

1 May 2019

SSF PUC Housing Partners, LLC
c/o Mr. Brian Baker
100 Bush Street, Suite 1450
San Francisco, California 94104

**SUBJECT: Preliminary Geotechnical Evaluation and Limited Environmental
Sampling and Analysis
SSF Transit-Oriented Development – 1051 Mission Road
South San Francisco, California
Langan Project No.: 750652601**

Dear Mr. Baker:

This letter presents the results of our preliminary geotechnical evaluation and limited environmental sampling and analyses for the proposed South San Francisco Transit-Oriented Development at 1051 Mission Road in South San Francisco, California.

The project site is on the southwest side of Mission Road, just north of the intersection of Oak Avenue and the terminus of Antoinette Lane; the approximate site location is shown on Figure 1. The site is divided into a northern and southern portion by the existing concrete-lined Colma Creek channel. The site is relatively flat, with ground surface elevations generally ranging from about 43 feet to 49 feet¹. The site is irregularly shaped with plan dimensions of about 1200 feet by 280 feet. Currently, most of the site is a dirt lot with scattered vegetation throughout. However, a gravel stockpile and several loose telephone poles are present on the southeastern tip of the northern portion of the site. Additionally, a concrete pad is present in the northernmost portion of the site and a shallow concrete V-ditch exists along the northeastern portion of the site.

Immediately southwest and roughly parallel to the site are a pair of below-grade tunnels operated by the Bay Area Rapid Transit (BART) district. A vent structure associated with the BART tunnels is visible west of the southern portion of the development. Based on our review of the BART drawings, it appears the bottom of the tunnel structure is about 31 to 36 feet beneath existing site grades.

We understand that current conceptual plans for site development include three proposed buildings, designated Buildings A, B, and C (BAR Architects, 2018). Buildings A and B will be located within the northern portion of the site and Building C will be located within the southern portion of the site. The buildings are planned to be multi-story residential buildings, likely consisting of a combination of concrete and timber construction. We understand a one-level

¹ Elevations presented herein reference North American Vertical Datum of 1988 (NAVD88) and are based on data available in our files and from a topographic survey file titled "618108 Topo.dwg" provided to us by SANDIS Civil Engineers Surveyors Planners via email on 19 December 2018.

basement is planned under portions of the three buildings. We anticipate that excavations for the one-level basements and associated foundations will extend about 15 feet below the existing ground surface (bgs).

SCOPE OF SERVICES

Our scope of services was outlined as tasks one and three in our proposal dated 3 August 2018. The purpose of our geotechnical study was to provide preliminary geotechnical recommendations for the design and construction of the proposed buildings. Our limited environmental soil sampling and analysis was to provide preliminary information regarding the potential for soil contamination resulting from past and/or present site activities.

Our geotechnical services consisted of reviewing existing subsurface information of the site and vicinity, performing a limited field investigation to better evaluate the subsurface conditions, performing laboratory testing on selected soil samples obtained during the field investigation, and performing engineering analyses to develop preliminary conclusions and recommendations regarding:

- subsurface conditions
- site seismicity and potential for seismic hazards including liquefaction, seismic densification, lateral spreading, and fault rupture
- temporary shoring
- potential foundation type(s) for the proposed buildings, including preliminary estimates of vertical and lateral capacities and associated estimated settlements
- constraints and design approaches associated with construction within the BART Zone of Influence
- 2016 California Building Code (CBC) seismic design values.

REVIEW OF EXISTING SUBSURFACE INFORMATION

To estimate the anticipated subsurface conditions at the 1051 Mission Road site, we reviewed the results of geotechnical investigations performed in the site vicinity by Ninyo & Moore and Treadwell & Rollo, Inc., our predecessor firm. These reports include:

- *Geotechnical Evaluation and Geologic Hazards Assessment, New Police Station, 1 Chestnut Avenue, South San Francisco, California* by Ninyo & Moore, dated 24 May 2018.
- *Geotechnical Evaluation and Geologic Hazard Assessment, Fire Station No. 63, 81 Arroyo Drive, South San Francisco, California* by Ninyo & Moore, dated 24 May 2018.
- *Draft Geotechnical Investigation, Park Station Apartments, 1410 El Camino Real, South San Francisco, California* by Treadwell & Rollo, Inc., dated 16 September 2003

FIELD INVESTIGATION AND LABORATORY TESTING

To supplement available subsurface information and gain further site specific data, we drilled two borings (designated B-1 and B-2) and advanced five cone penetration tests (CPTs, designated CPT-1 through CPT-5, respectively) at the site on 18 December 2018. The approximate locations of the borings and CPTs are presented on Figure 2.

Prior to performing the borings and CPTs, we obtained a drilling permit from San Mateo County Environmental Health Services (SMCEHS). In addition, because the field investigation was conducted on private property, we retained a private utility clearance subcontractor to check for underground utilities in the vicinity of our boring and CPT locations. As required by law, we also notified Underground Service Alert (USA) at least 48 hours prior to drilling.

Borings

The two borings were drilled using a truck-mounted hollow-stem auger drill rig operated by Exploration Geoservices, Inc. of San Jose, California. The borings were advanced to depths of about 55½ and 54 feet bgs, respectively. During drilling, our field engineer logged the soil encountered and obtained soil samples for visual classification and laboratory testing. Upon completion, both borings were backfilled with cement grout in accordance with the requirements of SMCEHS. Soil cuttings from the borings were spread out around each respective boring location.

Soil samples were obtained using the following sampler types:

- Standard Penetration Test (SPT) sampler with a 2.0-inch-outside and 1.38-inch-inside diameter
- Sprague and Henwood (S&H) sampler with a 3.0-inch outside diameter and 2.5-inch-inside diameter, lined with stainless steel tubes with an inside diameter of 2.43 inches

In general, the sampler types were chosen on the basis of soil type and desired sample quality for laboratory testing. Typically, the SPT sampler was used to evaluate the relative density of sandy soil and the S&H sampler was used to obtain samples in medium stiff to very stiff cohesive soil.

The SPT and S&H samplers were driven with a 140-pound, downhole wireline hammer falling 30 inches. The samplers were driven up to 18 inches and the hammer blows required to drive the samplers every six inches of penetration were recorded and are presented on the boring logs. A “blow count” is defined as the number of hammer blows per six inches of penetration. The blow counts required to drive the S&H and SPT samplers were converted to approximate SPT N-values to account for sampler type and hammer energy using factors of 0.5 and 0.9, respectively, based on energy calibrations provided by the drilling subcontractor. The blow counts used for the conversions were: 1) the last two blow counts if the sampler was driven more than 12 inches or 2) the last one blow count if the sampler was driven less than 12 inches. The final converted blow counts for each sample are shown on the boring logs.

The boring logs are presented in Appendix A on Figures A-1a through A-2b. The soil encountered in the borings was classified in accordance with the classification chart shown on Figure A-3.

Cone Penetration Tests (CPTs)

The five CPTs were advanced using a truck-mounted CPT rig by Gregg Drilling, LLC of Martinez, California. The CPTs were advanced to depths between about 63½ and 78 feet bgs, with the exception of CPT-2, which encountered refusal at a depth of about 24 feet bgs.

The CPTs were performed by hydraulically pushing a 1.7-inch-diameter cone-tipped probe with a projected area of 15 square centimeters into the ground. The cone tip measures tip resistance and the friction sleeve behind the cone tip measures frictional resistance. Electrical strain gauges or load cells within the cone continuously measured the cone tip resistance and frictional resistance during the entire depth of each probing. Accumulated data was processed by computer to provide engineering information, such as the types and approximate strength characteristics of the soil encountered. The CPT logs, showing tip resistance and sleeve friction by depth, as well as friction ratio, pore pressures, SPT N60 values, and interpreted soil behavior type, are presented in Appendix B.

Upon completion, the CPTs were backfilled with cement grout in accordance with SMCEHS requirements.

Laboratory Testing

The samples collected from the field investigation were re-examined in the office by the project engineer to check the field classifications and select representative samples for laboratory testing. Samples were tested to measure moisture content, dry density, fines contents, Atterberg Limits (plasticity), and compressibility. Results of the laboratory tests are included on the boring logs and in Appendix C.

To evaluate the corrosivity of the near-surface soil, we sent a composite sample consisting of near-surface soil from borings B-1 and B-2. The corrosivity testing and evaluation was performed by CERCO Analytical using ASTM Test Methods. The results of the laboratory corrosion test and a brief evaluation of the results are presented in Appendix D.

SUBSURFACE CONDITIONS

Based on the results of our preliminary field investigation at the site and existing data in the vicinity of the site, we conclude the development site is blanketed by undocumented fill that is underlain by Stream Deposits. The stream deposits are generally underlain by dense to very dense sands and stiff to hard clays associated with the Colma and Merced Formations. An idealized subsurface profile is shown on Figure 3. Subsurface conditions encountered are described in additional detail below.

The fill generally consists of medium dense to dense sand with variable silt, clay, and gravel contents. Where encountered, the fill thickness is about 6½ feet; however, based on a brief

comparison of historic topographic data, we anticipate fill thicknesses up to eight feet may exist at the project site.

Underlying the fill are Stream Deposits, which appear to relate to stream channel areas prior to the current channelized Colma Creek alignment. These deposits align with local geologic mapping performed in the site vicinity, which maps young (Holocene) Alluvial deposits at the site, as shown on Figure 4. The Stream Deposits generally consist of interlayered and interbedded layers of weak soils, including medium stiff to very stiff silts and clays and loose to medium dense sands with variable silt and clay contents. Variable organics contents are also present within the Stream Deposits. These deposits generally extend to depths between 20 and 50 feet bgs at the project site. The approximate depth to the bottom of the weak Stream Deposits at each of our exploration points is shown on Figure 2.

Based on local geographic mapping performed in the site vicinity, the Stream Deposits are underlain by the Colma Formation (Colma), which is in-turn underlain by the Merced Formation. However, we anticipate that portions of the Colma may have been eroded by the historic Colma Creek, such that in some areas the Merced Formation may directly underlie the Stream Deposits throughout portions of the project site. Where explored, the Colma Formation generally consists of dense to very dense sand with varying silt and clay contents. The Merced Formation generally consists of dense to very dense sands with varying fines contents interbedded with stiff to hard clays and silts with varying sand contents. The Merced Formation extends to the maximum depth explored of 78 feet bgs.

During our investigation, groundwater was encountered in borings B-1 and B-2 at depths of about 18½ and 14½ feet bgs, respectively, corresponding to approximate Elevations 30 and 30½ feet, respectively.

LIMITED ENVIRONMENTAL SOIL SAMPLING AND ANALYSIS

The purpose of the soil sampling and analytical testing was to evaluate the environmental quality of soil likely to be encountered during the potential construction activities. To preliminarily characterize the soil, samples were collected from each geotechnical boring at approximately depths of 2.5, 5.0, 7.5, 10, and 12.5 feet bgs. Each sample tube was sealed with Teflon and plastic caps, labeled, and placed on ice in a cooler for delivery to the analytical laboratory under chain of custody procedures. The chemical analytical schedule was chosen to satisfy typical soil profiling scenarios generally accepted by landfills. A total of four soil samples from each boring were analyzed at a State of California certified analytical laboratory for some or all of the following: total petroleum hydrocarbons as gasoline, diesel, and motor oil, volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), organochlorine pesticides (OCPs) and polychlorinated biphenyls (PCBs), and California assessment manual (CAM) 17 metals.

Based on the test results TPHg, TPHd, and TPHmo were detected above laboratory reporting limits but below the residential and commercial environmental screening levels (ESLs) in four of the soil samples analyzed. The highest concentrations of TPH were in boring B2-E1 at a depth of 2.5-feet bgs; TPHg was detected at a concentration of 34 milligrams per kilogram (mg/kg);

TPHd was detected at a concentration of 240 mg/kg; and TPHmo was detected at a concentration of 810 mg/kg.

Trace concentrations of the VOCs, 1,2,4 – trimethylbenzene and 1,3,5 – trimethylbenzene were detected in one soil sample, B2-E1-2.5 (at 2.5 feet bgs) at concentrations of 0.027 mg/kg and 0.013 mg/kg. Trace concentrations of ten SVOCs were detected in at least one soil sample, all of the concentrations were below the residential and commercial ESLs. No other VOC, SVOC, OCP, PCB, or asbestos were detected at concentrations above the respective laboratory reporting limit... Total chromium was detected in each of the eight samples analyzed at concentrations ranging from 19 mg/kg to 79 mg/kg. Total chromium was detected at concentrations above 50 mg/kg but below 1,000 mg/kg in three of the eight samples, all of which were subsequently analyzed for STLC chromium analysis to determine soluble chromium levels. STLC chromium was detected in five of the eight samples analyzed at concentrations ranging from 0.31 mg/L to 0.43 mg/L, none of which exceed the State of California hazardous waste criteria of 5 mg/L. The remaining metal concentrations were generally within normal background ranges found in the western United States.

The soil analytical results are summarized in Tables 1 through 3 in Appendix E and the certified analytical results and chain-of-custody records are included in Appendix F.

Based on the analytical results of the soil samples, the material does not contain any hazardous concentrations in the samples analyzed and disposal of the soil will most likely be as unrestricted material with the exception of the material near B2-E1 at a depth of 2.5 feet bgs, which will need to be disposed at a facility that can accept low levels of petroleum hydrocarbon contaminated soil.

REGIONAL SEISMICITY AND FAULTING

The major active faults in the area are the San Andreas, San Gregorio, and Hayward faults. These and other faults of the region are shown on Figure 5. For each of the active faults within about 50 kilometers (km) of the site, the distance from the site and estimated mean characteristic moment magnitude² [2007 Working Group on California Earthquake Probabilities (WGCEP) (2008) and Cao et al. (2003)] are summarized in Table 1.

² Moment magnitude is an energy-based scale and provides a physically meaningful measure of the size of a faulting event. Moment magnitude is directly related to average slip and fault rupture area.

TABLE 1
Regional Faults and Seismicity

Fault Name	Distance (km)	Direction from Site	Mean Characteristic Moment Magnitude
N. San Andreas - Peninsula	2.3	Southwest	7.23
N. San Andreas (1906 event)	2.3	Southwest	8.05
San Gregorio Connected	11	West	7.50
N. San Andreas - North Coast	19	Northwest	7.51
Total Hayward	27	Northeast	7.00
Total Hayward-Rodgers Creek	27	Northeast	7.33
Monte Vista-Shannon	30	Southeast	6.50
Total Calaveras	42	East	7.03
Mount Diablo Thrust	43	Northeast	6.70
Point Reyes	47	Northwest	6.90
Green Valley Connected	48	Northeast	6.80
Rodgers Creek	48	North	7.07

The City College shear zone is mapped as less than one km from the project site. The fault is believed to be late Cretaceous in age and is not mapped as active or potentially active.

Figure 5 also shows the earthquake epicenters for events with magnitude greater than 5.0 from January 1800 through August 2014. Since 1800, four major earthquakes have been recorded on the San Andreas Fault. In 1836 an earthquake with an estimated maximum intensity of VII on the Modified Mercalli (MM) scale (Figure 6) occurred east of Monterey Bay on the San Andreas Fault (Toppozada and Borchardt 1998). The estimated Moment magnitude, M_w , for this earthquake is about 6.25. In 1838, an earthquake occurred with an estimated intensity of about VIII-IX (MM), corresponding to an M_w of about 7.5. The San Francisco Earthquake of 1906 caused the most significant damage in the history of the Bay Area in terms of loss of lives and property damage. This earthquake created a surface rupture along the San Andreas Fault from Shelter Cove to San Juan Bautista approximately 470 kilometers in length. It had a maximum intensity of XI (MM), an M_w of about 7.9, and was felt 560 kilometers away in Oregon, Nevada, and Los Angeles. The Loma Prieta Earthquake occurred on 17 October 1989, in the Santa Cruz Mountains with an M_w of 6.9, approximately 85 kilometers from the site.

In 1868 an earthquake with an estimated maximum intensity of X on the MM scale occurred on the southern segment (between San Leandro and Fremont) of the Hayward Fault. The estimated M_w for the earthquake is 7.0. In 1861, an earthquake of unknown magnitude (probably an M_w of about 6.5) was reported on the Calaveras Fault. The most recent significant earthquake on this fault was the 1984 Morgan Hill earthquake ($M_w = 6.2$). The most recent significant earthquake to

be felt in the Bay Area occurred on 24 August 2014 and was located on the West Napa Fault ($M_w = 6.0$).

The 2014 WGCEP (WGCEP, 2015, USGS) predicted a 72 percent chance of a magnitude 6.7 or greater earthquake occurring in the San Francisco Bay Area in 30 years. More specific estimates of the probabilities for different faults in the Bay Area are presented in Table 2.

TABLE 2
WGCEP (2015) Estimates of 30-Year Probability
of a Magnitude 6.7 or Greater Earthquake

Fault	Probability (percent)
Hayward-Rodgers Creek	32
N. San Andreas	33
Calaveras	25
Green Valley	7
San Gregorio	6
Mount Diablo Thrust	4

SEISMIC HAZARDS

During a major earthquake, strong to violent ground shaking is expected to occur at the project site. Strong ground shaking during an earthquake can result in ground failure such as that associated with soil liquefaction³, lateral spreading⁴, cyclic densification⁵, and fault rupture. We used the available limited subsurface information to evaluate the potential of these phenomena to occur at the project site.

Liquefaction and Associated Hazards

When saturated soil with little to no cohesion liquefies during a major earthquake, it experiences a temporary loss of shear strength as a result of a transient rise in excess pore water pressure generated by strong ground motion. Flow failure, lateral spreading, differential settlement, loss

³ Liquefaction is a transformation of soil from a solid to a liquefied state during which saturated soil temporarily loses strength resulting from the buildup of excess pore water pressure, especially during earthquake-induced cyclic loading. Soil susceptible to liquefaction includes loose to medium dense sand and gravel, low-plasticity silt, and some low-plasticity clay deposits.

⁴ Lateral spreading is a phenomenon in which surficial soil displaces along a shear zone that has formed within an underlying liquefied layer. Upon reaching mobilization, the surficial blocks are transported downslope or in the direction of a free face by earthquake and gravitational forces.

⁵ Cyclic densification is a phenomenon in which non-saturated, cohesionless soil is densified by earthquake vibrations, causing ground-surface settlement.

of bearing, ground fissures, and sand boils are evidence of excess pore pressure generation and liquefaction.

We used the procedure outlined in the proceedings of the NCEER workshops (Youd, 2001) for the evaluation of liquefaction triggering for the soils at the site. The level of ground shaking used in our liquefaction evaluation was based on the Maximum Considered Earthquake (MCE) mapped values. A peak geometric mean ground acceleration (PGA_M) of 0.89 times gravity was used in our analyses. This PGA was calculated using the procedures specified in the 2016 California Building Code (CBC), using site class D. We assumed an earthquake magnitude of 8.05 in our analyses based on the close proximity of the San Andreas Fault. In addition, we assumed the design groundwater level could be as high as 10 feet bgs, or about Elevation 35 feet, in the liquefaction analyses.

Based on the results of our evaluations, we conclude that multiple layers within the Stream Deposits at each of our exploration points are susceptible to liquefaction and associated liquefaction-induced settlements. These layers range in thickness from just a few inches up to about five feet and range in depth from the groundwater table down to the base of the Stream Deposits (as deep as 50 feet beneath existing site grades). Using the Zhang et al (2002) method for evaluating earthquake-induced liquefaction settlement from CPT data, we estimate the portions of the Stream Deposits that are potentially susceptible to liquefaction could experience post-earthquake settlements of up to about six inches for free field conditions.

Considering an anticipated excavation depth of about 15 feet for the proposed buildings, we anticipate that some of the soil layers susceptible to liquefaction described above will be removed. However, the remainder of the soil layers which are susceptible to liquefaction will remain in place and the potential free-field liquefaction-induced settlement will be large (about 4 inches).

Lateral Spreading

Lateral spreading is a phenomenon in which a surficial soil displaces along a shear zone that has formed within an underlying liquefied layer. The surficial blocks are transported downslope or in the direction of a free face, such as a channel, by earthquake and gravitational forces. Lateral spreading is generally the most pervasive and damaging type of liquefaction-induced ground failure generated by earthquakes.

The potentially liquefiable layers observed in the site vicinity appear to be at least partially continuous, particularly within the southern portion of the project site. Additionally, some of these layers appear to have SPT N-values (blow counts) less than 15. According to Youd, Hansen, and Barlett (2002), for significant lateral spreading displacements to occur, the soil must consist of saturated cohesionless sandy sediments with corrected SPT N-values less than 15 blows per foot. However, we have not identified a substantial free face adjacent to the project vicinity that extends below the water table and overall site grades are relatively flat. We therefore preliminarily conclude that the potential for lateral spreading at the project site is low. However, this phenomenon should be further investigated during the final geotechnical investigation.

Seismic Densification

Seismic densification (also referred to as cyclic densification or differential compaction) can occur during strong ground shaking in loose, clean granular deposits above the water table, resulting in ground surface settlement.

Portions of the on-site fill and Stream Deposits above the groundwater table are loose to medium dense, and may be susceptible to seismic densification. However, assuming an excavation depth of about 15 feet for the proposed basements, the majority of the soils susceptible to seismic densification will be removed. Therefore, we anticipate that less than ½ inch settlement could occur due to seismic densification in the soil strata below the planned basement level. However, the area outside the planned basement, including adjacent sidewalks and surrounding areas, may experience up to ¾ inches of settlement due to seismic densification during a major earthquake. Utilities and building entrances should be designed to accommodate differential settlement between the building and the exterior ground.

Fault Rupture

Historically, ground surface fault rupture closely follows the trace of geologically young faults. The site is not within an Earthquake Fault Zone, as defined by the Alquist-Priolo Earthquake Fault Zoning Act, and no active or potentially active faults exist on the site. In a seismically active area, the remote possibility exists for future faulting in areas where no faults previously existed; however, we conclude the risk of surface faulting and consequent secondary ground failure is low.

DISCUSSION AND PRELIMINARY RECOMMENDATIONS

On the basis of our subsurface exploration, we preliminarily conclude that from a geotechnical standpoint, the site can be developed as planned. The primary geotechnical concerns at the project site are:

- the presence of the BART tunnels adjacent to the project site
- the presence of undocumented fill and weak Stream Deposits at the site
- liquefaction of the weak Stream Deposits and associated settlements
- appropriate foundation system
- presence of relatively shallow groundwater
- support of the excavation sidewalls during excavation and construction of the below-grade basement

These geotechnical concerns and their potential impacts on the proposed project are discussed in the following sections.

BART Considerations

The presence of the BART tunnels adjacent to the site may impact determination of the appropriate foundation, shoring, and dewatering systems, as appropriate, for the proposed project. BART has developed general guidelines for the construction near their subway structures. These guidelines are presented in Appendix G and include the following:

1. The BART Zone of Influence (ZOI) is defined as the area above a line from the critical point of the substructure at a slope of 1½ horizontal to 1 vertical.
2. Soil redistribution caused by temporary shoring or permanent foundation systems shall be analyzed.
3. Shoring shall be required to maintain soil's at-rest condition; shoring structures shall be monitored for movement.
4. Tunnels, where affected, shall be monitored for movement and deformation due to adjacent construction activities as to ensure structural and operational safety.
5. Dewatering shall be monitored for changes in groundwater level; recharge program will be required if existing groundwater level is expected to drop more than two feet.
6. Where basements are excavated, the amount of loading (on subway) can be increased to the extent it is balanced by the weight of the removed material; however, the effect of soil rebound in such cases shall be fully analyzed.
7. All structures shall be designed so as not to impose any temporary or permanent adverse effects, including unbalanced loading and seismic loading on the adjacent BART subways.

Our interpretations of the BART tunnel locations and ZOI's are shown on Figures 2 and 3. These interpretations are based on as-built drawings provided by BART⁶, the existing surface topography provided by Sandis⁷ and building renderings provided by BAR Architects⁸. Because portions of the proposed development are either within or very close to the ZOI's, the BART guidelines will have to be considered during the design and construction of the foundation and shoring system for the proposed buildings. BART engineering will review the final geotechnical report, the structural plans and calculations, and the temporary shoring plans and calculations. Furthermore, BART may require that soil-structure interaction analysis be performed using finite element or finite difference analysis methods to evaluate the effect of the development on BART facilities. We understand BART requires no additional soil pressures be applied to their facilities

⁶ BART drawings titled "San Francisco Airport Extension Line, Trackwork, and Systems, Utilities, Plan and Profile, W2 381+00 to W2 392+00, and W2 392+00 to W2 404+00." dated 30 May and 25 November 2003, respectively.

⁷ Topographic survey drawing by SANDIS Civil Engineers Surveyors Planners, titled "618108 Topo.dwg" and provided via email on 19 December 2018.

⁸ Drawings by BAR Architects, titled "Alt D – High Rise." Sheets 01, 02, AB.B1, AB.01, AB.02, AB03, AB04, C.B1, C.01, C.02, and C.03, dated 4 January 2018.

due to the temporary shoring or the proposed buildings under static and seismic loading conditions.

Groundwater Considerations

As discussed above, groundwater was encountered in borings B-1 and B-2 at depths of about 18½ and 14½ feet bgs, respectively. However, seasonal fluctuations in the groundwater levels should be expected during periods of heavy rainfall or changes in the climate. Therefore, we conclude a design high groundwater level corresponding to Elevation 35 feet should be considered to check for hydrostatic uplift and design of the basement walls.

Based on an assumed excavation depth of about 15 feet bgs, we anticipate that excavations for the proposed buildings will extend near or into the existing groundwater table. However, for planning, the groundwater should be lowered to a depth of at least 3 feet below the bottom of the final planned foundation excavations to help maintain safe and stable excavations. For example, in areas where the planned bottom of excavation is 15 feet bgs, the groundwater should be lowered to 18 feet bgs. However, BART restricts the lowering of groundwater to no more than 2 feet below an established pre-construction baseline groundwater level. If the groundwater outside the excavations is lowered more than two feet, BART will require the installation of injection/recharge wells to maintain the groundwater within two feet of the baseline measurements.

Based on the design groundwater elevation above, we anticipate that the proposed buildings' basements will extend below the design groundwater level. Therefore, waterproofing will be required and the buildings' foundation elements and slabs should be designed to resist the associated hydrostatic pressures.

Excavation and Shoring Considerations

Based on an anticipated excavation depth of about 15 feet bgs, the required excavations for the basements may be sloped where there is sufficient space. Temporary cut slopes taller than five feet should be excavated no steeper than 1½:1 (horizontal to vertical). Where sufficient space is not available for cut slopes, the excavations will need to be shored to protect the surrounding improvements.

There are several key considerations in selecting a suitable shoring system, including the:

- potential for groundwater at or near the bottom of the proposed excavations
- protection of surrounding improvements, including the existing Colma Creek channel and Mission Road
- ability of the shoring system to reduce potential for ground movement
- cost.

We anticipate the excavations can generally be retained using a soldier-pile-and-lagging shoring system, except where the excavations extend below the existing groundwater level. A soldier-

pile-and-lagging system typically consists of concrete encased steel H-beams placed in predrilled holes extending below the bottom of the excavations. Wood lagging is placed between the piles as the excavations proceed.

If tiebacks are incorporated into the proposed shoring system, they may require encroachment agreements from adjacent property owners and permits from the City of South San Francisco. Furthermore, BART restricts tiebacks within 10 feet of subsurface facilities. It may be advisable to plan on using internal bracing instead of adding tiebacks in the direction of the BART tunnels. Tiebacks, if any, on the street sides of the excavations should avoid underground utilities in the streets. If tiebacks are utilized, care should also be taken when installing tiebacks towards the existing Colma Creek channel, which divides the project site into northern and southern portions, to avoid damaging the existing channel.

Groundwater may be present at or near the bottom of the proposed excavations. However, as discussed above, the groundwater level should be lowered to a depth of at least 3 feet below the bottom of the final planned foundation excavations. Therefore, if the ultimate basement depth extends down to the water table, due to the BART requirements mentioned previously, a cutoff wall, likely consisting of a cement deep soil mixed (CDSM) wall, may be more suitable to reduce the chances of lowering the groundwater table in the BART vicinity.

Foundations and Settlement

We anticipate the bottoms of the proposed buildings' foundations will be underlain by potentially liquefiable Stream Deposits, which are not considered suitable for support of the proposed buildings; the soft clay and silt would be susceptible to excessive settlement under static building loads and, during an earthquake, there could be a loss of foundation support due to the potentially liquefiable soils. Therefore, we preliminarily conclude the building should be supported on deep foundations gaining support in the underlying Colma and/or Merced Formations. Alternatively, ground improvement could be used to mitigate the potential for liquefaction to occur and transfer the foundation loads to the underlying Colma/Merced Formations. However, due to the anticipated variable thicknesses and depths of the Stream Deposits, ground improvement may not be a cost-effective option in certain areas. Additionally, further evaluation of the top of the Colma/Merced Formations will be needed in order to determine requisite embedment depths for ground improvement elements, if used, to ensure the Colma and Merced Formations are capable of sustaining the anticipated building loads. Accordingly, information regarding deep foundations is presented below; however, additional discussion and recommendations regarding potential for ground improvement at the site will be presented in the final geotechnical report, if applicable.

We preliminarily conclude that the proposed buildings can be supported on deep foundations that gain support in the soils beneath the Stream Deposits; however, because the existing BART facilities and Colma Creek channel are adjacent to the site, deep foundations that displace the soil or induce ground vibrations are not desirable due to the potential impacts (vibrations, increase stresses, etc.) to these facilities. In addition, deep foundations that displace soil may encounter shallow refusal in localized dense sand layers, such as those encountered in CPT-2, prior to reaching sufficient embedment for high pile capacities. Therefore, we judge that the most appropriate deep foundations would be augered cast-in-place (ACIP) piles.

Because their capacity depends heavily on the method of installation, ACIP piles should be designed and installed by a design-build specialty contractor familiar with these types of piles. ACIP piles are installed by drilling to the required depth with a hollow stem auger. When the auger reaches the required depth, cement grout or concrete is injected through the bottom port of the auger. Grout or concrete is injected continuously as the augers are slowly withdrawn. While the grout is still fluid, a steel reinforcing cage is inserted into the shaft. ACIP piles can range in diameter; however, 16-, 18- and 24-inch-diameter piles are typical.

We preliminarily estimate that the allowable axial compressive capacities of 16-inch-diameter auger cast piles embedded 15 to 25 feet below the bottom of the Stream Deposits will be about 300 to 400 kips. As a result, total ACIP pile lengths for these capacities would likely range from about 50 to 75 feet.

The ACIP piles should develop lateral resistance from the passive pressure acting on the upper portion of the piles and their structural rigidity. The lateral capacity of the piles will depend on the pile stiffness, the strength of the surrounding soil, the axial load on the pile, the allowable deflection at the pile top and the ground surface, and the allowable moment capacity of the pile. Additional lateral load resistance can be obtained by passive resistance acting against the face of below-grade elements, such as the basement walls or other foundation elements.

Settlement caused by liquefaction during a major earthquake may cause downdrag. Downdrag is the additional load transferred to the piles when liquefied soil surrounding the pile reconsolidates and applies negative (downward) friction to the pile. Downdrag loads are developed where sufficient strain occurs in the soil to transfer load to the pile. The range of allowable axial compressive pile capacities presented above account for the anticipated additional loads due to downdrag.

Piles should be spaced at least three pile diameters center-to-center to prevent vertical capacity reductions due to pile group interaction effects; the outer auger-tip diameter should be used when determining the pile spacing for the piles. However, if pile groups are utilized, appropriate reduction factors should be applied to the single-pile lateral load capacities to account for pile group effects.

For planning purposes, it is important to note that we will recommend static load testing be performed on piles to evaluate load versus deflection characteristics of the piles and to confirm the anticipated pile capacities are valid under field conditions.

Foundation elements should be designed to accommodate the moderately corrosive conditions presented in Appendix D.

Seismic Design

As discussed above, liquefiable soil is present at the site. Therefore, in accordance with ASCE 7-10, the appropriate site class is Site Class F and a site-specific response spectra will likely need to be performed for final structural design of the buildings.

However, it is possible that for structures of this height, the natural periods of the proposed buildings may be less than $\frac{1}{2}$ second and the buildings would qualify for the exception noted in ASCE 7-10 section 20.3.1. For this condition, or if ground improvement is performed at the site to mitigate the potential for liquefaction to occur, then Site Class D would be appropriate for determining the seismic design parameters in accordance with the provisions of SFBC 2016/ASCE 7-10, which are presented below.

- MCE_R S_S and S_1 of 2.31g and 1.107g, respectively.
- Site Coefficients F_a and F_v of 1.0 and 1.5, respectively
- MCE_R spectral response acceleration parameters at short periods, S_{MS} , and at one-second period, S_{M1} , of 2.31g and 1.66g, respectively.
- DE spectral response acceleration parameters at short period, S_{DS} , and at one-second period, S_{D1} , of 1.54g and 1.107g, respectively.

LIMITATIONS AND FINAL GEOTECHNICAL INVESTIGATION

The conclusions and preliminary recommendations provided in this report result from our interpretation of the geotechnical conditions at the site inferred from a limited number of borings and CPTs. Prior to final design and construction, the subsurface conditions at the site should be evaluated during a final geotechnical investigation. Such an investigation will allow us to provide detailed final geotechnical conclusions and recommendations regarding the geotechnical aspects of the proposed project.

We appreciate the opportunity to work with you and the project team on this project. If you have any questions, please do not hesitate to contact us.

Sincerely yours,

Langan Engineering and Environmental Services, Inc.



Abraham Eng
Senior Staff Engineer



Scott A. Walker, PE, GE
Senior Associate/Vice President



750652601.02 AE_1051 Mission Road_Preliminary Geotechnical Report

Attachments: References

Figure 1 – Site Location Map

Figure 2 – Site Plan

Figure 3 – Idealized Subsurface Profile A-A'

Figure 4 – Regional Geologic Map

Figure 5 – Map of Major Faults and Earthquake Epicenters in the San Francisco Bay Area

Figure 6 – Modified Mercalli Intensity Scale

Appendix A – Log of Borings
Appendix B – Log of CPTs
Appendix C – Laboratory Data
Appendix D – Corrosivity Analysis with Brief Evaluation
Appendix E – Summary Tables of Analytical Results
Appendix F – Certified Analytical Laboratory Reports and Chain-of Custody Record
Appendix G – BART General Guidelines

REFERENCES

- 2014 Working Group on California Earthquake Probabilities, 2015, "UCERF3: A new earthquake forecast for California's complex fault system," U.S. Geological Survey 2015-3009, 6 p., <http://dx.doi.org/10.3133/fs20153009>.
- BAR Architects (2018), "Alt D – High Rise." Sheets 01, 02, AB.B1, AB.01, AB.02, AB03, AB04, C.B1, C.01, C.02, and C.03, dated 4 January.
- Bray, J. D. and Sancio, R. B. (2006). "Assessment of the Liquefaction Susceptibility of Fine Grained Soils," Journal of Geotechnical and Geoenvironmental Engineering, Vol. 132, No. 9, ASCE.
- Bray, J.D. and Macedo, J. (2017). "6th Ishihara Lecture: Simplified procedure for estimating liquefaction-induced building settlement," Soil Dynamics and Earthquake Engineering, No 102.
- California Building Standards Commission, 2016 California Building Code.
- California Division of Mines and Geology (1996). "Probabilistic Seismic Hazard Assessment for the State of California." DMG Open-File Report 96-08.
- California Division of Mines and Geology (2008). "Guidelines for Evaluating and Mitigating Seismic Hazards in California." Special Publication 117A.
- Cao, T., Bryant, W. A., Rowshandel, B., Branum D. and Wills, C. J. (2003). "The Revised 2002 California Probabilistic Seismic Hazard Maps."
- Holzer, Thomas L. (1998). "The Loma Prieta, California Earthquake of October 17, 1989 – Liquefaction." U.S. Geological Survey Professional Paper 1551-B.
- Idriss, I.M. and Boulanger, R.W. (2008). "Soil Liquefaction During Earthquakes." Earthquake Engineering Research Institute. Monograph MNO-12.
- Ishihara, K. and Yoshimine, M. (1992). "Evaluation of Settlements in Sand Deposits Following Liquefaction during Earthquakes," Soils and Foundations, Vol. 32, No. 1, pp. 173-188.
- Jennings, C.W. (1994). "Fault Activity Map of California and Adjacent Areas," California Division of Mines and Geology Geologic Data Map No. 6, scale 1: 750,000.
- Ninyo & Moore Geotechnical and Environmental Sciences Consultants (2018a). "Geotechnical Evaluation and Geologic Hazards Assessment, New Police Station, 1 Chestnut Avenue, South San Francisco, California," dated 24 May.
- Ninyo & Moore Geotechnical and Environmental Sciences Consultants (2018b). "Geotechnical Evaluation and Geologic Hazard Assessment, Fire Station No. 63, 81 Arroyo Drive, South San Francisco, California," dated 24 May.

REFERENCES (Continued)

Pradel, Daniel (1998). "Procedure to Evaluate Earthquake-Induced Settlements in Dry Sand," Journal of Geotechnical and Geoenvironmental Engineering, April, and errata October 1998, pp1048

Robertson, P.K. (2016). "Cone Penetration Test (CPT)-Based Soil Behavior Type (SBT) Classification System-An Update," NRC Research Press, Canadian Geotechnical Journal, 14 July 2016.

SANDIS Civil Engineers Surveyors Planners (2018). "618108 Topo.dwg" provided via email on 19 December.

San Francisco Bay Area Rapid Transit (SFBART, 2003a). "San Francisco Airport Extension Line, Trackwork, and Systems, Utilities, Plan and Profile, W2 381+00 to W2 392+00." dated 30 May.

San Francisco Bay Area Rapid Transit (SFBART, 2003b). "San Francisco Airport Extension Line, Trackwork, and Systems, Utilities, Plan and Profile, W2 392+00 to W2 404+00." dated 25 November.

Schlocker, J. (1974). "Geology of the San Francisco North Quadrangle, California."

Seed, H.B. and Idriss, I.M. (1971). "Simplified Procedure for Evaluating Soil Liquefaction during Earthquakes," Journal of Geotechnical Engineering Division, ASCE, 97 (9), 1249-1273.

