GEOTECHNICAL INVESTIGATION
MORGAN HILL SEWER TRUNK
PHASE 1 AND PHASE 2 ALIGNMENTS

SOUTH OF HIGHLAND AVENUE
SANTA CLARA COUNTY, CALIFORNIA

NOVEMBER 2, 2018
PROJECT NO. 2016.0096

SUBMITTED TO:

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GEOTECHNICAL INVESTIGATION
PROPOSED MORGAN HILL SEWER TRUNK, SOUTH OF HIGHLAND
PHASE 1 AND PHASE 2
SANTA CLARA COUNTY, CALIFORNIA

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1. INTRODUCTION

1.1 General

This report presents the results of our geotechnical investigation for the proposed Morgan Hill Sewer Trunk South of Highland project between San Martin and Gilroy, in Santa Clara County, California. This report combines our investigation for the Phase 1 alignment conducted in 2016-2017 and our current investigation for the Phase 2 alignment. The proposed pipeline alignment is shown on the Boring Location Maps, Figures 1, 2, and 3, of this report.

This report presents our conclusions and geotechnical recommendations for design and construction of the proposed pipeline. These conclusions and recommendations are based on subsurface information collected during our investigation. The conclusions and recommendations in this report should not be extrapolated to other areas or used for other projects without our review.

1.2 Project Description

The proposal project involves construction of a 36-inch diameter sanitary sewer pipeline. The proposed Phase 1 alignment will begin at Harding Avenue and Highland Avenue in San Martin in the north, then trend easterly along Highland Avenue, continuing southerly along the southbound side of Monterey Road to Cohansey Avenue. The total length of the Phase 1 pipeline is approximately 17,800 feet. The proposed pipe invert will be approximately 5 to 16 feet below ground surface. The Phase 1 pipeline will be constructed using conventional open cut and cover method.

The proposed Phase 2 alignment will begin at the south end of the Phase 1 alignment, at Monterey Road and Cohansey Avenue in the north, continuing south along Monterey Road, turning east along Las Animas Avenue, continuing south along Murray Avenue, turning west and then south along Chestnut Street, turning east along East 7th Street to the City of Gilroy Corporation Yard, crossing under Highway 101 to a Pacific Gas & Electric facility, and continuing south along Renz Lane to an existing sewer pipeline west of Camino Arroyo. The total length of the Phase 2 pipeline is approximately 17,200 feet. The proposed pipe invert will be approximately 6 to 19 feet below ground surface and will be constructed using conventional open cut and cover method except at the following five trenchless undercrossing locations.

- Union Pacific Railroad (UPRR) tracks crossing at Las Animas Avenue
- Miller Slough crossing at Murray Avenue
- Leavesley Road crossing at Murray Avenue
- Miller Slough crossing at Chestnut Street

- Highway 101 crossing at east of East 7th Street (City of Gilroy Corporation Yard)

We understand that pilot tube guided auger boring method is being recommended by DCM Consulting, Inc., project consultant for the trenchless pipeline construction aspect of the project. A copy of the Technical Memorandum prepared by DCM Consulting, dated October 10, 2018 is included in Appendix D of this report.

The above project descriptions are based on information provided to us. If the actual project differs from the descriptions above, Geo-Logic Associates should be contacted to review our conclusions and recommendations and present any necessary modifications to address the different project development schemes.

1.3 Information Provided

For this investigation, we were provided with the following information.

1. A drawing titled "Figure 2, Preliminary Phase 1 Alignment, Sewer Trunk Line Project, City of Morgan Hill," prepared by HydroScience Engineers, undated.

2. A set of 19 sheets of 30% submittal design plans prepared by HydroScience Engineers, dated December 2016.

3. Sheets 6 through 38 of the design plans titled "Sewer Trunk South of Highland, Plan and Profile," prepared by HydroScience, dated August 2018.

4. Technical Memorandum, Geotechnical and Trenchless Engineering, Five Undercrossings, City of Morgan Hill Sewer Trunk South of Highland, prepared by DCM Consulting, Inc., dated October 10, 2018.

1.4 Purpose and Scope of Services

The purpose of our geotechnical investigation was to perform subsurface exploration at selected locations along the proposed pipeline alignment and to develop geotechnical recommendations for design and construction of the pipeline. The following work was performed.

1. Performed site visits to observe surface conditions and to mark locations of our subsurface exploration along the proposed pipeline alignments.

2. Assisted the City of Morgan Hill in obtaining an encroachment permit from County of Santa Clara for our Phase 1 field work and encroachment permits from City of Gilroy for our Phase 2 field work. Traffic control plans were prepared and submitted with the permit applications.

3. Obtained a boring permit from Santa Clara Valley Water District for borings deeper than 45 feet (Phase 2 field exploration).

4. Obtained well permits from Santa Clara Valley Water District for the five groundwater monitoring wells at the five trenchless under-crossings (Phase 2 alignment).

5. Notified Underground Service Alert of our exploration.

6. Coordinated our field exploration with the County of Santa Clara, City of Gilroy, and Santa Clara Valley Water District.

7. Performed subsurface exploration by means of seventeen exploratory drill holes for Phase 1 and twenty three exploratory drill holes for Phase 2.

8. Converted one of the borings at each of the five under-crossing sites to a groundwater monitoring wells.

9. Measured groundwater levels in the monitoring wells periodically.

10. Performed geotechnical laboratory tests on selected soil samples obtained from the drill holes.

11. Performed analytical testing on three selected soil samples from the Phase 1 drill holes as preliminary screening of hazardous materials in the samples.

12. Provided drill hole logs and laboratory test results to DCM Consulting, Inc., project consultant for the trenchless construction portion of the project.

13. Performed engineering analysis of the collected data.

14. Prepared a draft report for our Phase 1 alignment investigation.

15. Prepared this geotechnical investigation report presenting our findings, conclusions and recommendations for both Phase 1 and Phase 2 pipeline alignments.

2. SITE INVESTIGATION

Our Phase 1 and Phase 2 field investigations each consisted of a site reconnaissance and a subsurface exploration program. The site reconnaissance was to observe existing site surface conditions. The subsurface exploration was to explore soil conditions along the proposed pipeline alignment.

2.1 Subsurface Exploration

Our subsurface exploration program for Phase 1 included seventeen exploratory drill holes (DH-1 through DH-17) performed on December 5, 6 and 7, 2016, to a depth of about 20 feet below ground surface. The subsurface exploration program for Phase 2 included twenty three exploratory drill holes (DH-1A through DH-23A) performed on August 28 through 31, September 1, 5, and 6, 2017, and May 22, 2018, to depths between roughly 18 and 60 feet below ground surface. Drilling was conducted using truck-mounted drill rigs equipped with 8-inch diameter hollow-stem augers. The drill holes were located in the field by referencing to existing site features and pacing; therefore, their locations are approximate. The approximate locations of the Phase 1 drill holes are shown on Figure 1 of this report and on Figures 2 and 3 for the Phase 2 drill holes. The approximate station numbers of the drill holes obtained from the August 2018 HydroScience plan and profile drawings are listed below.

Phase 1	
Drill Hole	**Station**
DH-1	344+00
DH-2	336+40
DH-3	320+50
DH-4	310+00
DH-5	299+50
DH-6	289+00
DH-7	278+50
DH-8	268+00
DH-9	257+50
DH-10	247+00
DH-11	236+50
DH-12	226+00
DH-13	215+50
DH-14	205+00
DH-15	194+50
DH-16	184+00
DH-17	173+50

Phase 2	
Drill Hole	**Station**
DH-1A	162+40
DH-2A	153+00

Phase 2	
Drill Hole	**Station**
DH-3A	151+10
DH-4A	142+20
DH-5A	131+60
DH-6A	123+10
DH-7A	121+10
DH-8A	111+00
DH-9A	103+10
DH-10A	98+50
DH-11A	93+20
DH-12A	83+10
DH-13A	75+30
DH-14A	64+80
DH-15A	58+50
DH-16A	52+10
DH-17A	50+30
DH-18A	42+10
DH-19A	34+20
DH-20A	23+60
DH-21A	20+00
DH-22A	10+20
DH-23A	2+10

Soil samples were obtained from the drill holes using a 2-inch outside diameter (1.4-inch inside diameter) split-barrel sampler (also called a Standard Penetration Test sampler) and a 3-inch outside diameter (2½-inch inside diameter) split barrel sampler with 6-inch-long liners. Drive samples were obtained by driving a soil sampler up to 18 inches into the earth material using a 140-pound hammer falling 30 inches. The hammer was operated using a wire winch and pulley system. The number of blows required to drive the samplers was recorded for each 6-inch penetration interval. The number of blows required to drive the sampler the last 12 inches, or the penetration interval indicated on the log where harder material was encountered, is shown as blows per foot (blow count) on the drill hole logs.

Visual classification of soils encountered in our drill holes was made in general accordance with the Unified Soil Classification System (ASTM D 2487 and D 2488). The laboratory test results were used to refine our field classifications. Two Keys to Soil Classification, one for fine grained soils and one for coarse grained soils, are included in Appendix A together with the drill hole logs.

2.2 Laboratory Testing

Laboratory tests were performed on selected soil samples recovered from the drill holes. The geotechnical testing included water content, dry density, Atterberg limits, unconfined compression, triaxial consolidated undrained shear, direct shear, particle size analysis, percent passing a No. 200 sieve, and hydraulic conductivity. Most of the laboratory test results are presented on the drill hole logs at the corresponding sample depths. The results of the Atterberg limits, unconfined compression, triaxial shear, direct shear, particle size analysis, and hydraulic conductivity tests are presented graphically on separate sheets in Appendix B.

In addition to geotechnical testing, analytical testing was performed on three selected soil samples collected from our Phase 1 drill holes. Analytical testing included CAM 17 metals, pesticides, volatile organic compounds, and hydrocarbon (gasoline, diesel, and motor oil). The results of the analytical testing are included in Appendix C. The objective of the analytical testing was preliminary screening of potential hazardous materials in the subsurface soils. Additional testing will be necessary based on the quantity of off-haul and requirements of the receiving party.

3. FINDINGS

3.1 Surface Conditions

The proposed sewer trunk will be constructed mostly in existing roadways within Santa Clara County and City of Gilroy. Portions of the Phase 2 alignment will be construction within the City of Gilroy Corporation Yard on East 7th Street and a Pacific Gas & Electric facility on Renz Lane.

Phase 1 Alignment: Between Harding Avenue and Monterey Road, Highland Avenue is a paved street with one traffic lane in each eastbound and westbound direction, generally with unpaved shoulders. There are no sidewalks except for the section bordering the north side of the Santa Clara County Sig Sanchez Government Center in the southwest corner of Highland Avenue and Monterey Road.

Along Monterey Road, between Highland Avenue and Cohansey Avenue, the proposed pipeline will be constructed along the southbound shoulder. Within this section, Monterey Road is a paved street with two lanes of traffic in each northbound and southbound direction, a paved median and a paved shoulder on each side of the road, and sections of sidewalk on each side. There is an overhead telephone line along the southbound side of Monterey Road. The proposed pipeline will cross several private driveway entrances and intersecting streets, including Carls Court, Neva Drive, Fitzgerald Avenue, and Day Road.

Topography along the Phase 1 alignment is essentially flat lying, with a gentle downslope from west to east along Highland Avenue, and from north to south along Monterey Road. The areas along the Phase 1 alignment are sparsely developed with agriculture, commercial and residential developments.

Phase 2 Alignment: Within the Phase 2 alignment, Monterey Road is a paved street with two lanes of traffic in each northbound and southbound direction, a paved median and a paved shoulder on each side of the road, and sections of sidewalk on each side. Las Animas Avenue is a paved street with one traffic lane in each eastbound and westbound direction, with sidewalk along most of the eastbound lane. Murray Avenue, Chestnut Street, East 7th Street, and Renz Lane are paved streets with single traffic lanes in each direction.

Topography along the Phase 2 pipeline alignment is essentially flat lying, with a gentle downslope from north to south. Areas along the northern portion of the Phase 2 alignment are sparsely developed with agriculture. The middle and southern portions of the Phase 2 alignment are more densely developed with commercial and residential developments.

3.2 Subsurface Conditions

The subsurface soils encountered in our drill holes can generally be described as alluvium with localized fill. The soils encountered in our drill holes are described below. Phase 1 drill holes are numbered as DH-1 through DH-17. Phase 2 drill holes are numbered as DH-1A through DH-23A. The stations referenced below are based on the August 2018 Plan and Profile drawings prepared by HydroScience.

3.2.1 Phase 1 Alignment

DH-1 was located at roughly Station 344+00 and DH-2 was located at roughly Station 366+40. In these holes, a pavement section consisting of roughly 3 to 4 inches of asphalt concrete over roughly 3 to 9 inches of base was encountered at the surface. The pavement section is underlain by stiff to hard lean clays with variable amounts of sand to a depth of roughly 7½ feet bgs. The clays are underlain by layers of medium dense to very dense clayey sand with gravel and well graded sand with gravel and clay to well graded gravel with sand and clay to the maximum explored depth of roughly 20 feet bgs.

DH-3 was located at roughly Station 320+50. A pavement section consisting of roughly 3 inches of asphalt concrete over roughly 10 inches of base was encountered at the surface. The pavement section is underlain by a layer of loose fill consisting of poorly graded sand to a depth of roughly 4 feet bgs. The fill is underlain by very stiff lean clay with sand to a depth of roughly 7½ feet bgs; and medium dense to dense clayey sand with gravel to the maximum explored depth of roughly 20 feet bgs.

DH-4 was located at roughly Station 310+00. A pavement section consisting of roughly 6 inches of asphalt concrete over roughly 10 inches of base was encountered at the surface. The pavement section is underlain by hard sandy lean clay to a depth of roughly 12 feet bgs; and medium dense to very dense clayey sand with gravel to the maximum explored depth of roughly 20 feet bgs.

DH-5 was located at roughly Station 299+50. The surficial soil layer consists of hard, lean clay to lean clay with sand to a depth of roughly 4 feet bgs. This clay is underlain by medium dense clayey sand with gravel to the maximum explored depth of roughly 20 feet bgs.

DH-6 was located at roughly Station 289+00. The surficial soil layers consist of stiff to very stiff lean clay to a depth of roughly 7½ feet bgs; and medium dense to dense poorly graded sand with gravel and clay to the maximum explored depth of roughly 20 feet bgs.

DH-7 was located at roughly Station 278+50. The surficial soil layer consists of very stiff fat clay to a depth of roughly 4½ feet bgs. This fat clay is underlain by medium dense to very dense well graded sand with gravel and clay to clayey sand with gravel to the maximum explored depth of roughly 20 feet bgs.

DH-8 was located at roughly Station 268+00. The surficial soil layer consists of very stiff fat clay to a depth of roughly 4 feet bgs. This fat clay is underlain by dense clayey sand to a depth of roughly 7½ feet bgs; and medium dense clayey sand with gravel to the maximum explored depth of roughly 20 feet bgs.

DH-9 was located at roughly Station 257+50. The surficial soil layer consists of medium dense clayey sand to a depth of roughly 4 feet bgs. This sand is underlain by medium dense to dense clayey sand with gravel to a depth of roughly 17 feet bgs; and very stiff lean clay to the maximum explored depth of roughly 20 feet bgs.

DH-10 was located at roughly Station 247+00. The surficial soil layer consists of very stiff lean clay with sand to a depth of roughly 4 feet bgs. This clay is underlain by dense to very dense clayey sand with gravel to the maximum explored depth of roughly 20 feet bgs.

DH-11 was located at roughly Station 236+50. The surficial soil layer consists of hard lean clay with sand to a depth of roughly 4 feet bgs. This clay is underlain by dense to very dense clayey sand with gravel to the maximum explored depth of roughly 20 feet bgs.

DH-12 was located at roughly Station 226+00. The surficial soil layer consists of very stiff sandy lean clay to a depth of roughly 4 feet bgs. This clay is underlain by medium dense to dense clayey sand with gravel to the maximum explored depth of roughly 20 feet bgs.

DH-13 was located at roughly Station 215+50. The surficial soil layer consists of stiff to very stiff lean clay to a depth of roughly 12 feet bgs. This clay is underlain by stiff sandy lean clay to a depth of roughly 17 feet bgs; and stiff lean clay to the maximum explored depth of roughly 20 feet bgs.

DH-14 was located at roughly Station 205+00. The surficial soil layer consists of medium dense clayey sand to a depth of roughly 4 feet bgs. This sandy is underlain by medium dense clayey sand with gravel to a depth of roughly 7½ feet bgs; and very stiff sandy lean clay to the maximum explored depth of roughly 20 feet bgs.

DH-15 was located at roughly Station 194+50. The surficial soil layer consists of hard lean clay with sand to a depth of roughly 4 feet bgs. This clay is underlain by medium dense to very dense clayey sand with gravel to the maximum explored depth of roughly 20 feet bgs.

DH-16 was located at roughly Station 184+00. The surficial soil layer consists of hard, high plasticity fat clay with sand to a depth of roughly 7½ feet bgs. This clay is underlain by medium dense clayey sand with gravel to a depth of roughly 12 feet bgs; and medium dense to dense well graded gravel with sand and clay to the maximum explored depth of roughly 20 feet bgs.

DH-17 was located at roughly Station 173+50. The surficial soil layer consists of hard, lean clay with sand to a depth of roughly 6 feet bgs. This clay is underlain by medium dense to dense well graded sand with gravel and clay to the maximum explored depth of roughly 20 feet bgs.

3.2.2 Phase 2 Alignment

Phase 2 drill hole DH-1A was located at West Las Animas Avenue and Monterey Road. Holes DH-2A, DH-3A, and DH-4A were located on Las Animas Avenue. Holes DH-5A through DH-15A were located on Murray Avenue. Holes DH-16A through DH-18A were located on Chestnut Street. Hole DH-19A was located on East 7th street. Hole DH-20A was located inside the City of Gilroy Corporation Yard. Hole DH-21A was located in the Pacific Gas & Electric facility at the north end of Renz Lane. Holes DH-22A and DH-23A were located on Renz Lane. The soil conditions encountered in these drill holes are described below.

In DH-1A, a pavement section consisting of roughly 3 inches of asphalt concrete over roughly 9 inches of base was encountered at the surface. The pavement section is underlain by alluvium consisting of very stiff to hard lean clay with sand to a depth of roughly 7½ feet bgs, and dense clayey sand with gravel to the maximum explored depth of roughly 20 feet bgs.

In DH-2A, a pavement section consisting of roughly 4 inches of asphalt concrete over roughly 8+ inches of base was encountered at the surface. The pavement section is underlain by fill consisting of medium dense, clayey sand to a depth of about 2 feet bgs. The fill is underlain by lean clay with sand to a depth of roughly 4 feet bgs; medium dense to dense clayey sand with variable amounts of gravel to a depth of about 20¾ feet bgs; very stiff lean clay with sand to a depth of roughly 24¾ feet bgs; stiff to hard fat clay and lean clay with sand to a depth of roughly 32 feet bgs; medium dense clayey sand with gravel to the maximum explored depth of roughly 50 feet bgs.

In DH-3A, a pavement section consisting of roughly 4 inches of asphalt concrete over roughly 8 inches of base was encountered at the surface. The pavement section is underlain by fill consisting of medium dense clayey sand with gravel to a depth of roughly 4 feet bgs. The fill is underlain by alluvium material consisting of very stiff to hard lean clay and sandy lean clay to a depth of 11½ feet bgs; medium dense clayey sand and clayey sand with gravel to a depth of roughly 22 feet bgs; well graded sand with gravel and clay to a depth of roughly 25 feet bgs; dense poorly graded sand with gravel and silt to a depth of about 30 feet bgs; dense clayey sand to a depth of roughly 37 feet bgs; very stiff sandy lean clay to dense clayey sand to a depth of roughly 45½ feet bgs; hard lean clay with sand to a depth of roughly 49 feet bgs; and very dense clayey sand to the maximum explored depth of roughly 50 feet bgs.

In DH-4A, a pavement section consisting of roughly 4 inches of asphalt concrete over roughly 8 inches of base was encountered at the surface. The pavement section is underlain by alluvium consisting of very stiff lean clay to a depth of roughly 3½ feet bgs, and medium dense clayey sand with gravel and clayey gravel with sand to the maximum explored depth of roughly 20 feet bgs.

In DH-5A, a layer of alluvium consisting of medium dense clayey sand to very stiff to hard sandy lean clay was encountered from the surface to roughly 5 feet bgs. This layer is underlain by medium dense to dense clayey sand with gravel to clayey gravel with sand to the maximum explored depth of roughly 20 feet bgs.

In DH-6A, a pavement section consisting of roughly 7 inches of asphalt concrete over roughly 8 inches of base was encountered at the surface. The pavement section is underlain by alluvium consisting of hard lean clay with sand to a depth of roughly 8 feet bgs; medium dense to very dense clayey sand to a depth of roughly 28 feet bgs; medium dense poorly graded sand with clay to clayey sand to a depth of roughly 32½ feet bgs; stiff lean clay with sand and lean clay to a depth of roughly 51½ feet bgs; very dense clayey to silty sand to a depth of roughly 56½ feet bgs; very dense poorly graded gravel with clay and sand to a depth of roughly 58½ feet bgs; and hard lean clay to the maximum explored depth of roughly 59.2 feet bgs.

In DH-7A, a pavement section consisting of roughly 4 inches of asphalt concrete over roughly 8 inches of base was encountered at the surface. The pavement section is underlain by alluvium consisting of very stiff sandy lean clay to a depth of roughly 4 feet bgs; medium dense to dense clayey sand to a depth of roughly 25 feet bgs; and stiff lean clay with sand to the maximum explored depth of roughly 60 feet bgs.

In DH-8A, a pavement section consisting of roughly 6 inches of asphalt concrete over roughly 7 inches of base was encountered at the surface. The pavement section is underlain by alluvium consisting of medium dense clayey gravel with sand to a depth of roughly 2½ feet bgs; very stiff to hard lean clay with sand to a depth of roughly 12 feet bgs; medium dense clayey sand to a depth of about 16½ feet bgs; and stiff to very stiff lean clay with sand to the maximum explored depth of roughly 20 feet bgs.

In DH-9A, a pavement section consisting of roughly 5 inches of asphalt concrete over roughly 7 inches of base was encountered at the surface. The pavement section is underlain by fill consisting of medium dense clayey sand with gravel to a depth of roughly 2½ feet bgs. The fill is underlain by alluvium consisting of very stiff to hard lean clay to a depth of roughly 12 feet bgs; dense clayey sand with gravel to a depth of roughly 17 feet bgs; and very stiff sandy lean clay to medium dense clayey sand to the maximum explored depth of roughly 20 feet bgs.

In DH-10A, a pavement section consisting of roughly 5 inches of asphalt concrete over roughly 12 inches of base was encountered at the surface. The pavement section is underlain by alluvium consisting of hard sandy lean clay to a depth of roughly 4 feet bgs; very dense clayey gravel to a depth of roughly 7½ feet bgs; very stiff to hard sandy lean clay to a depth of about 12 feet bgs; very dense clayey sand with gravel and clayey gravel with sand to a depth of roughly 28½ feet bgs; dense well graded sand with gravel to a depth of roughly 32 feet bgs; medium dense clayey sand with gravel to a depth of roughly 34½ feet bgs; very stiff lean clay to a depth of roughly 36½ feet bgs; very dense clayey gravel with sand to a depth of roughly

42 feet bgs; very stiff lean clay with sand to sandy lean clay and dense silty to clayey sand to the maximum explored depth of roughly 50 feet bgs.

In DH-11A, a pavement section consisting of roughly 5 inches of asphalt concrete over roughly 12 inches of base was encountered at the surface. The pavement section is underlain by alluvium consisting of stiff fat clay to a depth of roughly 4 feet bgs; and layers of medium dense to dense clayey sand with gravel, clayey gravel with sand, well graded gravel with sand, poorly graded sand with gravel and silt, and silty sand with gravel to a depth of roughly 42 feet bgs. These granular soils are underlain by very stiff lean clay to the maximum explored depth of roughly 50 feet bgs.

In DH-12A, a pavement section consisting of roughly 10 inches of asphalt concrete over roughly 8 inches of base was encountered at the surface. The pavement section is underlain by alluvium consisting of very stiff fat clay to a depth of roughly 4 feet bgs; very stiff lean clay to lean clay with sand to a depth of roughly 7½ feet bgs; medium dense clayey sand with gravel to clayey gravel with sand to a depth of roughly 17 feet bgs; and very stiff lean clay to lean clay with sand to the maximum explored depth of roughly 20 feet bgs.

In DH-13A, a pavement section consisting of roughly 4 inches of asphalt concrete over roughly 8 inches of base was encountered at the surface. The pavement section is underlain by alluvium consisting of medium dense clayey gravel with sand to a depth of roughly 7½ feet bgs; stiff lean clay to lean clay with sand to a depth of roughly 12 feet bgs; and medium dense clayey sand with gravel to the maximum explored depth of roughly 20 feet bgs.

In DH-14A, a pavement section consisting of roughly 5 inches of asphalt concrete over roughly 7 inches of base was encountered at the surface. The pavement section is underlain by alluvium consisting of very stiff to hard lean clay with sand to sandy lean clay to a depth of roughly 7½ feet bgs; medium dense clayey gravel with sand, clayey sand with gravel, and clayey sand to the maximum explored depth of roughly 20 feet bgs.

In DH-15A, a pavement section consisting of roughly 5 inches of asphalt concrete over roughly 7 inches of base was encountered at the surface. The pavement section is underlain by alluvium consisting of hard lean clay with sand to a depth of roughly 7 feet bgs; and medium dense to very dense clayey gravel with sand to the maximum explored depth of roughly 20 feet bgs.

In DH-16A, a pavement section consisting of roughly 1 inch of asphalt concrete over roughly 12 inches of Portland cement concrete was encountered at the surface. The pavement section is underlain by fill consisting of medium dense clayey gravel with sand to a depth of roughly 7 feet bgs. This layer is underlain by alluvium consisting of medium dense to dense clayey sand with gravel to clayey gravel with sand to a depth of roughly 21½ feet bgs; dense clayey sand to a depth of roughly 25 feet bgs; dense poorly graded sand with gravel and clay to a depth of roughly 27½ feet bgs; medium dense silty sand to a depth of roughly 31 feet bgs, dense well

graded gravel with sand to a depth of 42 feet bgs; and dense to very dense clayey sand to the maximum explored depth of roughly 50 feet bgs.

In DH-17A, a pavement section consisting of roughly 4 inches of asphalt concrete over roughly 3 inches of base was encountered at the surface. The pavement section is underlain by alluvium consisting of hard lean clay with sand to a depth of roughly 7½ feet bgs; loose clayey sand to a depth of roughly 12 feet bgs; medium dense clayey gravel with sand and clayey sand with gravel to a depth of roughly 26 feet bgs; dense well graded gravel with sand to a depth of roughly 29 feet bgs; dense poorly graded sand with gravel and silt to a depth of roughly 32 feet bgs; and dense to very dense well graded gravel with sand and silt to the maximum explored depth of roughly 50 feet bgs.

In DH-18A, a pavement section consisting of roughly 3 inches of asphalt concrete over roughly 2 inches of base was encountered at the surface. The pavement section is underlain by alluvium consisting of hard sandy lean clay to a depth of roughly 4 feet bgs; and medium dense to dense clayey sand with gravel to clayey gravel with sand to the maximum explored depth of roughly 20 feet bgs.

In DH-19A, a pavement section consisting of roughly 2 inches of asphalt concrete over roughly 3 inches of base was encountered at the surface. The pavement section is underlain by alluvium consisting of medium dense clayey sand to a depth of roughly 4 feet bgs; and medium dense to dense clayey gravel with sand to the maximum explored depth of roughly 18 feet bgs.

In DH-20A, a pavement section consisting of roughly 2 inches of asphalt concrete over roughly 6 inches of base was encountered at the surface. The pavement section is underlain by alluvium consisting of hard lean clay with sand to a depth of roughly 2 feet bgs; medium dense to dense clayey gravel with sand to a depth of roughly 12 feet bgs; dense clayey sand with gravel to a depth of roughly 16 feet bgs; layers of medium dense to dense poorly graded gravel with sand and clay, clayey gravel with sand, poorly graded sand with gravel and clay, poorly graded gravel with sand and clay to a depth of roughly 31½ feet bgs; stiff lean clay to a depth of roughly 37 feet bgs; medium dense clayey gravel with sand to a depth of roughly 47 feet bgs; and stiff lean clay to the maximum explored depth of roughly 60 feet bgs.

In DH-21A, a section of fill consisting of fat clay with sand and clayey sand with gravel was encountered from the ground surface to roughly 2 feet bgs. The fill section is underlain by alluvium consisting of very stiff to hard fat clay with sand to a depth of roughly 4 feet bgs; hard sandy lean clay to a depth of roughly 7½ feet bgs; medium dense poorly graded sand with gravel and clay to a depth of roughly 19 feet bgs; loose clayey sand to a depth of roughly 20 feet bgs; medium dense to dense clayey gravel with sand to a depth of roughly 24 feet bgs; stiff sandy lean clay to loose to medium dense clayey sand to a depth of roughly 27½ feet bgs; medium dense clayey sand to a depth of roughly 39½ feet bgs; and firm to hard lean clay and lean clay with sand to the maximum explored depth of roughly 60 feet bgs.

In DH-22A, a pavement section consisting of roughly 2 inches of asphalt concrete over roughly 4 inches of base was encountered at the surface. The pavement section is underlain by alluvium consisting of stiff to very stiff sandy lean clay to a depth of roughly 11½ feet bgs; and dense clayey gravel with sand to the maximum explored depth of roughly 20 feet bgs.

In DH-23A, a pavement section consisting of roughly 5 inches of asphalt concrete over roughly 12 inches of base was encountered at the surface. The pavement section is underlain by alluvium consisting of very stiff to hard lean clay and lean clay with sand to a depth of roughly 7½ feet bgs; and medium dense to dense well graded sand with gravel and clay to the maximum explored depth of roughly 20 feet bgs.

The above are generalized descriptions of the subsurface soil conditions encountered in our drill holes. For more detailed descriptions of the encountered soil conditions, refer to the drill hole logs in Appendix A.

3.3 Groundwater

Groundwater was encountered in DH-2A, DH-3A, DH-6A, DH-7A, DH-10A, DH-11A, DH-16A, DH-17A, DH-DH-20A, and DH-21A at the time of drilling. These Phase 2 drill holes were 50 to 60 feet deep for the five proposed trenchless under-crossings. Groundwater was not encountered in the remaining drill holes which were 18 to 20 feet deep.

Drill Hole	Date	Groundwater Level Encountered at Time of Drilling (feet)
DH-2A	8/28/2017	24.5
DH-3A	8/28/2017	26
DH-6A	8/29/2017	25
DH-7A	8/29/2017	31
DH-10A	8/30/2017	23
DH-11A	8/30/2017	26
DH-20A	9/5/2017	31.5
DH-21A	5/22/2018	30

Drill holes DH-3A, DH-6A, DH-11A, DH-17A, and DH-20A were converted to groundwater monitoring wells. The groundwater levels measured periodically in these monitoring wells are shown in the table below.

Well ID	Corresponding Drill Hole	Depth of Well (feet)	Measured Depth to Groundwater (feet)			
			1/23/2018	3/30/2018	8/20/2018	10/31/2018
GW-1	DH-3A	50	23.7	19.4	33.1	38.5
GW-2	DH-6A	59.2	22.7	18.3	33.9	37.7
GW-3	DH-11A	50	22.1	15.3	27.4	30.3
GW-4	DH-17A	50	22.7	18.3	37.4	39.3
GW-5	DH-20A	60	20.8	19.4	35.5	37.6

No groundwater monitoring wells were installed within the Phase 1 alignment. However, our review of groundwater information available from Santa Clara Valley Water District suggests a relatively shallow groundwater level of 8.4 feet bgs measured in April 2006 in the vicinity of the Phase 1 alignment. The reviewed available information suggests that average groundwater level in the vicinity of the Phase 1 alignment generally ranged about 30 to 40 feet bgs, with high average groundwater level as shallow as roughly 13 to 15 feet bgs between November 2005 and April 2006 and between November 2010 and April 2011.

It should be noted that fluctuations in the groundwater level may occur due to seasonal variations in rainfall and temperature, pumping from wells, regional groundwater recharge program, irrigation or other factors that were not evident at the time of our investigation.

3.4 Variations in Subsurface Conditions

Our interpretations of soil and groundwater conditions, as described in this report, are based on data obtained from our investigations for the Phase 1 and Phase 2 pipeline alignments. Our conclusions and geotechnical recommendations are based on these interpretations. Please realize the project areas have undergone different phases of development and construction. Therefore, it is likely that undisclosed variations in subsurface conditions exist at the site, such as old foundations, abandoned utilities and localized areas of deep and loose fill. Careful observations should be made during construction to verify our interpretations. Should variations from our interpretations be found, we should be notified to evaluate whether any revisions should be made to our recommendations.

4. SEISMIC CONSIDERATIONS

4.1 Seismic Sources

The Greater San Francisco Bay Area is seismically dominated by the active San Andreas Fault system, the general boundary between the northward moving Pacific Plate (west of the fault) and the southward moving North American Plate (east of the fault). This movement is distributed across a complex system of generally strike-slip, right lateral, parallel and subparallel faults.

The project area is not located within a State of California Earthquake Fault Zone and no mapped active faults are known to cross the site. Regional faults that have a potential to generate large magnitude earthquakes are listed below. Approximate distances and direction from the project site to these nearby faults are tabulated below.

Fault	North End of Phase 1	South End of Phase 1/North End of Phase 2	South End of Phase 2
Calaveras (central section)	6¼ km northeast	6¼ km northeast	5½ km northeast
Sargent	9¼ km southwest	8½ km southwest	5½ km southwest
San Andreas (Santa Cruz Mt section)	14¼ km southwest	13 km southwest	12¼ km southwest
Zayante-Vergeles	18½ km southwest	17¾ km southwest	17¾ km southwest
San Gregorio	54½ km southwest	54½ km southwest	56 km west

4.2 Ground Motions and Seismicity

We used the USGS Seismic Design Maps Application 3.1.0 to determine the peak ground acceleration at each drill hole location along the proposed pipeline alignment. For each drill hole location, we first determined its latitude and longitude, and its site class based on regional information from the USGS website. The peak ground acceleration values calculated by the USGS Seismic Design Maps Application are geometric mean values adjusted for site class effects (PGA_M).

Our review of the USGS regional information suggests the drill holes are generally located within Site Class C with the exception of drill holes DH-20A, DH-22A, and DH-23A which are located within Site Class D. Using the Site Class and the latitude and longitude of the drill holes, the geometric mean peak ground acceleration values determined by the USGS Seismic Design Maps Application range between 0.585g and 0.613g.

The Working Group on California Earthquake Probabilities (WGCEP) estimates of the probabilities of major earthquakes are now in their sixth iteration, with the greatest changes in approach being the inclusion of multifault rupture scenarios, in the progressive consideration of more potential seismic sources, the possibility of earthquakes on unrecognized faults, and the

inclusion of the notion of fault "readiness". Current estimates (WGCEP, 2014) for the San Francisco region indicate a 72% probability of a large (magnitude 6.7 or greater) earthquake in the San Francisco Bay area as a whole over the 30-year period beginning in 2014; this overall probability is greater than the previous (WGCEP, 2007) probability of 63%, due mainly to the inclusion of multifault rupture scenarios. The estimate for the Calaveras fault alone is 14.4% (revised up from the 7% presented by WGCEP, 2007); for the (northern) San Andreas fault alone, 27.4% (revised upward from the WGCEP (2007) value of 21%); and for the Hayward fault, 45.3% (revised upward from the WGCEP (2007) value of 31%).

4.3 Liquefaction

Soil liquefaction is a phenomenon in which saturated granular soils, and certain fine-grained soils, lose their strength due to the build-up of excess pore water pressure during cyclic loading, such as that induced by earthquakes. Soils most susceptible to liquefaction are saturated, clean, loose, fine-grained sands and non-plastic silts. Certain gravels, plastic silts, and clays are also susceptible to liquefaction. The primary factors affecting soil liquefaction include: 1) intensity and duration of seismic shaking; 2) soil type; 3) relative density of granular soils; 4) moisture content and plasticity of fine-grained soils; 5) overburden pressure; and 6) depth to ground water.

Our review of the Santa Clara County Liquefaction Hazard Zone maps (County of Santa Clara, 2012) indicates the proposed pipeline alignment is not located within a County Liquefaction Hazard Zone except for a relatively short section near the intersection of Highland Avenue and Harding Avenue in the Phase 1 alignment and at the locations of DH-20A though DH-23A in Phase 2 alignment. A detailed liquefaction analysis is not in the scope of this investigation.

5. DISCUSSION AND CONCLUSIONS

5.1 General

From a geotechnical viewpoint, it is our opinion that construction of the proposed pipeline is feasible provided our recommendations are incorporated in the design and construction of the project. Detailed recommendations are presented in the "RECOMMENDATIONS" section of this report. Geotechnical discussion and conclusions for the primary considerations of this project are presented below.

5.2 Surface Fault Rupture

The project site is not located in an Alquist-Priolo Earthquake Fault Zone. Because no active or potentially active faults are known to cross the site, it is reasonable to conclude the risk of fault rupture through the proposed pipeline alignments is low.

5.3 Seismic Ground Shaking

The project area is in an area of high seismicity. Based on general knowledge of site seismicity, it should be anticipated that, during the design life of the improvements, the site will be subject to high intensity ground shaking. The proposed improvements should be designed accordingly using applicable design codes and experience of the design professionals.

5.4 Anticipated Excavation Soil Conditions

As currently planned, the majority of the proposed pipeline will be constructed using conventional cut and cover method except at the five proposed trenchless under-crossing locations. For the cut and cover sections, the invert of the proposed pipeline will range between roughly 6 and 19 feet below ground surface. These excavations will generally extend through the upper clay layers and into the underlying sand and gravel layers, except where deeper clay layers were encountered. Although not necessarily mentioned in the drill hole logs specifically, the contractor should be aware of the presence of cobbles in the granular soil layers, especially the impact of cobbles on trenchless construction.

5.5 Groundwater

Groundwater was not encountered in our 20-foot deep drill holes at the time of drilling. In the 50 to 60-foot deep drill holes at the five proposed trenchless under-crossing sites within the Phase 2 alignment, groundwater was encountered between depths of 24.5 and 31.5 feet at the time of drilling. In the piezometers installed at these five under-crossing sites, groundwater was at least 27 feet bgs during the summer months. In March 2018, the measured groundwater level in the piezometers ranged between roughly 15 and 20 feet bgs. Refer to Section 3.3 of this report for additional information regarding regional groundwater.

The presence of groundwater will affect the proposed construction, especially pits for the trenchless construction. Groundwater is expected to be at a higher level during and shortly after the rainy months, especially after a wet winter. Excavations extending into groundwater will require dewatering and special considerations so construction can proceed in a "dry" condition. Special handling and disposal of the groundwater may be required. The bottom of the excavations should be over-excavated and replaced with a crushed rock section to create a more stable working platform. Refer to the “Recommendations” section of the report.

5.6 Excavations and Shoring

Conventional excavation equipment of sufficient size and power should be capable to dig through the anticipated subsurface soils along the pipeline alignment, depending on the wear and tear the contractor is willing to accept. No bedrock was encountered in any of our drill holes.

The selection, design, installation, maintenance and removal of the shoring system are the sole responsibility of the contractors, and should comply with the requirements of OSHA and local jurisdiction.

5.7 Buoyancy Force on Pipeline

Pipes below groundwater level will be subject to buoyancy force. Our review of regional groundwater information suggests a high groundwater level of about 8.4 feet bgs in the vicinity of the proposed pipeline. This high groundwater level would be above the proposed invert of the pipeline in many areas. The proposed pipeline should be designed accordingly for buoyancy force based on this high groundwater level.

5.8 Existing Improvements

Design and construction of the proposed improvements should take into account the existing improvements. Excavation near existing improvements should be performed carefully to avoid damage to the existing improvements.

6. RECCOMENDATIONS

6.1 Earthwork

Earthwork construction should conform to the project plans and specifications, and applicable local jurisdiction requirements. General guidelines are presented below.

6.1.1 Clearing and Stripping

Clearing and grubbing should include removal of obstructions and deleterious materials, including designated pavements, abandoned utility lines, debris, and obstructions. If tree roots are encountered, an arborist should be consulted regarding removed of tree roots. Depressions, voids and holes that extend below finish grade should be cleaned and backfilled with engineered fill.

6.1.2 Excavations, Temporary Construction Slopes and Dewatering

Excavations of roughly 6 to 19 feet in depth are anticipated for construction of the sewer pipeline except at the five proposed trenchless under-crossings where deeper excavations on the order of 20 to 30 feet may be required for construction of the boring and receiving pits. The excavations should be readily accomplished with conventional construction equipment of sufficient size and power, depending on the wear and tear the contractor is willing to accept. Excavations should be constructed in accordance with the current Cal-OSHA safety standards and local jurisdiction requirements. The stability and safety of excavations, braced or unbraced, is the responsibility of the contractor. Special care should be exercised when excavating near existing structures or underground structures and improvements.

The contractor is responsible for the design, installation, maintenance and removal of temporary shoring and bracing systems. The presence of existing structures, pavements, and underground utilities must be incorporated in the design of the shoring and bracing systems. Existing improvements outside the excavation areas should be protected.

Removal of the shoring system should not result in significant voids which could cause shifting and settlement of the backfill, and settlement of the road surface. Voids should be backfilled with sand or cement slurry, or other appropriate means to reduce the potential for settlement.

Groundwater along the proposed pipeline alignment is discussed in Section 3.3 of this report, including groundwater levels measured periodically in the monitoring wells at the five under-crossing sites. The presence of groundwater should be considered in the design and construction of the boring and receiving pits. It is recommended that construction be performed during the late summer months when groundwater is generally at its lowest. If construction is to be performed during or after the rainy months, groundwater level could rise above the planned excavation depth.

If groundwater is encountered during construction, dewatering should be provided to lower the groundwater to at least 3 feet below the bottom of the excavation. The design, installation, permitting, maintenance, and removal of dewatering systems are the responsibility of the contractor.

Relatively wet soil should be anticipated at the bottom of the planned excavations. If a firm work surface is needed, the bottom of the excavations should be over-excavated to a depth of at least 2 feet and replaced with a crushed rock section. The rock should be 1½-inch or ¾-inch by No. 4, clean crushed rock. Deeper over-excavation may be required depending on the conditions exposed and should be determined by the project geotechnical engineer at the time of construction. The crushed rock should be encapsulated in a geotextile fabric, such as Mirafi FW 402 or equivalent, to help stabilize the bottom and to separate the crushed rock from the adjacent soils.

The deeper excavations will encounter granular soils and the presence of cobbles should be anticipated. The contractor should be prepared to handle cobbles in the excavations.

6.1.3 Material for Backfill

Material for pipe zone backfill is defined as the material extending from the bottom of the trench to 6 inches above the pipe. In general, pipe zone backfill should consist of sand free from deleterious material and meeting the project specifications.

Trench zone backfill is the material extending from 6 inches above the pipe to the base of the pavement section. To reduce the potential trench settlement due to variable native soil types and compaction difficulties, use of Class 2 Aggregate Base (Caltrans Standard Specifications, latest edition) as the trench zone backfill is recommended.

All fills should be approved by the project geotechnical engineer prior to delivery to the site. At least five working days prior to importing to the site, a representative sample of the proposed import fill should be delivered to our laboratory for evaluation.

6.1.4 Backfill Placement and Compaction

Engineered fill should be placed in horizontal lifts each not exceeding 8 inches in loose thickness, moisture conditioned to the required moisture content, and mechanically compacted to meet the recommended relative compaction. Relative compaction or compaction is defined as the in-place dry density of the compacted soil divided by the laboratory maximum dry density as determined by ASTM Test Method D1557, latest edition, expressed as a percentage.

Moisture conditioning of soils should consist of adding water to the soils if they are too dry and allowing the soils to dry if they are too wet.

The sand bedding (pipe zone backfill) should be compacted to a minimum of 90 percent relative compaction. The aggregate base above should be compacted to a minimum of 95 percent relative compaction at a water content of between 1 and 3 percent above the laboratory optimum value.

6.1.5 Pavement Restoration

Restoration of pavements after construction should conform to the design plans and project specifications.

6.1.6 Wet Weather Construction

If construction is to be performed during the winter rainy months, the owner and the contractors should be fully aware of the potential impact of wet weather. Rainstorms can cause delay to construction and damage to previously completed work by saturating compacted fill or backfill, or flooding excavations.

Earthwork during rainy months will require extra effort and caution by the contractors. The contractors are responsible for protecting their work to avoid damage by rainwater. Standing pools of water should be pumped out immediately. Construction during wet weather conditions should be addressed in the project construction bid documents and/or specifications. We recommend the contractors submit a wet weather construction plan outlining procedures they will employ to protect their work and to minimize damage to their work by rainstorms.

6.2 Pipeline Buoyancy

Pipes below groundwater level will be subject to buoyancy force. Our review of regional groundwater information suggests a high groundwater level of about 8.4 feet bgs in the vicinity of the proposed pipeline alignments. We recommend the proposed pipeline be designed for buoyancy force based on this high groundwater level.

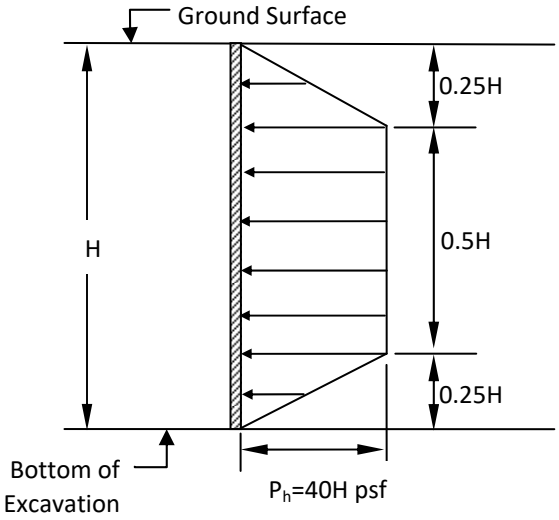
6.3 Lateral Soil Pressure for Temporary Shoring

Unbraced excavation shoring may be designed for an active lateral soil pressure of 40 pounds per cubic foot (pcf, equivalent fluid weight) if the top of the shoring system is allowed to move laterally and such movement will not impact adjacent improvements. If movement at the top of the shoring system is not allowed or desired, an at-rest soil pressure of 60 pcf should be considered. Any applicable surcharge loads, including traffic, construction equipment, and storage, should be added to the lateral soil pressure in the shoring system design.

To simulate the effect of traffic and equipment loading, a uniform lateral pressure of 250 pounds per square foot (psf) may be considered. Even with the inclusion of equipment

surcharge, heavy construction equipment should not be closer than 5 feet from the perimeter of the construction excavations.

Braced excavations should be designed for a trapezoidal lateral pressure distribution as shown below.



Notes:

1. Lateral pressures from surcharge loads not shown.
2. Excavation is dewatered with groundwater level at least 3 feet below bottom of excavation.
3. Seismic force not included.

Lateral Soil Pressure for Temporary Braced Excavations

7. PLAN REVIEW, EARTHWORK AND FOUNDATION OBSERVATION

Post-report geotechnical services by Geo-Logic Associates (GLA), typically consisting of pre-construction design consultations and reviews, construction observation and testing services, are necessary for GLA to confirm the recommendations contained in this report. This report is based on limited sampling and investigation, and by those constraints may not have discovered local anomalies or other varying conditions that may exist on the project site. Therefore, this report is only preliminary until GLA can confirm that actual conditions in the ground conform to those anticipated in the report. Accordingly, as an integral part of this report, GLA recommends post-report geotechnical services to assist the project team during design and construction of the project. GLA requires that it perform these services if it is to remain as the project geotechnical engineer-of-record.

During design, GLA can provide consultation and supplemental recommendations to assist the project team in design and value engineering, especially if the project design has been modified after completion of our report. It is impossible for us to anticipate every design scenario and use of construction materials during preparation of our report. Therefore, retaining GLA to provide post-report consultation will help address design changes, answer questions and evaluate alternatives proposed by the project designers and contractors.

Prior to issuing project plans and specifications for construction bidding purposes, GLA should review the grading, drainage and foundation plans and the project specifications to determine if the intent of our recommendations has been incorporated in these documents. We have found that such a review process will help reduce the likelihood of misinterpretation of our recommendations which may cause construction delay and additional cost.

Construction phase services can include, among other things, the observation and testing during site clearing, stripping, excavation, mass grading, subgrade preparation, fill placement and compaction, backfill compaction, foundation construction and pavement construction activities.

Geo-Logic Associates would be pleased to provide cost proposals for follow-up geotechnical services. Post-report geotechnical services may include additional field and laboratory services.

8. LIMITATIONS

In preparing the findings and professional opinions presented in this report, Geo-Logic Associates (GLA) has endeavored to follow generally accepted principles and practices of the engineering geologic and geotechnical engineering professions in the area and at the time our services were performed. No warranty, express or implied, is provided.

The conclusions and recommendations contained in this report are based, in part, on information that has been provided to us. In the event that the general development concept or general location and type of structures are modified, our conclusions and recommendations shall not be considered valid unless we are retained to review such changes and to make any necessary additions or changes to our recommendations. To remain as the project geotechnical engineer-of-record, GLA must be retained to provide geotechnical services as discussed under the Post-report Geotechnical Services section of this report.

Subsurface exploration is necessarily confined to selected locations and conditions may, and often do, vary between these locations. Should conditions different from those described in this report be encountered during project development, GLA should be consulted to review the conditions and determine whether our recommendations are still valid. Additional exploration, testing, and analysis may be required for such evaluation.

Should persons concerned with this project observe geotechnical features or conditions at the site or surrounding areas which are different from those described in this report, those observations should be reported immediately to GLA for evaluation.

It is important that the information in this report be made known to the design professionals involved with the project, that our recommendations be incorporated into project drawings and documents, and that the recommendations be carried out during construction by the contractor and subcontractors. It is not the responsibility of PGLA to notify the design professionals and the project contractors and subcontractors.

The findings, conclusions and recommendations presented in this report are applicable only to the specific project development on this specific site. These data should not be used for other projects, sites or purposes unless they are reviewed by GLA or a qualified geotechnical professional.

Report prepared by,

Geo-Logic Associates

Chalerm (Beeson) Liang
GE 2031

Distribution: HydroScience Engineers, Cindy Preuss (6)

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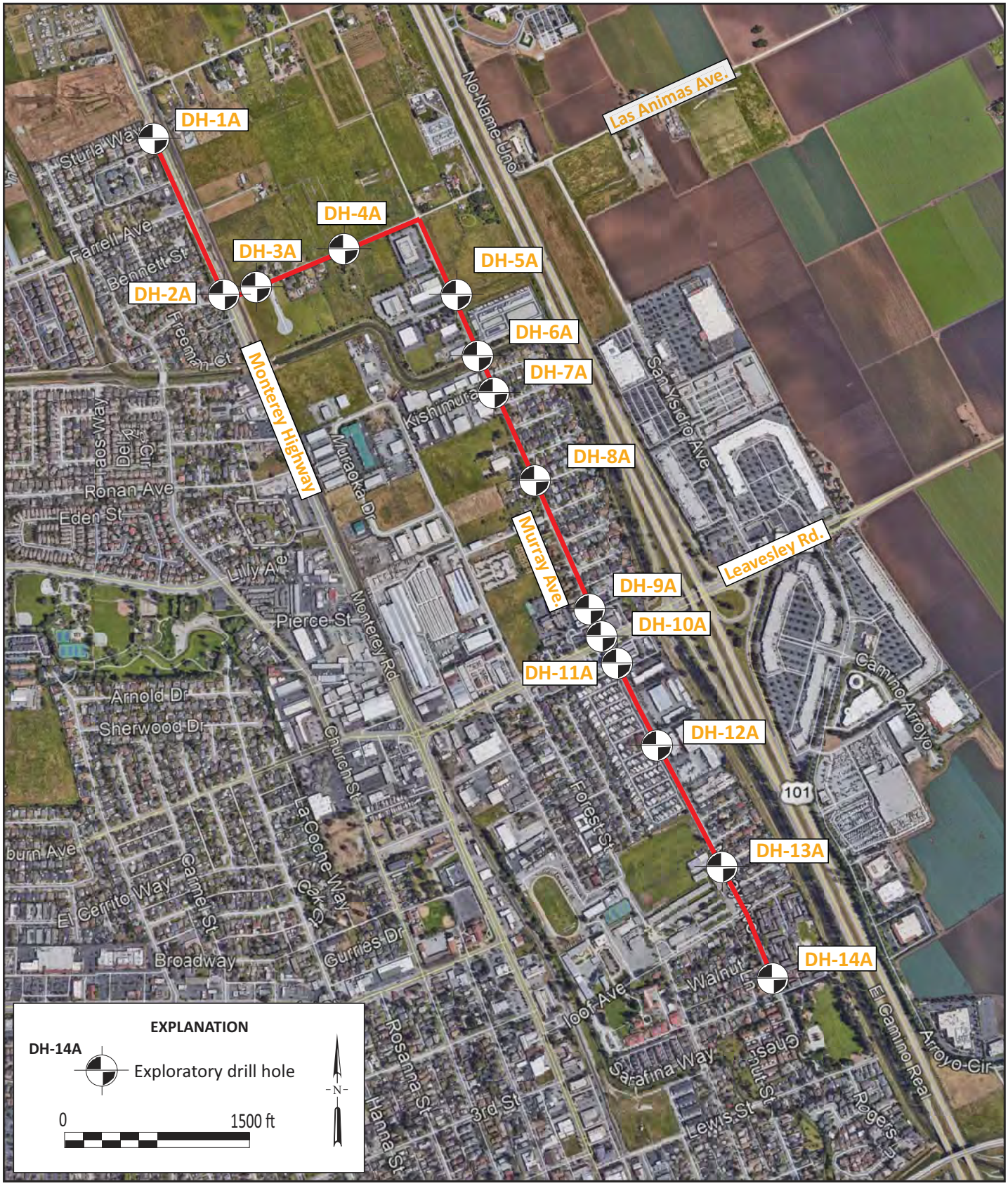
BORING LOCATION MAP
MORGAN HILL
SEWER TRUNK LINE PHASE 1 & 2

SAN MARTIN TO GILROY, CALIFORNIA

FIGURE 1

PROJECT 2016.0096

Drafted By: Francesca Senes	Date: 10/31/2018
Checked By: Beeson Liang	Revision: 10/31/2018



BASE: From Google Earth, May 2018.

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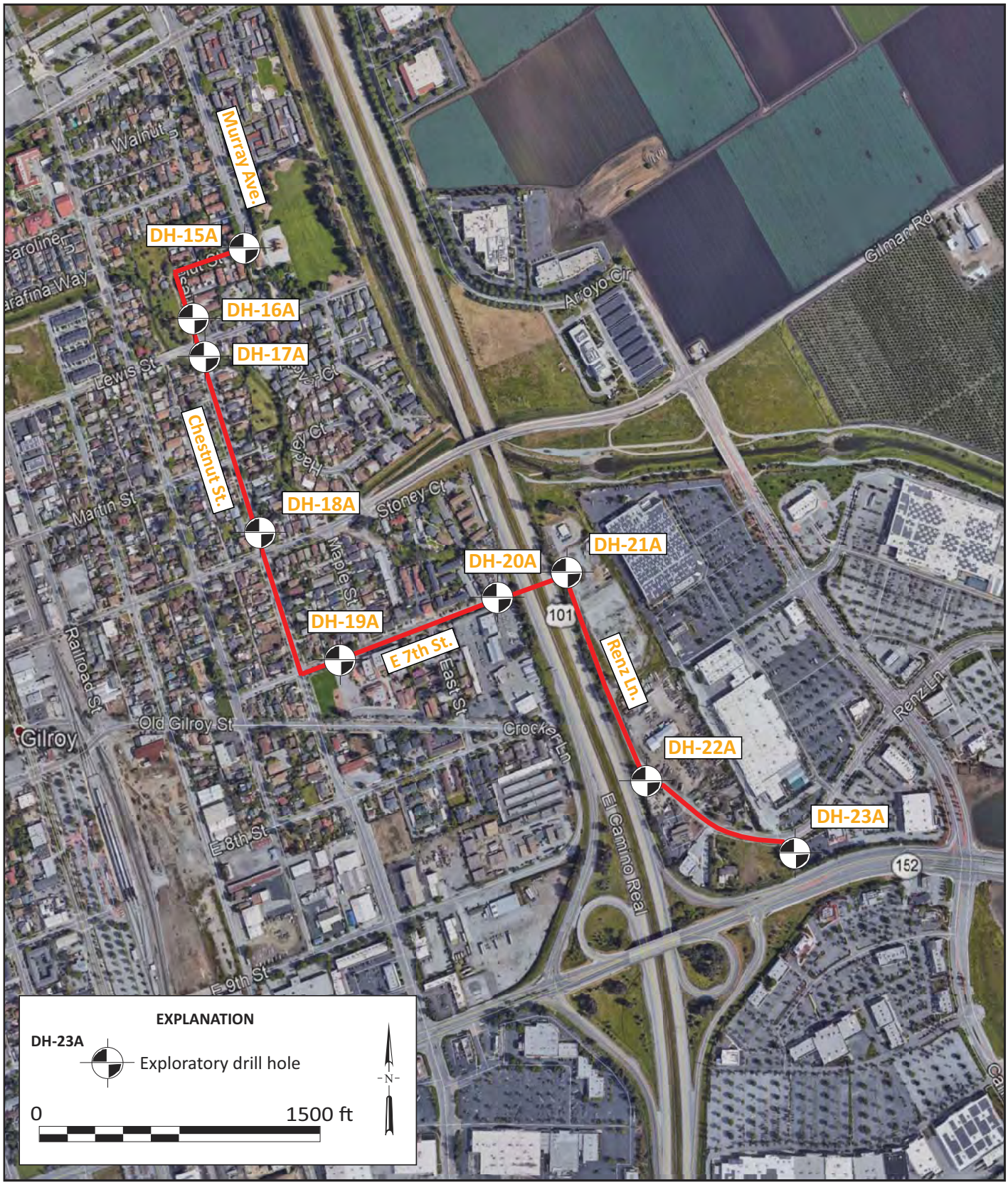
BORING LOCATION MAP
MORGAN HILL
SEWER TRUNK LINE PHASES 1 & 2

SAN MARTIN TO GILROY, CALIFORNIA

FIGURE 2

PROJECT 2016.0096

Drafted By: Francesca Senes	Date: 10/31/2018
Checked By: Beeson Liang	Revision: 10/31/2018



BASE: From Google Earth, May 2018.

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BORING LOCATION MAP
MORGAN HILL
SEWER TRUNK LINE PHASES 1 & 2

SAN MARTIN TO GILROY, CALIFORNIA

FIGURE 3

PROJECT 2016.0096

Drafted By: Francesca Senes	Date: 10/31/2018
Checked By: Beeson Liang	Revision: 10/31/2018

APPENDIX A – SUBSURFACE EXPLORATION

Keys to Soil Classification,

Logs of Drill Holes DH-1 through DH-17 (Phase 1 Alignment),

and

Logs of Drill Holes DH-1A through DH-23A (Phase 2 Alignment)

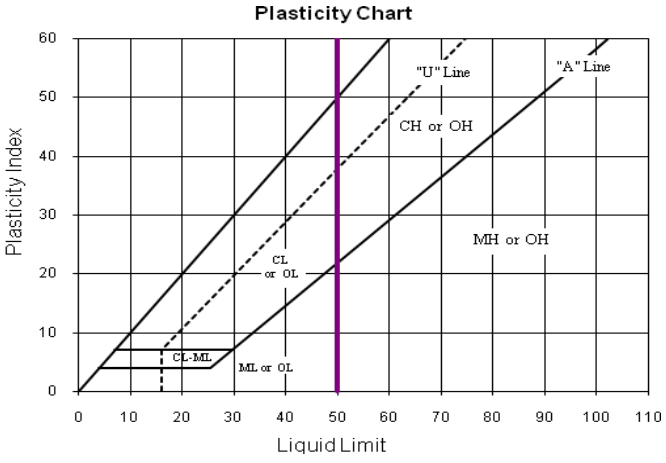
KEY TO SOIL CLASSIFICATION - FINE GRAINED SOILS
(50% OR MORE IS SMALLER THAN NO. 200 SIEVE SIZE)

MAJOR DIVISIONS			GROUP SYMBOLS	GROUP NAMES
SILTS AND CLAYS (Liquid Limit less than 50) Low Plasticity	Inorganic	PI < 4 or plots below "A" line	ML	Silt, Silt with Sand or Gravel, Sandy or Gravelly Silt, Sandy or Gravelly Silt with Sand or Gravel
	Inorganic	PI > 7 or plots on or above "A" line	CL	Lean Clay, Lean Clay with Sand or Gravel, Sandy or Gravelly Lean Clay, Sandy or Gravelly Lean Clay with Sand or Gravel
	Inorganic	PI between 4 and 7	CL-ML	Silty Clay, Silty Clay with Sand or Gravel, Sandy or Gravelly Silty Clay, Sandy or Gravelly Silty Clay with Sand or Gravel
	Organic	See footnote 3	OL	Organic Silt (below "A" Line) or Organic Clay (on or above "A" Line) (1,2)
SILTS AND CLAYS (Liquid Limit 50 or greater) High Plasticity	Inorganic	PI plots below "A" line	MH	Elastic Silt, Elastic Silt with Sand or Gravel, Sandy or Gravelly Elastic Silt, Sandy or Gravelly Elastic Silt with Sand or Gravel
	Inorganic	PI plots on or above "A" line	CH	Fat Clay, Fat Clay with Sand or Gravel, Sandy or Gravelly Fat Clay, Sandy or Gravelly Fat Clay with Sand or Gravel
	Organic	See note 3 below	OH	Organic Silt (below "A" Line) or Organic Clay (on or above "A" Line) (1,2)

1. If soil contains 15% to 29% plus No. 200 material, include "with sand" or "with gravel" to group name, whichever is predominant.
2. If soil contains ≥30% plus No. 200 material, include "sandy" or "gravelly" to group name, whichever is predominant. If soil contains ≥15% of sand or gravel sized material, add "with sand" or "with gravel" to group name.
3. Ratio of liquid limit of oven dried sample to liquid limit of not dried sample is less than 0.75.

CONSISTENCY	UNCONFINED SHEAR STRENGTH (KSF)	STANDARD PENETRATION (BLOWS/FOOT)
VERY SOFT	< 0.25	< 2
SOFT	0.25 – 0.5	2 – 4
FIRM	0.5 – 1.0	5 – 8
STIFF	1.0 – 2.0	9 – 15
VERY STIFF	2.0 – 4.0	16 – 30
HARD	> 4.0	> 30

MOISTURE	CRITERIA
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp, but no visible water
Wet	Visible free water, usually soil is below the water table



GEO-LOGIC ASSOCIATES

KEY TO SOIL CLASSIFICATION – COARSE GRAINED SOILS
(MORE THAN 50% IS LARGER THAN NO. 200 SIEVE SIZE)

MAJOR DIVISIONS			GROUP SYMBOLS	GROUP NAMES[1]
GRAVELS (more than 50% of coarse fraction is larger than No. 4 sieve size)	Gravels with less than 5% fines	Cu ≥ 4 and 1 ≤ Cc ≤ 3	GW	Well Graded Gravel, Well Graded Gravel with Sand
		Cu < 4 and/or 1 > Cc > 3	GP	Poorly Graded Gravel, Poorly Graded Gravel with Sand
	Gravels with 5% to 12% fines	ML or MH fines	GW-GM	Well Graded Gravel with Silt, Well Graded Gravel with Silt and Sand
			GP-GM	Poorly Graded Gravel with Silt, Poorly Graded Gravel with Silt and Sand
		CL or CH fines	GW-GC	Well Graded Gravel with Clay, Well Graded Gravel with Clay and Sand
			GP-GC	Poorly Graded Gravel with Clay, Poorly Graded Gravel with Clay and Sand
	Gravels with more than 12% fines	ML or MH fines	GM	Silty Gravel, Silty Gravel with Sand
		CL or CH fines	GC	Clayey Gravel, Clayey Gravel with Sand
		CL-ML fines	GC-GM	Silty Clayey Gravel; Silty, Clayey Gravel with Sand
SANDS (50% or more of coarse fraction is smaller than No. 4 sieve size)	Sands with less than 5% fines	Cu ≥ 6 and 1 ≤ Cc ≤ 3	SW	Well Graded Sand, Well Graded Sand with Gravel
		Cu < 6 and/or 1 > Cc > 3	SP	Poorly Graded Sand, Poorly Graded Sand with Gravel
	Sands with 5% to 12% fines	ML or MH fines	SW-SM	Well Graded Sand with Silt, Well Graded Sand with Silt and Gravel
			SP-SM	Poorly Graded Sand with Silt, Poorly Graded Sand with Silt and Gravel
		CL or CH fines	SW-SC	Well Graded Sand with Clay, Well Graded Sand with Clay and Gravel
			SP-SC	Poorly Graded Sand with Clay, Poorly Graded Sand with Clay and Gravel
	Sands with more than 12% fines	ML or MH fines	SM	Silty Sand, Silty Sand with Gravel
		CL or CH fines	SC	Clayey Sand, Clayey Sand with Gravel
		CL-ML fines	SC-SM	Silty, Clayey Sand; Silty, Clayey Sand with Gravel

US STANDARD SIEVES	3 Inch	¾ Inch	No. 4	No. 10	No. 40	No. 200	
	COARSE	FINE	COARSE	MEDIUM	FINE		
COBBLES & BOULDERS	GRAVELS		SANDS				SILTS AND CLAYS

RELATIVE DENSITY (SANDS AND GRAVELS)	STANDARD PENETRATION (BLOWS/FOOT)
Very Loose	0 - 4
Loose	5 – 10
Medium Dense	11 – 30
Dense	31 - 50
Very Dense	50+

1. Add “with sand” to group name if material contains 15% or greater of sand-sized particle. Add “with gravel” to group name if material contains 15% or greater of gravel-sized particle.

MOISTURE	CRITERIA
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp, but no visible water
Wet	Visible free water, usually soi is below the water table

GEO-LOGIC ASSOCIATES

DATE: 12/5/2016	LOG OF EXPLORATORY DRILL HOLE	DH- 1
PROJECT NAME: Morgan Hill Sewer Trunk Phase 1		PROJECT NUMBER: 2016.0096
DRILL RIG: Mobile B56, 140# downhole hammer & wire winch		LOGGED BY: CSS
HOLE DIAMETER: 8" hollow stem auger		HOLE ELEVATION: -----

SAMPLER: D = 3" OD, 2½" ID Split-spoon; X = 2½" OD, 2" ID Split-spoon; I = Standard Penetrometer (2" OD SPT); S = Slough in sample

GROUND WATER DEPTH: Initial: --- Final: ---

DESCRIPTION OF EARTH MATERIALS	SOIL TYPE	DEPTH (ft)	SAMPLE	BLOWS PER FOOT	POCKET PEN (tsf)	% PASSING #200 SIEVE	LIQUID LIMIT	WATER CONTENT	PLASTICITY INDEX	DRY DENSITY (pcf)	FAILURE STRAIN (%)	UNCONFINED COMPRESSIVE STRENGTH (psf)
PAVEMENT (±3" AC, ±9" base)		1										
ALLUVIUM, SANDY LEAN CLAY: Dark brown (7.5YR 3/3), moist, hard; with mostly fine sand	CL	2	S									
			D	23	4.5+		25	13	10	122		
		3	D		4.5+							
		4										
LEAN CLAY with SAND: Brown (10YR 4/3), moist, stiff to very stiff; with mostly fine sand	CL	5	S									
			D	25	2							
		6	D		3.7			21		105		
		7										
CLAYEY SAND with GRAVEL: Dark yellowish brown (10YR 4/4), moist, medium dense to dense; mostly fine sand	SC	8										
		9	S									
			D	44		45		15		120		
		10	D									
		11										
		12										
CLAYEY SAND with GRAVEL: Dark grayish brown (10YR 4/2), moist, very dense; fine to coarse mostly subangular sand; with fine to coarse gravel	SC	13										
		14	S									
			I	75	(no sample recovery)							
		15	I									
		16										
		17										
		18										
dense		19	S									
			I	47								
BOTTOM OF HOLE = 20 Feet		20	I									
No groundwater encountered												

DATE: 12/5/2016	LOG OF EXPLORATORY DRILL HOLE	DH- 2
PROJECT NAME: Morgan Hill Sewer Trunk Phase 1	PROJECT NUMBER:	2016.0096
DRILL RIG: Mobile B56, 140# downhole hammer & wire winch	LOGGED BY:	CSS
HOLE DIAMETER: 8" hollow stem auger	HOLE ELEVATION:	-----

SAMPLER: D = 3" OD, 2½" ID Split-spoon; X = 2½" OD, 2" ID Split-spoon; I = Standard Penetrometer (2" OD SPT); S = Slough in sample

GROUND WATER DEPTH: Initial: --- Final: ---

DESCRIPTION OF EARTH MATERIALS	SOIL TYPE	DEPTH (ft)	SAMPLE	BLOWS PER FOOT	POCKET PEN (tsf)	% PASSING #200 SIEVE	LIQUID LIMIT	WATER CONTENT	PLASTICITY INDEX	DRY DENSITY (pcf)	FAILURE STRAIN (%)	UNCONFINED COMPRESSIVE STRENGTH (psf)
PAVEMENT (±4" AC, ±3" base)												
ALLUVIUM, LEAN CLAY with SAND: Dark brown (7.5YR 3/3), moist, hard; with mostly fine sand	CL	1										
		2	S									
			D	26	4.5+			16		112		
		3	D		4.5+							
		4										
SANDY LEAN CLAY: Brown (7.5YR 4/3), moist, hard; with mostly fine to medium sand	CL	5										
			S									
		6	D	45	4.5			16		118		
			D		4.5+							
		7										
WELL GRADED SAND with GRAVEL and CLAY to WELL GRADED GRAVEL with SAND and CLAY: Dark grayish brown (10YR 4/2), moist, medium dense; fine to coarse subangular to subrounded sand; fine to coarse gravel	SW-SC/ GW-GC	8										
		9	S									
			I	26								
		10	I									
		11										
		12										
		13										
dense to very dense		14	S									
			I	51		11		9				
		15	I									
		16										
		17										
		18										
		19	S									
very dense			I	63								
BOTTOM OF HOLE = 20 Feet		20	I									
No groundwater encountered												

DATE: 12/5/2016	LOG OF EXPLORATORY DRILL HOLE	DH- 3
PROJECT NAME: Morgan Hill Sewer Trunk Phase 1		PROJECT NUMBER: 2016.0096
DRILL RIG: Mobile B56, 140# downhole hammer & wire winch		LOGGED BY: CSS
HOLE DIAMETER: 8" hollow stem auger		HOLE ELEVATION: -----
SAMPLER: D = 3" OD, 2½" ID Split-spoon; X = 2½" OD, 2" ID Split-spoon; I = Standard Penetrometer (2" OD SPT); S = Slough in sample	GROUND WATER DEPTH:	Initial: ---; Final: ---

DESCRIPTION OF EARTH MATERIALS	SOIL TYPE	DEPTH (ft)	SAMPLE	BLOWS PER FOOT	POCKET PEN (tsf)	% PASSING #200 SIEVE	LIQUID LIMIT	WATER CONTENT	PLASTICITY INDEX	DRY DENSITY (pcf)	FAILURE STRAIN (%)	UNCONFINED COMPRESSIVE STRENGTH (psf)
PAVEMENT (±3" AC, ±10" base)		1										
FILL, POORLY GRADED SAND: Yellowish brown (10YR 5/6), moist, loose; fine sand	SP	2	S									
		3	D D	7								
ALLUVIUM, LEAN CLAY with SAND: Brown (7.5YR 4/3), moist, very stiff; with mostly fine to medium sand	CL	4										
		5	S									
		6	I	20								
		7	I									
CLAYEY SAND with GRAVEL: Dark grayish brown (10YR 4/2), moist, medium dense; fine to coarse subangular to subrounded sand; with fine to coarse gravel	SC	8										
		9	S									
		10	I	28		13						
		11	I									
		12										
		13										
dense		14	S									
		15	I	38								
		16	I									
		17										
		18										
		19	S									
BOTTOM OF HOLE = 20 Feet		20	I	40								
No groundwater encountered			I									

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DATE: 12/5/2016	LOG OF EXPLORATORY DRILL HOLE	DH- 4
PROJECT NAME: Morgan Hill Sewer Trunk Phase 1		PROJECT NUMBER: 2016.0096
DRILL RIG: Mobile B56, 140# downhole hammer & wire winch		LOGGED BY: CSS
HOLE DIAMETER: 8" hollow stem auger		HOLE ELEVATION: -----
SAMPLER: D = 3" OD, 2½" ID Split-spoon; X = 2½" OD, 2" ID Split-spoon; I = Standard Penetrometer (2" OD SPT); S = Slough in sample	GROUND WATER DEPTH:	Initial: ---; Final: ---

DESCRIPTION OF EARTH MATERIALS	SOIL TYPE	DEPTH (ft)	SAMPLE	BLOWS PER FOOT	POCKET PEN (tsf)	% PASSING #200 SIEVE	LIQUID LIMIT	WATER CONTENT	PLASTICITY INDEX	DRY DENSITY (pcf)	FAILURE STRAIN (%)	UNCONFINED COMPRESSIVE STRENGTH (psf)
PAVEMENT (±6" AC, ±10" base)		1										
ALLUVIUM, SANDY LEAN CLAY: Dark brown (7.5YR 3/3), moist, hard; with mostly fine sand	CL	2	S									
		3	D	23	4.5+			11		98		
		4	D		4.5+							
		5										
		6	S D	45				13		120		
		7	D									
		8										
		9	S	50/6"								
		10	I									
		11										
		12										
CLAYEY SAND with GRAVEL: Dark grayish brown (10YR 4/2), moist, very dense; fine to coarse subangular to subrounded sand; with fine to coarse gravel	SC	13										
		14	S									
		15	I	68		20						
		16	I									
		17										
		18										
		19	S									
medium dense to dense		20	I	32								
BOTTOM OF HOLE = 20 Feet			I									
No groundwater encountered												

GEO-LOGIC ASSOCIATES	PAGE: 1 of 1

DATE: 12/6/2016	LOG OF EXPLORATORY DRILL HOLE	DH- 5
PROJECT NAME: Morgan Hill Sewer Trunk Phase 1	PROJECT NUMBER:	2016.0096
DRILL RIG: Mobile B40, 140# downhole hammer & wire winch	LOGGED BY:	CSS
HOLE DIAMETER: 8" hollow stem auger	HOLE ELEVATION:	-----

SAMPLER: D = 3" OD, 2½" ID Split-spoon; X = 2½" OD, 2" ID Split-spoon; I = Standard Penetrometer (2" OD SPT); S = Slough in sample

GROUND WATER DEPTH: Initial: --- Final: ---

DESCRIPTION OF EARTH MATERIALS	SOIL TYPE	DEPTH (ft)	SAMPLE	BLOWS PER FOOT	POCKET PEN (tsf)	% PASSING #200 SIEVE	LIQUID LIMIT	WATER CONTENT	PLASTICITY INDEX	DRY DENSITY (pcf)	FAILURE STRAIN (%)	UNCONFINED COMPRESSIVE STRENGTH (psf)
ALLUVIUM, LEAN CLAY to LEAN CLAY with SAND: Very dark grayish brown (10YR 4/2), moist, hard; with mostly fine sand	CL	1										
		2	S									
		3	D	11	4.5			19		106		
		4	D									
CLAYEY SAND with GRAVEL: Dark grayish brown (10YR 4/2), moist, medium dense; fine to coarse subangular to subrounded sand; with fine to coarse gravel	SC	5										
		6	S									
		7	D	39				10		125		
		8	D									
		9										
		10	S	18		19						
		11	I									
		12	I									
		13										
		14										
		15	S	16								
		16	I									
		17	I									
		18										
		19										
BOTTOM OF HOLE = 20 Feet		20	S	27								
			I									
			I									

No groundwater encountered

GEO-LOGIC ASSOCIATES	PAGE: 1 of 1

DATE: 12/6/2016	LOG OF EXPLORATORY DRILL HOLE	DH- 6
PROJECT NAME: Morgan Hill Sewer Trunk Phase 1	PROJECT NUMBER:	2016.0096
DRILL RIG: Mobile B40, 140# downhole hammer & wire winch	LOGGED BY:	CSS
HOLE DIAMETER: 8" hollow stem auger	HOLE ELEVATION:	-----

SAMPLER: D = 3" OD, 2½" ID Split-spoon; X = 2½" OD, 2" ID Split-spoon; I = Standard Penetrometer (2" OD SPT); S = Slough in sample

GROUND WATER DEPTH: Initial: --- Final: ---

DESCRIPTION OF EARTH MATERIALS	SOIL TYPE	DEPTH (ft)	SAMPLE	BLOWS PER FOOT	POCKET PEN (tsf)	% PASSING #200 SIEVE	LIQUID LIMIT	WATER CONTENT	PLASTICITY INDEX	DRY DENSITY (pcf)	FAILURE STRAIN (%)	UNCONFINED COMPRESSIVE STRENGTH (psf)
ALLUVIUM, LEAN CLAY: Very dark grayish brown (10YR 3/2), moist, very stiff	CL	1										
		2	S									
		3	D	11	3			22		104		
		4	D									
LEAN CLAY: Dark brown (7.5YR 3/4), moist, stiff	CL	5										
		6	S	12								
		7	I									
POORLY GRADED SAND with GRAVEL and CLAY: Dark grayish brown (10YR 4/2), moist, medium dense; fine to coarse subangular to subrounded sand; with fine to coarse gravel	SP-SC	8										
		9	S									
		10	I	14								
		11										
		12										
		13										
		14	S									
		15	I	14		11						
		16										
		17										
		18										
dense		19	S									
BOTTOM OF HOLE = 20 Feet		20	I	39								
No groundwater encountered												

DATE: 12/5/2016	LOG OF EXPLORATORY DRILL HOLE	DH- 7
PROJECT NAME: Morgan Hill Sewer Trunk Phase 1		PROJECT NUMBER: 2016.0096
DRILL RIG: Mobile B40, 140# downhole hammer & wire winch		LOGGED BY: CSS
HOLE DIAMETER: 8" hollow stem auger		HOLE ELEVATION: -----
SAMPLER: D = 3" OD, 2½" ID Split-spoon X = 2½" OD, 2" ID Split-spoon I = Standard Penetrometer (2" OD SPT) S = Slough in sample	GROUND WATER DEPTH:	Initial: --- Final: ---

DESCRIPTION OF EARTH MATERIALS	SOIL TYPE	DEPTH (ft)	SAMPLE	BLOWS PER FOOT	POCKET PEN (tsf)	% PASSING #200 SIEVE	LIQUID LIMIT	WATER CONTENT	PLASTICITY INDEX	DRY DENSITY (pcf)	FAILURE STRAIN (%)	UNCONFINED COMPRESSIVE STRENGTH (psf)
ALLUVIUM, FAT CLAY: Black (10YR 2/1), moist, very stiff	CH	1										
		2	S									
		3	D	18	2.25		59	28	38	92		
		4	D									
WELL GRADED SAND with GRAVEL and CLAY to CLAYEY SAND with GRAVEL: Brown (10YR 4/3) to Dark grayish brown (10YR 3/2), moist, very dense; fine to coarse subangular to subrounded sand; fine to coarse gravel	SW-SC/ SC	5	S									
		6	D	90/9"				10		133		
		7	D									
		8										
medium dense		9	S									
		10	I	18		12						
		11	I									
		12										
		13										
dense		14	S									
		15	I	39								
		16	I									
		17										
		18										
wet, mostly subrounded sand and gravel, medium dense		19	S									
BOTTOM OF HOLE = 20 Feet		20	I	13								
No groundwater encountered			I									

GEO-LOGIC ASSOCIATES	PAGE: 1 of 1

DATE: 12/6/2016	LOG OF EXPLORATORY DRILL HOLE	DH- 8
PROJECT NAME: Morgan Hill Sewer Trunk Phase 1	PROJECT NUMBER:	2016.0096
DRILL RIG: Mobile B40, 140# downhole hammer & wire winch	LOGGED BY:	CSS
HOLE DIAMETER: 8" hollow stem auger	HOLE ELEVATION:	-----

SAMPLER: D = 3" OD, 2½" ID Split-spoon; X = 2½" OD, 2" ID Split-spoon; I = Standard Penetrometer (2" OD SPT); S = Slough in sample

GROUND WATER DEPTH: Initial: --- Final: ---

DESCRIPTION OF EARTH MATERIALS	SOIL TYPE	DEPTH (ft)	SAMPLE	BLOWS PER FOOT	POCKET PEN (tsf)	% PASSING #200 SIEVE	LIQUID LIMIT	WATER CONTENT	PLASTICITY INDEX	DRY DENSITY (pcf)	FAILURE STRAIN (%)	UNCONFINED COMPRESSIVE STRENGTH (psf)
ALLUVIUM, FAT CLAY: Very dark grayish brown (10YR 4/2), moist, very stiff	CH	1										
		2	S									
		3	D	17	3.25			21		105		
			D		3.75							
		4										
CLAYEY SAND: Strong brown (7.5YR 4/6), moist, dense; fine to coarse subangular to subrounded sand	SC	5										
		6	S									
			D	60				12		121		
		7	D									
CLAYEY SAND with GRAVEL: Dark brown (10YR 3/3), moist, medium dense; fine to coarse subangular to subrounded sand; with fine to coarse gravel	SC	8										
		9	S									
		10	I	13		14						
		11	I									
		12										
		13										
		14	S									
			I	18								
		15	I									
		16										
		17										
		18										
		19	S									
			I	24								
BOTTOM OF HOLE = 20 Feet		20	I									
No groundwater encountered												

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DATE: 12/7/2016	LOG OF EXPLORATORY DRILL HOLE	DH- 9
PROJECT NAME: Morgan Hill Sewer Trunk Phase 1		PROJECT NUMBER: 2016.0096
DRILL RIG: Mobile B40, 140# downhole hammer & wire winch		LOGGED BY: CSS
HOLE DIAMETER: 8" hollow stem auger		HOLE ELEVATION: -----
SAMPLER: D = 3" OD, 2½" ID Split-spoon X = 2½" OD, 2" ID Split-spoon I = Standard Penetrometer (2" OD SPT) S = Slough in sample	GROUND WATER DEPTH:	Initial: --- Final: ---

DESCRIPTION OF EARTH MATERIALS	SOIL TYPE	DEPTH (ft)	SAMPLE	BLOWS PER FOOT	POCKET PEN (tsf)	% PASSING #200 SIEVE	LIQUID LIMIT	WATER CONTENT	PLASTICITY INDEX	DRY DENSITY (pcf)	FAILURE STRAIN (%)	UNCONFINED COMPRESSIVE STRENGTH (psf)
ALLUVIUM, CLAYEY SAND: Dark brown (7.5YR 3/4), moist, medium dense, fine to coarse sand	CI	1										
		2	S									
		3	D D	28				15		117		
		4										
CLAYEY SAND with GRAVEL: Dark brown (7.5YR 3/4), moist, dense; fine to coarse subangular to subrounded sand; with fine to coarse gravel	SC	5										
		6	S D D	64				9		120		
		7										
		8										
		9	S									
		10	I	45								
		11										
		12										
		13										
dark yellowish brown (10YR 4/4), medium dense		14	S									
		15	I	20		12						
		16										
		17										
LEAN CLAY: Brown (10YR 5/3) and strong brown (7.5YR 5/6), moist, very stiff	CL	18										
		19	S									
BOTTOM OF HOLE = 20 Feet		20	I	19								
No groundwater encountered												

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DATE: 12/7/2016	LOG OF EXPLORATORY DRILL HOLE	DH- 10
PROJECT NAME: Morgan Hill Sewer Trunk Phase 1		PROJECT NUMBER: 2016.0096
DRILL RIG: Mobile B40, 140# downhole hammer & wire winch		LOGGED BY: CSS
HOLE DIAMETER: 8" hollow stem auger		HOLE ELEVATION: -----
SAMPLER: D = 3" OD, 2½" ID Split-spoon X = 2½" OD, 2" ID Split-spoon I = Standard Penetrometer (2" OD SPT) S = Slough in sample	GROUND WATER DEPTH:	Initial: --- Final: ---

DESCRIPTION OF EARTH MATERIALS	SOIL TYPE	DEPTH (ft)	SAMPLE	BLOWS PER FOOT	POCKET PEN (tsf)	% PASSING #200 SIEVE	LIQUID LIMIT	WATER CONTENT	PLASTICITY INDEX	DRY DENSITY (pcf)	FAILURE STRAIN (%)	UNCONFINED COMPRESSIVE STRENGTH (psf)
ALLUVIUM, LEAN CLAY with SAND: Dark brown (7.5YR 3/3), moist, very stiff; with fine to coarse sand	CL	1										
		2	S									
		3	D D	21	2			16		117		
CLAYEY SAND with GRAVEL: Brown (7.5YR 5/3), dry to moist, very dense; fine to coarse subangular to subrounded sand; with mostly fine gravel	SC	4										
		5	S									
		6	I	58		13						
		7										
		8										
		9	S									
dense, with fine to coarse gravel		10	I	41		21		8				
		11										
		12										
		13										
		14	S									
dense to very dense		15	I	50								
		16										
		17										
		18										
		19	S									
dense			I	41								
BOTTOM OF HOLE = 20 Feet		20										
No groundwater encountered												0

DATE: 12/6/2016	LOG OF EXPLORATORY DRILL HOLE	DH- 11
PROJECT NAME: Morgan Hill Sewer Trunk Phase 1	PROJECT NUMBER:	2016.0096
DRILL RIG: Mobile B40, 140# downhole hammer & wire winch	LOGGED BY:	CSS
HOLE DIAMETER: 8" hollow stem auger	HOLE ELEVATION:	-----

SAMPLER: D = 3" OD, 2½" ID Split-spoon; X = 2½" OD, 2" ID Split-spoon; I = Standard Penetrometer (2" OD SPT); S = Slough in sample

GROUND WATER DEPTH: Initial: --- Final: ---

DESCRIPTION OF EARTH MATERIALS	SOIL TYPE	DEPTH (ft)	SAMPLE	BLOWS PER FOOT	POCKET PEN (tsf)	% PASSING #200 SIEVE	LIQUID LIMIT	WATER CONTENT	PLASTICITY INDEX	DRY DENSITY (pcf)	FAILURE STRAIN (%)	UNCONFINED COMPRESSIVE STRENGTH (psf)
ALLUVIUM, LEAN CLAY with SAND: Brown (7.5YR 4/4), moist, hard; with mostly fine sand	CL	1										
		2	S									
		3	D	21	4.5+			22		100		
		4	D		4.5+							
CLAYEY SAND with GRAVEL: Brown (7.5YR 4/4), dry to moist, very dense; fine to coarse subangular to subrounded sand; with mostly fine gravel	SC	5	S									
		6	I	50/6"								
		7										
		8										
dense, with fine to coarse gravel		9	S									
		10	I	49		14						
		11	I									
		12										
		13										
		14	S									
		15	I	31								
		16	I									
		17										
		18										
		19	S									
		20	I	34								
BOTTOM OF HOLE = 20 Feet												
No groundwater encountered												

DATE: 12/7/2016	LOG OF EXPLORATORY DRILL HOLE	DH- 12
PROJECT NAME: Morgan Hill Sewer Trunk Phase 1	PROJECT NUMBER:	2016.0096
DRILL RIG: Mobile B40, 140# downhole hammer & wire winch	LOGGED BY:	CSS
HOLE DIAMETER: 8" hollow stem auger	HOLE ELEVATION:	-----

SAMPLER: D = 3" OD, 2½" ID Split-spoon; X = 2½" OD, 2" ID Split-spoon; I = Standard Penetrometer (2" OD SPT); S = Slough in sample

GROUND WATER DEPTH: Initial: --- Final: ---

DESCRIPTION OF EARTH MATERIALS	SOIL TYPE	DEPTH (ft)	SAMPLE	BLOWS PER FOOT	POCKET PEN (tsf)	% PASSING #200 SIEVE	LIQUID LIMIT	WATER CONTENT	PLASTICITY INDEX	DRY DENSITY (pcf)	FAILURE STRAIN (%)	UNCONFINED COMPRESSIVE STRENGTH (psf)
ALLUVIUM, SANDY LEAN CLAY: Brown (7.5YR 4/2), moist, very stiff; with mostly fine sand	CL	1										
		2	S									
		3	D	13	2.25			16		117		
		4	D		2.5							
CLAYEY SAND with GRAVEL: Brown (7.5YR 4/3), moist, medium dense; fine to coarse subangular to subrounded sand; with mostly fine gravel	SC	5										
		6	S	13								
		7	I									
		8										
		9	S									
		10	I	21		20						
		11										
		12										
		13										
dense, with fine to coarse gravel		14	S									
		15	I	33								
		16										
		17										
		18										
		19	S									
		20	I	32								
BOTTOM OF HOLE = 20 Feet												
No groundwater encountered												

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DATE: 12/7/2016	LOG OF EXPLORATORY DRILL HOLE	DH- 13
PROJECT NAME: Morgan Hill Sewer Trunk Phase 1		PROJECT NUMBER: 2016.0096
DRILL RIG: Mobile B40, 140# downhole hammer & wire winch		LOGGED BY: CSS
HOLE DIAMETER: 8" hollow stem auger		HOLE ELEVATION: -----
SAMPLER: D = 3" OD, 2½" ID Split-spoon X = 2½" OD, 2" ID Split-spoon I = Standard Penetrometer (2" OD SPT) S = Slough in sample	GROUND WATER DEPTH:	Initial: --- Final: ---

DESCRIPTION OF EARTH MATERIALS	SOIL TYPE	DEPTH (ft)	SAMPLE	BLOWS PER FOOT	POCKET PEN (tsf)	% PASSING #200 SIEVE	LIQUID LIMIT	WATER CONTENT	PLASTICITY INDEX	DRY DENSITY (pcf)	FAILURE STRAIN (%)	UNCONFINED COMPRESSIVE STRENGTH (psf)
ALLUVIUM, LEAN CLAY: Brown (7.5YR 4/3), moist, stiff to very stiff	CL	1										
		2	S									
		3	D	18	2			23		103		
		4	D									
		5										
brown (7.5YR 4/4), very stiff		6	S		4.5+							
		7	D	71	4.5+			14		116	3	7480
		8	D									
		9										
		10	S	29								
		11	I									
		12	I									
SANDY LEAN CLAY: Light brownish gray (10YR 6/2) mottled with strong brown (7.5YR 4/6), moist, stiff; with mostly fine to medium sand	CL	13										
		14	S									
		15	I	18		64		17				
		16	I									
		17										
LEAN CLAY: Gray (10YR 6/1) with strong brown (7.5YR 4/6), moist, stiff	CL	18										
		19	S									
		20	I	15								
BOTTOM OF HOLE = 20 Feet			I									
No groundwater encountered												

