30 in. (Automatic)	ETR ~ 79%, N_{60} = $1.32N_{SPT}$ = $0.88N_{MC}$

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
	15		S11	10 15 13	28	37	22.5	-	-200			**UNDIFFERENTIATED SURFICIAL SOILS (continued):** Poorly-graded SAND with silt (SP-SM); dense; dark gray (10YR 5/1); wet; mostly fine sand; few to little fines; nonplastic; micaceous. PID=0.6 ppm (11% Fines)
55	10		S12	10^ 22^ 49^	^	^	16.6	-		55		Slow and difficult drilling on GRAVEL and COBBLES from 54 feet and 60 feet. Silty GRAVEL with sand (GM); wet; dark gray (10YR 5/1); mostly gravel; little to some sand; little fines; nonplastic; trace mica. PID=1.4 ppm (Estimated 20% COBBLES)
60	5									60		Poorly-graded SAND with silt (SP-SM); dark gray (10YR 5/1); wet; mostly fine sand; few to little fines; nonplastic.
65	0		S13	19^ 20^ 13^	^	^	16.1	-		65		Packed sampler.
70	-5		S14	25 37 50/3"	87/9"	>100	16.2	-	PA	70		**FRIARS FORMATION:** *Poorly-indurated SANDSTONE; fine grained; massive; gray (7.5YR 5/1); wet; moderately weathered; very soft; unfractured; (Silty SAND (SM); very dense; wet; mostly fine sand; some fines; nonplastic; weakly cemented). (0% Gravel; 61% Sand; 39% Fines)

BORING RECORD

PROJECT NAME	PROJECT NUMBER	BORING
SDSU Mission Valley	SD605	S-10

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	3/12/2019	3/12/2019	4 of 4

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Pacific Drilling	Hollow Stem Auger	S. Narveson	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GROUNDWATER (ft)
Diedrich D50	8	71.3	66	▼ 22.1 / *43.9*

SAMPLING METHOD	NOTES
Hammer: 140 lbs., Drop: 30 in. (Automatic)	ETR ~ 79%, N_{60} = $1.32N_{SPT}$ = $0.88N_{MC}$

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
	-10											Total Depth = 71.3 feet (Target depth reached). Groundwater measured during drilling at a depth of 22.1 feet. Boring backfilled on 3/12/19 with bentonite grout and capped with black dyed rapid set concrete. This Boring Record is part of a geotechnical report which must be considered in its entirety. ^ = Inaccurate blowcount. All soils encountered may include up to 10% COBBLES (granitic, subrounded, 3- to 12-inch diameter), estimated based on drill rig chatter, excessive auger inclination, and visual evaluation of drill cuttings. *Geologic Description; (Disturbed Soil Description).
80										80		
	-15											
85										85		
	-20											
90										90		
	-25											
95										95		
	-30											

BORING RECORD

PROJECT NAME	PROJECT NUMBER	BORING
SDSU Mission Valley	SD605	S-11

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	3/6/2019	3/7/2019	1 of 2

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Pacific Drilling	HSA (0-30') / Mud Rotary (30-36.5')	S. Narveson	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GROUNDWATER (ft)
Diedrich D50	8/4	36.5	54	▼ 10.0 / *44.0*

SAMPLING METHOD	NOTES
Hammer: 140 lbs., Drop: 30 in. (Automatic)	ETR ~ 79%, N_{60} = $1.32N_{SPT}$ = $0.88N_{MC}$

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
												PAVEMENT: Approximately 3.5 inches of ASPHALT CONCRETE
			B1				14.6	--	PA PI CR EI			**UNDIFFERENTIATED SURFICIAL SOILS:** Sandy lean CLAY (CL); stiff; dark brown (7.5YR 3/3); moist; mostly fines; some sand; trace gravel; medium plasticity. PP=1.5 tsf; PID=9.5 ppm (1% Gravel; 33% Sand; 66% Fines)
	50											
5			R2	4 9^ 15^	^	^	14.5	118	-200	5		Medium stiff to very stiff; gravel in sampler. PP=2.25 tsf; TV=0.45 tsf (59% Fines)
												Intermittant difficult drilling on GRAVEL and COBBLES from 7 to 12 ft.
	45											
10			S3	3 3 4	7	9	19.0	--	PI	10		Medium stiff to stiff; wet. PP=1 tsf; TV=0.3 tsf; PID=0.8 ppm
	40											
15			S4	5 9 32^	^	^	10.8	--	PA	15		Poorly graded SAND with clay and gravel (SP-SC); dark yellowish brown (10YR 4/6); wet; mostly fine to coarse sand; some gravel; few fines; low plasticity; trace mica; packed sampler PID=1.3 ppm (34% Gravel; 57% Sand; 9% Fines)
												Difficult drilling on GRAVEL and COBBLES from 18 to 19 ft.
	35											
20			S5	5 12 19	31	41	20.6	--	-200	20		Silty SAND (SM); dense; gray (2.5Y 5/1); wet; mostly fine sand; little fines; trace fine gravel; nonplastic; trace iron oxide staining. PID=0.4 ppm (22% Fines)
	30											

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THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED.

FIGURE B-11 a

BORING RECORD

PROJECT NAME SDSU Mission Valley	**PROJECT NUMBER** SD605	**BORING** S-11	
SITE LOCATION 9449 Friars Road, San Diego, California	**START** 3/6/2019	**FINISH** 3/7/2019	**SHEET NO.** 2 of 2
DRILLING COMPANY Pacific Drilling	**DRILLING METHOD** HSA (0-30') / Mud Rotary (30-36.5')	**LOGGED BY** S. Narveson	**CHECKED BY** C. Vonk
DRILLING EQUIPMENT Diedrich D50	**BORING DIA. (in)** 8/4	**TOTAL DEPTH (ft)** 36.5	**GROUND ELEV (ft)** 54
DEPTH/*ELEV.* GROUNDWATER (ft) ▼ 10.0 / *44.0*			
SAMPLING METHOD Hammer: 140 lbs., Drop: 30 in. (Automatic)	**NOTES** ETR ~ 79%, N_{60} = $1.32N_{SPT}$ = $0.88N_{MC}$		

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
			S6	50/3"	REF	REF						**UNDIFFERENTIATED SURFICIAL SOILS (continued):** Silty SAND (SM); gray (2.5Y 5/1); wet; mostly fine sand; little fines; trace fine gravel; nonplastic; no recovery; heaving/flowing sands.
30	25		S7	20 22 36	58	76	18.9	--	-200	30		**FRIARS FORMATION:** *Poorly-indurated SANDSTONE; fine to medium grained; massive; gray (2.5Y N/5/1); wet; moderately weathered; very soft; unfractured; (Silty SAND (SM); very dense; mostly fine to medium sand; little fines; nonplastic; weakly cemented). PID=0.1 ppm (22% Fines) Switch to mud rotary at 30 feet (tricone rotary drill bit).
35	20		S8	23 27 37	64	84	20.7	--		35		PID=0.2 ppm
40	15									40		
45	10									45		
	5											

Total Depth = 36.5 feet (Target depth reached).

Groundwater measured during drilling at a depth of 10 feet.

Boring backfilled on 3/7/19 shortly after drilling with bentonite grout and capped with black-dyed rapid set concrete.

This Boring Record is part of a geotechnical report which must be considered in its entirety.

All soils encountered may include up to 10% COBBLES (granitic, subrounded, 3- to 12-inch diameter), estimated based on drill rig chatter, excessive auger inclination, and visual evaluation of drill cuttings. . Percent COBBLES greater than 10% are noted in the boring record description and classification, where encountered. Cobble-rich layers encountered in this exploration were approximately 1 to 2 feet thick.

^=Inaccurate blowcount.

*Geologic Description (Disturbed Soil Description)

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FIGURE B-11 b

BORING RECORD

PROJECT NAME	PROJECT NUMBER	BORING
SDSU Mission Valley	SD605	**S-12**

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	3/8/2019	3/8/2019	1 of 2

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Pacific Drilling	Hollow Stem Auger	S. Narveson	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GROUNDWATER (ft)
Diedrich D50	8	41.5	58	▼ 21.8 / *36.2*

SAMPLING METHOD	NOTES
Hammer: 140 lbs., Drop: 30 in. (Automatic)	ETR ~ 79%, N_{60} = $1.32N_{SPT}$ = $0.88N_{MC}$

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
0	58											**PAVEMENT:** Approximately 4 inches of ASPHALT CONCRETE
												UNDIFFERENTIATED SURFICIAL SOILS: Clayey SAND (SC); brown (10YR 4/3); mostly fine to coarse sand; some fines; few gravel; low to medium plasticity. PID=1.2 ppm (5% Gravel; 48% Sand; 47% Fines)
	55		B1				13.2	--	PA EI			Very dark gray (10YR3/1).
5			S2	2 4 9	13	17	10.3	--		5		Medium dense; yellowish brown (10YR 5/4); little fines; low plasticity; trace mica. PID=3.2 ppm
	50											
10			R3	11^ 22^ 38^	^	^	9.1	--	-200	10		Clayey GRAVEL (GC); moist; dark grayish brown (10YR 4/2); mostly fine to coarse gravel; some fines; little sand; medium plasticity; gravel stuck in sampler. (47% Fines)
	45											Clayey SAND with gravel (SC); dark grayish brown (10YR 4/2); moist; mostly fine to coarse sand; little gravel; little to some fines; low plasticity; trace mica. PID= 1.4 ppm (18% Gravel; 54% Sand; 28% Fines)
15			S4	13^ 14^ 14^	^	^	15.9	--	PA	15		
	40											
20			S5	14^ 29^ 15^	^	^	10.0	--		20		Silty GRAVEL with sand (GM); dark grayish brown (10YR 4/2); wet; mostly fine to medium gravel; some sand; little fines; nonplastic; trace mica. PID=0.9 ppm
	35										▼	
												FRIARS FORMATION: *Poorly indurated SANDSTONE; (see next page)

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FIGURE

B-12 a

BORING RECORD

PROJECT NAME SDSU Mission Valley		**PROJECT NUMBER** SD605	**BORING** S-12
SITE LOCATION 9449 Friars Road, San Diego, California	**START** 3/8/2019	**FINISH** 3/8/2019	**SHEET NO.** 2 of 2
DRILLING COMPANY Pacific Drilling	**DRILLING METHOD** Hollow Stem Auger	**LOGGED BY** S. Narveson	**CHECKED BY** C. Vonk
DRILLING EQUIPMENT Diedrich D50	**BORING DIA. (in)** 8	**TOTAL DEPTH (ft)** 41.5	**GROUND ELEV (ft)** 58
DEPTH/*ELEV.* GROUNDWATER (ft) ▼ 21.8 / *36.2*			
SAMPLING METHOD Hammer: 140 lbs., Drop: 30 in. (Automatic)	**NOTES** ETR ~ 79%, N_{60} = $1.32N_{SPT}$ = $0.88N_{MC}$		

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
	30	☒	S6	45 25 39	64	84	14.7	--	-200			**FRIARS FORMATION (continued):** *Poorly-indurated SANDSTONE; fine grained; massive; gray (7.5YR 6/1); wet; moderately weathered; very soft; unfractured; (Silty SAND (SM); very dense; wet; mostly fine sand; little fines; nonplastic; weakly cemented). PID=0.7 ppm. (23% Fines)
30	25	☒	S7	22 31 50	81	>100	26.0	--		30		Gray (7.5YR 5/1); (Clayey SAND (SC); little fines; low plasticity). PID=0.3 ppm
35		☒	S8-1 S8-2	7 16 22	38	50	21.7 17.6	-- --	-200 PI -200	35		*Poorly-indurated CLAYSTONE; fine grained; massive; dark gray (2.5Y 4/1); wet; unfractured; moderately weathered; very soft; (Sandy fat CLAY (CH); hard; mostly fines; few fine sand; high plasticity). PID=0.5 ppm; (61% Fines)
	20											*Poorly-indurated SANDSTONE; fine grained; massive; dark gray (2.5Y 4/1); wet; moderately weathered; very soft; unfractured; (Silty SAND (SM); dense; mostly fine sand; some fines; nonplastic; weakly cemented). (35% Fines)
40		☒	S9	16 24 50	74	97	20.3	--		40		Very dense; PID=0 ppm
	15											Total Depth = 41.5 feet (Target depth reached). Groundwater measured during drilling at a depth of 21.8 feet. Boring backfilled on 3/8/19 with bentonite grout and capped with black-dyed rapid set concrete. This Boring Record is part of a geotechnical report which must be considered in its entirety.
45	10									45		All soils encountered may include up to 10% COBBLES (granitic, subrounded, 3- to 12-inch diameter), estimated based on drill rig chatter, excessive auger inclination, and visual evaluation of drill cuttings. ^= Inaccurate blowcount. *Geologic Description; (Disturbed Soil Description).

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FIGURE
B-12 b

BORING RECORD

PROJECT NAME	PROJECT NUMBER	BORING
SDSU Mission Valley	SD605	**S-13**

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	2/13/2019	2/25/2019	1 of 5

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Pacific Drilling	HSA (0-45') / Mud Rotary (45-101.5')	S. Narveson	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GROUNDWATER (ft)
Diedrich D50	8/4	101.5	75	▼ NM / *NM*

SAMPLING METHOD	NOTES
Hammer: 140 lbs., Drop: 30 in. (Automatic)	ETR ~ 79%, $N_{60} = 1.32N_{SPT} = 0.88N_{MC}$

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DESCRIPTION AND CLASSIFICATION
0	75									**PAVEMENT:** Approximately 3 inches of ASPHALT CONCRETE.
		Bulk	B1						PI EI	**UNDIFFERENTIATED SURFICIAL SOILS:** Clayey SAND (SC); grayish brown (10YR 5/2); moist; mostly fine sand; little fines; little gravel; medium plasticity. PID=3.3 ppm (23% Gravel; 56% Sand; 21% Fines)
		SPT	S2	25 16 10	26	34	12.9	-	PA	
		Bulk	B1							Slow and difficult drilling on GRAVEL and COBBLES. (Estimated 20% COBBLES).
5	70	SPT	S3	18 15^ 29^	^	^	12.2	-		Clayey GRAVEL (GC); dense; grayish brown (10YR 5/2); moist; mostly gravel and gravel-sized freshly broken rock fragments; little to some fines; little sand; medium plasticity.
10	65	SPT	S4	11 24^ 18^	^	^				
15	60	SPT	S5	7 20^ 24^	^	^				No recovery.
										Sandy lean CLAY with gravel (CL); grayish brown; moist; mostly fines; some sand; little gravel. (Estimated 10 to 20% COBBLES).
20	55	SPT	S6	7 50/3" ^	^	^				Slow and difficult drilling on GRAVEL and COBBLES from 20 to 30 ft. Clayey GRAVEL (GC); very dense; dark grayish brown; wet; mostly fine to coarse gravel; some sand; little fines; medium plasticity. Gravel stuck in sampler. PID=0.4 ppm (Estimated 20% COBBLES)

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BORING RECORD

PROJECT NAME	PROJECT NUMBER	BORING
SDSU Mission Valley	SD605	S-13

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	2/13/2019	2/25/2019	2 of 5

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Pacific Drilling	HSA (0-45') / Mud Rotary (45-101.5')	S. Narveson	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GROUNDWATER (ft)
Diedrich D50	8/4	101.5	75	▼ NM / *NM*

SAMPLING METHOD	NOTES
Hammer: 140 lbs., Drop: 30 in. (Automatic)	ETR ~ 79%, N_{60} = 1.32N_{SPT} = 0.88N_{MC}

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
			S7	50/1"	REF	REF						**UNDIFFERENTIATED SURFICIAL SOILS (continued):** No recovery. Clayey GRAVEL (GC) (continued).
30	45		S8	50/4"	REF	REF				30		No recovery.
												Poorly-graded SAND with silt (SP-SM); wet; gray (7.5YR 5/1); mostly fine to medium sand; few fines; trace gravel; nonplastic; micaceous.
35	40		S9	15 9 15	24	32	23.2	-	PA	35		Dense; no gravel; trace mica. PID=0.8 ppm (0% Gravel; 94% Sand; 6% Fines)
40	35		S10	6 7 10	17	22	18.0	-	-200	40		Medium dense; trace iron oxide staining. PID=0.8 ppm (7% Fines)
45	30		R11	6 5 8	13	11	27.6	-		45		Switch to mud rotary drilling (Tricone rotary drill bit). Dark gray (2.5Y 4/1); wet. PID=4.8 ppm

GDC_LOG_BORING_MMX_SOIL_SD SD605 LOGS - PHASE 01 - STADIUM.GPJ GDCLOG.GDT 5/9/19

BORING RECORD

PROJECT NAME	PROJECT NUMBER	BORING
SDSU Mission Valley	SD605	S-13

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	2/13/2019	2/25/2019	3 of 5

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Pacific Drilling	HSA (0-45') / Mud Rotary (45-101.5')	S. Narveson	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GROUNDWATER (ft)
Diedrich D50	8/4	101.5	75	▼ NM / *NM*

SAMPLING METHOD	NOTES
Hammer: 140 lbs., Drop: 30 in. (Automatic)	ETR ~ 79%, N_{60} = 1.32N_{SPT} = 0.88N_{MC}

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
			S12	9 10 10	20	26						**<u>UNDIFFERENTIATED SURFICIAL SOILS (continued)</u>:** Clayey SAND (SC); medium dense; dark gray (7.5YR 4/1); wet; mostly fine to coarse sand; some fines; few gravel; low plasticity; trace mica. PID=0.2 ppm
55	20		S13	17^ 17^ 16^	^	^	15.0	-	-200	55		Well-graded SAND with silt and gravel (SW-SM); dense; dark gray (7.5YR 4/1); wet; mostly fine to coarse sand; few fines; little gravel; nonplastic. PID=0 (9% Fines)
60	15		S14	50/5"	REF	REF				60		Sampler refusal; gravel stuck in shoe of sampler. PID=1.8 ppm Slow and difficult drilling on GRAVELS and COBBLES from 60 to 75 ft. (Estimated 20% COBBLES).
65	10									65		
70	5		S15	50/5.5"	REF	REF				70		PID=0

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BORING RECORD

PROJECT NAME SDSU Mission Valley		**PROJECT NUMBER** SD605	**BORING** S-13
SITE LOCATION 9449 Friars Road, San Diego, California	**START** 2/13/2019	**FINISH** 2/25/2019	**SHEET NO.** 4 of 5
DRILLING COMPANY Pacific Drilling	**DRILLING METHOD** HSA (0-45') / Mud Rotary (45-101.5')	**LOGGED BY** S. Narveson	**CHECKED BY** C. Vonk
DRILLING EQUIPMENT Diedrich D50	**BORING DIA. (in)** 8/4	**TOTAL DEPTH (ft)** 101.5 / **GROUND ELEV (ft)** 75	**DEPTH/*ELEV.* GROUNDWATER (ft)** ▼ NM / *NM*
SAMPLING METHOD Hammer: 140 lbs., Drop: 30 in. (Automatic)	**NOTES** ETR ~ 79%, N_{60} = $1.32N_{SPT}$ = $0.88N_{MC}$		

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
												FRIARS FORMATION: *Poorly-indurated SANDSTONE; fine to coarse grained; massive; gray (2.5Y 6/1); moderately to highly weathered; very soft; unfractured; (Clayey SAND (SC); dense; wet; mostly fine sand; little fines; low plasticity; weakly to moderately cemented).
80	-5		S16	15 17 24	41	54	25.8	-	-200	80		Very dense. PID=0 (25% Fines)
												Slow and difficult drilling 82 to 84 ft; moderately to strongly cemented SANDSTONE and possible concretions.
85	-10									85		
90	-15		S17	50/2"	REF	REF				90		Slow and difficult drilling from 89 to 92 ft; moderately to strongly cemented SANDSTONE and made possible concretions. No recovery; possible concretions.
95	-20									95		
												Slow and difficult drilling from 97 to 98 ft; moderately to strongly cemented SANDSTONE and possible concretions.

GDC_LOG_BORING_MMX_SOIL_SD SD605 LOGS - PHASE 01 - STADIUM.GPJ GDCLOG.GDT 5/9/19

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BORING RECORD

PROJECT NAME SDSU Mission Valley	**PROJECT NUMBER** SD605	**BORING** S-13	
SITE LOCATION 9449 Friars Road, San Diego, California	**START** 2/13/2019	**FINISH** 2/25/2019	**SHEET NO.** 5 of 5
DRILLING COMPANY Pacific Drilling	**DRILLING METHOD** HSA (0-45') / Mud Rotary (45-101.5')	**LOGGED BY** S. Narveson	**CHECKED BY** C. Vonk
DRILLING EQUIPMENT Diedrich D50	**BORING DIA. (in)** 8/4	**TOTAL DEPTH (ft)** 101.5	**GROUND ELEV (ft)** 75
DEPTH/*ELEV.* GROUNDWATER (ft) NM / *NM*			
SAMPLING METHOD Hammer: 140 lbs., Drop: 30 in. (Automatic)	**NOTES** ETR ~ 79%, N_{60} = $1.32N_{SPT}$ = $0.88N_{MC}$		

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
			S18	34 32 38	70	92	19.6	-				**FRIARS FORMATION (continued):** *Poorly-indurated SANDSTONE; fine to coarse grained; massive; gray (2.5Y 6/1); moderately to highly weathered; very soft; unfractured; (Silty SAND (SM); very dense; wet; mostly fine to coarse sand; little fines; low plasticity; weakly to moderately cemented.
105	-30									105		
110	-35									110		
115	-40									115		
120	-45									120		

Total Depth = 101.5 feet (Target depth reached).

Groundwater not measured.

Boring backfilled on 2/25/19 and 2/26/19 with bentonite grout and capped with cold patch asphalt.

This Boring Record is part of a geotechnical report which must be considered in its entirety.

^ = Inaccurate blowcount

All soils encountered may include up to 10% COBBLES (granitic, subrounded, 3- to 12-inch diameter), estimated based on drill rig chatter, excessive auger inclination, and visual evaulation of drill cuttings. Percent COBBLES greater than 10% are noted in the boring record description and classification, where encountered. Cobble-rich layers encountered in this exploration were approximately 10 to 20 feet thick.

*Geologic Description; (Disturbed Soil Description).

GDC_LOG_BORING_MMX_SOIL_SD SD605 LOGS - PHASE 01 - STADIUM.GPJ GDCLOG.GDT 5/9/19

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FIGURE B-13 e

BORING RECORD

PROJECT NAME	PROJECT NUMBER	BORING
SDSU Mission Valley	SD605	**B-14**

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	3/13/2019	3/13/2019	1 of 2

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Tri-County Drilling	Hollow Stem Auger	S. Narveson	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GROUNDWATER (ft)
CME 75	8	31.5	51	▼ NM / *NM*

SAMPLING METHOD	NOTES
Hammer: 140 lbs., Drop: 30 in. (Automatic)	ETR ~ 85%, $N_{60} = 1.42N_{SPT} = 0.95N_{MC}$

DEPTH (feet)	ELEVATION (feet)	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DESCRIPTION AND CLASSIFICATION
0	51								**PAVEMENT:** Approximately 4 inches of ASPHALT CONCRETE.
	50	B1						EI	**UNDIFFERENTIATED SURFICIAL SOILS:** Clayey SAND (SC); brown (7.5YR 4/3); moist; mostly fine to medium sand; some fines; few gravel; low plasticity.
		S2	6 9 9	18	26	9.0	-	PA	Medium dense; dark gray (10YR 5/1); little fines; trace gravel; micaceous. (1% Gravel; 86% Sand; 13% Fines) PID= 0.8 ppm.
		B3							PID=0.5 ppm.
5	45	S4	3 5 6	11	16	18.5	-	-200 PI	Lean CLAY with sand (CL); stiff to very stiff; reddish brown (5YR 4/4); moist; mostly fines; little fine sand; trace fine gravel; medium plasticity; trace mica. PP= 2.5 tsf; TV= 0.9 tsf; PID=0.6 ppm (66% Fines)
10	40	S5	16^ 25^ 29^	^	^				Clayey GRAVEL with sand (GC); reddish brown (5YR 4/3) and gray (10YR 5/1) gravels; moist; mostly gravel with fresh broken rock fragments; little sand; little fines; low plasticity. Gravel in sampler. Polymer/water mix added to hollow stem. PID=1 ppm. Slow and difficult drilling on GRAVEL and COBBLES from 7ft to 25ft. (Estimated 10 to 30% COBBLES)
15	35	S6	16^ 17^ 18^	^	^	11.1	-	-200	Poorly graded GRAVEL with silt and sand (GP-GM); dense; brown (10YR 4/3); wet; mostly gravel; some sand; few fines; nonplastic. Gravel in sampler. PID=0.9 ppm. (10% Fines) (Estimated 20% COBBLES)
20	30	S7	45^ 50/2" ^	^	^				No recovery; sampler refusal on gravel and cobbles.
									5-inch diameter cobble in spoils.

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THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED.

FIGURE
B-14 a

BORING RECORD

PROJECT NAME SDSU Mission Valley		**PROJECT NUMBER** SD605		**BORING** B-14
SITE LOCATION 9449 Friars Road, San Diego, California		**START** 3/13/2019	**FINISH** 3/13/2019	**SHEET NO.** 2 of 2
DRILLING COMPANY Tri-County Drilling	**DRILLING METHOD** Hollow Stem Auger		**LOGGED BY** S. Narveson	**CHECKED BY** C. Vonk
DRILLING EQUIPMENT CME 75	**BORING DIA. (in)** 8	**TOTAL DEPTH (ft)** 31.5	**GROUND ELEV (ft)** 51	**DEPTH/*ELEV.* GROUNDWATER (ft)** ▼ NM / *NM*
SAMPLING METHOD Hammer: 140 lbs., Drop: 30 in. (Automatic)	**NOTES** ETR ~ 85%, N_{60} = $1.42N_{SPT}$ = $0.95N_{MC}$			

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
	25		S8	20 30 47	77	>100	18.0	-	PA			**FRIARS FORMATION:** *Poorly-indurated SANDSTONE; fine to medium grained; massive; pinkish gray (7.5YR 6/2); highly weathered; very soft; unfractured (Silty SAND (SM); very dense; wet; mostly fine to medium sand; little fines; nonplastic; weakly cemented). (79% Sand; 21% Fines) PID = 0.9 ppm
30										30		*Poorly-indurated CLAYSTONE; fine grained; massive; redish gray (5YR 5/2); moderately weathered; very soft; unfractured (sandy lean CLAY (CL); hard; wet; mostly fines; some fine sand; medium to high plasticity).
	20		S9	14 30 44	74	>100	17.6	-	-200			*Poorly-indurated SANDSTONE; fine to medium grained; massive; pinkish gray (7.5YR 6/2); highly weathered; very soft; unfractured (Silty SAND (SM); very dense; wet; mostly fine to medium sand; little fines; nonplastic; weakly cemented). PID=0.3 ppm (19% Fines)
35										35		Total Depth = 31.5 feet (Target depth reached).
	15											
40										40		
	10											
45										45		
	5											

Groundwater was not measured during drilling because Polymer/water mix added down hollow stem to control heaving sands prior to encountering groundwater.

Boring backfilled on 3/13/2019 shortly after drilling with neat portland cement and capped with black-dyed rapid set concrete.

This Boring Record is part of a geotechnical report which must be considered in its entirety.

^ = Inaccurate blowcounts.

*Geologic Description; (Disturbed Soil Description).

All soils encountered may include up to 10% COBBLES (subrounded, 3- to 12-inch diameter), estimated based on drill rig chatter, excessive auger inclination, and visual evaluation of drill cuttings. Percent COBBLES greater than 10% are noted in the boring record description and classification, where encountered. Cobble-rich layers encountered in this exploration were approximately 15 to 20 feet thick.

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BORING RECORD

PROJECT NAME	PROJECT NUMBER	BORING
SDSU Mission Valley	SD605	**B-15**

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	2/11/2019	3/15/2019	1 of 2

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Pacific Drilling	Hollow Stem Auger	S. Narveson	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GROUNDWATER (ft)
Unimog Marl M5 & Deidrich D50	6	36.3	51	▼ 12.2 / *38.8*

SAMPLING METHOD	NOTES
Hammer: 140 lbs., Drop: 30 in. (Automatic)	ETR ~ 81% (Marl M5) / 79% (Deidrich D50)

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
												PAVEMENT: Approximately 5 inches of ASPHALT CONCRETE.
	50											**UNDIFFERENTIATED SURFICIAL SOILS:** Clayey SAND with gravel (SC); light brown (10YR 5/3); moist; mostly fine to coarse sand; some fines; little to some gravel and gravel-sized freshly broken rock fragments; medium plasticity. (26% Gravel; 44% Sand; 30% Fines)
			B1				11.4	-	PA			
5	45		R2-1 R2-2	12^ 29^ 22^	^	^	12.0 10.9	- -	-200 PI	5		Brown (7.5YR 4/3); little to some fines; approximately ~2.5-inch diameter gravel clast in sample number R2-1. PP=2.25 tsf; PID=0.3 ppm (27% Fines)
10	40		S3	2 3 5	8	11	22.4	-		10		Silty SAND (SM); medium dense; dark gray (2.5Y 4/1); moist; mostly fine to coarse sand; some fines; nonplastic; trace mica. PID=0.7 ppm
15	35		S4	12^ 14^ 12^	^	^	15.5	-		15		Clayey SAND with gravel (SC); dense; grayish brown (10YR 5/2); wet; mostly fine to coarse sand; some fines; little gravel; medium plasticity. Gravel in sampler. PID=1.0 ppm
												Slow and difficult drilling on GRAVEL and COBBLES. (Estimated 10 to 20% COBBLES)
20	30		S5	16^ 23^ 20^	^	^	8.4	-		20		Silty SAND with gravel (SM); yellowish brown (10YR 5/4); wet; mostly fine to coarse sand; some fines; little gravel; nonplastic. Gravel in sampler. PID=10.1 ppm

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THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED.

BORING RECORD

PROJECT NAME	PROJECT NUMBER	BORING
SDSU Mission Valley	SD605	**B-15**

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	2/11/2019	3/15/2019	2 of 2

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Pacific Drilling	Hollow Stem Auger	S. Narveson	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GROUNDWATER (ft)
Unimog Marl M5 & Deidrich D50	6	36.3	51	▼ 12.2 / *38.8*

SAMPLING METHOD	NOTES
Hammer: 140 lbs., Drop: 30 in. (Automatic)	ETR ~ 81% (Marl M5) / 79% (Deidrich D50)

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
	25		S6	7 10 50/3" ^	^	^						**UNDIFFERENTIATED SURFICIAL SOILS (continued):** Silty SAND with gravel (SM); dark grayish brown (10YR 6/2); wet; mostly fine to coarse sand; some fines; little gravel; nonplastic; gravel in bottom of sample.
												FRIARS FORMATION: *Poorly indurated SANDSTONE; fine grained; massive; light brownish gray (10YR 6/2); highly weathered; very soft; unfractured (Silty SAND (SM); very dense; wet; mostly fine sand; little fines; nonplastic; weakly cemented).
30	20		S7	8 16 24	40	53	19.4	-		30		
35	15		R8-1 R8-2	10 33 50/4"	83/10"	88	6.1	120	PA DS	35		Gray (10YR 6/1); strongly cemented concretion in sampler. (0% Gravel; 86% Sand; 14% Fines)
40	10									40		
45	5									45		

Total Depth = 36.3 feet (Target depth reached).

Groundwater measured during drilling at a depth of 12.2 feet on 2/11/19.

Marl M5 (0 to 26.3 feet); Deidrich D50 (26.3 to 36.3 feet).

Boring backfilled on 2/11/19 shortly after drilling with bentonite grout and capped with black-dyed rapid set concrete. Boring redrilled on 3/15/19, backfilled with bentonite grout and capped with black-dyed rapid set concrete.

This Boring Record is part of a geotechnical report which must be considered in its entirety.

^ = Inaccurate blowcounts.
*Geologic Description; (Disturbed Soil Description).

All soils encountered may include up to 10% COBBLES (subrounded, 3- to 12-inch diameter), estimated based on drill rig chatter, excessive auger inclination, and visual evaualation of drill cuttings. Percent COBBLES greater than 10% are noted in the boring record description and classification, where encountered. Cobble-rich layers encountered in this exploration were approximately 1 to 5 feet thick.

BORING RECORD

PROJECT NAME	PROJECT NUMBER	BORING
SDSU Mission Valley	SD605	B-16

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	2/13/2019	2/15/2019	1 of 4

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Pacific Drilling	HSA (0-45') / Mud Rotary (45-85')	S. Narveson	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GROUNDWATER (ft)
Diedrich D50	8/4	85	78	▼ 39.9 / *38.1*

SAMPLING METHOD	NOTES
Hammer: 140 lbs., Drop: 30 in. (Automatic)	ETR ~ 79%, N_{60} = $1.32N_{SPT}$ = $0.88N_{MC}$

DEPTH (feet)	ELEVATION (feet)	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS
	75	S1	5 5 6	11	14	13.6	-	
		B2				13.1	-	PA CR EI
5		R3	8 10 16	26	23	16.4	109	
	70							
10		S4	6^ 15^ 15^	^	^	13.1	-	-200
	65							
15		R5	50/2" ^	REF	REF			
	60							
20		S6	3 10 20	30	40	13.2	-	-200 PI
	55							

DESCRIPTION AND CLASSIFICATION

PAVEMENT: Approximately 3 inches of ASPHALT CONCRETE over 6 inches of AGGREGATE BASE.

UNDIFFERENTIATED SURFICIAL SOILS: Silty SAND (SM); medium dense; grayish brown (2.5Y 5/2); moist; mostly fine to medium sand; some fines; trace gravel and cobbles; nonplastic.

Clayey SAND (SC); medium dense; grayish brown (2.5Y 5/2); moist; mostly fine to medium sand; some fines; trace gravel and cobbles; low plasticity.
PID=0.0 ppm
(4% Gravel; 57% SAND; 39% fines)

Clayey SAND with gravel (SC); dense; dark grayish brown (10YR 4/2); moist; mostly fine sand; some fines; few to little gravel and gravel-sized freshly broken rock fragments; low plasticity.
PID=0.0 ppm
(38% Fines)

Slow and difficult drilling on GRAVEL and COBBLES. (Estimated 20% COBBLES)

No recovery; sampler refusal.

Clayey SAND (SC); dense; moist; mostly fine sand;some fines; few to little gravel; low to medium plasticity.
PP=1.0 tsf
(35% Fines)

BORING RECORD

PROJECT NAME	PROJECT NUMBER	BORING
SDSU Mission Valley	SD605	B-16

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	2/13/2019	2/15/2019	2 of 4

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Pacific Drilling	HSA (0-45') / Mud Rotary (45-85')	S. Narveson	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GROUNDWATER (ft)
Diedrich D50	8/4	85	78	▼ 39.9 / *38.1*

SAMPLING METHOD	NOTES
Hammer: 140 lbs., Drop: 30 in. (Automatic)	ETR ~ 79%, $N_{60} = 1.32N_{SPT} = 0.88N_{MC}$

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS
			R7	50/5" ^	REF	REF			
	50								
30			S8	16 7 9	16	21	16.4	-	PA
	45								
35			R9	18 30 26	56	49			
	40								
40			S10-1 S10-2	6 3 2	5	7	18.5 45.6	- -	-200 PI
	35								
45			R11-1 R11-2	14 20 33	53	47	13.6	116	-200
	30								

DESCRIPTION AND CLASSIFICATION

UNDIFFERENTIATED SURFICIAL SOILS (continued):
Hard drilling on GRAVEL and COBBLES.

No recovery; sampler refusal.
(Estimated 20-30% COBBLES)

Silty SAND (SM); medium dense; dark gray (5YR 4/1); moist; mostly fine sand; some fines; few gravel; nonplastic; micaceous; 1/2 inch clay lense in bottom 1/3rd of sample.
PID=0.3 ppm
(6% Gravel; 62% Sand; 32% Fines)

No recovery; dense.

Loose; dark gray (2.5Y 4/1); wet; mostly medium to coarse sand; trace mica.
PID=13.6 ppm

Sandy fat CLAY (CH); medium stiff; black (5Y 2.5/1); wet; mostly fines; some fine sand; high plasticity.
PID=26.4 ppm
(57% Fines)

Poorly-graded SAND with silt (SP-SM); dense; dark grayish brown (10YR 4/2); wet; mostly medium to coarse sand; few fines; trace gravel; nonplastic; well-graded in bottom rings of sample.
PID=0.0 ppm
(9% Fines)
Switch to mud rotary drilling (Tricone rotary drill bit) at 45 feet.

BORING RECORD

PROJECT NAME	PROJECT NUMBER	BORING
SDSU Mission Valley	SD605	**B-16**

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	2/13/2019	2/15/2019	3 of 4

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Pacific Drilling	HSA (0-45') / Mud Rotary (45-85')	S. Narveson	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GROUNDWATER (ft)
Diedrich D50	8/4	85	78	▼ 39.9 / *38.1*

SAMPLING METHOD	NOTES
Hammer: 140 lbs., Drop: 30 in. (Automatic)	ETR ~ 79%, N_{60} = $1.32N_{SPT}$ = $0.88N_{MC}$

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
			S12	12 8 11	19	25	24.6	-	-200			**UNDIFFERENTIATED SURFICIAL SOILS (continued):** Poorly-graded SAND (SP); medium dense; gray (10YR 5/1); wet; mostly fine to medium sand; trace fines and fine gravel; nonplastic; trace mica. PID=41.2 ppm (4% Fines)
	25											
55			R13	27 ^ 50/4" ^	^	^	16.6	-		55		Heaving sands; packed sampler PID=0.0 ppm
	20											
60										60		Slow and difficult drilling on GRAVEL and COBBLES. (Estimated 20-30% COBBLES)
	15											
65			S14	25^ 30^ 50/5" ^	^	^	12.2	-		65		Silty GRAVEL with sand (GM); very dense; dark grayish brown (2.5Y 4/2); wet; mostly gravel, cobbles and gravel-sized freshly broken rock fragments; little fines; little to some fine to coarse sand; nonplastic. PID=1.4 ppm
	10											Very slow and difficult drilling on GRAVEL and COBBLES (caving; drill bit getting stuck downhole). (Estimated 30% COBBLES)
70										70		
	5											

BORING RECORD

PROJECT NAME	PROJECT NUMBER	BORING
SDSU Mission Valley	SD605	B-16

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	2/13/2019	2/15/2019	4 of 4

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Pacific Drilling	HSA (0-45') / Mud Rotary (45-85')	S. Narveson	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/ELEV. GROUNDWATER (ft)
Diedrich D50	8/4	85	78	▼ 39.9 / *38.1*

SAMPLING METHOD	NOTES
Hammer: 140 lbs., Drop: 30 in. (Automatic)	ETR ~ 79%, $N_{60} = 1.32N_{SPT} = 0.88N_{MC}$

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
		⊠	S15	30^ 30^ 35^	^	^	21.8	-				**UNDIFFERENTIATED SURFICIAL SOILS (continued):** Silty GRAVEL with sand (GM); very dense; light olive brown (2.5Y 5/3); wet; mostly gravel and gravel-sized freshly broken rock fragments; little fines; little to some fine to coarse sand; nonplastic. (Estimated 20% COBBLES) PID=0.0 ppm
	0											
80		⊠	S16	21 29 50	79	>100	19.3	-		80		**FRIARS FORMATION:** *Poorly indurated SANDSTONE; fine to coarse grained; massive; gray (2.5Y 5/1); moderately to highly weathered; very soft; unfractured; (Poorly graded SAND with clay (SP-SC); very dense; wet; mostly fine sand; few to little fines; low plasticity; weakly cemented). PID=0.0 ppm
	-5											Unable to sample at 85 feet due to gravel caving into borehole.
85										85		Total Depth = 85 feet (Target depth reached).
	-10											Groundwater measured during drilling at a depth of 39.9 feet.
90										90		Boring backfilled on 2/15/19 shortly after drilling with bentonite grout and capped with black-dyed rapid set concrete.
												This Boring Record is part of a geotechnical report which must be considered in its entirety.
												^ = Inaccurate blowcounts.
	-15											*Geologic Description; (Disturbed Soil Description).
95										95		All soils encountered may include up to 10% COBBLES (subrounded, 3- to 12-inch diameter), estimated based on drill rig chatter, excessive auger inclination, and visual evaulation of drill cuttings. Percent COBBLES greater than 10% are noted in the boring record description and classification, where encountered. Cobble-rich layers encountered in this exploration were approximately 3 to 20 feet thick.
	-20											

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FIGURE

B-16 d

BORING RECORD

PROJECT NAME	PROJECT NUMBER	BORING
SDSU Mission Valley	SD605	**B-17**

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	2/12/2019	2/12/2019	1 of 4

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Pacific Drilling	HSA (0-25') / Mud Rotary (25-71.5')	S. Narveson	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GROUNDWATER (ft)
Diedrich D50	8/4	71.5	64	▼ 23.6 / *40.4*

SAMPLING METHOD	NOTES
Hammer: 140 lbs., Drop: 30 in. (Automatic)	ETR ~ 79%, $N_{60} = 1.32N_{SPT} = 0.88N_{MC}$

DEPTH (feet)	ELEVATION (feet)	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DESCRIPTION AND CLASSIFICATION
0	64								**PAVEMENT:** Approximately 4 inches of ASPHALT CONCRETE.
									UNDIFFERENTIATED SURFICIAL SOILS: Clayey SAND (SC); yellowish brown (10YR 5/4); moist; mostly fine to coarse sand; some fines; trace gravel; low to medium plasticity; few cobbles. PID=0.0 ppm (1% Gravel; 61% Sand; 38% Fines)
		B1				13.8	-	PA CR	
	60								Slow and difficult drilling on GRAVEL and COBBLES. (Estimated 10% COBBLES)
5		R2	20^ 25^ 17^	^	^	17.5	106	-200 PI	Clayey SAND with gravel (SC); dense; dark yellowish brown (10YR 4/2); moist; mostly fine to coarse sand, gravel, and gravel-sized freshly broken rock fragments; some fines; medium plasticity; sample disturbed in upper 12 inches. PP=1.75 tsf; PID=34.0 ppm (43% Fines)
	55								
10		S3	28^ 24^ 22^	^	^				Clayey GRAVEL (GC); very dense; yellowish brown (10 YR 5/4); moist; mostly gravel; some fines; little sand; low plasticity; low recovery. Slow and difficult drilling on GRAVEL and COBBLES. (Estimated 20% COBBLES)
	50								Sandy lean CLAY to clayey SAND (CL to SC); very stiff/"medium dense"; dark yellowish brown (10YR 4/2); moist; mostly fines and fine to coarse sand; few gravel; low to medium plasticity; 2 inch diameter gravel in sampler shoe. PP=2.5 tsf; PID=1.4 ppm (60% Fines)
15		R4-1 R4-2	7 7 22^	^	^	18.8	105	-200	
	45								
20		S5	14 9 8	17	22	13.5	-	-200 PI	PID=11.1 ppm (38% Fines)
									Poorly-graded SAND with silt (SP-SM); dark grayish brown (2.5Y 4/2); wet; mostly medium sand; little fines; few gravel; nonplastic.
	40								▼

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BORING RECORD

PROJECT NAME	PROJECT NUMBER	BORING
SDSU Mission Valley	SD605	**B-17**

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	2/12/2019	2/12/2019	2 of 4

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Pacific Drilling	HSA (0-25') / Mud Rotary (25-71.5')	S. Narveson	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GROUNDWATER (ft)
Diedrich D50	8/4	71.5	64	▼ 23.6 / *40.4*

SAMPLING METHOD	NOTES
Hammer: 140 lbs., Drop: 30 in. (Automatic)	ETR ~ 79%, N_{60} = $1.32N_{SPT}$ = $0.88N_{MC}$

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
			R6	29 50/5"	^	^						**UNDIFFERENTIATED SURFICIAL SOILS (continued):** Poorly-graded SAND with silt (SP-SM); very dense; dark grayish brown (2.5Y 4/2); wet; mostly medium sand; few fines; few gravel; nonplastic; trace mica; few cobbles. PID=11.7 ppm Switch to mud rotary drilling (Tricone rotary drill bit) at 25 feet.
	35											Slow and difficult drilling on GRAVEL and COBBLES. (Estimated 20% COBBLES)
30			S7	6 10 14	24	32	26.3	-	-200	30		Silty SAND (SM); dense; dark gray (2.5Y 4/1); wet; mostly medium to coarse sand; little fines; nonplastic; micaceous. PID=0 ppm (17% Fines)
	30											
35			R8-1 R8-2	4 4 6	10	9	28.7	95	-200	35		Very dark gray (2.5Y 3/1); mostly fine sand; some fines; trace mica. PID=0.4 ppm (36% Fines)
	25											
40			S9	3 2 5	7	9	20.8	-	-200	40		Dark grayish brown (10YR 4/2); micaceous. (34% Fines)
	20											Slow and difficult drilling on GRAVEL and COBBLES. (Estimated 20 to 30% COBBLES)
45										45		
	15											Interbedded COBBLES, GRAVEL, and SAND.

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BORING RECORD	PROJECT NAME SDSU Mission Valley	PROJECT NUMBER SD605	BORING **B-17**

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	2/12/2019	2/12/2019	3 of 4

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Pacific Drilling	HSA (0-25') / Mud Rotary (25-71.5')	S. Narveson	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GROUNDWATER (ft)
Diedrich D50	8/4	71.5	64	▼ 23.6 / *40.4*

SAMPLING METHOD	NOTES
Hammer: 140 lbs., Drop: 30 in. (Automatic)	ETR ~ 79%, N_{60} = 1.32N_{SPT} = 0.88N_{MC}

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
			S10	30 50/1"	50/1"	>100	15.5	-	PA			**FRIARS FORMATION:** *Poorly indurated SANDSTONE; fine to coarse grained; massive; gray (7.5YR 6/1); moderately weathered; very soft; unfractured; (Silty SAND (SM); very dense; wet; mostly fine sand; little fines; nonplastic; weakly to moderately cemented). PID=0 ppm (78% Sand; 22% Fines)
	10											
55			S11	23 26 38	64	84	20.0	-		55		(Trace gravel; iron oxide staining). PID=0 ppm
	5											Poorly-indurated CLAYSTONE.
60			R12-1 R12-2	40 50/5"	50/5"	>100	18.0 19.7	109 105	-200 DS	60		*Poorly indurated SANDSTONE; fine to coarse grained; massive; blueish gray (Gley 10B 5/1); moderately weathered; very soft; unfractured; (Poorly-graded SAND with silt (SP-SM); very dense; wet; mostly medium sand; few to little fines; nonplastic; weakly cemented). PID=0 ppm (11% Fines)
	0											
65										65		
	-5											
70			S13	25 35 43	78	>100	22.0	-		70		Thinly bedded. PID=0 ppm
												Total Depth = 71.5 feet (Target depth reached). Groundwater measured during drilling at a depth of 23.6'.
	-10											

GDC_LOG_BORING_MMX_SOIL_SD SD605 LOGS - PHASE 02 - SITE.GPJ GDCLOG.GDT 5/9/19

BORING RECORD

PROJECT NAME	PROJECT NUMBER	BORING
SDSU Mission Valley	SD605	**B-17**

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	2/12/2019	2/12/2019	4 of 4

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Pacific Drilling	HSA (0-25') / Mud Rotary (25-71.5')	S. Narveson	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GROUNDWATER (ft)
Diedrich D50	8/4	71.5	64	▼ 23.6 / *40.4*

SAMPLING METHOD	NOTES
Hammer: 140 lbs., Drop: 30 in. (Automatic)	ETR ~ 79%, N_{60} = $1.32N_{SPT}$ = $0.88N_{MC}$

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
	-15											Boring backfilled on 2/12/19 shortly after drilling with bentonite grout and capped with black-dyed rapid set concrete. This Boring Record is part of a geotechnical report which must be considered in its entirety. ^ = Inaccurate blowcounts. *Geologic Description; (Disturbed Soil Description). All soils encountered may include up to 10% COBBLES (subrounded, 3- to 12-inch diameter), estimated based on drill rig chatter, excessive auger inclination, and visual evaulation of drill cuttings. Percent COBBLES greater than 10% are noted in the boring record description and classification, where encountered. Cobble-rich layers encountered in this exploration were approximately 1 to 8 feet thick.
80										80		
	-20											
85										85		
	-25											
90										90		
	-30											
95										95		
	-35											

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THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED.

FIGURE

B-17 d

BORING RECORD

PROJECT NAME	PROJECT NUMBER	BORING
SDSU Mission Valley	SD605	**B-18**

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	2/11/2019	2/11/2019	1 of 2

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Pacific Drilling	Hollow Stem Auger	S. Narveson	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GROUNDWATER (ft)
Unimog Marl M5	6	20	48	▼ 8.1 / *39.9*

SAMPLING METHOD	NOTES
Hammer: 140 lbs., Drop: 30 in. (Automatic)	ETR ~ 81%, N_{60} = $1.35N_{SPT}$ = $0.9N_{MC}$

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
0	48											**PAVEMENT:** Approximately 4 inches of ASPHALT CONCRETE.
												UNDIFFERENTIATED SURFICIAL SOILS: Clayey SAND (SC); moist; brown (10YR 5/3); mostly sand; some fines; few to little gravel; medium plasticity. PID=0.1 ppm (14% Gravel; 44% Sand; 42% Fines)
	45		B1				12.8	--	PA PI			
5			S2	11 8 7	15	20	13.1	--		5		Medium dense; greenish gray (Gley 10G 6/1); moist; mostly fine to coarse sand; some fines; few gravel; low plasticity. PID=0 ppm
	40										▼	
10			R3	3 4 7	11	10	14.7	--		10		Grayish brown (2.5Y 5/2); wet; mostly fine to medium sand; trace to few gravel; medium plasticity. PID=0.3 ppm
	35											Hole caving at 14 feet; flowing/heaving sands.
15			S4	^ ^ ^	^		26.0	--		15		Slough; Poorly graded SAND with silt (SP-SM); dark gray (5Y 4/1); wet; mostly fine to medium sand; few to little fines; nonplastic; trace mica. PID=0.4 ppm
	30											Unable to sample at 20 feet due to hole caving.
20										20		Total Depth = 20 feet (Target depth reached). Groundwater measured during drilling at a depth of 8.1 feet. Boring backfilled on 2/11/19 shortly after drilling with bentonite grout and capped with black-dyed rapid set concrete.
	25											

BORING RECORD

PROJECT NAME	PROJECT NUMBER	BORING
SDSU Mission Valley	SD605	**B-18**

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	2/11/2019	2/11/2019	2 of 2

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Pacific Drilling	Hollow Stem Auger	S. Narveson	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GROUNDWATER (ft)
Unimog Marl M5	6	20	48	▼ 8.1 / *39.9*

SAMPLING METHOD	NOTES
Hammer: 140 lbs., Drop: 30 in. (Automatic)	ETR ~ 81%, N_{60} = $1.35N_{SPT}$ = $0.9N_{MC}$

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
												This Boring Record is part of a geotechnical report which must be considered in its entirety. ^ = Inaccurate blowcounts. *Geologic Description; (Disturbed Soil Description). All soils encountered may include up to 10% COBBLES (granitic, subrounded, 3- to 12-inch diameter), estimated based on drill rig chatter, excessive auger inclination, and visual evaulation of drill cuttings.
	20											
30										30		
	15											
35										35		
	10											
40										40		
	5											
45										45		
	0											

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THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED.

FIGURE

B-18 b

BORING RECORD

PROJECT NAME	PROJECT NUMBER	BORING
SDSU Mission Valley	SD605	B-19

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	3/12/2019	3/12/2019	1 of 1

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Pacific Drilling	Hollow Stem Auger	A. Bieda	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GROUNDWATER (ft)
Unimog Marl M5	8	4.4	54	▼ NE / *NE*

SAMPLING METHOD	NOTES
Bulk	Borehole Percolation test I-1 performed on 03/13/2019

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
												PAVEMENT: Approximately 5 inches of ASPHALT CONCRETE.
		Bulk	B1				10.0	-	PA EI			**UNDIFFERENTIATED SURFICIAL SOILS:** Clayey SAND (SC); light olive brown (2.5Y 5/3); moist; mostly fine to coarse sand; some fines; trace fine gravel; medium plasticity. (6% Gravel; 60% Sand; 34% Fines)
	50											With gravel; little fine to coarse gravel.
5										5		Total Depth = 4.4 feet (Target depth reached). Groundwater not encountered. Boring converted to a percolation test hole on 03/12/2019 shortly after drilling, and backfilled on 03/13/2019 and patched with black-dyed rapid set concrete after completion of percolation testing. This Boring Record is part of a geotechnical report which must be considered in its entirety.
	45											
10										10		
	40											
15										15		
	35											
20										20		
	30											

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San Diego, California 92126

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED.

FIGURE B-19

BORING RECORD

PROJECT NAME SDSU Mission Valley			**PROJECT NUMBER** SD605		**BORING** B-20	
SITE LOCATION 9449 Friars Road, San Diego, California		**START** 2/27/2019		**FINISH** 3/4/2019	**SHEET NO.** 1 of 3	
DRILLING COMPANY Pacific Drilling	**DRILLING METHOD** HSA (0-52') / Core (52-61.5')		**LOGGED BY** S. Narveson		**CHECKED BY** C. Vonk	
DRILLING EQUIPMENT Diedrich D50	**BORING DIA. (in)** 8/4	**TOTAL DEPTH (ft)** 61.3	**GROUND ELEV (ft)** 77		**DEPTH/*ELEV.* GROUNDWATER (ft)** ▼ 33.4 / *43.6*	
SAMPLING METHOD Hammer: 140 lbs., Drop: 30 in. (Automatic)	**NOTES** ETR ~ 79%, N_{60} = $1.32N_{SPT}$ = $0.88N_{MC}$					

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
												PAVEMENT: Approximately 4 inches of ASPHALT CONCRETE.
	75		B1				13.5	-	PA CR EI			**UNDIFFERENTIATED SURFICIAL SOILS:** Clayey SAND (SC); yellowish brown (10YR 5/4); moist; mostly fine to coarse sand; little fines; trace gravel; low to medium plasticity. PID=0.8 ppm (3% Gravel; 72% Sand; 25% Fines)
			S2	3 15 36 ^	^	^						Brown (7.5YR 5/2); low plasticity; gravel in sampler.
5			S3	50/1"	REF	REF				5		Slow and difficult drilling on GRAVEL and COBBLES. (Estimated 10 to 20% COBBLES).
			S4	50/6"	REF	REF						No recovery. Sampler refusal on gravel and cobbles.
	70											Sampler refusal on gravel and cobbles.
10			S5	38 21 10	31	41	14.1	-	-200	10		Clayey SAND (SC); Dense; grayish brown (10YR 5/2); moist; mostly fine to coarse sand; little to some fines; trace gravel; low plasticity. PID=0.3 ppm (27% Fines)
	65											
15			R6	50/5.5"	REF	REF				15		Slow and difficult drilling on GRAVEL and COBBLES. No recovery. (Estimated 10% to 20% COBBLES).
	60											
20			S7	13 9 11	20	26	11.1	-	-200	20		Clayey SAND (SC); medium dense; dark yellowish brown (10YR 3/4); moist; mostly sand; some fines; few gravel; medium plasticity; trace mica. PP=1 tsf (40% Fines)
	55											Silty SAND (SM); medium dense; gray (25Y 5/1); moist; mostly fine to medium sand; little fines; trace gravel. PID=0.3 ppm

BORING RECORD

PROJECT NAME	PROJECT NUMBER	BORING
SDSU Mission Valley	SD605	B-20

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	2/27/2019	3/4/2019	2 of 3

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Pacific Drilling	HSA (0-52') / Core (52-61.5')	S. Narveson	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GROUNDWATER (ft)
Diedrich D50	8/4	61.3	77	▼ 33.4 / *43.6*

SAMPLING METHOD	NOTES
Hammer: 140 lbs., Drop: 30 in. (Automatic)	ETR ~ 79%, $N_{60} = 1.32N_{SPT} = 0.88N_{MC}$

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
			S8-1 S8-2	13 5 5	10	13	14.1 15.8	- -	-200			**UNDIFFERENTIATED SURFICIAL SOILS (continued):** (35% Fines)
	50											Sandy lean CLAY (CL); stiff to very stiff; very dark yellowish brown (2.5YR 3/2); moist; mostly fines; some fine sand; few gravel; low-medium plasticity. PP= 2.25 tsf; PID=0.1 ppm
30			S9	4 15 17	32	42	13.7	-	-200	30		Silty SAND (SM); dense; dark gray (2.5YR 4/1); moist; mostly fine sand; little fines; nonplastic; trace mica. PID=0.3 ppm (19% Fines)
	45											
35			S10	3 8 10	18	24	20.4	-	PA	35		Poorly graded SAND with silt (SP-SM); medium dense; dark gray (7.5Y 4/1); wet; mostly fine to medium sand; few fines; trace gravel; nonplastic. PID=0.3 ppm (4% Gravel; 88% Sand; 8% Fines)
	40											
40			S11-1 S11-2	2 2 2	4	5	20.3	-	-200	40		Trace mica; PID=0 ppm.
	35											Sandy lean CLAY (CL); medium stiff; brown (7.5YR 4/2); wet; mostly fines; some fine sand; medium plasticity; PP=1 tsf; PID= 0.3 ppm (53% Fines)
45			S12	50/2"	REF	REF				45		Slow and difficult drilling on GRAVEL and COBBLES. (Estimated 20 to 30% COBBLES). Sampler refusal on gravel and gobbles; no recovery. Equipment failure- sheared drive cap at 45 ft.
	30											

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BORING RECORD

PROJECT NAME	PROJECT NUMBER	BORING
SDSU Mission Valley	SD605	B-20

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	2/27/2019	3/4/2019	3 of 3

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Pacific Drilling	HSA (0-52') / Core (52-61.5')	S. Narveson	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GROUNDWATER (ft)
Diedrich D50	8/4	61.3	77	▼ 33.4 / *43.6*

SAMPLING METHOD	NOTES
Hammer: 140 lbs., Drop: 30 in. (Automatic)	ETR ~ 79%, N_{60} = 1.32N_{SPT} = 0.88N_{MC}

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
			S13	100/6"	REF	REF						**UNDIFFERENTIATED SURFICIAL SOILS (continued):** Silty GRAVEL with sand (GM); grayish brown (10YR 5/2); wet; mostly gravel; some sand; little fines; non-plastic. (Estimated 20 to 30% COBBLES). Blueish gray (GLEY 2 5PB 5/1).
	25											
55										55		Equipment failure-sheared drive cap at 52 ft. Switch to coring.
	20											
												FRIARS FORMATION: *Poorly indurated SANDSTONE; fine to coarse grained; massive; gray (2.5YR 6/1); wet; moderately to highly weathered; very soft; unfractured; (Silty SAND (SM); very dense; wet; mostly fine to medium sand; little fines; trace fine gravel; nonplastic; weakly cemented).
60			S14	13 22 50/4"	72/10"	>100	16.8	-	-200	60		PID=0 ppm (33% Fines)
	15											Total Depth = 61.3 feet (Target depth reached).
												Groundwater measured during drilling at a depth of 33.4 feet.
65										65		Boring backfilled on 3/4/19 shortly after drilling with bentonite grout and patched with black-dyed rapid set concrete.
	10											This Boring Record is part of a geotechnical report which must be considered in its entirety.
												^ = Inaccurate blowcount
												*Geologic Description; (Disturbed Soil Description).
70										70		All soils encountered may include up to 10% COBBLES (subrounded, 3- to 12-inch diameter), estimated based on drill rig chatter, excessive auger inclination, and visual evaulation of drill cuttings. Percent COBBLES greater than 10% are noted in the boring record description and classification, where encountered. Cobble-rich layers encountered in this exploration were approximately 5 to 15 feet thick.
	5											

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THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED.

FIGURE
B-20 c

BORING RECORD

PROJECT NAME	PROJECT NUMBER	BORING
SDSU Mission Valley	SD605	**B-21**

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	3/12/2019	3/13/2019	1 of 3

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Pacific Drilling & Tri-County	Hollow Stem Auger	S. Narveson	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GROUNDWATER (ft)
Unimog Marl (Pacific) M5 & CME 75 (Tri-County)	8	45.9	61	▼ 10.8 / *50.2*

SAMPLING METHOD	NOTES
Hammer: 140 lbs., Drop: 30 in. (Automatic)	ETR ~ 81% (Marl M5) / ~ 85%, (CME 75)

DEPTH (feet)	ELEVATION (feet)	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DESCRIPTION AND CLASSIFICATION
0									**PAVEMENT:** Approximately 6 inches of ASPHALT CONCRETE.
	60	B1				14.1	--	PA CR EI	**UNDIFFERENTIATED SURFICIAL SOILS:** Clayey SAND (SC); dark grayish brown (10YR 4/2); moist; mostly fine to medium sand; some fines; trace fine gravel; low plasticity. (4% Gravel; 51% Sand; 45% Fines)
5	55	S2	3 6 8	14	19	16.5	--	-200 PI	Medium dense; dark gray (5Y 4/1). PP=1 tsf; PID=2.3 ppm. (47% Fines)
									Hard drilling on GRAVEL and COBBLES. (Estimated 10-20% COBBLES)
10	50	R3-1 R3-2	7 17 17	34	31	4.9	--	-200	Sandy lean CLAY (CL); very stiff; very dark gray (2.5Y 3/1); moist; mostly fines; some fine sand; medium plasticity. PP=3.25 tsf; PID=0.8 ppm.
									Poorly-graded SAND (SP); dense; olive gray (5Y 4/2); wet; mostly fine to medium sand; trace fines; nonplastic. (4% Fines) Switch rig from Marl M5 to CME 75 at 11.5 feet.
15	45	S4	3 3 3	6	9			PA	Silty SAND (SM); loose; dark gray (2.5Y 4/1); wet; mostly fine to medium sand; few to little fines; nonplastic; trace mica. PID=1.1 ppm. (87% Sand; 13% Fines)
20	40	S5	6 16 16	32	45	2.1	--	-200	Poorly graded SAND with silt and gravel (SP-SM); dense; dark gray (2.5Y 3/1); wet; mostly fine sand; few to little fines; little gravel; nonplastic; micaceous; thinly bedded. PID=1.9 ppm. (11% Fines)

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BORING RECORD

PROJECT NAME	PROJECT NUMBER	BORING
SDSU Mission Valley	SD605	**B-21**

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	3/12/2019	3/13/2019	2 of 3

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Pacific Drilling & Tri-County	Hollow Stem Auger	S. Narveson	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GROUNDWATER (ft)
Unimog Marl (Pacific) M5 & CME 75 (Tri-County)	8	45.9	61	▼ 10.8 / *50.2*

SAMPLING METHOD	NOTES
Hammer: 140 lbs., Drop: 30 in. (Automatic)	ETR ~ 81% (Marl M5) / ~ 85%, (CME 75)

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
	35		S6	4 5 6	11	16	20.3	--	-200 PI			**UNDIFFERENTIATED SURFICIAL SOILS (continued):** Sandy lean CLAY (CL); stiff; olive brown (2.5Y 4/3); wet; mostly fines; some fine sand; low plasticity; trace mica. PP=2.0 tsf; TV=0.55 tsf; PID=2.9 ppm. (56% Fines)
30			R7	50/5" ^	REF	REF	14.7	--	-200	30		Heaving sands, sampler packed. Well graded SAND with gravel (SW); dark gray (7.5YR 4/1); wet; mostly fine to coarse sand; little gravel; trace fines; nonplastic. (5% Fines)
	30											
												Slow and difficult drilling on GRAVEL and COBBLES from 33' to 39'. (Estimated 20 to 30% COBBLES) Polymer/water added to hollow stem to control heaving sands.
35										35		
	25											
40										40		**FRIARS FORMATION:** *Poorly-indurated SANDSTONE; fine to coarse grained; massive; gray (7.5YR 6/1); wet; moderately weathered; very soft; unfractured (Silty SAND (SM); very dense; mostly fine sand; some fines; nonplastic; weakly cemented; iron oxide staining in lower 1/3" of sample). PID=0.6 ppm. (70% Sand; 30% Fines)
	20		S8	26 42 50/4"	92/10"	>100	16.3	--	PA			
45										45		Light gray (7.5Y 7/1); no iron oxide staining.
	15		S9	31 50/5"	50/5"	>100	21.1	--				
												Total Depth = 45.9 feet (Target depth reached). Switch rig from Marl M5 to CME 75 below 11.5 feet. Polymer/water mix added down hollow stem to control heaving sands.

BORING RECORD

PROJECT NAME	PROJECT NUMBER	BORING
SDSU Mission Valley	SD605	**B-21**

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	3/12/2019	3/13/2019	3 of 3

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Pacific Drilling & Tri-County	Hollow Stem Auger	S. Narveson	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GROUNDWATER (ft)
Unimog Marl (Pacific) M5 & CME 75 (Tri-County)	8	45.9	61	▼ 10.8 / *50.2*

SAMPLING METHOD	NOTES
Hammer: 140 lbs., Drop: 30 in. (Automatic)	ETR ~ 81% (Marl M5) / ~ 85%, (CME 75)

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
	10											Groundwater measured during drilling at a depth of 10.8 feet bgs. Boring backfilled on 3/13/2019 shortly after drilling with bentonite grout and capped with black-dyed rapid set concrete. This Boring Record is part of a geotechnical report which must be considered in its entirety. ^ = Inaccurate blowcounts. *Geologic Description; (Disturbed Soil Description). All soils encountered may include up to 10% COBBLES (subrounded, 3- to 12-inch diameter), estimated based on drill rig chatter, excessive auger inclination, and visual evaulation of drill cuttings. Percent COBBLES greater than 10% are noted in the boring record description and classification, where encountered. Cobble-rich layers encountered in this exploration were approximately 1 to 8 feet thick.
55										55		
	5											
60										60		
	0											
65										65		
	-5											
70										70		
	-10											

BORING RECORD

PROJECT NAME: SDSU Mission Valley	PROJECT NUMBER: SD605	BORING: **B-22**	
SITE LOCATION: 9449 Friars Road, San Diego, California	START: 3/11/2019	FINISH: 3/11/2019	SHEET NO.: 1 of 2
DRILLING COMPANY: Pacific Drilling	DRILLING METHOD: Hollow Stem Auger	LOGGED BY: A. Bieda	CHECKED BY: C. Vonk
DRILLING EQUIPMENT: Unimog Marl M5	BORING DIA. (in): 6	TOTAL DEPTH (ft): 21.5	GROUND ELEV (ft): 54
DEPTH/*ELEV.* GROUNDWATER (ft): ▼ 7.0 / *47.0*			
SAMPLING METHOD: Hammer: 140 lbs., Drop: 30 in. (Automatic)	NOTES: ETR ~ 81%, N_{60} = $1.35N_{SPT}$ = $0.9N_{MC}$		

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
0	54									0		**PAVEMENT:** Approximately 5 inches of ASPHALT CONCRETE.
		Bulk	B1-1				9.3	--				**UNDIFFERENTIATED SURFICIAL SOILS:** Clayey SAND with gravel (SC); olive brown (2.5Y 4/3); moist; mostly fine to medium sand; little fines; little fine to medium gravel; low plasticity. (24% Gravel; 53% Sand; 23% Fines)
	50	Bulk	B1-2				14.2	--	PA			
5		SPT	S2	17 16 14	30	41				5		No recovery. Cuttings: Sandy lean CLAY (CL); olive gray (5Y 4/2); moist; mostly fines; some fine sand; trace fine gravel; low plasticity. PID=3.7 ppm.
	45											
10		SPT	S3	15 8 2	10	14	9.9	--	-200	10		Poorly-graded SAND with silt and gravel (SM); medium dense; dark grayish brown (10YR 4/2); wet; mostly fine to medium sand; few fines; little fine to coarse gravel; nonplastic; trace mica. PID=19.8 ppm. (7% Fines)
	40											
15		SPT	S4	5 13 21	34	46	11.1	--	-200 PI	15		Clayey SAND with gravel (SC); dense; dark grayish brown (2.5Y 4/2); wet; mostly fine to medium sand; some fines; little fine gravel; low plasticity. PID=2.1 ppm. (35% Fines)
	35											
20		SPT	S5	13 30 18	48	65	14.7	--		20		Very dense; PID=1.2 ppm
	30											Total Depth = 21.5 feet (target depth reached). Groundwater measured during drilling at a depth of 7.0 feet bgs.