Tokimatsu, K. and Seed H. B. (1987). "Evaluation of Settlements in Sand due to Earthquake Shaking." Journal of Geotechnical Engineering, Vol. 113, No. 8, pp. 861-878.

Topozada, T.R. and Borchardt G. (1998). "Re-evaluation of the 1936 Hayward Fault and the 1838 San Andreas Fault Earthquakes." *Bulletin of Seismological Society of America*, 88(1), 140-159.

Townley, S. D. and Allen, M. W. (1939). "Descriptive Catalog of Earthquakes of the Pacific Coast of the United States 1769 to 1928." *Bulletin of the Seismological Society of America*, 29(1).

Treadwell & Rollo, Inc. (2003), "Draft Geotechnical Investigation, Park Station Apartments, 1410 El Camino Real, South San Francisco, California," dated 16 September.

Wesnousky, S. G. (1986). "Earthquakes, quaternary faults, and seismic hazards in California." *Journal of Geophysical Research*, 91(1312)

Working Group on California Earthquake Probabilities (WGCEP) (2003). "Summary of Earthquake Probabilities in the San Francisco Bay Region: 2002 to 2031." Open File Report 03-214.

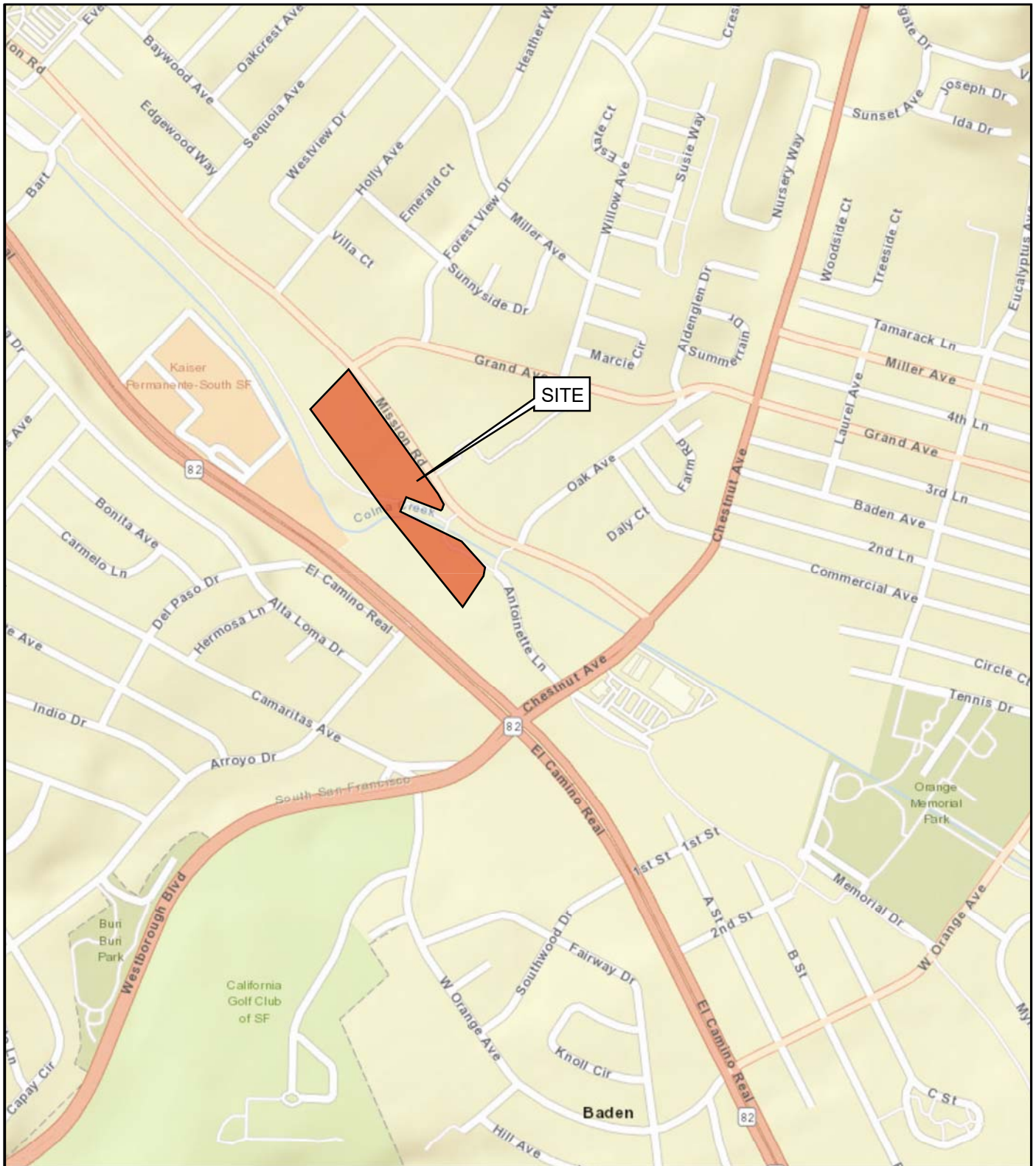
Working Group on California Earthquake Probabilities (WGCEP) (2008). "The Uniform California Earthquake Rupture Forecast, Version 2." Open File Report 2007-1437.

REFERENCES (Continued)

Youd, T.L., and Idriss, I.M. (2001). "Liquefaction Resistance of Soils: Summary Report from the 1996 NCEER and 1998 NCEER/NSF Workshops on Evaluation of Liquefaction Resistance of Soils," Journal of Geotechnical and Geoenvironmental Engineering, Vol. 127, No. 4.

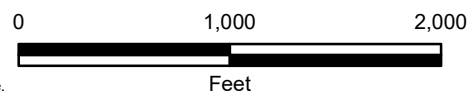
Youd, T.L., and Garriss, C.T. (1995). "Liquefaction-induced ground-surface disruption." Journal of Geotechnical Engineering, American Society of Civil Engineers, Vol. 121, 805-809.

FIGURES



NOTES:

World street basemap is provided through Langan's Esri ArcGIS software licensing and ArcGIS online.
Credits: Sources: Esri, DeLorme, NAVTEQ, USGS, Intermap, IPC, NRCAN.



SSF TRANSIT-ORIENTED DEVELOPMENT
1051 MISSION ROAD
South San Francisco, California

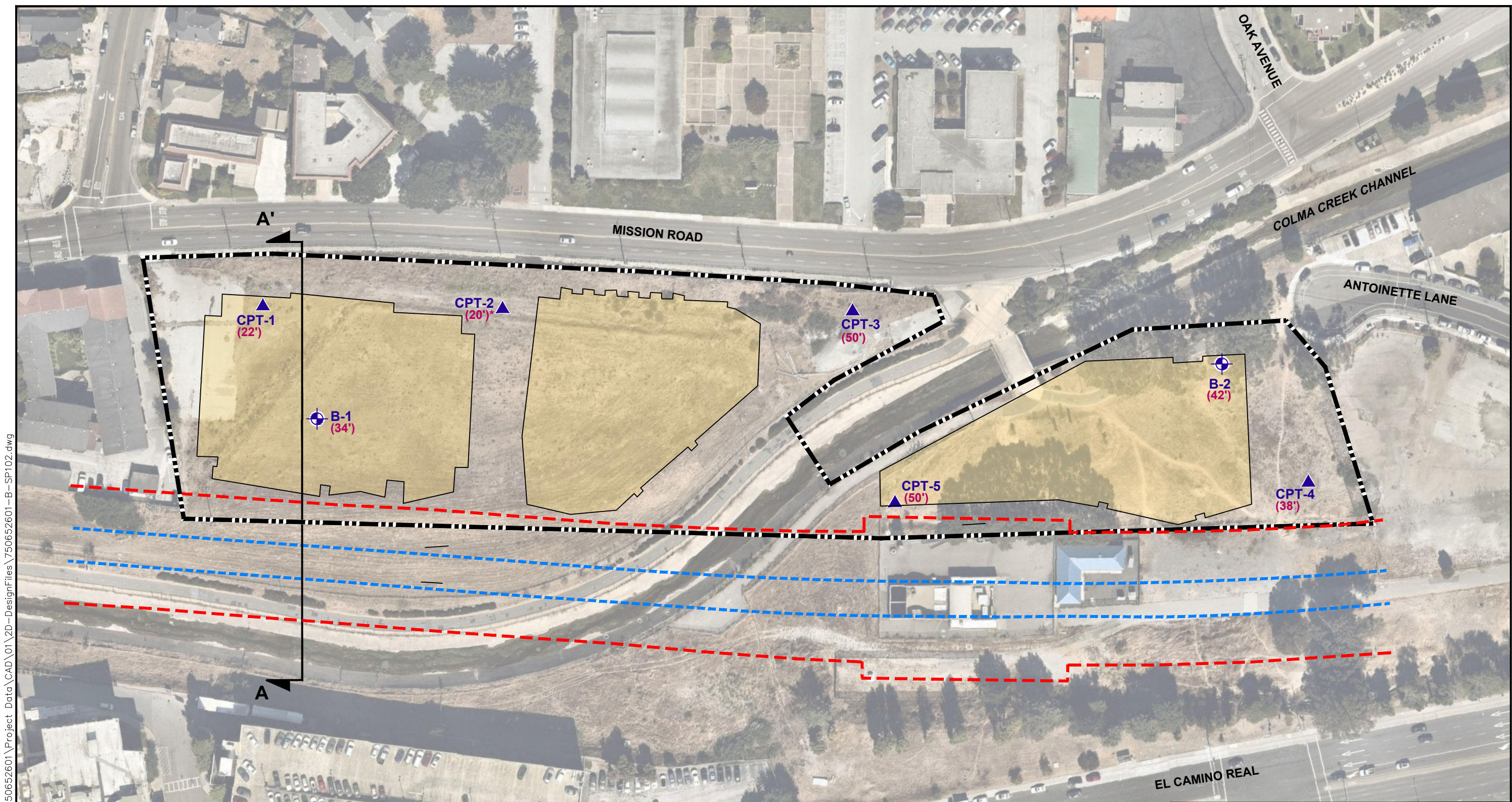
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SITE LOCATION MAP

Date 02/04/19

Project No. 750652601

Figure 1



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EXPLANATION

B-1
(34')

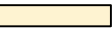


Approximate location of boring by Langan,
December 2018 and depth to bottom of Stream
Deposits

CPT-1



Approximate location of cone penetration test
by Langan, December 2018



Approximate proposed building outline



Approximate property boundary



Approximate limit of outer walls of BART
subway box



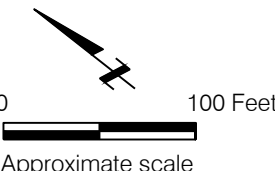
Approximate limit of BART zone of influence at
existing ground surface

*

CPT encountered shallow refusal. Actual depth
to bottom of Stream Deposits may vary



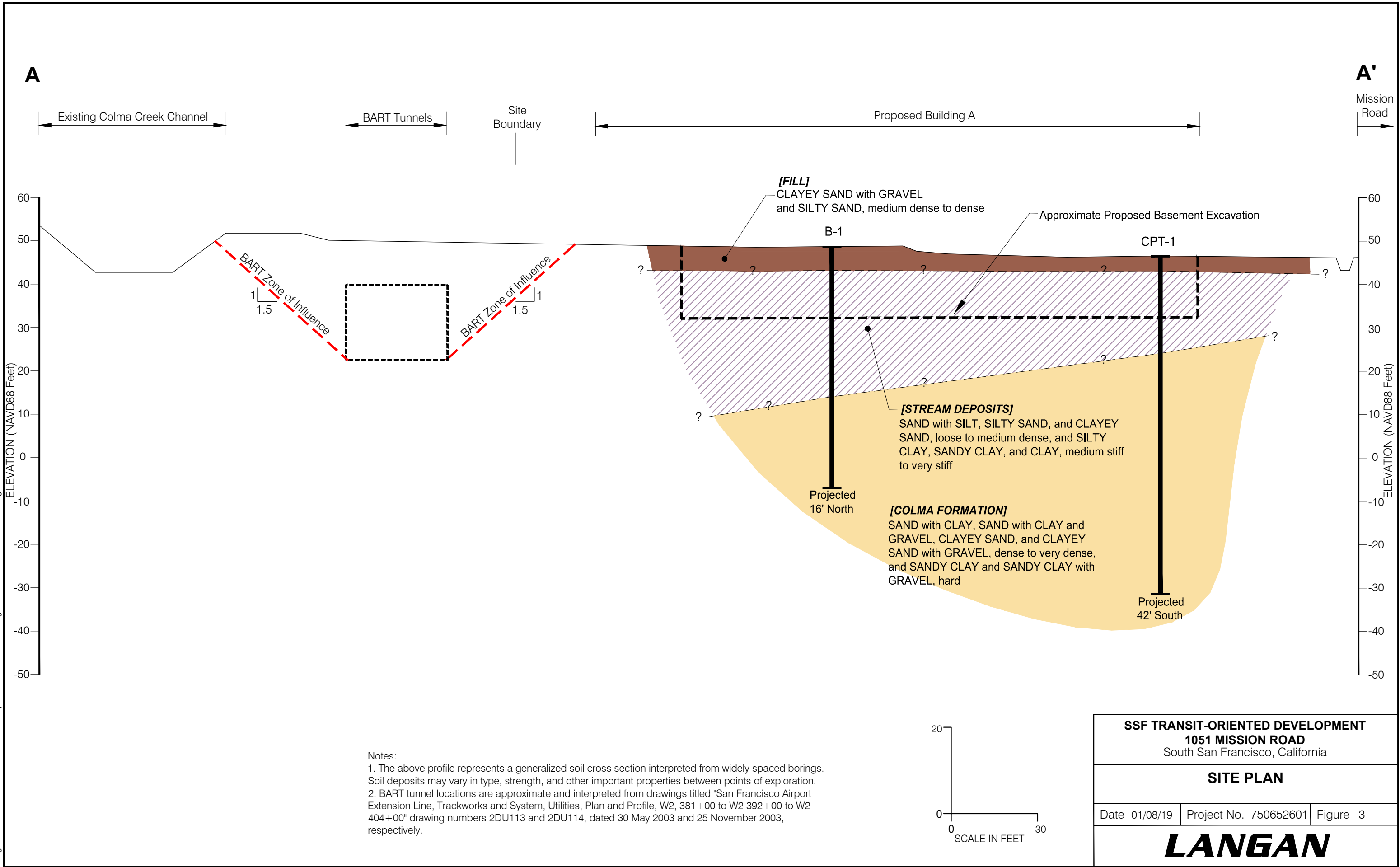
Idealized cross section location



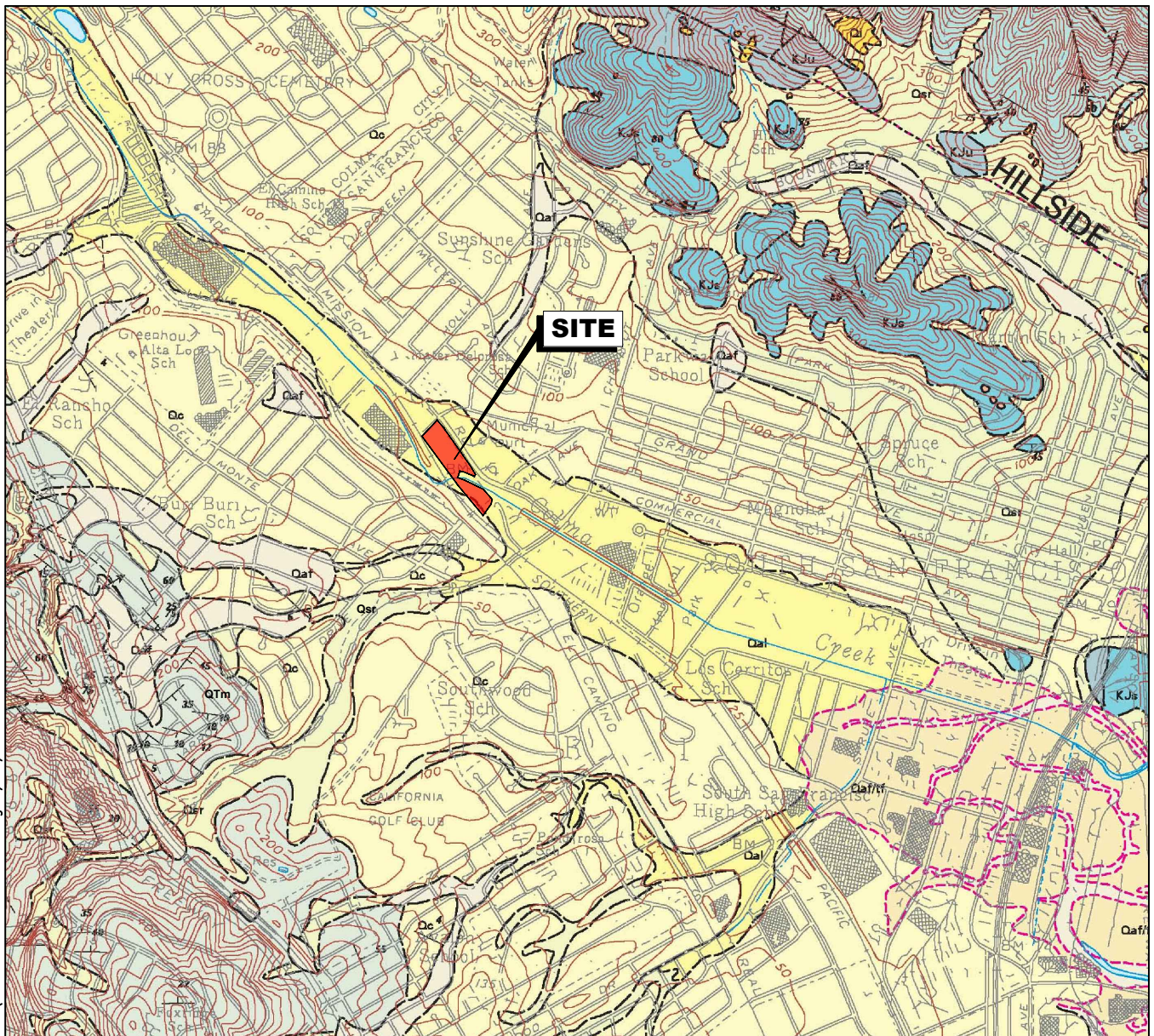
REFERENCE: Aerial by nearmaps 2019.

SSF TRANSIT-ORIENTED DEVELOPMENT 1051 MISSION ROAD South San Francisco, California		
SITE PLAN		
Date 02/04/19	Project No. 750652601	Figure 2
LANGAN		

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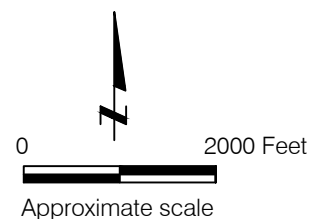
EXPLANATION

Qaf	Artificial fill (Historic)
Qal	Alluvial (Pleistocene)
Qsr	Slope debris and ravine fill (xxxxxx)
Qc	Colma Formation (xxxxxxx)
QTm	Merced Formation (xxxxx)
KJs	Sandstone and shale
KJu	Sheared rocks

--- 1800s shoreline and stream channels

--- Approximate location of depositional or intrusive contact

35 | Bedding; dashed where approximately located
35 |



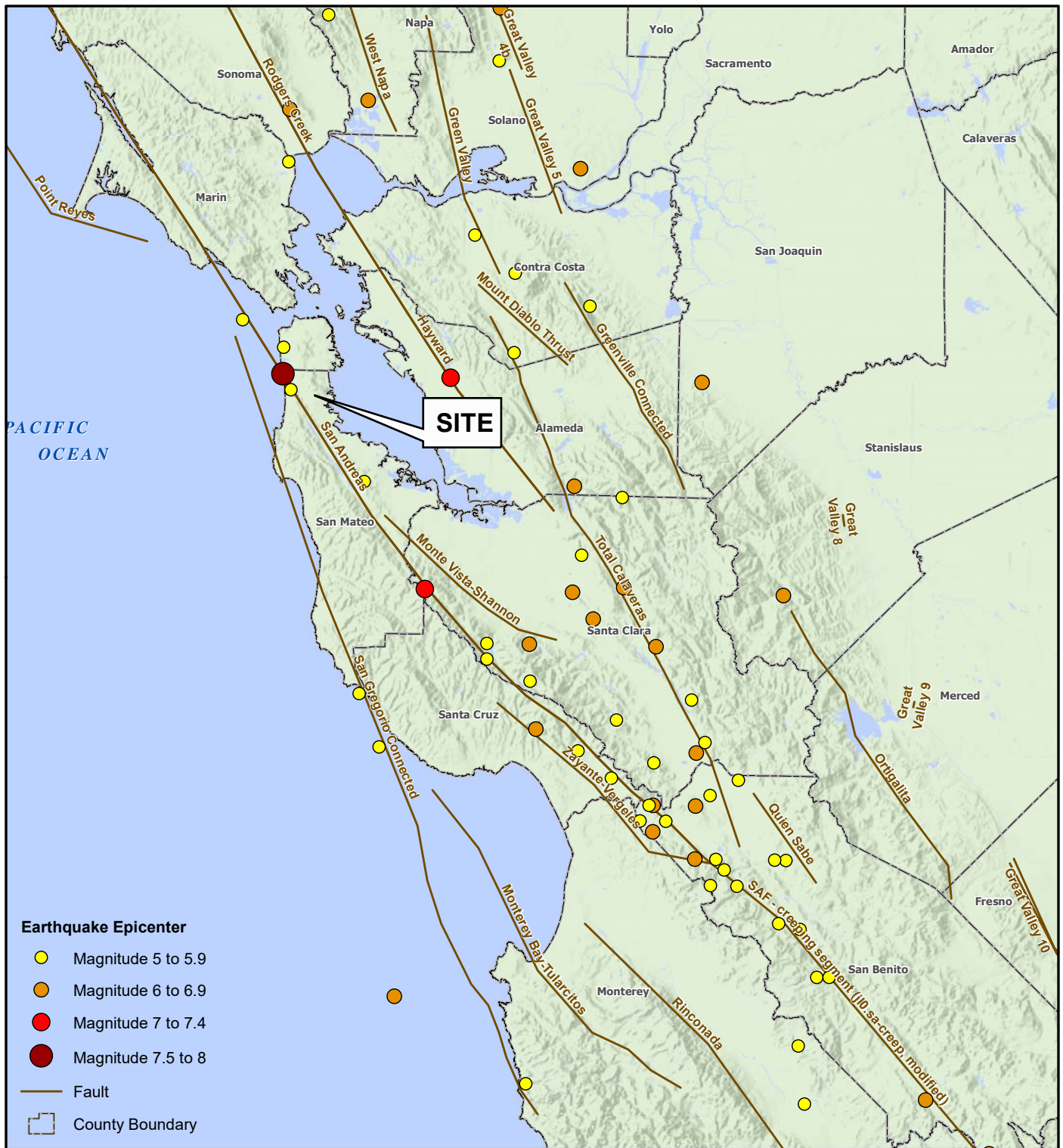
Base map: Geology Map and Map Database of the San Francisco South and San Francisco Bay Area, California, by Carl Wentworth, Marjorie Lucks, Heather Schoonover, Scott Graham, and Thomas May 1998.

1051 MISSION ROAD
South San Francisco, California

REGIONAL GEOLOGIC MAP

LANGAN

Date 02/04/19 Project No. 750652601 Figure 5



0 5 10 20
Miles



SSF TRANSIT-ORIENTED DEVELOPMENT
1051 MISSION ROAD
South San Francisco, California

LANGAN

**MAP OF MAJOR FAULTS AND
EARTHQUAKE EPICENTERS IN
THE SAN FRANCISCO BAY AREA**

Date 02/04/19

Project No. 750652601

Figure 5

<p>I Not felt by people, except under especially favorable circumstances. However, dizziness or nausea may be experienced. Sometimes birds and animals are uneasy or disturbed. Trees, structures, liquids, bodies of water may sway gently, and doors may swing very slowly.</p> <p>II Felt indoors by a few people, especially on upper floors of multi-story buildings, and by sensitive or nervous persons. As in Grade I, birds and animals are disturbed, and trees, structures, liquids and bodies of water may sway. Hanging objects swing, especially if they are delicately suspended.</p> <p>III Felt indoors by several people, usually as a rapid vibration that may not be recognized as an earthquake at first. Vibration is similar to that of a light, or lightly loaded trucks, or heavy trucks some distance away. Duration may be estimated in some cases. Movements may be appreciable on upper levels of tall structures. Standing motor cars may rock slightly.</p> <p>IV Felt indoors by many, outdoors by a few. Awakens a few individuals, particularly light sleepers, but frightens no one except those apprehensive from previous experience. Vibration like that due to passing of heavy, or heavily loaded trucks. Sensation like a heavy body striking building, or the falling of heavy objects inside. Dishes, windows and doors rattle; glassware and crockery clink and clash. Walls and house frames creak, especially if intensity is in the upper range of this grade. Hanging objects often swing. Liquids in open vessels are disturbed slightly. Stationary automobiles rock noticeably.</p> <p>V Felt indoors by practically everyone, outdoors by most people. Direction can often be estimated by those outdoors. Awakens many, or most sleepers. Frightens a few people, with slight excitement; some persons run outdoors. Buildings tremble throughout. Dishes and glassware break to some extent. Windows crack in some cases, but not generally. Vases and small or unstable objects overturn in many instances, and a few fall. Hanging objects and doors swing generally or considerably. Pictures knock against walls, or swing out of place. Doors and shutters open or close abruptly. Pendulum clocks stop, or run fast or slow. Small objects move, and furnishings may shift to a slight extent. Small amounts of liquids spill from well-filled open containers. Trees and bushes shake slightly.</p> <p>VI Felt by everyone, indoors and outdoors. Awakens all sleepers. Frightens many people; general excitement, and some persons run outdoors. Persons move unsteadily. Trees and bushes shake slightly to moderately. Liquids are set in strong motion. Small bells in churches and schools ring. Poorly built buildings may be damaged. Plaster falls in small amounts. Other plaster cracks somewhat. Many dishes and glasses, and a few windows break. Knickknacks, books and pictures fall. Furniture overturns in many instances. Heavy furnishings move.</p> <p>VII Frightens everyone. General alarm, and everyone runs outdoors. People find it difficult to stand. Persons driving cars notice shaking. Trees and bushes shake moderately to strongly. Waves form on ponds, lakes and streams. Water is muddied. Gravel or sand stream banks cave in. Large church bells ring. Suspended objects quiver. Damage is negligible in buildings of good design and construction; slight to moderate in well-built ordinary buildings; considerable in poorly built or badly designed buildings, adobe houses, old walls (especially where laid up without mortar), spires, etc. Plaster and some stucco fall. Many windows and some furniture break. Loosened brickwork and tiles shake down. Weak chimneys break at the roofline. Cornices fall from towers and high buildings. Bricks and stones are dislodged. Heavy furniture overturns. Concrete irrigation ditches are considerably damaged.</p> <p>VIII General fright, and alarm approaches panic. Persons driving cars are disturbed. Trees shake strongly, and branches and trunks break off (especially palm trees). Sand and mud erupts in small amounts. Flow of springs and wells is temporarily and sometimes permanently changed. Dry wells renew flow. Temperatures of spring and well waters varies. Damage slight in brick structures built especially to withstand earthquakes; considerable in ordinary substantial buildings, with some partial collapse; heavy in some wooden houses, with some tumbling down. Panel walls break away in frame structures. Decayed pilings break off. Walls fall. Solid stone walls crack and break seriously. Wet grounds and steep slopes crack to some extent. Chimneys, columns, monuments and factory stacks and towers twist and fall. Very heavy furniture moves conspicuously or overturns.</p> <p>IX Panic is general. Ground cracks conspicuously. Damage is considerable in masonry structures built especially to withstand earthquakes; great in other masonry buildings - some collapse in large part. Some wood frame houses built especially to withstand earthquakes are thrown out of plumb, others are shifted wholly off foundations. Reservoirs are seriously damaged and underground pipes sometimes break.</p> <p>X Panic is general. Ground, especially when loose and wet, cracks up to widths of several inches; fissures up to a yard in width run parallel to canal and stream banks. Landsliding is considerable from river banks and steep coasts. Sand and mud shifts horizontally on beaches and flat land. Water level changes in wells. Water is thrown on banks of canals, lakes, rivers, etc. Dams, dikes, embankments are seriously damaged. Well-built wooden structures and bridges are severely damaged, and some collapse. Dangerous cracks develop in excellent brick walls. Most masonry and frame structures, and their foundations are destroyed. Railroad rails bend slightly. Pipe lines buried in earth tear apart or are crushed endwise. Open cracks and broad wavy folds open in cement pavements and asphalt road surfaces.</p> <p>XI Panic is general. Disturbances in ground are many and widespread, varying with the ground material. Broad fissures, earth slumps, and land slips develop in soft, wet ground. Water charged with sand and mud is ejected in large amounts. Sea waves of significant magnitude may develop. Damage is severe to wood frame structures, especially near shock centers, great to dams, dikes and embankments, even at long distances. Few if any masonry structures remain standing. Supporting piers or pillars of large, well-built bridges are wrecked. Wooden bridges that "give" are less affected. Railroad rails bend greatly and some thrust endwise. Pipe lines buried in earth are put completely out of service.</p> <p>XII Panic is general. Damage is total, and practically all works of construction are damaged greatly or destroyed. Disturbances in the ground are great and varied, and numerous shearing cracks develop. Landslides, rock falls, and slumps in river banks are numerous and extensive. Large rock masses are wrenched loose and torn off. Fault slips develop in firm rock, and horizontal and vertical offset displacements are notable. Water channels, both surface and underground, are disturbed and modified greatly. Lakes are dammed, new waterfalls are produced, rivers are deflected, etc. Surface waves are seen on ground surfaces. Lines of sight and level are distorted. Objects are thrown upward into the air.</p>	<div> <div> SSF TRANSIT-ORIENTED DEVELOPMENT 1051 MISSION ROAD South San Francisco, California </div> <div> <div> MODIFIED MERCALLI INTENSITY SCALE </div> <div> <div> LANGAN </div> <div> Date 02/04/19Project No. 750652601Figure 6 </div> </div> </div> </div>		
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**APPENDIX A
LOG OF BORINGS**

TEST GEOTECH LOG 750652601 1051 MISSION RD.GPJ TR.GDT 2/22/19











PROJECT: SSF TRANSIT-ORIENTED DEVELOPMENT 1051 MISSION ROAD South San Francisco, California						Log of Boring B-1						PAGE 1 OF 2	
Boring location: See Site Plan, Figure 2						Logged by: B. Sanders							
Date started: 12/18/18			Date finished: 12/18/18										
Drilling method: Hollow Stem Auger													
Hammer weight/drop: 140 lbs./30 inches			Hammer type: Downhole Wireline			LABORATORY TEST DATA							
Samplers: Sprague & Henwood (S&H), Standard Penetration Test (SPT)													
DEPTH (feet)	SAMPLES				LITHOLOGY	MATERIAL DESCRIPTION	Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft	
	Sampler Type	Sample	Blows/ 6"	SPT N-value ¹									
Ground Surface Elevation: 48.5 feet ²													
1						CLAYEY SAND with GRAVEL (SC) yellow-brown, medium dense, moist, fine-grained, fine subangular gravel, trace asphalt debris	FILL	PP	1,250	39.5	78		
2						Corrosivity Analysis, see Appendix D							
3	S&H		9 15 24	20	SC								
4													
5	S&H		50/ 5"	25/ 5"		brown, fine- to coarse-grained, trace silt							
6													
7						SILTY CLAY (CL) dark brown, medium stiff to stiff, moist, trace fine-grained sand, with organics	PP	1,250	36.1	28.6	95		
8	S&H		17 8 8	8	CL								
9													
10	S&H		9 9 10	10									
11													
12						SAND with SILT (SP-SM) gray-brown with yellow-brown mottling, loose, to medium dense, moist, fine-grained	PP	1,250	36.1	28.6	95		
13	S&H		11 15 27	21	SP-SM								
14													
15													
16	S&H		15 29 37	33	SM	dense							
17							STREAM DEPOSITS	PP	1,500	19.1	114		
18	SPT		8 8 19	14		SILTY CLAY (CL) gray-black, stiff, moist, trace fine-grained sand, with organics and occasional sandy interbeds (12/18/18, 10:20 a.m.) very stiff, with fine-grained sand LL = 24, PI = 10, see Figure C-2							
19	S&H		12 16 21	19		reduced sand content							
20													
21	SPT		8 9 20	26	CL								
22							PP	1,500					
23													
24	S&H		11 16 20	18									
25													
26	SPT		15 15 18	30		CLAY (CL) gray, very stiff to hard, wet, trace organics gray to blue-gray							
27							PP	1,300					
28						black							
29	S&H		16 28 32	30									
30													
							LANGAN						
							Project No.: 750652601		Figure: A-1a				

PROJECT:

SSF TRANSIT-ORIENTED DEVELOPMENT
1051 MISSION ROAD
 South San Francisco, California

Log of Boring B-1

PAGE 2 OF 2

DEPTH (feet)	SAMPLES				LITHOLOGY	MATERIAL DESCRIPTION	LABORATORY TEST DATA					
	Sampler Type	Sample	Blows/ 6"	SPT N-Value ¹			Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
31	SPT		11 26 35	55	CL	SILTY CLAY (CL) black, very stiff to hard, wet, with organics	PP		1,500			
32					SC	SANDY CLAY (CL) gray with black mottling, hard, wet, fine-grained sand, with organics						
33					SC	CLAYEY SAND (SC) gray-brown, very dense, wet, fine-grained, with organics						
34	S&H		28 60/ 6"	30/ 6"	SP-SC	SAND with CLAY (SP-SC) olive-gray with yellow-brown mottling, very dense, wet, fine-grained, trace subangular gravel, trace organics						
35	SPT		60/ 6"	54/ 6"								
36	SPT		57 60/ 5"	54/ 6"								
37												
38						CLAYEY SAND (SC) yellow-brown with gray-brown mottling, dense, wet, fine-grained						
39	S&H		22 27 41	34		LL = 28, PI = 16, see Figure C-2						
40	SPT		12 38 44	74	SC	red-brown with gray-brown mottling, very dense, trace silt						
41												
42												
43												
44												
45												
46						SANDY CLAY (CL) yellow, hard, wet, fine-grained sand, with silt						
47					CL							
48												
49	S&H		33 60/ 5"	30/ 6"								
50	SPT		60/ 5"	54/ 5"	CL	SANDY CLAY with GRAVEL (CL) yellow-brown with red-brown mottling, hard, wet, fine- to coarse-grained sand, fine subangular gravel						
51												
52						SAND with CLAY and GRAVEL (SP-SC) red-brown, very dense, wet, fine- to coarse-grained, fine subangular gravel, trace silt						
53					SP-SC							
54	S&H		60/ 6"	30/ 6"		yellow-brown with red-brown mottling						
55	SPT		57 60/ 1"	54/ 1"	SC	CLAYEY SAND with GRAVEL (SC) yellow-brown with orange mottling and black spotting, very dense, wet, fine- to coarse-grained, fine subangular gravel, lightly cemented						
56												
57												
58												
59												
60												

Boring terminated at a depth of 55.5 feet below ground surface.
 Boring backfilled with cement grout.
 Groundwater encountered at 18.5 feet at time of drilling.
 PP = Pocket penetrometer.

¹ S&H and SPT blow counts for the last two increments were converted to SPT N-Values using factors of 0.5 and 0.9, respectively to account for sampler type and hammer energy.
² Elevations based on North American Vertical Datum 1988 (NAVD 88).

LANGAN
 Project No.:
 750652601

 Figure:
 A-1b

TEST GEOTECH LOG 750652601 1051 MISSION RD.GPJ TR.GDT 2/22/19

PROJECT: **SSF TRANSIT-ORIENTED DEVELOPMENT**
1051 MISSION ROAD
 South San Francisco, California

Log of Boring B-2

PAGE 1 OF 2

Boring location: See Site Plan, Figure 2

Logged by: B. Sanders

Date started: 12/18/18

Date finished: 12/18/18










Drilling method: Hollow Stem Auger

Hammer weight/drop: 140 lbs./30 inches

Hammer type: Downhole Wireline

Samplers: Sprague & Henwood (S&H), Standard Penetration Test (SPT)

LABORATORY TEST DATA

DEPTH (feet)	SAMPLES				LITHOLOGY	MATERIAL DESCRIPTION	Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
	Sampler Type	Sample	Blows/ 6"	SPT N-Value ¹								
Ground Surface Elevation: 45.2 feet ²												
1	S&H		14 26 50/ 6"	38	SC	CLAYEY SAND with GRAVEL (SC) brown with yellow-brown mottling, dense, moist, fine- to coarse-grained, fine subrounded gravel, trace silt, trace asphalt debris	↑					
2												
3						Corrosivity Analysis, see Appendix D						
4	S&H		18 17 23	20	SM	SILTY SAND (SM) brown to olive-brown, medium dense, moist, fine- to coarse-grained, trace fine subrounded to rounded gravel, trace clay, trace asphalt debris	FILL					
5												
6												
7	S&H		8 11 17	14	SM	SILTY SAND (SM) yellow-brown with brown and orange mottling, medium dense, moist, fine-grained	↑					
8												
9						yellow-brown with red-brown mottling						
10	S&H		9 10 12	11								
11												
12												
13	S&H		7 9 12	11	ML	SANDY SILT (ML) dark brown with red-brown mottling, stiff, moist, fine-grained sand LL = 30, PI = 6, see Figure C-2	PP		1,750	76.6		
14												
15												
16	S&H		15 36 35	36	SM	SILTY SAND (SM) olive-gray to gray, dense, wet, fine-grained					21.4	103
17												
18												
19	SPT		13 18 26	40	CL	SANDY CLAY (CL) dark gray, hard, moist, fine-grained sand, with coarse rounded gravel	STREAM DEPOSITS					
20												
21						SP- SM						
22	S&H		10 14 21	18	CL	SANDY CLAY (CL) olive-gray, stiff, moist, fine-grained sand		PP		1,750		
23												
24												
25	SPT		15 21 36	51	SM	SILTY CLAY (CL) gray to black, stiff, moist Consolidation Test, see Figure C-1	PP		1,500			
26												
27												
28						SILTY SAND (SM) gray to olive-gray, very dense, moist, fine-grained						
29												
30												

LANGAN

Project No.: 750652601

Figure: A-2a

LANGAN

Project No.:
750652601

Figure:
A-2a

TEST GEOTECH LOG 750652601 1051 MISSION RD.GPJ TR.GDT 2/22/19

PROJECT:

SSF TRANSIT-ORIENTED DEVELOPMENT
1051 MISSION ROAD
 South San Francisco, California

Log of Boring B-2

PAGE 2 OF 2

DEPTH (feet)	SAMPLES				LITHOLOGY	MATERIAL DESCRIPTION	LABORATORY TEST DATA					
	Sampler Type	Sample	Blows/ 6"	SPT N-Value ¹			Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
31					SM	SILTY SAND (SM) (continued)	PP	1,000				
32												
33						CLAY (CL) gray to black, very stiff, moist, with silt, with organics						
34	S&H		10	18								
35			14									
36			21									
37					CL							
38												
39	SPT		17	40		hard, increased organics content						
40			18									
41			26									
42												
43						SANDY CLAY (CL) olive-gray with brown mottling, hard, wet, fine-grained sand, with silt	PP	3,250				
44	S&H		14	58/								
45			55	11"	CL							
46			50/									
47			5"									
48						SAND with CLAY (SP-SC) gray-brown, very dense, wet, fine-grained, trace silt						
49	SPT		16	79	SP-SC							
50			33									
51			55									
52					SC	CLAYEY SAND (SC) gray-brown with yellow-brown mottling, very dense, wet, fine-grained, trace silt						
53												
54	S&H		60/	54/	SP	SAND (SP) yellow-brown, very dense, wet, fine-grained						
55			6"	6"								
56												
57												
58												
59												
60												

Boring terminated at a depth of 54 feet below ground surface.
 Boring backfilled with cement grout.
 Groundwater encountered at 14.5 feet at time of drilling.
 PP = Pocket penetrometer.