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DATE: 12/7/2016	LOG OF EXPLORATORY DRILL HOLE	DH- 14
PROJECT NAME: Morgan Hill Sewer Trunk Phase 1		PROJECT NUMBER: 2016.0096
DRILL RIG: Mobile B40, 140# downhole hammer & wire winch		LOGGED BY: CSS
HOLE DIAMETER: 8" hollow stem auger		HOLE ELEVATION: -----
SAMPLER: D = 3" OD, 2½" ID Split-spoon; X = 2½" OD, 2" ID Split-spoon; I = Standard Penetrometer (2" OD SPT); S = Slough in sample	GROUND WATER DEPTH:	Initial: ---; Final: ---

DESCRIPTION OF EARTH MATERIALS	SOIL TYPE	DEPTH (ft)	SAMPLE	BLOWS PER FOOT	POCKET PEN (tsf)	% PASSING #200 SIEVE	LIQUID LIMIT	WATER CONTENT	PLASTICITY INDEX	DRY DENSITY (pcf)	FAILURE STRAIN (%)	UNCONFINED COMPRESSIVE STRENGTH (psf)
ALLUVIUM, CLAYEY SAND: Very dark brown (7.5YR 2.5/2), moist, medium dense; mostly fine to medium sand	SC	1										
		2	S									
		3	D	20				16		115		
		4	D									
CLAYEY SAND with GRAVEL: Dark brown (7.5YR 3/3), moist, medium dense; fine to coarse subangular to subrounded sand; with mostly fine gravel	SC	5										
		6	S	19		21		10				
		7	I									
SANDY LEAN CLAY: Brown (7.5YR 5/4), dry to moist, very stiff; with mostly fine sand	CL	8										
		9	S									
		10	I	37								
		11										
		12										
		13										
		14	S									
		15	I	51								
		16										
		17										
		18										
brown (7.5YR 4/3), moist		19	S									
BOTTOM OF HOLE = 20 Feet		20	I	22								
No groundwater encountered												

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DATE: 12/7/2016	LOG OF EXPLORATORY DRILL HOLE	DH- 15
PROJECT NAME: Morgan Hill Sewer Trunk Phase 1	PROJECT NUMBER:	2016.0096
DRILL RIG: Mobile B40, 140# downhole hammer & wire winch	LOGGED BY:	CSS
HOLE DIAMETER: 8" hollow stem auger	HOLE ELEVATION:	-----

SAMPLER: D = 3" OD, 2½" ID Split-spoon; X = 2½" OD, 2" ID Split-spoon; I = Standard Penetrometer (2" OD SPT); S = Slough in sample

GROUND WATER DEPTH: Initial: --- Final: ---

DESCRIPTION OF EARTH MATERIALS	SOIL TYPE	DEPTH (ft)	SAMPLE	BLOWS PER FOOT	POCKET PEN (tsf)	% PASSING #200 SIEVE	LIQUID LIMIT	WATER CONTENT	PLASTICITY INDEX	DRY DENSITY (pcf)	FAILURE STRAIN (%)	UNCONFINED COMPRESSIVE STRENGTH (psf)
ALLUVIUM, LEAN CLAY with SAND: Dark brown (7.5YR 3/3), moist, hard; with mostly fine to medium sand	CL	1										
		2	S									
		3	D	16	4.5+			9		92		
		4	D		4.5+							
CLAYEY SAND with GRAVEL: Brown (7.5YR 5/4) to strong brown (7.5YR 4/6), moist, dense to very dense; fine to coarse subangular to subrounded sand; with mostly fine gravel	SC	5										
		6	S									
		7	D	78				8		111		
		8	D									
medium dense		9										
		10	S									
		11	I	21		21		10				
		12	I									
		13										
dense, with fine to coarse gravel		14										
		15	S									
		16	I	33								
		17	I									
		18										
		19										
very dense		20	S									
BOTTOM OF HOLE = 20 Feet			I									
			I	56								
No groundwater encountered												

DATE: 12/7/2016	LOG OF EXPLORATORY DRILL HOLE	DH- 16
PROJECT NAME: Morgan Hill Sewer Trunk Phase 1		PROJECT NUMBER: 2016.0096
DRILL RIG: Mobile B40, 140# downhole hammer & wire winch		LOGGED BY: CSS
HOLE DIAMETER: 8" hollow stem auger		HOLE ELEVATION: -----
SAMPLER: D = 3" OD, 2½" ID Split-spoon; X = 2½" OD, 2" ID Split-spoon; I = Standard Penetrometer (2" OD SPT); S = Slough in sample	GROUND WATER DEPTH:	Initial: ---; Final: ---

DESCRIPTION OF EARTH MATERIALS	SOIL TYPE	DEPTH (ft)	SAMPLE	BLOWS PER FOOT	POCKET PEN (tsf)	% PASSING #200 SIEVE	LIQUID LIMIT	WATER CONTENT	PLASTICITY INDEX	DRY DENSITY (pcf)	FAILURE STRAIN (%)	UNCONFINED COMPRESSIVE STRENGTH (psf)
ALLUVIUM, FAT CLAY with SAND: Brown (7.5YR 4/4), moist, hard; with mostly fine sand	CH	1										
		2	S									
		3	D	17	4.5		55	20	33	106	6	13530
		4	D									
		5										
		6	S		4.5+							
		7	D	78	4.5+			15		107		
CLAYEY SAND with GRAVEL: Brown (7.5YR 5/4), moist, medium dense; fine to coarse subangular to subrounded sand; with mostly fine gravel	SC	8										
		9	S									
		10	I	24								
		11	I									
		12										
WELL GRADED GRAVEL with SAND and CLAY: Brown (7.5YR 4/4), moist, dense; fine to coarse gravel; with fine to coarse subangular to subrounded sand	GW-GC	13										
		14	S									
		15	I	33		10						
		16	I									
		17										
		18										
		19	S									
medium dense		20	I	11								
BOTTOM OF HOLE = 20 Feet												
No groundwater encountered												

GEO-LOGIC ASSOCIATES	PAGE: 1 of 1

DATE: 12/7/2016	LOG OF EXPLORATORY DRILL HOLE	DH- 17
PROJECT NAME: Morgan Hill Sewer Trunk Phase 1		PROJECT NUMBER: 2016.0096
DRILL RIG: Mobile B40, 140# downhole hammer & wire winch		LOGGED BY: CSS
HOLE DIAMETER: 8" hollow stem auger		HOLE ELEVATION: -----
SAMPLER: D = 3" OD, 2½" ID Split-spoon X = 2½" OD, 2" ID Split-spoon I = Standard Penetrometer (2" OD SPT) S = Slough in sample	GROUND WATER DEPTH:	Initial: --- Final: ---

DESCRIPTION OF EARTH MATERIALS	SOIL TYPE	DEPTH (ft)	SAMPLE	BLOWS PER FOOT	POCKET PEN (tsf)	% PASSING #200 SIEVE	LIQUID LIMIT	WATER CONTENT	PLASTICITY INDEX	DRY DENSITY (pcf)	FAILURE STRAIN (%)	UNCONFINED COMPRESSIVE STRENGTH (psf)
ALLUVIUM, LEAN CLAY with SAND: Brown (7.5YR 4/4), moist, hard; with mostly fine sand	CL	1										
		2	S									
		3	D	16	4.5+			16		116		
		4	D									
		5										
		6	S	44								
WELL GRADED SAND with GRAVEL and CLAY: Brown (7.5YR 4/4), moist, dense; fine to coarse subangular to subrounded sand; with fine to coarse gravel	SW-SC	7	I									
		8										
		9	S									
		10	I	33		12						
		11										
		12										
		13										
medium dense		14	S									
		15	I	16	(no sample recovery)							
		16										
		17										
		18										
dense		19	S									
BOTTOM OF HOLE = 20 Feet		20	I	33								
No groundwater encountered												

GEO-LOGIC ASSOCIATES	PAGE: 1 of 1

DATE: 9/1/2017	LOG OF EXPLORATORY DRILL HOLE	DH- 1A
PROJECT NAME: Morgan Hill Sewer Trunk, Phase 2		PROJECT NUMBER: 2016.0096
DRILL RIG: Mobile B56, 140# downhole hammer with wire winch		LOGGED BY: CSS
HOLE DIAMETER: 8" hollow stem augers		HOLE ELEVATION: ±219
SAMPLER: D = 3" OD, 2½" ID Split-spoon X = 2½" OD, 2" ID Split-spoon I = Standard Penetrometer (2" OD SPT) S = Slough in sample	GROUND WATER DEPTH:	Initial: --- Final: ---

DESCRIPTION OF EARTH MATERIALS	SOIL TYPE	DEPTH (ft)	SAMPLE	BLOWS PER FOOT	POCKET PEN (tsf)	% PASSING #200 SIEVE	LIQUID LIMIT	WATER CONTENT	PLASTICITY INDEX	DRY DENSITY (pcf)	FAILURE STRAIN (%)	UNCONFINED COMPRESSIVE STRENGTH (psf)
PAVEMENT (±3" AC over ±9" baserock)												
ALLUVIUM: LEAN CLAY with SAND: Dark brown (7.5YR 3/3); moist; very stiff to hard; with fine sand	CL	1										
		2	S	17	>4.5			16		115		
		3	D									
		4										
		5	S	36	4.5							
		6	D		>4.5			14		121		
		7										
CLAYEY SAND with GRAVEL: Brown to dark brown (10YR 4/3 to 3/3); moist; dense; fine to coarse, subangular to subrounded sand and gravel	SC/ GC	8										
		9	S	31		15						
		10	I									
		11										
		12										
		13										
		14	S	41								
		15	I									
		16										
		17										
		18										
moist to wet; dark grayish brown (10YR 4/2)		19	S	34								
BOTTOM OF HOLE = 20 Feet		20	I									
No Groundwater Encountered												

GEO-LOGIC ASSOCIATES	PAGE: 1 of 1

DATE: 8/28/2017	LOG OF EXPLORATORY DRILL HOLE	DH- 2A
PROJECT NAME: Morgan Hill Sewer Trunk, Phase 2		PROJECT NUMBER: 2016.0096
DRILL RIG: Mobile B56, 140# downhole hammer with wire winch		LOGGED BY: CSS
HOLE DIAMETER: 8" hollow stem augers		HOLE ELEVATION: ±216

SAMPLER: D = 3" OD, 2½" ID Split-spoon; X = 2½" OD, 2" ID Split-spoon; I = Standard Penetrometer (2" OD SPT); S = Slough in sample

GROUND WATER DEPTH: Initial: --- Final: 24.5 ft

DESCRIPTION OF EARTH MATERIALS	SOIL TYPE	DEPTH (ft)	SAMPLE	BLOWS PER FOOT	POCKET PEN (tsf)	% PASSING #200 SIEVE	LIQUID LIMIT	WATER CONTENT	PLASTICITY INDEX	DRY DENSITY (pcf)	FAILURE STRAIN (%)	UNCONFINED COMPRESSIVE STRENGTH (psf)
PAVEMENT (±4" AC over 8"+ Baserock)		1										
FILL: CLAYEY SAND: Brown to dark brown (10YR 4/3 to 3/3); moist; medium dense; fine to coarse, angular to subrounded sand	SC	2	SD	15	>4.5			14		115		
LEAN CLAY with SAND: Brown (10YR 4/3); moist; very stiff; with fine sand	CL	3										
CLAYEY SAND: Dark yellowish brown (10YR 4/4); moist; medium dense; mostly fine sand	SC	4										
		5	SD	37				13		114		
		6										
		7										
CLAYEY SAND with GRAVEL: Brown to dark brown (10YR 4/3 to 3/3); moist; medium dense to dense; fine to coarse, subangular to subrounded sand and fine gravel	SC	8										
		9	SD	46				8		122		
		10										
		11										
		12										
		13										
		14	SI	31								
		15										
		16										
CLAYEY SAND: Brown (10YR 4/3); moist; medium dense; fine to coarse sand	SC	17										
		18										
direct shear test, see Appendix B		19	SDS	24		47	34	18	18	109		
		20										

DATE: 8/28/2017	LOG OF EXPLORATORY DRILL HOLE	DH- 2A
PROJECT NAME: Morgan Hill Sewer Trunk, Phase 2		PROJECT NUMBER: 2016.0096
DRILL RIG: Mobile B56, 140# downhole hammer with wire winch		LOGGED BY: CSS
HOLE DIAMETER: 8" hollow stem augers		HOLE ELEVATION: ±216
SAMPLER: D = 3" OD, 2½" ID Split-spoon; X = 2½" OD, 2" ID Split-spoon; I = Standard Penetrometer (2" OD SPT); S = Slough in sample	GROUND WATER DEPTH:	Initial: ---; Final: 24.5 ft

DESCRIPTION OF EARTH MATERIALS	SOIL TYPE	DEPTH (ft)	SAMPLE	BLOWS PER FOOT	POCKET PEN (tsf)	% PASSING #200 SIEVE	LIQUID LIMIT	WATER CONTENT	PLASTICITY INDEX	DRY DENSITY (pcf)	FAILURE STRAIN (%)	UNCONFINED COMPRESSIVE STRENGTH (psf)
CLAYEY SAND: continued	SC		I	31								
LEAN CLAY with SAND: Mottled brown (10YR 4/3) and strong brown (7.5YR 4/6); moist; very stiff; with manganese oxide	CL	21	S		3.5							
		22	D	15	3.0	83	38	28	20	97	12	3124
		23	S									
		24	I	14		74						
FAT CLAY: Brown (10YR 4/3); moist; stiff to hard	CH	25	S	19	1.5 3.75	92	50	28	27	96	3.0	4348
LEAN CLAY with SAND: Brown (10YR 5/3); moist; stiff to very stiff; with fine sand	CL	26	D									
		27	S	14								
		28	I	28	>4.5 >4.5	84	40	23	22	104	8	5688
by 28.5 ft, mottled grayish brown (10YR 5/2) and strong brown (7.5YR 4/6)		29	S									
		30	D	14								
		31	S									
		32	I									
CLAYEY SAND with GRAVEL: Dark grayish brown to brown (10YR 4/2 to 4/3); wet; medium dense; fine to coarse, subangular to subrounded sand and gravel; with cobbles (based on choppy drilling and poor sample recovery)	SC	33	S									
		34	D	33								
		35	D					13		129		
		36										
		37										
		38										
very dense		39	I	50/4" (no sample recovered)								
		40										

DATE: 8/28/2017	LOG OF EXPLORATORY DRILL HOLE	DH- 2A
PROJECT NAME: Morgan Hill Sewer Trunk, Phase 2		PROJECT NUMBER: 2016.0096
DRILL RIG: Mobile B56, 140# downhole hammer with wire winch		LOGGED BY: CSS
HOLE DIAMETER: 8" hollow stem augers		HOLE ELEVATION: ±216
SAMPLER: D = 3" OD, 2½" ID Split-spoon X = 2½" OD, 2" ID Split-spoon I = Standard Penetrometer (2" OD SPT) S = Slough in sample	GROUND WATER DEPTH:	Initial: --- Final: 24.5 ft

DESCRIPTION OF EARTH MATERIALS	SOIL TYPE	DEPTH (ft)	SAMPLE	BLOWS PER FOOT	POCKET PEN (tsf)	% PASSING #200 SIEVE	LIQUID LIMIT	WATER CONTENT	PLASTICITY INDEX	DRY DENSITY (pcf)	FAILURE STRAIN (%)	UNCONFINED COMPRESSIVE STRENGTH (psf)
CLAYEY SAND with GRAVEL: continued	SC	41	S	64								
			S									
			I									
		42										
		43										
		44	S	50/6"								
			I									
		45										
		46										
		47										
		48										
		49	S	85/								
			I	10"								
		50	I									
BOTTOM OF HOLE = 50 Feet		51										
		52										
		53										
		54										
		55										
		56										
		57										
		58										
		59										
		60										

DATE: 8/28/2017	LOG OF EXPLORATORY DRILL HOLE	DH- 3A
PROJECT NAME: Morgan Hill Sewer Trunk, Phase 2		PROJECT NUMBER: 2016.0096
DRILL RIG: Mobile B56, 140# downhole hammer with wire winch		LOGGED BY: CSS
HOLE DIAMETER: 8" hollow stem augers		HOLE ELEVATION: ±215
SAMPLER: D = 3" OD, 2½" ID Split-spoon; X = 2½" OD, 2" ID Split-spoon; I = Standard Penetrometer (2" OD SPT); S = Slough in sample	GROUND WATER DEPTH: Initial: ±26 ft; Final: 26 ft	

DESCRIPTION OF EARTH MATERIALS	SOIL TYPE	DEPTH (ft)	SAMPLE	BLOWS PER FOOT	POCKET PEN (tsf)	% PASSING #200 SIEVE	LIQUID LIMIT	WATER CONTENT	PLASTICITY INDEX	DRY DENSITY (pcf)	FAILURE STRAIN (%)	UNCONFINED COMPRESSIVE STRENGTH (psf)
PAVEMENT (±4" AC over ±8" Baserock)		1										
FILL: CLAYEY SAND with GRAVEL: Very dark grayish brown (10YR 3/2); moist; medium dense; fine to coarse, subangular to subrounded sand; fine gravel	SC	2	S									
		3	D	17				11		126		
ALLUVIUM: LEAN CLAY: Brown (10YR 4/3); moist; very stiff to hard	CL	4										
		5	S									
		6	D	37	2.75 >4.5			17		113		
		7										
SANDY LEAN CLAY: Brown (10YR 4/3); moist; very stiff; with mostly fine to medium sand	CL	8										
		9	S									
		10	I	24								
		11										
CLAYEY SAND: Mottled brown (10YR 5/3) and strong brown (7.5YR 4/6); moist; medium dense; mostly fine sand	SC	12										
		13										
		14	S									
		15	D	26				17		116		
CLAYEY SAND with GRAVEL: Dark brown (7.5YR 4/3); moist; medium dense; fine to coarse sand; with fine gravel	SC	16										
		17										
		18										
direct shear test, see Appendix B		19	S					15		117		
		20	D	25		31	33		17			

DATE: 8/28/2017	LOG OF EXPLORATORY DRILL HOLE	DH- 3A
PROJECT NAME: Morgan Hill Sewer Trunk, Phase 2		PROJECT NUMBER: 2016.0096
DRILL RIG: Mobile B56, 140# downhole hammer with wire winch		LOGGED BY: CSS
HOLE DIAMETER: 8" hollow stem augers		HOLE ELEVATION: ±215
SAMPLER: D = 3" OD, 2½" ID Split-spoon; X = 2½" OD, 2" ID Split-spoon; I = Standard Penetrometer (2" OD SPT); S = Slough in sample	GROUND WATER DEPTH:	Initial: ±26 ft; Final: 26 ft

DESCRIPTION OF EARTH MATERIALS	SOIL TYPE	DEPTH (ft)	SAMPLE	BLOWS PER FOOT	POCKET PEN (tsf)	% PASSING #200 SIEVE	LIQUID LIMIT	WATER CONTENT	PLASTICITY INDEX	DRY DENSITY (pcf)	FAILURE STRAIN (%)	UNCONFINED COMPRESSIVE STRENGTH (psf)
CLAYEY SAND with GRAVEL: continued ±4" thick clay at approx. 20¾ ft	SC	21	S	22		29						
		22	I									
WELL GRADED SAND with GRAVEL and CLAY: Brown to dark grayish brown (10YR 4/3 to 4/2); moist; medium dense to dense; fine to coarse, subangular to subrounded sand; fine gravel	SW-SC	22	S	53		8	39	10	24	115	2	561
		23	D									
		24	S	29								
		25	I									
POORLY GRADED SAND with GRAVEL and SILT: Brown to dark grayish brown (10YR 4/3 to 4/2); moist to wet; dense; fine to coarse, subangular to subrounded sand; fine gravel	SP-SM	25	S	76		6	21	10	3	122		
		26	D									
		27	S	42								
		28	I									
		29	S	57				14		123		
		30	D									
CLAYEY SAND: Dark brown (10YR 3/3); wet; dense; fine sand	SC	31	S	32								
		32	I									
CLAYEY SAND with GRAVEL to CLAYEY GRAVEL with SAND: Dark brown (10YR 3/3); wet; dense; fine to coarse, subangular to subrounded sand and gravel; with cobbles	SC/GC	33										
		34	S	39								
		35	I									
		36										
SANDY LEAN CLAY to CLAYEY SAND: Very dark grayish brown (10YR 3/2); wet; very stiff clay to dense sand; mostly fine to medium, subangular to subrounded sand	CL/SC	37										
		38	S	44								
		39	S									
		40	I									

DATE: 8/28/2017	LOG OF EXPLORATORY DRILL HOLE	DH- 3A
PROJECT NAME: Morgan Hill Sewer Trunk, Phase 2		PROJECT NUMBER: 2016.0096
DRILL RIG: Mobile B56, 140# downhole hammer with wire winch		LOGGED BY: CSS
HOLE DIAMETER: 8" hollow stem augers		HOLE ELEVATION: ±215
SAMPLER: D = 3" OD, 2½" ID Split-spoon; X = 2½" OD, 2" ID Split-spoon; I = Standard Penetrometer (2" OD SPT); S = Slough in sample	GROUND WATER DEPTH:	Initial: ±26 ft; Final: 26 ft

DESCRIPTION OF EARTH MATERIALS	SOIL TYPE	DEPTH (ft)	SAMPLE	BLOWS PER FOOT	POCKET PEN (tsf)	% PASSING #200 SIEVE	LIQUID LIMIT	WATER CONTENT	PLASTICITY INDEX	DRY DENSITY (pcf)	FAILURE STRAIN (%)	UNCONFINED COMPRESSIVE STRENGTH (psf)
SANDY LEAN CLAY to CLAYEY SAND: continued	CL/ SC	41										
		42										
		43										
		44	S I I	37	(no sample recovered)							
		45										
LEAN CLAY with SAND: Brown (10YR 5/3) mottled with strong brown (7.5YR 4/6); moist to wet; hard	CL	46										
		47										
		48										
CLAYEY SAND: Dark brown (10YR 3/3); wet; very dense	SC	49	S I I	75/ 10"								
		50										
BOTTOM OF HOLE = 50 Feet		51										
		52										
		53										
		54										
		55										
		56										
		57										
		58										
		59										
		60										

DATE: 8/28/2017	LOG OF EXPLORATORY DRILL HOLE	DH- 4A
PROJECT NAME: Morgan Hill Sewer Trunk, Phase 2		PROJECT NUMBER: 2016.0096
DRILL RIG: Mobile B56, 140# downhole hammer with wire winch		LOGGED BY: CSS
HOLE DIAMETER: 8" hollow stem augers		HOLE ELEVATION: ±213½
SAMPLER: D = 3" OD, 2½" ID Split-spoon X = 2½" OD, 2" ID Split-spoon I = Standard Penetrometer (2" OD SPT) S = Slough in sample	GROUND WATER DEPTH:	Initial: --- Final: ---

DESCRIPTION OF EARTH MATERIALS	SOIL TYPE	DEPTH (ft)	SAMPLE	BLOWS PER FOOT	POCKET PEN (tsf)	% PASSING #200 SIEVE	LIQUID LIMIT	WATER CONTENT	PLASTICITY INDEX	DRY DENSITY (pcf)	FAILURE STRAIN (%)	UNCONFINED COMPRESSIVE STRENGTH (psf)
PAVEMENT (±4" AC over ±8" baserock)		1										
ALLUVIUM: LEAN CLAY: Dark brown (10YR 3/3); moist; very stiff	CL	2	S D D	12	2.75			15		105		
		3										
CLAYEY SAND with GRAVEL: Dark brown (7.5YR 3/3); moist; medium dense; fine to coarse, subangular to subrounded sand; with fine gravel	SC	4										
		5	S D D	32				13		121		
		6										
		7										
		8										
		9	S D D	31				7		122		
		10										
		11										
CLAYEY GRAVEL with SAND: Very dark grayish brown (10YR 3/2); moist; medium dense; fine to coarse, subangular to subrounded sand and gravel	GC	12										
		13										
		14	S D D	38				8		105		
		15										
		16										
		17										
		18										
dense		19	S I I	40								
BOTTOM OF HOLE = 20 Feet		20										
No Groundwater Encountered												

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DATE: 9/1/2017	LOG OF EXPLORATORY DRILL HOLE	DH- 5A
PROJECT NAME: Morgan Hill Sewer Trunk, Phase 2		PROJECT NUMBER: 2016.0096
DRILL RIG: Mobile B56, 140# downhole hammer with wire winch		LOGGED BY: CSS
HOLE DIAMETER: 8" hollow stem augers		HOLE ELEVATION: ±211½
SAMPLER: D = 3" OD, 2½" ID Split-spoon X = 2½" OD, 2" ID Split-spoon I = Standard Penetrometer (2" OD SPT) S = Slough in sample	GROUND WATER DEPTH:	Initial: --- Final: ---

DESCRIPTION OF EARTH MATERIALS	SOIL TYPE	DEPTH (ft)	SAMPLE	BLOWS PER FOOT	POCKET PEN (tsf)	% PASSING #200 SIEVE	LIQUID LIMIT	WATER CONTENT	PLASTICITY INDEX	DRY DENSITY (pcf)	FAILURE STRAIN (%)	UNCONFINED COMPRESSIVE STRENGTH (psf)
ALLUVIUM: CLAYEY SAND to SANDY LEAN CLAY: Brown (7.5YR 4/3); moist; medium dense sand/very stiff to hard clay; mostly fine to medium, angular to subrounded sand	SC/ CL	1										
		2	S									
		3	D D	27	>4.5 >4.5			11		107		
		4										
		5										
CLAYEY SAND with GRAVEL to CLAYEY GRAVEL with SAND: Brown to dark brown (7.5YR 4/3 to 3/3); moist; medium dense; fine to coarse, subangular to subrounded sand and gravel	SC/ GC	6	S D	17	(no sample recovery)							
		7	D									
		8										
		9	S									
		10	I	25								
		11	I									
		12										
		13										
		14	S									
medium dense to dense		15	I	33								
		16	I									
		17										
		18										
		19	S									
BOTTOM OF HOLE = 20 Feet		20	I	35								
No Groundwater Encountered			I									

GEO-LOGIC ASSOCIATES	PAGE: 1 of 1

DATE: 8/29/2017	LOG OF EXPLORATORY DRILL HOLE	DH- 6A
PROJECT NAME: Morgan Hill Sewer Trunk, Phase 2		PROJECT NUMBER: 2016.0096
DRILL RIG: Mobile B56, 140# downhole hammer with wire winch		LOGGED BY: CSS
HOLE DIAMETER: 8" hollow stem augers		HOLE ELEVATION: ±210
SAMPLER: D = 3" OD, 2½" ID Split-spoon X = 2½" OD, 2" ID Split-spoon I = Standard Penetrometer (2" OD SPT) S = Slough in sample	GROUND WATER DEPTH:	Initial: 25 ft Final: ---

DESCRIPTION OF EARTH MATERIALS	SOIL TYPE	DEPTH (ft)	SAMPLE	BLOWS PER FOOT	POCKET PEN (tsf)	% PASSING #200 SIEVE	LIQUID LIMIT	WATER CONTENT	PLASTICITY INDEX	DRY DENSITY (pcf)	FAILURE STRAIN (%)	UNCONFINED COMPRESSIVE STRENGTH (psf)
PAVEMENT (±7" AC over ±8" baserock)		1										
ALLUVIUM: LEAN CLAY with SAND: Brown (10YR 4/3); moist; hard; with fine sand	CL	2	S									
		3	D	20	>4.5							
		4	D		>4.5							
		5										
		6	S D	93/	>4.5			15		115		
		7	D	8"								
		8										
CLAYEY SAND: Dark brown (7.5YR 3/4); moist; dense; fine to coarse, subangular to subrounded sand	SC	9	S									
		10	I	38								
		11										
		12										
		13										
medium dense		14	S									
		15	I	26								
		16										
		17										
		18										
very dense		19	S									
		20	I	55								

DATE: 8/29/2017	LOG OF EXPLORATORY DRILL HOLE	DH- 6A
PROJECT NAME: Morgan Hill Sewer Trunk, Phase 2		PROJECT NUMBER: 2016.0096
DRILL RIG: Mobile B56, 140# downhole hammer with wire winch		LOGGED BY: CSS
HOLE DIAMETER: 8" hollow stem augers		HOLE ELEVATION: ±210
SAMPLER: D = 3" OD, 2½" ID Split-spoon X = 2½" OD, 2" ID Split-spoon I = Standard Penetrometer (2" OD SPT) S = Slough in sample	GROUND WATER DEPTH:	Initial: 25 ft Final: ---

DESCRIPTION OF EARTH MATERIALS	SOIL TYPE	DEPTH (ft)	SAMPLE	BLOWS PER FOOT	POCKET PEN (tsf)	% PASSING #200 SIEVE	LIQUID LIMIT	WATER CONTENT	PLASTICITY INDEX	DRY DENSITY (pcf)	FAILURE STRAIN (%)	UNCONFINED COMPRESSIVE STRENGTH (psf)
CLAYEY SAND: continued	SC	21										
		22										
		23										
		24	S									
by 25', brown (10YR 4/3), wet		25	I	30								
		26	I									
		27										
		28										
POORLY GRADED SAND with CLAY to CLAYEY SAND: Dark grayish brown (10YR 4/2); wet; medium dense; mostly fine to medium sand	SP-SC/ SC	29										
		30										
		31										
direct shear test, see Appendix B		32	S	15		18						
clayey sand	SC		D									
LEAN CLAY with SAND: Brown (10YR 5/3); moist to wet; stiff; with mostly fine sand	CL	33	S	15	1.0 2.25	84	28		13			
		34	I									
		35	S	26	1.5 2.0							
		36	D									
		37	S	14								
		38	I	23	1.25 2.75	77	38	21	21	106	8	2908
approx. 4" thick clayey sand lens		39	S									
		40	D	13	1.25 1.5							
			S									
			I									

DATE: 8/29/2017	LOG OF EXPLORATORY DRILL HOLE	DH- 6A
PROJECT NAME: Morgan Hill Sewer Trunk, Phase 2		PROJECT NUMBER: 2016.0096
DRILL RIG: Mobile B56, 140# downhole hammer with wire winch		LOGGED BY: CSS
HOLE DIAMETER: 8" hollow stem augers		HOLE ELEVATION: ±210
SAMPLER: D = 3" OD, 2½" ID Split-spoon; X = 2½" OD, 2" ID Split-spoon; I = Standard Penetrometer (2" OD SPT); S = Slough in sample	GROUND WATER DEPTH:	Initial: 25 ft; Final: ---

DESCRIPTION OF EARTH MATERIALS	SOIL TYPE	DEPTH (ft)	SAMPLE	BLOWS PER FOOT	POCKET PEN (tsf)	% PASSING #200 SIEVE	LIQUID LIMIT	WATER CONTENT	PLASTICITY INDEX	DRY DENSITY (pcf)	FAILURE STRAIN (%)	UNCONFINED COMPRESSIVE STRENGTH (psf)
LEAN CLAY: Brown (10YR 5/3); moist to wet; very stiff	CL	41	S	34	3.5							
			D		4.0	97	43	21	26	108	6	4852
		42	D									
			S	17	3.5							
		43	I		3							
		44	I									
		45										
			S									
		46	D	30	3							
			D		3			28		97		
		47										
		48										
by 48.5', sandy silty clay		49	S									
			D	21	4							
		50	D		4.5			22		106		
		51										
CLAYEY to SILTY SAND: Dark brown (10YR 4/3); wet; very dense; fine sand	SC/ SM	52										
		53										
		54	S									
			I	58								
POORLY GRADED GRAVEL with CLAY and SAND: Dark grayish brown (10YR 4/2); wet; very dense; fine to coarse, subangular to subrounded sand and gravel	GP-GC	55	I									
		56										
		57										
LEAN CLAY: Mottled light grayish brown (10YR 6/2) and strong brown (7.5YR 4/6); moist; hard	CL	58										
		59	S									
			D	50/2"				12		103		
BOTTOM OF HOLE = 59.2 Feet		60										

DATE: 8/29/2017	LOG OF EXPLORATORY DRILL HOLE	DH- 7A
PROJECT NAME: Morgan Hill Sewer Trunk, Phase 2		PROJECT NUMBER: 2016.0096
DRILL RIG: Mobile B56, 140# downhole hammer with wire winch		LOGGED BY: CSS
HOLE DIAMETER: 8" hollow stem augers		HOLE ELEVATION: ±210
SAMPLER: D = 3" OD, 2½" ID Split-spoon X = 2½" OD, 2" ID Split-spoon I = Standard Penetrometer (2" OD SPT) S = Slough in sample	GROUND WATER DEPTH:	Initial: ±31 ft Final: ---

DESCRIPTION OF EARTH MATERIALS	SOIL TYPE	DEPTH (ft)	SAMPLE	BLOWS PER FOOT	POCKET PEN (tsf)	% PASSING #200 SIEVE	LIQUID LIMIT	WATER CONTENT	PLASTICITY INDEX	DRY DENSITY (pcf)	FAILURE STRAIN (%)	UNCONFINED COMPRESSIVE STRENGTH (psf)
PAVEMENT (±4" AC over ±8" baserock)		1										
ALLUVIUM: SANDY LEAN CLAY: Brown (10YR 4/3); moist; very stiff; with fine sand	CL	2	S									
		3	D	8	3.5			16		115		
		4	D		2.5							
CLAYEY SAND: Dark brown (7.5YR 3/4); moist; medium dense; fine to coarse, subangular to subrounded sand	SC	5										
		6	S									
		7	D	25				10		118		
		8	D									
		9										
		10	S									
		11	D	28				8		117		
		12	D									
		13										
dense		14	S									
		15	I	36								
		16	I									
		17										
		18										
		19	S									
		20	I	49								

DATE: 8/29/2017	LOG OF EXPLORATORY DRILL HOLE	DH- 7A
PROJECT NAME: Morgan Hill Sewer Trunk, Phase 2		PROJECT NUMBER: 2016.0096
DRILL RIG: Mobile B56, 140# downhole hammer with wire winch		LOGGED BY: CSS
HOLE DIAMETER: 8" hollow stem augers		HOLE ELEVATION: ±210
SAMPLER: D = 3" OD, 2½" ID Split-spoon X = 2½" OD, 2" ID Split-spoon I = Standard Penetrometer (2" OD SPT) S = Slough in sample	GROUND WATER DEPTH:	Initial: ±31 ft Final: ---

DESCRIPTION OF EARTH MATERIALS	SOIL TYPE	DEPTH (ft)	SAMPLE	BLOWS PER FOOT	POCKET PEN (tsf)	% PASSING #200 SIEVE	LIQUID LIMIT	WATER CONTENT	PLASTICITY INDEX	DRY DENSITY (pcf)	FAILURE STRAIN (%)	UNCONFINED COMPRESSIVE STRENGTH (psf)
CLAYEY SAND: continued	SC	21										
		22										
		23										
		24	S									
		25	I	25								
LEAN CLAY with SAND: Grayish brown (10YR 5/2) mottled with strong brown (7.5YR 4/6); moist; stiff; with mostly fine sand	CL	25										
		26										
		27										
water on sampler		28										
		29	S		2.75							
		30	D	20	2.75			15		110	14	3067
wet		31										
		32	S		1.5							
		33	D	22	2.5	74	25	18	12	114	11	3628
		34	S	17								
some thin sandy lenses		35	I		2.5							
		36	S	19								
		37	D	12								
		38	S		2.75							
		39	I	22	1.5	78	31	22	15	106	15	2592
		40		16								

DATE: 8/29/2017	LOG OF EXPLORATORY DRILL HOLE	DH- 7A
PROJECT NAME: Morgan Hill Sewer Trunk, Phase 2		PROJECT NUMBER: 2016.0096
DRILL RIG: Mobile B56, 140# downhole hammer with wire winch		LOGGED BY: CSS
HOLE DIAMETER: 8" hollow stem augers		HOLE ELEVATION: ±210
SAMPLER: D = 3" OD, 2½" ID Split-spoon X = 2½" OD, 2" ID Split-spoon I = Standard Penetrometer (2" OD SPT) S = Slough in sample	GROUND WATER DEPTH:	Initial: ±31 ft Final: ---

DESCRIPTION OF EARTH MATERIALS	SOIL TYPE	DEPTH (ft)	SAMPLE	BLOWS PER FOOT	POCKET PEN (tsf)	% PASSING #200 SIEVE	LIQUID LIMIT	WATER CONTENT	PLASTICITY INDEX	DRY DENSITY (pcf)	FAILURE STRAIN (%)	UNCONFINED COMPRESSIVE STRENGTH (psf)
LEAN CLAY with SAND: continued	CL	41	S	46	1.75							
			D		1.5			22		107		
		42	D									
			S									
		43	I	16								
			I									
		44	S									
			D	37	3.0			21		110		
		45	D									
		46										
		47										
		48										
		49	S									
			D	41	1.75							
		50	D		2.25			23		105		
		51										
		52										
		53										
		54	S									
			I	29								
		55	I									
		56										
		57										
		58										
		59	S									
			I	26								
		60	I									
BOTTOM OF HOLE = 60 Feet												

GEO-LOGIC ASSOCIATES	PAGE: 3 of 3

DATE: 9/1/2017	LOG OF EXPLORATORY DRILL HOLE	DH- 8A
PROJECT NAME: Morgan Hill Sewer Trunk, Phase 2		PROJECT NUMBER: 2016.0096
DRILL RIG: Mobile B56, 140# downhole hammer with wire winch		LOGGED BY: CSS
HOLE DIAMETER: 8" hollow stem augers		HOLE ELEVATION: ±207
SAMPLER: D = 3" OD, 2½" ID Split-spoon; X = 2½" OD, 2" ID Split-spoon; I = Standard Penetrometer (2" OD SPT); S = Slough in sample	GROUND WATER DEPTH: Initial: ---; Final: ---	

DESCRIPTION OF EARTH MATERIALS	SOIL TYPE	DEPTH (ft)	SAMPLE	BLOWS PER FOOT	POCKET PEN (tsf)	% PASSING #200 SIEVE	LIQUID LIMIT	WATER CONTENT	PLASTICITY INDEX	DRY DENSITY (pcf)	FAILURE STRAIN (%)	UNCONFINED COMPRESSIVE STRENGTH (psf)
PAVEMENT (±6" AC over ±7" baserock)		1										
ALLUVIUM: CLAYEY GRAVEL with SAND: Very dark gray (7.5YR 3/1); moist; medium dense; fine angular to subrounded gravel; with fine to coarse sand	GC	2	S									
		3	D	22				13		111		
LEAN CLAY with SAND: Dark brown (7.5YR 3/3); moist; very stiff to hard; with fine sand	CL	4										
		5	S									
		6	D	38	>4.5			15		102		
		7			>4.5							
		8										
		9	S									
		10	D	25	4.5			17		107		
		11			>4.5							
CLAYEY SAND: Dark brown (7.5YR 3/3); moist; medium dense; mostly fine sand	SC	12										
		13										
		14	S									
		15	I	20								
		16	I									
LEAN CLAY with SAND: Mottled grayish brown (10YR 5/2) and strong brown (7.5YR 4/6); moist; stiff to very stiff; with fine sand	CL	17										
		18										
		19	S									
BOTTOM OF HOLE = 20 Feet		20	I	23								
No Groundwater Encountered			I									

GEO-LOGIC ASSOCIATES	PAGE: 1 of 1

DATE: 9/1/2017	LOG OF EXPLORATORY DRILL HOLE	DH- 9A
PROJECT NAME: Morgan Hill Sewer Trunk, Phase 2		PROJECT NUMBER: 2016.0096
DRILL RIG: Mobile B56, 140# downhole hammer with wire winch		LOGGED BY: CSS
HOLE DIAMETER: 8" hollow stem augers		HOLE ELEVATION: ±204½
SAMPLER: D = 3" OD, 2½" ID Split-spoon; X = 2½" OD, 2" ID Split-spoon; I = Standard Penetrometer (2" OD SPT); S = Slough in sample	GROUND WATER DEPTH:	Initial: ---; Final: ---

DESCRIPTION OF EARTH MATERIALS	SOIL TYPE	DEPTH (ft)	SAMPLE	BLOWS PER FOOT	POCKET PEN (tsf)	% PASSING #200 SIEVE	LIQUID LIMIT	WATER CONTENT	PLASTICITY INDEX	DRY DENSITY (pcf)	FAILURE STRAIN (%)	UNCONFINED COMPRESSIVE STRENGTH (psf)
PAVEMENT (±5" AC over ±7" baserock)												
FILL: CLAYEY SAND with GRAVEL: Very dark gray (7.5YR 3/1); moist; medium dense; fine to coarse, angular to subrounded sand; with fine gravel	SC	1	S									
		2	D	16	2.5			18		114		
	CL	3	D									
ALLUVIUM: LEAN CLAY (7.5YR 3/3); moist; very stiff to hard		4										
brownish yellow (10YR6/6); dry to moist; hard		5	S									
		6	D	51	>4.5			17		116		
		7										
		8										
brown (10YR 3/4); moist		9	S									
		10	D	24	>4.5 4.5			20		110		
		11										
CLAYEY SAND with GRAVEL: Dark yellowish brown (10YR 4/4); moist; dense; fine to coarse, subangular to subrounded sand; with fine gravel	SC	12										
		13										
		14	S									
		15	D	56				9		128		
		16										
SANDY LEAN CLAY to CLAYEY SAND: Dark brown (10YR 3/3); moist; very stiff clay to medium dense sand; mostly fine to medium sand	CL/ SC	17										
		18										
		19	S									
BOTTOM OF HOLE = 20 Feet		20	I	18								
No Groundwater Encountered												

GEO-LOGIC ASSOCIATES	PAGE: 1 of 1

DATE: 8/30/2017	LOG OF EXPLORATORY DRILL HOLE	DH- 10A
PROJECT NAME: Morgan Hill Sewer Trunk, Phase 2		PROJECT NUMBER: 2016.0096
DRILL RIG: Mobile B56, 140# downhole hammer with wire winch		LOGGED BY: CSS
HOLE DIAMETER: 8" hollow stem augers		HOLE ELEVATION: ±203

SAMPLER: D = 3" OD, 2½" ID Split-spoon; X = 2½" OD, 2" ID Split-spoon; I = Standard Penetrometer (2" OD SPT); S = Slough in sample

GROUND WATER DEPTH: Initial: 23 ft; Final: ---

DESCRIPTION OF EARTH MATERIALS	SOIL TYPE	DEPTH (ft)	SAMPLE	BLOWS PER FOOT	POCKET PEN (tsf)	% PASSING #200 SIEVE	LIQUID LIMIT	WATER CONTENT	PLASTICITY INDEX	DRY DENSITY (pcf)	FAILURE STRAIN (%)	UNCONFINED COMPRESSIVE STRENGTH (psf)
PAVEMENT (±5" AC on ±12" PCC on baserock)		1										
ALLUVIUM: SANDY LEAN CLAY: Dark yellowish brown (10YR 4/4); moist; hard; fine sand	CL	2	S	23	>4.5			16		108		
		3	D									
		4										
CLAYEY GRAVEL: yellowish brown (10YR 3/4); moist; very dense	GC	5	S	50/4"	>4.5			10		120		
		6	D									
		7										
SANDY LEAN CLAY: mottled pale brown (10YR 6/3) and strong brown (7.5YR 5/8); moist; very stiff to hard	CL	8										
		9	S	36	>4.5			15		117		
		10	D		>4.5							
		11										
CLAYEY SAND with GRAVEL: Dark grayish brown (10YR 4/2) mottled with strong brown (7.5YR 4/6); moist; dense; fine to coarse, subangular to subrounded sand; with fine gravel	SC	12										
		13										
		14	S	35								
		15	I									
		16	I									
		17										
CLAYEY GRAVEL with SAND: Dark grayish brown (10YR 4/2); moist to wet; dense; fine to coarse, subangular to subrounded sand & gravel; with cobbles	GC	18										
		19										
		20										

DATE: 8/30/2017	LOG OF EXPLORATORY DRILL HOLE	DH- 10A
PROJECT NAME: Morgan Hill Sewer Trunk, Phase 2		PROJECT NUMBER: 2016.0096
DRILL RIG: Mobile B56, 140# downhole hammer with wire winch		LOGGED BY: CSS
HOLE DIAMETER: 8" hollow stem augers		HOLE ELEVATION: ±203

SAMPLER: D = 3" OD, 2½" ID Split-spoon; X = 2½" OD, 2" ID Split-spoon; I = Standard Penetrometer (2" OD SPT); S = Slough in sample

GROUND WATER DEPTH: Initial: 23 ft; Final: ---

DESCRIPTION OF EARTH MATERIALS	SOIL TYPE	DEPTH (ft)	SAMPLE	BLOWS PER FOOT	POCKET PEN (tsf)	% PASSING #200 SIEVE	LIQUID LIMIT	WATER CONTENT	PLASTICITY INDEX	DRY DENSITY (pcf)	FAILURE STRAIN (%)	UNCONFINED COMPRESSIVE STRENGTH (psf)
POORLY GRADED GRAVEL with SAND and CLAY: Dark grayish brown (10YR 4/2); moist to wet; dense; fine to coarse, subangular to subrounded sand & gravel; with cobbles	GC	21	SDS									
		22		62		10	30	9	14	128		
		23										
		24	SDS	44								
very dense		25		50/6"				9		122		
dense		26	SIS	36								
±4 in. thick clay from approx. 26.5-27 ft		27										
POORLY GRADED SAND with GRAVEL and SILT: Dark grayish brown (10YR 4/2); wet; dense; with cobbles	SP-SM	28	SDS	52		7	NP	11	NP	110		
WELL GRADED SAND with GRAVEL: Dark grayish brown (10YR 4/2); wet; dense	SW	29	SIS	50		4	NP	26	NP			
		30										
		31	SD	50/5.5" (no sample recovery)								
CLAYEY SAND with GRAVEL: Grayish brown (10YR 5/2); wet; medium dense; fine to coarse sand	SC	32	SIS	25		45		14				
		33										
LEAN CLAY: Grayish brown (10YR 5/2); moist to wet; very stiff	CL	34	SIS	16								
		35										
		36										
CLAYEY GRAVEL with SAND: Dark grayish brown (10YR 4/2); wet; very dense; fine to coarse, subangular to subrounded sand & gravel; with cobbles	GC	37										
		38										
		39	SIS	59								
		40										

DATE: 8/30/2017	LOG OF EXPLORATORY DRILL HOLE	DH- 10A
PROJECT NAME: Morgan Hill Sewer Trunk, Phase 2		PROJECT NUMBER: 2016.0096
DRILL RIG: Mobile B56, 140# downhole hammer with wire winch		LOGGED BY: CSS
HOLE DIAMETER: 8" hollow stem augers		HOLE ELEVATION: ±203
SAMPLER: D = 3" OD, 2½" ID Split-spoon X = 2½" OD, 2" ID Split-spoon I = Standard Penetrometer (2" OD SPT) S = Slough in sample		GROUND WATER DEPTH: Initial: 23 ft Final: ---

DESCRIPTION OF EARTH MATERIALS	SOIL TYPE	DEPTH (ft)	SAMPLE	BLOWS PER FOOT	POCKET PEN (tsf)	% PASSING #200 SIEVE	LIQUID LIMIT	WATER CONTENT	PLASTICITY INDEX	DRY DENSITY (pcf)	FAILURE STRAIN (%)	UNCONFINED COMPRESSIVE STRENGTH (psf)
CLAYEY GRAVEL with SAND: continued	GC	41										
		42										
LEAN CLAY with SAND to SANDY LEAN CLAY: Mostly strong brown (7.5YR 4/6); moist; very stiff; with fine to coarse, subangular to subrounded sand	CL	43										
		44	S	25								
		45	I									
		46	I									
SILTY to CLAYEY SAND: Dark yellowish brown (10YR 4/4) with strong brown (7.5YR) spots; moist; dense; fine sand	SC/ SM	47										
		48										
		49	S	31								
		50	I									
BOTTOM OF HOLE = 50 Feet		51	I									
		52										
		53										
		54										
		55										
		56										
		57										
		58										
		59										
		60										

DATE: 8/30/2017	LOG OF EXPLORATORY DRILL HOLE	DH- 11A
PROJECT NAME: Morgan Hill Sewer Trunk, Phase 2		PROJECT NUMBER: 2016.0096
DRILL RIG: Mobile B56, 140# downhole hammer with wire winch		LOGGED BY: CSS
HOLE DIAMETER: 8" hollow stem augers		HOLE ELEVATION: ±201½
SAMPLER: D = 3" OD, 2½" ID Split-spoon X = 2½" OD, 2" ID Split-spoon I = Standard Penetrometer (2" OD SPT) S = Slough in sample	GROUND WATER DEPTH:	Initial: 26 ft Final: ---

DESCRIPTION OF EARTH MATERIALS	SOIL TYPE	DEPTH (ft)	SAMPLE	BLOWS PER FOOT	POCKET PEN (tsf)	% PASSING #200 SIEVE	LIQUID LIMIT	WATER CONTENT	PLASTICITY INDEX	DRY DENSITY (pcf)	FAILURE STRAIN (%)	UNCONFINED COMPRESSIVE STRENGTH (psf)
PAVEMENT (±5" AC over ±12" baserock)		1										
ALLUVIUM: FAT CLAY: Black (10YR 2/1); moist; stiff	CH	2	S									
		3	D	11	1.75			24		101		
CLAYEY SAND with GRAVEL: Mottled grayish brown (10YR 5/2) with strong brown (7.5YR 4/6); moist; medium dense; fine to coarse, angular to rounded sand; with fine gravel	SC	4										
		5	S									
		6	D	18				18		112		
		7										
		8										
		9	S									
		10	I	21								
		11										
		12										
		13										
dense		14	S									
		15	I	34								
		16										
		17										
		18										
medium dense		19	S									
		20	D	34				16		111		

DATE: 8/30/2017	LOG OF EXPLORATORY DRILL HOLE	DH- 11A
PROJECT NAME: Morgan Hill Sewer Trunk, Phase 2		PROJECT NUMBER: 2016.0096
DRILL RIG: Mobile B56, 140# downhole hammer with wire winch		LOGGED BY: CSS
HOLE DIAMETER: 8" hollow stem augers		HOLE ELEVATION: ±201½
SAMPLER: D = 3" OD, 2½" ID Split-spoon X = 2½" OD, 2" ID Split-spoon I = Standard Penetrometer (2" OD SPT) S = Slough in sample	GROUND WATER DEPTH:	Initial: 26 ft Final: ---

DESCRIPTION OF EARTH MATERIALS	SOIL TYPE	DEPTH (ft)	SAMPLE	BLOWS PER FOOT	POCKET PEN (tsf)	% PASSING #200 SIEVE	LIQUID LIMIT	WATER CONTENT	PLASTICITY INDEX	DRY DENSITY (pcf)	FAILURE STRAIN (%)	UNCONFINED COMPRESSIVE STRENGTH (psf)
CLAYEY SAND with GRAVEL: continued	SC											
CLAYEY GRAVEL with SAND: Dark grayish brown (10YR 5/2) to brown (7.5YR 4/3) with strong brown (7/5YR 4/6); moist; medium dense to dense; fine to coarse, subangular to subrounded sand and gravel; cobbles likely but not observed	GC	21	SDS									
		22		39		27		16		113		
		23		47								
	GW	24										
WELL GRADED GRAVEL with SAND: Dark brown (10YR 4/3), moist to wet; medium dense to dense; fine to coarse gravel; with fine to coarse		25	SDS	70		4	25	7	10	123		
	SP-SM	26		27								
POORLY GRADED SAND with GRAVEL and SILT: Dark brown (10YR 3/3); wet; dense; fine to coarse, subangular to subrounded sand; with fine gravel		27	SDS									
		28		42		8		12	NP	115		
		29	SDS	35								
	SM	30										
SILTY SAND with GRAVEL: Dark brown (10YR 3/3); wet; dense; fine to coarse sand; with fine gravel and cobbles		31	SDS	51		19		15	NP	114		
grayish brown to dark grayish brown (10YR 5/2); very dense		32		71		13		8				
for sample @ 30.5-31.5 ft: permeability test, see Appendix B direct shear test, see Appendix B		33										
		34	SI	50/6" (no sample recovered)								
		35										
		36										
		37										
		38										
		39	SI	50/6"								
		40										

DATE: 8/30/2017	LOG OF EXPLORATORY DRILL HOLE	DH- 11A
PROJECT NAME: Morgan Hill Sewer Trunk, Phase 2		PROJECT NUMBER: 2016.0096
DRILL RIG: Mobile B56, 140# downhole hammer with wire winch		LOGGED BY: CSS
HOLE DIAMETER: 8" hollow stem augers		HOLE ELEVATION: ±201½
SAMPLER: D = 3" OD, 2½" ID Split-spoon X = 2½" OD, 2" ID Split-spoon I = Standard Penetrometer (2" OD SPT) S = Slough in sample	GROUND WATER DEPTH:	Initial: 26 ft Final: ---

DESCRIPTION OF EARTH MATERIALS	SOIL TYPE	DEPTH (ft)	SAMPLE	BLOWS PER FOOT	POCKET PEN (tsf)	% PASSING #200 SIEVE	LIQUID LIMIT	WATER CONTENT	PLASTICITY INDEX	DRY DENSITY (pcf)	FAILURE STRAIN (%)	UNCONFINED COMPRESSIVE STRENGTH (psf)
SILTY SAND with GRAVEL: continued	SM	41										
		42										
LEAN CLAY: Dark greenish gray (gley1 4/10GY); moist; very stiff	CL	43										
		44	S	22								
		45	I									
		46	I									
		47										
		48										
		49	S	44	1.0	99		26		100		
		50	D		4.0							
BOTTOM OF HOLE = 50 Feet		51	D									
		52										
		53										
		54										
		55										
		56										
		57										
		58										
		59										
		60										

DATE: 9/6/2017	LOG OF EXPLORATORY DRILL HOLE	DH- 12A
PROJECT NAME: Morgan Hill Sewer Trunk, Phase 2		PROJECT NUMBER: 2016.0096
DRILL RIG: Mobile B53, 140# downhole hammer with wire winch		LOGGED BY: CSS
HOLE DIAMETER: 8" hollow stem augers		HOLE ELEVATION: ±200½
SAMPLER: D = 3" OD, 2½" ID Split-spoon X = 2½" OD, 2" ID Split-spoon I = Standard Penetrometer (2" OD SPT) S = Slough in sample	GROUND WATER DEPTH:	Initial: --- Final: ---

DESCRIPTION OF EARTH MATERIALS	SOIL TYPE	DEPTH (ft)	SAMPLE	BLOWS PER FOOT	POCKET PEN (tsf)	% PASSING #200 SIEVE	LIQUID LIMIT	WATER CONTENT	PLASTICITY INDEX	DRY DENSITY (pcf)	FAILURE STRAIN (%)	UNCONFINED COMPRESSIVE STRENGTH (psf)
PAVEMENT (±10" AC over ±8" baserock)		1										
ALLUVIUM: FAT CLAY: Black (10YR 2/1); moist; very stiff	CH	2	S	15	3.75							
		3	D		3.5			23		104		
		4	D									
LEAN CLAY to LEAN CLAY with SAND: Dark grayish brown (10YR 4/2); moist; very stiff; with fine sand, abundant manganese oxide	CL	5	S	17	3							
		6	D		3.5			16		118		
		7										
CLAYEY SAND with GRAVEL to CLAYEY GRAVEL with SAND: Brown (7.5YR 4/2 to 4/3); moist; medium dense; fine to coarse, subangular to subrounded sand and gravel	SC/ GC	8										
		9	S	38								
		10	D					9		121		
		11										
		12										
		13										
		14	S	28								
		15	I									
		16	I									
		17										
LEAN CLAY to LEAN CLAY with SAND: Dark grayish brown (10YR 4/2); moist; very stiff; with fine sand	CL	18										
		19	S	15								
BOTTOM OF HOLE = 20 Feet		20	I									
No Groundwater Encountered			I									

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DATE: 9/1/2017	LOG OF EXPLORATORY DRILL HOLE	DH- 13A
PROJECT NAME: Morgan Hill Sewer Trunk, Phase 2		PROJECT NUMBER: 2016.0096
DRILL RIG: Mobile B56, 140# downhole hammer with wire winch		LOGGED BY: CSS
HOLE DIAMETER: 8" hollow stem augers		HOLE ELEVATION: ±200½
SAMPLER: D = 3" OD, 2½" ID Split-spoon X = 2½" OD, 2" ID Split-spoon I = Standard Penetrometer (2" OD SPT) S = Slough in sample	GROUND WATER DEPTH:	Initial: --- Final: ---

DESCRIPTION OF EARTH MATERIALS	SOIL TYPE	DEPTH (ft)	SAMPLE	BLOWS PER FOOT	POCKET PEN (tsf)	% PASSING #200 SIEVE	LIQUID LIMIT	WATER CONTENT	PLASTICITY INDEX	DRY DENSITY (pcf)	FAILURE STRAIN (%)	UNCONFINED COMPRESSIVE STRENGTH (psf)
PAVEMENT (±4" AC over ±8" baserock)		1										
ALLUVIUM: CLAYEY GRAVEL with SAND: Dark brown (7.5YR 3/3); moist; medium dense; fine to coarse, subangular to subrounded sand and gravel	GC	2	S									
		3	D	33				6		106		
		4	D									
		5										
		6	S	14								
		7	I									
LEAN CLAY to LEAN CLAY with SAND: Brown (7.5YR 4/3); moist; stiff; with fine to medium, subangular to subrounded sand	CL	8										
		9	S									
		10	I	13								
		11	I									
CLAYEY SAND with GRAVEL: Brown (7.5YR 4/3); moist; medium dense; fine to coarse, subangular to subrounded sand and gravel	SC	12										
		13										
		14	S									
		15	I	17								
		16	I									
		17										
		18										
		19	S									
medium dense to dense		20	I	30								
BOTTOM OF HOLE = 20 Feet												
No Groundwater Encountered												

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DATE: 9/6/2017	LOG OF EXPLORATORY DRILL HOLE	DH- 14A
PROJECT NAME: Morgan Hill Sewer Trunk, Phase 2		PROJECT NUMBER: 2016.0096
DRILL RIG: Mobile B53, 140# downhole hammer with wire winch		LOGGED BY: CSS
HOLE DIAMETER: 8" hollow stem augers		HOLE ELEVATION: ±196
SAMPLER: D = 3" OD, 2½" ID Split-spoon; X = 2½" OD, 2" ID Split-spoon; I = Standard Penetrometer (2" OD SPT); S = Slough in sample	GROUND WATER DEPTH: Initial: ---; Final: ---	

DESCRIPTION OF EARTH MATERIALS	SOIL TYPE	DEPTH (ft)	SAMPLE	BLOWS PER FOOT	POCKET PEN (tsf)	% PASSING #200 SIEVE	LIQUID LIMIT	WATER CONTENT	PLASTICITY INDEX	DRY DENSITY (pcf)	FAILURE STRAIN (%)	UNCONFINED COMPRESSIVE STRENGTH (psf)
PAVEMENT (±5" AC over ±7" baserock)												
ALLUVIUM: LEAN CLAY with SAND: Brown to dark brown (7.5YR 4/3 to 3/3); moist; very stiff; with fine sand	CL	1										
		2	S	11	3.75			21		106		
		3	D									
LEAN CLAY to SANDY LEAN CLAY: Mottled grayish brown (10YR 5/2) and strong brown (7.5YR 4/6); moist; hard; with mostly fine sand	CL	4										
		5			4							
		6	S D	27	4.5			19		118		
		7										
CLAYEY GRAVEL with SAND: Brown (10YR 4/3); moist; medium dense; fine to coarse, subangular to subrounded sand and gravel	GC	8										
		9	S	27								
		10	I									
		11										
CLAYEY SAND with GRAVEL: Dark brown (7.5YR 3/3 to 2/3); moist; medium dense; fine to coarse, subrounded to subangular sand and fine gravel	SC	12										
		13										
		14	S	16								
		15	I									
CLAYEY SAND: Brown (10YR 4/3); wet; medium dense; fine sand		16										
		17										
CLAYEY GRAVEL with SAND: Brown (10YR 4/3); moist; medium dense; fine to coarse, subangular to subrounded sand and gravel	SC	18										
	GC	19	S	23								
BOTTOM OF HOLE = 20 Feet		20	I									
No Groundwater Encountered												

GEO-LOGIC ASSOCIATES	PAGE: 1 of 1

DATE: 9/6/2017	LOG OF EXPLORATORY DRILL HOLE	DH- 15A
PROJECT NAME: Morgan Hill Sewer Trunk, Phase 2		PROJECT NUMBER: 2016.0096
DRILL RIG: Mobile B53, 140# downhole hammer with wire winch		LOGGED BY: CSS
HOLE DIAMETER: 8" hollow stem augers		HOLE ELEVATION: ±195½
SAMPLER: D = 3" OD, 2½" ID Split-spoon X = 2½" OD, 2" ID Split-spoon I = Standard Penetrometer (2" OD SPT) S = Slough in sample	GROUND WATER DEPTH:	Initial: --- Final: ---

DESCRIPTION OF EARTH MATERIALS	SOIL TYPE	DEPTH (ft)	SAMPLE	BLOWS PER FOOT	POCKET PEN (tsf)	% PASSING #200 SIEVE	LIQUID LIMIT	WATER CONTENT	PLASTICITY INDEX	DRY DENSITY (pcf)	FAILURE STRAIN (%)	UNCONFINED COMPRESSIVE STRENGTH (psf)
PAVEMENT (±5" AC over ±7" baserock)		1										
ALLUVIUM: LEAN CLAY with SAND: Brown to dark brown (7.5YR 4/3 to 3/3); moist; hard; with fine sand	CL	2	S	30	>4.5							
		3	D		>4.5							
LEAN CLAY with SAND: Dark grayish brown (10YR 4/2) mottled with strong brown (7.5YR 4/6); moist; hard; with fine sand	CL	4										
		5	S									
		6	D	24	>4.5							
		7			>4.5							
CLAYEY GRAVEL with SAND: Brown (10YR 4/3); moist; medium dense; fine to coarse, subangular to subrounded sand and gravel	GC	8										
		9	S									
		10	I	26								
		11										
		12										
		13										
		14	S									
		15	I	27								
		16										
		17										
		18										
very dense		19	S									
BOTTOM OF HOLE = 20 Feet			I	62								
		20										
No Groundwater Encountered												

GEO-LOGIC ASSOCIATES	PAGE: 1 of 1

DATE: 8/31/2017	LOG OF EXPLORATORY DRILL HOLE	DH- 16A
PROJECT NAME: Morgan Hill Sewer Trunk, Phase 2		PROJECT NUMBER: 2016.0096
DRILL RIG: Mobile B56, 140# downhole hammer with wire winch		LOGGED BY: CSS
HOLE DIAMETER: 8" hollow stem augers		HOLE ELEVATION: ±197
SAMPLER: D = 3" OD, 2½" ID Split-spoon X = 2½" OD, 2" ID Split-spoon I = Standard Penetrometer (2" OD SPT) S = Slough in sample	GROUND WATER DEPTH:	Initial: ±23 ft Final: ---

DESCRIPTION OF EARTH MATERIALS	SOIL TYPE	DEPTH (ft)	SAMPLE	BLOWS PER FOOT	POCKET PEN (tsf)	% PASSING #200 SIEVE	LIQUID LIMIT	WATER CONTENT	PLASTICITY INDEX	DRY DENSITY (pcf)	FAILURE STRAIN (%)	UNCONFINED COMPRESSIVE STRENGTH (psf)
PAVEMENT (±1" AC over ±12" PCC concrete)		1										
FILL: CLAYEY GRAVEL with SAND: Very dark brown (10YR 2/2); moist; medium dense; fine to coarse, subangular to subrounded sand and fine gravel	GC	2	S									
		3	D	17								
		4	D									
		5										
		6	S									
		7	D	39								
ALLUVIUM: CLAYEY SAND with GRAVEL to CLAYEY GRAVEL with SAND: Brown (7.5YR 4/3); moist to wet; dense; fine to coarse, subangular to subrounded sand and gravel	SC/ GC	8										
		9	S									
		10	I	36								
		11	I									
		12										
		13										
medium dense		14	S									
		15	I	16								
		16	I									
		17										
		18										
		19	S									
		20	D	32				16		117		

DATE: 8/31/2017	LOG OF EXPLORATORY DRILL HOLE	DH- 16A
PROJECT NAME: Morgan Hill Sewer Trunk, Phase 2		PROJECT NUMBER: 2016.0096
DRILL RIG: Mobile B56, 140# downhole hammer with wire winch		LOGGED BY: CSS
HOLE DIAMETER: 8" hollow stem augers		HOLE ELEVATION: ±197
SAMPLER: D = 3" OD, 2½" ID Split-spoon; X = 2½" OD, 2" ID Split-spoon; I = Standard Penetrometer (2" OD SPT); S = Slough in sample	GROUND WATER DEPTH:	Initial: ±23 ft; Final: ---

DESCRIPTION OF EARTH MATERIALS	SOIL TYPE	DEPTH (ft)	SAMPLE	BLOWS PER FOOT	POCKET PEN (tsf)	% PASSING #200 SIEVE	LIQUID LIMIT	WATER CONTENT	PLASTICITY INDEX	DRY DENSITY (pcf)	FAILURE STRAIN (%)	UNCONFINED COMPRESSIVE STRENGTH (psf)
CLAYEY SAND with GRAVEL to CLAYEY GRAVEL with SAND: continued	SC/ GC	21										
CLAYEY SAND: Dark grayish brown to brown (10YR 5/3 to 4/3), moist to wet; dense; mostly fine to medium sand	SC	22										
		23										
		24	S	51				13		123		
direct shear test, see Appendix B			D					16		115		
POORLY GRADED SAND with GRAVEL and CLAY: Dark grayish brown to brown (10YR 5/3 to 4/3); moist to wet, dense; fine to coarse; subangular to subrounded sand and gravel	GC	25	D	37								
		26	S									
		27	D	27		7	39	14	24	115	2	446
SILTY SAND: Mottled light brownish gray (10YR 2/6) and strong brown (7.5YR 4/6); moist to wet; medium dense; fine sand	SM	28	D	16								
		29	S									
		30	I	31		15		19	NP	105	2	446
WELL GRADED GRAVEL with SAND: Dark grayish brown to brown (10YR 5/3 to 4/3); moist to wet; dense; fine to coarse; subangular to subrounded sand and gravel	GW	31	I	50								
		32	S									
		33	D	55		3		8	NP	118		
		34	D									
			S	43								
		35	I									
		36	I									
		37										
		38										
		39	S									
			I	41								
		40	I									

DATE: 8/31/2017	LOG OF EXPLORATORY DRILL HOLE	DH- 16A
PROJECT NAME: Morgan Hill Sewer Trunk, Phase 2		PROJECT NUMBER: 2016.0096
DRILL RIG: Mobile B56, 140# downhole hammer with wire winch		LOGGED BY: CSS
HOLE DIAMETER: 8" hollow stem augers		HOLE ELEVATION: ±197
SAMPLER: D = 3" OD, 2½" ID Split-spoon X = 2½" OD, 2" ID Split-spoon I = Standard Penetrometer (2" OD SPT) S = Slough in sample		GROUND WATER DEPTH: Initial: ±23 ft Final: ---

DESCRIPTION OF EARTH MATERIALS	SOIL TYPE	DEPTH (ft)	SAMPLE	BLOWS PER FOOT	POCKET PEN (tsf)	% PASSING #200 SIEVE	LIQUID LIMIT	WATER CONTENT	PLASTICITY INDEX	DRY DENSITY (pcf)	FAILURE STRAIN (%)	UNCONFINED COMPRESSIVE STRENGTH (psf)
WELL GRADED GRAVEL with SAND: continued	GW	41										
		42										
CLAYEY SAND: Mottled light brownish gray (10YR 6/2) and strong brown (7.5YR 4/6); moist to wet; dense to very dense; fine sand	SC	43										
		44	S	50								
		45	I									
		46	I									
		47										
		48										
dense		49	S	39								
		50	I									
BOTTOM OF HOLE = 50 Feet		51	I									
		52										
		53										
		54										
		55										
		56										
		57										
		58										
		59										
		60										

DATE: 8/31/2017	LOG OF EXPLORATORY DRILL HOLE	DH- 17A
PROJECT NAME: Morgan Hill Sewer Trunk, Phase 2		PROJECT NUMBER: 2016.0096
DRILL RIG: Mobile B53, 140# downhole hammer with wire winch		LOGGED BY: CSS
HOLE DIAMETER: 8" hollow stem augers		HOLE ELEVATION: ±195½

SAMPLER: D = 3" OD, 2½" ID Split-spoon; X = 2½" OD, 2" ID Split-spoon; I = Standard Penetrometer (2" OD SPT); S = Slough in sample

GROUND WATER DEPTH: Initial: 30 ft; Final: ---

DESCRIPTION OF EARTH MATERIALS	SOIL TYPE	DEPTH (ft)	SAMPLE	BLOWS PER FOOT	POCKET PEN (tsf)	% PASSING #200 SIEVE	LIQUID LIMIT	WATER CONTENT	PLASTICITY INDEX	DRY DENSITY (pcf)	FAILURE STRAIN (%)	UNCONFINED COMPRESSIVE STRENGTH (psf)
PAVEMENT (±4" AC over ±3" baserock)												
ALLUVIUM: LEAN CLAY with SAND: Very dark gray (10YR 3/1); dry to moist; hard; fine sand; grades coarser with depth	CL	1										
		2	S	23	>4.5			19		110		
		3	D									
LEAN CLAY with SAND: Dark yellowish brown (10YR 4/4), moist, very stiff; with fine sand	CL	4										
		5	S		3.5							
		6	D	11	>4.5			16		108		
		7										
CLAYEY SAND: Mottled light brownish gray (10YR 6/2) and strong brown (7.5YR 4/6); moist; loose; fine sand	SC	8										
		9	S	9								
		10	I									
		11										
CLAYEY GRAVEL with SAND and CLAYEY SAND with GRAVEL: Brown (10YR 4/3), moist; medium dense; fine to coarse, subangular to subrounded sand and gravel	GC/ SC	12										
		13										
		14	S	23								
		15	I									
		16										
		17										
		18										
		19	S	27				5				
		20	I									

DATE: 8/31/2017	LOG OF EXPLORATORY DRILL HOLE	DH- 17A
PROJECT NAME: Morgan Hill Sewer Trunk, Phase 2		PROJECT NUMBER: 2016.0096
DRILL RIG: Mobile B53, 140# downhole hammer with wire winch		LOGGED BY: CSS
HOLE DIAMETER: 8" hollow stem augers		HOLE ELEVATION: ±195½
SAMPLER: D = 3" OD, 2½" ID Split-spoon; X = 2½" OD, 2" ID Split-spoon; I = Standard Penetrometer (2" OD SPT); S = Slough in sample	GROUND WATER DEPTH:	Initial: 30 ft; Final: ---

DESCRIPTION OF EARTH MATERIALS	SOIL TYPE	DEPTH (ft)	SAMPLE	BLOWS PER FOOT	POCKET PEN (tsf)	% PASSING #200 SIEVE	LIQUID LIMIT	WATER CONTENT	PLASTICITY INDEX	DRY DENSITY (pcf)	FAILURE STRAIN (%)	UNCONFINED COMPRESSIVE STRENGTH (psf)
CLAYEY GRAVEL with SAND to CLAYEY SAND with GRAVEL: continued	GC/SC	21										
CLAYEY SAND with GRAVEL: Dark grayish brown to brown (10YR 3/3 to 4/3); moist to wet; dense to very dense; fine to coarse, subangular to subrounded sand	SC	22										
		23	S									
		24	I	52				8				
		25	S	57								
		26	I									
WELL GRADED GRAVEL with SAND: Dark grayish brown to brown (10YR 5/3 to 4/3); moist to wet; dense; fine to coarse, subangular to subrounded sand and gravel	GW	27	S	61	DS	4	35	9 8	20	115 110		
		28	D	42								
		29	S									
POORLY GRADED SAND with GRAVEL and SILT: Dark grayish brown (10YR 5/3); moist to wet; dense; fine to coarse, subangular to subrounded sand and gravel	SP-SM	30	I	61		9		14	NP	111		
		31	S	51								
		32	I									
WELL GRADED GRAVEL with SAND and SILT: Dark grayish brown to brown (10YR 5/3 to 4/3); moist to wet; dense; fine to coarse, subangular to subrounded sand and gravel	GW-GM	33	S	59		7		12		124		
		34	D	45								
		35	S									
		36	I									
		37										
		38										
		39	S	45								
		40	I									

DATE: 8/31/2017	LOG OF EXPLORATORY DRILL HOLE	DH- 17A
PROJECT NAME: Morgan Hill Sewer Trunk, Phase 2		PROJECT NUMBER: 2016.0096
DRILL RIG: Mobile B53, 140# downhole hammer with wire winch		LOGGED BY: CSS
HOLE DIAMETER: 8" hollow stem augers		HOLE ELEVATION: ±195½
SAMPLER: D = 3" OD, 2½" ID Split-spoon X = 2½" OD, 2" ID Split-spoon I = Standard Penetrometer (2" OD SPT) S = Slough in sample	GROUND WATER DEPTH:	Initial: 30 ft Final: ---

DESCRIPTION OF EARTH MATERIALS	SOIL TYPE	DEPTH (ft)	SAMPLE	BLOWS PER FOOT	POCKET PEN (tsf)	% PASSING #200 SIEVE	LIQUID LIMIT	WATER CONTENT	PLASTICITY INDEX	DRY DENSITY (pcf)	FAILURE STRAIN (%)	UNCONFINED COMPRESSIVE STRENGTH (psf)
WELL GRADED GRAVEL with SAND and SILT: continued	GW-GM	41										
		42										
		43										
very dense		44	S									
		45	I	71								
		46	I									
		47										
		48										
		49	S									
		50	I	66								
BOTTOM OF HOLE = 50 Feet		51										
		52										
		53										
		54										
		55										
		56										
		57										
		58										
		59										
		60										

DATE: 8/31/2017	LOG OF EXPLORATORY DRILL HOLE	DH- 18A
PROJECT NAME: Morgan Hill Sewer Trunk, Phase 2		PROJECT NUMBER: 2016.0096
DRILL RIG: Mobile B56, 140# downhole hammer with wire winch		LOGGED BY: CSS
HOLE DIAMETER: 8" hollow stem augers		HOLE ELEVATION: ±195
SAMPLER: D = 3" OD, 2½" ID Split-spoon X = 2½" OD, 2" ID Split-spoon I = Standard Penetrometer (2" OD SPT) S = Slough in sample	GROUND WATER DEPTH:	Initial: --- Final: ---

DESCRIPTION OF EARTH MATERIALS	SOIL TYPE	DEPTH (ft)	SAMPLE	BLOWS PER FOOT	POCKET PEN (tsf)	% PASSING #200 SIEVE	LIQUID LIMIT	WATER CONTENT	PLASTICITY INDEX	DRY DENSITY (pcf)	FAILURE STRAIN (%)	UNCONFINED COMPRESSIVE STRENGTH (psf)
PAVEMENT (±3" AC over ±2" baserock)												
ALLUVIUM: SANDY LEAN CLAY: Dark brown (10YR 3/2); moist; hard; with fine to medium, angular to subrounded sand	CL	1										
		2	S									
		3	D	15	>4.5			18		112		
		4	D									
CLAYEY SAND with GRAVEL to CLAYEY GRAVEL with SAND: Grayish brown to brown (10YR 5/2 to 5/3); moist; medium dense; fine to coarse, subangular to subrounded sand and gravel	SC/ GC	5										
		6	S									
		7	D	32				9		118		
		8										
		9	S									
		10	I	26								
		11	I									
		12										
		13										
dark grayish brown (10YR 4/2)		14	S									
		15	I	24								
		16	I									
		17										
		18										
		19	S									
dense		20	I	41								
BOTTOM OF BORING = 20 feet												
No Groundwater Encountered												

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DATE: 9/6/2017	LOG OF EXPLORATORY DRILL HOLE	DH- 19A
PROJECT NAME: Morgan Hill Sewer Trunk, Phase 2		PROJECT NUMBER: 2016.0096
DRILL RIG: Mobile B53, 140# downhole hammer with wire winch		LOGGED BY: CSS
HOLE DIAMETER: 8" hollow stem augers		HOLE ELEVATION: ±193
SAMPLER: D = 3" OD, 2½" ID Split-spoon X = 2½" OD, 2" ID Split-spoon I = Standard Penetrometer (2" OD SPT) S = Slough in sample	GROUND WATER DEPTH:	Initial: --- Final: ---

DESCRIPTION OF EARTH MATERIALS	SOIL TYPE	DEPTH (ft)	SAMPLE	BLOWS PER FOOT	POCKET PEN (tsf)	% PASSING #200 SIEVE	LIQUID LIMIT	WATER CONTENT	PLASTICITY INDEX	DRY DENSITY (pcf)	FAILURE STRAIN (%)	UNCONFINED COMPRESSIVE STRENGTH (psf)
PAVEMENT (±2" AC over ±3" baserock)												
ALLUVIUM: CLAYEY SAND: Very dark grayish brown (10YR 3/2); moist; medium dense; fine to coarse, angular to subrounded sand	SC	1										
		2	S									
		3	D D	13				12		115		
CLAYEY GRAVEL with SAND: Dark brown (10YR 3/3); moist; medium dense; fine to coarse, angular to subrounded sand and gravel; with cobbles	GC	4										
		5										
		6	S D D	30				6		122		
		7										
		8										
		9	S I	23								
		10	I									
		11										
		12										
		13										
at 15', drilling advanced ~1.5 ft in 5 mins; dense		14	S I	40								
		15	I									
		16										
medium dense		17	S I	28								
		18	I									
BOTTOM OF HOLE = 18 Feet No Groundwater Encountered		19										
		20										

DATE: 9/5/2017	LOG OF EXPLORATORY DRILL HOLE	DH- 20A
PROJECT NAME: Morgan Hill Sewer Trunk, Phase 2		PROJECT NUMBER: 2016.0096
DRILL RIG: Mobile B56, 140# downhole hammer with wire winch		LOGGED BY: CSS
HOLE DIAMETER: 8" hollow stem augers		HOLE ELEVATION: ±193
SAMPLER: D = 3" OD, 2½" ID Split-spoon; X = 2½" OD, 2" ID Split-spoon; I = Standard Penetrometer (2" OD SPT); S = Slough in sample	GROUND WATER DEPTH:	Initial: 31.5 ft; Final: ---

DESCRIPTION OF EARTH MATERIALS	SOIL TYPE	DEPTH (ft)	SAMPLE	BLOWS PER FOOT	POCKET PEN (tsf)	% PASSING #200 SIEVE	LIQUID LIMIT	WATER CONTENT	PLASTICITY INDEX	DRY DENSITY (pcf)	FAILURE STRAIN (%)	UNCONFINED COMPRESSIVE STRENGTH (psf)
PAVEMENT (±2" AC over ±6" baserock)												
ALLUVIUM: LEAN CLAY with SAND: Very dark gray (10YR 2/2); moist; hard; with fine sand	CL	1										
		2	S									
	GC	3	D	17	4.5			7		106		
CLAYEY GRAVEL with SAND: Very dark gray (10YR 4/1); moist; medium dense to dense; fine angular to subrounded gravel; with fine to coarse sand		4										
		5	S									
		6	D	37				4		106		
		7										
		8										
		9	S									
		10	I	35								
		11										
	SC	12										
CLAYEY SAND with GRAVEL: Dark brown (7.5YR 3/3); moist; dense; fine to coarse, angular to subrounded sand; with fine gravel		13										
		14	S									
		15	I	33								
	GP-GC	16										
POORLY GRADED GRAVEL with SAND and CLAY: Dark brown (7.5YR 3/3); moist; medium dense to dense; fine to coarse, angular to subrounded gravel; with fine to coarse sand and cobbles		17										
		18	S	44		11	52	12	34	113		
		19	D									
		20	S	51								
			I									
			I									

DATE: 9/5/2017	LOG OF EXPLORATORY DRILL HOLE	DH- 20A
PROJECT NAME: Morgan Hill Sewer Trunk, Phase 2		PROJECT NUMBER: 2016.0096
DRILL RIG: Mobile B56, 140# downhole hammer with wire winch		LOGGED BY: CSS
HOLE DIAMETER: 8" hollow stem augers		HOLE ELEVATION: ±193
SAMPLER: D = 3" OD, 2½" ID Split-spoon X = 2½" OD, 2" ID Split-spoon I = Standard Penetrometer (2" OD SPT) S = Slough in sample	GROUND WATER DEPTH:	Initial: 31.5 ft Final: ---

DESCRIPTION OF EARTH MATERIALS	SOIL TYPE	DEPTH (ft)	SAMPLE	BLOWS PER FOOT	POCKET PEN (tsf)	% PASSING #200 SIEVE	LIQUID LIMIT	WATER CONTENT	PLASTICITY INDEX	DRY DENSITY (pcf)	FAILURE STRAIN (%)	UNCONFINED COMPRESSIVE STRENGTH (psf)
CLAYEY GRAVEL with SAND: Dark brown (7.5YR 3/3); moist; dense; fine, angular to subrounded gravel; with fine to coarse sand	GC	21	S	55		13	46	11	30	127	2	1771
		22	D									
		23	S	67								
POORLY GRADED SAND with GRAVEL and CLAY: Dark brown (7.5YR 3/3); moist; dense; fine to coarse, angular to subrounded sand and gravel and cobbles	SP-SC	24	I	71		9	40	11	24	121	2	936
		25	S	47								
		26	D									
POORLY GRADED GRAVEL with SAND and CLAY: Dark brown (7.5YR 3/3); moist; dense; fine to coarse, angular to subrounded gravel; with fine to coarse sand and cobbles	GP-GC	27	S	57		11	28	8	14	136		
		28	D	36								
		29	S									
		30	I									
		31	I									
LEAN CLAY: Mottled brown (10YR 5/3) and strong brown (7.5YR 4/6); moist to wet; stiff	CL	32										
		33										
		34	S	15	1.25			26		90		
		35	D									
		36	D									
CLAYEY GRAVEL with SAND: Dark brown (7.5YR 3/3); moist; medium dense; fine to coarse, angular to subrounded gravel; with fine to coarse sand	GC	37										
		38										
		39	S	22								
		40	D									

DATE: 9/5/2017	LOG OF EXPLORATORY DRILL HOLE	DH- 20A
PROJECT NAME: Morgan Hill Sewer Trunk, Phase 2		PROJECT NUMBER: 2016.0096
DRILL RIG: Mobile B56, 140# downhole hammer with wire winch		LOGGED BY: CSS
HOLE DIAMETER: 8" hollow stem augers		HOLE ELEVATION: ±193
SAMPLER: D = 3" OD, 2½" ID Split-spoon; X = 2½" OD, 2" ID Split-spoon; I = Standard Penetrometer (2" OD SPT); S = Slough in sample	GROUND WATER DEPTH:	Initial: 31.5 ft; Final: ---

DESCRIPTION OF EARTH MATERIALS	SOIL TYPE	DEPTH (ft)	SAMPLE	BLOWS PER FOOT	POCKET PEN (tsf)	% PASSING #200 SIEVE	LIQUID LIMIT	WATER CONTENT	PLASTICITY INDEX	DRY DENSITY (pcf)	FAILURE STRAIN (%)	UNCONFINED COMPRESSIVE STRENGTH (psf)
CLAYEY GRAVEL with SAND: continued	GC	41										
		42										
		43										
		44	S									
		45	I	38								
		46	I									
		47										
LEAN CLAY: Mottled brown (10YR 5/3) and strong brown (7.5YR 4/6); moist to wet; stiff	CL	48										
		49	S		2							
		50	I	13	1.75							
		51	I									
		52										
		53										
		54	S		2							
		55	D	14	2.5			25		103		
		56	D									
		57										
		58										
		59	S		3.5							
		60	D	24	2.75			23		107		
BOTTOM OF HOLE = 60 Feet												

DATE: 5/22/2018	LOG OF EXPLORATORY DRILL HOLE	DH- 21A
PROJECT NAME: Morgan Hill Sewer Trunk, Phase 2		PROJECT NUMBER: 2016.0096
DRILL RIG: Mobile B53 140# automatic hammer w rods		LOGGED BY: CSS
HOLE DIAMETER: 8" hollow stem augers		HOLE ELEVATION: ±191½
SAMPLER: D = 3" OD, 2½" ID Split-spoon X = 2½" OD, 2" ID Split-spoon I = Standard Penetrometer (2" OD SPT) S = Slough in sample	GROUND WATER DEPTH:	Initial: 30 ft Final: 30 ft

DESCRIPTION OF EARTH MATERIALS	SOIL TYPE	DEPTH (ft)	SAMPLE	BLOWS PER FOOT	POCKET PEN (tsf)	% PASSING #200 SIEVE	LIQUID LIMIT	WATER CONTENT	PLASTICITY INDEX	DRY DENSITY (pcf)	FAILURE STRAIN (%)	UNCONFINED COMPRESSIVE STRENGTH (psf)
FILL: FAT CLAY with SAND and CLAYEY SAND with GRAVEL	CH/ SC	1	S									
		2	D	23				7		114		
ALLUVIUM: FAT CLAY with SAND: Black (10YR 2/1); moist; very stiff to hard; with mostly fine to medium sand	CH	3	D									
		4										
SANDY LEAN CLAY: Dark grayish brown (10YR 4/2) mottled with strong brown (7.5YR 4/6); moist; hard; with mostly fine sand	CL	5	S									
		6	D	15	4.5+ 4.5+			19		99		
		7										
POORLY GRADED SAND with GRAVEL and CLAY: Brown (7.5YR 4/4); moist; medium dense; fine to coarse, angular to subrounded sand; with fine gravel	SP-SC	8										
		9	S									
		10	D	16								
		11										
		12										
		13										
		14	S									
		15	I	12		11		6				
		16										
		17										
		18	S	46								
CLAYEY SAND: Brown (10YR 5/3) mottled with strong brown (7.5YR 4/6); moist to wet; loose; with mostly fine sand	SC	19	D									
		20	S	9		32		15				
			I									

DATE: 5/22/2018	LOG OF EXPLORATORY DRILL HOLE	DH- 21A
PROJECT NAME: Morgan Hill Sewer Trunk, Phase 2		PROJECT NUMBER: 2016.0096
DRILL RIG: Mobile B53 140# automatic hammer w rods		LOGGED BY: CSS
HOLE DIAMETER: 8" hollow stem augers		HOLE ELEVATION: ±191½
SAMPLER: D = 3" OD, 2½" ID Split-spoon; X = 2½" OD, 2" ID Split-spoon; I = Standard Penetrometer (2" OD SPT); S = Slough in sample	GROUND WATER DEPTH:	Initial: 30 ft; Final: 30 ft

DESCRIPTION OF EARTH MATERIALS	SOIL TYPE	DEPTH (ft)	SAMPLE	BLOWS PER FOOT	POCKET PEN (tsf)	% PASSING #200 SIEVE	LIQUID LIMIT	WATER CONTENT	PLASTICITY INDEX	DRY DENSITY (pcf)	FAILURE STRAIN (%)	UNCONFINED COMPRESSIVE STRENGTH (psf)
CLAYEY GRAVEL with SAND: Yellowish brown (10YR 5/4); moist to wet; medium dense to dense; fine to coarse, angular to subrounded sand and gravel	GC	21	S	30								
		22	D									
			D									
		23	S	29		14		12				
			I									
		24	I									
TXCU test, see Appendix B			S	11				13		124		TXCU
SANDY LEAN CLAY to CLAYEY SAND: Grayish brown (10YR 5/2) mottled with strong brown (7.5YR 4/6); moist to wet; stiff clay to loose to medium dense sand; with mostly fine sand	CL/ SC	25	D									
			D	8								
		26	S									
			I									
		27	I		1.25							
			S	19	1.75			20		110	6	1606
CLAYEY SAND: Brown (10YR 5/3); wet; medium dense; fine to coarse sand	SC	28	D									
			D	17		15		15				
		29	S									
			I									
		30	I									
		31										
		32										
		33										
fine to coarse subangular to subrounded sand		34	S									
			D	81				9		140		
		35	D									
		36										
		37										
		38										
		39	S									
			I	6								
see next page		40	I									

DATE: 5/22/2018	LOG OF EXPLORATORY DRILL HOLE	DH- 21A
PROJECT NAME: Morgan Hill Sewer Trunk, Phase 2		PROJECT NUMBER: 2016.0096
DRILL RIG: Mobile B53 140# automatic hammer w rods		LOGGED BY: CSS
HOLE DIAMETER: 8" hollow stem augers		HOLE ELEVATION: ±191½
SAMPLER: D = 3" OD, 2½" ID Split-spoon X = 2½" OD, 2" ID Split-spoon I = Standard Penetrometer (2" OD SPT) S = Slough in sample	GROUND WATER DEPTH:	Initial: 30 ft Final: 30 ft

DESCRIPTION OF EARTH MATERIALS	SOIL TYPE	DEPTH (ft)	SAMPLE	BLOWS PER FOOT	POCKET PEN (tsf)	% PASSING #200 SIEVE	LIQUID LIMIT	WATER CONTENT	PLASTICITY INDEX	DRY DENSITY (pcf)	FAILURE STRAIN (%)	UNCONFINED COMPRESSIVE STRENGTH (psf)
LEAN CLAY: Brown (10YR 5/2) mottled with strong brown (7.5YR 4/6); moist to wet; firm to stiff	CL	41										
		42										
		43										
interbedded CLAY, SILTY CLAY, and CLAYEY SAND with GRAVEL: Mottled brown (10YR 5/3) and strong brown (7.5YR 4/6); moist to wet; stiff		44	S	35								
		45	I									
		46	I									
LEAN CLAY: Grayish brown to dark grayish brown (10YR 5/2 to 4/2) mottled with strong brown (7.5YR 4/6); moist to wet; stiff to very stiff	CL	47										
		48										
		49	S	17	3.25							
		50	I		3.5							
		51	I									
		52										
		53										
very stiff to hard		54	S	29	4.5+							
		55	D		4.5+							
LEAN CLAY to LEAN CLAY with SAND: Very dark gray (10YR 3/1); wet; stiff to very stiff	CL	56	D									
		57										
		58										
		59	S	29	3.25							
		60	D		1.5							
BOTTOM OF HOLE = 60 Feet												

DATE: 9/6/2017	LOG OF EXPLORATORY DRILL HOLE	DH- 22A
PROJECT NAME: Morgan Hill Sewer Trunk, Phase 2		PROJECT NUMBER: 2016.0096
DRILL RIG: Mobile B53, 140# downhole hammer with wire winch		LOGGED BY: CSS
HOLE DIAMETER: 8" hollow stem augers		HOLE ELEVATION: ±191
SAMPLER: D = 3" OD, 2½" ID Split-spoon X = 2½" OD, 2" ID Split-spoon I = Standard Penetrometer (2" OD SPT) S = Slough in sample	GROUND WATER DEPTH:	Initial: --- Final: ---

DESCRIPTION OF EARTH MATERIALS	SOIL TYPE	DEPTH (ft)	SAMPLE	BLOWS PER FOOT	POCKET PEN (tsf)	% PASSING #200 SIEVE	LIQUID LIMIT	WATER CONTENT	PLASTICITY INDEX	DRY DENSITY (pcf)	FAILURE STRAIN (%)	UNCONFINED COMPRESSIVE STRENGTH (psf)
PAVEMENT (±2" AC over ±4" baserock)												
ALLUVIUM: SANDY LEAN CLAY: Brown (7.5YR 4/4); dry; stiff to very stiff clay; with fine sand	CL	1										
		2										
		3										
		4										
		5	S									
		6	D	18				13		97		
		7	D									
		8										
		9	S									
		10	I	48								
		11	I									
CLAYEY GRAVEL with SAND: Brown (7.5YR 4/4); moist; dense; fine to coarse, subangular to subrounded sand and gravel	GC	12										
		13										
		14	S									
		15	I	37								
		16	I									
		17										
		18										
		19	S									
BOTTOM OF BORING = 20 feet		20	I	49								
No Groundwater Encountered												

GEO-LOGIC ASSOCIATES	PAGE: 1 of 1

DATE: 5/22/2018	LOG OF EXPLORATORY DRILL HOLE	DH- 23A
PROJECT NAME: Morgan Hill Sewer Trunk, Phase 2		PROJECT NUMBER: 2016.0096
DRILL RIG: Mobile B53, 140# downhole hammer with wire winch		LOGGED BY: CSS
HOLE DIAMETER: 8" hollow stem augers		HOLE ELEVATION: ±188
SAMPLER: D = 3" OD, 2½" ID Split-spoon X = 2½" OD, 2" ID Split-spoon I = Standard Penetrometer (2" OD SPT) S = Slough in sample	GROUND WATER DEPTH:	Initial: --- Final: ---

DESCRIPTION OF EARTH MATERIALS	SOIL TYPE	DEPTH (ft)	SAMPLE	BLOWS PER FOOT	POCKET PEN (tsf)	% PASSING #200 SIEVE	LIQUID LIMIT	WATER CONTENT	PLASTICITY INDEX	DRY DENSITY (pcf)	FAILURE STRAIN (%)	UNCONFINED COMPRESSIVE STRENGTH (psf)
PAVEMENT (±5" AC over ±12" baserock)		1										
ALLUVIUM: LEAN CLAY: Dark grayish brown (10YR 4/2); moist; hard	CL	2	S									
		3	D	19	4.5			19		110		
		4	D		4.25							
LEAN CLAY with SAND: Dark grayish brown (10YR 4/2) mottled with strong brown (7.5YR 4/6); moist; very stiff; with mostly fine to medium sand	CL	5										
		6	S									
		7	D	17	3.0	67		17		104		
WELL GRADED SAND with GRAVEL and CLAY: Brown (7.5YR 4/3); moist; medium dense to dense; fine to coarse, angular to subrounded sand and gravel	SW-SC	8										
		9	S									
		10	D	42				7				
		11										
		12										
		13										
medium dense		14	S									
		15	I	21								
		16	I									
		17										
		18										
medium dense to dense		19	S									
BOTTOM OF BORING = 20 feet		20	I	31								
No Groundwater Encountered			I									

GEO-LOGIC ASSOCIATES	PAGE: 1 of 1

APPENDIX B

LABORATORY TEST RESULTS

ATTERBERG LIMITS

Summary Report

ASTM D-4318

Geo-Logic ASSOCIATES

Client : Pacific Geotechnical Engineering

Project No: 2016.0096.100

Lab Log No.: **4141**

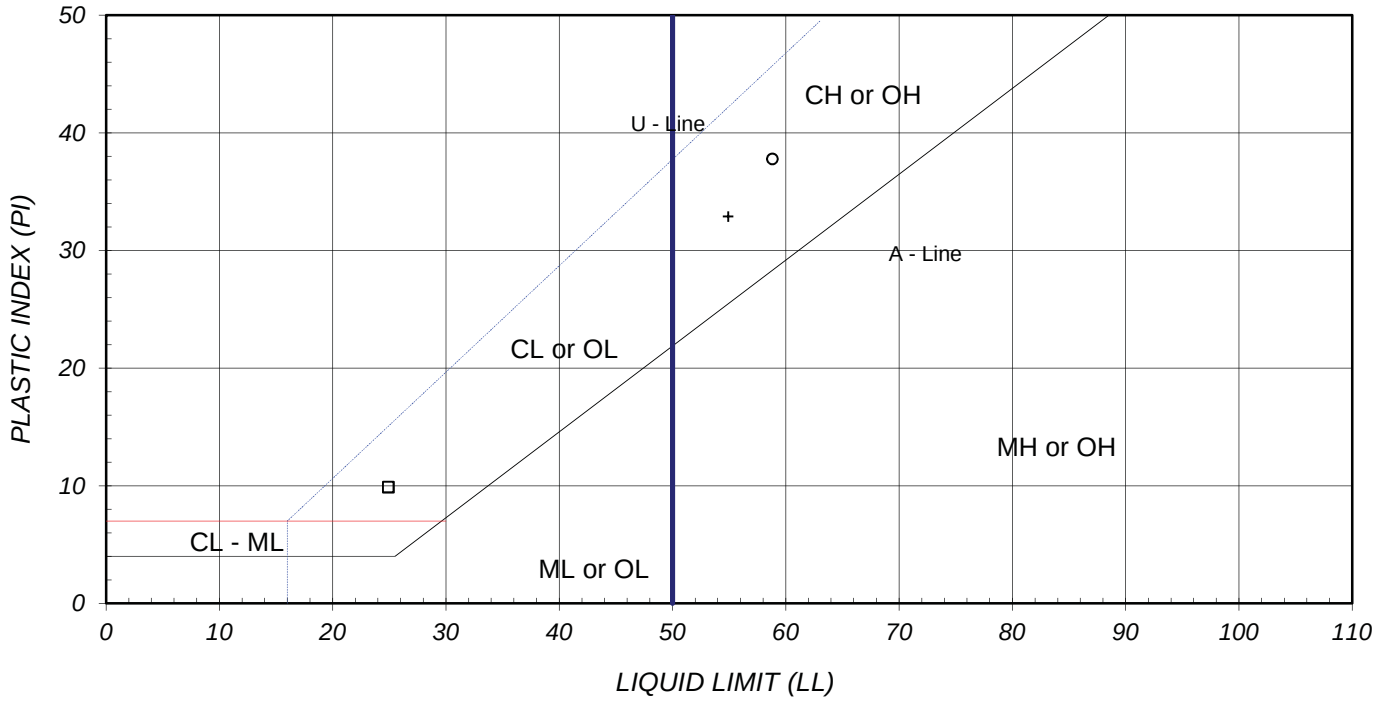
Project Name: Morgan Hill Sewer Trunk

Report Date: December 23, 2016

LSN	SYMBOL	SAMPLE IDENTIFICATION	SAMPLE DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	PLASTIC INDEX
4141A	□	DH1 @ 2.5'	Brown Sandy Lean Clay with Gravel	25	15	10
4141Q	○	DH7 @ 2.5'	Dark Brown Fat Clay	59	21	38
4141AO	+	DH16 @ 2.5'	Brown Fat Clay	55	22	33

* Visual Classification based on ASTM D-2488

PLASTICITY CHART



This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the samples supplied and tested for the above referenced job.