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BORING RECORD

PROJECT NAME	PROJECT NUMBER	BORING
SDSU Mission Valley	SD605	**B-22**

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	3/11/2019	3/11/2019	2 of 2

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Pacific Drilling	Hollow Stem Auger	A. Bieda	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GROUNDWATER (ft)
Unimog Marl M5	6	21.5	54	▼ 7.0 / *47.0*

SAMPLING METHOD	NOTES
Hammer: 140 lbs., Drop: 30 in. (Automatic)	ETR ~ 81%, N_{60} = $1.35N_{SPT}$ = $0.9N_{MC}$

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
												Boring backfilled on 3/11/19 shortly after drilling with bentonite grout and capped with cold patch asphalt. This Boring Record is part of a geotechnical report which must be considered in its entirety. All soils encountered may include up to 10% COBBLES (subrounded, 3- to 12-inch diameter), estimated based on drill rig chatter, excessive auger inclination, and visual evaluation of drill cuttings.
	25											
30										30		
	20											
35										35		
	15											
40										40		
	10											
45										45		
	5											

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FIGURE

B-22 b

BORING RECORD

PROJECT NAME	PROJECT NUMBER	BORING
SDSU Mission Valley	SD605	**B-23**

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	3/16/2019	3/16/2019	1 of 4

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Tri-County Drilling	Hollow Stem Auger	A. Bieda	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GROUNDWATER (ft)
Deidrich D120	8	70.4	58	▼ 9.2 / *48.8*

SAMPLING METHOD	NOTES
Hammer: 140 lbs., Drop: 30 in. (Automatic)	ETR ~ 89%, N_{60} = 1.48N_{SPT} = 0.99N_{MC}

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
												PAVEMENT: Approximately 5 inches of ASPHALT CONCRETE.
	55		B1				8.5	--	PA			**UNDIFFERENTIATED SURFICIAL SOILS:** Clayey SAND (SC); very dark grayish brown (10YR 3/2); moist; mostly fine to coarse sand; some fines; low plasticity. PID= 1.7 ppm (68% Sand; 32% Fines)
												Slow and difficult drilling on GRAVEL at 4'.
5			S2	2^ 2^ 3^	^	^	3.4	--	-200	5		Poorly graded SAND (SP); loose; light olive brown (2.5Y 6/3); moist; mostly fine to medium sand; trace fines; nonplastic; trace mica. Coarse gravel in sampling shoe. PID=3.3 ppm. (1% Fines)
	50											
10			R3-1 R3-2	6^ 12^ 15^	^	^	24.5	94	PA	10		Medium dense; wet; few cobbles (<4"). PID=2.8 ppm. (97% Sand; 3% Fines)
	45											
15			S4	2 19 30^	^	^	20.9	--	-200	15		Poorly-graded SAND with gravel (SP); light olive brown (2.5Y 6/3); wet; mostly fine to medium sand; some coarse gravel; nonplastic; trace mica; gravel (<3") in sampling shoe. PID=3.3 ppm. (4% Fines)
	40											
20			R5-1 R5-2	17 29^ 31^	^	^	16.2	110	-200	20		Poorly-graded SAND with silt (SP-SM); light olive brown (2.5Y 6/3); wet; mostly fine sand; few to little fines; few cobbles (<5"); nonplastic. PID=59.7 ppm (12% Fines)
	35											

BORING RECORD

PROJECT NAME	PROJECT NUMBER	BORING
SDSU Mission Valley	SD605	B-23

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	3/16/2019	3/16/2019	2 of 4

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Tri-County Drilling	Hollow Stem Auger	A. Bieda	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GROUNDWATER (ft)
Deidrich D120	8	70.4	58	▼ 9.2 / *48.8*

SAMPLING METHOD	NOTES
Hammer: 140 lbs., Drop: 30 in. (Automatic)	ETR ~ 89%, N_{60} = 1.48N_{SPT} = 0.99N_{MC}

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
	30		S6	16 50/5" ^	^	^	17.4	--	PA			**UNDIFFERENTIATED SURFICIAL SOILS (continued):** Poorly-graded SAND with silt and gravel (SP-SM); very dense; dark gray (2.5 Y 4/1); wet; mostly fine sand; some gravel; few to little fines; nonplastic. PP=0.5 tsf; PID=149.4 ppm. (30% Gravel; 58% Sand; 12% Fines)
30	25		S7	16 35 50/2"	85/8"	>100	17.2	--	-200	30		**FRIARS FORMATION:** *Poorly-indurated SANDSTONE; fine to coarse grained; massive; grayish brown (2.5Y 5/2); wet; moderately weathered; very soft; unfractured (Silty SAND (SM); very dense; mostly fine to medium sand; little fines; nonplastic; weakly cemented). PID=32.2 ppm. (20% Fines)
35	20		S8	24 50/2"	50/2"	>100	19.0	--		35		PID=76.6 ppm.
40	15		S9	19 33 50	83	>100	20.0	--	PA	40		Poorly-indurated SILTSTONE; fine grained; massive; grayish brown (2.5Y 5/2); wet; moderately weathered; very soft; unfractured (Sandy SILT (ML); hard; mostly fines; some sand; trace gravel; nonplastic; 2" beds of yellowish oxide staining). PID=6.6 ppm. (1% Gravel; 49% Sand; 50% Fines)
45	10									45		

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FIGURE B-23 b

BORING RECORD

PROJECT NAME: SDSU Mission Valley	PROJECT NUMBER: SD605	BORING: **B-23**	
SITE LOCATION: 9449 Friars Road, San Diego, California	START: 3/16/2019	FINISH: 3/16/2019	SHEET NO. 3 of 4
DRILLING COMPANY: Tri-County Drilling	DRILLING METHOD: Hollow Stem Auger	LOGGED BY: A. Bieda	CHECKED BY: C. Vonk
DRILLING EQUIPMENT: Deidrich D120	BORING DIA. (in): 8	TOTAL DEPTH (ft): 70.4	GROUND ELEV (ft): 58
DEPTH/*ELEV.* GROUNDWATER (ft): ▼ 9.2 / *48.8*			
SAMPLING METHOD: Hammer: 140 lbs., Drop: 30 in. (Automatic)	NOTES: ETR ~ 89%, N_{60} = $1.48N_{SPT}$ = $0.99N_{MC}$		

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DESCRIPTION AND CLASSIFICATION
			S10	25 41 50/4"	91/4"	>100	19.7	--	-200	**<u>FRIARS FORMATION, (continued)</u>:** Poorly-indurated SANDSTONE; fine to coarse grained; massive; grayish brown (2.5Y 5/2); wet; moderately weathered; very soft; unfractured (Silty SAND (SM); very dense; mostly fine to medium sand; little fines; nonplastic; weakly to moderately cemented). PID=11.2 ppm (20% Fines)
	5									
55										
	0									
60			S11	27 50/6"	50/6"	>100	17.7	--	-200 PI	(Gray (2.5Y 5/1)). PID=4.0 ppm (28% Fines)
	-5									
65										
	-10									
70			S12	50/5" ^	REF	REF				Sampler refusal on strongly cemented sandstone concretion. PID=7.3 ppm
	-15									Total Depth = 70.4 feet (target depth reached). Groundwater measured during drilling at a depth of 9.2 feet bgs. Boring backfilled on 3/16/2019 shortly after drilling with

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THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED.

FIGURE B-23 c

BORING RECORD

PROJECT NAME	PROJECT NUMBER	BORING
SDSU Mission Valley	SD605	**B-23**

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	3/16/2019	3/16/2019	4 of 4

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Tri-County Drilling	Hollow Stem Auger	A. Bieda	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GROUNDWATER (ft)
Deidrich D120	8	70.4	58	▼ 9.2 / *48.8*

SAMPLING METHOD	NOTES
Hammer: 140 lbs., Drop: 30 in. (Automatic)	ETR ~ 89%, N_{60} = $1.48N_{SPT}$ = $0.99N_{MC}$

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
												Portland cement grout and capped with black-dyed rapid set concrete. This Boring Record is part of a geotechnical report which must be considered in its entirety. ^ = inaccurate blowcounts *Geologic Description; (Disturbed Soil Description). All soils encountered may include up to 10% COBBLES (subrounded, 3- to 12-inch diameter), estimated based on drill rig chatter, excessive auger inclination, and visual evaluation of drill cuttings.
	-20											
80										80		
	-25											
85										85		
	-30											
90										90		
	-35											
95										95		
	-40											

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THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED.

BORING RECORD

PROJECT NAME: SDSU Mission Valley			**PROJECT NUMBER:** SD605	**BORING:** B-24
SITE LOCATION: 9449 Friars Road, San Diego, California		**START:** 3/12/2019	**FINISH:** 3/13/2019	**SHEET NO.:** 1 of 4
DRILLING COMPANY: Pacific Drilling	**DRILLING METHOD:** Hollow Stem Auger		**LOGGED BY:** A. Bieda	**CHECKED BY:** C. Vonk
DRILLING EQUIPMENT: Unimog Marl M5 & Deidrich D50	**BORING DIA. (in):** 8	**TOTAL DEPTH (ft):** 66.5	**GROUND ELEV (ft):** 73	**DEPTH/*ELEV.* GROUNDWATER (ft):** ▼ 25.7 / *47.3*
SAMPLING METHOD: Hammer: 140 lbs., Drop: 30 in. (Automatic)	**NOTES:** ETR ~ 81% (Marl M5) / ~ 79% (Diedrich D50)			

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
0	73											**PAVEMENT:** Approximately 4 inches of ASPHALT CONCRETE.
			B1						PA CR EI			**UNDIFFERENTIATED SURFICIAL SOILS:** Clayey SAND (SC); light brownish gray (2.5Y 6/2); moist; mostly fine to medium sand; some fines; trace gravel; medium plasticity. (2% Gravel; 56% Sand; 42% Fines)
	70		S2	8 7 8	15	20	14.1	--	-200			Medium dense; no gravel. (30% Fines) PID= 0.4 ppm.
5			S3	7 6 9	15	20				5		PID= 2 ppm.
	65											
10			S4	8 14 15	29	39	13.8	--	PA	10		Dense; trace gravel. PID= 0.7 ppm. (2% Gravel; 60% Sand; 38% fines)
	60											
15			R5	13 17 14	31	28	3.4	--		15		Medium dense; very dark grayish brown (2.5Y 3/2); trace fine gravel. PID= 45.9 ppm.
	55											
20			S6	4 6 7	13	18	2.0	--	-200	20		Poorly graded SAND (SP); medium dense; light olive brown (2.5Y 5/3); moist; mostly fine to medium sand; trace fines; nonplastic. PID=2.7 ppm. (4% Fines)
	50											

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BORING RECORD

PROJECT NAME	PROJECT NUMBER	BORING
SDSU Mission Valley	SD605	**B-24**

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	3/12/2019	3/13/2019	2 of 4

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Pacific Drilling	Hollow Stem Auger	A. Bieda	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GROUNDWATER (ft)
Unimog Marl M5 & Deidrich D50	8	66.5	73	▼ 25.7 / *47.3*

SAMPLING METHOD	NOTES
Hammer: 140 lbs., Drop: 30 in. (Automatic)	ETR ~ 81% (Marl M5) / ~ 79% (Diedrich D50)

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
			S7	5 7 10	17	23	12.6	--	PA			**<u>UNDIFFERENTIATED SURFICIAL SOILS (continued)</u>:** Poorly graded SAND with silt (SP-SM); medium dense; light olive brown (2.5Y 5/3); wet; mostly fine to medium sand; few fines; nonplastic; trace mica. PID=2.5 ppm. (93% Sand; 7% Fines)
	45											
30			R8-1 R8-2	9 19 26	45	41	15.8	111	-200	30		Dense. PID=18.6 ppm. (8% Fines)
	40											
35			S9	8 8 17	25	34	20.8	--	PA	35		PID=1.1 ppm. (93% Sand; 7% Fines)
	35											
40			R10-1 R10-2	15 20 28	48	43	20.4	108	-200	40		PID=0.8 ppm. (8% Fines) Very dark grayish brown (10YR 3/2); trace fine gravel.
	30											
45			S11	11 13 16	29	39	22.0	--	-200	45		Trace mica. PID=7.9 ppm. (7% Fines)
	25											

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BORING RECORD

PROJECT NAME	PROJECT NUMBER	BORING
SDSU Mission Valley	SD605	B-24

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	3/12/2019	3/13/2019	3 of 4

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Pacific Drilling	Hollow Stem Auger	A. Bieda	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GROUNDWATER (ft)
Unimog Marl M5 & Deidrich D50	8	66.5	73	▼ 25.7 / *47.3*

SAMPLING METHOD	NOTES
Hammer: 140 lbs., Drop: 30 in. (Automatic)	ETR ~ 81% (Marl M5) / ~ 79% (Diedrich D50)

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
		X	S12	10 31 46	77	>100	16.7	--	-200			**UNDIFFERENTIATED SURFICIAL SOILS (continued):** Poorly-graded SAND with silt (SP-SM); very dense; very dark grayish brown (10YR 3/2); wet; mostly fine to medium sand; few fines; trace fine gravel; nonplastic; micaceous. PID=10.6 ppm. (9% Fines) Switch to Deidrich D-50 to continue drilling on 3/13/2019.
	20											
55		X	S13	19^ 29^ 35^	^	^	18.0	--	PA	55		Poorly graded SAND (SP); dark greenish brown (10YR 4/2); wet; mostly fine to medium sand; trace fines; nonplastic; trace mica. Coarse gravel in sampling shoe. PID=8.1 ppm. (96% Sand; 4% Fines) Difficult drilling on GRAVEL and COBBLES; equipment failure- drive cap sheared. (Estimated 30 to 40% COBBLES)
	15											
60		X	S14	21^ 28^ 36^	^	^	13.4	--	-200	60		Poorly-graded SAND with silt (SP-SM); dark greenish brown (10YR 4/2); wet; mostly fine to medium sand; few fines; nonplastic; trace mica; coarse gravel in sampler shoe. PID=6.5 ppm. (6% Fines)
	10											
65		X	S15	22 30 50	80	>100	18.1	--	-200	65		**FRIARS FORMATION:** *Poorly-indurated SANDSTONE; fine to coarse grained; laminated; dark gray (5YR 4/1); wet; moderately weathered; very soft; unfractured (Silty SAND (SM); very dense; dark gray (5Y 4/1); mostly fine sand; little fines; nonplastic; weakly cemented). PID=0.7 ppm. (17% Fines)
	5											
70										70		Total Depth = 66.5 feet (target depth reached). Groundwater measured during drilling at a depth of 25.7 feet bgs. Boring backfilled on 3/13/2019 shortly after drilling with bentonite grout and capped with black-dyed rapid set concrete. This Boring Record is part of a geotechnical report which must be considered in its entirety.
	0											

BORING RECORD

PROJECT NAME SDSU Mission Valley		**PROJECT NUMBER** SD605	**BORING** **B-24**
SITE LOCATION 9449 Friars Road, San Diego, California	**START** 3/12/2019	**FINISH** 3/13/2019	**SHEET NO.** 4 of 4
DRILLING COMPANY Pacific Drilling	**DRILLING METHOD** Hollow Stem Auger	**LOGGED BY** A. Bieda	**CHECKED BY** C. Vonk
DRILLING EQUIPMENT Unimog Marl M5 & Deidrich D50	**BORING DIA. (in)** 8	**TOTAL DEPTH (ft)** 66.5	**GROUND ELEV (ft)** 73
DEPTH/ELEV. GROUNDWATER (ft) ▼ 25.7 / *47.3*			
SAMPLING METHOD Hammer: 140 lbs., Drop: 30 in. (Automatic)	**NOTES** ETR ~ 81% (Marl M5) / ~ 79% (Diedrich D50)		

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
	-5											^ = inaccurate blowcounts *Geologic Description; (Disturbed Soil Description). All soils encountered may include up to 10% COBBLES (subrounded, 3- to 12-inch diameter), estimated based on drill rig chatter, excessive auger inclination, and visual evaluation of drill cuttings.
80										80		
	-10											
85										85		
	-15											
90										90		
	-20											
95										95		
	-25											

GDC_LOG_BORING_MMX_SOIL_SD SD605 LOGS - PHASE 02 - SITE.GPJ GDCLOG.GDT 5/9/19

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FIGURE

B-24 d

BORING RECORD

PROJECT NAME	PROJECT NUMBER	BORING
SDSU Mission Valley	SD605	**B-25**

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	3/11/2019	3/11/2019	1 of 2

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Pacific Drilling	Hollow Stem Auger	A. Bieda	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GROUNDWATER (ft)
Unimog Marl M5	6	20	58	▼ 9.2 / *48.8*

SAMPLING METHOD	NOTES
Hammer: 140 lbs., Drop: 30 in. (Automatic)	ETR ~ 81%, N_{60} = 1.35N_{SPT} = 0.9N_{MC}

DEPTH (feet)	ELEVATION (feet)	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DESCRIPTION AND CLASSIFICATION
0	58								**PAVEMENT:** Approximately 4 inches of ASPHALT CONCRETE Over 1-inch AGGREGATE BASE.
	55	B1				4.7	-	PA	**UNDIFFERENTIATED SURFICIAL SOILS:** Silty SAND (SM); moist; olive brown (2.5Y 4/3); mostly fine to medium sand; little fines; trace fine gravel; nonplastic. (2% Gravel; 77% Sand; 21% Fines)
5		S2	5 5 5	10	14	4.6	-	-200	Sandy lean CLAY (CL); medium stiff to stiff; dark grayish brown (2.5Y 4/2); moist; mostly fines; some fine sand; low plasticity; trace mica. PP=1.0 tsf; PID=1.7 ppm
	50								Poorly graded SAND with silt (SP-SM); medium dense; light olive brown (2.5Y 5/3); moist; mostly fine to medium sand; few fines; trace fine gravel; nonplastic. (8% Fines)
10		S3	3 4 5	9	12	17.5	-	PA	Silty SAND (SM); medium dense; olive (5Y 4/4); wet; mostly fine to medium sand; little fines; trace gravel; nonplastic; trace mica. PID=2.5 ppm (2% Gravel; 78% Sand; 20% Fines) Rig chatter from 13 ft to 14 ft; GRAVEL layer.
15	45	S4	5 6 8	14	19	27.3	-	-200	Poorly graded SAND (SP); medium dense; oilve (5Y 4/4); wet; mostly fine to medium sand; trace fines; nonplastic; trace mica. PID=1.9 ppm (1% Fines) Hole caving at 20 ft; flowing/heaving sands; unable to sample.
20	40								Total Depth = 20 feet (Target depth reached). Groundwater measured during drilling at a depth of 9.2 feet. Boring backfilled on 3/11/2019 shortly after drilling with bentonite grout and capped with black-dyed rapid set concrete.
	35								

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FIGURE B-25 a

BORING RECORD

PROJECT NAME	PROJECT NUMBER	BORING
SDSU Mission Valley	SD605	**B-25**

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	3/11/2019	3/11/2019	2 of 2

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Pacific Drilling	Hollow Stem Auger	A. Bieda	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GROUNDWATER (ft)
Unimog Marl M5	6	20	58	▼ 9.2 / *48.8*

SAMPLING METHOD	NOTES
Hammer: 140 lbs., Drop: 30 in. (Automatic)	ETR ~ 81%, $N_{60} = 1.35N_{SPT} = 0.9N_{MC}$

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
												This Boring Record is part of a geotechnical report which must be considered in its entirety. All soils encountered may include up to 10% COBBLES (subrounded, 3- to 12-inch diameter), estimated based on drill rig chatter, excessive auger inclination, and visual evaulation of drill cuttings.
	30											
30										30		
	25											
35										35		
	20											
40										40		
	15											
45										45		
	10											

GDC_LOG_BORING_MMX_SOIL_SD SD605 LOGS - PHASE 02 - SITE.GPJ GDCLOG.GDT 5/8/19

BORING RECORD

PROJECT NAME	PROJECT NUMBER	BORING
SDSU Mission Valley	SD605	**B-26**

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	3/15/2019	3/15/2019	1 of 3

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Pacific Drilling	HSA (0-43') / Mud Rotary (43-51')	S. Narveson	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GROUNDWATER (ft)
Diedrich D50	8/4	51.5	57	▼ NM / *NM*

SAMPLING METHOD	NOTES
Hammer: 140 lbs., Drop: 30 in. (Automatic)	ETR ~ 79%, N_{60} = $1.32N_{SPT}$ = $0.88N_{MC}$

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
												PAVEMENT: Approximately 4 inches of ASPHALT CONCRETE.
			B1						CR			**UNDIFFERENTIATED SURFICIAL SOILS:** Silty SAND (SM); dark brown (10YR 3/3); moist; mostly fine sand; some fines; nonplastic. PID=0.9 ppm
	55		S2	5 9 11	20	26	9.2	--	-200			Medium dense; light grayish brown (10YR 6/2); little fines; trace mica. PID=4.0 ppm (14% Fines)
5			R3-1 R3-2	6 10 13	23	20	7.7	96	PA	5		Poorly-graded SAND (SP); medium dense; light grayish brown (10YR 6/2); moist; mostly fine sand; trace fines; nonplastic. PID=0.3 ppm. 95% Sand; 5% Fines)
	50											
10			S4	5 5 7	12	16	22.0	--	-200	10		Poorly-graded SAND with silt (SP-SM); medium dense; light grayish brown (10YR 6/2); wet; mostly fine sand; few fines; nonplastic. PID=3.6 ppm (6% Fines)
	45											
15			S5	3 4 6	10	13	24.1	--	PA	15		Poorly-graded SAND (SP); medium dense; yellowish brown (10YR 5/4); wet; mostly fine to medium sand; trace gravel; trace mica; nonplastic. PID=0.3 ppm. (1% Gravel; 94% Sand; 5% Fines)
	40											
20			S6	7 8^ 10^	^	^	20.5	--	-200	20		Gray (7.5YR 6/1); mostly fine to coarse sand; trace fines; trace gravel; trace mica; nonplastic; packed sampler. PID=0.5 ppm (5% Fines)
	35											

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BORING RECORD

PROJECT NAME SDSU Mission Valley			**PROJECT NUMBER** SD605		**BORING** B-26
SITE LOCATION 9449 Friars Road, San Diego, California		**START** 3/15/2019	**FINISH** 3/15/2019		**SHEET NO.** 2 of 3
DRILLING COMPANY Pacific Drilling	**DRILLING METHOD** HSA (0-43') / Mud Rotary (43-51')		**LOGGED BY** S. Narveson		**CHECKED BY** C. Vonk
DRILLING EQUIPMENT Diedrich D50	**BORING DIA. (in)** 8/4	**TOTAL DEPTH (ft)** 51.5	**GROUND ELEV (ft)** 57		**DEPTH/*ELEV.* GROUNDWATER (ft)** ▼ NM / *NM*
SAMPLING METHOD Hammer: 140 lbs., Drop: 30 in. (Automatic)	**NOTES** ETR ~ 79%, N_{60} = $1.32N_{SPT}$ = $0.88N_{MC}$				

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
	30		R7-1 R7-2	4 10 15	25	22	19.1	108	PA			**UNDIFFERENTIATED SURFICIAL SOILS (continued):** Poorly-graded SAND with silt (SP-SM); medium dense; dark gray (10YR 4/1); wet; mostly fine to medium sand; few fines; nonplastic. (92% Sand; 8% Fines)
30	25		S8	4 7 10	17	22	24.3	--	-200	30		Poorly-graded SAND (SP); medium dense; gray (10YR 5/1); wet; mostly fine to medium sand; trace fines; nonplastic; trace mica. PID=42.9 ppm (3% Fines)
35	20		S9	4 4 8	12	16	24.3	--	PA	35		Dark gray (10YR 4/1). PID=6.9 ppm (96% Sand; 4% Fines)
40	15		R10	9^ 18^ 31^	^	^	3.8	--		40		Slow and difficult drilling on GRAVEL and COBBLES from 38 to 48 feet. Well-graded GRAVEL with sand (GW); dense; wet; mostly fine to coarse, subrounded to rounded gravel; little fine to coarse sand; trace fines; nonplastic. (Estimated 10-20% COBBLES)
												Equipment failure at 43 feet - broken gimble. Switch to mud rotary (tri-cone drill bit).
45	10									45		Harder drilling. (Estimated 30% COBBLES)
												FRIARS FORMATION: *Poorly-indurated SANDSTONE; fine to coarse grained; massive; bluish gray (GLEY 2 5PB 6/1); ... (SEE NEXT PAGE)

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BORING RECORD

PROJECT NAME	PROJECT NUMBER	BORING
SDSU Mission Valley	SD605	**B-26**

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	3/15/2019	3/15/2019	3 of 3

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Pacific Drilling	HSA (0-43') / Mud Rotary (43-51')	S. Narveson	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GROUNDWATER (ft)
Diedrich D50	8/4	51.5	57	▼ NM / *NM*

SAMPLING METHOD	NOTES
Hammer: 140 lbs., Drop: 30 in. (Automatic)	ETR ~ 79%, N_{60} = 1.32N_{SPT} = 0.88N_{MC}

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
		X	S11	20 28 43	71	93	21.9	--	-200			**FRIARS FORMATION, (continued):** moderately weathered; very soft; unfractured (Silty SAND (SM); very dense; wet; mostly fine sand; little fines; nonplastic; weakly cemented). PID=0.9 ppm (16% Fines)
	5											
												Total Depth = 51.5 feet (target depth reached).
55										55		Groundwater not measured.
	0											Boring backfilled on 3/15/2019 shortly after drilling with bentonite grout and capped with black-dyed rapid set concrete.
												This Boring Record is part of a geotechnical report which must be considered in its entirety.
												^ = inaccurate blowcounts
60										60		*Geologic Description; (Disturbed Soil Description).
	-5											All soils encountered may include up to 10% COBBLES (subrounded, 3- to 12-inch diameter), estimated based on drill rig chatter, excessive auger inclination, and visual evaualation of drill cuttings. Percent COBBLES greater than 10% are noted in the boring record description and classification, where encountered. Cobble-rich layers encountered in this exploration were approximately 10 to 15 feet thick.
65										65		
	-10											
70										70		
	-15											

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BORING RECORD

PROJECT NAME	SDSU Mission Valley
PROJECT NUMBER	SD605
BORING	B-27
SITE LOCATION	9449 Friars Road, San Diego, California
START	3/15/2019
FINISH	3/15/2019
SHEET NO.	1 of 4
DRILLING COMPANY	Tri-County Drilling
DRILLING METHOD	Hollow Stem Auger
LOGGED BY	A. Bieda
CHECKED BY	C. Vonk
DRILLING EQUIPMENT	CME 75
BORING DIA. (in)	8
TOTAL DEPTH (ft)	70.6
GROUND ELEV (ft)	72
DEPTH/*ELEV.* GROUNDWATER (ft)	▼ 24.6 / *47.4*
SAMPLING METHOD	Hammer: 140 lbs., Drop: 30 in. (Automatic)
NOTES	ETR ~ 85%, N_{60} = $1.42N_{SPT}$ = $0.95N_{MC}$

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
												PAVEMENT: Approximately 4 inches of ASPHALT CONCRETE.
	70		B1				13.9	--	PA PI CR EI			**UNDIFFERENTIATED SURFICIAL SOILS:** Clayey SAND (SC); grayish brown (2.5Y 5/2); moist; mostly fine sand; some fines; few fine gravel; medium plasticity. PID=17.4 ppm (8% Gravel; 53% Sands; 39% Fines)
			S2	7^ 13^ 15^	^	^						Gravel in shoe. PP=1.25 tsf; PID=41.6 ppm
5	65		S3	17 20 21	41	58			-200	5		Very dense; light yellowish brown (2.5Y 6/4); little fine to coarse gravel. PID=12.5 ppm (26% Fines)
10	60									10		Very slow and difficult drilling on GRAVEL and COBBLES from 7 to 12.5 feet. (Estimated 30% COBBLES)
			S4	8^ 13^ 26^	^	^	8.1	--				Clayey SAND with gravel (SC); light yellowish brown (2.5Y 6/4); moist; mostly fine to coarse sand; some fine to coarse gravel; little fines; medium plasticity. PID=19.4 ppm
15			R5-1 R5-2	23^ 19^ 20^	^	^	10.8	--	PA	15		PID=26.2 ppm (38% Gravel; 42% Sand; 20% Fines)
	55											SILT with sand (ML); very dark greenish gray (GLEY 1 3/1); moist; mostly fines; little fine sand; nonplastic.
20	50		S6	6 7 8	15	21	5.2	--	-200	20		Poorly-graded SAND (SP); medium dense; grayish brown (10YR 5/2); moist; mostly fine to medium sand; trace fines; nonplastic; trace mica. PID=13.7 ppm (5% Fines)

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FIGURE B-27 a

BORING RECORD

PROJECT NAME	PROJECT NUMBER	BORING
SDSU Mission Valley	SD605	**B-27**

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	3/15/2019	3/15/2019	2 of 4

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Tri-County Drilling	Hollow Stem Auger	A. Bieda	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GROUNDWATER (ft)
CME 75	8	70.6	72	▼ 24.6 / *47.4*

SAMPLING METHOD	NOTES
Hammer: 140 lbs., Drop: 30 in. (Automatic)	ETR ~ 85%, N_{60} = $1.42N_{SPT}$ = $0.95N_{MC}$

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
	45		R7-1 R7-2	3 5 7	12	11	28.5	93	-200 PI			**UNDIFFERENTIATED SURFICIAL SOILS (continued):** Sandy lean CLAY (CL); stiff; dark grayish brown (10YR 4/2); moist; mostly fines; some fine sand; medium plasticity. PP=1.75 tsf; PID=70.2 ppm (61% Fines)
30	40		S8	2 9 11	20	28	26.3	--	PA	30		Clayey SAND (SC); medium dense; dark gray (2.5Y 4/1); wet; mostly fine sand; some fines; low plasticity; micaceous. PID=26.5 ppm (53% Sand; 47% Fines)
35	35		R9-1 R9-2	7 20 33	53	50	17.3	109	PA	35		Poorly-graded SAND (SP); very dense; dark brown (10YR 3/3); wet; mostly fine to medium sand; trace fines; nonplastic. PID=7.5 ppm (95% Sand; 5% Fines)
40	30		S10	5 9 11	20	28	23.9	--	PA	40		Silty SAND (SM); medium dense; dark gray (2.5Y 4/1); wet; mostly fine to medium SAND; little fines; low plasticity; micaceous. PID=162.9 ppm (77% Sand; 23% Fines)
45	25		R11-1 R11-2	13 22 35	57	54	22.1	100		45		Poorly graded SAND (SP); very dense; dark brown (10YR 3/3); wet; mostly fine to medium sand; trace fines; nonplastic.

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THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED.

FIGURE
B-27 b

BORING RECORD

PROJECT NAME	PROJECT NUMBER	BORING
SDSU Mission Valley	SD605	**B-27**

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	3/15/2019	3/15/2019	3 of 4

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Tri-County Drilling	Hollow Stem Auger	A. Bieda	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GROUNDWATER (ft)
CME 75	8	70.6	72	▼ 24.6 / *47.4*

SAMPLING METHOD	NOTES
Hammer: 140 lbs., Drop: 30 in. (Automatic)	ETR ~ 85%, $N_{60} = 1.42N_{SPT} = 0.95N_{MC}$

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
	20		S12	5 3 4	7	10	28.4	--	PI			**UNDIFFERENTIATED SURFICIAL SOILS (continued):** Poorly graded SAND (SP); dark grayish brown (10YR 3/1); wet; mostly fine sand; trace fines; nonplastic.
												Lean CLAY (CL); medium stiff; dark gray (2.5Y 4/1); moist; moistly fines; few fine sand; medium plasticity. PP=0.5 tsf; PID=16.8 ppm
55	15		S13	10^ 21^ 21^	^	^	20.3	--	-200	55		Silty SAND (SM); dark grayish brown (2.5Y 4/2); wet; mostly fine to medium sand; little fines; nonplastic; micaceous; coarse gravel in shoe. PID=7.2 ppm (21% Fines)
60	10		S14	13 35 48	83	118	16.4	--		60		Poorly-graded SAND with silt (SP-SM); very dense; very dark gray (5Y 3/1); wet; mostly fine to medium sand; few fines; few fine gravel; nonplastic; trace mica. PID=18.8 ppm
65	5		S15	3 8 29^	^	^	20.1	--	-200	65		PID=17.2 ppm (12% Fines)
70	0		S16	40 50/1"	50/1"	>100	14.6	--		70		**FRIARS FORMATION:** *Poorly-indurated SANDSTONE; fine to coarse grained; laminated; dark gray (2.5Y 4/1); moderately weathered; very soft; unfractured (Silty SAND (SM); very dense; wet; mostly fine sand; some fines; low plasticity; weakly cemented). PID=4.1 ppm (73% Sand; 27% Fines)
												Total Depth = 70.6 feet (target depth reached).

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BORING RECORD

PROJECT NAME	PROJECT NUMBER	BORING
SDSU Mission Valley	SD605	**B-27**

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	3/15/2019	3/15/2019	4 of 4

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Tri-County Drilling	Hollow Stem Auger	A. Bieda	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GROUNDWATER (ft)
CME 75	8	70.6	72	▼ 24.6 / *47.4*

SAMPLING METHOD	NOTES
Hammer: 140 lbs., Drop: 30 in. (Automatic)	ETR ~ 85%, N_{60} = $1.42N_{SPT}$ = $0.95N_{MC}$

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
	-5											Groundwater measured during drilling at a depth of 24.6 feet bgs. Boring backfilled on 3/15/2019 shortly after drilling with Portland cement grout and capped with black-dyed rapid set concrete. This Boring Record is part of a geotechnical report which must be considered in its entirety. ^ = inaccurate blowcounts *Geologic Description; (Disturbed Soil Description). All soils encountered may include up to 10% COBBLES (subrounded, 3- to 12-inch diameter), estimated based on drill rig chatter, excessive auger inclination, and visual evaulation of drill cuttings. Percent COBBLES greater than 10% are noted in the boring record description and classification, where encountered. Cobble-rich layers encountered in this exploration were approximately 4 to 6 feet thick.
80										80		
	-10											
85										85		
	-15											
90										90		
	-20											
95										95		
	-25											

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FIGURE

B-27 d

BORING RECORD

PROJECT NAME	PROJECT NUMBER	BORING
SDSU Mission Valley	SD605	B-28

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	3/16/2019	3/16/2019	1 of 3

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Tri-County Drilling	Hollow Stem Auger	A. Bieda	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GROUNDWATER (ft)
Deidrich D120	8	60.8	61	▼ 17.5 / *43.6*

SAMPLING METHOD	NOTES
Hammer: 140 lbs., Drop: 30 in. (Automatic)	ETR ~ 89%, $N_{60} = 1.48N_{SPT} = 0.99N_{MC}$

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DESCRIPTION AND CLASSIFICATION
										PAVEMENT: Approximately 4 inches of ASPHALT CONCRETE.
	60	Bulk	B1				13.7	--	PA EI	**UNDIFFERENTIATED SURFICIAL SOILS:** Clayey SAND (SC); medium dense; grayish brown (10YR 5/2); moist; mostly fine to medium sand; some fines; trace gravel; medium plasticity; micaceous. PID=1.4 ppm (3% Gravel; 59% Sand; 38% Fines)
		SPT	S2	3 3 5	8	12				Dark gray (2.5Y 4/1). PID=6.8 ppm
5	55	SPT	S3	3 4 5	9	13				Grading from Sandy lean CLAY (CL) to Clayey SAND (SC). CL: medium stiff; dark gray (2.5Y 4/1); moist; mostly fines; some fine sand; medium plasticity; PP=0.5 tsf; PID=1.8 ppm. SC: medium dense; dark gray (2.5Y 4/1); moist; mostly fine sand; some fines; medium plasticity; trace mica.
10	50	SPT	S4	1 4 5	9	13	15.8	--	-200	Clayey SAND (SC); medium dense; grayish brown (10YR 5/2); moist; mostly fine to medium sand; some fines; medium plasticity. PP=1.0 tsf; PID=5.1 ppm (38% Fines)
15	45	SPT	S5	P P P	P	P	28.1	--	-200 PI	Sandy lean CLAY (CL); soft; dark grayish brown (10YR 4/2); moist; mostly fines; some fine sand; medium plasticity; trace mica. PP=0.5 tsf; PID=5.8 ppm (58% Fines)
20	40	SPT	S6	1 9 10	19	28	20.1	--	-200	Poorly-graded SAND (SP); medium dense; olive brown (2.5Y 4/3); wet; mostly fine to medium sand; trace fines; nonplastic; trace mica. PID=7.5 ppm (5% Fines)

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FIGURE B-28 a

BORING RECORD

PROJECT NAME	PROJECT NUMBER	BORING
SDSU Mission Valley	SD605	**B-28**

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	3/16/2019	3/16/2019	2 of 3

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Tri-County Drilling	Hollow Stem Auger	A. Bieda	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GROUNDWATER (ft)
Deidrich D120	8	60.8	61	▼ 17.5 / *43.6*

SAMPLING METHOD	NOTES
Hammer: 140 lbs., Drop: 30 in. (Automatic)	ETR ~ 89%, N_{60} = 1.48N_{SPT} = 0.99N_{MC}

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DESCRIPTION AND CLASSIFICATION
	35		R7-1 R7-2	3 8 18	26	26	14.9	113	PA	**UNDIFFERENTIATED SURFICIAL SOILS (continued):** Silty SAND (SM); medium dense; dark grayish brown (2.5Y 4/2); wet; mostly fine to medium sand; little fines; nonplastic. PID=0.8 ppm (76% Sand; 24% Fines)
30	30		S8	3 10 13	23	34	26.9	--	-200	Poorly-graded SAND with silt (SP-SM); dense; very dark grayish brown (10YR 3/2); wet; mostly fine to medium sand; few fines; nonplastic; micaceous. PID=5.1 ppm (11% Fines)
35	25		S9	7 11 12	23	34	27.2	--	PA	Poorly-graded SAND (SP); dense; grayish brown (10YR 5/2); wet; mostly fine to medium sand; trace fines; nonplastic; trace mica. PID=1.6 ppm (95% Sand; 5% Fines)
40	20		S10	12 13 17	30	45	16.1	--	-200	Silty SAND with gravel (SM); dense; very dark grayish brown (10YR 3/2); wet; mostly fine to medium sand; little fine to coarse gravel; few to little fines; low plasticity. (13% Fines)
										Slow and difficult drilling through GRAVEL and COBBLES from 42 to 52 feet. (Estimated 20-30% COBBLES)
45	15									

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THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED.

FIGURE B-28 b

BORING RECORD

PROJECT NAME	PROJECT NUMBER	BORING
SDSU Mission Valley	SD605	B-28

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	3/16/2019	3/16/2019	3 of 3

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Tri-County Drilling	Hollow Stem Auger	A. Bieda	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/ELEV. GROUNDWATER (ft)
Deidrich D120	8	60.8	61	▼ 17.5 / *43.6*

SAMPLING METHOD	NOTES
Hammer: 140 lbs., Drop: 30 in. (Automatic)	ETR ~ 89%, N_{60} = $1.48N_{SPT}$ = $0.99N_{MC}$

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
	10											**UNDIFFERENTIATED SURFICIAL SOILS (continued):** Slow and difficult drilling on GRAVEL and COBBLES. (Estimated 20-30% COBBLES)
		X	S11	17 50/5"	50/5"	>100	17.9	--	-200			**FRIARS FORMATION:** *Poorly-indurated SANDSTONE; fine to coarse grained; massive with minor bedding; moderately weathered; gray (10Y 5/1); very soft; unfractured (Silty SAND (SM); very dense; wet; mostly fine sand; little fines; nonplastic; weakly cemented). PID=4.1 ppm (25% Fines)
55	5									55		
60		X	S12	23 50/3"	50/3"	>100	19.2	--		60		Fine gravel in shoe of sampler. PID=8.0 ppm
	0											Total Depth = 60.8 feet (target depth reached). Groundwater measured during drilling at a depth of 17.5 feet bgs. Boring backfilled on 3/16/2019 shortly after drilling with Portland cement grout and capped with black-dyed rapid set concrete. This Boring Record is part of a geotechnical report which must be considered in its entirety. *Geologic Description; (Disturbed Soil Description). All soils encountered may include up to 10% COBBLES (subrounded, 3- to 12-inch diameter), estimated based on drill rig chatter, excessive auger inclination, and visual evaulation of drill cuttings. Percent COBBLES greater than 10% are noted in the boring record description and classification, where encountered. Cobble-rich layers encountered in this exploration were approximately 10 feet thick.
65	-5									65		
70	-10									70		

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FIGURE B-28 c

BORING RECORD

PROJECT NAME SDSU Mission Valley		**PROJECT NUMBER** SD605		**BORING** B-29
SITE LOCATION 9449 Friars Road, San Diego, California		**START** 3/12/2019	**FINISH** 3/12/2019	**SHEET NO.** 1 of 1
DRILLING COMPANY Pacific Drilling	**DRILLING METHOD** Hollow Stem Auger		**LOGGED BY** A. Bieda	**CHECKED BY** C. Vonk
DRILLING EQUIPMENT Unimog Marl M5	**BORING DIA. (in)** 8	**TOTAL DEPTH (ft)** 4.8	**GROUND ELEV (ft)** 58	**DEPTH/*ELEV.* GROUNDWATER (ft)** ▼ NE / *NE*
SAMPLING METHOD Bulk	**NOTES** Borehole Percolation test I-3 performed on 03/13/2019			

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
0												**PAVEMENT:** Approximately 4 inches of ASPHALT CONCRETE over 1-inch AGGREGATE BASE.
	55	Bulk	B1				9.3	-	PA			**UNDIFFERENTIATED SURFICIAL SOILS:** Clayey SAND (SC); grayish brown (2.5Y 5/2); moist; mostly fine to medium sand; some fines; trace fine gravel; low plasticity. PID=16.9 ppm (2% Gravel; 64% Sand; 34% Fines)
5										5		Total Depth = 4.8 feet (Target depth reached). Groundwater not encountered. Boring converted to a percolation test hole on 03/12/2019 shortly after drilling, and backfilled on 03/13/2019 and patched with black-dyed rapid set concrete after completion of percolation testing. This Boring Record is part of a geotechnical report which must be considered in its entirety.
	50											
10										10		
	45											
15										15		
	40											
20										20		
	35											

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FIGURE

B-29

BORING RECORD

PROJECT NAME	PROJECT NUMBER	BORING
SDSU Mission Valley	SD605	**B-30**

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	3/16/2019	3/16/2019	1 of 3

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Tri-County Drilling	Hollow Stem Auger	S. Narveson	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GROUNDWATER (ft)
CME 75	8	55.8	58	▼ 12.1 / *45.9*

SAMPLING METHOD	NOTES
Hammer: 140 lbs., Drop: 30 in. (Automatic)	ETR ~ 85%, $N_{60} = 1.42N_{SPT} = 0.95N_{MC}$

DEPTH (feet)	ELEVATION (feet)	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DESCRIPTION AND CLASSIFICATION
0	58								**PAVEMENT:** Approximately 4 inches of ASPHALT CONCRETE.
		B1				15.7	--	PA PI CR EI	**UNDIFFERENTIATED SURFICIAL SOILS:** Clayey SAND (SC); loose; dark brown (10YR 3/3); moist; mostly fine sand; some fines; low plasticity. PID= 10.5ppm (62% Sand; 38% Fines)
	55	S2	2 3 3	6	9	17.8	--		
5		S3	3 4 4	8	11	14.1	--	-200	Silty SAND (SM); medium dense; dark yellowish brown (10YR 4/2); moist; mostly fine to medium sand; little fines; nonplastic. PID=12.0 ppm (21% Fines)
	50								
10		S4	1 2 5	7	10	26.2	--	PA	Some fines; trace mica. PID=10.5 ppm (57% Sand; 43% Fines)
▼ 12.1	45								
15		S5	5 8 8	16	23	24.7	--	-200	Dark grayish brown (10YR 4/2); wet; little fines; micaceous. PID=10.3 ppm. (17% Fines)
	40								
20		S6	3 5 5	10	14	26.5	--	-200	Poorly-graded SAND with silt (SP-SM); medium dense; dark grayish brown (10YR 4/2); wet; mostly fine to medium sand; few fines; nonplastic; micaceous; thinly bedded. PID=13.5 ppm (6% Fines)
	35								

BORING RECORD

PROJECT NAME	PROJECT NUMBER	BORING
SDSU Mission Valley	SD605	B-30

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	3/16/2019	3/16/2019	2 of 3

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Tri-County Drilling	Hollow Stem Auger	S. Narveson	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GROUNDWATER (ft)
CME 75	8	55.8	58	▼ 12.1 / *45.9*

SAMPLING METHOD	NOTES
Hammer: 140 lbs., Drop: 30 in. (Automatic)	ETR ~ 85%, N_{60} = $1.42N_{SPT}$ = $0.95N_{MC}$

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
	30		S7	5 4 7	11	16	34.6	--	PA			**UNDIFFERENTIATED SURFICIAL SOILS (continued):** Silty SAND (SM); medium dense; dark grayish brown (2.5Y 4/2); wet; mostly fine sand; little fines; nonplastic; micaceous. PID=60.2 ppm (73% Sand; 27% Fines)
30	25		R8	17 13 10	23	22	23.2	101	-200	30		Poorly-graded SAND with silt (SP-SM); medium dense; grayish brown (2.5Y 5/2); wet; mostly fine to medium sand; few fines; nonplastic. (7% Fines)
35	20		S9	10 10 9	19	27	22.1	--	-200	35		Micaceous. PID=181.4 ppm (11% Fines)
40	15		S10	10^ 19^ 25^	^	^	19.6	--	PA	40		Very dense; few gravel; micaceous. PID=151.3 ppm. (13% Gravel; 78% Sand; 9% Fines) Increasing gravel content; light rig chatter from 41 to 44 feet.
45	10									45		Slow and difficult drilling on GRAVEL and COBBLES from 44 to 54 feet. (Estimated 30% COBBLES)

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BORING RECORD

PROJECT NAME	PROJECT NUMBER	BORING
SDSU Mission Valley	SD605	**B-30**

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	3/16/2019	3/16/2019	3 of 3

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Tri-County Drilling	Hollow Stem Auger	S. Narveson	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GROUNDWATER (ft)
CME 75	8	55.8	58	▼ 12.1 / *45.9*

SAMPLING METHOD	NOTES
Hammer: 140 lbs., Drop: 30 in. (Automatic)	ETR ~ 85%, $N_{60} = 1.42N_{SPT} = 0.95N_{MC}$

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
			S11	50/1"	REF	REF						**UNDIFFERENTIATED SURFICIAL SOILS (continued):** No recovery. Sampler refusal on cobble. Increasing drilling difficulty. (Estimated 30-40% COBBLES).
	5											
55			S12	40 50/4"	50/4"	>100	16.4	--	-200	55		**FRIARS FORMATION:** *Poorly-indurated SANDSTONE; fine to coarse grained; massive ; moderately weathered; very soft; bluish gray (GLEY 2 5PB 6/1); unfractured (Silty SAND (SM); very dense; mostly fine sand; little fines; nonplastic; weakly cemented) PID=37.6 ppm (21% Fines)
	0											Total Depth = 55.8 feet (target depth reached).
60										60		Groundwater measured during drilling at a depth of 12.1 feet bgs.
												Boring backfilled on 3/16/2019 shortly after drilling with Portland cement grout and capped with black-dyed rapid set concrete.
	-5											This Boring Record is part of a geotechnical report which must be considered in its entirety.
												*Geologic Description; (Disturbed Soil Description).
65										65		All soils encountered may include up to 10% COBBLES (subrounded, 3- to 12-inch diameter), estimated based on drill rig chatter, excessive auger inclination, and visual evaulation of drill cuttings. Percent COBBLES greater than 10% are noted in the boring record description and classification, where encountered. Cobble-rich layers encountered in this exploration were approximately 10 to 15 feet thick.
	-10											
70										70		
	-15											

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BORING RECORD

PROJECT NAME	PROJECT NUMBER	BORING
SDSU Mission Valley	SD605	B-31

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	3/16/2019	3/16/2019	1 of 4

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Tri-County Drilling	Hollow Stem Auger	S. Narveson	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GROUNDWATER (ft)
CME 75	8	65.9	66	▼ 21.3 / *44.7*

SAMPLING METHOD
Hammer: 140 lbs., Drop: 30 in. (Automatic)

NOTES
ETR ~ 85%, $N_{60} = 1.42N_{SPT} = 0.95N_{MC}$

DEPTH (feet)	ELEVATION (feet)	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS
	65							
		S1	3, 6, 8	14	20			
		B2				11.8	--	PA, EI
5								
	60	S3	9, 6, 6	12	17			-200
10								
	55	S4	4, 4, 5	9	13	20.3	--	-200
15								
	50	S5	3, 3, 5	8	11	21.8	--	PA
20								
	45	R6-1, R6-2	4, 9, 14	23	22	22.9	102	-200, -200

DESCRIPTION AND CLASSIFICATION

PAVEMENT: Approximately 4 inches of ASPHALT CONCRETE.

UNDIFFERENTIATED SURFICIAL SOILS: Silty SAND (SM); medium dense; dark brown (10YR 3/3); moist; mostly fine sand; some fines; trace fine gravel; nonplastic; trace mica.
PID=1.7 ppm

Clayey SAND (SC); dark brown (10YR 3/3); moist; mostly fine sand; some fines; trace gravel; low plasticity; micaceous.
(2% Gravel; 60% Sand; 38% Fines)

Silty SAND (SM); medium dense; grayish brown (10YR 5/2); moist; mostly fine sand; little fines; nonplastic.
PID=1.3 ppm
(16% Fines)

Clayey SAND (SC); medium dense; dark grayish brown (10YR 4/2); moist; mostly fine sand; some fines; trace gravel; low plasticity; micaceous; thinly bedded.

PID=2.5 ppm
(45% Fines)

Trace mica.
PP=0.5 tsf; PID=1.2 ppm
(1% Gravel; 52% Sand; 47% Fines)

PP=0.75 tsf
(43% Fines)

Silty SAND (SM); medium dense; dark grayish brown (10YR 4/2); moist; mostly fine sand; little fines; nonplastic.
(22% Fines)

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FIGURE B-31 a

BORING RECORD	PROJECT NAME: SDSU Mission Valley	PROJECT NUMBER: SD605	BORING: B-31
SITE LOCATION: 9449 Friars Road, San Diego, California	START: 3/16/2019	FINISH: 3/16/2019	SHEET NO.: 2 of 4
DRILLING COMPANY: Tri-County Drilling	DRILLING METHOD: Hollow Stem Auger	LOGGED BY: S. Narveson	CHECKED BY: C. Vonk
DRILLING EQUIPMENT: CME 75	BORING DIA. (in): 8	TOTAL DEPTH (ft): 65.9 / GROUND ELEV (ft): 66	DEPTH/*ELEV.* GROUNDWATER (ft): ▼ 21.3 / *44.7*
SAMPLING METHOD: Hammer: 140 lbs., Drop: 30 in. (Automatic)	NOTES: ETR ~ 85%, N_{60} = $1.42N_{SPT}$ = $0.95N_{MC}$		

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	DESCRIPTION AND CLASSIFICATION
	40		S7	9^ 11^ 12^	^	^	20.3	--	PA		**UNDIFFERENTIATED SURFICIAL SOILS (continued):** Silty SAND (SM); light grayish brown (10YR 6/2); wet; mostly fine to medium sand; few to little fines; nonplastic; trace mica; sampler packed. PID=1.5 ppm (87% Sand; 13% Fines) Polymer/water added to hollow stem to control heaving sands.
30	35		S8	1 2 2	4	6	30.6	--	-200 PI	30	Sandy lean CLAY (CL); soft to medium stiff; dark yellowish brown (10YR 4/4); wet; mostly fine; some fine sand; medium plasticity; micaceous. PP=0.25 tsf; TV=0.4 tsf; PID=8.2 ppm (56% Fines)
35	30		S9	1 0 1	1	1	30.2	--	-200	35	Clayey SAND (SC); very loose; dark yellowish brown (10YR 4/4); wet; mostly fine sand; some fines; medium plasticity. PP<0.25 tsf; TV=0.2 tsf; PID=22.6 ppm. (45% Fines)
40	25		R10	10 15 15	30	28	20.4	107	PA	40	Poorly-graded SAND with silt (SP-SM); medium dense; gray (10YR 5/1); wet; mostly fine to medium sand; few fines; trace fine gravel; nonplastic. (2% Gravel; 92% Sand; 6% Fines)
45	20		S11	11^ 25^ 33^	^	^	11.1	--		45	Slow and difficult drilling on GRAVEL and COBBLES from 44 to 61 feet. Poorly-graded GRAVEL with sand (GP); dark gray (7.5YR 4/1); wet; mostly fine to coarse, rounded to subrounded gravel; little sand; trace to few fines; nonplastic; micaceous. (Estimated 20% COBBLES) PID=22.8 ppm

BORING RECORD

PROJECT NAME SDSU Mission Valley	**PROJECT NUMBER** SD605	**BORING** B-31	
SITE LOCATION 9449 Friars Road, San Diego, California	**START** 3/16/2019	**FINISH** 3/16/2019	**SHEET NO.** 3 of 4
DRILLING COMPANY Tri-County Drilling	**DRILLING METHOD** Hollow Stem Auger	**LOGGED BY** S. Narveson	**CHECKED BY** C. Vonk
DRILLING EQUIPMENT CME 75	**BORING DIA. (in)** 8	**TOTAL DEPTH (ft)** 65.9	**GROUND ELEV (ft)** 66
DEPTH/*ELEV.* GROUNDWATER (ft) ▼ 21.3 / *44.7*			
SAMPLING METHOD Hammer: 140 lbs., Drop: 30 in. (Automatic)	**NOTES** ETR ~ 85%, N_{60} = $1.42N_{SPT}$ = $0.95N_{MC}$		

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
	15											**UNDIFFERENTIATED SURFICIAL SOILS (continued):** Poorly-graded GRAVEL with sand (GP); very dense; dark gray (7.5YR 4/1); wet; mostly fine to coarse, rounded to subrounded gravel; little sand; trace to few fines; nonplastic; micaceous.
55			S12	50/4"	REF	REF	11.4	--		55		Dark grayish brown (10YR 4/2); mostly fine to coarse gravel and freshly broken rock fragments; some sand; trace to few fines; nonplastic. PID=2.3 ppm Increasing COBBLES from 55 to 61 feet (Estimated 30% COBBLES)
	10											
60										60		
	5											**FRIARS FORMATION:** *Poorly-indurated SANDSTONE; fine to coarse grained; massive; bluish gray (GLEY 2 5PB 6/1); moderately weathered; very soft; unfractured (Silty SAND (SM); very dense; wet; mostly fine sand; little fines; nonplastic; weakly cemented).
65			S13	33 50/5"	50/5"	>100	16.4	--	-200	65		(80% Sand; 20% Fines)
	0											Total Depth = 65.9 feet (target depth reached).
70										70		
	-5											

Groundwater measured during drilling at a depth of 21.3 feet bgs.

Polymer/water mixture added to hollow stem for heaving sands.

Boring backfilled on 3/16/2019 shortly after drilling with Portland cement grout and capped with black-dyed rapid set concrete.

This Boring Record is part of a geotechnical report which must be considered in its entirety.

^ = inaccurate blowcounts

*Geologic Description; (Disturbed Soil Description).

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FIGURE

B-31 c

BORING RECORD	PROJECT NAME SDSU Mission Valley	PROJECT NUMBER SD605	BORING B-31

SITE LOCATION	START	FINISH	SHEET NO.
9449 Friars Road, San Diego, California	3/16/2019	3/16/2019	4 of 4

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
Tri-County Drilling	Hollow Stem Auger	S. Narveson	C. Vonk

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GROUNDWATER (ft)
CME 75	8	65.9	66	▼ 21.3 / *44.7*

SAMPLING METHOD	NOTES
Hammer: 140 lbs., Drop: 30 in. (Automatic)	ETR ~ 85%, N_{60} = $1.42N_{SPT}$ = $0.95N_{MC}$

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
	-10											All soils encountered may include up to 10% COBBLES (subrounded, 3- to 12-inch diameter), estimated based on drill rig chatter, excessive auger inclination, and visual evaulation of drill cuttings. Percent COBBLES greater than 10% are noted in the boring record description and classification, where encountered. Cobble-rich layers encountered in this exploration were approximately 15 to 20 feet thick.
80										80		
	-15											
85										85		
	-20											
90										90		
	-25											
95										95		
	-30											

BORING RECORD

PROJECT NAME	SDSU Mission Valley
PROJECT NUMBER	SD605
BORING	B-32
SITE LOCATION	9449 Friars Road, San Diego, California
START	3/12/2019
FINISH	3/12/2019
SHEET NO.	1 of 1
DRILLING COMPANY	Pacific Drilling
DRILLING METHOD	Hollow Stem Auger
LOGGED BY	A. Bieda
CHECKED BY	C. Vonk
DRILLING EQUIPMENT	Unimog Marl M5
BORING DIA. (in)	8
TOTAL DEPTH (ft)	5
GROUND ELEV (ft)	54
DEPTH/*ELEV.* GROUNDWATER (ft)	▼ NE / *NE*
SAMPLING METHOD	Bulk
NOTES	Borehole Percolation test I-2 performed on 03/13/2019

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	N_{60}	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	DEPTH (feet)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
0–5	54–49	Bulk	B1				12.6	-	PA	0–5		**PAVEMENT:** Approximately 5 inches of ASPHALT CONCRETE. **UNDIFFERENTIATED SURFICIAL SOILS:** Clayey SAND with gravel (SC); grayish brown (2.5Y 5/2); moist; mostly fine to medium sand; some fines; trace fine gravel; low plasticity. PID=8.0 ppm Rig chatter from 3 ft to 4 ft; Gravel layer. (2% Gravel; 59% Sand; 39% Fines)
5										5		Total Depth = 5 feet (Target depth reached). Groundwater not encountered. Boring converted to a percolation test hole on 03/12/2019 shortly after drilling, and backfilled on 03/13/2019 and patched with black-dyed rapid set concrete after completion of percolation testing. This Boring Record is part of a geotechnical report which must be considered in its entirety.
10	45									10		
15	40									15		
20	35									20		
	30											

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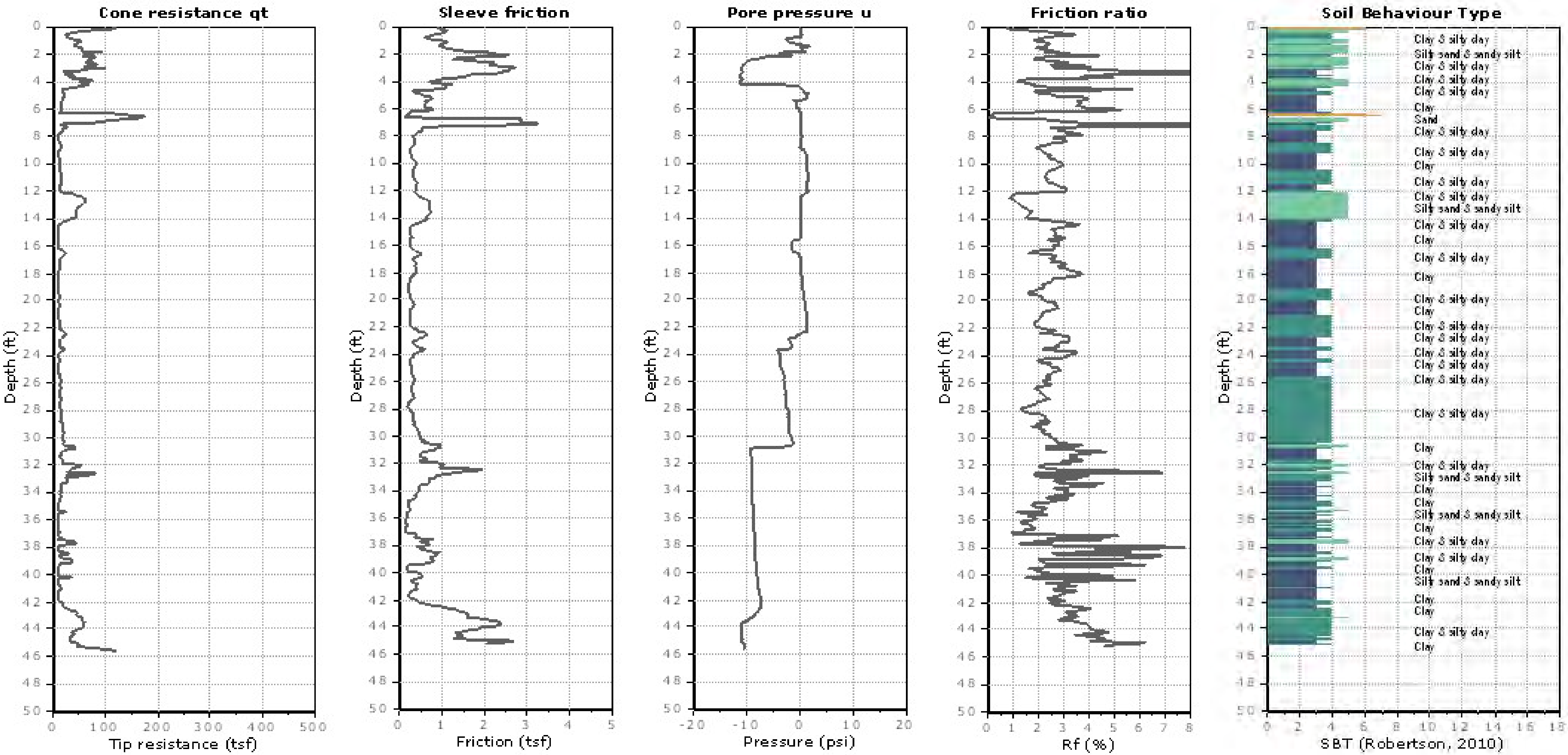
Project: Group Delta Consultants / SDSU Mission Valley

Location: San Diego, CA

CPT-2

Total depth: 45.54 ft, Date: 3/18/2019



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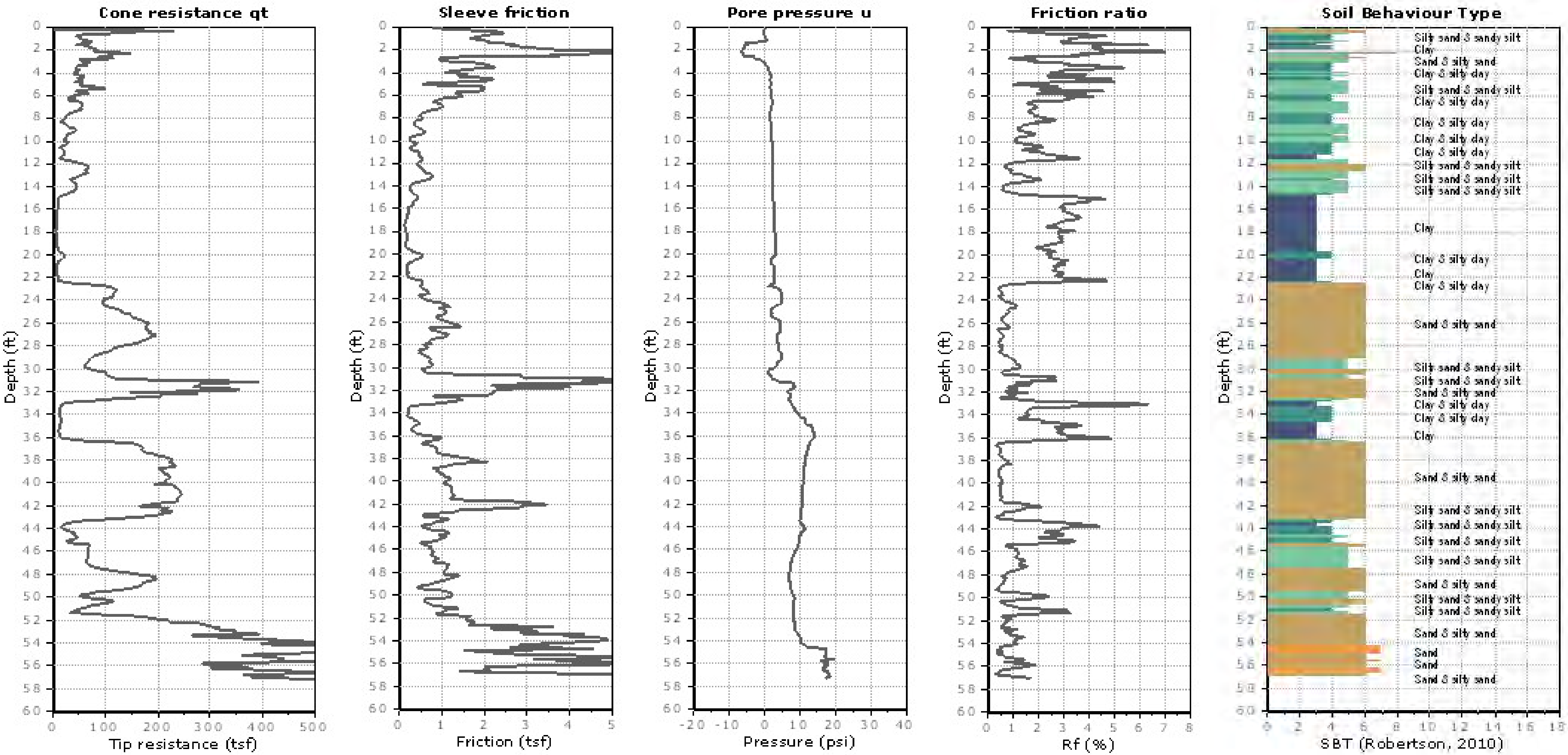
Location: San Diego, CA