¹ S&H and SPT blow counts for the last two increments were converted to SPT N-Values using factors of 0.5 and 0.9, respectively to account for sampler type and hammer energy.
² Elevations based on North American Vertical Datum 1988 (NAVD 88).

LANGAN
 Project No.:
 750652601

 Figure:
 A-2b

TEST GEOTECH LOG 750652601 1051 MISSION RD.GPJ TR.GDT 2/22/19

UNIFIED SOIL CLASSIFICATION SYSTEM			
Major Divisions		Symbols	Typical Names
Coarse-Grained Soils (more than half of soil > no. 200 sieve size)	Gravels (More than half of coarse fraction > no. 4 sieve size)	GW	Well-graded gravels or gravel-sand mixtures, little or no fines
		GP	Poorly-graded gravels or gravel-sand mixtures, little or no fines
		GM	Silty gravels, gravel-sand-silt mixtures
		GC	Clayey gravels, gravel-sand-clay mixtures
	Sands (More than half of coarse fraction < no. 4 sieve size)	SW	Well-graded sands or gravelly sands, little or no fines
		SP	Poorly-graded sands or gravelly sands, little or no fines
		SM	Silty sands, sand-silt mixtures
		SC	Clayey sands, sand-clay mixtures
Fine -Grained Soils (more than half of soil < no. 200 sieve size)	Silts and Clays LL = < 50	ML	Inorganic silts and clayey silts of low plasticity, sandy silts, gravelly silts
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, lean clays
		OL	Organic silts and organic silt-clays of low plasticity
	Silts and Clays LL = > 50	MH	Inorganic silts of high plasticity
		CH	Inorganic clays of high plasticity, fat clays
		OH	Organic silts and clays of high plasticity
Highly Organic Soils		PT	Peat and other highly organic soils

GRAIN SIZE CHART

Classification	Range of Grain Sizes	
	U.S. Standard Sieve Size	Grain Size in Millimeters
Boulders	Above 12"	Above 305
Cobbles	12" to 3"	305 to 76.2
Gravel coarse fine	3" to No. 4	76.2 to 4.76
	3" to 3/4"	76.2 to 19.1
	3/4" to No. 4	19.1 to 4.76
Sand coarse medium fine	No. 4 to No. 200	4.76 to 0.075
	No. 4 to No. 10	4.76 to 2.00
	No. 10 to No. 40	2.00 to 0.420
	No. 40 to No. 200	0.420 to 0.075
Silt and Clay	Below No. 200	Below 0.075

Unstabilized groundwater level

Stabilized groundwater level

Sample taken with Sprague & Henwood split-barrel sampler with a 3.0-inch outside diameter and a 2.43-inch inside diameter. Darkened area indicates soil recovered

Classification sample taken with Standard Penetration Test sampler

Undisturbed sample taken with thin-walled tube

Disturbed sample

Sampling attempted with no recovery

Core sample

Analytical laboratory sample, grab groundwater

Sample taken with Direct Push sampler

Sonic

SAMPLER TYPE

C

Core barrel

CA

California split-barrel sampler with 2.5-inch outside diameter and a 1.93-inch inside diameter

D&M

Dames & Moore piston sampler using 2.5-inch outside diameter, thin-walled tube

O

Osterberg piston sampler using 3.0-inch outside diameter, thin-walled Shelby tube

PT

Pitcher tube sampler using 3.0-inch outside diameter, thin-walled Shelby tube

S&H

Sprague & Henwood split-barrel sampler with a 3.0-inch outside diameter and a 2.43-inch inside diameter

SPT

Standard Penetration Test (SPT) split-barrel sampler with a 2.0-inch outside diameter and a 1.5-inch inside diameter

ST

Shelby Tube (3.0-inch outside diameter, thin-walled tube) advanced with hydraulic pressure

SSF TRANSIT-ORIENTED DEVELOPMENT

1051 MISSION ROAD

South San Francisco, California

LANGAN

CLASSIFICATION CHART

Date 01/18/19

Project No. 750652601

Figure A-3

**APPENDIX B
LOG OF CPTS**



GREGG DRILLING, INC.
www.greggdrilling.com

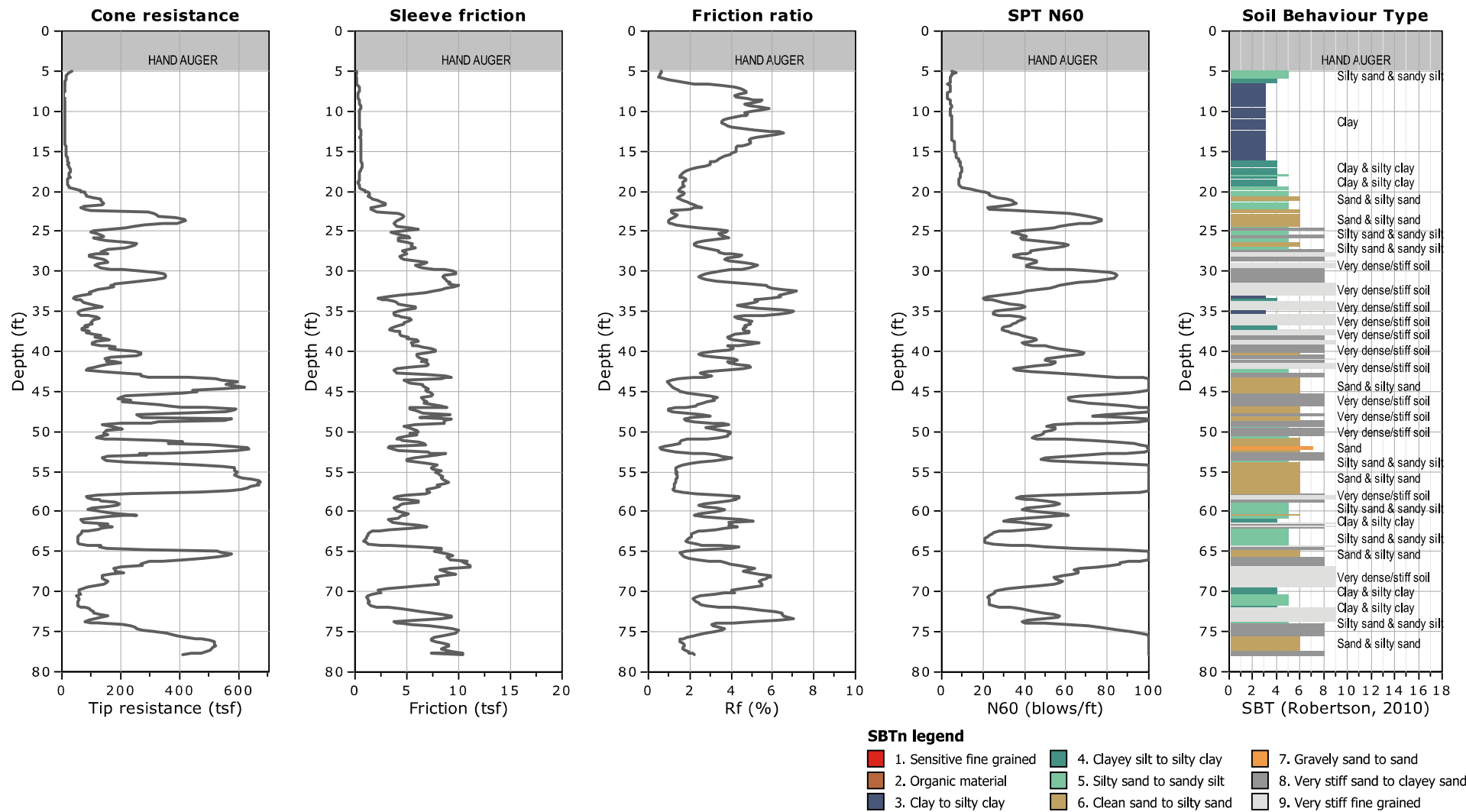
CPT: CPT-1

CLIENT: LANGAN

SITE: 1051 MISSION ROAD, SOUTH SAN FRANCISCO, CA

Field Rep: BRANDON SANDERS

Total depth: 77.92 ft, Date: 12/18/2018





GREGG DRILLING, INC.
www.greggdrilling.com

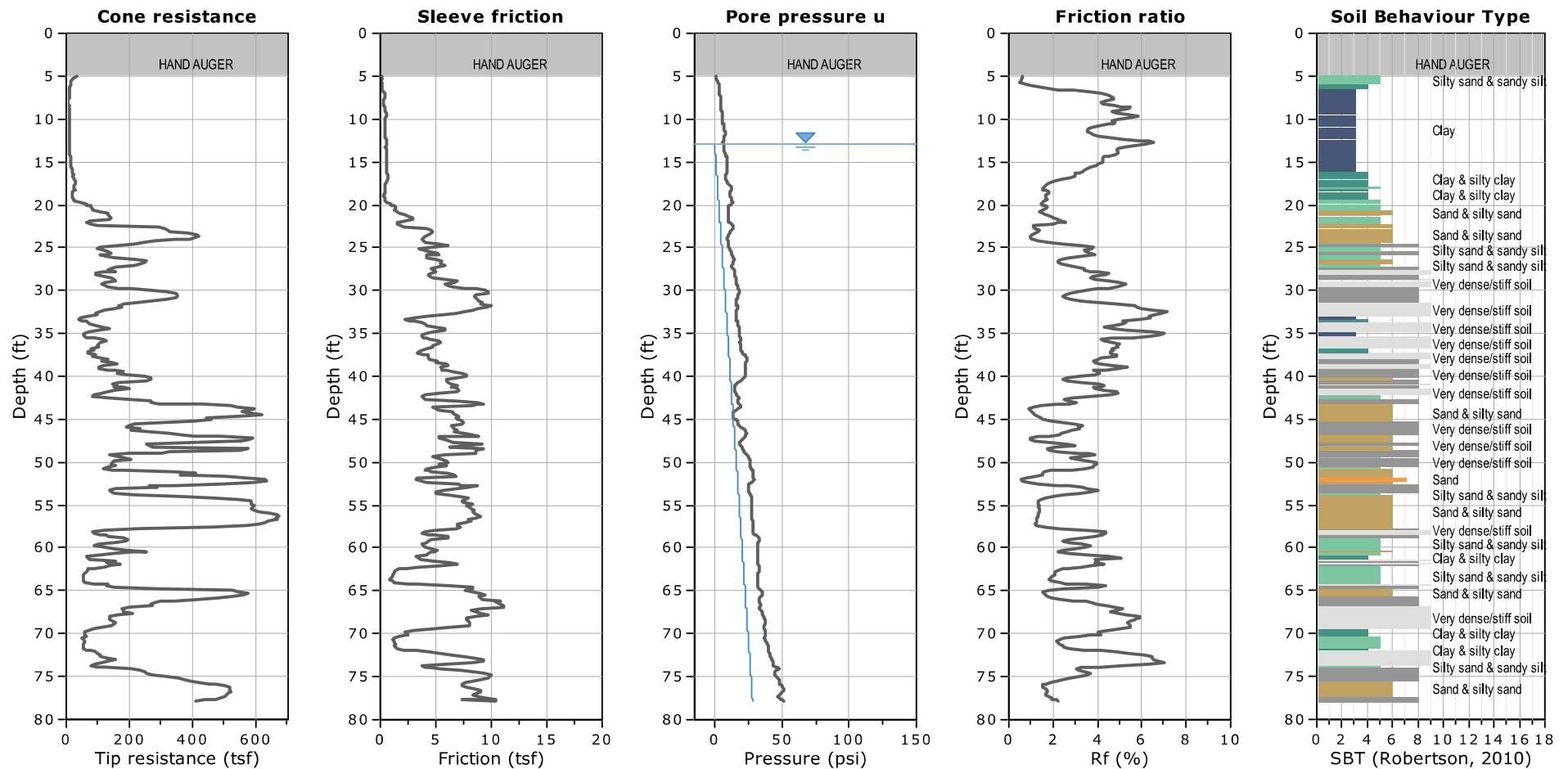
CPT: CPT-1

CLIENT: LANGAN

SITE: 1051 MISSION ROAD, SOUTH SAN FRANCISCO, CA

Field Rep: BRANDON SANDERS

Total depth: 77.92 ft, Date: 12/18/2018



WATER TABLE FOR ESTIMATING PURPOSES ONLY

SBTn legend

- | | | |
|---------------------------|------------------------------|-----------------------------------|
| 1. Sensitive fine grained | 4. Clayey silt to silty clay | 7. Gravely sand to sand |
| 2. Organic material | 5. Silty sand to sandy silt | 8. Very stiff sand to clayey sand |
| 3. Clay to silty clay | 6. Clean sand to silty sand | 9. Very stiff fine grained |



GREGG DRILLING, INC.
www.greggdrilling.com

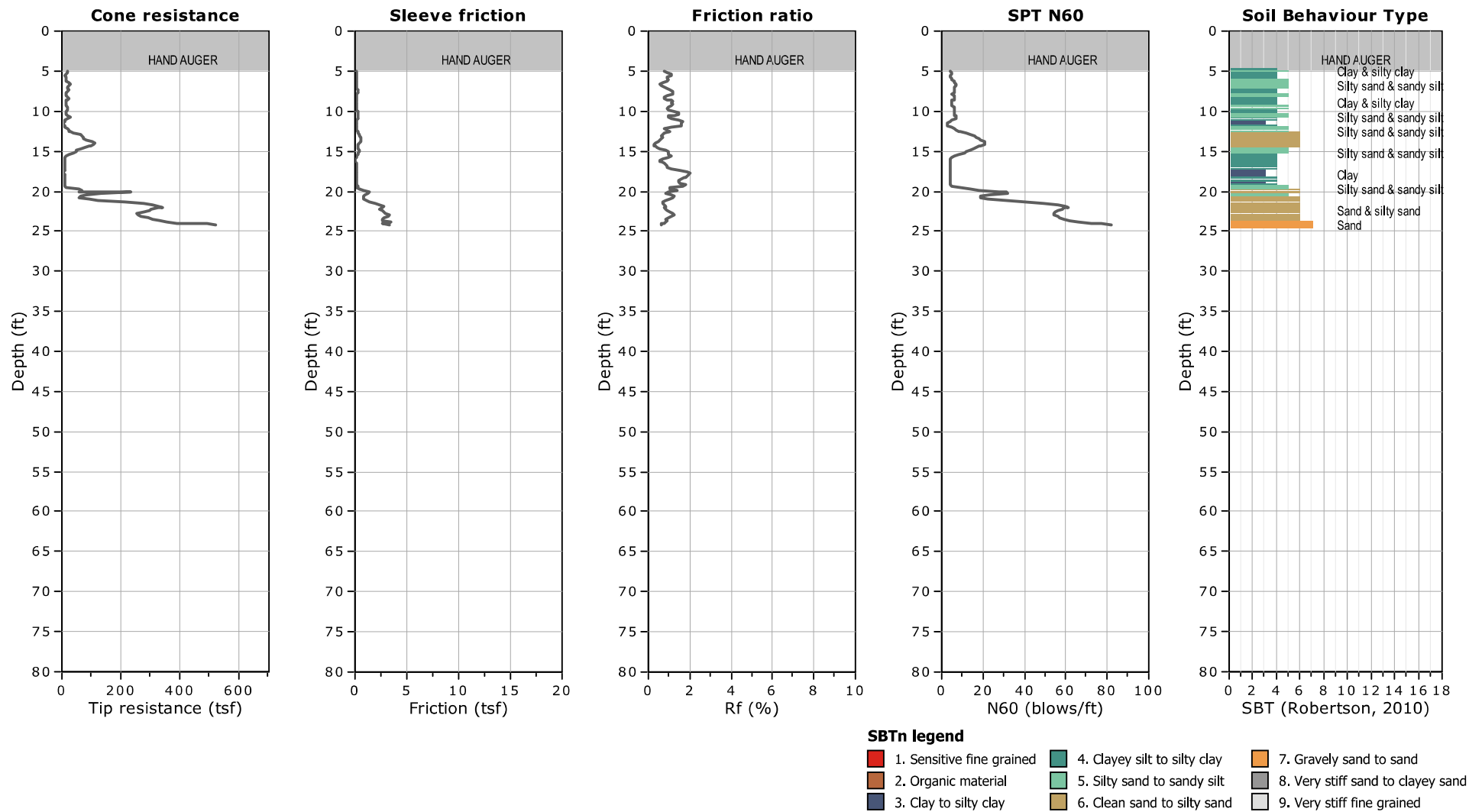
CPT: CPT-2A

CLIENT: LANGAN

SITE: 1051 MISSION ROAD, SOUTH SAN FRANCISCO, CA

Field Rep: BRANDON SANDERS

Total depth: 24.28 ft, Date: 12/18/2018





GREGG DRILLING, INC.
www.greggdrilling.com

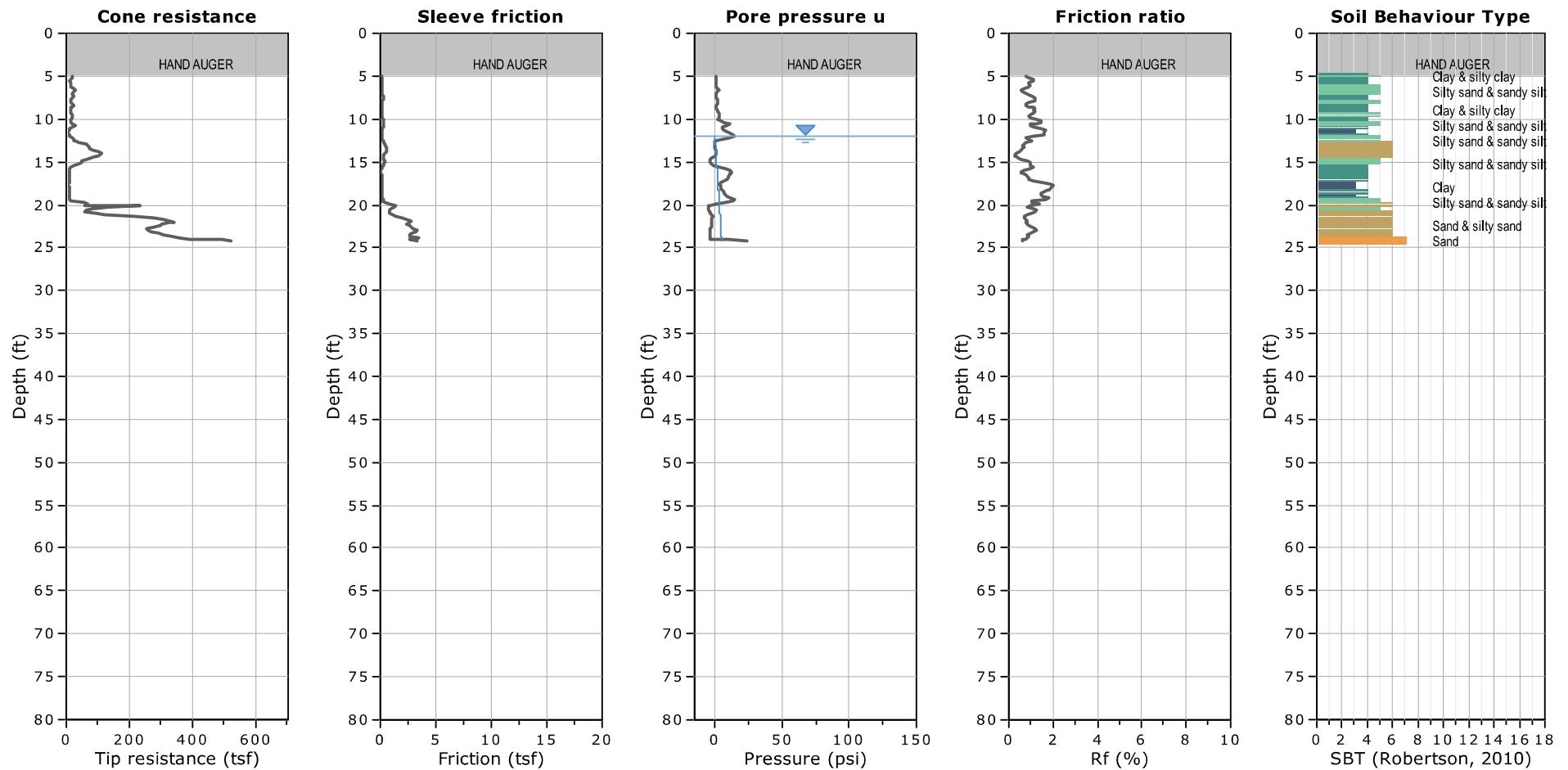
CPT: CPT-2A

CLIENT: LANGAN

SITE: 1051 MISSION ROAD, SOUTH SAN FRANCISCO, CA

Field Rep: BRANDON SANDERS

Total depth: 24.28 ft, Date: 12/18/2018



SBTn legend

- | | | |
|---------------------------|------------------------------|-----------------------------------|
| 1. Sensitive fine grained | 4. Clayey silt to silty clay | 7. Gravely sand to sand |
| 2. Organic material | 5. Silty sand to sandy silt | 8. Very stiff sand to clayey sand |
| 3. Clay to silty clay | 6. Clean sand to silty sand | 9. Very stiff fine grained |

WATER TABLE FOR ESTIMATING PURPOSES ONLY



GREGG DRILLING, INC.
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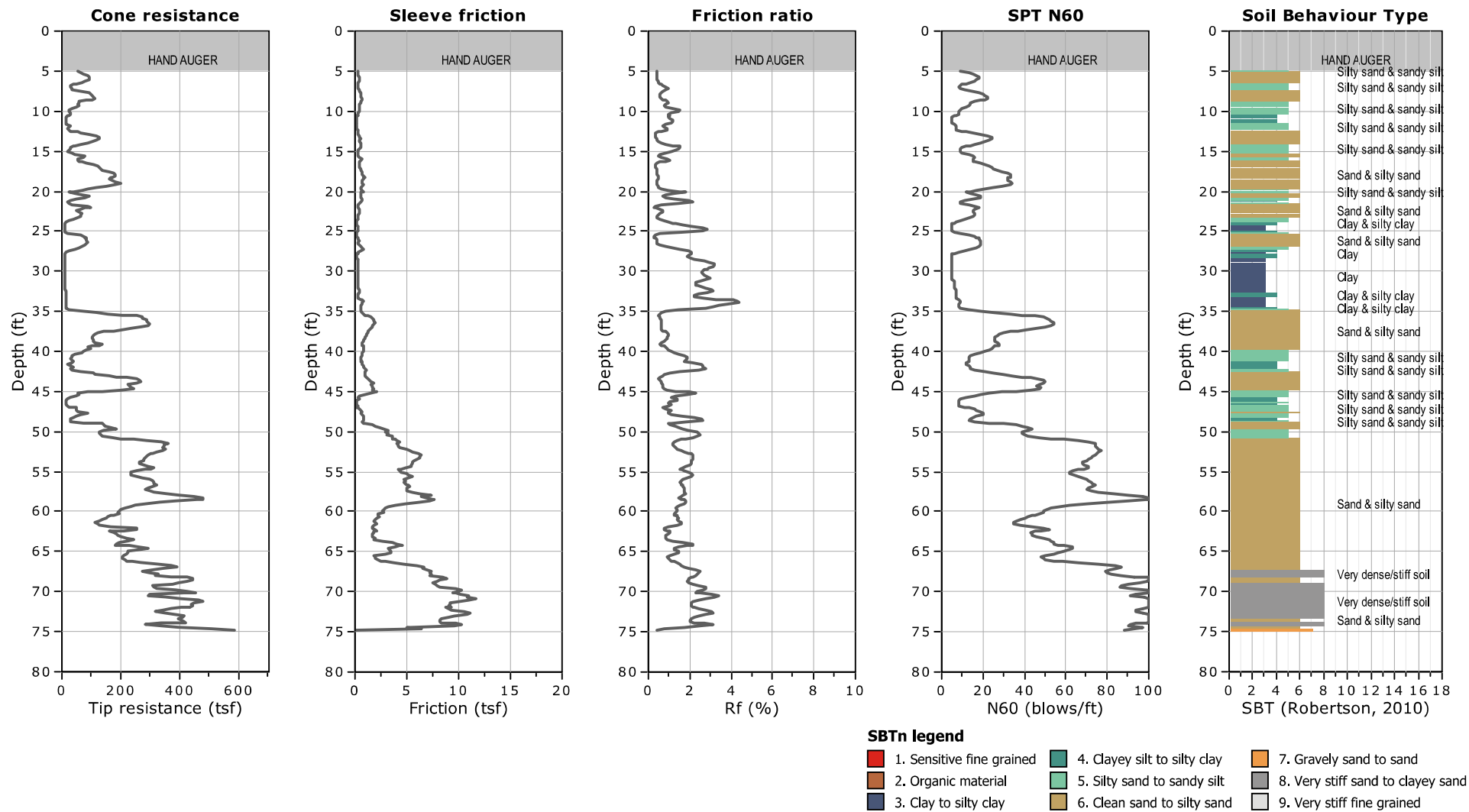
CPT: CPT-3

CLIENT: LANGAN

SITE: 1051 MISSION ROAD, SOUTH SAN FRANCISCO, CA

Field Rep: BRANDON SANDERS

Total depth: 74.80 ft, Date: 12/18/2018





GREGG DRILLING, INC.
www.greggdrilling.com

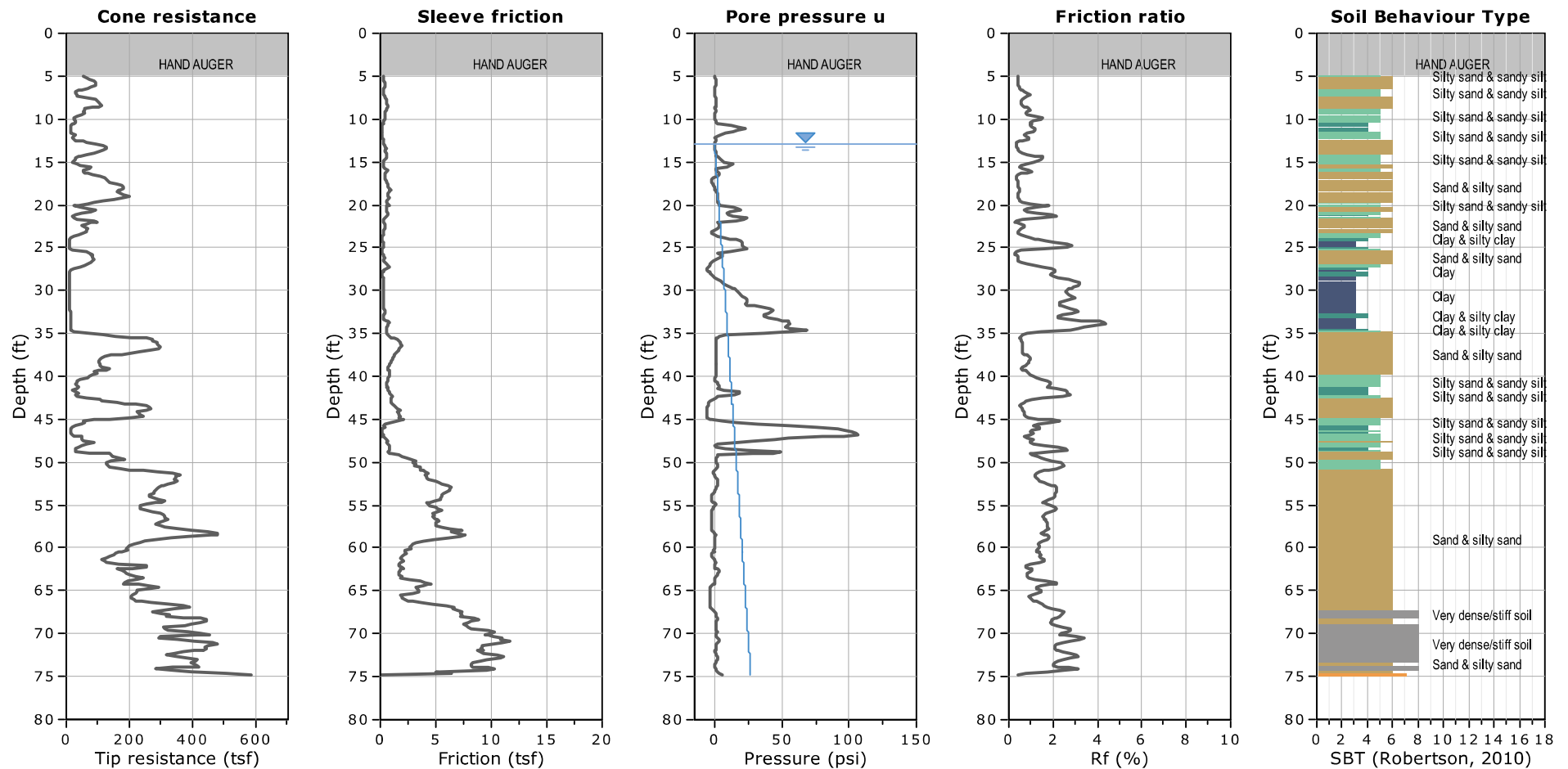
CPT: CPT-3

CLIENT: LANGAN

SITE: 1051 MISSION ROAD, SOUTH SAN FRANCISCO, CA

Field Rep: BRANDON SANDERS

Total depth: 74.80 ft, Date: 12/18/2018



SBTn legend

- | | | |
|---------------------------|------------------------------|-----------------------------------|
| 1. Sensitive fine grained | 4. Clayey silt to silty clay | 7. Gravely sand to sand |
| 2. Organic material | 5. Silty sand to sandy silt | 8. Very stiff sand to clayey sand |
| 3. Clay to silty clay | 6. Clean sand to silty sand | 9. Very stiff fine grained |

WATER TABLE FOR ESTIMATING PURPOSES ONLY



GREGG DRILLING, INC.
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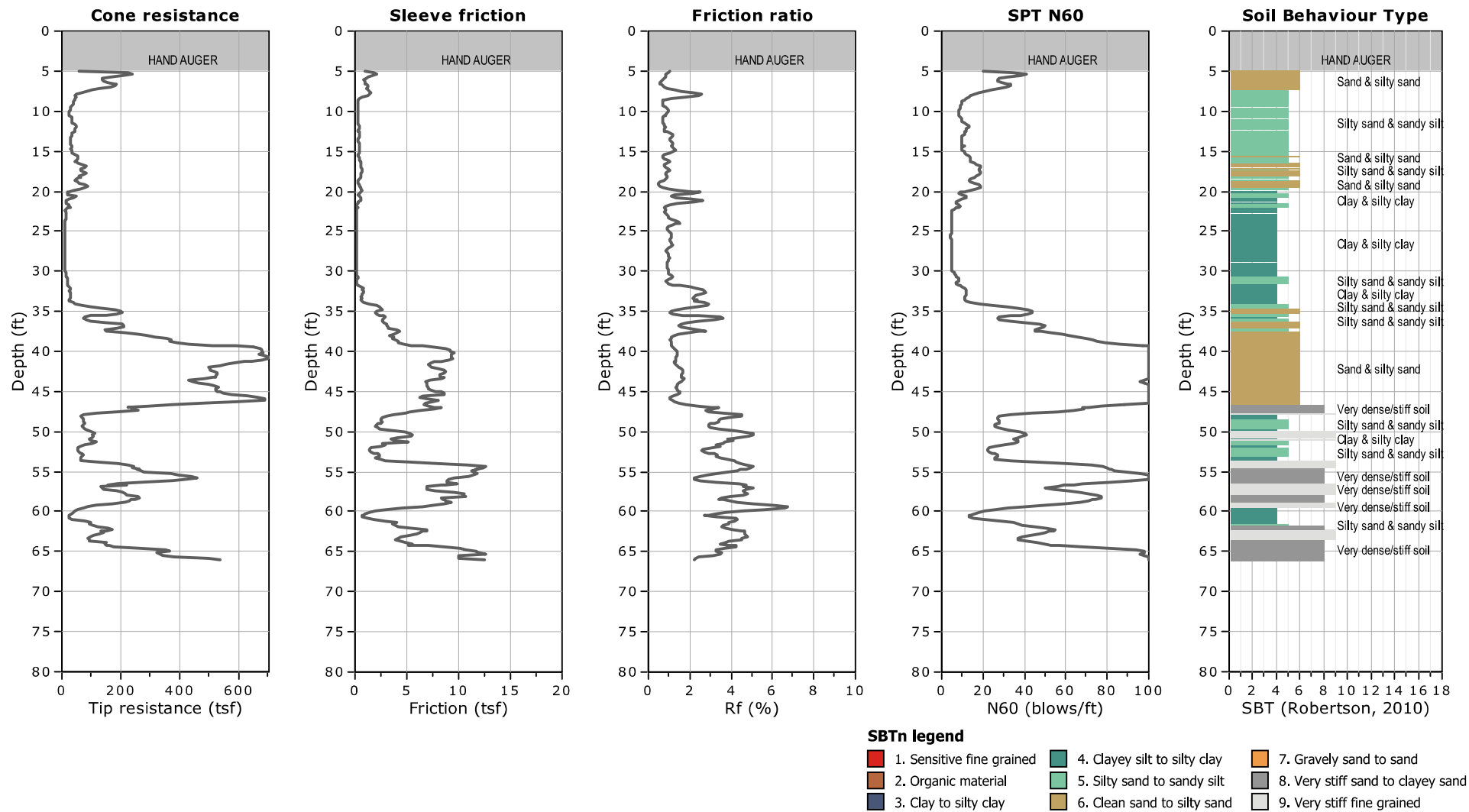
CPT: CPT-4

CLIENT: LANGAN

SITE: 1051 MISSION ROAD, SOUTH SAN FRANCISCO, CA

Field Rep: BRANDON SANDERS

Total depth: 65.94 ft, Date: 12/18/2018





GREGG DRILLING, INC.
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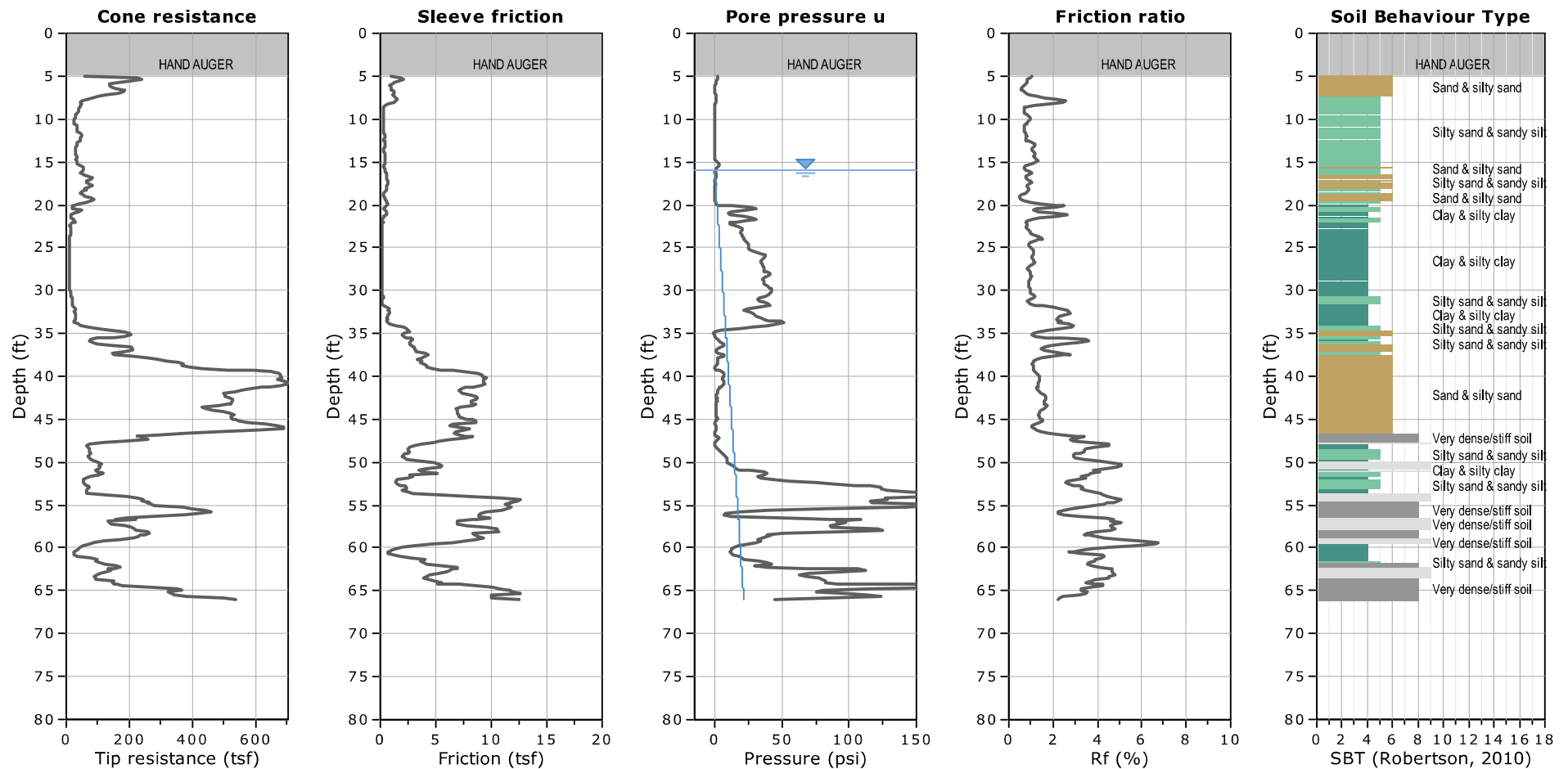
CPT: CPT-4