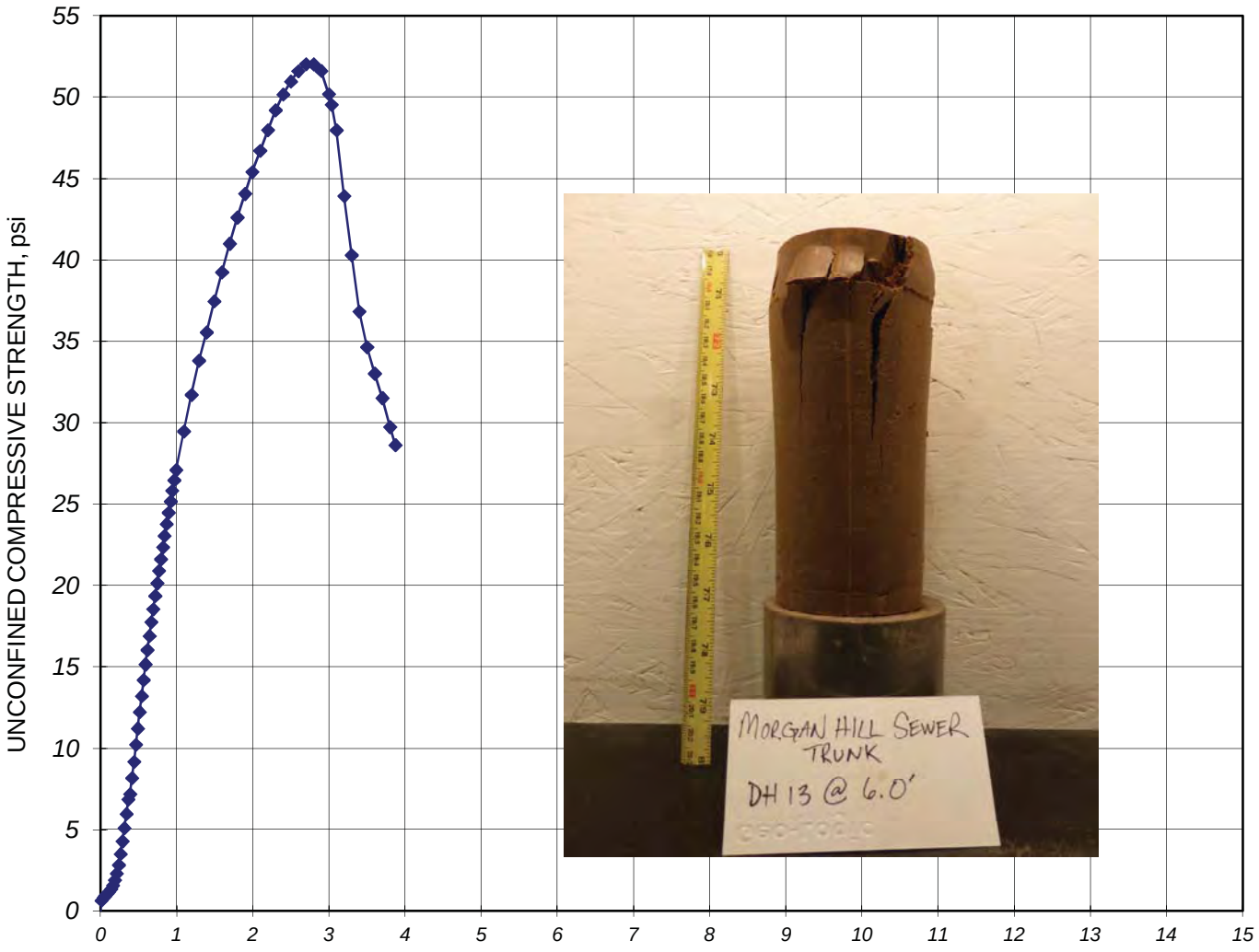
Geo-Logic ASSOCIATES

UNCONFINED COMPRESSIVE STRENGTH

ASTM D-2166

Client / Project Name:	Project No:	Lab Log:
Pacific Geotechnical Engineering	2016.0096.100	**4141AH**

Project Name:	Sample ID	Report Date:
Morgan Hill Sewer Trunk	DH13 @ 6.0'	December 20, 2016



Test No.	Initial Water Content %	Initial Dry Density pcf	Description	UNCONFINED COMPRESSIVE STRENGTH q_u, psi	UNCONFINED COMPRESSIVE STRENGTH shear, psi
1	13.6	116	Brown Silty Clay	**52.0**	**26.0**

* Water content determined on total sample after test.

NOTE:

Sample Diameter = 2.4 in.
Sample Height = 6.0 in.
Height / Dia. Ratio = 2.5

Strain Rate: 0.030 in./ min.
Strain % : 0.50 % / min.
Test Date : December 19, 2016

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the samples supplied and tested for the above referenced job.

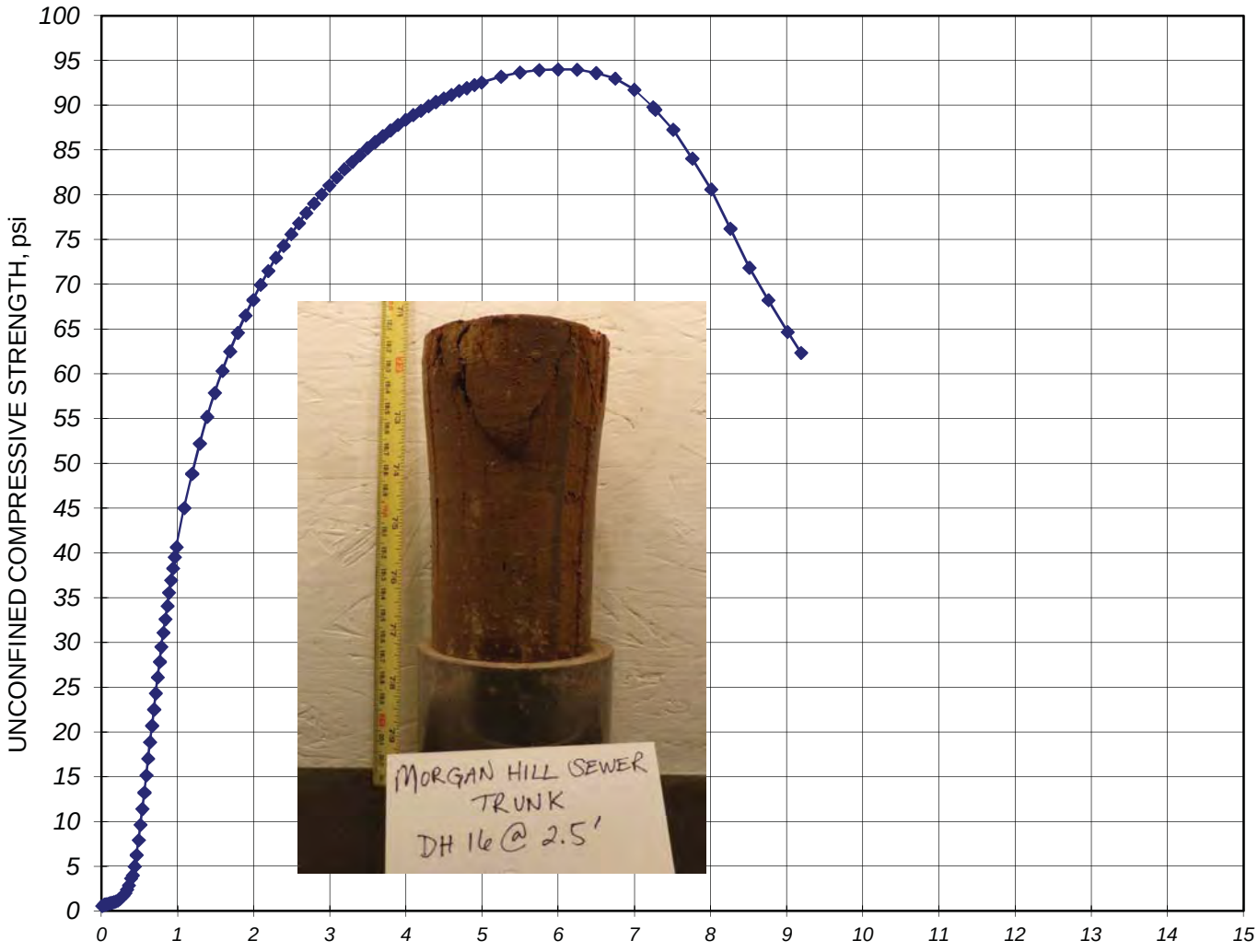
Geo-Logic ASSOCIATES

UNCONFINED COMPRESSIVE STRENGTH

ASTM D-2166

Client / Project Name:	Project No:	Lab Log:
Pacific Geotechnical Engineering	2016.0096.100	**4141AO**

Project Name:	Sample ID	Report Date:
Morgan Hill Sewer Trunk	DH16 @ 2.5'	December 20, 2016



Test No.	Initial Water Content %	Initial Dry Density pcf	Description	UNCONFINED COMPRESSIVE STRENGTH q_u, psi	UNCONFINED COMPRESSIVE STRENGTH shear, psi
1	20.3	106	Brown Fat Clay	**94.0**	**47.0**

NOTE:

Sample Diameter = 2.4 in.
Sample Height = 5.2 in.
Height / Dia. Ratio = 2.2

Strain Rate: 0.030 in./ min.
Strain % : 0.50 % / min.
Test Date : December 19, 2016

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the samples supplied and tested for the above referenced job.

PARTICLE SIZE ANALYSIS

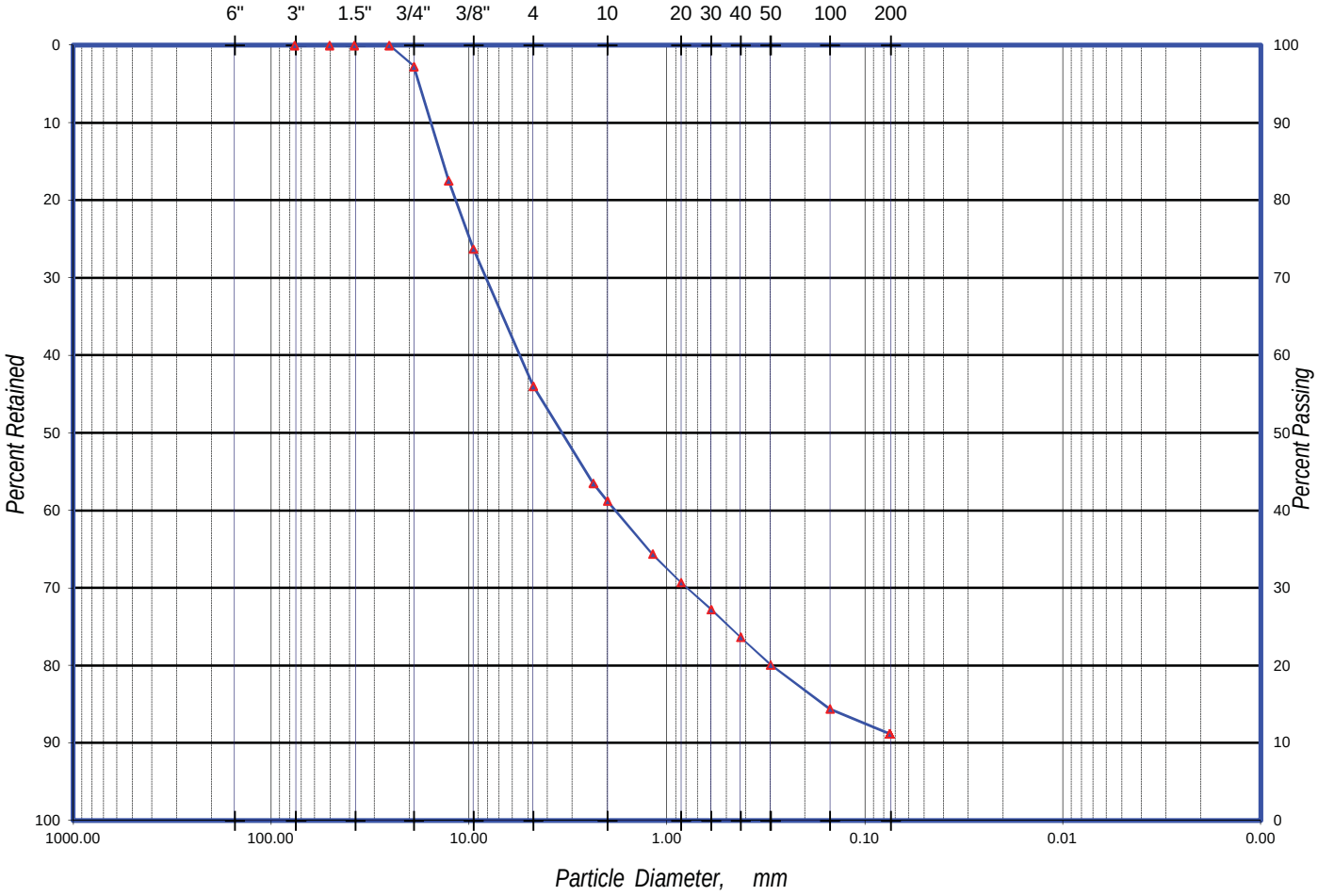
Test Report

ASTM D-6913 / D-7928, (replacing D-422)
Method A: (+/-1%)

Client :	Project No:	Lab Sample No:
PACIFIC GEOTECHNICAL ENGINEERING	2016.0096.100	**4141F**

Project Name:	Report Date:
MORGAN HILL SEWER TRUNK	December 23, 2016

BOULDERS	COBBLES	GRAVEL		SAND			SILT AND CLAY
		COARSE	FINE	COARSE	MEDIUM	FINE	
US SIEVE SIZE, INCHES				US STANDARD SIEVE SIZE No.			HYDROMETER



Symbol	Sample ID	* Description	% Gravel	% Sand	% Silt - Clay
▲	DH2 @ 14-15'	Brown Sand w/ Silty Clay and Gravel	44.0	44.9	11.2

Size Passing, mm D_{60} = 5.82 D_{30} = 0.80 D_{10} = N/A

Coefficient of Curvature, C_c: N/A Coefficient of Uniformity, C_u: N/A Fineness Modulus = 4.33

* Visual Classification based on ASTM D-2488

Note: * Percentages are +/- 0.1% based on computer rounding as allowed by ASTM D-6026-01 Section 5.2.3.

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the sampl supplied and tested for the above referenced job

PARTICLE SIZE ANALYSIS

Test Report

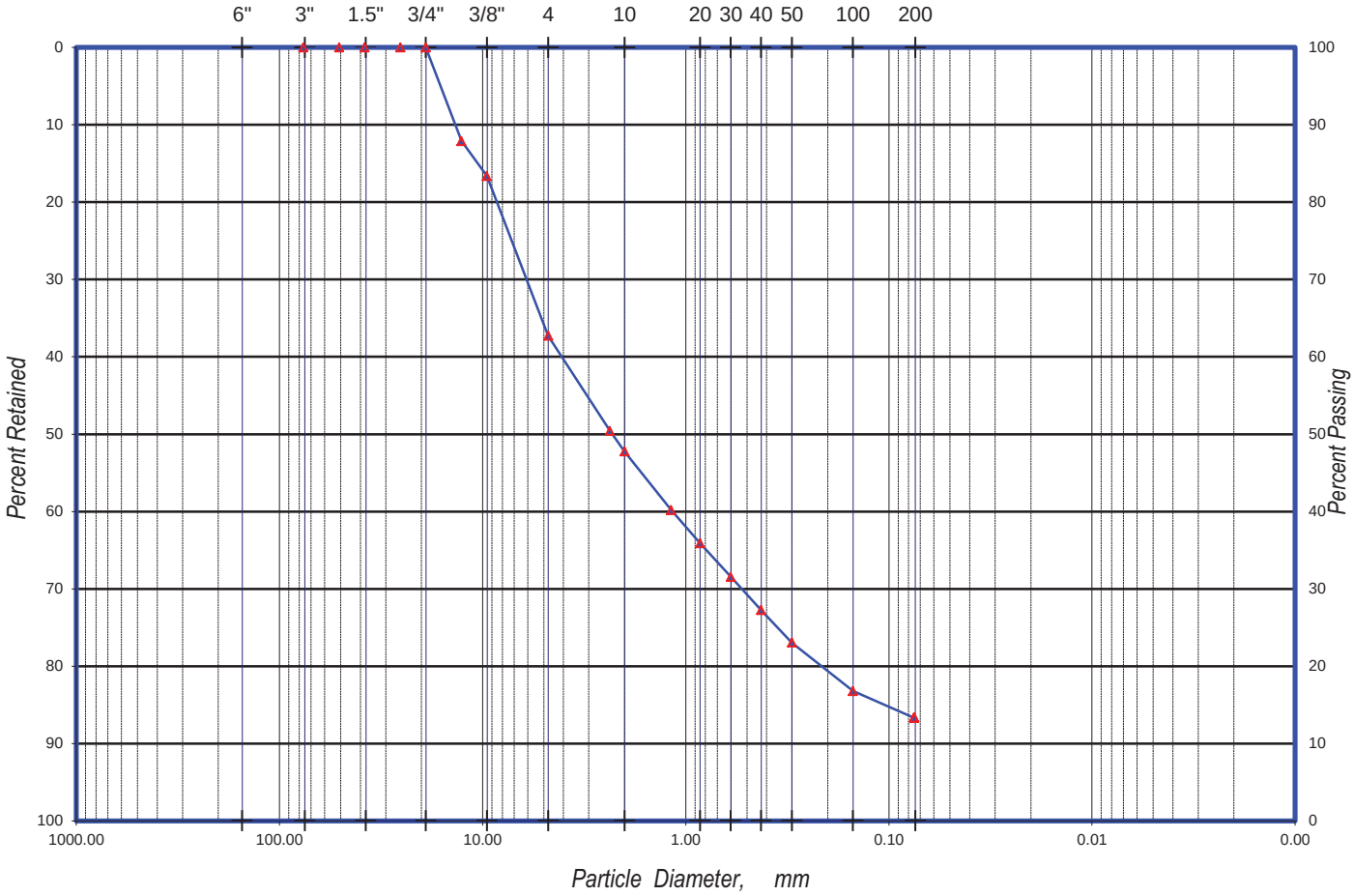
ASTM D-6913 / D-7928, (replacing D-422)
Method A: (+/-1%)

Geo-Logic ASSOCIATES

Client :	Project No:	Lab Sample No:
PACIFIC GEOTECHNICAL ENGINEERING	2016.0096.100	**4141H**

Project Name:	Report Date:
MORGAN HILL SEWER TRUNK	December 23, 2016

BOULDERS	COBBLES	GRAVEL		SAND			SILT AND CLAY
		COARSE	FINE	COARSE	MEDIUM	FINE	
US SIEVE SIZE, INCHES				US STANDARD SIEVE SIZE No.			HYDROMETER



Symbol	Sample ID	* Description	% Gravel	% Sand	% Silt - Clay
▲	DH3 @ 9-10'	Brown Clayey Sand with Gravel	37.3	49.4	13.3

Size Passing, mm D_{60} = 4.22 D_{30} = 0.54 D_{10} = N/A

Coefficient of Curvature, C_c: N/A Coefficient of Uniformity, C_u: N/A Fineness Modulus = 3.92

* Visual Classification based on ASTM D-2488

Note: * Percentages are +/- 0.1% based on computer rounding as allowed by ASTM D-6026-01 Section 5.2.3.

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the samples supplied and tested for the above referenced job.

PARTICLE SIZE ANALYSIS

Test Report

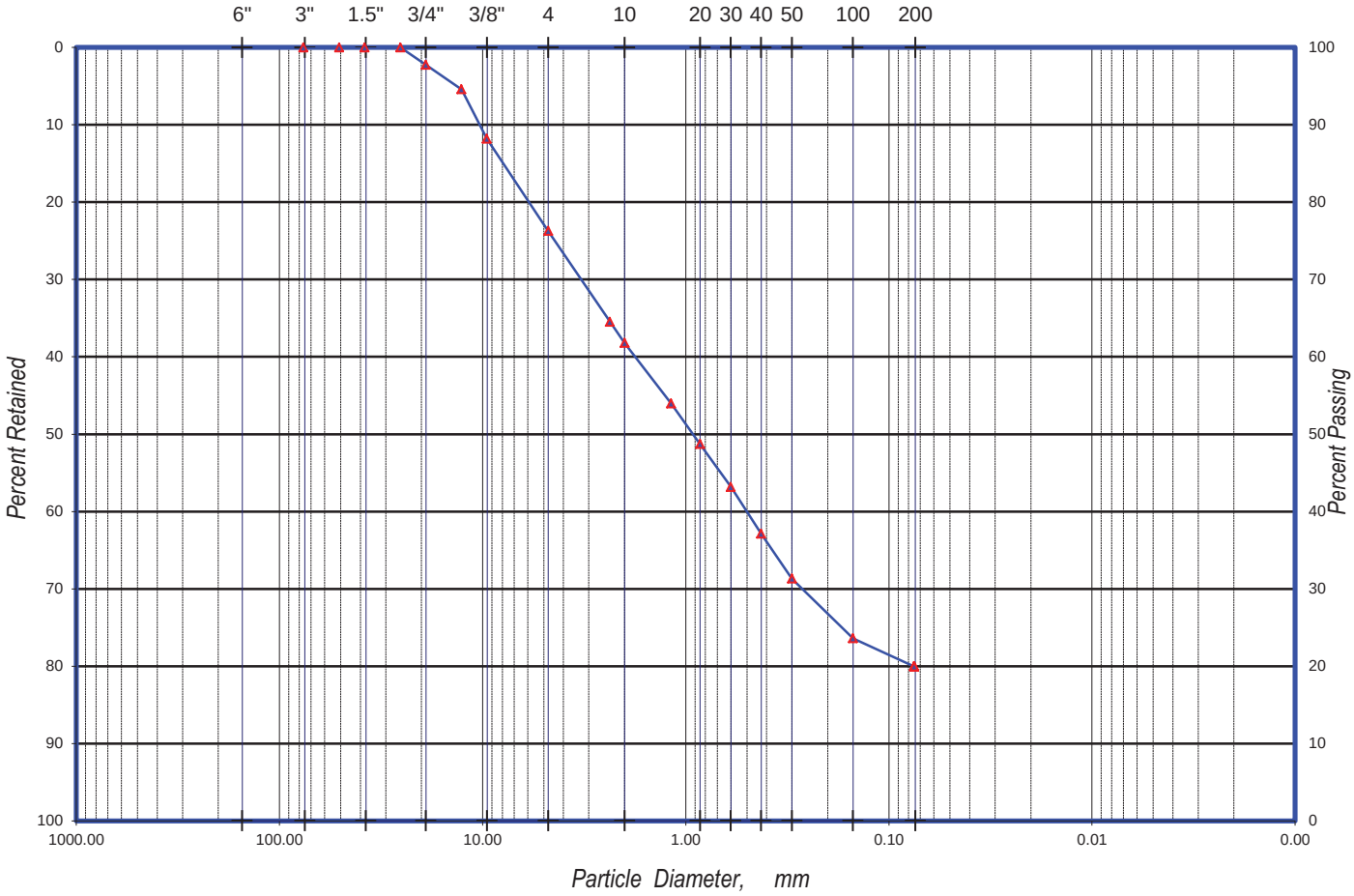
ASTM D-6913 / D-7928, (replacing D-422)
Method A: (+/-1%)

Geo-Logic ASSOCIATES

Client :	Project No:	Lab Sample No:
PACIFIC GEOTECHNICAL ENGINEERING	2016.0096.100	**4141K**

Project Name:	Report Date:
MORGAN HILL SEWER TRUNK	December 23, 2016

BOULDERS	COBBLES	GRAVEL		SAND			SILT AND CLAY
		COARSE	FINE	COARSE	MEDIUM	FINE	
US SIEVE SIZE, INCHES				US STANDARD SIEVE SIZE No.			HYDROMETER



Symbol	Sample ID	* Description	% Gravel	% Sand	% Silt - Clay
▲	DH4 @ 14-15'	Brown Clayey Sand with Gravel	23.7	56.3	20.0

Size Passing, mm D_{60} = 1.81 D_{30} = 0.27 D_{10} = N/A

Coefficient of Curvature, C_c: N/A Coefficient of Uniformity, C_u: N/A Fineness Modulus = 3.21

* Visual Classification based on ASTM D-2488

Note: * Percentages are +/- 0.1% based on computer rounding as allowed by ASTM D-6026-01 Section 5.2.3.

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the samples supplied and tested for the above referenced job.

PARTICLE SIZE ANALYSIS

Test Report

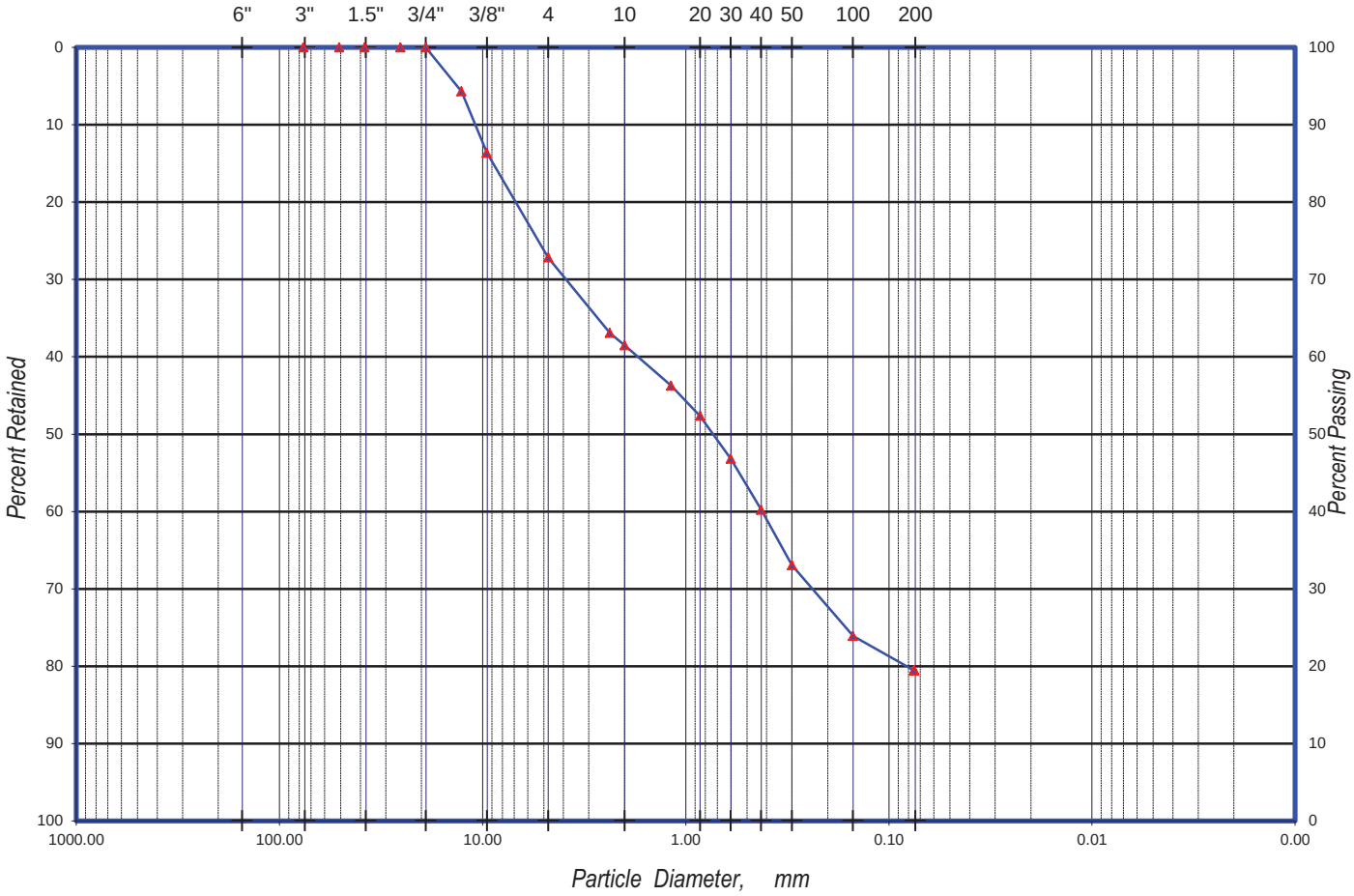
ASTM D-6913 / D-7928, (replacing D-422)
Method A: (+/-1%)

Geo-Logic ASSOCIATES

Client :	Project No:	Lab Sample No:
PACIFIC GEOTECHNICAL ENGINEERING	2016.0096.100	**4141N**

Project Name:	Report Date:
MORGAN HILL SEWER TRUNK	December 23, 2016

BOULDERS	COBBLES	GRAVEL		SAND			SILT AND CLAY
		COARSE	FINE	COARSE	MEDIUM	FINE	
US SIEVE SIZE, INCHES				US STANDARD SIEVE SIZE No.			HYDROMETER



Symbol	Sample ID	* Description	% Gravel	% Sand	% Silt - Clay
▲	DH5 @ 9-10'	Brown Clayey Sand with Gravel	27.2	53.4	19.4

Size Passing, mm D_{60} = 1.77 D_{30} = 0.25 D_{10} = N/A

Coefficient of Curvature, C_c: N/A Coefficient of Uniformity, C_u: N/A Fineness Modulus = 3.18

* Visual Classification based on ASTM D-2488

Note: * Percentages are +/- 0.1% based on computer rounding as allowed by ASTM D-6026-01 Section 5.2.3.

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the samples supplied and tested for the above referenced job.

PARTICLE SIZE ANALYSIS

Test Report

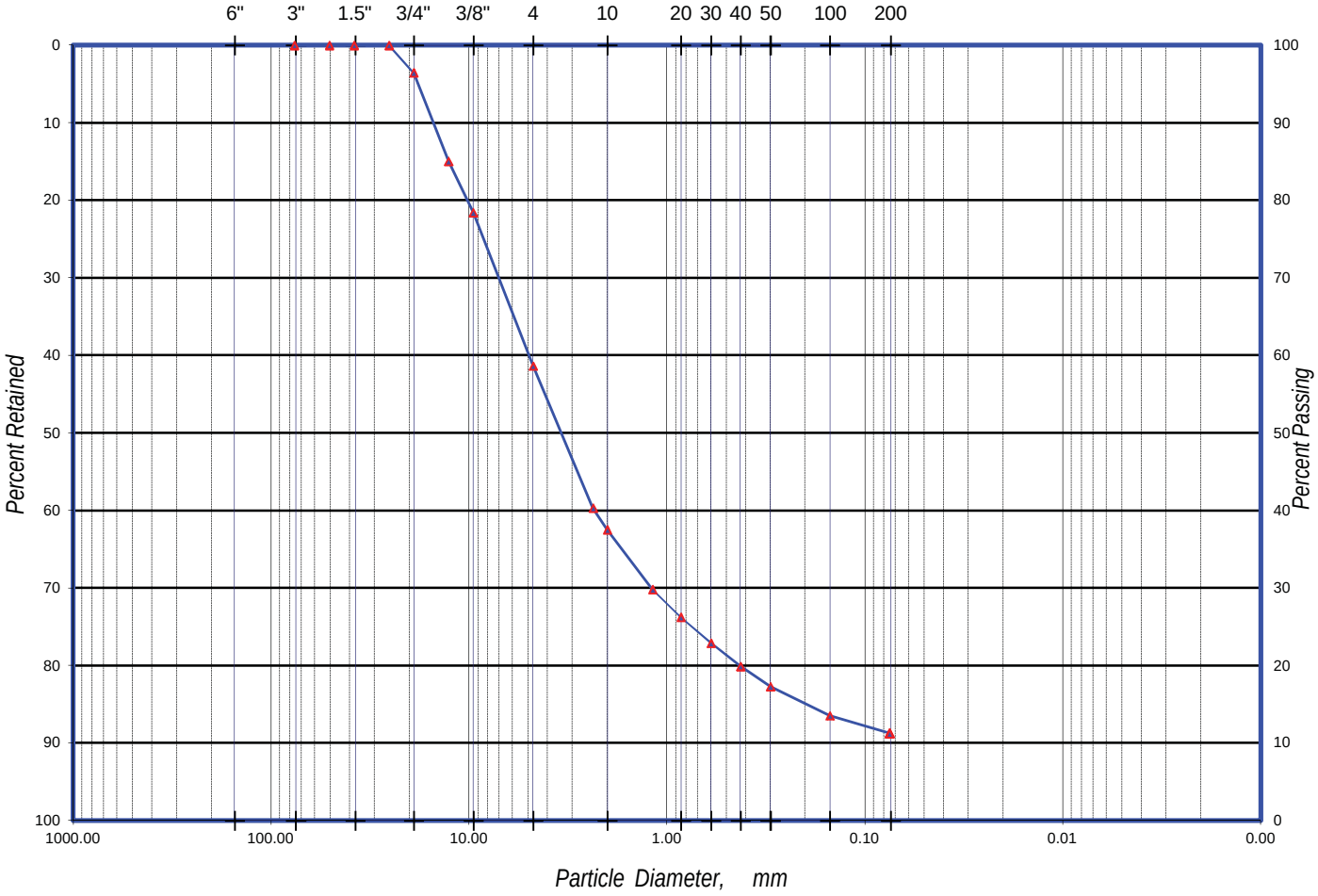
ASTM D-6913 / D-7928, (replacing D-422)
Method A: (+/-1%)

Geo-Logic ASSOCIATES

Client :	Project No:	Lab Sample No:
PACIFIC GEOTECHNICAL ENGINEERING	2016.0096.100	**4141P**

Project Name:	Report Date:
MORGAN HILL SEWER TRUNK	December 23, 2016

BOULDERS	COBBLES	GRAVEL		SAND			SILT AND CLAY
		COARSE	FINE	COARSE	MEDIUM	FINE	
US SIEVE SIZE, INCHES				US STANDARD SIEVE SIZE No.			HYDROMETER



Symbol	Sample ID	* Description	% Gravel	% Sand	% Silt - Clay
▲	DH6 @ 14-15'	Brown Sand with Clay and Gravel	41.4	47.4	11.2

Size Passing, mm D_{60} = 5.08 D_{30} = 1.20 D_{10} = N/A

Coefficient of Curvature, C_c: N/A Coefficient of Uniformity, C_u: N/A Fineness Modulus = 4.43

* Visual Classification based on ASTM D-2488

Note: * Percentages are +/- 0.1% based on computer rounding as allowed by ASTM D-6026-01 Section 5.2.3.

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the sampl supplied and tested for the above referenced job

PARTICLE SIZE ANALYSIS

Test Report

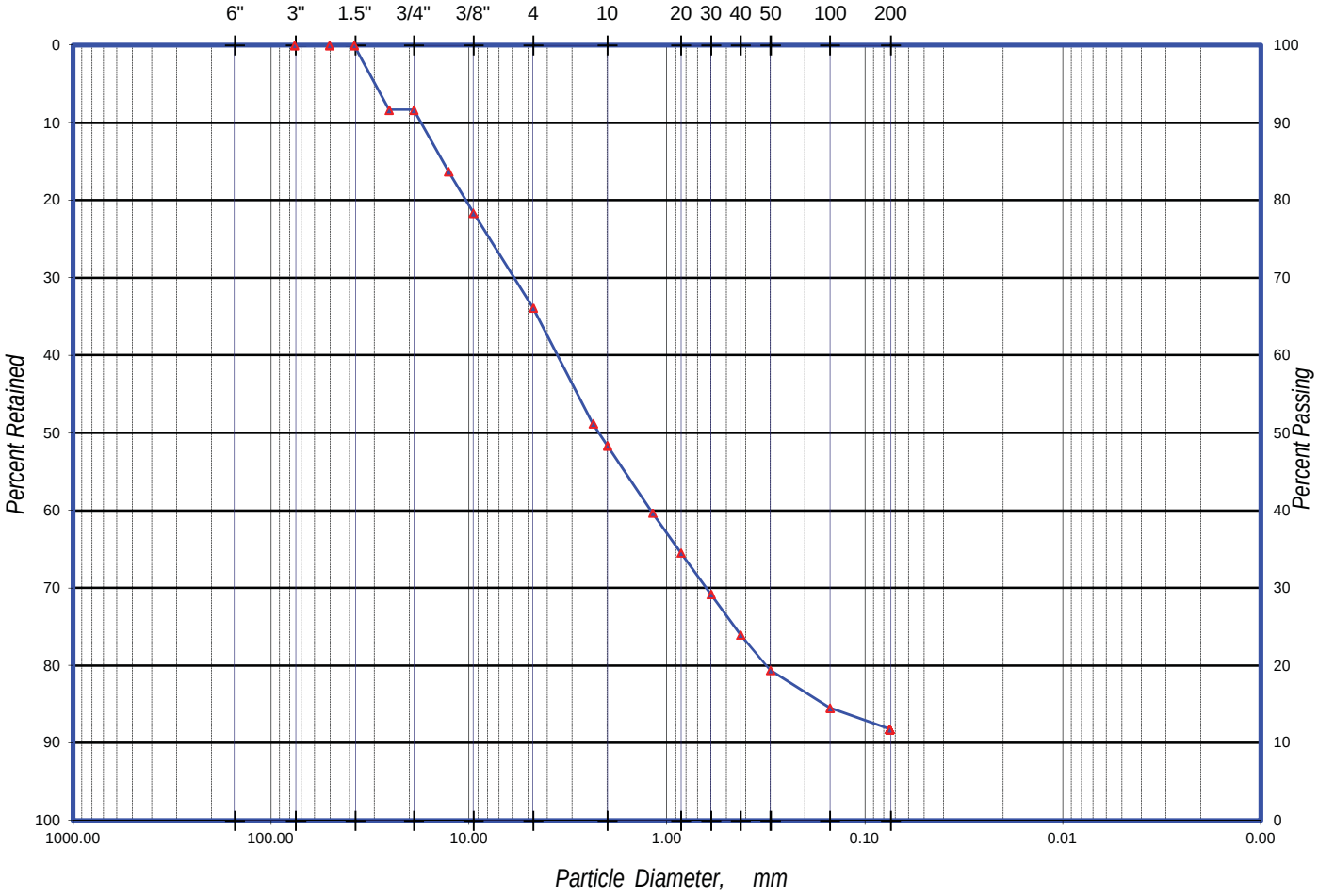
ASTM D-6913 / D-7928, (replacing D-422)
Method A: (+/-1%)

Geo-Logic ASSOCIATES

Client :	Project No:	Lab Sample No:
PACIFIC GEOTECHNICAL ENGINEERING	2016.0096.100	**4141S**

Project Name:	Report Date:
MORGAN HILL SEWER TRUNK	December 23, 2016

BOULDERS	COBBLES	GRAVEL		SAND			SILT AND CLAY
		COARSE	FINE	COARSE	MEDIUM	FINE	
US SIEVE SIZE, INCHES				US STANDARD SIEVE SIZE No.			HYDROMETER



Symbol	Sample ID	* Description	% Gravel	% Sand	% Silt - Clay
▲	DH7 @ 9-10'	Brown Sand with Clay and Gravel	33.9	54.3	11.8

Size Passing, mm D_{60} = 3.77 D_{30} = 0.64 D_{10} = N/A

Coefficient of Curvature, C_c: N/A Coefficient of Uniformity, C_u: N/A Fineness Modulus = 4.10

* Visual Classification based on ASTM D-2488

Note: * Percentages are +/- 0.1% based on computer rounding as allowed by ASTM D-6026-01 Section 5.2.3.

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the sampl supplied and tested for the above referenced job

PARTICLE SIZE ANALYSIS

Test Report

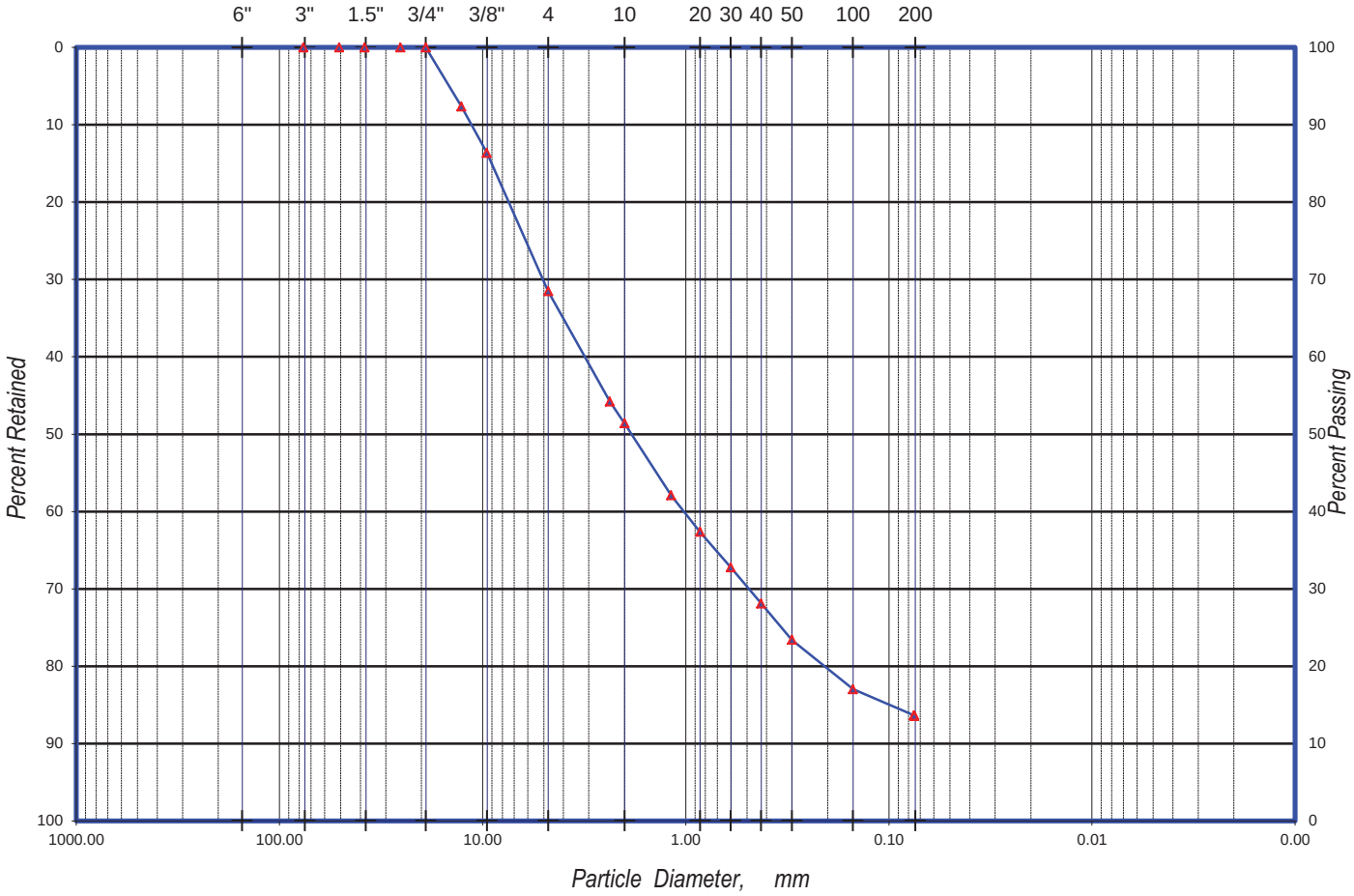
ASTM D-6913 / D-7928, (replacing D-422)
Method A: (+/-1%)

Geo-Logic ASSOCIATES

Client :	Project No:	Lab Sample No:
PACIFIC GEOTECHNICAL ENGINEERING	2016.0096.100	**4141V**

Project Name:	Report Date:
MORGAN HILL SEWER TRUNK	December 23, 2016

BOULDERS	COBBLES	GRAVEL		SAND			SILT AND CLAY
		COARSE	FINE	COARSE	MEDIUM	FINE	
US SIEVE SIZE, INCHES				US STANDARD SIEVE SIZE No.			HYDROMETER



Symbol	Sample ID	* Description	% Gravel	% Sand	% Silt - Clay
▲	DH8 @ 9-10'	Brown Clayey Sand with Gravel	31.5	54.9	13.6

Size Passing, mm D_{60} = 3.33 D_{30} = 0.50 D_{10} = N/A

Coefficient of Curvature, C_c: N/A Coefficient of Uniformity, C_u: N/A Fineness Modulus = 3.76

* Visual Classification based on ASTM D-2488

Note: * Percentages are +/- 0.1% based on computer rounding as allowed by ASTM D-6026-01 Section 5.2.3.

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the samples supplied and tested for the above referenced job.

PARTICLE SIZE ANALYSIS

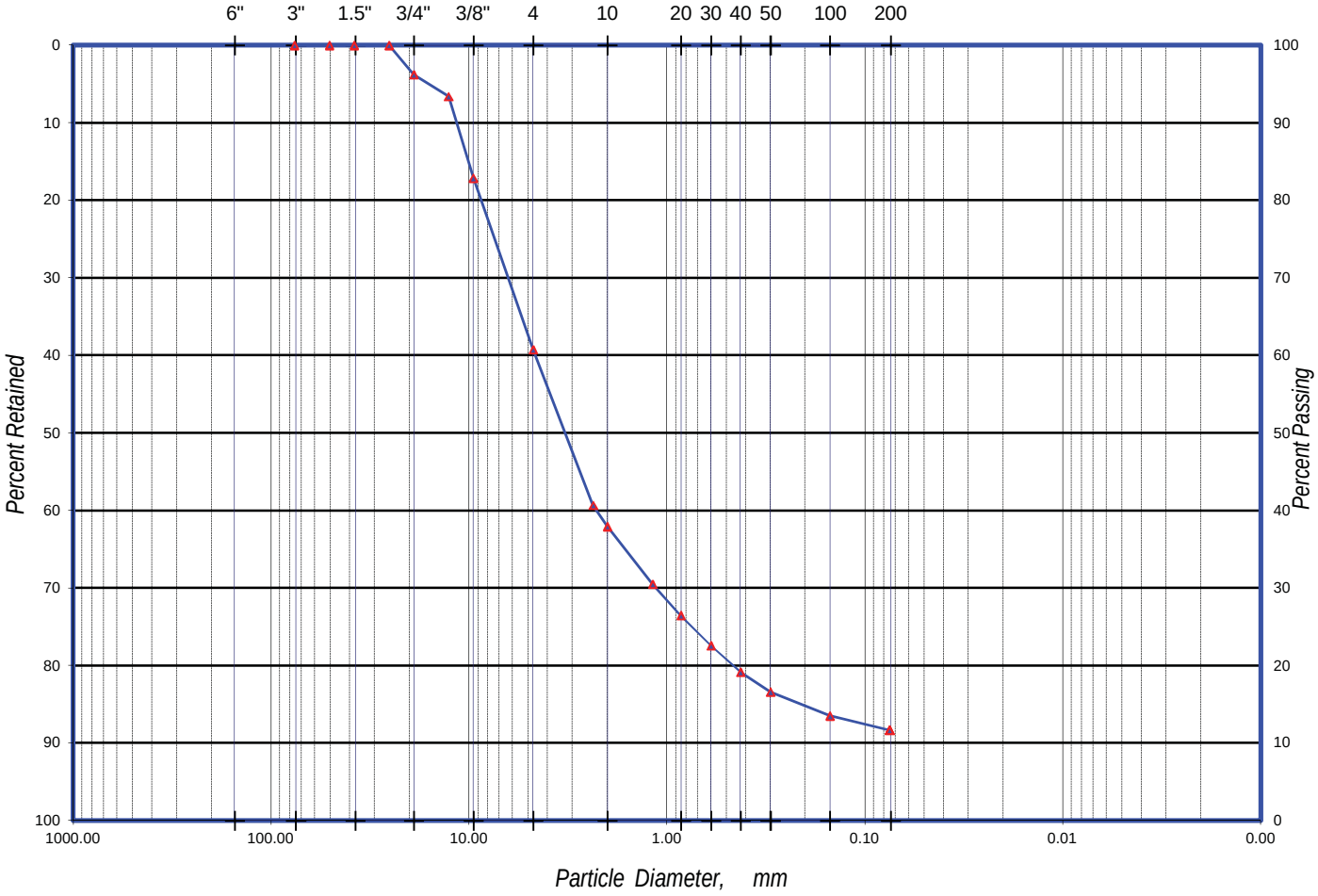
Test Report

ASTM D-6913 / D-7928, (replacing D-422)
Method A: (+/-1%)

Client :	Project No:	Lab Sample No:
PACIFIC GEOTECHNICAL ENGINEERING	2016.0096.100	**4141Y**

Project Name:	Report Date:
MORGAN HILL SEWER TRUNK	December 23, 2016

BOULDERS	COBBLES	GRAVEL		SAND			SILT AND CLAY
		COARSE	FINE	COARSE	MEDIUM	FINE	
US SIEVE SIZE, INCHES				US STANDARD SIEVE SIZE No.			HYDROMETER



Symbol	Sample ID	* Description	% Gravel	% Sand	% Silt - Clay
▲	DH9 @ 14-15'	Light Brown Sand with Clay and Gravel	39.3	49.1	11.7

Size Passing, mm D_{60} = 4.66 D_{30} = 1.14 D_{10} = N/A

Coefficient of Curvature, C_c: N/A Coefficient of Uniformity, C_u: N/A Fineness Modulus = 4.36

* Visual Classification based on ASTM D-2488

Note: * Percentages are +/- 0.1% based on computer rounding as allowed by ASTM D-6026-01 Section 5.2.3.

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the sampl supplied and tested for the above referenced job

PARTICLE SIZE ANALYSIS

Test Report

ASTM D-6913 / D-7928, (replacing D-422)
Method A: (+/-1%)

Client : PACIFIC GEOTECHNICAL ENGINEERING

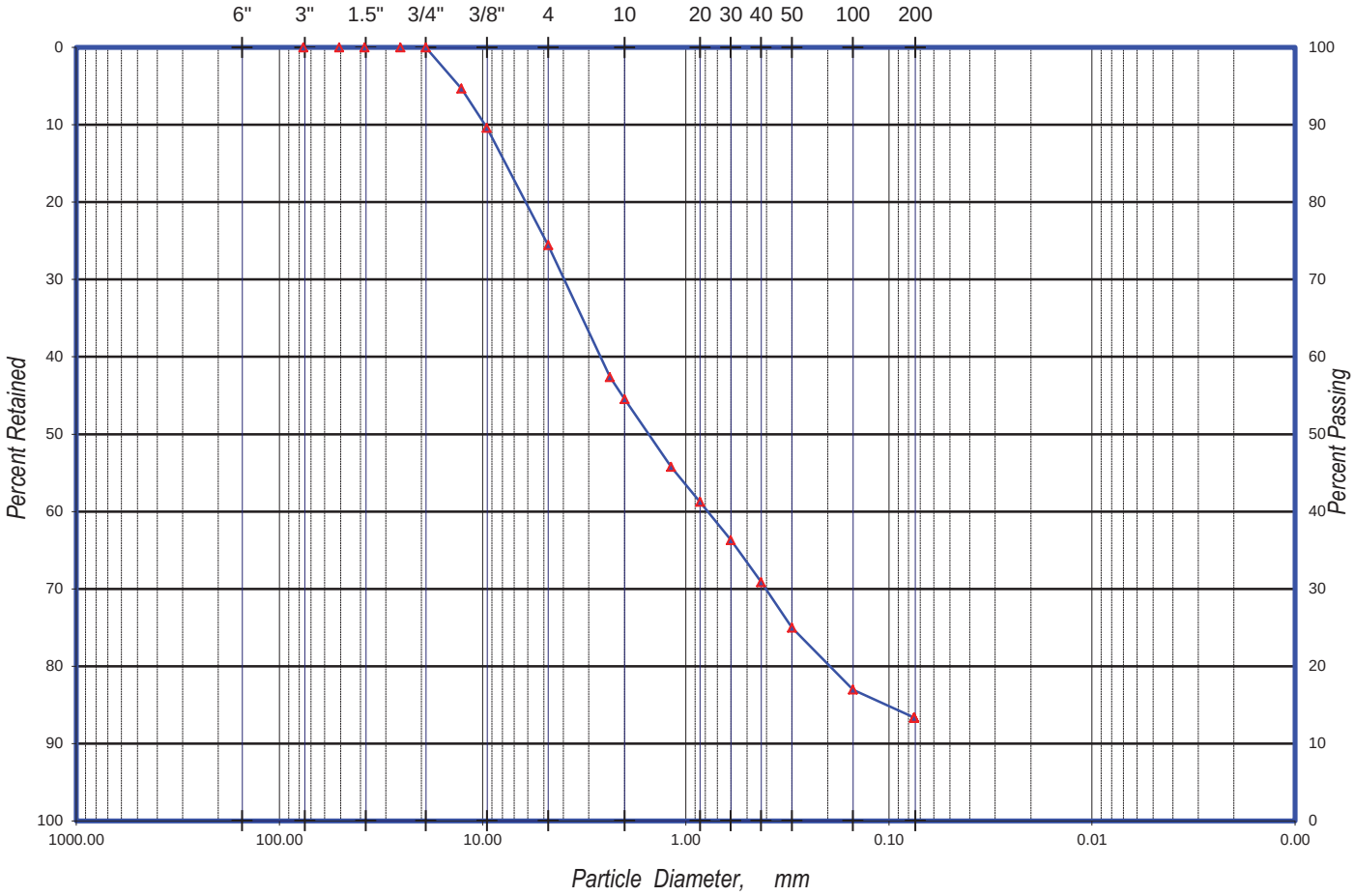
Project No: 2016.0096.100

Lab Sample No: **4141AA**

Project Name: MORGAN HILL SEWER TRUNK

Report Date: December 23, 2016

BOULDERS	COBBLES	GRAVEL		SAND			SILT AND CLAY
		COARSE	FINE	COARSE	MEDIUM	FINE	
US SIEVE SIZE, INCHES				US STANDARD SIEVE SIZE No.			HYDROMETER



Symbol	Sample ID	* Description	% Gravel	% Sand	% Silt - Clay
▲	DH10 @ 5.5-6.5'	Light Brown Clayey Sand with Gravel	25.6	61.1	13.3

Size Passing, mm D_{60} = 2.73 D_{30} = 0.41 D_{10} = N/A

Coefficient of Curvature, C_c: N/A Coefficient of Uniformity, C_u: N/A Fineness Modulus = 3.55

* Visual Classification based on ASTM D-2488

Note: * Percentages are +/- 0.1% based on computer rounding as allowed by ASTM D-6026-01 Section 5.2.3.

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the samples supplied and tested for the above referenced job.

PARTICLE SIZE ANALYSIS

Test Report

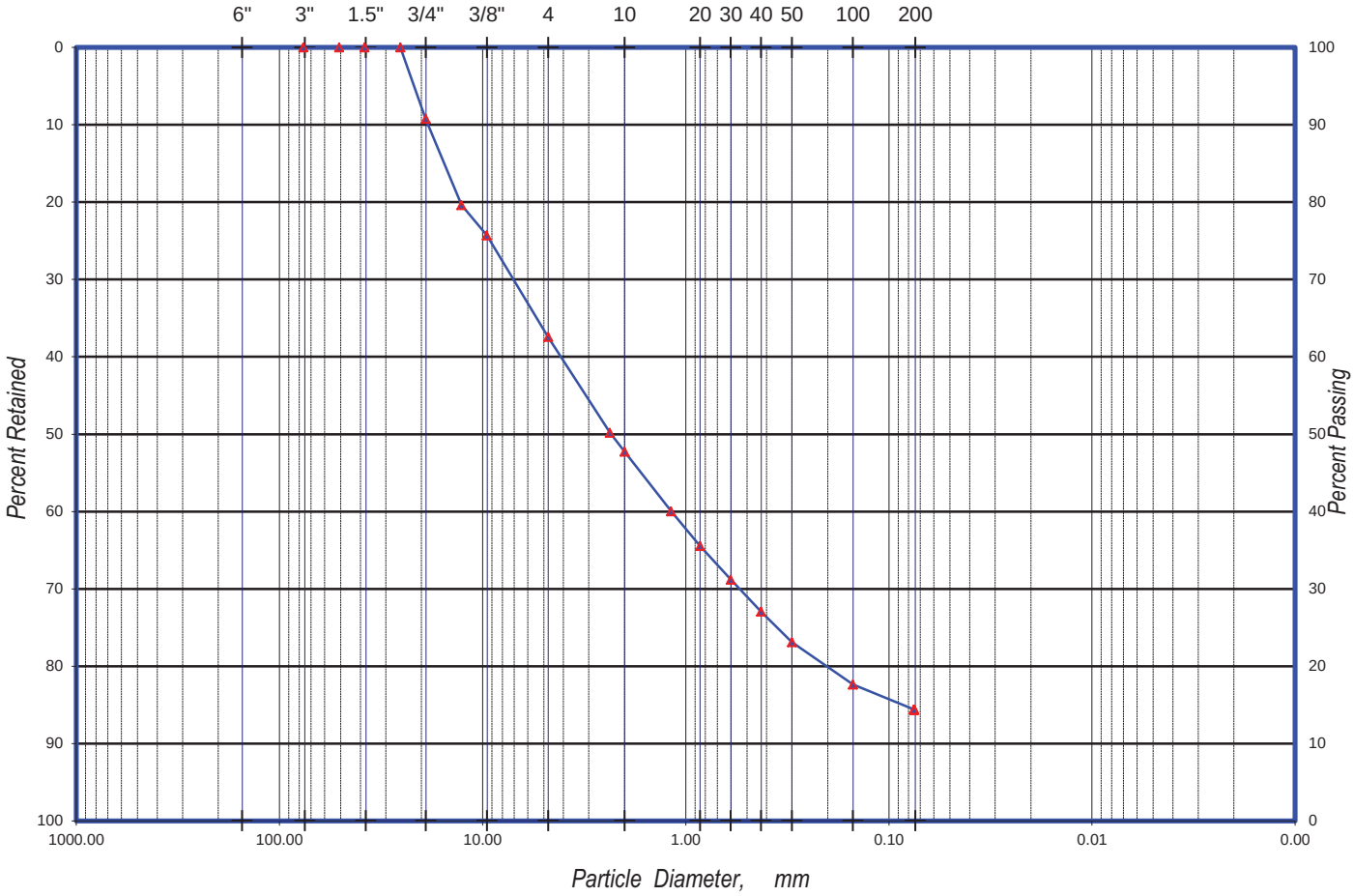
ASTM D-6913 / D-7928, (replacing D-422)
Method A: (+/-1%)

Geo-Logic ASSOCIATES

Client :	Project No:	Lab Sample No:
PACIFIC GEOTECHNICAL ENGINEERING	2016.0096.100	**4141AD**

Project Name:	Report Date:
MORGAN HILL SEWER TRUNK	December 23, 2016

BOULDERS	COBBLES	GRAVEL		SAND			SILT AND CLAY
		COARSE	FINE	COARSE	MEDIUM	FINE	
US SIEVE SIZE, INCHES				US STANDARD SIEVE SIZE No.			HYDROMETER



Symbol	Sample ID	* Description	% Gravel	% Sand	% Silt - Clay
▲	DH11 @ 9-10'	Light Brown Silty Clayey Sand with Gravel	37.4	48.2	14.4

Size Passing, mm D_{60} = 4.26 D_{30} = 0.55 D_{10} = N/A

Coefficient of Curvature, C_c: N/A Coefficient of Uniformity, C_u: N/A Fineness Modulus = 4.09

* Visual Classification based on ASTM D-2488

Note: * Percentages are +/- 0.1% based on computer rounding as allowed by ASTM D-6026-01 Section 5.2.3.

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the samples supplied and tested for the above referenced job.

L : Labexcel \ Projects \ Client \ Client Name \ 4141 \ 4141AD-ma	Print Date:	Entered By:	Reviewed By:	LSN:
DCN: MA-rp (rev. 6/27/12)	12/23/16	JL	KH	**4141AD**

Figure B-13

PARTICLE SIZE ANALYSIS

Test Report

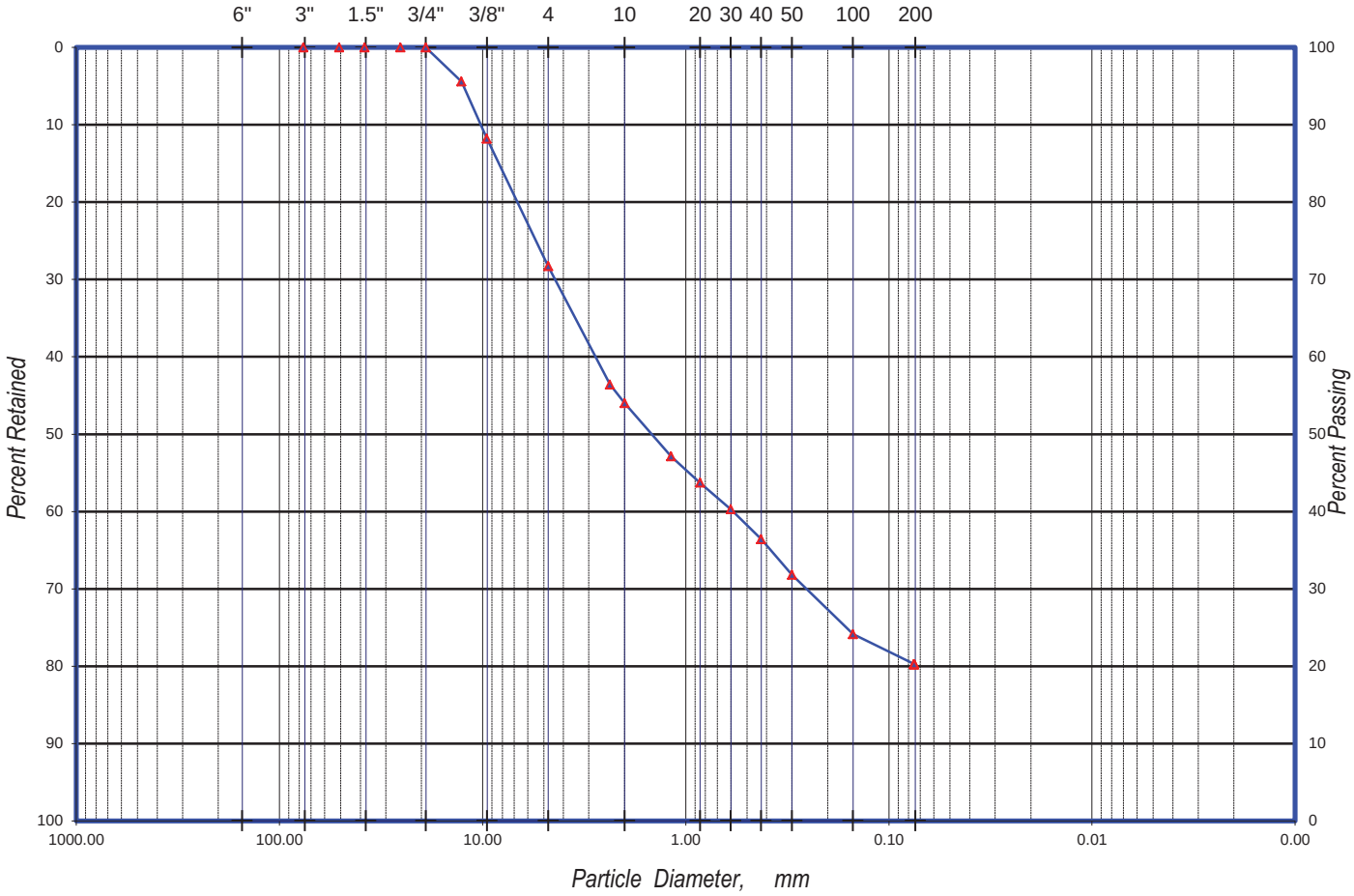
ASTM D-6913 / D-7928, (replacing D-422)
Method A: (+/-1%)

Geo-Logic ASSOCIATES

Client :	Project No:	Lab Sample No:
PACIFIC GEOTECHNICAL ENGINEERING	2016.0096.100	**4141AF**

Project Name:	Report Date:
MORGAN HILL SEWER TRUNK	December 23, 2016

BOULDERS	COBBLES	GRAVEL		SAND			SILT AND CLAY
		COARSE	FINE	COARSE	MEDIUM	FINE	
US SIEVE SIZE, INCHES				US STANDARD SIEVE SIZE No.			HYDROMETER



Symbol	Sample ID	* Description	% Gravel	% Sand	% Silt - Clay
▲	DH12 @ 9-10'	Brown Clayey Sand with Gravel	28.3	51.4	20.3

Size Passing, mm D_{60} = 2.92 D_{30} = 0.26 D_{10} = N/A

Coefficient of Curvature, C_c: N/A Coefficient of Uniformity, C_u: N/A Fineness Modulus = 3.40

* Visual Classification based on ASTM D-2488

Note: * Percentages are +/- 0.1% based on computer rounding as allowed by ASTM D-6026-01 Section 5.2.3.

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the samples supplied and tested for the above referenced job.

PARTICLE SIZE ANALYSIS

Test Report

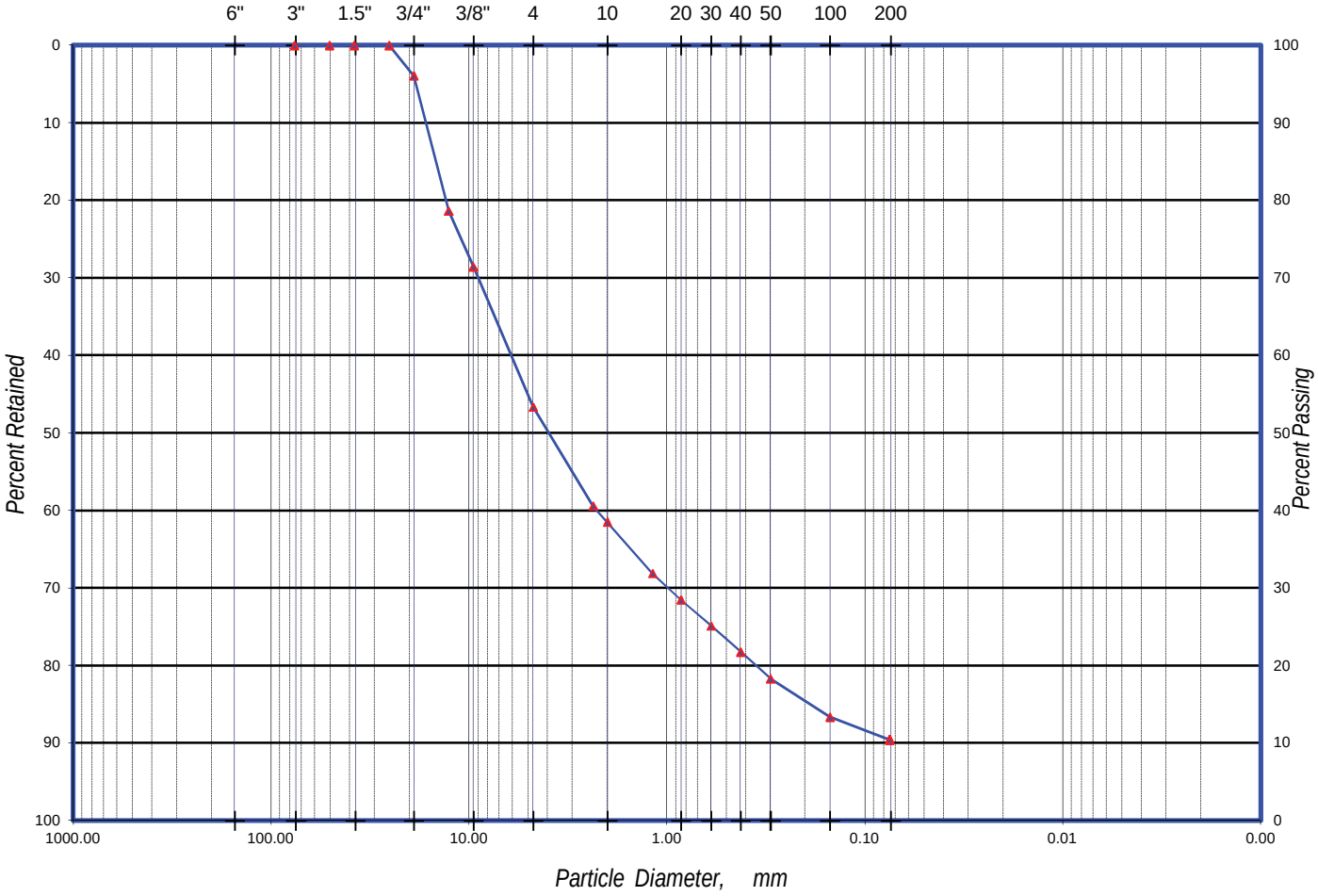
ASTM D-6913 / D-7928, (replacing D-422)
Method A: (+/-1%)

Geo-Logic ASSOCIATES

Client :	Project No:	Lab Sample No:
PACIFIC GEOTECHNICAL ENGINEERING	2016.0096.100	**4141AQ**

Project Name:	Report Date:
MORGAN HILL SEWER TRUNK	December 23, 2016

BOULDERS	COBBLES	GRAVEL		SAND			SILT AND CLAY
		COARSE	FINE	COARSE	MEDIUM	FINE	
US SIEVE SIZE, INCHES				US STANDARD SIEVE SIZE No.			HYDROMETER



Symbol	Sample ID	* Description	% Gravel	% Sand	% Silt - Clay
▲	DH16 @ 14-15'	Gravel w/ Silty Clay and Sand	46.7	42.9	10.4

Size Passing, mm D_{60} = 6.51 D_{30} = 1.00 D_{10} = N/A

Coefficient of Curvature, C_c: N/A Coefficient of Uniformity, C_u: N/A Fineness Modulus = 4.50

* Visual Classification based on ASTM D-2488

Note: * Percentages are +/- 0.1% based on computer rounding as allowed by ASTM D-6026-01 Section 5.2.3.

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the sampl supplied and tested for the above referenced job

PARTICLE SIZE ANALYSIS

Test Report

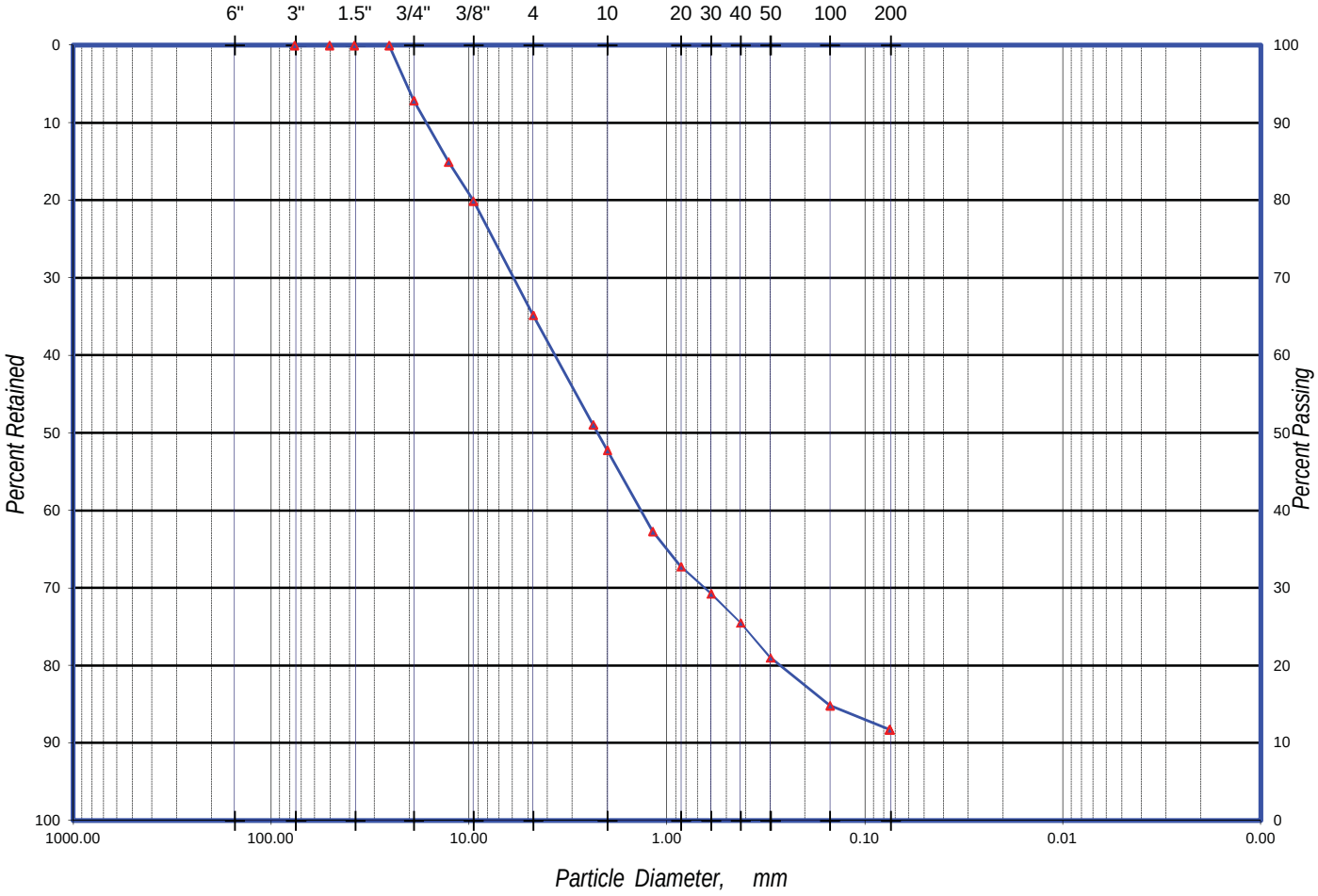
ASTM D-6913 / D-7928, (replacing D-422)
Method A: (+/-1%)

Geo-Logic ASSOCIATES

Client :	Project No:	Lab Sample No:
PACIFIC GEOTECHNICAL ENGINEERING	2016.0096.100	**4141AS**

Project Name:	Report Date:
MORGAN HILL SEWER TRUNK	December 23, 2016

BOULDERS	COBBLES	GRAVEL		SAND			SILT AND CLAY
		COARSE	FINE	COARSE	MEDIUM	FINE	
US SIEVE SIZE, INCHES				US STANDARD SIEVE SIZE No.			HYDROMETER



Symbol	Sample ID	* Description	% Gravel	% Sand	% Silt - Clay
▲	DH17 @ 9-10'	Brown Sand with Clay and Gravel	34.8	53.5	11.7

Size Passing, mm D_{60} = 3.87 D_{30} = 0.65 D_{10} = N/A

Coefficient of Curvature, C_c: N/A Coefficient of Uniformity, C_u: N/A Fineness Modulus = 4.09

* Visual Classification based on ASTM D-2488

Note: * Percentages are +/- 0.1% based on computer rounding as allowed by ASTM D-6026-01 Section 5.2.3.

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the sampl supplied and tested for the above referenced job

ATTERBERG LIMITS

Summary Report

ASTM D-4318

Geo-Logic ASSOCIATES

Client : Pacific Geotechnical Engineering

Project No: 2016.0096.300

Lab Log No.: **4308**

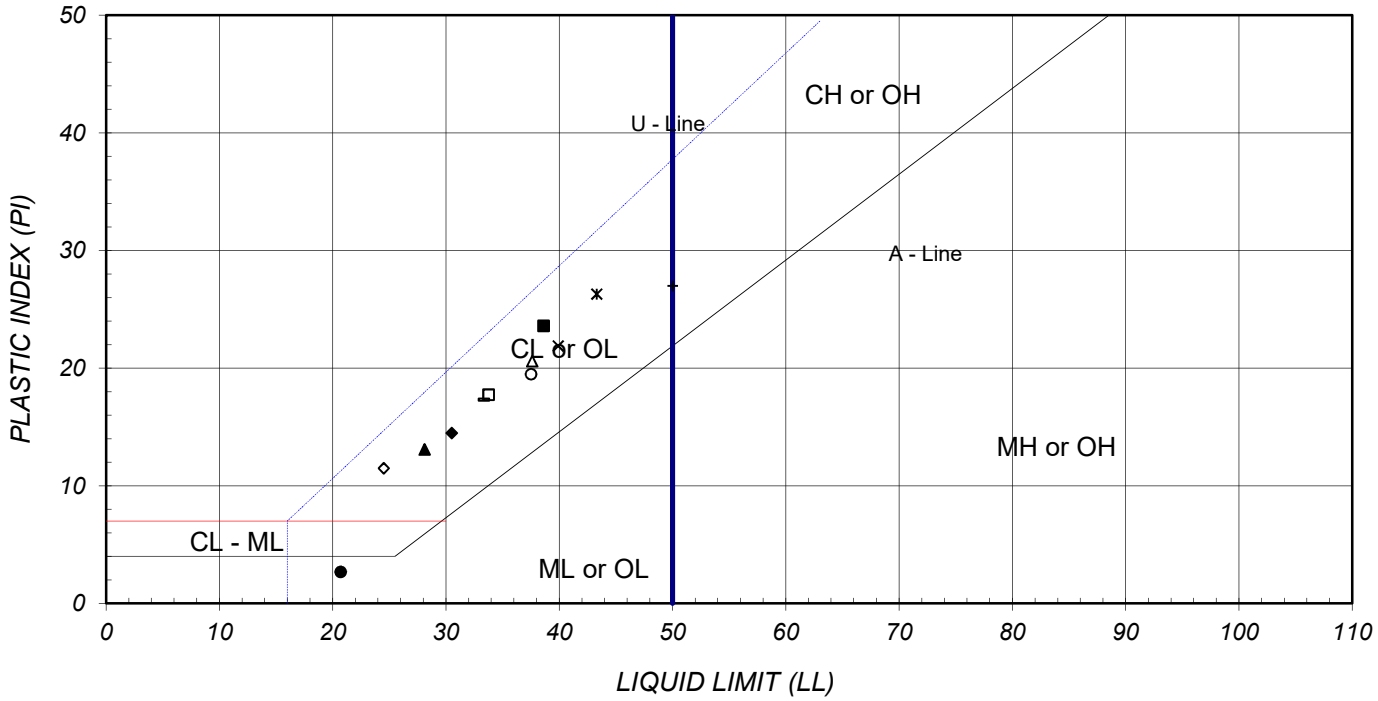
Project Name: Morgan Hill Sewer Trunk - Gilroy 2017

Report Date: December 14, 2017

LSN	SYMBOL	SAMPLE IDENTIFICATION	SAMPLE DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	PLASTIC INDEX
4308D	□	DH-2A @ 19.0'	Yellowish Brown Clayey Sand (SC)	34	16	18
4308E	○	DH-2A @ 22.0'	Light Brown Lean Clay with Sand (CL)	38	18	20
4308F	+	DH-2A @ 25.0 '	Brown Fat Clay (CH)	50	23	27
4308G	x	DH-2A @ 28.0'	Yellowish Brown Lean Clay with Sand (CL)	40	18	22
4308L	-	DH-3A @ 19.5'	Brown Clayey Sand with Gravel	33	16	17
4308M	■	DH-3A @ 22.0-22.5'	Brown Well Graded Sand with Clay and Gravel (SW-SC)	39	15	24
4308N	●	DH-3A @ 25.5'	Brown Poorly Graded Sand with Silt and Gravel (SP-SM)	21	18	3
4308T	▲	DH-6A @ 33-34'	Light Brown Lean Clay with Sand (CL)	28	15	13
4308V	△	DH-6A @ 38.0'	Light Brown Lean Clay with Sand (CL)	38	17	21
4308W	⧓	DH-6A @ 41.0'	Light Brown Lean Clay (CL)	43	17	26
4308AE	◇	DH-7A @ 32.0'	Light Brown Lean Clay with Sand (CL)	25	13	12
4308AG	◆	DH-7A @ 38.0'	Light Brown Lean Clay with Sand (CL)	31	16	15

Note: NP = Nonplastic (ASTM D-4318, 19.1.4) * Visual Classification based on ASTM D-2488

PLASTICITY CHART



This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the samples supplied and tested for the above referenced job.

ATTERBERG LIMITS

Summary Report

ASTM D-4318

Geo-Logic ASSOCIATES

Client : Pacific Geotechnical Engineering

Project No: 2016.0096.300

Lab Log No.: 4308

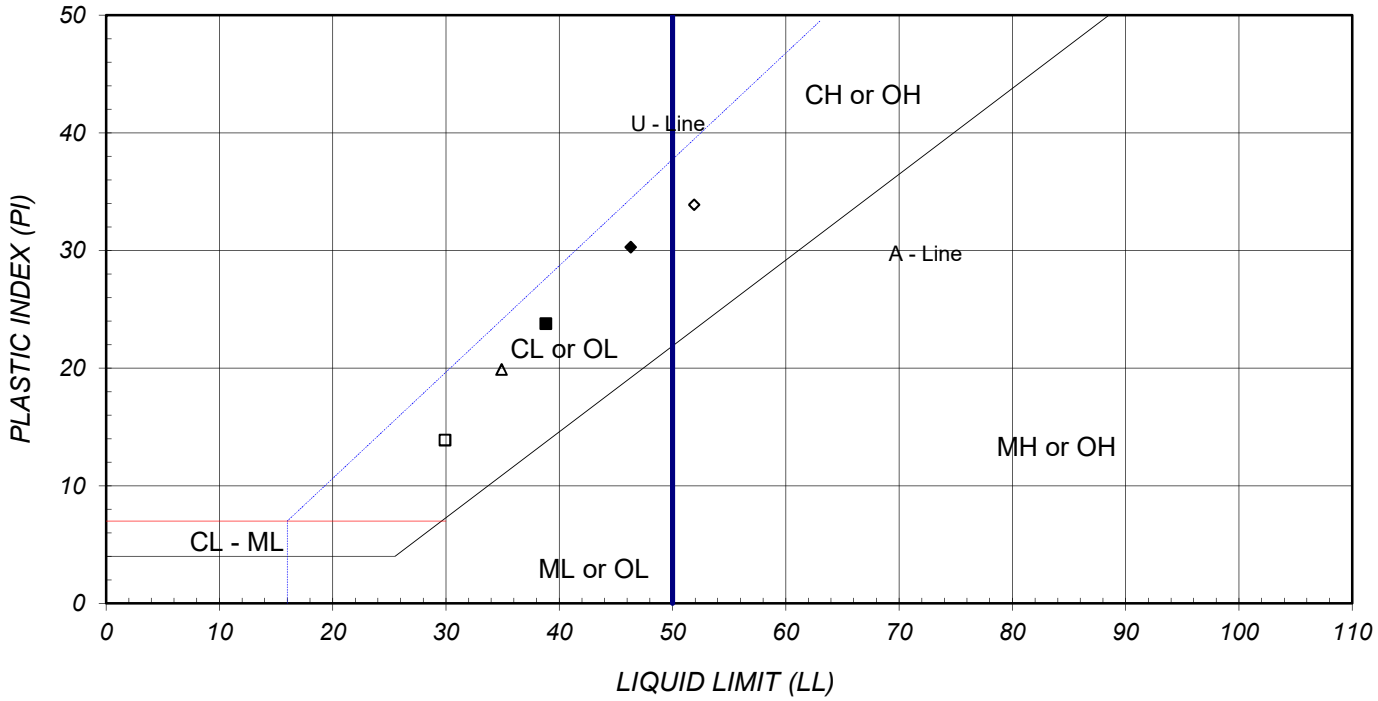
Project Name: Morgan Hill Sewer Trunk - Gilroy 2017

Report Date: December 14, 2017

LSN	SYMBOL	SAMPLE IDENTIFICATION	SAMPLE DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	PLASTIC INDEX
4308AN	□	DH-10A @ 22.0'	Light Brown Poorly Graded Gravel with Sand and Clay (GP-GC)	30	16	14
4308AP	○	DH-10A @ 28.0'	Light Brown Poorly Graded Sand w/ Silt & Gravel (SP-SM)	NP	NP	NP
4308AQ	+	DH-10A @ 29-30'	Light Brown Poorly Graded Sand with Gravel (SP)	NP	NP	NP
4308AW	x	DH-11A @ 28.0'	Dark Brown Poorly Graded Sand with Silt and Gravel (SP-SM)	NP	NP	NP
4308AX	-	DH-11A @ 31.0'	Light Brown Silty Sand with Gravel (SM)	NP	NP	NP
4308BD	■	DH-16A @ 26.5-27.0'	Light Brown Well Graded Sand with Clay and Gravel (SW-SC)	39	15	24
4308BE	●	DH-16A @ 30.0'	Brown Silty Sand (SM)	NP	NP	NP
4308BF	▲	DH-16A @ 32.5'	Brown Well Graded Gravel with Sand (GW)	NP	NP	NP
4308BL	△	DH-17A @ 27.0'	Brown Well Graded Gravel with Sand (GW)	35	15	20
4308BM	⧓	DH-17A @ 30.0'	Brown Poorly Graded Sand with Silt and Gravel (SP-SM)	NP	NP	NP
4308BQ	◇	DH-20A @ 18.0'	Light Brown Poorly Graded Gravel with Sand and Clay (GP-GC)	52	18	34
4308BR	◆	DH-20A @ 21.0'	Light Brown Clayey Gravel with Sand (GC)	46	16	30

Note: NP = Nonplastic (ASTM D-4318, 19.1.4) * Visual Classification based on ASTM D-2488

PLASTICITY CHART



This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the samples supplied and tested for the above referenced job.