SCPT-5
Total depth: 57.36 ft, Date: 4/8/2019



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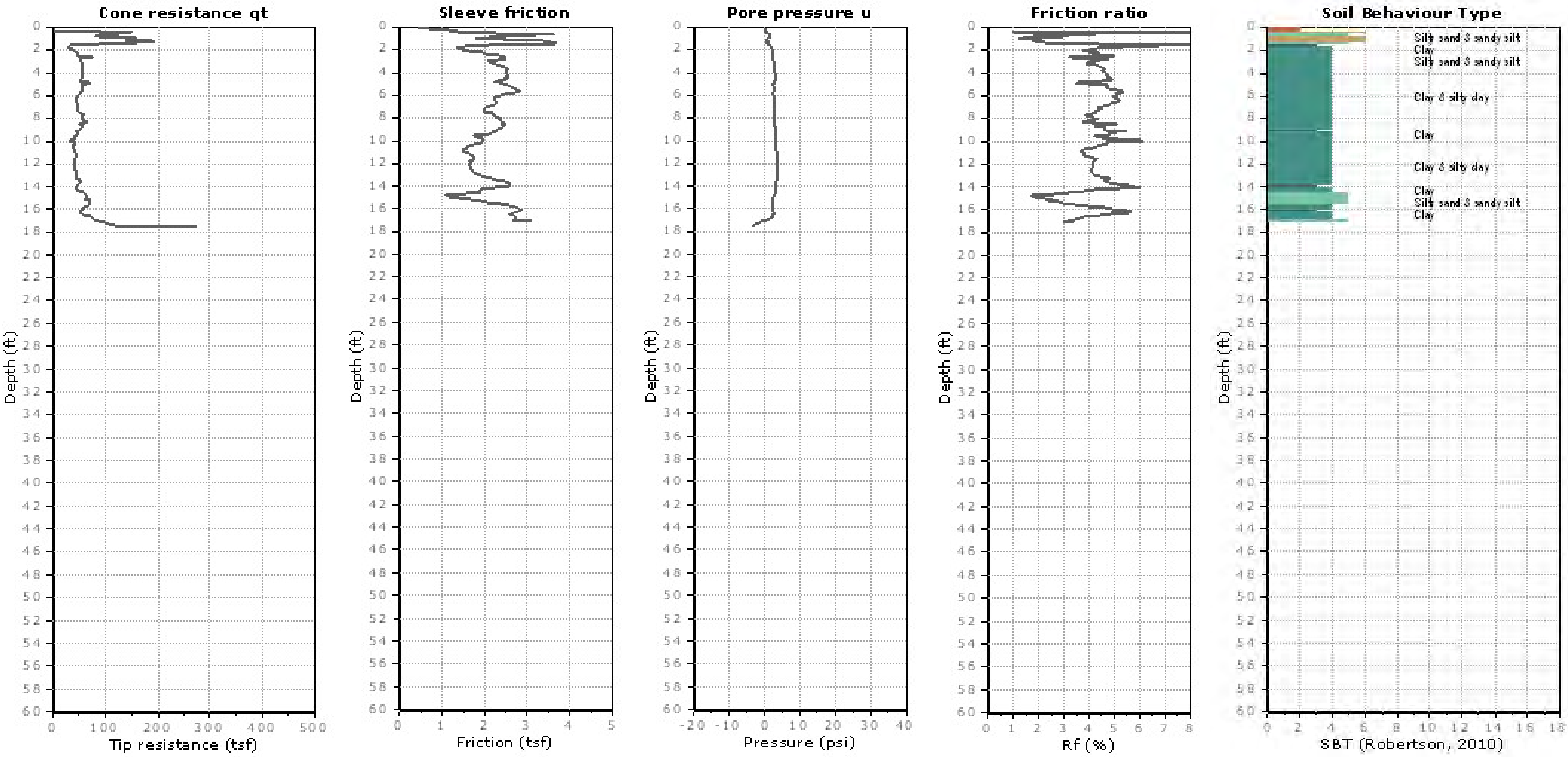
Project: Group Delta Consultants / SDSU Mission Valley

Location: San Diego, CA

SCPT-7

Total depth: 17.48 ft, Date: 4/8/2019



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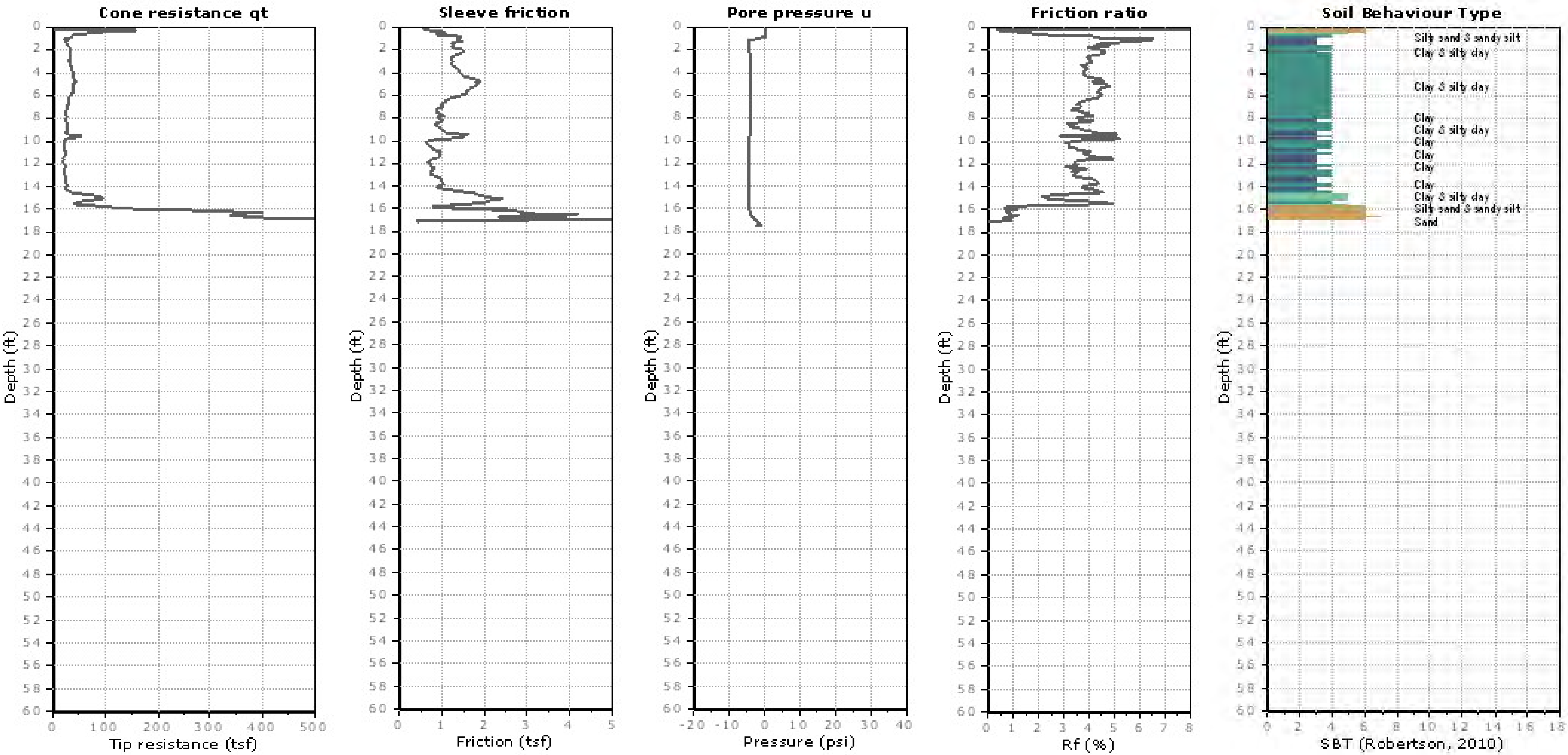
Project: **Group Delta Consultants / SDSU Mission Valley**
Location: **San Diego, CA**

CPT-11
Total depth: 17.52 ft, Date: 4/8/2019



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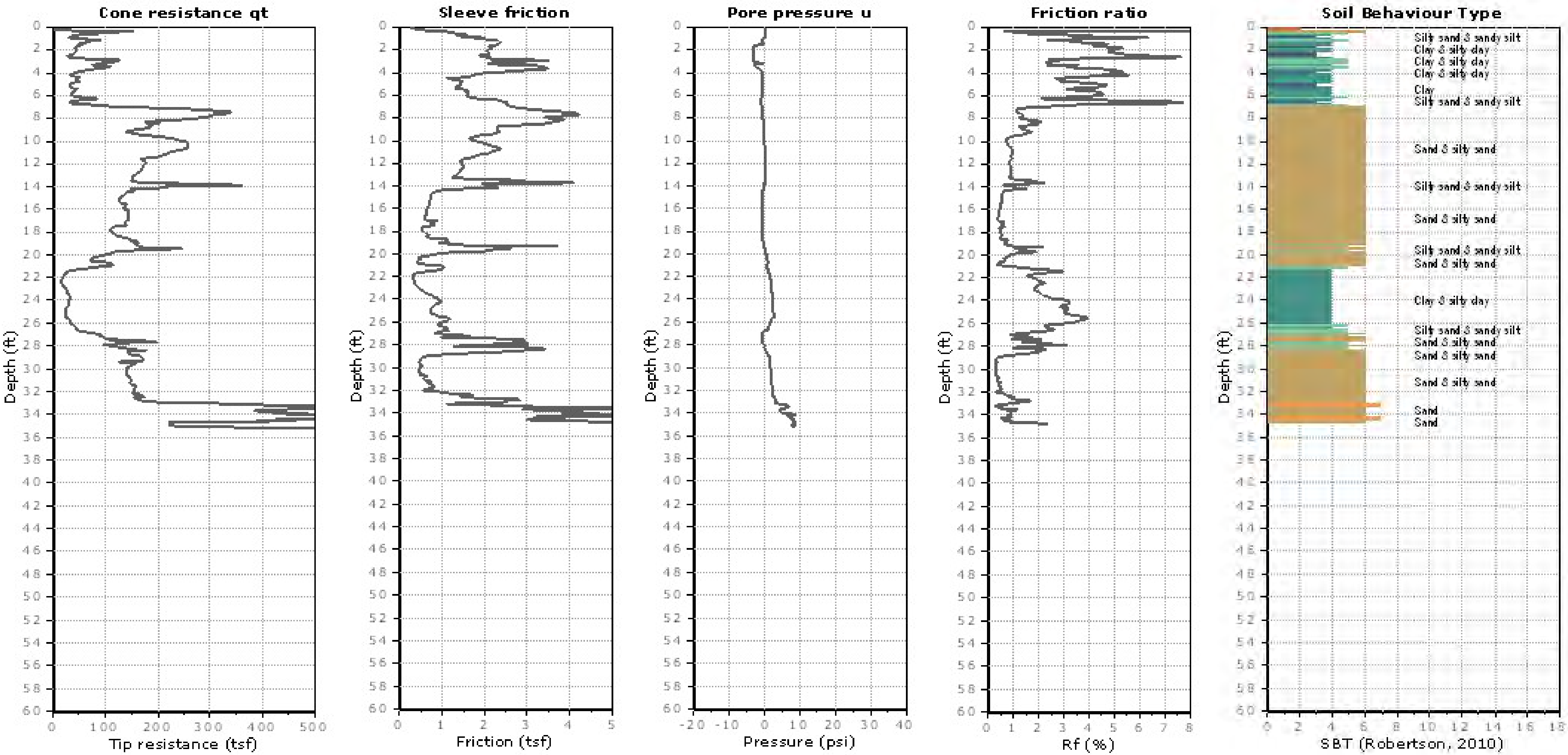
Project: Group Delta Consultants / SDSU Mission Valley

Location: San Diego, CA

CPT-21

Total depth: 35.17 ft, Date: 4/8/2019



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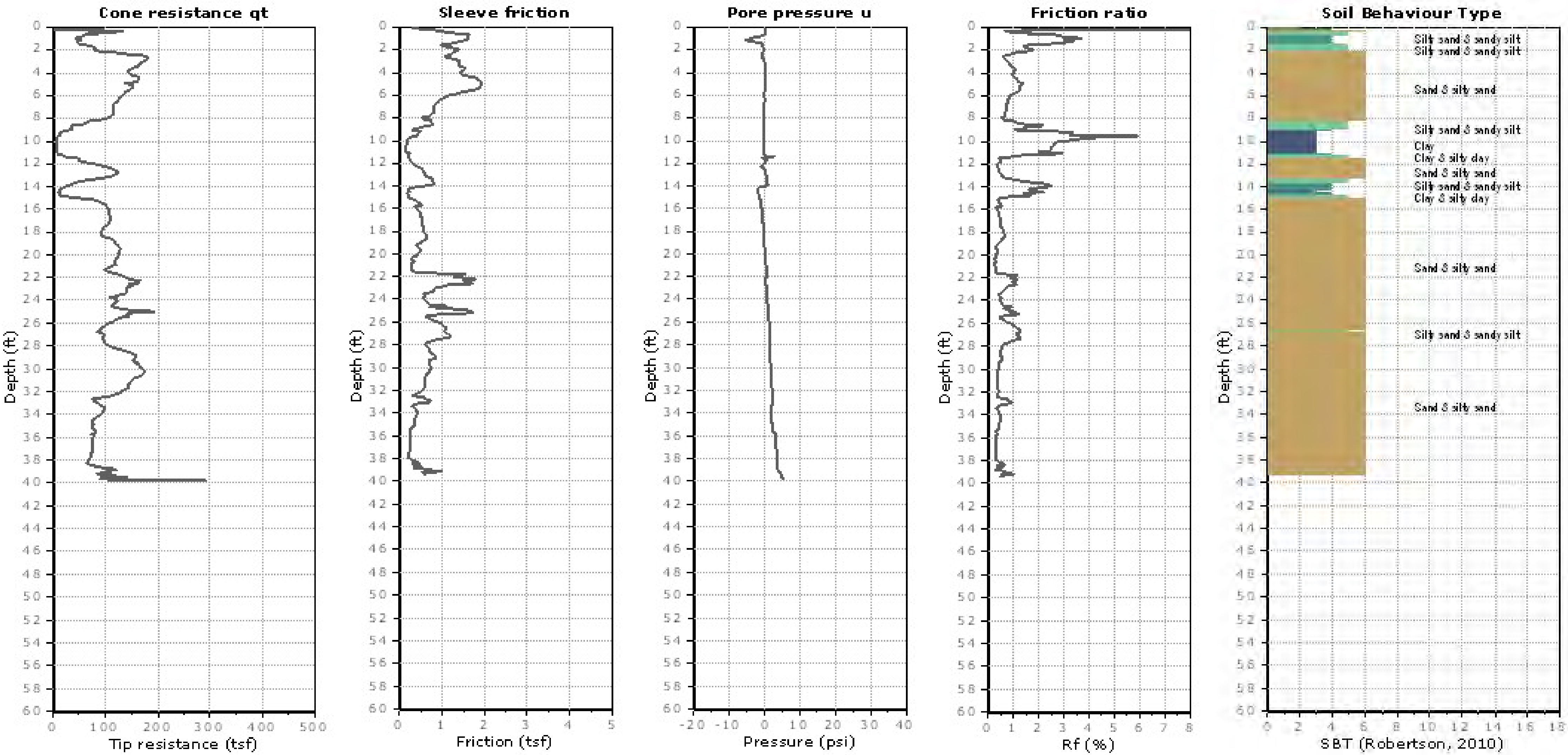
Project: Group Delta Consultants / SDSU Mission Valley

Location: San Diego, CA

CPT-26

Total depth: 39.77 ft, Date: 4/08/2019



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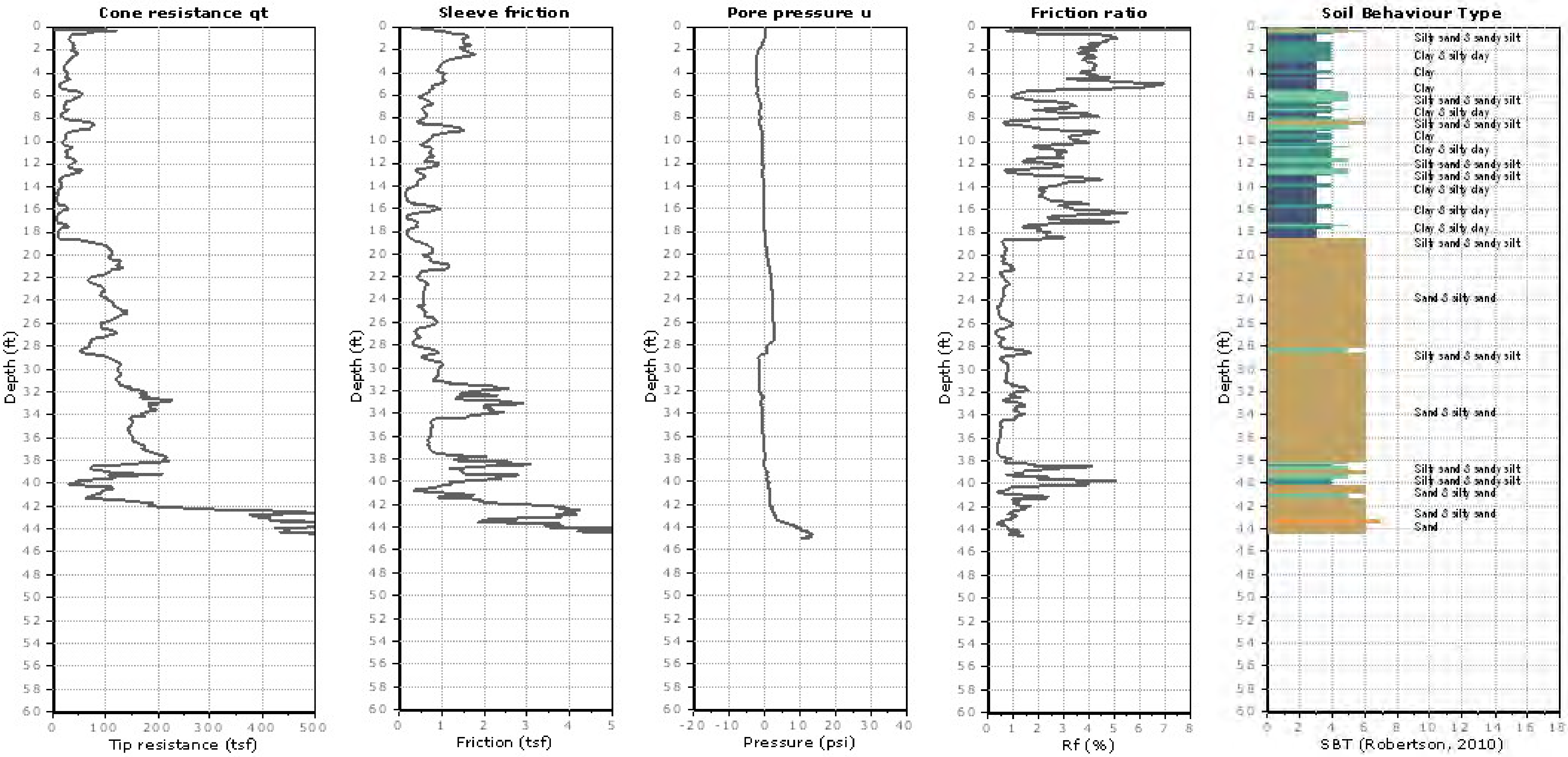
Project: Group Delta Consultants / SDSU Mission Valley

Location: San Diego, CA

CPT-28

Total depth: 44.96 ft, Date: 4/8/2019



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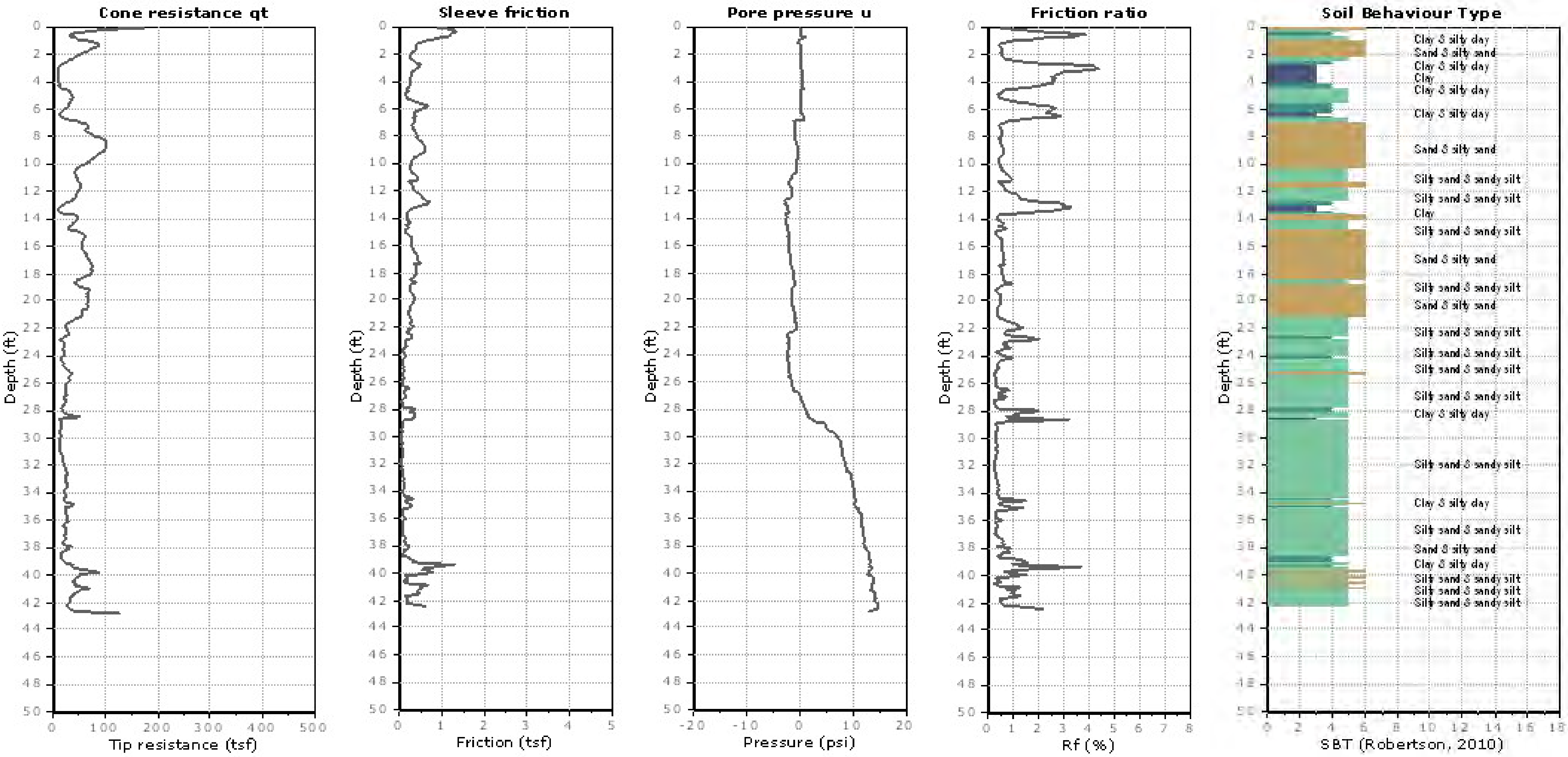
Project: Group Delta Consultants / SDSU Mission Valley

Location: San Diego, CA

CPT-30

Total depth: 42.79 ft, Date: 3/18/2019



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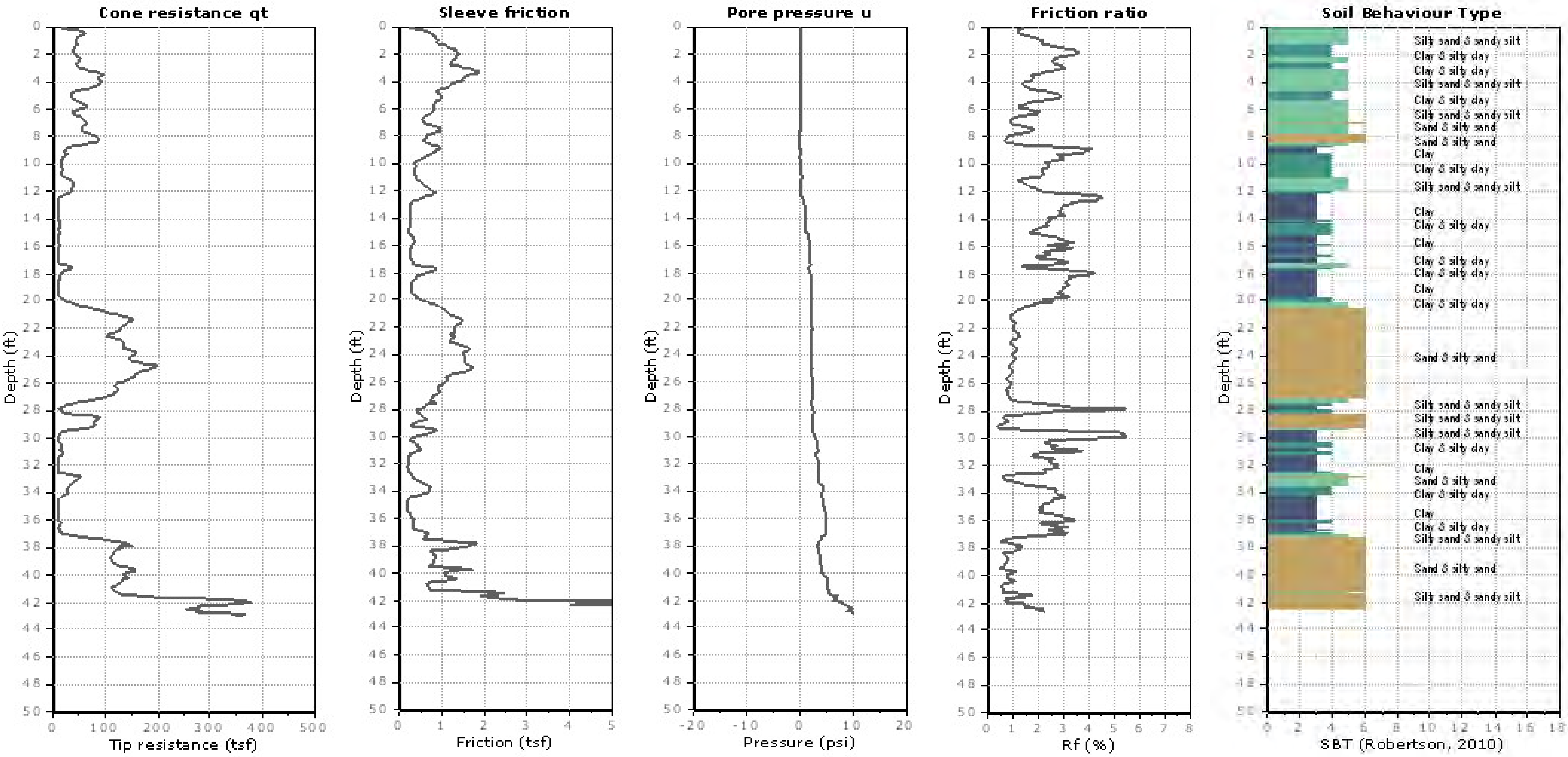
Project: Group Delta Consultants / SDSU Mission Valley

Location: San Diego, CA

CPT-31

Total depth: 42.98 ft, Date: 3/18/2019



SDSU Mission Valley
San Diego, CA

CPT Shear Wave Measurements

Location	Tip Depth (ft)	Geophone Depth (ft)	Travel Distance (ft)	S-Wave Arrival (msec)	S-Wave Velocity from Surface (ft/sec)	Interval S-Wave Velocity (ft/sec)
SCPT-5	4.99	3.99	6.40	6.40	999.51	
	10.01	9.01	10.30	11.22	918.39	810.68
	14.99	13.99	14.86	17.86	831.84	685.58
	20.05	19.05	19.70	27.92	705.42	480.97
	25.00	24.00	24.52	37.48	654.09	504.19
	30.02	29.02	29.45	44.32	664.43	721.09
	35.01	34.01	34.38	51.80	663.62	658.82
	40.03	39.03	39.35	58.66	670.80	724.98
	45.01	44.01	44.29	64.64	685.23	826.78
	50.07	49.07	49.32	72.24	682.78	661.97
	54.99	53.99	54.22	76.64	707.48	1112.94
	57.35	56.35	56.57	77.92	726.02	1836.22
SCPT-7	5.05	4.05	6.43	5.10	1261.66	
	9.97	8.97	10.27	10.16	1010.77	757.89
	14.99	13.99	14.86	14.12	1052.17	1158.39
	17.52	16.52	17.26	16.36	1055.02	1072.96
SCPT-13	4.99	3.99	6.40	6.10	1048.67	
	10.10	9.10	10.38	11.36	914.01	757.85
	14.99	13.99	14.86	15.08	985.19	1202.55
	20.08	19.08	19.72	19.04	1035.94	1229.19
	25.00	24.00	24.52	23.24	1054.88	1140.72
	30.02	29.02	29.45	27.84	1057.74	1072.24
	35.01	34.01	34.38	34.04	1009.86	794.84
	40.06	39.06	39.38	40.44	973.76	781.74
	44.98	43.98	44.26	45.16	980.14	1034.87
	50.00	49.00	49.25	50.84	968.81	878.72
	55.02	54.02	54.25	57.48	943.82	752.48
	60.07	59.07	59.28	63.04	940.37	904.74
	66.83	65.83	66.02	71.40	924.64	806.03

S-Wave Velocity from Surface = Travel Distance/S-Wave Arrival
Interval S-Wave Velocity = (Travel Dist2-Travel Dist1)/(Time2-Time1)

APPENDIX C
LABORATORY TESTING

APPENDIX C

LABORATORY TESTING

Laboratory testing was conducted in a manner consistent with the level of care and skill ordinarily exercised by members of the profession currently practicing under similar conditions and in the same locality. No warranty, express or implied, is made as to the correctness or serviceability of the test results, or the conclusions derived from these tests. Where a specific laboratory test method has been referenced, such as ASTM or Caltrans, the reference only applies to the specified laboratory test method, which has been used only as a guidance document for the general performance of the test and not as a "Test Standard". A brief description of the tests follows.

Classification: Soils were visually classified according to the Unified Soil Classification System as established by the American Society of Civil Engineers per ASTM D2487. The soil classifications are shown on the boring logs in Appendix C.

Particle Size Analysis: Particle size analyses were performed in general accordance with ASTM D422, and were used to supplement visual classifications. The test results are summarized on the Boring Records in Appendix B and are presented in detail in Figures C-1.1 through C-1.80.

Atterberg Limits: ASTM D4318 was used to determine the liquid and plastic limits, and plasticity index of selected soil samples. The test results are presented with the associated gradation analyses in Figures C-1.1 through C-1.80 and are also summarized in Figure C-1.81 and C-1.82.

Expansion Index: The expansion potential of selected soil samples was estimated in general accordance with ASTM D4829. The test results are summarized in Figure C-2, along with a summary of previous expansion index tests we conducted at the site. Figure C-2 also presents common criteria for evaluating the expansion potential based on the expansion index.

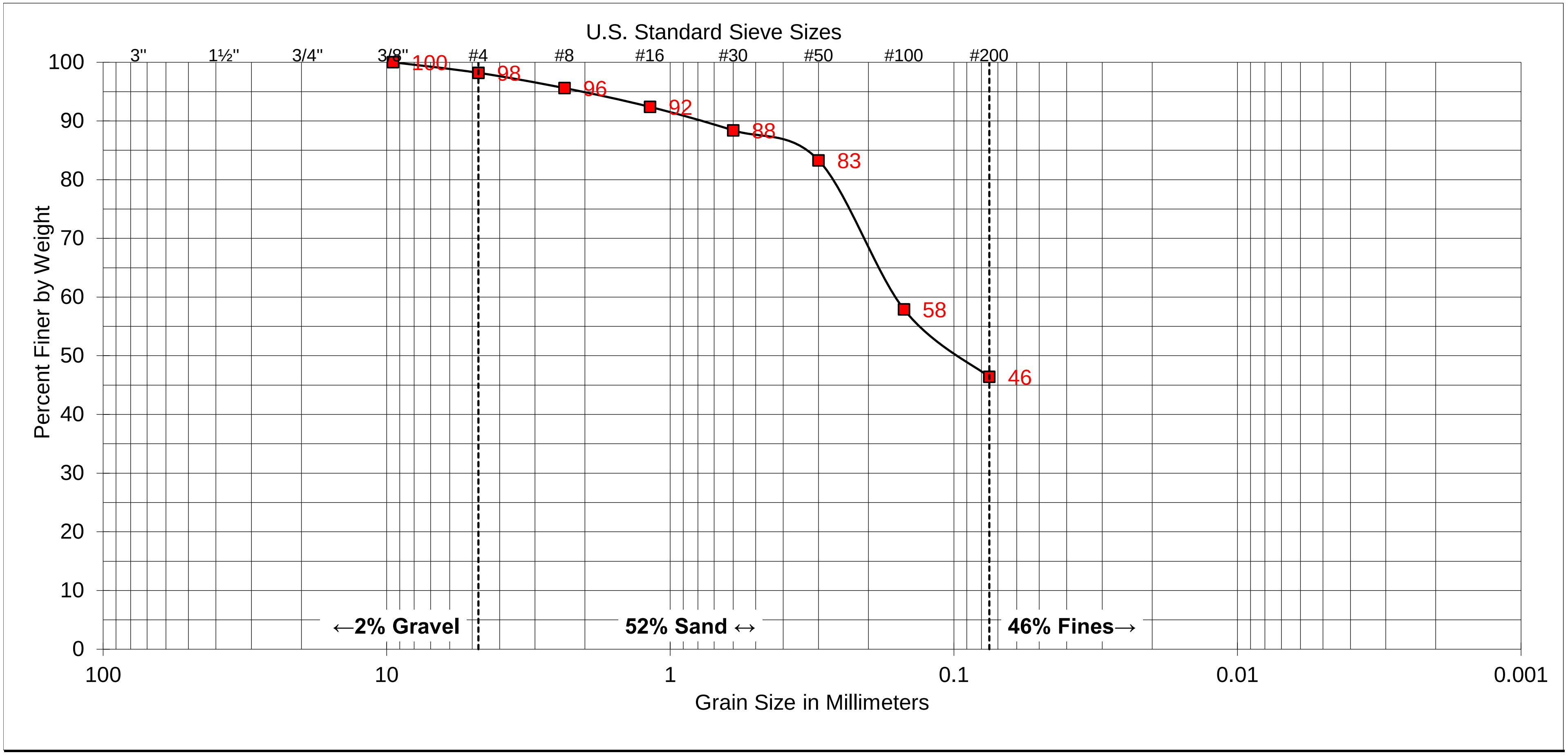
pH and Resistivity: To assess the potential for reactivity with buried metals, selected soil samples were tested for pH and minimum resistivity using Caltrans test method 643. The corrosivity test results are summarized in Figure C-3, along with previous corrosion tests we conducted on site.

Sulfate Content: To assess the potential for reactivity with concrete, selected soil samples were tested for water soluble sulfate. The sulfate was extracted from the soil under vacuum using a 10:1 (water to dry soil) dilution ratio. The extracted solution was tested for water soluble sulfate in general accordance with ASTM D516. The test results are also presented in Figure C-3, along with common criteria for evaluating soluble sulfate content.

Chloride Content: Soil samples were also tested for water soluble chloride. The chloride was extracted from the soil under vacuum using a 10:1 (water to dry soil) dilution ratio. The extracted solution was then tested for water soluble chloride using a calibrated ion specific electronic probe in general accordance with ASTM D512. The test results are also shown in Figure C-3.

Direct Shear: The shear strength of selected partially intact samples of the soils from the site were assessed using direct shear testing performed in general accordance with ASTM D3080. The test results are shown in Figures C-4.1 through C-4.4.

Consolidation: The one-dimensional consolidation properties of a selected sample was evaluated in general accordance with ASTM D2435. The sample was inundated with water under a nominal seating load, allowed to swell, and then subjected to controlled stress increments while restrained laterally and drained axially. The test results are presented in Figure C-5.



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND
GRAVEL		SAND			CLAY

SAMPLE	
BORING NUMBER:	S-1
SAMPLE DEPTH:	2' - 5'

UNIFIED SOIL CLASSIFICATION: SC

DESCRIPTION: CLAYEY SAND

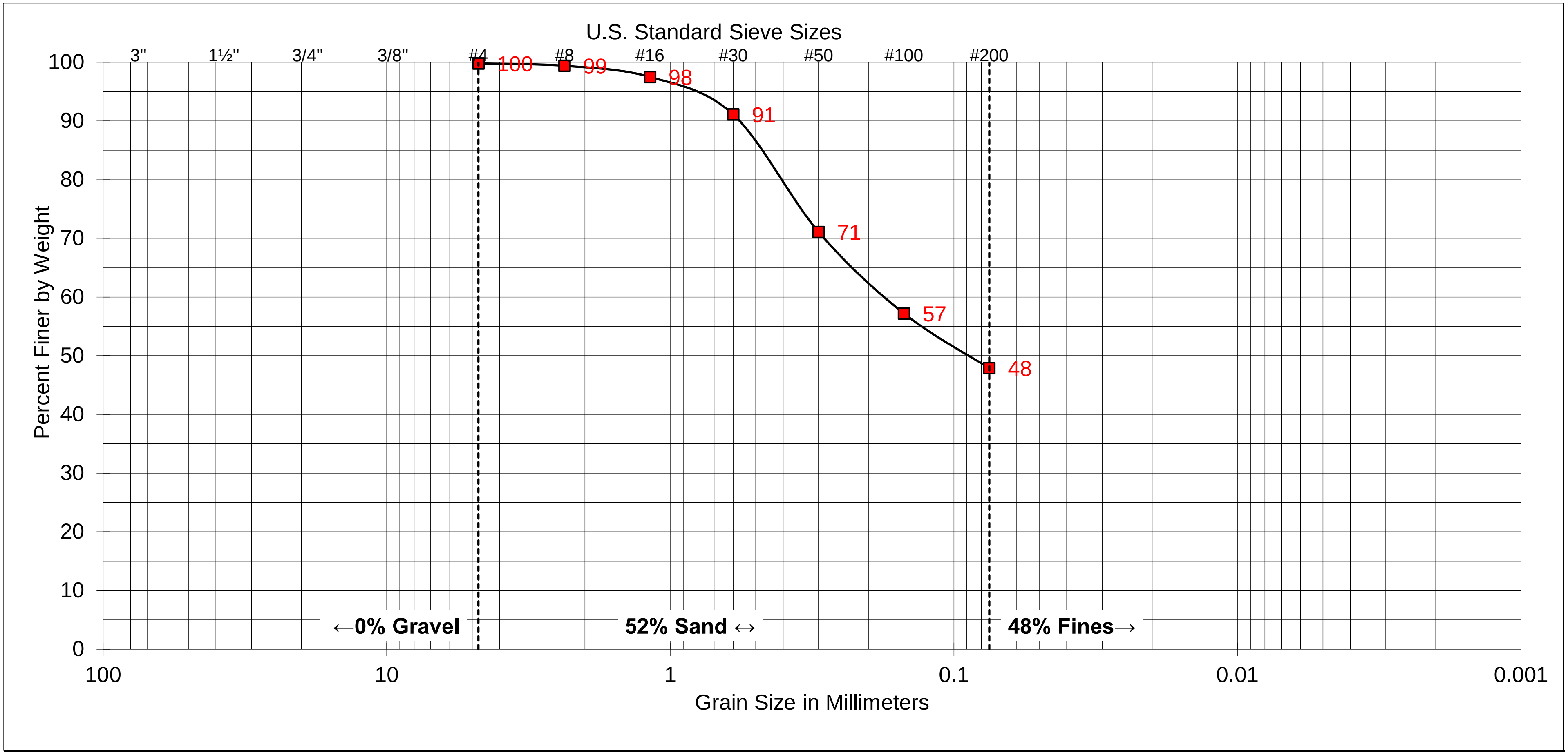
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.1



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND
GRAVEL		SAND			CLAY

SAMPLE	
BORING NUMBER:	S-1
SAMPLE DEPTH:	25' - 26.5'

UNIFIED SOIL CLASSIFICATION: SC

DESCRIPTION: CLAYEY SAND

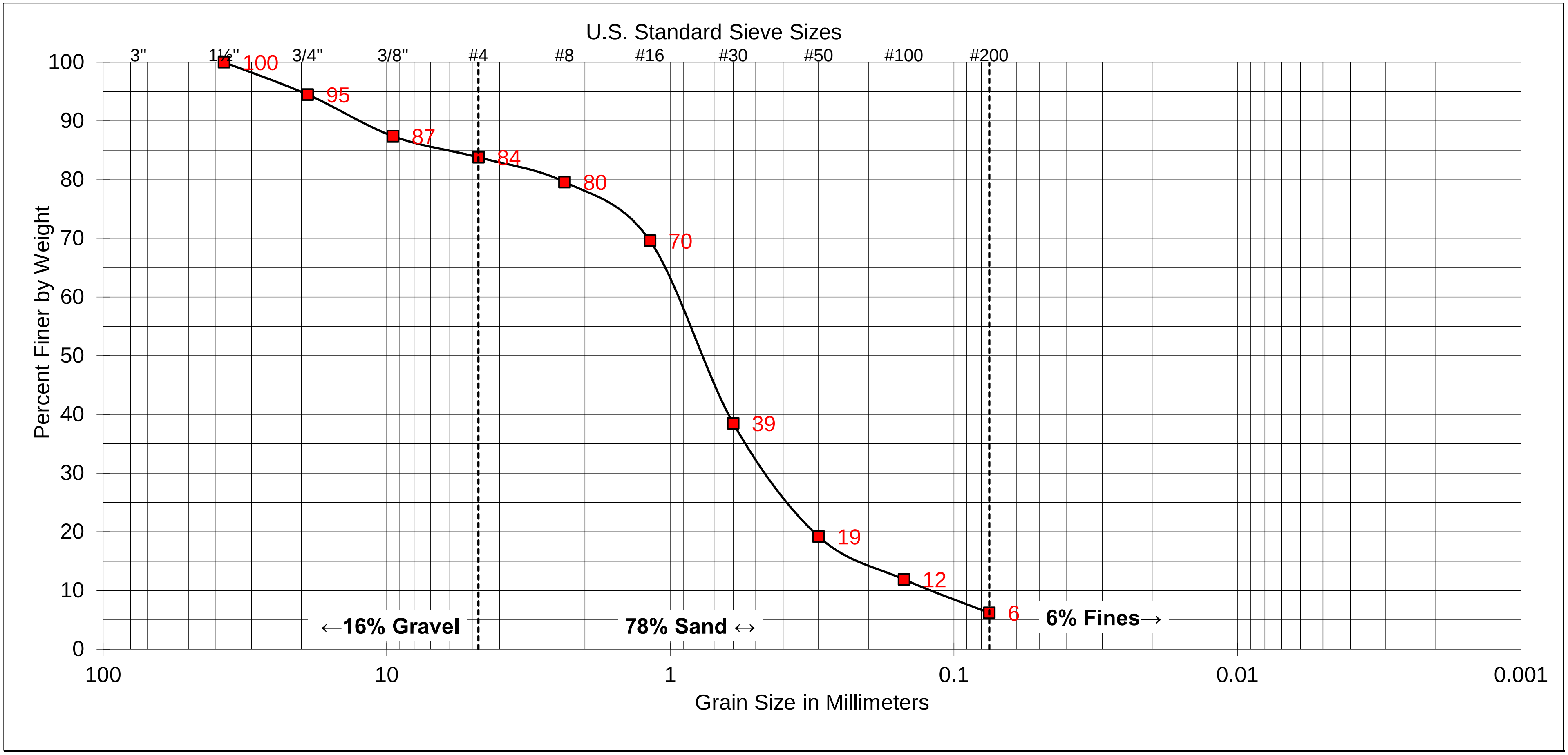
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.2



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND
GRAVEL		SAND			CLAY

SAMPLE	
BORING NUMBER:	S-1
SAMPLE DEPTH:	40' - 40.8'

UNIFIED SOIL CLASSIFICATION: SW-SM

DESCRIPTION: WELL GRADED SAND WITH SILT AND GRAVEL

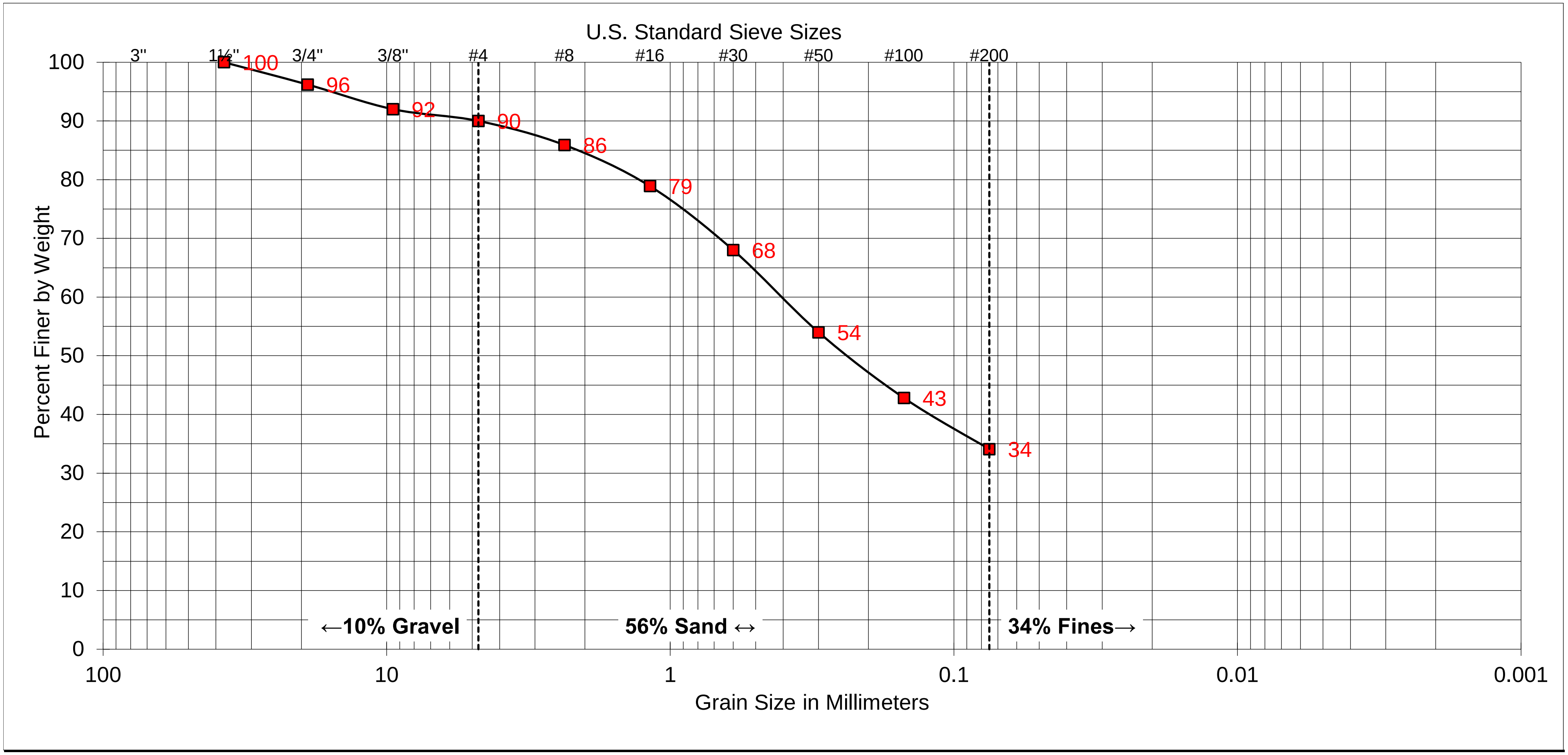
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.3



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND CLAY
GRAVEL		SAND			

SAMPLE	
BORING NUMBER:	S-2
SAMPLE DEPTH:	0.5' - 5'

UNIFIED SOIL CLASSIFICATION: SC

DESCRIPTION: CLAYEY SAND

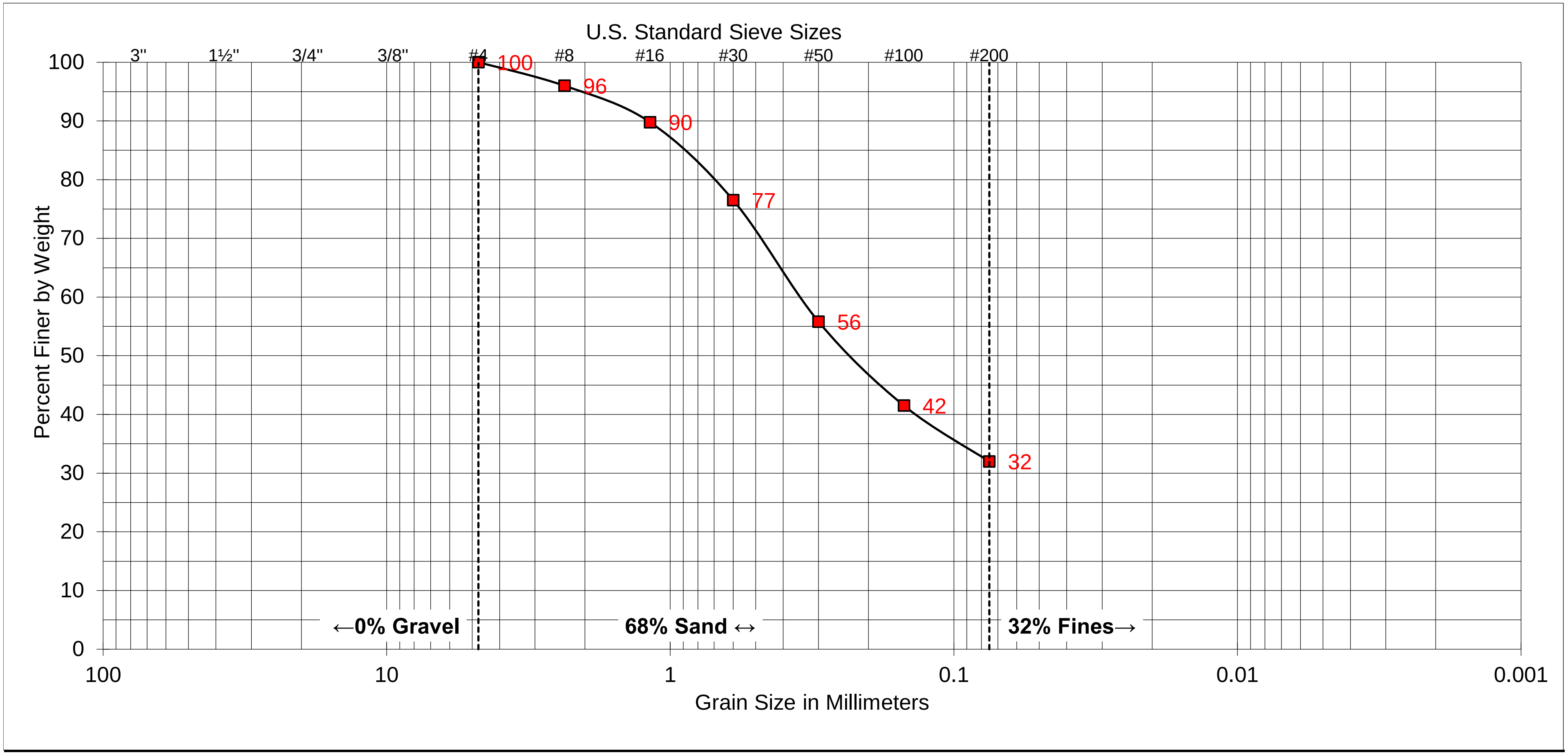
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.4



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND CLAY
GRAVEL		SAND			

SAMPLE	
BORING NUMBER:	S-3
SAMPLE DEPTH:	0.5' - 5'

UNIFIED SOIL CLASSIFICATION: SC

DESCRIPTION: CLAYEY SAND

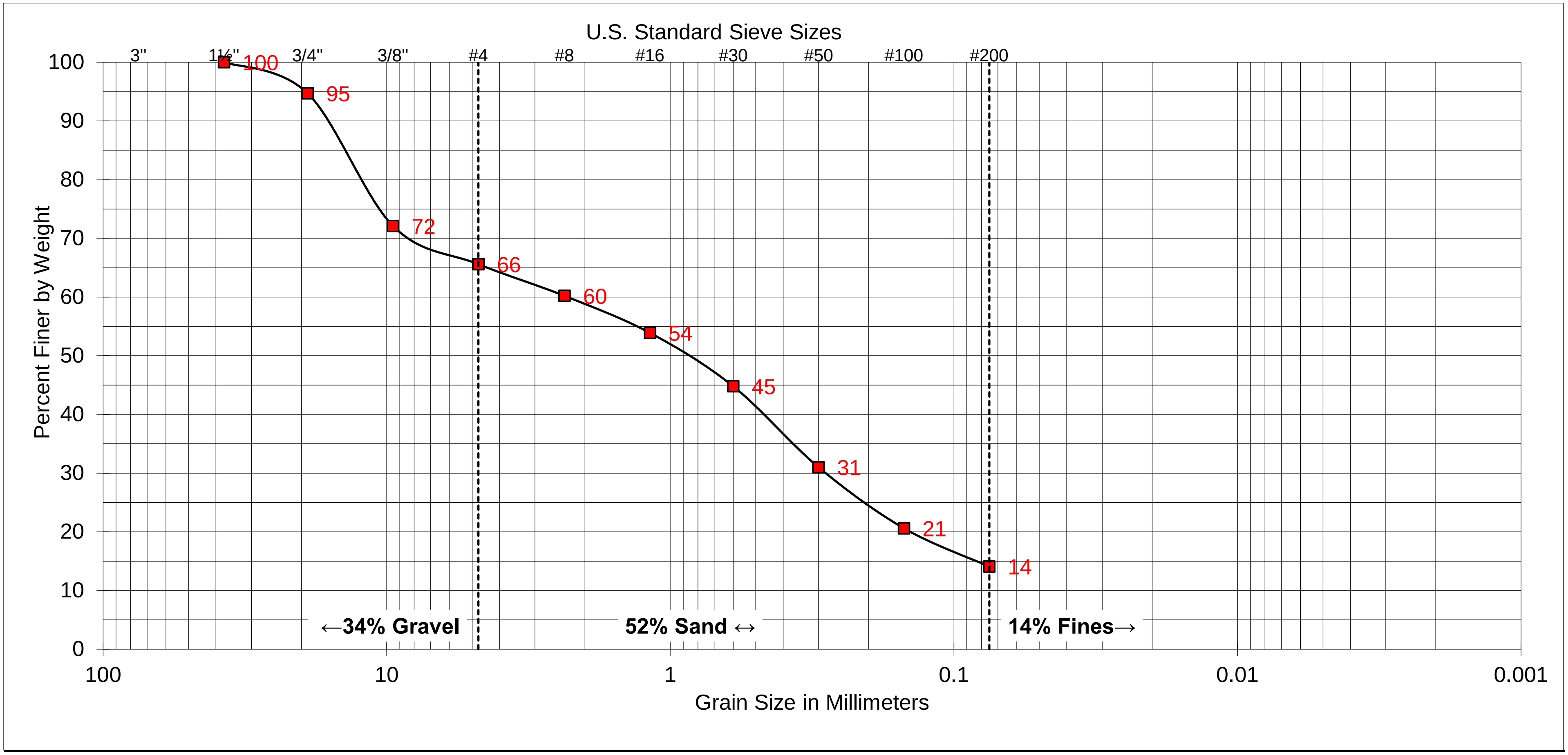
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.5



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND CLAY
GRAVEL		SAND			

SAMPLE	
BORING NUMBER:	S-3
SAMPLE DEPTH:	30' - 31.5'

UNIFIED SOIL CLASSIFICATION: SM

DESCRIPTION: SILTY SAND WITH GRAVEL

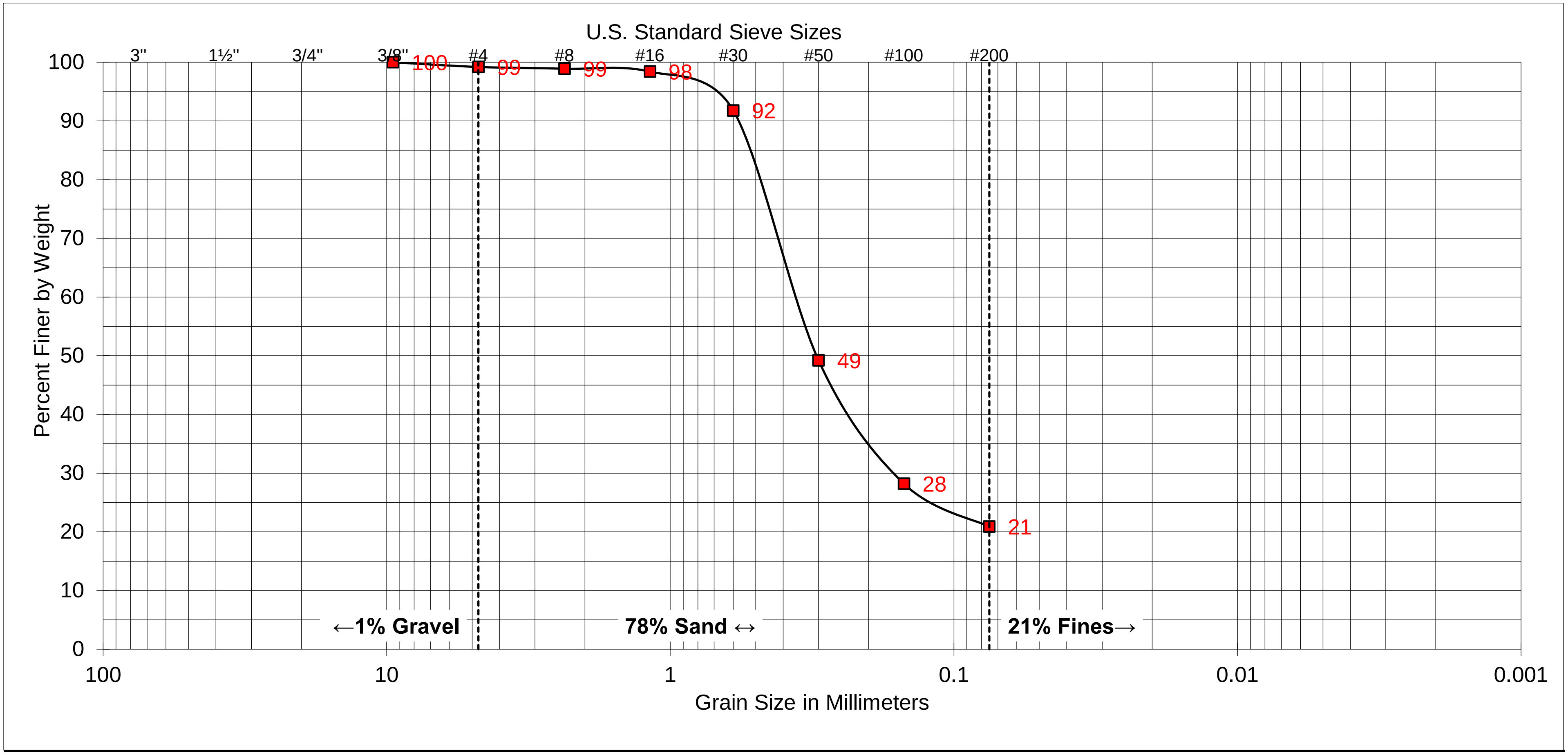
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.6



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND
GRAVEL		SAND			CLAY

SAMPLE	
BORING NUMBER:	S-4
SAMPLE DEPTH:	0.5' - 4'

UNIFIED SOIL CLASSIFICATION: SC

DESCRIPTION: CLAYEY SAND

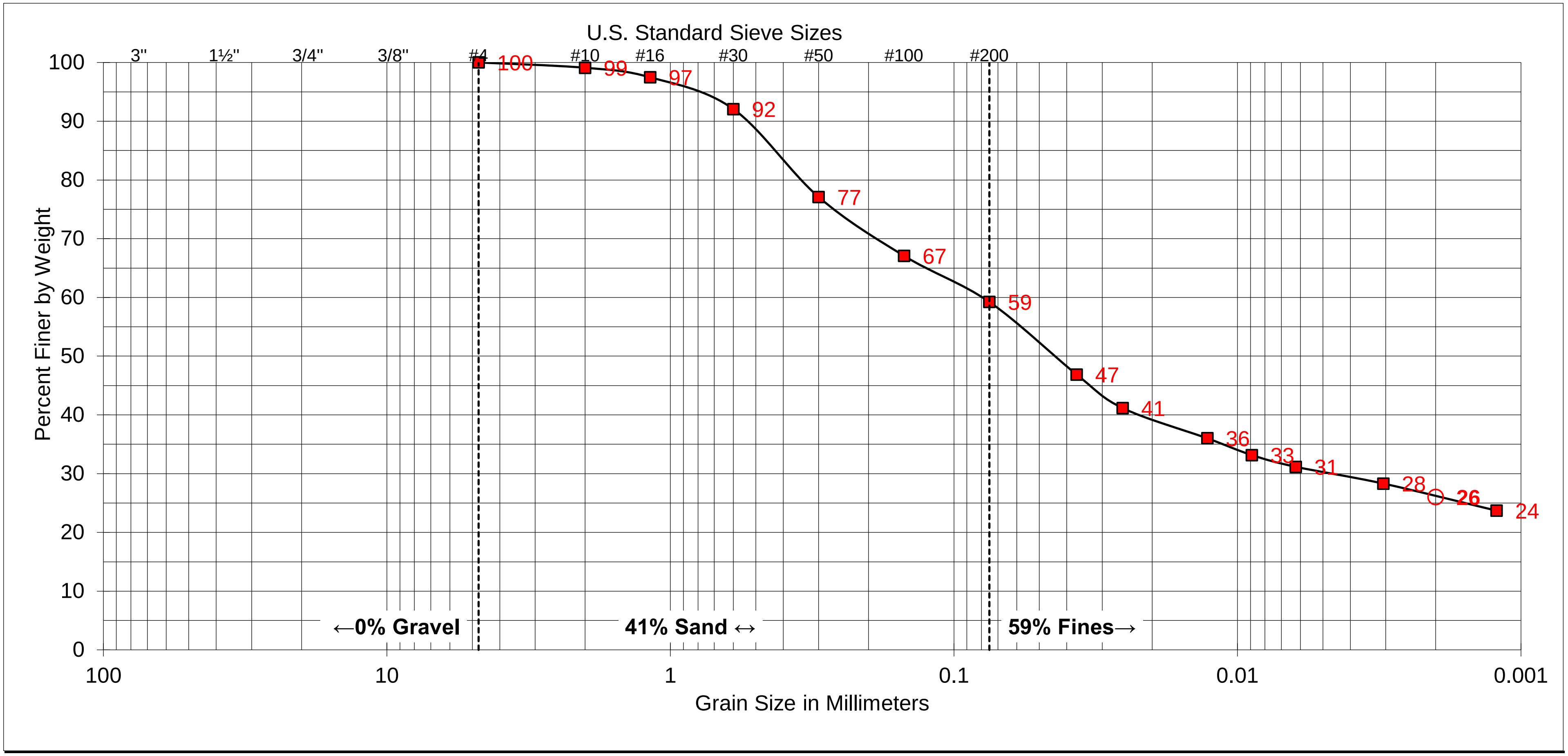
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.7



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND CLAY
GRAVEL		SAND			

SAMPLE
SAMPLE NUMBER: S-4
SAMPLE DEPTH: 15' - 16.5'

UNIFIED SOIL CLASSIFICATION: CL

DESCRIPTION: SANDY LEAN CLAY

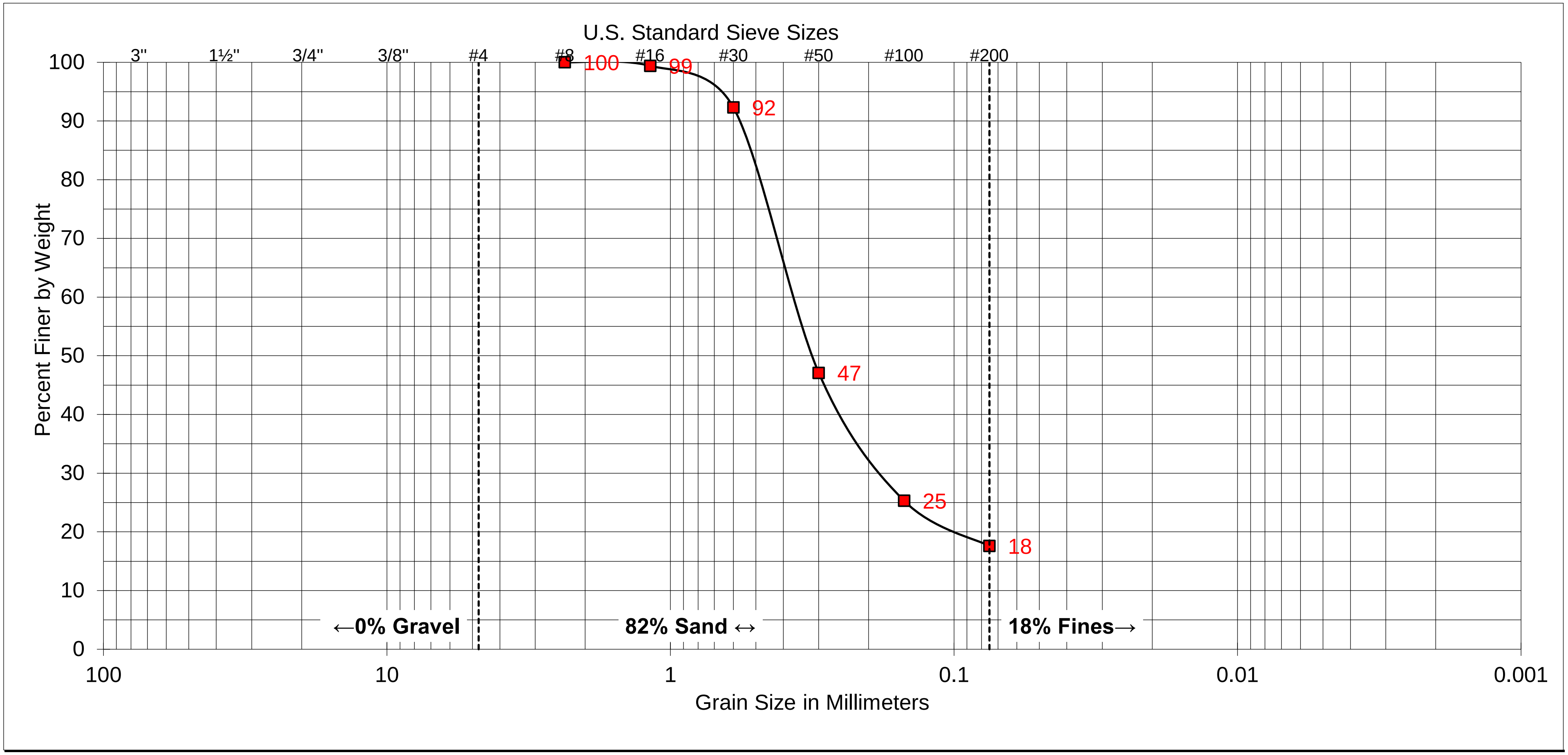
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.8



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND
GRAVEL		SAND			CLAY

SAMPLE	
BORING NUMBER:	S-4
SAMPLE DEPTH:	35' - 36.5'