CLIENT: LANGAN

SITE: 1051 MISSION ROAD, SOUTH SAN FRANCISCO, CA

Field Rep: BRANDON SANDERS

Total depth: 65.94 ft, Date: 12/18/2018



SBTn legend

- | | | |
|---------------------------|------------------------------|-----------------------------------|
| 1. Sensitive fine grained | 4. Clayey silt to silty clay | 7. Gravely sand to sand |
| 2. Organic material | 5. Silty sand to sandy silt | 8. Very stiff sand to clayey sand |
| 3. Clay to silty clay | 6. Clean sand to silty sand | 9. Very stiff fine grained |

WATER TABLE FOR ESTIMATING PURPOSES ONLY



GREGG DRILLING, INC.
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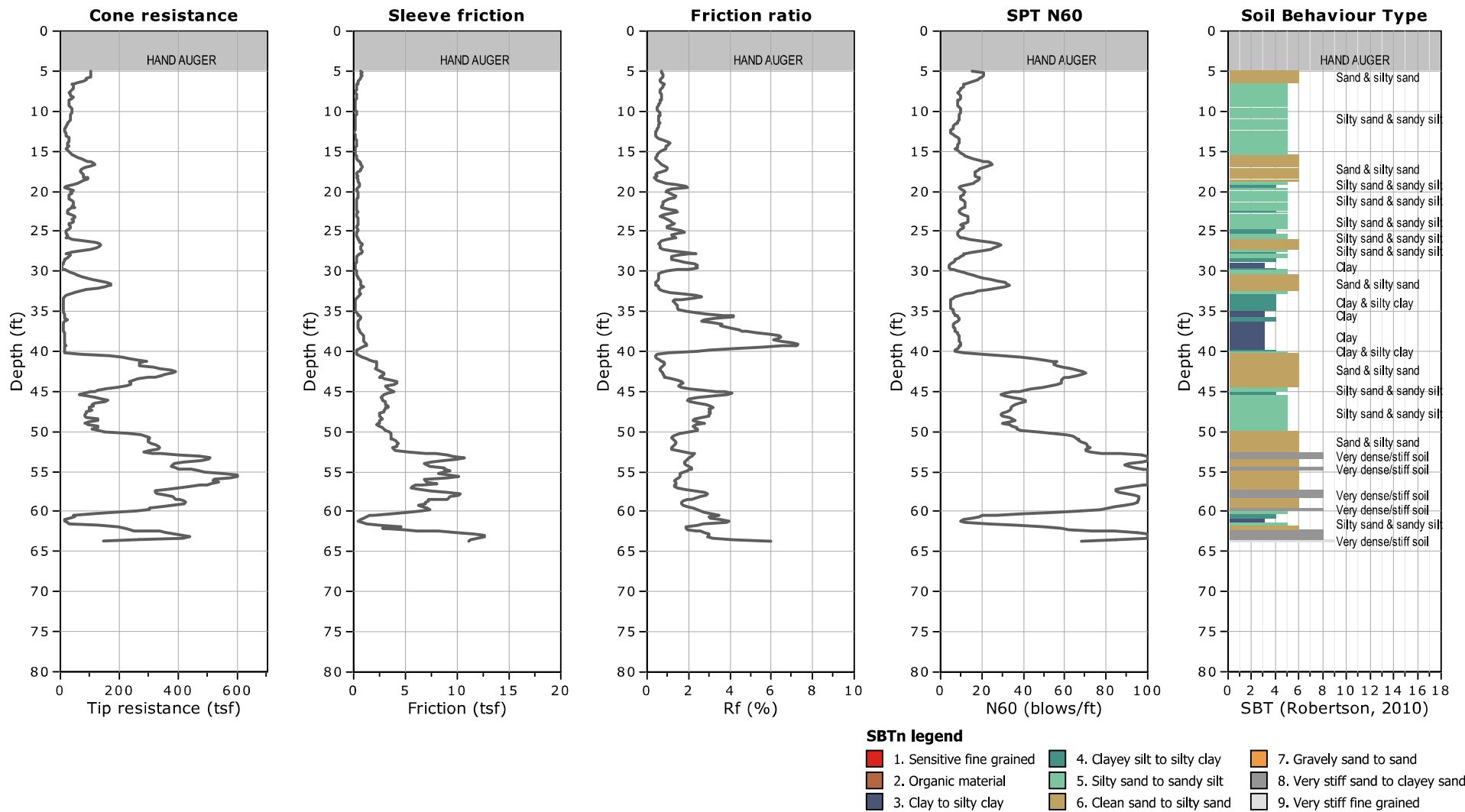
CPT: CPT-5

CLIENT: LANGAN

SITE: 1051 MISSION ROAD, SOUTH SAN FRANCISCO, CA

Field Rep: BRANDON SANDERS

Total depth: 63.65 ft, Date: 12/18/2018





GREGG DRILLING, INC.
www.greggdrilling.com

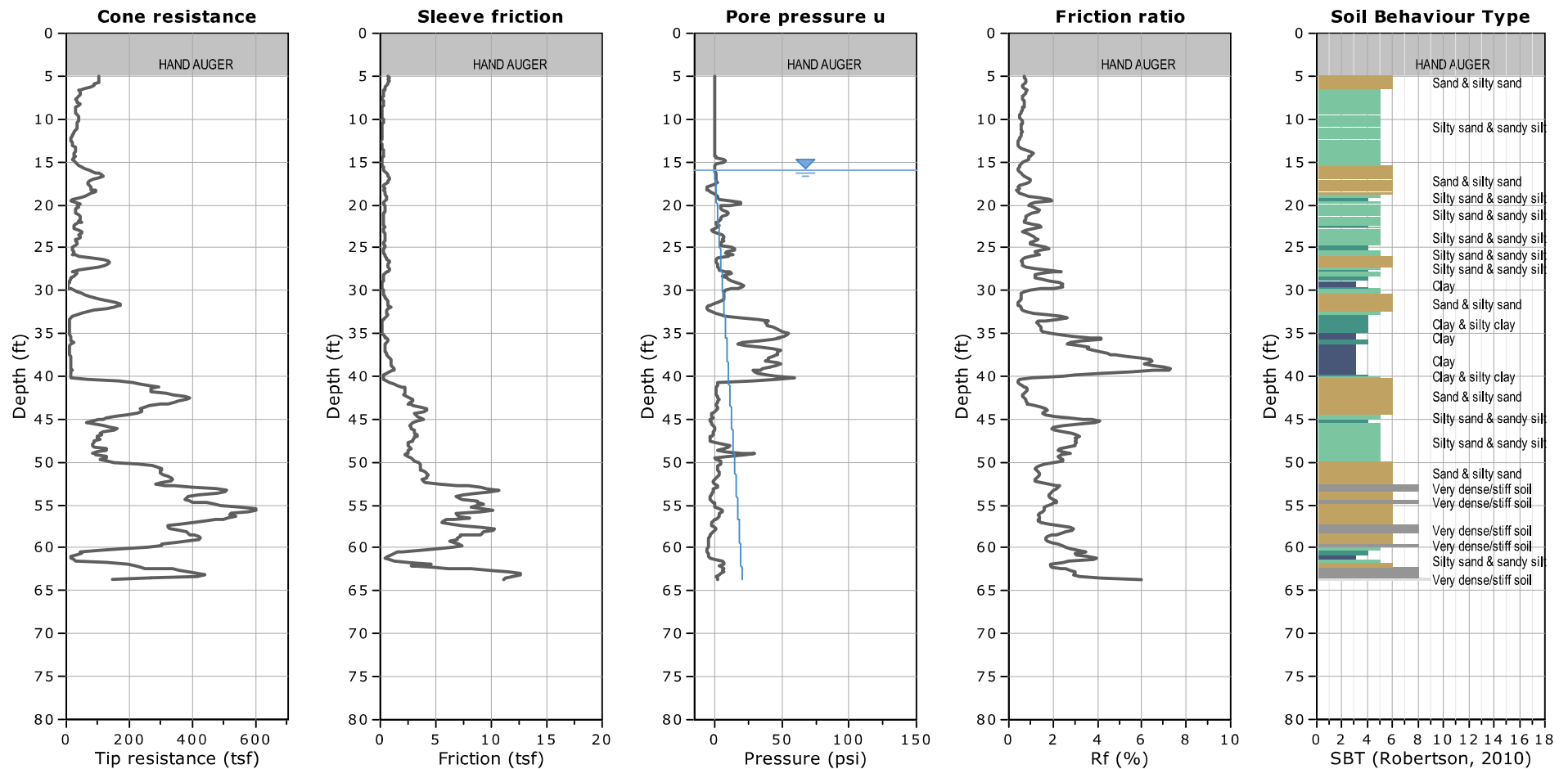
CPT: CPT-5

CLIENT: LANGAN

SITE: 1051 MISSION ROAD, SOUTH SAN FRANCISCO, CA

Field Rep: BRANDON SANDERS

Total depth: 63.65 ft, Date: 12/18/2018



SBTn legend

- | | | |
|---------------------------|------------------------------|-----------------------------------|
| 1. Sensitive fine grained | 4. Clayey silt to silty clay | 7. Gravely sand to sand |
| 2. Organic material | 5. Silty sand to sandy silt | 8. Very stiff sand to clayey sand |
| 3. Clay to silty clay | 6. Clean sand to silty sand | 9. Very stiff fine grained |

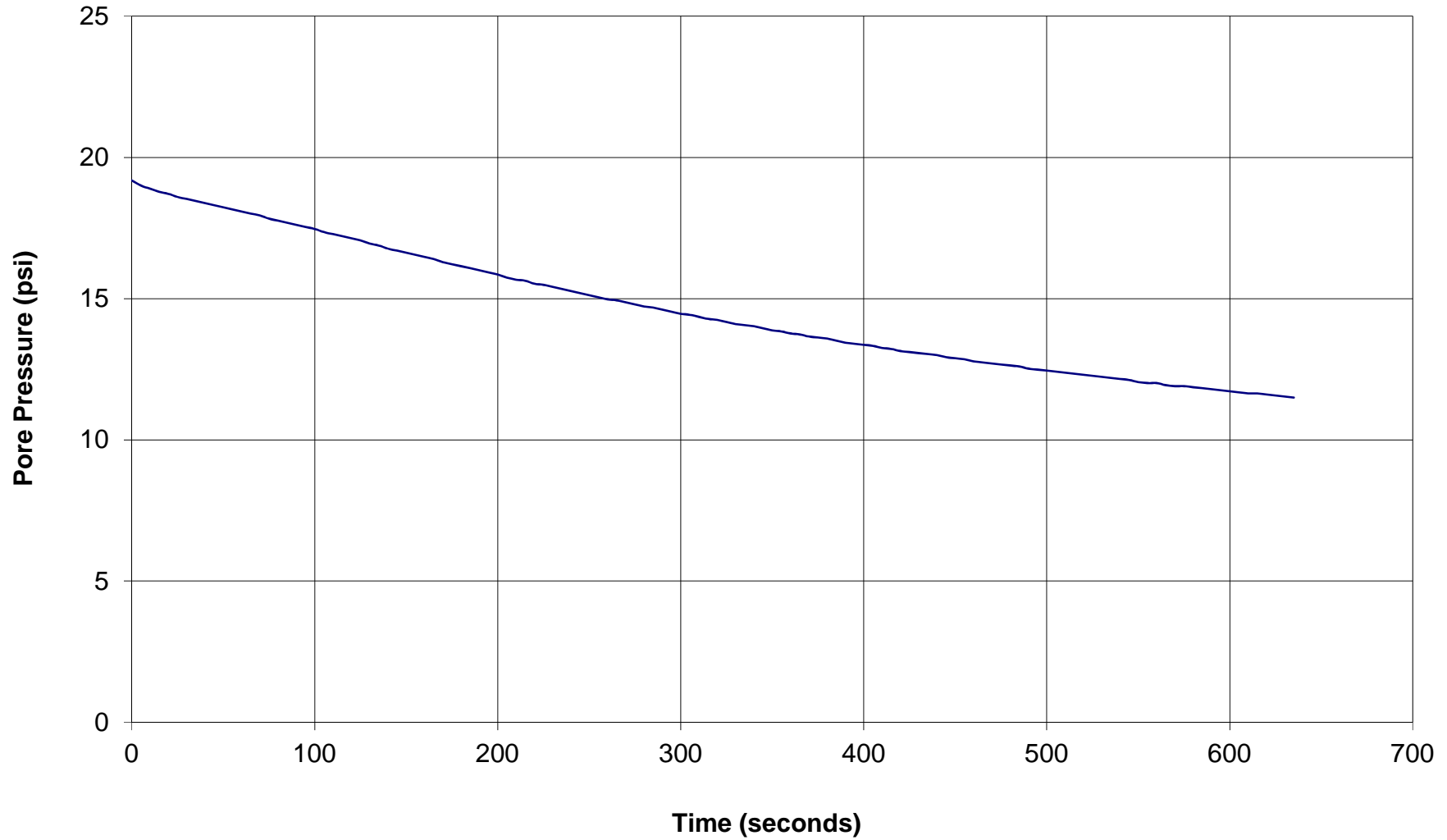
WATER TABLE FOR ESTIMATING PURPOSES ONLY



GREGG DRILLING & TESTING

Pore Pressure Dissipation Test

Sounding: CPT-1
Depth: 40.5182505
Site: 1051 Mission Road
Engineer: Brandon Sanders

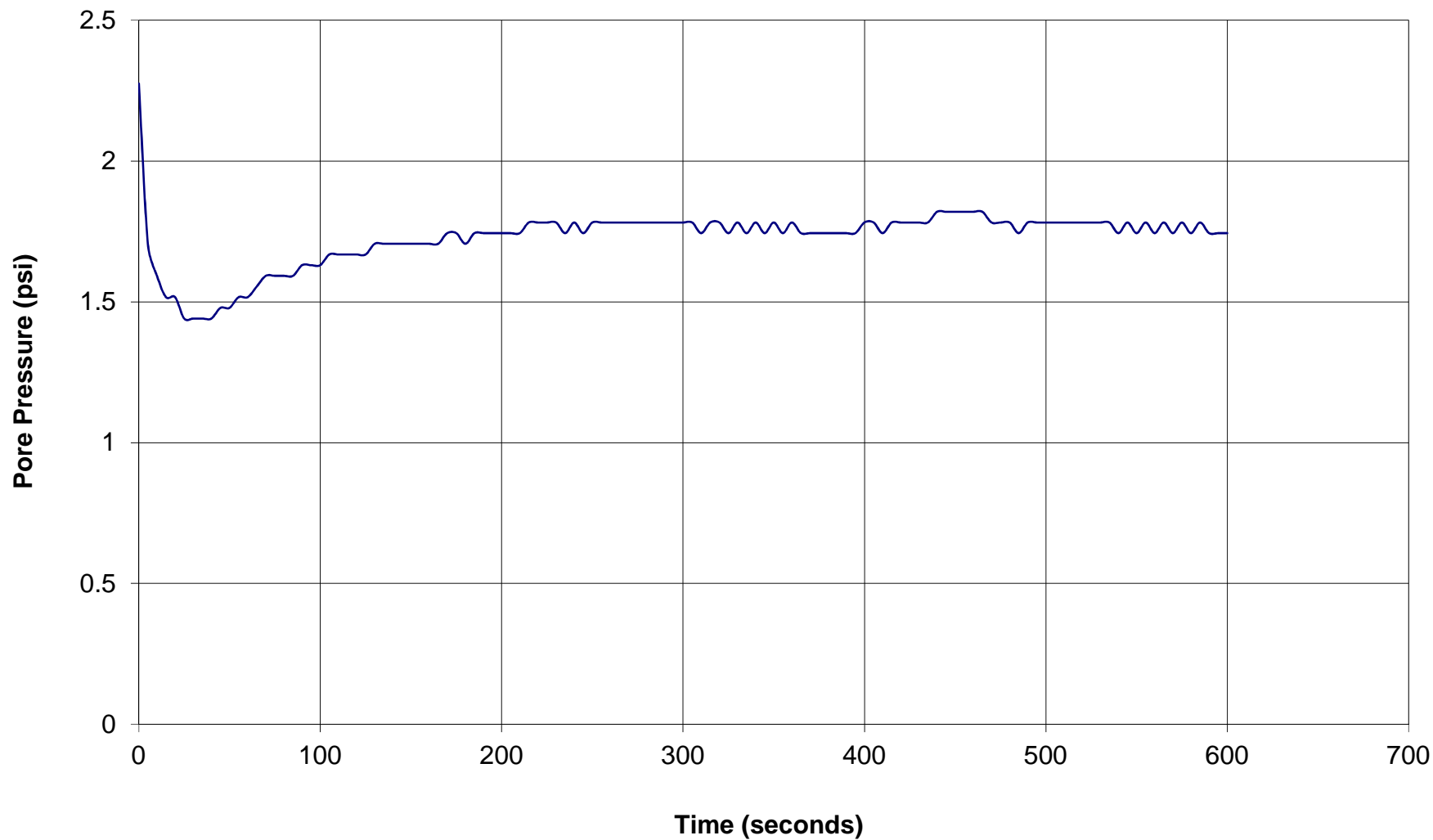




GREGG DRILLING & TESTING

Pore Pressure Dissipation Test

Sounding: CPT-2A
Depth: 14.107569
Site: 1051 Mission Road
Engineer: Brandon Sanders

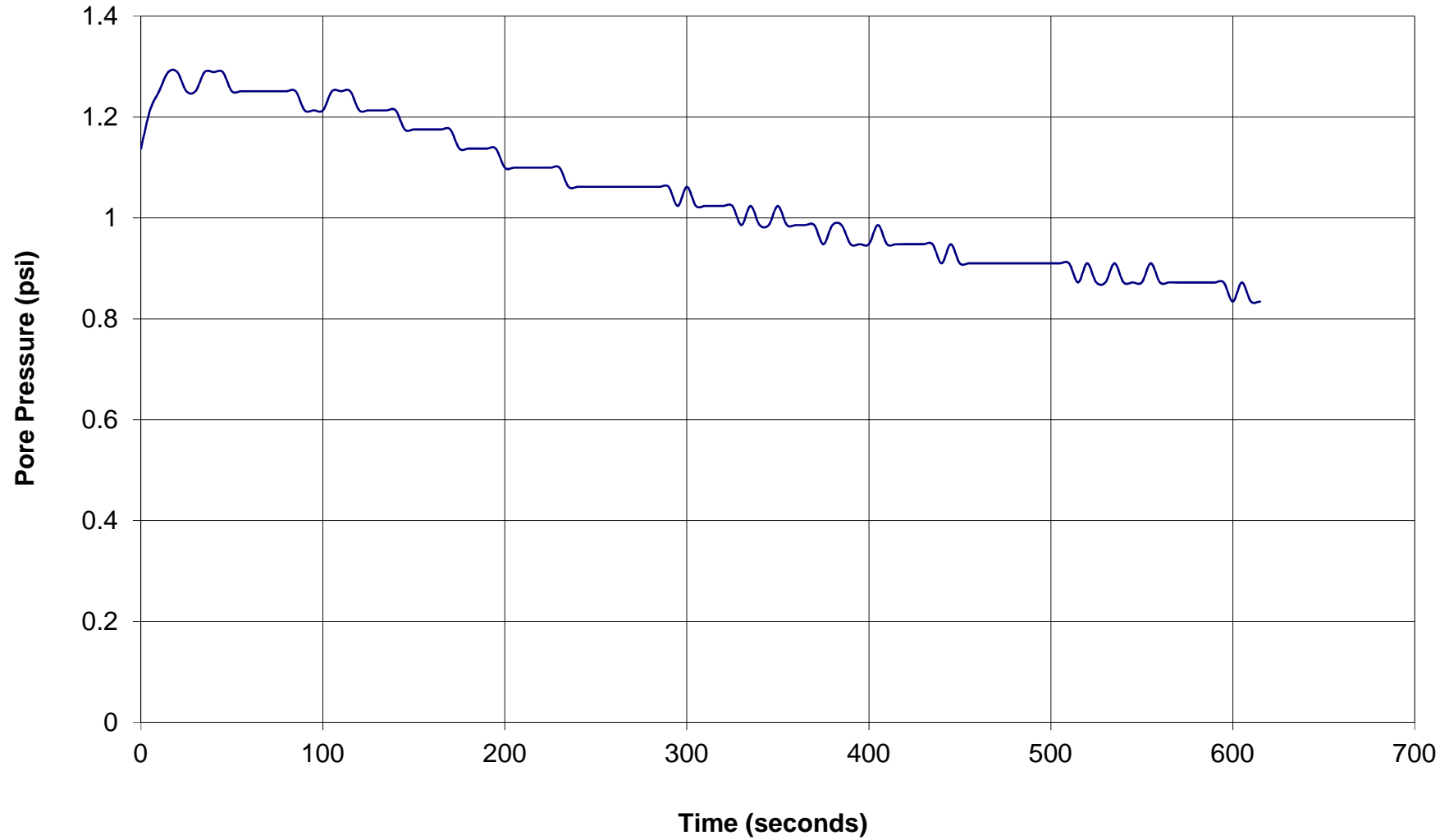




GREGG DRILLING & TESTING

Pore Pressure Dissipation Test

Sounding: CPT-3
Depth: 13.6154445
Site: 1051 Mission Road
Engineer: Brandon Sanders

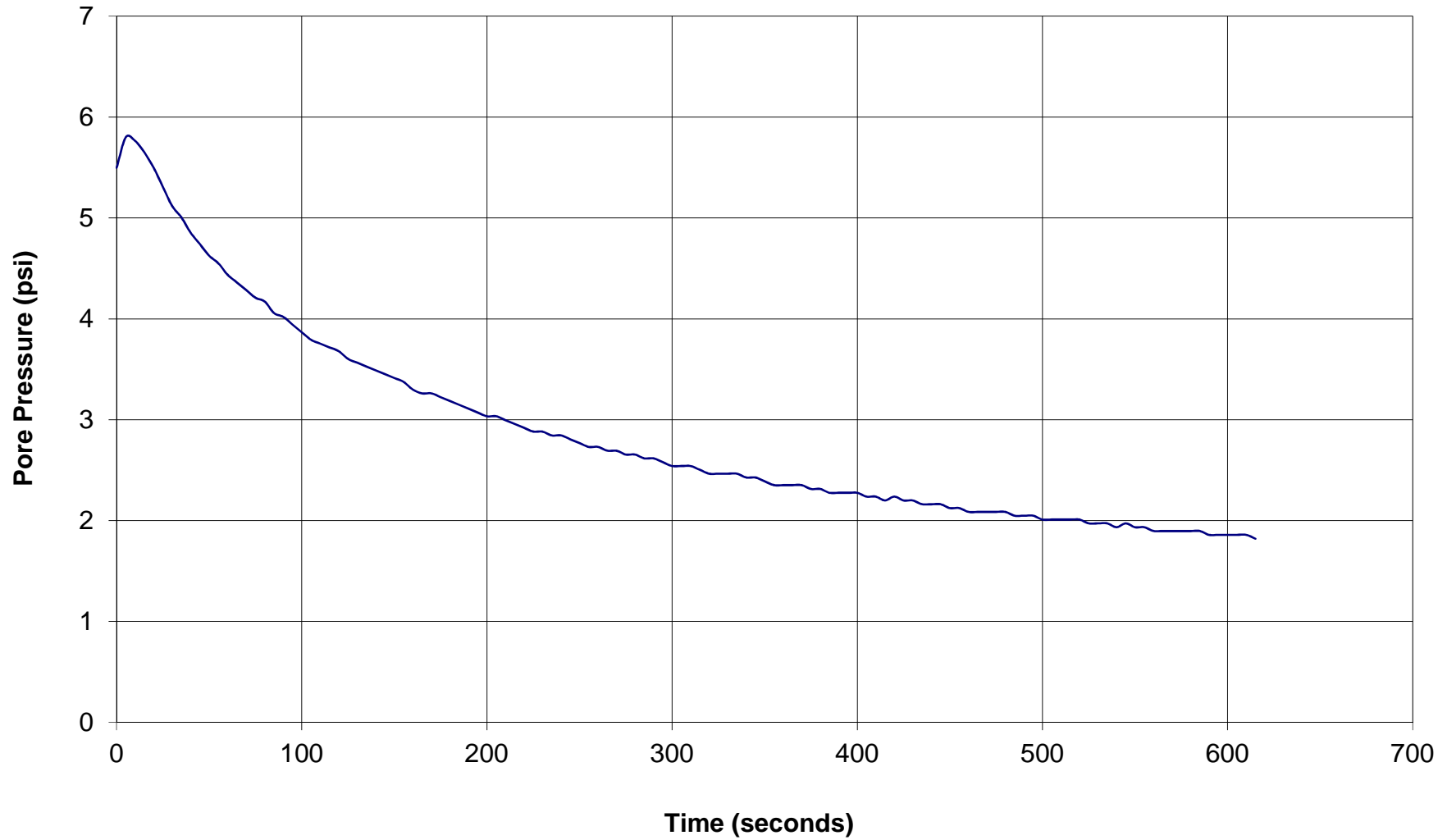




GREGG DRILLING & TESTING

Pore Pressure Dissipation Test

Sounding: CPT-4
Depth: 35.104881
Site: 1051 Mission Road
Engineer: Brandon Sanders

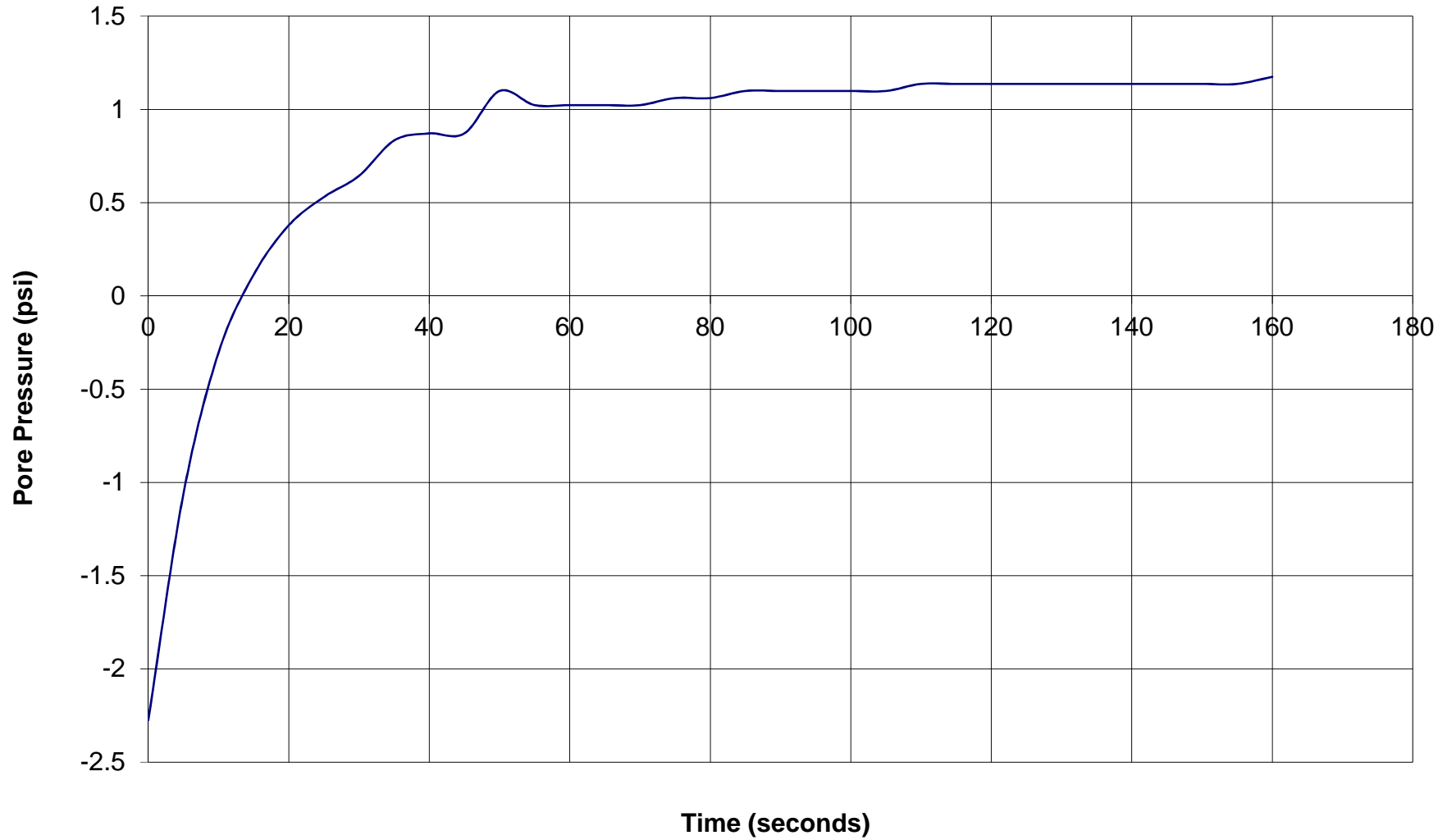




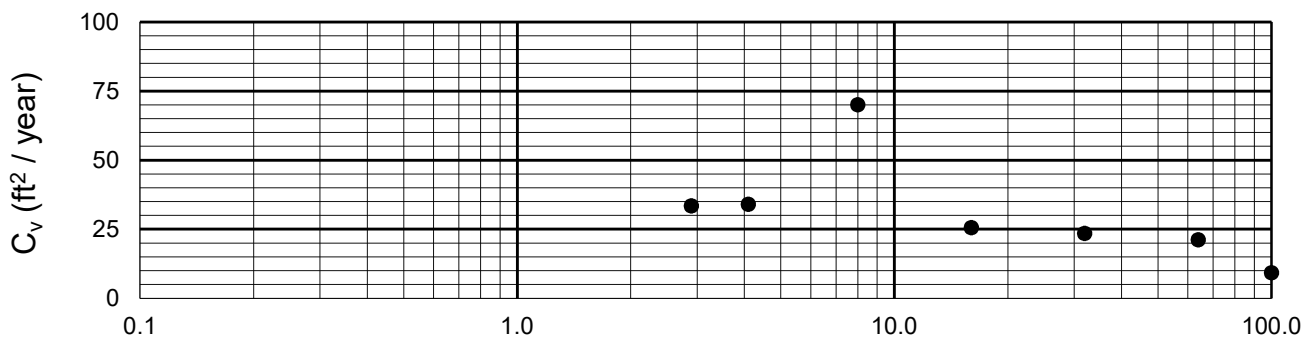
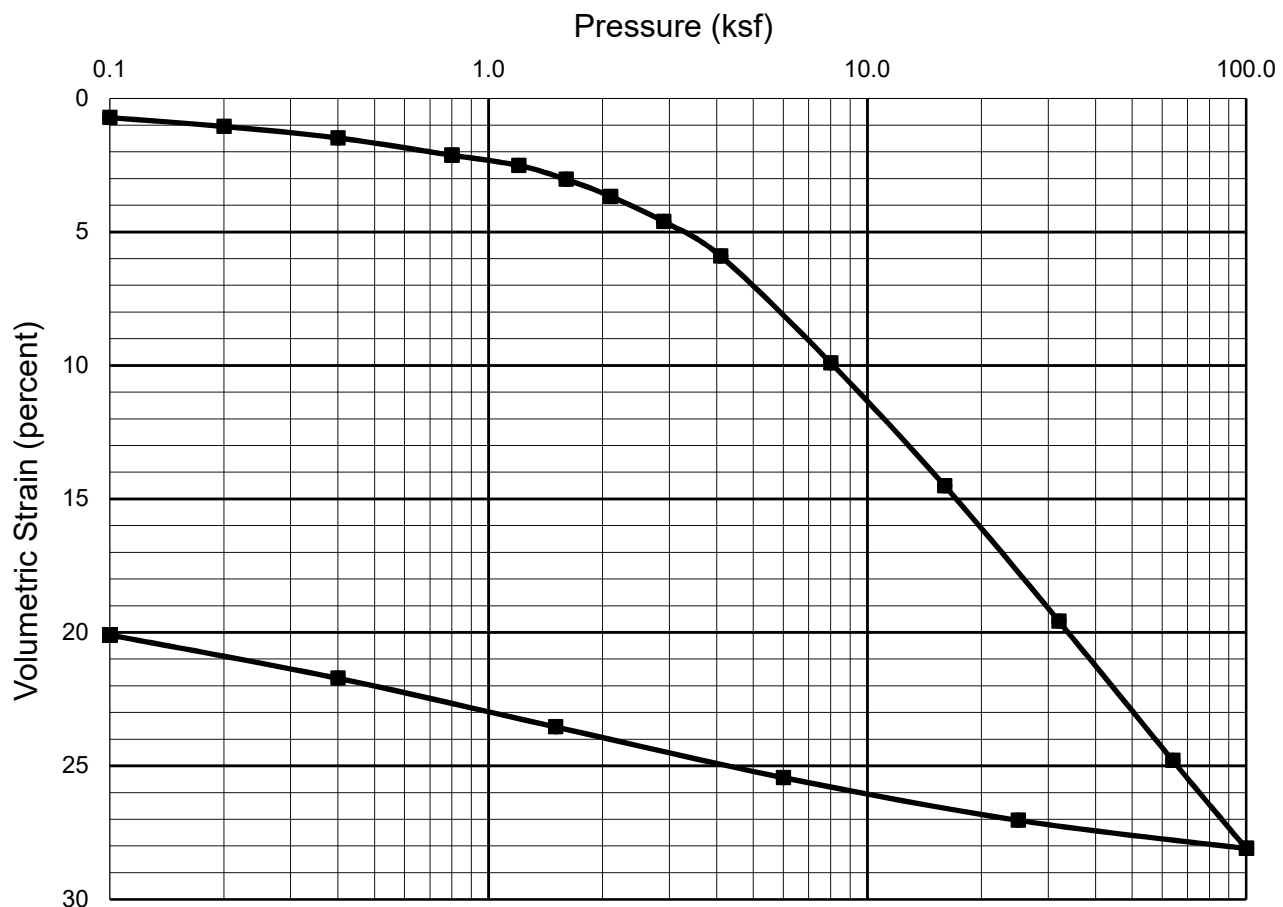
GREGG DRILLING & TESTING

Pore Pressure Dissipation Test

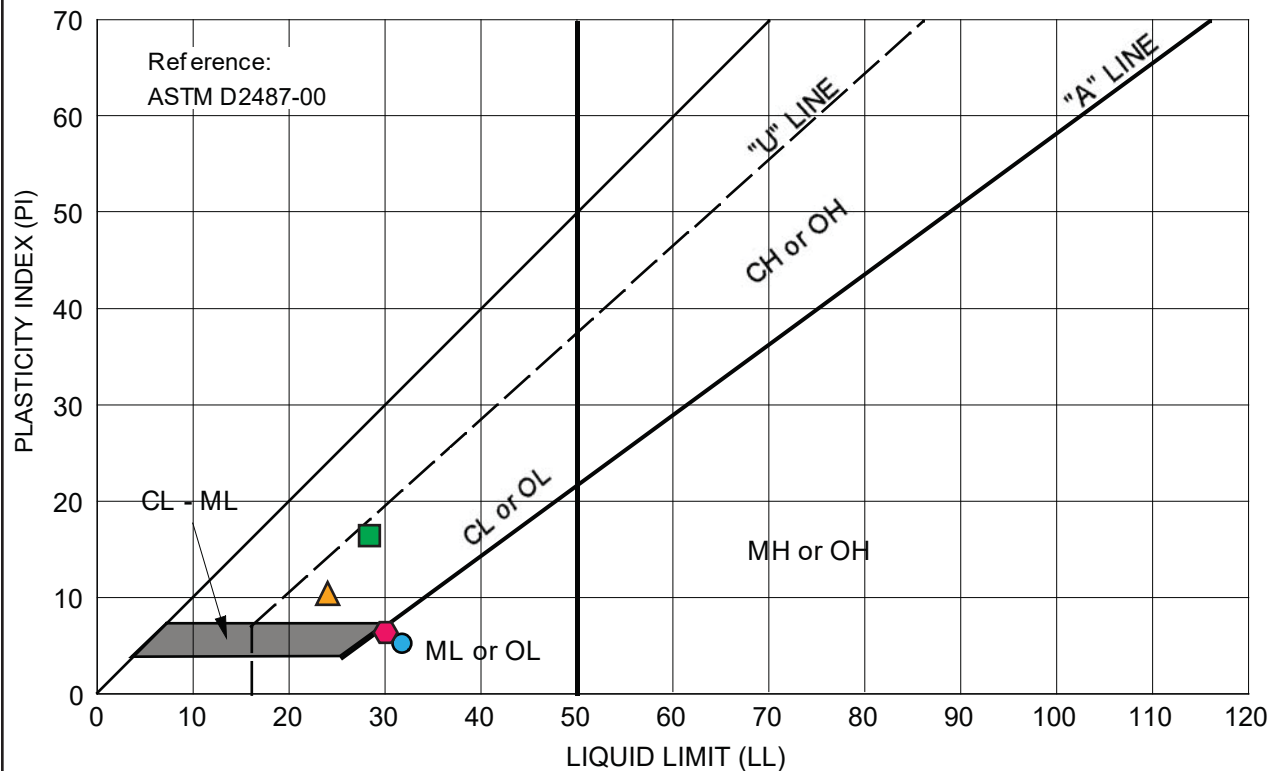
Sounding: CPT-5
Depth: 18.5366895
Site: 1051 Mission Road
Engineer: Brandon Sanders



APPENDIX C
LABORATORY DATA



Sampler Type:			Sprague & Henwood		Condition		Before Test			After Test			
Diameter (in)		2.42	Height (in)		1.00	Water Content		w _o	40.0 %		w _f	27.6 %	
Overburden Pressure, p _o			2,500		psf	Void Ratio		e _o	1.18		e _f	0.74	
Preconsol. Pressure, p _c			3,500		psf	Saturation		S _o	91 %		S _f	100 %	
Compression Ratio, C _{cc}			0.18			Dry Density		γ _d	77 pcf		γ _d	97 pcf	
LL		--	PL --			PI --			G _s	2.70		(assumed)	
Classification SILTY CLAY (CL), gray to black						Source B-2 at 24.5 feet							
SSF TRANSIT-ORIENTED DEVELOPMENT 1051 MISSION ROAD South San Francisco, California						CONSOLIDATION TEST REPORT							
LANGAN													
Date		01/30/19		Project No.		750652601		Figure		C-1			



NP = Non Plastic

Symbol	Source	Description and Classification	Natural M.C. (%)	Liquid Limit (%)	Plasticity Index (%)	% Passing #200 Sieve
	B-1 at 13 feet	SILTY SAND (SM), gray to black	28.6	32	5	36.1
	B-1 at 19.5 feet	SILTY CLAY (CL), gray-black	19.1	24	10	--
	B-1 at 39.5 feet	CLAYEY SAND (SC), yellow-brown with gray-brown mottling	17.2	28	16	43.4
	B-2 at 13 feet	SANDY SILT (ML), dark brown with red-brown mottling	--	30	6	76.6

SSF TRANSIT-ORIENTED DEVELOPMENT
1051 MISSION ROAD
 South San Francisco, California

LANGAN

PLASTICITY CHART

Date 02/04/19 Project No. 750652601 Figure C-2

APPENDIX D
CORROSIVITY ANALYSIS WITH BRIEF EVALUATION



1100 Willow Pass Court, Suite A
Concord, CA 94520-1006

925 462 2771 Fax. 925 462 2775

www.cercoanalytical.com

8 January, 2019

Job No. 1812204
Cust. No. 10727

Mr. Abraham Eng
Langan
555 Montgomery Street, Suite 1300
San Francisco, CA 94111

Subject: Project No.: 750652601.700.001.00
Project Name: 1051 Mission Road
Corrosivity Analysis – ASTM Methods

Dear Mr. Eng:

Pursuant to your request, CERCO Analytical has analyzed the soil sample submitted on December 26, 2018. Based on the analytical results, this brief corrosivity evaluation is enclosed for your consideration.