ATTERBERG LIMITS

Summary Report

ASTM D-4318

Geo-Logic ASSOCIATES

Client : Pacific Geotechnical Engineering

Project No: 2016.0096.300

Lab Log No.: **4308**

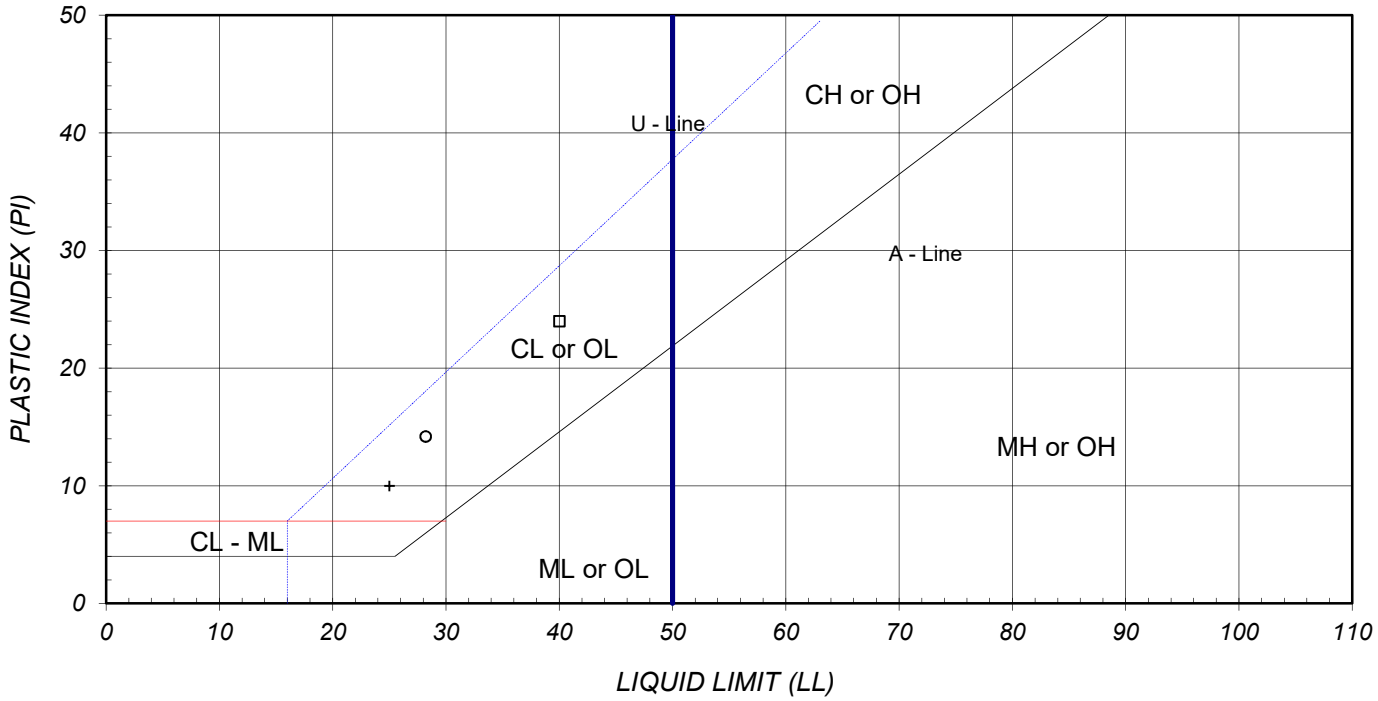
Project Name: Morgan Hill Sewer Trunk - Gilroy 2017

Report Date: December 14, 2017

LSN	SYMBOL	SAMPLE IDENTIFICATION	SAMPLE DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	PLASTIC INDEX
4308BS	□	DH-20A @ 24.0'	Light Brown Poorly Graded Sand w/ Clay & Gravel (SP-SC)	40	16	24
4308BT	○	DH-20A @ 26.5-27.0'	Light Brown Poorly Graded Gravel with Sand and Clay (GP-GC)	28	14	14
4308BY	+	DH-11A @ 24.5-25.0'	Brown Well Graded Gravel with Sand (GW)	25	15	10

Note: NP = Nonplastic (ASTM D-4318, 19.1.4) * Visual Classification based on ASTM D-2488

PLASTICITY CHART



This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the samples supplied and tested for the above referenced job.

L : Labexcel \ Projects \ Client \ Pacific Geotech \ 2016.0096.300

Print Date: 01/11/18 Entered By: JL Reviewed By: KH LLN:

DCN: PI-rp (rev. 9/18/12)

4308

Figure B-19

Geo-Logic ASSOCIATES

ASTM D-2166

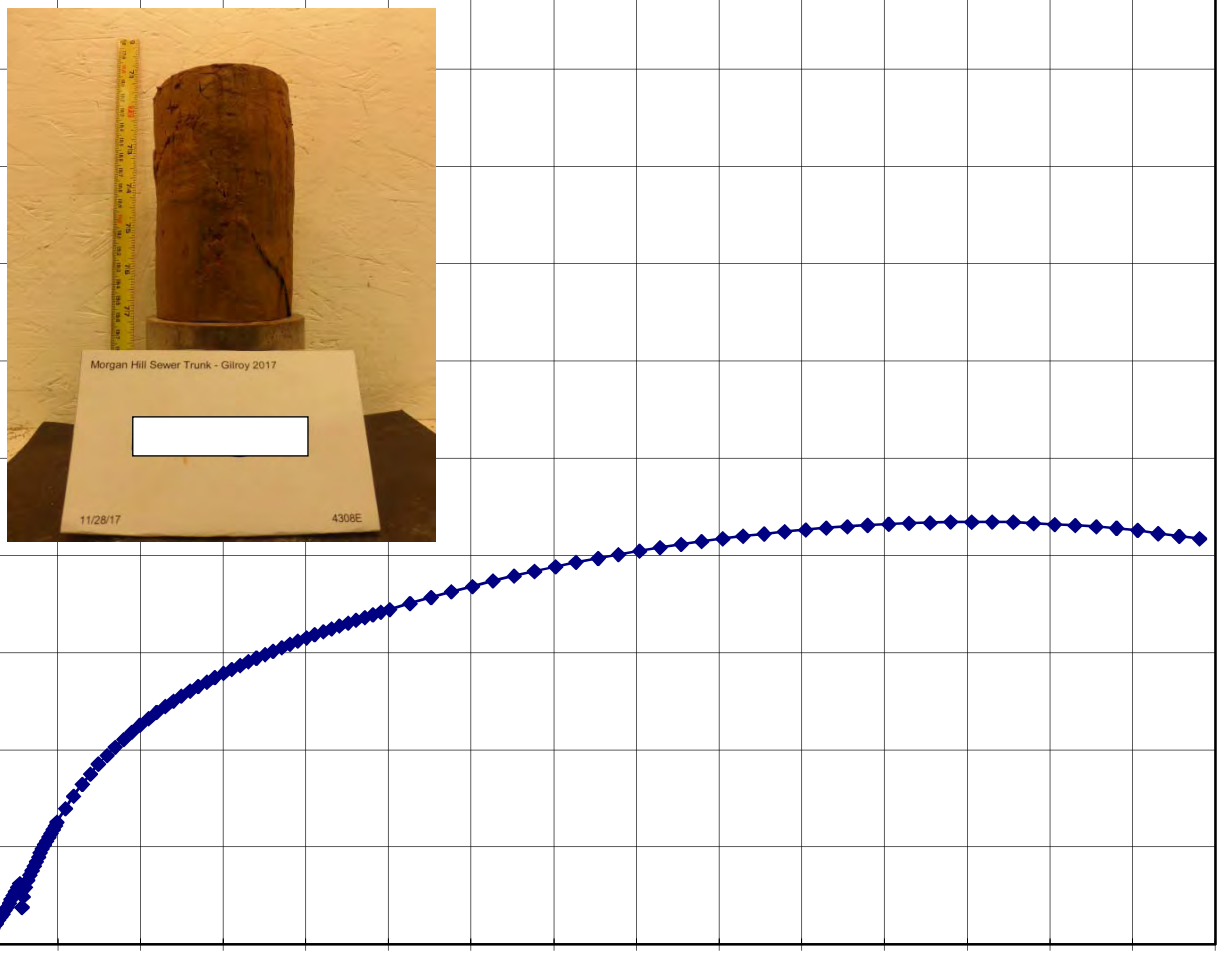
Pacific Geotechnical Engineering

Project No: | Lab Log: **4308E**

Project Name: Morgan Hill Sewer Trunk - Gilroy 2017

Sample ID: DH-2A @22'

Report Date: 01/11/18



Test No.	Description	UNCONFINED COMPRESSIVE STRENGTH q_u, psi	shear, psi
1	Light Brown Lean Clay w/ Sand (CL)		

NOTE:

Sample Diameter = 2.4 in.
Sample Height = 5.3 in.
Height / Dia. Ratio = 2.2

Strain Rate: in./ min.
Strain %: %/ min.
Test Date :

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the samples supplied and tested for the above referenced job.

Geo-Logic ASSOCIATES

UNCONFINED COMPRESSIVE STRENGTH

ASTM D-2166

Client / Project Name: Paci□c Geotechnical Engineering

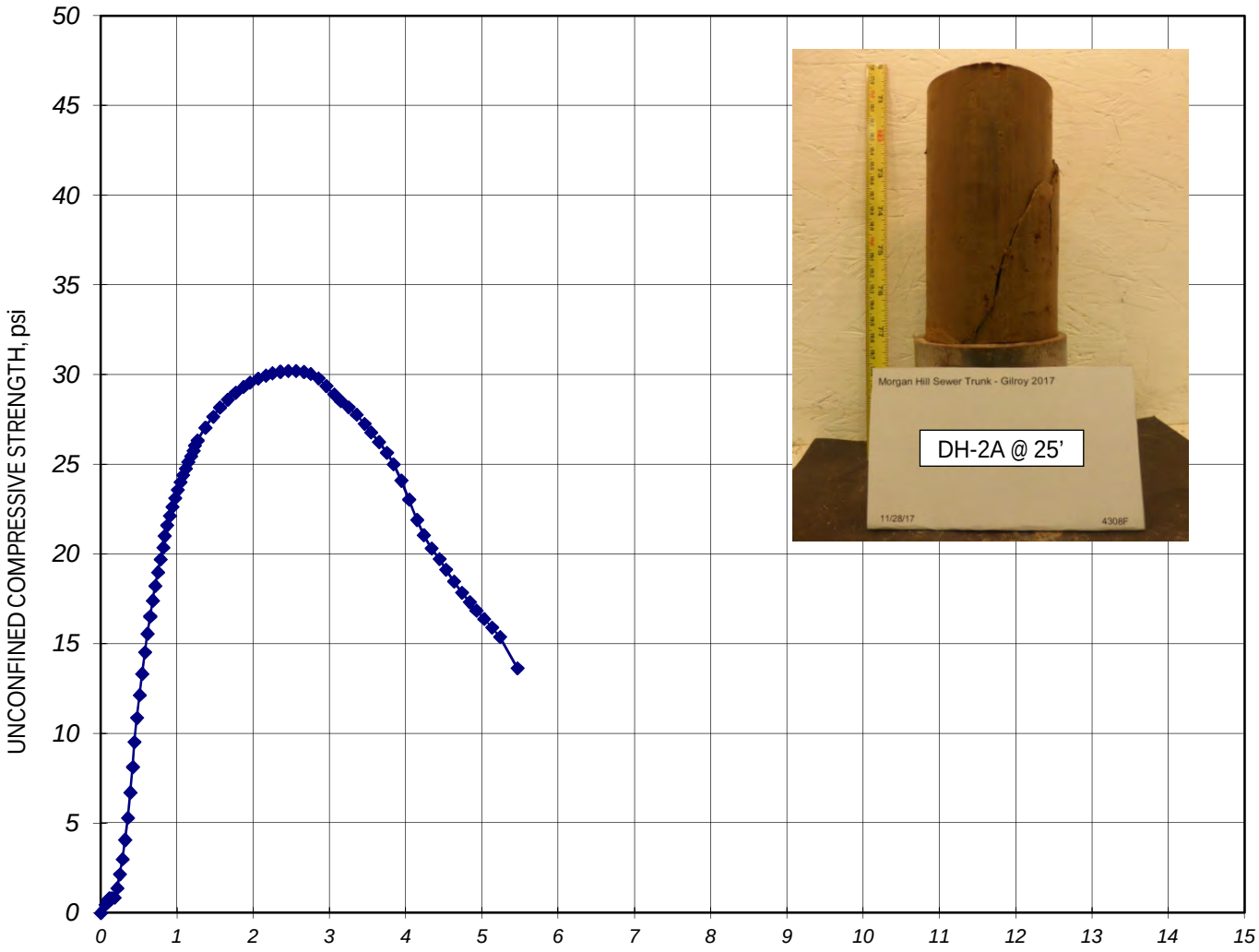
Project No: 2016.0096.300

Lab Log: **4308F**

Project Name: Morgan Hill Sewer Trunk - Gilroy 2017

Sample ID: DH-2A @ 25'

Report Date: January 2, 2018



Test No.	Initial Water Content %	Initial Dry Density pcf	Description	UNCONFINED COMPRESSIVE STRENGTH q_u, psi	shear, psi
1	28.0	96	Brown Fat Clay (CH)	**30.2**	**15.1**

NOTE:

Sample Diameter = 2.4 in.

Sample Height = 5.3 in.

Height / Dia. Ratio = 2.2

Strain Rate: 0.10 in./ min.

Strain % : 2.0 % / min.

Test Date : December 7, 2018

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the samples supplied and tested for the above referenced job.

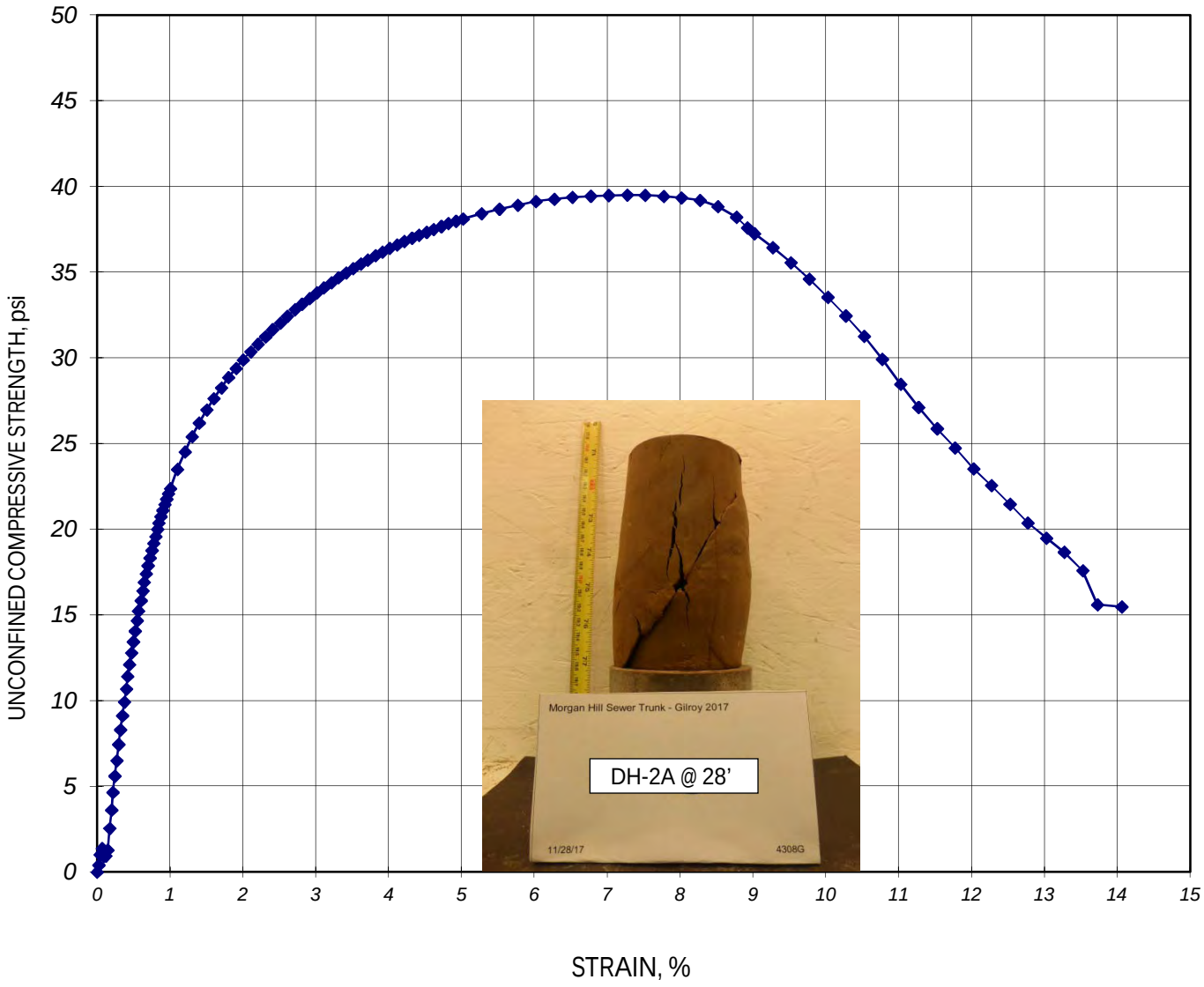
Geo-Logic ASSOCIATES

UNCONFINED COMPRESSIVE STRENGTH

ASTM D-2166

Client / Project Name:	Project No:	Lab Log:
Paci□c Geotechnical Engineering	2016.0096.300	**4308G**

Project Name:	Sample ID	Report Date:
Morgan Hill Sewer Trunk - Gilroy 2017	DH-2A @ 28'	January 9, 2018



Test No.	Initial Water Content %	Initial Dry Density pcf	Description	UNCONFINED COMPRESSIVE STRENGTH q_u, psi	shear, psi
1	22.9	104	Yellowish Brown Lean Clay w/ Sand (CL)	**39.5**	**19.8**

NOTE:

Sample Diameter = 2.4 in.
Sample Height = 5.4 in.
Height / Dia. Ratio = 2.2

Strain Rate: 0.050 in./ min.
Strain % : 1.00 % / min.
Test Date : December 7, 2018

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the samples supplied and tested for the above referenced job.

Geo-Logic ASSOCIATES

UNCONFINED COMPRESSIVE STRENGTH

ASTM D-2166

Client / Project Name: Paci□c Geotechnical Engineering

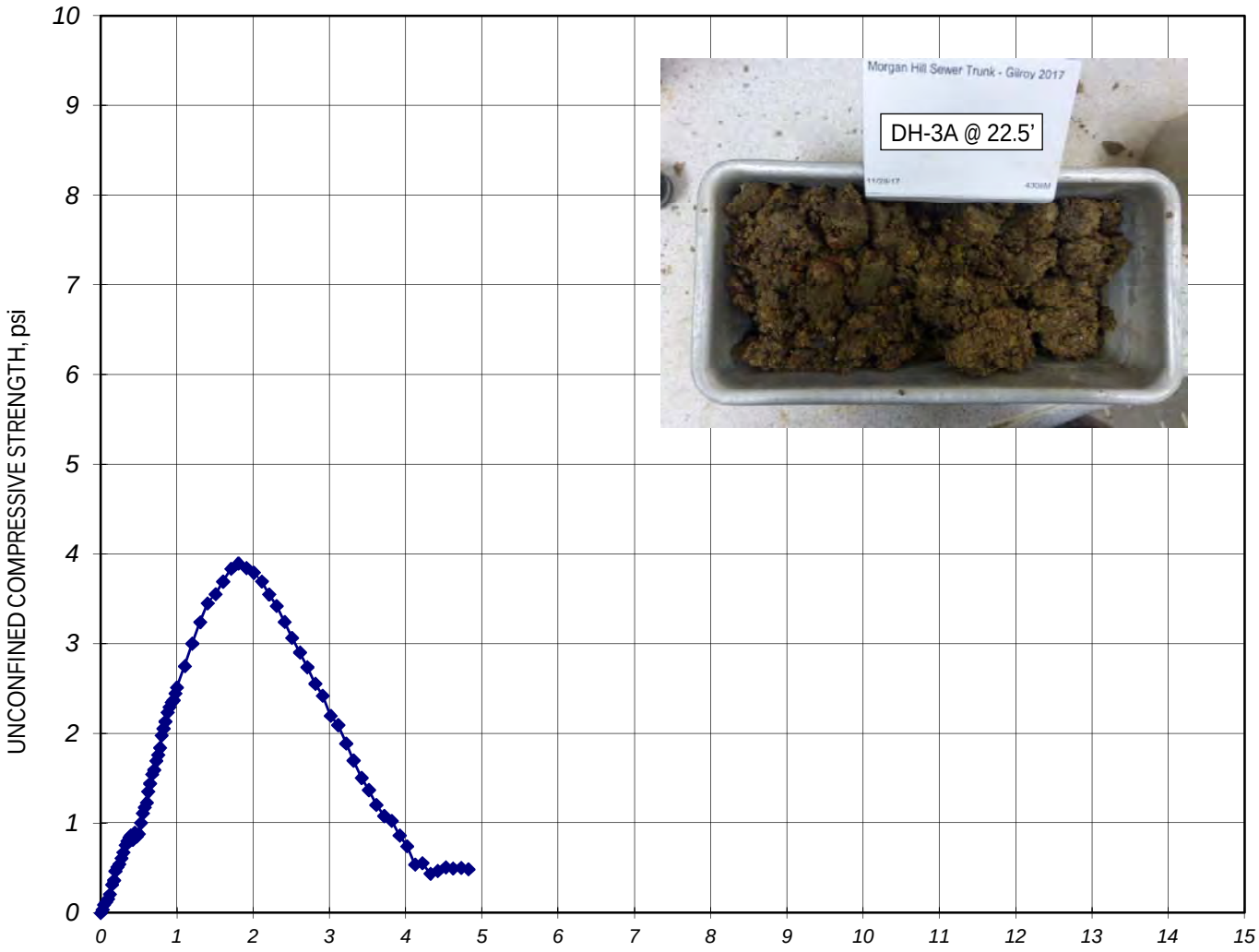
Project No: 2016.0096.300

Lab Log: **4308M**

Project Name: Morgan Hill Sewer Trunk - Gilroy 2017

Sample ID: DH-3A @ 22.5'

Report Date: January 9, 2018



Test No.	Initial Water Content %	Initial Dry Density pcf	Description	UNCONFINED COMPRESSIVE STRENGTH q_u, psi	shear, psi
1	10.3	115	Brown Well Graded Sand w/ Clay & Gravel (SW-SC)	**3.9**	**2.0**

NOTE:

Sample Diameter = 2.4 in.

Sample Height = 5.5 in.

Height / Dia. Ratio = 2.3

Strain Rate: 0.05 in./ min.

Strain % : 1.0 % / min.

Test Date : December 8, 2018

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the samples supplied and tested for the above referenced job.

Geo-Logic ASSOCIATES

UNCONFINED COMPRESSIVE STRENGTH

ASTM D-2166

Client / Project Name: Paci□c Geotechnical Engineering

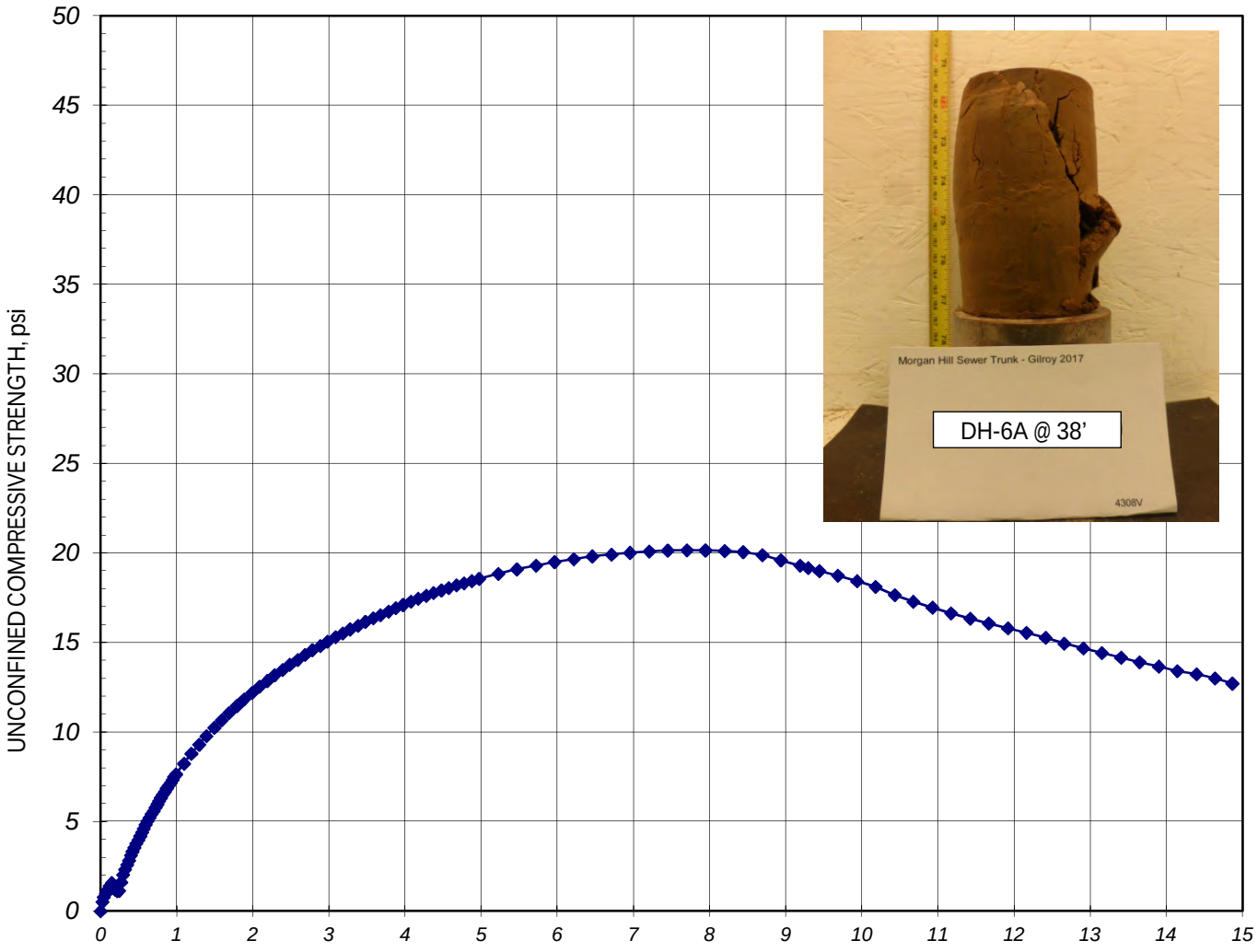
Project No: 2016.0096.300

Lab Log: **4308V**

Project Name: Morgan Hill Sewer Trunk - Gilroy 2017

Sample ID: DH-6A @ 38'

Report Date: January 9, 2018



Test No.	Initial Water Content %	Initial Dry Density pcf	Description	UNCONFINED COMPRESSIVE STRENGTH q_u, psi	shear, psi
1	21.4	106	Light Brown Lean Clay w/ Sand (CL)	**20.2**	**10.1**

NOTE:

Sample Diameter = 2.4 in.

Sample Height = 5.0 in.

Height / Dia. Ratio = 2.1

Strain Rate: 0.05 in./ min.

Strain % : 1.0 % / min.

Test Date : December 8, 2018

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the samples supplied and tested for the above referenced job.

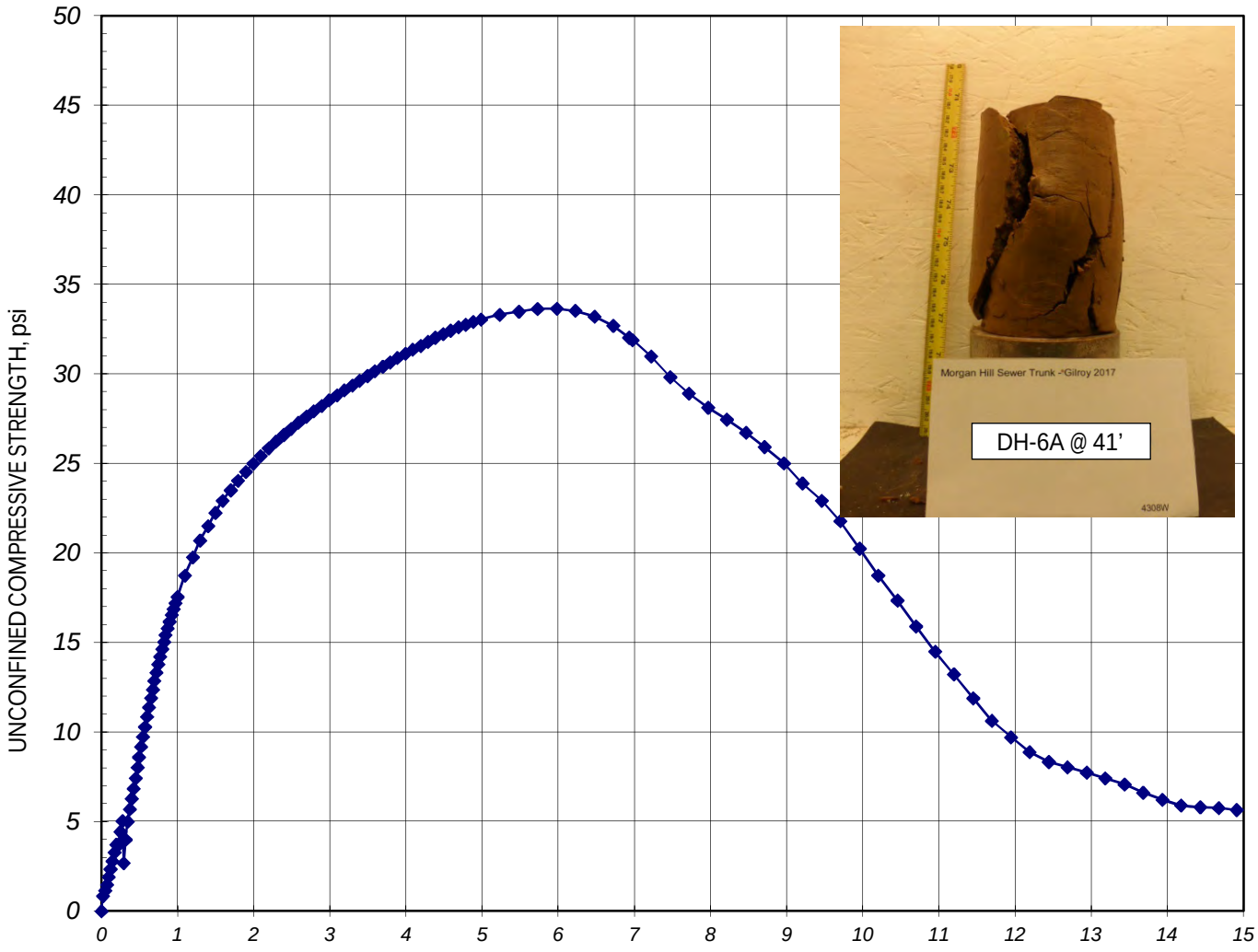
Geo-Logic ASSOCIATES

UNCONFINED COMPRESSIVE STRENGTH

ASTM D-2166

Client / Project Name:	Project No:	Lab Log:
Paci□c Geotechnical Engineering	2016.0096.300	**4308W**

Project Name:	Sample ID	Report Date:
Morgan Hill Sewer Trunk - Gilroy 2017	DH-6A @ 41'	January 9, 2018



Test No.	Initial Water Content %	Initial Dry Density pcf	Description	UNCONFINED COMPRESSIVE STRENGTH q_u, psi	shear, psi
1	20.6	108	Light Brown Lean Clay (CL)	**33.7**	**16.9**

NOTE:

Sample Diameter = 2.4 in.
Sample Height = 5.0 in.
Height / Dia. Ratio = 2.1

Strain Rate: 0.05 in./ min.
Strain % : 1.0 % / min.
Test Date : December 8, 2018

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the samples supplied and tested for the above referenced job.

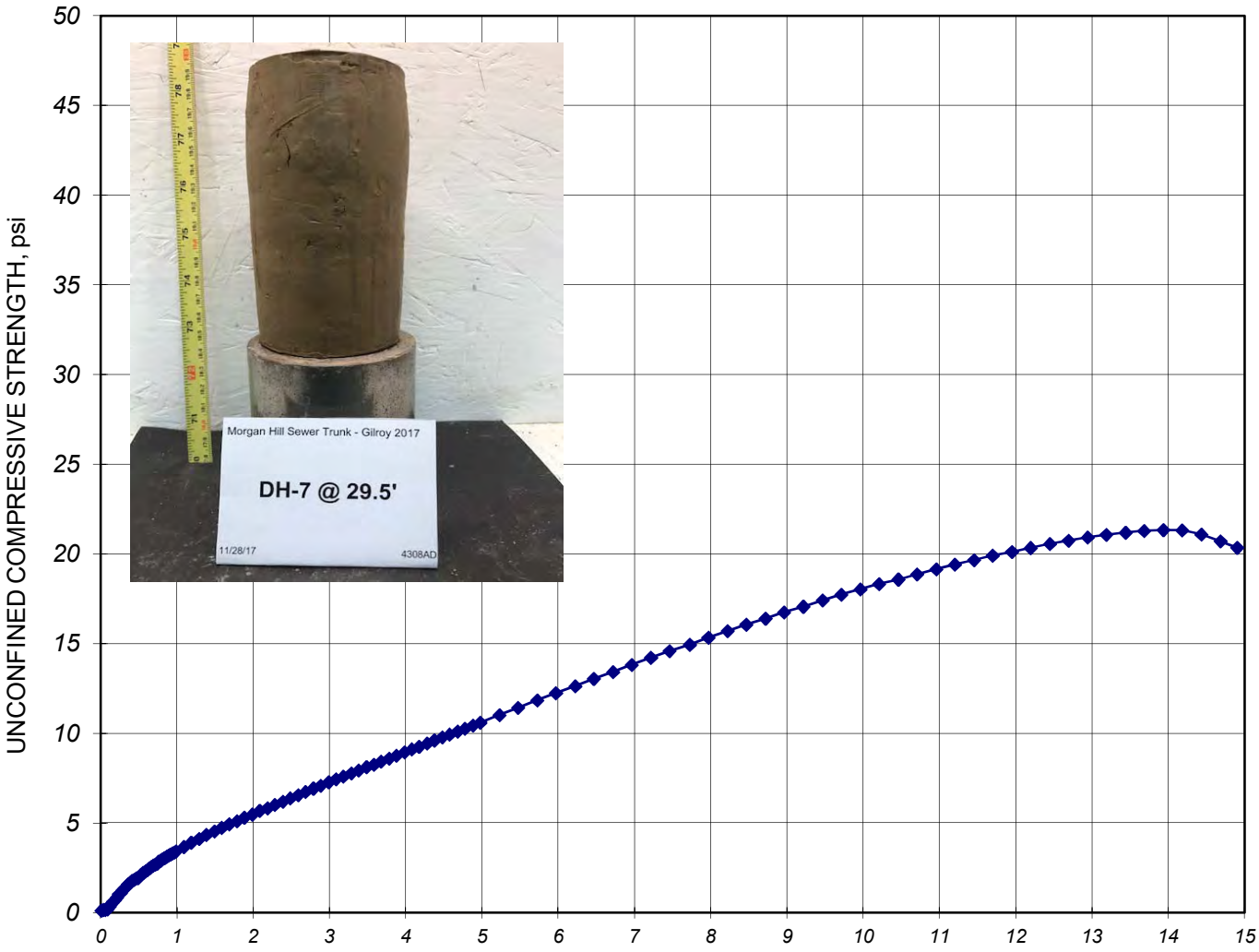
Geo-Logic ASSOCIATES

UNCONFINED COMPRESSIVE STRENGTH

ASTM D-2166

Client / Project Name:	Project No:	Lab Log:
Pacific Geotechnical Engineering	2016.0096.300	**4308AD**

Project Name:	Sample ID	Report Date:
Morgan Hill Sewer Trunk - Gilroy 2017	DH-7A @ 29.5'	November 28, 2017



Test No.	Initial Water Content %	Initial Dry Density pcf	Description	UNCONFINED COMPRESSIVE STRENGTH q_u, psi	UNCONFINED COMPRESSIVE STRENGTH shear, psi
1	14.5	110	Brown Clay	**21.3**	**10.7**

* Water content determined on total sample after test.

NOTE:

Sample Diameter = 2.4 in.
Sample Height = 5.4 in.
Height / Dia. Ratio = 2.3

Strain Rate: 0.050 in./ min.
Strain % : 1.00 % / min.
Test Date : November 28, 2017

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the samples supplied and tested for the above referenced job.

Geo-Logic ASSOCIATES

UNCONFINED COMPRESSIVE STRENGTH

ASTM D-2166

Client / Project Name: Paci□c Geotechnical Engineering

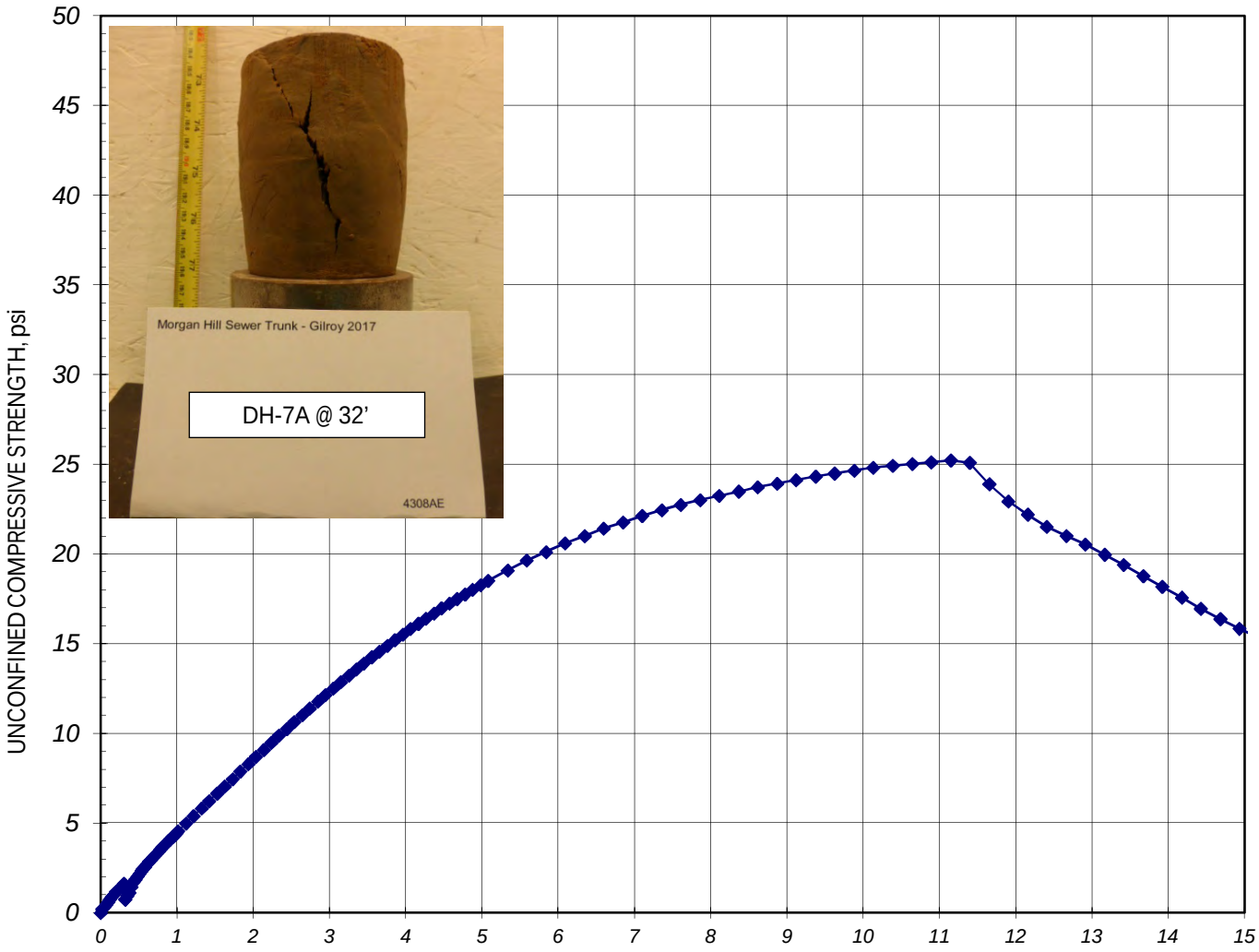
Project No: 2016.0096.300

Lab Log: **4308AE**

Project Name: Morgan Hill Sewer Trunk - Gilroy 2017

Sample ID: DH-7A @ 32'

Report Date: January 9, 2018



Test No.	Initial Water Content %	Initial Dry Density pcf	Description	UNCONFINED COMPRESSIVE STRENGTH q_u, psi	UNCONFINED COMPRESSIVE STRENGTH shear, psi
1	17.7	114	Light Brown Lean Clay w/ Sand (CL)	**25.2**	**12.6**

NOTE:

Sample Diameter = 2.4 in.

Sample Height = 4.1 in. Short sample-tube not full

Height / Dia. Ratio = 1.7

Strain Rate: 0.04 in./ min.

Strain % : 1.0 % / min.

Test Date : December 11, 2018

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the samples supplied and tested for the above referenced job.

Geo-Logic ASSOCIATES

UNCONFINED COMPRESSIVE STRENGTH

ASTM D-2166

Client / Project Name:	Project No:	Lab Log:
Paci□c Geotechnical Engineering	2016.0096.300	**4308AG**

Project Name:	Sample ID	Report Date:
Morgan Hill Sewer Trunk - Gilroy 2017	DH-7A @ 38'	January 9, 2018

Test No.	Initial Water Content %	Initial Dry Density pcf	Description	UNCONFINED COMPRESSIVE STRENGTH q_u, psi	shear, psi
1	21.8	106	Light Brown Lean Clay w/ Sand (CL)	**18.0**	**9.0**

NOTE:

Sample Diameter = 2.4 in.
Sample Height = 5.2 in.
Height / Dia. Ratio = 2.2

Strain Rate: 0.05 in./ min.
Strain % : 1.0 % / min.
Test Date : December 11, 2018

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the samples supplied and tested for the above referenced job.

Geo-Logic ASSOCIATES

UNCONFINED COMPRESSIVE STRENGTH

ASTM D-2166

Client / Project Name: Paci□c Geotechnical Engineering

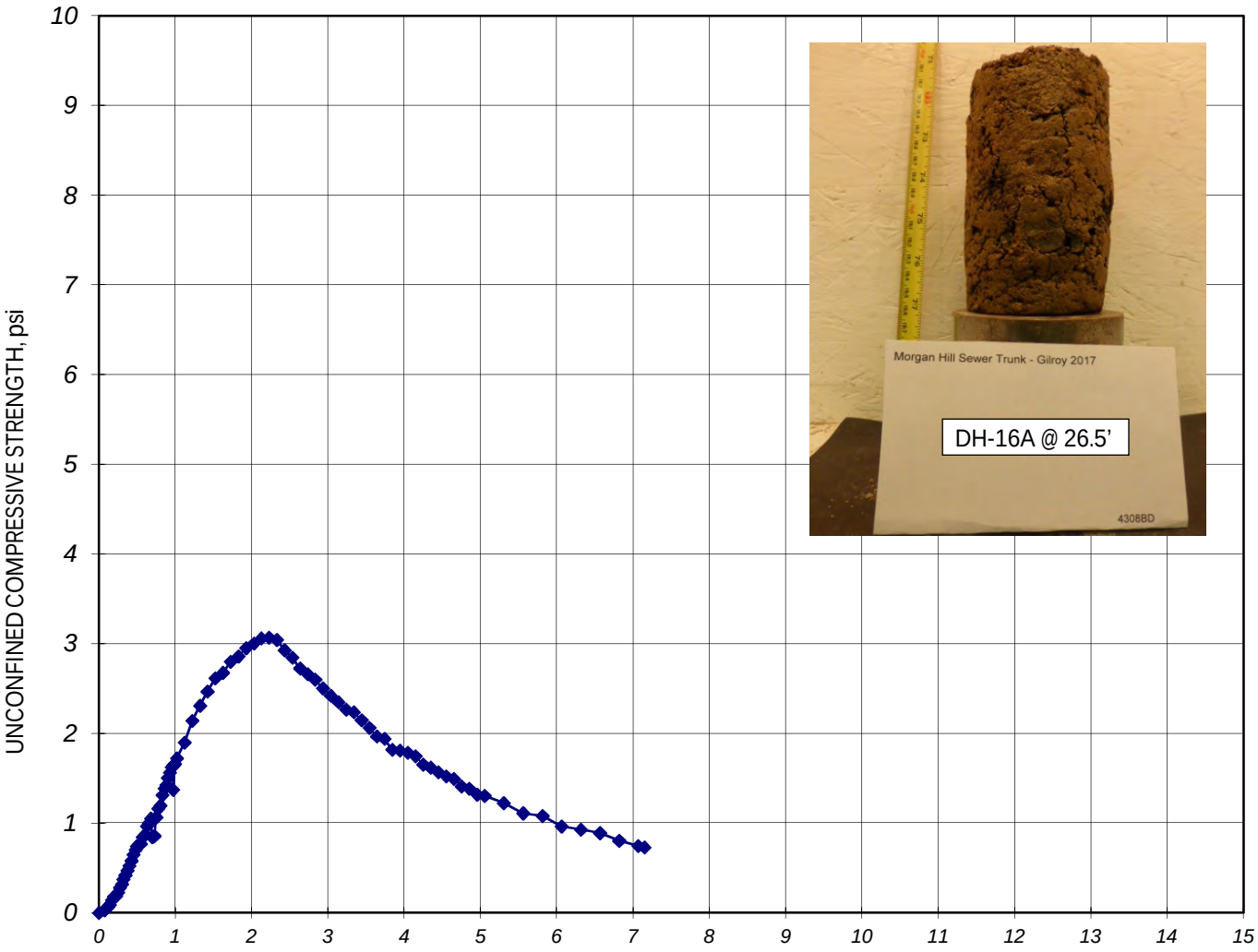
Project No: 2016.0096.300

Lab Log: **4308BD**

Project Name: Morgan Hill Sewer Trunk - Gilroy 2017

Sample ID: DH-16A @ 26.5'

Report Date: January 9, 2018



Test No.	Initial Water Content %	Initial Dry Density pcf	Description	UNCONFINED COMPRESSIVE STRENGTH q_u, psi	shear, psi
1	14.0	115	Well Graded Sand w/ Clay & Gravel (SW-SC)	**3.1**	**1.6**

NOTE:

Sample Diameter = 2.4 in.

Sample Height = 4.8 in.

Height / Dia. Ratio = 2.0

Strain Rate: 0.02 in./ min.

Strain % : 0.5 % / min.

Test Date : December 11, 2018

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the samples supplied and tested for the above referenced job.

Geo-Logic ASSOCIATES

UNCONFINED COMPRESSIVE STRENGTH

ASTM D-2166

Client / Project Name: Paci□c Geotechnical Engineering

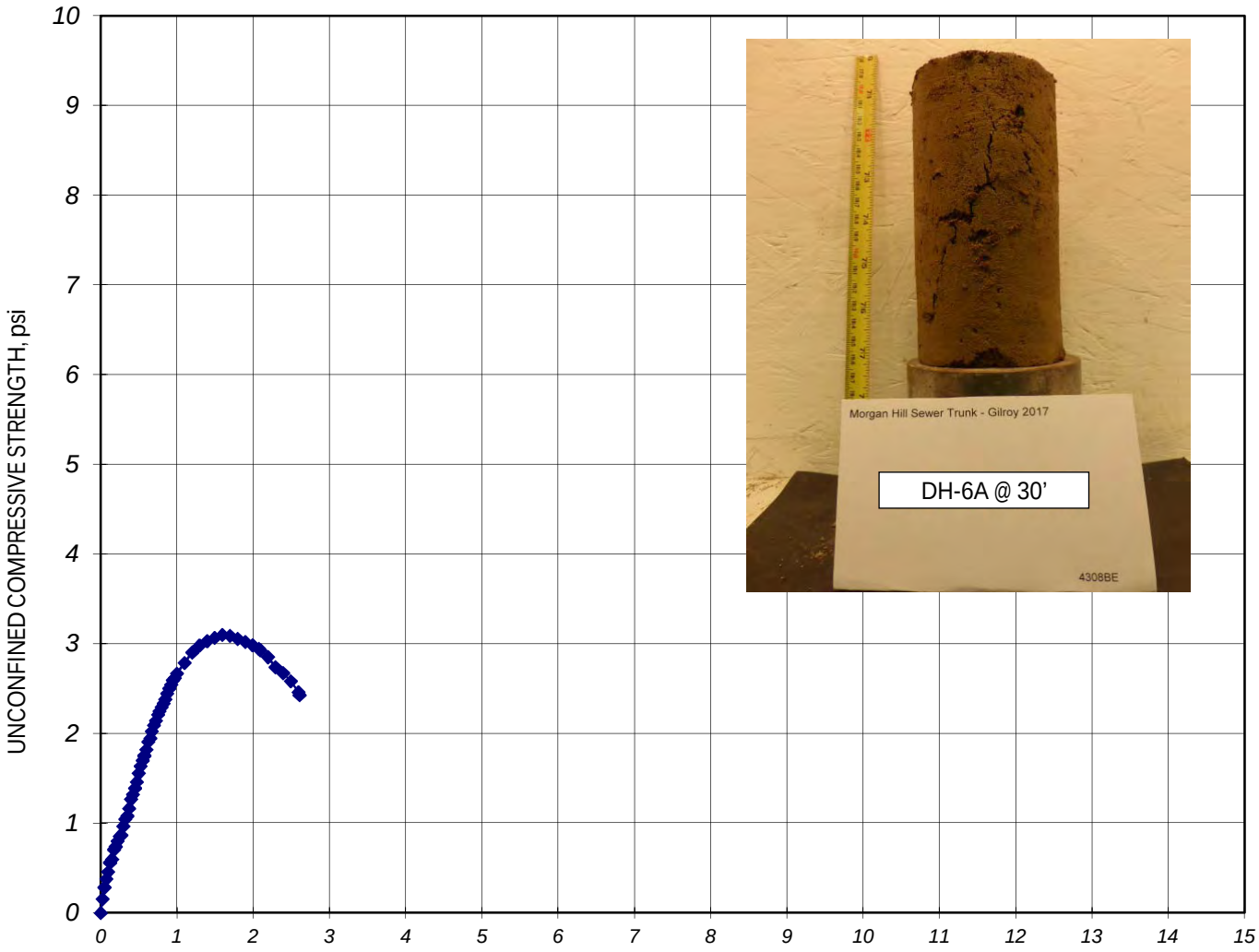
Project No: 2016.0096.300

Lab Log: **4308BE**

Project Name: Morgan Hill Sewer Trunk - Gilroy 2017

Sample ID: DH-16A @ 30'

Report Date: January 9, 2018



Test No.	Initial Water Content %	Initial Dry Density pcf	Description	UNCONFINED COMPRESSIVE STRENGTH q_u, psi	shear, psi
1	19.2	105	Brown Silty Sand (SM)	**3.1**	**1.6**

NOTE:

Sample Diameter = 2.4 in.

Sample Height = 5.1 in.

Height / Dia. Ratio = 2.1

Strain Rate: 0.03 in./ min.

Strain % : 0.5 % / min.

Test Date : December 12, 2018

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the samples supplied and tested for the above referenced job.

Geo-Logic ASSOCIATES

UNCONFINED COMPRESSIVE STRENGTH

ASTM D-2166

Client / Project Name: Paci□c Geotechnical Engineering

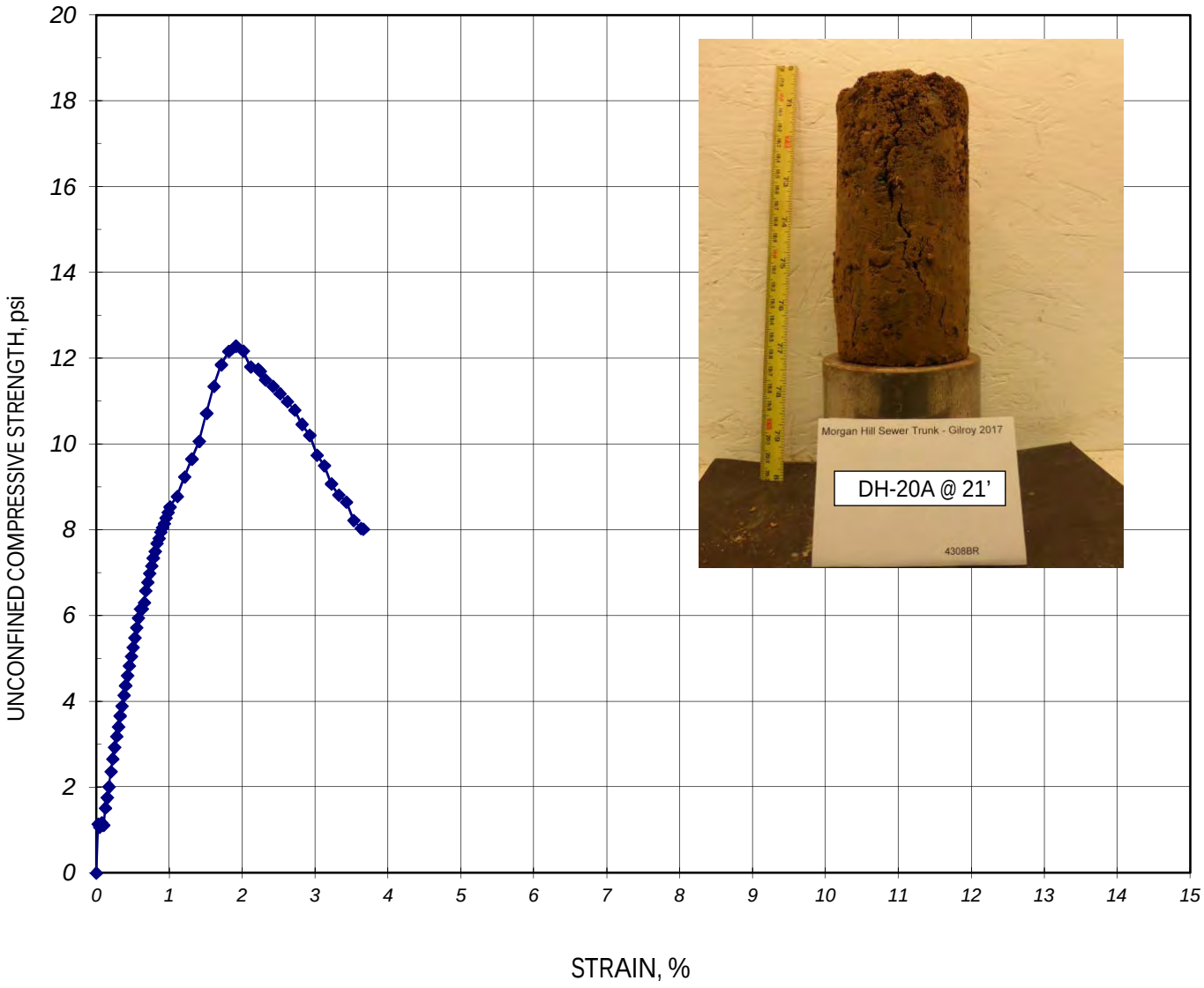
Project No: 2016.0096.300

Lab Log: **4308BR**

Project Name: Morgan Hill Sewer Trunk - Gilroy 2017

Sample ID: DH-20A @ 21'

Report Date: January 9, 2018



Test No.	Initial Water Content %	Initial Dry Density pcf	Description	UNCONFINED COMPRESSIVE STRENGTH q_u, psi	UNCONFINED COMPRESSIVE STRENGTH shear, psi
1	10.5	127	Light Brown Clayey Gravel w/ Sand (GC)	**12.3**	**6.2**

NOTE:

Sample Diameter = 2.4 in.

Sample Height = 5.4 in.

Height / Dia. Ratio = 2.2

Strain Rate: 0.03 in./ min.

Strain % : 0.5 % / min.

Test Date : December 12, 2018

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the samples supplied and tested for the above referenced job.

Geo-Logic ASSOCIATES

UNCONFINED COMPRESSIVE STRENGTH

ASTM D-2166

Client / Project Name: Paci□c Geotechnical Engineering

Project No: 2016.0096.300

Lab Log: **4308BS**

Project Name: Morgan Hill Sewer Trunk - Gilroy 2017

Sample ID: DH-20A @ 24'

Report Date: January 9, 2018

Test No.	Initial Water Content %	Initial Dry Density pcf	Description	UNCONFINED COMPRESSIVE STRENGTH q_u, psi	UNCONFINED COMPRESSIVE STRENGTH shear, psi
1	10.9	121	Poorly Graded Sand w/ Clay & Gravel (SP-SC)	**6.5**	**3.3**

NOTE:

Sample Diameter = 2.4 in.

Sample Height = 5.8 in.

Height / Dia. Ratio = 2.4

Strain Rate: 0.03 in./ min.

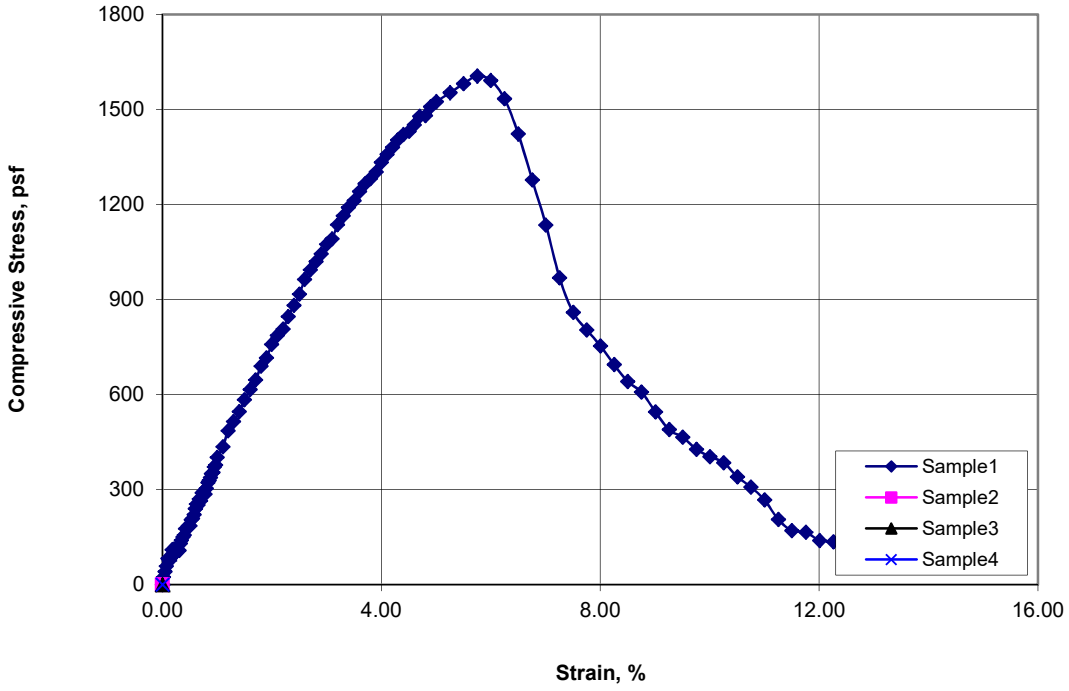
Strain % : 0.5 % / min.

Test Date : December 12, 2018

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the samples supplied and tested for the above referenced job.

Unconfined Compressive Strength

ASTM D2166



Sample No.:	1	2	3	4	
Unconfined Compressive Strength, psf	1606				
Unconfined Compressive Strength, psi	11.2				
Undrained Shear Strength, psf	803				
Failure Strain, %	5.8				
Strain Rate, % per minute	1.0				
Strain Rate, inches/minute	0.05				
Moisture Content, %	20.1				
Dry Density, pcf	110.1				
Saturation, %	98.6				
Void Ratio	0.559				
Specimen Diameter, inches	2.420				
Specimen Height, inches	5.01				
Height to Diameter Ratio	2.1				
Assumed Specific Gravity	2.75				

Sample Location				
	Boring	Sample	Depth, ft.	Soil Description
1	DH-21A		27	Yellowish Brown Clayey SAND
2				
3				
4				

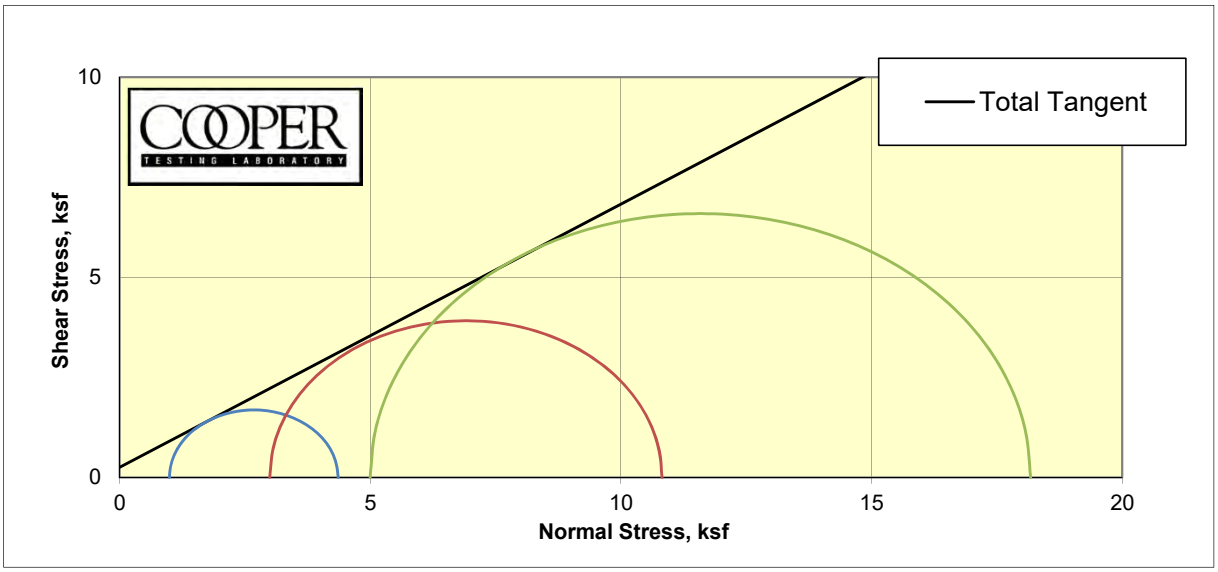
Job No.:	516-041	Type of Sample	Undisturbed
Client:	Geo-Logic Associates		
Project:	2016.0096		
Date:	8/9/2018 By: MD/RU		

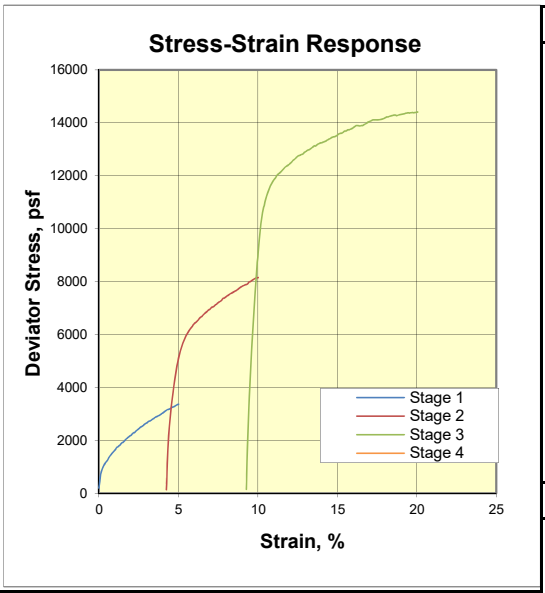
Remarks:

COOPER TESTING LABORATORY

Figure B-33

Staged Consolidated Undrained Triaxial Compression
ASTM D4767m





CTL Number:	516-041
Client Name:	Geo-Logic Associates
Project Name:	MH Sewer Trunk
Project Number:	2016.0096
Date:	8/17/2018 By: MD/DC
Total C	0.250 ksf
Total phi	33.3 degrees
Eff. C	N/A ksf
Eff. Phi	N/A degrees ©

Stage	1	2	3	4
Boring	DH-21A			
Sample				
Depth	23.5			
Visual Description	Ollve Brown Clayey SAND w/ Gravel			
MC (%)	13.3			
Dry Density (pcf)	124.3			
Saturation (%)	96.2			
Void Ratio	0.381			
Diameter (in)	2.39			
Height (in)	4.97			
	Final			
MC (%)	13.8	13.0	12.4	
Dry Density (pcf)	124.6	126.4	128.0	
Saturation (%)	100.0	100.0	100.0	
Void Ratio	0.378	0.359	0.341	
Diameter (in)	2.38	2.42	2.47	
Height (in)	4.98	4.77	4.52	
Cell Pressure (psi)	55.4	69.3	83.2	
Back Pressure (psi)	48.5	48.5	48.5	
	Total Stresses At:			
Strain (%)	5.0	5.0	5.0	
Deviator (ksf)	3.365	7.827	13.177	
Excess PP (psi)				
Sigma 1 (ksf)	4.359	10.823	18.174	
Sigma 3 (ksf)	0.994	2.995	4.997	
P (ksf)	2.676	6.909	11.585	
Q (ksf)	1.683	3.914	6.588	
Stress Ratio	4.387	3.613	3.637	
Rate (in/min)	0.0247	0.0243	0.0242	

Figure B-34

DIRECT SHEAR REPORT

Consolidated - Drained Test

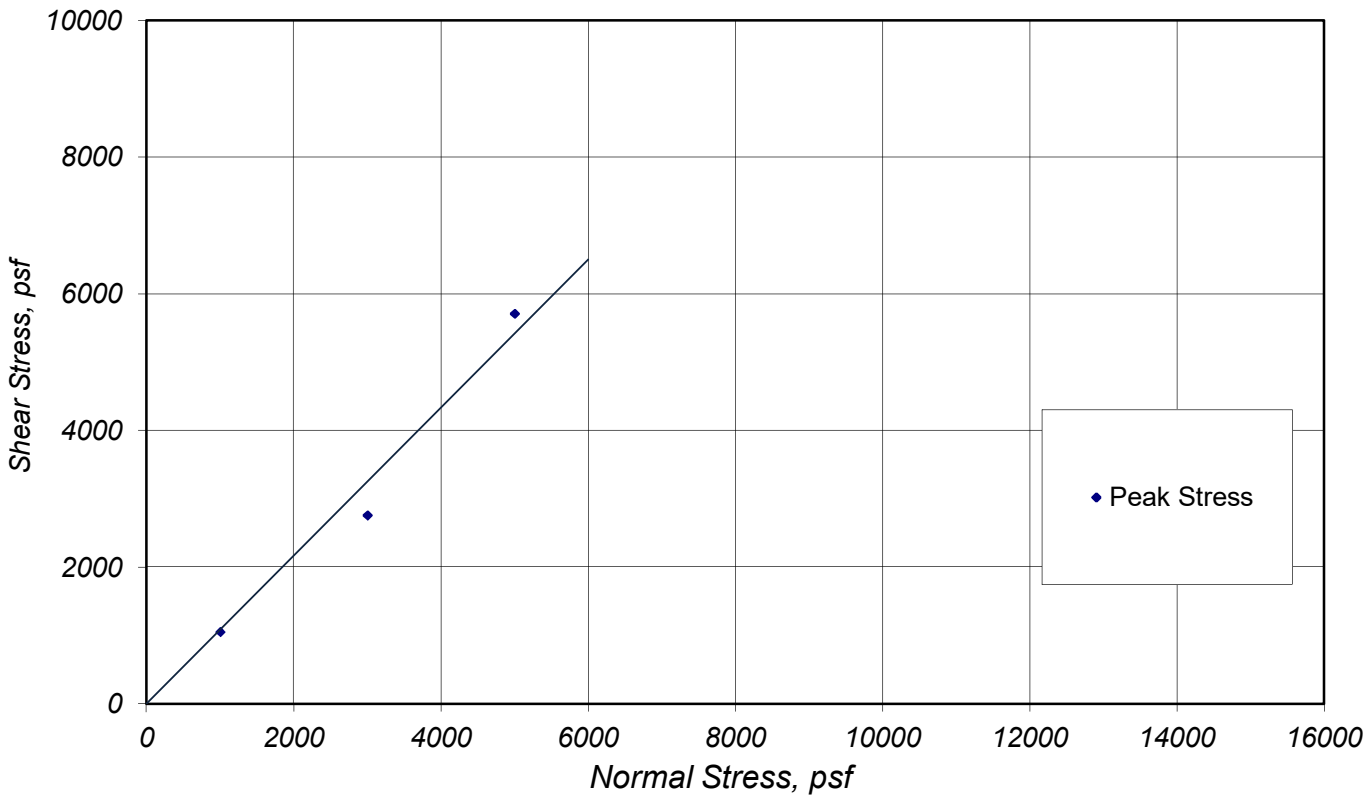
ASTM D- 3080

Geo-Logic ASSOCIATES

Client / Project Name:	Project No. :	Lab Log:
Pacific Geotechnical Engineering / Morgan Hill Sewer Trunk - Gilroy 2017	2016.0096.300	4308D

Sample :	Soil Description:	Report Date:
DH-2A @ 18.5-19.0	Yellowish Brown Clayey Sand (SC)	December 19, 2017

STRENGTH ENVELOPE



		Peak
Coefficient of Friction	:	1.083
Friction Angle	:	47.3
Cohesion, psf:	:	0

Note: Intercept changed to "0"

Point No.	Normal Stress psf	Shear Stress Peak psf		Initial Water Content %	Initial Dry Density pcf	Final Water Content %	Final Dry Density pcf
1	1000	1054		18.2	109.0	20.2	110.0
2	3000	2760		15.6	110.1	19.7	112.9
3	5000	5712		12.5	114.0	17.5	118.0

Horizontal Displacement Rate, in. / min. : 0.005 *Sample Diameter, in.:* 2.40

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the samples supplied and tested for the above referenced job.

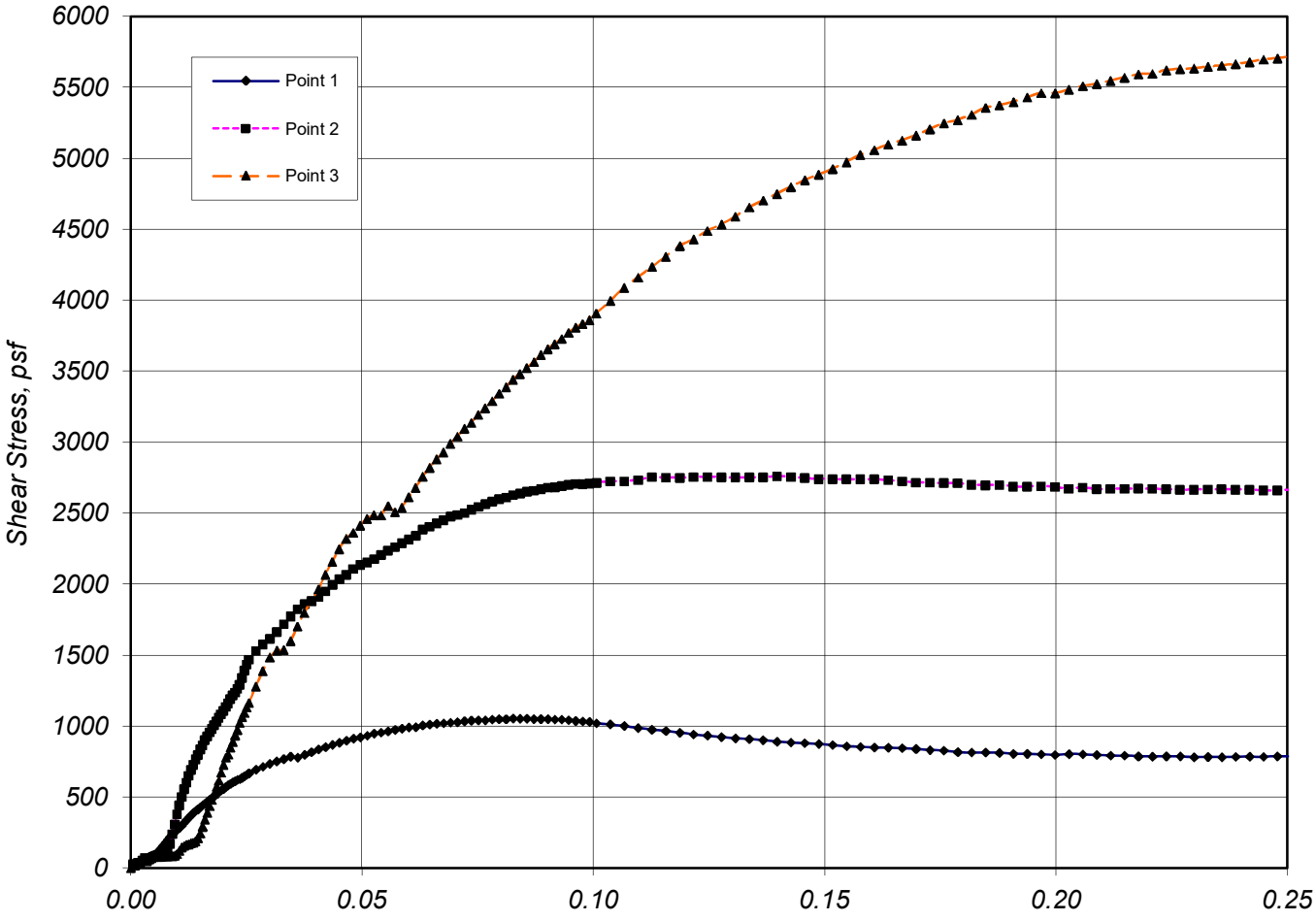
Geo-Logic ASSOCIATES

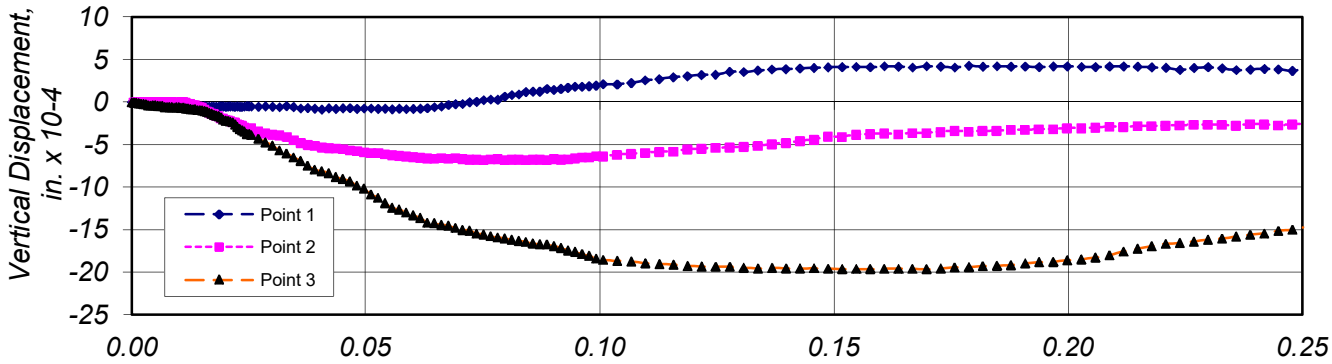
DIRECT SHEAR REPORT

ASTM D- 3080

Client / Project Name:	Project No. :	Lab Log:
Pacific Geotechnical Engineering / Morgan Hill Sewer Trunk - Gilroy 2017	2016.0096.300	4308D

Sample :	Soil Description:	Report Date:
DH-2A @ 18.5-19.0	Yellowish Brown Clayey Sand (SC)	December 19, 2017





NORMAL STRESSES, psf :	Point - 1	1000	Point - 2	3000	Point - 3	5000

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the samples supplied and tested for the above referenced job.

DIRECT SHEAR REPORT

Consolidated - Drained Test

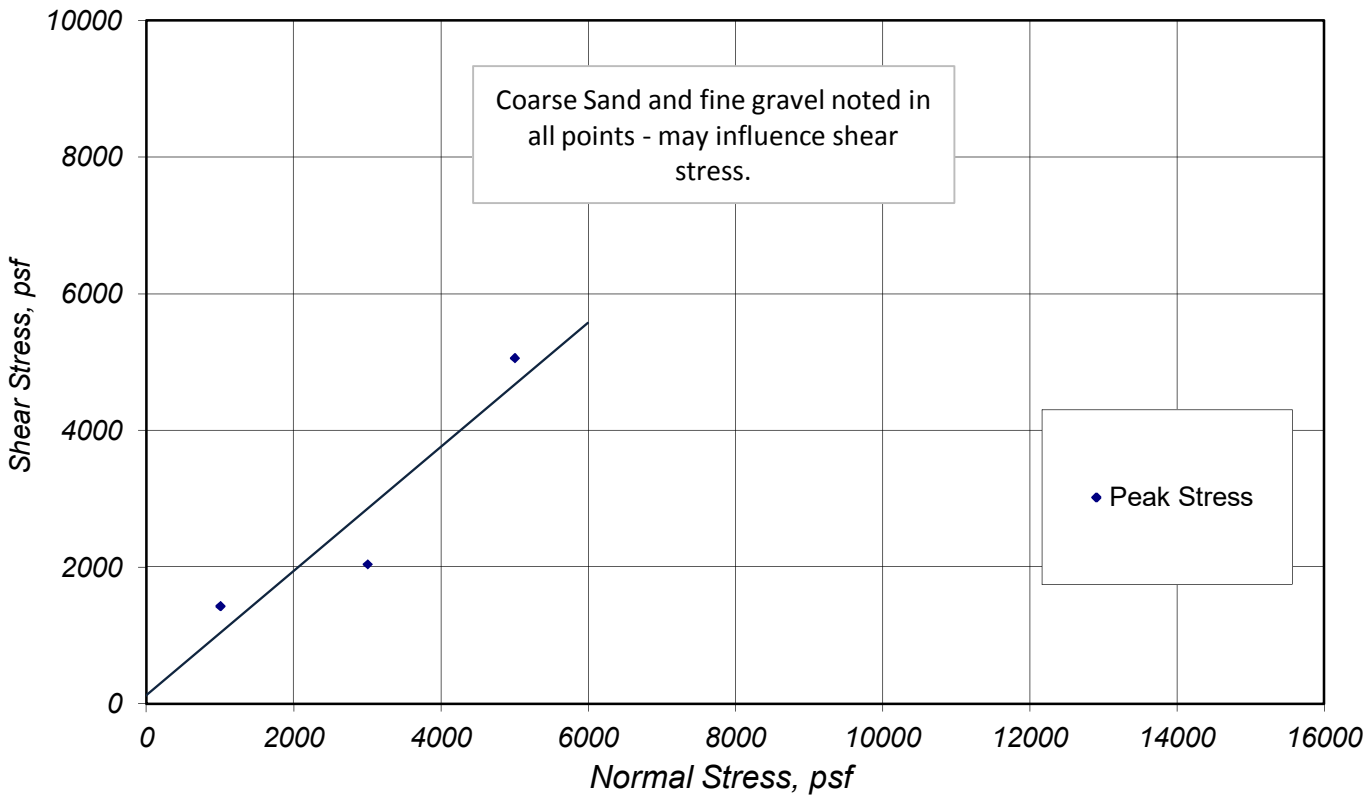
ASTM D- 3080

Geo-Logic ASSOCIATES

Client / Project Name:	Project No. :	Lab Log:
Pacific Geotechnical Engineering / Morgan Hill Sewer Trunk - Gilroy 2017	2016.0096.300	4308L

Sample :	Soil Description:	Report Date:
DH-3A @ 19.0-19.5'	Brown Clayey Sand w/ Gravel	January 2, 2018

STRENGTH ENVELOPE



		Peak
Coefficient of Friction	:	0.908
Friction Angle	:	42.2
Cohesion, psf:	:	120.0

Point No.	Normal Stress psf	Shear Stress Peak psf		Initial Water Content %	Initial Dry Density pcf	Final Water Content %	Final Dry Density pcf
1	1000	1431		15.2	116.7	19.9	117.8
2	3000	2045		18.7	110.9	21.2	113.3
3	5000	5064		15.1	109.6	17.9	116.9

Horizontal Displacement Rate, in. / min. : 0.005 *Sample Diameter, in.:* 2.43

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the samples supplied and tested for the above referenced job.

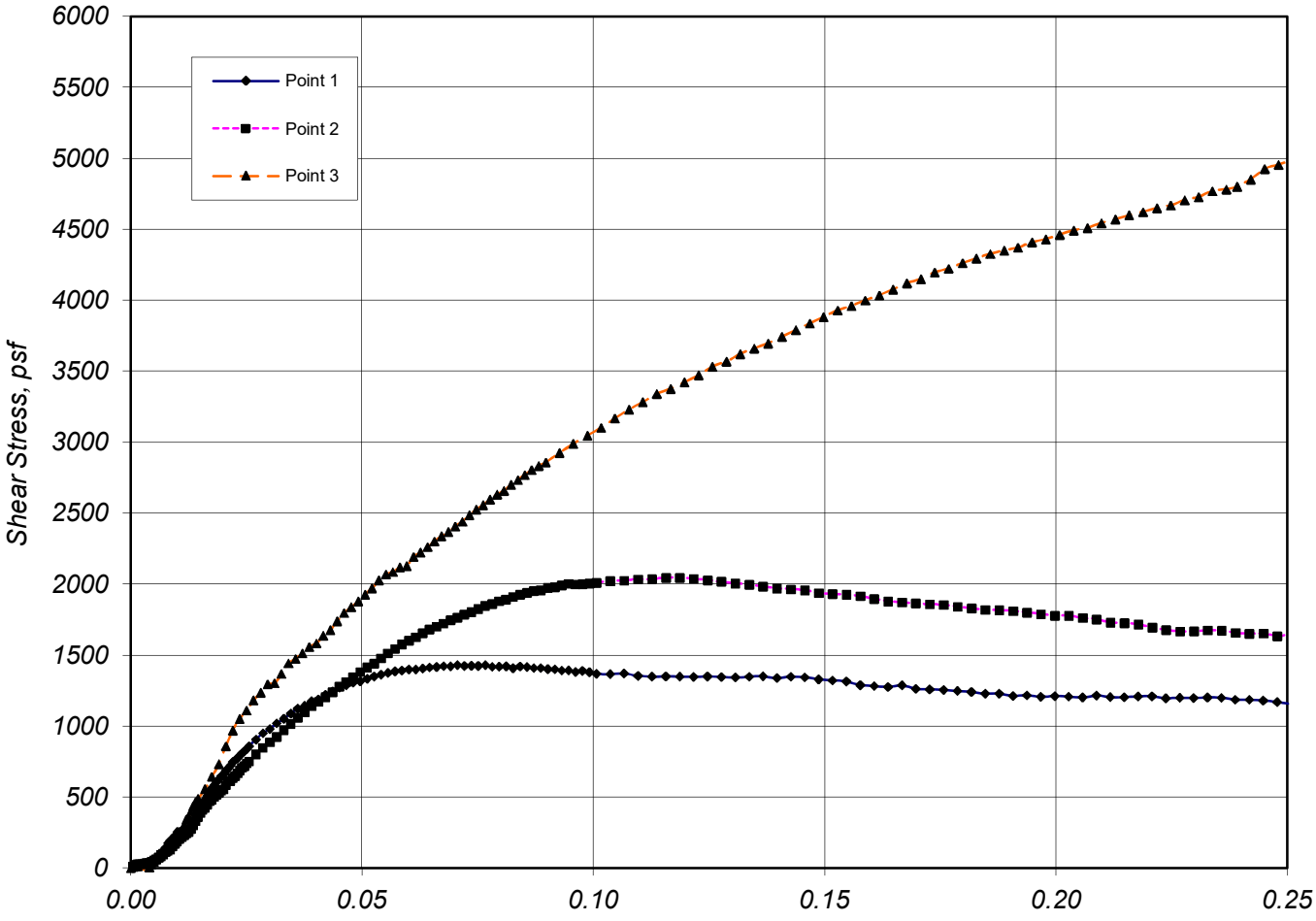
Geo-Logic ASSOCIATES

DIRECT SHEAR REPORT

ASTM D- 3080

Client / Project Name:	Project No. :	Lab Log:
Pacific Geotechnical Engineering / Morgan Hill Sewer Trunk - Gilroy 2017	2016.0096.300	4308L

Sample :	Soil Description:	Report Date:
DH-3A @ 19.0-19.5'	Brown Clayey Sand w/ Gravel	January 2, 2018



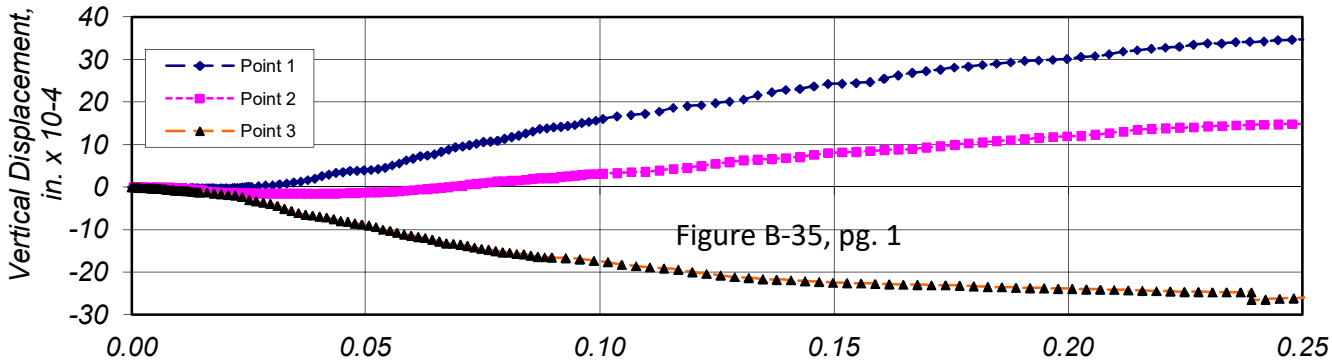


Figure B-35, pg. 1

NORMAL STRESSES, psf :	Point - 1	1000	Point - 2	3000	Point - 3	5000

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the samples supplied and tested for the above referenced job.

DIRECT SHEAR REPORT

Consolidated - Drained Test

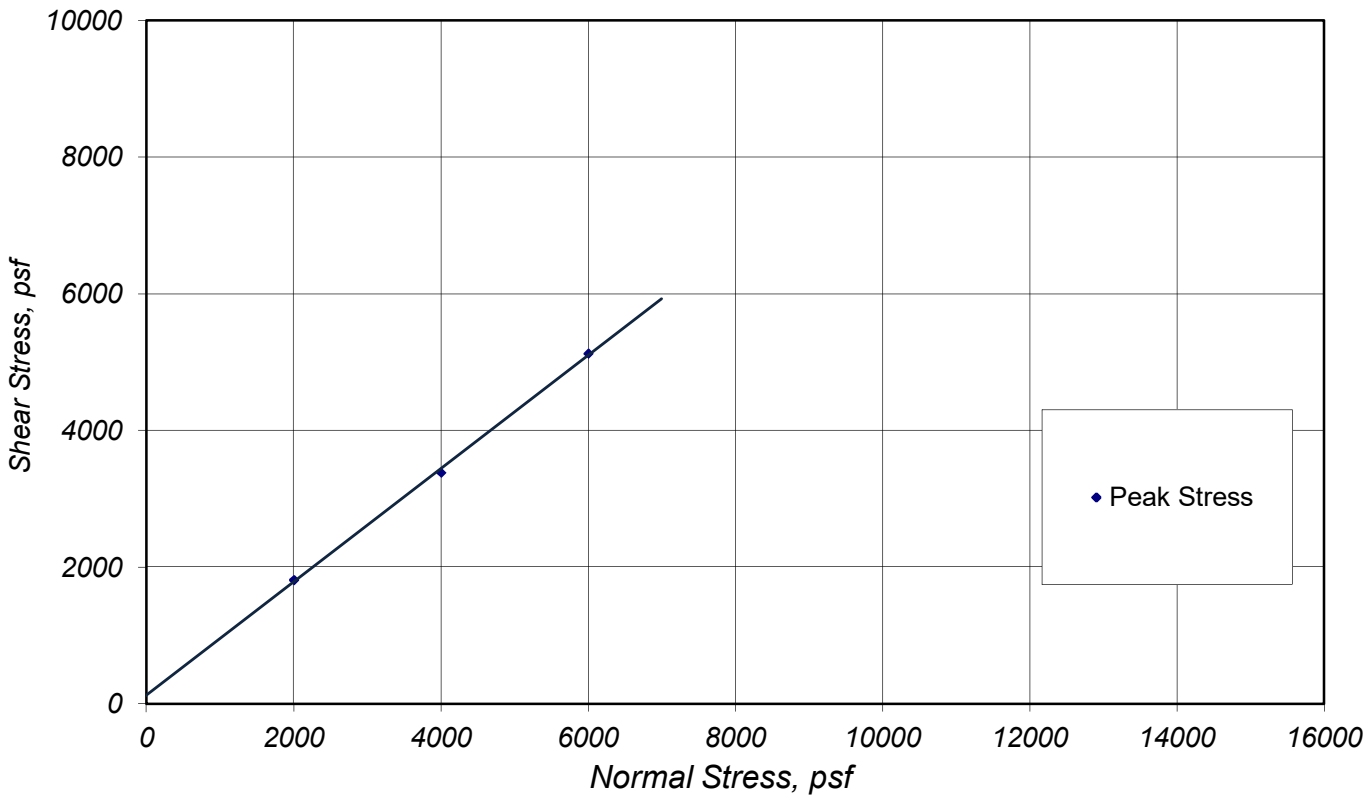
ASTM D- 3080

Geo-Logic ASSOCIATES

Client / Project Name:	Project No. :	Lab Log:
Pacific Geotechnical Engineering / Morgan Hill Sewer Trunk - Gilroy 2017	2016.0096.300	4308S

Sample :	Soil Description:	Report Date:
DH-6A @ 31.5-32'	Brown Silty Clayey Sand	January 2, 2018

STRENGTH ENVELOPE



		Peak
Coefficient of Friction	:	0.829
Friction Angle	:	39.6
Cohesion, psf:	:	130.0

Point No.	Normal Stress psf	Shear Stress Peak psf		Initial Water Content %	Initial Dry Density pcf	Final Water Content %	Final Dry Density pcf
1	2000	1814		21.8	109.5	22.1	113.6
2	4000	3384		20.8	107.9	19.8	115.1
3	6000	5128		16.1	110.7	17.8	117.2

Horizontal Displacement Rate, in. / min. : 0.005 *Sample Diameter, in.:* 2.43

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the samples supplied and tested for the above referenced job.