UNIFIED SOIL CLASSIFICATION: SM

DESCRIPTION: SILTY SAND

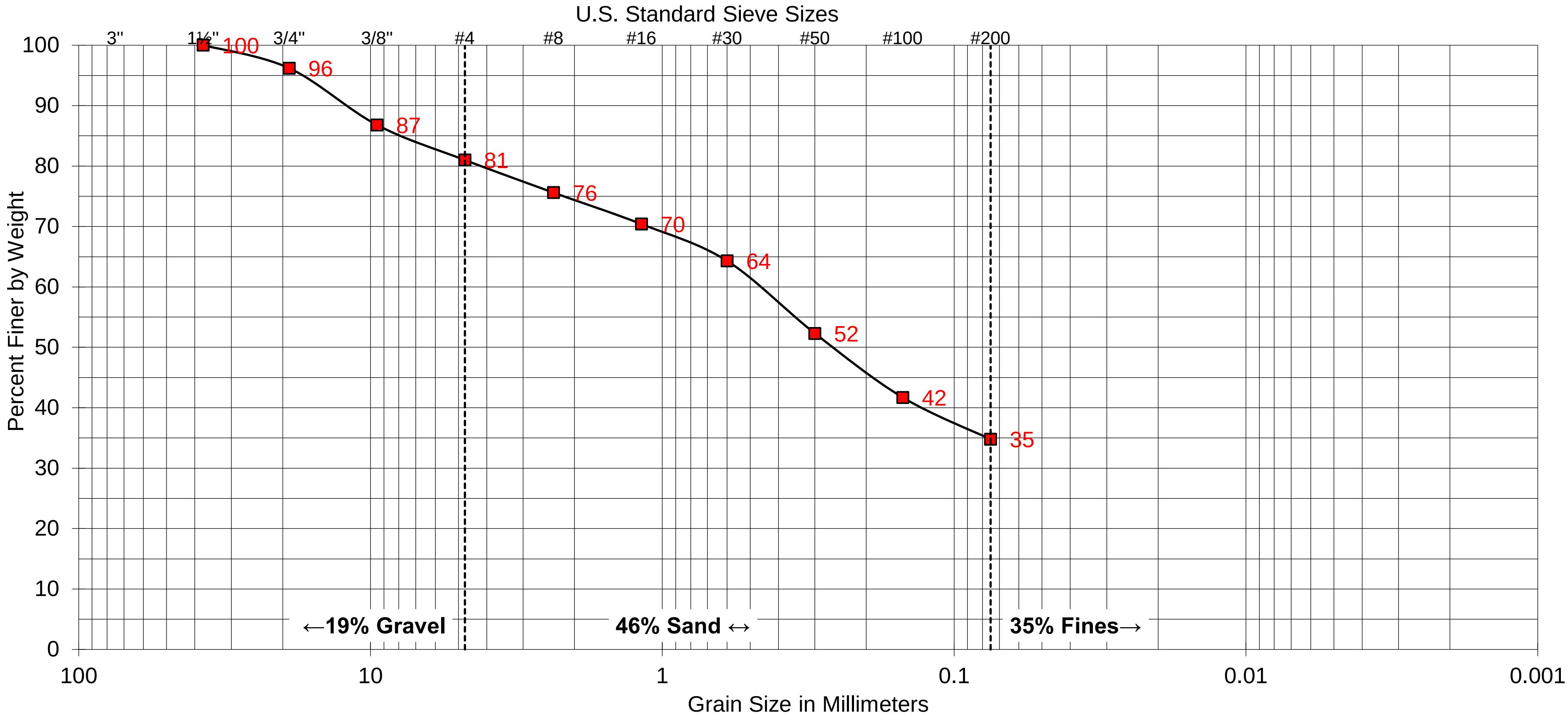
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.9



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND CLAY
GRAVEL		SAND			

SAMPLE	
BORING NUMBER:	S-5
SAMPLE DEPTH:	0.5' - 5'

UNIFIED SOIL CLASSIFICATION: SC

DESCRIPTION: CLAYEY SAND WITH GRAVEL

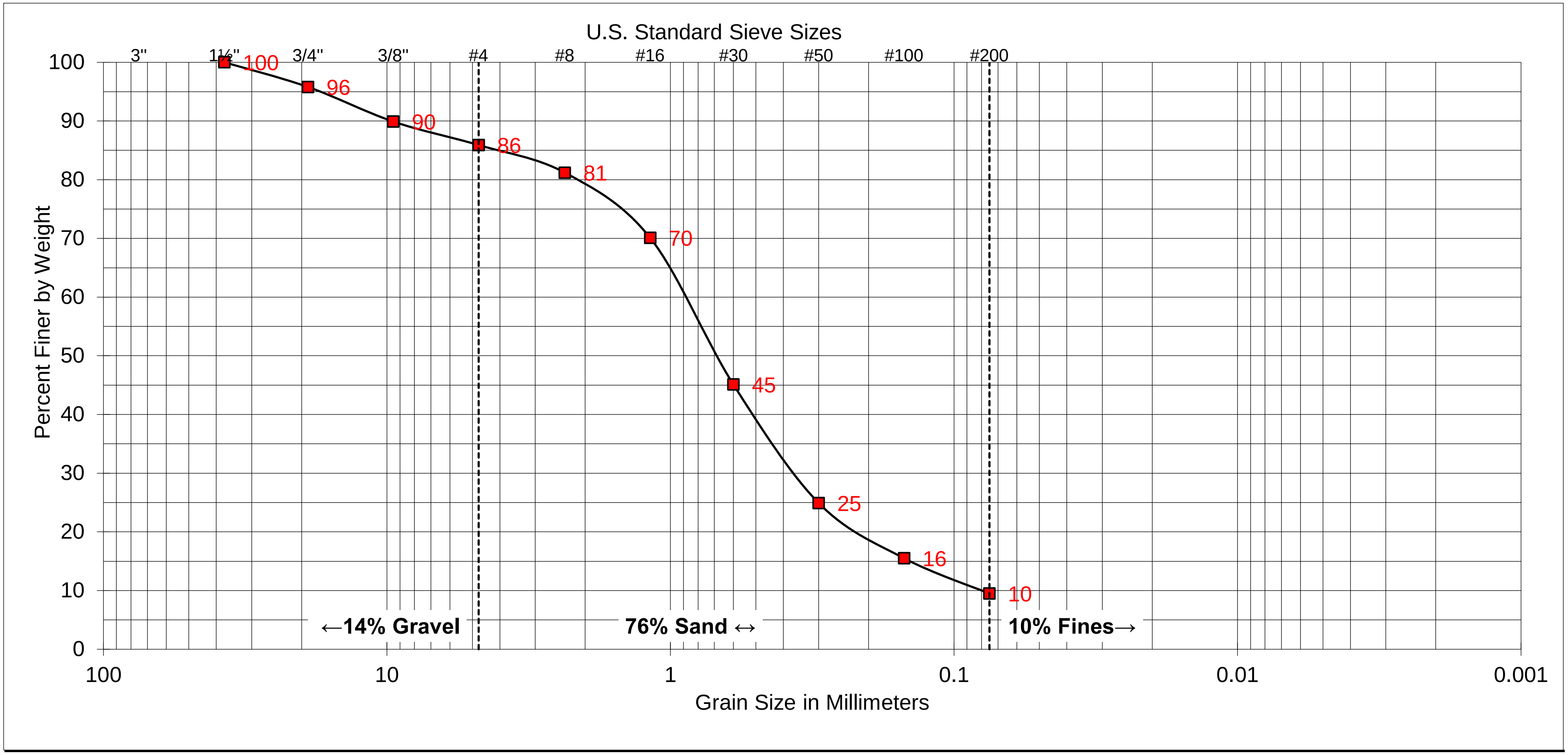
ATTERBERG LIMITS	
LIQUID LIMIT:	38
PLASTIC LIMIT:	15
PLASTICITY INDEX:	23

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.10



GRAVEL		SAND			SILT AND CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

SAMPLE	
BORING NUMBER:	S-5
SAMPLE DEPTH:	40' - 41.5'

UNIFIED SOIL CLASSIFICATION: SW

DESCRIPTION: WELL GRADED SAND WITH SILT

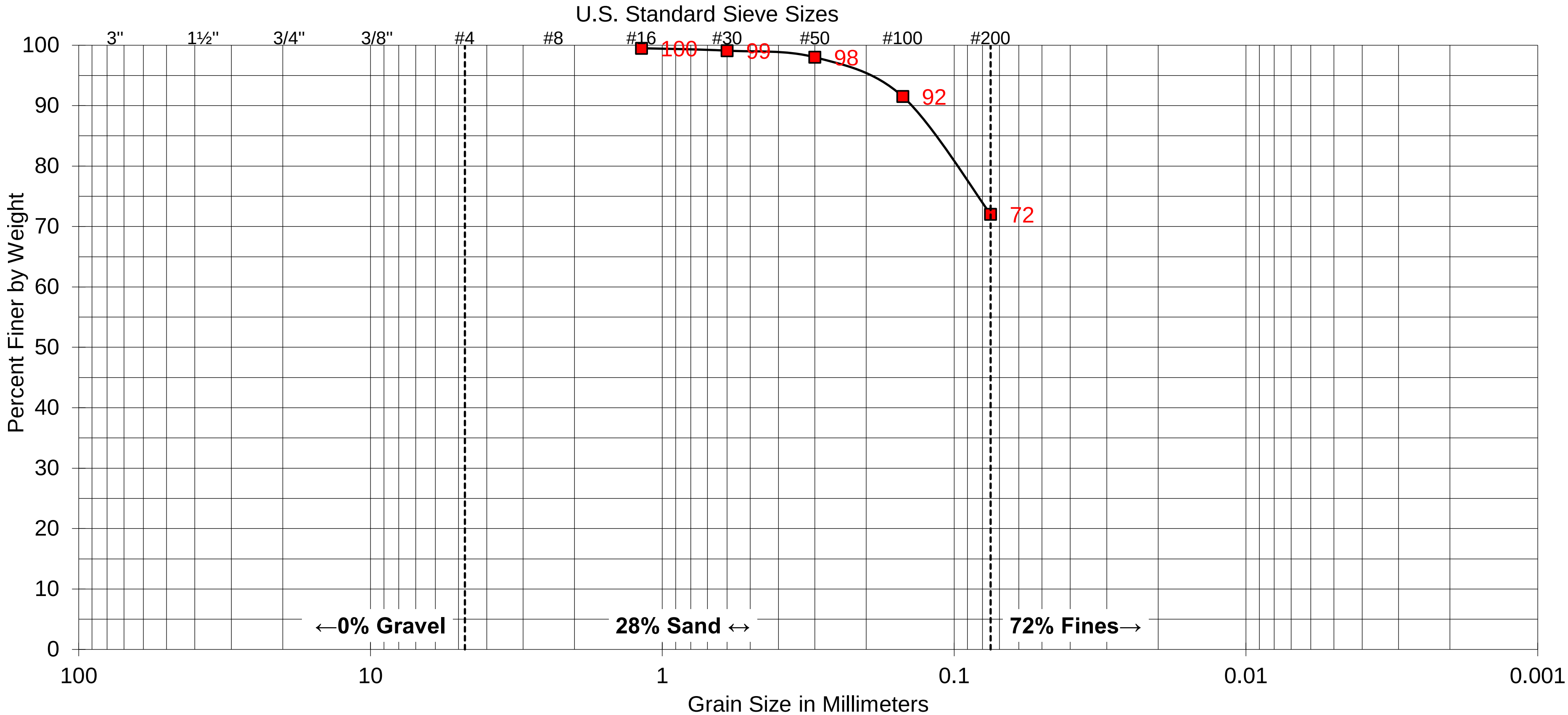
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.11



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND
GRAVEL		SAND			CLAY

SAMPLE	
BORING NUMBER:	S-6
SAMPLE DEPTH:	0.5' - 5'

UNIFIED SOIL CLASSIFICATION: CL

DESCRIPTION: LEAN CLAY WITH SAND

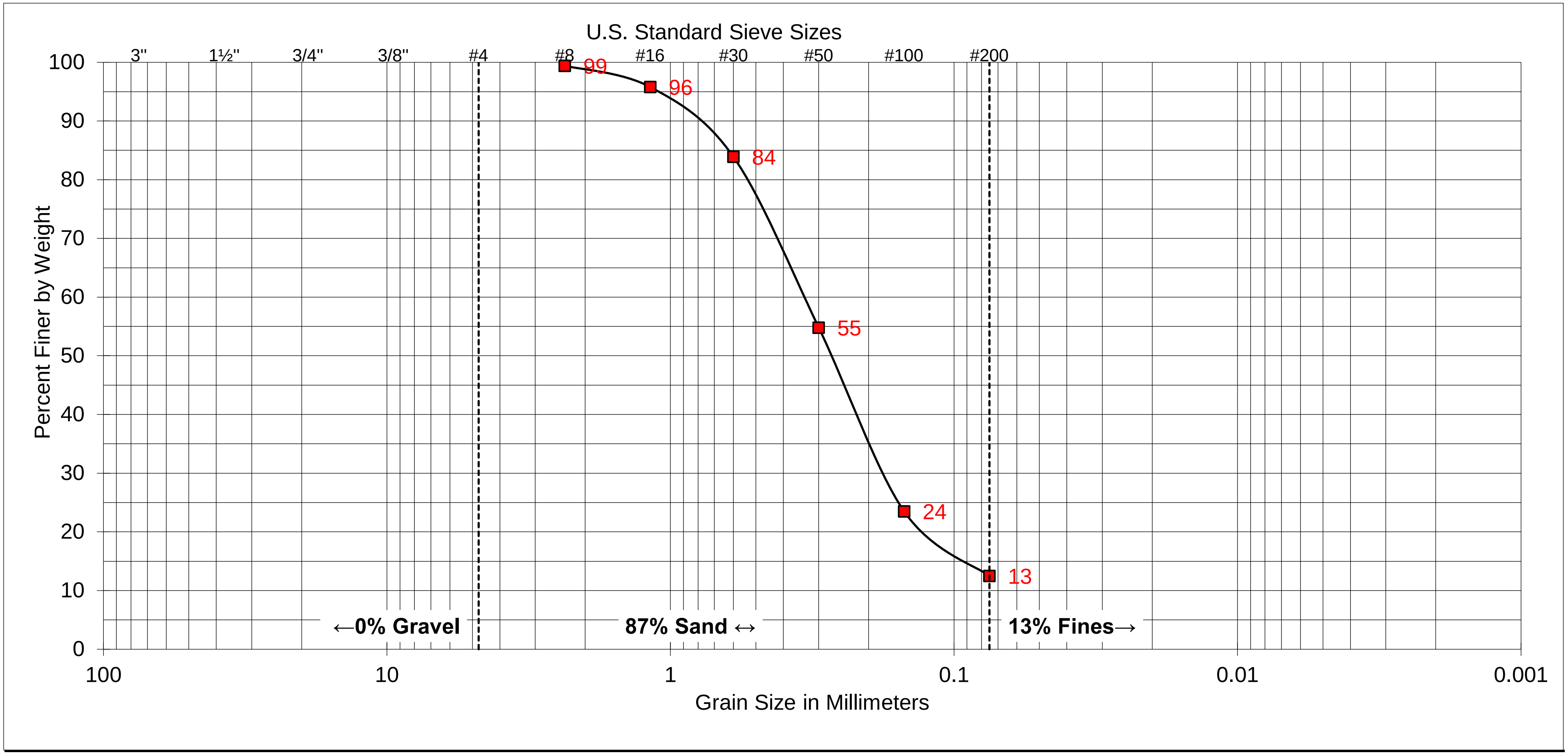
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.12



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND
GRAVEL		SAND			CLAY

SAMPLE	
BORING NUMBER:	S-6
SAMPLE DEPTH:	15' - 16.5'

UNIFIED SOIL CLASSIFICATION: SM

DESCRIPTION: SILTY SAND

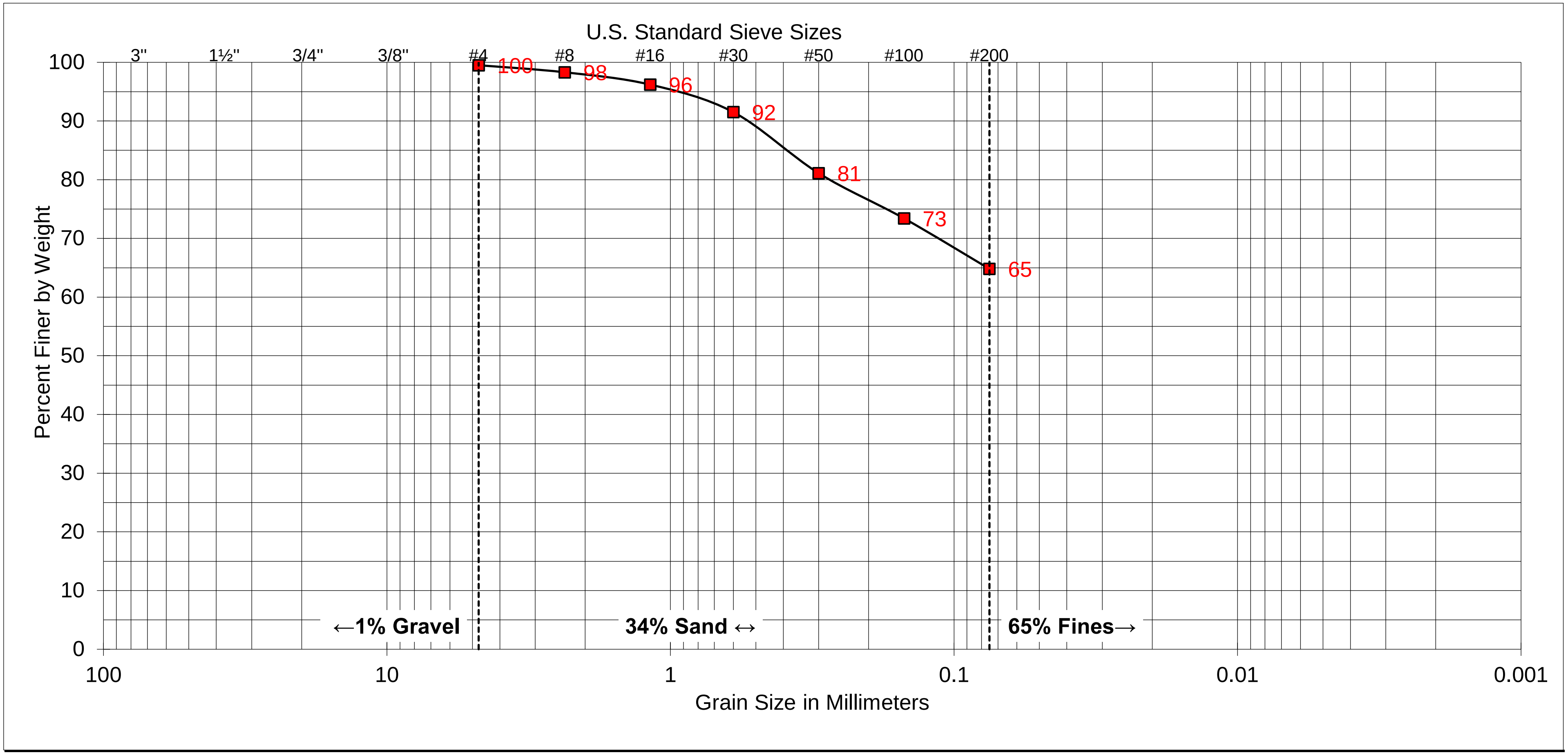
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.13



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND
GRAVEL		SAND			CLAY

SAMPLE	
BORING NUMBER:	S-7
SAMPLE DEPTH:	0.5' - 5'

UNIFIED SOIL CLASSIFICATION: CL

DESCRIPTION: SANDY LEAN CLAY

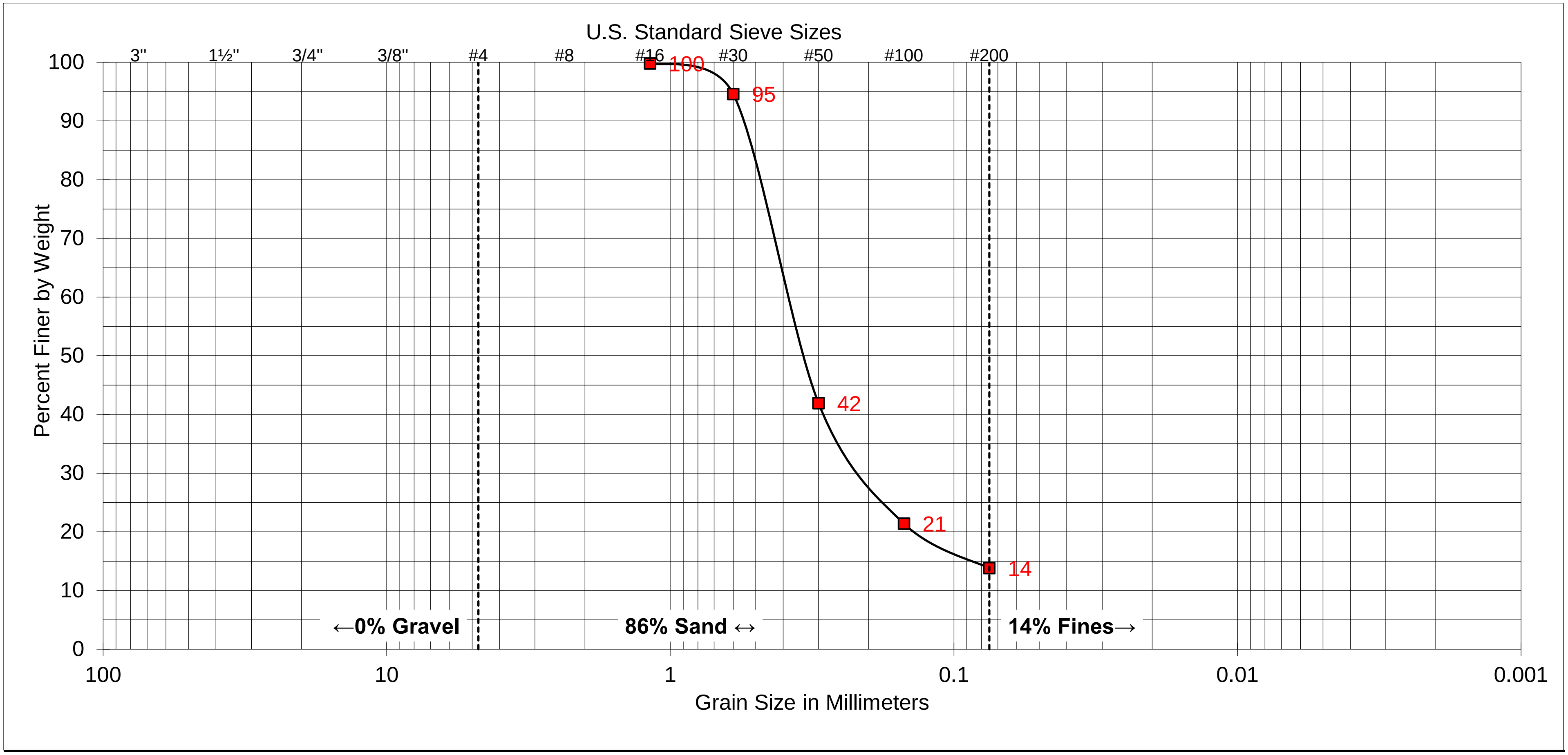
ATTERBERG LIMITS	
LIQUID LIMIT:	39
PLASTIC LIMIT:	14
PLASTICITY INDEX:	25

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.14



GRAVEL		SAND			SILT AND CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

SAMPLE	
BORING NUMBER:	S-7
SAMPLE DEPTH:	25' - 26.5'

UNIFIED SOIL CLASSIFICATION: SM

DESCRIPTION: SILTY SAND

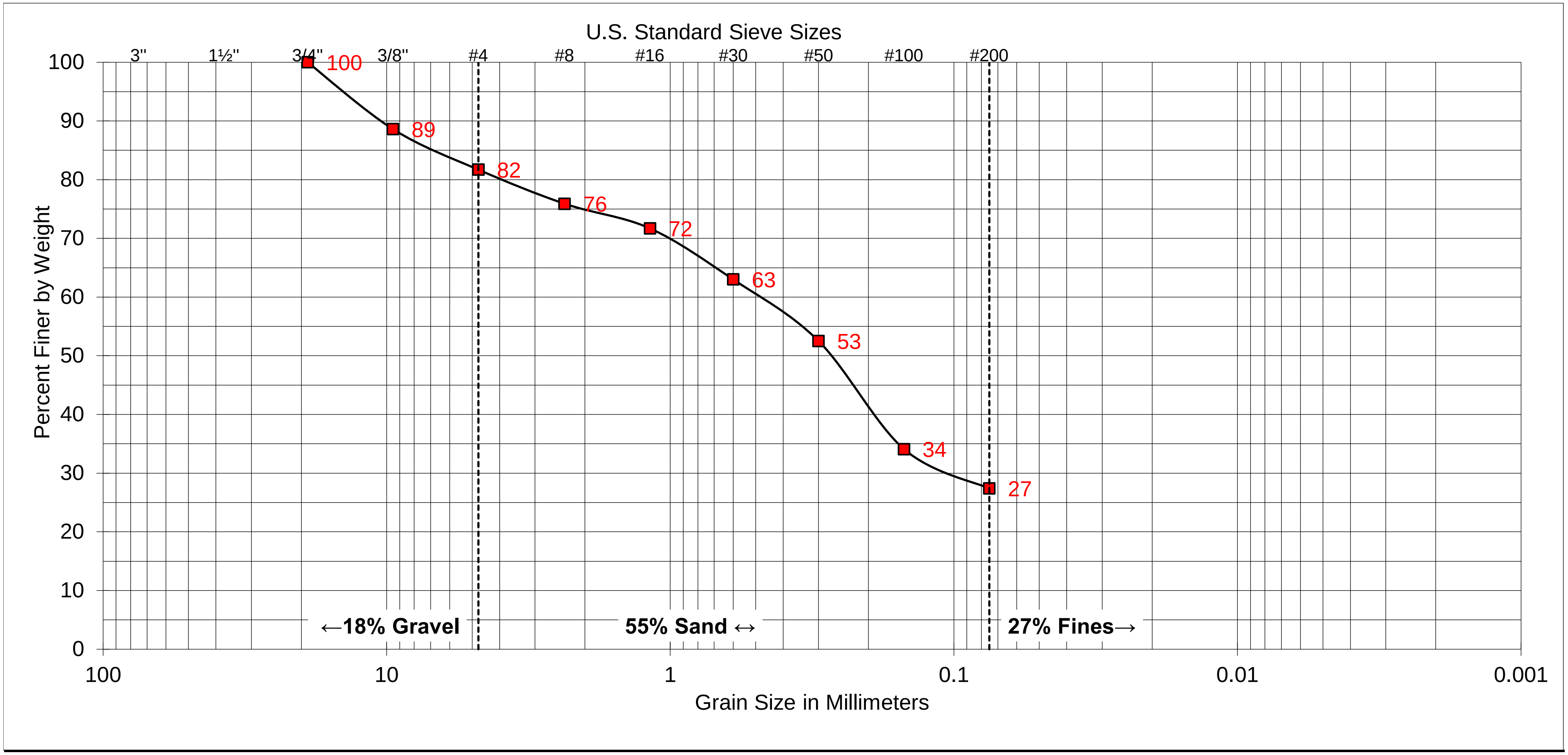
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.15



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND
GRAVEL		SAND			CLAY

SAMPLE	
BORING NUMBER:	S-8
SAMPLE DEPTH:	0.5' - 2.5'

UNIFIED SOIL CLASSIFICATION: SC

DESCRIPTION: CLAYEY SAND WITH GRAVEL

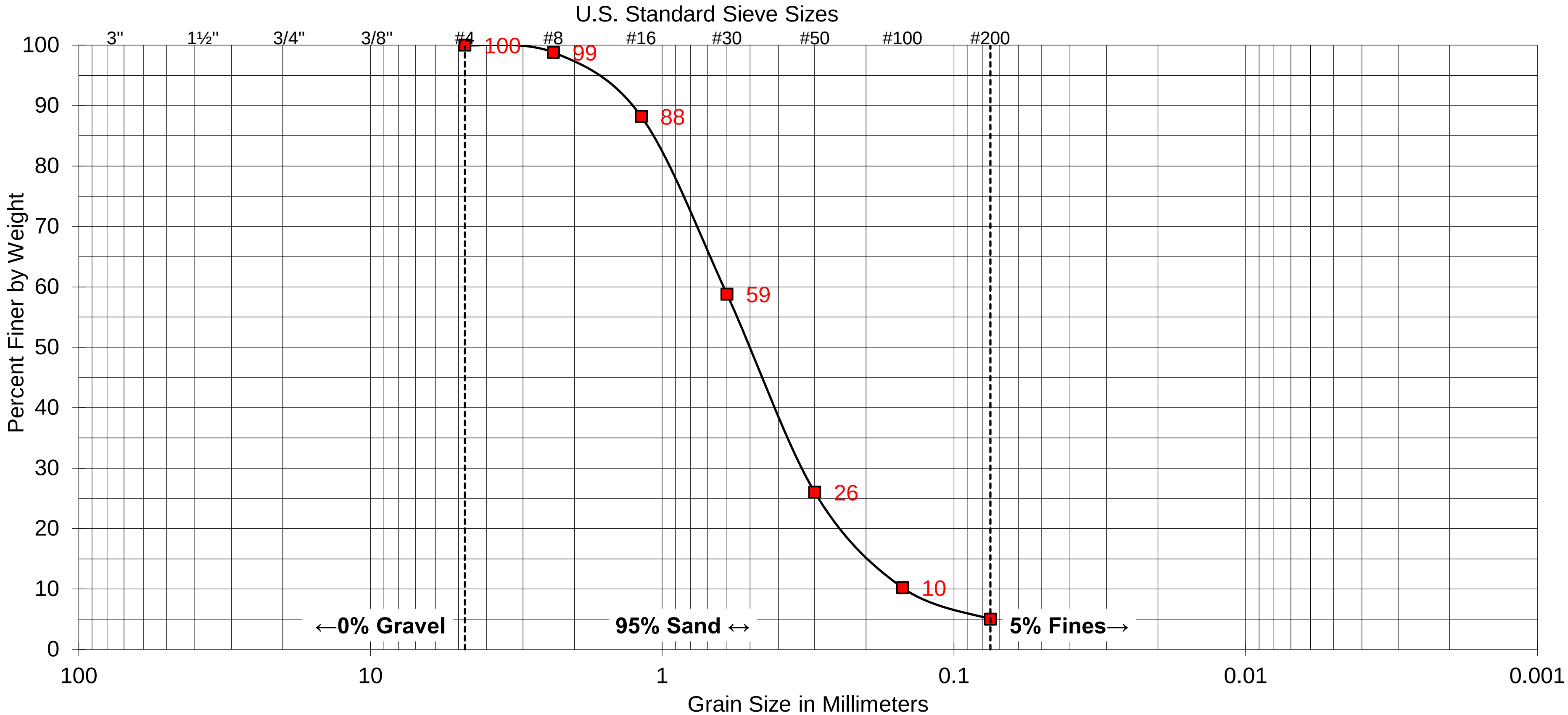
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.16



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND CLAY
GRAVEL		SAND			

SAMPLE	
BORING NUMBER:	S-8
SAMPLE DEPTH:	20' - 21.5'

UNIFIED SOIL CLASSIFICATION: SP

DESCRIPTION: POORLY GRADED SAND

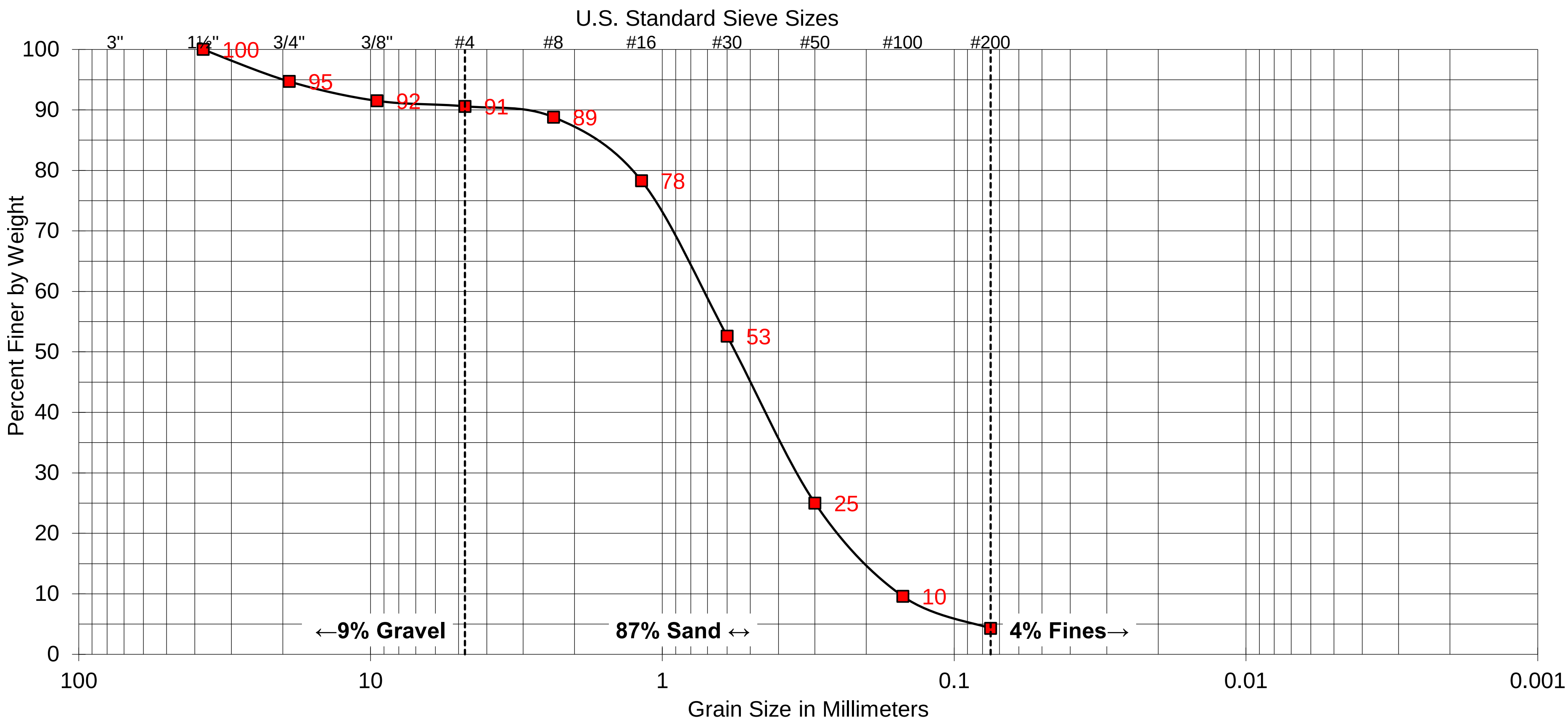
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.17



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND CLAY
GRAVEL		SAND			

SAMPLE	
BORING NUMBER:	S-8
SAMPLE DEPTH:	30' - 31.5'

UNIFIED SOIL CLASSIFICATION: SP

DESCRIPTION: POORLY GRADED SAND

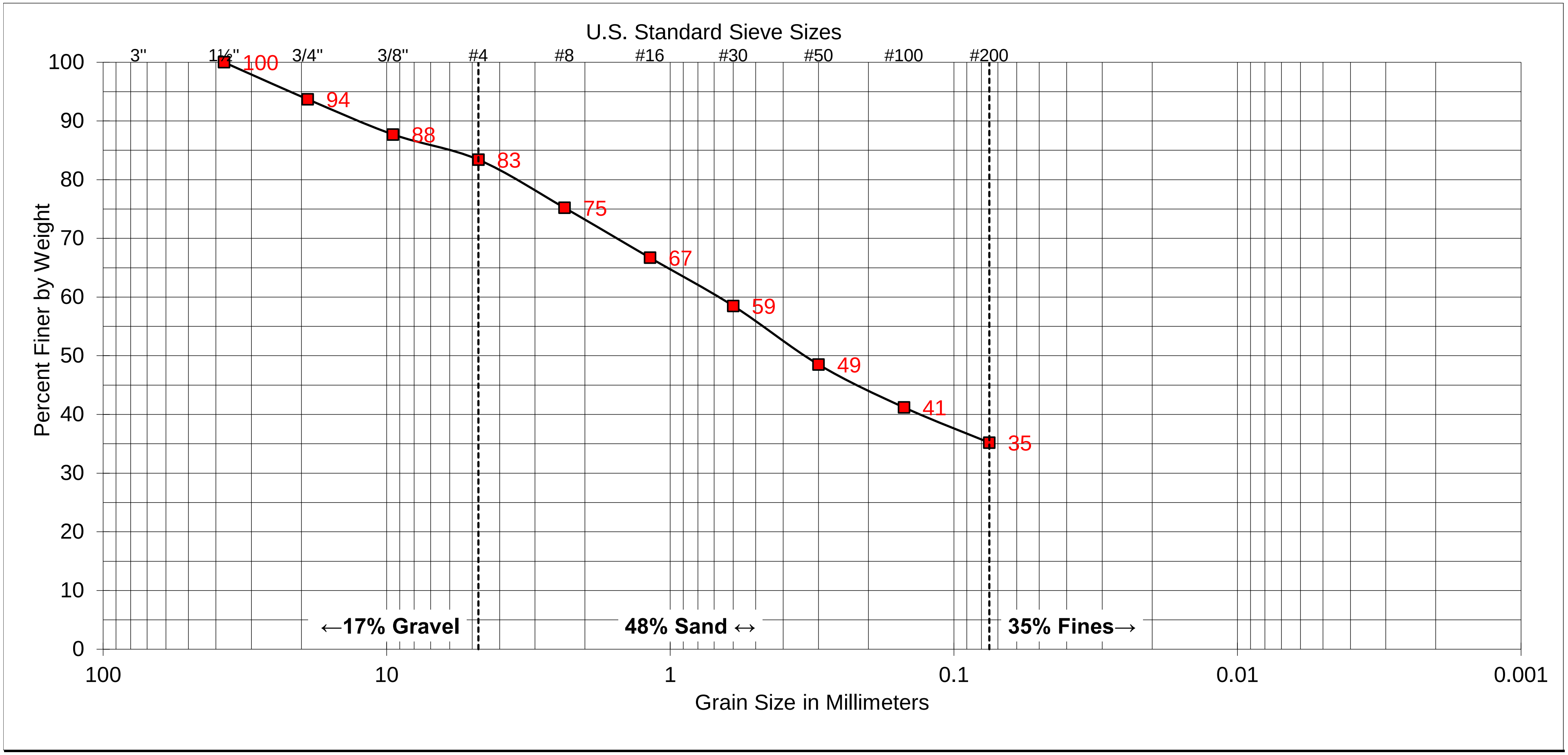
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.18



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CLAY</td></tr>
<tr><td colspan="2">GRAVEL</td><td colspan="3">SAND</td></tr>
</table>

SAMPLE	
BORING NUMBER:	S-9
SAMPLE DEPTH:	0.5' - 5'

UNIFIED SOIL CLASSIFICATION: SC

DESCRIPTION: CLAYEY SAND WITH GRAVEL

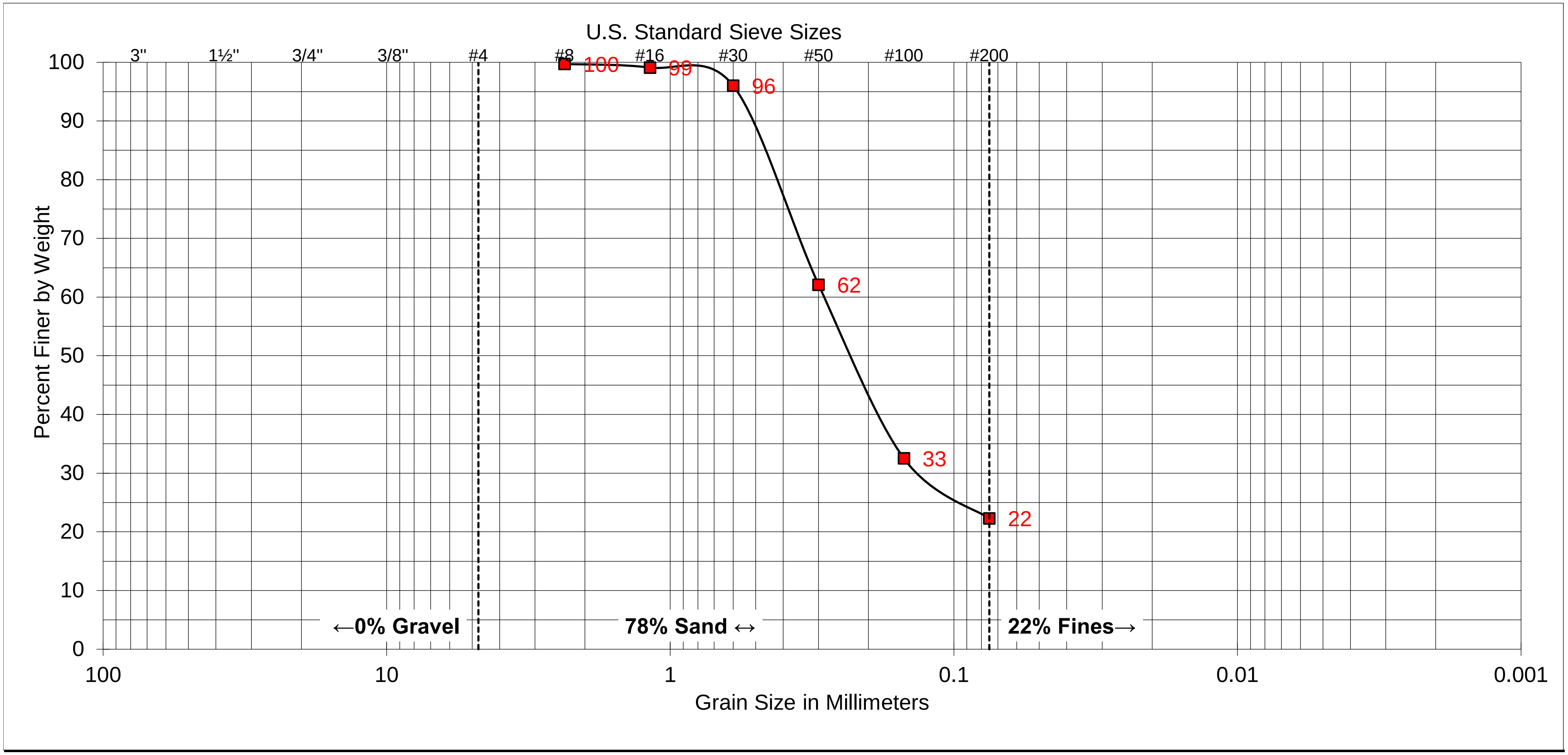
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.19



<table>
<tr><td>COARSE</td><td>FINE</td><td>COARSE</td><td>MEDIUM</td><td>FINE</td><td rowspan="2">SILT AND
CLAY</td></tr>
<tr><td colspan="2">GRAVEL</td><td colspan="3">SAND</td></tr>
</table>

SAMPLE	
BORING NUMBER:	S-9
SAMPLE DEPTH:	25' - 26.5'

UNIFIED SOIL CLASSIFICATION: SM

DESCRIPTION: SILTY SAND

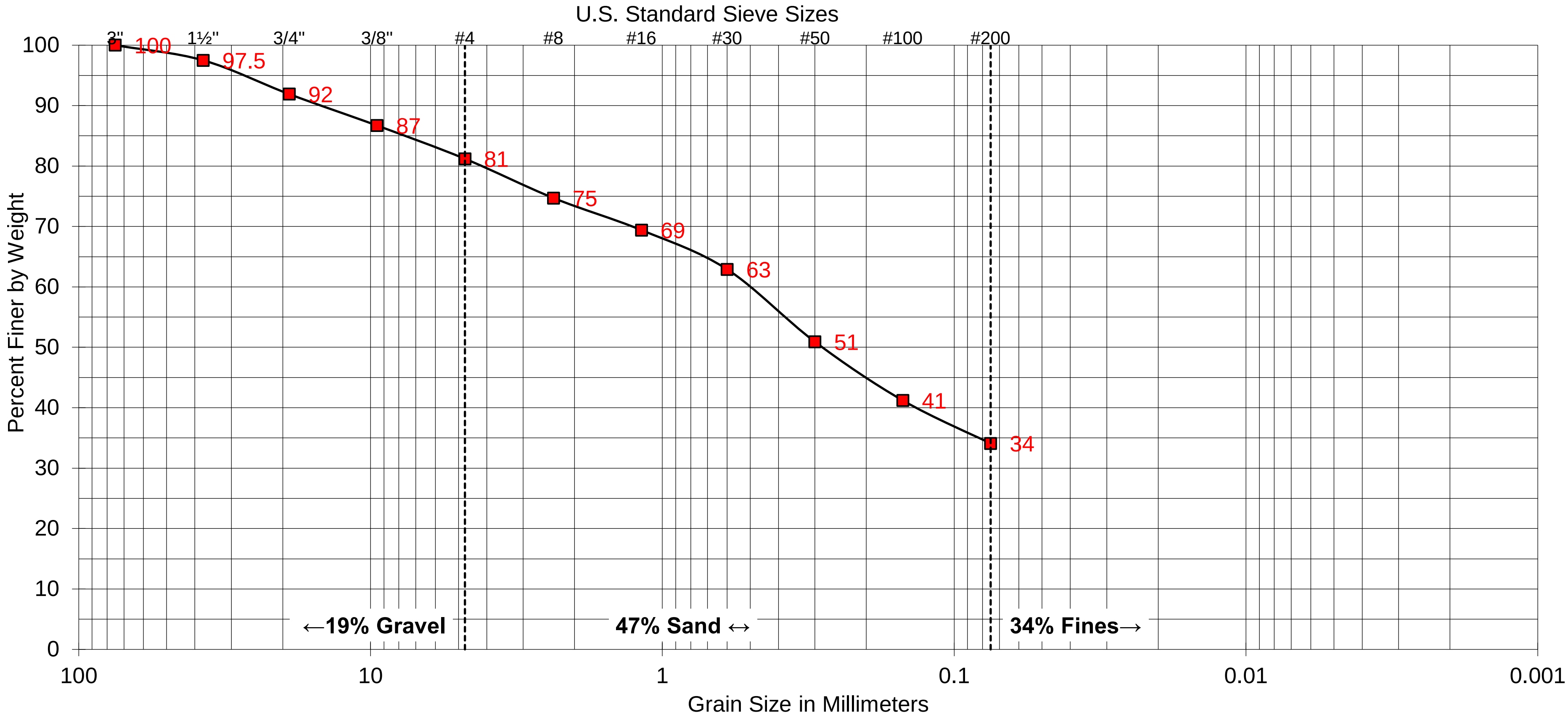
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.20



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND
GRAVEL		SAND			CLAY

SAMPLE	
BORING NUMBER:	S-10
SAMPLE DEPTH:	0.5' - 5'

UNIFIED SOIL CLASSIFICATION: SC

DESCRIPTION: CLAYEY SAND WITH GRAVEL

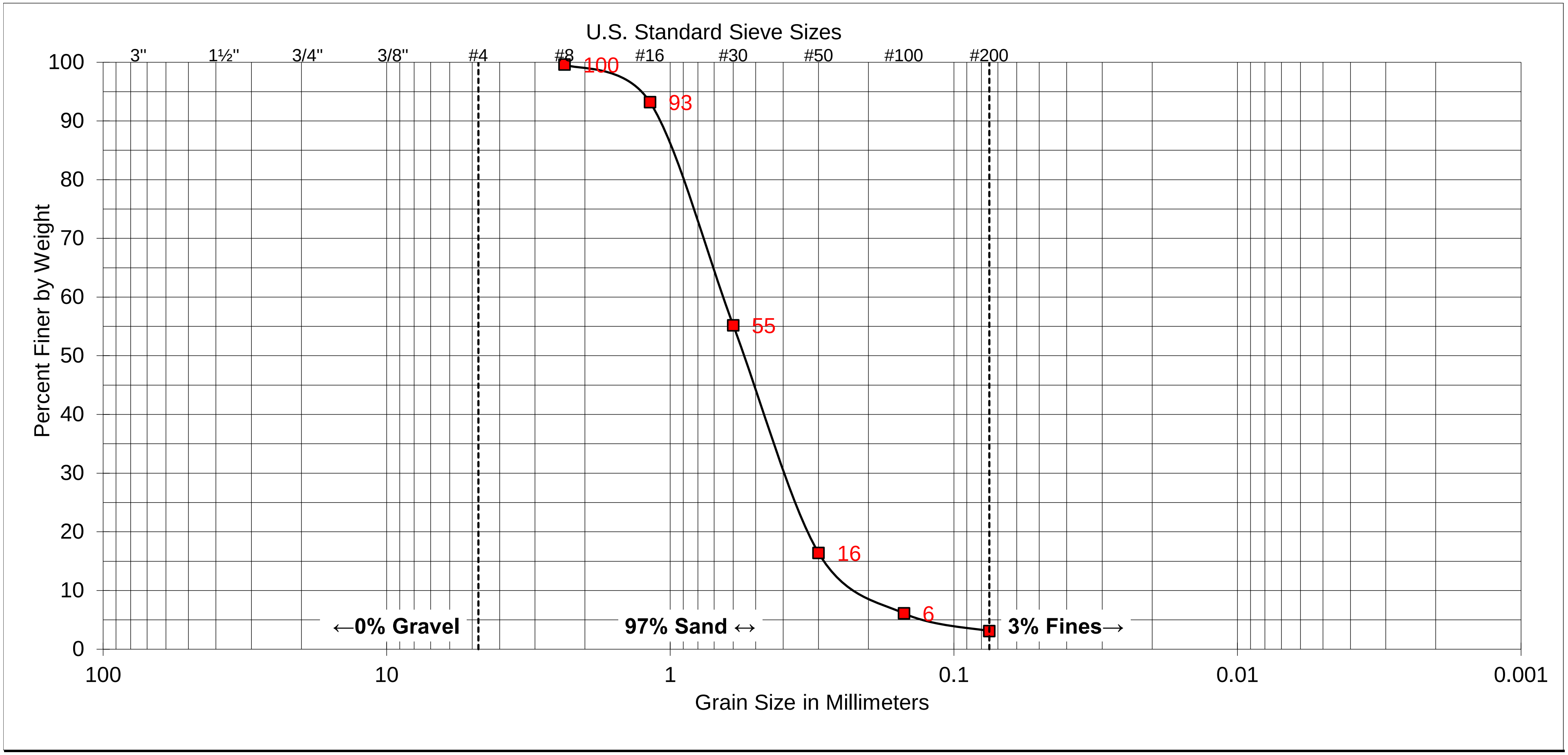
ATTERBERG LIMITS	
LIQUID LIMIT:	39
PLASTIC LIMIT:	15
PLASTICITY INDEX:	24

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.21



GRAVEL		SAND			SILT AND CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

SAMPLE	
BORING NUMBER:	S-10
SAMPLE DEPTH:	20' - 21.5'

UNIFIED SOIL CLASSIFICATION: SP

DESCRIPTION: POORLY GRADED SAND

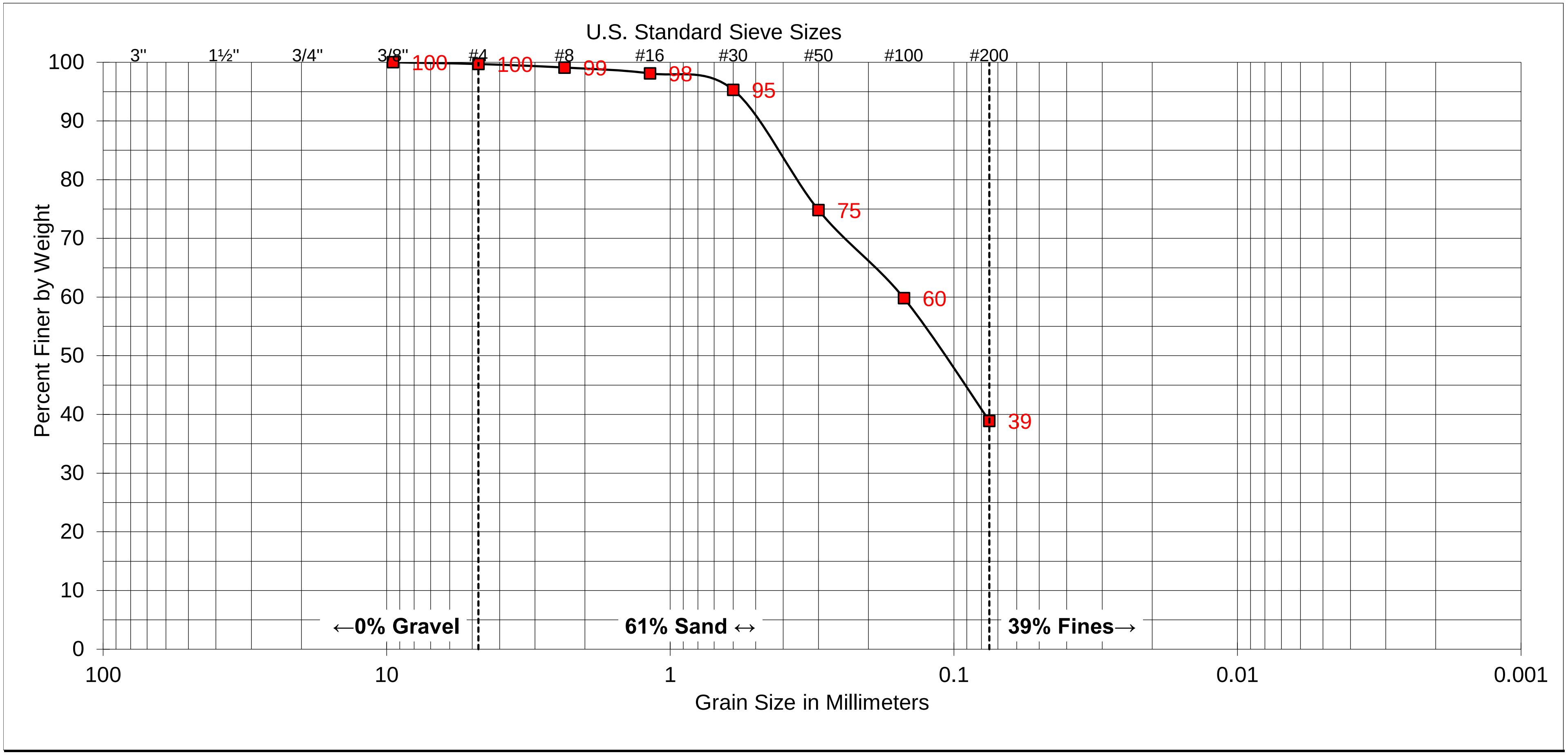
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.22



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND CLAY
GRAVEL		SAND			

SAMPLE	
BORING NUMBER:	S-10
SAMPLE DEPTH:	70' - 71.3'

UNIFIED SOIL CLASSIFICATION: SM

DESCRIPTION: SILTY SAND

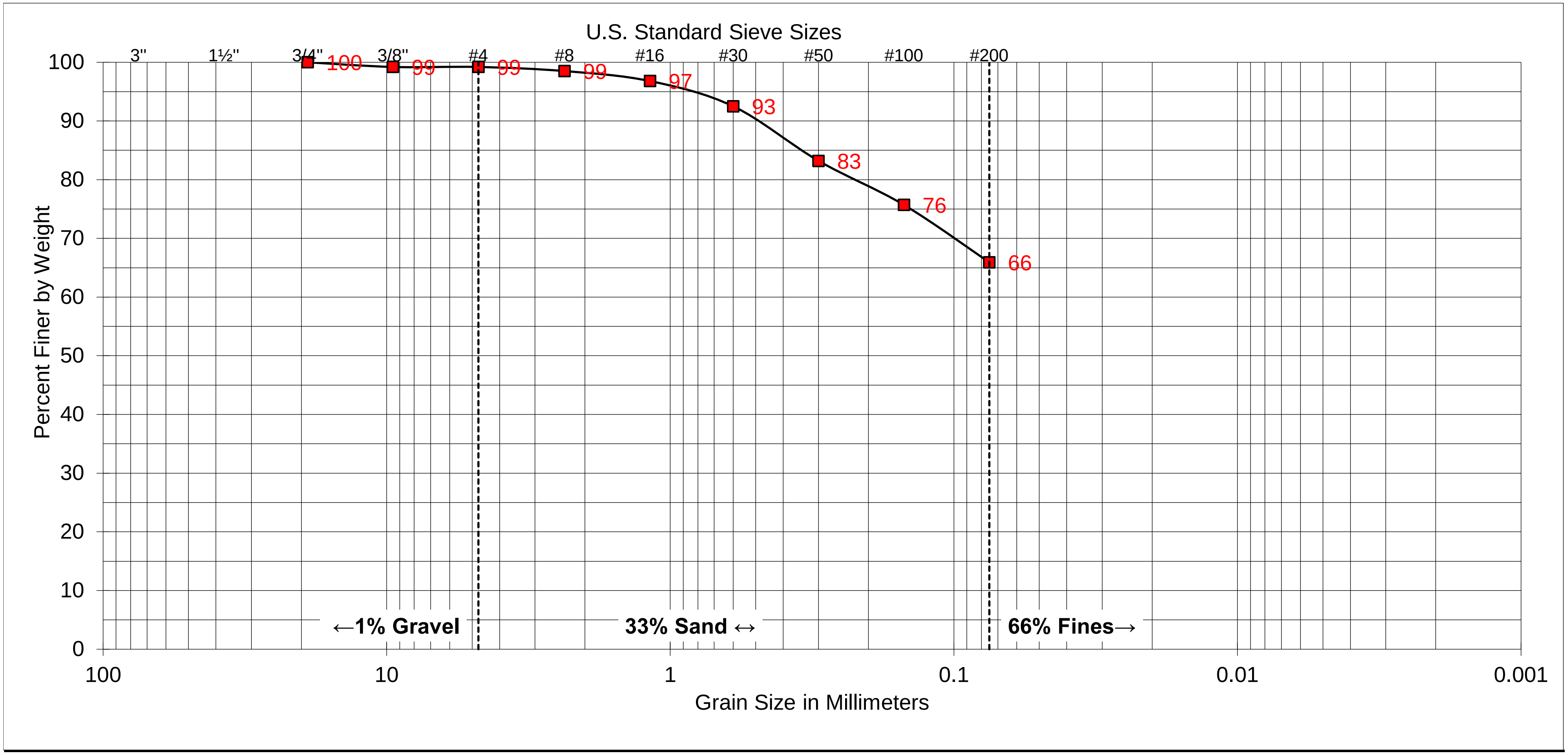
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.23



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND
GRAVEL		SAND			CLAY

SAMPLE	
BORING NUMBER:	S-11
SAMPLE DEPTH:	0.5' - 5'

UNIFIED SOIL CLASSIFICATION: CL

DESCRIPTION: SANDY LEAN CLAY

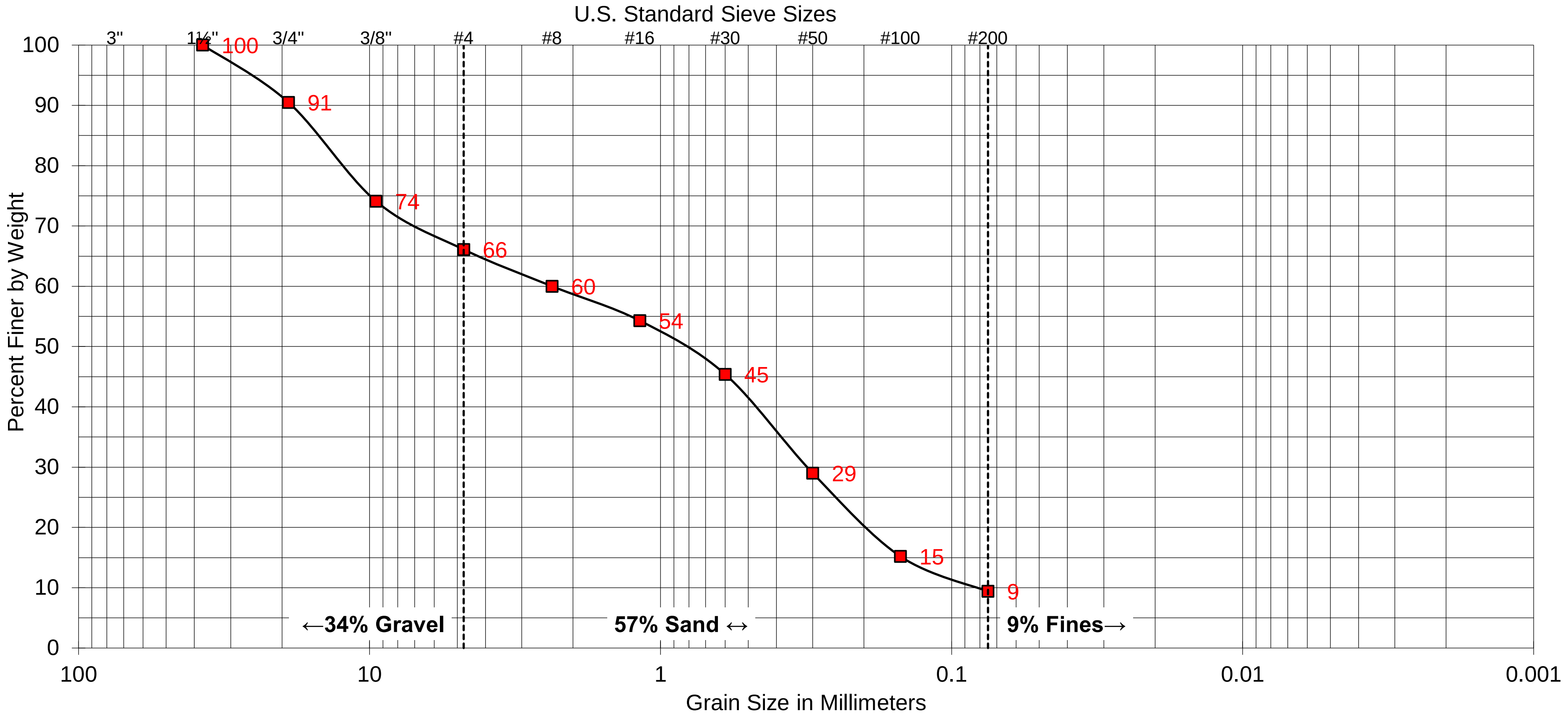
ATTERBERG LIMITS	
LIQUID LIMIT:	38
PLASTIC LIMIT:	13
PLASTICITY INDEX:	25

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.24



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND
GRAVEL		SAND			CLAY

SAMPLE	
BORING NUMBER:	S-11
SAMPLE DEPTH:	15' - 16.5'

UNIFIED SOIL CLASSIFICATION: SP-SM

DESCRIPTION: POORLY GRADED SAND WITH SILT AND GRAVEL

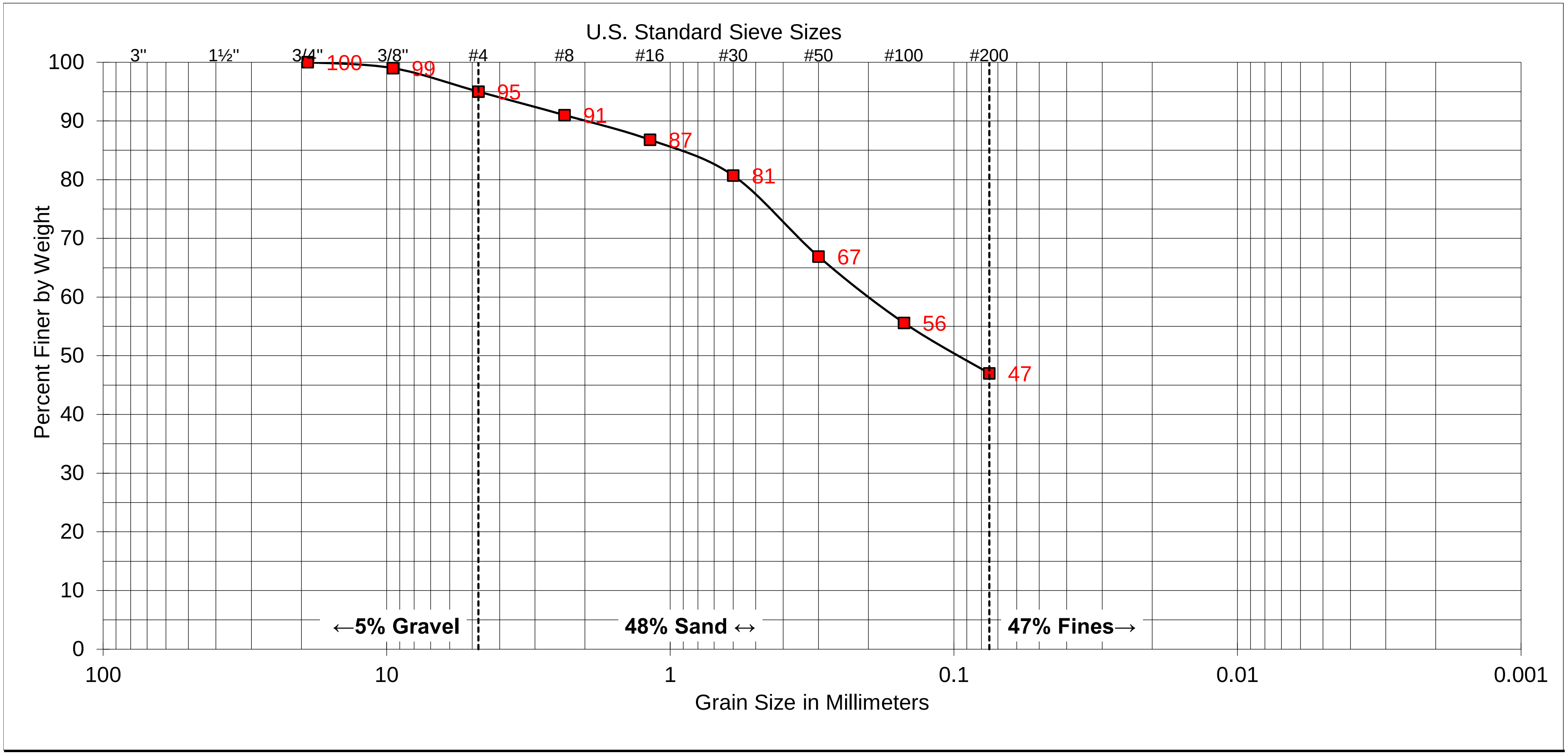
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.25



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND
GRAVEL		SAND			CLAY

SAMPLE	
BORING NUMBER:	S-12
SAMPLE DEPTH:	0.5' - 5'