Based upon the resistivity measurement, this sample is classified as “moderately corrosive”. All buried iron, steel, cast iron, ductile iron, galvanized steel and dielectric coated steel or iron should be properly protected against corrosion depending upon the critical nature of the structure. All buried metallic pressure piping such as ductile iron firewater pipelines should be protected against corrosion.

The chloride ion concentration reflects none detected with a reporting limit of 15 mg/kg.

The sulfate ion concentration is 55 mg/kg and is determined to be insufficient to damage reinforced concrete structures and cement mortar-coated steel at this location.


The pH of the soil is 8.33, which does not present corrosion problems for buried iron, steel, mortar-coated steel and reinforced concrete structures.

The redox potential is 350-mV and is indicative of potentially “slightly corrosive” soils resulting from anaerobic soil conditions.

This corrosivity evaluation is based on general corrosion engineering standards and is non-specific in nature. For specific long-term corrosion control design recommendations or consultation, please call *JDH Corrosion Consultants, Inc.* at (925) 927-6630.

We appreciate the opportunity of working with you on this project. If you have any questions, or if you require further information, please do not hesitate to contact us.

Very truly yours,
CERCO ANALYTICAL, INC.


J. Darby Howard, Jr., P.E.
President

JDH/jdl
Enclosure

Date of Report: 8-Jan-2019

Method:	ASTM D1498	ASTM D4972	ASTM D1125M	ASTM G57	ASTM D4658M	ASTM D4327	ASTM D4327
Reporting Limit:	-	-	10	-	50	15	15
Date Analyzed:	7-Jan-2019	7-Jan-2019	-	3-Jan-2019	-	7-Jan-2019	7-Jan-2019

Date Analyzed: _____

Cheryl McMillen

Cheryl McMillen

10727

12521

LANGAN

CHAIN OF CUSTODY RECORD

<input checked="" type="checkbox"/>	555 Montgomery Street, Suite 1300, San Francisco, CA 94111
<input type="checkbox"/>	501 14th Street, Third Floor, Oakland, CA 94612
<input type="checkbox"/>	3320 Data Drive, Suite 350, Rancho Cordova, CA 95670-7982
<input type="checkbox"/>	1 Almaden Boulevard, Suite 590, San Jose, CA 95113

Site Name: 1051 Mission Road

Job Number: 750652601 -700-001.0

Project Manager/Contact: Abraham Eng / aeng@caracal.com

Samplers: Brandon Sanders

Recorder (Signature Required): Alvin S.

Turnaround

Time

075

[illegible]

White Copy - Original

Yellow Copy - Laboratory

Pink Copy - Field

COC Number:

APPENDIX E
SUMMARY TABLES OF ANALYTICAL RESULTS

Table 1
Soil Analytical Results for Non-Metals
1051 Mission Road
South San Francisco, California

Sample ID	Date Sampled	Depth of Sample (feet)	TPHg	TPHd	TPHmo	VOCs			OCPs	PCBs	Asbestos
						1,2,4-Trimethylbenzene	1,3,5-Trimethylbenzene	All other VOCS			
Units			(mg/kg)								
B1-E1-2.5	12/18/2018	2.5	< 1.0	< 1.0	< 5.0	< 0.005	< 0.005	ND	ND	ND	—
B1-E2-7.5	12/18/2018	8	< 1.0	< 1.0	< 5.0	—	—	—	—	ND	—
B1-E3-10	12/18/2018	10	< 1.0	< 1.0	< 5.0	< 0.005	< 0.005	ND	—	—	ND
B1-E4-12.5	12/18/2018	12.5	< 1.0	< 1.0	< 5.0	—	—	—	—	—	—
B2-E1-2.5	12/18/2018	3	34	240	810	0.027	0.013	ND	ND	ND	—
B2-E2-5	12/18/2018	5	4.9	10	21	—	—	—	—	ND	—
B2-E3-7.5	12/18/2018	7.5	2.8	3.5	7.7	< 0.005	< 0.005	ND	—	—	ND
B2-E4-10	12/18/2018	10	< 1.0	6.5	9.5	—	—	—	—	—	—
Residential ESLs			430	260	12,000	NE	NE	Various	Various	Various	Various
Commercial/Industrial ESLs			2,000	1,200	180,000	NE	NE	Various	Various	Various	Various

Notes:

TPHg - total petroleum hydrocarbons as gasoline

TPHd - total petroleum hydrocarbons as diesel

TPHmo - total petroleum hydrocarbons as motor oil

VOC - Volatile Organic Compounds

mg/kg - milligrams per kilogram

— Not analyzed or criteria not established

< 1.0 - Analyte was not detected above the laboratory reporting limit (1.0mg/kg)

1- Acetone detected at a concentration of 0.21 mg/kg

Residential ESL - Bay Area Regional Water Quality Control Board (RWQCB) Residential Direct Exposure Human Health Risk Levels (HHRLs) for Soil (Table S-1) (Interim Final January 2019)

Commercial/Industrial ESL - RWQCB Commercial/Industrial Direct Exposure (HHRLs) for Soil (Table S-1) (Interim Final January 2019)

NE - Not Established

Table 2
Soil Analytical Results for Semi-Volatile Organic Compounds
1051 Mission Road
South San Francisco, California

Sample ID	Date Sampled	Depth of Sample	SVOCs										
			Benzo (a) anthracene	Benzo (a) pyrene	Benzo (b) fluoranthene	Benzo (g,h,i) perylene	Benzo (k) fluoranthene	Chrysene	Di-n-butyl Phthalate	Fluoranthene	Indeno (1,2,3-cd) pyrene	Pyrene	All Other SVOCs
Units		(feet)	(mg/kg)										
B1-E1-2.5	12/18/2018	2.5	< 0.0050	< 0.0025	< 0.0013	< 0.0025	< 0.0013	< 0.0025	< 0.0025	< 0.0013	< 0.0025	< 0.0025	ND
B1-E2-7.5	12/18/2018	8	—	—	—	—	—	—	—	—	—	—	
B1-E3-10	12/18/2018	10	< 0.0050	< 0.0025	< 0.0013	< 0.0025	< 0.0013	< 0.0025	0.0034	0.0017	< 0.0025	< 0.0025	ND
B1-E4-12.5	12/18/2018	12.5	—	—	—	—	—	—	—	—	—	—	
B2-E1-2.5	12/18/2018	3	0.083	0.041	0.030	0.076	0.017	0.034	0.030	0.058	0.033	0.058	ND
B2-E2-5	12/18/2018	5	—	—	—	—	—	—	—	—	—	—	
B2-E3-7.5	12/18/2018	7.5	< 0.0050	< 0.0025	< 0.0013	< 0.0025	< 0.0013	< 0.0025	0.0026	< 0.0013	< 0.0025	< 0.0025	ND
B2-E4-10	12/18/2018	10	—	—	—	—	—	—	—	—	—	—	
Residential ESLs			1.1	0.11	1.1	NE	11	110	NE	2,400	1.1	1,800	Various
Commercial/Industrial ESLs			20	2.1	21	NE	210	2,100	NE	30,000	21	23,000	Various

Notes:

SVOC - Semi-Volatile Organic Compounds

mg/kg - milligrams per kilogram

-- Not analyzed or criteria not established

< 0.0050 - Analyte was not detected above the laboratory reporting limit (0.0050 mg/kg)

Residential ESL - Bay Area Regional Water Quality Control Board (RWQCB) Residential Direct Exposure Human Health Risk Levels (HHRLs) for Soil (Table S-1)(Interim Final January 2019)

Commercial/Industrial ESL - RWQCB Commercial/Industrial Direct Exposure (HHRLs) for Soil (Table S-1) (Interim Final January 2019)

ND - No concentrations detected above respective laboratory detection limits

NE - Not Established

Table 3
Soil Analytical Results for Metals
1051 Mission Road
South San Francisco, California

Sample ID	Date Sampled	Depth of Sample (feet)	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	STLC Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
Units			(mg/kg)							(mg/L)		(mg/kg)								
B1-E1-2.5	12/18/2018	2.5	< 0.50	3.3	56	< 0.50	< 0.25	79	0.43	5.5	18	3.6	0.052	< 0.50	67	< 0.50	< 0.50	< 0.50	47	23
B1-E2-7.5	12/18/2018	7.5	< 0.50	4.6	73	< 0.50	< 0.25	50	0.31	6.3	11	9.5	0.056	0.52	40	< 0.50	< 0.50	< 0.50	37	39
B1-E3-10	12/18/2018	10.0	< 0.50	3.4	66	< 0.50	< 0.25	43	—	5.6	8.5	5.3	< 0.050	< 0.50	35	< 0.50	< 0.50	< 0.50	32	29
B1-E4-12.5	12/18/2018	12.5	< 0.50	4.7	72	< 0.50	< 0.25	53	0.43	6.7	11	5.7	0.053	0.69	40	< 0.50	< 0.50	< 0.50	39	33
B2-E1-2.5	12/18/2018	2.5	0.89	3.7	67	< 0.50	< 0.25	49	—	9.1	19	14	0.13	< 0.50	80	< 0.50	< 0.50	< 0.50	43	41
B2-E2-5	12/18/2018	5.0	< 0.50	1.6	36	< 0.50	< 0.25	37	—	10	23	8.9	< 0.050	< 0.50	25	< 0.50	< 0.50	< 0.50	60	40
B2-E3-7.5	12/18/2018	7.5	< 0.50	1.3	22	< 0.50	< 0.25	20	—	2.1	2.9	1.8	< 0.050	< 0.50	13	< 0.50	< 0.50	< 0.50	16	18
B2-E4-10	12/18/2018	10.0	< 0.50	1.3	19	< 0.50	< 0.25	19	—	1.7	2.5	1.5	< 0.050	< 0.50	13	< 0.50	< 0.50	< 0.50	14	11
Background [Metal] in Bay Area Soils*			1.5-7.1	1.2-31	41-411	0.29-1.1	0.27-3.3	10-142	NE	6.5-25.5	5.4-100	4.8-65	0.07-0.6	0.33-11.4	16-144	< 0.25-7	0.2-2.2	< 0.25-42.5	22-90	33-282
TTLC			500	500	10,000	75	100	2,500	—	8,000	2,500	1,000	20.0	3,500	2,000	100	500	700	2,400	5,000
STLC			15	5	100	0.75	1	5	5	80	25	5	0.2	350	20	1	5	7	24	250
TCLP			—	5	100	—	1	5	—	—	—	5	0.2	—	—	1	5	—	—	—

Abbreviations:

NE - Not Established

Bold -Exceeds Hazardous Waste Criteria

Notes:

mg/kg - milligrams per kilogram

< 0.50 - Analyte was not detected above the laboratory reporting limit (0.50 mg/Kg)

— Not analyzed or criteria not established

TTLC - California Total Threshold Limit Concentration - State hazardous waste criterion

STLC - California Soluble Threshold Limit Concentration

TCLP - Federal Toxicity Characteristic Leaching Procedure

*Background concentration ranges of metals in Bay Area soils, Appendix A, Table A-2 from Environmental Resources Management. *Feasibility Study, Hookston Station, Pleasant Hill, California.* July 2006

APPENDIX F
CERTIFIED ANALYTICAL LABORATORY REPORTS AND CHAIN-OF
CUSTODY RECORD



McC Campbell Analytical, Inc.

"When Quality Counts"

Analytical Report

WorkOrder: 1812D91

Report Created for: Langan

555 Montgomery St., Suite 1300
San Francisco, CA 94111

Project Contact: Peter Cusack

Project P.O.:

Project: 750652601; 1051 Mission Road

Project Received: 12/28/2018

Analytical Report reviewed & approved for release on 01/07/2019 by:

Yen Cao

Project Manager

The report shall not be reproduced except in full, without the written approval of the laboratory. The analytical results relate only to the items tested. Results reported conform to the most current NELAP standards, where applicable, unless otherwise stated in the case narrative.





Glossary of Terms & Qualifier Definitions

Client: Langan
Project: 750652601; 1051 Mission Road
WorkOrder: 1812D91

Glossary Abbreviation

%D	Serial Dilution Percent Difference
95% Interval	95% Confident Interval
DF	Dilution Factor
DI WET	(DISTLC) Waste Extraction Test using DI water
DISS	Dissolved (direct analysis of 0.45 µm filtered and acidified water sample)
DLT	Dilution Test (Serial Dilution)
DUP	Duplicate
EDL	Estimated Detection Limit
ERS	External reference sample. Second source calibration verification.
ITEF	International Toxicity Equivalence Factor
LCS	Laboratory Control Sample
MB	Method Blank
MB % Rec	% Recovery of Surrogate in Method Blank, if applicable
MDL	Method Detection Limit
ML	Minimum Level of Quantitation
MS	Matrix Spike
MSD	Matrix Spike Duplicate
N/A	Not Applicable
ND	Not detected at or above the indicated MDL or RL
NR	Data Not Reported due to matrix interference or insufficient sample amount.
PDS	Post Digestion Spike
PDSD	Post Digestion Spike Duplicate
PF	Prep Factor
RD	Relative Difference
RL	Reporting Limit (The RL is the lowest calibration standard in a multipoint calibration.)
RPD	Relative Percent Deviation
RRT	Relative Retention Time
SPK Val	Spike Value
SPKRef Val	Spike Reference Value
SPLP	Synthetic Precipitation Leachate Procedure
ST	Sorbent Tube
TCLP	Toxicity Characteristic Leachate Procedure
TEQ	Toxicity Equivalents
TZA	TimeZone Net Adjustment for sample collected outside of MAI's UTC.
WET (STLC)	Waste Extraction Test (Soluble Threshold Limit Concentration)



Glossary of Terms & Qualifier Definitions

Client: Langan
Project: 750652601; 1051 Mission Road
WorkOrder: 1812D91

Analytical Qualifiers

H	Samples were analyzed out of hold time.
a3	Sample diluted due to high organic content.
d7	Strongly aged gasoline or diesel range compounds are significant in the TPH(g) chromatogram.
e2/e8	Diesel range compounds are significant; no recognizable pattern; and/or Pattern resembles kerosene/kerosene range/jet fuel range.
e2	Diesel range compounds are significant; no recognizable pattern.
e7	Oil range compounds are significant.
e8	Pattern resembles kerosene/kerosene range/jet fuel range.
h4	Sulfuric acid permanganate (EPA 3665) cleanup.
k10	CARB 435 Exception 1 - No asbestos detected. The limit of quantitation (LOQ) = 0.25%.

Quality Control Qualifiers

F1	MS/MSD recovery and/or RPD is out of acceptance criteria; LCS validates the prep batch.
F2	LCS/LCSD recovery and/or RPD/RSD is out of acceptance criteria.



Analytical Report

Client: Langan

Date Received: 12/28/18 12:45

Date Prepared: 1/3/19

Project: 750652601; 1051 Mission Road

WorkOrder: 1812D91

Extraction Method: SW3550B/3640Am/3630Cm

Analytical Method: SW8081A/8082

Unit: mg/kg

Organochlorine Pesticides + PCBs

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
B1-E1-2.5'	1812D91-001A	Soil	12/18/2018	GC20 01031912.D	170895

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Aldrin	ND	H	0.00010	1	01/03/2019 21:21
a-BHC	ND	H	0.00010	1	01/03/2019 21:21
b-BHC	ND	H	0.00030	1	01/03/2019 21:21
d-BHC	ND	H	0.00020	1	01/03/2019 21:21
g-BHC	ND	H	0.00010	1	01/03/2019 21:21
Chlordane (Technical)	ND	H	0.0025	1	01/03/2019 21:21
a-Chlordane	ND	H	0.00010	1	01/03/2019 21:21
g-Chlordane	ND	H	0.00010	1	01/03/2019 21:21
p,p-DDD	ND	H	0.00010	1	01/03/2019 21:21
p,p-DDE	ND	H	0.00010	1	01/03/2019 21:21
p,p-DDT	ND	H	0.00010	1	01/03/2019 21:21
Dieldrin	ND	H	0.00010	1	01/03/2019 21:21
Endosulfan I	ND	H	0.00010	1	01/03/2019 21:21
Endosulfan II	ND	H	0.00010	1	01/03/2019 21:21
Endosulfan sulfate	ND	H	0.00010	1	01/03/2019 21:21
Endrin	ND	H	0.00010	1	01/03/2019 21:21
Endrin aldehyde	ND	H	0.00010	1	01/03/2019 21:21
Endrin ketone	ND	H	0.00010	1	01/03/2019 21:21
Heptachlor	ND	H	0.00010	1	01/03/2019 21:21
Heptachlor epoxide	ND	H	0.00010	1	01/03/2019 21:21
Hexachlorobenzene	ND	H	0.0010	1	01/03/2019 21:21
Hexachlorocyclopentadiene	ND	H	0.0020	1	01/03/2019 21:21
Methoxychlor	ND	H	0.00020	1	01/03/2019 21:21
Toxaphene	ND	H	0.0050	1	01/03/2019 21:21
Aroclor1016	ND	H	0.0050	1	01/03/2019 21:21
Aroclor1221	ND	H	0.0050	1	01/03/2019 21:21
Aroclor1232	ND	H	0.0050	1	01/03/2019 21:21
Aroclor1242	ND	H	0.0050	1	01/03/2019 21:21
Aroclor1248	ND	H	0.0050	1	01/03/2019 21:21
Aroclor1254	ND	H	0.0050	1	01/03/2019 21:21
Aroclor1260	ND	H	0.0050	1	01/03/2019 21:21
PCBs, total	ND	H	0.0050	1	01/03/2019 21:21

Surrogates	REC (%)	Qualifiers	Limits	
Decachlorobiphenyl	129	H	20-145	01/03/2019 21:21

Analyst(s): LT

(Cont.)



Analytical Report

Client: Langan

Date Received: 12/28/18 12:45

Date Prepared: 1/3/19

Project: 750652601; 1051 Mission Road

WorkOrder: 1812D91

Extraction Method: SW3550B/3640Am/3630Cm

Analytical Method: SW8081A/8082

Unit: mg/kg

Organochlorine Pesticides + PCBs

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
B2-E1-2.5'	1812D91-005A	Soil	12/18/2018	GC20 01031913.D	170895

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Aldrin	ND	H	0.0010	10	01/03/2019 21:37
a-BHC	ND	H	0.0010	10	01/03/2019 21:37
b-BHC	ND	H	0.0030	10	01/03/2019 21:37
d-BHC	ND	H	0.0020	10	01/03/2019 21:37
g-BHC	ND	H	0.0010	10	01/03/2019 21:37
Chlordane (Technical)	ND	H	0.025	10	01/03/2019 21:37
a-Chlordane	ND	H	0.0010	10	01/03/2019 21:37
g-Chlordane	ND	H	0.0010	10	01/03/2019 21:37
p,p-DDD	ND	H	0.0010	10	01/03/2019 21:37
p,p-DDE	ND	H	0.0010	10	01/03/2019 21:37
p,p-DDT	ND	H	0.0010	10	01/03/2019 21:37
Dieldrin	ND	H	0.0010	10	01/03/2019 21:37
Endosulfan I	ND	H	0.0010	10	01/03/2019 21:37
Endosulfan II	ND	H	0.0010	10	01/03/2019 21:37
Endosulfan sulfate	ND	H	0.0010	10	01/03/2019 21:37
Endrin	ND	H	0.0010	10	01/03/2019 21:37
Endrin aldehyde	ND	H	0.0010	10	01/03/2019 21:37
Endrin ketone	ND	H	0.0010	10	01/03/2019 21:37
Heptachlor	ND	H	0.0010	10	01/03/2019 21:37
Heptachlor epoxide	ND	H	0.0010	10	01/03/2019 21:37
Hexachlorobenzene	ND	H	0.010	10	01/03/2019 21:37
Hexachlorocyclopentadiene	ND	H	0.020	10	01/03/2019 21:37
Methoxychlor	ND	H	0.0020	10	01/03/2019 21:37
Toxaphene	ND	H	0.050	10	01/03/2019 21:37
Aroclor1016	ND	H	0.050	10	01/03/2019 21:37
Aroclor1221	ND	H	0.050	10	01/03/2019 21:37
Aroclor1232	ND	H	0.050	10	01/03/2019 21:37
Aroclor1242	ND	H	0.050	10	01/03/2019 21:37
Aroclor1248	ND	H	0.050	10	01/03/2019 21:37
Aroclor1254	ND	H	0.050	10	01/03/2019 21:37
Aroclor1260	ND	H	0.050	10	01/03/2019 21:37
PCBs, total	ND	H	0.050	10	01/03/2019 21:37

Surrogates	REC (%)	Qualifiers	Limits	
Decachlorobiphenyl	116	H	20-145	01/03/2019 21:37

Analyst(s): LT

Analytical Comments: a3



Analytical Report

Client: Langan
Date Received: 12/28/18 12:45
Date Prepared: 12/28/18
Project: 750652601; 1051 Mission Road

WorkOrder: 1812D91
Extraction Method: SW3550B
Analytical Method: SW8082
Unit: mg/kg

Polychlorinated Biphenyls (PCBs) Aroclors

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
B1-E2-7.5'	1812D91-002A	Soil	12/18/2018	GC23 01021918.d	170723

Analytes	Result	MDL	RL	DF	Date Analyzed
Aroclor1016	ND	0.0051	0.050	1	01/02/2019 15:00
Aroclor1221	ND	0.033	0.050	1	01/02/2019 15:00
Aroclor1232	ND	0.0032	0.050	1	01/02/2019 15:00
Aroclor1242	ND	0.0035	0.050	1	01/02/2019 15:00
Aroclor1248	ND	0.0036	0.050	1	01/02/2019 15:00
Aroclor1254	ND	0.0022	0.050	1	01/02/2019 15:00
Aroclor1260	ND	0.0085	0.050	1	01/02/2019 15:00
PCBs, total	ND	N/A	0.050	1	01/02/2019 15:00

Surrogates	REC (%)	Limits	
Decachlorobiphenyl	112	69-143	01/02/2019 15:00

Analyst(s): LT

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
B2-E2-5'	1812D91-006A	Soil	12/18/2018	GC23 01021928.d	170723

Analytes	Result	MDL	RL	DF	Date Analyzed
Aroclor1016	ND	0.0051	0.050	1	01/02/2019 17:37
Aroclor1221	ND	0.033	0.050	1	01/02/2019 17:37
Aroclor1232	ND	0.0032	0.050	1	01/02/2019 17:37
Aroclor1242	ND	0.0035	0.050	1	01/02/2019 17:37
Aroclor1248	ND	0.0036	0.050	1	01/02/2019 17:37
Aroclor1254	ND	0.0022	0.050	1	01/02/2019 17:37
Aroclor1260	ND	0.0085	0.050	1	01/02/2019 17:37
PCBs, total	ND	N/A	0.050	1	01/02/2019 17:37

Surrogates	REC (%)	Limits	
Decachlorobiphenyl	104	69-143	01/02/2019 17:37

Analyst(s): LT

Analytical Comments: h4



Analytical Report

Client: Langan
Date Received: 12/28/18 12:45
Date Prepared: 12/28/18
Project: 750652601; 1051 Mission Road

WorkOrder: 1812D91
Extraction Method: SW5030B
Analytical Method: SW8260B
Unit: mg/kg

Volatile Organics

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
B1-E1-2.5'	1812D91-001A	Soil	12/18/2018	GC38 12291809.D	170722

Analytes	Result	RL	DF	Date Analyzed
Acetone	ND	0.10	1	12/29/2018 16:46
tert-Amyl methyl ether (TAME)	ND	0.0050	1	12/29/2018 16:46
Benzene	ND	0.0050	1	12/29/2018 16:46
Bromobenzene	ND	0.0050	1	12/29/2018 16:46
Bromochloromethane	ND	0.0050	1	12/29/2018 16:46
Bromodichloromethane	ND	0.0010	1	12/29/2018 16:46
Bromoform	ND	0.0050	1	12/29/2018 16:46
Bromomethane	ND	0.0050	1	12/29/2018 16:46
2-Butanone (MEK)	ND	0.020	1	12/29/2018 16:46
t-Butyl alcohol (TBA)	ND	0.050	1	12/29/2018 16:46
n-Butyl benzene	ND	0.0050	1	12/29/2018 16:46
sec-Butyl benzene	ND	0.0050	1	12/29/2018 16:46
tert-Butyl benzene	ND	0.0050	1	12/29/2018 16:46
Carbon Disulfide	ND	0.0050	1	12/29/2018 16:46
Carbon Tetrachloride	ND	0.0050	1	12/29/2018 16:46
Chlorobenzene	ND	0.0050	1	12/29/2018 16:46
Chloroethane	ND	0.0050	1	12/29/2018 16:46
Chloroform	ND	0.0050	1	12/29/2018 16:46
Chloromethane	ND	0.0050	1	12/29/2018 16:46
2-Chlorotoluene	ND	0.0050	1	12/29/2018 16:46
4-Chlorotoluene	ND	0.0050	1	12/29/2018 16:46
Dibromochloromethane	ND	0.0050	1	12/29/2018 16:46
1,2-Dibromo-3-chloropropane	ND	0.00025	1	12/29/2018 16:46
1,2-Dibromoethane (EDB)	ND	0.00010	1	12/29/2018 16:46
Dibromomethane	ND	0.0050	1	12/29/2018 16:46
1,2-Dichlorobenzene	ND	0.0050	1	12/29/2018 16:46
1,3-Dichlorobenzene	ND	0.0050	1	12/29/2018 16:46
1,4-Dichlorobenzene	ND	0.0050	1	12/29/2018 16:46
Dichlorodifluoromethane	ND	0.0050	1	12/29/2018 16:46
1,1-Dichloroethane	ND	0.0050	1	12/29/2018 16:46
1,2-Dichloroethane (1,2-DCA)	ND	0.00025	1	12/29/2018 16:46
1,1-Dichloroethene	ND	0.00025	1	12/29/2018 16:46
cis-1,2-Dichloroethene	ND	0.0050	1	12/29/2018 16:46
trans-1,2-Dichloroethene	ND	0.0050	1	12/29/2018 16:46
1,2-Dichloropropane	ND	0.0050	1	12/29/2018 16:46
1,3-Dichloropropane	ND	0.0050	1	12/29/2018 16:46
2,2-Dichloropropane	ND	0.0050	1	12/29/2018 16:46

(Cont.)



Analytical Report

Client: Langan
Date Received: 12/28/18 12:45
Date Prepared: 12/28/18
Project: 750652601; 1051 Mission Road

WorkOrder: 1812D91
Extraction Method: SW5030B
Analytical Method: SW8260B
Unit: mg/kg

Volatile Organics

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
B1-E1-2.5'	1812D91-001A	Soil	12/18/2018	GC38 12291809.D	170722

Analytes	Result	RL	DF	Date Analyzed
1,1-Dichloropropene	ND	0.0050	1	12/29/2018 16:46
cis-1,3-Dichloropropene	ND	0.0050	1	12/29/2018 16:46
trans-1,3-Dichloropropene	ND	0.0050	1	12/29/2018 16:46
Diisopropyl ether (DIPE)	ND	0.0050	1	12/29/2018 16:46
Ethylbenzene	ND	0.0050	1	12/29/2018 16:46
Ethyl tert-butyl ether (ETBE)	ND	0.0050	1	12/29/2018 16:46
Freon 113	ND	0.0050	1	12/29/2018 16:46
Hexachlorobutadiene	ND	0.0050	1	12/29/2018 16:46
Hexachloroethane	ND	0.0050	1	12/29/2018 16:46
2-Hexanone	ND	0.0050	1	12/29/2018 16:46
Isopropylbenzene	ND	0.0050	1	12/29/2018 16:46
4-Isopropyl toluene	ND	0.0050	1	12/29/2018 16:46
Methyl-t-butyl ether (MTBE)	ND	0.0050	1	12/29/2018 16:46
Methylene chloride	ND	0.010	1	12/29/2018 16:46
4-Methyl-2-pentanone (MIBK)	ND	0.0050	1	12/29/2018 16:46
Naphthalene	ND	0.0050	1	12/29/2018 16:46
n-Propyl benzene	ND	0.0050	1	12/29/2018 16:46
Styrene	ND	0.0050	1	12/29/2018 16:46
1,1,1,2-Tetrachloroethane	ND	0.0050	1	12/29/2018 16:46
1,1,2,2-Tetrachloroethane	ND	0.00025	1	12/29/2018 16:46
Tetrachloroethene	ND	0.00025	1	12/29/2018 16:46
Toluene	ND	0.0050	1	12/29/2018 16:46
1,2,3-Trichlorobenzene	ND	0.0050	1	12/29/2018 16:46
1,2,4-Trichlorobenzene	ND	0.0050	1	12/29/2018 16:46
1,1,1-Trichloroethane	ND	0.0050	1	12/29/2018 16:46
1,1,2-Trichloroethane	ND	0.0050	1	12/29/2018 16:46
Trichloroethene	ND	0.0050	1	12/29/2018 16:46
Trichlorofluoromethane	ND	0.0050	1	12/29/2018 16:46
1,2,3-Trichloropropane	ND	0.00025	1	12/29/2018 16:46
1,2,4-Trimethylbenzene	ND	0.0050	1	12/29/2018 16:46
1,3,5-Trimethylbenzene	ND	0.0050	1	12/29/2018 16:46
Vinyl Chloride	ND	0.00025	1	12/29/2018 16:46
m,p-Xylene	ND	0.0050	1	12/29/2018 16:46
o-Xylene	ND	0.0050	1	12/29/2018 16:46
Xylenes, Total	ND	0.0050	1	12/29/2018 16:46

(Cont.)