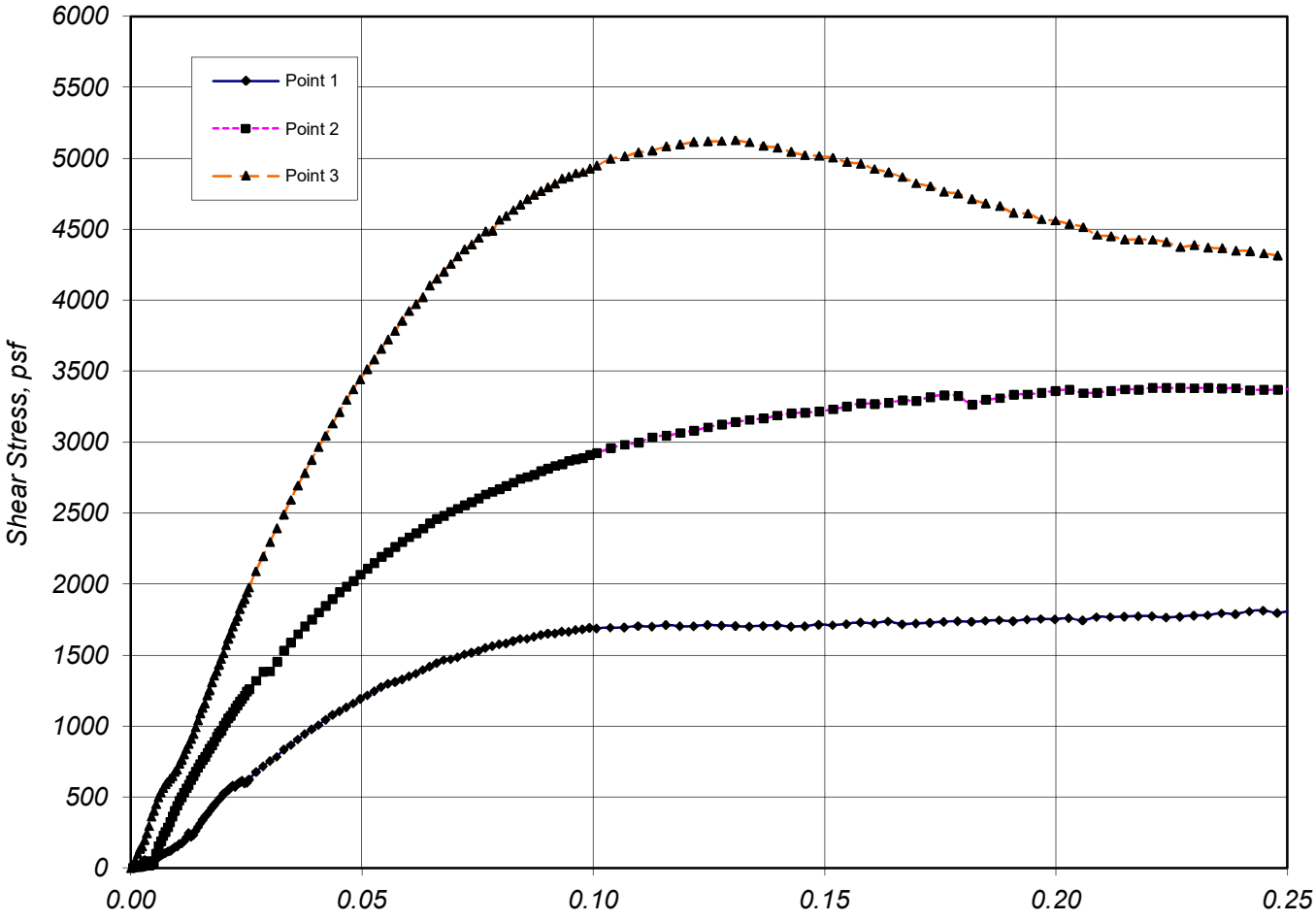
Geo-Logic ASSOCIATES

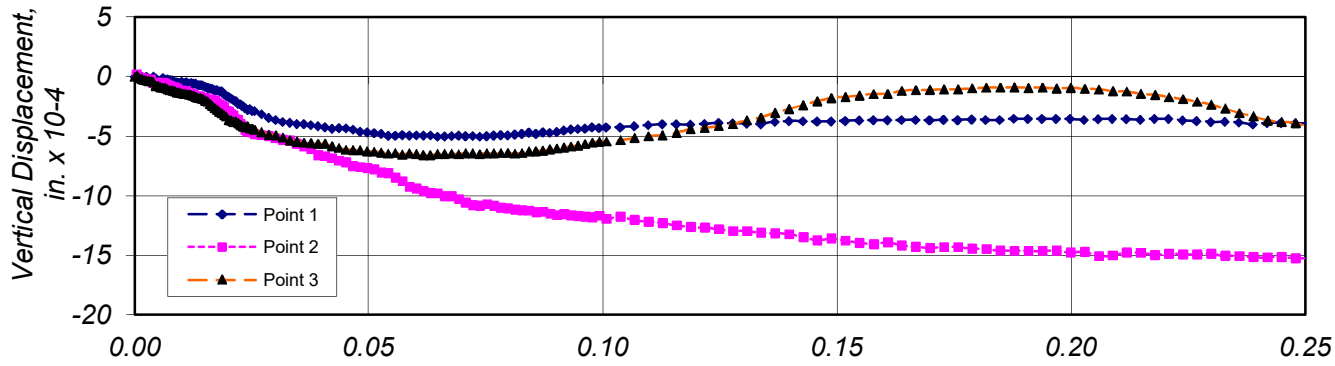
DIRECT SHEAR REPORT

ASTM D- 3080

Client / Project Name:	Project No. :	Lab Log:
Pacific Geotechnical Engineering / Morgan Hill Sewer Trunk - Gilroy 2017	2016.0096.300	4308S

Sample :	Soil Description:	Report Date:
DH-6A @ 31.5-32'	Brown Silty Clayey Sand	January 2, 2018





NORMAL STRESSES, psf :	Point - 1	2000	Point - 2	4000	Point - 3	6000

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the samples supplied and tested for the above referenced job.

DIRECT SHEAR REPORT

Consolidated - Drained Test

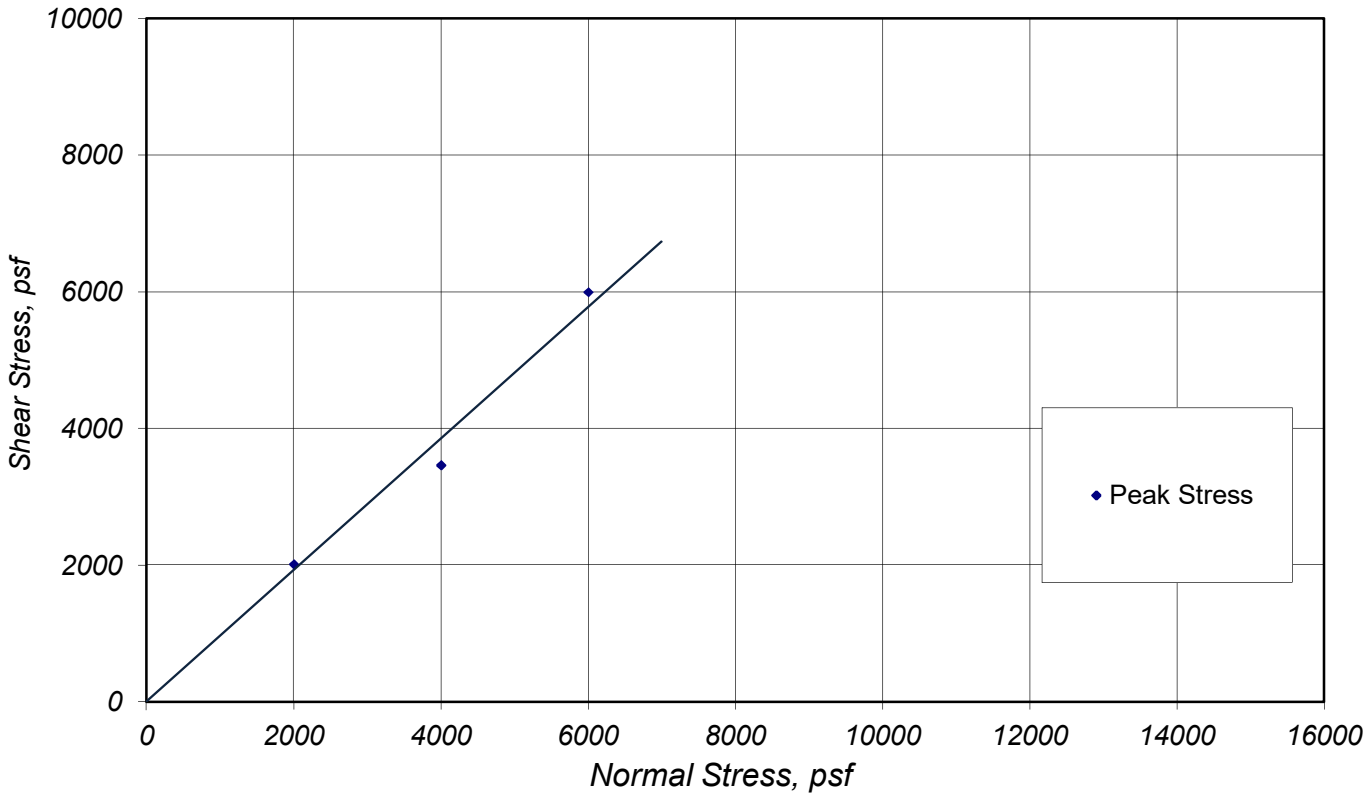
ASTM D- 3080

Geo-Logic ASSOCIATES

Client / Project Name:	Project No. :	Lab Log:
Pacific Geotechnical Engineering / Morgan Hill Sewer Trunk - Gilroy 2017	2016.0096.300	4308AX

Sample :	Soil Description:	Report Date:
DH-11A @ 31.0'	Light Brown Silty Sand w/ Gravel (SM)	January 2, 2018

STRENGTH ENVELOPE



		Peak
Coefficient of Friction	:	0.962
Friction Angle	:	43.9
Cohesion, psf:	:	0.0

Note: Intercept changed to "0"

Point No.	Normal Stress psf	Shear Stress Peak psf		Initial Water Content %	Initial Dry Density pcf	Final Water Content %	Final Dry Density pcf
1	2000	2013		15.1	114.4	17.0	117.2
2	4000	3464		14.7	118.4	17.4	122.6
3	6000	5997		12.8	120.3	16.2	128.9

Horizontal Displacement Rate, in. / min. : 0.005 *Sample Diameter, in.:* 2.40

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the samples supplied and tested for the above referenced job.

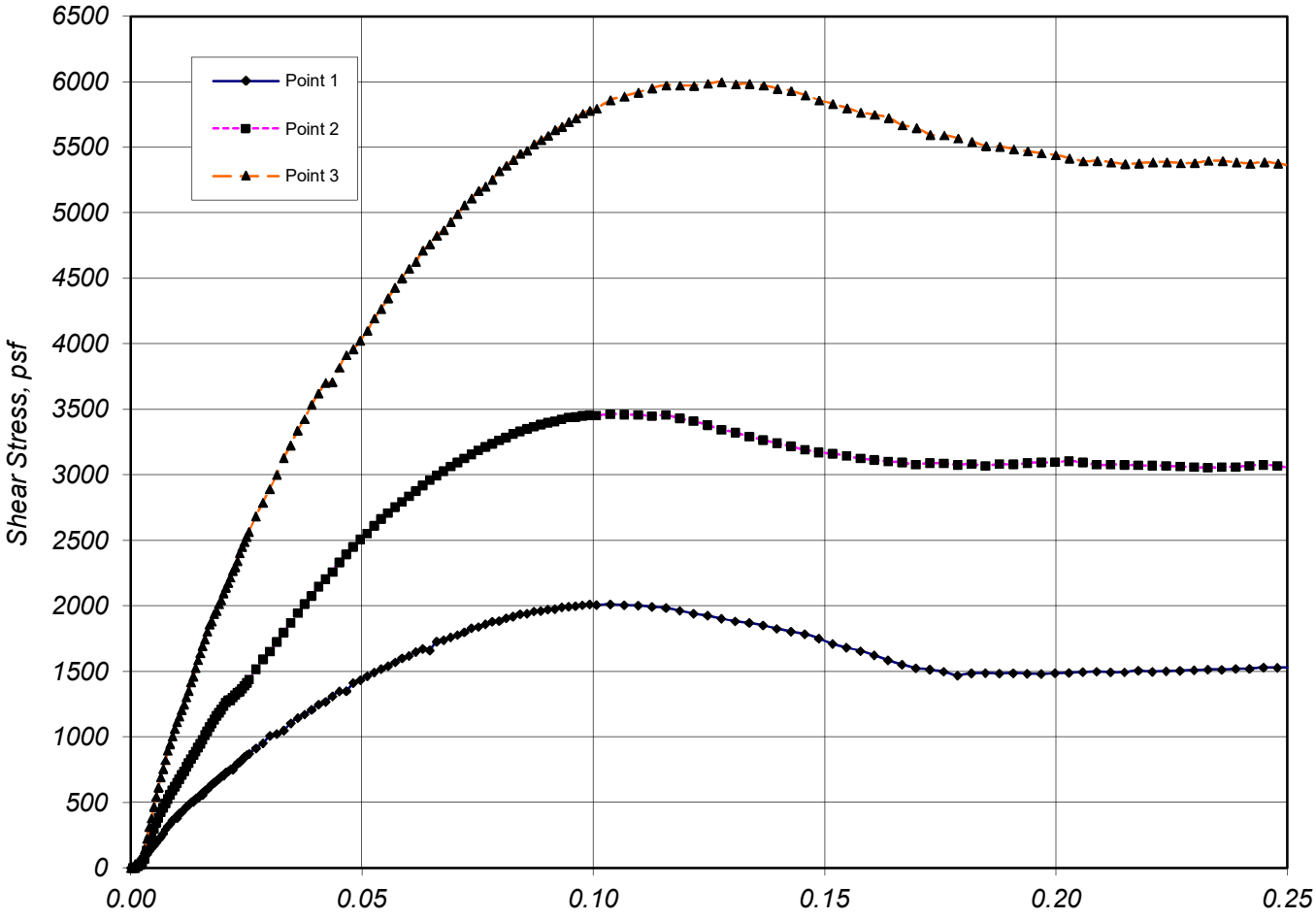
Geo-Logic ASSOCIATES

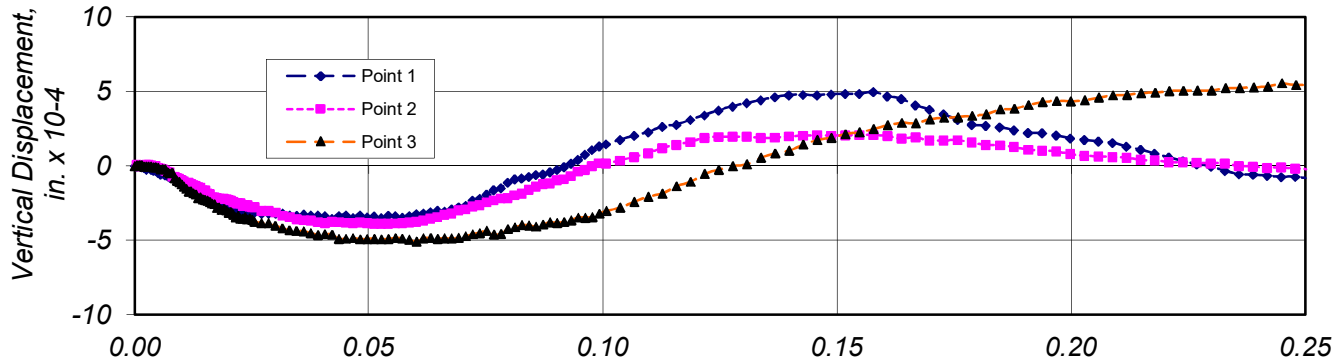
DIRECT SHEAR REPORT

ASTM D- 3080

Client / Project Name:	Project No. :	Lab Log:
Pacific Geotechnical Engineering / Morgan Hill Sewer Trunk - Gilroy 2017	2016.0096.300	4308AX

Sample :	Soil Description:	Report Date:
DH-11A @ 31.0'	Light Brown Silty Sand w/ Gravel (SM)	January 2, 2018





NORMAL STRESSES, psf :	Point - 1	2000	Point - 2	4000	Point - 3	6000

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the samples supplied and tested for the above referenced job.

DIRECT SHEAR REPORT

Consolidated - Drained Test

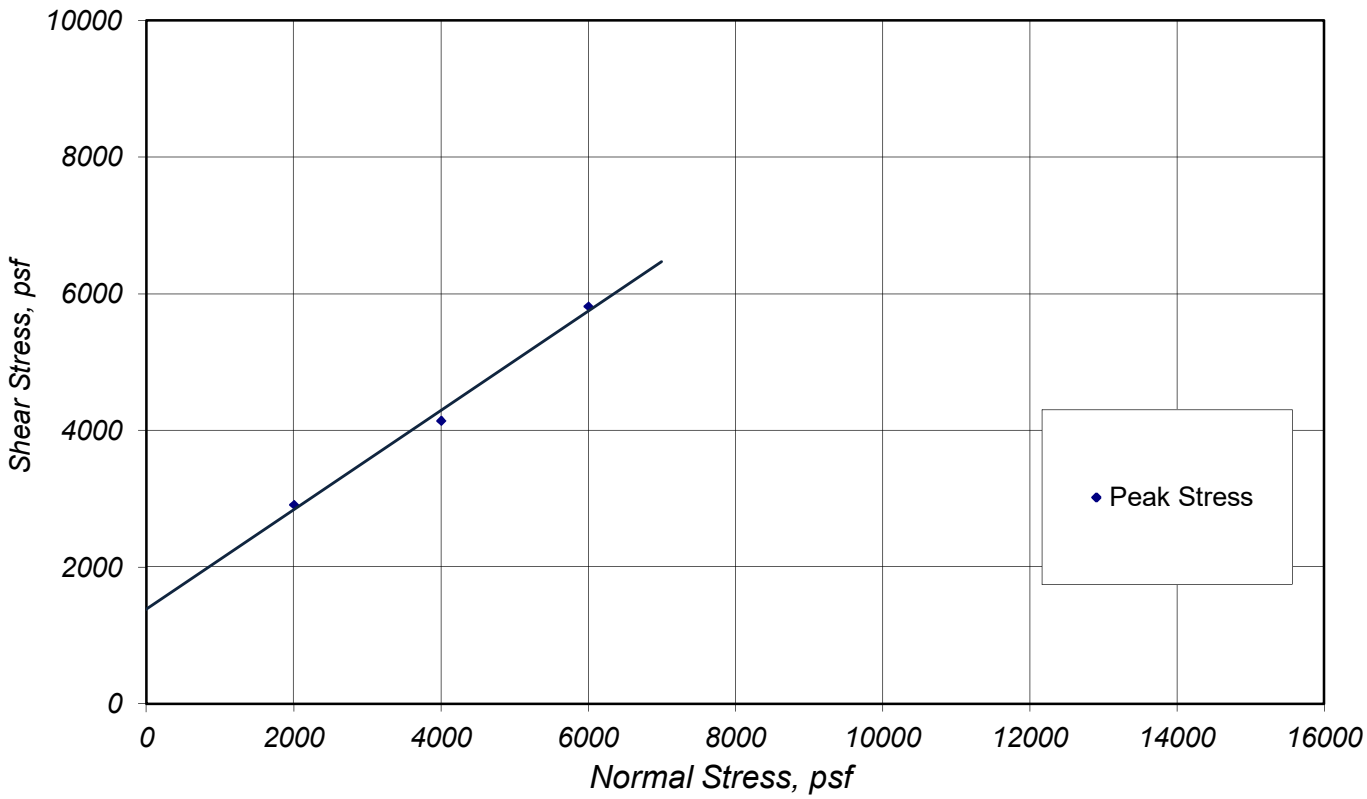
ASTM D- 3080

Geo-Logic ASSOCIATES

Client / Project Name:	Project No. :	Lab Log:
Pacific Geotechnical Engineering / Morgan Hill Sewer Trunk - Gilroy 2017	2016.0096.300	4308BC

Sample :	Soil Description:	Report Date:
DH-16A @ 24'	Brown Clayey Sand	January 2, 2018

STRENGTH ENVELOPE



		Peak
Coefficient of Friction	:	0.726
Friction Angle	:	36.0
Cohesion, psf:	:	1390

Point No.	Normal Stress psf	Shear Stress Peak psf		Initial Water Content %	Initial Dry Density pcf	Final Water Content %	Final Dry Density pcf
1	2000	2914		12.9	123.3	16.0	125.7
2	4000	4145		16.1	114.6	19.1	119.1
3	6000	5820		16.4	115.3	18.2	121.3

Horizontal Displacement Rate, in. / min. : 0.005 *Sample Diameter, in.:* 2.43

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the samples supplied and tested for the above referenced job.

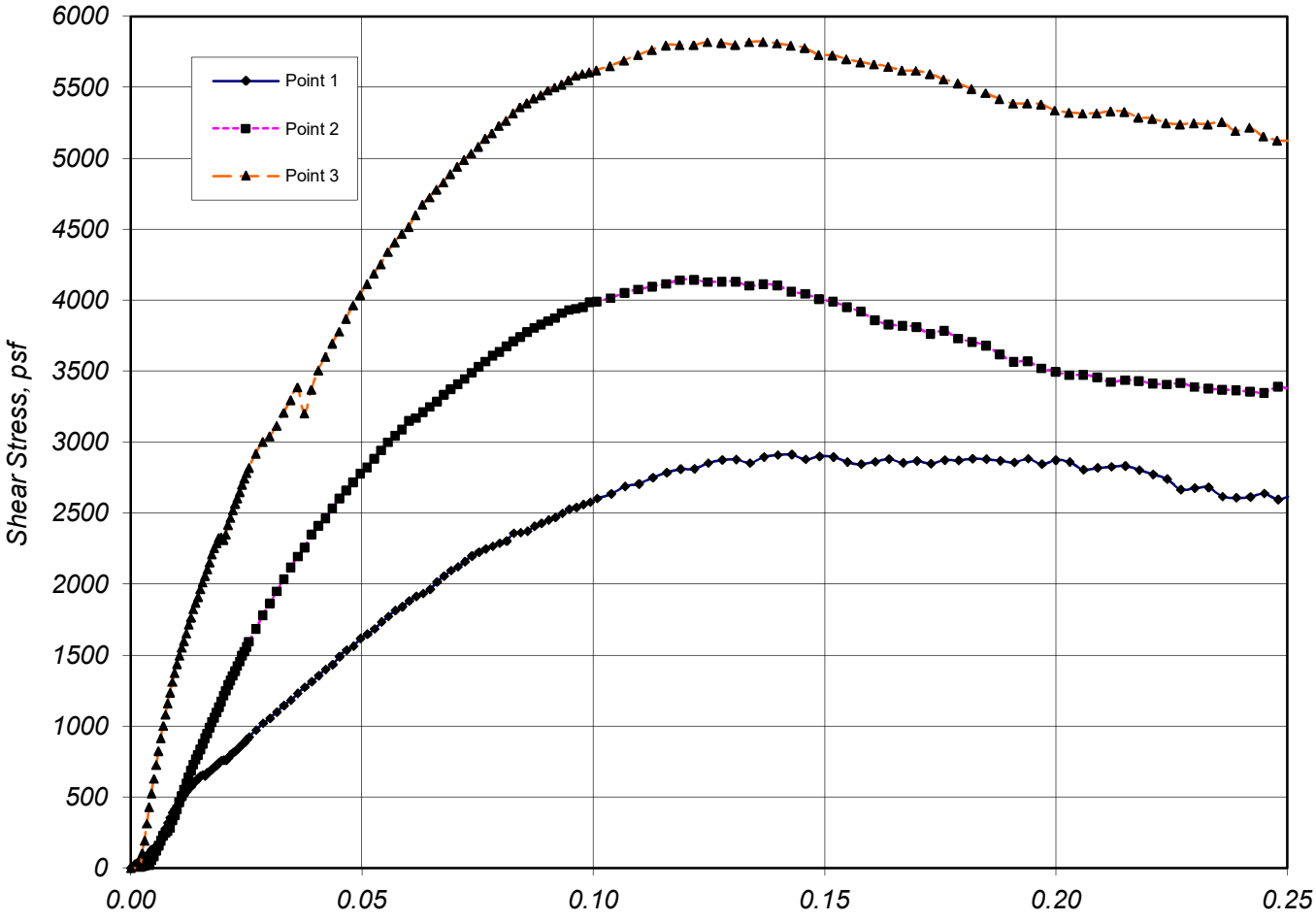
Geo-Logic ASSOCIATES

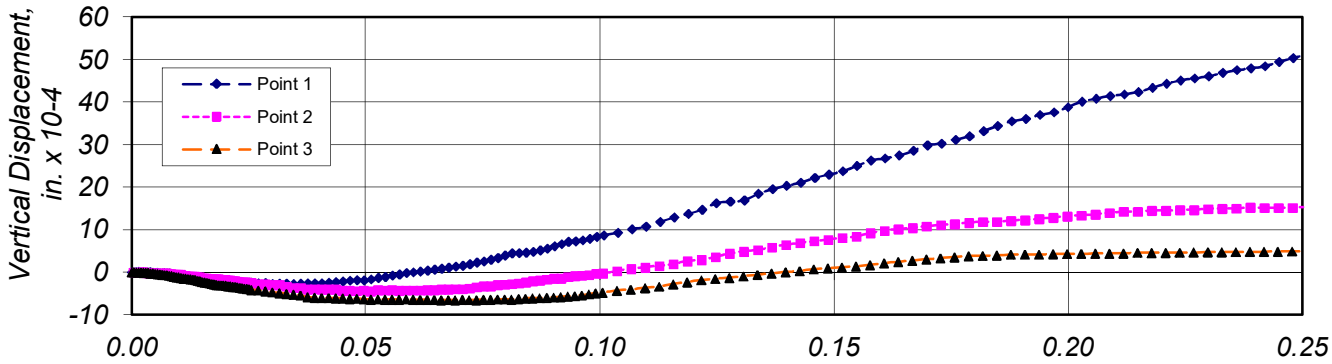
DIRECT SHEAR REPORT

ASTM D- 3080

Client / Project Name:	Project No. :	Lab Log:
Pacific Geotechnical Engineering / Morgan Hill Sewer Trunk - Gilroy 2017	2016.0096.300	4308BC

Sample :	Soil Description:	Report Date:
DH-16A @ 24'	Brown Clayey Sand	January 2, 2018





NORMAL STRESSES, psf :	Point - 1	2000	Point - 2	4000	Point - 3	6000

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the samples supplied and tested for the above referenced job.

DIRECT SHEAR REPORT

Consolidated - Drained Test

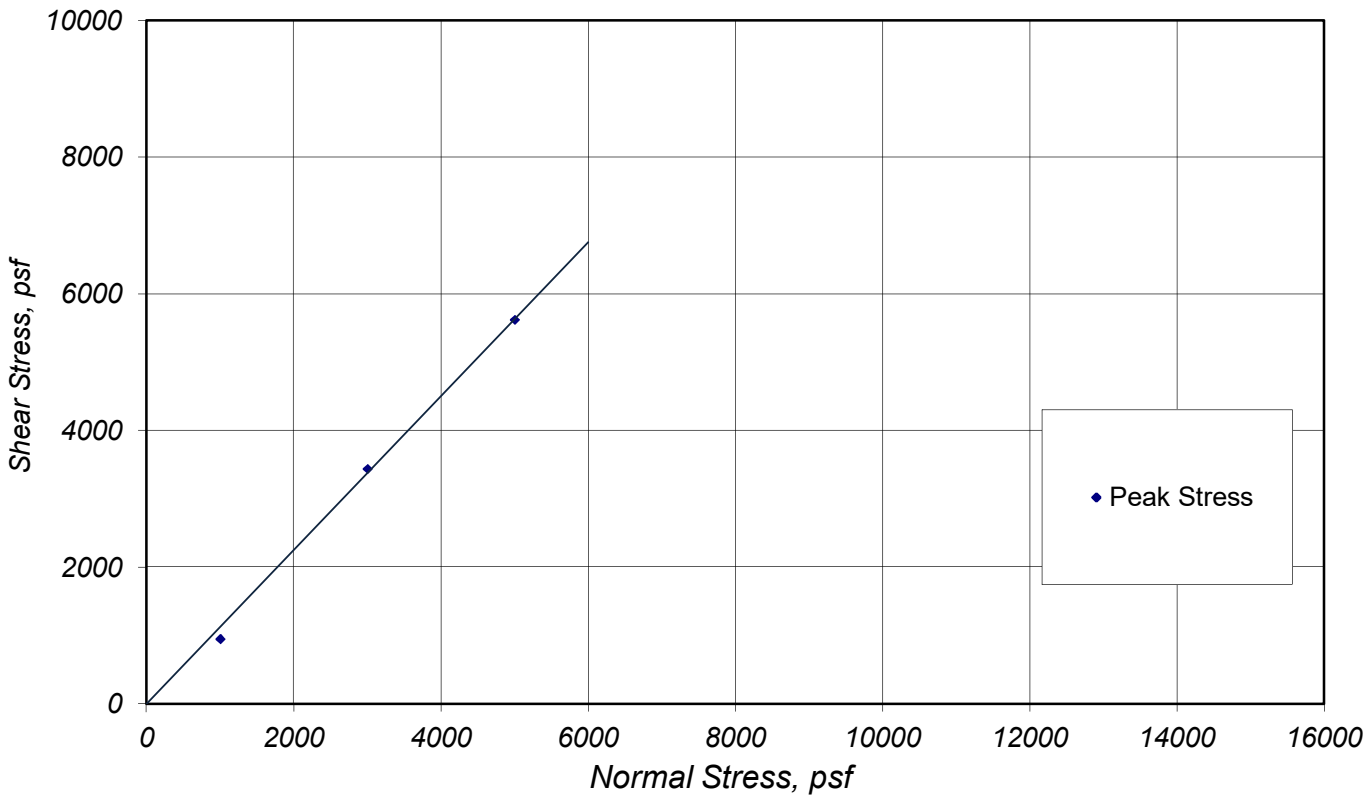
ASTM D- 3080

Geo-Logic ASSOCIATES

Client / Project Name:	Project No. :	Lab Log:
Pacific Geotechnical Engineering / Morgan Hill Sewer Trunk - Gilroy 2017	2016.0096.300	4308BQ

Sample :	Soil Description:	Report Date:
DH-17A @ 26.5-27.0'	Light Brown Poorly Graded Gravel w/ Sand & Clay (GP-GC)	January 2, 2018

STRENGTH ENVELOPE



		Peak
Coefficient of Friction	:	1.126
Friction Angle	:	48.4
Cohesion, psf:	:	0

Note: Intercept changed to "0"

Point No.	Normal Stress psf	Shear Stress Peak psf		Initial Water Content %	Initial Dry Density pcf	Final Water Content %	Final Dry Density pcf
1	1000	951		11.8	113.0	18.4	115.7
2	3000	3441		9.3	115.9	15.5	123.3
3	5000	5623		8.8	115.1	16.1	125.7

Horizontal Displacement Rate, in. / min. : 0.005 *Sample Diameter, in.:* 2.43

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the samples supplied and tested for the above referenced job.

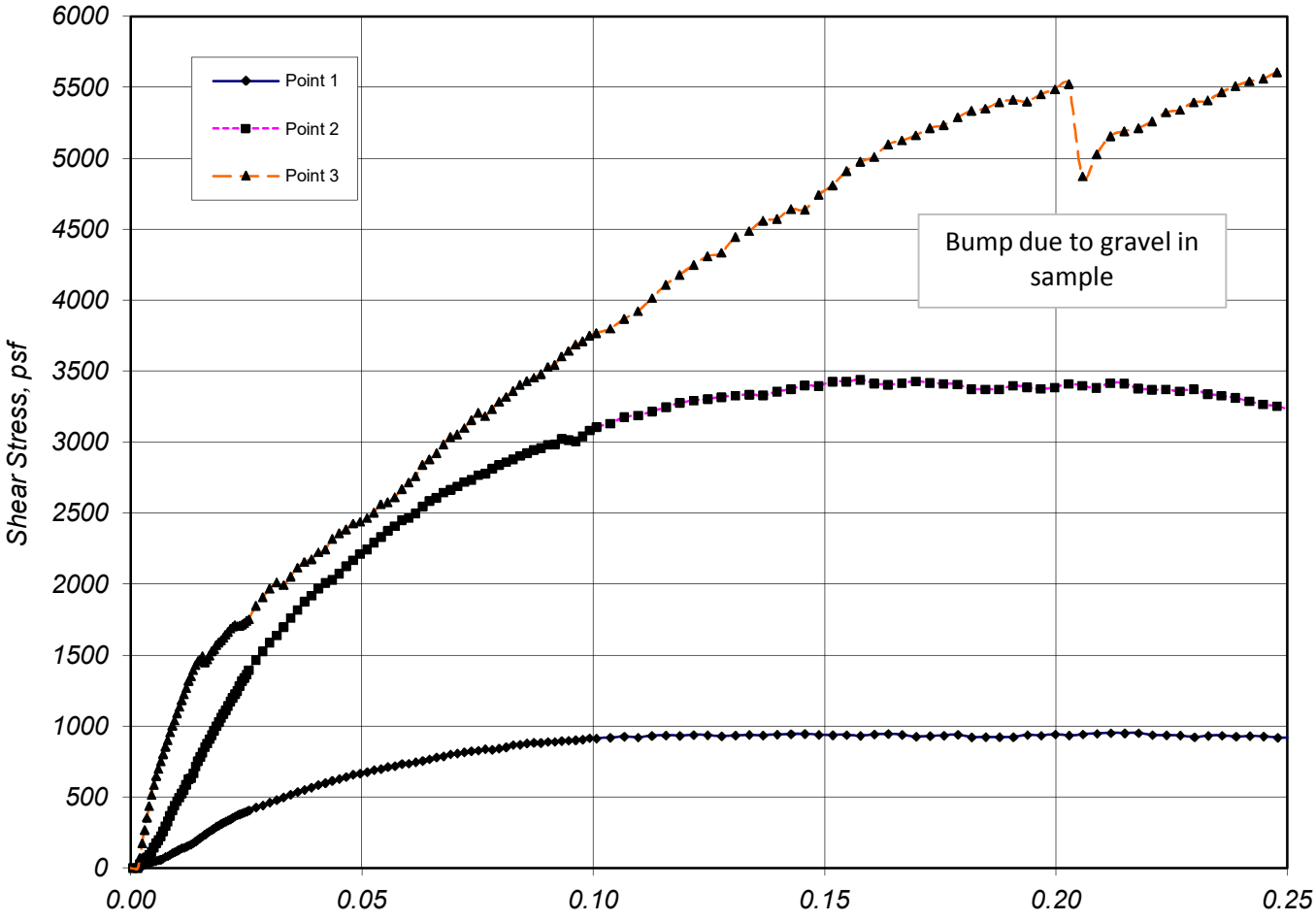
Geo-Logic ASSOCIATES

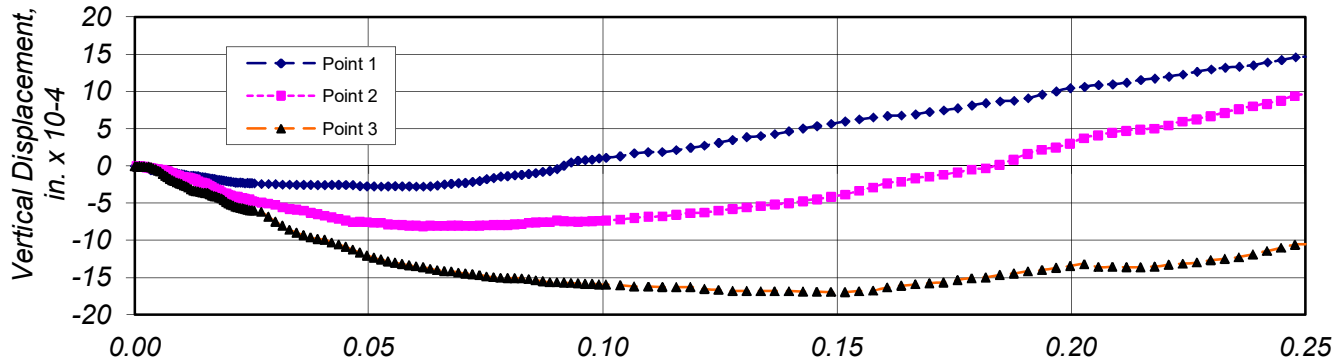
DIRECT SHEAR REPORT

ASTM D- 3080

Client / Project Name:	Project No. :	Lab Log:
Pacific Geotechnical Engineering / Morgan Hill Sewer Trunk - Gilroy 2017	2016.0096.300	4308BQ

Sample :	Soil Description:	Report Date:
DH-17A @ 26.5-27.0'	Light Brown Poorly Graded Gravel w/ Sand & Clay (GP-GC)	January 2, 2018





NORMAL STRESSES, psf :	Point - 1	1000	Point - 2	3000	Point - 3	5000

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the samples supplied and tested for the above referenced job.

PARTICLE SIZE ANALYSIS

Test Report

ASTM D-6913 / D-7928, (replacing D-422)
Method A: (+/-1%)

Geo-Logic ASSOCIATES

Client : PACIFIC GEOTECHNICAL ENGINEERING

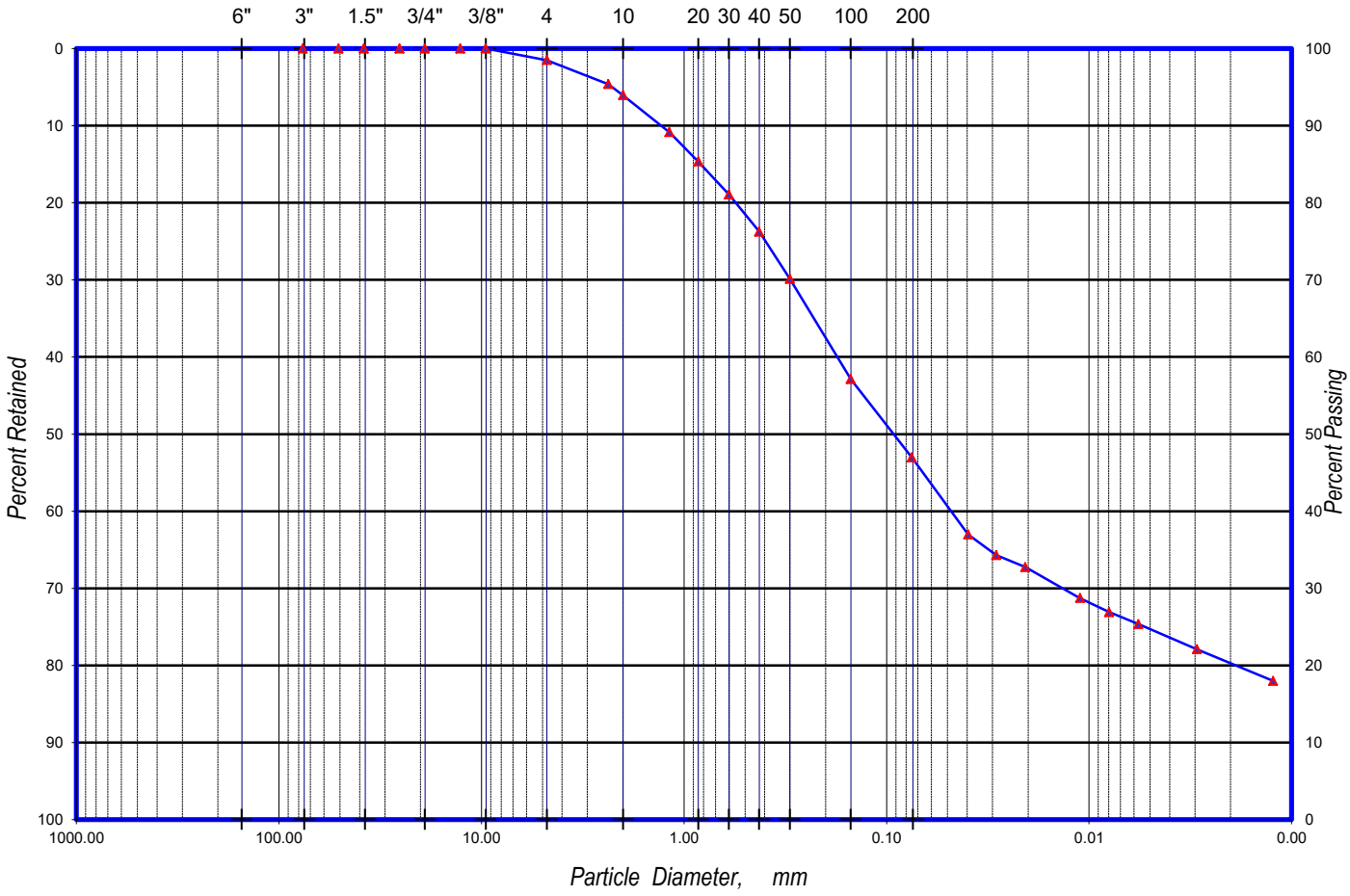
Project No: 2016.0096.300

Lab Sample No: **4308D**

Project Name: MORGAN HILL SEWER TRUNK - GILROY 2017

Report Date: January 3, 2018

BOULDERS	COBBLES	GRAVEL		SAND			SILT AND CLAY
		COARSE	FINE	COARSE	MEDIUM	FINE	
US SIEVE SIZE, INCHES				US STANDARD SIEVE SIZE No.			HYDROMETER



Symbol	Sample ID	Description	% Gravel	% Sand	% Silt - Clay
▲	DH-2A @ 19.0'	Yellowish Brown Clayey Sand (SC)	1.5	51.6	46.9

Size Passing, mm D_{60} = 0.18 D_{30} = 0.01 D_{10} = 0.00 5 micron (%) = 24

Coefficient of Curvature, C_c: 1.14 Coefficient of Uniformity, C_u: 192.07 Fineness Modulus = 1.09

Note: * Percentages are +/- 0.1% based on computer rounding as allowed by ASTM D-6026-01 Section 5.2.3.

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the samples supplied and tested for the above referenced job.

PARTICLE SIZE ANALYSIS

Test Report

ASTM D-6913 / D-7928, (replacing D-422)
Method A: (+/-1%)

Client : PACIFIC GEOTECHNICAL ENGINEERING

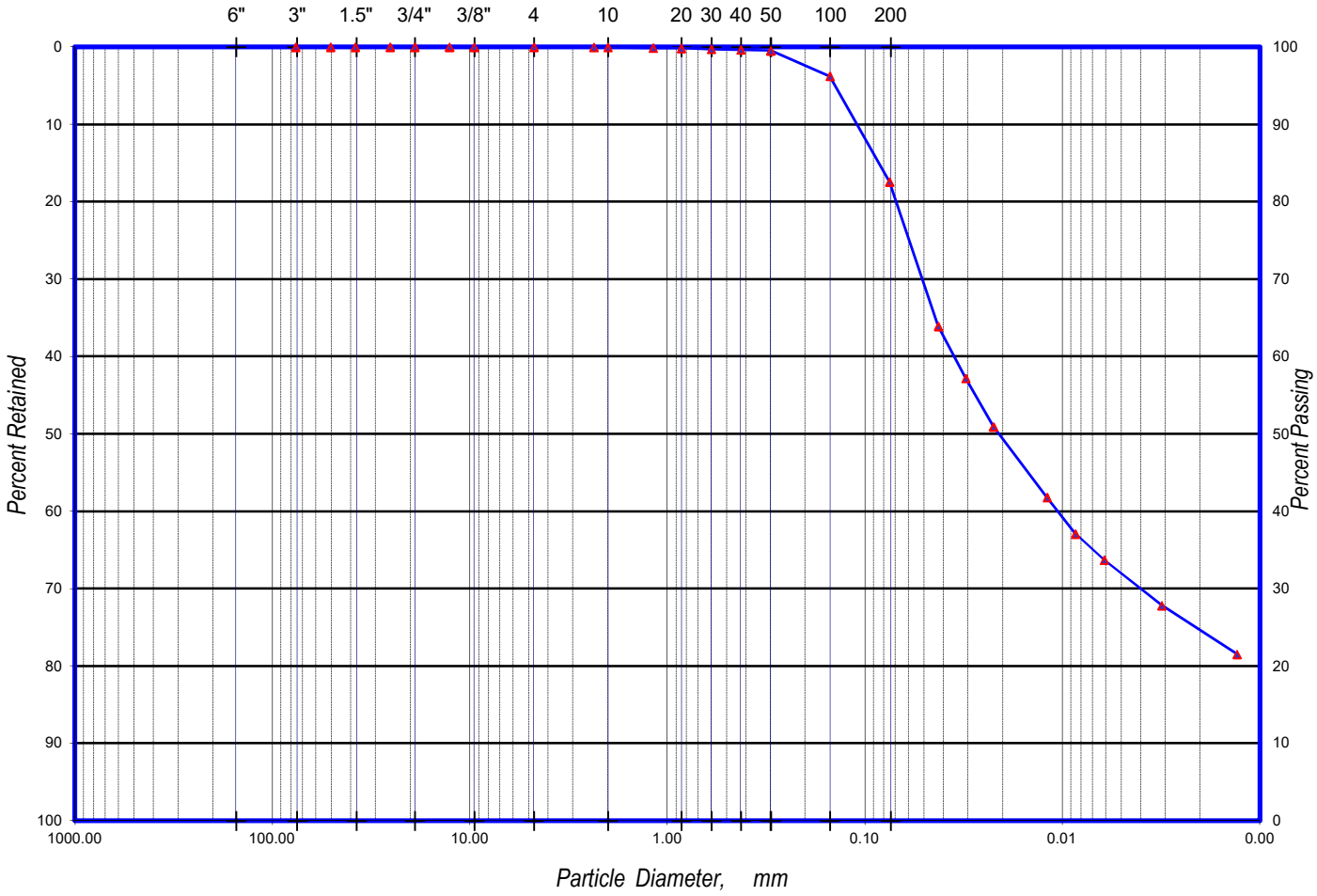
Project No: 2016.0096.300

Lab Sample No: **4308E**

Project Name: MORGAN HILL SEWER TRUNK - GILROY 2017

Report Date: January 3, 2018

BOULDERS	COBBLES	GRAVEL		SAND			SILT AND CLAY
		COARSE	FINE	COARSE	MEDIUM	FINE	
US SIEVE SIZE, INCHES				US STANDARD SIEVE SIZE No.			HYDROMETER



Symbol	Sample ID	Description	% Gravel	% Sand	% Silt - Clay
▲	DH-2A @ 22.0'	Light Brown Lean Clay with Sand (CL)	0.0	17.4	82.6

Size Passing, mm D_{60} = 0.04 D_{30} = 0.00 D_{10} = N/A 5 micron (%) = 32

Coefficient of Curvature, C_c: N/A Coefficient of Uniformity, C_u: N/A Fineness Modulus = 0.05

Note: * Percentages are +/- 0.1% based on computer rounding as allowed by ASTM D-6026-01 Section 5.2.3.

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the sample supplied and tested for the above referenced job

PARTICLE SIZE ANALYSIS

Test Report

ASTM D-6913 / D-7928, (replacing D-422)
Method A: (+/-1%)

Client : PACIFIC GEOTECHNICAL ENGINEERING

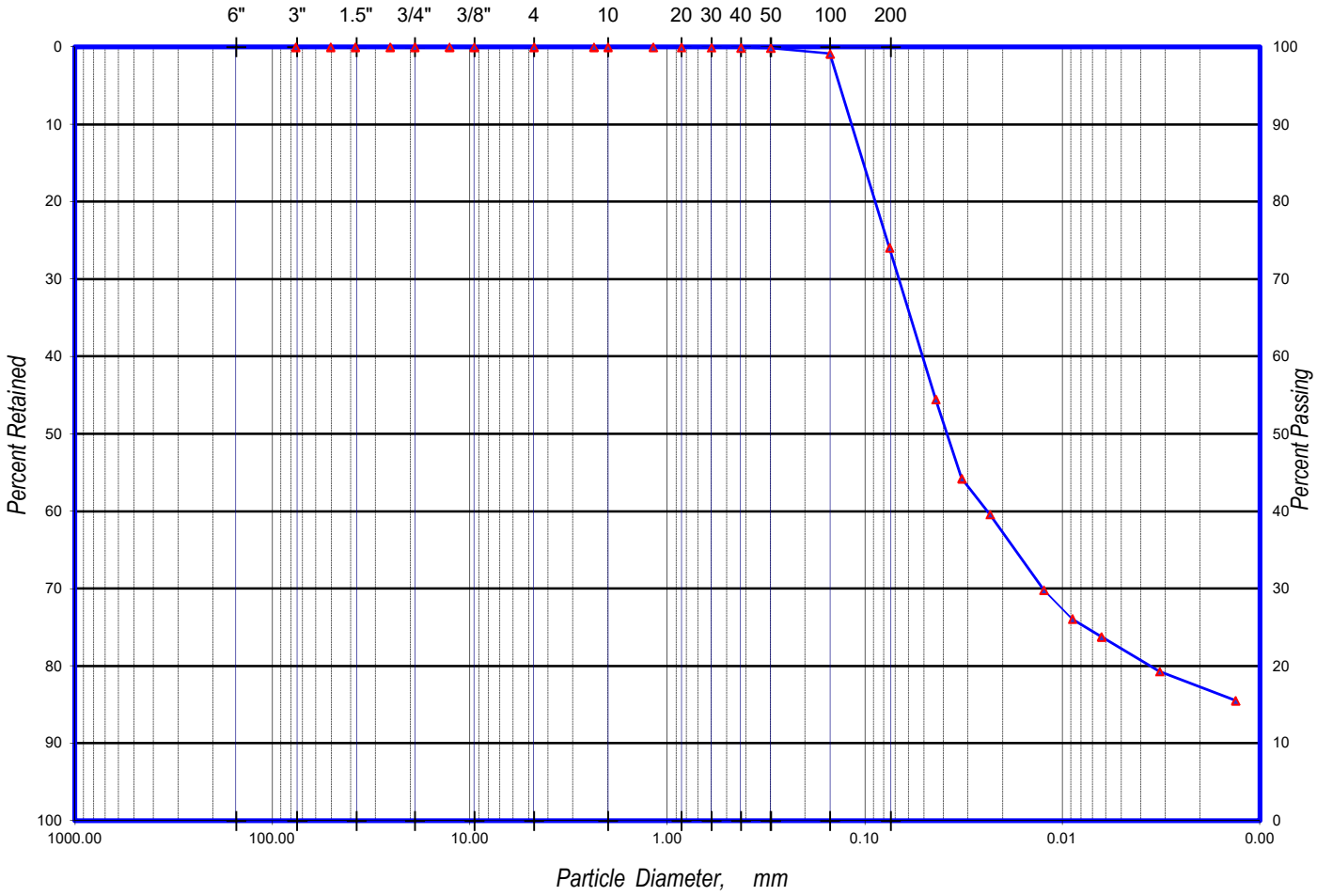
Project No: 2016.0096.300

Lab Sample No: **4308BX**

Project Name: MORGAN HILL SEWER TRUNK - GILROY 2017

Report Date: January 11, 2018

BOULDERS	COBBLES	GRAVEL		SAND			SILT AND CLAY
		COARSE	FINE	COARSE	MEDIUM	FINE	
US SIEVE SIZE, INCHES				US STANDARD SIEVE SIZE No.			HYDROMETER



Symbol	Sample ID	* Description	% Gravel	% Sand	% Silt - Clay
▲	DH-2A @ 23.0-24.0'	Brown Silty Clay w/ Sand	0.0	25.9	74.1

Size Passing, mm D_{60} = 0.05 D_{30} = 0.01 D_{10} = N/A 5 micron (%) = 22

Coefficient of Curvature, C_c: N/A Coefficient of Uniformity, C_u: N/A Fineness Modulus = 0.01

* Visual Classification based on ASTM D-2488

Note: * Percentages are +/- 0.1% based on computer rounding as allowed by ASTM D-6026-01 Section 5.2.3.

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the sample supplied and tested for the above referenced job

PARTICLE SIZE ANALYSIS

Test Report

ASTM D-6913 / D-7928, (replacing D-422)
Method A: (+/-1%)

Client : PACIFIC GEOTECHNICAL ENGINEERING

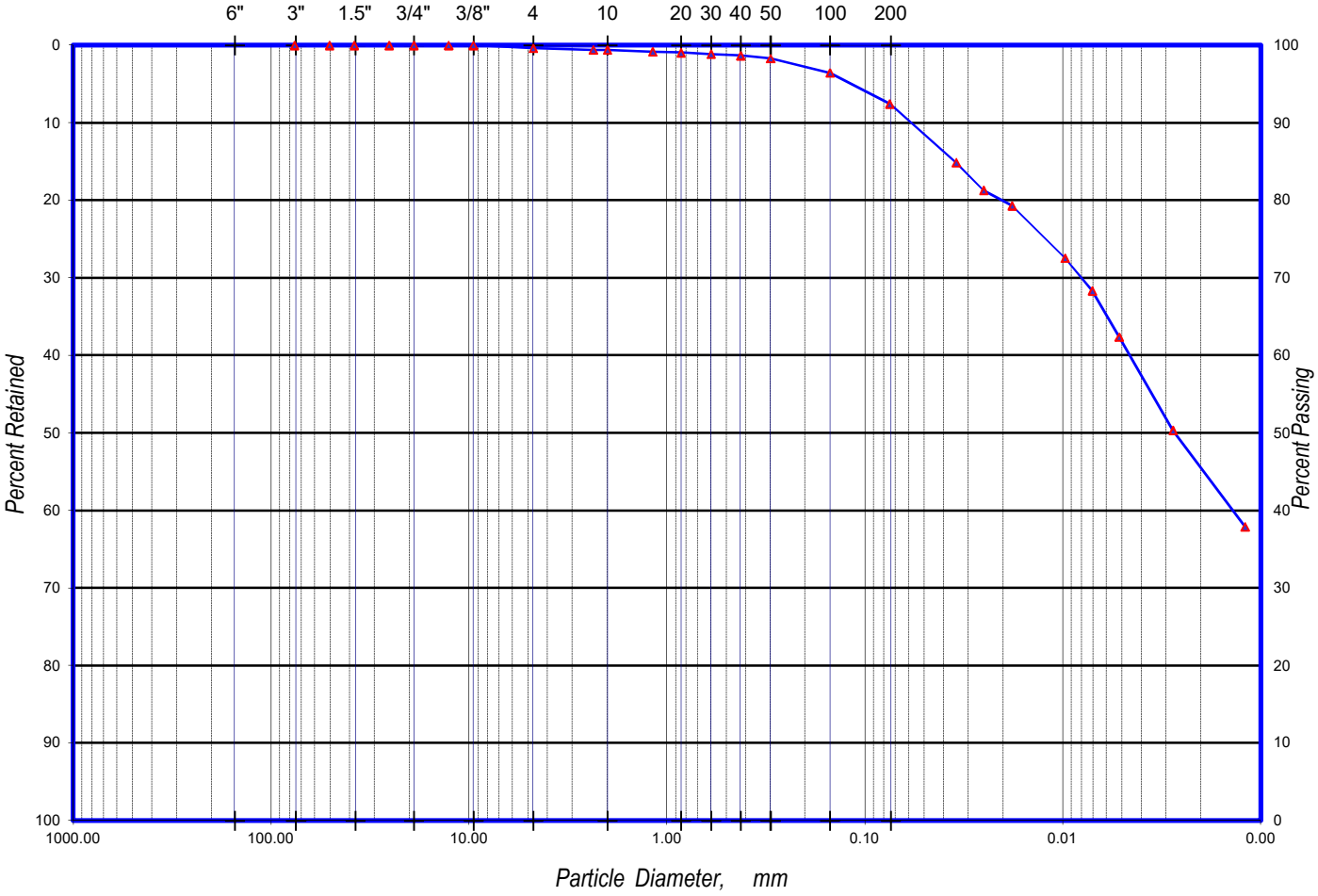
Project No: 2016.0096.300

Lab Sample No: **4308F**

Project Name: MORGAN HILL SEWER TRUNK - GILROY 2017

Report Date: January 3, 2018

BOULDERS	COBBLES	GRAVEL		SAND			SILT AND CLAY
		COARSE	FINE	COARSE	MEDIUM	FINE	
US SIEVE SIZE, INCHES				US STANDARD SIEVE SIZE No.			HYDROMETER



Symbol	Sample ID	Description	% Gravel	% Sand	% Silt - Clay
▲	DH-2A @ 25.0'	Brown Fat Clay (CH)	0.4	7.2	92.4

Size Passing, mm D_{60} = 0.00 D_{30} = 0.00 D_{10} = N/A 5 micron (%) = 62

Coefficient of Curvature, C_c: N/A Coefficient of Uniformity, C_u: N/A Fineness Modulus = 0.08

Note: * Percentages are +/- 0.1% based on computer rounding as allowed by ASTM D-6026-01 Section 5.2.3.

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the sample supplied and tested for the above referenced job

PARTICLE SIZE ANALYSIS

Test Report

ASTM D-6913 / D-7928, (replacing D-422)
Method A: (+/-1%)

Client : PACIFIC GEOTECHNICAL ENGINEERING

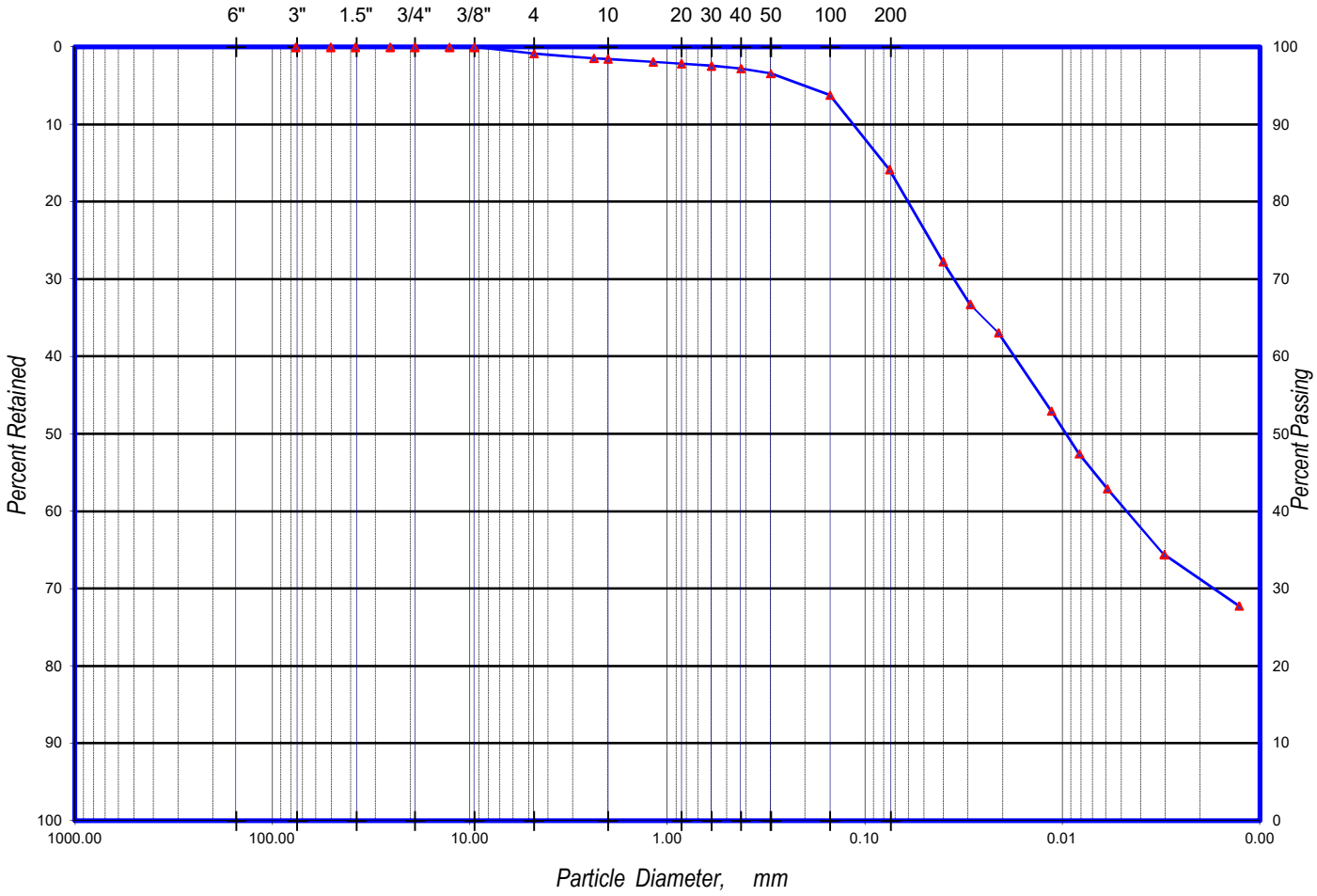
Project No: 2016.0096.300

Lab Sample No: **4308G**

Project Name: MORGAN HILL SEWER TRUNK - GILROY 2017

Report Date: January 11, 2018

BOULDERS	COBBLES	GRAVEL		SAND			SILT AND CLAY
		COARSE	FINE	COARSE	MEDIUM	FINE	
US SIEVE SIZE, INCHES				US STANDARD SIEVE SIZE No.			HYDROMETER



Symbol	Sample ID	Description	% Gravel	% Sand	% Silt - Clay
▲	DH-2A @ 28.0'	Yellowish Brown Lean Clay with Sand (CL)	0.8	15.0	84.2

Size Passing, mm D_{60} = 0.02 D_{30} = 0.00 D_{10} = N/A 5 micron (%) = 41

Coefficient of Curvature, C_c: N/A Coefficient of Uniformity, C_u: N/A Fineness Modulus = 0.16

Note: * Percentages are +/- 0.1% based on computer rounding as allowed by ASTM D-6026-01 Section 5.2.3.

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the sample supplied and tested for the above referenced job

L : Labexcel \ Projects \ Client \ Client Name \ 4308 \ 4308G-ma	Print Date:	Entered By:	Reviewed By:	LSN:
DCN: MA-rp (rev. 6/27/12)	01/11/18	JL	KH	**4308G**

Figure B-45

PARTICLE SIZE ANALYSIS

Test Report

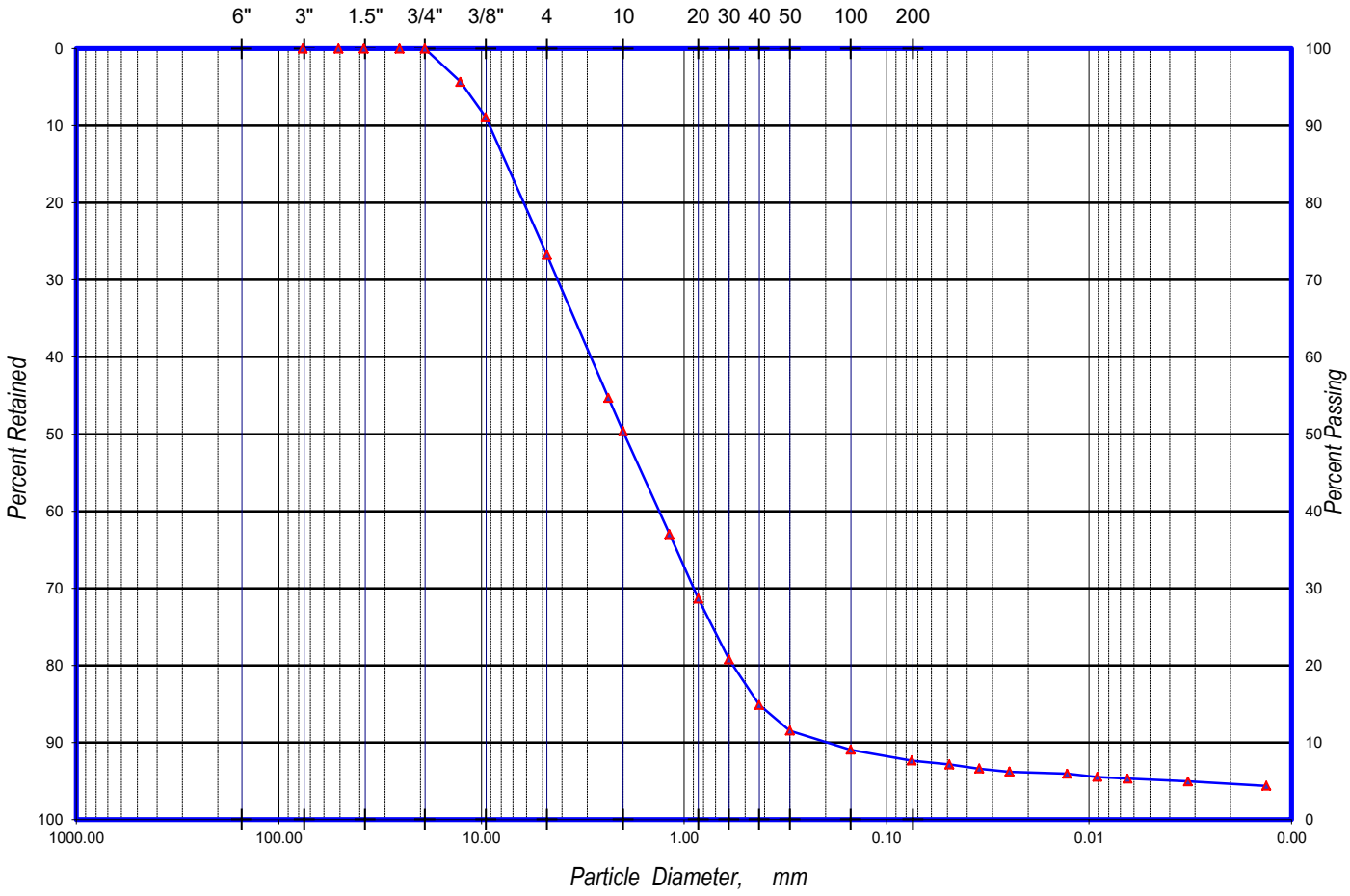
ASTM D-6913 / D-7928, (replacing D-422)
Method A: (+/-1%)

Geo-Logic ASSOCIATES

Client :	Project No:	Lab Sample No:
PACIFIC GEOTECHNICAL ENGINEERING	2016.0096.300	**4308M**

Project Name:	Report Date:
MORGAN HILL SEWER TRUNK - GILROY 2017	January 3, 2018

BOULDERS	COBBLES	GRAVEL		SAND			SILT AND CLAY
		COARSE	FINE	COARSE	MEDIUM	FINE	
US SIEVE SIZE, INCHES				US STANDARD SIEVE SIZE No.			HYDROMETER



Symbol	Sample ID	Description	% Gravel	% Sand	% Silt - Clay
▲	DH-3A @ 22.0-22.5'	Brown Well Graded Sand with Clay and Gravel (SW-SC)	26.8	65.6	7.6

Size Passing, mm D_{60} = 3.05 D_{30} = 0.90 D_{10} = 0.21 5 micron (%) = 5

Coefficient of Curvature, C_c: 1.29 Coefficient of Uniformity, C_u: 14.64 Fineness Modulus = 4.03

Note: * Percentages are +/- 0.1% based on computer rounding as allowed by ASTM D-6026-01 Section 5.2.3.

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the samples supplied and tested for the above referenced job.

L : Labexcel \ Projects \ Client \ Client Name \ 4308 \ 4308M-ma	Print Date:	Entered By:	Reviewed By:	LSN:
DCN: MA-rp (rev. 6/27/12)	01/05/18	JL	KH	**4308M**

Figure B-46

PARTICLE SIZE ANALYSIS

Test Report

ASTM D-6913 / D-7928, (replacing D-422)
Method A: (+/-1%)

Client : PACIFIC GEOTECHNICAL ENGINEERING

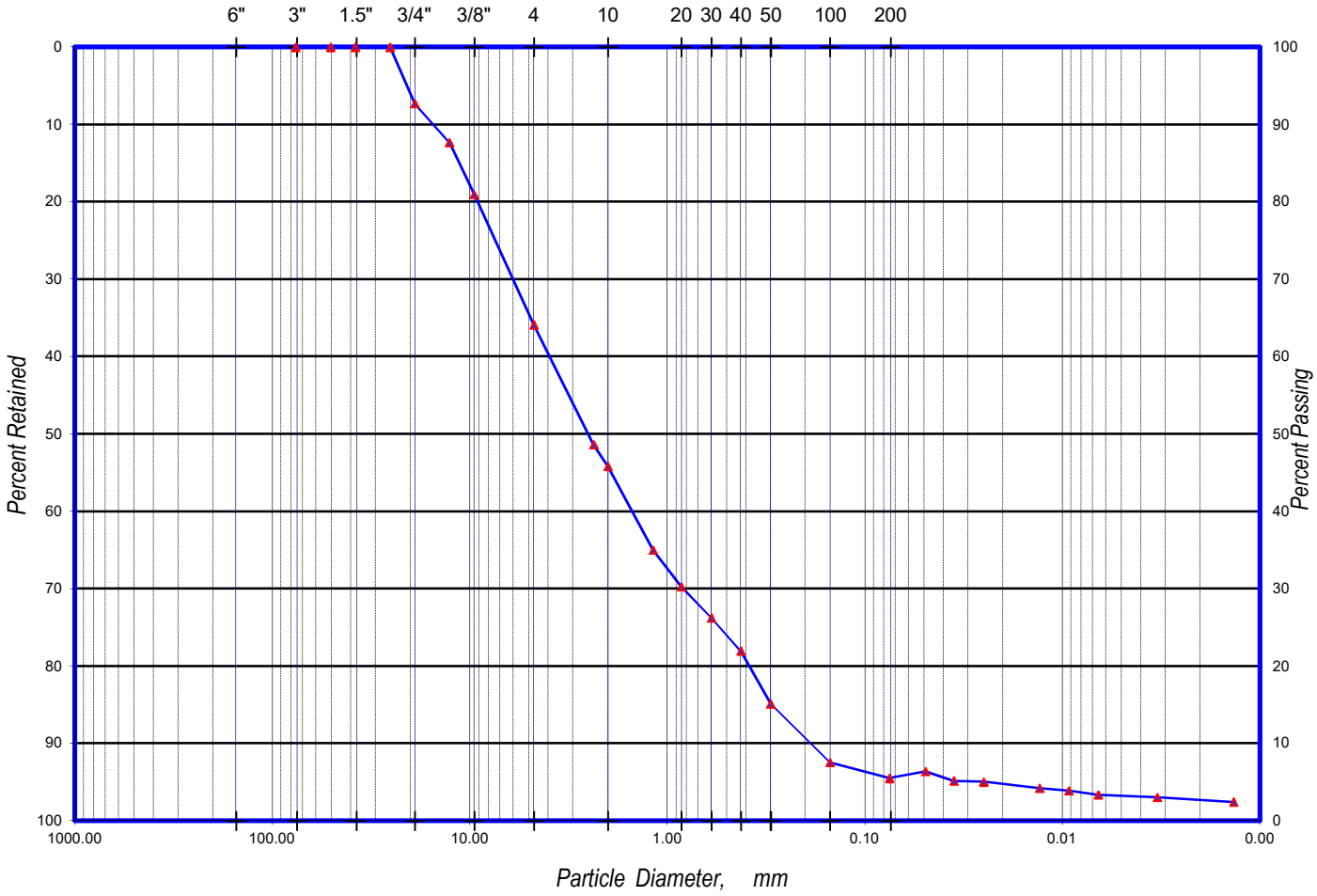
Project No: 2016.0096.300

Lab Sample No: **4308N**

Project Name: MORGAN HILL SEWER TRUNK - GILROY 2017

Report Date: January 3, 2018

BOULDERS	COBBLES	GRAVEL		SAND			SILT AND CLAY
		COARSE	FINE	COARSE	MEDIUM	FINE	
US SIEVE SIZE, INCHES				US STANDARD SIEVE SIZE No.			HYDROMETER



Symbol	Sample ID	Description	% Gravel	% Sand	% Silt - Clay
▲	DH-3A @ 25.5'	Brown Poorly Graded Sand with Silt and Gravel (SP-SM)	35.9	58.6	5.5

Size Passing, mm D_{60} = 4.12 D_{30} = 0.84 D_{10} = 0.20 5 micron (%) = 3

Coefficient of Curvature, C_c: 0.85 Coefficient of Uniformity, C_u: 20.67 Fineness Modulus = 4.30

Note: * Percentages are +/- 0.1% based on computer rounding as allowed by ASTM D-6026-01 Section 5.2.3.

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the sample supplied and tested for the above referenced job

PARTICLE SIZE ANALYSIS

Test Report

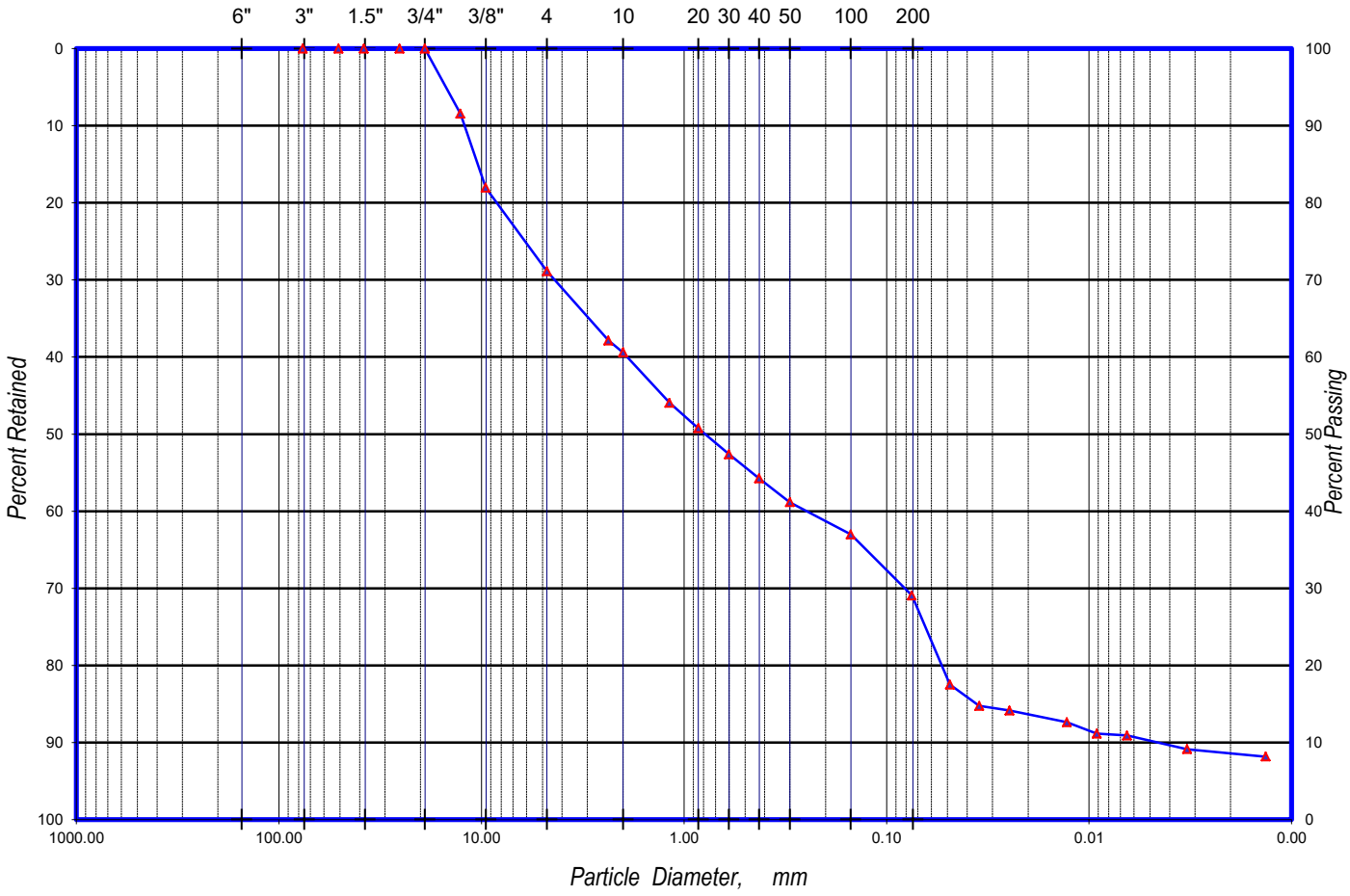
ASTM D-6913 / D-7928, (replacing D-422)
Method A: (+/-1%)

Geo-Logic ASSOCIATES

Client :	Project No:	Lab Sample No:
PACIFIC GEOTECHNICAL ENGINEERING	2016.0096.300	**4308O**

Project Name:	Report Date:
MORGAN HILL SEWER TRUNK - GILROY 2017	January 3, 2018

BOULDERS	COBBLES	GRAVEL		SAND			SILT AND CLAY
		COARSE	FINE	COARSE	MEDIUM	FINE	
US SIEVE SIZE, INCHES				US STANDARD SIEVE SIZE No.			HYDROMETER



Symbol	Sample ID	* Description	% Gravel	% Sand	% Silt - Clay
▲	DH-3A @ 20.5-21.5'	Brown Silty Clayey Sand with Gravel	28.9	42.1	29.1

Size Passing, mm D_{60} = 1.93 D_{30} = 0.08 D_{10} = 0.00 5 micron (%) = 10

Coefficient of Curvature, C_c: 0.75 Coefficient of Uniformity, C_u: 396.48 Fineness Modulus = 3.05

* Visual Classification based on ASTM D-2488

Note: * Percentages are +/- 0.1% based on computer rounding as allowed by ASTM D-6026-01 Section 5.2.3.

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the samples supplied and tested for the above referenced job.

L : Labexcel \ Projects \ Client \ Client Name \ 4308 \ 4308O-ma	Print Date:	Entered By:	Reviewed By:	LSN:
DCN: MA-rp (rev. 6/27/12)	01/05/18	JL	KH	**4308O**

Figure B-48

PARTICLE SIZE ANALYSIS

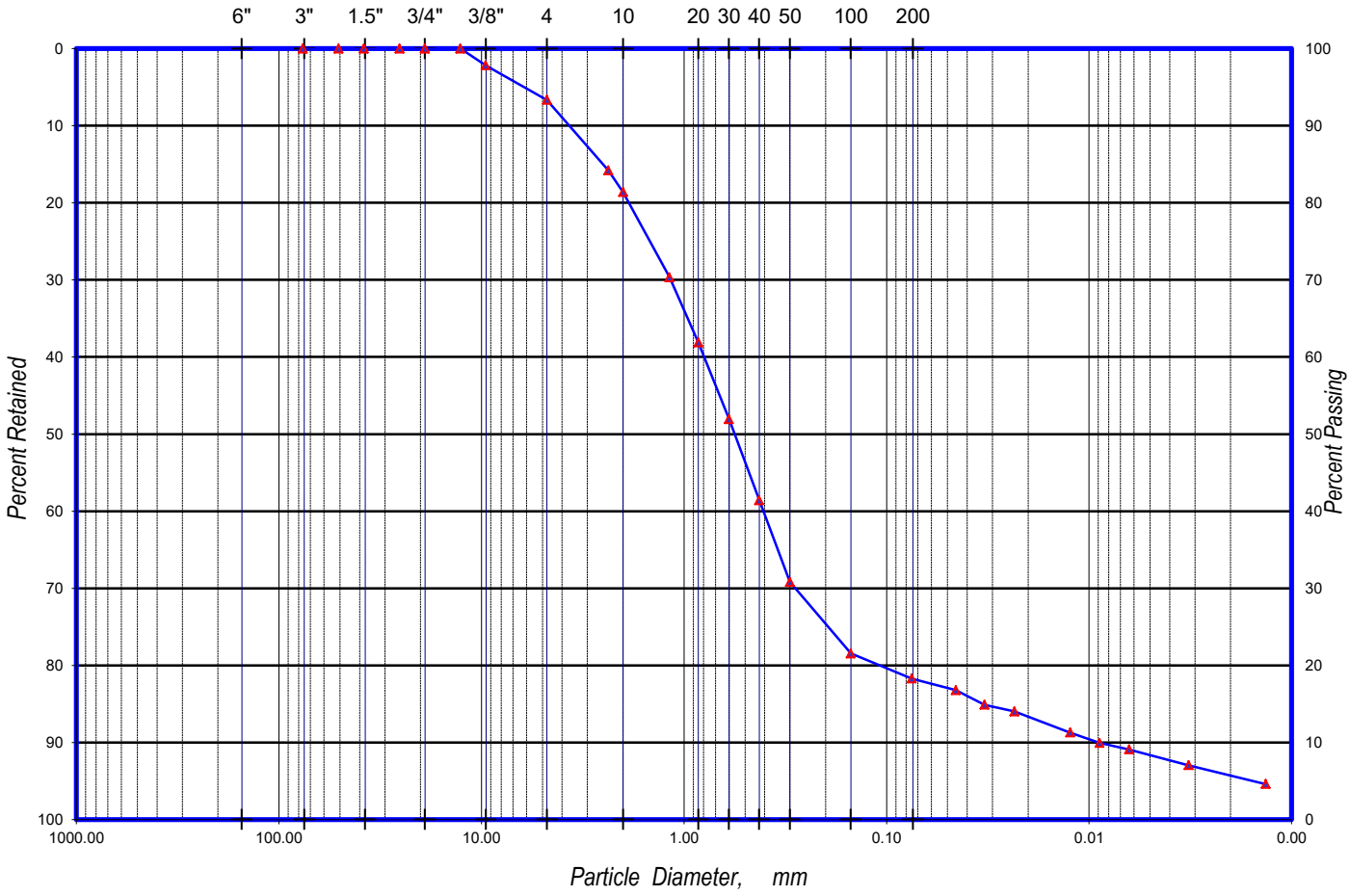
Test Report

ASTM D-6913 / D-7928, (replacing D-422)
Method A: (+/-1%)

Client :	Project No:	Lab Sample No:
PACIFIC GEOTECHNICAL ENGINEERING	2016.0096.300	**4308S**

Project Name:	Report Date:
MORGAN HILL SEWER TRUNK - GILROY 2017	January 3, 2018

BOULDERS	COBBLES	GRAVEL		SAND			SILT AND CLAY
		COARSE	FINE	COARSE	MEDIUM	FINE	
US SIEVE SIZE, INCHES				US STANDARD SIEVE SIZE No.			HYDROMETER



Symbol	Sample ID	* Description	% Gravel	% Sand	% Silt - Clay
▲	DH-6A @ 32.0'	Brown Silty Clayey Sand	6.7	75.1	18.3

Size Passing, mm D_{60} = 0.80 D_{30} = 0.29 D_{10} = 0.01 5 micron (%) = 8

Coefficient of Curvature, C_c: 11.31 Coefficient of Uniformity, C_u: 88.60 Fineness Modulus = 2.50

* Visual Classification based on ASTM D-2488

Note: * Percentages are +/- 0.1% based on computer rounding as allowed by ASTM D-6026-01 Section 5.2.3.

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the samples supplied and tested for the above referenced job.

L : Labexcel \ Projects \ Client \ Client Name \ 4308 \ 4308S-ma	Print Date:	Entered By:	Reviewed By:	LSN:
DCN: MA-rp (rev. 6/27/12)	01/03/18	JL	KH	**4308S**

Figure B-49

PARTICLE SIZE ANALYSIS

Test Report

ASTM D-6913 / D-7928, (replacing D-422)
Method A: (+/-1%)

Client : PACIFIC GEOTECHNICAL ENGINEERING

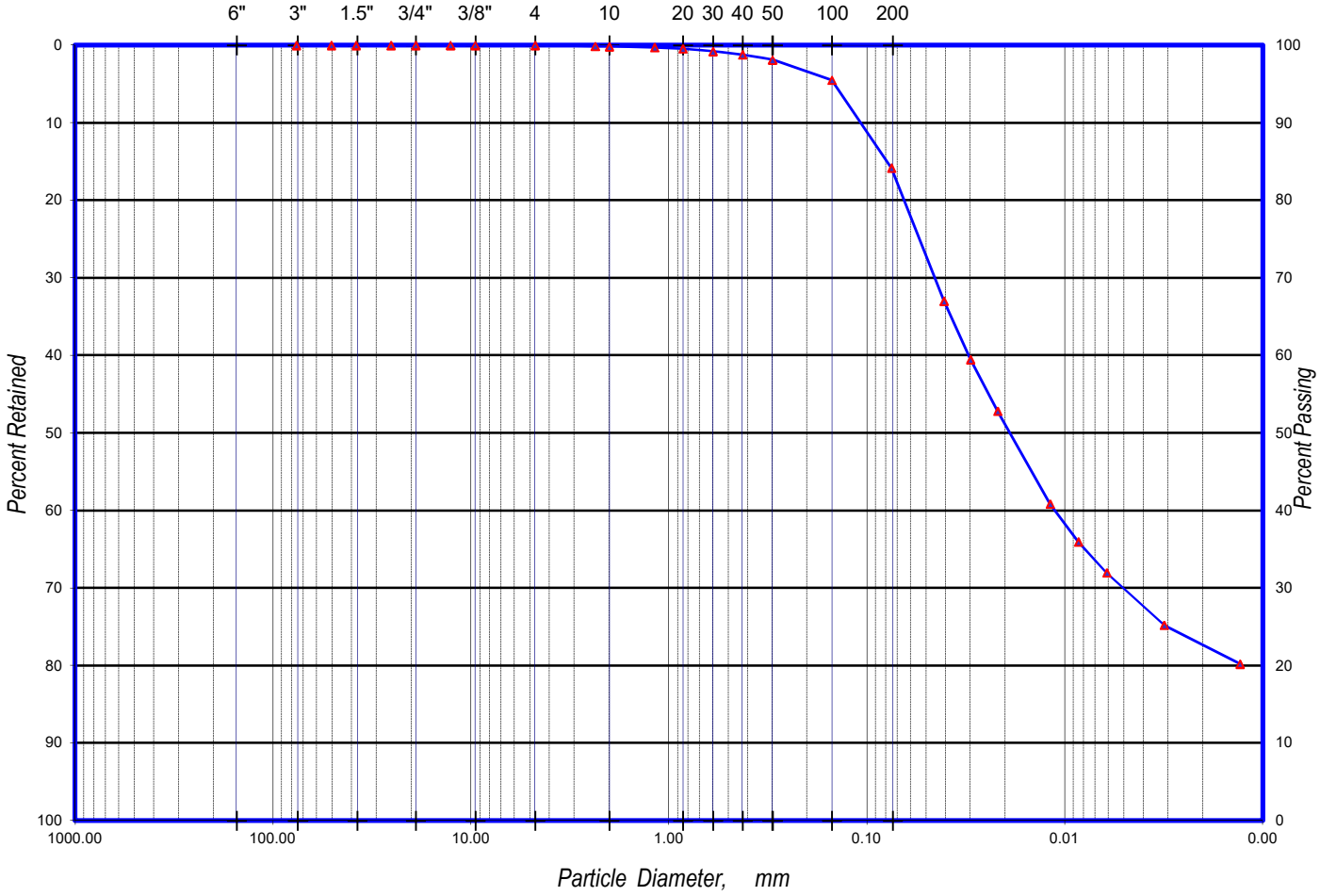
Project No: 2016.0096.300

Lab Sample No: **4308T**

Project Name: MORGAN HILL SEWER TRUNK - GILROY 2017

Report Date: January 11, 2018

BOULDERS	COBBLES	GRAVEL		SAND			SILT AND CLAY
		COARSE	FINE	COARSE	MEDIUM	FINE	
US SIEVE SIZE, INCHES				US STANDARD SIEVE SIZE No.			HYDROMETER



Symbol	Sample ID	Description	% Gravel	% Sand	% Silt - Clay
▲	DH-6A @ 33.0-34.0'	Light Brown Lean Clay with Sand (CL)	0.0	15.8	84.2

Size Passing, mm D_{60} = 0.03 D_{30} = 0.01 D_{10} = N/A 5 micron (%) = 30

Coefficient of Curvature, C_c: N/A Coefficient of Uniformity, C_u: N/A Fineness Modulus = 0.08

Note: * Percentages are +/- 0.1% based on computer rounding as allowed by ASTM D-6026-01 Section 5.2.3.