UNIFIED SOIL CLASSIFICATION: SC

DESCRIPTION: CLAYEY SAND

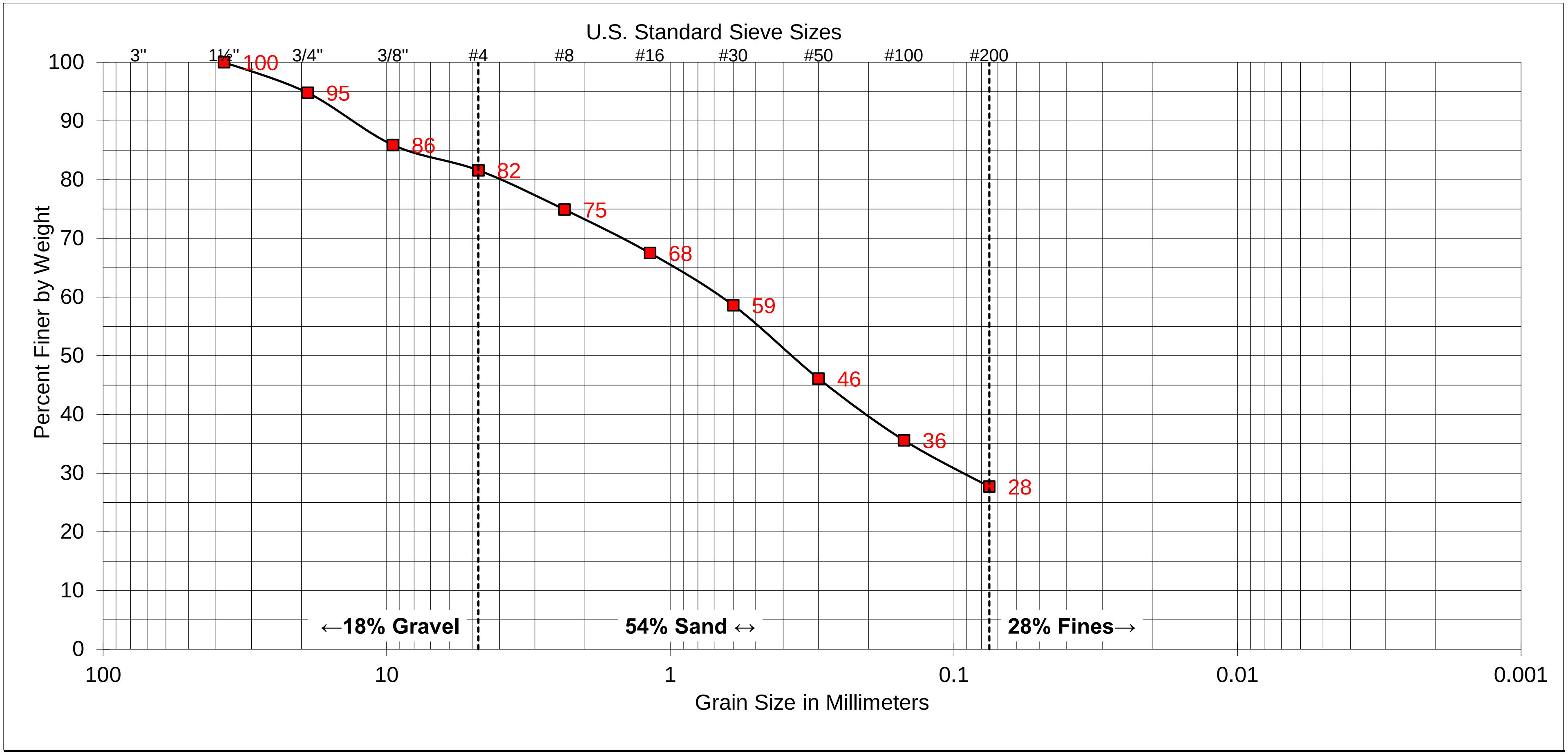
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.26



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND CLAY
GRAVEL		SAND			

SAMPLE	
BORING NUMBER:	S-12
SAMPLE DEPTH:	15' - 16.5'

UNIFIED SOIL CLASSIFICATION: SC

DESCRIPTION: CLAYEY SAND WITH GRAVEL

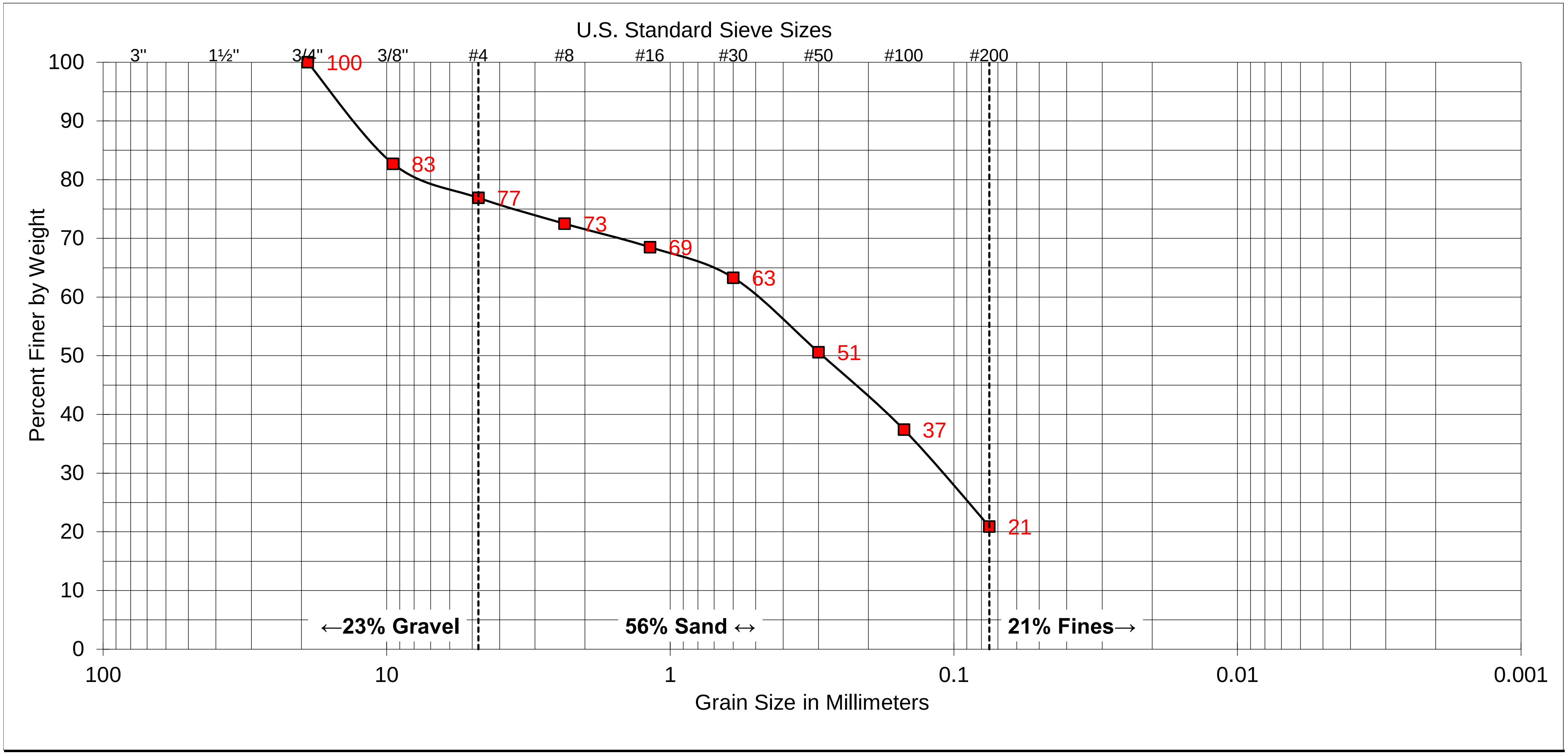
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.27



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND
GRAVEL		SAND			CLAY

SAMPLE	
BORING NUMBER:	S-13
SAMPLE DEPTH:	2.5' - 4'

UNIFIED SOIL CLASSIFICATION: SC

DESCRIPTION: CLAYEY SAND WITH GRAVEL

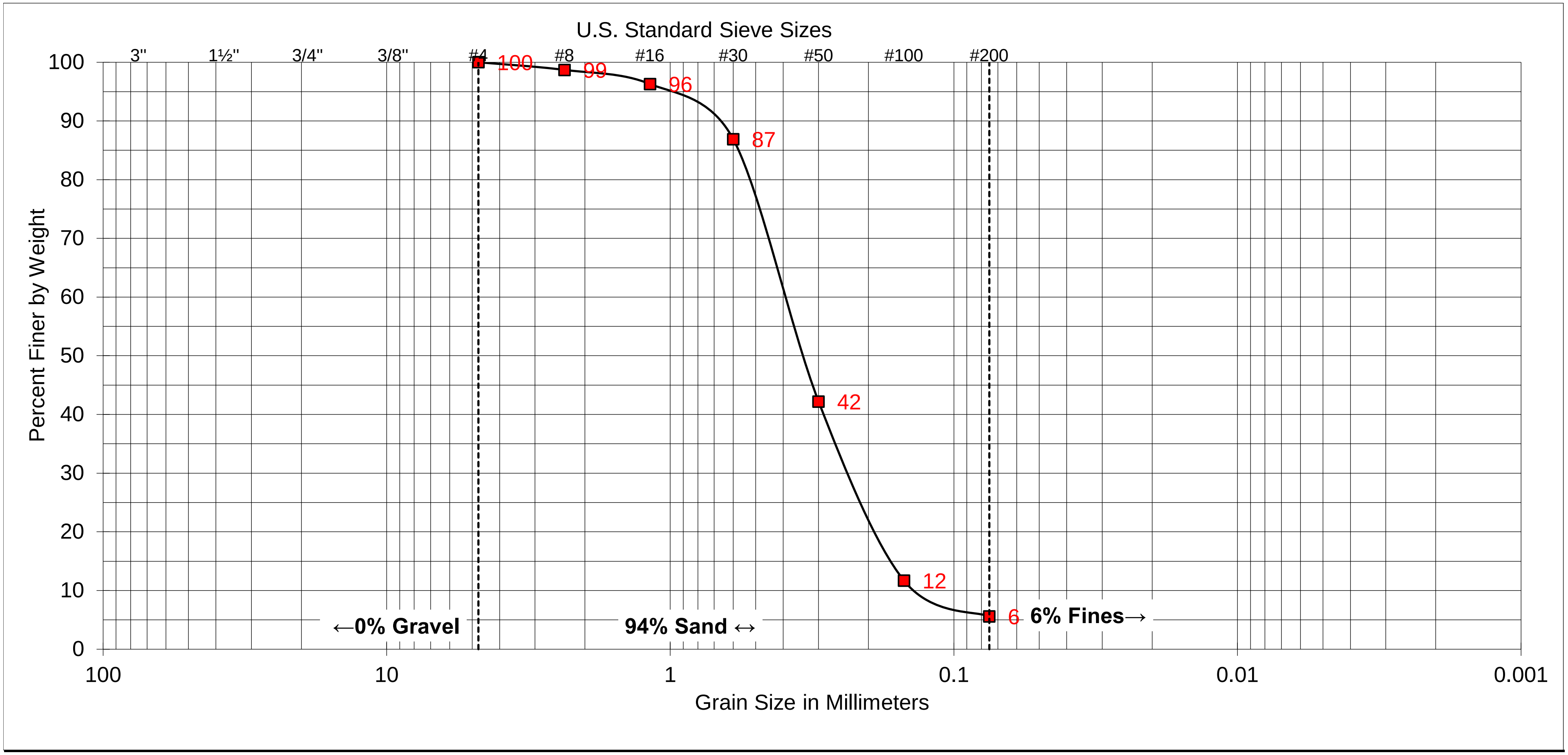
ATTERBERG LIMITS	
LIQUID LIMIT:	0
PLASTIC LIMIT:	0
PLASTICITY INDEX:	0

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.28



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND
GRAVEL		SAND			CLAY

SAMPLE	
BORING NUMBER:	S-13
SAMPLE DEPTH:	35' - 36.5'

UNIFIED SOIL CLASSIFICATION: SP-SM

DESCRIPTION: POORLY GRADED SAND WITH SILT

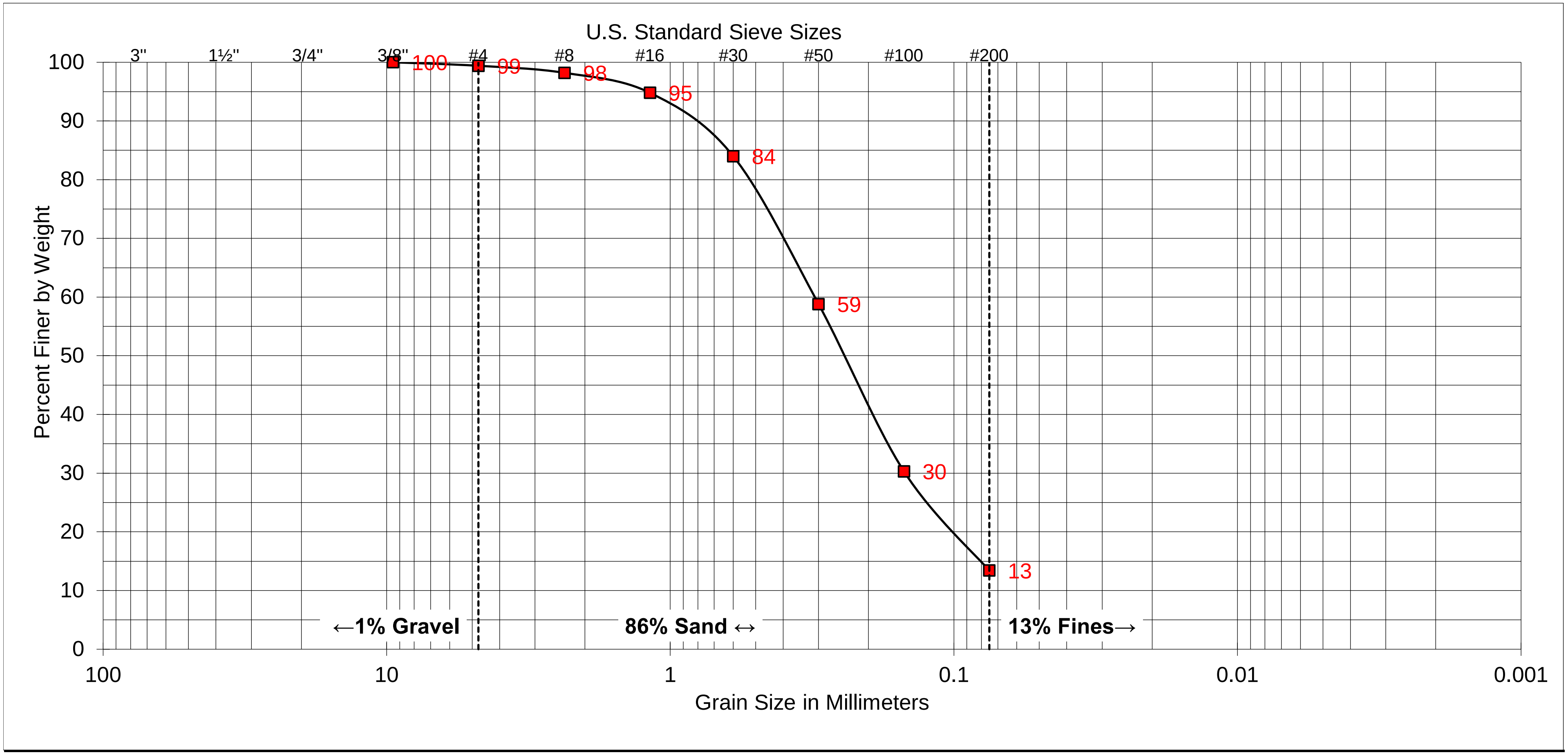
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.29



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND
GRAVEL		SAND			CLAY

SAMPLE	
BORING NUMBER:	B-14
SAMPLE DEPTH:	2.5' - 4'

UNIFIED SOIL CLASSIFICATION: SC

DESCRIPTION: CLAYEY SAND

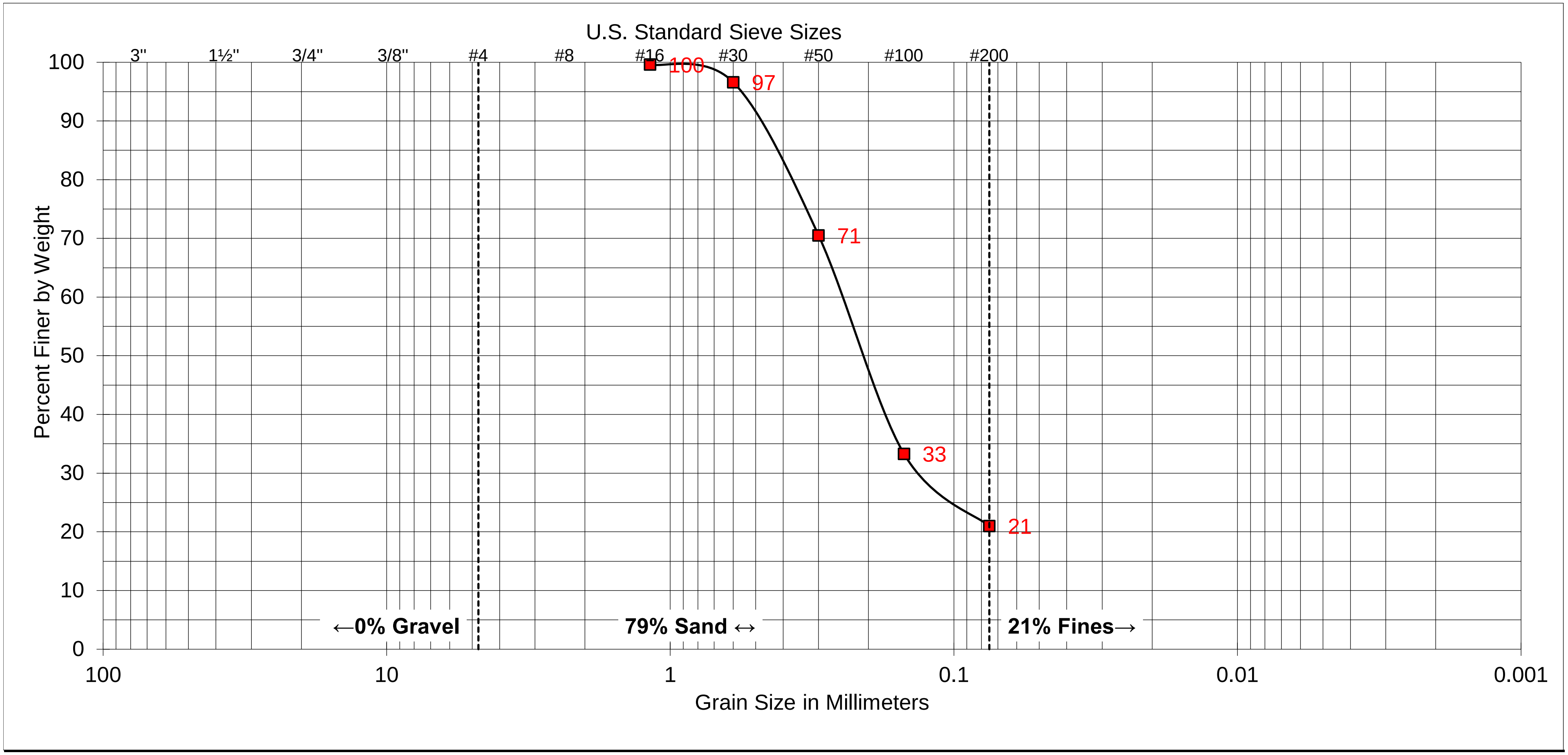
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.30



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND
GRAVEL		SAND			CLAY

SAMPLE	
BORING NUMBER:	B-14
SAMPLE DEPTH:	25' - 26.5'

UNIFIED SOIL CLASSIFICATION: SM

DESCRIPTION: SILTY SAND

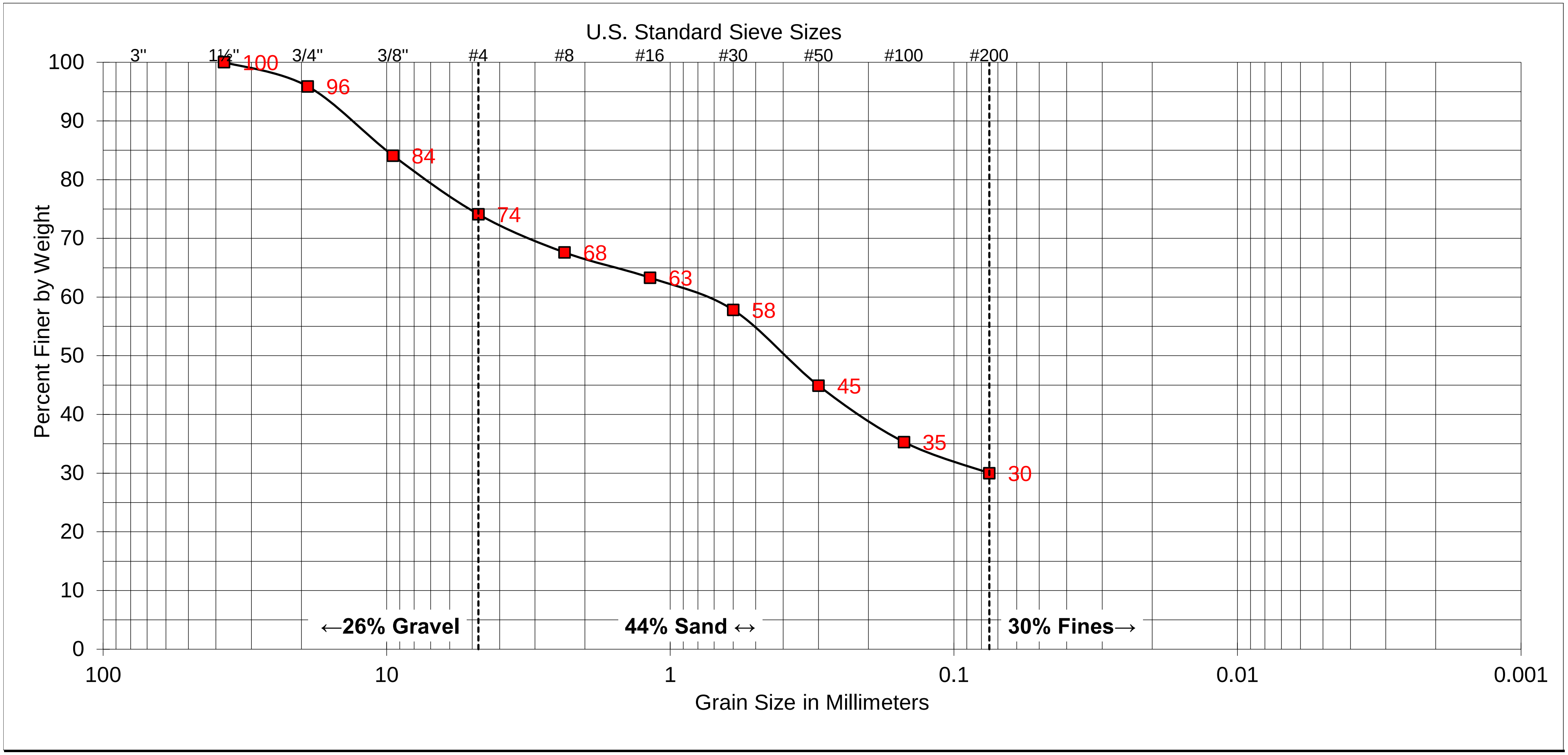
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.31



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND CLAY
GRAVEL		SAND			

SAMPLE	
BORING NUMBER:	B-15
SAMPLE DEPTH:	0.5' - 5'

UNIFIED SOIL CLASSIFICATION: SC

DESCRIPTION: CLAYEY SAND WITH GRAVEL

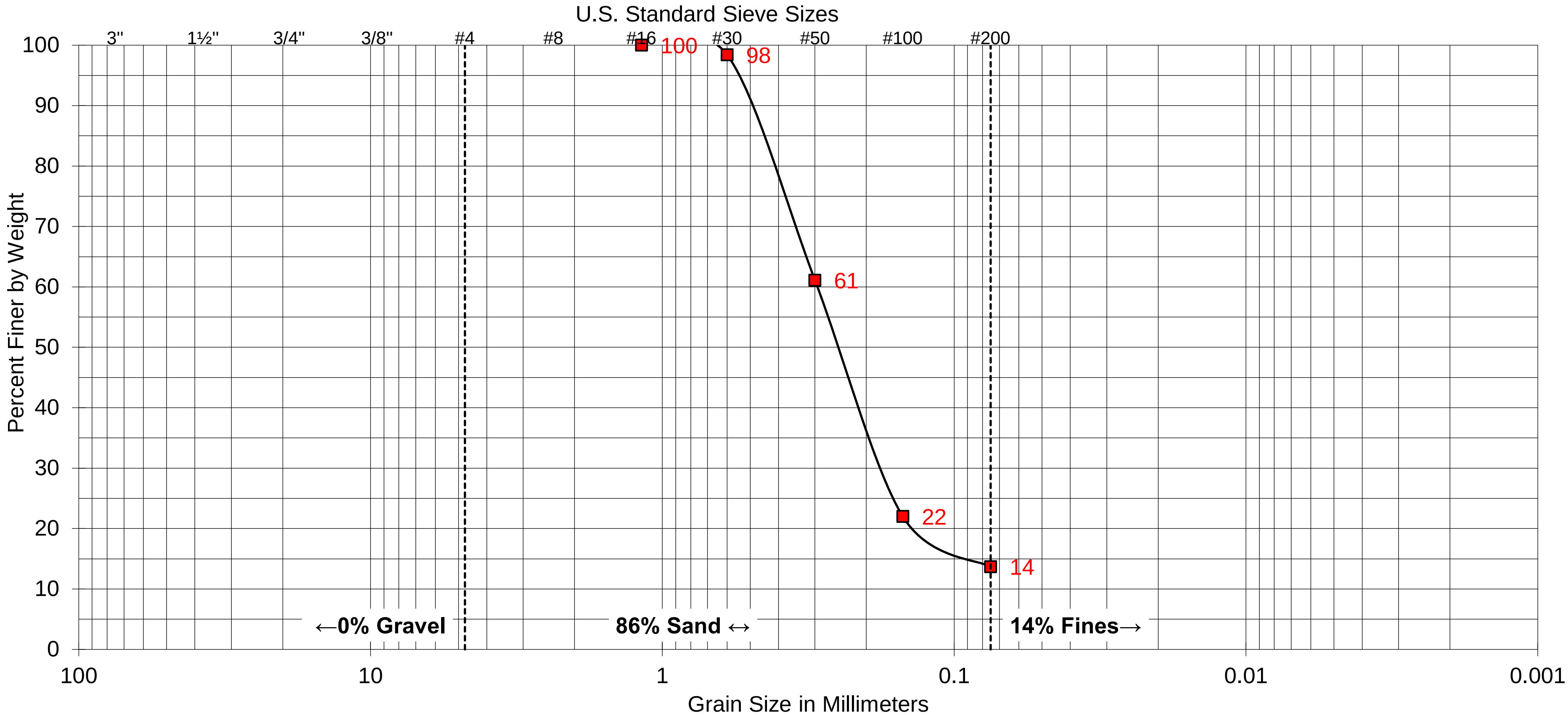
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.32



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND
GRAVEL		SAND			CLAY

SAMPLE	
BORING NUMBER:	B-15
SAMPLE DEPTH:	35.5' - 36'

UNIFIED SOIL CLASSIFICATION: SM

DESCRIPTION: SILTY SAND

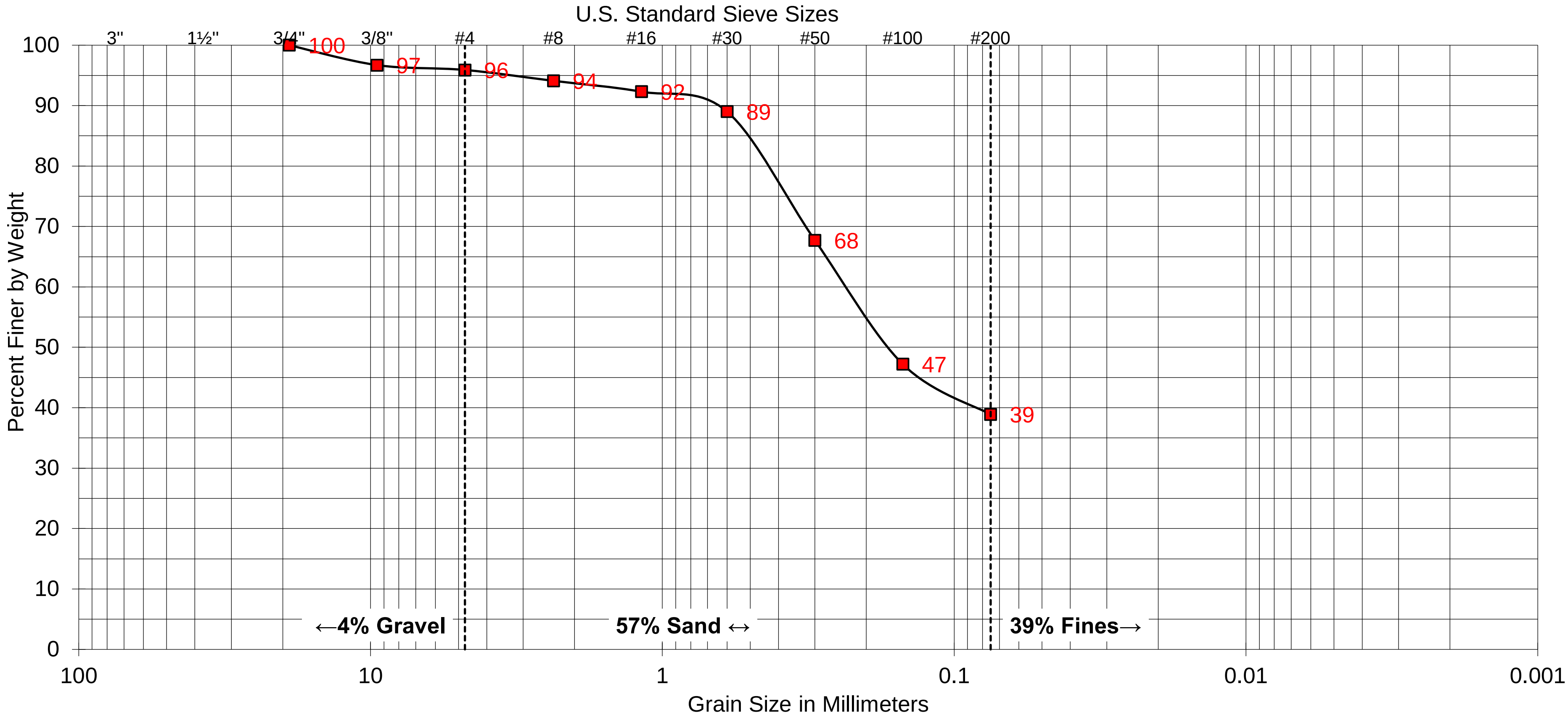
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.33



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND
GRAVEL		SAND			CLAY

SAMPLE	
BORING NUMBER:	B-16
SAMPLE DEPTH:	2.5' - 5'

UNIFIED SOIL CLASSIFICATION: SC

DESCRIPTION: CLAYEY SAND

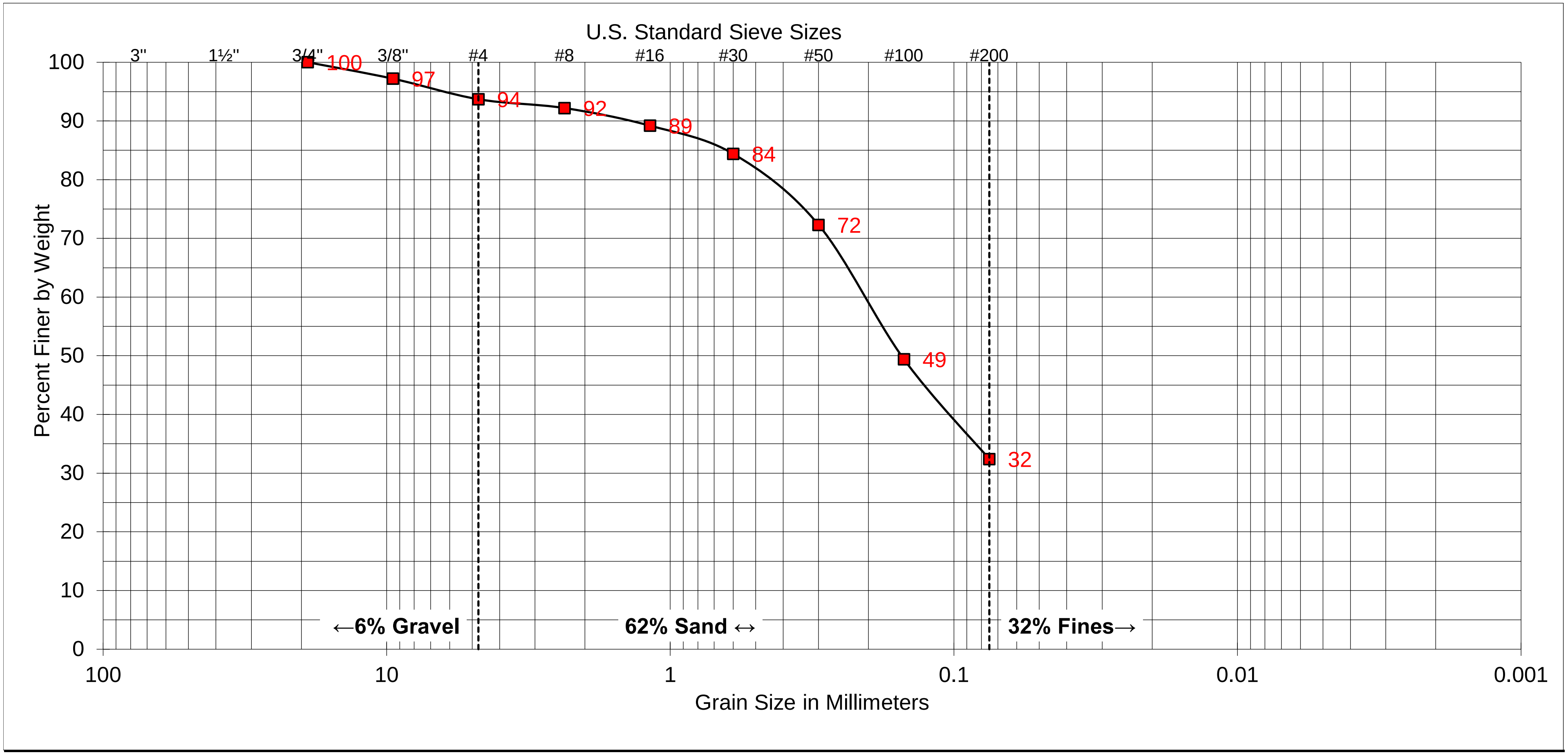
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.34



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND
GRAVEL		SAND			CLAY

SAMPLE	
BORING NUMBER:	B-16
SAMPLE DEPTH:	30' - 31.5'

UNIFIED SOIL CLASSIFICATION: SM

DESCRIPTION: SILTY SAND

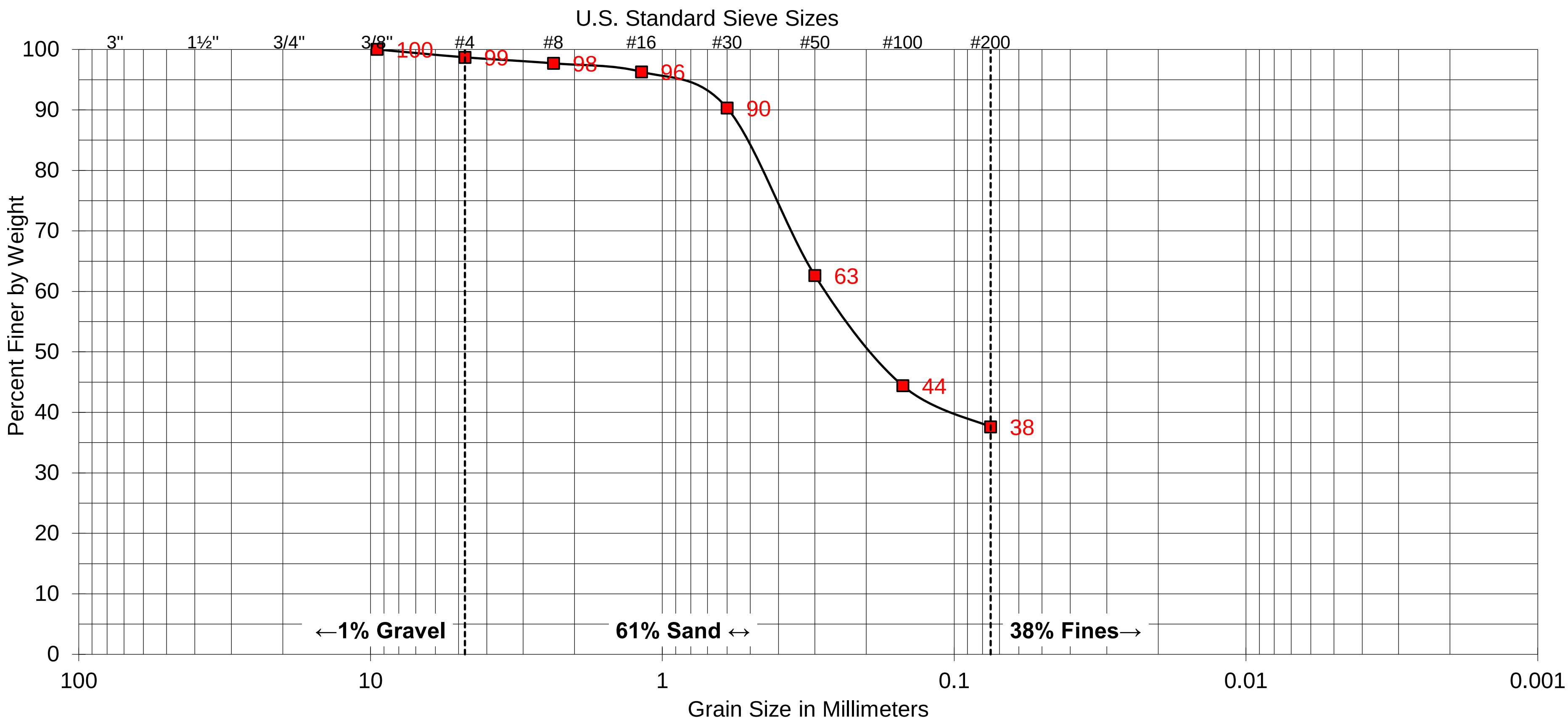
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.35



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND CLAY
GRAVEL		SAND			

SAMPLE	
BORING NUMBER:	B-17
SAMPLE DEPTH:	0.5' - 5'

UNIFIED SOIL CLASSIFICATION: SC

DESCRIPTION: CLAYEY SAND

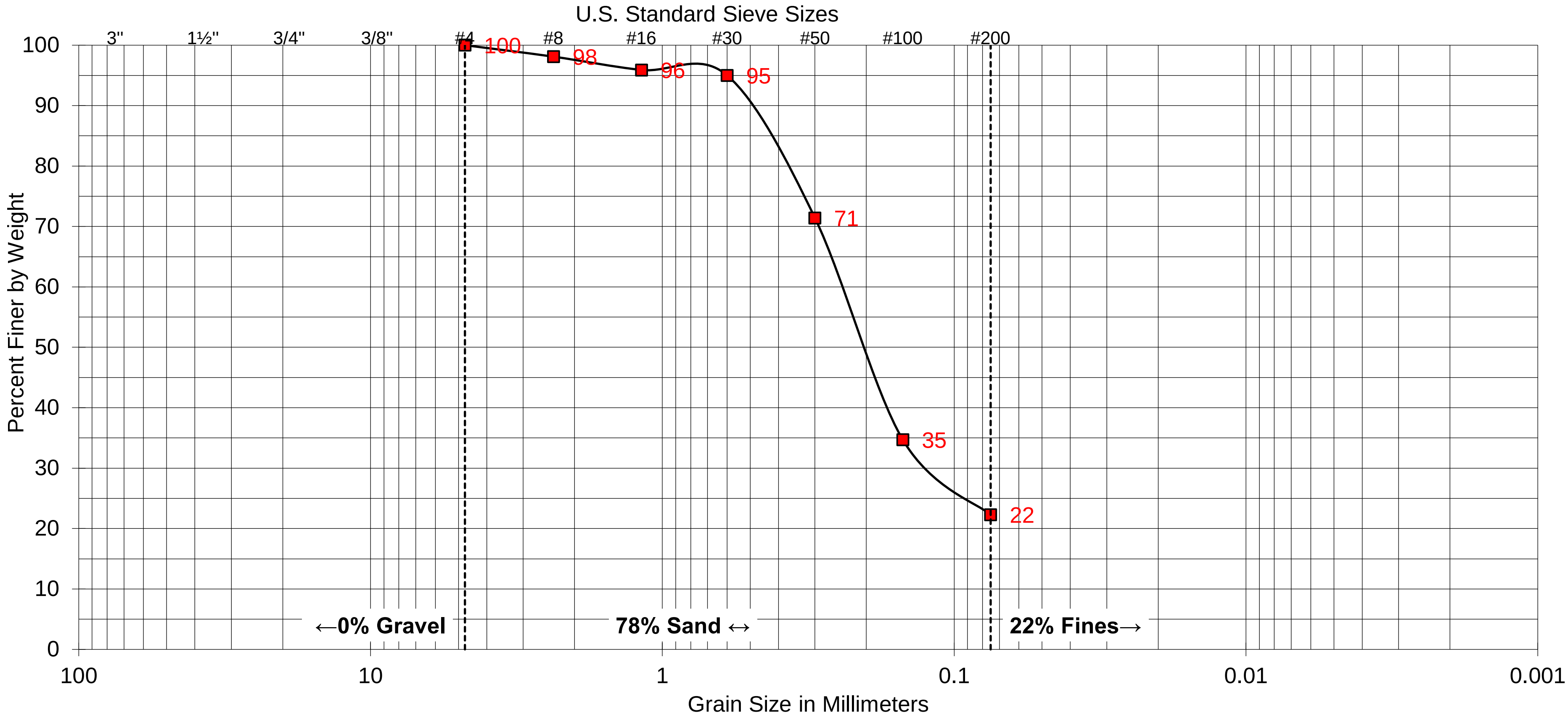
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.36



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND
GRAVEL		SAND			CLAY

SAMPLE	
BORING NUMBER:	B-17
SAMPLE DEPTH:	50' - 51'

UNIFIED SOIL CLASSIFICATION: SM

DESCRIPTION: SILTY SAND

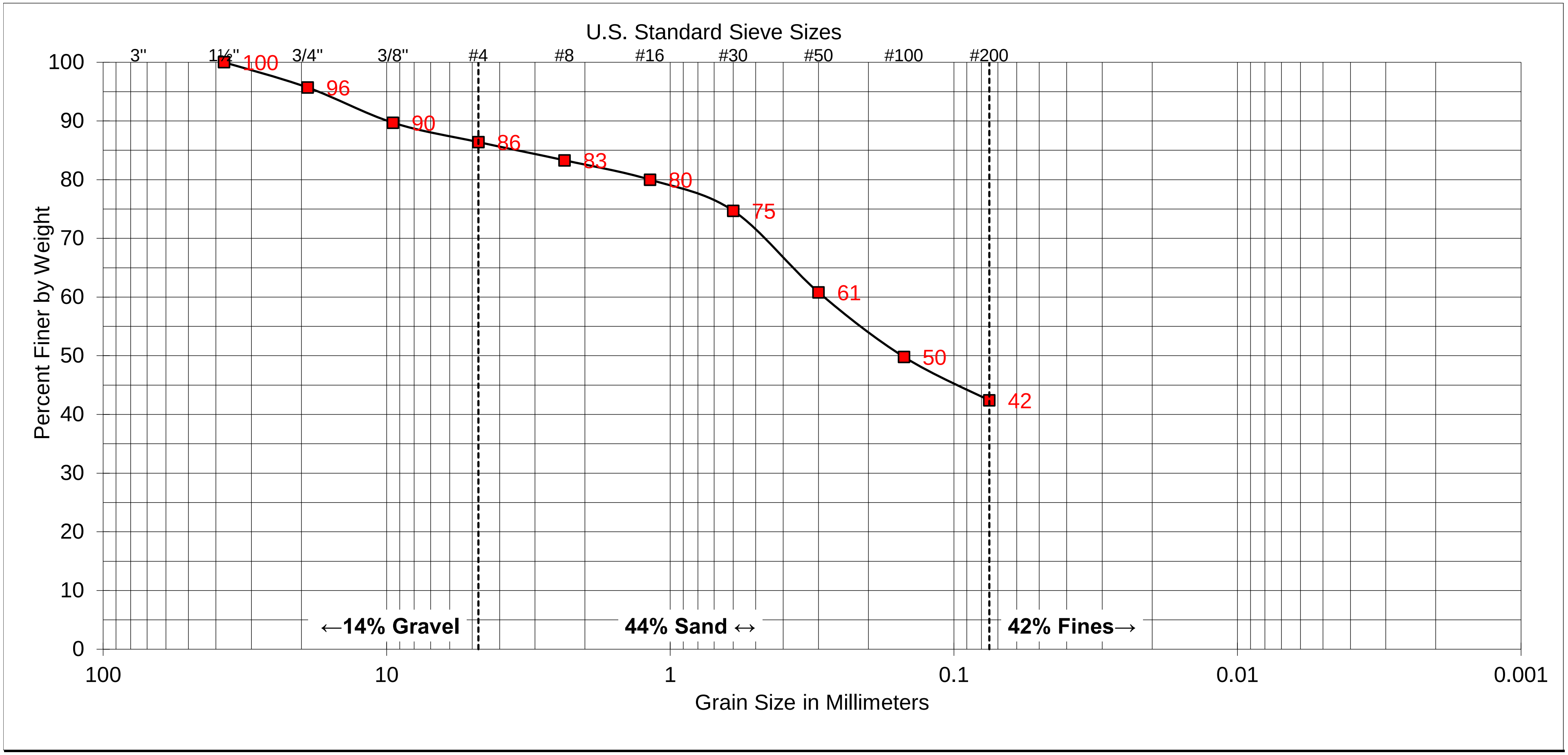
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.37



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND CLAY
GRAVEL		SAND			

SAMPLE	
BORING NUMBER:	B-18
SAMPLE DEPTH:	0.5' - 5'

UNIFIED SOIL CLASSIFICATION: SC

DESCRIPTION: CLAYEY SAND

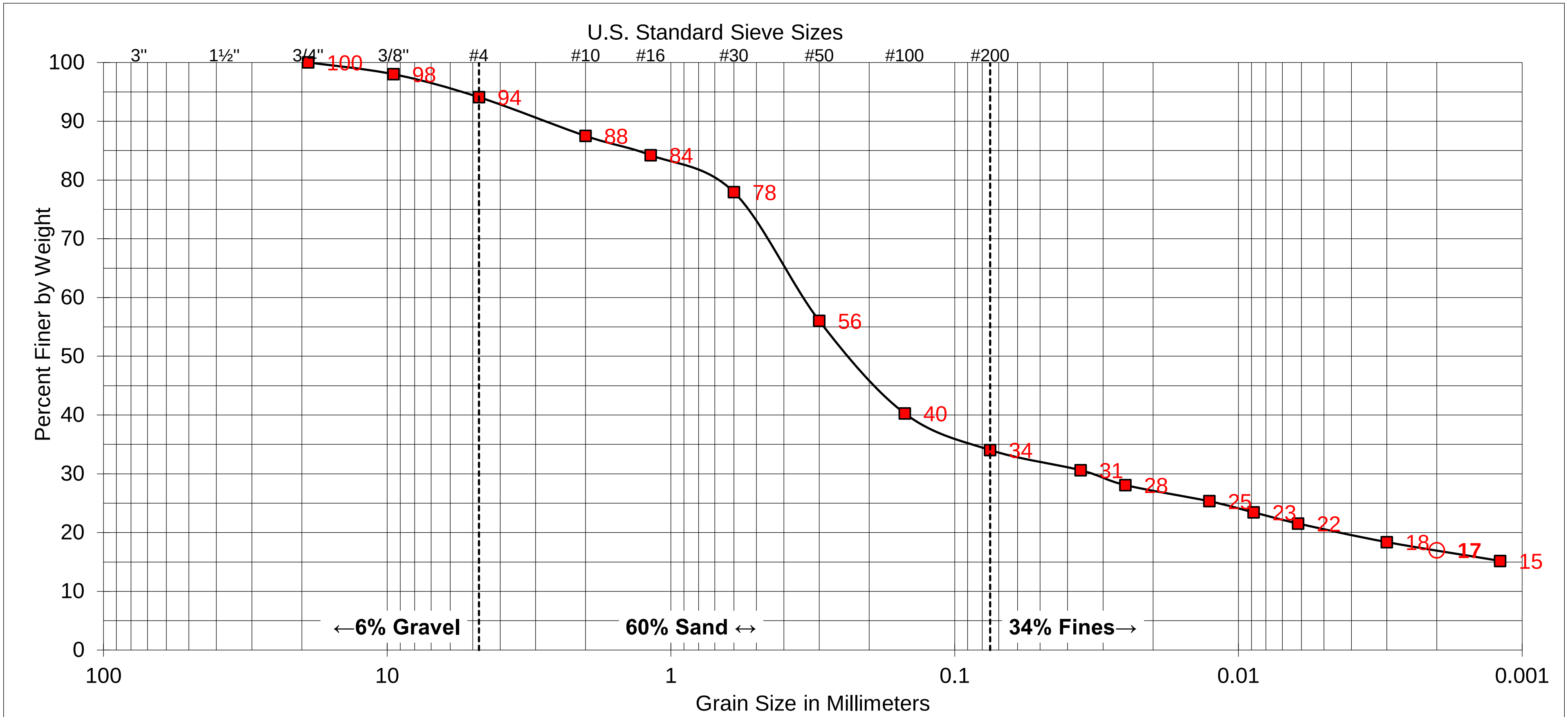
ATTERBERG LIMITS	
LIQUID LIMIT:	38
PLASTIC LIMIT:	15
PLASTICITY INDEX:	23

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.38



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND
GRAVEL		SAND			CLAY

SAMPLE	
SAMPLE NUMBER:	B-19
SAMPLE DEPTH:	0.5' - 4.4'

UNIFIED SOIL CLASSIFICATION: SC

DESCRIPTION: CLAYEY SAND

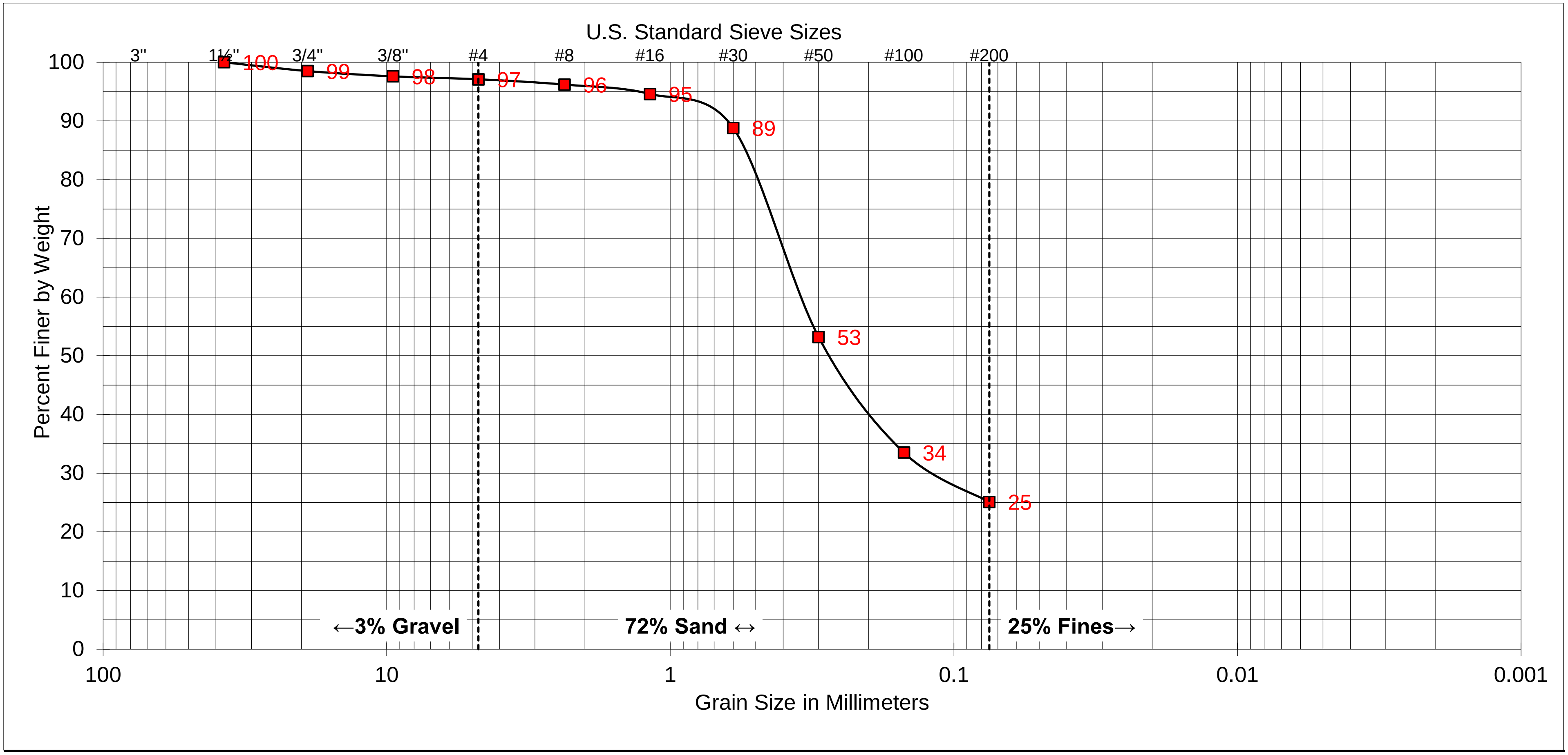
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.39



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND
GRAVEL		SAND			CLAY

SAMPLE	
BORING NUMBER:	B-20
SAMPLE DEPTH:	0.5' - 2.5'

UNIFIED SOIL CLASSIFICATION: SC

DESCRIPTION: CLAYEY SAND

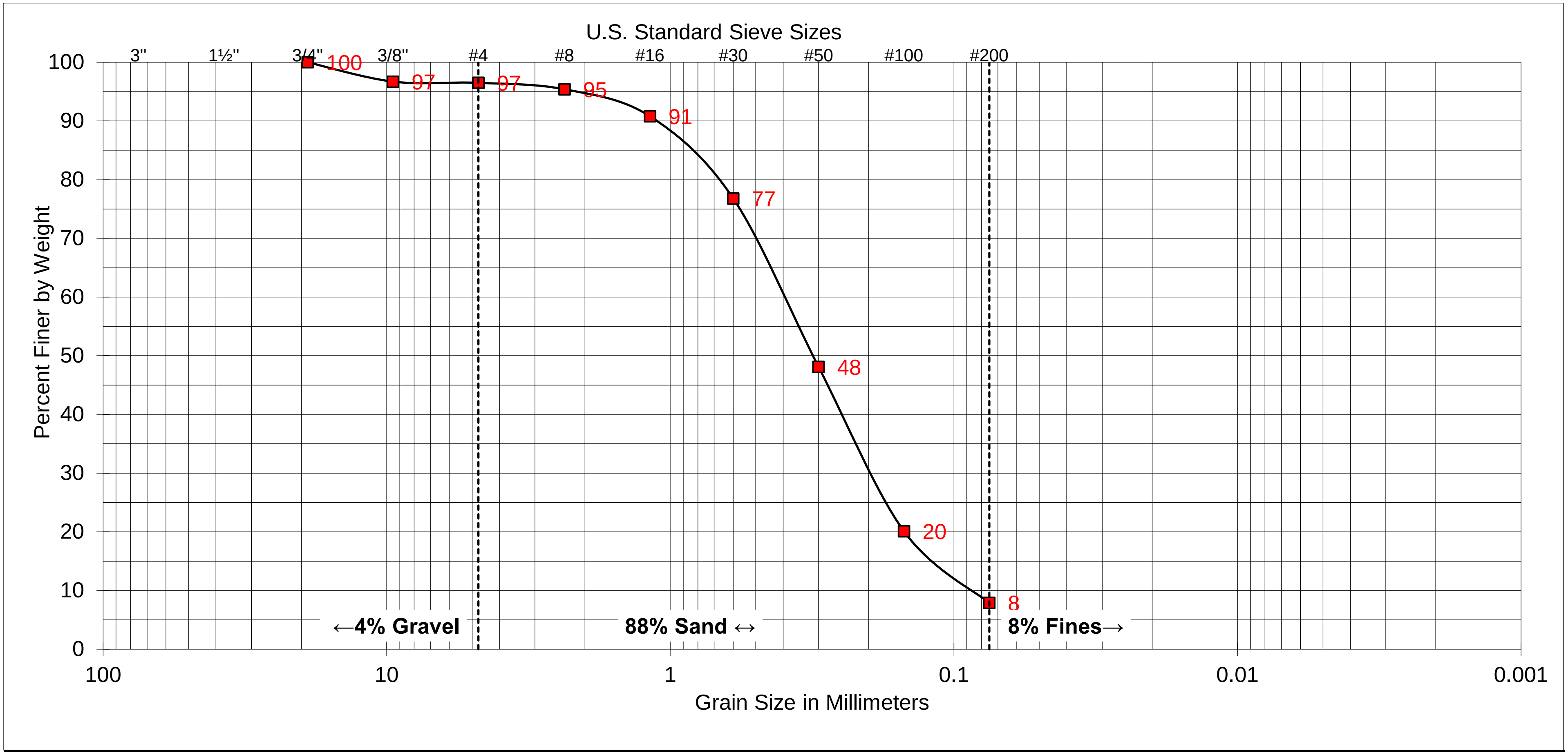
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.40



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND CLAY
GRAVEL		SAND			

SAMPLE	
BORING NUMBER:	B-20
SAMPLE DEPTH:	35' - 36.5'

UNIFIED SOIL CLASSIFICATION: SP

DESCRIPTION: POORLY GRADED SAND WITH SILT

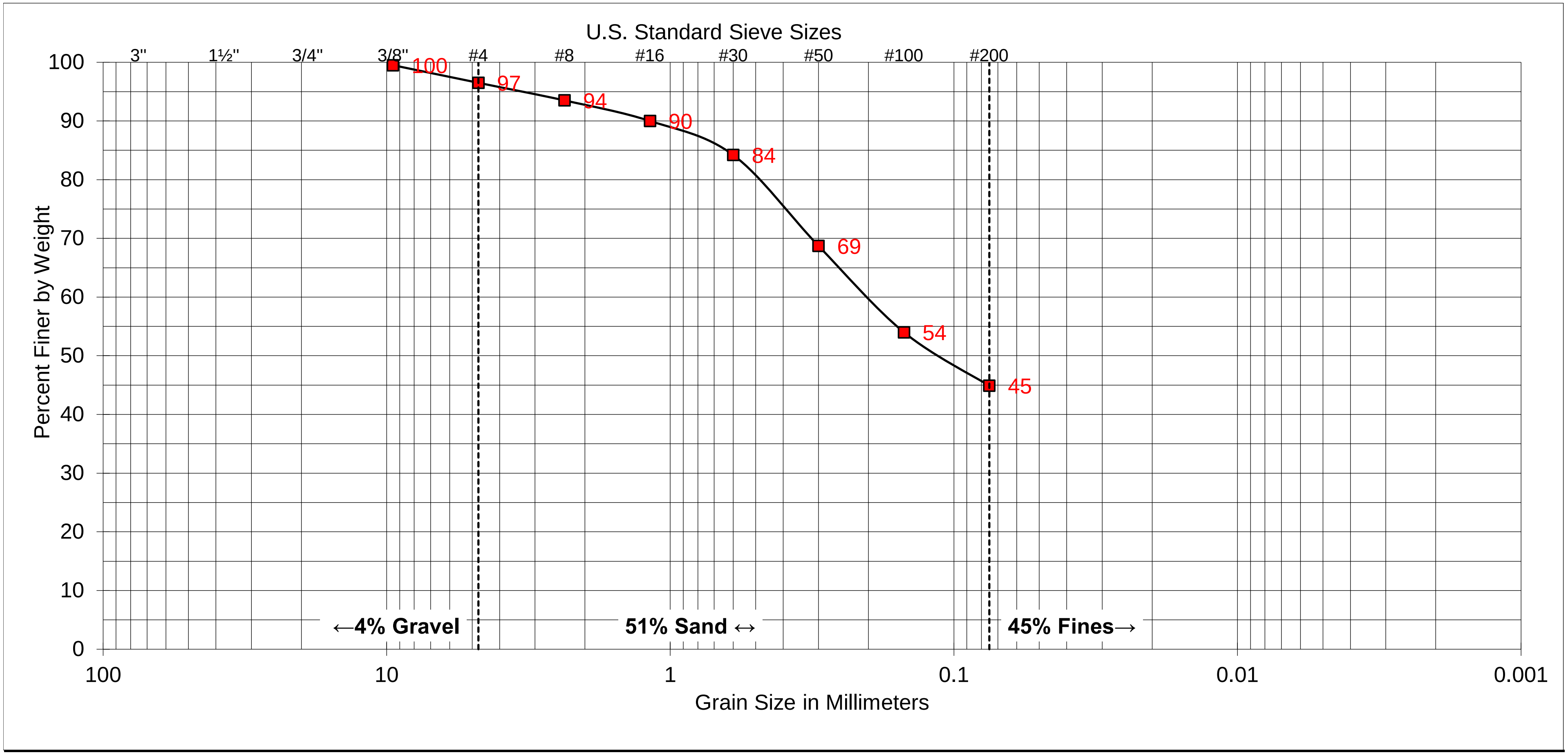
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.41



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND CLAY
GRAVEL		SAND			

SAMPLE	
BORING NUMBER:	B-21
SAMPLE DEPTH:	0.5' - 5'

UNIFIED SOIL CLASSIFICATION: SC

DESCRIPTION: CLAYEY SAND

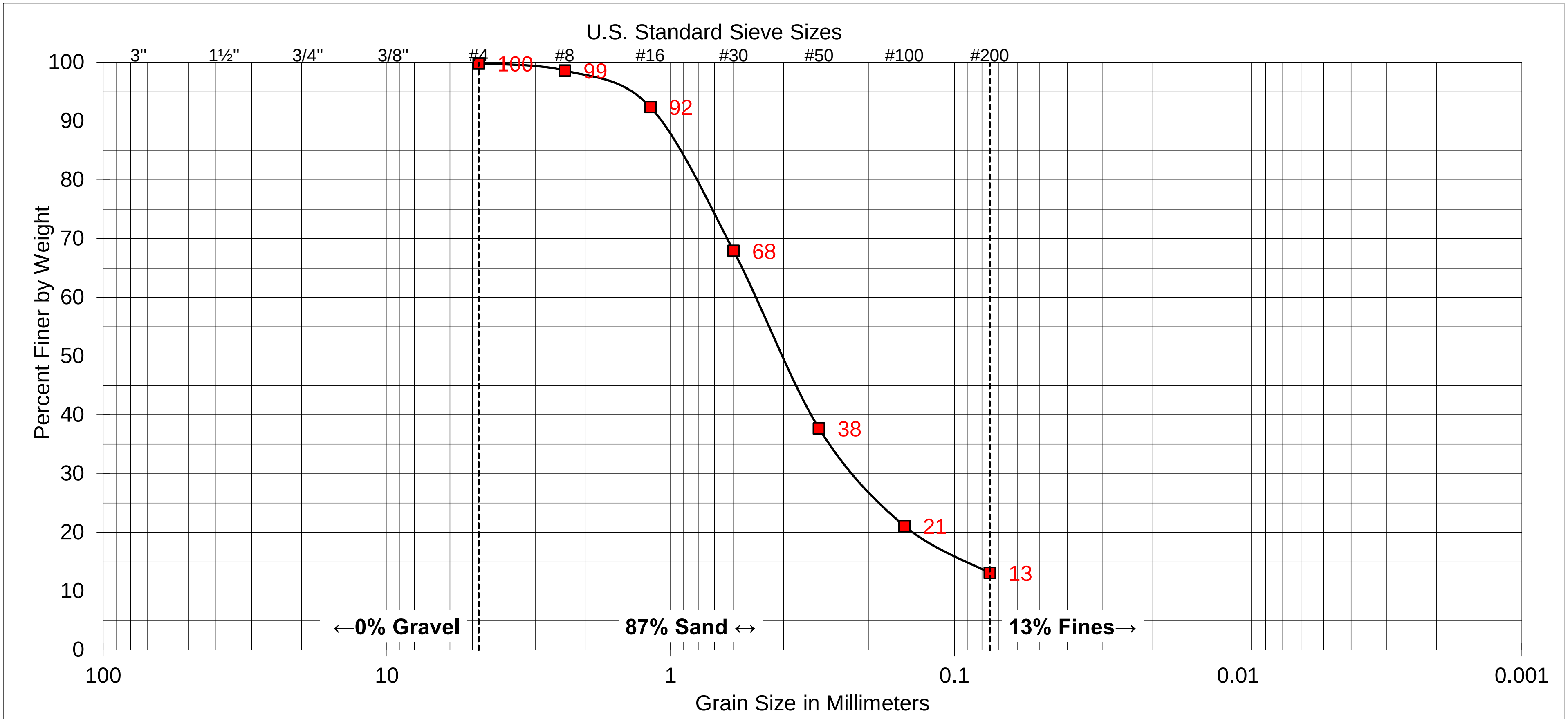
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.42



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND
GRAVEL		SAND			CLAY

SAMPLE	
BORING NUMBER:	B-21
SAMPLE DEPTH:	15' - 16.5'

UNIFIED SOIL CLASSIFICATION: SM

DESCRIPTION: SILTY SAND

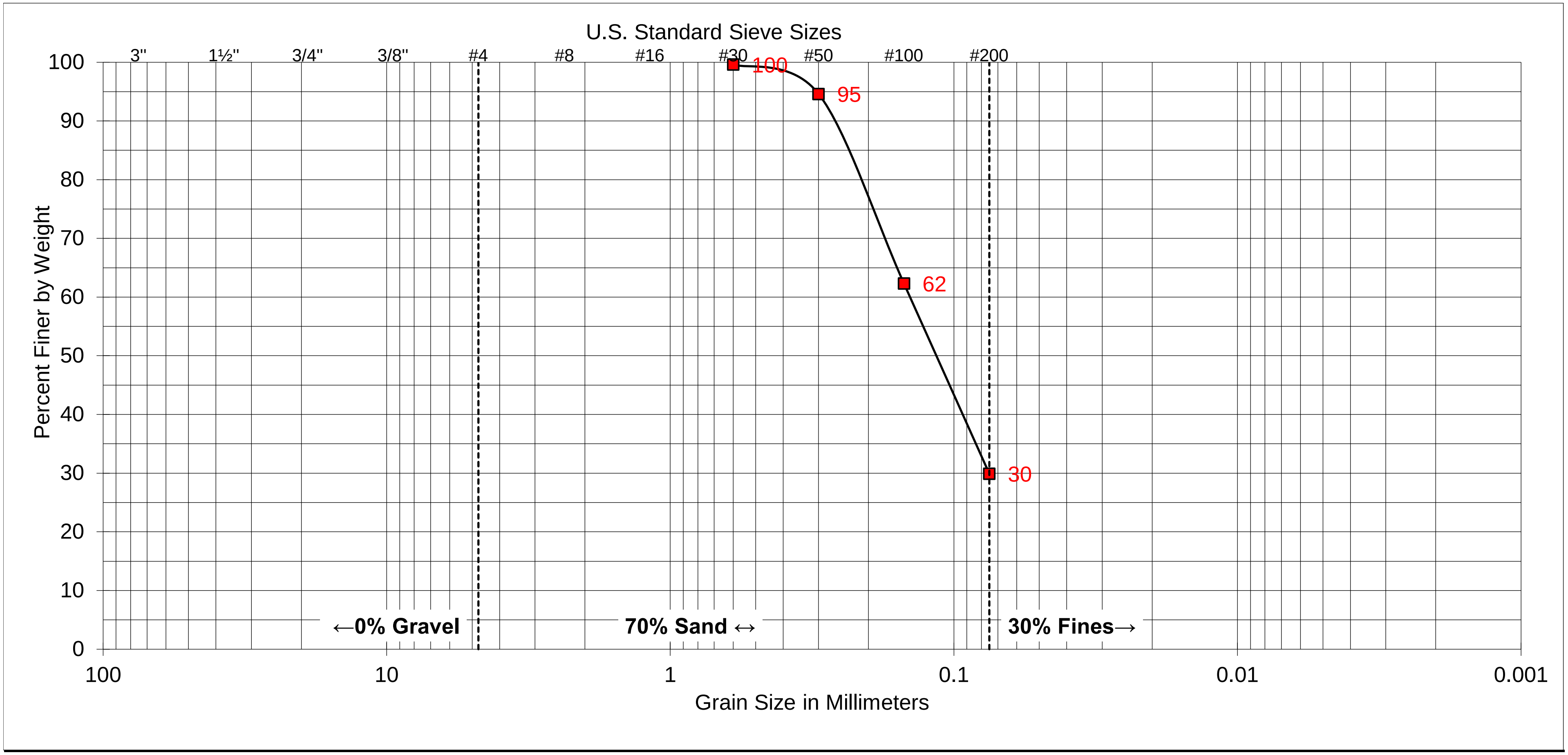
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.43