Analytical Report

Client: Langan
Date Received: 12/28/18 12:45
Date Prepared: 12/28/18
Project: 750652601; 1051 Mission Road

WorkOrder: 1812D91
Extraction Method: SW5030B
Analytical Method: SW8260B
Unit: mg/kg

Volatile Organics

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
B1-E1-2.5'	1812D91-001A	Soil	12/18/2018	GC38 12291809.D	170722

Analytes	Result	RL	DF	Date Analyzed
<u>Surrogates</u>	<u>REC (%)</u>	<u>Limits</u>		
Dibromofluoromethane	101	82-136		12/29/2018 16:46
Toluene-d8	99	92-139		12/29/2018 16:46
4-BFB	95	82-135		12/29/2018 16:46
Benzene-d6	107	55-122		12/29/2018 16:46
Ethylbenzene-d10	111	58-141		12/29/2018 16:46
1,2-DCB-d4	85	51-107		12/29/2018 16:46

Analyst(s): JEM



Analytical Report

Client: Langan
Date Received: 12/28/18 12:45
Date Prepared: 12/28/18
Project: 750652601; 1051 Mission Road

WorkOrder: 1812D91
Extraction Method: SW5030B
Analytical Method: SW8260B
Unit: mg/kg

Volatile Organics

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
B1-E3-10'	1812D91-003A	Soil	12/18/2018	GC38 12291813.D	170722

Analytes	Result	RL	DF	Date Analyzed
Acetone	ND	0.10	1	12/29/2018 19:16
tert-Amyl methyl ether (TAME)	ND	0.0050	1	12/29/2018 19:16
Benzene	ND	0.0050	1	12/29/2018 19:16
Bromobenzene	ND	0.0050	1	12/29/2018 19:16
Bromochloromethane	ND	0.0050	1	12/29/2018 19:16
Bromodichloromethane	ND	0.0010	1	12/29/2018 19:16
Bromoform	ND	0.0050	1	12/29/2018 19:16
Bromomethane	ND	0.0050	1	12/29/2018 19:16
2-Butanone (MEK)	ND	0.020	1	12/29/2018 19:16
t-Butyl alcohol (TBA)	ND	0.050	1	12/29/2018 19:16
n-Butyl benzene	ND	0.0050	1	12/29/2018 19:16
sec-Butyl benzene	ND	0.0050	1	12/29/2018 19:16
tert-Butyl benzene	ND	0.0050	1	12/29/2018 19:16
Carbon Disulfide	ND	0.0050	1	12/29/2018 19:16
Carbon Tetrachloride	ND	0.0050	1	12/29/2018 19:16
Chlorobenzene	ND	0.0050	1	12/29/2018 19:16
Chloroethane	ND	0.0050	1	12/29/2018 19:16
Chloroform	ND	0.0050	1	12/29/2018 19:16
Chloromethane	ND	0.0050	1	12/29/2018 19:16
2-Chlorotoluene	ND	0.0050	1	12/29/2018 19:16
4-Chlorotoluene	ND	0.0050	1	12/29/2018 19:16
Dibromochloromethane	ND	0.0050	1	12/29/2018 19:16
1,2-Dibromo-3-chloropropane	ND	0.00025	1	12/29/2018 19:16
1,2-Dibromoethane (EDB)	ND	0.00010	1	12/29/2018 19:16
Dibromomethane	ND	0.0050	1	12/29/2018 19:16
1,2-Dichlorobenzene	ND	0.0050	1	12/29/2018 19:16
1,3-Dichlorobenzene	ND	0.0050	1	12/29/2018 19:16
1,4-Dichlorobenzene	ND	0.0050	1	12/29/2018 19:16
Dichlorodifluoromethane	ND	0.0050	1	12/29/2018 19:16
1,1-Dichloroethane	ND	0.0050	1	12/29/2018 19:16
1,2-Dichloroethane (1,2-DCA)	ND	0.00025	1	12/29/2018 19:16
1,1-Dichloroethene	ND	0.00025	1	12/29/2018 19:16
cis-1,2-Dichloroethene	ND	0.0050	1	12/29/2018 19:16
trans-1,2-Dichloroethene	ND	0.0050	1	12/29/2018 19:16
1,2-Dichloropropane	ND	0.0050	1	12/29/2018 19:16
1,3-Dichloropropane	ND	0.0050	1	12/29/2018 19:16
2,2-Dichloropropane	ND	0.0050	1	12/29/2018 19:16

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Analytical Report

Client: Langan
Date Received: 12/28/18 12:45
Date Prepared: 12/28/18
Project: 750652601; 1051 Mission Road

WorkOrder: 1812D91
Extraction Method: SW5030B
Analytical Method: SW8260B
Unit: mg/kg

Volatile Organics

Client ID	Lab ID	Matrix	Date Collected		Instrument	Batch ID
B1-E3-10'	1812D91-003A	Soil	12/18/2018		GC38 12291813.D	170722
Analytes	Result		RL	DF	Date Analyzed	
1,1-Dichloropropene	ND		0.0050	1	12/29/2018 19:16	
cis-1,3-Dichloropropene	ND		0.0050	1	12/29/2018 19:16	
trans-1,3-Dichloropropene	ND		0.0050	1	12/29/2018 19:16	
Diisopropyl ether (DIPE)	ND		0.0050	1	12/29/2018 19:16	
Ethylbenzene	ND		0.0050	1	12/29/2018 19:16	
Ethyl tert-butyl ether (ETBE)	ND		0.0050	1	12/29/2018 19:16	
Freon 113	ND		0.0050	1	12/29/2018 19:16	
Hexachlorobutadiene	ND		0.0050	1	12/29/2018 19:16	
Hexachloroethane	ND		0.0050	1	12/29/2018 19:16	
2-Hexanone	ND		0.0050	1	12/29/2018 19:16	
Isopropylbenzene	ND		0.0050	1	12/29/2018 19:16	
4-Isopropyl toluene	ND		0.0050	1	12/29/2018 19:16	
Methyl-t-butyl ether (MTBE)	ND		0.0050	1	12/29/2018 19:16	
Methylene chloride	ND		0.010	1	12/29/2018 19:16	
4-Methyl-2-pentanone (MIBK)	ND		0.0050	1	12/29/2018 19:16	
Naphthalene	ND		0.0050	1	12/29/2018 19:16	
n-Propyl benzene	ND		0.0050	1	12/29/2018 19:16	
Styrene	ND		0.0050	1	12/29/2018 19:16	
1,1,1,2-Tetrachloroethane	ND		0.0050	1	12/29/2018 19:16	
1,1,2,2-Tetrachloroethane	ND		0.00025	1	12/29/2018 19:16	
Tetrachloroethene	ND		0.00025	1	12/29/2018 19:16	
Toluene	ND		0.0050	1	12/29/2018 19:16	
1,2,3-Trichlorobenzene	ND		0.0050	1	12/29/2018 19:16	
1,2,4-Trichlorobenzene	ND		0.0050	1	12/29/2018 19:16	
1,1,1-Trichloroethane	ND		0.0050	1	12/29/2018 19:16	
1,1,2-Trichloroethane	ND		0.0050	1	12/29/2018 19:16	
Trichloroethene	ND		0.0050	1	12/29/2018 19:16	
Trichlorofluoromethane	ND		0.0050	1	12/29/2018 19:16	
1,2,3-Trichloropropane	ND		0.00025	1	12/29/2018 19:16	
1,2,4-Trimethylbenzene	ND		0.0050	1	12/29/2018 19:16	
1,3,5-Trimethylbenzene	ND		0.0050	1	12/29/2018 19:16	
Vinyl Chloride	ND		0.00025	1	12/29/2018 19:16	
m,p-Xylene	ND		0.0050	1	12/29/2018 19:16	
o-Xylene	ND		0.0050	1	12/29/2018 19:16	
Xylenes, Total	ND		0.0050	1	12/29/2018 19:16	

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Analytical Report

Client: Langan
Date Received: 12/28/18 12:45
Date Prepared: 12/28/18
Project: 750652601; 1051 Mission Road

WorkOrder: 1812D91
Extraction Method: SW5030B
Analytical Method: SW8260B
Unit: mg/kg

Volatile Organics

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
B1-E3-10'	1812D91-003A	Soil	12/18/2018	GC38 12291813.D	170722

Analytes	Result	RL	DF	Date Analyzed
<u>Surrogates</u>	<u>REC (%)</u>	<u>Limits</u>		
Dibromofluoromethane	96	82-136		12/29/2018 19:16
Toluene-d8	98	92-139		12/29/2018 19:16
4-BFB	89	82-135		12/29/2018 19:16
Benzene-d6	80	55-122		12/29/2018 19:16
Ethylbenzene-d10	89	58-141		12/29/2018 19:16
1,2-DCB-d4	70	51-107		12/29/2018 19:16

Analyst(s): JEM



Analytical Report

Client: Langan
Date Received: 12/28/18 12:45
Date Prepared: 12/28/18
Project: 750652601; 1051 Mission Road

WorkOrder: 1812D91
Extraction Method: SW5030B
Analytical Method: SW8260B
Unit: mg/kg

Volatile Organics

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
B2-E1-2.5'	1812D91-005A	Soil	12/18/2018	GC38 12291814.D	170722

Analytes	Result	RL	DF	Date Analyzed
Acetone	ND	0.10	1	12/29/2018 19:53
tert-Amyl methyl ether (TAME)	ND	0.0050	1	12/29/2018 19:53
Benzene	ND	0.0050	1	12/29/2018 19:53
Bromobenzene	ND	0.0050	1	12/29/2018 19:53
Bromochloromethane	ND	0.0050	1	12/29/2018 19:53
Bromodichloromethane	ND	0.0010	1	12/29/2018 19:53
Bromoform	ND	0.0050	1	12/29/2018 19:53
Bromomethane	ND	0.0050	1	12/29/2018 19:53
2-Butanone (MEK)	ND	0.020	1	12/29/2018 19:53
t-Butyl alcohol (TBA)	ND	0.050	1	12/29/2018 19:53
n-Butyl benzene	ND	0.0050	1	12/29/2018 19:53
sec-Butyl benzene	ND	0.0050	1	12/29/2018 19:53
tert-Butyl benzene	ND	0.0050	1	12/29/2018 19:53
Carbon Disulfide	ND	0.0050	1	12/29/2018 19:53
Carbon Tetrachloride	ND	0.0050	1	12/29/2018 19:53
Chlorobenzene	ND	0.0050	1	12/29/2018 19:53
Chloroethane	ND	0.0050	1	12/29/2018 19:53
Chloroform	ND	0.0050	1	12/29/2018 19:53
Chloromethane	ND	0.0050	1	12/29/2018 19:53
2-Chlorotoluene	ND	0.0050	1	12/29/2018 19:53
4-Chlorotoluene	ND	0.0050	1	12/29/2018 19:53
Dibromochloromethane	ND	0.0050	1	12/29/2018 19:53
1,2-Dibromo-3-chloropropane	ND	0.00025	1	12/29/2018 19:53
1,2-Dibromoethane (EDB)	ND	0.00010	1	12/29/2018 19:53
Dibromomethane	ND	0.0050	1	12/29/2018 19:53
1,2-Dichlorobenzene	ND	0.0050	1	12/29/2018 19:53
1,3-Dichlorobenzene	ND	0.0050	1	12/29/2018 19:53
1,4-Dichlorobenzene	ND	0.0050	1	12/29/2018 19:53
Dichlorodifluoromethane	ND	0.0050	1	12/29/2018 19:53
1,1-Dichloroethane	ND	0.0050	1	12/29/2018 19:53
1,2-Dichloroethane (1,2-DCA)	ND	0.00025	1	12/29/2018 19:53
1,1-Dichloroethene	ND	0.00025	1	12/29/2018 19:53
cis-1,2-Dichloroethene	ND	0.0050	1	12/29/2018 19:53
trans-1,2-Dichloroethene	ND	0.0050	1	12/29/2018 19:53
1,2-Dichloropropane	ND	0.0050	1	12/29/2018 19:53
1,3-Dichloropropane	ND	0.0050	1	12/29/2018 19:53
2,2-Dichloropropane	ND	0.0050	1	12/29/2018 19:53

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Analytical Report

Client: Langan
Date Received: 12/28/18 12:45
Date Prepared: 12/28/18
Project: 750652601; 1051 Mission Road

WorkOrder: 1812D91
Extraction Method: SW5030B
Analytical Method: SW8260B
Unit: mg/kg

Volatile Organics

Client ID	Lab ID	Matrix	Date Collected		Instrument	Batch ID
B2-E1-2.5'	1812D91-005A	Soil	12/18/2018		GC38 12291814.D	170722
Analytes	Result		RL	DF	Date Analyzed	
1,1-Dichloropropene	ND		0.0050	1	12/29/2018 19:53	
cis-1,3-Dichloropropene	ND		0.0050	1	12/29/2018 19:53	
trans-1,3-Dichloropropene	ND		0.0050	1	12/29/2018 19:53	
Diisopropyl ether (DIPE)	ND		0.0050	1	12/29/2018 19:53	
Ethylbenzene	ND		0.0050	1	12/29/2018 19:53	
Ethyl tert-butyl ether (ETBE)	ND		0.0050	1	12/29/2018 19:53	
Freon 113	ND		0.0050	1	12/29/2018 19:53	
Hexachlorobutadiene	ND		0.0050	1	12/29/2018 19:53	
Hexachloroethane	ND		0.0050	1	12/29/2018 19:53	
2-Hexanone	ND		0.0050	1	12/29/2018 19:53	
Isopropylbenzene	ND		0.0050	1	12/29/2018 19:53	
4-Isopropyl toluene	ND		0.0050	1	12/29/2018 19:53	
Methyl-t-butyl ether (MTBE)	ND		0.0050	1	12/29/2018 19:53	
Methylene chloride	ND		0.010	1	12/29/2018 19:53	
4-Methyl-2-pentanone (MIBK)	ND		0.0050	1	12/29/2018 19:53	
Naphthalene	ND		0.0050	1	12/29/2018 19:53	
n-Propyl benzene	ND		0.0050	1	12/29/2018 19:53	
Styrene	ND		0.0050	1	12/29/2018 19:53	
1,1,1,2-Tetrachloroethane	ND		0.0050	1	12/29/2018 19:53	
1,1,2,2-Tetrachloroethane	ND		0.00025	1	12/29/2018 19:53	
Tetrachloroethene	ND		0.00025	1	12/29/2018 19:53	
Toluene	ND		0.0050	1	12/29/2018 19:53	
1,2,3-Trichlorobenzene	ND		0.0050	1	12/29/2018 19:53	
1,2,4-Trichlorobenzene	ND		0.0050	1	12/29/2018 19:53	
1,1,1-Trichloroethane	ND		0.0050	1	12/29/2018 19:53	
1,1,2-Trichloroethane	ND		0.0050	1	12/29/2018 19:53	
Trichloroethene	ND		0.0050	1	12/29/2018 19:53	
Trichlorofluoromethane	ND		0.0050	1	12/29/2018 19:53	
1,2,3-Trichloropropane	ND		0.00025	1	12/29/2018 19:53	
1,2,4-Trimethylbenzene	0.027		0.0050	1	12/29/2018 19:53	
1,3,5-Trimethylbenzene	0.013		0.0050	1	12/29/2018 19:53	
Vinyl Chloride	ND		0.00025	1	12/29/2018 19:53	
m,p-Xylene	ND		0.0050	1	12/29/2018 19:53	
o-Xylene	ND		0.0050	1	12/29/2018 19:53	
Xylenes, Total	ND		0.0050	1	12/29/2018 19:53	

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Analytical Report

Client: Langan
Date Received: 12/28/18 12:45
Date Prepared: 12/28/18
Project: 750652601; 1051 Mission Road

WorkOrder: 1812D91
Extraction Method: SW5030B
Analytical Method: SW8260B
Unit: mg/kg

Volatile Organics

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
B2-E1-2.5'	1812D91-005A	Soil	12/18/2018	GC38 12291814.D	170722

Analytes	Result	RL	DF	Date Analyzed
<u>Surrogates</u>	<u>REC (%)</u>	<u>Limits</u>		
Dibromofluoromethane	94	82-136		12/29/2018 19:53
Toluene-d8	99	92-139		12/29/2018 19:53
4-BFB	101	82-135		12/29/2018 19:53
Benzene-d6	94	55-122		12/29/2018 19:53
Ethylbenzene-d10	103	58-141		12/29/2018 19:53
1,2-DCB-d4	79	51-107		12/29/2018 19:53

Analyst(s): JEM



Analytical Report

Client: Langan
Date Received: 12/28/18 12:45
Date Prepared: 12/28/18
Project: 750652601; 1051 Mission Road

WorkOrder: 1812D91
Extraction Method: SW5030B
Analytical Method: SW8260B
Unit: mg/kg

Volatile Organics

Client ID	Lab ID	Matrix	Date Collected		Instrument	Batch ID
B2-E3-7.5	1812D91-007A	Soil	12/18/2018		GC38 12291815.D	170722
Analytes	Result	RL	DF	Date Analyzed		
Acetone	ND	0.10	1	12/29/2018 20:31		
tert-Amyl methyl ether (TAME)	ND	0.0050	1	12/29/2018 20:31		
Benzene	ND	0.0050	1	12/29/2018 20:31		
Bromobenzene	ND	0.0050	1	12/29/2018 20:31		
Bromochloromethane	ND	0.0050	1	12/29/2018 20:31		
Bromodichloromethane	ND	0.0010	1	12/29/2018 20:31		
Bromoform	ND	0.0050	1	12/29/2018 20:31		
Bromomethane	ND	0.0050	1	12/29/2018 20:31		
2-Butanone (MEK)	ND	0.020	1	12/29/2018 20:31		
t-Butyl alcohol (TBA)	ND	0.050	1	12/29/2018 20:31		
n-Butyl benzene	ND	0.0050	1	12/29/2018 20:31		
sec-Butyl benzene	ND	0.0050	1	12/29/2018 20:31		
tert-Butyl benzene	ND	0.0050	1	12/29/2018 20:31		
Carbon Disulfide	ND	0.0050	1	12/29/2018 20:31		
Carbon Tetrachloride	ND	0.0050	1	12/29/2018 20:31		
Chlorobenzene	ND	0.0050	1	12/29/2018 20:31		
Chloroethane	ND	0.0050	1	12/29/2018 20:31		
Chloroform	ND	0.0050	1	12/29/2018 20:31		
Chloromethane	ND	0.0050	1	12/29/2018 20:31		
2-Chlorotoluene	ND	0.0050	1	12/29/2018 20:31		
4-Chlorotoluene	ND	0.0050	1	12/29/2018 20:31		
Dibromochloromethane	ND	0.0050	1	12/29/2018 20:31		
1,2-Dibromo-3-chloropropane	ND	0.00025	1	12/29/2018 20:31		
1,2-Dibromoethane (EDB)	ND	0.00010	1	12/29/2018 20:31		
Dibromomethane	ND	0.0050	1	12/29/2018 20:31		
1,2-Dichlorobenzene	ND	0.0050	1	12/29/2018 20:31		
1,3-Dichlorobenzene	ND	0.0050	1	12/29/2018 20:31		
1,4-Dichlorobenzene	ND	0.0050	1	12/29/2018 20:31		
Dichlorodifluoromethane	ND	0.0050	1	12/29/2018 20:31		
1,1-Dichloroethane	ND	0.0050	1	12/29/2018 20:31		
1,2-Dichloroethane (1,2-DCA)	ND	0.00025	1	12/29/2018 20:31		
1,1-Dichloroethene	ND	0.00025	1	12/29/2018 20:31		
cis-1,2-Dichloroethene	ND	0.0050	1	12/29/2018 20:31		
trans-1,2-Dichloroethene	ND	0.0050	1	12/29/2018 20:31		
1,2-Dichloropropane	ND	0.0050	1	12/29/2018 20:31		
1,3-Dichloropropane	ND	0.0050	1	12/29/2018 20:31		
2,2-Dichloropropane	ND	0.0050	1	12/29/2018 20:31		

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Analytical Report

Client: Langan
Date Received: 12/28/18 12:45
Date Prepared: 12/28/18
Project: 750652601; 1051 Mission Road

WorkOrder: 1812D91
Extraction Method: SW5030B
Analytical Method: SW8260B
Unit: mg/kg

Volatile Organics

Client ID	Lab ID	Matrix	Date Collected		Instrument	Batch ID
B2-E3-7.5	1812D91-007A	Soil	12/18/2018		GC38 12291815.D	170722
Analytes	Result	RL	DF	Date Analyzed		
1,1-Dichloropropene	ND	0.0050	1	12/29/2018 20:31		
cis-1,3-Dichloropropene	ND	0.0050	1	12/29/2018 20:31		
trans-1,3-Dichloropropene	ND	0.0050	1	12/29/2018 20:31		
Diisopropyl ether (DIPE)	ND	0.0050	1	12/29/2018 20:31		
Ethylbenzene	ND	0.0050	1	12/29/2018 20:31		
Ethyl tert-butyl ether (ETBE)	ND	0.0050	1	12/29/2018 20:31		
Freon 113	ND	0.0050	1	12/29/2018 20:31		
Hexachlorobutadiene	ND	0.0050	1	12/29/2018 20:31		
Hexachloroethane	ND	0.0050	1	12/29/2018 20:31		
2-Hexanone	ND	0.0050	1	12/29/2018 20:31		
Isopropylbenzene	ND	0.0050	1	12/29/2018 20:31		
4-Isopropyl toluene	ND	0.0050	1	12/29/2018 20:31		
Methyl-t-butyl ether (MTBE)	ND	0.0050	1	12/29/2018 20:31		
Methylene chloride	ND	0.010	1	12/29/2018 20:31		
4-Methyl-2-pentanone (MIBK)	ND	0.0050	1	12/29/2018 20:31		
Naphthalene	ND	0.0050	1	12/29/2018 20:31		
n-Propyl benzene	ND	0.0050	1	12/29/2018 20:31		
Styrene	ND	0.0050	1	12/29/2018 20:31		
1,1,1,2-Tetrachloroethane	ND	0.0050	1	12/29/2018 20:31		
1,1,2,2-Tetrachloroethane	ND	0.00025	1	12/29/2018 20:31		
Tetrachloroethene	ND	0.00025	1	12/29/2018 20:31		
Toluene	ND	0.0050	1	12/29/2018 20:31		
1,2,3-Trichlorobenzene	ND	0.0050	1	12/29/2018 20:31		
1,2,4-Trichlorobenzene	ND	0.0050	1	12/29/2018 20:31		
1,1,1-Trichloroethane	ND	0.0050	1	12/29/2018 20:31		
1,1,2-Trichloroethane	ND	0.0050	1	12/29/2018 20:31		
Trichloroethene	ND	0.0050	1	12/29/2018 20:31		
Trichlorofluoromethane	ND	0.0050	1	12/29/2018 20:31		
1,2,3-Trichloropropane	ND	0.00025	1	12/29/2018 20:31		
1,2,4-Trimethylbenzene	ND	0.0050	1	12/29/2018 20:31		
1,3,5-Trimethylbenzene	ND	0.0050	1	12/29/2018 20:31		
Vinyl Chloride	ND	0.00025	1	12/29/2018 20:31		
m,p-Xylene	ND	0.0050	1	12/29/2018 20:31		
o-Xylene	ND	0.0050	1	12/29/2018 20:31		
Xylenes, Total	ND	0.0050	1	12/29/2018 20:31		

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Analytical Report

Client: Langan
Date Received: 12/28/18 12:45
Date Prepared: 12/28/18
Project: 750652601; 1051 Mission Road

WorkOrder: 1812D91
Extraction Method: SW5030B
Analytical Method: SW8260B
Unit: mg/kg

Volatile Organics

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
B2-E3-7.5	1812D91-007A	Soil	12/18/2018	GC38 12291815.D	170722

Analytes	Result	RL	DF	Date Analyzed
<u>Surrogates</u>	<u>REC (%)</u>	<u>Limits</u>		
Dibromofluoromethane	93	82-136		12/29/2018 20:31
Toluene-d8	99	92-139		12/29/2018 20:31
4-BFB	98	82-135		12/29/2018 20:31
Benzene-d6	89	55-122		12/29/2018 20:31
Ethylbenzene-d10	97	58-141		12/29/2018 20:31
1,2-DCB-d4	77	51-107		12/29/2018 20:31

Analyst(s): JEM



Analytical Report

Client: Langan
Date Received: 12/28/18 12:45
Date Prepared: 12/29/18
Project: 750652601; 1051 Mission Road

WorkOrder: 1812D91
Extraction Method: SW3550B/3640A
Analytical Method: SW8270C
Unit: mg/Kg

Semi-Volatile Organics (Low Level) with GPC Cleanup

Client ID	Lab ID	Matrix	Date Collected		Instrument	Batch ID
B1-E1-2.5'	1812D91-001A	Soil	12/18/2018		GC17 01021910.D	170678
Analytes	Result	RL	DF	Date Analyzed		
Acenaphthene	ND	0.0013	1	01/02/2019 16:08		
Acenaphthylene	ND	0.0013	1	01/02/2019 16:08		
Acetochlor	ND	0.25	1	01/02/2019 16:08		
Anthracene	ND	0.0013	1	01/02/2019 16:08		
Benzidine	ND	1.2	1	01/02/2019 16:08		
Benzo (a) anthracene	ND	0.0050	1	01/02/2019 16:08		
Benzo (a) pyrene	ND	0.0025	1	01/02/2019 16:08		
Benzo (b) fluoranthene	ND	0.0013	1	01/02/2019 16:08		
Benzo (g,h,i) perylene	ND	0.0025	1	01/02/2019 16:08		
Benzo (k) fluoranthene	ND	0.0013	1	01/02/2019 16:08		
Benzyl Alcohol	ND	1.2	1	01/02/2019 16:08		
1,1-Biphenyl	ND	0.013	1	01/02/2019 16:08		
Bis (2-chloroethoxy) Methane	ND	0.25	1	01/02/2019 16:08		
Bis (2-chloroethyl) Ether	ND	0.0025	1	01/02/2019 16:08		
Bis (2-chloroisopropyl) Ether	ND	0.0025	1	01/02/2019 16:08		
Bis (2-ethylhexyl) Adipate	ND	0.50	1	01/02/2019 16:08		
Bis (2-ethylhexyl) Phthalate	ND	0.0050	1	01/02/2019 16:08		
4-Bromophenyl Phenyl Ether	ND	0.25	1	01/02/2019 16:08		
Butylbenzyl Phthalate	ND	0.025	1	01/02/2019 16:08		
4-Chloroaniline	ND	0.0025	1	01/02/2019 16:08		
4-Chloro-3-methylphenol	ND	0.25	1	01/02/2019 16:08		
2-Chloronaphthalene	ND	0.25	1	01/02/2019 16:08		
2-Chlorophenol	ND	0.0050	1	01/02/2019 16:08		
4-Chlorophenyl Phenyl Ether	ND	0.25	1	01/02/2019 16:08		
Chrysene	ND	0.0025	1	01/02/2019 16:08		
Dibenzo (a,h) anthracene	ND	0.0025	1	01/02/2019 16:08		
Dibenzofuran	ND	0.25	1	01/02/2019 16:08		
Di-n-butyl Phthalate	ND	0.0025	1	01/02/2019 16:08		
1,2-Dichlorobenzene	ND	0.25	1	01/02/2019 16:08		
1,3-Dichlorobenzene	ND	0.25	1	01/02/2019 16:08		
1,4-Dichlorobenzene	ND	0.25	1	01/02/2019 16:08		
3,3-Dichlorobenzidine	ND	0.0025	1	01/02/2019 16:08		
2,4-Dichlorophenol	ND	0.013	1	01/02/2019 16:08		
Diethyl Phthalate	ND	0.0050	1	01/02/2019 16:08		
2,4-Dimethylphenol	ND	0.25	1	01/02/2019 16:08		
Dimethyl Phthalate	ND	0.0025	1	01/02/2019 16:08		
4,6-Dinitro-2-methylphenol	ND	1.2	1	01/02/2019 16:08		

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Analytical Report

Client: Langan
Date Received: 12/28/18 12:45
Date Prepared: 12/29/18
Project: 750652601; 1051 Mission Road

WorkOrder: 1812D91
Extraction Method: SW3550B/3640A
Analytical Method: SW8270C
Unit: mg/Kg

Semi-Volatile Organics (Low Level) with GPC Cleanup

Client ID	Lab ID	Matrix	Date Collected		Instrument	Batch ID
B1-E1-2.5'	1812D91-001A	Soil	12/18/2018		GC17 01021910.D	170678
Analytes	Result	RL	DF	Date Analyzed		
2,4-Dinitrophenol	ND	0.13	1	01/02/2019 16:08		
2,4-Dinitrotoluene	ND	0.0063	1	01/02/2019 16:08		
2,6-Dinitrotoluene	ND	0.0025	1	01/02/2019 16:08		
Di-n-octyl Phthalate	ND	0.0050	1	01/02/2019 16:08		
1,2-Diphenylhydrazine	ND	0.25	1	01/02/2019 16:08		
Fluoranthene	ND	0.0013	1	01/02/2019 16:08		
Fluorene	ND	0.0025	1	01/02/2019 16:08		
Hexachlorobenzene	ND	0.0013	1	01/02/2019 16:08		
Hexachlorobutadiene	ND	0.0025	1	01/02/2019 16:08		
Hexachlorocyclopentadiene	ND	2.0	1	01/02/2019 16:08		
Hexachloroethane	ND	0.0025	1	01/02/2019 16:08		
Indeno (1,2,3-cd) pyrene	ND	0.0025	1	01/02/2019 16:08		
Isophorone	ND	0.25	1	01/02/2019 16:08		
2-Methylnaphthalene	ND	0.0025	1	01/02/2019 16:08		
2-Methylphenol (o-Cresol)	ND	0.50	1	01/02/2019 16:08		
3 & 4-Methylphenol (m,p-Cresol)	ND	0.25	1	01/02/2019 16:08		
Naphthalene	ND	0.0013	1	01/02/2019 16:08		
2-Nitroaniline	ND	1.2	1	01/02/2019 16:08		
3-Nitroaniline	ND	1.2	1	01/02/2019 16:08		
4-Nitroaniline	ND	1.2	1	01/02/2019 16:08		
Nitrobenzene	ND	0.25	1	01/02/2019 16:08		
2-Nitrophenol	ND	1.2	1	01/02/2019 16:08		
4-Nitrophenol	ND	1.2	1	01/02/2019 16:08		
N-Nitrosodiphenylamine	ND	0.25	1	01/02/2019 16:08		
N-Nitrosodi-n-propylamine	ND	0.25	1	01/02/2019 16:08		
Pentachlorophenol	ND	0.031	1	01/02/2019 16:08		
Phenanthrene	ND	0.0050	1	01/02/2019 16:08		
Phenol	ND	0.0050	1	01/02/2019 16:08		
Pyrene	ND	0.0025	1	01/02/2019 16:08		
Pyridine	ND	0.25	1	01/02/2019 16:08		
1,2,4-Trichlorobenzene	ND	0.25	1	01/02/2019 16:08		
2,4,5-Trichlorophenol	ND	0.0025	1	01/02/2019 16:08		
2,4,6-Trichlorophenol	ND	0.013	1	01/02/2019 16:08		

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Analytical Report

Client: Langan
Date Received: 12/28/18 12:45
Date Prepared: 12/29/18
Project: 750652601; 1051 Mission Road

WorkOrder: 1812D91
Extraction Method: SW3550B/3640A
Analytical Method: SW8270C
Unit: mg/Kg

Semi-Volatile Organics (Low Level) with GPC Cleanup

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
B1-E1-2.5'	1812D91-001A	Soil	12/18/2018	GC17 01021910.D	170678

Analytes	Result	RL	DF	Date Analyzed
<u>Surrogates</u>	<u>REC (%)</u>	<u>Limits</u>		
2-Fluorophenol	88	30-130		01/02/2019 16:08
Phenol-d5	82	30-130		01/02/2019 16:08
Nitrobenzene-d5	67	30-130		01/02/2019 16:08
2-Fluorobiphenyl	70	30-130		01/02/2019 16:08
2,4,6-Tribromophenol	43	16-130		01/02/2019 16:08
4-Terphenyl-d14	80	30-130		01/02/2019 16:08

Analyst(s): REB



Analytical Report

Client: Langan
Date Received: 12/28/18 12:45
Date Prepared: 12/29/18
Project: 750652601; 1051 Mission Road

WorkOrder: 1812D91
Extraction Method: SW3550B/3640A
Analytical Method: SW8270C
Unit: mg/Kg

Semi-Volatile Organics (Low Level) with GPC Cleanup

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
B1-E3-10'	1812D91-003A	Soil	12/18/2018	GC17 01021911.D	170678
Analytes	Result	RL	DF	Date Analyzed	
Acenaphthene	ND	0.0013	1	01/02/2019 16:35	
Acenaphthylene	ND	0.0013	1	01/02/2019 16:35	
Acetochlor	ND	0.25	1	01/02/2019 16:35	
Anthracene	ND	0.0013	1	01/02/2019 16:35	
Benzidine	ND	1.2	1	01/02/2019 16:35	
Benzo (a) anthracene	ND	0.0050	1	01/02/2019 16:35	
Benzo (a) pyrene	ND	0.0025	1	01/02/2019 16:35	
Benzo (b) fluoranthene	ND	0.0013	1	01/02/2019 16:35	
Benzo (g,h,i) perylene	ND	0.0025	1	01/02/2019 16:35	
Benzo (k) fluoranthene	ND	0.0013	1	01/02/2019 16:35	
Benzyl Alcohol	ND	1.2	1	01/02/2019 16:35	
1,1-Biphenyl	ND	0.013	1	01/02/2019 16:35	
Bis (2-chloroethoxy) Methane	ND	0.25	1	01/02/2019 16:35	
Bis (2-chloroethyl) Ether	ND	0.0025	1	01/02/2019 16:35	
Bis (2-chloroisopropyl) Ether	ND	0.0025	1	01/02/2019 16:35	
Bis (2-ethylhexyl) Adipate	ND	0.50	1	01/02/2019 16:35	
Bis (2-ethylhexyl) Phthalate	ND	0.0050	1	01/02/2019 16:35	
4-Bromophenyl Phenyl Ether	ND	0.25	1	01/02/2019 16:35	
Butylbenzyl Phthalate	ND	0.025	1	01/02/2019 16:35	
4-Chloroaniline	ND	0.0025	1	01/02/2019 16:35	
4-Chloro-3-methylphenol	ND	0.25	1	01/02/2019 16:35	
2-Chloronaphthalene	ND	0.25	1	01/02/2019 16:35	
2-Chlorophenol	ND	0.0050	1	01/02/2019 16:35	
4-Chlorophenyl Phenyl Ether	ND	0.25	1	01/02/2019 16:35	
Chrysene	ND	0.0025	1	01/02/2019 16:35	
Dibenzo (a,h) anthracene	ND	0.0025	1	01/02/2019 16:35	
Dibenzofuran	ND	0.25	1	01/02/2019 16:35	
Di-n-butyl Phthalate	0.0034	0.0025	1	01/02/2019 16:35	
1,2-Dichlorobenzene	ND	0.25	1	01/02/2019 16:35	
1,3-Dichlorobenzene	ND	0.25	1	01/02/2019 16:35	
1,4-Dichlorobenzene	ND	0.25	1	01/02/2019 16:35	
3,3-Dichlorobenzidine	ND	0.0025	1	01/02/2019 16:35	
2,4-Dichlorophenol	ND	0.013	1	01/02/2019 16:35	
Diethyl Phthalate	ND	0.0050	1	01/02/2019 16:35	
2,4-Dimethylphenol	ND	0.25	1	01/02/2019 16:35	
Dimethyl Phthalate	ND	0.0025	1	01/02/2019 16:35	
4,6-Dinitro-2-methylphenol	ND	1.2	1	01/02/2019 16:35	

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Analytical Report

Client: Langan
Date Received: 12/28/18 12:45
Date Prepared: 12/29/18
Project: 750652601; 1051 Mission Road

WorkOrder: 1812D91
Extraction Method: SW3550B/3640A
Analytical Method: SW8270C
Unit: mg/Kg

Semi-Volatile Organics (Low Level) with GPC Cleanup

Client ID	Lab ID	Matrix	Date Collected		Instrument	Batch ID
B1-E3-10'	1812D91-003A	Soil	12/18/2018		GC17 01021911.D	170678
Analytes	Result	RL	DF	Date Analyzed		
2,4-Dinitrophenol	ND	0.13	1	01/02/2019 16:35		
2,4-Dinitrotoluene	ND	0.0063	1	01/02/2019 16:35		
2,6-Dinitrotoluene	ND	0.0025	1	01/02/2019 16:35		
Di-n-octyl Phthalate	ND	0.0050	1	01/02/2019 16:35		
1,2-Diphenylhydrazine	ND	0.25	1	01/02/2019 16:35		
Fluoranthene	0.0017	0.0013	1	01/02/2019 16:35		
Fluorene	ND	0.0025	1	01/02/2019 16:35		
Hexachlorobenzene	ND	0.0013	1	01/02/2019 16:35		
Hexachlorobutadiene	ND	0.0025	1	01/02/2019 16:35		
Hexachlorocyclopentadiene	ND	2.0	1	01/02/2019 16:35		
Hexachloroethane	ND	0.0025	1	01/02/2019 16:35		
Indeno (1,2,3-cd) pyrene	ND	0.0025	1	01/02/2019 16:35		
Isophorone	ND	0.25	1	01/02/2019 16:35		
2-Methylnaphthalene	ND	0.0025	1	01/02/2019 16:35		
2-Methylphenol (o-Cresol)	ND	0.50	1	01/02/2019 16:35		
3 & 4-Methylphenol (m,p-Cresol)	ND	0.25	1	01/02/2019 16:35		
Naphthalene	ND	0.0013	1	01/02/2019 16:35		
2-Nitroaniline	ND	1.2	1	01/02/2019 16:35		
3-Nitroaniline	ND	1.2	1	01/02/2019 16:35		
4-Nitroaniline	ND	1.2	1	01/02/2019 16:35		
Nitrobenzene	ND	0.25	1	01/02/2019 16:35		
2-Nitrophenol	ND	1.2	1	01/02/2019 16:35		
4-Nitrophenol	ND	1.2	1	01/02/2019 16:35		
N-Nitrosodiphenylamine	ND	0.25	1	01/02/2019 16:35		
N-Nitrosodi-n-propylamine	ND	0.25	1	01/02/2019 16:35		
Pentachlorophenol	ND	0.031	1	01/02/2019 16:35		
Phenanthrene	ND	0.0050	1	01/02/2019 16:35		
Phenol	ND	0.0050	1	01/02/2019 16:35		
Pyrene	ND	0.0025	1	01/02/2019 16:35		
Pyridine	ND	0.25	1	01/02/2019 16:35		
1,2,4-Trichlorobenzene	ND	0.25	1	01/02/2019 16:35		
2,4,5-Trichlorophenol	ND	0.0025	1	01/02/2019 16:35		
2,4,6-Trichlorophenol	ND	0.013	1	01/02/2019 16:35		

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Analytical Report

Client: Langan
Date Received: 12/28/18 12:45
Date Prepared: 12/29/18
Project: 750652601; 1051 Mission Road

WorkOrder: 1812D91
Extraction Method: SW3550B/3640A
Analytical Method: SW8270C
Unit: mg/Kg

Semi-Volatile Organics (Low Level) with GPC Cleanup

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
B1-E3-10'	1812D91-003A	Soil	12/18/2018	GC17 01021911.D	170678

Analytes	Result	RL	DF	Date Analyzed
<u>Surrogates</u>	<u>REC (%)</u>	<u>Limits</u>		
2-Fluorophenol	94	30-130		01/02/2019 16:35
Phenol-d5	92	30-130		01/02/2019 16:35
Nitrobenzene-d5	76	30-130		01/02/2019 16:35
2-Fluorobiphenyl	71	30-130		01/02/2019 16:35
2,4,6-Tribromophenol	52	16-130		01/02/2019 16:35
4-Terphenyl-d14	71	30-130		01/02/2019 16:35

Analyst(s): REB



Analytical Report

Client: Langan
Date Received: 12/28/18 12:45
Date Prepared: 12/29/18
Project: 750652601; 1051 Mission Road

WorkOrder: 1812D91
Extraction Method: SW3550B/3640A
Analytical Method: SW8270C
Unit: mg/Kg

Semi-Volatile Organics (Low Level) with GPC Cleanup

Client ID	Lab ID	Matrix	Date Collected		Instrument	Batch ID
B2-E1-2.5'	1812D91-005A	Soil	12/18/2018		GC17 01021918.D	170678
Analytes	Result		RL	DF	Date Analyzed	
Acenaphthene	ND		0.013	10	01/02/2019 19:44	
Acenaphthylene	ND		0.013	10	01/02/2019 19:44	
Acetochlor	ND		2.5	10	01/02/2019 19:44	
Anthracene	ND		0.013	10	01/02/2019 19:44	
Benzidine	ND		12	10	01/02/2019 19:44	
Benzo (a) anthracene	0.083		0.050	10	01/02/2019 19:44	
Benzo (a) pyrene	0.041		0.025	10	01/02/2019 19:44	
Benzo (b) fluoranthene	0.030		0.013	10	01/02/2019 19:44	
Benzo (g,h,i) perylene	0.076		0.025	10	01/02/2019 19:44	
Benzo (k) fluoranthene	0.017		0.013	10	01/02/2019 19:44	
Benzyl Alcohol	ND		12	10	01/02/2019 19:44	
1,1-Biphenyl	ND		0.13	10	01/02/2019 19:44	
Bis (2-chloroethoxy) Methane	ND		2.5	10	01/02/2019 19:44	
Bis (2-chloroethyl) Ether	ND		0.025	10	01/02/2019 19:44	
Bis (2-chloroisopropyl) Ether	ND		0.025	10	01/02/2019 19:44	
Bis (2-ethylhexyl) Adipate	ND		5.0	10	01/02/2019 19:44	
Bis (2-ethylhexyl) Phthalate	ND		0.050	10	01/02/2019 19:44	
4-Bromophenyl Phenyl Ether	ND		2.5	10	01/02/2019 19:44	
Butylbenzyl Phthalate	ND		0.25	10	01/02/2019 19:44	
4-Chloroaniline	ND		0.025	10	01/02/2019 19:44	
4-Chloro-3-methylphenol	ND		2.5	10	01/02/2019 19:44	
2-Chloronaphthalene	ND		2.5	10	01/02/2019 19:44	
2-Chlorophenol	ND		0.050	10	01/02/2019 19:44	
4-Chlorophenyl Phenyl Ether	ND		2.5	10	01/02/2019 19:44	
Chrysene	0.034		0.025	10	01/02/2019 19:44	
Dibenzo (a,h) anthracene	ND		0.025	10	01/02/2019 19:44	
Dibenzofuran	ND		2.5	10	01/02/2019 19:44	
Di-n-butyl Phthalate	0.030		0.025	10	01/02/2019 19:44	
1,2-Dichlorobenzene	ND		2.5	10	01/02/2019 19:44	
1,3-Dichlorobenzene	ND		2.5	10	01/02/2019 19:44	
1,4-Dichlorobenzene	ND		2.5	10	01/02/2019 19:44	
3,3-Dichlorobenzidine	ND		0.025	10	01/02/2019 19:44	
2,4-Dichlorophenol	ND		0.13	10	01/02/2019 19:44	
Diethyl Phthalate	ND		0.050	10	01/02/2019 19:44	
2,4-Dimethylphenol	ND		2.5	10	01/02/2019 19:44	
Dimethyl Phthalate	ND		0.025	10	01/02/2019 19:44	
4,6-Dinitro-2-methylphenol	ND		12	10	01/02/2019 19:44	