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the sample supplied and tested for the above referenced job

PARTICLE SIZE ANALYSIS

Test Report

ASTM D-6913 / D-7928, (replacing D-422)
Method A: (+/-1%)

Client : PACIFIC GEOTECHNICAL ENGINEERING

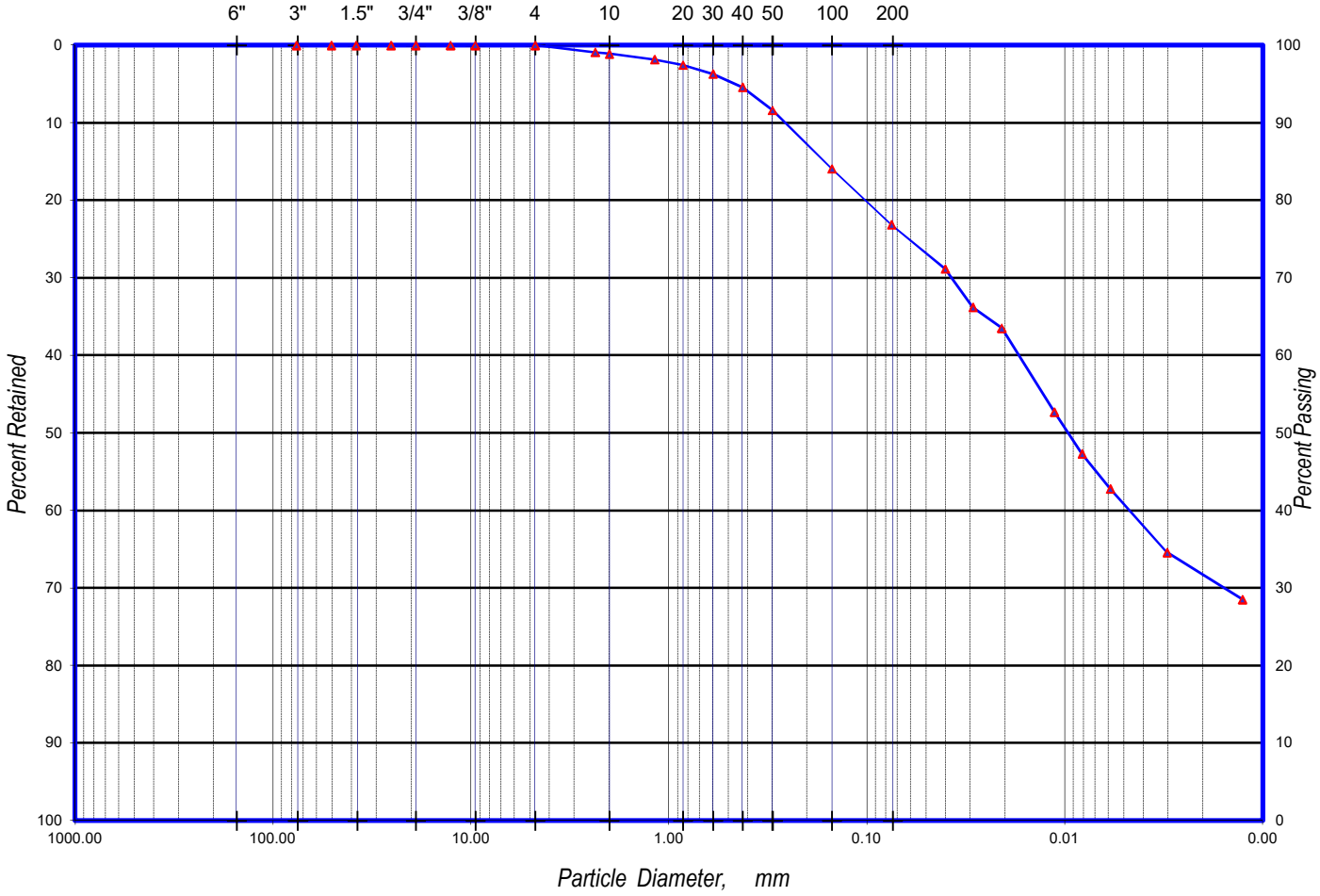
Project No: 2016.0096.300

Lab Sample No: **4308V**

Project Name: MORGAN HILL SEWER TRUNK - GILROY 2017

Report Date: January 11, 2018

BOULDERS	COBBLES	GRAVEL		SAND			SILT AND CLAY
		COARSE	FINE	COARSE	MEDIUM	FINE	
US SIEVE SIZE, INCHES				US STANDARD SIEVE SIZE No.			HYDROMETER



Symbol	Sample ID	Description	% Gravel	% Sand	% Silt - Clay
▲	DH-6A @ 38.0'	Light Brown Lean Clay with Sand (CL)	0.0	23.1	76.9

Size Passing, mm D_{60} = 0.02 D_{30} = 0.00 D_{10} = N/A 5 micron (%) = 41

Coefficient of Curvature, C_c: N/A Coefficient of Uniformity, C_u: N/A Fineness Modulus = 0.31

Note: * Percentages are +/- 0.1% based on computer rounding as allowed by ASTM D-6026-01 Section 5.2.3.

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the sample supplied and tested for the above referenced job

L : Labexcel \ Projects \ Client \ Client Name \ 4308 \ 4308V-ma | Print Date: 01/11/18 | Entered By: JL | Reviewed By: KH | LSN: **4308V**

DCN: MA-rp (rev. 6/27/12)

Figure B-51

PARTICLE SIZE ANALYSIS

Test Report

ASTM D-6913 / D-7928, (replacing D-422)
Method A: (+/-1%)

Client : PACIFIC GEOTECHNICAL ENGINEERING

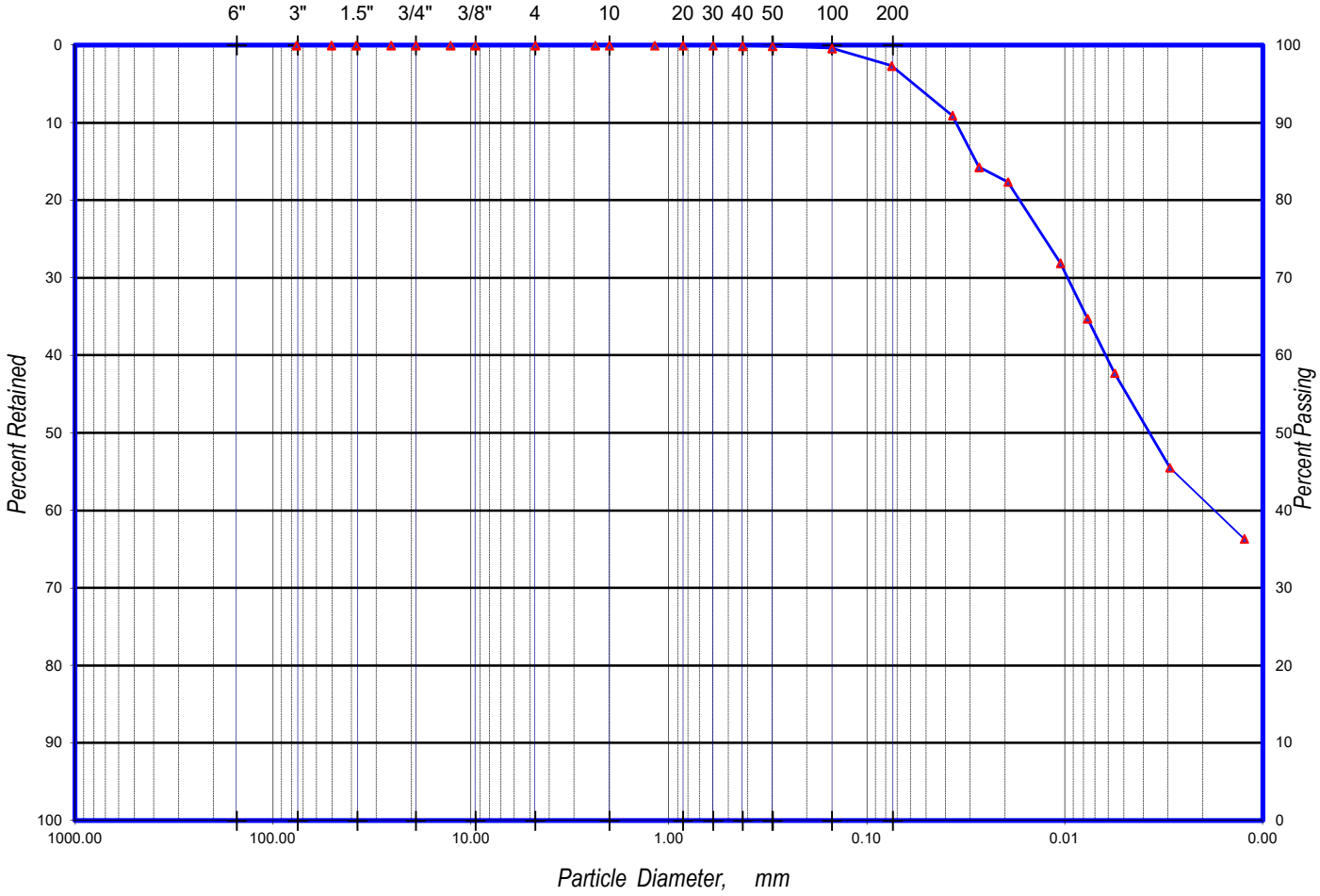
Project No: 2016.0096.300

Lab Sample No: **4308W**

Project Name: MORGAN HILL SEWER TRUNK - GILROY 2017

Report Date: January 11, 2018

BOULDERS	COBBLES	GRAVEL		SAND			SILT AND CLAY
		COARSE	FINE	COARSE	MEDIUM	FINE	
US SIEVE SIZE, INCHES				US STANDARD SIEVE SIZE No.			HYDROMETER



Symbol	Sample ID	Description	% Gravel	% Sand	% Silt - Clay
▲	DH-6A @ 41.0'	Light Brown Lean Clay (CL)	0.0	2.6	97.4

Size Passing, mm D_{60} = 0.01 D_{30} = 0.00 D_{10} = N/A 5 micron (%) = 56

Coefficient of Curvature, C_c: N/A Coefficient of Uniformity, C_u: N/A Fineness Modulus = 0.01

Note: * Percentages are +/- 0.1% based on computer rounding as allowed by ASTM D-6026-01 Section 5.2.3.

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the sample supplied and tested for the above referenced job

PARTICLE SIZE ANALYSIS

Test Report

ASTM D-6913 / D-7928, (replacing D-422)
Method A: (+/-1%)

Geo-Logic ASSOCIATES

Client : PACIFIC GEOTECHNICAL ENGINEERING

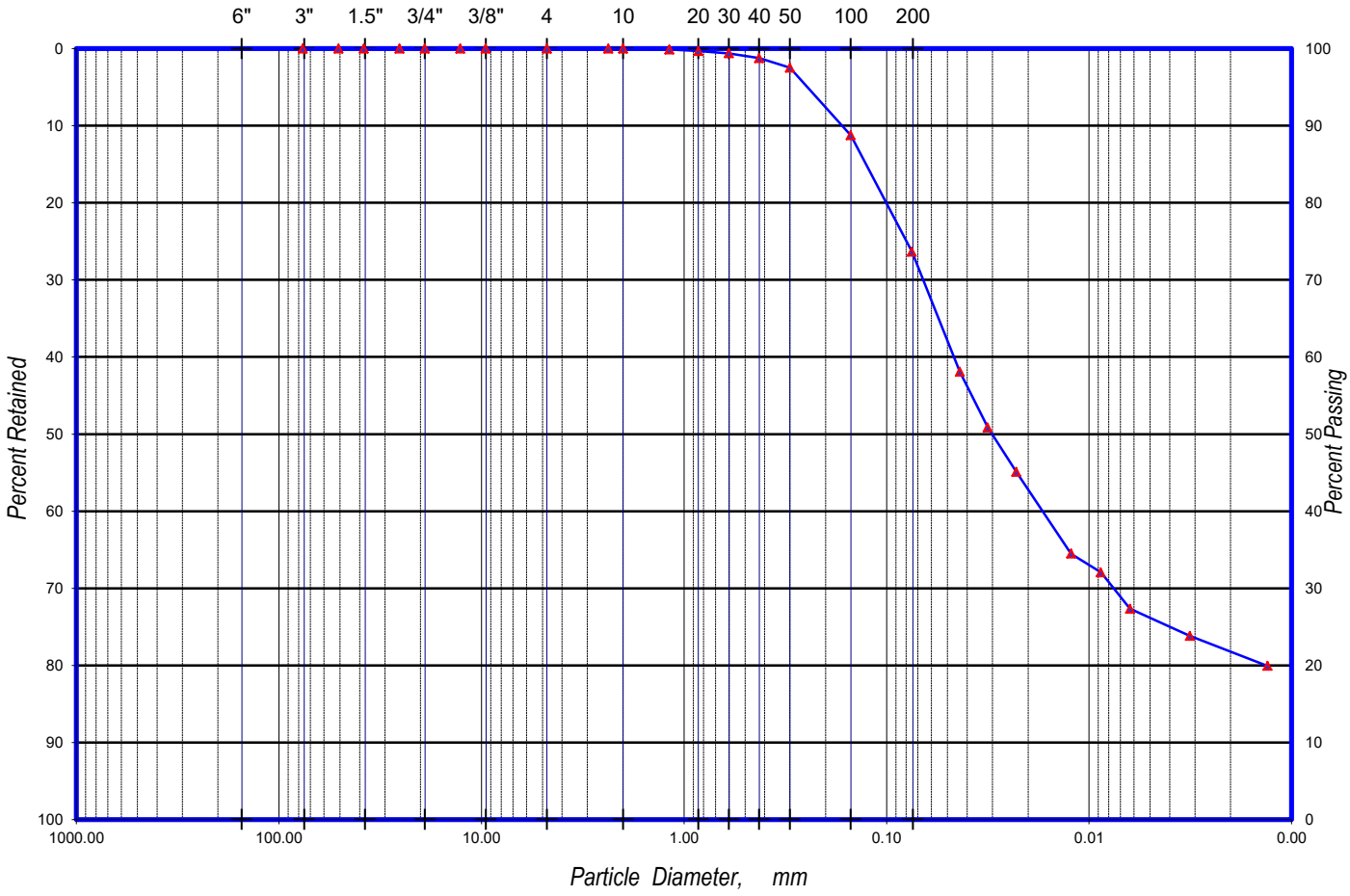
Project No: 2016.0096.300

Lab Sample No: **4308AE**

Project Name: MORGAN HILL SEWER TRUNK - GILROY 2017

Report Date: January 3, 2018

BOULDERS	COBBLES	GRAVEL		SAND			SILT AND CLAY
		COARSE	FINE	COARSE	MEDIUM	FINE	
US SIEVE SIZE, INCHES				US STANDARD SIEVE SIZE No.			HYDROMETER



Symbol	Sample ID	Description	% Gravel	% Sand	% Silt - Clay
▲	DH-7A @ 32.0'	Light Brown Lean Clay with Sand (CL)	0.0	26.4	73.6

Size Passing, mm D_{60} = 0.05 D_{30} = 0.01 D_{10} = N/A 5 micron (%) = 26

Coefficient of Curvature, C_c: N/A Coefficient of Uniformity, C_u: N/A Fineness Modulus = 0.14

Note: * Percentages are +/- 0.1% based on computer rounding as allowed by ASTM D-6026-01 Section 5.2.3.

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the samples supplied and tested for the above referenced job.

PARTICLE SIZE ANALYSIS

Test Report

ASTM D-6913 / D-7928, (replacing D-422)
Method A: (+/-1%)

Client : PACIFIC GEOTECHNICAL ENGINEERING

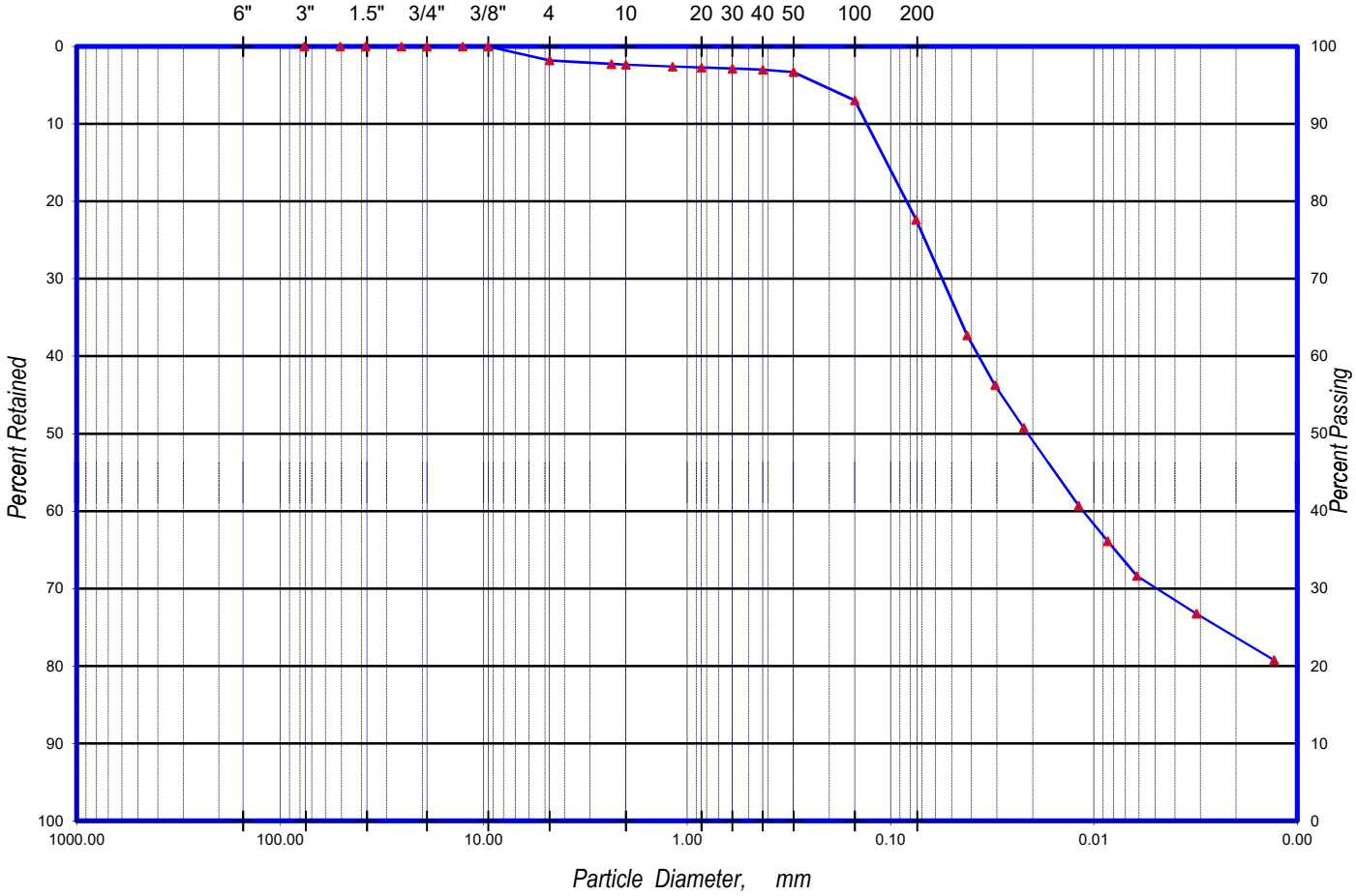
Project No: 2016.0096.300

Lab Sample No: **4308AG**

Project Name: MORGAN HILL SEWER TRUNK - GILROY 2017

Report Date: January 11, 2018

BOULDERS	COBBLES	GRAVEL		SAND			SILT AND CLAY
		COARSE	FINE	COARSE	MEDIUM	FINE	
US SIEVE SIZE, INCHES				US STANDARD SIEVE SIZE No.			HYDROMETER



Symbol	Sample ID	Description	% Gravel	% Sand	% Silt - Clay
▲	DH-7A @ 38.0'	Light Brown Lean Clay with Sand (CL)	1.8	20.6	77.6

Size Passing, mm D_{60} = 0.04 D_{30} = 0.01 D_{10} = N/A 5 micron (%) = 30

Coefficient of Curvature, C_c: N/A Coefficient of Uniformity, C_u: N/A Fineness Modulus = 0.20

Note: * Percentages are +/- 0.1% based on computer rounding as allowed by ASTM D-6026-01 Section 5.2.3.

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the samples supplied and tested for the above referenced job.

PARTICLE SIZE ANALYSIS

Test Report

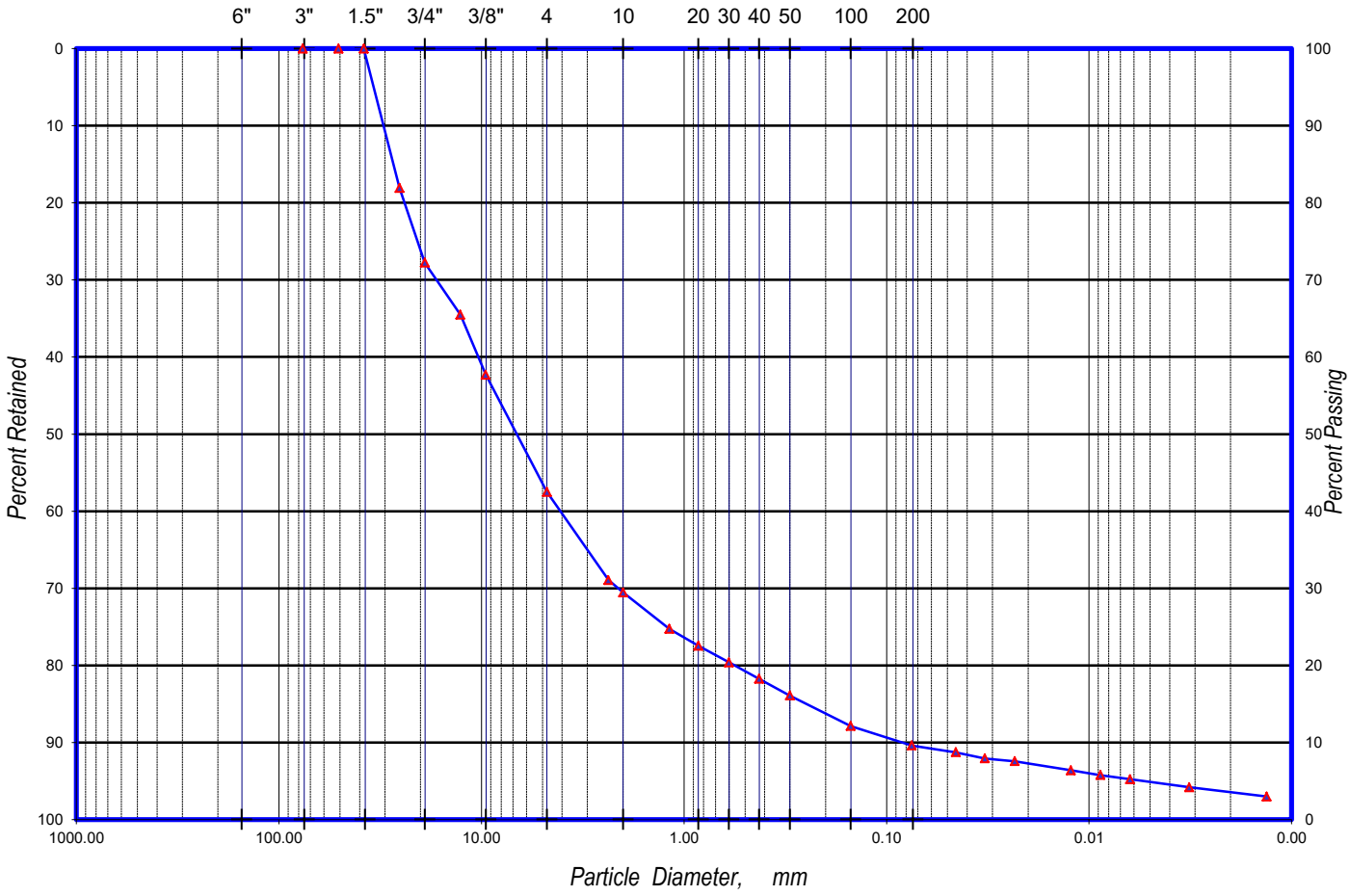
ASTM D-6913 / D-7928, (replacing D-422)
Method A: (+/-1%)

Geo-Logic ASSOCIATES

Client :	Project No:	Lab Sample No:
PACIFIC GEOTECHNICAL ENGINEERING	2016.0096.300	**4308AN**

Project Name:	Report Date:
MORGAN HILL SEWER TRUNK - GILROY 2017	January 3, 2018

BOULDERS	COBBLES	GRAVEL		SAND			SILT AND CLAY
		COARSE	FINE	COARSE	MEDIUM	FINE	
US SIEVE SIZE, INCHES				US STANDARD SIEVE SIZE No.			HYDROMETER



Symbol	Sample ID	Description	% Gravel	% Sand	% Silt - Clay
▲	DH-10A @ 22.0'	Light Brown Poorly Graded Gravel with Sand and Clay (GP-GC)	57.5	32.9	9.6

Size Passing, mm D_{60} = 10.46 D_{30} = 2.12 D_{10} = 0.09 5 micron (%) = 5

Coefficient of Curvature, C_c: 4.96 Coefficient of Uniformity, C_u: 120.70 Fineness Modulus = 5.23

Note: * Percentages are +/- 0.1% based on computer rounding as allowed by ASTM D-6026-01 Section 5.2.3.

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the samples supplied and tested for the above referenced job.

PARTICLE SIZE ANALYSIS

Test Report

ASTM D-6913 / D-7928, (replacing D-422)
Method A: (+/-1%)

Client : PACIFIC GEOTECHNICAL ENGINEERING

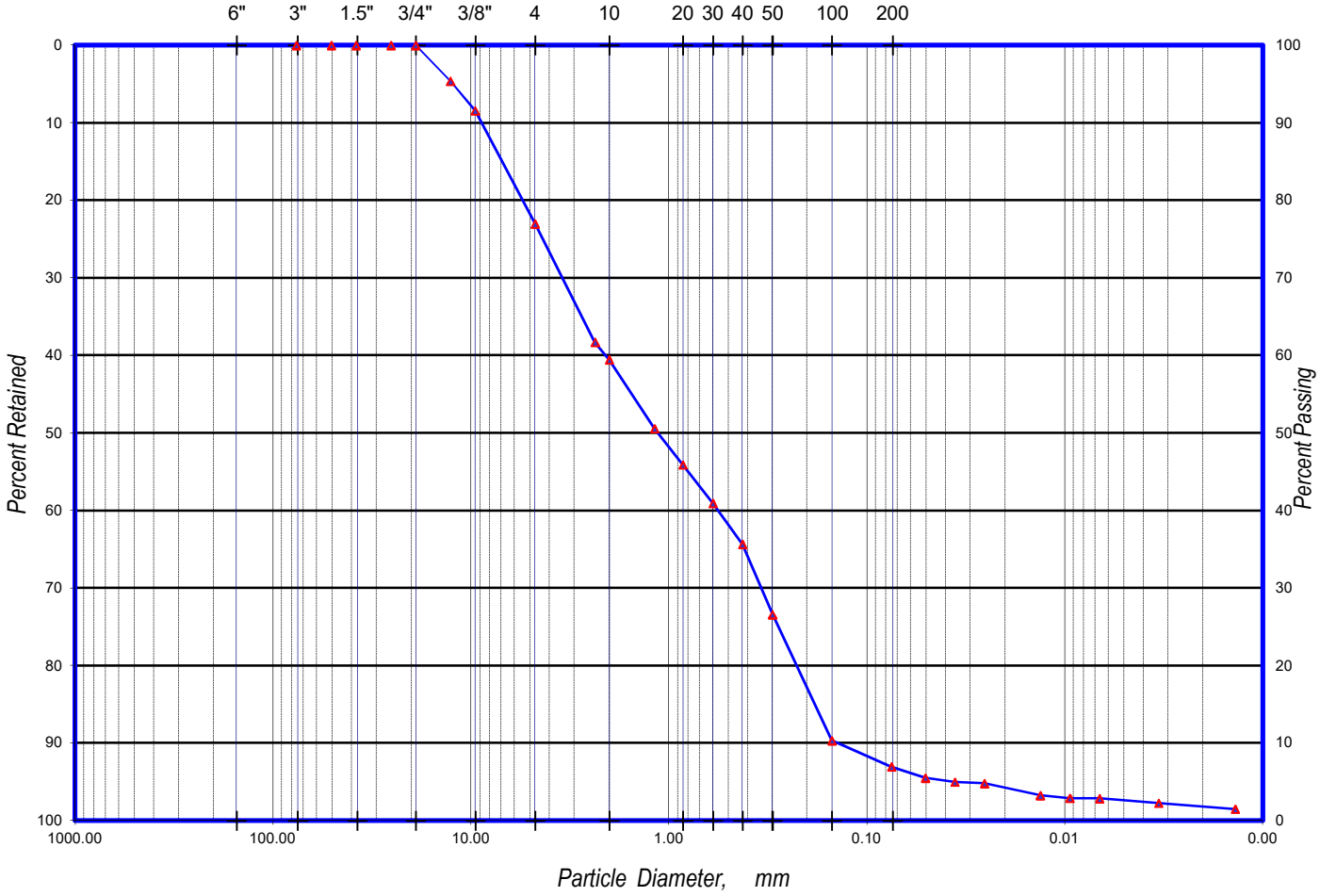
Project No: 2016.0096.300

Lab Sample No: **4308AP**

Project Name: MORGAN HILL SEWER TRUNK - GILROY 2017

Report Date: January 3, 2018

BOULDERS	COBBLES	GRAVEL		SAND			SILT AND CLAY
		COARSE	FINE	COARSE	MEDIUM	FINE	
US SIEVE SIZE, INCHES				US STANDARD SIEVE SIZE No.			HYDROMETER



Symbol	Sample ID	Description	% Gravel	% Sand	% Silt - Clay
▲	DH-10A @ 28.0'	Light Brown Poorly Graded Sand with Silt & Gravel (SP-SM)	23.0	70.0	6.9

Size Passing, mm D_{60} = 2.09 D_{30} = 0.35 D_{10} = 0.14 5 micron (%) = 2

Coefficient of Curvature, C_c: 0.40 Coefficient of Uniformity, C_u: 14.60 Fineness Modulus = 3.41

Note: * Percentages are +/- 0.1% based on computer rounding as allowed by ASTM D-6026-01 Section 5.2.3.

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the sample supplied and tested for the above referenced job

PARTICLE SIZE ANALYSIS

Test Report

ASTM D-6913 / D-7928, (replacing D-422)
Method A: (+/-1%)

Client : PACIFIC GEOTECHNICAL ENGINEERING

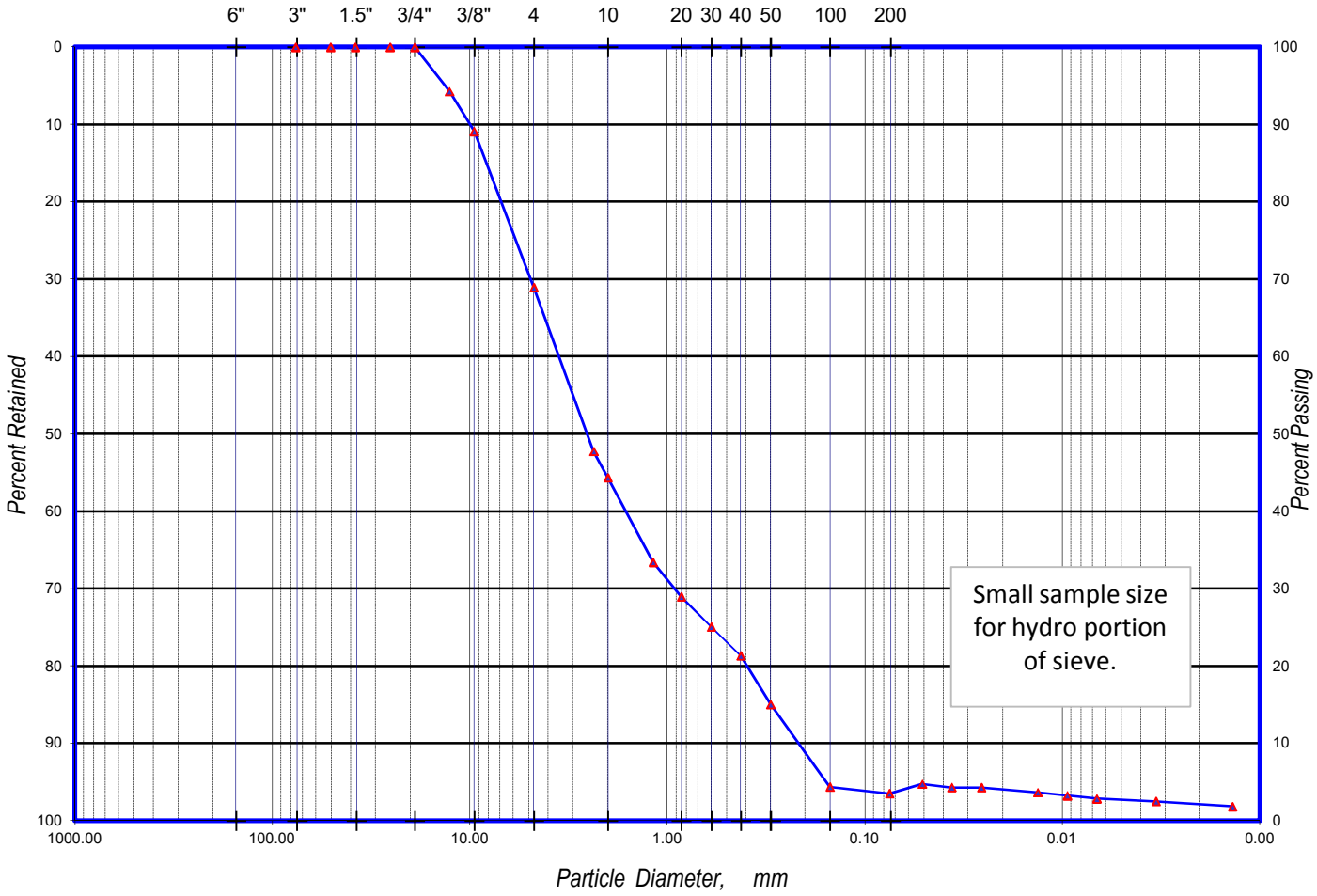
Project No: 2016.0096.300

Lab Sample No: **4308AQ**

Project Name: MORGAN HILL SEWER TRUNK - GILROY 2017

Report Date: January 11, 2018

BOULDERS	COBBLES	GRAVEL		SAND			SILT AND CLAY
		COARSE	FINE	COARSE	MEDIUM	FINE	
US SIEVE SIZE, INCHES				US STANDARD SIEVE SIZE No.			HYDROMETER



Symbol	Sample ID	Description	% Gravel	% Sand	% Silt - Clay
▲	DH-10A @ 29.0-30.0	Light Brown Well Graded Sand w/ Gravel (SW)	31.1	65.4	3.5

Size Passing, mm D_{60} = 3.74 D_{30} = 0.93 D_{10} = 0.23 5 micron (%) = 3

Coefficient of Curvature, C_c: 1.00 Coefficient of Uniformity, C_u: 16.32 Fineness Modulus = 4.16

Note: * Percentages are +/- 0.1% based on computer rounding as allowed by ASTM D-6026-01 Section 5.2.3.

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the sample supplied and tested for the above referenced job

PARTICLE SIZE ANALYSIS

Test Report

ASTM D-6913 / D-7928, (replacing D-422)
Method A: (+/-1%)

Client : PACIFIC GEOTECHNICAL ENGINEERING

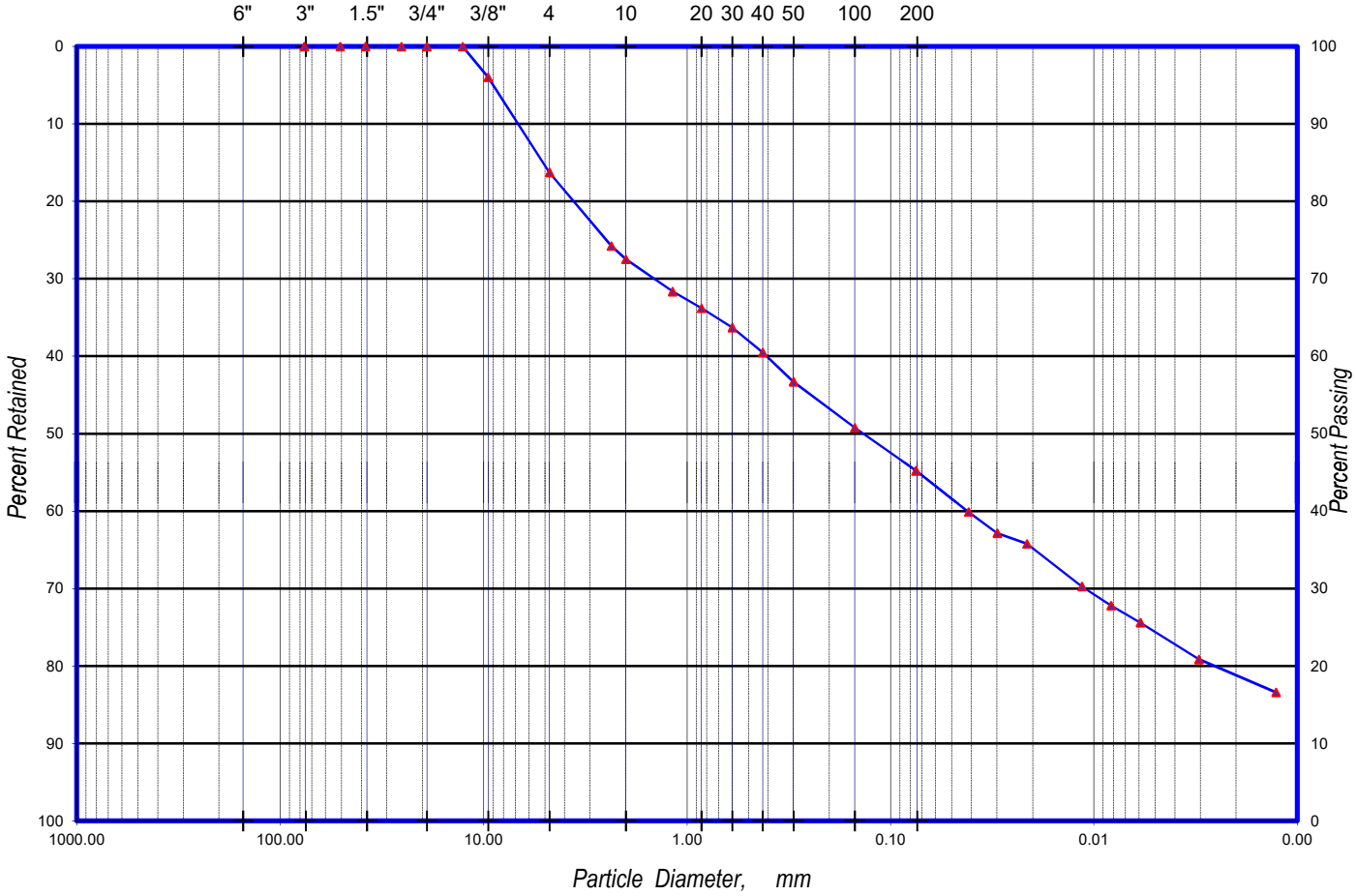
Project No: 2016.0096.300

Lab Sample No: **4308AR**

Project Name: MORGAN HILL SEWER TRUNK - GILROY 2017

Report Date: January 11, 2018

BOULDERS	COBBLES	GRAVEL		SAND			SILT AND CLAY
		COARSE	FINE	COARSE	MEDIUM	FINE	
US SIEVE SIZE, INCHES				US STANDARD SIEVE SIZE No.			HYDROMETER



Symbol	Sample ID	* Description	% Gravel	% Sand	% Silt - Clay
▲	DH-10A @ 32.0-33.0'	Brown Silty Clayey Sand with Gravel	16.2	38.5	45.2

Size Passing, mm D_{60} = 0.41 D_{30} = 0.01 D_{10} = N/A 5 micron (%) = 24

Coefficient of Curvature, C_c: N/A Coefficient of Uniformity, C_u: N/A Fineness Modulus = 2.06

* Visual Classification based on ASTM D-2488

Note: * Percentages are +/- 0.1% based on computer rounding as allowed by ASTM D-6026-01 Section 5.2.3.

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the samples supplied and tested for the above referenced job.

L : Labexcel \ Projects \ Client \ Client Name \ 4308 \ 4308AR-ma

Print Date: 01/11/18

Entered By: JL

Reviewed By: KH

LSN: **4308AR**

DCN: MA-rp (rev. 6/27/12)

Figure B-59

PARTICLE SIZE ANALYSIS

Test Report

ASTM D-6913 / D-7928, (replacing D-422)
Method A: (+/-1%)

Client : PACIFIC GEOTECHNICAL ENGINEERING

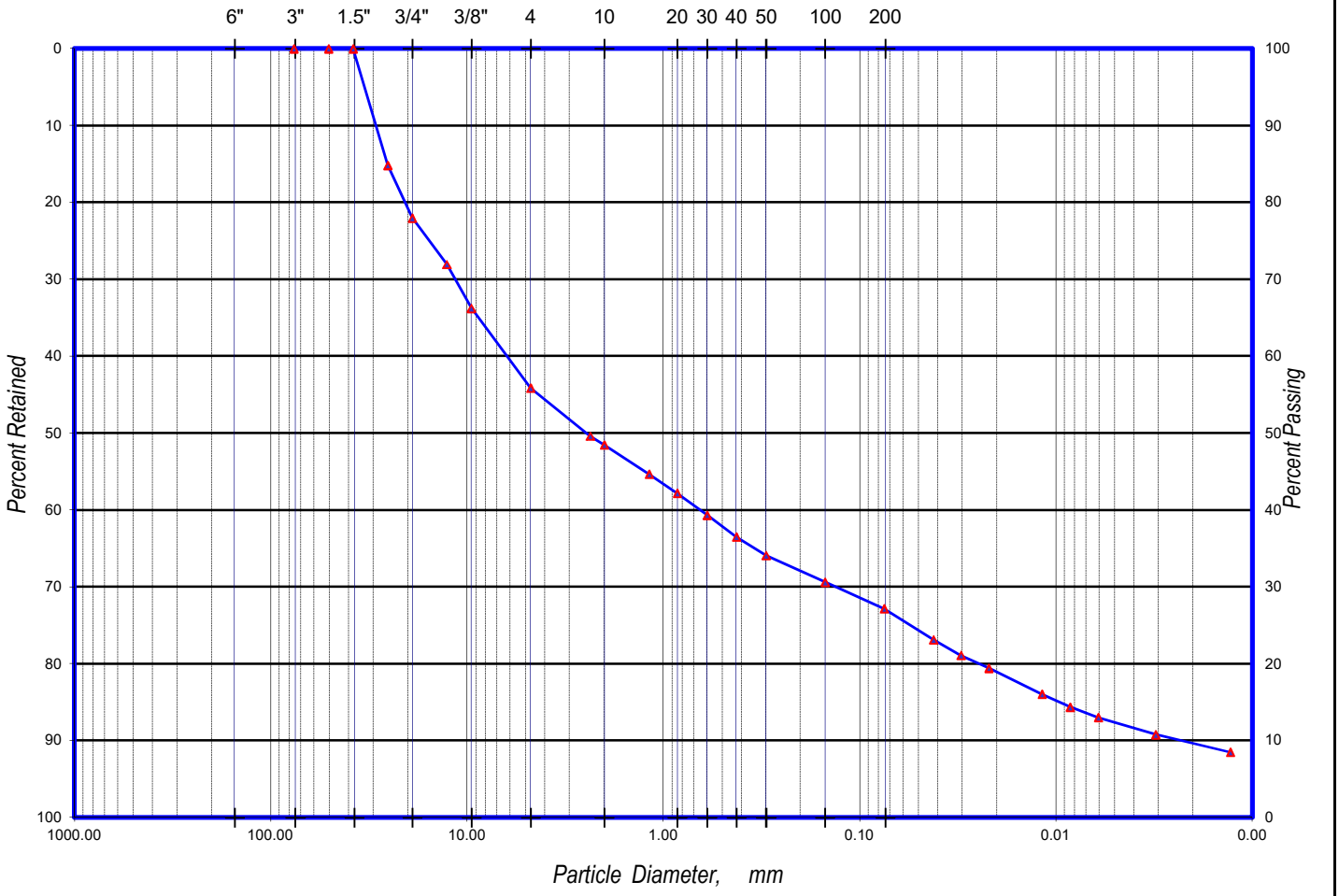
Project No: 2016.0096.300

Lab Sample No: **4308AV**

Project Name: MORGAN HILL SEWER TRUNK - GILROY 2017

Report Date: January 11, 2018

BOULDERS	COBBLES	GRAVEL		SAND			SILT AND CLAY
		COARSE	FINE	COARSE	MEDIUM	FINE	
US SIEVE SIZE, INCHES				US STANDARD SIEVE SIZE No.			HYDROMETER



Symbol	Sample ID	* Description	% Gravel	% Sand	% Silt - Clay
▲	DH-11A @ 22.0'	Brown Silty Clayey Gravel with Sand	44.1	28.7	27.1

Size Passing, mm D_{60} = 6.66 D_{30} = 0.14 D_{10} = 0.00 5 micron (%) = 13

Coefficient of Curvature, C_c: 1.13 Coefficient of Uniformity, C_u: 2661.01 Fineness Modulus = 4.02

* Visual Classification based on ASTM D-2488

Note: * Percentages are +/- 0.1% based on computer rounding as allowed by ASTM D-6026-01 Section 5.2.3.

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the sample supplied and tested for the above referenced job

PARTICLE SIZE ANALYSIS

Test Report

ASTM D-6913 / D-7928, (replacing D-422)
Method A: (+/-1%)

Geo-Logic ASSOCIATES

Client : PACIFIC GEOTECHNICAL ENGINEERING

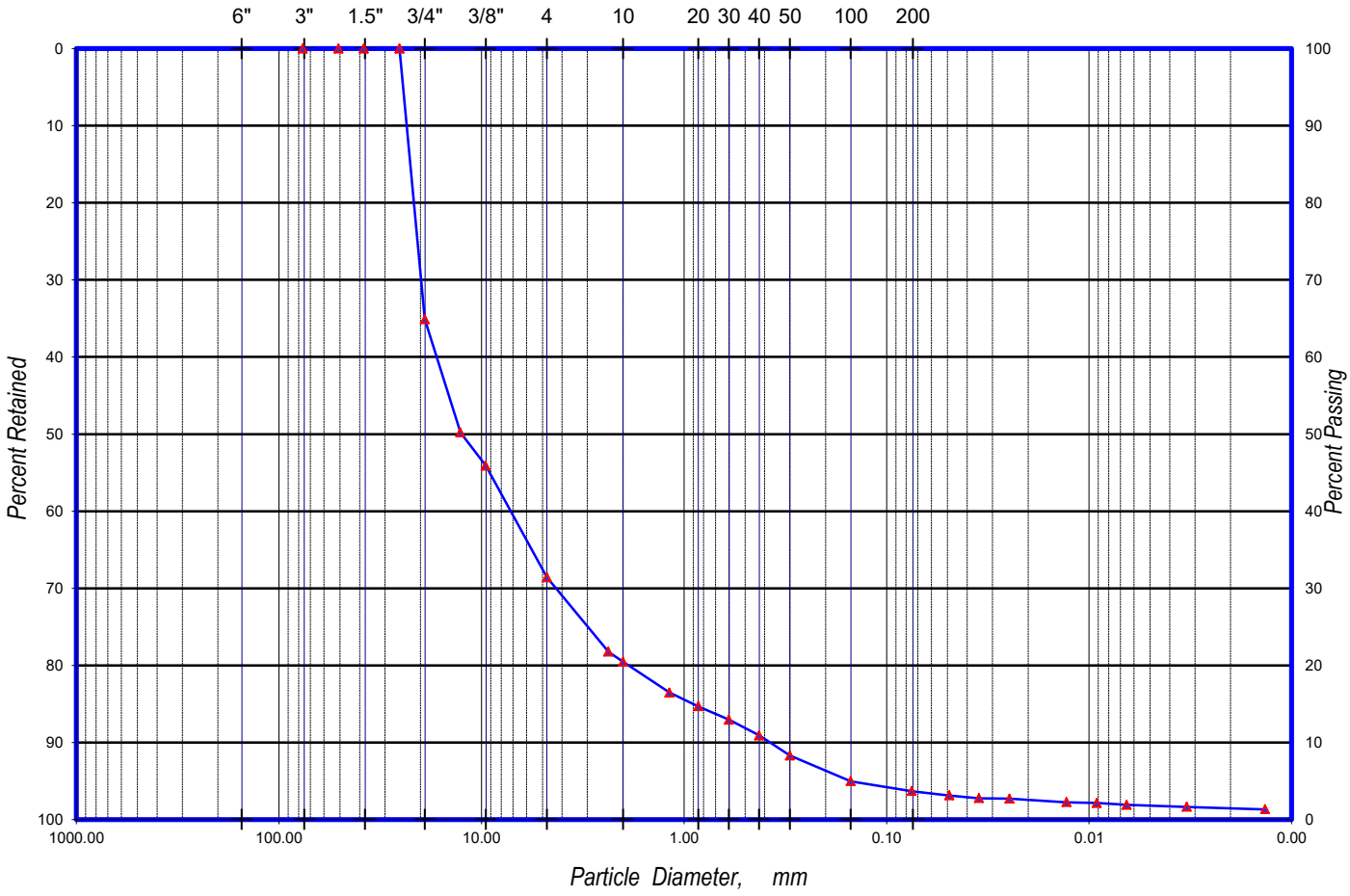
Project No: 2016.0096.300

Lab Sample No: **4308BY**

Project Name: MORGAN HILL SEWER TRUNK - GILROY 2017

Report Date: January 3, 2018

BOULDERS	COBBLES	GRAVEL		SAND			SILT AND CLAY
		COARSE	FINE	COARSE	MEDIUM	FINE	
US SIEVE SIZE, INCHES				US STANDARD SIEVE SIZE No.			HYDROMETER



Symbol	Sample ID	Description	% Gravel	% Sand	% Silt - Clay
▲	DH-11A @ 24.5-25.0'	Brown Well Graded Gravel with Sand (GW)	68.6	27.7	3.7

Size Passing, mm D_{60} = 16.93 D_{30} = 4.40 D_{10} = 0.38 5 micron (%) = 2

Coefficient of Curvature, C_c: 3.00 Coefficient of Uniformity, C_u: 44.38 Fineness Modulus = 5.93

Note: * Percentages are +/- 0.1% based on computer rounding as allowed by ASTM D-6026-01 Section 5.2.3.

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the samples supplied and tested for the above referenced job.

PARTICLE SIZE ANALYSIS

Test Report

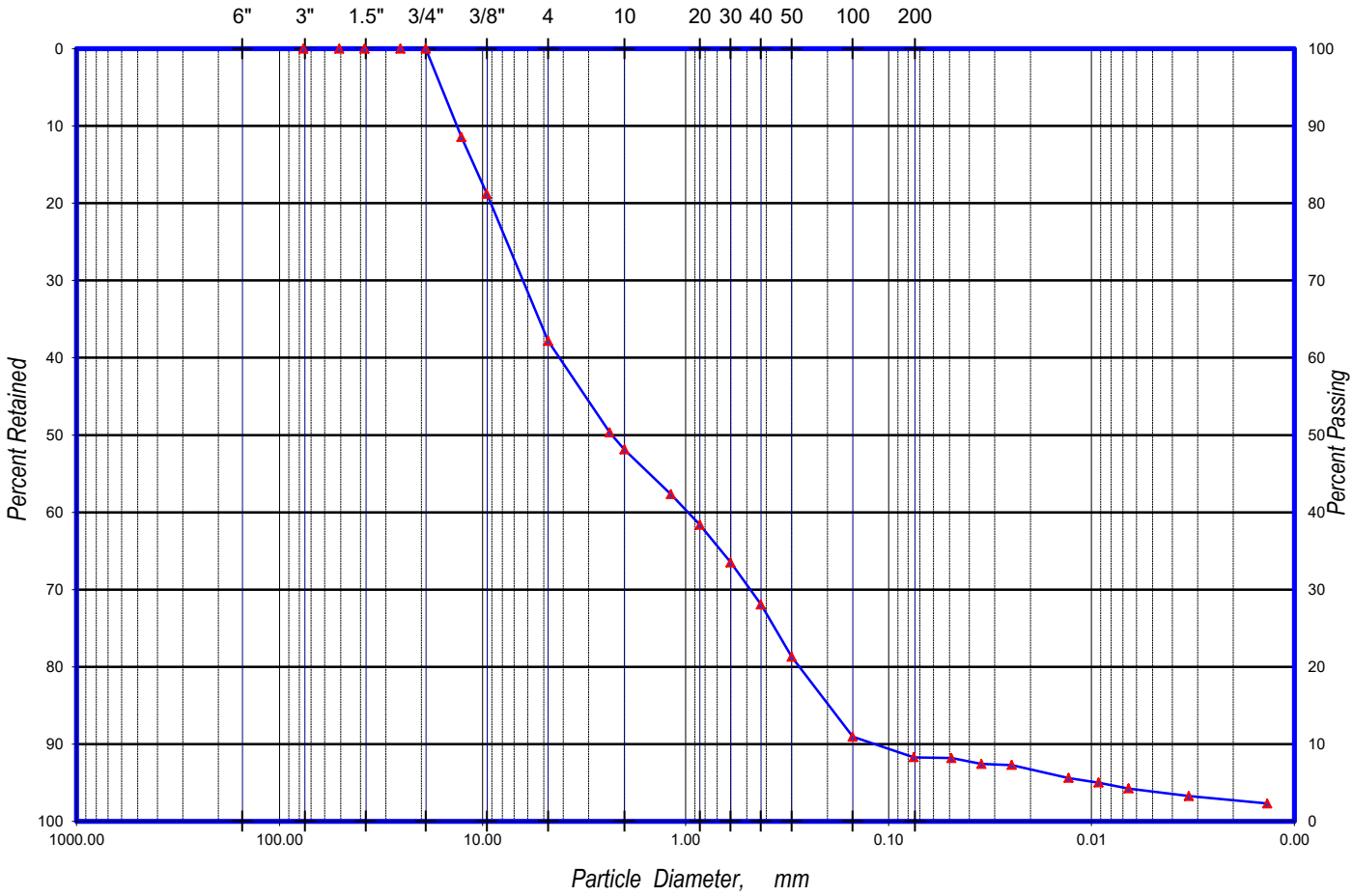
ASTM D-6913 / D-7928, (replacing D-422)
Method A: (+/-1%)

Geo-Logic ASSOCIATES

Client :	Project No:	Lab Sample No:
PACIFIC GEOTECHNICAL ENGINEERING	2016.0096.300	**4308AW**

Project Name:	Report Date:
MORGAN HILL SEWER TRUNK - GILROY 2017	January 3, 2018

BOULDERS	COBBLES	GRAVEL		SAND			SILT AND CLAY
		COARSE	FINE	COARSE	MEDIUM	FINE	
US SIEVE SIZE, INCHES				US STANDARD SIEVE SIZE No.			HYDROMETER



Symbol	Sample ID	Description	% Gravel	% Sand	% Silt - Clay
▲	DH-11A @ 28.0'	Dark Brown Poorly Graded Sand with Silt and Gravel (SP-SM)	37.8	53.9	8.3

Size Passing, mm D_{60} = 4.31 D_{30} = 0.49 D_{10} = 0.12 5 micron (%) = 3

Coefficient of Curvature, C_c: 0.45 Coefficient of Uniformity, C_u: 34.96 Fineness Modulus = 3.98

Note: * Percentages are +/- 0.1% based on computer rounding as allowed by ASTM D-6026-01 Section 5.2.3.

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the samples supplied and tested for the above referenced job.

PARTICLE SIZE ANALYSIS

Test Report

ASTM D-6913 / D-7928, (replacing D-422)
Method A: (+/-1%)

Client : PACIFIC GEOTECHNICAL ENGINEERING

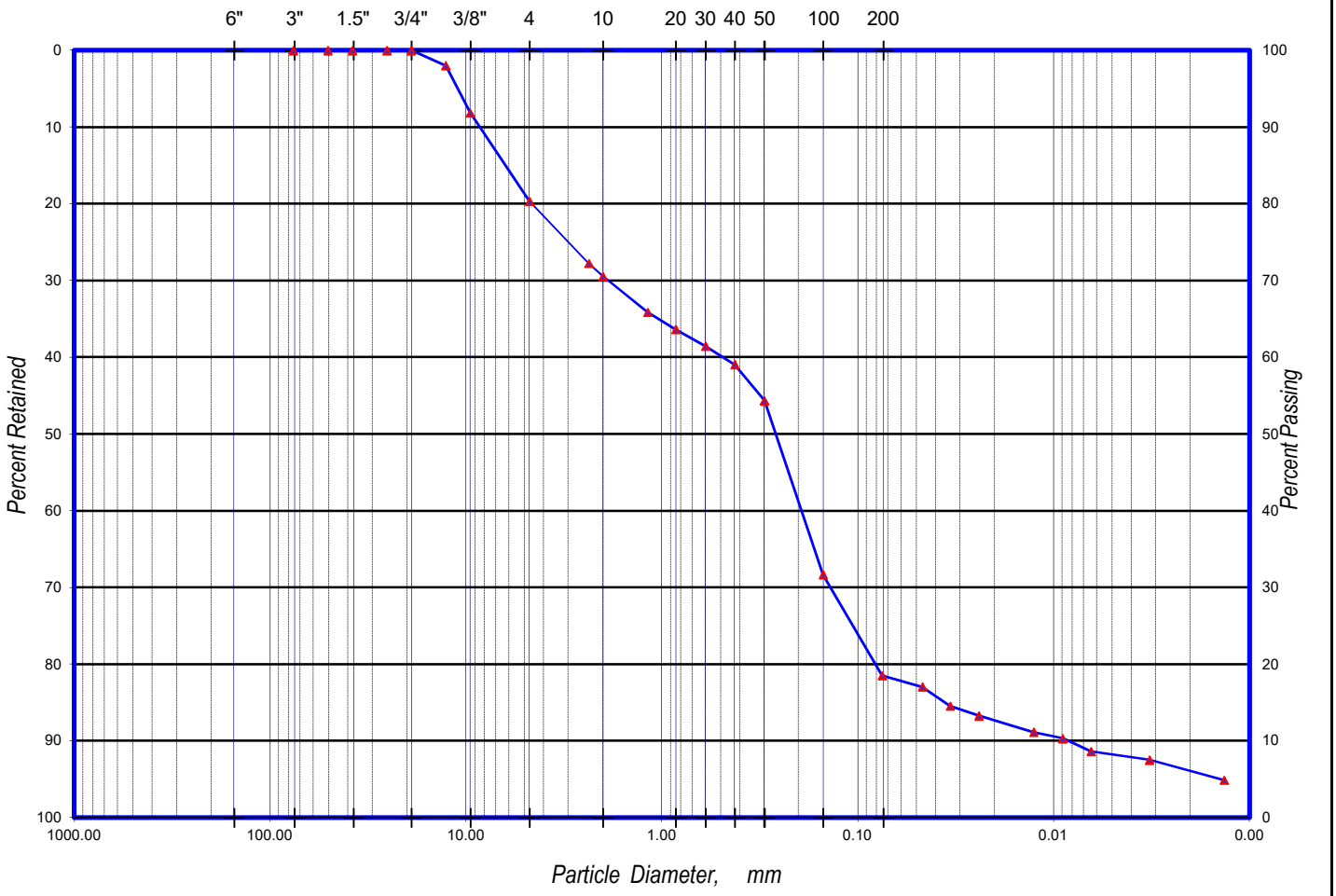
Project No: 2016.0096.300

Lab Sample No: **4308AX**

Project Name: MORGAN HILL SEWER TRUNK - GILROY 2017

Report Date: January 3, 2018

BOULDERS	COBBLES	GRAVEL		SAND			SILT AND CLAY
		COARSE	FINE	COARSE	MEDIUM	FINE	
US SIEVE SIZE, INCHES				US STANDARD SIEVE SIZE No.			HYDROMETER



Symbol	Sample ID	Description	% Gravel	% Sand	% Silt - Clay
▲	DH-11A @ 31.0'	Light Brown Silty Sand with Gravel (SM)	19.7	61.9	18.5

Size Passing, mm D_{60} = 0.49 D_{30} = 0.14 D_{10} = 0.01 5 micron (%) = 8

Coefficient of Curvature, C_c: 4.68 Coefficient of Uniformity, C_u: 57.91 Fineness Modulus = 2.42

Note: * Percentages are +/- 0.1% based on computer rounding as allowed by ASTM D-6026-01 Section 5.2.3.

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the sample supplied and tested for the above referenced job

PARTICLE SIZE ANALYSIS

Test Report

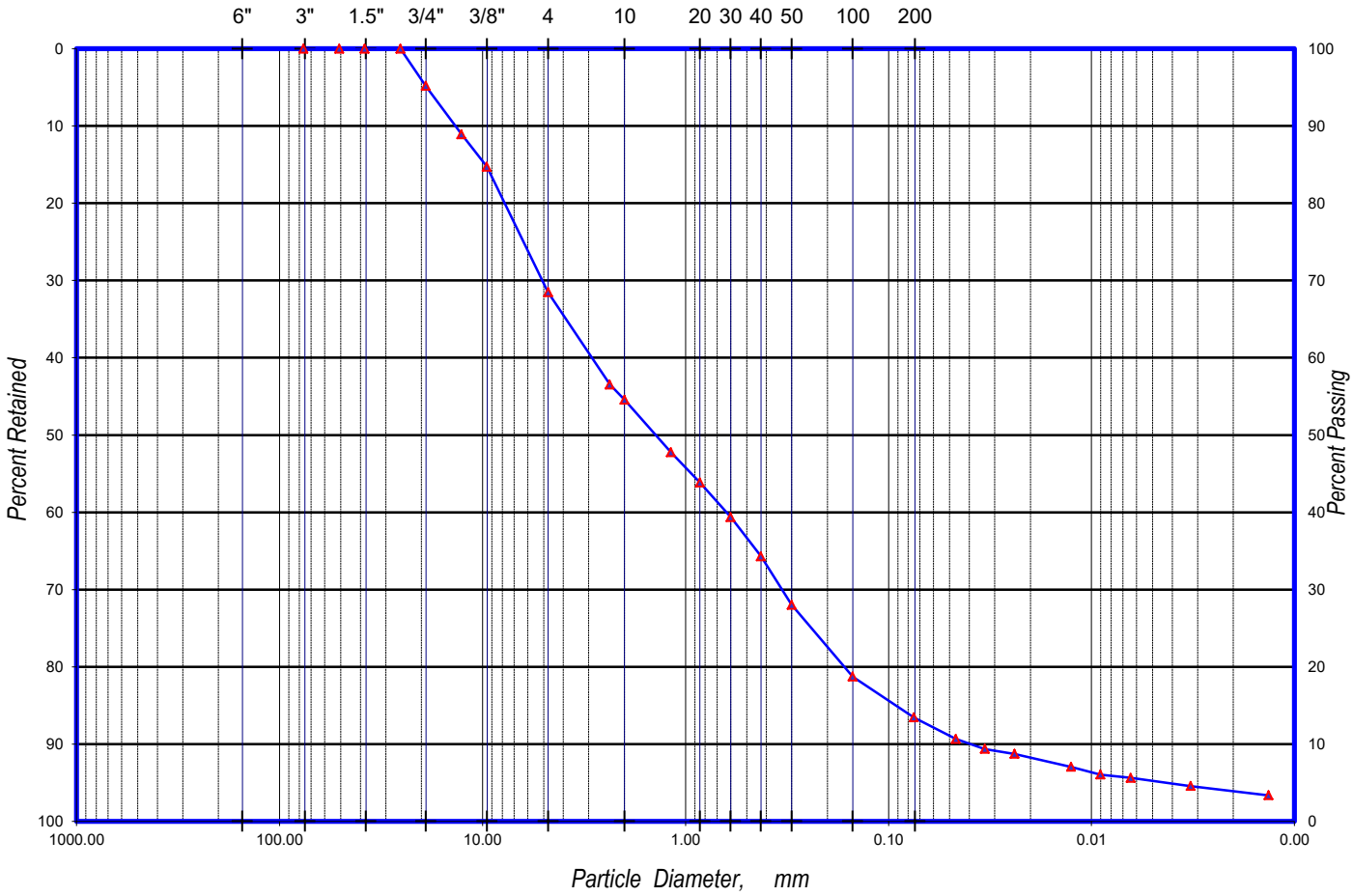
ASTM D-6913 / D-7928, (replacing D-422)
Method A: (+/-1%)

Geo-Logic ASSOCIATES

Client :	Project No:	Lab Sample No:
PACIFIC GEOTECHNICAL ENGINEERING	2016.0096.300	**4308AY-1**

Project Name:	Report Date:
MORGAN HILL SEWER TRUNK - GILROY 2017	January 3, 2018

BOULDERS	COBBLES	GRAVEL		SAND			SILT AND CLAY
		COARSE	FINE	COARSE	MEDIUM	FINE	
US SIEVE SIZE, INCHES				US STANDARD SIEVE SIZE No.			HYDROMETER



Symbol	Sample ID	* Description	% Gravel	% Sand	% Silt - Clay
▲	DH-11A @ 32-33'	Brown Silty Clayey Sand with Gravel	31.5	55.0	13.4

Size Passing, mm D_{60} = 3.05 D_{30} = 0.34 D_{10} = 0.04 5 micron (%) = 5

Coefficient of Curvature, C_c: 0.94 Coefficient of Uniformity, C_u: 76.41 Fineness Modulus = 3.61

* Visual Classification based on ASTM D-2488

Note: * Percentages are +/- 0.1% based on computer rounding as allowed by ASTM D-6026-01 Section 5.2.3.

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the samples supplied and tested for the above referenced job.

PARTICLE SIZE ANALYSIS

Test Report

ASTM D-6913 / D-7928, (replacing D-422)
Method B:(+/-0.1%)

Client : PACIFIC GEOTECHNICAL ENGINEERING

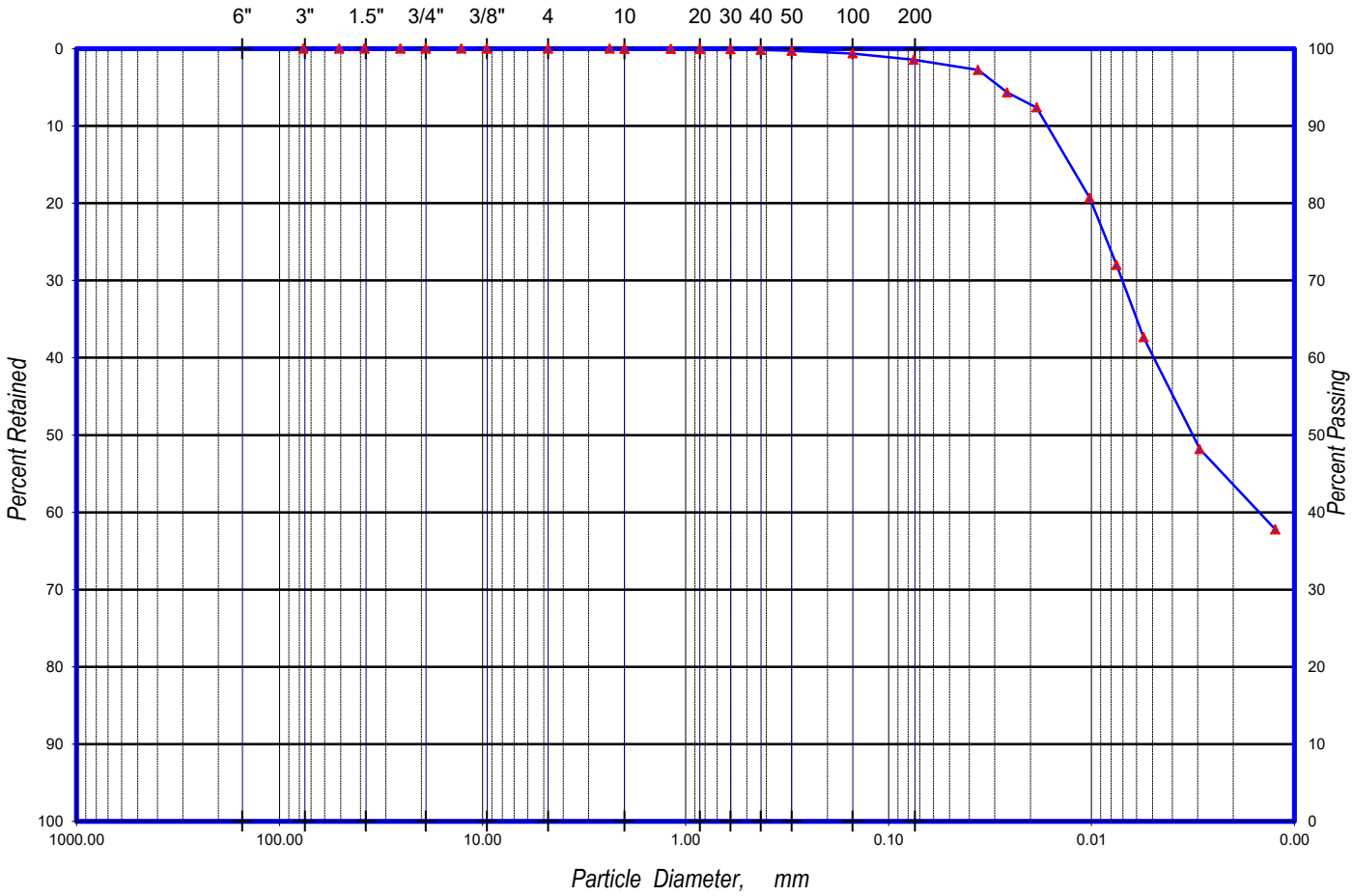
Project No: 2016.0096.300

Lab Sample No: **4308AY**

Project Name: MORGAN HILL SEWER TRUNK - GILROY 2017

Report Date: January 3, 2018

BOULDERS	COBBLES	GRAVEL		SAND			SILT AND CLAY
		COARSE	FINE	COARSE	MEDIUM	FINE	
US SIEVE SIZE, INCHES				US STANDARD SIEVE SIZE No.			HYDROMETER



Symbol	Sample ID	* Description	% Gravel	% Sand	% Silt - Clay
▲	DH-11A @ 49.5'	Gray Brown Clay	0.0	1.4	98.6

Size Passing, mm D_{60} = 0.01 D_{30} = N/A D_{10} = N/A 5 micron (%) = 60

Coefficient of Curvature, C_c: N/A Coefficient of Uniformity, C_u: N/A Fineness Modulus = 0.01

* Visual Classification based on ASTM D-2488

Note: * Percentages are +/- 0.1% based on computer rounding as allowed by ASTM D-6026-01 Section 5.2.3.

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the samples supplied and tested for the above referenced job.

PARTICLE SIZE ANALYSIS

Test Report

ASTM D-6913 / D-7928, (replacing D-422)
Method A: (+/-1%)

Client : PACIFIC GEOTECHNICAL ENGINEERING

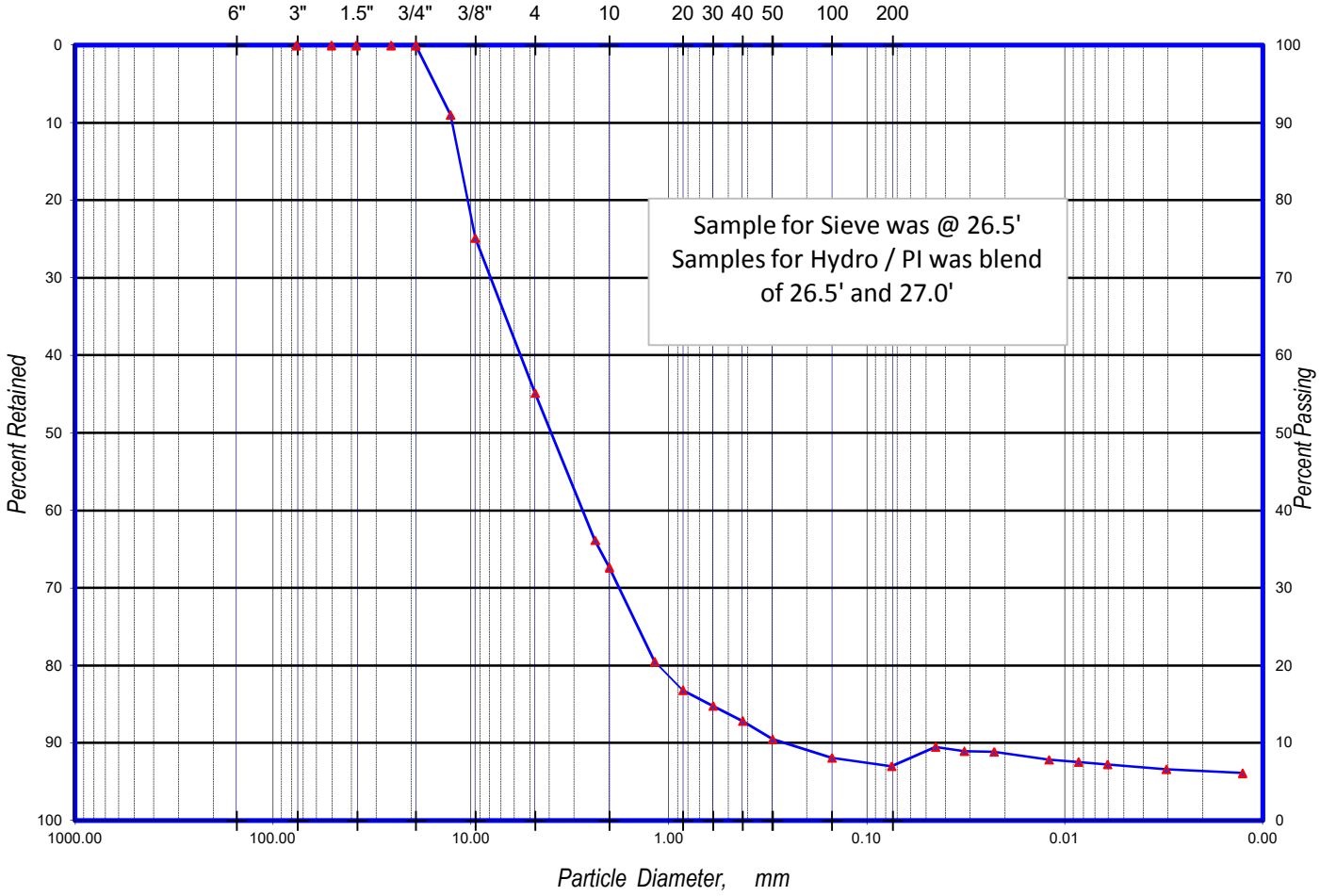
Project No: 2016.0096.300

Lab Sample No: **4308BD**

Project Name: MORGAN HILL SEWER TRUNK - GILROY 2017

Report Date: January 3, 2018

BOULDERS	COBBLES	GRAVEL		SAND			SILT AND CLAY
		COARSE	FINE	COARSE	MEDIUM	FINE	
US SIEVE SIZE, INCHES				US STANDARD SIEVE SIZE No.			HYDROMETER



Symbol	Sample ID	Description	% Gravel	% Sand	% Silt - Clay
▲	DH-16A @ 26.5-27.0	Light Brown Well Graded Sand with Clay and Gravel (SW-SC)	44.9	48.1	7.0

Size Passing, mm D_{60} = 5.91 D_{30} = 1.82 D_{10} = 0.27 5 micron (%) = 7

Coefficient of Curvature, C_c: 2.09 Coefficient of Uniformity, C_u: 22.05 Fineness Modulus = 4.80

Note: * Percentages are +/- 0.1% based on computer rounding as allowed by ASTM D-6026-01 Section 5.2.3.

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the sample supplied and tested for the above referenced job

PARTICLE SIZE ANALYSIS

Test Report

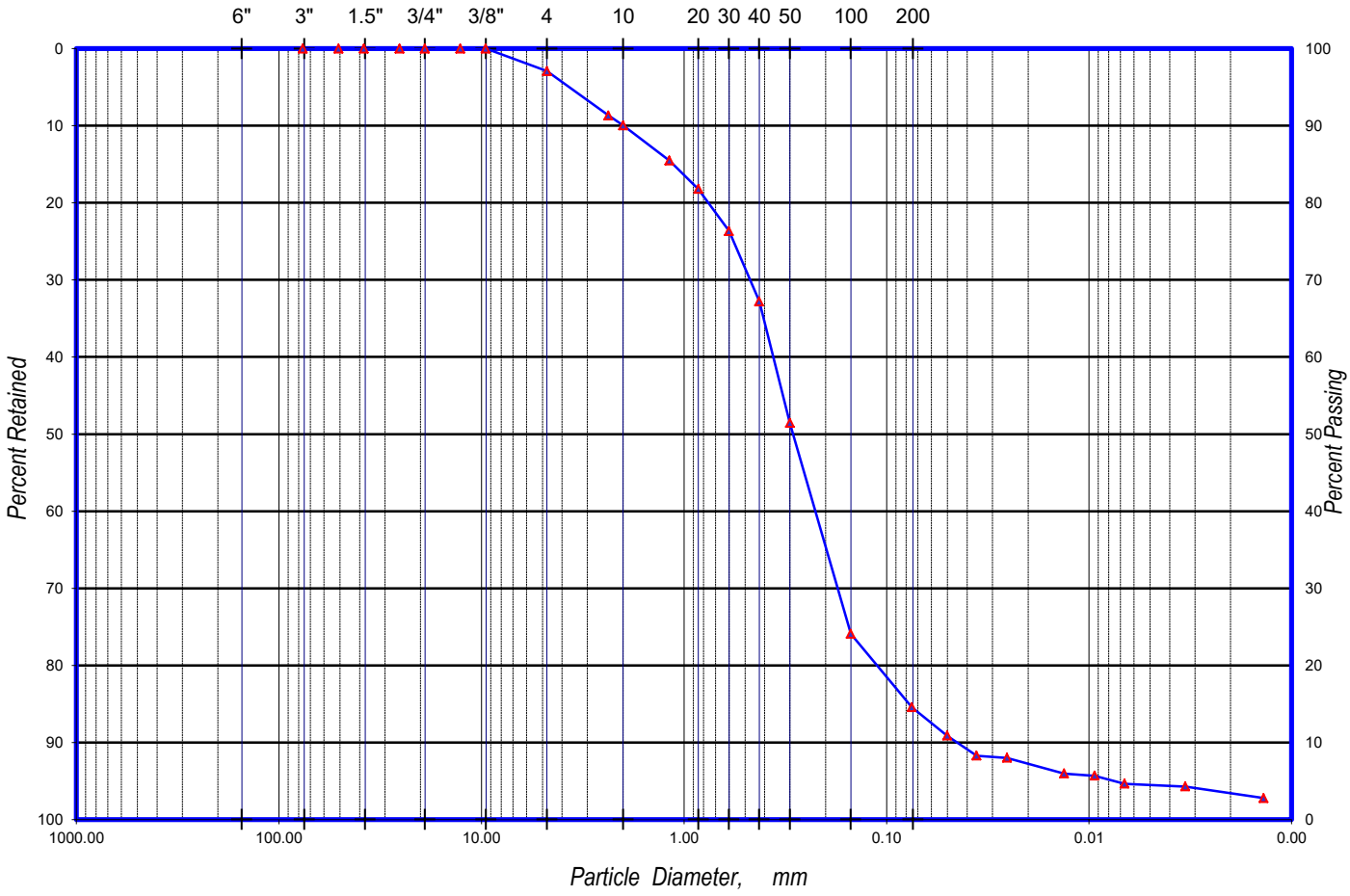
ASTM D-6913 / D-7928, (replacing D-422)
Method A: (+/-1%)

Geo-Logic ASSOCIATES

Client :	Project No:	Lab Sample No:
PACIFIC GEOTECHNICAL ENGINEERING	2016.0096.300	**4308BE**

Project Name:	Report Date:
MORGAN HILL SEWER TRUNK - GILROY 2017	January 3, 2018

BOULDERS	COBBLES	GRAVEL		SAND			SILT AND CLAY
		COARSE	FINE	COARSE	MEDIUM	FINE	
US SIEVE SIZE, INCHES				US STANDARD SIEVE SIZE No.			HYDROMETER



Symbol	Sample ID	Description	% Gravel	% Sand	% Silt - Clay
▲	DH-16A @ 30.0'	Brown Silty Sand (SM)	2.9	82.5	14.6

Size Passing, mm D_{60} = 0.37 D_{30} = 0.18 D_{10} = 0.05 5 micron (%) = 4

Coefficient of Curvature, C_c: 2.00 Coefficient of Uniformity, C_u: 8.12 Fineness Modulus = 1.74

Note: * Percentages are +/- 0.1% based on computer rounding as allowed by ASTM D-6026-01 Section 5.2.3.

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the samples supplied and tested for the above referenced job.

PARTICLE SIZE ANALYSIS

Test Report

ASTM D-6913 / D-7928, (replacing D-422)
Method A: (+/-1%)

Client : PACIFIC GEOTECHNICAL ENGINEERING

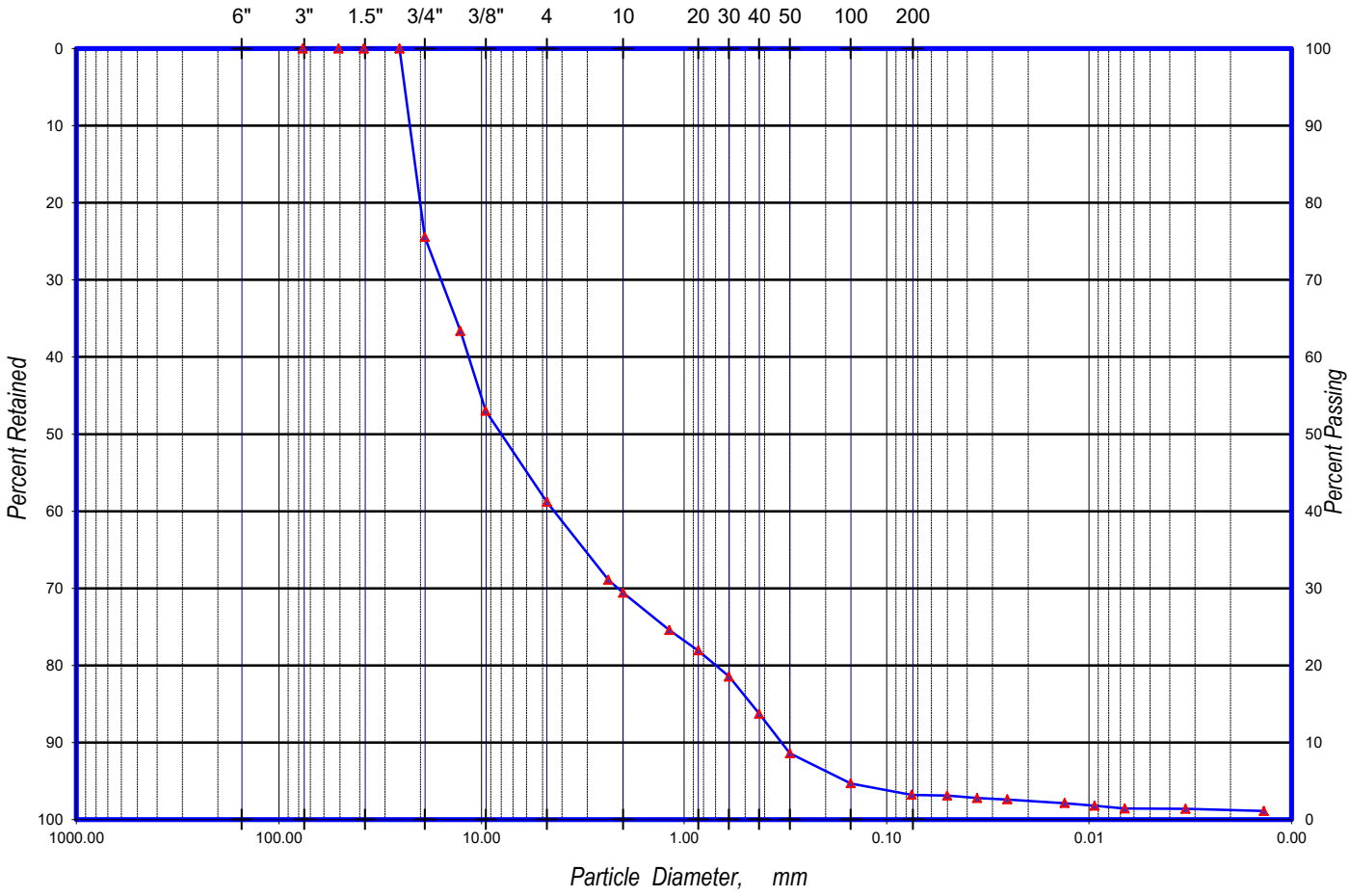
Project No: 2016.0096.300

Lab Sample No: **4308BF**

Project Name: MORGAN HILL SEWER TRUNK - GILROY 2017

Report Date: January 3, 2018

BOULDERS	COBBLES	GRAVEL		SAND			SILT AND CLAY
		COARSE	FINE	COARSE	MEDIUM	FINE	
US SIEVE SIZE, INCHES				US STANDARD SIEVE SIZE No.			HYDROMETER



Symbol	Sample ID	Description	% Gravel	% Sand	% Silt - Clay
▲	DH-16A @ 32.5'	Brown Well Graded Gravel with Sand (GW)	58.8	38.0	3.2

Size Passing, mm D_{60} = 11.67 D_{30} = 2.13 D_{10} = 0.33 5 micron (%) = 1

Coefficient of Curvature, C_c: 1.16 Coefficient of Uniformity, C_u: 34.87 Fineness Modulus = 5.43

Note: * Percentages are +/- 0.1% based on computer rounding as allowed by ASTM D-6026-01 Section 5.2.3.

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the samples supplied and tested for the above referenced job.

PARTICLE SIZE ANALYSIS

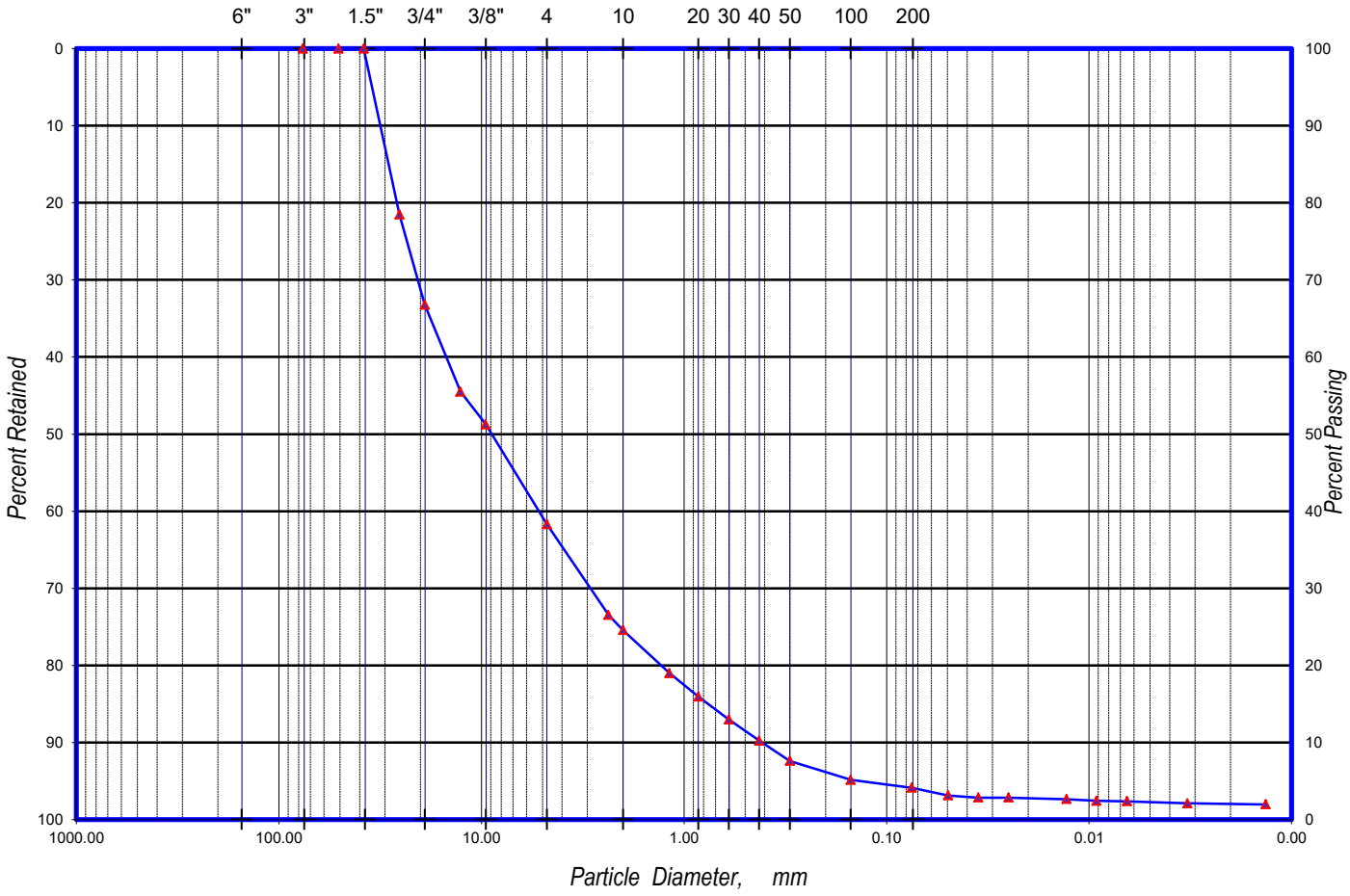
Test Report

ASTM D-6913 / D-7928, (replacing D-422)
Method A: (+/-1%)

Client :	Project No:	Lab Sample No:
PACIFIC GEOTECHNICAL ENGINEERING	2016.0096.300	**4308BL**

Project Name:	Report Date:
MORGAN HILL SEWER TRUNK - GILROY 2017	January 3, 2018

BOULDERS	COBBLES	GRAVEL		SAND			SILT AND CLAY
		COARSE	FINE	COARSE	MEDIUM	FINE	
US SIEVE SIZE, INCHES				US STANDARD SIEVE SIZE No.			HYDROMETER



Symbol	Sample ID	Description	% Gravel	% Sand	% Silt - Clay
▲	DH-17A @ 27.0'	Brown Well Graded Gravel with Sand (GW)	61.7	34.2	4.1

Size Passing, mm D_{60} = 15.24 D_{30} = 3.07 D_{10} = 0.41 5 micron (%) = 2

Coefficient of Curvature, C_c: 1.49 Coefficient of Uniformity, C_u: 36.79 Fineness Modulus = 5.72

Note: * Percentages are +/- 0.1% based on computer rounding as allowed by ASTM D-6026-01 Section 5.2.3.

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the samples supplied and tested for the above referenced job.