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND
GRAVEL		SAND			CLAY

SAMPLE	
BORING NUMBER:	B-21
SAMPLE DEPTH:	40' - 41.5'

UNIFIED SOIL CLASSIFICATION: SM

DESCRIPTION: SILTY SAND

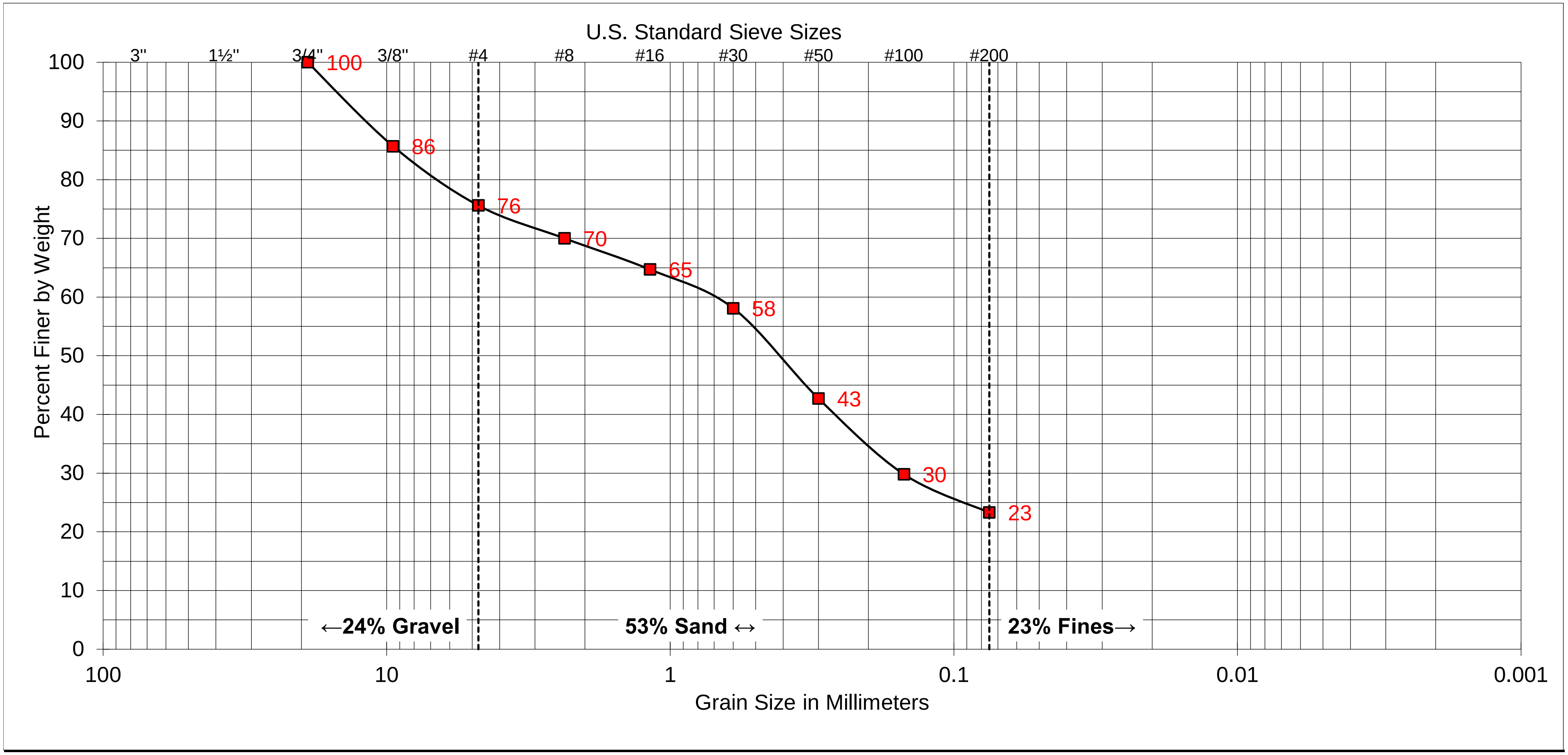
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.44



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND
GRAVEL		SAND			CLAY

SAMPLE	
BORING NUMBER:	B-22
SAMPLE DEPTH:	1' - 3'

UNIFIED SOIL CLASSIFICATION: SC

DESCRIPTION: CLAYEY SAND WITH GRAVEL

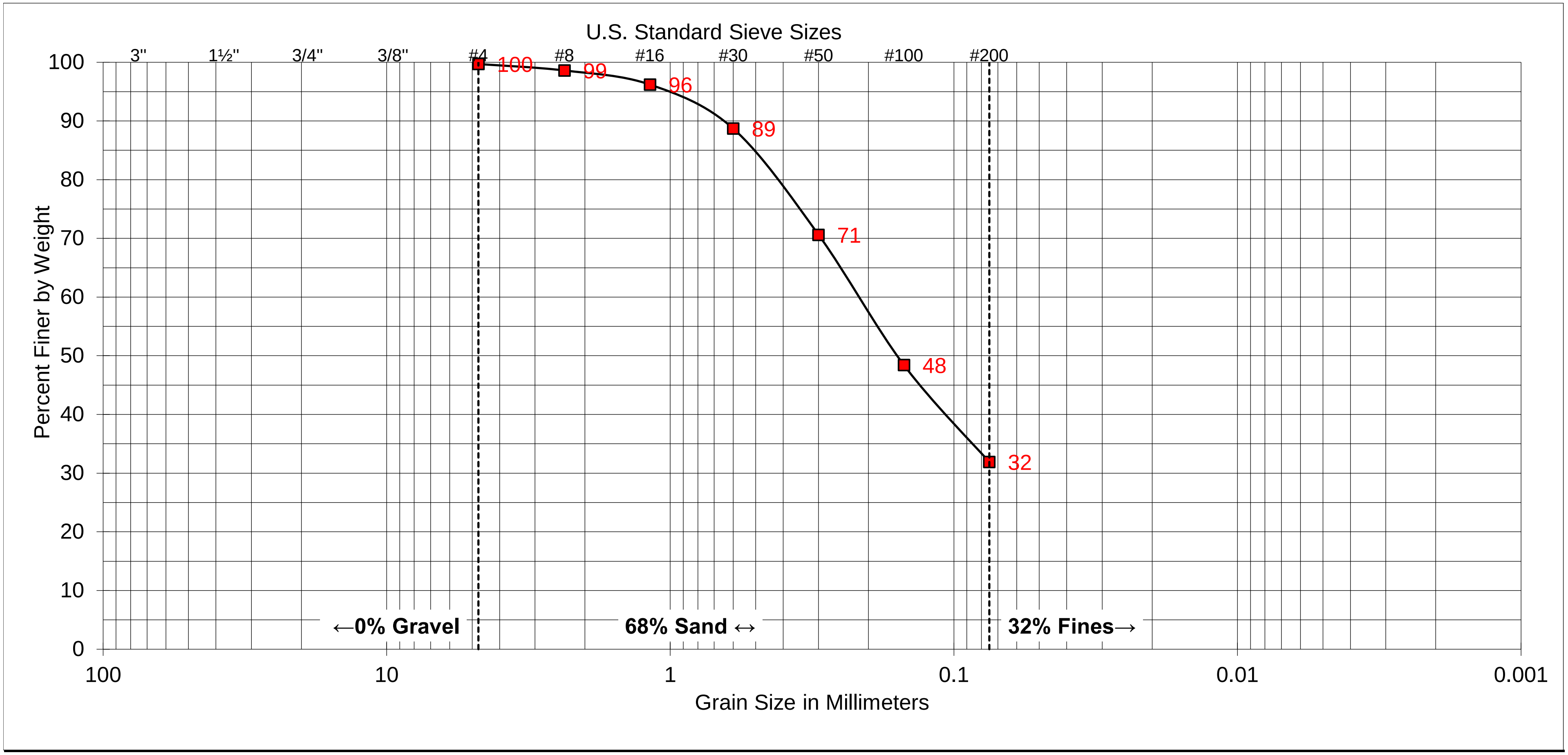
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.45



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND
GRAVEL		SAND			CLAY

SAMPLE	
BORING NUMBER:	B-23
SAMPLE DEPTH:	0.5' - 5'

UNIFIED SOIL CLASSIFICATION: SM

DESCRIPTION: SILTY SAND

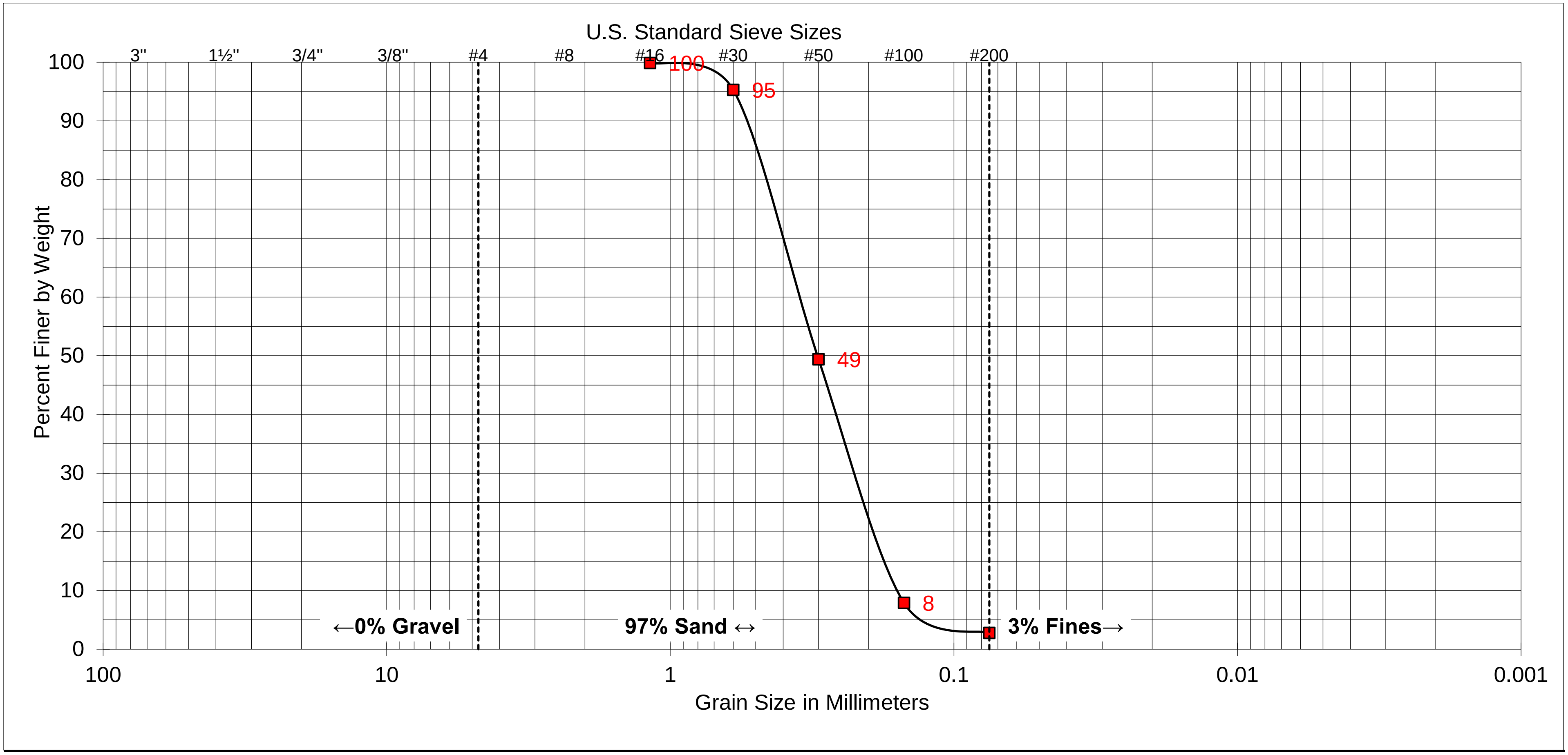
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.46



GRAVEL		SAND			SILT AND CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

SAMPLE	
BORING NUMBER:	B-23
SAMPLE DEPTH:	10.5' - 11'

UNIFIED SOIL CLASSIFICATION: SP

DESCRIPTION: POORLY GRADED SAND

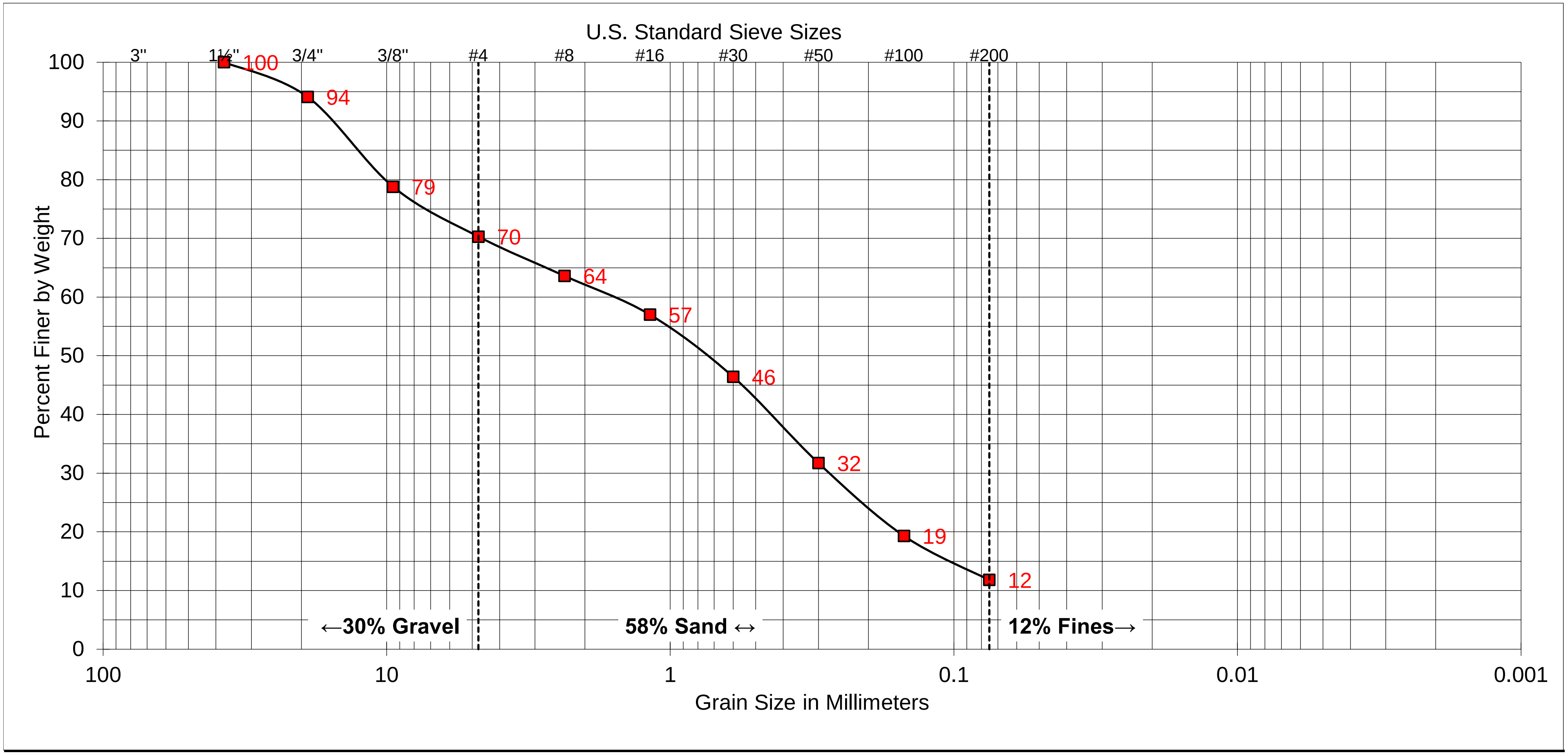
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.47



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND CLAY
GRAVEL		SAND			

SAMPLE	
BORING NUMBER:	B-23
SAMPLE DEPTH:	25' - 25.9'

UNIFIED SOIL CLASSIFICATION: SP-SM

DESCRIPTION: POORLY GRADED SAND WITH SILT AND GRAVEL

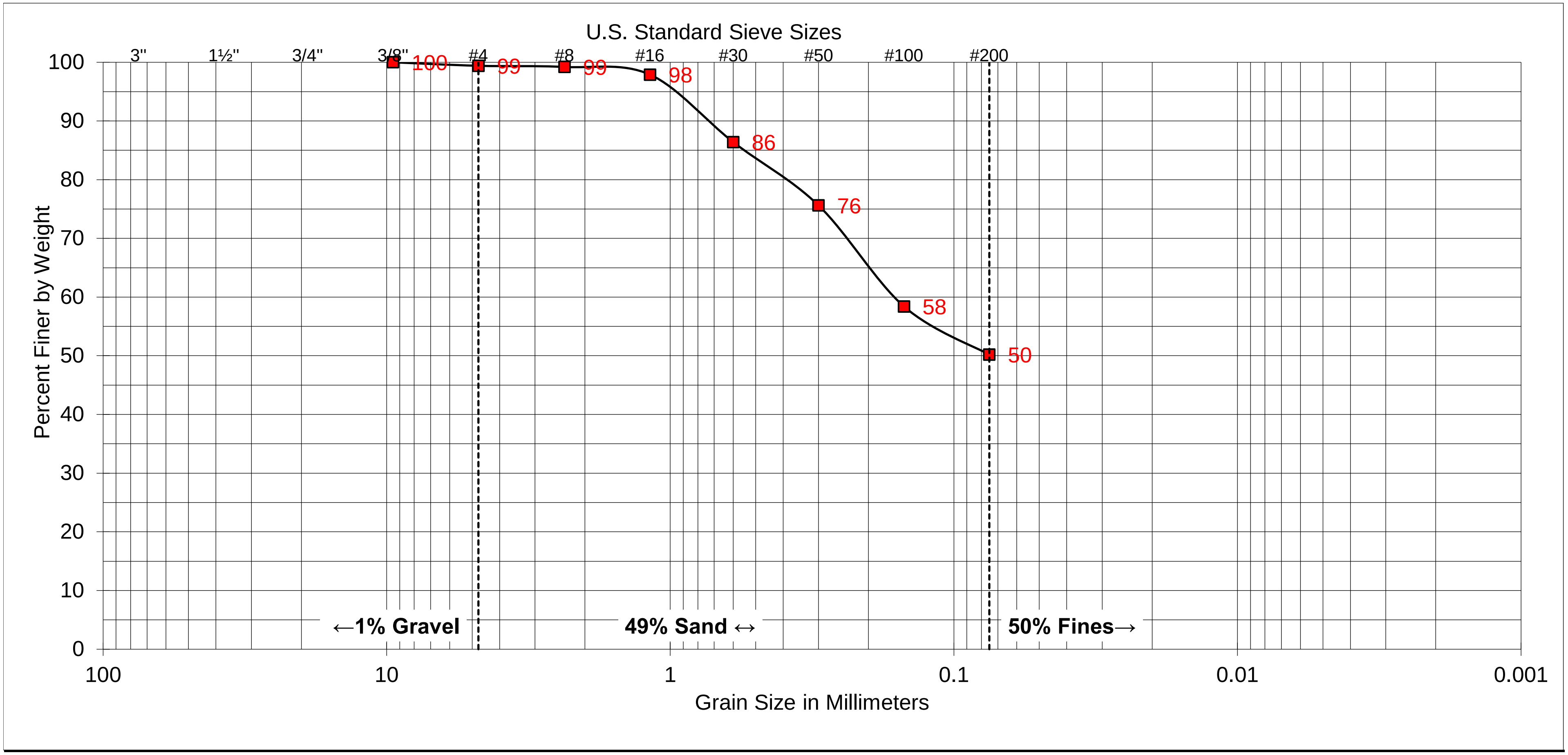
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.48



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND
GRAVEL		SAND			CLAY

SAMPLE	
BORING NUMBER:	B-23
SAMPLE DEPTH:	40 - 41.5'

UNIFIED SOIL CLASSIFICATION: SM / ML

DESCRIPTION: SILTY SAND / SANDY SILT

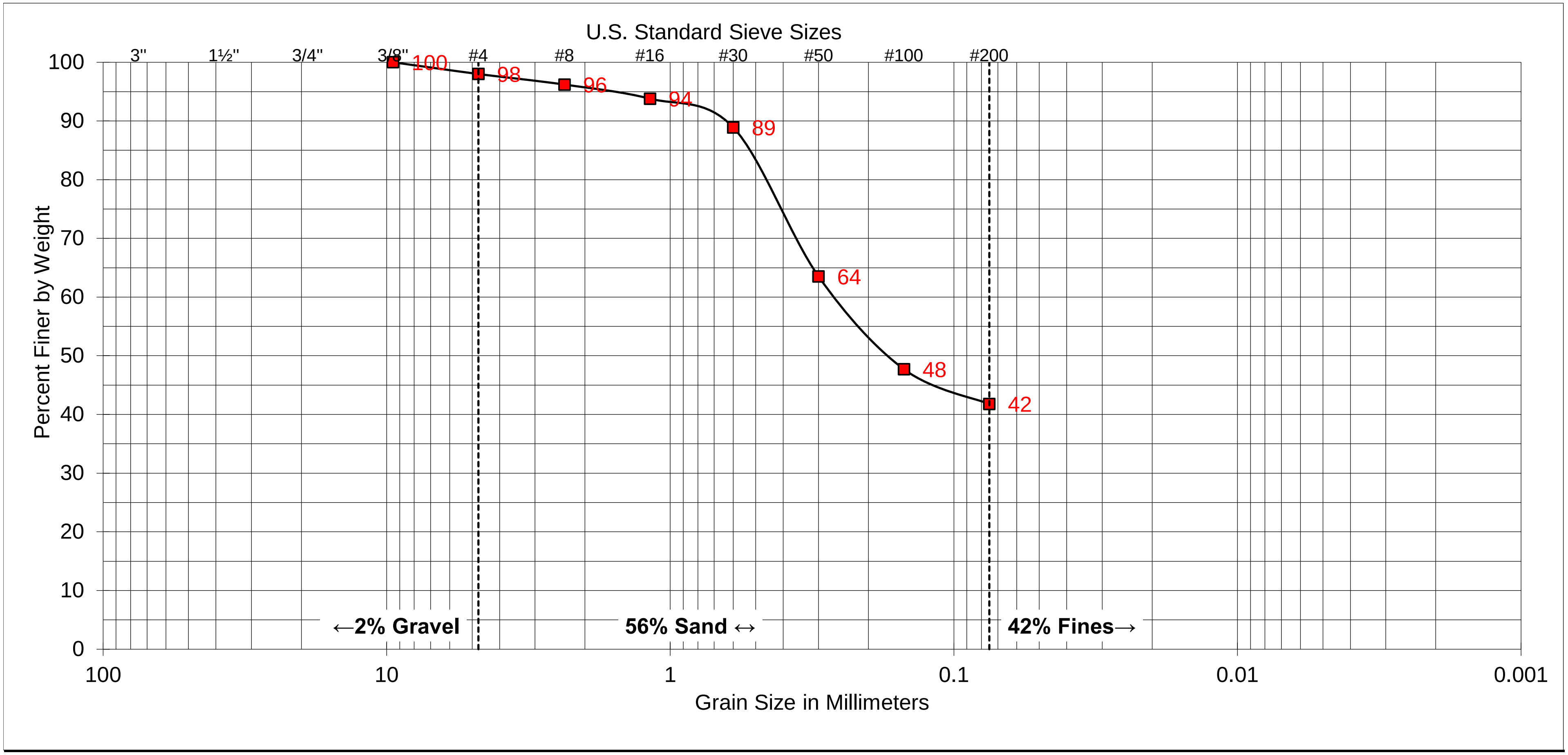
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.49



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND
GRAVEL		SAND			CLAY

SAMPLE	
BORING NUMBER:	B-24
SAMPLE DEPTH:	0.5' - 5'

UNIFIED SOIL CLASSIFICATION: SC

DESCRIPTION: CLAYEY SAND

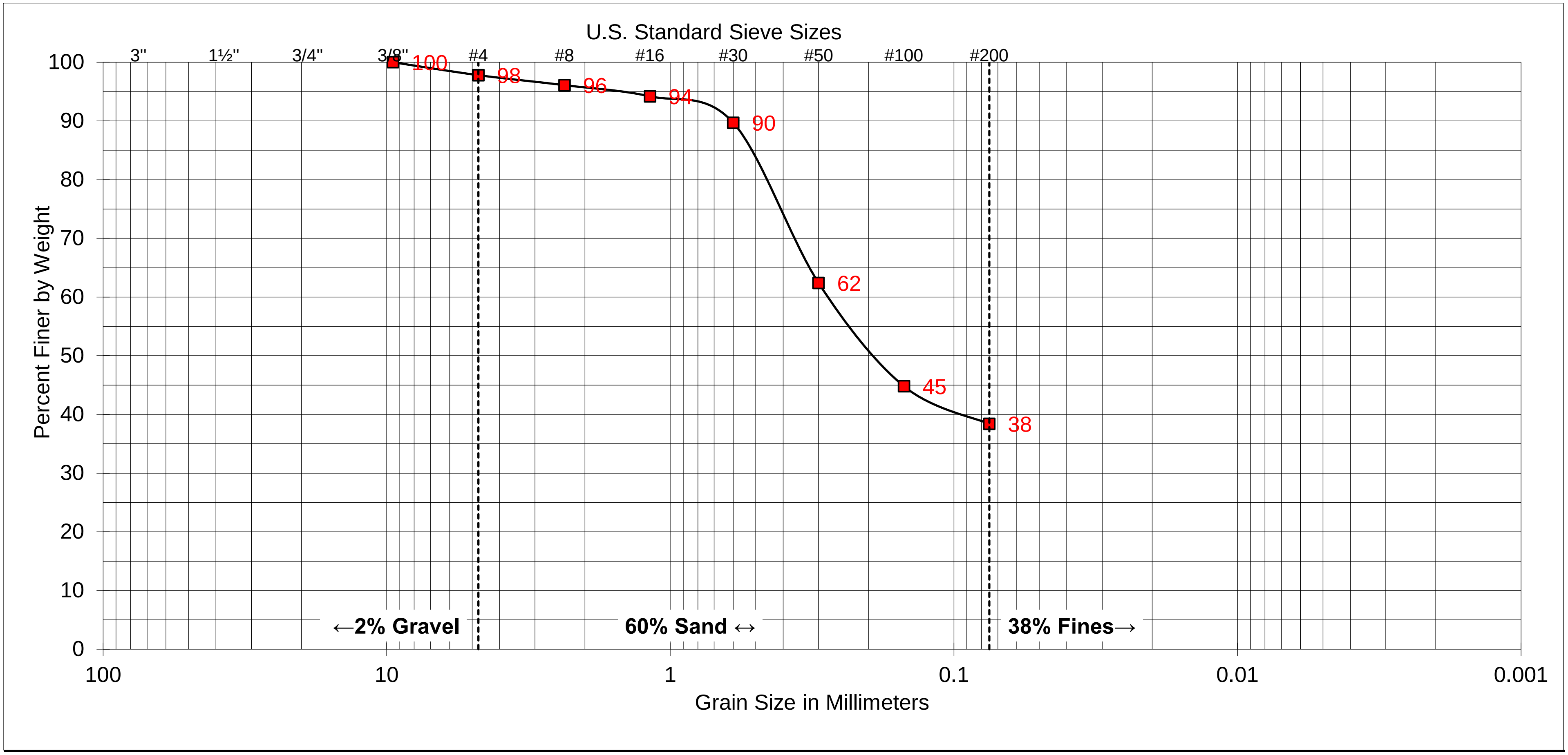
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.50



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND
GRAVEL		SAND			CLAY

SAMPLE	
BORING NUMBER:	B-24
SAMPLE DEPTH:	10' - 11.5'

UNIFIED SOIL CLASSIFICATION: SC

DESCRIPTION: CLAYEY SAND

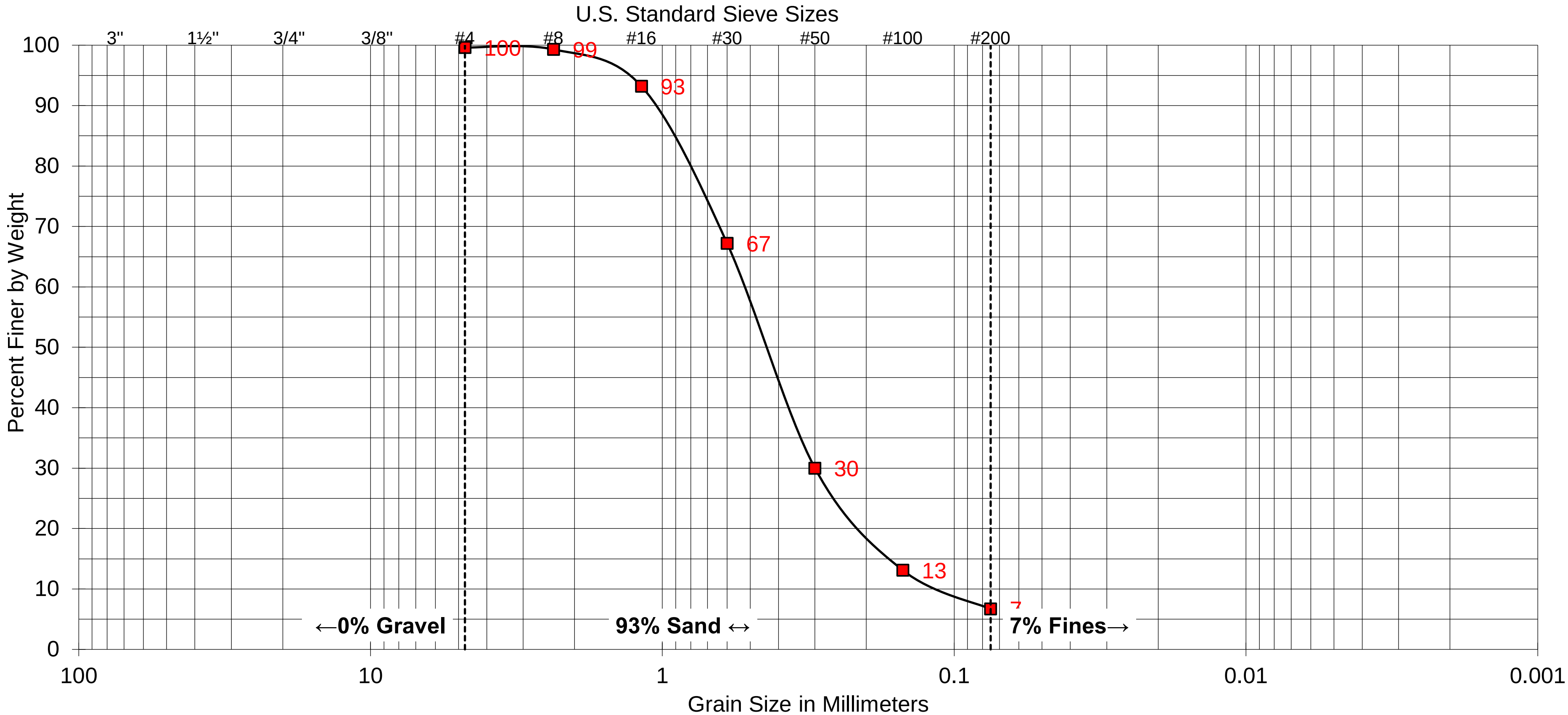
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.51



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND
GRAVEL		SAND			CLAY

SAMPLE	
BORING NUMBER:	B-24
SAMPLE DEPTH:	25' - 26.5'

UNIFIED SOIL CLASSIFICATION: SP

DESCRIPTION: POORLY GRADED SAND WITH SILT

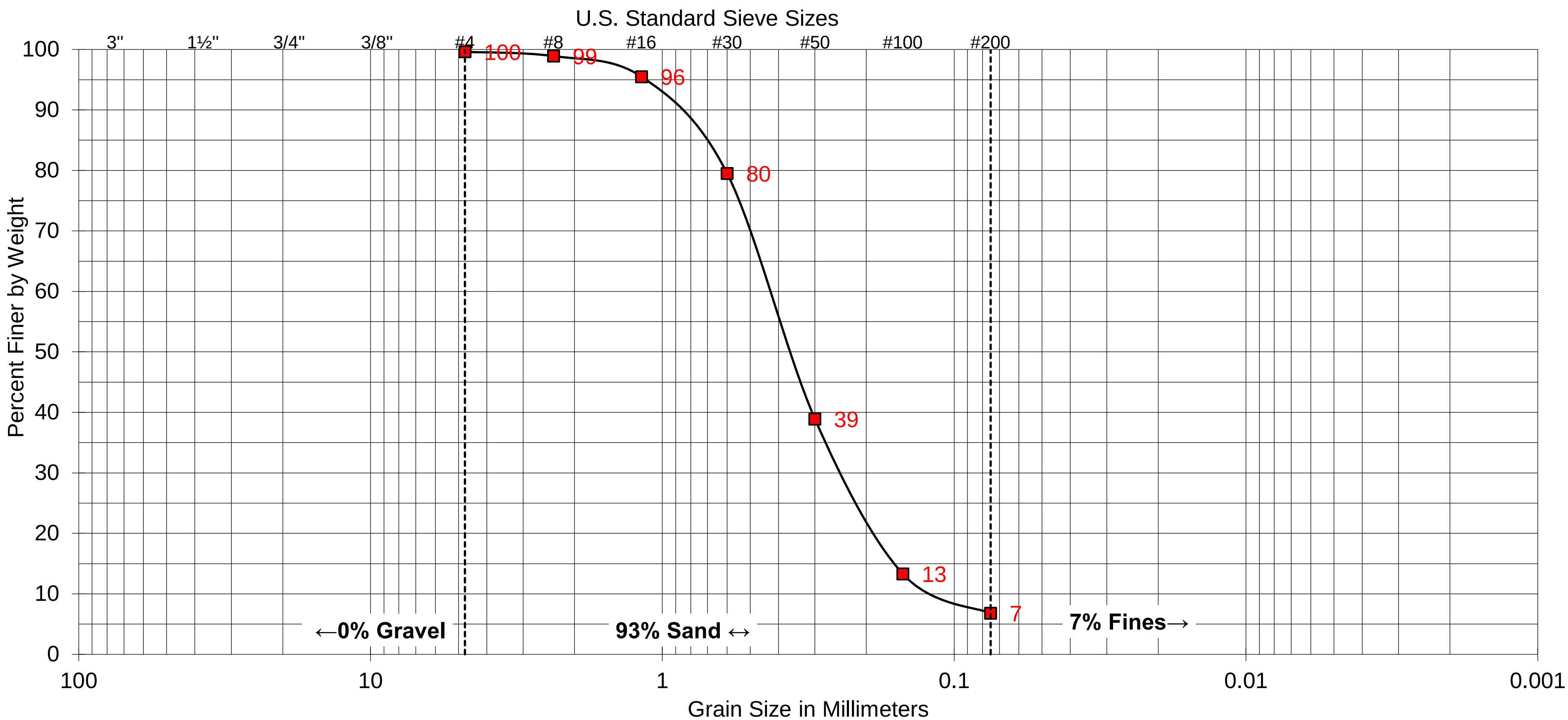
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.52



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND CLAY
GRAVEL		SAND			

SAMPLE	
BORING NUMBER:	B-24
SAMPLE DEPTH:	35' - 36.5'

UNIFIED SOIL CLASSIFICATION: SP-SM

DESCRIPTION: POORLY GRADED SAND WITH SILT

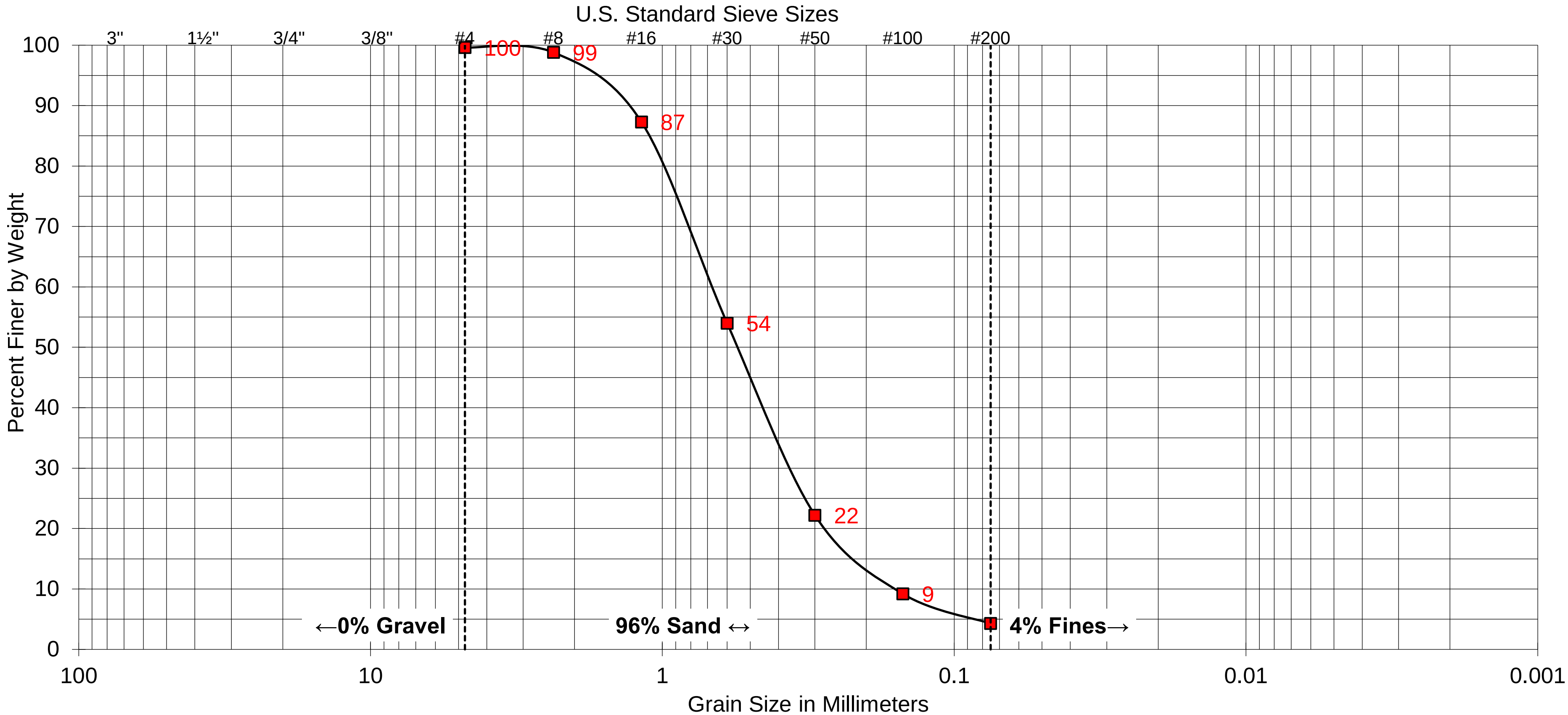
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.53



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND
GRAVEL		SAND			CLAY

SAMPLE	
BORING NUMBER:	B-24
SAMPLE DEPTH:	55' - 56.5'

UNIFIED SOIL CLASSIFICATION: SP

DESCRIPTION: POORLY GRADED SAND

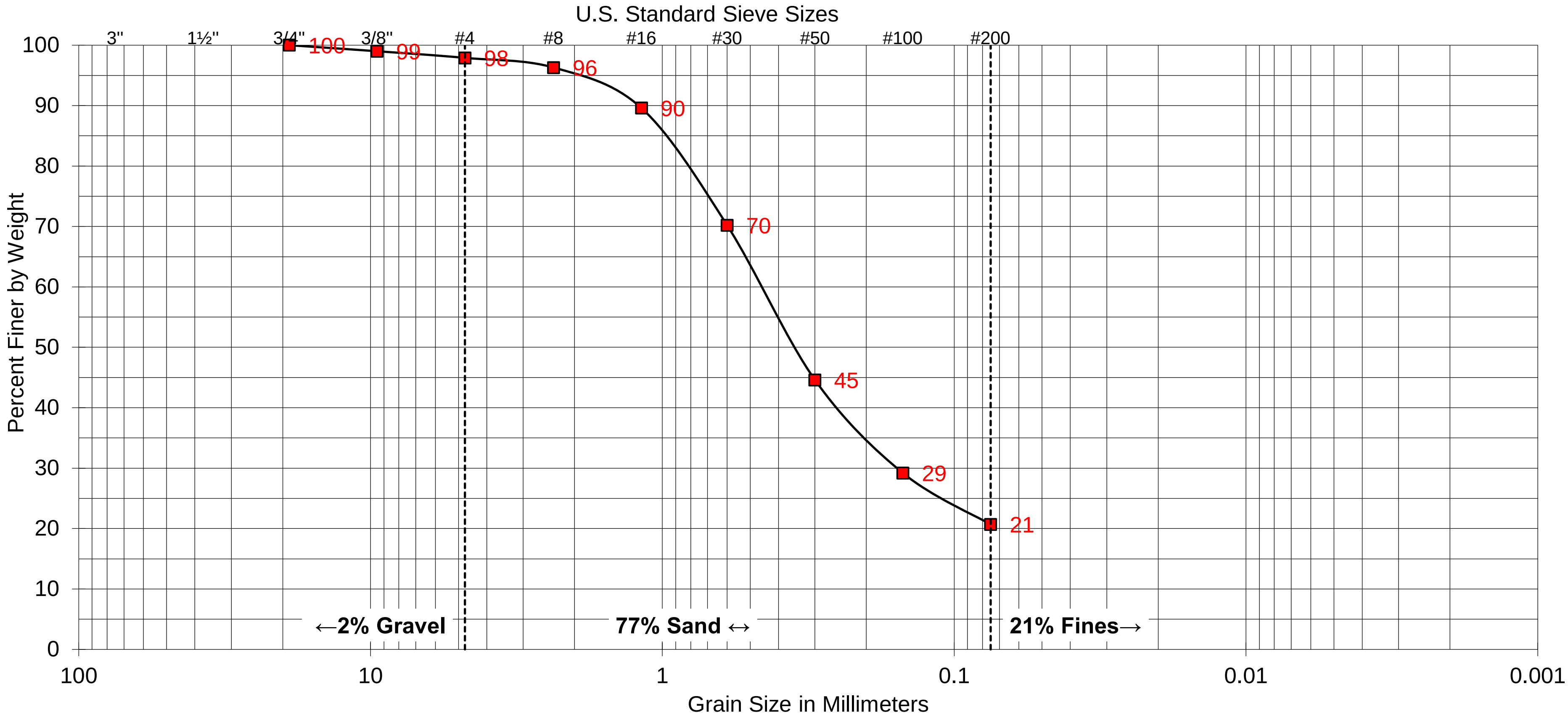
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.54



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND CLAY
GRAVEL		SAND			

SAMPLE	
BORING NUMBER:	B-25
SAMPLE DEPTH:	0' - 5'

UNIFIED SOIL CLASSIFICATION: SM

DESCRIPTION: SILTY SAND

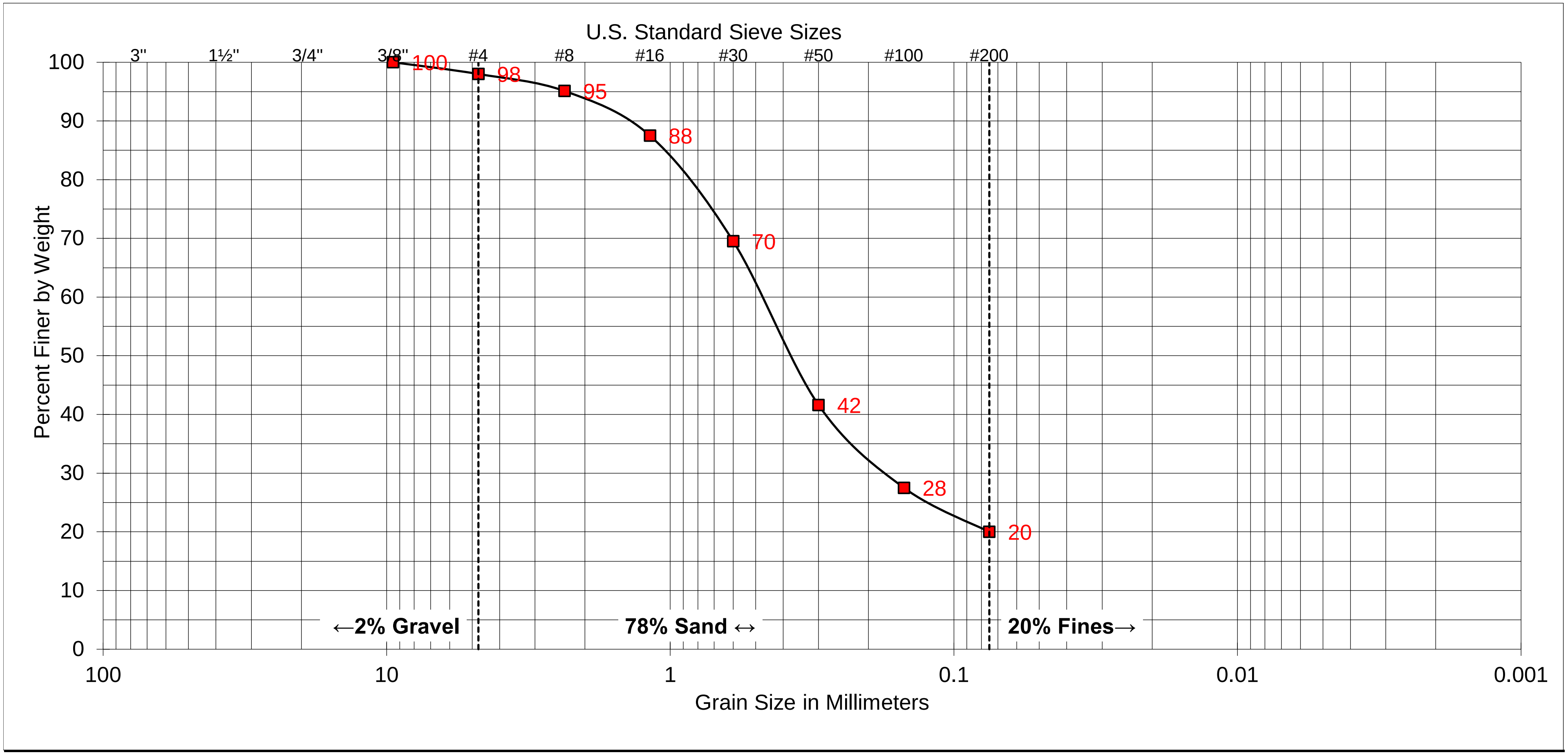
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.55



GRAVEL		SAND			SILT AND CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

SAMPLE	
BORING NUMBER:	B-25
SAMPLE DEPTH:	10' - 11.5'

UNIFIED SOIL CLASSIFICATION: SM

DESCRIPTION: SILTY SAND

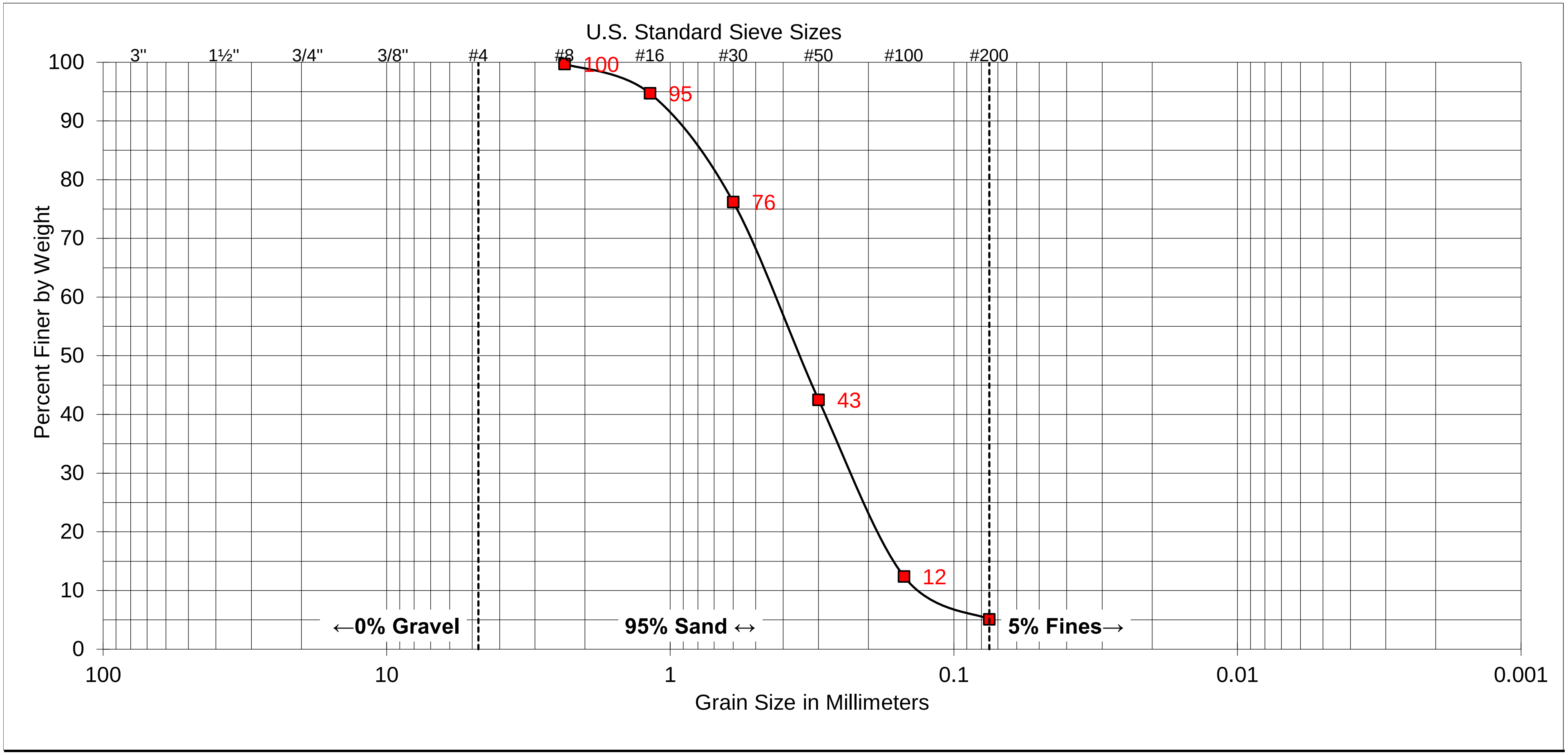
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.56



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND CLAY
GRAVEL		SAND			

SAMPLE	
BORING NUMBER:	B-26
SAMPLE DEPTH:	5.5' - 6'

UNIFIED SOIL CLASSIFICATION: SP

DESCRIPTION: POORLY GRADED SAND

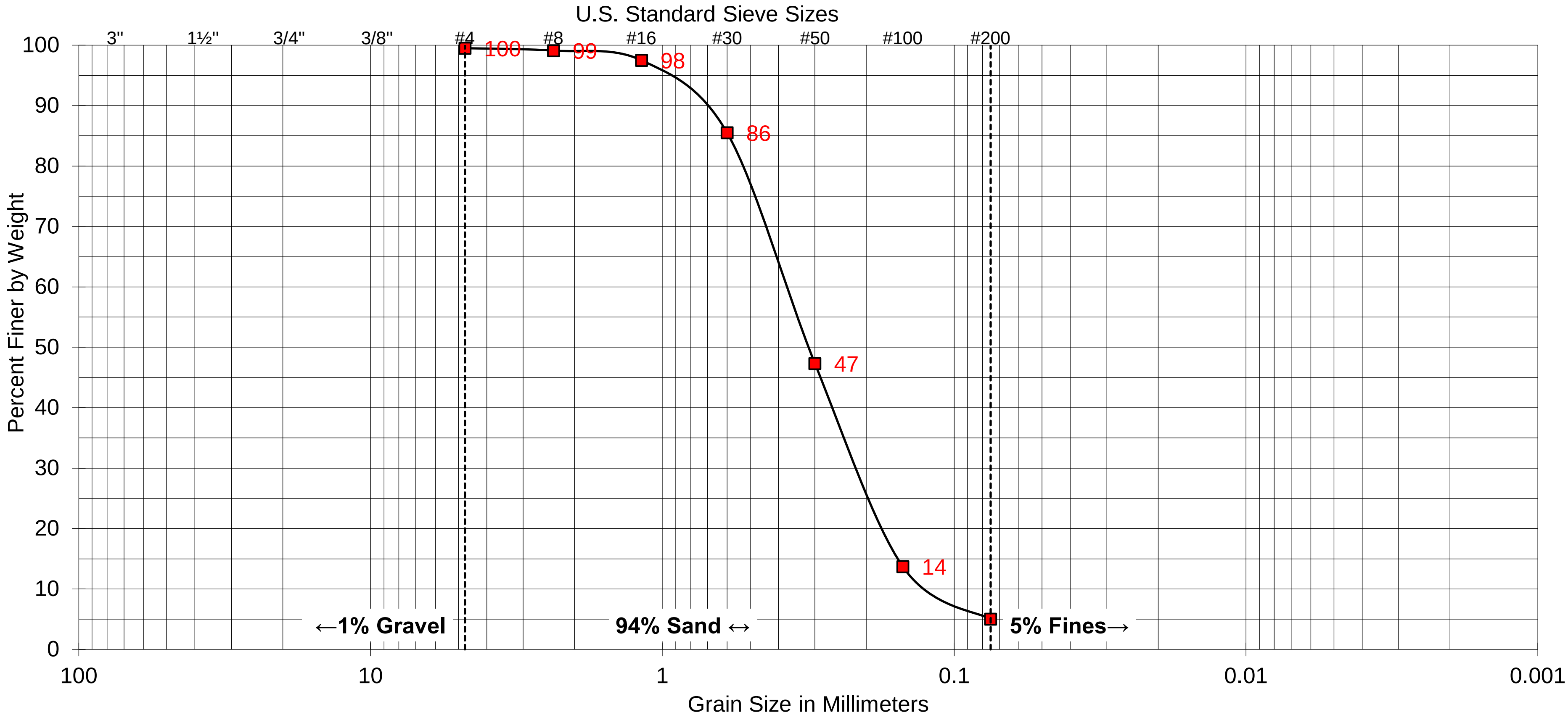
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.57



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<tr><td>COARSE</td><td>FINE</td><td>COARSE</td><td>MEDIUM</td><td>FINE</td><td rowspan="2">SILT AND CLAY</td></tr>
<tr><td colspan="2">GRAVEL</td><td colspan="3">SAND</td></tr>
</table>

SAMPLE	
BORING NUMBER:	B-26
SAMPLE DEPTH:	15' - 16.5'

UNIFIED SOIL CLASSIFICATION: SP

DESCRIPTION: POORLY GRADED SAND

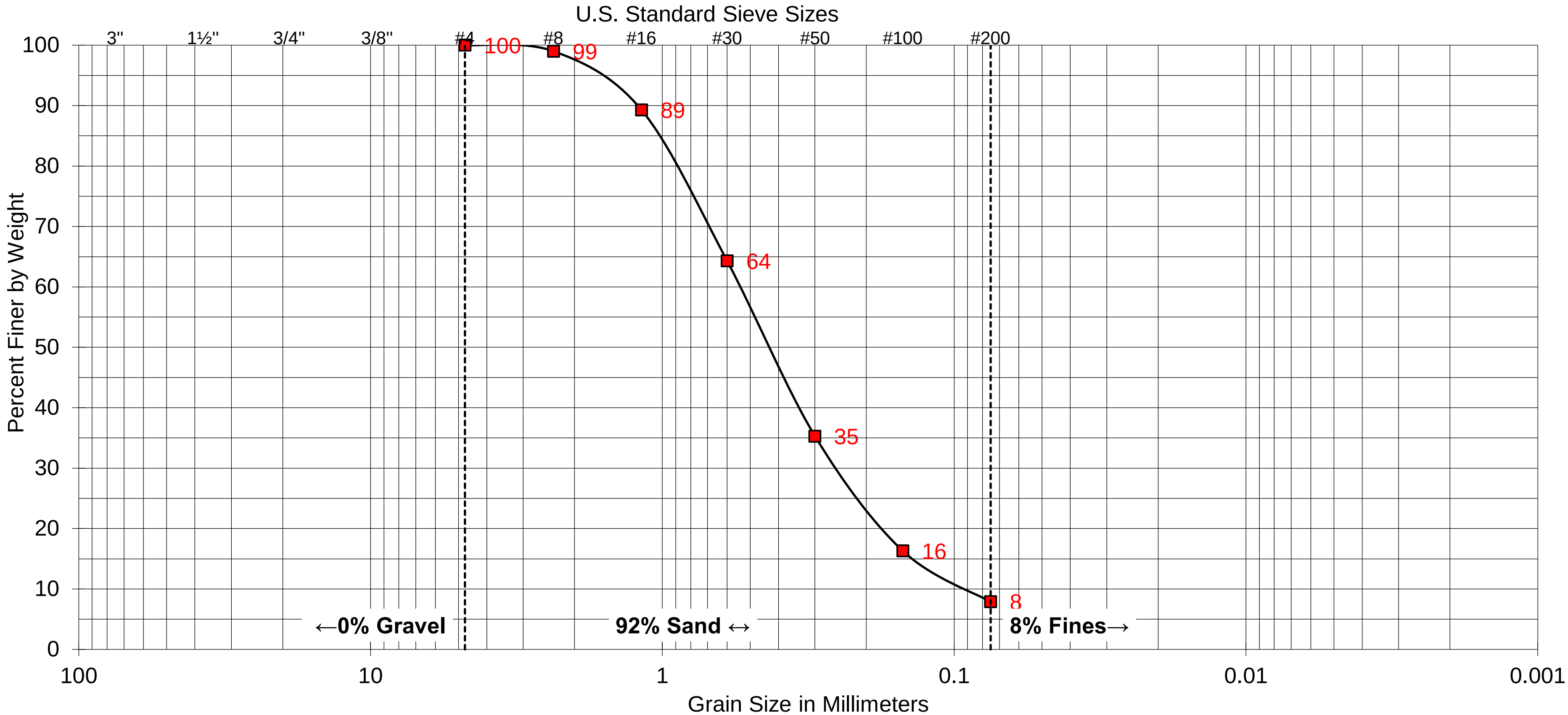
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.58



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND CLAY
GRAVEL		SAND			

SAMPLE	
BORING NUMBER:	B-26
SAMPLE DEPTH:	25' - 26'

UNIFIED SOIL CLASSIFICATION: SP

DESCRIPTION: POORLY GRADED SAND WITH SILT

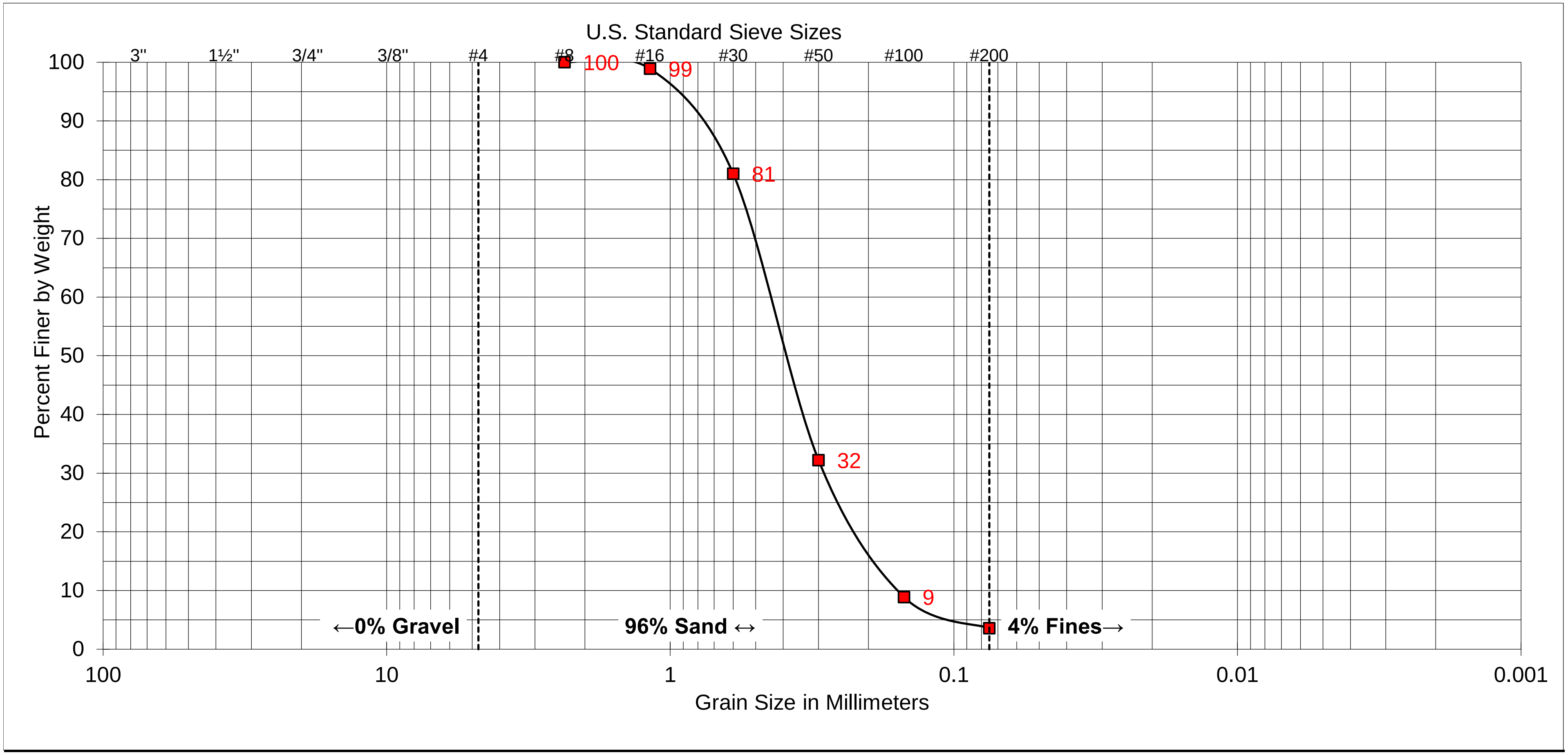
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.59



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND CLAY
GRAVEL		SAND			

SAMPLE	
BORING NUMBER:	B-26
SAMPLE DEPTH:	35' - 36.5'

UNIFIED SOIL CLASSIFICATION: SP

DESCRIPTION: POORLY GRADED SAND

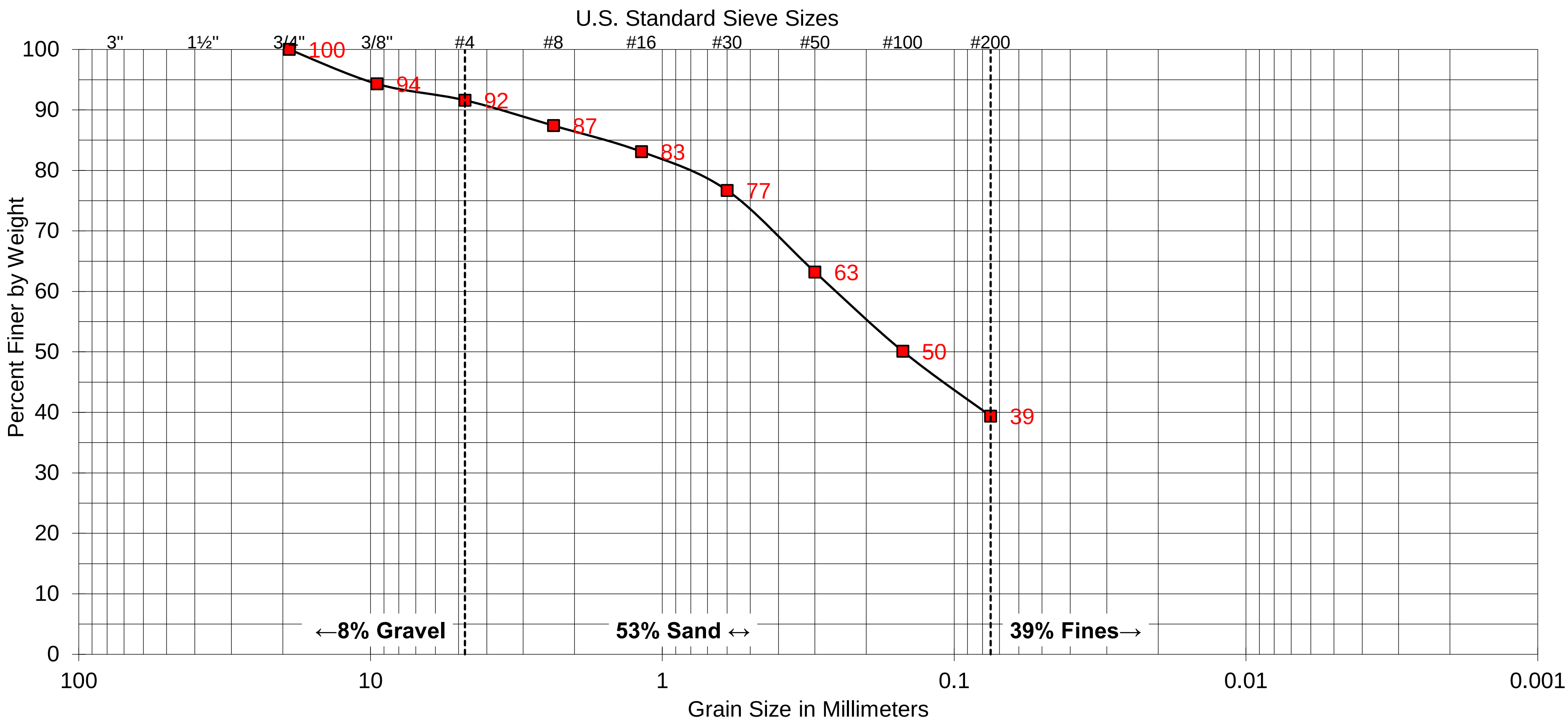
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.60



GRAVEL		SAND			SILT AND CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

SAMPLE	
BORING NUMBER:	B-27
SAMPLE DEPTH:	0.5' - 5'