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Analytical Report

Client: Langan
Date Received: 12/28/18 12:45
Date Prepared: 12/29/18
Project: 750652601; 1051 Mission Road

WorkOrder: 1812D91
Extraction Method: SW3550B/3640A
Analytical Method: SW8270C
Unit: mg/Kg

Semi-Volatile Organics (Low Level) with GPC Cleanup

Client ID	Lab ID	Matrix	Date Collected		Instrument	Batch ID
B2-E1-2.5'	1812D91-005A	Soil	12/18/2018		GC17 01021918.D	170678
Analytes	Result		RL	DF	Date Analyzed	
2,4-Dinitrophenol	ND		1.3	10	01/02/2019 19:44	
2,4-Dinitrotoluene	ND		0.063	10	01/02/2019 19:44	
2,6-Dinitrotoluene	ND		0.025	10	01/02/2019 19:44	
Di-n-octyl Phthalate	ND		0.050	10	01/02/2019 19:44	
1,2-Diphenylhydrazine	ND		2.5	10	01/02/2019 19:44	
Fluoranthene	0.058		0.013	10	01/02/2019 19:44	
Fluorene	ND		0.025	10	01/02/2019 19:44	
Hexachlorobenzene	ND		0.013	10	01/02/2019 19:44	
Hexachlorobutadiene	ND		0.025	10	01/02/2019 19:44	
Hexachlorocyclopentadiene	ND		20	10	01/02/2019 19:44	
Hexachloroethane	ND		0.025	10	01/02/2019 19:44	
Indeno (1,2,3-cd) pyrene	0.033		0.025	10	01/02/2019 19:44	
Isophorone	ND		2.5	10	01/02/2019 19:44	
2-Methylnaphthalene	ND		0.025	10	01/02/2019 19:44	
2-Methylphenol (o-Cresol)	ND		5.0	10	01/02/2019 19:44	
3 & 4-Methylphenol (m,p-Cresol)	ND		2.5	10	01/02/2019 19:44	
Naphthalene	ND		0.013	10	01/02/2019 19:44	
2-Nitroaniline	ND		12	10	01/02/2019 19:44	
3-Nitroaniline	ND		12	10	01/02/2019 19:44	
4-Nitroaniline	ND		12	10	01/02/2019 19:44	
Nitrobenzene	ND		2.5	10	01/02/2019 19:44	
2-Nitrophenol	ND		12	10	01/02/2019 19:44	
4-Nitrophenol	ND		12	10	01/02/2019 19:44	
N-Nitrosodiphenylamine	ND		2.5	10	01/02/2019 19:44	
N-Nitrosodi-n-propylamine	ND		2.5	10	01/02/2019 19:44	
Pentachlorophenol	ND		0.31	10	01/02/2019 19:44	
Phenanthrene	ND		0.050	10	01/02/2019 19:44	
Phenol	ND		0.050	10	01/02/2019 19:44	
Pyrene	0.058		0.025	10	01/02/2019 19:44	
Pyridine	ND		2.5	10	01/02/2019 19:44	
1,2,4-Trichlorobenzene	ND		2.5	10	01/02/2019 19:44	
2,4,5-Trichlorophenol	ND		0.025	10	01/02/2019 19:44	
2,4,6-Trichlorophenol	ND		0.13	10	01/02/2019 19:44	

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Analytical Report

Client: Langan
Date Received: 12/28/18 12:45
Date Prepared: 12/29/18
Project: 750652601; 1051 Mission Road

WorkOrder: 1812D91
Extraction Method: SW3550B/3640A
Analytical Method: SW8270C
Unit: mg/Kg

Semi-Volatile Organics (Low Level) with GPC Cleanup

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
B2-E1-2.5'	1812D91-005A	Soil	12/18/2018	GC17 01021918.D	170678

Analytes	Result	RL	DF	Date Analyzed
<u>Surrogates</u>	<u>REC (%)</u>	<u>Limits</u>		
2-Fluorophenol	111	30-130		01/02/2019 19:44
Phenol-d5	92	30-130		01/02/2019 19:44
Nitrobenzene-d5	71	30-130		01/02/2019 19:44
2-Fluorobiphenyl	76	30-130		01/02/2019 19:44
2,4,6-Tribromophenol	81	16-130		01/02/2019 19:44
4-Terphenyl-d14	85	30-130		01/02/2019 19:44

Analyst(s): REB



Analytical Report

Client: Langan
Date Received: 12/28/18 12:45
Date Prepared: 12/29/18
Project: 750652601; 1051 Mission Road

WorkOrder: 1812D91
Extraction Method: SW3550B/3640A
Analytical Method: SW8270C
Unit: mg/Kg

Semi-Volatile Organics (Low Level) with GPC Cleanup

Client ID	Lab ID	Matrix	Date Collected		Instrument	Batch ID
B2-E3-7.5	1812D91-007A	Soil	12/18/2018		GC17 01021912.D	170678
<u>Analytes</u>	<u>Result</u>		<u>RL</u>	<u>DF</u>	<u>Date Analyzed</u>	
Acenaphthene	ND		0.0013	1	01/02/2019 17:02	
Acenaphthylene	ND		0.0013	1	01/02/2019 17:02	
Acetochlor	ND		0.25	1	01/02/2019 17:02	
Anthracene	ND		0.0013	1	01/02/2019 17:02	
Benzidine	ND		1.2	1	01/02/2019 17:02	
Benzo (a) anthracene	ND		0.0050	1	01/02/2019 17:02	
Benzo (a) pyrene	ND		0.0025	1	01/02/2019 17:02	
Benzo (b) fluoranthene	ND		0.0013	1	01/02/2019 17:02	
Benzo (g,h,i) perylene	ND		0.0025	1	01/02/2019 17:02	
Benzo (k) fluoranthene	ND		0.0013	1	01/02/2019 17:02	
Benzyl Alcohol	ND		1.2	1	01/02/2019 17:02	
1,1-Biphenyl	ND		0.013	1	01/02/2019 17:02	
Bis (2-chloroethoxy) Methane	ND		0.25	1	01/02/2019 17:02	
Bis (2-chloroethyl) Ether	ND		0.0025	1	01/02/2019 17:02	
Bis (2-chloroisopropyl) Ether	ND		0.0025	1	01/02/2019 17:02	
Bis (2-ethylhexyl) Adipate	ND		0.50	1	01/02/2019 17:02	
Bis (2-ethylhexyl) Phthalate	ND		0.0050	1	01/02/2019 17:02	
4-Bromophenyl Phenyl Ether	ND		0.25	1	01/02/2019 17:02	
Butylbenzyl Phthalate	ND		0.025	1	01/02/2019 17:02	
4-Chloroaniline	ND		0.0025	1	01/02/2019 17:02	
4-Chloro-3-methylphenol	ND		0.25	1	01/02/2019 17:02	
2-Chloronaphthalene	ND		0.25	1	01/02/2019 17:02	
2-Chlorophenol	ND		0.0050	1	01/02/2019 17:02	
4-Chlorophenyl Phenyl Ether	ND		0.25	1	01/02/2019 17:02	
Chrysene	ND		0.0025	1	01/02/2019 17:02	
Dibenzo (a,h) anthracene	ND		0.0025	1	01/02/2019 17:02	
Dibenzofuran	ND		0.25	1	01/02/2019 17:02	
Di-n-butyl Phthalate	0.0026		0.0025	1	01/02/2019 17:02	
1,2-Dichlorobenzene	ND		0.25	1	01/02/2019 17:02	
1,3-Dichlorobenzene	ND		0.25	1	01/02/2019 17:02	
1,4-Dichlorobenzene	ND		0.25	1	01/02/2019 17:02	
3,3-Dichlorobenzidine	ND		0.0025	1	01/02/2019 17:02	
2,4-Dichlorophenol	ND		0.013	1	01/02/2019 17:02	
Diethyl Phthalate	ND		0.0050	1	01/02/2019 17:02	
2,4-Dimethylphenol	ND		0.25	1	01/02/2019 17:02	
Dimethyl Phthalate	ND		0.0025	1	01/02/2019 17:02	
4,6-Dinitro-2-methylphenol	ND		1.2	1	01/02/2019 17:02	

(Cont.)



Analytical Report

Client: Langan
Date Received: 12/28/18 12:45
Date Prepared: 12/29/18
Project: 750652601; 1051 Mission Road

WorkOrder: 1812D91
Extraction Method: SW3550B/3640A
Analytical Method: SW8270C
Unit: mg/Kg

Semi-Volatile Organics (Low Level) with GPC Cleanup

Client ID	Lab ID	Matrix	Date Collected		Instrument	Batch ID
B2-E3-7.5	1812D91-007A	Soil	12/18/2018		GC17 01021912.D	170678
<u>Analytes</u>	<u>Result</u>		<u>RL</u>	<u>DF</u>	<u>Date Analyzed</u>	
2,4-Dinitrophenol	ND		0.13	1	01/02/2019 17:02	
2,4-Dinitrotoluene	ND		0.0063	1	01/02/2019 17:02	
2,6-Dinitrotoluene	ND		0.0025	1	01/02/2019 17:02	
Di-n-octyl Phthalate	ND		0.0050	1	01/02/2019 17:02	
1,2-Diphenylhydrazine	ND		0.25	1	01/02/2019 17:02	
Fluoranthene	ND		0.0013	1	01/02/2019 17:02	
Fluorene	ND		0.0025	1	01/02/2019 17:02	
Hexachlorobenzene	ND		0.0013	1	01/02/2019 17:02	
Hexachlorobutadiene	ND		0.0025	1	01/02/2019 17:02	
Hexachlorocyclopentadiene	ND		2.0	1	01/02/2019 17:02	
Hexachloroethane	ND		0.0025	1	01/02/2019 17:02	
Indeno (1,2,3-cd) pyrene	ND		0.0025	1	01/02/2019 17:02	
Isophorone	ND		0.25	1	01/02/2019 17:02	
2-Methylnaphthalene	ND		0.0025	1	01/02/2019 17:02	
2-Methylphenol (o-Cresol)	ND		0.50	1	01/02/2019 17:02	
3 & 4-Methylphenol (m,p-Cresol)	ND		0.25	1	01/02/2019 17:02	
Naphthalene	ND		0.0013	1	01/02/2019 17:02	
2-Nitroaniline	ND		1.2	1	01/02/2019 17:02	
3-Nitroaniline	ND		1.2	1	01/02/2019 17:02	
4-Nitroaniline	ND		1.2	1	01/02/2019 17:02	
Nitrobenzene	ND		0.25	1	01/02/2019 17:02	
2-Nitrophenol	ND		1.2	1	01/02/2019 17:02	
4-Nitrophenol	ND		1.2	1	01/02/2019 17:02	
N-Nitrosodiphenylamine	ND		0.25	1	01/02/2019 17:02	
N-Nitrosodi-n-propylamine	ND		0.25	1	01/02/2019 17:02	
Pentachlorophenol	ND		0.031	1	01/02/2019 17:02	
Phenanthrene	ND		0.0050	1	01/02/2019 17:02	
Phenol	ND		0.0050	1	01/02/2019 17:02	
Pyrene	ND		0.0025	1	01/02/2019 17:02	
Pyridine	ND		0.25	1	01/02/2019 17:02	
1,2,4-Trichlorobenzene	ND		0.25	1	01/02/2019 17:02	
2,4,5-Trichlorophenol	ND		0.0025	1	01/02/2019 17:02	
2,4,6-Trichlorophenol	ND		0.013	1	01/02/2019 17:02	

(Cont.)



Analytical Report

Client: Langan
Date Received: 12/28/18 12:45
Date Prepared: 12/29/18
Project: 750652601; 1051 Mission Road

WorkOrder: 1812D91
Extraction Method: SW3550B/3640A
Analytical Method: SW8270C
Unit: mg/Kg

Semi-Volatile Organics (Low Level) with GPC Cleanup

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
B2-E3-7.5	1812D91-007A	Soil	12/18/2018	GC17 01021912.D	170678

Analytes	Result	RL	DF	Date Analyzed
<u>Surrogates</u>	<u>REC (%)</u>	<u>Limits</u>		
2-Fluorophenol	100	30-130		01/02/2019 17:02
Phenol-d5	88	30-130		01/02/2019 17:02
Nitrobenzene-d5	68	30-130		01/02/2019 17:02
2-Fluorobiphenyl	73	30-130		01/02/2019 17:02
2,4,6-Tribromophenol	56	16-130		01/02/2019 17:02
4-Terphenyl-d14	65	30-130		01/02/2019 17:02

Analyst(s): REB



Analytical Report

Client: Langan
Date Received: 12/28/18 12:45
Date Prepared: 12/28/18
Project: 750652601; 1051 Mission Road

WorkOrder: 1812D91
Extraction Method: SW3050B
Analytical Method: SW6020
Unit: mg/Kg

CAM / CCR 17 Metals

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
B1-E1-2.5'	1812D91-001A	Soil	12/18/2018	ICP-MS1 056SMPL.D	170715

Analytes	Result	RL	DF	Date Analyzed
Antimony	ND	0.50	1	12/31/2018 18:04
Arsenic	3.3	0.50	1	12/31/2018 18:04
Barium	56	5.0	1	12/31/2018 18:04
Beryllium	ND	0.50	1	12/31/2018 18:04
Cadmium	ND	0.25	1	12/31/2018 18:04
Chromium	79	0.50	1	12/31/2018 18:04
Cobalt	5.5	0.50	1	12/31/2018 18:04
Copper	18	0.50	1	12/31/2018 18:04
Lead	3.6	0.50	1	12/31/2018 18:04
Mercury	0.052	0.050	1	12/31/2018 18:04
Molybdenum	ND	0.50	1	12/31/2018 18:04
Nickel	67	0.50	1	12/31/2018 18:04
Selenium	ND	0.50	1	12/31/2018 18:04
Silver	ND	0.50	1	12/31/2018 18:04
Thallium	ND	0.50	1	12/31/2018 18:04
Vanadium	47	0.50	1	12/31/2018 18:04
Zinc	23	5.0	1	12/31/2018 18:04

Surrogates	REC (%)	Limits	
Terbium	101	70-130	12/31/2018 18:04

Analyst(s): ND

(Cont.)



Analytical Report

Client: Langan
Date Received: 12/28/18 12:45
Date Prepared: 12/28/18
Project: 750652601; 1051 Mission Road

WorkOrder: 1812D91
Extraction Method: SW3050B
Analytical Method: SW6020
Unit: mg/Kg

CAM / CCR 17 Metals

Client ID	Lab ID	Matrix	Date Collected		Instrument	Batch ID
B1-E2-7.5'	1812D91-002A	Soil	12/18/2018		ICP-MS3 102SMPL.D	170715
<u>Analytes</u>	<u>Result</u>		<u>RL</u>	<u>DF</u>	<u>Date Analyzed</u>	
Antimony	ND		0.50	1	12/31/2018 19:23	
Arsenic	4.6		0.50	1	12/31/2018 19:23	
Barium	73		5.0	1	12/31/2018 19:23	
Beryllium	ND		0.50	1	12/31/2018 19:23	
Cadmium	ND		0.25	1	12/31/2018 19:23	
Chromium	50		0.50	1	12/31/2018 19:23	
Cobalt	6.3		0.50	1	12/31/2018 19:23	
Copper	11		0.50	1	12/31/2018 19:23	
Lead	9.5		0.50	1	12/31/2018 19:23	
Mercury	0.056		0.050	1	12/31/2018 19:23	
Molybdenum	0.52		0.50	1	12/31/2018 19:23	
Nickel	40		0.50	1	12/31/2018 19:23	
Selenium	ND		0.50	1	12/31/2018 19:23	
Silver	ND		0.50	1	12/31/2018 19:23	
Thallium	ND		0.50	1	12/31/2018 19:23	
Vanadium	37		0.50	1	12/31/2018 19:23	
Zinc	39		5.0	1	12/31/2018 19:23	

<u>Surrogates</u>	<u>REC (%)</u>	<u>Limits</u>	
Terbium	100	70-130	12/31/2018 19:23

Analyst(s): DB



Analytical Report

Client: Langan
Date Received: 12/28/18 12:45
Date Prepared: 12/28/18
Project: 750652601; 1051 Mission Road

WorkOrder: 1812D91
Extraction Method: SW3050B
Analytical Method: SW6020
Unit: mg/Kg

CAM / CCR 17 Metals

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
B1-E3-10'	1812D91-003A	Soil	12/18/2018	ICP-MS3 096SMPL.D	170715

Analytes	Result	RL	DF	Date Analyzed
Antimony	ND	0.50	1	12/31/2018 18:47
Arsenic	3.4	0.50	1	12/31/2018 18:47
Barium	66	5.0	1	12/31/2018 18:47
Beryllium	ND	0.50	1	12/31/2018 18:47
Cadmium	ND	0.25	1	12/31/2018 18:47
Chromium	43	0.50	1	12/31/2018 18:47
Cobalt	5.6	0.50	1	12/31/2018 18:47
Copper	8.5	0.50	1	12/31/2018 18:47
Lead	5.3	0.50	1	12/31/2018 18:47
Mercury	ND	0.050	1	12/31/2018 18:47
Molybdenum	ND	0.50	1	12/31/2018 18:47
Nickel	35	0.50	1	12/31/2018 18:47
Selenium	ND	0.50	1	12/31/2018 18:47
Silver	ND	0.50	1	12/31/2018 18:47
Thallium	ND	0.50	1	12/31/2018 18:47
Vanadium	32	0.50	1	12/31/2018 18:47
Zinc	29	5.0	1	12/31/2018 18:47

Surrogates	REC (%)	Limits	
Terbium	101	70-130	12/31/2018 18:47

Analyst(s): DB

(Cont.)



Analytical Report

Client: Langan
Date Received: 12/28/18 12:45
Date Prepared: 12/28/18
Project: 750652601; 1051 Mission Road

WorkOrder: 1812D91
Extraction Method: SW3050B
Analytical Method: SW6020
Unit: mg/Kg

CAM / CCR 17 Metals

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
B1-E4-12.5'	1812D91-004A	Soil	12/18/2018	ICP-MS1 057SMPL.D	170715

Analytes	Result	RL	DF	Date Analyzed
Antimony	ND	0.50	1	12/31/2018 18:10
Arsenic	4.7	0.50	1	12/31/2018 18:10
Barium	72	5.0	1	12/31/2018 18:10
Beryllium	ND	0.50	1	12/31/2018 18:10
Cadmium	ND	0.25	1	12/31/2018 18:10
Chromium	53	0.50	1	12/31/2018 18:10
Cobalt	6.7	0.50	1	12/31/2018 18:10
Copper	11	0.50	1	12/31/2018 18:10
Lead	5.7	0.50	1	12/31/2018 18:10
Mercury	0.053	0.050	1	12/31/2018 18:10
Molybdenum	0.69	0.50	1	12/31/2018 18:10
Nickel	40	0.50	1	12/31/2018 18:10
Selenium	ND	0.50	1	12/31/2018 18:10
Silver	ND	0.50	1	12/31/2018 18:10
Thallium	ND	0.50	1	12/31/2018 18:10
Vanadium	39	0.50	1	12/31/2018 18:10
Zinc	33	5.0	1	12/31/2018 18:10

Surrogates	REC (%)	Limits	
Terbium	103	70-130	12/31/2018 18:10

Analyst(s): ND

(Cont.)



Analytical Report

Client: Langan
Date Received: 12/28/18 12:45
Date Prepared: 12/28/18
Project: 750652601; 1051 Mission Road

WorkOrder: 1812D91
Extraction Method: SW3050B
Analytical Method: SW6020
Unit: mg/Kg

CAM / CCR 17 Metals

Client ID	Lab ID	Matrix	Date Collected		Instrument	Batch ID
B2-E1-2.5'	1812D91-005A	Soil	12/18/2018		ICP-MS1 058SMPL.D	170715
<u>Analytes</u>	<u>Result</u>		<u>RL</u>	<u>DF</u>	<u>Date Analyzed</u>	
Antimony	0.89		0.50	1	12/31/2018 18:16	
Arsenic	3.7		0.50	1	12/31/2018 18:16	
Barium	67		5.0	1	12/31/2018 18:16	
Beryllium	ND		0.50	1	12/31/2018 18:16	
Cadmium	ND		0.25	1	12/31/2018 18:16	
Chromium	49		0.50	1	12/31/2018 18:16	
Cobalt	9.1		0.50	1	12/31/2018 18:16	
Copper	19		0.50	1	12/31/2018 18:16	
Lead	14		0.50	1	12/31/2018 18:16	
Mercury	0.13		0.050	1	12/31/2018 18:16	
Molybdenum	ND		0.50	1	12/31/2018 18:16	
Nickel	80		0.50	1	12/31/2018 18:16	
Selenium	ND		0.50	1	12/31/2018 18:16	
Silver	ND		0.50	1	12/31/2018 18:16	
Thallium	ND		0.50	1	12/31/2018 18:16	
Vanadium	43		0.50	1	12/31/2018 18:16	
Zinc	41		5.0	1	12/31/2018 18:16	

<u>Surrogates</u>	<u>REC (%)</u>	<u>Limits</u>	
Terbium	99	70-130	12/31/2018 18:16

Analyst(s): ND



Analytical Report

Client: Langan
Date Received: 12/28/18 12:45
Date Prepared: 12/28/18
Project: 750652601; 1051 Mission Road

WorkOrder: 1812D91
Extraction Method: SW3050B
Analytical Method: SW6020
Unit: mg/Kg

CAM / CCR 17 Metals

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
B2-E2-5'	1812D91-006A	Soil	12/18/2018	ICP-MS1 059SMPL.D	170715

Analytes	Result	RL	DF	Date Analyzed
Antimony	ND	0.50	1	12/31/2018 18:23
Arsenic	1.6	0.50	1	12/31/2018 18:23
Barium	36	5.0	1	12/31/2018 18:23
Beryllium	ND	0.50	1	12/31/2018 18:23
Cadmium	ND	0.25	1	12/31/2018 18:23
Chromium	37	0.50	1	12/31/2018 18:23
Cobalt	10	0.50	1	12/31/2018 18:23
Copper	23	0.50	1	12/31/2018 18:23
Lead	8.9	0.50	1	12/31/2018 18:23
Mercury	ND	0.050	1	12/31/2018 18:23
Molybdenum	ND	0.50	1	12/31/2018 18:23
Nickel	25	0.50	1	12/31/2018 18:23
Selenium	ND	0.50	1	12/31/2018 18:23
Silver	ND	0.50	1	12/31/2018 18:23
Thallium	ND	0.50	1	12/31/2018 18:23
Vanadium	60	0.50	1	12/31/2018 18:23
Zinc	40	5.0	1	12/31/2018 18:23

Surrogates	REC (%)	Limits	
Terbium	101	70-130	12/31/2018 18:23

Analyst(s): ND

(Cont.)



Analytical Report

Client: Langan
Date Received: 12/28/18 12:45
Date Prepared: 12/28/18
Project: 750652601; 1051 Mission Road

WorkOrder: 1812D91
Extraction Method: SW3050B
Analytical Method: SW6020
Unit: mg/Kg

CAM / CCR 17 Metals

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
B2-E3-7.5	1812D91-007A	Soil	12/18/2018	ICP-MS3 038SMPL.D	170719

Analytes	Result	RL	DF	Date Analyzed
Antimony	ND	0.50	1	12/31/2018 12:52
Arsenic	1.3	0.50	1	12/31/2018 12:52
Barium	22	5.0	1	12/31/2018 12:52
Beryllium	ND	0.50	1	12/31/2018 12:52
Cadmium	ND	0.25	1	12/31/2018 12:52
Chromium	20	0.50	1	12/31/2018 12:52
Cobalt	2.1	0.50	1	12/31/2018 12:52
Copper	2.9	0.50	1	12/31/2018 12:52
Lead	1.8	0.50	1	12/31/2018 12:52
Mercury	ND	0.050	1	12/31/2018 12:52
Molybdenum	ND	0.50	1	12/31/2018 12:52
Nickel	13	0.50	1	12/31/2018 12:52
Selenium	ND	0.50	1	12/31/2018 12:52
Silver	ND	0.50	1	12/31/2018 12:52
Thallium	ND	0.50	1	12/31/2018 12:52
Vanadium	16	0.50	1	12/31/2018 12:52
Zinc	18	5.0	1	12/31/2018 12:52

Surrogates	REC (%)	Limits	
Terbium	101	70-130	12/31/2018 12:52

Analyst(s): ND

(Cont.)



Analytical Report

Client: Langan
Date Received: 12/28/18 12:45
Date Prepared: 12/28/18
Project: 750652601; 1051 Mission Road

WorkOrder: 1812D91
Extraction Method: SW3050B
Analytical Method: SW6020
Unit: mg/Kg

CAM / CCR 17 Metals

Client ID	Lab ID	Matrix	Date Collected		Instrument	Batch ID
B2-E4-10'	1812D91-008A	Soil	12/18/2018		ICP-MS1 060SMPL.D	170719
<u>Analytes</u>	<u>Result</u>		<u>RL</u>	<u>DF</u>	<u>Date Analyzed</u>	
Antimony	ND		0.50	1	12/31/2018 18:29	
Arsenic	1.3		0.50	1	12/31/2018 18:29	
Barium	19		5.0	1	12/31/2018 18:29	
Beryllium	ND		0.50	1	12/31/2018 18:29	
Cadmium	ND		0.25	1	12/31/2018 18:29	
Chromium	19		0.50	1	12/31/2018 18:29	
Cobalt	1.7		0.50	1	12/31/2018 18:29	
Copper	2.5		0.50	1	12/31/2018 18:29	
Lead	1.5		0.50	1	12/31/2018 18:29	
Mercury	ND		0.050	1	12/31/2018 18:29	
Molybdenum	ND		0.50	1	12/31/2018 18:29	
Nickel	13		0.50	1	12/31/2018 18:29	
Selenium	ND		0.50	1	12/31/2018 18:29	
Silver	ND		0.50	1	12/31/2018 18:29	
Thallium	ND		0.50	1	12/31/2018 18:29	
Vanadium	14		0.50	1	12/31/2018 18:29	
Zinc	11		5.0	1	12/31/2018 18:29	

<u>Surrogates</u>	<u>REC (%)</u>	<u>Limits</u>	
Terbium	103	70-130	12/31/2018 18:29

Analyst(s): ND



Analytical Report

Client: Langan
Date Received: 12/28/18 12:45
Date Prepared: 12/31/18
Project: 750652601; 1051 Mission Road

WorkOrder: 1812D91
Extraction Method: CARB 435 Asbestos
Analytical Method: 435 CARB
Unit: %

Asbestos (CARB 435) 400 Point Count

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
B1-E3-10'	1812D91-003A	Soil	12/18/2018	WetChem	170772

<u>Analytes</u>	<u>Result</u>	<u>RL</u>	<u>DF</u>	<u>Date Analyzed</u>
Asbestos	ND	NA	1	12/31/2018 14:30

Analyst(s): DA

Analytical Comments: k10

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
B2-E3-7.5	1812D91-007A	Soil	12/18/2018	WetChem	170772

<u>Analytes</u>	<u>Result</u>	<u>RL</u>	<u>DF</u>	<u>Date Analyzed</u>
Asbestos	ND	NA	1	12/31/2018 14:45

Analyst(s): DA

Analytical Comments: k10



Analytical Report

Client: Langan
Date Received: 12/28/18 12:45
Date Prepared: 12/28/18
Project: 750652601; 1051 Mission Road

WorkOrder: 1812D91
Extraction Method: SW5030B
Analytical Method: SW8021B/8015Bm
Unit: mg/Kg

Gasoline Range (C6-C12) Volatile Hydrocarbons as Gasoline with BTEX and MTBE

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
B1-E1-2.5'	1812D91-001A	Soil	12/18/2018	GC19 12281833.D	170703

Analytes	Result	RL	DF	Date Analyzed
TPH(g) (C6-C12)	ND	1.0	1	12/29/2018 03:22
MTBE	---	0.050	1	12/29/2018 03:22
Benzene	---	0.0050	1	12/29/2018 03:22
Toluene	---	0.0050	1	12/29/2018 03:22
Ethylbenzene	---	0.0050	1	12/29/2018 03:22
m,p-Xylene	---	0.010	1	12/29/2018 03:22
o-Xylene	---	0.0050	1	12/29/2018 03:22
Xylenes	---	0.0050	1	12/29/2018 03:22

Surrogates	REC (%)	Limits	
2-Fluorotoluene	85	62-126	12/29/2018 03:22

Analyst(s): IA

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
B1-E2-7.5'	1812D91-002A	Soil	12/18/2018	GC19 12281834.D	170703

Analytes	Result	RL	DF	Date Analyzed
TPH(g) (C6-C12)	ND	1.0	1	12/29/2018 03:52
MTBE	---	0.050	1	12/29/2018 03:52
Benzene	---	0.0050	1	12/29/2018 03:52
Toluene	---	0.0050	1	12/29/2018 03:52
Ethylbenzene	---	0.0050	1	12/29/2018 03:52
m,p-Xylene	---	0.010	1	12/29/2018 03:52
o-Xylene	---	0.0050	1	12/29/2018 03:52
Xylenes	---	0.0050	1	12/29/2018 03:52

Surrogates	REC (%)	Limits	
2-Fluorotoluene	74	62-126	12/29/2018 03:52

Analyst(s): IA

(Cont.)



Analytical Report

Client: Langan
Date Received: 12/28/18 12:45
Date Prepared: 12/28/18
Project: 750652601; 1051 Mission Road

WorkOrder: 1812D91
Extraction Method: SW5030B
Analytical Method: SW8021B/8015Bm
Unit: mg/Kg

Gasoline Range (C6-C12) Volatile Hydrocarbons as Gasoline with BTEX and MTBE

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
B1-E3-10'	1812D91-003A	Soil	12/18/2018	GC19 12281835.D	170703

Analytes	Result	RL	DF	Date Analyzed
TPH(g) (C6-C12)	ND	1.0	1	12/29/2018 04:22
MTBE	---	0.050	1	12/29/2018 04:22
Benzene	---	0.0050	1	12/29/2018 04:22
Toluene	---	0.0050	1	12/29/2018 04:22
Ethylbenzene	---	0.0050	1	12/29/2018 04:22
m,p-Xylene	---	0.010	1	12/29/2018 04:22
o-Xylene	---	0.0050	1	12/29/2018 04:22
Xylenes	---	0.0050	1	12/29/2018 04:22

Surrogates	REC (%)	Limits	
2-Fluorotoluene	76	62-126	12/29/2018 04:22

Analyst(s): IA

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
B1-E4-12.5'	1812D91-004A	Soil	12/18/2018	GC19 12281836.D	170703

Analytes	Result	RL	DF	Date Analyzed
TPH(g) (C6-C12)	ND	1.0	1	12/29/2018 04:52
MTBE	---	0.050	1	12/29/2018 04:52
Benzene	---	0.0050	1	12/29/2018 04:52
Toluene	---	0.0050	1	12/29/2018 04:52
Ethylbenzene	---	0.0050	1	12/29/2018 04:52
m,p-Xylene	---	0.010	1	12/29/2018 04:52
o-Xylene	---	0.0050	1	12/29/2018 04:52
Xylenes	---	0.0050	1	12/29/2018 04:52

Surrogates	REC (%)	Limits	
2-Fluorotoluene	74	62-126	12/29/2018 04:52

Analyst(s): IA

(Cont.)



Analytical Report

Client: Langan
Date Received: 12/28/18 12:45
Date Prepared: 12/28/18
Project: 750652601; 1051 Mission Road

WorkOrder: 1812D91
Extraction Method: SW5030B
Analytical Method: SW8021B/8015Bm
Unit: mg/Kg

Gasoline Range (C6-C12) Volatile Hydrocarbons as Gasoline with BTEX and MTBE

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
B2-E1-2.5'	1812D91-005A	Soil	12/18/2018	GC19 12281837.D	170703

Analytes	Result	RL	DF	Date Analyzed
TPH(g) (C6-C12)	34	1.0	1	12/29/2018 05:22
MTBE	---	0.050	1	12/29/2018 05:22
Benzene	---	0.0050	1	12/29/2018 05:22
Toluene	---	0.0050	1	12/29/2018 05:22
Ethylbenzene	---	0.0050	1	12/29/2018 05:22
m,p-Xylene	---	0.010	1	12/29/2018 05:22
o-Xylene	---	0.0050	1	12/29/2018 05:22
Xylenes	---	0.0050	1	12/29/2018 05:22

Surrogates	REC (%)	Limits	
2-Fluorotoluene	77	62-126	12/29/2018 05:22

Analyst(s): IA Analytical Comments: d7

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
B2-E2-5'	1812D91-006A	Soil	12/18/2018	GC19 12281838.D	170703

Analytes	Result	RL	DF	Date Analyzed
TPH(g) (C6-C12)	4.9	1.0	1	12/29/2018 05:52
MTBE	---	0.050	1	12/29/2018 05:52
Benzene	---	0.0050	1	12/29/2018 05:52
Toluene	---	0.0050	1	12/29/2018 05:52
Ethylbenzene	---	0.0050	1	12/29/2018 05:52
m,p-Xylene	---	0.010	1	12/29/2018 05:52
o-Xylene	---	0.0050	1	12/29/2018 05:52
Xylenes	---	0.0050	1	12/29/2018 05:52

Surrogates	REC (%)	Limits	
2-Fluorotoluene	86	62-126	12/29/2018 05:52

Analyst(s): IA Analytical Comments: d7

(Cont.)



Analytical Report

Client: Langan
Date Received: 12/28/18 12:45
Date Prepared: 12/28/18
Project: 750652601; 1051 Mission Road

WorkOrder: 1812D91
Extraction Method: SW5030B
Analytical Method: SW8021B/8015Bm
Unit: mg/Kg

Gasoline Range (C6-C12) Volatile Hydrocarbons as Gasoline with BTEX and MTBE

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
B2-E3-7.5	1812D91-007A	Soil	12/18/2018	GC19 12281839.D	170703

Analytes	Result	RL	DF	Date Analyzed
TPH(g) (C6-C12)	2.8	1.0	1	12/29/2018 06:22
MTBE	---	0.050	1	12/29/2018 06:22
Benzene	---	0.0050	1	12/29/2018 06:22
Toluene	---	0.0050	1	12/29/2018 06:22
Ethylbenzene	---	0.0050	1	12/29/2018 06:22
m,p-Xylene	---	0.010	1	12/29/2018 06:22
o-Xylene	---	0.0050	1	12/29/2018 06:22
Xylenes	---	0.0050	1	12/29/2018 06:22

Surrogates	REC (%)	Limits	
2-Fluorotoluene	86	62-126	12/29/2018 06:22

Analyst(s): IA Analytical Comments: d7

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
B2-E4-10'	1812D91-008A	Soil	12/18/2018	GC19 12281843.D	170721

Analytes	Result	RL	DF	Date Analyzed
TPH(g) (C6-C12)	ND	1.0	1	12/29/2018 08:21
MTBE	---	0.050	1	12/29/2018 08:21
Benzene	---	0.0050	1	12/29/2018 08:21
Toluene	---	0.0050	1	12/29/2018 08:21
Ethylbenzene	---	0.0050	1	12/29/2018 08:21
m,p-Xylene	---	0.010	1	12/29/2018 08:21
o-Xylene	---	0.0050	1	12/29/2018 08:21
Xylenes	---	0.0050	1	12/29/2018 08:21

Surrogates	REC (%)	Limits	
2-Fluorotoluene	85	62-126	12/29/2018 08:21

Analyst(s): IA



Analytical Report

Client: Langan
Date Received: 12/28/18 12:45
Date Prepared: 12/28/18-12/31/18
Project: 750652601; 1051 Mission Road

WorkOrder: 1812D91
Extraction Method: SW3550B
Analytical Method: SW8015B
Unit: mg/Kg

Total Extractable Petroleum Hydrocarbons w/out SG Clean-Up

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
B1-E1-2.5'	1812D91-001A	Soil	12/18/2018	GC39A 12281884.D	170714

Analytes	Result	RL	DF	Date Analyzed
TPH-Diesel (C10-C23)	ND	1.0	1	12/29/2018 19:01
TPH-Motor Oil (C18-C36)	ND	5.0	1	12/29/2018 19:01

Surrogates	REC (%)	Limits	
C9	90	74-123	12/29/2018 19:01

Analyst(s): JIS

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
B1-E2-7.5'	1812D91-002A	Soil	12/18/2018	GC6B 12311851.D	170759

Analytes	Result	RL	DF	Date Analyzed
TPH-Diesel (C10-C23)	ND	1.0	1	01/01/2019 00:28
TPH-Motor Oil (C18-C36)	ND	5.0	1	01/01/2019 00:28

Surrogates	REC (%)	Limits	
C9	97	74-123	01/01/2019 00:28

Analyst(s): JIS

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
B1-E3-10'	1812D91-003A	Soil	12/18/2018	GC6B 12311855.D	170759

Analytes	Result	RL	DF	Date Analyzed
TPH-Diesel (C10-C23)	ND	1.0	1	01/01/2019 01:46
TPH-Motor Oil (C18-C36)	ND	5.0	1	01/01/2019 01:46

Surrogates	REC (%)	Limits	
C9	96	74-123	01/01/2019 01:46

Analyst(s): JIS

(Cont.)