L : Labexcel \ Projects \ Client \ Client Name \ 4308 \ 4308BL-ma	Print Date:	Entered By:	Reviewed By:	LSN:
DCN: MA-rp (rev. 6/27/12)	01/05/18	JL	KH	**4308BL**

Figure B-69

PARTICLE SIZE ANALYSIS

Test Report

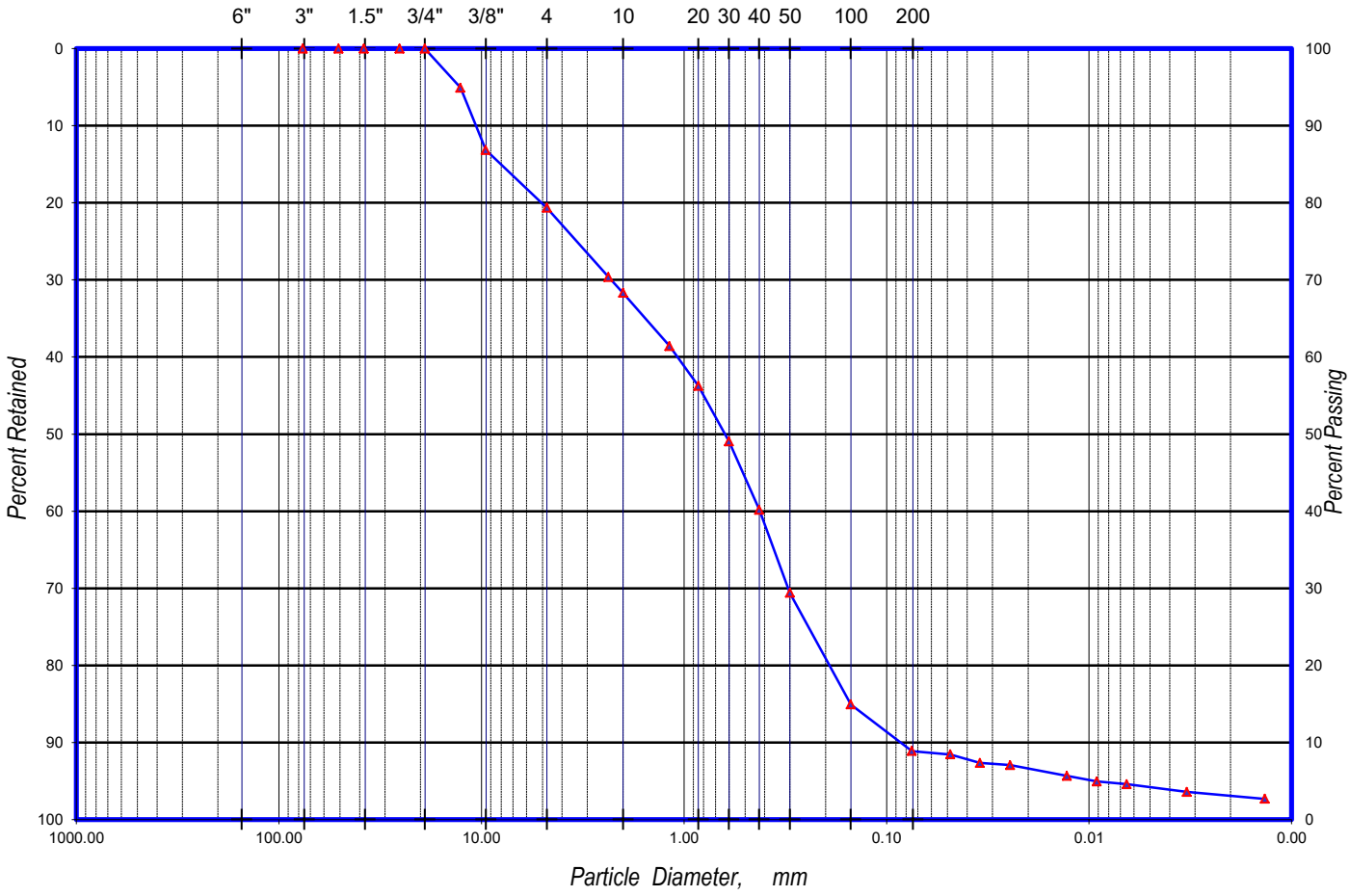
ASTM D-6913 / D-7928, (replacing D-422)
Method A: (+/-1%)

Geo-Logic ASSOCIATES

Client :	Project No:	Lab Sample No:
PACIFIC GEOTECHNICAL ENGINEERING	2016.0096.300	**4308BM**

Project Name:	Report Date:
MORGAN HILL SEWER TRUNK - GILROY 2017	January 3, 2018

BOULDERS	COBBLES	GRAVEL		SAND			SILT AND CLAY
		COARSE	FINE	COARSE	MEDIUM	FINE	
US SIEVE SIZE, INCHES				US STANDARD SIEVE SIZE No.			HYDROMETER



Symbol	Sample ID	Description	% Gravel	% Sand	% Silt - Clay
▲	DH-17A @ 30.0'	Brown Poorly Graded Sand with Silt and Gravel (SP-SM)	20.7	70.5	8.9

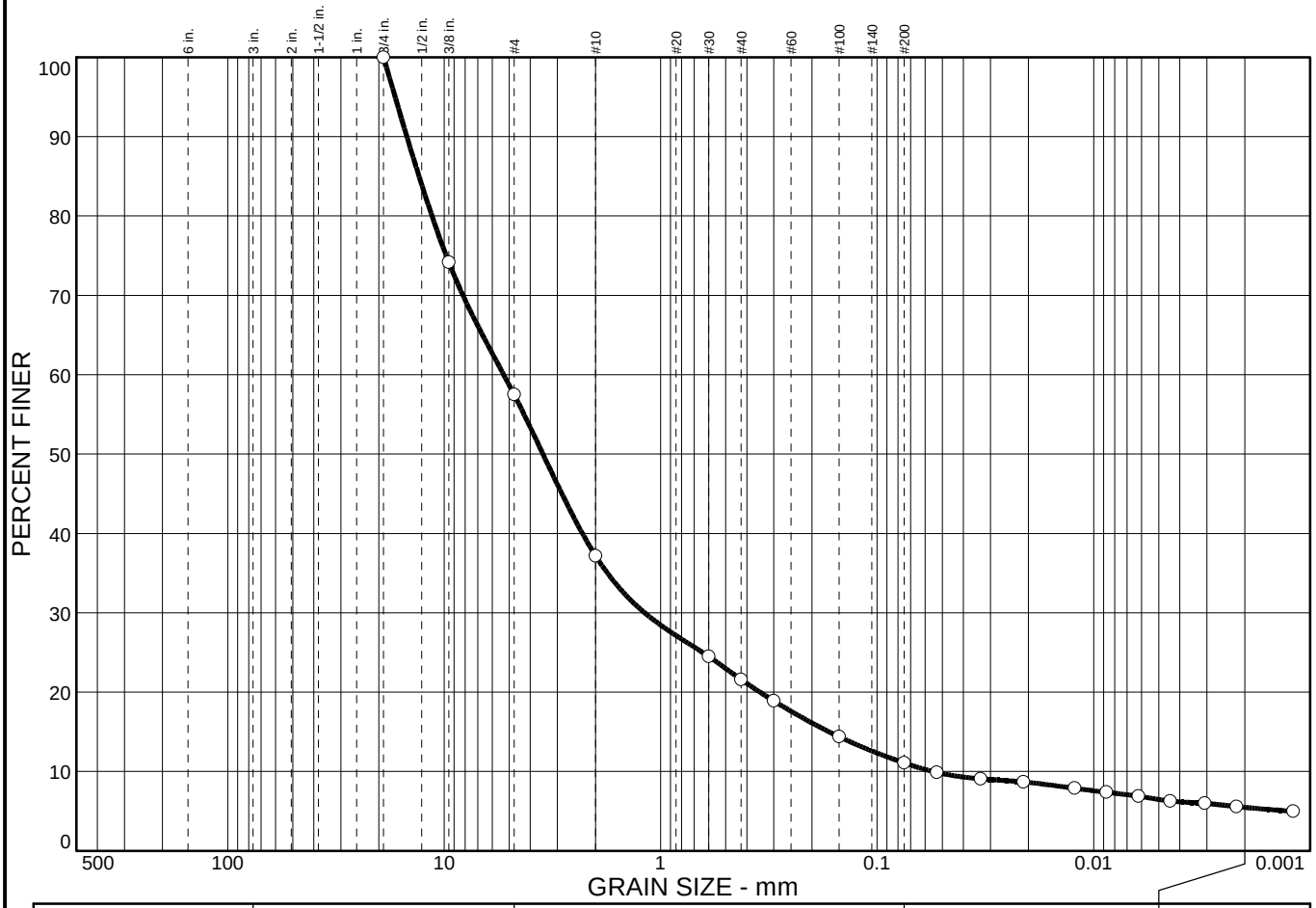
Size Passing, mm D_{60} = 1.09 D_{30} = 0.31 D_{10} = 0.09 5 micron (%) = 4

Coefficient of Curvature, C_c: 0.97 Coefficient of Uniformity, C_u: 12.25 Fineness Modulus = 3.09

Note: * Percentages are +/- 0.1% based on computer rounding as allowed by ASTM D-6026-01 Section 5.2.3.

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the samples supplied and tested for the above referenced job.

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	42.5	46.4	5.6	5.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
3/8 in.	74.2		
#4	57.5		
#10	37.2		
#30	24.5		
#40	21.6		
#50	18.9		
#100	14.4		
#200	11.1		
#270	9.9		
0.0332 mm.	9.1		
0.0211 mm.	8.7		
0.0122 mm.	7.9		
0.0087 mm.	7.4		
0.0062 mm.	6.9		
0.0044 mm.	6.3		
0.0031 mm.	6.0		
0.0022 mm.	5.6		
0.0012 mm.	5.0		

* (no specification provided)

Soil Description

Yellowish Brown Poorly Graded SAND w/ Clay & Gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 13.1 D_{60}= 5.30 D_{50}= 3.50
D_{30}= 1.19 D_{15}= 0.166 D_{10}= 0.0549
C_u= 96.58 C_c= 4.82

Classification

USCS= AASHTO=

Remarks

Sample No.: **Source of Sample:** DH-21A **Date:** 8/15/18
Location: **Elev./Depth:** 14-15'

COOPER TESTING LABORATORY

Client: Geo-Logic Associates
Project: MH Sewer Trunk - 2016.0096
Project No: 516-041 **Figure**

PARTICLE SIZE ANALYSIS

Test Report

ASTM D-6913 / D-7928, (replacing D-422)
Method A: (+/-1%)

Client : PACIFIC GEOTECHNICAL ENGINEERING

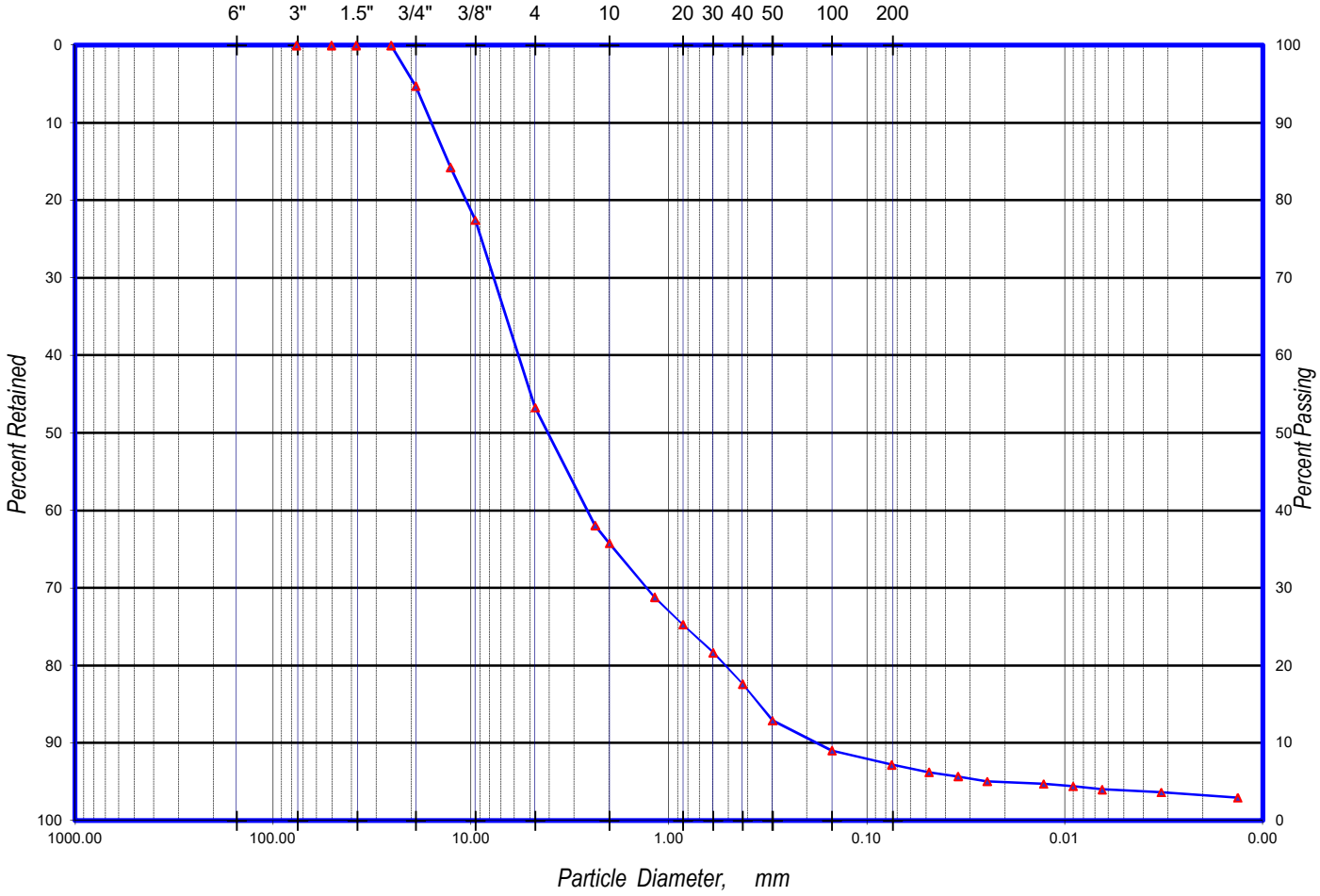
Project No: 2016.0096.300

Lab Sample No: **4308BN**

Project Name: MORGAN HILL SEWER TRUNK - GILROY 2017

Report Date: January 3, 2018

BOULDERS	COBBLES	GRAVEL		SAND			SILT AND CLAY
		COARSE	FINE	COARSE	MEDIUM	FINE	
US SIEVE SIZE, INCHES				US STANDARD SIEVE SIZE No.			HYDROMETER



Symbol	Sample ID	Description	% Gravel	% Sand	% Silt - Clay
▲	DH-17A @ 32.5'	Brown Well Graded Gravel with Silt and Sand	46.7	46.1	7.2

Size Passing, mm D_{60} = 6.08 D_{30} = 1.32 D_{10} = 0.19 5 micron (%) = 4

Coefficient of Curvature, C_c: 1.53 Coefficient of Uniformity, C_u: 32.37 Fineness Modulus = 4.64

Note: * Percentages are +/- 0.1% based on computer rounding as allowed by ASTM D-6026-01 Section 5.2.3.

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the sample supplied and tested for the above referenced job

PARTICLE SIZE ANALYSIS

Test Report

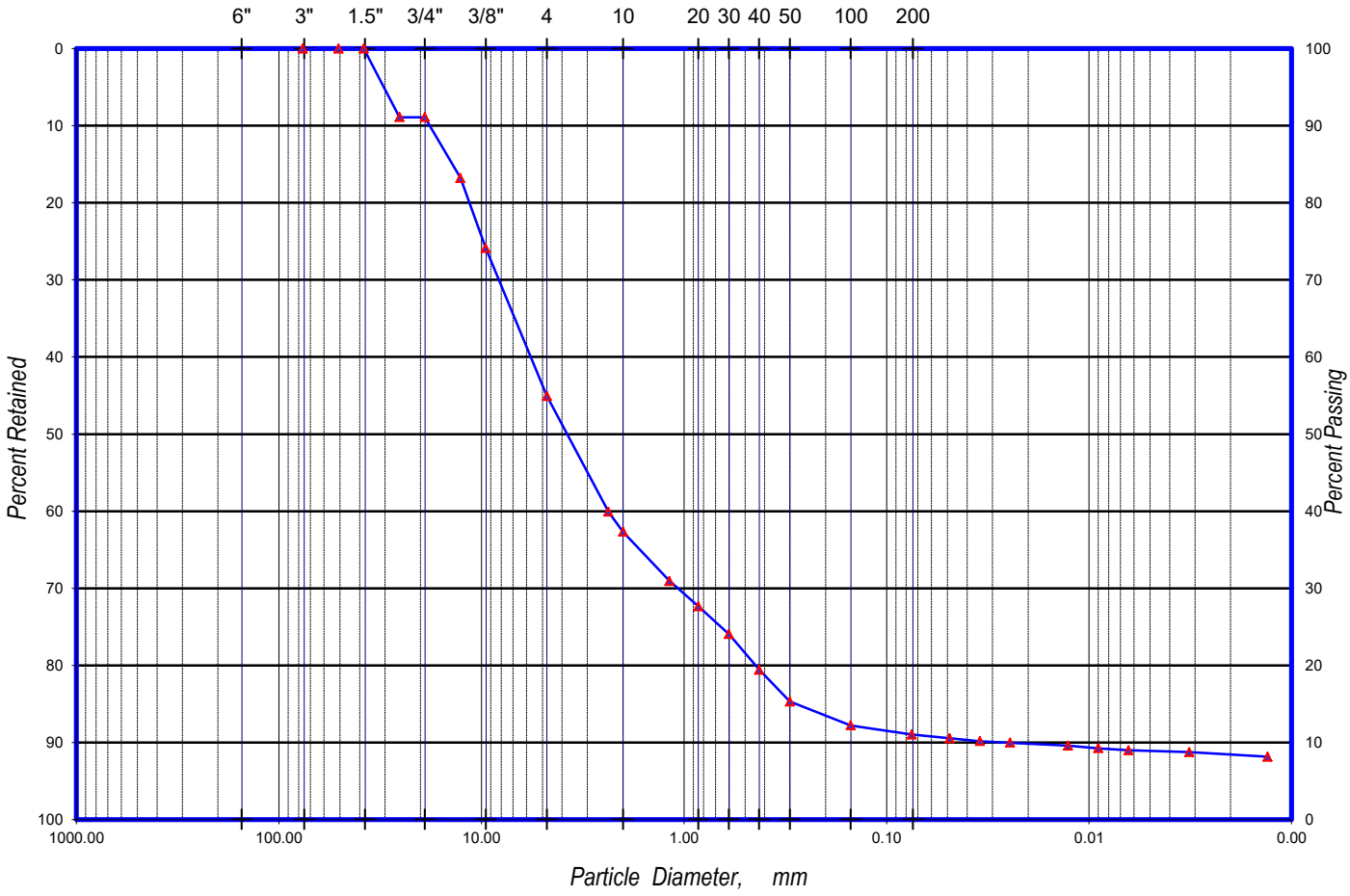
ASTM D-6913 / D-7928, (replacing D-422)
Method A: (+/-1%)

Geo-Logic ASSOCIATES

Client :	Project No:	Lab Sample No:
PACIFIC GEOTECHNICAL ENGINEERING	2016.0096.300	**4308BQ**

Project Name:	Report Date:
MORGAN HILL SEWER TRUNK - GILROY 2017	January 3, 2018

BOULDERS	COBBLES	GRAVEL		SAND			SILT AND CLAY
		COARSE	FINE	COARSE	MEDIUM	FINE	
US SIEVE SIZE, INCHES				US STANDARD SIEVE SIZE No.			HYDROMETER



Symbol	Sample ID	Description	% Gravel	% Sand	% Silt - Clay
▲	DH-20A @ 18.0'	Light Brown Poorly Graded Gravel with Sand and Clay (GP-GC)	45.1	43.9	11.0

Size Passing, mm D_{60} = 6.01 D_{30} = 1.09 D_{10} = 0.03 5 micron (%) = 9

Coefficient of Curvature, C_c: 7.45 Coefficient of Uniformity, C_u: 228.63 Fineness Modulus = 4.57

Note: * Percentages are +/- 0.1% based on computer rounding as allowed by ASTM D-6026-01 Section 5.2.3.

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the samples supplied and tested for the above referenced job.

PARTICLE SIZE ANALYSIS

Test Report

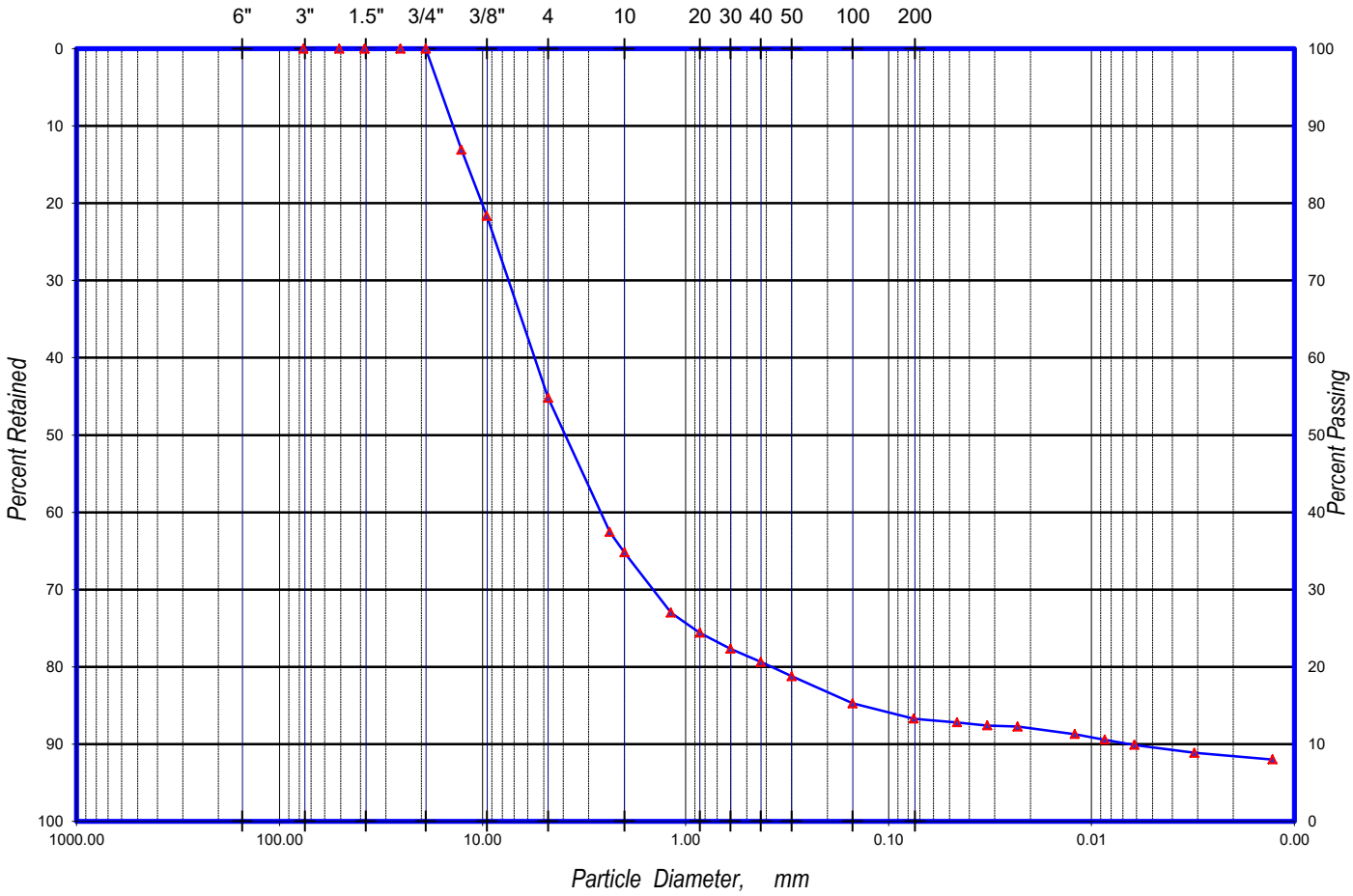
ASTM D-6913 / D-7928, (replacing D-422)
Method A: (+/-1%)

Geo-Logic ASSOCIATES

Client :	Project No:	Lab Sample No:
PACIFIC GEOTECHNICAL ENGINEERING	2016.0096.300	**4308BR**

Project Name:	Report Date:
MORGAN HILL SEWER TRUNK - GILROY 2017	January 3, 2018

BOULDERS	COBBLES	GRAVEL		SAND			SILT AND CLAY
		COARSE	FINE	COARSE	MEDIUM	FINE	
US SIEVE SIZE, INCHES				US STANDARD SIEVE SIZE No.			HYDROMETER



Symbol	Sample ID	Description	% Gravel	% Sand	% Silt - Clay
▲	DH-20A @ 21.0'	Light Brown Clayey Gravel with Sand (GC)	45.2	41.5	13.3

Size Passing, mm D_{60} = 5.80 D_{30} = 1.50 D_{10} = 0.01 5 micron (%) = 10

Coefficient of Curvature, C_c: 58.56 Coefficient of Uniformity, C_u: 882.52 Fineness Modulus = 4.46

Note: * Percentages are +/- 0.1% based on computer rounding as allowed by ASTM D-6026-01 Section 5.2.3.

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the samples supplied and tested for the above referenced job.

PARTICLE SIZE ANALYSIS

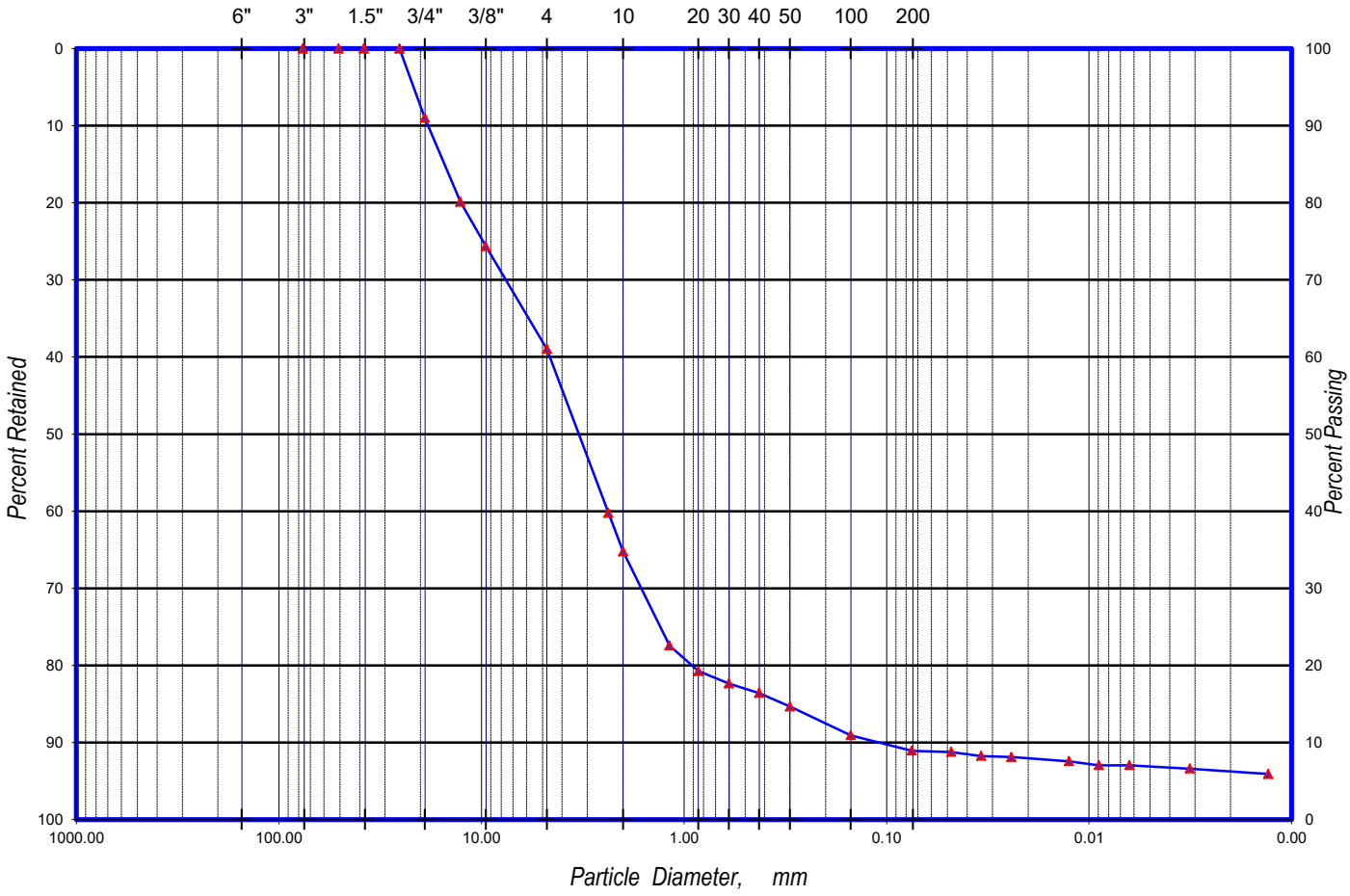
Test Report

ASTM D-6913 / D-7928, (replacing D-422)
Method A: (+/-1%)

Client :	Project No:	Lab Sample No:
PACIFIC GEOTECHNICAL ENGINEERING	2016.0096.300	**4308BS**

Project Name:	Report Date:
MORGAN HILL SEWER TRUNK - GILROY 2017	January 3, 2018

BOULDERS	COBBLES	GRAVEL		SAND			SILT AND CLAY
		COARSE	FINE	COARSE	MEDIUM	FINE	
US SIEVE SIZE, INCHES				US STANDARD SIEVE SIZE No.			HYDROMETER



Symbol	Sample ID	Description	% Gravel	% Sand	% Silt - Clay
▲	DH-20A @ 24.0'	Light Brown Poorly Graded Sand with Clay and Gravel (SP-SC)	39.0	52.1	8.9

Size Passing, mm D_{60} = 4.63 D_{30} = 1.68 D_{10} = 0.12 5 micron (%) = 7

Coefficient of Curvature, C_c: 5.28 Coefficient of Uniformity, C_u: 40.18 Fineness Modulus = 4.68

Note: * Percentages are +/- 0.1% based on computer rounding as allowed by ASTM D-6026-01 Section 5.2.3.

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the samples supplied and tested for the above referenced job.

PARTICLE SIZE ANALYSIS

Test Report

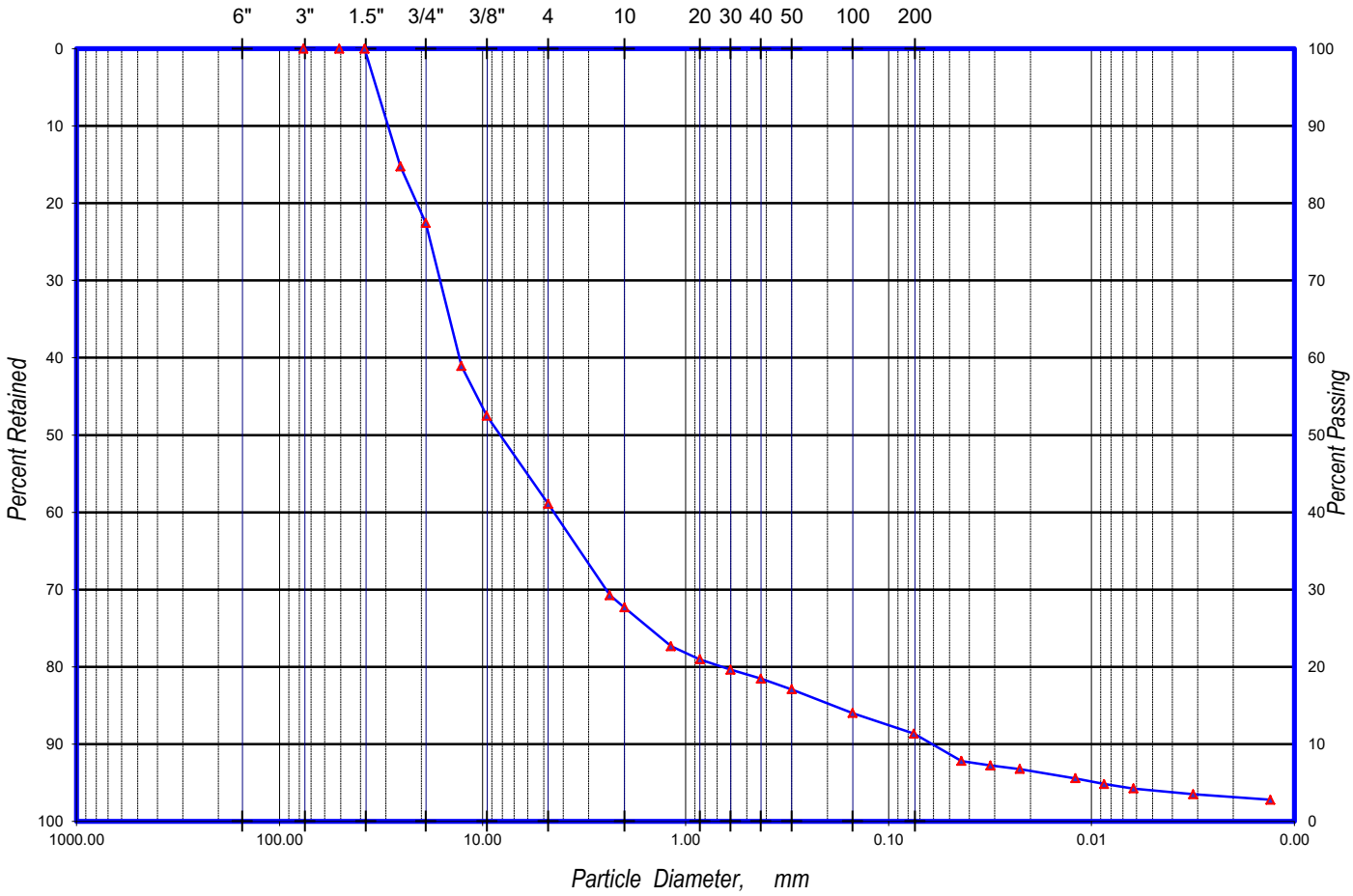
ASTM D-6913 / D-7928, (replacing D-422)
Method A: (+/-1%)

Geo-Logic ASSOCIATES

Client :	Project No:	Lab Sample No:
PACIFIC GEOTECHNICAL ENGINEERING	2016.0096.300	**4308BT**

Project Name:	Report Date:
MORGAN HILL SEWER TRUNK - GILROY 2017	January 3, 2018

BOULDERS	COBBLES	GRAVEL		SAND			SILT AND CLAY
		COARSE	FINE	COARSE	MEDIUM	FINE	
US SIEVE SIZE, INCHES				US STANDARD SIEVE SIZE No.			HYDROMETER



Symbol	Sample ID	Description	% Gravel	% Sand	% Silt - Clay
▲	DH-20A @ 26.5-27.0'	Light Brown Poorly Graded Gravel with Sand and Clay (GP-GC)	58.9	29.8	11.3

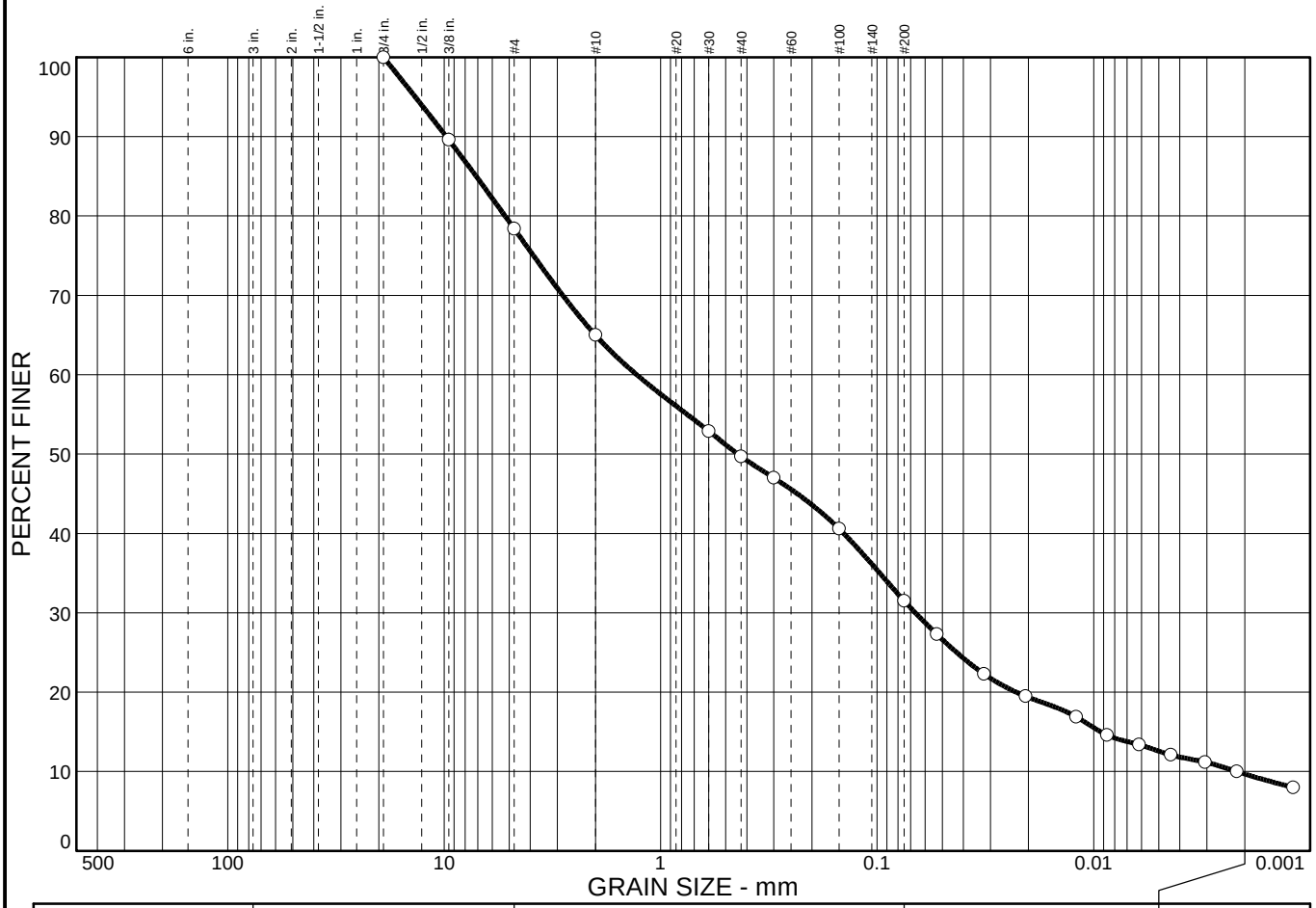
Size Passing, mm D_{60} = 13.07 D_{30} = 2.51 D_{10} = 0.06 5 micron (%) = 3

Coefficient of Curvature, C_c: 7.64 Coefficient of Uniformity, C_u: 206.89 Fineness Modulus = 5.26

Note: * Percentages are +/- 0.1% based on computer rounding as allowed by ASTM D-6026-01 Section 5.2.3.

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the samples supplied and tested for the above referenced job.

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	21.6	46.9	21.8	9.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
3/8 in.	89.6		
#4	78.4		
#10	65.0		
#30	52.9		
#40	49.7		
#50	47.0		
#100	40.6		
#200	31.5		
#270	27.3		
0.0321 mm.	22.3		
0.0206 mm.	19.5		
0.0120 mm.	16.9		
0.0087 mm.	14.6		
0.0062 mm.	13.4		
0.0044 mm.	12.1		
0.0031 mm.	11.2		
0.0022 mm.	10.0		
0.0012 mm.	8.0		

* (no specification provided)

Soil Description

Yellowish Brown Clayey SAND w/ Gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 7.12 D_{60}= 1.29 D_{50}= 0.440
D_{30}= 0.0666 D_{15}= 0.0093 D_{10}= 0.0022
C_u= 591.42 C_c= 1.58

Classification

USCS= AASHTO=

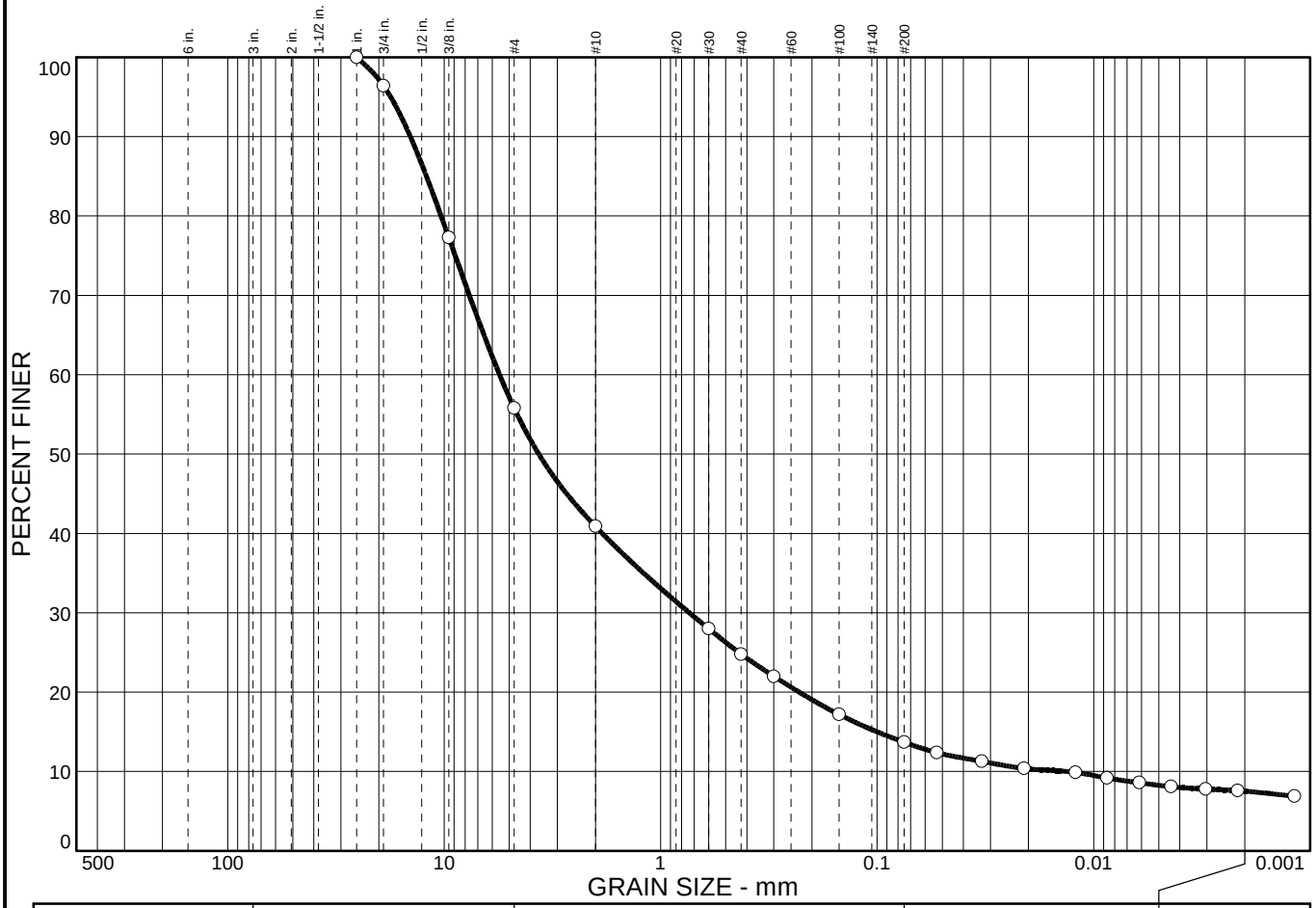
Remarks

Sample No.: **Source of Sample:** DH-21 **Date:** 8/15/18
Location: **Elev./Depth:** 19-20'

COOPER TESTING LABORATORY

Client: Geo-Logic Associates
Project: MH Sewer Trunk - 2016.0096
Project No: 516-041 **Figure**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	44.2	42.1	6.2	7.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
3/4 in.	96.4		
3/8 in.	77.3		
#4	55.8		
#10	40.9		
#30	28.0		
#40	24.8		
#50	22.0		
#100	17.2		
#200	13.7		
#270	12.4		
0.0328 mm.	11.3		
0.0210 mm.	10.4		
0.0121 mm.	9.9		
0.0087 mm.	9.2		
0.0062 mm.	8.6		
0.0044 mm.	8.1		
0.0030 mm.	7.8		
0.0022 mm.	7.6		
0.0012 mm.	6.9		

* (no specification provided)

Soil Description

Reddish Brown Clayey GRAVEL w/ Sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 12.1 D_{60}= 5.55 D_{50}= 3.65
D_{30}= 0.737 D_{15}= 0.0998 D_{10}= 0.0130
C_u= 425.38 C_c= 7.50

Classification

USCS= AASHTO=

Remarks

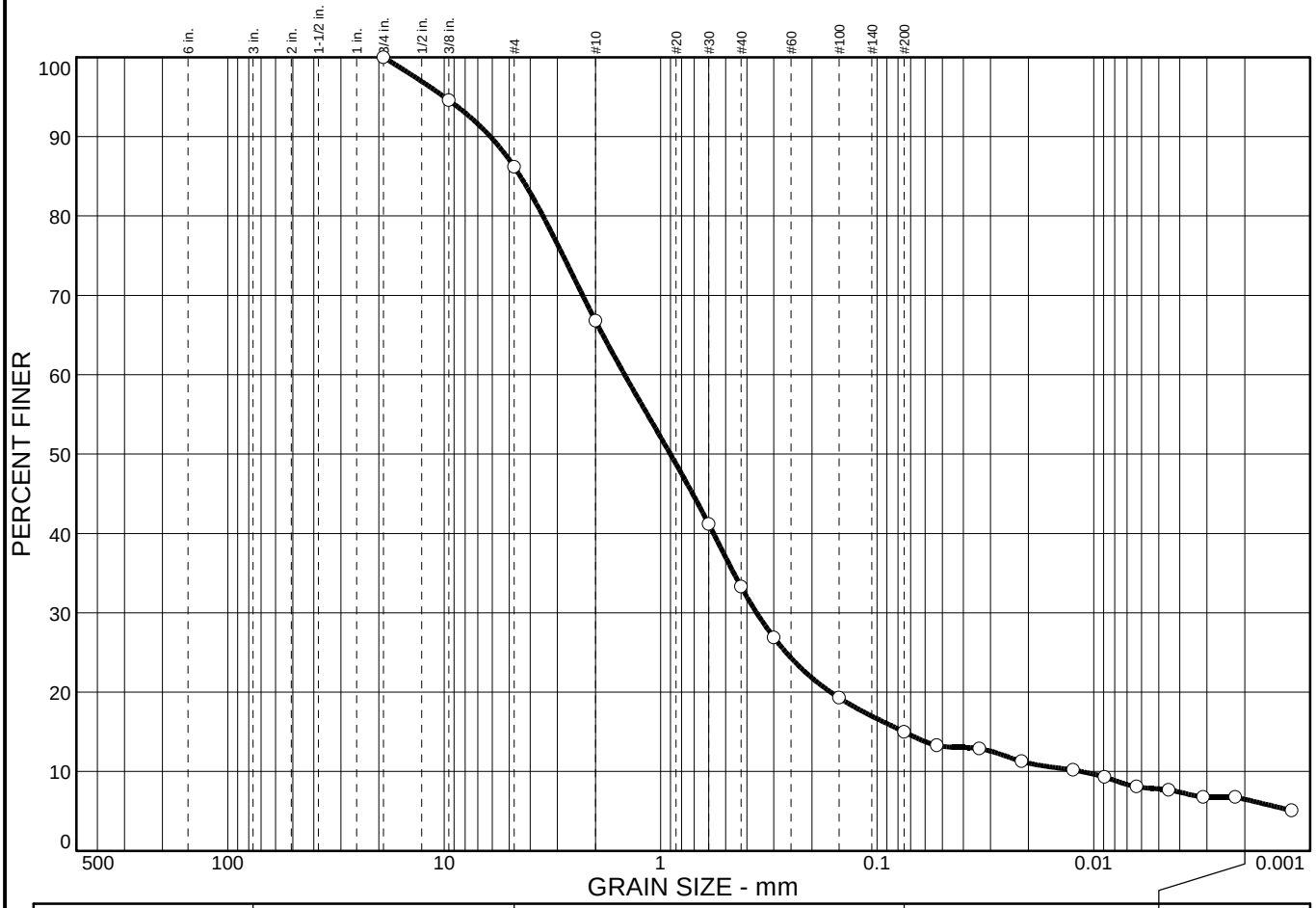
Sample No.: **Source of Sample:** DH-21 **Date:** 8/15/18
Location: **Elev./Depth:** 22-23'

COOPER TESTING LABORATORY

Client: Geo-Logic Associates
Project: MH Sewer Trunk - 2016.0096

Project No: 516-041 **Figure**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	13.8	71.2	8.5	6.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
3/8 in.	94.6		
#4	86.2		
#10	66.8		
#30	41.2		
#40	33.3		
#50	26.9		
#100	19.3		
#200	15.0		
#270	13.3		
0.0337 mm.	12.9		
0.0215 mm.	11.3		
0.0125 mm.	10.2		
0.0089 mm.	9.3		
0.0063 mm.	8.1		
0.0045 mm.	7.7		
0.0031 mm.	6.8		
0.0022 mm.	6.8		
0.0012 mm.	5.1		

* (no specification provided)

Soil Description

Olive Brown Clayey SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 4.45 D_{60}= 1.47 D_{50}= 0.902
D_{30}= 0.360 D_{15}= 0.0750 D_{10}= 0.0113
C_u= 129.70 C_c= 7.82

Classification

USCS= AASHTO=

Remarks

Sample No.: **Source of Sample:** DH-21 **Date:** 8/15/18
Location: **Elev./Depth:** 28-29'

COOPER TESTING LABORATORY

Client: Geo-Logic Associates
Project: MH Sewer Trunk - 2016.0096
Project No: 516-041 **Figure**

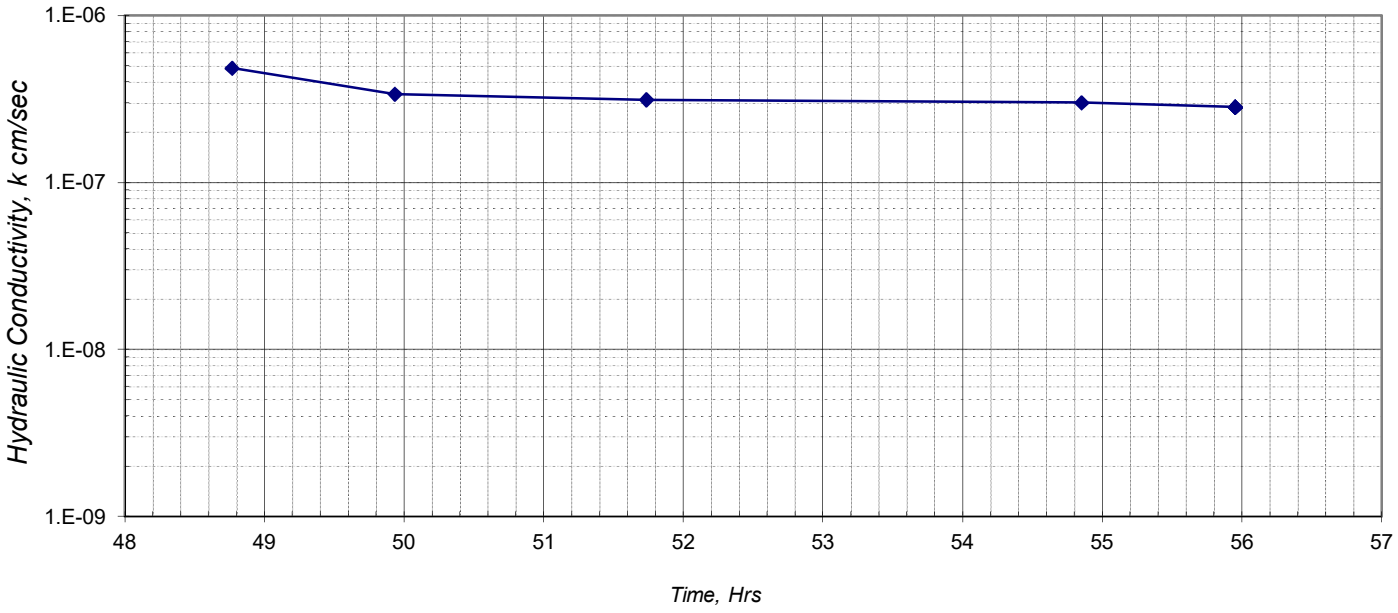
HYDRAULIC CONDUCTIVITY
REPORT

Geo-Logic ASSOCIATES

Client / Project Name:	Project No:	Lab Sample Number:
Pacific Geotechnical Engineering / Morgan Hill Sewer Trunk - Gilroy 2017	2016.0096.300	4308BZ

Sample ID:	Description:	Report Date:
DH-11A 30.5'	Brown Clayey Sand	December 18, 2017

Hydraulic Conductivity vs Time



SPECIMEN DATA

SAMPLE ID:	DH-11 30.5'	
DESCRIPTION:	Brown Clayey Sand	
	INITIAL	FINAL
HEIGHT, in.	3.8	3.8
DIAMETER, in.	2.4	2.4
WATER CONTENT, %	18.3	16.7
DRY DENSITY, pcf	113	116
SATURATION, %	100	100

(Specific Gravity assumed as 2.7)

COMMENTS:

Tap water used as permeant.

TEST DATA

ASTM D-5084, Method C

EFFECTIVE STRESS:	25 psi
GRADIENT RANGE:	9 - 11
IN / OUT RATIO:	0.98
"B" PARAMETER:	0.95

TRIAL nos.	TIME hrs.	HYDRAULIC CONDUCTIVITY, k_{20} cm / s
1	48.8	4.8E-07
2	49.9	3.4E-07
3	51.7	3.1E-07
4	54.9	3.0E-07
5	56.0	2.8E-07

AVERAGE LAST 4 : **3.1E-07**

corrected to 20° C

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the samples supplied and tested for the above referenced job.

L : Labexcel \PROJECTS \ Pacific Geotechnic \ 4308BZ-txk	Print Date:	Entered By:	Reviewed By:	LSN:
DCN: TXK-QC-GRAPH (rev. 11/20/12)	12/19/17	KH	krc	4308BZ

Figure B-80

APPENDIX C

ANALYTICAL TEST RESULTS

Date of Report: 02/09/2017

Beeson Liang

Geologic/Pacific Geotechnical Engineering
16055-D Caputo Drive
Morgan Hill, CA 95037

Client Project:	MH Sewer Trunk 2016.0096
BCL Project:	Soil Analysis
BCL Work Order:	1702487
Invoice ID:	B259080

Enclosed are the results of analyses for samples received by the laboratory on 1/27/2017. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Contact Person: Tina Green
Client Services Manager

Authorized Signature

Table of Contents

BC Laboratories, Inc.

Chain of Custody Form

Page ____ of ____

Report To: Client: Geo-Logic Associates	Project #: 2016.0096
Attn: Beesan Hiang	Project Name: MH Sewer Trunk
Street Address: 1600 SD Capitola	Global ID #:
City, State, Zip: Morgan Hill CA 95037	Sampler(s):
Phone: 408-778-288 Fax: 408-779-6879	
Email Address: bliang@geo-logic.com	
Work Order #: 17-02487	

Analysis Requested

Please refer to the back of this page for completion instructions and method legend.

Comments:

Sample #	Description		Date Sampled	Time Sampled	Cam 17 metals	Pesticides	VOC	Total hydrocarbons	Sample Matrix: Soil	Sludge	Drinking Water	Ground Water	Waste Water	Other	Turnaround # of work days*	Notes
MH3	5.5-6.5 feet	-1	12/5/16	11:00	/	/	/	/							10	
MH11	5.5-6.0 feet	-2	12/6/16	14:30	/	/	/	/							↓	
MH7	5.5-6.5 feet	-3	12/7/16	13:15	/	/	/	/							↓	

Are there any tests with holding times less than or equal to 48 hours? ☐ Yes ☒ No

* Standard Turnaround = 10 work days

CHK BY KHB

DISTRIBUTION DATA ENTRY SUB-OUT

Billing ☒ Same as above

Client: ____

Address: ____

City: ____ State ____ Zip ____

Attn: ____

PO#: ____

EDF Required? ☐ Yes ☒ No

Send Copy to State of CA? (EDT) ☐ Yes ☒ No

Global ID ____ (Needed for EDF)

System # ____ (Needed for EDT)

	Relinquished By	Date	Time	Received By	Date	Time
1.		1-27-17	1410		1-27-17	1410
2.		1-27-17	1600		1/27/17	1800
3.		1/27/17	2216		1/27/17	2216

BC Laboratories, Inc. – 4100 Atlas Ct. – Bakersfield, CA 93308 – 661.327.4911 – Fax: 661.327.1918 – www.bclabs.com

Chain of Custody and Cooler Receipt Form for 1702487 Page 2 of 2

BC LABORATORIES INC. COOLER RECEIPT FORM Page 1 Of 1

Submission #: 17-02487

SHIPPING INFORMATION	SHIPPING CONTAINER	FREE LIQUID
Fed Ex ☐ UPS ☐ Ontrac ☐ Hand Delivery ☐	Ice Chest ☒ None ☐ Box ☐	YES ☐ NO ☐
BC Lab Field Service ☒ Other ☐ (Specify)_____	Other ☐ (Specify)_____	W / (S)

Refrigerant: Ice ☒ Blue Ice ☐ None ☐ Other ☐ Comments:

Custody Seals Ice Chest ☐ Intact? Yes ☐ No ☐ Containers ☐ Intact? Yes ☐ No ☐ None ☒ Comments:

All samples received? Yes ☒ No ☐ All samples containers intact? Yes ☒ No ☐ Description(s) match COC? Yes ☒ No ☐

COC Received ☒ YES ☐ NO

Emissivity: 0.97 Container: VOA Thermometer ID: 207 Date/Time 1/27/17

Temperature: (A) 0.7 °C / (C) 0.9 °C Analyst Init KNB 2219

SAMPLE CONTAINERS	SAMPLE NUMBERS 1	2	3	4	5	6	7	8	9	10
QT PE UNPRES										
4oz / 8oz / 16oz PE UNPRES										
2oz Cr^{+6}										
QT INORGANIC CHEMICAL METALS										
INORGANIC CHEMICAL METALS 4oz / 8oz / 16oz										
PT CYANIDE										
PT NITROGEN FORMS										
PT TOTAL SULFIDE										
2oz. NITRATE / NITRITE										
PT TOTAL ORGANIC CARBON										
PT CHEMICAL OXYGEN DEMAND										
PtA PHENOLICS										
40ml VOA VIAL TRAVEL BLANK										
40ml VOA VIAL										
QT EPA 1664										
PT ODOR										
RADIOLOGICAL										
BACTERIOLOGICAL										
40 ml VOA VIAL- 504										
QT EPA 508/608/8080										
QT EPA 515.1/8150										
QT EPA 525										
QT EPA 525 TRAVEL BLANK										
40ml EPA 547										
40ml EPA 531.1										
8oz EPA 548										
QT EPA 549										
QT EPA 8015M										
QT EPA 8270										
8oz / 16oz / 32oz AMBER										
8oz / (16oz) / 32oz JAR	A	A	A							
SOIL SLEEVE										
PCB VIAL										
PLASTIC BAG										
TEDLAR BAG										
FERROUS IRON										
ENCORE										
SMART KIT										
SUMMA CANISTER										

Comments:

Sample Numbering Completed By: KNB Date/Time: 1/27/17 2240

A = Actual / C = Corrected

Rev 21 05/23/2016

[S:\WPDoc\WordPerfect\LAB_DOCS\FORMS\SAMREC rev 20]

Geologic/Pacific Geotechnical Engineering
16055-D Caputo Drive
Morgan Hill, CA 95037

Reported: 02/09/2017 12:48
Project: Soil Analysis
Project Number: MH Sewer Trunk 2016.0096
Project Manager: Beeson Liang

Laboratory / Client Sample Cross Reference

Laboratory	Client Sample Information			
1702487-01	**COC Number:**	---	**Receive Date:**	01/27/2017 22:16
	Project Number:	---	**Sampling Date:**	12/05/2016 11:00
	Sampling Location:	---	**Sample Depth:**	---
	Sampling Point:	DH3 S.S-6.5 Feet	**Lab Matrix:**	Solids
	Sampled By:	---	**Sample Type:**	Soil
1702487-02	**COC Number:**	---	**Receive Date:**	01/27/2017 22:16
	Project Number:	---	**Sampling Date:**	12/06/2016 14:30
	Sampling Location:	---	**Sample Depth:**	---
	Sampling Point:	DH11 5.5-6.0 Feet	**Lab Matrix:**	Solids
	Sampled By:	---	**Sample Type:**	Soil
1702487-03	**COC Number:**	---	**Receive Date:**	01/27/2017 22:16
	Project Number:	---	**Sampling Date:**	12/07/2016 13:15
	Sampling Location:	---	**Sample Depth:**	---
	Sampling Point:	DH17 5.5 - 6.5 Feet	**Lab Matrix:**	Solids
	Sampled By:	---	**Sample Type:**	Soil

Geologic/Pacific Geotechnical Engineering
16055-D Caputo Drive
Morgan Hill, CA 95037

Reported: 02/09/2017 12:48
Project: Soil Analysis
Project Number: MH Sewer Trunk 2016.0096
Project Manager: Beeson Liang

Organochlorine Pesticides (EPA Method 8081A)

BCL Sample ID: 1702487-01 | **Client Sample Name:** DH3 S.S-6.5 Feet, 12/5/2016 11:00:00AM

Constituent	Result	Units	PQL	MDL	Method	TTLC Limits	Lab Quals	Run #
Aldrin	ND	mg/kg	0.00050	0.000055	EPA-8081A	1.4	S05	1
alpha-BHC	ND	mg/kg	0.00050	0.000064	EPA-8081A		S05	1
beta-BHC	ND	mg/kg	0.00050	0.000071	EPA-8081A		S05	1
delta-BHC	ND	mg/kg	0.00050	0.000059	EPA-8081A		S05	1
gamma-BHC (Lindane)	ND	mg/kg	0.00050	0.000034	EPA-8081A	4.0	S05	1
Chlordane (Technical)	ND	mg/kg	0.050	0.0015	EPA-8081A	2.5	S05	1
4,4'-DDD	ND	mg/kg	0.00050	0.000085	EPA-8081A	1.0	S05	1
4,4'-DDE	ND	mg/kg	0.00050	0.000083	EPA-8081A	1.0	S05	1
4,4'-DDT	ND	mg/kg	0.00050	0.000078	EPA-8081A	1.0	S05	1
Dieldrin	ND	mg/kg	0.00050	0.000070	EPA-8081A	8.0	S05	1
Endosulfan I	ND	mg/kg	0.00050	0.000087	EPA-8081A		S05	1
Endosulfan II	ND	mg/kg	0.00050	0.00011	EPA-8081A		S05	1
Endosulfan sulfate	ND	mg/kg	0.00050	0.000099	EPA-8081A		S05	1
Endrin	ND	mg/kg	0.00050	0.000087	EPA-8081A	0.2	S05	1
Endrin aldehyde	ND	mg/kg	0.00050	0.000097	EPA-8081A		S05	1
Heptachlor	ND	mg/kg	0.00050	0.000057	EPA-8081A	4.7	S05	1
Heptachlor epoxide	ND	mg/kg	0.00050	0.000078	EPA-8081A		S05	1
Methoxychlor	ND	mg/kg	0.00050	0.00011	EPA-8081A	100	S05	1
Toxaphene	ND	mg/kg	0.050	0.0013	EPA-8081A	5	S05	1
TCMX (Surrogate)	29.3	%	20 - 130 (LCL - UCL)		EPA-8081A		S05	1
Decachlorobiphenyl (Surrogate)	42.0	%	40 - 130 (LCL - UCL)		EPA-8081A		S05	1

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID
1	EPA-8081A	01/30/17	02/05/17 11:04	HKS	GC-17	0.990	B[B0055

Geologic/Pacific Geotechnical Engineering
16055-D Caputo Drive
Morgan Hill, CA 95037

Reported: 02/09/2017 12:48
Project: Soil Analysis
Project Number: MH Sewer Trunk 2016.0096
Project Manager: Beeson Liang

Volatile Organic Analysis (EPA Method 8260B)

BCL Sample ID: 1702487-01 | **Client Sample Name:** DH3 S.S-6.5 Feet, 12/5/2016 11:00:00AM

Constituent	Result	Units	PQL	MDL	Method	TTLC Limits	Lab Quals	Run #
Benzene	ND	mg/kg	0.0050	0.0013	EPA-8260B		A26	1
Bromobenzene	ND	mg/kg	0.0050	0.0013	EPA-8260B		A26	1
Bromochloromethane	ND	mg/kg	0.0050	0.00092	EPA-8260B		A26	1
Bromodichloromethane	ND	mg/kg	0.0050	0.00084	EPA-8260B		A26	1
Bromoform	ND	mg/kg	0.0050	0.0015	EPA-8260B		A26	1
Bromomethane	ND	mg/kg	0.0050	0.0016	EPA-8260B		A26	1
n-Butylbenzene	ND	mg/kg	0.0050	0.0015	EPA-8260B		A26	1
sec-Butylbenzene	ND	mg/kg	0.0050	0.0012	EPA-8260B		A26	1
tert-Butylbenzene	ND	mg/kg	0.0050	0.0012	EPA-8260B		A26	1
Carbon tetrachloride	ND	mg/kg	0.0050	0.0011	EPA-8260B		A26	1
Chlorobenzene	ND	mg/kg	0.0050	0.0013	EPA-8260B		A26	1
Chloroethane	ND	mg/kg	0.0050	0.0014	EPA-8260B		A26	1
Chloroform	ND	mg/kg	0.0050	0.00063	EPA-8260B		A26	1
Chloromethane	ND	mg/kg	0.0050	0.0014	EPA-8260B		A26	1
2-Chlorotoluene	ND	mg/kg	0.0050	0.0018	EPA-8260B		A26	1
4-Chlorotoluene	ND	mg/kg	0.0050	0.0014	EPA-8260B		A26	1
Dibromochloromethane	ND	mg/kg	0.0050	0.00099	EPA-8260B		A26	1
1,2-Dibromo-3-chloropropane	ND	mg/kg	0.0050	0.0017	EPA-8260B		A26	1
1,2-Dibromoethane	ND	mg/kg	0.0050	0.0010	EPA-8260B		A26	1
Dibromomethane	ND	mg/kg	0.0050	0.0018	EPA-8260B		A26	1
1,2-Dichlorobenzene	ND	mg/kg	0.0050	0.00081	EPA-8260B		A26	1
1,3-Dichlorobenzene	ND	mg/kg	0.0050	0.0014	EPA-8260B		A26	1
1,4-Dichlorobenzene	ND	mg/kg	0.0050	0.0015	EPA-8260B		A26	1
Dichlorodifluoromethane	ND	mg/kg	0.0050	0.0013	EPA-8260B		A26	1
1,1-Dichloroethane	ND	mg/kg	0.0050	0.0014	EPA-8260B		A26	1
1,2-Dichloroethane	ND	mg/kg	0.0050	0.00085	EPA-8260B		A26	1
1,1-Dichloroethene	ND	mg/kg	0.0050	0.0012	EPA-8260B		A26	1
cis-1,2-Dichloroethene	ND	mg/kg	0.0050	0.0013	EPA-8260B		A26	1
trans-1,2-Dichloroethene	ND	mg/kg	0.0050	0.0014	EPA-8260B		A26	1
1,2-Dichloropropane	ND	mg/kg	0.0050	0.00081	EPA-8260B		A26	1
1,3-Dichloropropane	ND	mg/kg	0.0050	0.0011	EPA-8260B		A26	1
2,2-Dichloropropane	ND	mg/kg	0.0050	0.0013	EPA-8260B		A26	1
1,1-Dichloropropene	ND	mg/kg	0.0050	0.0012	EPA-8260B		A26	1

Geologic/Pacific Geotechnical Engineering
16055-D Caputo Drive
Morgan Hill, CA 95037

Reported: 02/09/2017 12:48
Project: Soil Analysis
Project Number: MH Sewer Trunk 2016.0096
Project Manager: Beeson Liang

Volatile Organic Analysis (EPA Method 8260B)

BCL Sample ID: 1702487-01 | **Client Sample Name:** DH3 S.S-6.5 Feet, 12/5/2016 11:00:00AM

Constituent	Result	Units	PQL	MDL	Method	TTLC Limits	Lab Quals	Run #
cis-1,3-Dichloropropene	ND	mg/kg	0.0050	0.0011	EPA-8260B		A26	1
trans-1,3-Dichloropropene	ND	mg/kg	0.0050	0.0012	EPA-8260B		A26	1
Ethylbenzene	ND	mg/kg	0.0050	0.0015	EPA-8260B		A26	1
Hexachlorobutadiene	ND	mg/kg	0.0050	0.0017	EPA-8260B		A26	1
Isopropylbenzene	ND	mg/kg	0.0050	0.0013	EPA-8260B		A26	1
p-Isopropyltoluene	ND	mg/kg	0.0050	0.0013	EPA-8260B		A26	1
Methylene chloride	ND	mg/kg	0.010	0.0024	EPA-8260B		A26	1
Methyl t-butyl ether	ND	mg/kg	0.0050	0.00050	EPA-8260B		A26	1
Naphthalene	ND	mg/kg	0.0050	0.0014	EPA-8260B		A26	1
n-Propylbenzene	ND	mg/kg	0.0050	0.0013	EPA-8260B		A26	1
Styrene	ND	mg/kg	0.0050	0.0014	EPA-8260B		A26	1
1,1,1,2-Tetrachloroethane	ND	mg/kg	0.0050	0.0011	EPA-8260B		A26	1
1,1,2,2-Tetrachloroethane	ND	mg/kg	0.0050	0.0011	EPA-8260B		A26	1
Tetrachloroethene	ND	mg/kg	0.0050	0.0013	EPA-8260B		A26	1
Toluene	ND	mg/kg	0.0050	0.0012	EPA-8260B		A26	1
1,2,3-Trichlorobenzene	ND	mg/kg	0.0050	0.0021	EPA-8260B		A26	1
1,2,4-Trichlorobenzene	ND	mg/kg	0.0050	0.0020	EPA-8260B		A26	1
1,1,1-Trichloroethane	ND	mg/kg	0.0050	0.0011	EPA-8260B		A26	1
1,1,2-Trichloroethane	ND	mg/kg	0.0050	0.00077	EPA-8260B		A26	1
Trichloroethene	ND	mg/kg	0.0050	0.0011	EPA-8260B	2040	A26	1
Trichlorofluoromethane	ND	mg/kg	0.0050	0.0011	EPA-8260B		A26	1
1,2,3-Trichloropropane	ND	mg/kg	0.0050	0.0016	EPA-8260B		A26	1
1,1,2-Trichloro-1,2,2-trifluoroethane	ND	mg/kg	0.0050	0.0013	EPA-8260B		A26	1
1,2,4-Trimethylbenzene	ND	mg/kg	0.0050	0.0013	EPA-8260B		A26	1
1,3,5-Trimethylbenzene	ND	mg/kg	0.0050	0.0015	EPA-8260B		A26	1
Vinyl chloride	ND	mg/kg	0.0050	0.0016	EPA-8260B		A26	1
Total Xylenes	ND	mg/kg	0.010	0.0034	EPA-8260B		A26	1
p- & m-Xylenes	ND	mg/kg	0.0050	0.0022	EPA-8260B		A26	1
o-Xylene	ND	mg/kg	0.0050	0.0012	EPA-8260B		A26	1
1,2-Dichloroethane-d4 (Surrogate)	105	%	70 - 121 (LCL - UCL)		EPA-8260B			1
Toluene-d8 (Surrogate)	102	%	81 - 117 (LCL - UCL)		EPA-8260B			1
4-Bromofluorobenzene (Surrogate)	103	%	74 - 121 (LCL - UCL)		EPA-8260B			1

Geologic/Pacific Geotechnical Engineering
16055-D Caputo Drive
Morgan Hill, CA 95037

Reported: 02/09/2017 12:48
Project: Soil Analysis
Project Number: MH Sewer Trunk 2016.0096
Project Manager: Beeson Liang

Volatile Organic Analysis (EPA Method 8260B)

BCL Sample ID: 1702487-01 | **Client Sample Name:** DH3 S.S-6.5 Feet, 12/5/2016 11:00:00AM

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID
1	EPA-8260B	01/30/17	01/30/17 16:55	ADC	MS-V3	1	B[A1908

Geologic/Pacific Geotechnical Engineering
16055-D Caputo Drive
Morgan Hill, CA 95037

Reported: 02/09/2017 12:48
Project: Soil Analysis
Project Number: MH Sewer Trunk 2016.0096
Project Manager: Beeson Liang

Total Petroleum Hydrocarbons

BCL Sample ID: 1702487-01 | **Client Sample Name:** DH3 S.S-6.5 Feet, 12/5/2016 11:00:00AM

Constituent	Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
TPH - Gasoline	ND	mg/kg	20	5.0	EPA-8015B/FFP	ND	S05	1
TPH - Diesel (FFP)	ND	mg/kg	10	1.2	EPA-8015B/FFP	ND	S05	1
TPH - Motor Oil	ND	mg/kg	20	6.5	EPA-8015B/FFP	ND	S05	1
Tetracosane (Surrogate)	95.6	%	20 - 145 (LCL - UCL)		EPA-8015B/FFP		S05	1

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID
1	EPA-8015B/FFP	01/30/17	02/03/17 20:22	AS1	GC-2	0.984	B[A2394

Geologic/Pacific Geotechnical Engineering
16055-D Caputo Drive
Morgan Hill, CA 95037

Reported: 02/09/2017 12:48
Project: Soil Analysis
Project Number: MH Sewer Trunk 2016.0096
Project Manager: Beeson Liang

Total Concentrations (TTLC)

BCL Sample ID: 1702487-01 | **Client Sample Name:** DH3 S.S-6.5 Feet, 12/5/2016 11:00:00AM

Constituent	Result	Units	PQL	MDL	Method	TTLC Limits	Lab Quals	Run #
Antimony	ND	mg/kg	5.0	0.33	EPA-6010B	500		1
Arsenic	**1.9**	**mg/kg**	**1.0**	**0.40**	**EPA-6010B**	500		1
Barium	**110**	**mg/kg**	**0.50**	**0.18**	**EPA-6010B**	10000		1
Beryllium	**0.44**	**mg/kg**	**0.50**	**0.047**	**EPA-6010B**	75	**J**	1
Cadmium	ND	mg/kg	0.50	0.052	EPA-6010B	100		1
Chromium	**99**	**mg/kg**	**0.50**	**0.050**	**EPA-6010B**	2500		1
Cobalt	**17**	**mg/kg**	**2.5**	**0.098**	**EPA-6010B**	8000		1
Copper	**34**	**mg/kg**	**1.0**	**0.050**	**EPA-6010B**	2500		1
Lead	**6.2**	**mg/kg**	**2.5**	**0.28**	**EPA-6010B**	1000		1
Mercury	**0.11**	**mg/kg**	**0.16**	**0.041**	**EPA-7471A**	20	**J,S05**	2
Molybdenum	ND	mg/kg	2.5	0.050	EPA-6010B	3500		1
Nickel	**110**	**mg/kg**	**0.50**	**0.15**	**EPA-6010B**	2000		1
Selenium	ND	mg/kg	1.0	0.98	EPA-6010B	100		1
Silver	**0.29**	**mg/kg**	**0.50**	**0.067**	**EPA-6010B**	500	**J**	1
Thallium	ND	mg/kg	5.0	0.64	EPA-6010B	700		1
Vanadium	**73**	**mg/kg**	**0.50**	**0.11**	**EPA-6010B**	2400		1
Zinc	**41**	**mg/kg**	**2.5**	**0.087**	**EPA-6010B**	5000		1

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID
1	EPA-6010B	02/01/17	02/01/17 13:46	JCC	PE-OP3	0.935	B[B0016
2	EPA-7471A	01/31/17	02/01/17 13:22	MEV	CETAC2	1.025	B[A2372

Geologic/Pacific Geotechnical Engineering
16055-D Caputo Drive
Morgan Hill, CA 95037

Reported: 02/09/2017 12:48
Project: Soil Analysis
Project Number: MH Sewer Trunk 2016.0096
Project Manager: Beeson Liang

Organochlorine Pesticides (EPA Method 8081A)

BCL Sample ID: 1702487-02 | **Client Sample Name:** DH11 5.5-6.0 Feet, 12/6/2016 2:30:00PM

Constituent	Result	Units	PQL	MDL	Method	TTLC Limits	Lab Quals	Run #
Aldrin	ND	mg/kg	0.00050	0.000055	EPA-8081A	1.4	S05	1
alpha-BHC	ND	mg/kg	0.00050	0.000064	EPA-8081A		S05	1
beta-BHC	ND	mg/kg	0.00050	0.000071	EPA-8081A		S05	1
delta-BHC	ND	mg/kg	0.00050	0.000059	EPA-8081A		S05	1
gamma-BHC (Lindane)	ND	mg/kg	0.00050	0.000034	EPA-8081A	4.0	S05	1
Chlordane (Technical)	ND	mg/kg	0.050	0.0015	EPA-8081A	2.5	S05	1
4,4'-DDD	ND	mg/kg	0.00050	0.000085	EPA-8081A	1.0	S05	1
4,4'-DDE	ND	mg/kg	0.00050	0.000083	EPA-8081A	1.0	S05	1
4,4'-DDT	ND	mg/kg	0.00050	0.000078	EPA-8081A	1.0	S05	1
Dieldrin	ND	mg/kg	0.00050	0.000070	EPA-8081A	8.0	S05	1
Endosulfan I	ND	mg/kg	0.00050	0.000087	EPA-8081A		S05	1
Endosulfan II	ND	mg/kg	0.00050	0.00011	EPA-8081A		S05	1
Endosulfan sulfate	ND	mg/kg	0.00050	0.000099	EPA-8081A		S05	1
Endrin	ND	mg/kg	0.00050	0.000087	EPA-8081A	0.2	S05	1
Endrin aldehyde	ND	mg/kg	0.00050	0.000097	EPA-8081A		S05	1
Heptachlor	ND	mg/kg	0.00050	0.000057	EPA-8081A	4.7	S05	1
Heptachlor epoxide	ND	mg/kg	0.00050	0.000078	EPA-8081A		S05	1
Methoxychlor	ND	mg/kg	0.00050	0.00011	EPA-8081A	100	S05	1
Toxaphene	ND	mg/kg	0.050	0.0013	EPA-8081A	5	S05	1
TCMX (Surrogate)	60.0	%	20 - 130 (LCL - UCL)		EPA-8081A		S05	1
Decachlorobiphenyl (Surrogate)	33.9	%	40 - 130 (LCL - UCL)		EPA-8081A		S05	1

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID
1	EPA-8081A	01/30/17	02/05/17 11:18	HKS	GC-17	0.993	B[B0055

Geologic/Pacific Geotechnical Engineering
16055-D Caputo Drive
Morgan Hill, CA 95037

Reported: 02/09/2017 12:48
Project: Soil Analysis
Project Number: MH Sewer Trunk 2016.0096
Project Manager: Beeson Liang

Volatile Organic Analysis (EPA Method 8260B)

BCL Sample ID: 1702487-02 | **Client Sample Name:** DH11 5.5-6.0 Feet, 12/6/2016 2:30:00PM

Constituent	Result	Units	PQL	MDL	Method	TTLC Limits	Lab Quals	Run #
Benzene	ND	mg/kg	0.0050	0.0013	EPA-8260B		A26	1
Bromobenzene	ND	mg/kg	0.0050	0.0013	EPA-8260B		A26	1
Bromochloromethane	ND	mg/kg	0.0050	0.00092	EPA-8260B		A26	1
Bromodichloromethane	ND	mg/kg	0.0050	0.00084	EPA-8260B		A26	1
Bromoform	ND	mg/kg	0.0050	0.0015	EPA-8260B		A26	1
Bromomethane	ND	mg/kg	0.0050	0.0016	EPA-8260B		A26	1
n-Butylbenzene	ND	mg/kg	0.0050	0.0015	EPA-8260B		A26	1
sec-Butylbenzene	ND	mg/kg	0.0050	0.0012	EPA-8260B		A26	1
tert-Butylbenzene	ND	mg/kg	0.0050	0.0012	EPA-8260B		A26	1
Carbon tetrachloride	ND	mg/kg	0.0050	0.0011	EPA-8260B		A26	1
Chlorobenzene	ND	mg/kg	0.0050	0.0013	EPA-8260B		A26	1
Chloroethane	ND	mg/kg	0.0050	0.0014	EPA-8260B		A26	1
Chloroform	ND	mg/kg	0.0050	0.00063	EPA-8260B		A26	1
Chloromethane	ND	mg/kg	0.0050	0.0014	EPA-8260B		A26	1
2-Chlorotoluene	ND	mg/kg	0.0050	0.0018	EPA-8260B		A26	1
4-Chlorotoluene	ND	mg/kg	0.0050	0.0014	EPA-8260B		A26	1
Dibromochloromethane	ND	mg/kg	0.0050	0.00099	EPA-8260B		A26	1
1,2-Dibromo-3-chloropropane	ND	mg/kg	0.0050	0.0017	EPA-8260B		A26	1
1,2-Dibromoethane	ND	mg/kg	0.0050	0.0010	EPA-8260B		A26	1
Dibromomethane	ND	mg/kg	0.0050	0.0018	EPA-8260B		A26	1
1,2-Dichlorobenzene	ND	mg/kg	0.0050	0.00081	EPA-8260B		A26	1
1,3-Dichlorobenzene	ND	mg/kg	0.0050	0.0014	EPA-8260B		A26	1
1,4-Dichlorobenzene	ND	mg/kg	0.0050	0.0015	EPA-8260B		A26	1
Dichlorodifluoromethane	ND	mg/kg	0.0050	0.0013	EPA-8260B		A26	1
1,1-Dichloroethane	ND	mg/kg	0.0050	0.0014	EPA-8260B		A26	1
1,2-Dichloroethane	ND	mg/kg	0.0050	0.00085	EPA-8260B		A26	1
1,1-Dichloroethene	ND	mg/kg	0.0050	0.0012	EPA-8260B		A26	1
cis-1,2-Dichloroethene	ND	mg/kg	0.0050	0.0013	EPA-8260B		A26	1
trans-1,2-Dichloroethene	ND	mg/kg	0.0050	0.0014	EPA-8260B		A26	1
1,2-Dichloropropane	ND	mg/kg	0.0050	0.00081	EPA-8260B		A26	1
1,3-Dichloropropane	ND	mg/kg	0.0050	0.0011	EPA-8260B		A26	1
2,2-Dichloropropane	ND	mg/kg	0.0050	0.0013	EPA-8260B		A26	1
1,1-Dichloropropene	ND	mg/kg	0.0050	0.0012	EPA-8260B		A26	1

Geologic/Pacific Geotechnical Engineering
16055-D Caputo Drive
Morgan Hill, CA 95037

Reported: 02/09/2017 12:48
Project: Soil Analysis
Project Number: MH Sewer Trunk 2016.0096
Project Manager: Beeson Liang

Volatile Organic Analysis (EPA Method 8260B)

BCL Sample ID: 1702487-02 | **Client Sample Name:** DH11 5.5-6.0 Feet, 12/6/2016 2:30:00PM

Constituent	Result	Units	PQL	MDL	Method	TTLC Limits	Lab Quals	Run #
cis-1,3-Dichloropropene	ND	mg/kg	0.0050	0.0011	EPA-8260B		A26	1
trans-1,3-Dichloropropene	ND	mg/kg	0.0050	0.0012	EPA-8260B		A26	1
Ethylbenzene	ND	mg/kg	0.0050	0.0015	EPA-8260B		A26	1
Hexachlorobutadiene	ND	mg/kg	0.0050	0.0017	EPA-8260B		A26	1
Isopropylbenzene	ND	mg/kg	0.0050	0.0013	EPA-8260B		A26	1
p-Isopropyltoluene	ND	mg/kg	0.0050	0.0013	EPA-8260B		A26	1
Methylene chloride	ND	mg/kg	0.010	0.0024	EPA-8260B		A26	1
Methyl t-butyl ether	ND	mg/kg	0.0050	0.00050	EPA-8260B		A26	1
Naphthalene	ND	mg/kg	0.0050	0.0014	EPA-8260B		A26	1
n-Propylbenzene	ND	mg/kg	0.0050	0.0013	EPA-8260B		A26	1
Styrene	ND	mg/kg	0.0050	0.0014	EPA-8260B		A26	1
1,1,1,2-Tetrachloroethane	ND	mg/kg	0.0050	0.0011	EPA-8260B		A26	1
1,1,2,2-Tetrachloroethane	ND	mg/kg	0.0050	0.0011	EPA-8260B		A26	1
Tetrachloroethene	ND	mg/kg	0.0050	0.0013	EPA-8260B		A26	1
Toluene	ND	mg/kg	0.0050	0.0012	EPA-8260B		A26	1
1,2,3-Trichlorobenzene	ND	mg/kg	0.0050	0.0021	EPA-8260B		A26	1
1,2,4-Trichlorobenzene	ND	mg/kg	0.0050	0.0020	EPA-8260B		A26	1
1,1,1-Trichloroethane	ND	mg/kg	0.0050	0.0011	EPA-8260B		A26	1
1,1,2-Trichloroethane	ND	mg/kg	0.0050	0.00077	EPA-8260B		A26	1
Trichloroethene	ND	mg/kg	0.0050	0.0011	EPA-8260B	2040	A26	1
Trichlorofluoromethane	ND	mg/kg	0.0050	0.0011	EPA-8260B		A26	1
1,2,3-Trichloropropane	ND	mg/kg	0.0050	0.0016	EPA-8260B		A26	1
1,1,2-Trichloro-1,2,2-trifluoroethane	ND	mg/kg	0.0050	0.0013	EPA-8260B		A26	1
1,2,4-Trimethylbenzene	ND	mg/kg	0.0050	0.0013	EPA-8260B		A26	1
1,3,5-Trimethylbenzene	ND	mg/kg	0.0050	0.0015	EPA-8260B		A26	1
Vinyl chloride	ND	mg/kg	0.0050	0.0016	EPA-8260B		A26	1
Total Xylenes	ND	mg/kg	0.010	0.0034	EPA-8260B		A26	1
p- & m-Xylenes	ND	mg/kg	0.0050	0.0022	EPA-8260B		A26	1
o-Xylene	ND	mg/kg	0.0050	0.0012	EPA-8260B		A26	1
1,2-Dichloroethane-d4 (Surrogate)	105	%	70 - 121 (LCL - UCL)		EPA-8260B			1
Toluene-d8 (Surrogate)	98.7	%	81 - 117 (LCL - UCL)		EPA-8260B			1
4-Bromofluorobenzene (Surrogate)	98.9	%	74 - 121 (LCL - UCL)		EPA-8260B			1

Geologic/Pacific Geotechnical Engineering
16055-D Caputo Drive
Morgan Hill, CA 95037

Reported: 02/09/2017 12:48
Project: Soil Analysis
Project Number: MH Sewer Trunk 2016.0096
Project Manager: Beeson Liang

Volatile Organic Analysis (EPA Method 8260B)

BCL Sample ID: 1702487-02 | **Client Sample Name:** DH11 5.5-6.0 Feet, 12/6/2016 2:30:00PM

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID
1	EPA-8260B	01/30/17	01/30/17 17:18	ADC	MS-V3	1	B[A2213

Geologic/Pacific Geotechnical Engineering
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Morgan Hill, CA 95037

Reported: 02/09/2017 12:48
Project: Soil Analysis
Project Number: MH Sewer Trunk 2016.0096
Project Manager: Beeson Liang

Total Petroleum Hydrocarbons

BCL Sample ID: 1702487-02 | **Client Sample Name:** DH11 5.5-6.0 Feet, 12/6/2016 2:30:00PM

Constituent	Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
TPH - Gasoline	ND	mg/kg	20	5.0	EPA-8015B/FFP	ND	S05	1
TPH - Diesel (FFP)	ND	mg/kg	10	1.2	EPA-8015B/FFP	ND	S05	1
TPH - Motor Oil	ND	mg/kg	20	6.5	EPA-8015B/FFP	ND	S05	1
Tetracosane (Surrogate)	93.6	%	20 - 145 (LCL - UCL)		EPA-8015B/FFP		S05	1

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID
1	EPA-8015B/FFP	01/30/17	02/03/17 20:45	AS1	GC-2	0.997	B[A2394

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Reported: 02/09/2017 12:48
Project: Soil Analysis
Project Number: MH Sewer Trunk 2016.0096
Project Manager: Beeson Liang

Total Concentrations (TTLC)

BCL Sample ID: 1702487-02 | **Client Sample Name:** DH11 5.5-6.0 Feet, 12/6/2016 2:30:00PM

Constituent	Result	Units	PQL	MDL	Method	TTLC Limits	Lab Quals	Run #
Antimony	ND	mg/kg	5.0	0.33	EPA-6010B	500		1
Arsenic	**2.3**	**mg/kg**	**1.0**	**0.40**	**EPA-6010B**	500		1
Barium	**120**	**mg/kg**	**0.50**	**0.18**	**EPA-6010B**	10000		1
Beryllium	**0.40**	**mg/kg**	**0.50**	**0.047**	**EPA-6010B**	75	**J**	1
Cadmium	ND	mg/kg	0.50	0.052	EPA-6010B	100		1
Chromium	**130**	**mg/kg**	**0.50**	**0.050**	**EPA-6010B**	2500		1
Cobalt	**17**	**mg/kg**	**2.5**	**0.098**	**EPA-6010B**	8000		1
Copper	**32**	**mg/kg**	**1.0**	**0.050**	**EPA-6010B**	2500		1
Lead	**5.5**	**mg/kg**	**2.5**	**0.28**	**EPA-6010B**	1000		1
Mercury	**0.056**	**mg/kg**	**0.16**	**0.041**	**EPA-7471A**	20	**J,S05**	2
Molybdenum	ND	mg/kg	2.5	0.050	EPA-6010B	3500		1
Nickel	**110**	**mg/kg**	**0.50**	**0.15**	**EPA-6010B**	2000		1
Selenium	**1.2**	**mg/kg**	**1.0**	**0.98**	**EPA-6010B**	100		1
Silver	**0.36**	**mg/kg**	**0.50**	**0.067**	**EPA-6010B**	500	**J**	1
Thallium	**1.2**	**mg/kg**	**5.0**	**0.64**	**EPA-6010B**	700	**J**	1
Vanadium	**77**	**mg/kg**	**0.50**	**0.11**	**EPA-6010B**	2400		1
Zinc	**45**	**mg/kg**	**2.5**	**0.087**	**EPA-6010B**	5000		1

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID
1	EPA-6010B	02/01/17	02/01/17 13:48	JCC	PE-OP3	0.926	B[B0016
2	EPA-7471A	01/31/17	02/01/17 13:28	MEV	CETAC2	1.008	B[A2372

Geologic/Pacific Geotechnical Engineering
16055-D Caputo Drive
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Reported: 02/09/2017 12:48
Project: Soil Analysis
Project Number: MH Sewer Trunk 2016.0096
Project Manager: Beeson Liang

Organochlorine Pesticides (EPA Method 8081A)

BCL Sample ID: 1702487-03 | **Client Sample Name:** DH17 5.5 - 6.5 Feet, 12/7/2016 1:15:00PM