UNIFIED SOIL CLASSIFICATION: SC

DESCRIPTION: CLAYEY SAND

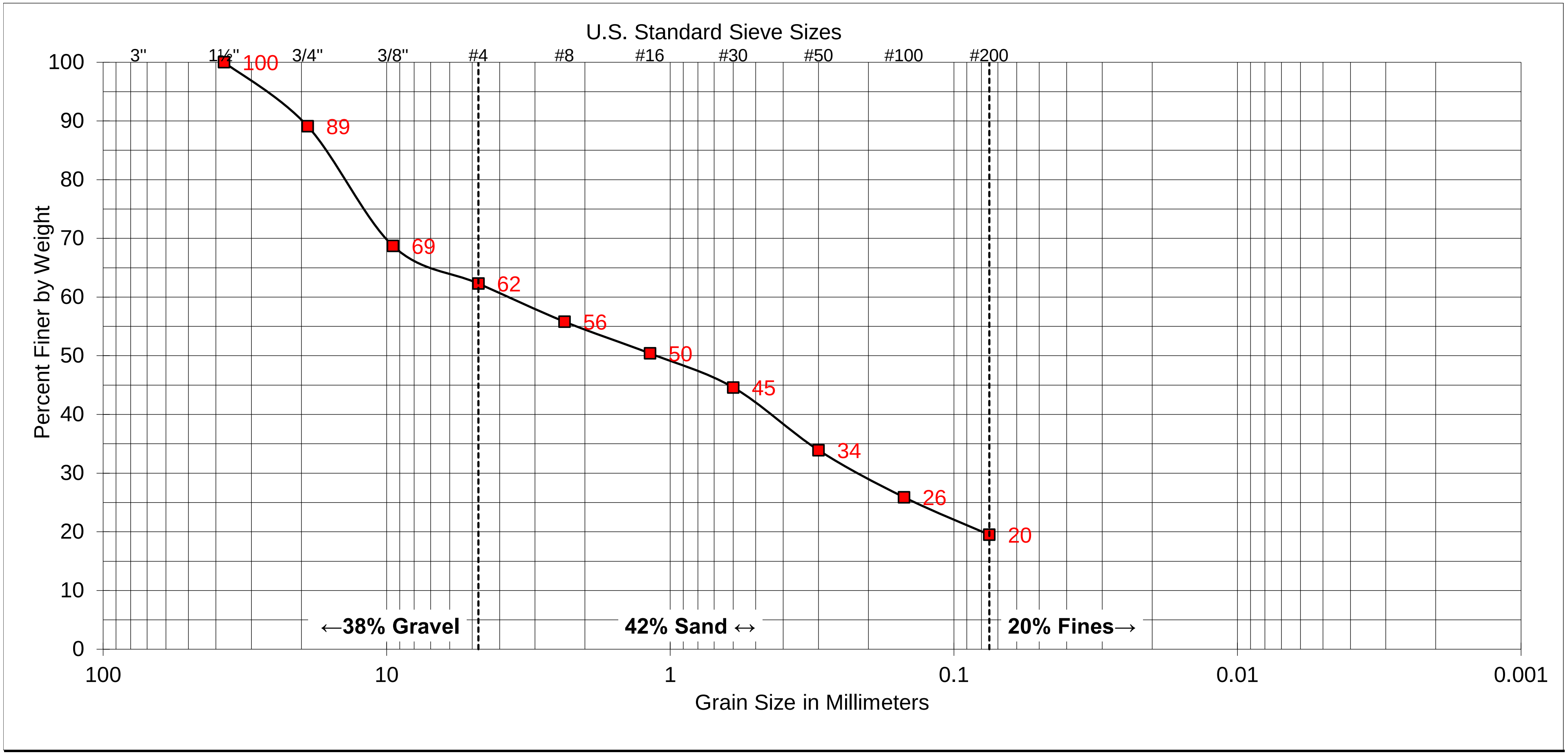
ATTERBERG LIMITS	
LIQUID LIMIT:	36
PLASTIC LIMIT:	15
PLASTICITY INDEX:	21

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.61



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND CLAY
GRAVEL		SAND			

SAMPLE	
BORING NUMBER:	B-27
SAMPLE DEPTH:	15.5' - 16'

UNIFIED SOIL CLASSIFICATION: SC

DESCRIPTION: CLAYEY SAND WITH GRAVEL

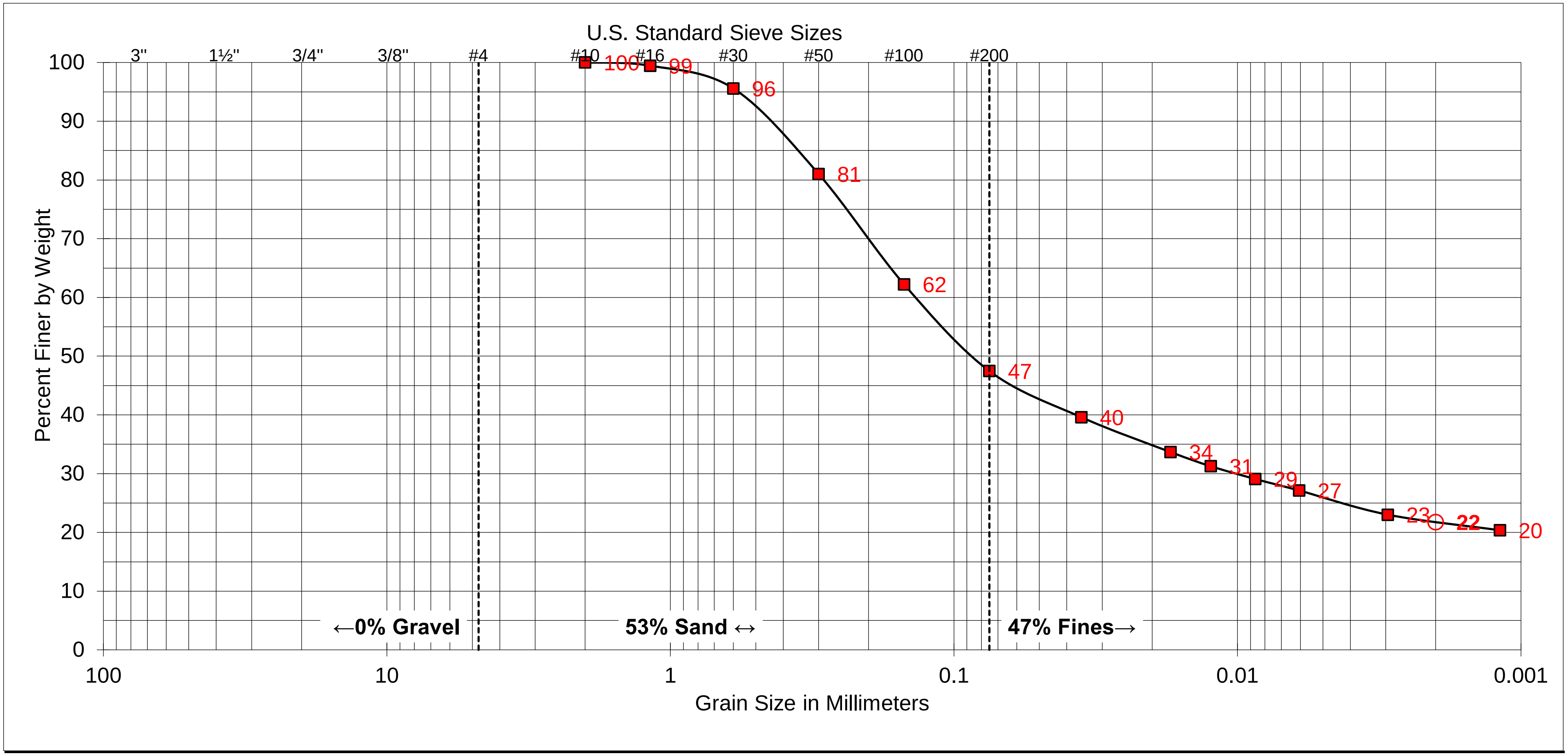
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.62



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND
GRAVEL		SAND			CLAY

SAMPLE
SAMPLE NUMBER: B-27
SAMPLE DEPTH: 30' - 31.5'

UNIFIED SOIL CLASSIFICATION: SC

DESCRIPTION: CLAYEY SAND

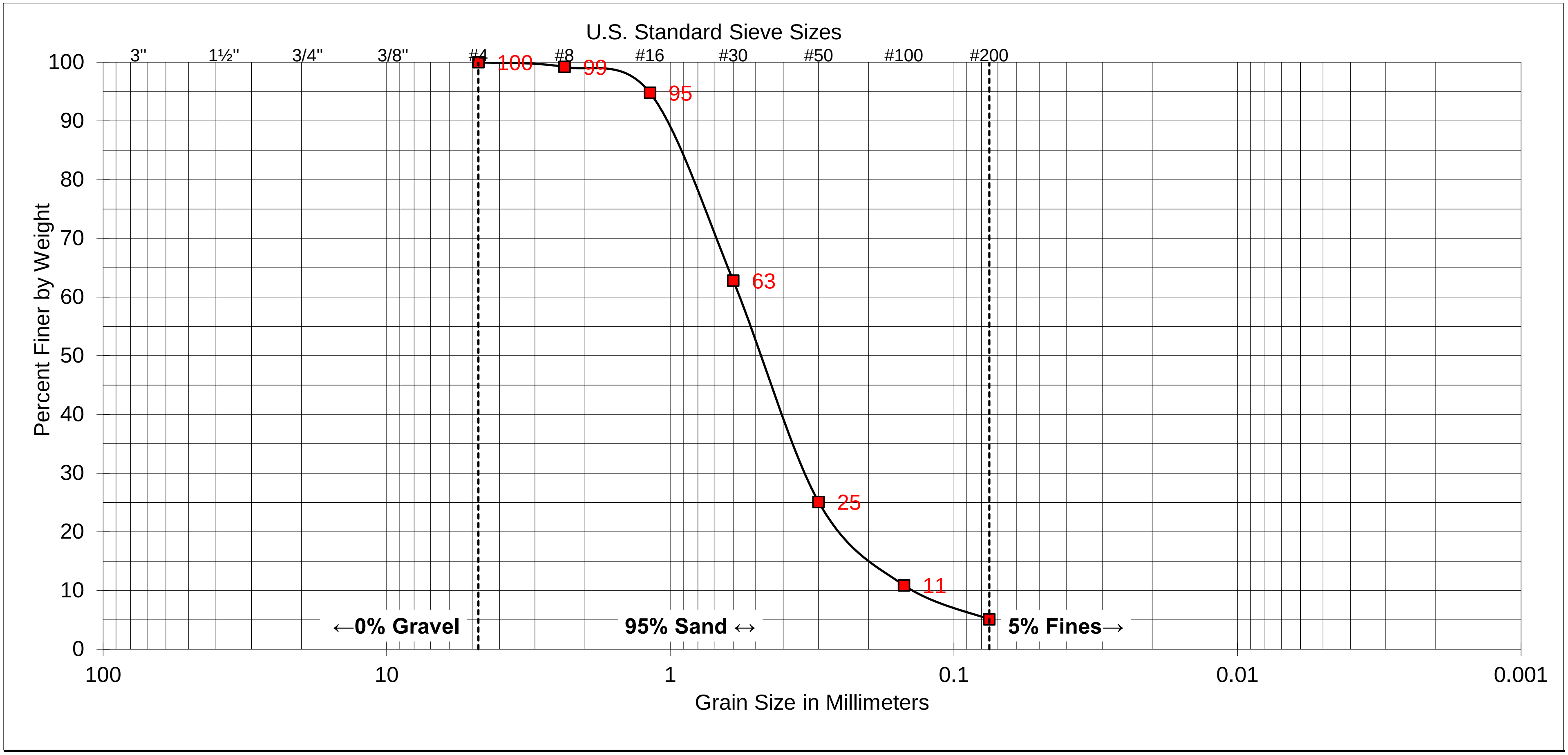
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.63



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND CLAY
GRAVEL		SAND			

SAMPLE	
BORING NUMBER:	B-27
SAMPLE DEPTH:	35.5' - 36'

UNIFIED SOIL CLASSIFICATION: SP

DESCRIPTION: POORLY GRADED SAND

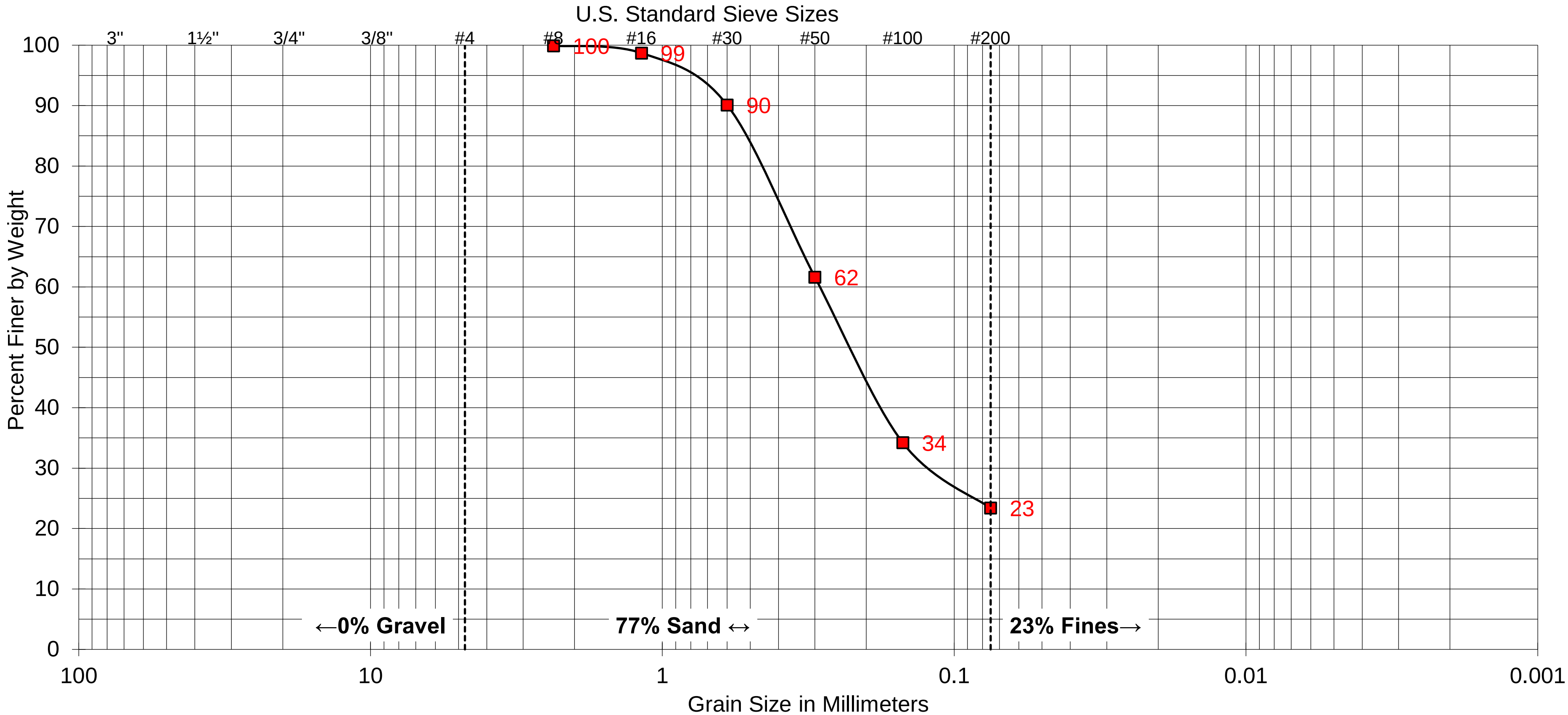
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.64



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<tr><td>COARSE</td><td>FINE</td><td>COARSE</td><td>MEDIUM</td><td>FINE</td><td rowspan="2">SILT AND
CLAY</td></tr>
<tr><td colspan="2">GRAVEL</td><td colspan="3">SAND</td></tr>
</table>

SAMPLE	
BORING NUMBER:	B-27
SAMPLE DEPTH:	40' - 41.5'

UNIFIED SOIL CLASSIFICATION: SM

DESCRIPTION: SILTY SAND

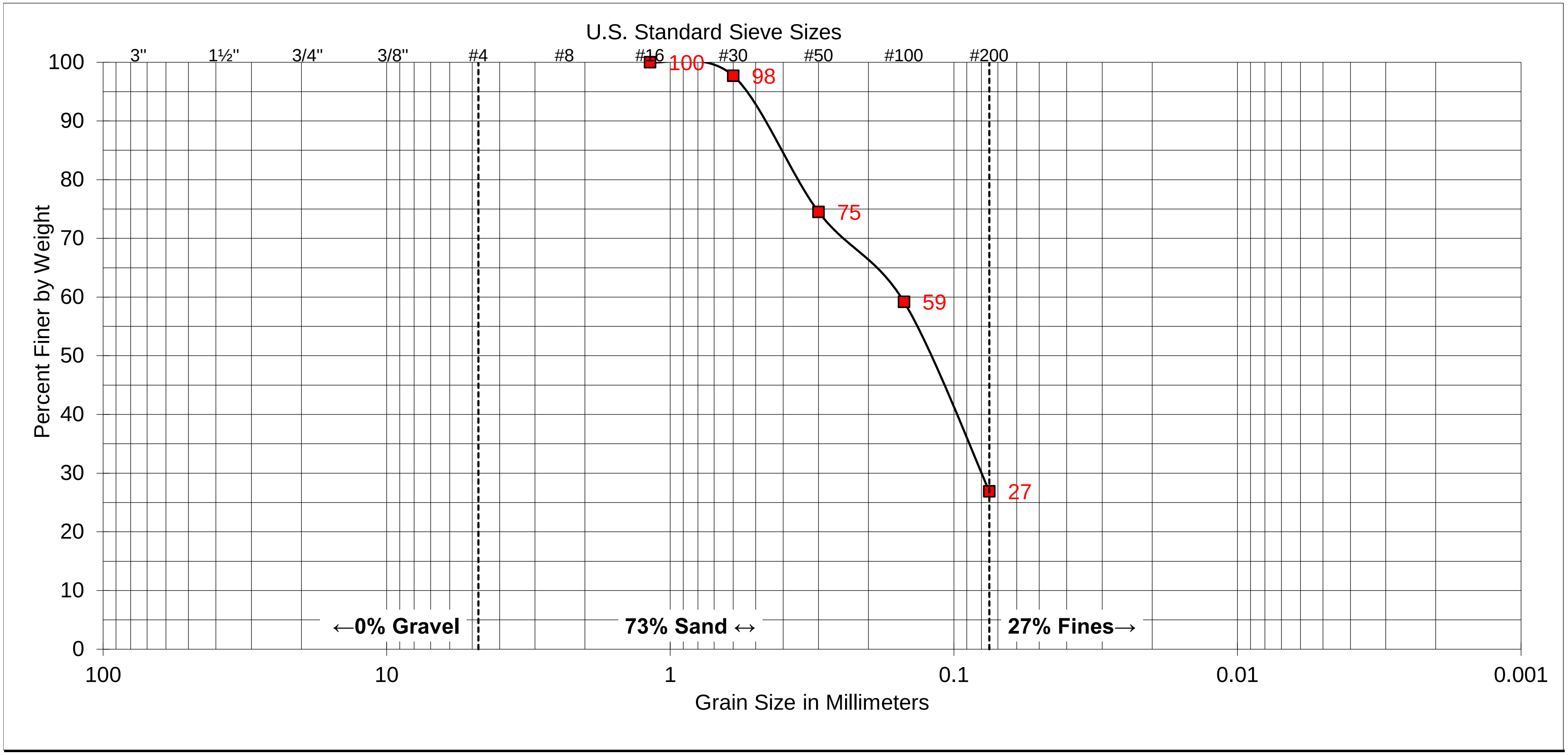
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.65



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND
GRAVEL		SAND			CLAY

SAMPLE	
BORING NUMBER:	B-27
SAMPLE DEPTH:	70' - 70.6'

UNIFIED SOIL CLASSIFICATION: SM

DESCRIPTION: SILTY SAND

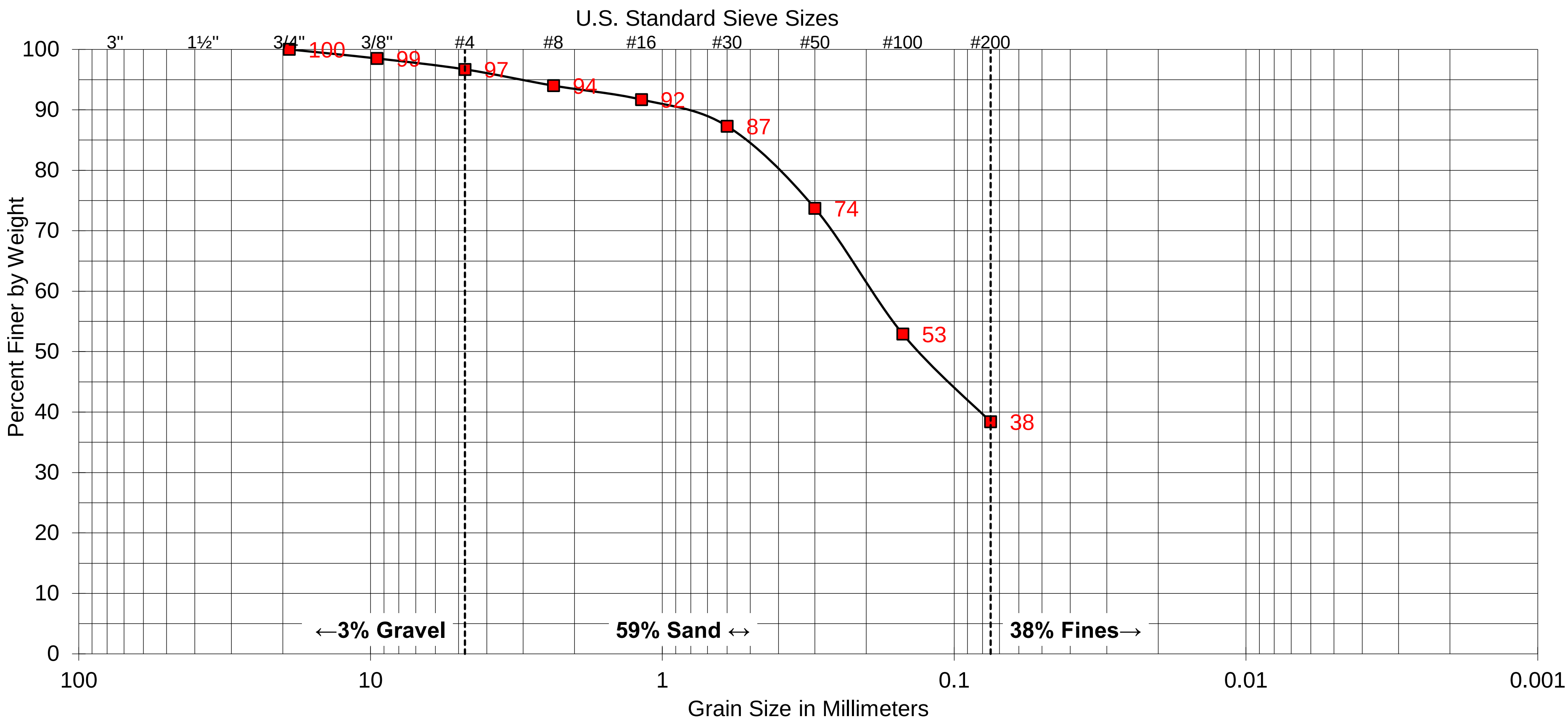
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.66



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND CLAY
GRAVEL		SAND			

SAMPLE	
BORING NUMBER:	B-28
SAMPLE DEPTH:	0.5' - 5'

UNIFIED SOIL CLASSIFICATION: SC

DESCRIPTION: CLAYEY SAND

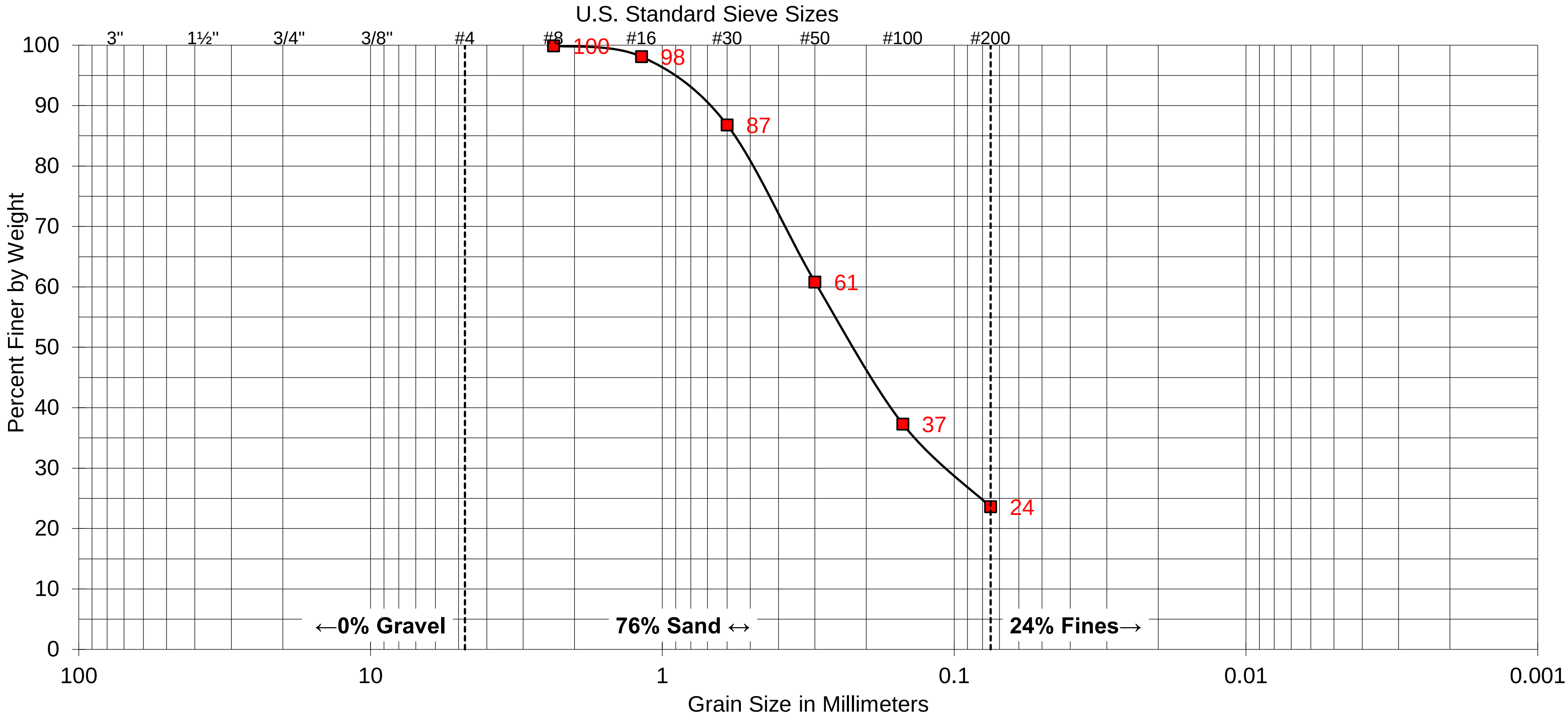
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.67



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND
GRAVEL		SAND			CLAY

SAMPLE	
BORING NUMBER:	B-28
SAMPLE DEPTH:	25.5' - 26'

UNIFIED SOIL CLASSIFICATION: SM

DESCRIPTION: SILTY SAND

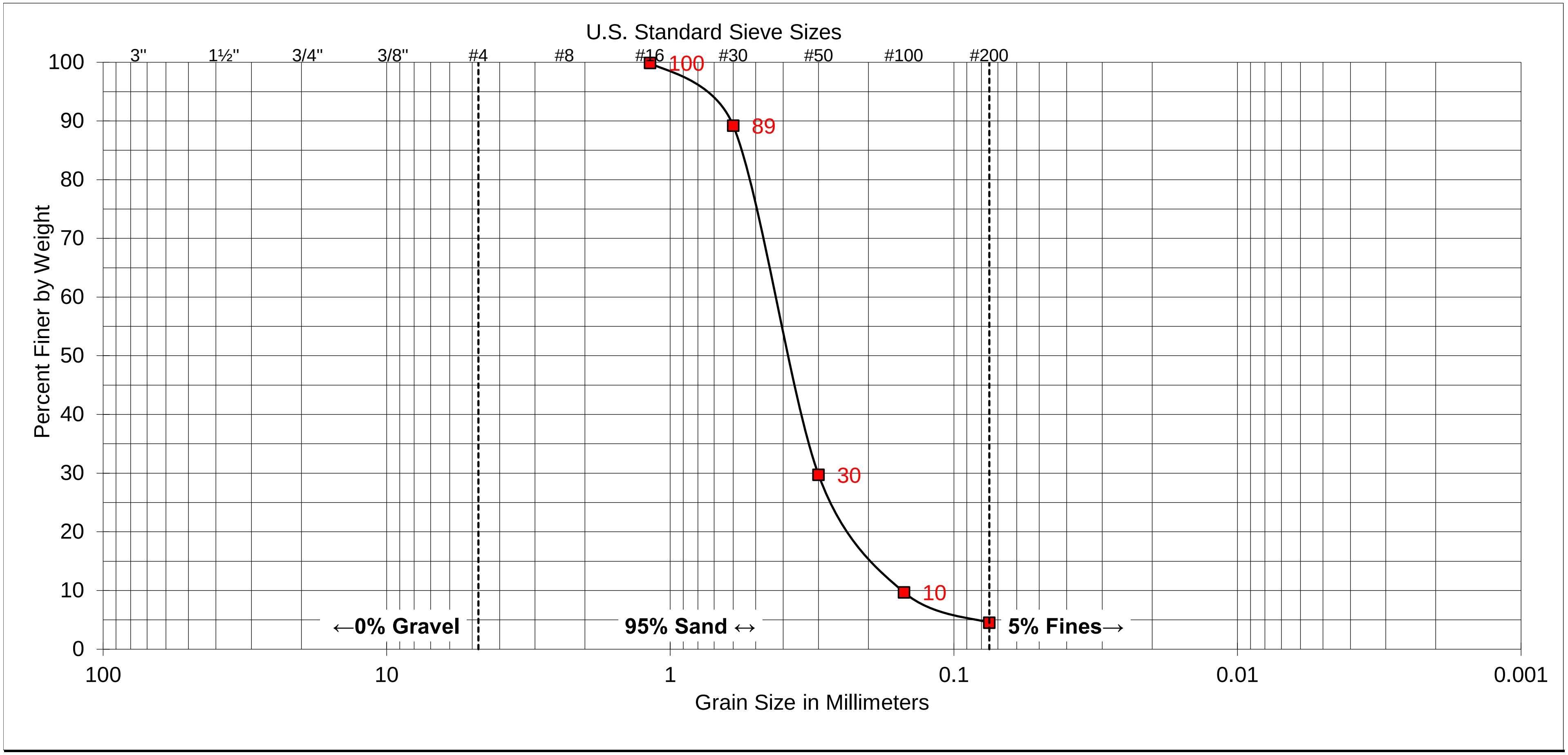
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.68



GRAVEL		SAND			SILT AND CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

SAMPLE	
BORING NUMBER:	B-28
SAMPLE DEPTH:	35' - 36.5'

UNIFIED SOIL CLASSIFICATION: SP

DESCRIPTION: POORLY GRADED SAND

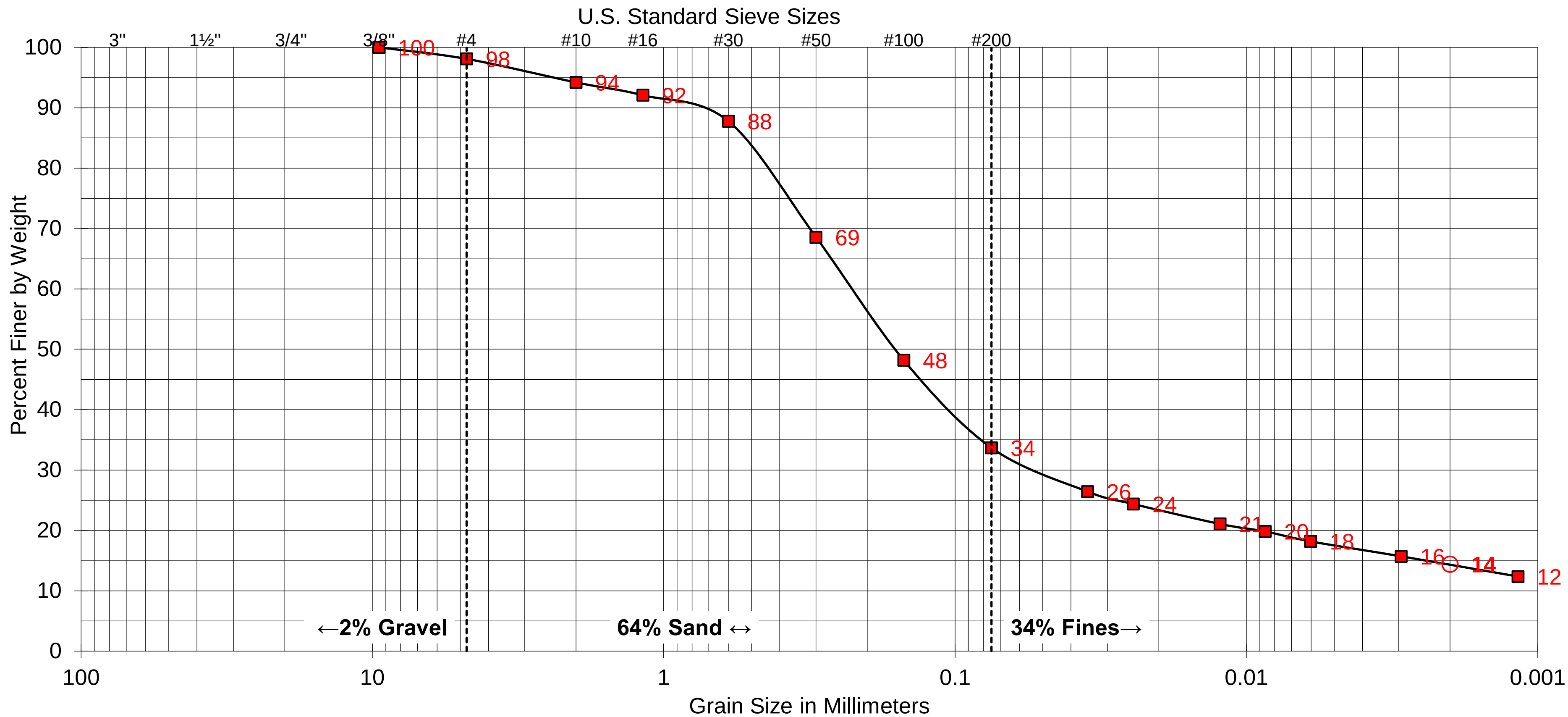
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.69



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND
GRAVEL		SAND			CLAY

SAMPLE
SAMPLE NUMBER: B-29
SAMPLE DEPTH: 0.5 - 4.8'

UNIFIED SOIL CLASSIFICATION: SC

DESCRIPTION: CLAYEY SAND

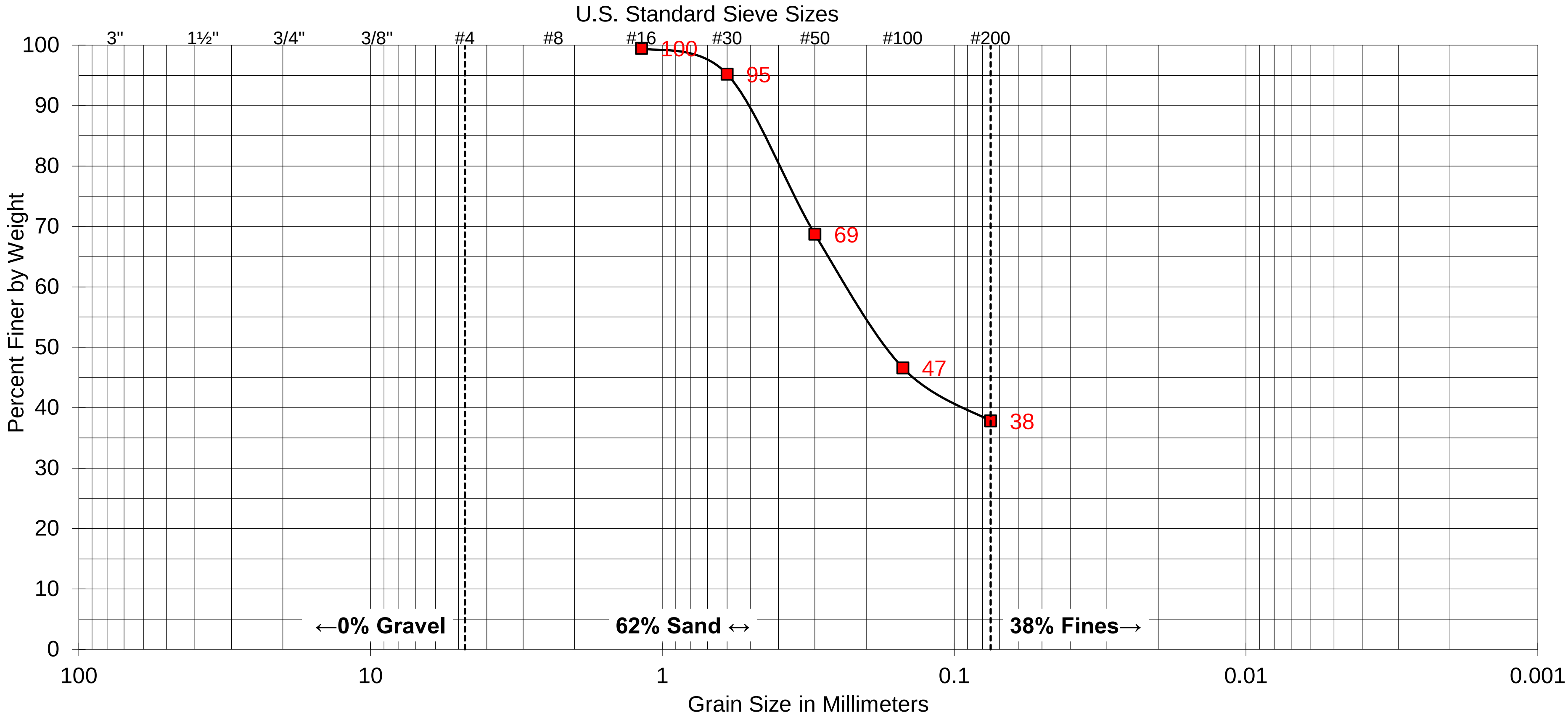
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.70



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND
GRAVEL		SAND			CLAY

SAMPLE	
BORING NUMBER:	B-30
SAMPLE DEPTH:	0.5' - 5'

UNIFIED SOIL CLASSIFICATION: SC

DESCRIPTION: CLAYEY SAND

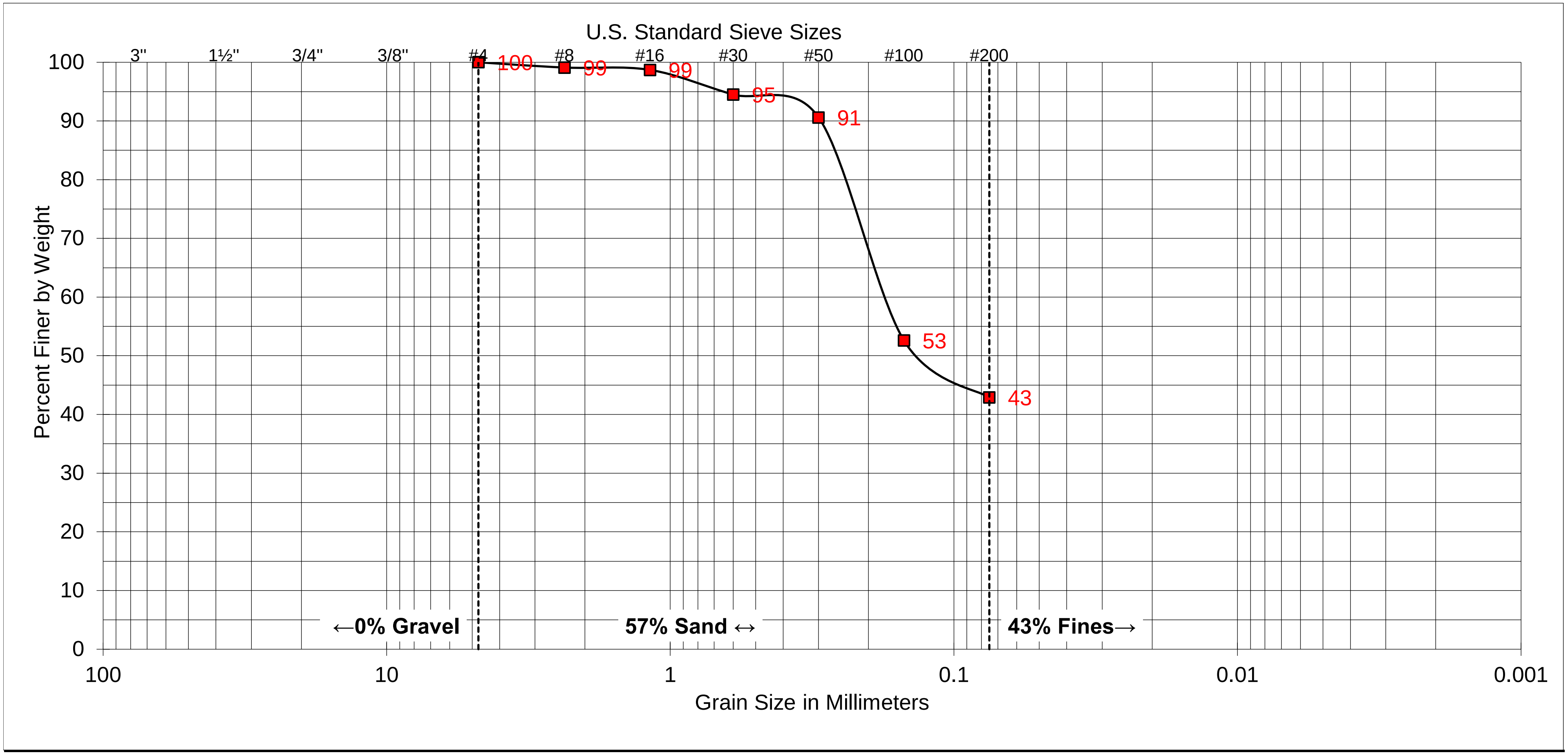
ATTERBERG LIMITS	
LIQUID LIMIT:	29
PLASTIC LIMIT:	14
PLASTICITY INDEX:	15

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.71



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND
GRAVEL		SAND			CLAY

SAMPLE	
BORING NUMBER:	B-30
SAMPLE DEPTH:	10' - 11.5'

UNIFIED SOIL CLASSIFICATION: SM

DESCRIPTION: SILTY SAND

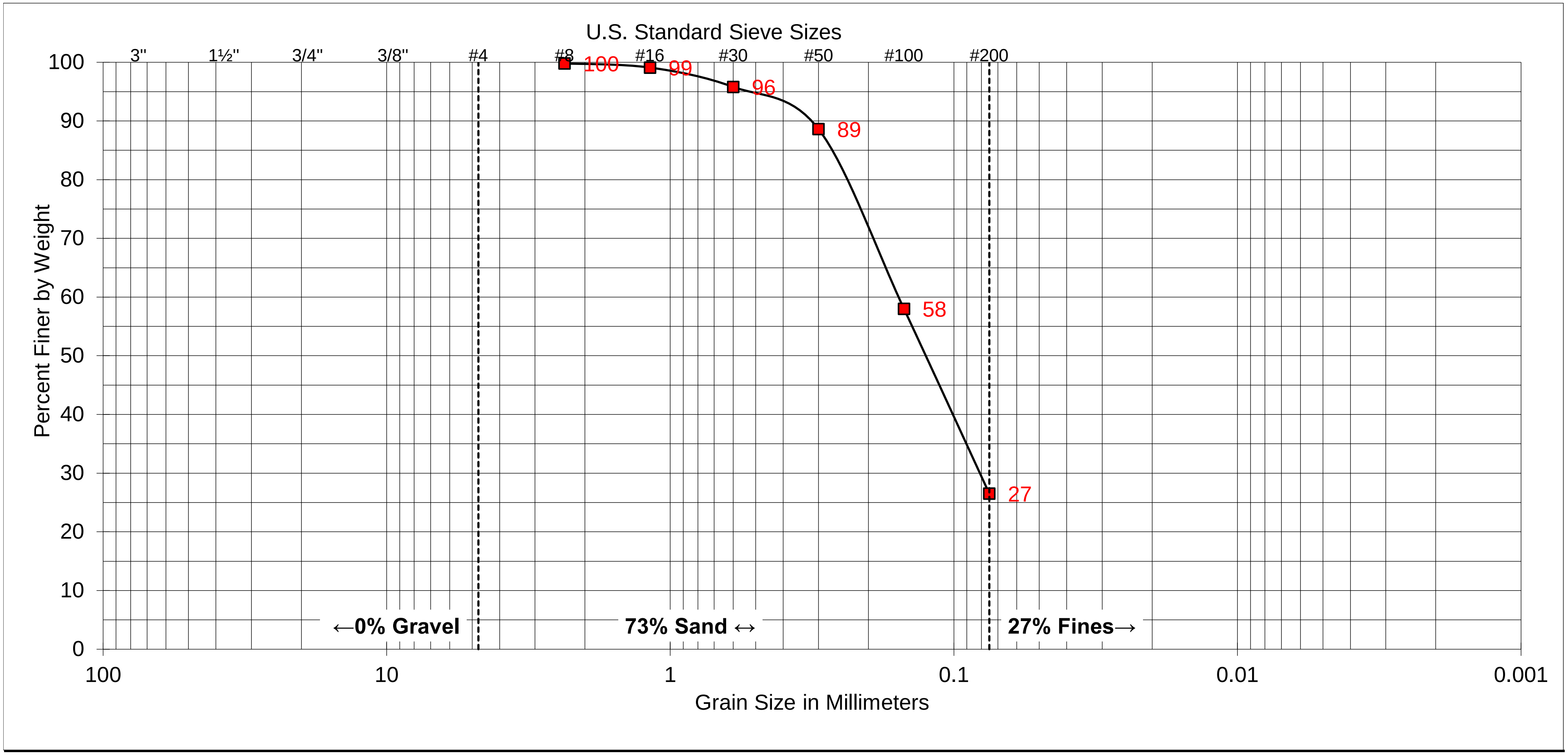
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.72



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND CLAY
GRAVEL		SAND			

SAMPLE	
BORING NUMBER:	B-30
SAMPLE DEPTH:	25' - 26.5'

UNIFIED SOIL CLASSIFICATION: SM

DESCRIPTION: SILTY SAND

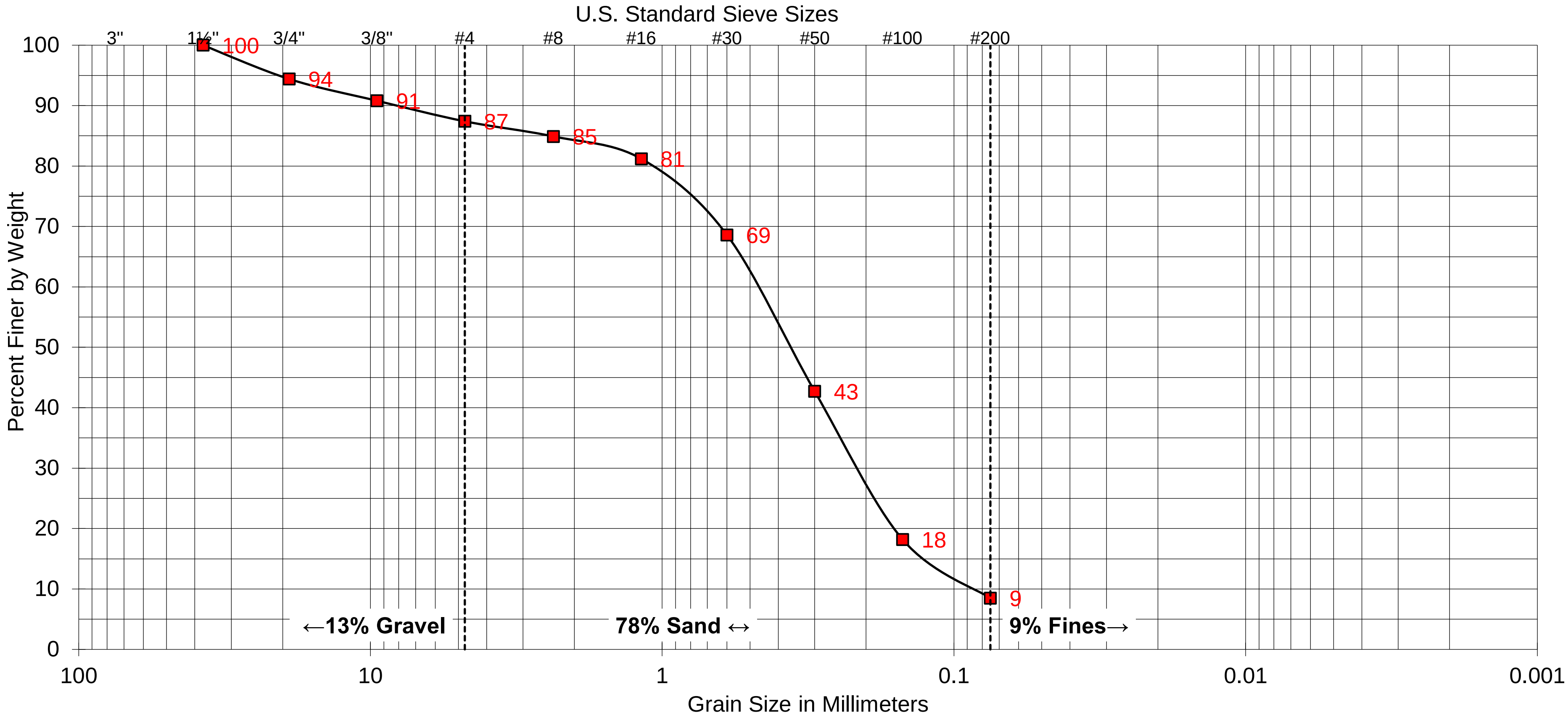
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.73



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND
GRAVEL		SAND			CLAY

SAMPLE	
BORING NUMBER:	B-30
SAMPLE DEPTH:	40' - 41.5'

UNIFIED SOIL CLASSIFICATION: SP

DESCRIPTION: POORLY GRADED SAND WITH SILT

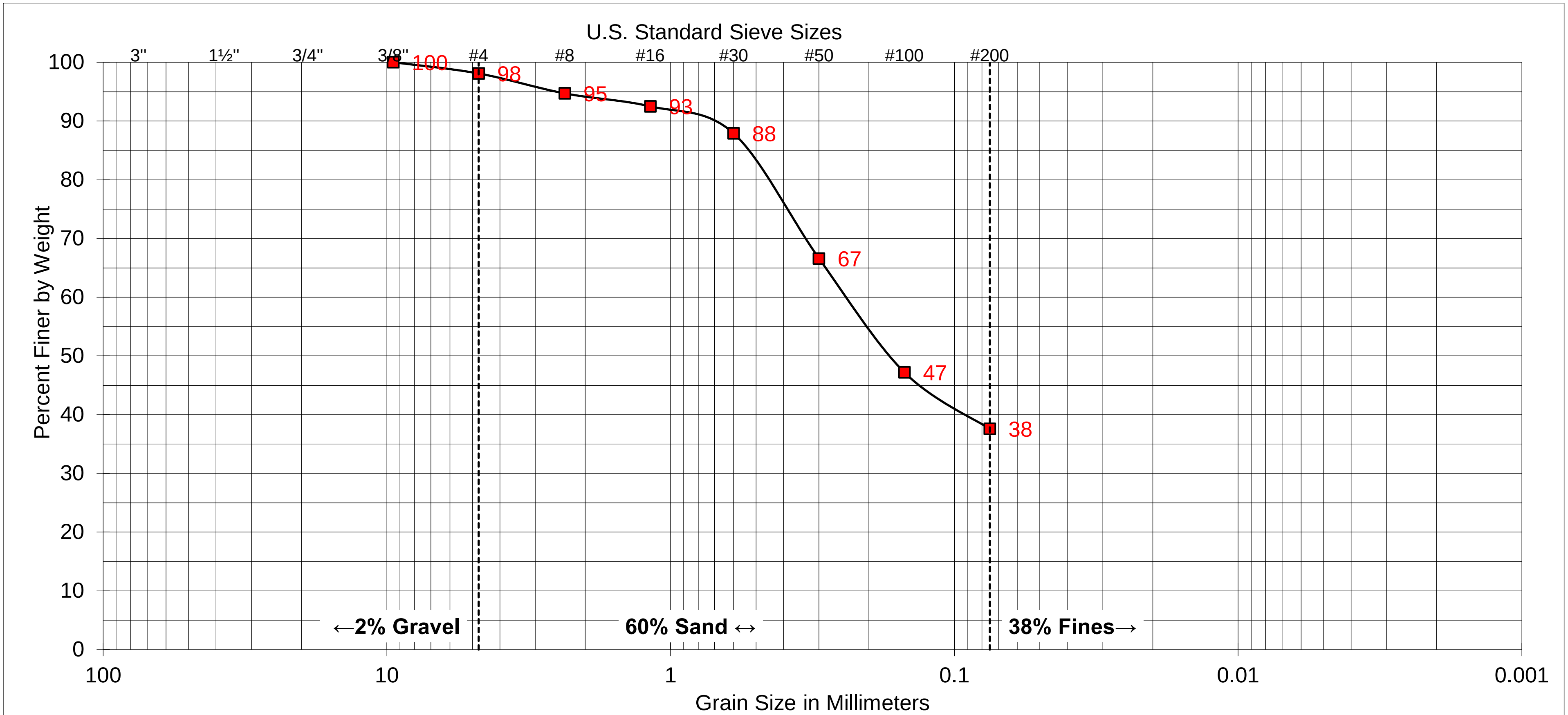
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.74



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND CLAY
GRAVEL		SAND			

SAMPLE	
BORING NUMBER:	B-31
SAMPLE DEPTH:	2.5' - 5'

UNIFIED SOIL CLASSIFICATION: SC

DESCRIPTION: CLAYEY SAND

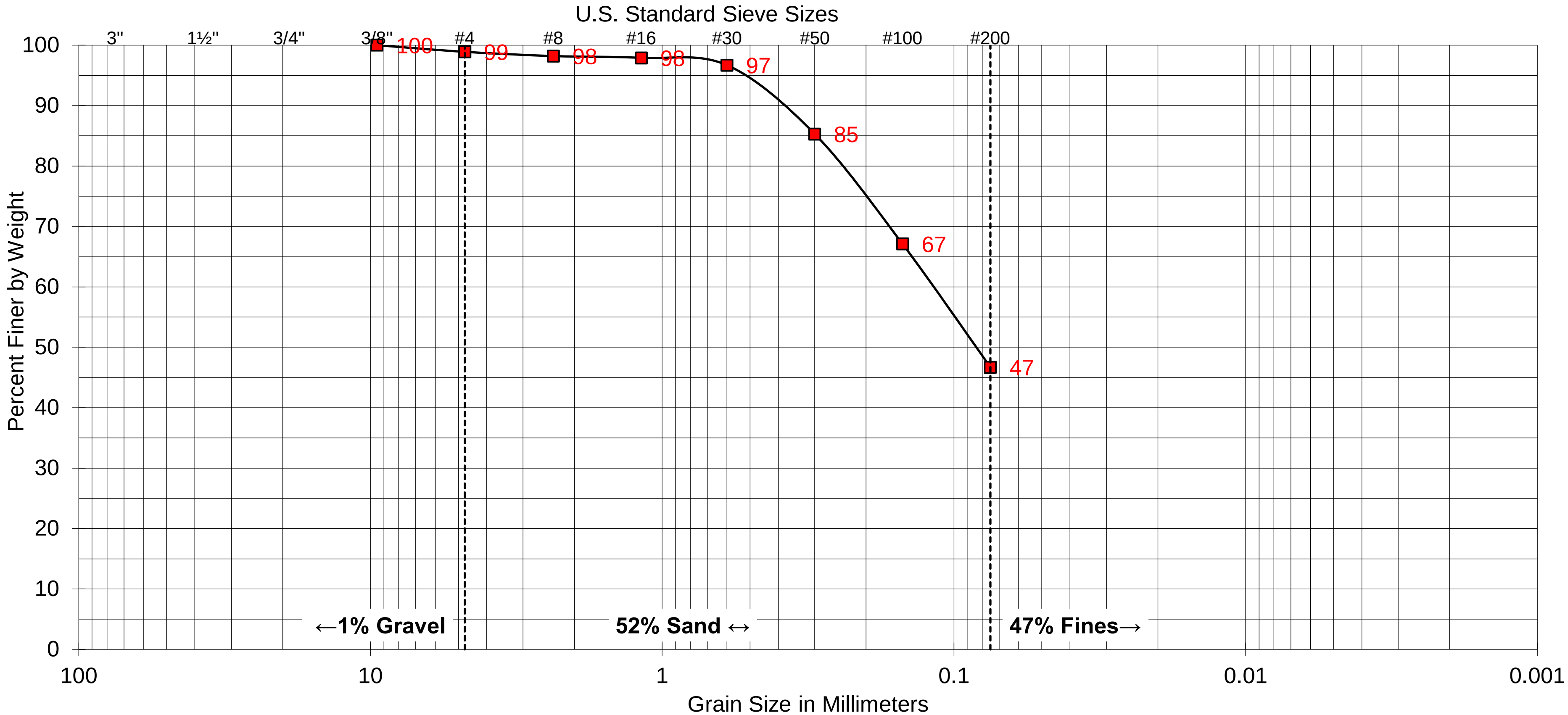
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.75



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND
GRAVEL		SAND			CLAY

SAMPLE	
BORING NUMBER:	B-31
SAMPLE DEPTH:	15' - 16.5'

UNIFIED SOIL CLASSIFICATION: SC

DESCRIPTION: CLAYEY SAND

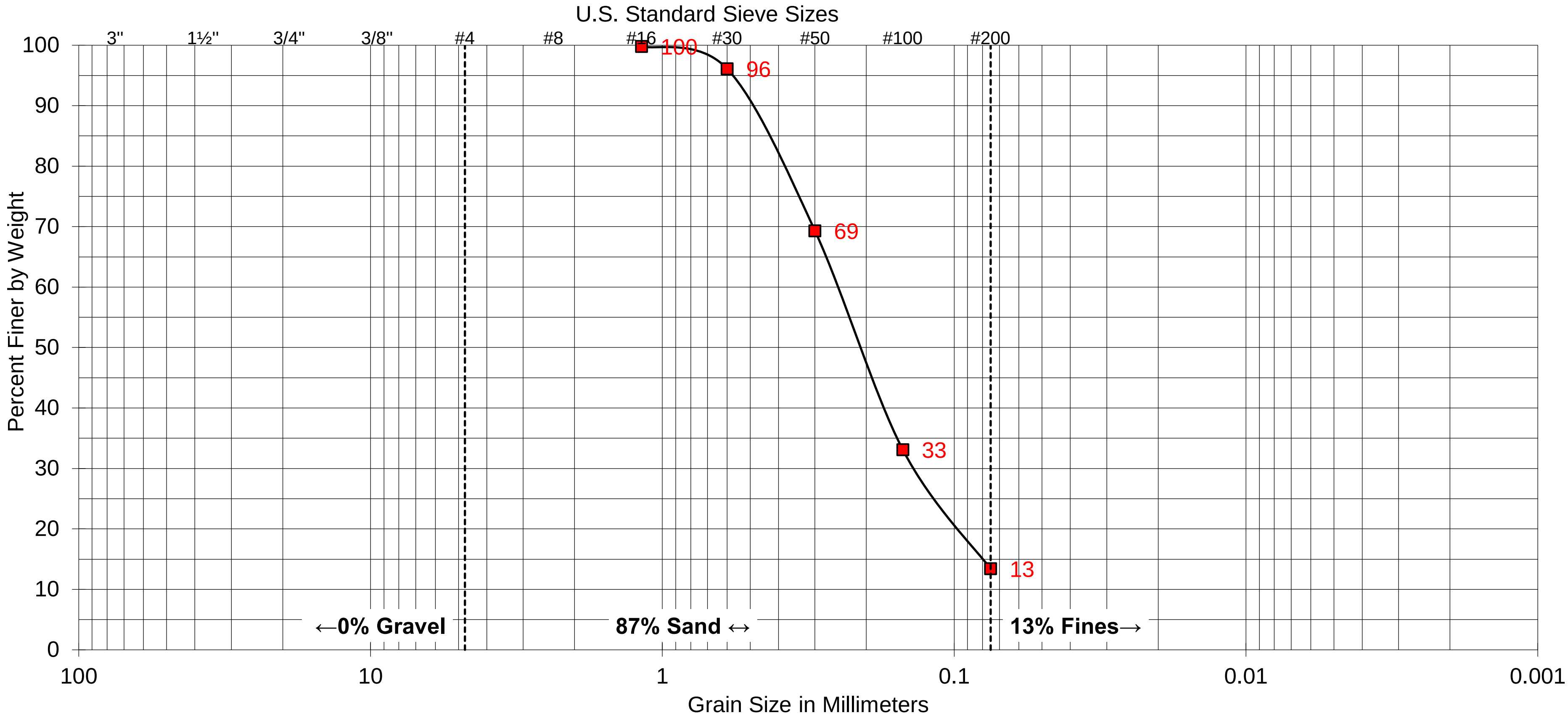
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.76



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND CLAY
GRAVEL		SAND			

SAMPLE	
BORING NUMBER:	B-31
SAMPLE DEPTH:	25' - 26.5'

UNIFIED SOIL CLASSIFICATION: SM

DESCRIPTION: SILTY SAND

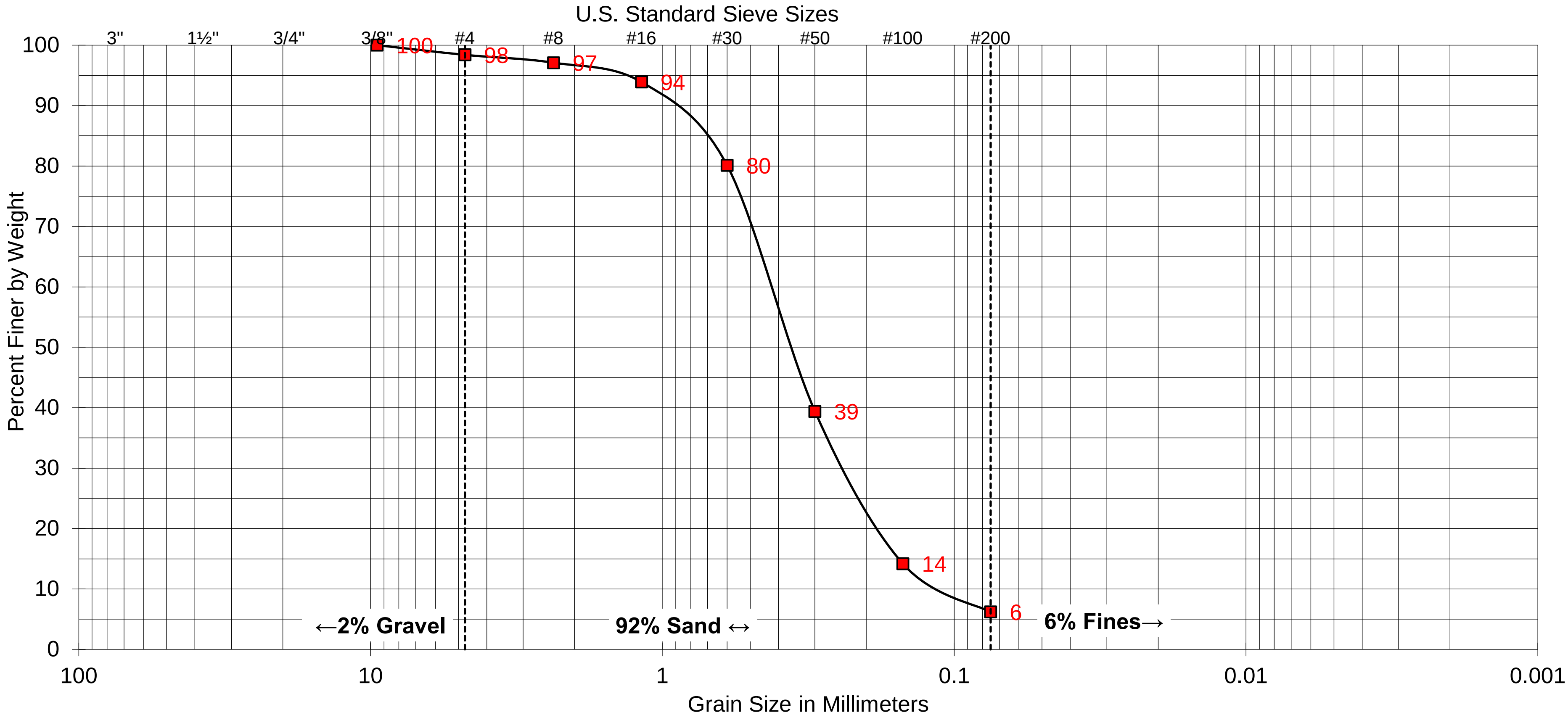
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.77



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND
GRAVEL		SAND			CLAY

SAMPLE	
BORING NUMBER:	B-31
SAMPLE DEPTH:	40' - 41.5'

UNIFIED SOIL CLASSIFICATION: SP

DESCRIPTION: POORLY GRADED SAND WITH SILT

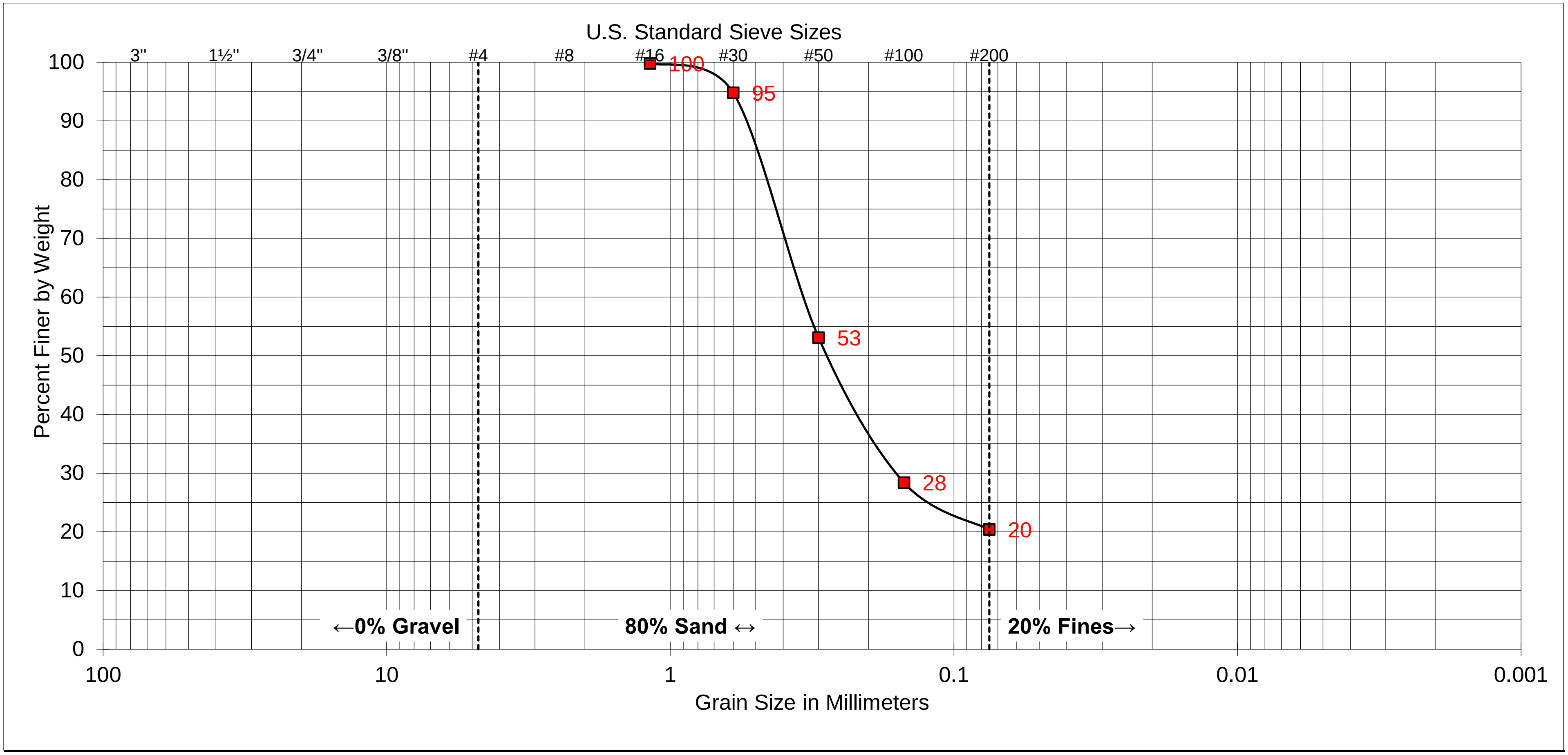
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.78



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND
GRAVEL		SAND			CLAY

SAMPLE	
BORING NUMBER:	B-31
SAMPLE DEPTH:	65' - 65.9'

UNIFIED SOIL CLASSIFICATION: SM

DESCRIPTION: SILTY SAND

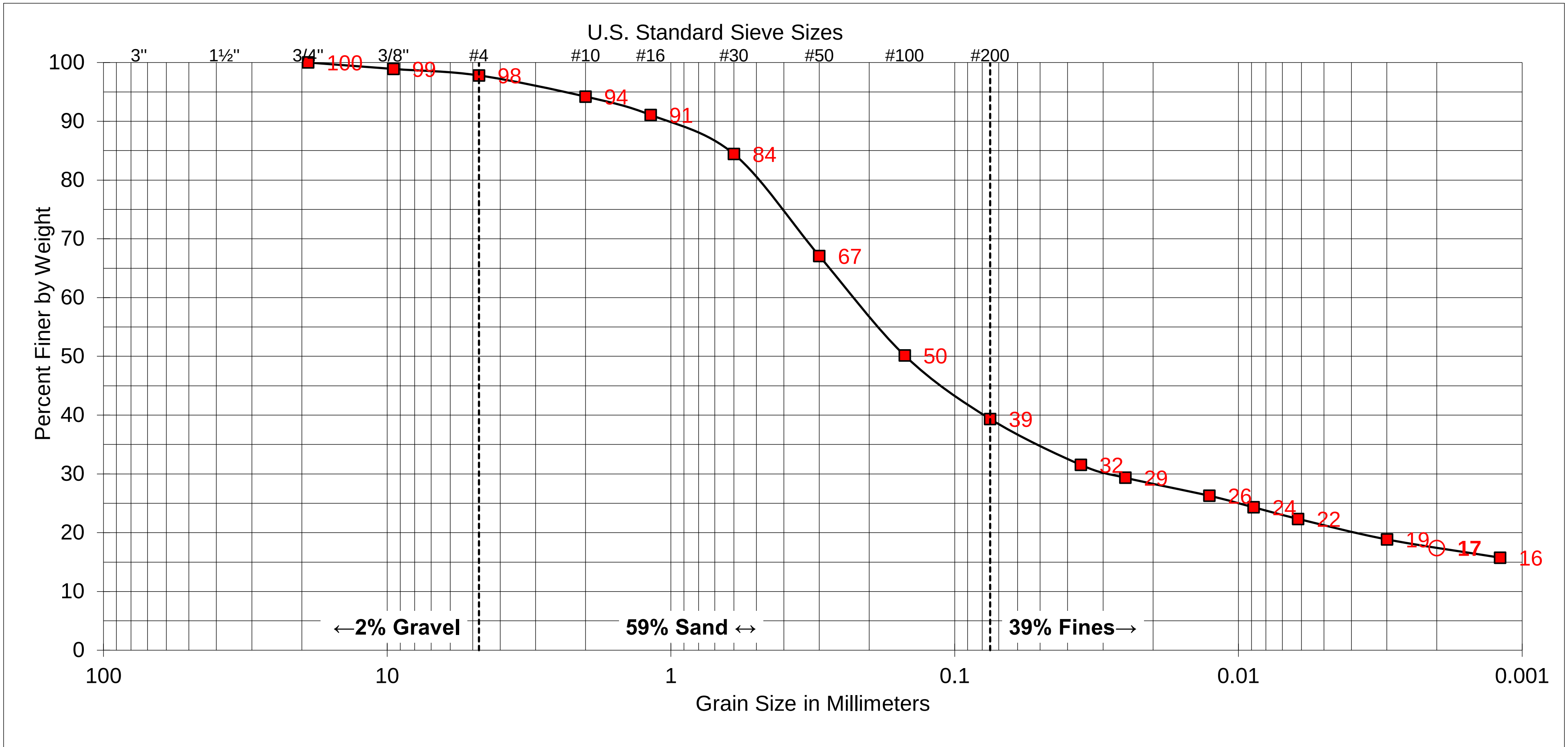
ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.79



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND
GRAVEL		SAND			CLAY

SAMPLE	
SAMPLE NUMBER:	B-32
SAMPLE DEPTH:	0.5 - 5'

UNIFIED SOIL CLASSIFICATION: SC

DESCRIPTION: CLAYEY SAND

ATTERBERG LIMITS	
LIQUID LIMIT:	--
PLASTIC LIMIT:	--
PLASTICITY INDEX:	--

GROUP DELTA

SOIL CLASSIFICATION

Project No. SD605

FIGURE C-1.80

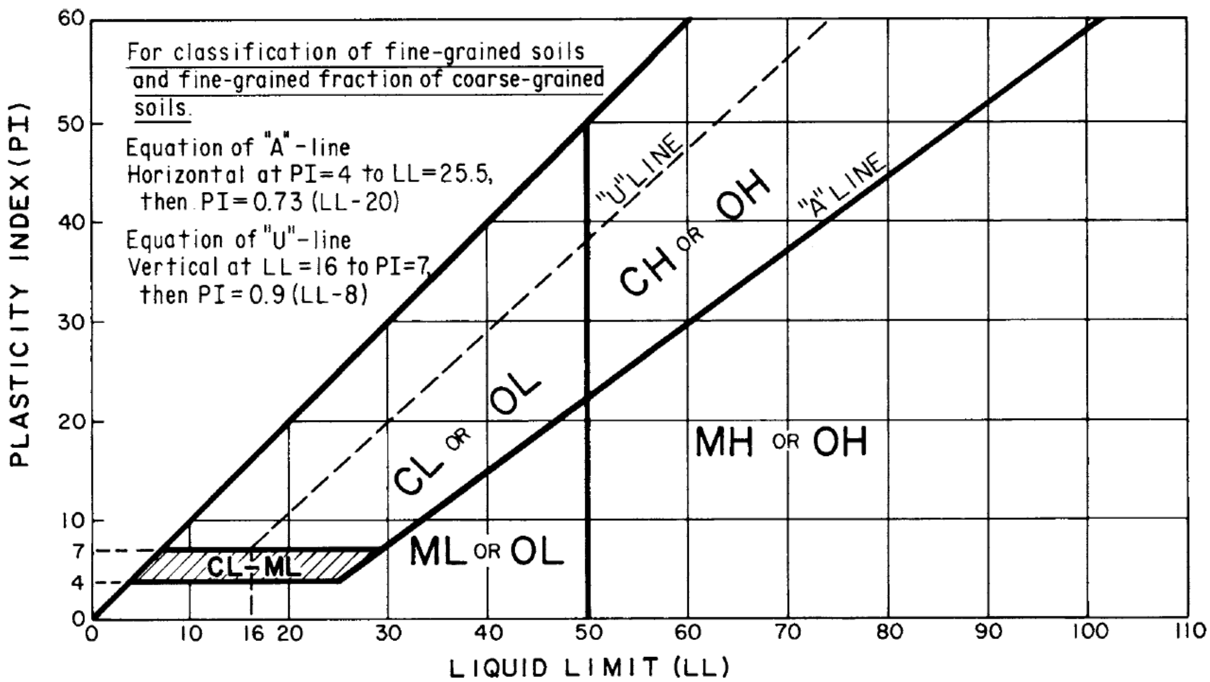
ATTERBERG LIMITS RESULTS
(ASTM D4318)

SAMPLE	DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX
S-2 @ 10' – 11.5'	Sandy Lean CLAY (CL)	40	18	22
S-2 @ 26' – 26.5'	Sandy Lean CLAY (CL)	39	17	22
S-2 @ 50' – 51'	Fat CLAY with sand (CH)	51	24	27
S-3 @ 10.5' – 11'	Sandy Lean CLAY (CL)	42	18	24
S-3 @ 34' – 36'	Sandy Lean CLAY (CL)	42	14	28
S-4 @ 10' – 11.5'	Lean CLAY with sand (CL)	48	19	29
S-4 @ 20' – 21.5'	Lean CLAY with sand (CL)	42	16	26
S-5 @ 0.5' – 5'	Clayey SAND with gravel (SC)	38	15	23
S-5 @ 20.5' – 21'	Lean CLAY with sand (CL)	46	20	26
S-6 @ 20' – 21.5'	Sandy Lean CLAY (CL)	42	16	26
S-7 @ 0.5' – 5'	Sandy Lean CLAY (CL)	39	14	25
S-8 @ 40.5' – 41'	Fat CLAY (CH)	59	21	38
S-9 @ 30' – 31'	Fat CLAY (CH)	66	22	44
S-10 @ 0.5' – 5'	Clayey SAND with gravel (SC)	39	15	24
S-10 @ 35' – 36.5'	Sandy Lean CLAY (CL)	45	16	29
S-10 @ 45' – 46.5'	Sandy Lean CLAY (CL)	46	17	29
S-11 @ 0.5' – 5'	Sandy Lean CLAY (CL)	38	13	25
S-11 @ 10' – 11.5'	Sandy Lean CLAY (CL)	38	15	23
S-12 @ 35' – 36'	Sandy fat CLAY (CH)	53	21	32
S-13 @ 0.5' – 5'	Clayey SAND with gravel (SC)	40	17	23
B-14 @ 5' – 6.5'	Sandy Lean CLAY (CL)	40	17	23
B-15 @ 6' – 6.5'	Clayey SAND with gravel (SC)	36	19	17
B-16 @ 20' – 21.5'	Clayey SAND (SC)	34	17	17
B-16 @ 41' – 41.5'	Sandy Fat CLAY (CH)	55	28	27
B-17 @ 20' – 21.5'	Clayey SAND (SC)	35	16	19
B-18 @ 0.5' – 5'	Clayey SAND (SC)	38	15	23
B-21 @ 5' – 6.5'	Clayey SAND (SC)	33	18	15

ATTERBERG LIMITS RESULTS (CONTINUED)
(ASTM D4318)

SAMPLE	DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX
B-21 @ 25' – 26.5'	Sandy Lean CLAY (CL)	33	18	15
B-22 @ 15' – 16.5'	Clayey SAND (SC)	33	15	18
B-23 @ 60' – 61'	Silty SAND (SM)	NP	NP	NP
B-27 @ 0.5' – 5'	Clayey SAND (SC)	36	15	21
B-27 @ 25.5' – 26'	Sandy Lean CLAY (CL)	41	21	20
B-27 @ 50' – 51.5'	Lean CLAY (CL)	47	16	31
B-28 @ 15' – 16.5'	Sandy Lean CLAY (CL)	41	18	23
B-30 @ 0.5' – 5'	Clayey SAND (SC)	29	14	15
B-31 @ 30' – 31.5'	Sandy Lean CLAY (CL)	36	20	16

NP = Nonplastic



EXPANSION TEST RESULTS

(ASTM D4829)

SAMPLE	DESCRIPTION	EXPANSION INDEX
S-2 @ 0.5' – 5'	Clayey SAND (SC)	26
S-6 @ 0.5' – 5'	Lean CLAY with sand (CL)	75
S-7 @ 0.5' – 5'	Sandy Lean CLAY (CL)	50
S-10 @ 0.5' – 5'	Clayey SAND with gravel (SC)	20
S-11 @ 0.5' – 5'	Sandy Lean CLAY (CL)	63
S-12 @ 0.5' – 5'	Clayey SAND (SC)	25
S-13 @ 0.5' – 5'	Clayey SAND (SC)	70
B-14 @ 0.5' – 2.5'	Clayey SAND (SC)	6
B-16 @ 2.5' – 5'	Clayey SAND (SC)	55
B-19 @ 0.5' – 4.4'	Clayey SAND (SC)	31
B-20 @ 0.5' – 2.5'	Clayey SAND (SC)	36
B-21 @ 0.5' – 5'	Clayey SAND (SC)	52
B-24 @ 0.5' – 5'	Clayey SAND (SC)	55
B-27 @ 0.5' – 5'	Clayey SAND (SC)	36
B-28 @ 0.5' – 5'	Clayey SAND (SC)	32
B-30 @ 0.5' – 5'	Clayey SAND (SC)	18
B-31 @ 2.5' – 5'	Clayey SAND (SC)	34

EXPANSION INDEX	POTENTIAL EXPANSION
0 to 20	Very low
21 to 50	Low
51 to 90	Medium
91 to 130	High
Above 130	Very High

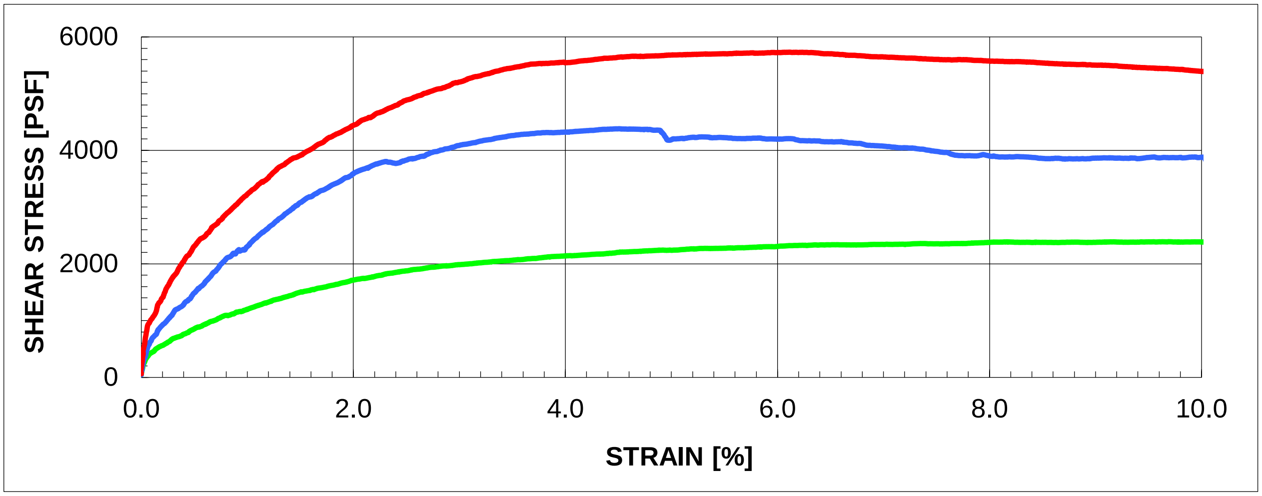
CORROSIVITY TEST RESULTS
(ASTM D516, CTM 643)

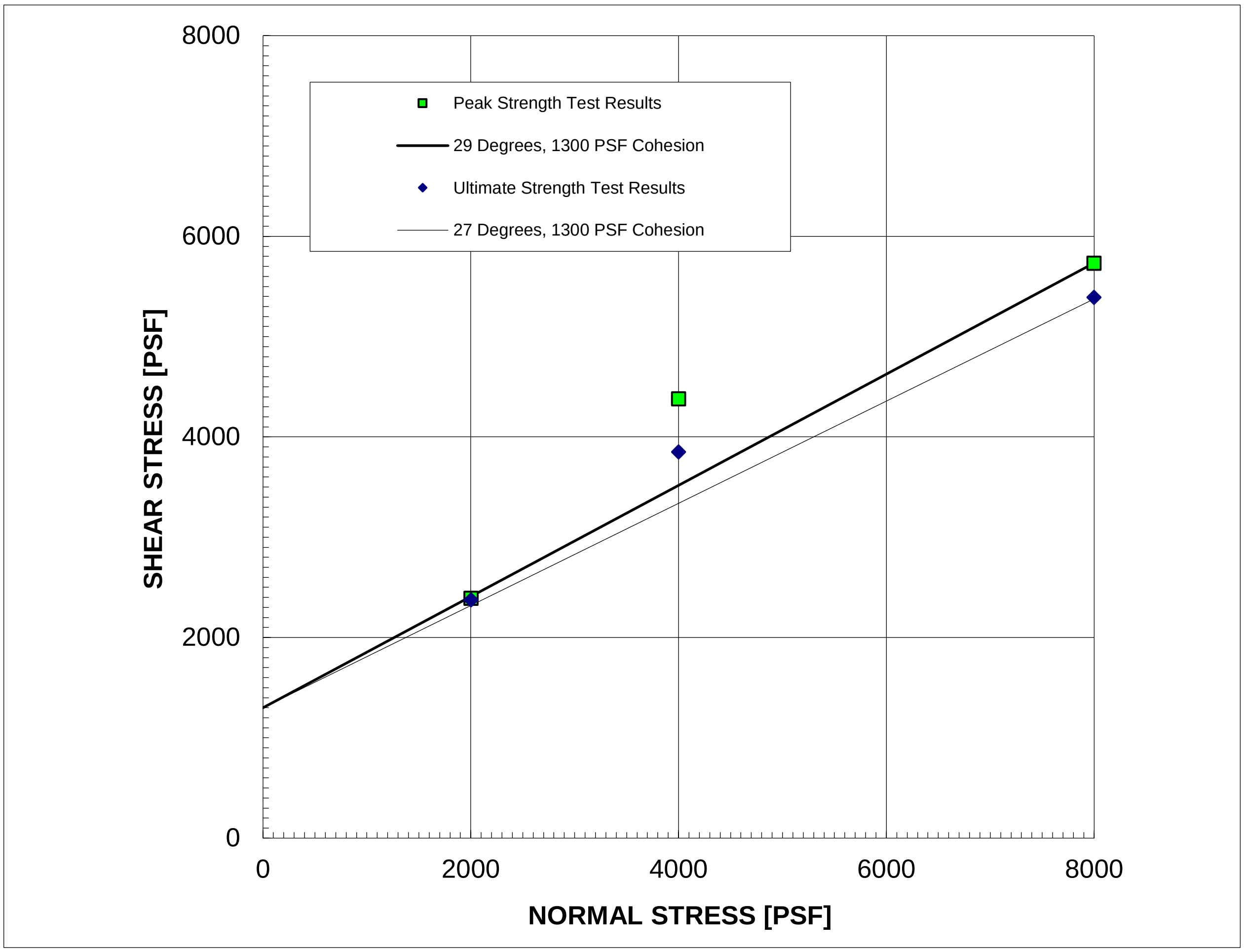
SAMPLE	pH	RESISTIVITY [OHM-CM]	SULFATE CONTENT [%]	CHLORIDE CONTENT [%]
S-2 @ 0.5' – 5'	8.6	1,950	<0.01	<0.01
S-6 @ 0.5' – 5'	7.1	1,135	0.01	0.01
S-7 @ 0.5' – 5'	8.0	600	0.03	0.07
S-10 @ 0.5' – 5'	7.9	980	<0.01	0.06
S-11 @ 0.5' – 5'	8.2	940	<0.01	0.01
B-16 @ 2.5' – 5'	8.6	970	0.01	0.01
B-17 @ 0.5' – 5'	8.5	1,080	<0.01	<0.01
B-20 @ 0.5' – 2.5'	8.3	1,120	<0.01	0.01
B-21 @ 0.5' – 5'	8.5	1,960	<0.01	0.01
B-24 @ 0.5' – 5'	8.8	880	<0.01	0.01
B-26 @ 0.5' – 5'	8.4	2,210	<0.01	0.01
B-27 @ 0.5' – 5'	7.9	720	0.02	0.07
B-30 @ 0.5' – 5'	8.6	1,320	0.01	0.01

SULFATE CONTENT [%]	SULFATE EXPOSURE	CEMENT TYPE
0.00 to 0.10	Negligible	-
0.10 to 0.20	Moderate	II, IP(MS), IS(MS)
0.20 to 2.00	Severe	V
Above 2.00	Very Severe	V plus pozzolan

SOIL RESISTIVITY [OHM-CM]	GENERAL DEGREE OF CORROSIVITY TO FERROUS METALS
0 to 1,000	Very Corrosive
1,000 to 2,000	Corrosive
2,000 to 5,000	Moderately Corrosive
5,000 to 10,000	Mildly Corrosive
Above 10,000	Slightly Corrosive

CHLORIDE (Cl) CONTENT [%]	GENERAL DEGREE OF CORROSIVITY TO METALS
0.00 to 0.03	Negligible
0.03 to 0.15	Corrosive
Above 0.15	Severely Corrosive





SAMPLE: S-2 @ 46' - 46.5'

Description:
Clayey SAND (SC)

	PEAK	ULTIMATE
ϕ'	29 °	27 °
C'	1,300 PSF	1,300 PSF

STRAIN RATE: 0.0020 IN/MIN

(Sample was consolidated and drained)

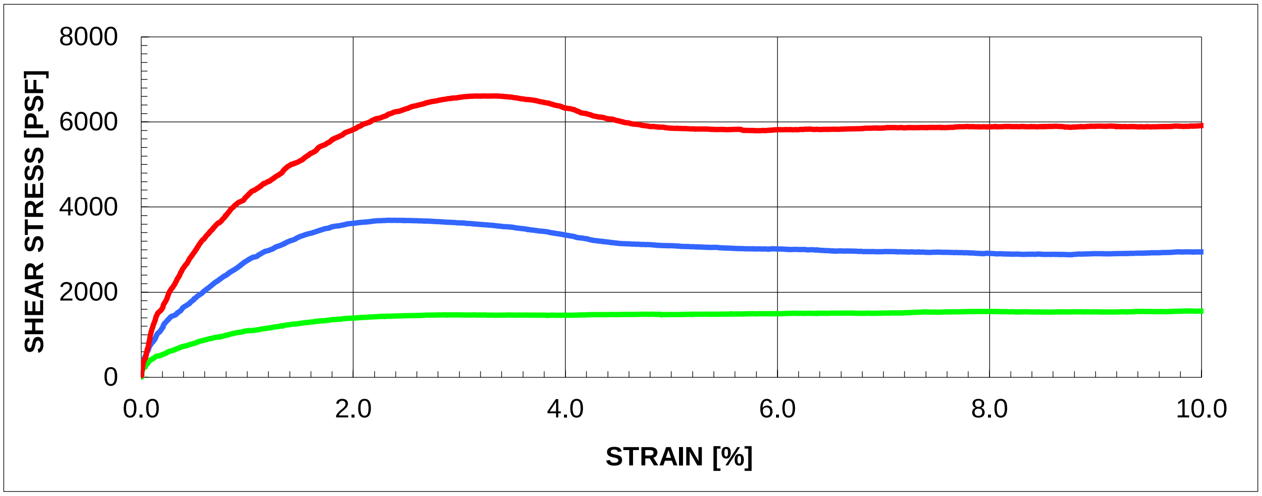
	IN-SITU	AS-TESTED
γ_d	102.3 PCF	102.3 PCF
w_c	21.1 %	24.0 %

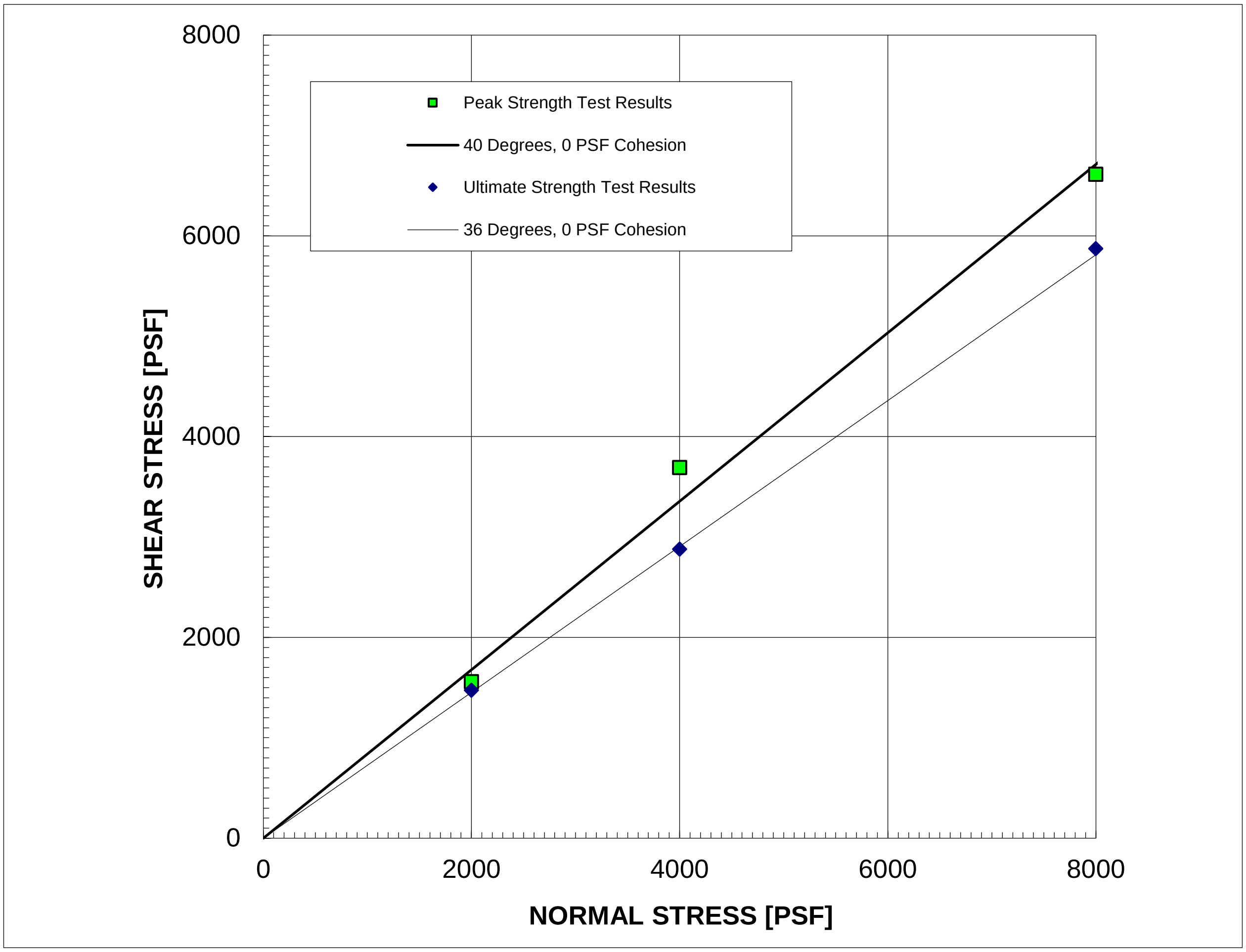
GROUP DELTA

DIRECT SHEAR TEST RESULTS

Project No. SD605

FIGURE C-4.1





SAMPLE: S-7 @ 50.4' - 50.9'

Description:
Silty SAND (SM)

	PEAK	ULTIMATE
φ'	40 °	36 °
C'	0 PSF	0 PSF

STRAIN RATE: 0.0030 IN/MIN

(Sample was consolidated and drained)

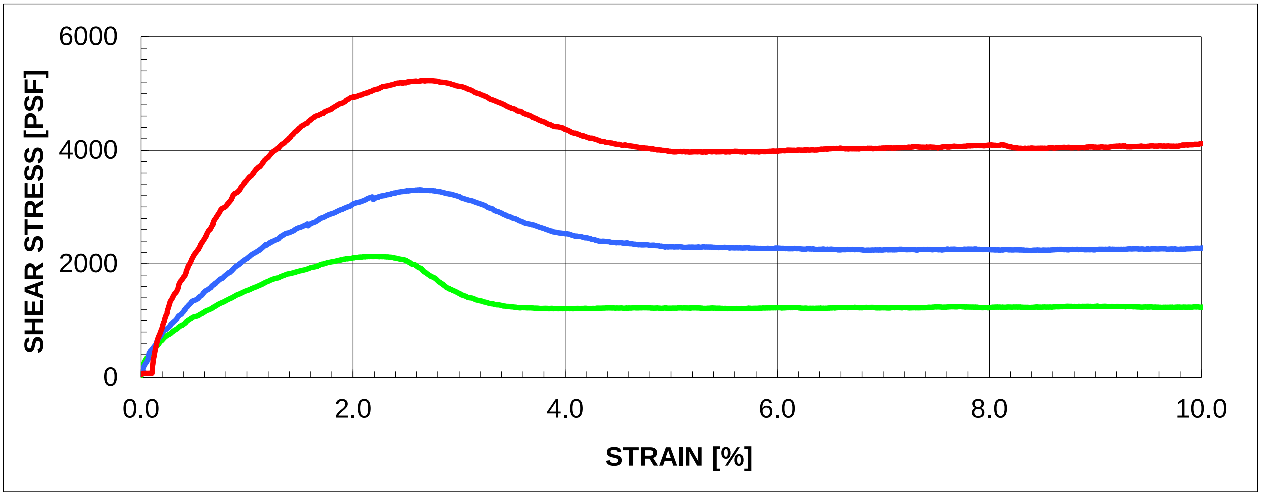
	IN-SITU	AS-TESTED
γ_d	103.2 PCF	103.2 PCF
w_c	22.0 %	23.3 %

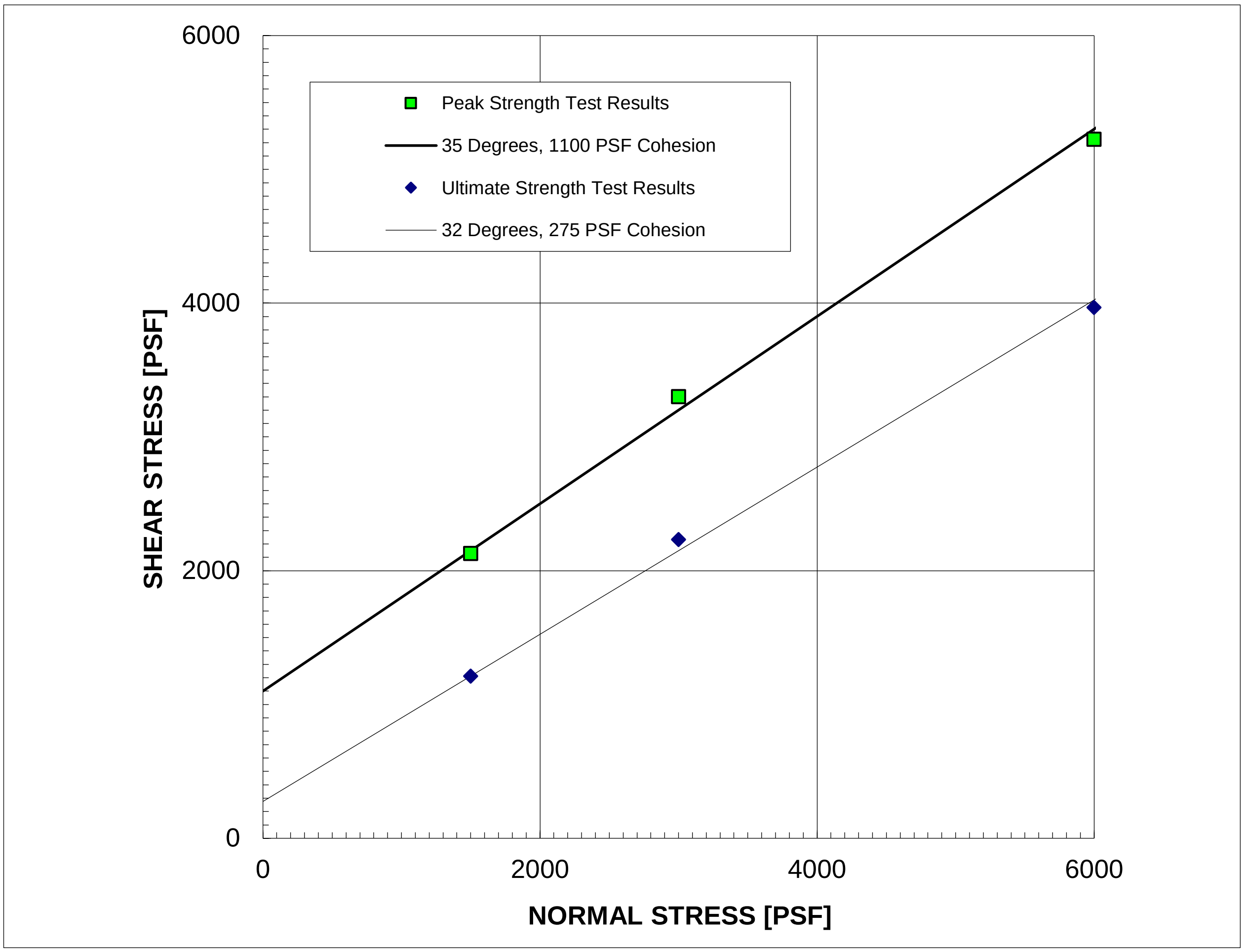
GROUP DELTA

DIRECT SHEAR TEST RESULTS

Project No. SD605

FIGURE C-4.2





SAMPLE: B-15 @ 35.5' - 36'

Description:
Gray silty SAND (SM)

	PEAK	ULTIMATE
ϕ'	35 ^{o}	32 ^{o}
C'	1,100 PSF	275 PSF

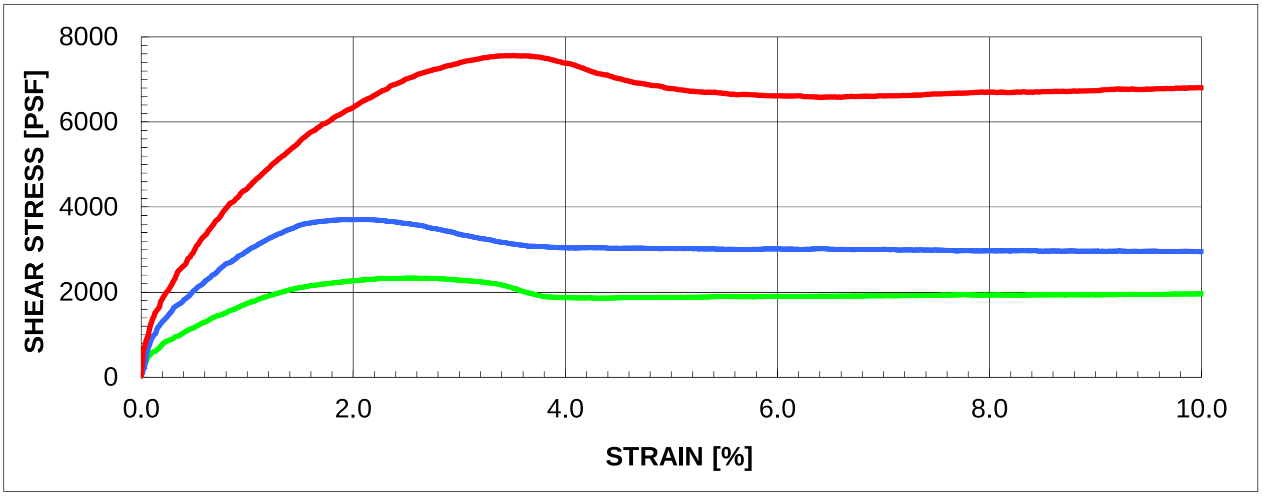
STRAIN RATE: 0.0030 IN/MIN
(Sample was consolidated and drained)

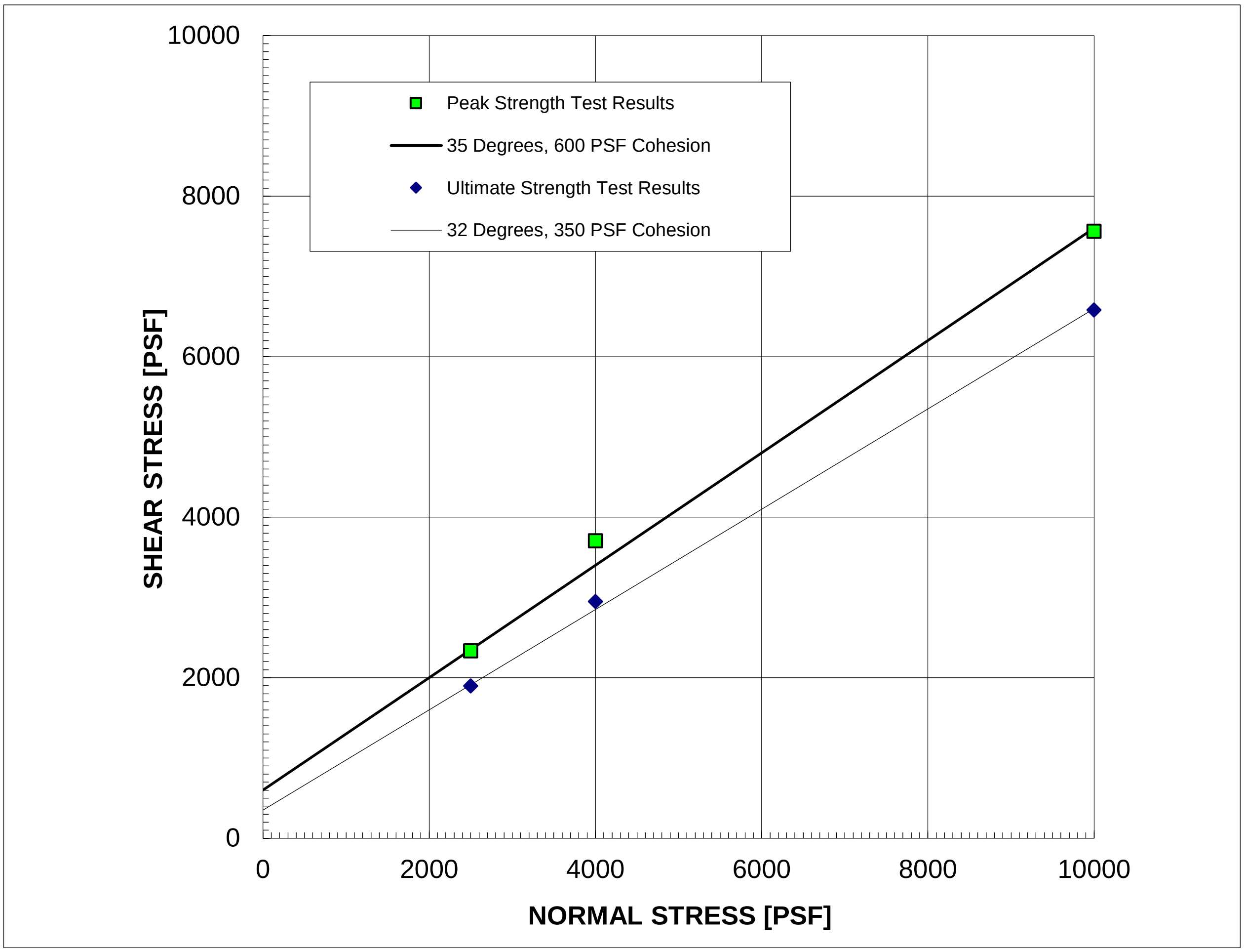
	IN-SITU	AS-TESTED
γ_d	119.7 PCF	119.7 PCF
w_c	6.1 %	15.1 %

GROUP DELTA

DIRECT SHEAR TEST RESULTS

Project No. SD605
FIGURE C-4.3





SAMPLE: B-17 @ 60.5' - 70'

Description:
Poorly graded SAND with silt (SP-SM)

	PEAK	ULTIMATE
ϕ'	35 ^{o}	32 ^{o}
C'	600 PSF	350 PSF

STRAIN RATE: 0.0030 IN/MIN

(Sample was consolidated and drained)

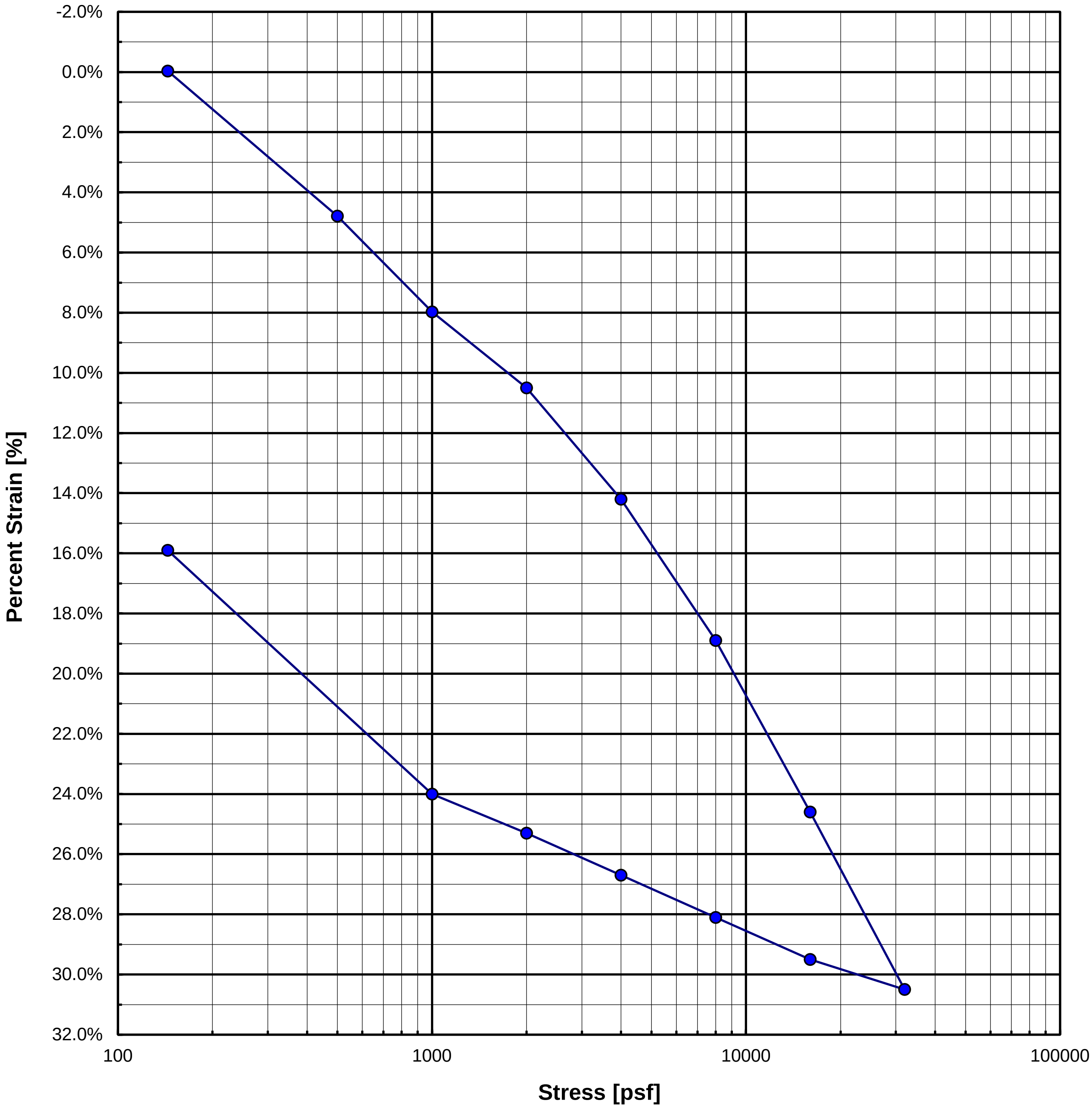
	IN-SITU	AS-TESTED
γ_d	105.3 PCF	105.3 PCF
w_c	19.7 %	22.2 %

GROUP DELTA

DIRECT SHEAR TEST RESULTS

Project No. SD605

FIGURE C-4.4



BORING NUMBER/DEPTH: **S-5 @ 21' - 21.5'** DESCRIPTION: **Lean CLAY with sand (CL)**

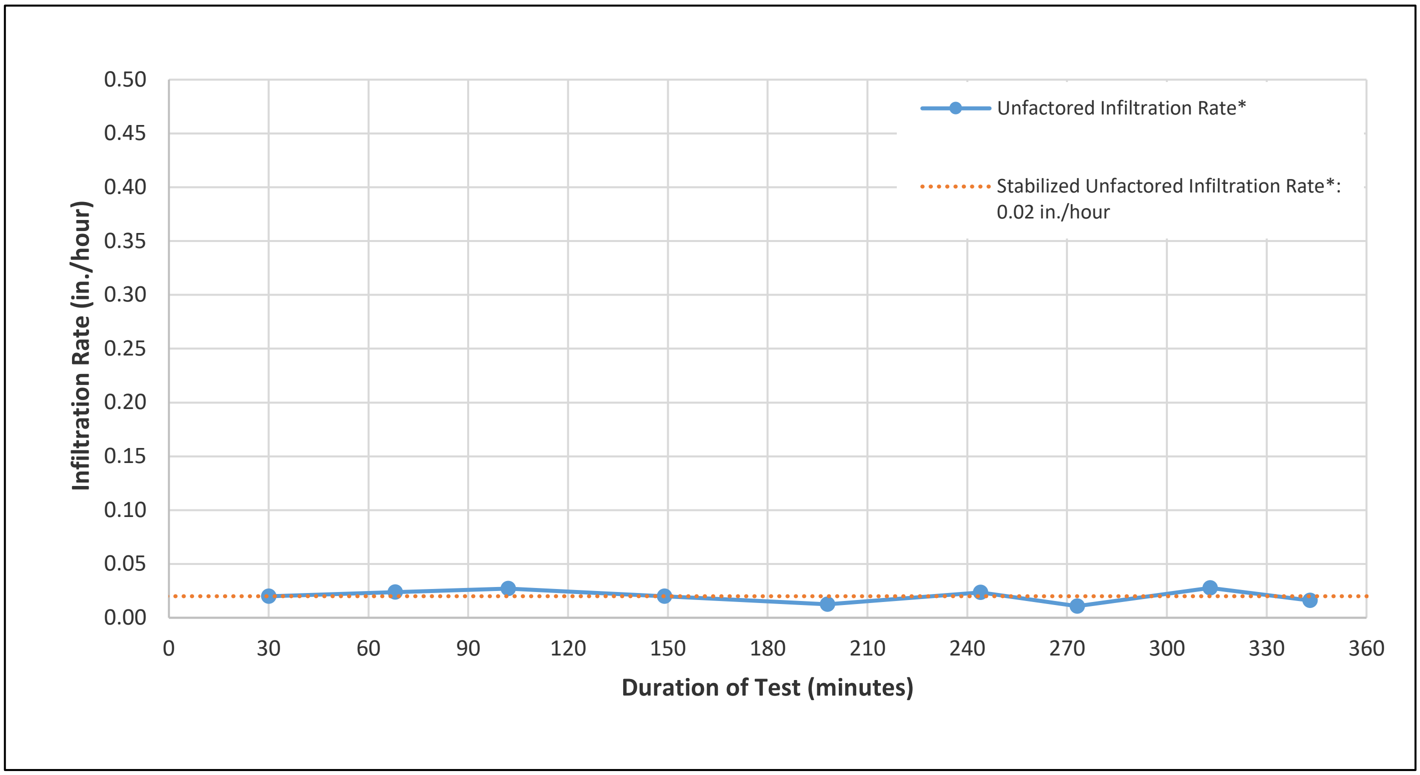
INITIAL	FINAL	
1.0000	0.8410	SAMPLE HEIGHT [IN]
72.2	85.9	DRY DENSITY [PCF]
2.96	2.96	SPECIFIC GRAVITY (ASSUMED)
1.56	1.16	VOID RATIO (e)
50.1	39.0	WATER CONTENT [%]
95.0	100.0	DEGREE OF SATURATION [%]

APPENDIX D
STORM WATER INFILTRATION TEST RESULTS

BOREHOLE PERCOLATION TEST

Project Name:	SDSU Mission Valley	**Date Drilled:**	3/12/2019	**Borehole Radius (*r):**	4 in.
Project Number:	SD605	**Date Tested:**	3/13/2019	**Casing Diameter:**	4 in.
Test Hole Number:	I-1	**Tested By:**	TSL	**Depth of Hole:**	4.4 ft
Drilling Method:	Hollow-Stem Auger	**Average Temp. of Water:**	60 F	**Average Test Depth:**	2.4' - 4.4'

UNFACTORED INFILTRATION RATES* DURING TEST



Preliminary Factored Infiltration Rate[1]: 0.01 in./hr.

Feasibility Screening Factor of Safety, F.S.[2]: 2

Temperature Correction Factor[2,3]: 0.86

Factored Infiltration Rate[2]	Design Condition[2]
Below 0.05	No Infiltration
0.05 to 0.5	Partial Infiltration
Above 0.50	Full Infiltration

*Porchet method used to convert percolation rate to infiltration rate. See Appendix D for details.

1: Rate Factored by Factor of Safety and Temperature Correction Factor.

2: Reference: The City of San Diego, BMP Design Manual (2018).

3: Factor based on as-tested water temperature of 60 F and rainfall temperature of 50 F.

SAN DIEGO STATE UNIVERSITY MISSION VALLEY SAN DIEGO, CALIFORNIA	BOREHOLE PERCOLATION TEST - I-1 INFILTRATION RATE	GROUP DELTA PROJECT NUMBER SD605	FIGURE NUMBER D-1.1

BOREHOLE PERCOLATION TEST

Project Name: SDSU Mission Valley
Project Number: SD605
Test Hole Number: I-1
Drilling Method: Hollow-Stem Auger

Date Drilled: 3/12/2019
Date Tested: 3/13/2019
Tested By: TSL
Average Temp. of Water: 60 F

Borehole Radius (*r): 4 in.
Casing Diameter: 4 in.
Depth of Hole: 4.4 ft
Average Test Depth: 2.4' - 4.4'

DATA SHEET

Reading Number	Time Interval (min.)	Cumulative Time (min.)	Initial Depth to Water (ft.)	Final Depth to Water (ft.)	Average Height of Water (Head) (in.)	Measured Drop in Water Level (in.)	Corrected Drop in Water Level[1] (in.)	Corrected Percolation Rate[1] (in./hour)	Unfactored Infiltration Rate* (in./hour)
	Δt	T	[from ground surface]		H_{avg}	ΔH	ΔH_c	$\Delta H_c/\Delta t$	I_t
Pre-soak	-	-			--	--	--	--	--
1	30	30	2.35	2.37	24.48	0.24	0.13	0.26	0.02
2	38	68	2.37	2.40	24.18	0.36	0.20	0.31	0.02
3	34	102	2.40	2.43	23.82	0.36	0.20	0.35	0.03
4	47	149	2.43	2.46	23.46	0.36	0.20	0.25	0.02
5	49	198	2.40	2.42	23.88	0.24	0.13	0.16	0.01
6	46	244	2.42	2.46	23.55	0.42	0.23	0.30	0.02
7	29	273	2.46	2.47	23.28	0.12	0.07	0.14	0.01
8	40	313	2.47	2.50	23.01	0.42	0.23	0.35	0.03
9	30	343	2.50	2.52	22.71	0.18	0.10	0.20	0.02

1: Porosity of gravel assumed to be 0.4 to correct drop in water. See Appendix D for details.
*Porchet method used to convert percolation rate to infiltration rate. See Appendix D for details.

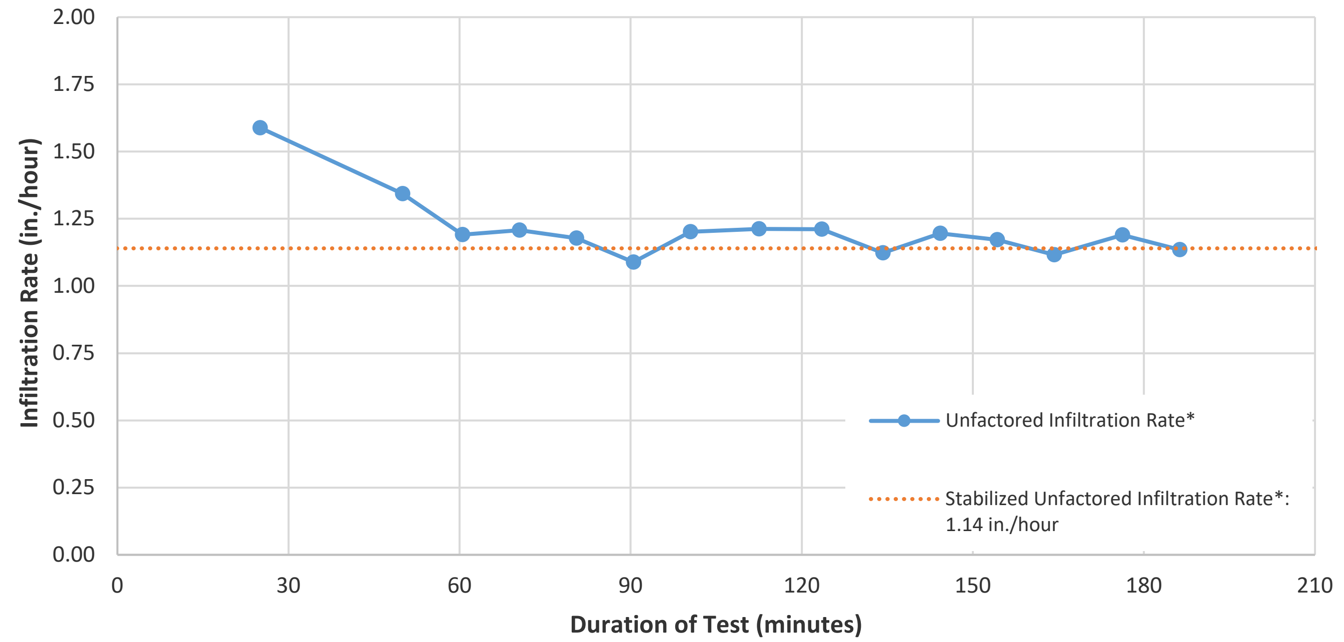
Stabilized, Unfactored Infiltration Rate*: 0.02 inch/hour

SAN DIEGO STATE UNIVERSITY MISSION VALLEY SAN DIEGO, CALIFORNIA	**BOREHOLE PERCOLATION TEST - I-1 INFILTRATION RATE**	GROUP DELTA PROJECT NUMBER **SD605**	FIGURE NUMBER **D-1.2**

BOREHOLE PERCOLATION TEST

Project Name:	SDSU Mission Valley	**Date Drilled:**	3/12/2019	**Borehole Radius (*r):**	4 in.
Project Number:	SD605	**Date Tested:**	3/13/2019	**Casing Diameter:**	4 in.
Test Hole Number:	I-2	**Tested By:**	TSL	**Depth of Hole:**	5.0 ft
Drilling Method:	Hollow-Stem Auger	**Average Temp. of Water:**	60 F	**Average Test Depth:**	2.9' - 5'

UNFACTORED INFILTRATION RATES* DURING TEST



Preliminary Factored Infiltration Rate[1]: 0.49 in./hr.

Feasibility Screening Factor of Safety, F.S.[2]: 2

Temperature Correction Factor[2,3]: 0.86

Factored Infiltration Rate[2]	Design Condition[2]
Below 0.05	No Infiltration
0.05 to 0.5	Partial Infiltration
Above 0.50	Full Infiltration

*Porchet method used to convert percolation rate to infiltration rate. See Appendix D for details.

1: Rate Factored by Factor of Safety and Temperature Correction Factor.

2: Reference: The City of San Diego, BMP Design Manual (2018).

3: Factor based on as-tested water temperature of 60 F and rainfall temperature of 50 F.

SAN DIEGO STATE UNIVERSITY MISSION VALLEY SAN DIEGO, CALIFORNIA	BOREHOLE PERCOLATION TEST - I-2 INFILTRATION RATE	GROUP DELTA PROJECT NUMBER: SD605 FIGURE NUMBER: D-2.1

BOREHOLE PERCOLATION TEST

Project Name:	SDSU Mission Valley	**Date Drilled:**	3/12/2019	**Borehole Radius (*r):**	4 in.
Project Number:	SD605	**Date Tested:**	3/13/2019	**Casing Diameter:**	4 in.
Test Hole Number:	I-2	**Tested By:**	TSL	**Depth of Hole:**	5.0 ft
Drilling Method:	Hollow-Stem Auger	**Average Temp. of Water:**	60 F	**Average Test Depth:**	2.9' - 5'

DATA SHEET

Reading Number	Time Interval (min.)	Cumulative Time (min.)	Initial Depth to Water (ft.)	Final Depth to Water (ft.)	Average Height of Water (Head) (in.)	Measured Drop in Water Level (in.)	Corrected Drop in Water Level[1] (in.)	Corrected Percolation Rate[1] (in./hour)	Unfactored Infiltration Rate* (in./hour)
	Δt	T	[from ground surface]		H_{avg}	ΔH	ΔH_c	$\Delta H_c/\Delta t$	I_t
Pre-soak	-	-			--	--	--	--	--
1	25	25	2.27	3.61	24.72	16.08	8.84	21.23	1.59
2	25	50	2.80	3.76	20.64	11.52	6.34	15.21	1.34
3	11	61	2.97	3.35	22.08	4.56	2.51	14.33	1.19
4	10	71	2.96	3.33	22.26	4.44	2.44	14.65	1.21
5	10	81	2.97	3.33	22.20	4.32	2.38	14.26	1.18
6	10	91	2.87	3.22	23.46	4.20	2.31	13.86	1.09
7	10	101	2.95	3.32	22.38	4.44	2.44	14.65	1.20
8	12	113	2.95	3.39	21.96	5.28	2.90	14.52	1.21
9	11	124	2.93	3.34	22.38	4.92	2.71	14.76	1.21
10	11	134	2.96	3.33	22.26	4.44	2.44	13.63	1.12
11	10	144	3.00	3.36	21.84	4.32	2.38	14.26	1.20
12	10	154	3.02	3.37	21.66	4.20	2.31	13.86	1.17
13	10	164	3.05	3.38	21.42	3.96	2.18	13.07	1.12
14	12	176	2.81	3.27	23.52	5.52	3.04	15.18	1.19
15	10	186	3.02	3.36	21.72	4.08	2.24	13.46	1.14

1: Porosity of gravel assumed to be 0.4 to correct drop in water. See Appendix D for details.
*Porchet method used to convert percolation rate to infiltration rate. See Appendix D for details.

Stabilized, Unfactored Infiltration Rate*: 1.14 inch/hour

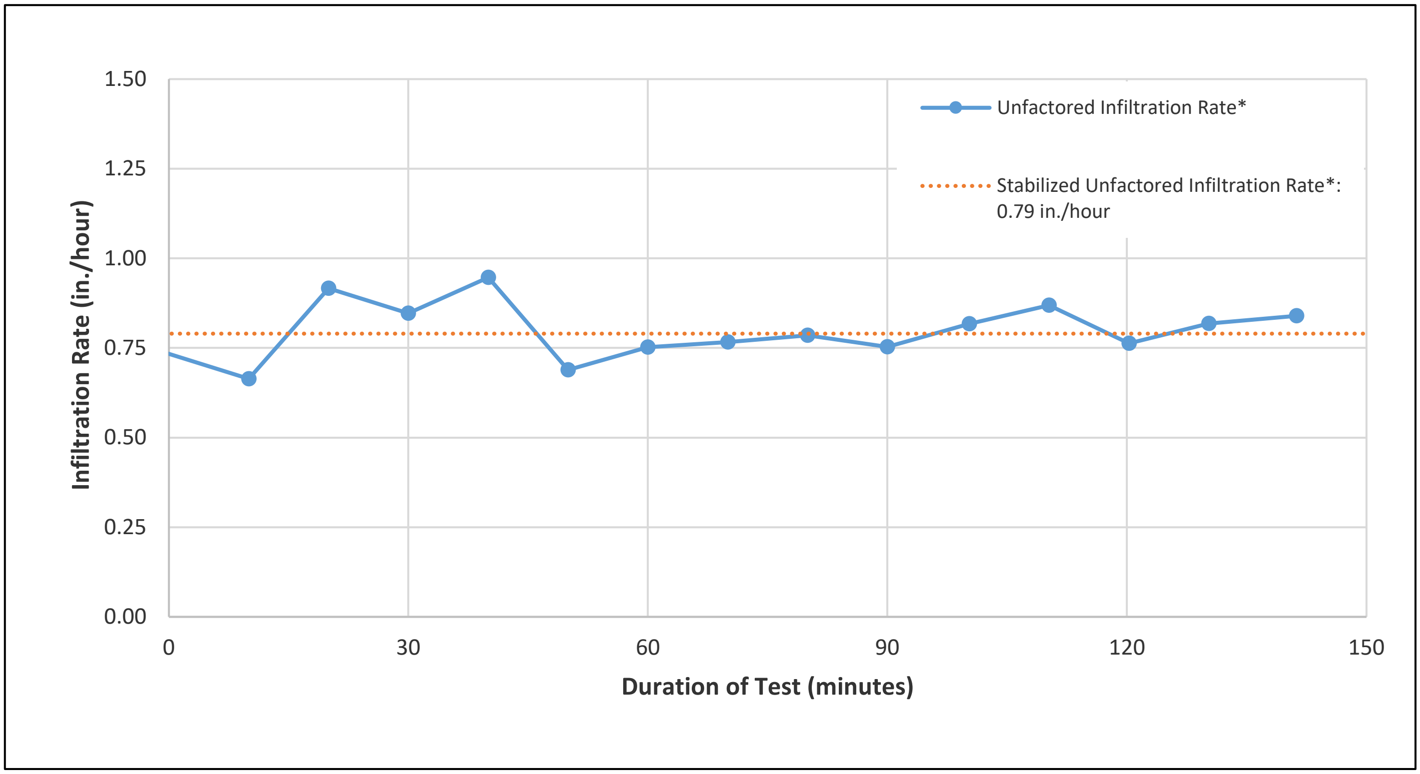
SAN DIEGO STATE UNIVERSITY MISSION VALLEY SAN DIEGO, CALIFORNIA	**BOREHOLE PERCOLATION TEST - I-2 INFILTRATION RATE**	PROJECT NUMBER **SD605**	FIGURE NUMBER **D-2.2**

GROUP DELTA

BOREHOLE PERCOLATION TEST

Project Name:	SDSU Mission Valley	**Date Drilled:**	3/12/2019	**Borehole Radius (*r):**	4 in.
Project Number:	SD605	**Date Tested:**	3/13/2019	**Casing Diameter:**	4 in.
Test Hole Number:	I-3	**Tested By:**	TSL	**Depth of Hole:**	4.8 ft
Drilling Method:	Hollow-Stem Auger	**Average Temp. of Water:**	60 F	**Average Test Depth:**	2.7' - 4.8'

UNFACTORED INFILTRATION RATES* DURING TEST



Preliminary Factored Infiltration Rate[1]: 0.34 in./hr.

Feasibility Screening Factor of Safety, F.S.[2]: 2

Temperature Correction Factor[2,3]: 0.86

Factored Infiltration Rate[2]	Design Condition[2]
Below 0.05	No Infiltration
0.05 to 0.5	Partial Infiltration
Above 0.50	Full Infiltration

*Porchet method used to convert percolation rate to infiltration rate. See Appendix D for details.

1: Rate Factored by Factor of Safety and Temperature Correction Factor.

2: Reference: The City of San Diego, BMP Design Manual (2018).

3: Factor based on as-tested water temperature of 60 F and rainfall temperature of 50 F.

SAN DIEGO STATE UNIVERSITY MISSION VALLEY SAN DIEGO, CALIFORNIA	BOREHOLE PERCOLATION TEST - I-3 INFILTRATION RATE	GROUP DELTA PROJECT NUMBER SD605	FIGURE NUMBER D-3.1

BOREHOLE PERCOLATION TEST

Project Name: SDSU Mission Valley
Date Drilled: 3/12/2019
Borehole Radius (*r): 4 in.

Project Number: SD605
Date Tested: 3/13/2019
Casing Diameter: 4 in.

Test Hole Number: I-3
Tested By: TSL
Depth of Hole: 4.8 ft

Drilling Method: Hollow-Stem Auger
Average Temp. of Water: 60 F
Average Test Depth: 2.7' - 4.8'

DATA SHEET

Reading Number	Time Interval (min.)	Cumulative Time (min.)	Initial Depth to Water (ft.)	Final Depth to Water (ft.)	Average Height of Water (Head) (in.)	Measured Drop in Water Level (in.)	Corrected Drop in Water Level[1] (in.)	Corrected Percolation Rate[1] (in./hour)	Unfactored Infiltration Rate* (in./hour)
	Δt	T	[from ground surface]		H_{avg}	ΔH	ΔH_c	$\Delta H_c/\Delta t$	I_t
Pre-soak	-	-			--	--	--	--	--
Pre-soak	(25)	(25)	2.70	3.55	19.50	10.20	5.61	13.46	1.25
Pre-soak	(25)	(50)	2.74	3.48	19.68	8.88	4.88	11.72	1.08
1	10	10	2.62	2.84	24.24	2.64	1.45	8.71	0.66
2	10	20	2.76	3.04	22.20	3.36	1.85	11.09	0.92
3	10	30	2.76	3.02	22.32	3.12	1.72	10.30	0.85
4	10	40	2.75	3.04	22.26	3.48	1.91	11.48	0.95
5	10	50	2.70	2.92	23.28	2.64	1.45	8.71	0.69
6	10	60	2.69	2.93	23.28	2.88	1.58	9.50	0.75
7	10	70	2.73	2.97	22.80	2.88	1.58	9.50	0.77
8	10	80	2.69	2.94	23.22	3.00	1.65	9.90	0.79
9	10	90	2.60	2.85	24.30	3.00	1.65	9.90	0.75
10	10	100	2.78	3.04	22.11	3.06	1.68	9.85	0.82
11	10	110	2.65	2.93	23.52	3.36	1.85	11.09	0.87
12	10	120	2.72	2.96	22.92	2.88	1.58	9.50	0.76
13	10	130	2.69	2.95	23.16	3.12	1.72	10.30	0.82
14	11	141	2.70	2.99	22.86	3.48	1.91	10.44	0.84

1: Porosity of gravel assumed to be 0.4 to correct drop in water. See Appendix D for details.
*Porchet method used to convert percolation rate to infiltration rate. See Appendix D for details.

Stabilized, Unfactored Infiltration Rate*: 0.79 inch/hour

SAN DIEGO STATE UNIVERSITY MISSION VALLEY SAN DIEGO, CALIFORNIA	BOREHOLE PERCOLATION TEST - I-3 INFILTRATION RATE	GROUP DELTA PROJECT NUMBER: SD605	FIGURE NUMBER: D-3.2