Constituent	Result	Units	PQL	MDL	Method	TTLC Limits	Lab Quals	Run #
Aldrin	ND	mg/kg	0.00050	0.000055	EPA-8081A	1.4	S05	1
alpha-BHC	ND	mg/kg	0.00050	0.000064	EPA-8081A		S05	1
beta-BHC	ND	mg/kg	0.00050	0.000071	EPA-8081A		S05	1
delta-BHC	ND	mg/kg	0.00050	0.000059	EPA-8081A		S05	1
gamma-BHC (Lindane)	ND	mg/kg	0.00050	0.000034	EPA-8081A	4.0	S05	1
Chlordane (Technical)	ND	mg/kg	0.050	0.0015	EPA-8081A	2.5	S05	1
4,4'-DDD	ND	mg/kg	0.00050	0.000085	EPA-8081A	1.0	S05	1
4,4'-DDE	ND	mg/kg	0.00050	0.000083	EPA-8081A	1.0	S05	1
4,4'-DDT	ND	mg/kg	0.00050	0.000078	EPA-8081A	1.0	S05	1
Dieldrin	ND	mg/kg	0.00050	0.000070	EPA-8081A	8.0	S05	1
Endosulfan I	ND	mg/kg	0.00050	0.000087	EPA-8081A		S05	1
Endosulfan II	ND	mg/kg	0.00050	0.00011	EPA-8081A		S05	1
Endosulfan sulfate	ND	mg/kg	0.00050	0.000099	EPA-8081A		S05	1
Endrin	ND	mg/kg	0.00050	0.000087	EPA-8081A	0.2	S05	1
Endrin aldehyde	ND	mg/kg	0.00050	0.000097	EPA-8081A		S05	1
Heptachlor	ND	mg/kg	0.00050	0.000057	EPA-8081A	4.7	S05	1
Heptachlor epoxide	ND	mg/kg	0.00050	0.000078	EPA-8081A		S05	1
Methoxychlor	ND	mg/kg	0.00050	0.00011	EPA-8081A	100	S05	1
Toxaphene	ND	mg/kg	0.050	0.0013	EPA-8081A	5	S05	1
TCMX (Surrogate)	43.7	%	20 - 130 (LCL - UCL)		EPA-8081A		S05	1
Decachlorobiphenyl (Surrogate)	31.2	%	40 - 130 (LCL - UCL)		EPA-8081A		S05	1

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID
1	EPA-8081A	01/30/17	02/06/17 14:35	HKS	GC-17	1.014	B[B0055

Geologic/Pacific Geotechnical Engineering
16055-D Caputo Drive
Morgan Hill, CA 95037

Reported: 02/09/2017 12:48
Project: Soil Analysis
Project Number: MH Sewer Trunk 2016.0096
Project Manager: Beeson Liang

Volatile Organic Analysis (EPA Method 8260B)

BCL Sample ID: 1702487-03 | **Client Sample Name:** DH17 5.5 - 6.5 Feet, 12/7/2016 1:15:00PM

Constituent	Result	Units	PQL	MDL	Method	TTLC Limits	Lab Quals	Run #
Benzene	ND	mg/kg	0.0050	0.0013	EPA-8260B		A26	1
Bromobenzene	ND	mg/kg	0.0050	0.0013	EPA-8260B		A26	1
Bromochloromethane	ND	mg/kg	0.0050	0.00092	EPA-8260B		A26	1
Bromodichloromethane	ND	mg/kg	0.0050	0.00084	EPA-8260B		A26	1
Bromoform	ND	mg/kg	0.0050	0.0015	EPA-8260B		A26	1
Bromomethane	ND	mg/kg	0.0050	0.0016	EPA-8260B		A26	1
n-Butylbenzene	ND	mg/kg	0.0050	0.0015	EPA-8260B		A26	1
sec-Butylbenzene	ND	mg/kg	0.0050	0.0012	EPA-8260B		A26	1
tert-Butylbenzene	ND	mg/kg	0.0050	0.0012	EPA-8260B		A26	1
Carbon tetrachloride	ND	mg/kg	0.0050	0.0011	EPA-8260B		A26	1
Chlorobenzene	ND	mg/kg	0.0050	0.0013	EPA-8260B		A26	1
Chloroethane	ND	mg/kg	0.0050	0.0014	EPA-8260B		A26	1
Chloroform	ND	mg/kg	0.0050	0.00063	EPA-8260B		A26	1
Chloromethane	ND	mg/kg	0.0050	0.0014	EPA-8260B		A26	1
2-Chlorotoluene	ND	mg/kg	0.0050	0.0018	EPA-8260B		A26	1
4-Chlorotoluene	ND	mg/kg	0.0050	0.0014	EPA-8260B		A26	1
Dibromochloromethane	ND	mg/kg	0.0050	0.00099	EPA-8260B		A26	1
1,2-Dibromo-3-chloropropane	ND	mg/kg	0.0050	0.0017	EPA-8260B		A26	1
1,2-Dibromoethane	ND	mg/kg	0.0050	0.0010	EPA-8260B		A26	1
Dibromomethane	ND	mg/kg	0.0050	0.0018	EPA-8260B		A26	1
1,2-Dichlorobenzene	ND	mg/kg	0.0050	0.00081	EPA-8260B		A26	1
1,3-Dichlorobenzene	ND	mg/kg	0.0050	0.0014	EPA-8260B		A26	1
1,4-Dichlorobenzene	ND	mg/kg	0.0050	0.0015	EPA-8260B		A26	1
Dichlorodifluoromethane	ND	mg/kg	0.0050	0.0013	EPA-8260B		A26	1
1,1-Dichloroethane	ND	mg/kg	0.0050	0.0014	EPA-8260B		A26	1
1,2-Dichloroethane	ND	mg/kg	0.0050	0.00085	EPA-8260B		A26	1
1,1-Dichloroethene	ND	mg/kg	0.0050	0.0012	EPA-8260B		A26	1
cis-1,2-Dichloroethene	ND	mg/kg	0.0050	0.0013	EPA-8260B		A26	1
trans-1,2-Dichloroethene	ND	mg/kg	0.0050	0.0014	EPA-8260B		A26	1
1,2-Dichloropropane	ND	mg/kg	0.0050	0.00081	EPA-8260B		A26	1
1,3-Dichloropropane	ND	mg/kg	0.0050	0.0011	EPA-8260B		A26	1
2,2-Dichloropropane	ND	mg/kg	0.0050	0.0013	EPA-8260B		A26	1
1,1-Dichloropropene	ND	mg/kg	0.0050	0.0012	EPA-8260B		A26	1

Geologic/Pacific Geotechnical Engineering
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Morgan Hill, CA 95037

Reported: 02/09/2017 12:48
Project: Soil Analysis
Project Number: MH Sewer Trunk 2016.0096
Project Manager: Beeson Liang

Volatile Organic Analysis (EPA Method 8260B)

BCL Sample ID: 1702487-03 | **Client Sample Name:** DH17 5.5 - 6.5 Feet, 12/7/2016 1:15:00PM

Constituent	Result	Units	PQL	MDL	Method	TTLC Limits	Lab Quals	Run #
cis-1,3-Dichloropropene	ND	mg/kg	0.0050	0.0011	EPA-8260B		A26	1
trans-1,3-Dichloropropene	ND	mg/kg	0.0050	0.0012	EPA-8260B		A26	1
Ethylbenzene	ND	mg/kg	0.0050	0.0015	EPA-8260B		A26	1
Hexachlorobutadiene	ND	mg/kg	0.0050	0.0017	EPA-8260B		A26	1
Isopropylbenzene	ND	mg/kg	0.0050	0.0013	EPA-8260B		A26	1
p-Isopropyltoluene	ND	mg/kg	0.0050	0.0013	EPA-8260B		A26	1
Methylene chloride	ND	mg/kg	0.010	0.0024	EPA-8260B		A26	1
Methyl t-butyl ether	ND	mg/kg	0.0050	0.00050	EPA-8260B		A26	1
Naphthalene	ND	mg/kg	0.0050	0.0014	EPA-8260B		A26	1
n-Propylbenzene	ND	mg/kg	0.0050	0.0013	EPA-8260B		A26	1
Styrene	ND	mg/kg	0.0050	0.0014	EPA-8260B		A26	1
1,1,1,2-Tetrachloroethane	ND	mg/kg	0.0050	0.0011	EPA-8260B		A26	1
1,1,2,2-Tetrachloroethane	ND	mg/kg	0.0050	0.0011	EPA-8260B		A26	1
Tetrachloroethene	ND	mg/kg	0.0050	0.0013	EPA-8260B		A26	1
Toluene	ND	mg/kg	0.0050	0.0012	EPA-8260B		A26	1
1,2,3-Trichlorobenzene	ND	mg/kg	0.0050	0.0021	EPA-8260B		A26	1
1,2,4-Trichlorobenzene	ND	mg/kg	0.0050	0.0020	EPA-8260B		A26	1
1,1,1-Trichloroethane	ND	mg/kg	0.0050	0.0011	EPA-8260B		A26	1
1,1,2-Trichloroethane	ND	mg/kg	0.0050	0.00077	EPA-8260B		A26	1
Trichloroethene	ND	mg/kg	0.0050	0.0011	EPA-8260B	2040	A26	1
Trichlorofluoromethane	ND	mg/kg	0.0050	0.0011	EPA-8260B		A26	1
1,2,3-Trichloropropane	ND	mg/kg	0.0050	0.0016	EPA-8260B		A26	1
1,1,2-Trichloro-1,2,2-trifluoroethane	ND	mg/kg	0.0050	0.0013	EPA-8260B		A26	1
1,2,4-Trimethylbenzene	ND	mg/kg	0.0050	0.0013	EPA-8260B		A26	1
1,3,5-Trimethylbenzene	ND	mg/kg	0.0050	0.0015	EPA-8260B		A26	1
Vinyl chloride	ND	mg/kg	0.0050	0.0016	EPA-8260B		A26	1
Total Xylenes	ND	mg/kg	0.010	0.0034	EPA-8260B		A26	1
p- & m-Xylenes	ND	mg/kg	0.0050	0.0022	EPA-8260B		A26	1
o-Xylene	ND	mg/kg	0.0050	0.0012	EPA-8260B		A26	1
1,2-Dichloroethane-d4 (Surrogate)	105	%	70 - 121 (LCL - UCL)		EPA-8260B			1
Toluene-d8 (Surrogate)	99.5	%	81 - 117 (LCL - UCL)		EPA-8260B			1
4-Bromofluorobenzene (Surrogate)	104	%	74 - 121 (LCL - UCL)		EPA-8260B			1

Geologic/Pacific Geotechnical Engineering
16055-D Caputo Drive
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Reported: 02/09/2017 12:48
Project: Soil Analysis
Project Number: MH Sewer Trunk 2016.0096
Project Manager: Beeson Liang

Volatile Organic Analysis (EPA Method 8260B)

BCL Sample ID: 1702487-03 | **Client Sample Name:** DH17 5.5 - 6.5 Feet, 12/7/2016 1:15:00PM

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID
1	EPA-8260B	01/30/17	01/30/17 17:41	ADC	MS-V3	1	B[A2213

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Project Number: MH Sewer Trunk 2016.0096
Project Manager: Beeson Liang

Total Petroleum Hydrocarbons

BCL Sample ID: 1702487-03 | **Client Sample Name:** DH17 5.5 - 6.5 Feet, 12/7/2016 1:15:00PM

Constituent	Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
TPH - Gasoline	ND	mg/kg	20	5.0	EPA-8015B/FFP	ND	S05	1
TPH - Diesel (FFP)	ND	mg/kg	10	1.2	EPA-8015B/FFP	ND	S05	1
TPH - Motor Oil	ND	mg/kg	20	6.5	EPA-8015B/FFP	ND	S05	1
Tetracosane (Surrogate)	93.7	%	20 - 145 (LCL - UCL)		EPA-8015B/FFP		S05	1

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID
1	EPA-8015B/FFP	01/30/17	02/03/17 21:08	AS1	GC-2	1.007	B[A2394

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Project: Soil Analysis
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Total Concentrations (TTLC)

BCL Sample ID: 1702487-03 | **Client Sample Name:** DH17 5.5 - 6.5 Feet, 12/7/2016 1:15:00PM

Constituent	Result	Units	PQL	MDL	Method	TTLC Limits	Lab Quals	Run #
Antimony	ND	mg/kg	5.0	0.33	EPA-6010B	500		1
Arsenic	**2.1**	**mg/kg**	**1.0**	**0.40**	**EPA-6010B**	500		1
Barium	**110**	**mg/kg**	**0.50**	**0.18**	**EPA-6010B**	10000		1
Beryllium	**0.39**	**mg/kg**	**0.50**	**0.047**	**EPA-6010B**	75	**J**	1
Cadmium	ND	mg/kg	0.50	0.052	EPA-6010B	100		1
Chromium	**100**	**mg/kg**	**0.50**	**0.050**	**EPA-6010B**	2500		1
Cobalt	**14**	**mg/kg**	**2.5**	**0.098**	**EPA-6010B**	8000		1
Copper	**30**	**mg/kg**	**1.0**	**0.050**	**EPA-6010B**	2500		1
Lead	**5.3**	**mg/kg**	**2.5**	**0.28**	**EPA-6010B**	1000		1
Mercury	**0.066**	**mg/kg**	**0.16**	**0.041**	**EPA-7471A**	20	**J,S05**	2
Molybdenum	ND	mg/kg	2.5	0.050	EPA-6010B	3500		1
Nickel	**120**	**mg/kg**	**0.50**	**0.15**	**EPA-6010B**	2000		1
Selenium	**2.0**	**mg/kg**	**1.0**	**0.98**	**EPA-6010B**	100		1
Silver	**0.29**	**mg/kg**	**0.50**	**0.067**	**EPA-6010B**	500	**J**	1
Thallium	ND	mg/kg	5.0	0.64	EPA-6010B	700		1
Vanadium	**72**	**mg/kg**	**0.50**	**0.11**	**EPA-6010B**	2400		1
Zinc	**39**	**mg/kg**	**2.5**	**0.087**	**EPA-6010B**	5000		1

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID
1	EPA-6010B	02/01/17	02/01/17 13:49	JCC	PE-OP3	0.990	B[B0016
2	EPA-7471A	01/31/17	02/01/17 13:30	MEV	CETAC2	1.025	B[A2372

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Project: Soil Analysis
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Organochlorine Pesticides (EPA Method 8081A)

Quality Control Report - Method Blank Analysis

Constituent	QC Sample ID	MB Result	Units	PQL	MDL	Lab Quals
QC Batch ID: B[B0055						
Aldrin	B[B0055-BLK1	ND	mg/kg	0.00050	0.000055	
alpha-BHC	B[B0055-BLK1	ND	mg/kg	0.00050	0.000064	
beta-BHC	B[B0055-BLK1	ND	mg/kg	0.00050	0.000071	
delta-BHC	B[B0055-BLK1	ND	mg/kg	0.00050	0.000059	
gamma-BHC (Lindane)	B[B0055-BLK1	ND	mg/kg	0.00050	0.000034	
Chlordane (Technical)	B[B0055-BLK1	ND	mg/kg	0.050	0.0015	
4,4'-DDD	B[B0055-BLK1	ND	mg/kg	0.00050	0.000085	
4,4'-DDE	B[B0055-BLK1	ND	mg/kg	0.00050	0.000083	
4,4'-DDT	B[B0055-BLK1	ND	mg/kg	0.00050	0.000078	
Dieldrin	B[B0055-BLK1	ND	mg/kg	0.00050	0.000070	
Endosulfan I	B[B0055-BLK1	ND	mg/kg	0.00050	0.000087	
Endosulfan II	B[B0055-BLK1	ND	mg/kg	0.00050	0.00011	
Endosulfan sulfate	B[B0055-BLK1	ND	mg/kg	0.00050	0.000099	
Endrin	B[B0055-BLK1	ND	mg/kg	0.00050	0.000087	
Endrin aldehyde	B[B0055-BLK1	ND	mg/kg	0.00050	0.000097	
Heptachlor	B[B0055-BLK1	ND	mg/kg	0.00050	0.000057	
Heptachlor epoxide	B[B0055-BLK1	ND	mg/kg	0.00050	0.000078	
Methoxychlor	B[B0055-BLK1	ND	mg/kg	0.00050	0.00011	
Toxaphene	B[B0055-BLK1	ND	mg/kg	0.050	0.0013	
TCMX (Surrogate)	**B[B0055-BLK1**	**70.4**	%	**20 - 130 (LCL - UCL)**		
Decachlorobiphenyl (Surrogate)	**B[B0055-BLK1**	**75.8**	%	**40 - 130 (LCL - UCL)**		

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Organochlorine Pesticides (EPA Method 8081A)

Quality Control Report - Laboratory Control Sample

Constituent	QC Sample ID	Type	Result	Spike Level	Units	Percent Recovery	RPD	Control Limits Percent Recovery	Control Limits RPD	Lab Quals
QC Batch ID: B[B0055										
Aldrin	B[B0055-BS1	LCS	0.0043099	0.0049342	mg/kg	87.3		70 - 130		
gamma-BHC (Lindane)	B[B0055-BS1	LCS	0.0042763	0.0049342	mg/kg	86.7		60 - 140		
4,4'-DDT	B[B0055-BS1	LCS	0.0039375	0.0049342	mg/kg	79.8		60 - 140		
Dieldrin	B[B0055-BS1	LCS	0.0042204	0.0049342	mg/kg	85.5		70 - 130		
Endrin	B[B0055-BS1	LCS	0.0040293	0.0049342	mg/kg	81.7		60 - 140		
Heptachlor	B[B0055-BS1	LCS	0.0041306	0.0049342	mg/kg	83.7		60 - 140		
TCMX (Surrogate)	B[B0055-BS1	LCS	0.0074579	0.0098684	mg/kg	75.6		20 - 130		
Decachlorobiphenyl (Surrogate)	B[B0055-BS1	LCS	0.014628	0.019737	mg/kg	74.1		40 - 130		

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Organochlorine Pesticides (EPA Method 8081A)

Quality Control Report - Precision & Accuracy

Constituent	Type	Source Sample ID	Source Result	Result	Spike Added	Units	RPD	Percent Recovery	Control Limits RPD	Control Limits Percent Recovery	Lab Quals
QC Batch ID: B[B0055	Used client sample: Y - Description: DH3 S.S-6.5 Feet, 12/05/2016 11:00										
Aldrin	MS	1702487-01	ND	0.0034017	0.0049669	mg/kg		68.5		50 - 140	
	MSD	1702487-01	ND	0.0035828	0.0049669	mg/kg	5.2	72.1	30	50 - 140	
gamma-BHC (Lindane)	MS	1702487-01	ND	0.0035146	0.0049669	mg/kg		70.8		50 - 140	
	MSD	1702487-01	ND	0.0036377	0.0049669	mg/kg	3.4	73.2	30	50 - 140	
4,4'-DDT	MS	1702487-01	ND	0.0032844	0.0049669	mg/kg		66.1		50 - 140	
	MSD	1702487-01	ND	0.0036010	0.0049669	mg/kg	9.2	72.5	30	50 - 140	
Dieldrin	MS	1702487-01	ND	0.0031470	0.0049669	mg/kg		63.4		40 - 140	
	MSD	1702487-01	ND	0.0032570	0.0049669	mg/kg	3.4	65.6	30	40 - 140	
Endrin	MS	1702487-01	ND	0.0034179	0.0049669	mg/kg		68.8		50 - 150	
	MSD	1702487-01	ND	0.0035801	0.0049669	mg/kg	4.6	72.1	30	50 - 150	
Heptachlor	MS	1702487-01	ND	0.0034265	0.0049669	mg/kg		69.0		60 - 140	
	MSD	1702487-01	ND	0.0035510	0.0049669	mg/kg	3.6	71.5	30	60 - 140	
TCMX (Surrogate)	MS	1702487-01	ND	0.0071772	0.0099338	mg/kg		72.3		20 - 130	
	MSD	1702487-01	ND	0.0074815	0.0099338	mg/kg	4.2	75.3		20 - 130	
Decachlorobiphenyl (Surrogate)	MS	1702487-01	ND	0.012184	0.019868	mg/kg		61.3		40 - 130	
	MSD	1702487-01	ND	0.012686	0.019868	mg/kg	4.0	63.9		40 - 130	

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Reported: 02/09/2017 12:48
Project: Soil Analysis
Project Number: MH Sewer Trunk 2016.0096
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Volatile Organic Analysis (EPA Method 8260B)

Quality Control Report - Method Blank Analysis

Constituent	QC Sample ID	MB Result	Units	PQL	MDL	Lab Quals
QC Batch ID: B[A1908						
Benzene	B[A1908-BLK1	ND	mg/kg	0.0050	0.0013	
Bromobenzene	B[A1908-BLK1	ND	mg/kg	0.0050	0.0013	
Bromochloromethane	B[A1908-BLK1	ND	mg/kg	0.0050	0.00092	
Bromodichloromethane	B[A1908-BLK1	ND	mg/kg	0.0050	0.00084	
Bromoform	B[A1908-BLK1	ND	mg/kg	0.0050	0.0015	
Bromomethane	B[A1908-BLK1	ND	mg/kg	0.0050	0.0016	
n-Butylbenzene	B[A1908-BLK1	ND	mg/kg	0.0050	0.0015	
sec-Butylbenzene	B[A1908-BLK1	ND	mg/kg	0.0050	0.0012	
tert-Butylbenzene	B[A1908-BLK1	ND	mg/kg	0.0050	0.0012	
Carbon tetrachloride	B[A1908-BLK1	ND	mg/kg	0.0050	0.0011	
Chlorobenzene	B[A1908-BLK1	ND	mg/kg	0.0050	0.0013	
Chloroethane	B[A1908-BLK1	ND	mg/kg	0.0050	0.0014	
Chloroform	B[A1908-BLK1	ND	mg/kg	0.0050	0.00063	
Chloromethane	B[A1908-BLK1	ND	mg/kg	0.0050	0.0014	
2-Chlorotoluene	B[A1908-BLK1	ND	mg/kg	0.0050	0.0018	
4-Chlorotoluene	B[A1908-BLK1	ND	mg/kg	0.0050	0.0014	
Dibromochloromethane	B[A1908-BLK1	ND	mg/kg	0.0050	0.00099	
1,2-Dibromo-3-chloropropane	B[A1908-BLK1	ND	mg/kg	0.0050	0.0017	
1,2-Dibromoethane	B[A1908-BLK1	ND	mg/kg	0.0050	0.0010	
Dibromomethane	B[A1908-BLK1	ND	mg/kg	0.0050	0.0018	
1,2-Dichlorobenzene	B[A1908-BLK1	ND	mg/kg	0.0050	0.00081	
1,3-Dichlorobenzene	B[A1908-BLK1	ND	mg/kg	0.0050	0.0014	
1,4-Dichlorobenzene	B[A1908-BLK1	ND	mg/kg	0.0050	0.0015	
Dichlorodifluoromethane	B[A1908-BLK1	ND	mg/kg	0.0050	0.0013	
1,1-Dichloroethane	B[A1908-BLK1	ND	mg/kg	0.0050	0.0014	
1,2-Dichloroethane	B[A1908-BLK1	ND	mg/kg	0.0050	0.00085	
1,1-Dichloroethene	B[A1908-BLK1	ND	mg/kg	0.0050	0.0012	
cis-1,2-Dichloroethene	B[A1908-BLK1	ND	mg/kg	0.0050	0.0013	
trans-1,2-Dichloroethene	B[A1908-BLK1	ND	mg/kg	0.0050	0.0014	
1,2-Dichloropropane	B[A1908-BLK1	ND	mg/kg	0.0050	0.00081	
1,3-Dichloropropane	B[A1908-BLK1	ND	mg/kg	0.0050	0.0011	
2,2-Dichloropropane	B[A1908-BLK1	ND	mg/kg	0.0050	0.0013	
1,1-Dichloropropene	B[A1908-BLK1	ND	mg/kg	0.0050	0.0012	
cis-1,3-Dichloropropene	B[A1908-BLK1	ND	mg/kg	0.0050	0.0011	

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Volatile Organic Analysis (EPA Method 8260B)

Quality Control Report - Method Blank Analysis

Constituent	QC Sample ID	MB Result	Units	PQL	MDL	Lab Quals
QC Batch ID: B[A1908						
trans-1,3-Dichloropropene	B[A1908-BLK1	ND	mg/kg	0.0050	0.0012	
Ethylbenzene	B[A1908-BLK1	ND	mg/kg	0.0050	0.0015	
Hexachlorobutadiene	B[A1908-BLK1	ND	mg/kg	0.0050	0.0017	
Isopropylbenzene	B[A1908-BLK1	ND	mg/kg	0.0050	0.0013	
p-Isopropyltoluene	B[A1908-BLK1	ND	mg/kg	0.0050	0.0013	
Methylene chloride	B[A1908-BLK1	ND	mg/kg	0.010	0.0024	
Methyl t-butyl ether	B[A1908-BLK1	ND	mg/kg	0.0050	0.00050	
Naphthalene	B[A1908-BLK1	ND	mg/kg	0.0050	0.0014	
n-Propylbenzene	B[A1908-BLK1	ND	mg/kg	0.0050	0.0013	
Styrene	B[A1908-BLK1	ND	mg/kg	0.0050	0.0014	
1,1,1,2-Tetrachloroethane	B[A1908-BLK1	ND	mg/kg	0.0050	0.0011	
1,1,2,2-Tetrachloroethane	B[A1908-BLK1	ND	mg/kg	0.0050	0.0011	
Tetrachloroethene	B[A1908-BLK1	ND	mg/kg	0.0050	0.0013	
Toluene	B[A1908-BLK1	ND	mg/kg	0.0050	0.0012	
1,2,3-Trichlorobenzene	B[A1908-BLK1	ND	mg/kg	0.0050	0.0021	
1,2,4-Trichlorobenzene	B[A1908-BLK1	ND	mg/kg	0.0050	0.0020	
1,1,1-Trichloroethane	B[A1908-BLK1	ND	mg/kg	0.0050	0.0011	
1,1,2-Trichloroethane	B[A1908-BLK1	ND	mg/kg	0.0050	0.00077	
Trichloroethene	B[A1908-BLK1	ND	mg/kg	0.0050	0.0011	
Trichlorofluoromethane	B[A1908-BLK1	ND	mg/kg	0.0050	0.0011	
1,2,3-Trichloropropane	B[A1908-BLK1	ND	mg/kg	0.0050	0.0016	
1,1,2-Trichloro-1,2,2-trifluoroethane	B[A1908-BLK1	ND	mg/kg	0.0050	0.0013	
1,2,4-Trimethylbenzene	B[A1908-BLK1	ND	mg/kg	0.0050	0.0013	
1,3,5-Trimethylbenzene	B[A1908-BLK1	ND	mg/kg	0.0050	0.0015	
Vinyl chloride	B[A1908-BLK1	ND	mg/kg	0.0050	0.0016	
Total Xylenes	B[A1908-BLK1	ND	mg/kg	0.010	0.0034	
p- & m-Xylenes	B[A1908-BLK1	ND	mg/kg	0.0050	0.0022	
o-Xylene	B[A1908-BLK1	ND	mg/kg	0.0050	0.0012	
1,2-Dichloroethane-d4 (Surrogate)	**B[A1908-BLK1**	**106**	%	**70 - 121 (LCL - UCL)**		
Toluene-d8 (Surrogate)	**B[A1908-BLK1**	**101**	%	**81 - 117 (LCL - UCL)**		
4-Bromofluorobenzene (Surrogate)	**B[A1908-BLK1**	**101**	%	**74 - 121 (LCL - UCL)**		
QC Batch ID: B[A2213						
Benzene	B[A2213-BLK1	ND	mg/kg	0.0050	0.0013	

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Volatile Organic Analysis (EPA Method 8260B)

Quality Control Report - Method Blank Analysis

Constituent	QC Sample ID	MB Result	Units	PQL	MDL	Lab Quals
QC Batch ID: B[A2213						
Bromobenzene	B[A2213-BLK1	ND	mg/kg	0.0050	0.0013	
Bromochloromethane	B[A2213-BLK1	ND	mg/kg	0.0050	0.00092	
Bromodichloromethane	B[A2213-BLK1	ND	mg/kg	0.0050	0.00084	
Bromoform	B[A2213-BLK1	ND	mg/kg	0.0050	0.0015	
Bromomethane	B[A2213-BLK1	ND	mg/kg	0.0050	0.0016	
n-Butylbenzene	B[A2213-BLK1	ND	mg/kg	0.0050	0.0015	
sec-Butylbenzene	B[A2213-BLK1	ND	mg/kg	0.0050	0.0012	
tert-Butylbenzene	B[A2213-BLK1	ND	mg/kg	0.0050	0.0012	
Carbon tetrachloride	B[A2213-BLK1	ND	mg/kg	0.0050	0.0011	
Chlorobenzene	B[A2213-BLK1	ND	mg/kg	0.0050	0.0013	
Chloroethane	B[A2213-BLK1	ND	mg/kg	0.0050	0.0014	
Chloroform	B[A2213-BLK1	ND	mg/kg	0.0050	0.00063	
Chloromethane	B[A2213-BLK1	ND	mg/kg	0.0050	0.0014	
2-Chlorotoluene	B[A2213-BLK1	ND	mg/kg	0.0050	0.0018	
4-Chlorotoluene	B[A2213-BLK1	ND	mg/kg	0.0050	0.0014	
Dibromochloromethane	B[A2213-BLK1	ND	mg/kg	0.0050	0.00099	
1,2-Dibromo-3-chloropropane	B[A2213-BLK1	ND	mg/kg	0.0050	0.0017	
1,2-Dibromoethane	B[A2213-BLK1	ND	mg/kg	0.0050	0.0010	
Dibromomethane	B[A2213-BLK1	ND	mg/kg	0.0050	0.0018	
1,2-Dichlorobenzene	B[A2213-BLK1	ND	mg/kg	0.0050	0.00081	
1,3-Dichlorobenzene	B[A2213-BLK1	ND	mg/kg	0.0050	0.0014	
1,4-Dichlorobenzene	B[A2213-BLK1	ND	mg/kg	0.0050	0.0015	
Dichlorodifluoromethane	B[A2213-BLK1	ND	mg/kg	0.0050	0.0013	
1,1-Dichloroethane	B[A2213-BLK1	ND	mg/kg	0.0050	0.0014	
1,2-Dichloroethane	B[A2213-BLK1	ND	mg/kg	0.0050	0.00085	
1,1-Dichloroethene	B[A2213-BLK1	ND	mg/kg	0.0050	0.0012	
cis-1,2-Dichloroethene	B[A2213-BLK1	ND	mg/kg	0.0050	0.0013	
trans-1,2-Dichloroethene	B[A2213-BLK1	ND	mg/kg	0.0050	0.0014	
1,2-Dichloropropane	B[A2213-BLK1	ND	mg/kg	0.0050	0.00081	
1,3-Dichloropropane	B[A2213-BLK1	ND	mg/kg	0.0050	0.0011	
2,2-Dichloropropane	B[A2213-BLK1	ND	mg/kg	0.0050	0.0013	
1,1-Dichloropropene	B[A2213-BLK1	ND	mg/kg	0.0050	0.0012	
cis-1,3-Dichloropropene	B[A2213-BLK1	ND	mg/kg	0.0050	0.0011	
trans-1,3-Dichloropropene	B[A2213-BLK1	ND	mg/kg	0.0050	0.0012	

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Volatile Organic Analysis (EPA Method 8260B)

Quality Control Report - Method Blank Analysis

Constituent	QC Sample ID	MB Result	Units	PQL	MDL	Lab Quals
QC Batch ID: B[A2213						
Ethylbenzene	B[A2213-BLK1	ND	mg/kg	0.0050	0.0015	
Hexachlorobutadiene	B[A2213-BLK1	ND	mg/kg	0.0050	0.0017	
Isopropylbenzene	B[A2213-BLK1	ND	mg/kg	0.0050	0.0013	
p-Isopropyltoluene	B[A2213-BLK1	ND	mg/kg	0.0050	0.0013	
Methylene chloride	B[A2213-BLK1	ND	mg/kg	0.010	0.0024	
Methyl t-butyl ether	B[A2213-BLK1	ND	mg/kg	0.0050	0.00050	
Naphthalene	B[A2213-BLK1	ND	mg/kg	0.0050	0.0014	
n-Propylbenzene	B[A2213-BLK1	ND	mg/kg	0.0050	0.0013	
Styrene	B[A2213-BLK1	ND	mg/kg	0.0050	0.0014	
1,1,1,2-Tetrachloroethane	B[A2213-BLK1	ND	mg/kg	0.0050	0.0011	
1,1,2,2-Tetrachloroethane	B[A2213-BLK1	ND	mg/kg	0.0050	0.0011	
Tetrachloroethene	B[A2213-BLK1	ND	mg/kg	0.0050	0.0013	
Toluene	B[A2213-BLK1	ND	mg/kg	0.0050	0.0012	
1,2,3-Trichlorobenzene	B[A2213-BLK1	ND	mg/kg	0.0050	0.0021	
1,2,4-Trichlorobenzene	B[A2213-BLK1	ND	mg/kg	0.0050	0.0020	
1,1,1-Trichloroethane	B[A2213-BLK1	ND	mg/kg	0.0050	0.0011	
1,1,2-Trichloroethane	B[A2213-BLK1	ND	mg/kg	0.0050	0.00077	
Trichloroethene	B[A2213-BLK1	ND	mg/kg	0.0050	0.0011	
Trichlorofluoromethane	B[A2213-BLK1	ND	mg/kg	0.0050	0.0011	
1,2,3-Trichloropropane	B[A2213-BLK1	ND	mg/kg	0.0050	0.0016	
1,1,2-Trichloro-1,2,2-trifluoroethane	B[A2213-BLK1	ND	mg/kg	0.0050	0.0013	
1,2,4-Trimethylbenzene	B[A2213-BLK1	ND	mg/kg	0.0050	0.0013	
1,3,5-Trimethylbenzene	B[A2213-BLK1	ND	mg/kg	0.0050	0.0015	
Vinyl chloride	B[A2213-BLK1	ND	mg/kg	0.0050	0.0016	
Total Xylenes	B[A2213-BLK1	ND	mg/kg	0.010	0.0034	
p- & m-Xylenes	B[A2213-BLK1	ND	mg/kg	0.0050	0.0022	
o-Xylene	B[A2213-BLK1	ND	mg/kg	0.0050	0.0012	
1,2-Dichloroethane-d4 (Surrogate)	**B[A2213-BLK1**	**97.9**	%	**70 - 121 (LCL - UCL)**		
Toluene-d8 (Surrogate)	**B[A2213-BLK1**	**97.9**	%	**81 - 117 (LCL - UCL)**		
4-Bromofluorobenzene (Surrogate)	**B[A2213-BLK1**	**104**	%	**74 - 121 (LCL - UCL)**		

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Volatile Organic Analysis (EPA Method 8260B)

Quality Control Report - Laboratory Control Sample

Constituent	QC Sample ID	Type	Result	Spike Level	Units	Percent Recovery	RPD	Control Limits Percent Recovery	Control Limits RPD	Lab Quals
QC Batch ID: B[A1908										
Benzene	B[A1908-BS1	LCS	0.11896	0.12500	mg/kg	95.2		70 - 130		
Bromodichloromethane	B[A1908-BS1	LCS	0.11746	0.12500	mg/kg	94.0		70 - 130		
Chlorobenzene	B[A1908-BS1	LCS	0.12298	0.12500	mg/kg	98.4		70 - 130		
Chloroethane	B[A1908-BS1	LCS	0.11442	0.12500	mg/kg	91.5		70 - 130		
1,4-Dichlorobenzene	B[A1908-BS1	LCS	0.12365	0.12500	mg/kg	98.9		70 - 130		
1,1-Dichloroethane	B[A1908-BS1	LCS	0.11996	0.12500	mg/kg	96.0		70 - 130		
1,1-Dichloroethene	B[A1908-BS1	LCS	0.11503	0.12500	mg/kg	92.0		70 - 130		
Toluene	B[A1908-BS1	LCS	0.12088	0.12500	mg/kg	96.7		70 - 130		
Trichloroethene	B[A1908-BS1	LCS	0.11677	0.12500	mg/kg	93.4		70 - 130		
1,2-Dichloroethane-d4 (Surrogate)	B[A1908-BS1	LCS	0.050500	0.050000	mg/kg	101		70 - 121		
Toluene-d8 (Surrogate)	B[A1908-BS1	LCS	0.049130	0.050000	mg/kg	98.3		81 - 117		
4-Bromofluorobenzene (Surrogate)	B[A1908-BS1	LCS	0.050830	0.050000	mg/kg	102		74 - 121		
QC Batch ID: B[A2213										
Benzene	B[A2213-BS1	LCS	0.12082	0.12500	mg/kg	96.7		70 - 130		
Bromodichloromethane	B[A2213-BS1	LCS	0.11778	0.12500	mg/kg	94.2		70 - 130		
Chlorobenzene	B[A2213-BS1	LCS	0.12191	0.12500	mg/kg	97.5		70 - 130		
Chloroethane	B[A2213-BS1	LCS	0.11281	0.12500	mg/kg	90.2		70 - 130		
1,4-Dichlorobenzene	B[A2213-BS1	LCS	0.11834	0.12500	mg/kg	94.7		70 - 130		
1,1-Dichloroethane	B[A2213-BS1	LCS	0.11572	0.12500	mg/kg	92.6		70 - 130		
1,1-Dichloroethene	B[A2213-BS1	LCS	0.11284	0.12500	mg/kg	90.3		70 - 130		
Toluene	B[A2213-BS1	LCS	0.11847	0.12500	mg/kg	94.8		70 - 130		
Trichloroethene	B[A2213-BS1	LCS	0.11616	0.12500	mg/kg	92.9		70 - 130		
1,2-Dichloroethane-d4 (Surrogate)	B[A2213-BS1	LCS	0.050620	0.050000	mg/kg	101		70 - 121		
Toluene-d8 (Surrogate)	B[A2213-BS1	LCS	0.049460	0.050000	mg/kg	98.9		81 - 117		
4-Bromofluorobenzene (Surrogate)	B[A2213-BS1	LCS	0.049360	0.050000	mg/kg	98.7		74 - 121		

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Volatile Organic Analysis (EPA Method 8260B)

Quality Control Report - Precision & Accuracy

Constituent	Type	Source Sample ID	Source Result	Result	Spike Added	Units	RPD	Percent Recovery	Control Limits RPD	Control Limits Percent Recovery	Lab Quals
QC Batch ID: B[A1908	Used client sample: N										
Benzene	MS	1701379-12	ND	0.11988	0.12500	mg/kg		95.9		70 - 130	
	MSD	1701379-12	ND	0.11907	0.12500	mg/kg	0.7	95.3	20	70 - 130	
Bromodichloromethane	MS	1701379-12	ND	0.11941	0.12500	mg/kg		95.5		70 - 130	
	MSD	1701379-12	ND	0.12203	0.12500	mg/kg	2.2	97.6	20	70 - 130	
Chlorobenzene	MS	1701379-12	ND	0.12909	0.12500	mg/kg		103		70 - 130	
	MSD	1701379-12	ND	0.12767	0.12500	mg/kg	1.1	102	20	70 - 130	
Chloroethane	MS	1701379-12	ND	0.12704	0.12500	mg/kg		102		70 - 130	
	MSD	1701379-12	ND	0.11354	0.12500	mg/kg	11.2	90.8	20	70 - 130	
1,4-Dichlorobenzene	MS	1701379-12	ND	0.12897	0.12500	mg/kg		103		70 - 130	
	MSD	1701379-12	ND	0.13235	0.12500	mg/kg	2.6	106	20	70 - 130	
1,1-Dichloroethane	MS	1701379-12	ND	0.12144	0.12500	mg/kg		97.2		70 - 130	
	MSD	1701379-12	ND	0.11630	0.12500	mg/kg	4.3	93.0	20	70 - 130	
1,1-Dichloroethene	MS	1701379-12	ND	0.12449	0.12500	mg/kg		99.6		70 - 130	
	MSD	1701379-12	ND	0.11474	0.12500	mg/kg	8.2	91.8	20	70 - 130	
Toluene	MS	1701379-12	ND	0.12776	0.12500	mg/kg		102		70 - 130	
	MSD	1701379-12	ND	0.12142	0.12500	mg/kg	5.1	97.1	20	70 - 130	
Trichloroethene	MS	1701379-12	ND	0.12692	0.12500	mg/kg		102		70 - 130	
	MSD	1701379-12	ND	0.11974	0.12500	mg/kg	5.8	95.8	20	70 - 130	
1,2-Dichloroethane-d4 (Surrogate)	MS	1701379-12	ND	0.048780	0.050000	mg/kg		97.6		70 - 121	
	MSD	1701379-12	ND	0.049420	0.050000	mg/kg	1.3	98.8		70 - 121	
Toluene-d8 (Surrogate)	MS	1701379-12	ND	0.048050	0.050000	mg/kg		96.1		81 - 117	
	MSD	1701379-12	ND	0.049640	0.050000	mg/kg	3.3	99.3		81 - 117	
4-Bromofluorobenzene (Surrogate)	MS	1701379-12	ND	0.050070	0.050000	mg/kg		100		74 - 121	
	MSD	1701379-12	ND	0.052690	0.050000	mg/kg	5.1	105		74 - 121	
QC Batch ID: B[A2213	Used client sample: N										
Benzene	MS	1701379-34	ND	0.11135	0.12500	mg/kg		89.1		70 - 130	
	MSD	1701379-34	ND	0.11723	0.12500	mg/kg	5.1	93.8	20	70 - 130	
Bromodichloromethane	MS	1701379-34	ND	0.11659	0.12500	mg/kg		93.3		70 - 130	
	MSD	1701379-34	ND	0.11673	0.12500	mg/kg	0.1	93.4	20	70 - 130	
Chlorobenzene	MS	1701379-34	ND	0.12056	0.12500	mg/kg		96.4		70 - 130	
	MSD	1701379-34	ND	0.11902	0.12500	mg/kg	1.3	95.2	20	70 - 130	
Chloroethane	MS	1701379-34	ND	0.10532	0.12500	mg/kg		84.3		70 - 130	
	MSD	1701379-34	ND	0.11192	0.12500	mg/kg	6.1	89.5	20	70 - 130	
1,4-Dichlorobenzene	MS	1701379-34	ND	0.12115	0.12500	mg/kg		96.9		70 - 130	
	MSD	1701379-34	ND	0.11870	0.12500	mg/kg	2.0	95.0	20	70 - 130	
1,1-Dichloroethane	MS	1701379-34	ND	0.10780	0.12500	mg/kg		86.2		70 - 130	
	MSD	1701379-34	ND	0.11221	0.12500	mg/kg	4.0	89.8	20	70 - 130	

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Volatile Organic Analysis (EPA Method 8260B)

Quality Control Report - Precision & Accuracy

Constituent	Type	Source Sample ID	Source Result	Result	Spike Added	Units	RPD	Percent Recovery	Control Limits RPD	Control Limits Percent Recovery	Lab Quals
QC Batch ID: B[A2213	Used client sample: N										
1,1-Dichloroethene	MS	1701379-34	ND	0.10274	0.12500	mg/kg		82.2		70 - 130	
	MSD	1701379-34	ND	0.10594	0.12500	mg/kg	3.1	84.8	20	70 - 130	
Toluene	MS	1701379-34	ND	0.11982	0.12500	mg/kg		95.9		70 - 130	
	MSD	1701379-34	ND	0.11689	0.12500	mg/kg	2.5	93.5	20	70 - 130	
Trichloroethene	MS	1701379-34	ND	0.11534	0.12500	mg/kg		92.3		70 - 130	
	MSD	1701379-34	ND	0.11629	0.12500	mg/kg	0.8	93.0	20	70 - 130	
1,2-Dichloroethane-d4 (Surrogate)	MS	1701379-34	ND	0.046530	0.050000	mg/kg		93.1		70 - 121	
	MSD	1701379-34	ND	0.050910	0.050000	mg/kg	9.0	102		70 - 121	
Toluene-d8 (Surrogate)	MS	1701379-34	ND	0.049650	0.050000	mg/kg		99.3		81 - 117	
	MSD	1701379-34	ND	0.050250	0.050000	mg/kg	1.2	100		81 - 117	
4-Bromofluorobenzene (Surrogate)	MS	1701379-34	ND	0.051260	0.050000	mg/kg		103		74 - 121	
	MSD	1701379-34	ND	0.051340	0.050000	mg/kg	0.2	103		74 - 121	

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Total Petroleum Hydrocarbons

Quality Control Report - Method Blank Analysis

Constituent	QC Sample ID	MB Result	Units	PQL	MDL	Lab Quals
QC Batch ID: B[A2394						
TPH - Gasoline	B[A2394-BLK1	ND	mg/kg	20	5.0	
TPH - Diesel (FFP)	B[A2394-BLK1	ND	mg/kg	10	1.2	
TPH - Motor Oil	B[A2394-BLK1	ND	mg/kg	20	6.5	
Tetracosane (Surrogate)	**B[A2394-BLK1**	**81.4**	%	**20 - 145 (LCL - UCL)**		

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Total Petroleum Hydrocarbons

Quality Control Report - Laboratory Control Sample

Constituent	QC Sample ID	Type	Result	Spike Level	Units	Percent Recovery	RPD	Control Limits Percent Recovery	Control Limits RPD	Lab Quals
QC Batch ID: B[A2394										
TPH - Diesel (FFP)	B[A2394-BS1	LCS	62.421	83.056	mg/kg	75.2		64 - 124		
Tetracosane (Surrogate)	B[A2394-BS1	LCS	2.7635	3.3223	mg/kg	83.2		20 - 145		

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Total Petroleum Hydrocarbons

Quality Control Report - Precision & Accuracy

Constituent	Type	Source Sample ID	Source Result	Result	Spike Added	Units	RPD	Percent Recovery	Control Limits RPD	Control Limits Percent Recovery	Lab Quals
QC Batch ID: B[A2394	Used client sample: N										
TPH - Diesel (FFP)	MS	1701379-34	ND	57.010	81.967	mg/kg		69.6		52 - 131	
	MSD	1701379-34	ND	64.786	83.893	mg/kg	12.8	77.2	30	52 - 131	
Tetracosane (Surrogate)	MS	1701379-34	ND	2.4964	3.2787	mg/kg		76.1		20 - 145	
	MSD	1701379-34	ND	2.8649	3.3557	mg/kg	13.7	85.4		20 - 145	

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Total Concentrations (TTLC)

Quality Control Report - Method Blank Analysis

Constituent	QC Sample ID	MB Result	Units	PQL	MDL	Lab Quals
QC Batch ID: B[A2372						
Mercury	B[A2372-BLK1	ND	mg/kg	0.16	0.041	
QC Batch ID: B[B0016						
Antimony	B[B0016-BLK1	ND	mg/kg	5.0	0.33	
Arsenic	B[B0016-BLK1	ND	mg/kg	1.0	0.40	
Barium	B[B0016-BLK1	ND	mg/kg	0.50	0.18	
Beryllium	B[B0016-BLK1	ND	mg/kg	0.50	0.047	
Cadmium	B[B0016-BLK1	ND	mg/kg	0.50	0.052	
Chromium	**B[B0016-BLK1**	**0.25226**	**mg/kg**	**0.50**	**0.050**	**J**
Cobalt	B[B0016-BLK1	ND	mg/kg	2.5	0.098	
Copper	B[B0016-BLK1	ND	mg/kg	1.0	0.050	
Lead	B[B0016-BLK1	ND	mg/kg	2.5	0.28	
Molybdenum	**B[B0016-BLK1**	**0.078483**	**mg/kg**	**2.5**	**0.050**	**J**
Nickel	B[B0016-BLK1	ND	mg/kg	0.50	0.15	
Selenium	B[B0016-BLK1	ND	mg/kg	1.0	0.98	
Silver	B[B0016-BLK1	ND	mg/kg	0.50	0.067	
Thallium	B[B0016-BLK1	ND	mg/kg	5.0	0.64	
Vanadium	B[B0016-BLK1	ND	mg/kg	0.50	0.11	
Zinc	**B[B0016-BLK1**	**0.19762**	**mg/kg**	**2.5**	**0.087**	**J**

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Total Concentrations (TTLC)

Quality Control Report - Laboratory Control Sample

Constituent	QC Sample ID	Type	Result	Spike Level	Units	Percent Recovery	RPD	Control Limits Percent Recovery	Control Limits RPD	Lab Quals
QC Batch ID: B[A2372										
Mercury	B[A2372-BS1	LCS	0.87712	0.80000	mg/kg	110		80 - 120		
QC Batch ID: B[B0016										
Antimony	B[B0016-BS1	LCS	108.63	100.00	mg/kg	109		75 - 125		
Arsenic	B[B0016-BS1	LCS	10.721	10.000	mg/kg	107		75 - 125		
Barium	B[B0016-BS1	LCS	105.61	100.00	mg/kg	106		75 - 125		
Beryllium	B[B0016-BS1	LCS	9.9647	10.000	mg/kg	99.6		75 - 125		
Cadmium	B[B0016-BS1	LCS	10.245	10.000	mg/kg	102		75 - 125		
Chromium	B[B0016-BS1	LCS	109.25	100.00	mg/kg	109		75 - 125		
Cobalt	B[B0016-BS1	LCS	103.59	100.00	mg/kg	104		75 - 125		
Copper	B[B0016-BS1	LCS	99.250	100.00	mg/kg	99.2		75 - 125		
Lead	B[B0016-BS1	LCS	101.35	100.00	mg/kg	101		75 - 125		
Molybdenum	B[B0016-BS1	LCS	104.81	100.00	mg/kg	105		75 - 125		
Nickel	B[B0016-BS1	LCS	111.12	100.00	mg/kg	111		75 - 125		
Selenium	B[B0016-BS1	LCS	10.475	10.000	mg/kg	105		75 - 125		
Silver	B[B0016-BS1	LCS	9.9235	10.000	mg/kg	99.2		75 - 125		
Thallium	B[B0016-BS1	LCS	117.68	100.00	mg/kg	118		75 - 125		
Vanadium	B[B0016-BS1	LCS	106.44	100.00	mg/kg	106		75 - 125		
Zinc	B[B0016-BS1	LCS	101.31	100.00	mg/kg	101		75 - 125		

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Total Concentrations (TTLC)

Quality Control Report - Precision & Accuracy

Constituent	Type	Source Sample ID	Source Result	Result	Spike Added	Units	RPD	Percent Recovery	Control Limits RPD	Control Limits Percent Recovery	Lab Quals
QC Batch ID: B[A2372	Used client sample: N										
Mercury	DUP	1702574-01	ND	ND		mg/kg			20		
	MS	1702574-01	ND	0.86460	0.79365	mg/kg		109		80 - 120	
	MSD	1702574-01	ND	0.80619	0.79365	mg/kg	7.0	102	20	80 - 120	
QC Batch ID: B[B0016	Used client sample: N										
Antimony	DUP	1702530-01	ND	ND		mg/kg			20		
	MS	1702530-01	ND	54.488	100.00	mg/kg		54.5		16 - 119	
	MSD	1702530-01	ND	55.980	100.00	mg/kg	2.7	56.0	20	16 - 119	
Arsenic	DUP	**1702530-01**	**2.1159**	**2.8040**		**mg/kg**	**28.0**		**20**		**A02**
	MS	**1702530-01**	**2.1159**	**12.342**	**10.000**	**mg/kg**		**102**		**75 - 125**	
	MSD	**1702530-01**	**2.1159**	**12.628**	**10.000**	**mg/kg**	**2.3**	**105**	**20**	**75 - 125**	
Barium	DUP	1702530-01	46.924	55.041		mg/kg	15.9		20		
	MS	1702530-01	46.924	145.71	100.00	mg/kg		98.8		75 - 125	
	MSD	1702530-01	46.924	146.71	100.00	mg/kg	0.7	99.8	20	75 - 125	
Beryllium	DUP	1702530-01	0.12798	0.13516		mg/kg	5.5		20		J
	MS	1702530-01	0.12798	9.4789	10.000	mg/kg		93.5		75 - 125	
	MSD	1702530-01	0.12798	9.4763	10.000	mg/kg	0.0	93.5	20	75 - 125	
Cadmium	DUP	1702530-01	0.44717	0.39947		mg/kg	11.3		20		J
	MS	1702530-01	0.44717	10.047	10.000	mg/kg		96.0		75 - 125	
	MSD	1702530-01	0.44717	10.023	10.000	mg/kg	0.2	95.8	20	75 - 125	
Chromium	DUP	1702530-01	16.651	17.464		mg/kg	4.8		20		
	MS	1702530-01	16.651	115.19	100.00	mg/kg		98.5		75 - 125	
	MSD	1702530-01	16.651	117.22	100.00	mg/kg	1.7	101	20	75 - 125	
Cobalt	DUP	1702530-01	3.7471	3.5083		mg/kg	6.6		20		
	MS	1702530-01	3.7471	98.349	100.00	mg/kg		94.6		75 - 125	
	MSD	1702530-01	3.7471	97.066	100.00	mg/kg	1.3	93.3	20	75 - 125	
Copper	DUP	1702530-01	52.314	50.336		mg/kg	3.9		20		
	MS	1702530-01	52.314	146.63	100.00	mg/kg		94.3		75 - 125	
	MSD	1702530-01	52.314	142.31	100.00	mg/kg	3.0	90.0	20	75 - 125	
Lead	DUP	**1702530-01**	**445.98**	**897.80**		**mg/kg**	**67.2**		**20**		**Q01**
	MS	**1702530-01**	**445.98**	**565.72**	**100.00**	**mg/kg**		**120**		**75 - 125**	
	MSD	**1702530-01**	**445.98**	**637.25**	**100.00**	**mg/kg**	**11.9**	**191**	**20**	**75 - 125**	**A03**
Molybdenum	DUP	**1702530-01**	**1.8068**	**1.3973**		**mg/kg**	**25.6**		**20**		**J,A02**
	MS	**1702530-01**	**1.8068**	**97.438**	**100.00**	**mg/kg**		**95.6**		**75 - 125**	
	MSD	**1702530-01**	**1.8068**	**98.457**	**100.00**	**mg/kg**	**1.0**	**96.6**	**20**	**75 - 125**	
Nickel	DUP	**1702530-01**	**13.998**	**27.765**		**mg/kg**	**65.9**		**20**		**Q01**
	MS	**1702530-01**	**13.998**	**113.46**	**100.00**	**mg/kg**		**99.5**		**75 - 125**	
	MSD	**1702530-01**	**13.998**	**112.35**	**100.00**	**mg/kg**	**1.0**	**98.4**	**20**	**75 - 125**	

Geologic/Pacific Geotechnical Engineering
16055-D Caputo Drive
Morgan Hill, CA 95037

Reported: 02/09/2017 12:48
Project: Soil Analysis
Project Number: MH Sewer Trunk 2016.0096
Project Manager: Beeson Liang

Total Concentrations (TTLC)

Quality Control Report - Precision & Accuracy

Constituent	Type	Source Sample ID	Source Result	Result	Spike Added	Units	RPD	Percent Recovery	Control Limits RPD	Control Limits Percent Recovery	Lab Quals
QC Batch ID: B[B0016	Used client sample: N										
Selenium	DUP	**1702530-01**	**1.7633**	**2.6255**		**mg/kg**	**39.3**		**20**		**A02**
	MS	**1702530-01**	**1.7633**	**12.319**	**10.000**	**mg/kg**		**106**		**75 - 125**	
	MSD	**1702530-01**	**1.7633**	**11.359**	**10.000**	**mg/kg**	**8.1**	**96.0**	**20**	**75 - 125**	
Silver	DUP	1702530-01	0.13160	0.13622		mg/kg	3.4		20		J
	MS	1702530-01	0.13160	9.7951	10.000	mg/kg		96.6		75 - 125	
	MSD	1702530-01	0.13160	9.8209	10.000	mg/kg	0.3	96.9	20	75 - 125	
Thallium	DUP	1702530-01	ND	ND		mg/kg			20		
	MS	1702530-01	ND	101.69	100.00	mg/kg		102		75 - 125	
	MSD	1702530-01	ND	102.17	100.00	mg/kg	0.5	102	20	75 - 125	
Vanadium	DUP	1702530-01	27.163	26.383		mg/kg	2.9		20		
	MS	1702530-01	27.163	123.90	100.00	mg/kg		96.7		75 - 125	
	MSD	1702530-01	27.163	122.86	100.00	mg/kg	0.8	95.7	20	75 - 125	
Zinc	DUP	1702530-01	187.61	176.51		mg/kg	6.1		20		
	MS	1702530-01	187.61	293.25	100.00	mg/kg		106		75 - 125	
	MSD	1702530-01	187.61	267.49	100.00	mg/kg	9.2	79.9	20	75 - 125	

Geologic/Pacific Geotechnical Engineering
16055-D Caputo Drive
Morgan Hill, CA 95037

Reported: 02/09/2017 12:48
Project: Soil Analysis
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Project Manager: Beeson Liang

Notes And Definitions

J	Estimated Value (CLP Flag)
MDL	Method Detection Limit
ND	Analyte Not Detected
PQL	Practical Quantitation Limit
A02	The difference between duplicate readings is less than the quantitation limit.
A03	The sample concentration is more than 4 times the spike level.
A26	Sample received past holding time.
Q01	Sample precision is not within the control limits.
S05	The sample holding time was exceeded.

APPENDIX D

TECHNICAL MEMORANDUM FROM DCM CONSULTING

DCM Consulting, Inc.

P.O. Box 225, Lafayette, CA 94549, Telephone: 925.322.9590 www.dcmconsults.com

Technical Memorandum

To:	Cindy Preuss HydroScience Engineers	Date:	October 10, 2018
From:	Dave Mathy DCM Consulting, Inc.	File:	No. 253
Subject:	Geotechnical and Trenchless Engineering Five Undercrossings City of Morgan Hill Sewer Trunk South of Highland		
Reference A:	Preliminary Boring Logs and Laboratory Tests Morgan Hill Sewer Trunk, Phase 2 DH-2A and DH-3A dated 8/28/17 DH-6A and DH-7A dated 8/29/17 DH-10A and DH-11A dated 8/30/17 DH-16A and DH-17A dated 8/31/17 DH-20A and DH-21A dated 9/5/17 and 5/22/18, respectively By: Geo-Logic Associates Transmitted and received by email dated 8/28/18		
Reference B:	Plan and Profile Drawings City of Morgan Hill Sewer Trunk South of Highland Drawing Nos.: C001 through C015 By: HydroScience Engineers Dated: August 31, 2018 Transmitted and received by email dated 8/31/18		
Reference C:	Plan and Profile Drawings City of Morgan Hill Sewer Trunk South of Highland Drawings Nos.: C012, C012 (2) and C015 – revised on 10/2/18 By: HydroScience Engineers Dated: August 31, 2018 – revised on 10/2/18 Transmitted and received by email dated 10/2/18		

1.0 INTRODUCTION

This technical memorandum presents the conclusions and recommendations of a geotechnical and trenchless engineering evaluation of five specific trenchless undercrossings for the City of Morgan Hill's Sewer Trunk South of Highland project. The new trunk sewer pipeline will be 36 inches in inside diameter and will extend from Renz Lane in Gilroy, California (downstream, south end) to the intersection of Las Animas Avenue and Monterey Road in Gilroy, California (upstream, north end) for a total length of

approximately 15,270 feet (see Reference B). The new trunk sewer will be constructed by conventional open-cut trenching with the exception of the following five trenchless undercrossings:

- UPRR tracks crossing Las Animas Avenue;
- Miller Slough crossing Murray Avenue;
- Leavesley Road (Caltrans 152) crossing Murray Avenue;
- Miller Slough crossing Chestnut Street, and
- Highway 101 east of 7th Street.

The current project plans and profiles (see References B and C) illustrate a gravity slope for the 36-inch pipeline. Where possible, at each trenchless undercrossing, this gravity slope will be maintained. Where it is not possible to maintain gravity slopes due to inadequate clearance from existing utilities, channel bottom, etc. or where systemic settlement impacts require greater cover depths, the new trunk sewer pipeline may need to be lowered which will create a localized siphon.

A subsurface geotechnical investigation has been completed for the project by Geo-Logic Associates of Morgan Hill, California. Geo-Logic Associates has completed two test borings at each trenchless undercrossing location and has installed one open standpipe groundwater monitoring well at each undercrossing location (see Reference A).

The current project plans and profiles by HydroScience Engineers (References B and C) and the geotechnical boring logs and laboratory tests by Geo-Logic Associates (Reference A) are the basis of DCM Consulting, Inc.'s trenchless undercrossing evaluations. DCM Consulting, Inc.'s scope of services is described in Task Order No. 2017-01 to Master Agreement for Services between HydroScience Engineers and DCM Consulting, Inc. and included: alignment reconnaissance (completed in conjunction with HydroScience Engineers and Geo-Logic Associates on August 10, 2017); review of geotechnical investigation; and preparation of this technical memorandum. Optional tasks described in Task Order No. 2017-01 have not been authorized or completed.

2.0 GEOTECHNICAL FINDINGS

2.1. UPRR Tracks Crossing, Las Animas Avenue

The geotechnical conditions at the UPRR tracks undercrossing on Las Animas Avenue are described in test borings DH-2A and DH-3A and groundwater monitoring well GW-1. The gravity pipe zone at this location is about 20 feet deep to invert (El. 196). The depth of cover on the gravity pipeline below the railroad tracks is approximately 18 feet. The following summarizes selected geotechnical conditions at and near the gravity pipe zone at the UPRR undercrossing:

- Composition: clayey sand
- Unified Soil Classification System: SC

- Consistency: medium dense, Standard Penetration Test Blow Count, N-value, N=16
- Moisture Content: 15% to 18%
- Dry Unit Weight: 109 pcf to 117 pcf
- Fines content (% passing a No. 200 sieve): 31%
- Atterberg Limits: Liquid Limit = 33% to 34%, Plasticity Index = 17 to 18
- Direct Shear: Ø = 42° to 47°, c = 0 psf to 12 psf
- Cobbles noted on logs of DH-2A and DH-3A well below the gravity pipe zone

The depth to groundwater at this undercrossing has been recorded by Geo-Logic Associates over the period 1/23/18 to 8/20/18 in groundwater monitoring well GW-1 (at DH-3A location). The depth to groundwater has varied significantly from a wintertime high of 19.4 feet deep to a summertime low of 33.1 feet, a seasonal variance of 13.7 feet.

2.2. Miller Slough Crossing, Murray Avenue

The geotechnical conditions at the Miller Slough undercrossing on Murray Avenue are described in test borings DH-6A and DH-7A and groundwater monitoring well GW-2. The gravity pipe zone at this location is about 20 to 23 feet deep to invert (El 190 to 187). The depth of cover on the gravity pipeline below the creek channel bottom is approximately 15 feet. At this elevation the gravity pipeline conflicts with the footing foundations for the Murray Avenue bridge over Miller Slough (See reference 4). As a result, the pipeline elevation must be lowered which will create a siphon under Miller Slough. The minimum separation between the bottom of the bridge footing foundations and top of pipe should be 6 feet. This corresponds to a top of pipe elevation of El 180 or a depth of 30 feet in test borings DH-6A and DH-7A. The following summarizes selected geotechnical conditions at and below El 180 at the Miller Slough undercrossing:

- Composition: lean clay with sand with lesser poorly graded sand with clay and clayey sand
- Unified Soil Classification System: CL, SC, SP-SC
- Consistency: stiff to medium dense, Standard Penetration Test Blow Count, N-value, N=10 to 26
- Moisture Content: 15% to 22%
- Dry Unit Weight: 106 pcf to 114 pcf
- Fines Content: (% passing a No. 200 sieve); 74% to 97% in clays and 18% in clayey sands
- Atterberg Limits: Liquid Limit = 25% to 43%
  Plasticity Index = 12 to 36

- Direct Shear: Ø = 40°, c = 130 psf in clayey sand
- Unconfined Compressive Strength: UCS = 2,909 psf to 3,629 psf
- No cobbles noted on logs of DH-6A and DH-7A

The depth to groundwater at this undercrossing has been recorded by Geo-Logic Associates over the period 1/23/18 to 8/20/18 in groundwater monitoring well GW-2 (at DH-6A location). The depth to groundwater has varied significantly from a wintertime high of 18.3 feet to a summertime low of 33.9 feet, a seasonal variation of 15.6 feet.

2.3. Leavesley Road (Caltrans 152) Crossing, Murray Avenue

The geotechnical conditions at the Leavesley Road (Caltrans 152) undercrossing on Murray Avenue are described in test borings DH-10A and DH-11A and groundwater monitoring well GW-3. The gravity pipe zone at this location is about 20 feet deep to invert (El 182). The depth of cover on the gravity pipeline below Leavesley Road is approximately 17 feet. The following summarizes selected geotechnical conditions at and near the gravity pipe zone at the Leavesley Road (Caltrans 152) undercrossing:

- Composition: clayey sand with gravel, clayey gravel with sand
- Unified Soil Classification System: SC, GC
- Consistency: medium dense to dense, Standard Penetration Test Blow Count, N-value, N=22 to 47
- Moisture Content: 9% to 16%
- Dry Unit Weight: 110 pcf to 128 pcf
- Fines Content: (% passing a No. 200 sieve); 10% to 27%
- Atterberg Limits: Liquid Limit = 30%
  Plasticity Index = 14
- Direct Shear: Ø = 44°, c = 0 psf
- Permeability: k = 3.1×10^{-7} cm/sec
- Percent gravel: 16% to 69%, average = 37%
- Cobbles noted on logs of DH-10A and DH-11A in the pipe zone

The depth to groundwater at this undercrossing has been recorded by Geo-Logic Associates over the period 1/23/18 to 8/20/18 in groundwater monitoring well GW-3 (at DH-11A location). The depth to groundwater has varied significantly from a wintertime high of 15.3 feet deep to a summertime low of 27.4 feet, a seasonal variation of 12.1 feet.

2.4. Miller Slough Crossing, Chestnut Street

The geotechnical conditions at the Miller Slough undercrossing on Chestnut Street are described in test borings DH-16A and DH-17A and groundwater monitoring well GW-4. The gravity pipe zone at this location is about 18 feet deep to invert (El. 178). At the Miller Slough channel the depth of cover on the gravity pipeline is approximately 7 feet. The following summarizes selected geotechnical conditions at and near the gravity pipe zone at the Miller Slough undercrossing on Chestnut Street:

- Composition: clayey sand with gravel, clayey gravel with sand
- Unified Soil Classification System: SC, GC, GC/SC
- Consistency: medium dense, Standard Penetration Test Blow Count, N-value, N=16 to 27
- Moisture Content: 5% to 16%
- Dry Unit Weight: 117 pcf to 123 pcf
- Fines Content: (% passing a No. 200 sieve); 7% to 9%
- Atterberg Limits: Liquid Limit = 39%
  Plasticity Index = 24
- Direct Shear: Ø = 36°, c = 1,390 psf
- Percent gravel: 45% to 61%
- No cobbles noted on logs of DH-16A and DH-17A

The depth to groundwater at this undercrossing has been recorded by Geo-Logic Associates over the period 1/23/18 to 8/20/18 in groundwater monitoring well GW-4 (at DH-16A location). The depth to groundwater has varied significantly from a wintertime high of 18.3 feet deep to a summertime low of 37.4 feet, a seasonal variation of 19.1 feet.

2.5. Highway 101 Crossing, East of 7th Street

The geotechnical conditions at the Highway 101 undercrossing east of 7th Street are described in borings DH-20A and DH-21A and groundwater monitoring well GW-5. The gravity pipe zone at this location is about 19 to 20 feet deep to invert on each side of the highway (E. 173). The depth of cover on the gravity pipeline below Highway 101 is approximately 20 feet. The following summarizes selected geotechnical conditions at and near the gravity pipe zone at the Highway 101 undercrossing.

- Composition: clayey sand with gravel, poorly graded gravel with sand and clay, clayey gravel with sand, poorly graded sand with gravel and clay, clayey sand, clayey gravel with sand
- Unified Soil Classification System: SC, GP-GC, GC, SP-SC, GC

- Consistency: medium dense to dense, Standard Penetration Test Blow Count, N-values, N = 9 to 51
- Moisture Content: 6% to 15%
- Dry Unit Weight: 124 pcf to 127 pcf
- Fines Content: (% passing a No. 200 sieve); 11% to 32%
- Atterberg Limits: Liquid Limit = 46% to 52%
  Plasticity Index = 30 to 34
- CU Triax: Ø = 33°, c = 250 psf
- Unconfined Compressive Strength: c = 936 psf to 1,771 psf
- Percent gravel: 22% to 59%
- Cobbles noted on log DH-20A in pipe zone, no cobbles noted in DH-21A

The depth to groundwater at this undercrossing has been recorded by Geo-Logic Associates over the period 1/23/18 to 8/20/18 in groundwater monitoring well GW-5 (at DH-20A location). The depth to groundwater has varied significantly from a wintertime high of 19.4 feet deep to a summertime low of 35.5 feet, a seasonal variation of 16.1 feet.

3.0 CONCLUSIONS AND RECOMMENDATIONS

Groundwater

Groundwater elevations as monitored in GW-1 through GW-5 from January 23, 2018 through August 20, 2018 at the project's five trenchless undercrossings have varied significantly from wintertime highs to summertime lows. Wintertime high groundwater is consistently at or above the gravity pipe zone and summertime low groundwater is consistently below the gravity pipe zone (from 4.5 feet to 13 feet below the pipe invert). Since groundwater elevations at or above the gravity pipe zone significantly impact trenchless options and costs and shaft construction options and costs, this technical memorandum assumes that the project plans, specifications and bid documents will limit trenchless construction to late summer (e.g. August/September) when groundwater levels are a minimum of 3 feet below the gravity pipe invert.

In the event that project planning delays construction (i.e., more than one year following the date of this Technical Memorandum), groundwater levels in monitoring wells GW-1 through GW-5 should be recorded a minimum of two times per year (late winter and late summer) on a continuing basis up to bid time. Tabulated or graphical groundwater level fluctuations over time should be provided to bidding contractors.

Trenchless Design

The following conclusions and recommendations are for each of the project's five trenchless undercrossings. These conclusions and recommendations are based on the soil and groundwater conditions described and referenced above and on the relatively shallow slope of the gravity pipeline and grade sensitivity. Trenchless construction methods considered include:

- Auger Bore and Jack (ABJ), requires 48-inch-minimum steel casing;
- Pilot Tube Guided Auger Bore and Jack (PTGABJ), requires 48-inch-minimum steel casing;
- Pipe Ramming (PR), requires thick wall, 48-inch-minimum steel casing;
- Pilot Tube Guided Pipe Ramming (PTGPR), requires thick wall, 48-inch-minimum steel casing;
- Horizontal Directional Drilling (HDD), direct installation of 36-inch-I.D. HDPE or fusible PVC pipe; and
- Microtunneling (MT), direct installation of 36-inch VCP, RCP or FRP pipe

Given the project's favorable soil and summertime groundwater conditions (i.e., firm ground behavior above groundwater) microtunneling, the must expensive of the trenchless construction methods, is not necessary. The most economic trenchless construction method for the project's undercrossings capable of gravity slope grade accuracy is PTGAB. Recent innovations in pilot tube guided boring methods (see Reference 2) allow for pilot tube installation in a wide variety of soil and even bedrock conditions and is not limited to "displaceable" soils any more. These pilot tube innovations can then be applied to the project undercrossings with very accurate line and grade control and less expense than microtunneling.

For all 48-inch steel casing installations, the overcut annular space (i.e. the space outside the casing) must be contact grouted immediately after the casing is fully installed. This is accomplished through grout ports installed in the casing, typically at the 10:00 o'clock and 2:00 o'clock positions at no more than 8 feet apart. Contact grouting will fill any remaining overcut annular space and any inadvertent overexcavation.

3.1. UPRR Tracks Crossing, Las Animas Avenue

Union Pacific Railroad will require a steel casing for the 36-inch-I.D. gravity sewer at this undercrossing. The steel casing will be a minimum of 48 inches in diameter. The depth of cover over the steel casing at the railroad tracks is approximately 18 feet. The invert elevation on the steel casing is approximately El. 195 with gravity grade maintained (see Reference C). The following summarizes trenchless design and construction conclusions and recommendations for the UPRR undercrossing at Las Animas Avenue.

- Design groundwater elevation: El 182 based on summertime groundwater level in GW-1.
- Tunnelman's Ground Classification: firm.

- Trenchless installation method: Pilot Tube Guided Auger Boring (PTGAB), 48-inch steel casing
- Shaft construction: conventional stacked trench shield shoring with steel end plates, guide rail system or sheet piles.
- Dewatering: not required with summertime groundwater levels.
- Tunnel portal ground improvement: not required in firm ground as long as exit and entry portal sizes are kept to a minimum.
- Anticipated jacking load: assuming a 48-inch-O.D. steel casing and an installation length of 100 feet, required jacking loads should be nominal at approximately 130 tons without lubrication and 65 tons with lubrication, well within conventional jacking pad capacity with the given soil conditions.
- Anticipated systemic settlement: assuming 3/8-inch overcut banding on the 48-inch O.D. steel casing and no tunnel face loss, systemic settlement at the railroad tracks with 18 feet of cover separation is estimated at less than 0.50 inches under non-lubricated conditions and less than 0.25 inches under lubricated conditions.
- Potential for obstructions: assuming a 48-inch steel casing, obstructions will be defined as objects greater than 16 inches in maximum dimension. While cobbles (3 inches to 12 inches in least dimension) are noted in borings DH-2A and DH-3A they are well below the pipe zone at 32 feet and below. The potential for natural obstructions is low.
- Special conditions: verify depths of fiber optics and other utilities in the railroad right-of-way paralleling the railroad tracks to confirm safe separation from the 48-inch steel casing.

3.2. Miller Slough Crossing, Murray Avenue

The Miller Slough undercrossing on Murray Avenue will have to pass beneath both the Miller Slough Channel bottom (El 194) and the Murray Avenue bridge footing foundations (El 187). Since the invert of the gravity pipe approaching Miller Slough is at El 187, there is a conflict with the bridge foundations. The sanitary sewer pipeline will have to be lowered at this undercrossing location creating a siphon under Miller Slough. The minimum separation between the bottom of the bridge footing foundations and new pipeline should be 6 feet if installed by PTGAB (invert at 177) and greater than 20 feet if installed by HDD (invert below El 163). The following summarizes trenchless design and construction conclusions and recommendations for the Miller Slough undercrossing on Murray Avenue.

- Design groundwater elevation: El 176 based on summertime groundwater level in GW-2.
- Tunnelman's Ground Classification: firm.
- Trenchless installation method: Pilot Tube Guided Auger Boring (PTGAB) with 48-inch steel casing or HDD with 36-inch-I.D. HDPE or fusible PVC pipe.

- Shaft construction (for PTGAB): conventional stacked trench shield shoring with steel end plates, guide rail system or sheet piles.

- Dewatering: not required for PTGAB with summertime groundwater levels, not required for wintertime or summertime groundwater levels for HDD.

- Tunnel portal ground improvement (for PTGAB): not required in firm ground as long as exit and entry portal sizes are kept to a minimum.

- Anticipated jacking load (for PTGAB): assuming a 48-inch steel casing and an installation length of 300 feet, and full lubrication, required jacking loads should be on the order of 200 tons, well within conventional jacking pad capacity with the given soil conditions.

- Anticipated systemic settlement (for PTGAB): assuming 3/8-inch overcut banding on the 48-inch O.D. steel casing and no tunnel face loss, systemic settlement at the bottom of the Murray Avenue bridge footings (6 feet of cover separation) is estimated at less than 0.80 inches under non-lubricated conditions and less than 0.40 inches under lubricated conditions, systemic ground surface settlement with 30 feet of cover is estimated at less than 0.25 inches under non-lubricated conditions and less than 0.12 inches under lubricated conditions.

- Potential for obstructions (for PTGAB): assuming a 48-inch steel casing, obstructions will be defined as objects greater than 16 inches in maximum dimension. There are no notations of cobbles (3 inches to 12 inches in least dimension) in borings DH-6A and DH-7A. The potential for natural obstructions is low.

- Special conditions: verify the location and remnant foundations of any predecessor bridge (pre-1986) to the current Murray Avenue bridge that may represent manmade obstructions to shaft construction or tunneling.

- HDD option: HDD installation of a 36-inch HDPE or fusible PVC pipe will require a bore hole on the order of 60 inches in diameter. The large annular overcut (approximately 150% of the 36-inch pipe O.D.) required for HDD installation presents significant systemic settlement concerns and risks with respect to the Murray Avenue bridge footing foundations. Even with 20 feet of separation, systemic settlement estimates at the bottom of the bridge foundation footings are on the order of 3 to 4 inches. For this reason, PTGAB with a 48-inch steel casing and minor annular overcut is preferred for passing beneath the bridge footings.

3.3. Leavesley Road (Caltrans 152) Crossing, Murray Avenue

The Leavesley Road (Caltrans 152) undercrossing on Murray Avenue will have a depth of cover of about 19 feet to the road surface. However, there is an existing 24-inch VCP sanitary sewer running east-west in Leavesley Road with an invert elevation of 186.36. The top of the new 36-inch sewer is at approximately El 185. Accounting for a 48-inch steel casing (required for PTGAB) the top of the casing will be at approximately El 185.5. Assuming the existing 24-inch VCP sanitary sewer pipeline wall thickness at 3 inches, the pipe O.D. of the barrel will be 30 inches. The O.D. at the 24-inch VCP pipe bells will be approximately 36 inches. Therefore, the bottom of the O.D. bell for the existing 24-inch VCP is about 6

inches lower than pipe invert or at about El 185.86. The top of a 48-inch casing will be at El 185.5 with only about 4 inches of separation to the bells of the 24-inch VCP sewer. This nominal separation presents several risk factors including:

- Direct hit and breaking the existing 24-inch sewer.
- Excavating into the existing 24-inch sewer bedding and if bedding is non-cohesive and exhibiting running ground behavior, inadvertent overexcavation of a mixed-face tunneling condition and undermining and breaking the existing 24-inch sewer.
- Close proximity systemic settlement causing joint deflection and damage to the existing 24-inch sewer.

For these reasons it is recommended that the new 36-inch sewer be lowered, creating a siphon, and creating a minimum of 3 feet of separation between existing 24-inch sewer bells and 48-inch casing. That will put the invert of the 48-inch casing at about El 179 or about 23 to 24 feet below street grade. The following summarizes trenchless design and construction conclusions and recommendations for the Leavesley Road (Caltrans 152) undercrossing on Murray Avenue:

- Design groundwater elevation: El 174 based on summertime groundwater level in GW-3.
- Tunnelman's Ground Classification: firm.
- Trenchless installation method: Pilot Tube Guided Auger Boring (PTGAB), 48-inch steel casing.
- Shaft construction: conventional stacked trench shield shoring with steel end plates or guide rail system (cobbles and high blow counts noted in DH-10A and DH-11A make sheet pile driving difficult with higher levels of ground vibration that may be damaging to utilities in Leavesley Road).
- Dewatering: not required with summertime groundwater levels.
- Tunnel portal ground improvement: not required in firm ground as long as exit and entry portal sizes are kept to a minimum.
- Anticipated jacking load: assuming a 48-inch-O.D. steel casing and an installation length of 300 feet, with full lubrication, required jacking loads should be on the order of 200 tons, well within conventional jacking pad capacity with the given soil conditions.
- Anticipated systemic settlement: assuming 3/8-inch overcut banding on the 48-inch O.D. steel casing and no tunnel face loss, systemic settlement at the 24-inch VCP sewer (3 feet of cover separation) is estimated at 1.20 inches under non-lubricated conditions and 0.60 inches under lubricated conditions, ground surface settlement with 19 feet of cover should be less than 0.50 inches under non-lubricated conditions and less than 0.25 inches under lubricated conditions

- Potential for obstructions: assuming a 48-inch steel casing, obstructions will be defined as objects greater than 16 inches in maximum dimension. Cobbles (3" to 12" in least dimension) are noted in both borings DH-10A and DH 11A. The potential for natural obstructions is low to moderate.

- Special conditions: With only 3 feet of separation between the top of casing and existing 24-inch VCP sewer, the pipe bedding and pipe embedment materials around the existing 24-inch pipe should be permeation grouted to provide stability and enhanced strength in these soils prior to tunneling. In addition, a utility monitoring point (UMP, see Figure 2) should be installed on the 24-inch pipeline to monitor for settlement.

3.4. Miller Slough Crossing, Chestnut Street

The 36-inch gravity pipeline at the Miller Slough undercrossing has approximately 7 feet of cover below the channel bottom. The invert of the 36-inch gravity pipe at about El 178 is approximately 14 feet below top of creek banks and about 18 feet below ground surface at street grades. The following summarizes trenchless design and construction conclusions and recommendations for the Miller Slough undercrossing at Chestnut Street:

- Design groundwater elevation: El 160 based on summertime groundwater level in GW-4.

- Tunnelman's Ground Classification: firm.

- Trenchless installation method: Pilot Tube Guided Auger Boring (PTGAB), 48-inch steel casing.

- Shaft construction: conventional stacked trench shield shoring with steel end plates, guide rail system or sheet piles.

- Dewatering: not required with summertime groundwater levels.

- Tunnel portal ground improvement: not required in firm ground as long as exit and entry portal sizes are kept to a minimum.

- Anticipated jacking load: assuming a 48-inch-O.D. steel casing and an installation length of 100 feet, required jacking loads should be nominal at approximately 130 tons, well within conventional jacking pad capacity with the given soil conditions.

- Anticipated systemic settlement: assuming a 3/8-inch overcut banding on the 48-inch O.D. steel casing and no tunnel face loss, systemic settlement at the ground surface with 14 feet of cover is estimated at 0.50 inches under non-lubricated conditions and 0.25 inches under lubricated conditions.

- Potential for obstructions: assuming a 48-inch steel casing, obstructions will be defined as objects greater than 16 inches in maximum dimension. Cobbles (3" to 12" in least dimension) are not noted in either borings DH-16A and DH 17A. The potential for natural obstructions is low.

- Special conditions: Maintain a distance of at least 2 casing diameters (i.e. 8 feet) between the 48-inch casing and the nearby pedestrian bridge foundations over Miller Slough.

3.5. Highway 101 Crossing, East of 7th Street

Caltrans will require a steel casing for the 36-inch-I.D. gravity sewer at this location. The 36-inch gravity pipeline at the Highway 101 undercrossing has approximately 20 feet of cover below the highway surface. The invert of the 36-inch gravity sewer is at approximately El 173. The following summarizes trenchless design and construction conclusions and recommendations for the Highway 101 undercrossing east of 7th Street:

- Design groundwater elevation: El 158 based on summertime groundwater level in GW-5.
- Tunnelman's Ground Classification: firm.
- Trenchless installation method: Pilot Tube Guided Auger Boring (PTGAB), 48-inch steel casing.
- Shaft construction: conventional stacked trench shield shoring with steel end plates, guide rail system or sheet piles (sheet pile installation on the west side of Highway 101 may be difficult due to cobbles and high blow counts).
- Dewatering: not required with summertime groundwater levels.
- Tunnel portal ground improvement: not required in firm ground as long as exit and entry portal sizes are kept to a minimum.
- Anticipated jacking load: assuming a 48-inch-O.D. steel casing and an installation length of 300 feet, with full lubrication, required jacking loads should be on the order of 200 tons, well within conventional jacking pad capacity with the given soil conditions.
- Anticipated systemic settlement: assuming 3/8-inch overcut banding on the 48-inch O.D. steel casing and no tunnel face loss, systemic settlement at the highway surface with 20 feet of cover separation is estimated at less than 0.40 inches under non-lubricated conditions and less than 0.20 inches under lubricated conditions.
- Potential for obstructions: assuming a 48-inch steel casing, obstructions will be defined as objects greater than 16 inches in maximum dimension. Cobbles (3" to 12" in least dimension) are noted in and near the tunnel zone in DH-20A but not in DH-21A. The potential for natural obstructions is low to moderate.
- Special conditions: Confirm with Caltrans that there are no abandoned facility foundations (e.g., historic highway signs) in conflict with the tunnel zone that may represent manmade obstructions to tunneling.

4.0 LIMITATIONS

This Technical Memorandum has been prepared for the exclusive use of HydroScience Engineers in designing the City of Morgan Hill's Sewer Trunk South of Highland project as described herein. This Technical Memorandum may not be used for any other purpose or for any other project. This Technical Memorandum should only be read and used in conjunction with the project Geotechnical Investigation Report prepared by Geo-Logic Associates of Morgan Hill, California. In the event of delayed construction (i.e., more than one year after the date of this Technical Memorandum), and in recognition of on-going groundwater monitoring and currently evolving trenchless technologies, DCM Consulting, Inc. should be given the opportunity to update the trenchless engineering conclusions and recommendations made herein. Within the limitations of scope, schedule and budget, DCM Consulting, Inc.'s services have been provided in accordance with generally accepted practices in the fields of geotechnical and trenchless engineering as currently practiced in the San Francisco Bay Area at the time this technical memorandum was completed. No warranty or other conditions express or implied is made or intended in connection with the professional engineering services provided for this project.

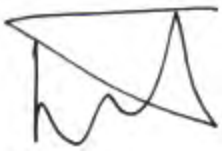
5.0 REFERENCES

1. ASCE Manuals and Reports on Engineering Practice No. 106, Horizontal Auger Boring Projects, Second Edition, Atalah, et al, 2017.

2. ASCE Manuals and Reports on Engineering Practice No. 133, Pilot Tube and other Guided Boring Methods, First Edition, 2017.

3. "Analysis and Mitigation of Settlement Risks in New Trenchless Installations", Wallin, Wallin and Bennett, NASTT No-Dig Conference Proceedings, 2008.

4. Murray Avenue Bridge at West Branch Llagas Creek, Gilroy, California, Santa Clara Valley Water District, 1986.



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TUNNELMAN'S GROUND CLASSIFICATION FOR SOILS

Classification		Behavior	Typical Soil Types
FIRM		Heading can be advanced without initial support and final lining can be constructed before ground starts to move	Loess above water table; hard clay marl, cemented sand and gravel when not highly overstressed.
RAVELING	Slow Raveling	Chucks or flakes of material begin to drop out of the arch or walls sometime after the ground has been exposed due to loosening or to overstress and "brittle" fracture (ground separates or breaks along distinct surfaces, opposed to squeezing ground). In fast raveling ground, the process starts within a few minutes; otherwise the ground is slow raveling.	Residual soils or sand with small amounts of binder may be fast raveling below the water table, slow raveling above. Stiff fissured clays may be slow or fast raveling depending upon degree of overstress.
	Fast Raveling		
SQUEEZING		Ground squeezes or extrudes plastically into tunnel, without visible fracturing or loss of continuity, and without perceptible increase in water content. Ductile, plastic yield and flow due to overstress.	Ground with low frictional strength. Rate of squeeze depends on degree of overstress. Occurs at shallow to medium depth in clay of very soft to medium consistency. Stiff to hard clay under high cover may move in combination of raveling at excavation surface and squeezing at depth behind surface.
RUNNING	Cohesive, running	Granular materials without cohesion are unstable at a slope greater than their angle of repose (±30-35°). When exposed at steeper slopes, they run like granulated sugar or dune sand until the slope flattens to the angle of repose.	Clean, dry granular materials. Apparent cohesion in moist sand or weak cementation in any granular soil may allow the material to stand for brief period of raveling before it breaks down and runs. Such behavior is cohesive-running.
	Running		
FLOWING		A mixture of soil and water flows into the tunnel like a viscous fluid. The material can enter the tunnel from the invert as well as from the face, crown, and walls, and can flow for great distances, completely filling the tunnel in some cases.	Below the water table in silt, sand, or gravel without enough clay content to give significant cohesion and plasticity. May also occur in highly sensitive clay when such material is disturbed.
SWELLING		Ground absorbs water, increases in volume, and expands slowly into the tunnel.	Highly preconsolidated clay with plasticity index in excess of about 30, generally containing significant percentages of montmorillonite.
REFERENCE: Heuer, R. E., 1974, Important ground parameters in soft ground tunneling, Subsurface exploration for underground excavation and heavy construction, New England College, Henniker, New Hampshire, American Society of Civil Engineers, New York, P. 41-55.			

Figure 1 – Tunnelman's Ground Classification for Soils

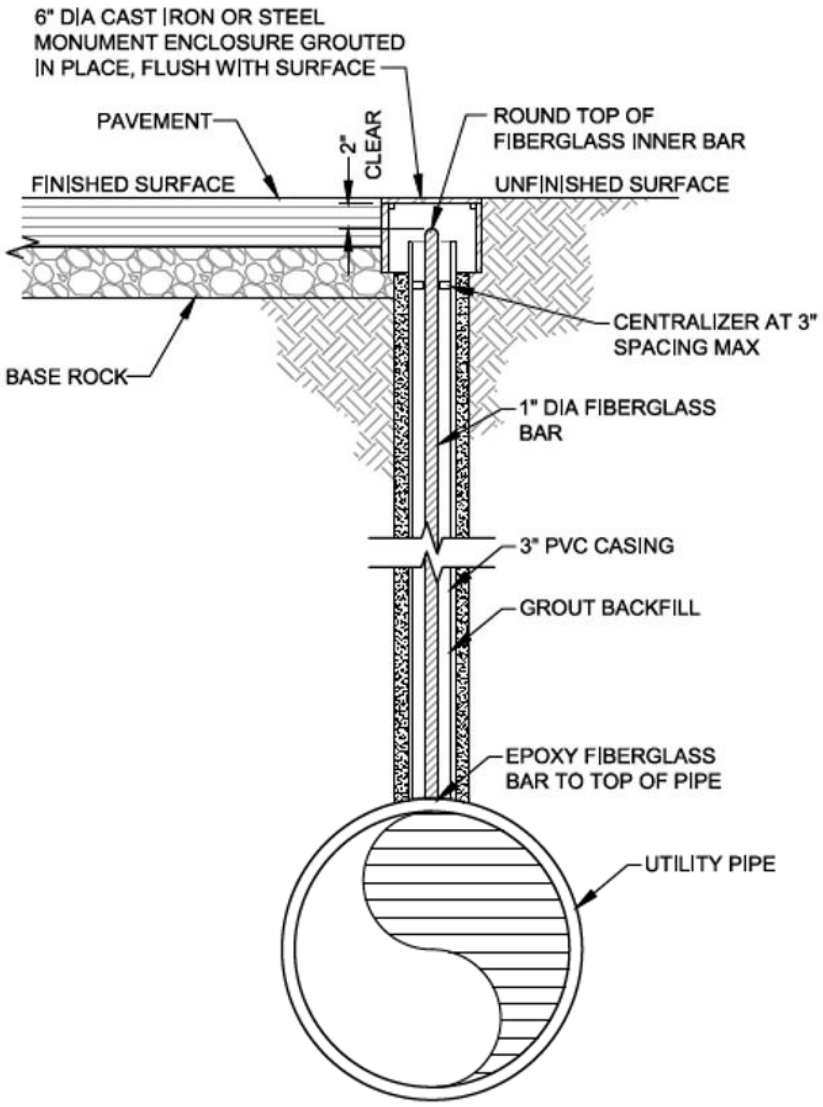

Figure 2 – Utility Monitoring Point (UMP)