Analytical Report

Client: Langan
Date Received: 12/28/18 12:45
Date Prepared: 12/28/18-12/31/18
Project: 750652601; 1051 Mission Road

WorkOrder: 1812D91
Extraction Method: SW3550B
Analytical Method: SW8015B
Unit: mg/Kg

Total Extractable Petroleum Hydrocarbons w/out SG Clean-Up

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
B1-E4-12.5'	1812D91-004A	Soil	12/18/2018	GC6B 12311859.D	170759

Analytes	Result	RL	DF	Date Analyzed
TPH-Diesel (C10-C23)	ND	1.0	1	01/01/2019 03:04
TPH-Motor Oil (C18-C36)	ND	5.0	1	01/01/2019 03:04

Surrogates	REC (%)	Limits	
C9	95	74-123	01/01/2019 03:04

Analyst(s): JIS

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
B2-E1-2.5'	1812D91-005A	Soil	12/18/2018	GC11B 12311831.D	170714

Analytes	Result	RL	DF	Date Analyzed
TPH-Diesel (C10-C23)	240	20	20	12/31/2018 17:55
TPH-Motor Oil (C18-C36)	810	100	20	12/31/2018 17:55

Surrogates	REC (%)	Limits	
C9	109	74-123	12/31/2018 17:55

Analyst(s): JIS

Analytical Comments: e7,e2,e8

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
B2-E2-5'	1812D91-006A	Soil	12/18/2018	GC6B 12281865.D	170714

Analytes	Result	RL	DF	Date Analyzed
TPH-Diesel (C10-C23)	10	1.0	1	12/29/2018 14:02
TPH-Motor Oil (C18-C36)	21	5.0	1	12/29/2018 14:02

Surrogates	REC (%)	Limits	
C9	96	74-123	12/29/2018 14:02

Analyst(s): JIS

Analytical Comments: e7,e2,e8

(Cont.)



Analytical Report

Client: Langan
Date Received: 12/28/18 12:45
Date Prepared: 12/28/18-12/31/18
Project: 750652601; 1051 Mission Road

WorkOrder: 1812D91
Extraction Method: SW3550B
Analytical Method: SW8015B
Unit: mg/Kg

Total Extractable Petroleum Hydrocarbons w/out SG Clean-Up

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
B2-E3-7.5	1812D91-007A	Soil	12/18/2018	GC6B 12281869.D	170714

Analytes	Result	RL	DF	Date Analyzed
TPH-Diesel (C10-C23)	3.5	1.0	1	12/29/2018 15:20
TPH-Motor Oil (C18-C36)	7.7	5.0	1	12/29/2018 15:20

Surrogates	REC (%)	Limits	
C9	95	74-123	12/29/2018 15:20

Analyst(s): JIS

Analytical Comments: e7,e2,e8

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
B2-E4-10'	1812D91-008A	Soil	12/18/2018	GC6B 12311863.D	170759

Analytes	Result	RL	DF	Date Analyzed
TPH-Diesel (C10-C23)	6.5	1.0	1	01/01/2019 04:22
TPH-Motor Oil (C18-C36)	9.5	5.0	1	01/01/2019 04:22

Surrogates	REC (%)	Limits	
C9	96	74-123	01/01/2019 04:22

Analyst(s): JIS

Analytical Comments: e7,e2/e8



Quality Control Report

Client: Langan

Date Prepared: 1/3/19

Date Analyzed: 1/4/19

Instrument: GC20

Matrix: Soil

Project: 750652601; 1051 Mission Road

WorkOrder: 1812D91

BatchID: 170895

Extraction Method: SW3550B/3640Am/3630Cm

Analytical Method: SW8081A/8082

Unit: mg/kg

Sample ID: MB/LCS/LCSD-170895

QC Summary Report for SW8081A/8082

Analyte	MB Result	RL	SPK Val	MB SS %REC	MB SS Limits
Aldrin	ND	0.00010	-	-	-
a-BHC	ND	0.00010	-	-	-
b-BHC	ND	0.00030	-	-	-
d-BHC	ND	0.00020	-	-	-
g-BHC	ND	0.00010	-	-	-
Chlordane (Technical)	ND	0.0025	-	-	-
a-Chlordane	ND	0.00010	-	-	-
g-Chlordane	ND	0.00010	-	-	-
p,p-DDD	ND	0.00010	-	-	-
p,p-DDE	ND	0.00010	-	-	-
p,p-DDT	ND	0.00010	-	-	-
Dieldrin	ND	0.00010	-	-	-
Endosulfan I	ND	0.00010	-	-	-
Endosulfan II	ND	0.00010	-	-	-
Endosulfan sulfate	ND	0.00010	-	-	-
Endrin	ND	0.00010	-	-	-
Endrin aldehyde	ND	0.00010	-	-	-
Endrin ketone	ND	0.00010	-	-	-
Heptachlor	ND	0.00010	-	-	-
Heptachlor epoxide	ND	0.00010	-	-	-
Hexachlorobenzene	ND	0.0010	-	-	-
Hexachlorocyclopentadiene	ND	0.0020	-	-	-
Methoxychlor	ND	0.00020	-	-	-
Toxaphene	ND	0.0050	-	-	-
Aroclor1016	ND	0.0050	-	-	-
Aroclor1221	ND	0.0050	-	-	-
Aroclor1232	ND	0.0050	-	-	-
Aroclor1242	ND	0.0050	-	-	-
Aroclor1248	ND	0.0050	-	-	-
Aroclor1254	ND	0.0050	-	-	-
Aroclor1260	ND	0.0050	-	-	-
PCBs, total	ND	0.0050	-	-	-
Surrogate Recovery					
Decachlorobiphenyl	0.0060		0.0050	120	28-170

(Cont.)



Quality Control Report

Client: Langan

Date Prepared: 1/3/19

Date Analyzed: 1/4/19

Instrument: GC20

Matrix: Soil

Project: 750652601; 1051 Mission Road

WorkOrder: 1812D91

BatchID: 170895

Extraction Method: SW3550B/3640Am/3630Cm

Analytical Method: SW8081A/8082

Unit: mg/kg

Sample ID: MB/LCS/LCSD-170895

QC Summary Report for SW8081A/8082

Analyte	LCS Result	LCSD Result	SPK Val	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Limit
Aldrin	0.0059	0.0059	0.0050	118	118	31-155	0	20
a-BHC	0.0057	0.0058	0.0050	114	115	32-160	0.669	20
b-BHC	0.0054	0.0055	0.0050	108	110	44-149	1.60	20
d-BHC	0.0061	0.0062	0.0050	122	124	37-157	1.65	20
g-BHC	0.0057	0.0058	0.0050	115	115	43-154	0	20
a-Chlordane	0.0057	0.0058	0.0050	113	115	39-150	1.72	20
g-Chlordane	0.0058	0.0059	0.0050	116	118	39-151	1.69	20
p,p-DDD	0.0048	0.0050	0.0050	97	100	30-158	2.84	20
p,p-DDE	0.0060	0.0061	0.0050	120	123	47-149	1.95	20
p,p-DDT	0.0056	0.0056	0.0050	111	112	56-166	0.282	20
Dieldrin	0.0064	0.0065	0.0050	128	131	50-163	1.92	20
Endosulfan I	0.0056	0.0057	0.0050	112	114	45-159	1.78	20
Endosulfan II	0.0055	0.0056	0.0050	109	112	41-155	2.22	20
Endosulfan sulfate	0.0062	0.0063	0.0050	123	125	45-156	1.84	20
Endrin	0.0062	0.0063	0.0050	123	125	54-154	1.60	20
Endrin aldehyde	0.0046	0.0047	0.0050	93	95	27-159	2.25	20
Endrin ketone	0.0056	0.0057	0.0050	112	114	40-147	2.11	20
Heptachlor	0.0058	0.0058	0.0050	115	115	52-165	0	20
Heptachlor epoxide	0.0054	0.0055	0.0050	108	109	46-145	1.24	20
Hexachlorobenzene	0.0049	0.0050	0.0050	99	99	22-156	0	20
Hexachlorocyclopentadiene	0.0056	0.0054	0.0050	113	108	43-173	4.41	20
Methoxychlor	0.0055	0.0055	0.0050	110	109	49-150	0.348	20
Aroclor1016	0.016	0.016	0.015	104	104	49-120	0	20
Aroclor1260	0.016	0.016	0.015	105	106	48-160	1.47	20
Surrogate Recovery								
Decachlorobiphenyl	0.0059	0.0059	0.0050	119	119	28-170	0	20



Quality Control Report

Client: Langan
Date Prepared: 12/28/18
Date Analyzed: 1/2/19 - 1/7/19
Instrument: GC23
Matrix: Soil
Project: 750652601; 1051 Mission Road

WorkOrder: 1812D91
BatchID: 170723
Extraction Method: SW3550B
Analytical Method: SW8082
Unit: mg/kg
Sample ID: MB/LCS/LCSD-170723
1812D91-002AMS/MSD

QC Summary Report for SW8082

Analyte	MB Result	MDL	RL	SPK Val	MB SS %REC	MB SS Limits
Aroclor1016	ND	0.0051	0.050	-	-	-
Aroclor1221	ND	0.011	0.050	-	-	-
Aroclor1232	ND	0.0063	0.050	-	-	-
Aroclor1242	ND	0.0067	0.050	-	-	-
Aroclor1248	ND	0.0040	0.050	-	-	-
Aroclor1254	ND	0.0068	0.050	-	-	-
Aroclor1260	ND	0.0061	0.050	-	-	-
PCBs, total	ND	N/A	0.050	-	-	-

Surrogate Recovery

Decachlorobiphenyl	0.43	0.050	860	75-136
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Analyte	LCS Result	LCSD Result	SPK Val	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Limit
Aroclor1016	0.14	0.15	0.15	95	98	90-125	2.66	20
Aroclor1260	0.14	0.14	0.15	95	96	77-122	0.379	20

Surrogate Recovery

Decachlorobiphenyl	0.058	0.055	0.050	117	110	75-136	6.16	20
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Analyte	MS DF	MS Result	MSD Result	SPK Val	SPKRef Val	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD Limit
Aroclor1016	1	0.14	0.14	0.15	ND	95	96	55-174	1.59	20
Aroclor1260	1	0.13	0.14	0.15	ND	87	93	41-170	7.15	20

Surrogate Recovery

Decachlorobiphenyl	1	0.054	0.053	0.050		109	106	69-143	2.14	20
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Quality Control Report

Client: Langan
Date Prepared: 12/28/18
Date Analyzed: 12/29/18
Instrument: GC38
Matrix: Soil
Project: 750652601; 1051 Mission Road

WorkOrder: 1812D91
BatchID: 170722
Extraction Method: SW5030B
Analytical Method: SW8260B
Unit: mg/kg
Sample ID: MB/LCS/LCSD-170722
1812D91-001AMS/MSD

QC Summary Report for SW8260B

Analyte	MB Result	RL	SPK Val	MB SS %REC	MB SS Limits
Acetone	ND	0.10	-	-	-
tert-Amyl methyl ether (TAME)	ND	0.0050	-	-	-
Benzene	ND	0.0050	-	-	-
Bromobenzene	ND	0.0050	-	-	-
Bromochloromethane	ND	0.0050	-	-	-
Bromodichloromethane	ND	0.0010	-	-	-
Bromoform	ND	0.0050	-	-	-
Bromomethane	ND	0.0050	-	-	-
2-Butanone (MEK)	ND	0.020	-	-	-
t-Butyl alcohol (TBA)	ND	0.050	-	-	-
n-Butyl benzene	ND	0.0050	-	-	-
sec-Butyl benzene	ND	0.0050	-	-	-
tert-Butyl benzene	ND	0.0050	-	-	-
Carbon Disulfide	ND	0.0050	-	-	-
Carbon Tetrachloride	ND	0.0050	-	-	-
Chlorobenzene	ND	0.0050	-	-	-
Chloroethane	ND	0.0050	-	-	-
Chloroform	ND	0.0050	-	-	-
Chloromethane	ND	0.0050	-	-	-
2-Chlorotoluene	ND	0.0050	-	-	-
4-Chlorotoluene	ND	0.0050	-	-	-
Dibromochloromethane	ND	0.0050	-	-	-
1,2-Dibromo-3-chloropropane	ND	0.00025	-	-	-
1,2-Dibromoethane (EDB)	ND	0.00010	-	-	-
Dibromomethane	ND	0.0050	-	-	-
1,2-Dichlorobenzene	ND	0.0050	-	-	-
1,3-Dichlorobenzene	ND	0.0050	-	-	-
1,4-Dichlorobenzene	ND	0.0050	-	-	-
Dichlorodifluoromethane	ND	0.0050	-	-	-
1,1-Dichloroethane	ND	0.0050	-	-	-
1,2-Dichloroethane (1,2-DCA)	ND	0.00025	-	-	-
1,1-Dichloroethene	ND	0.00025	-	-	-
cis-1,2-Dichloroethene	ND	0.0050	-	-	-
trans-1,2-Dichloroethene	ND	0.0050	-	-	-
1,2-Dichloropropane	ND	0.0050	-	-	-
1,3-Dichloropropane	ND	0.0050	-	-	-
2,2-Dichloropropane	ND	0.0050	-	-	-
1,1-Dichloropropene	ND	0.0050	-	-	-

(Cont.)



Quality Control Report

Client: Langan
Date Prepared: 12/28/18
Date Analyzed: 12/29/18
Instrument: GC38
Matrix: Soil
Project: 750652601; 1051 Mission Road

WorkOrder: 1812D91
BatchID: 170722
Extraction Method: SW5030B
Analytical Method: SW8260B
Unit: mg/kg
Sample ID: MB/LCS/LCSD-170722
1812D91-001AMS/MSD

QC Summary Report for SW8260B

Analyte	MB Result	RL	SPK Val	MB SS %REC	MB SS Limits
cis-1,3-Dichloropropene	ND	0.0050	-	-	-
trans-1,3-Dichloropropene	ND	0.0050	-	-	-
Diisopropyl ether (DIPE)	ND	0.0050	-	-	-
Ethylbenzene	ND	0.0050	-	-	-
Ethyl tert-butyl ether (ETBE)	ND	0.0050	-	-	-
Freon 113	ND	0.0050	-	-	-
Hexachlorobutadiene	ND	0.0050	-	-	-
Hexachloroethane	ND	0.0050	-	-	-
2-Hexanone	ND	0.0050	-	-	-
Isopropylbenzene	ND	0.0050	-	-	-
4-Isopropyl toluene	ND	0.0050	-	-	-
Methyl-t-butyl ether (MTBE)	ND	0.0050	-	-	-
Methylene chloride	ND	0.010	-	-	-
4-Methyl-2-pentanone (MIBK)	ND	0.0050	-	-	-
Naphthalene	ND	0.0050	-	-	-
n-Propyl benzene	ND	0.0050	-	-	-
Styrene	ND	0.0050	-	-	-
1,1,1,2-Tetrachloroethane	ND	0.0050	-	-	-
1,1,2,2-Tetrachloroethane	ND	0.00025	-	-	-
Tetrachloroethene	ND	0.00025	-	-	-
Toluene	ND	0.0050	-	-	-
1,2,3-Trichlorobenzene	ND	0.0050	-	-	-
1,2,4-Trichlorobenzene	ND	0.0050	-	-	-
1,1,1-Trichloroethane	ND	0.0050	-	-	-
1,1,2-Trichloroethane	ND	0.0050	-	-	-
Trichloroethene	ND	0.0050	-	-	-
Trichlorofluoromethane	ND	0.0050	-	-	-
1,2,3-Trichloropropane	ND	0.00025	-	-	-
1,2,4-Trimethylbenzene	ND	0.0050	-	-	-
1,3,5-Trimethylbenzene	ND	0.0050	-	-	-
Vinyl Chloride	ND	0.00025	-	-	-
m,p-Xylene	ND	0.0050	-	-	-
o-Xylene	ND	0.0050	-	-	-
Xylenes, Total	ND	0.0050	-	-	-

(Cont.)



Quality Control Report

Client: Langan
Date Prepared: 12/28/18
Date Analyzed: 12/29/18
Instrument: GC38
Matrix: Soil
Project: 750652601; 1051 Mission Road

WorkOrder: 1812D91
BatchID: 170722
Extraction Method: SW5030B
Analytical Method: SW8260B
Unit: mg/kg
Sample ID: MB/LCS/LCSD-170722
1812D91-001AMS/MSD

QC Summary Report for SW8260B

Analyte	MB Result	RL	SPK Val	MB SS %REC	MB SS Limits
Surrogate Recovery					
Dibromofluoromethane	0.13		0.12	101	87-127
Toluene-d8	0.13		0.12	101	93-141
4-BFB	0.011		0.012	90	84-137
Benzene-d6	0.12		0.10	115	67-131
Ethylbenzene-d10	0.12		0.10	120	78-153
1,2-DCB-d4	0.090		0.10	90	63-109



Quality Control Report

Client: Langan
Date Prepared: 12/28/18
Date Analyzed: 12/29/18
Instrument: GC38
Matrix: Soil
Project: 750652601; 1051 Mission Road

WorkOrder: 1812D91
BatchID: 170722
Extraction Method: SW5030B
Analytical Method: SW8260B
Unit: mg/kg
Sample ID: MB/LCS/LCSD-170722
1812D91-001AMS/MSD

QC Summary Report for SW8260B

Analyte	LCS Result	LCSD Result	SPK Val	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Limit
Acetone	0.18	0.18	0.20	92	92	48-156	0	30
tert-Amyl methyl ether (TAME)	0.0057	0.0060	0.010	57	60	56-115	5.15	30
Benzene	0.011	0.011	0.010	106	106	63-131	0	30
Bromobenzene	0.010	0.010	0.010	103	100	66-127	2.84	30
Bromochloromethane	0.0099	0.0098	0.010	99	98	64-124	1.48	30
Bromodichloromethane	0.0095	0.0095	0.010	95	95	64-120	0	30
Bromoform	0.0062	0.0062	0.010	62	62	48-92	0	30
Bromomethane	0.011	0.011	0.010	113	109	25-163	3.73	30
2-Butanone (MEK)	0.024	0.0017	0.040	61	4, F2	51-133	174,F2	30
t-Butyl alcohol (TBA)	0.022	0.026	0.040	55	64	52-129	15.6	30
n-Butyl benzene	0.014	0.014	0.010	141	138	83-200	2.63	30
sec-Butyl benzene	0.014	0.014	0.010	140	137	81-199	1.67	30
tert-Butyl benzene	0.012	0.012	0.010	125	123	79-178	1.75	30
Carbon Disulfide	0.0092	0.0087	0.010	92	87	64-136	5.27	30
Carbon Tetrachloride	0.011	0.011	0.010	112	111	66-140	0.872	30
Chlorobenzene	0.011	0.010	0.010	105	105	73-116	0	30
Chloroethane	0.010	0.011	0.010	104	109	35-147	5.07	30
Chloroform	0.011	0.011	0.010	114	113	65-130	0.720	30
Chloromethane	0.0067	0.0065	0.010	67	65	30-137	3.13	30
2-Chlorotoluene	0.012	0.012	0.010	125	122	75-152	2.63	30
4-Chlorotoluene	0.011	0.011	0.010	115	112	71-148	2.94	30
Dibromochloromethane	0.0071	0.0072	0.010	71	72	61-106	1.35	30
1,2-Dibromo-3-chloropropane	0.0029	0.0028	0.0040	73	70	36-120	3.30	30
1,2-Dibromoethane (EDB)	0.0081	0.0082	0.010	81	82	67-118	1.66	30
Dibromomethane	0.0090	0.0091	0.010	90	91	61-116	0.968	30
1,2-Dichlorobenzene	0.0092	0.0089	0.010	92	89	59-106	3.48	30
1,3-Dichlorobenzene	0.011	0.011	0.010	111	109	75-129	2.31	30
1,4-Dichlorobenzene	0.011	0.010	0.010	105	103	66-127	2.55	30
Dichlorodifluoromethane	0.0095	0.0087	0.010	95, F2	87, F2	13-74	8.60	30
1,1-Dichloroethane	0.011	0.011	0.010	106	105	65-134	0.875	30
1,2-Dichloroethane (1,2-DCA)	0.0095	0.0095	0.010	95	95	57-131	0	30
1,1-Dichloroethene	0.012	0.012	0.010	117	116	62-127	0.827	30
cis-1,2-Dichloroethene	0.0098	0.0099	0.010	98	99	66-130	0.982	30
trans-1,2-Dichloroethene	0.010	0.010	0.010	104	102	60-131	1.09	30
1,2-Dichloropropane	0.0097	0.0098	0.010	97	98	63-127	0.680	30
1,3-Dichloropropane	0.0086	0.0086	0.010	86	86	68-124	0	30
2,2-Dichloropropane	0.010	0.010	0.010	101	100	63-150	1.15	30
1,1-Dichloropropene	0.010	0.010	0.010	103	104	67-134	0.573	30

(Cont.)



Quality Control Report

Client: Langan
Date Prepared: 12/28/18
Date Analyzed: 12/29/18
Instrument: GC38
Matrix: Soil
Project: 750652601; 1051 Mission Road

WorkOrder: 1812D91
BatchID: 170722
Extraction Method: SW5030B
Analytical Method: SW8260B
Unit: mg/kg
Sample ID: MB/LCS/LCSD-170722
1812D91-001AMS/MSD

QC Summary Report for SW8260B

Analyte	LCS Result	LCSD Result	SPK Val	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Limit
cis-1,3-Dichloropropene	0.0086	0.0088	0.010	86	88	65-138	2.21	30
trans-1,3-Dichloropropene	0.0086	0.0087	0.010	86	87	66-124	0.823	30
Diisopropyl ether (DIPE)	0.0079	0.0080	0.010	79	80	58-129	0.994	30
Ethylbenzene	0.012	0.011	0.010	115	114	73-145	0.885	30
Ethyl tert-butyl ether (ETBE)	0.0066	0.0069	0.010	66	69	62-125	3.83	30
Freon 113	0.0097	0.0096	0.010	97	96	55-116	0.668	30
Hexachlorobutadiene	0.014	0.013	0.010	137	134	75-178	2.93	30
Hexachloroethane	0.012	0.012	0.010	116	116	75-152	0	30
2-Hexanone	0.0059	0.0055	0.010	59	55	41-113	6.82	30
Isopropylbenzene	0.013	0.013	0.010	132	131	67-172	0.885	30
4-Isopropyl toluene	0.013	0.013	0.010	133	131	88-171	1.47	30
Methyl-t-butyl ether (MTBE)	0.0069	0.0071	0.010	69	71	58-122	2.94	30
Methylene chloride	0.016	0.016	0.010	162, F2	164, F2	57-140	1.30	30
4-Methyl-2-pentanone (MIBK)	0.0042	0.0046	0.010	42	46	42-117	8.06	30
Naphthalene	0.0049	0.0040	0.010	49	40	29-65	19.6	30
n-Propyl benzene	0.013	0.013	0.010	133	131	85-174	1.42	30
Styrene	0.0094	0.0093	0.010	94	93	63-126	1.10	30
1,1,1,2-Tetrachloroethane	0.0095	0.0096	0.010	95	96	68-131	1.45	30
1,1,2,2-Tetrachloroethane	0.0070	0.0072	0.010	70	72	45-121	2.60	30
Tetrachloroethene	0.011	0.011	0.010	114	114	65-150	0	30
Toluene	0.011	0.011	0.010	111	112	72-135	0.627	30
1,2,3-Trichlorobenzene	0.0060	0.0057	0.010	60	57	35-80	5.01	30
1,2,4-Trichlorobenzene	0.0073	0.0071	0.010	73	71	45-103	2.71	30
1,1,1-Trichloroethane	0.011	0.011	0.010	108	108	67-137	0	30
1,1,2-Trichloroethane	0.0088	0.0090	0.010	88	90	67-117	2.03	30
Trichloroethene	0.011	0.011	0.010	114	114	62-135	0	30
Trichlorofluoromethane	0.0067	0.0062	0.010	67	62	56-124	8.55	30
1,2,3-Trichloropropane	0.0087	0.0088	0.010	87	88	58-133	1.55	30
1,2,4-Trimethylbenzene	0.012	0.012	0.010	118	116	78-161	1.65	30
1,3,5-Trimethylbenzene	0.013	0.012	0.010	126	124	85-170	1.56	30
Vinyl Chloride	0.0095	0.0091	0.010	95	91	32-142	4.61	30
m,p-Xylene	0.022	0.021	0.020	112	104	70-138	7.54	30
o-Xylene	0.011	0.011	0.010	108	110	69-135	1.27	30
Xylenes, Total	0.033	0.032	0.030	111	106	70-137	4.60	30

(Cont.)



Quality Control Report

Client: Langan
Date Prepared: 12/28/18
Date Analyzed: 12/29/18
Instrument: GC38
Matrix: Soil
Project: 750652601; 1051 Mission Road

WorkOrder: 1812D91
BatchID: 170722
Extraction Method: SW5030B
Analytical Method: SW8260B
Unit: mg/kg
Sample ID: MB/LCS/LCSD-170722
1812D91-001AMS/MSD

QC Summary Report for SW8260B

Analyte	LCS Result	LCSD Result	SPK Val	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Limit
Surrogate Recovery								
Dibromofluoromethane	0.13	0.13	0.12	105	105	87-127	0	30
Toluene-d8	0.13	0.13	0.12	102	102	93-141	0	30
4-BFB	0.012	0.012	0.012	99	97	84-137	1.67	30
Benzene-d6	0.10	0.11	0.10	102	106	67-131	3.64	30
Ethylbenzene-d10	0.11	0.12	0.10	112	116	78-153	3.40	30
1,2-DCB-d4	0.082	0.084	0.10	82	84	63-109	3.04	30

Analyte	MS DF	MS Result	MSD Result	SPK Val	SPKRef Val	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD Limit
Acetone	1	0.16	0.16	0.20	ND	78	81	36-141	4.36	30
tert-Amyl methyl ether (TAME)	1	0.0057	0.0060	0.010	ND	57	60	46-105	4.30	30
Benzene	1	0.0099	0.010	0.010	ND	99	100	46-124	1.16	30
Bromobenzene	1	0.0094	0.0097	0.010	ND	94	97	50-119	3.55	30
Bromochloromethane	1	0.0093	0.0094	0.010	ND	93	94	42-122	1.72	30
Bromodichloromethane	1	0.0090	0.0089	0.010	ND	90	89	48-112	0.699	30
Bromoform	1	0.0059	0.0061	0.010	ND	59	61	36-90	2.13	30
Bromomethane	1	0.0099	0.0096	0.010	ND	99	96	10-149	3.38	30
2-Butanone (MEK)	1	0.025	0.026	0.040	ND	64	64	43-114	0	30
t-Butyl alcohol (TBA)	1	0.024	0.024	0.040	ND	60	61	33-123	1.99	30
n-Butyl benzene	1	0.014	0.014	0.010	ND	136	144	40-185	5.74	30
sec-Butyl benzene	1	0.013	0.013	0.010	ND	128	133	40-183	3.84	30
tert-Butyl benzene	1	0.012	0.012	0.010	ND	117	124	44-168	5.55	30
Carbon Disulfide	1	0.0080	0.0082	0.010	ND	80	82	23-139	1.85	30
Carbon Tetrachloride	1	0.010	0.010	0.010	ND	103	101	43-133	2.03	30
Chlorobenzene	1	0.0097	0.0099	0.010	ND	97	99	51-115	1.22	30
Chloroethane	1	0.0089	0.0084	0.010	ND	89	84	16-138	6.43	30
Chloroform	1	0.010	0.011	0.010	ND	105	106	54-117	0.855	30
Chloromethane	1	0.0056	0.0055	0.010	ND	56	55	14-128	1.29	30
2-Chlorotoluene	1	0.011	0.011	0.010	ND	110	114	54-141	3.71	30
4-Chlorotoluene	1	0.011	0.011	0.010	ND	105	110	52-134	4.81	30
Dibromochloromethane	1	0.0067	0.0068	0.010	ND	67	68	46-102	0.998	30
1,2-Dibromo-3-chloropropane	1	0.0028	0.0028	0.0040	ND	48	49	16-120	0.700	30
1,2-Dibromoethane (EDB)	1	0.0076	0.0078	0.010	ND	72	75	48-113	3.17	30
Dibromomethane	1	0.0086	0.0087	0.010	ND	86	87	44-110	1.35	30
1,2-Dichlorobenzene	1	0.0086	0.0086	0.010	ND	86	86	43-106	0	30

(Cont.)



Quality Control Report

Client: Langan
Date Prepared: 12/28/18
Date Analyzed: 12/29/18
Instrument: GC38
Matrix: Soil
Project: 750652601; 1051 Mission Road

WorkOrder: 1812D91
BatchID: 170722
Extraction Method: SW5030B
Analytical Method: SW8260B
Unit: mg/kg
Sample ID: MB/LCS/LCSD-170722
1812D91-001AMS/MSD

QC Summary Report for SW8260B

Analyte	MS DF	MS Result	MSD Result	SPK Val	SPKRef Val	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD Limit
1,3-Dichlorobenzene	1	0.010	0.010	0.010	ND	103	104	49-128	1.57	30
1,4-Dichlorobenzene	1	0.0097	0.010	0.010	ND	97	100	48-120	2.91	30
Dichlorodifluoromethane	1	0.0079	0.0063	0.010	ND	79,F1	63	8-63	22.3	30
1,1-Dichloroethane	1	0.0097	0.0099	0.010	ND	97	99	50-122	1.21	30
1,2-Dichloroethane (1,2-DCA)	1	0.0089	0.0088	0.010	ND	89	88	46-116	0.487	30
1,1-Dichloroethene	1	0.011	0.011	0.010	ND	106	106	37-124	0	30
cis-1,2-Dichloroethene	1	0.0093	0.0097	0.010	ND	93	97	47-123	4.09	30
trans-1,2-Dichloroethene	1	0.0095	0.0097	0.010	ND	95	97	31-131	2.49	30
1,2-Dichloropropane	1	0.0092	0.0093	0.010	ND	92	93	50-116	1.75	30
1,3-Dichloropropane	1	0.0089	0.0083	0.010	ND	89	83	52-115	7.41	30
2,2-Dichloropropane	1	0.0091	0.0092	0.010	ND	91	92	43-137	0.640	30
1,1-Dichloropropene	1	0.0096	0.0098	0.010	ND	96	98	43-126	2.07	30
cis-1,3-Dichloropropene	1	0.0079	0.0083	0.010	ND	79	83	35-134	4.92	30
trans-1,3-Dichloropropene	1	0.0079	0.0082	0.010	ND	79	82	35-124	3.76	30
Diisopropyl ether (DIPE)	1	0.0075	0.0077	0.010	ND	75	77	49-116	2.94	30
Ethylbenzene	1	0.011	0.011	0.010	ND	106	107	49-137	1.37	30
Ethyl tert-butyl ether (ETBE)	1	0.0064	0.0066	0.010	ND	64	66	50-113	3.06	30
Freon 113	1	0.0086	0.0083	0.010	ND	86	83	28-114	3.61	30
Hexachlorobutadiene	1	0.012	0.013	0.010	ND	124	130	22-180	4.16	30
Hexachloroethane	1	0.010	0.011	0.010	ND	103	108	28-158	4.77	30
2-Hexanone	1	0.0056	0.0057	0.010	ND	56	57	31-102	2.18	30
Isopropylbenzene	1	0.012	0.012	0.010	ND	117	124	50-153	5.94	30
4-Isopropyl toluene	1	0.012	0.013	0.010	ND	124	131	41-171	4.81	30
Methyl-t-butyl ether (MTBE)	1	0.0065	0.0068	0.010	ND	65	68	48-110	4.22	30
Methylene chloride	1	0.015	0.016	0.010	ND	92	99	42-127	4.42	30
4-Methyl-2-pentanone (MIBK)	1	0.0041	0.0045	0.010	ND	41	45	24-114	8.37	30
Naphthalene	1	0.0051	0.0053	0.010	ND	51	53	19-69	4.14	30
n-Propyl benzene	1	0.012	0.013	0.010	ND	119	128	46-168	7.39	30
Styrene	1	0.0089	0.0090	0.010	ND	89	90	42-122	0.736	30
1,1,1,2-Tetrachloroethane	1	0.0089	0.0090	0.010	ND	89	90	52-121	1.68	30
1,1,2,2-Tetrachloroethane	1	0.0076	0.0077	0.010	ND	75	76	27-116	1.55	30
Tetrachloroethene	1	0.010	0.010	0.010	ND	102	104	37-149	2.07	30
Toluene	1	0.010	0.010	0.010	ND	102	105	52-124	2.78	30
1,2,3-Trichlorobenzene	1	0.0067	0.0067	0.010	ND	67	67	20-86	0	30
1,2,4-Trichlorobenzene	1	0.0083	0.0082	0.010	ND	83	82	24-107	0.582	30
1,1,1-Trichloroethane	1	0.0099	0.010	0.010	ND	99	100	48-128	0.451	30
1,1,2-Trichloroethane	1	0.0083	0.0086	0.010	ND	62	65	51-110	3.49	30
Trichloroethene	1	0.0098	0.010	0.010	ND	98	100	42-128	1.87	30

(Cont.)



Quality Control Report

Client: Langan
Date Prepared: 12/28/18
Date Analyzed: 12/29/18
Instrument: GC38
Matrix: Soil
Project: 750652601; 1051 Mission Road

WorkOrder: 1812D91
BatchID: 170722
Extraction Method: SW5030B
Analytical Method: SW8260B
Unit: mg/kg
Sample ID: MB/LCS/LCSD-170722
1812D91-001AMS/MSD

QC Summary Report for SW8260B

Analyte	MS DF	MS Result	MSD Result	SPK Val	SPKRef Val	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD Limit
Trichlorofluoromethane	1	0.0054	0.0055	0.010	ND	54	55	31-121	0.642	30
1,2,3-Trichloropropane	1	0.0079	0.0082	0.010	ND	79	82	50-115	2.85	30
1,2,4-Trimethylbenzene	1	0.011	0.012	0.010	ND	112	118	48-151	4.65	30
1,3,5-Trimethylbenzene	1	0.012	0.012	0.010	ND	115	119	51-159	3.23	30
Vinyl Chloride	1	0.0082	0.0078	0.010	ND	82	78	11-136	4.31	30
m,p-Xylene	1	0.021	0.021	0.020	ND	104	106	30-150	1.98	30
o-Xylene	1	0.010	0.010	0.010	ND	102	102	48-128	0	30
Xylenes, Total	1	0.031	0.031	0.030	ND	103	105	38-141	1.61	30
Surrogate Recovery										
Dibromofluoromethane	1	0.13	0.13	0.12		106	106	82-136	0	30
Toluene-d8	1	0.12	0.12	0.12		99	100	92-139	1.03	30
4-BFB	1	0.012	0.012	0.012		96	96	82-135	0	30
Benzene-d6	1	0.093	0.10	0.10		93	100	55-122	6.71	30
Ethylbenzene-d10	1	0.099	0.11	0.10		99	107	58-141	7.41	30
1,2-DCB-d4	1	0.077	0.081	0.10		77	81	51-107	4.86	30



Quality Control Report

Client: Langan
Date Prepared: 12/28/18
Date Analyzed: 12/28/18
Instrument: GC17
Matrix: Soil
Project: 750652601; 1051 Mission Road

WorkOrder: 1812D91
BatchID: 170678
Extraction Method: SW3550B/3640A
Analytical Method: SW8270C
Unit: mg/Kg
Sample ID: MB/LCS/LCSD-170678

QC Summary Report for SW8270C (Low Level) w/ GPC

Analyte	MB Result	RL	SPK Val	MB SS %REC	MB SS Limits
Acenaphthene	ND	0.0013	-	-	-
Acenaphthylene	ND	0.0013	-	-	-
Acetochlor	ND	0.25	-	-	-
Anthracene	ND	0.0013	-	-	-
Benzidine	ND	1.2	-	-	-
Benzo (a) anthracene	ND	0.0050	-	-	-
Benzo (a) pyrene	ND	0.0025	-	-	-
Benzo (b) fluoranthene	ND	0.0013	-	-	-
Benzo (g,h,i) perylene	ND	0.0025	-	-	-
Benzo (k) fluoranthene	ND	0.0013	-	-	-
Benzyl Alcohol	ND	1.2	-	-	-
1,1-Biphenyl	ND	0.013	-	-	-
Bis (2-chloroethoxy) Methane	ND	0.25	-	-	-
Bis (2-chloroethyl) Ether	ND	0.0025	-	-	-
Bis (2-chloroisopropyl) Ether	ND	0.0025	-	-	-
Bis (2-ethylhexyl) Adipate	ND	0.50	-	-	-
Bis (2-ethylhexyl) Phthalate	ND	0.0050	-	-	-
4-Bromophenyl Phenyl Ether	ND	0.25	-	-	-
Butylbenzyl Phthalate	ND	0.025	-	-	-
4-Chloroaniline	ND	0.0025	-	-	-
4-Chloro-3-methylphenol	ND	0.25	-	-	-
2-Chloronaphthalene	ND	0.25	-	-	-
2-Chlorophenol	ND	0.0050	-	-	-
4-Chlorophenyl Phenyl Ether	ND	0.25	-	-	-
Chrysene	ND	0.0025	-	-	-
Dibenzo (a,h) anthracene	ND	0.0025	-	-	-
Dibenzofuran	ND	0.25	-	-	-
Di-n-butyl Phthalate	ND	0.0025	-	-	-
1,2-Dichlorobenzene	ND	0.25	-	-	-
1,3-Dichlorobenzene	ND	0.25	-	-	-
1,4-Dichlorobenzene	ND	0.25	-	-	-
3,3-Dichlorobenzidine	ND	0.0025	-	-	-
2,4-Dichlorophenol	ND	0.013	-	-	-
Diethyl Phthalate	ND	0.0050	-	-	-
2,4-Dimethylphenol	ND	0.25	-	-	-
Dimethyl Phthalate	ND	0.0025	-	-	-
4,6-Dinitro-2-methylphenol	ND	1.2	-	-	-
2,4-Dinitrophenol	ND	0.13	-	-	-

(Cont.)



Quality Control Report

Client: Langan
Date Prepared: 12/28/18
Date Analyzed: 12/28/18
Instrument: GC17
Matrix: Soil
Project: 750652601; 1051 Mission Road

WorkOrder: 1812D91
BatchID: 170678
Extraction Method: SW3550B/3640A
Analytical Method: SW8270C
Unit: mg/Kg
Sample ID: MB/LCS/LCSD-170678

QC Summary Report for SW8270C (Low Level) w/ GPC

Analyte	MB Result	RL	SPK Val	MB SS %REC	MB SS Limits
2,4-Dinitrotoluene	ND	0.0063	-	-	-
2,6-Dinitrotoluene	ND	0.0025	-	-	-
Di-n-octyl Phthalate	ND	0.0050	-	-	-
1,2-Diphenylhydrazine	ND	0.25	-	-	-
Fluoranthene	ND	0.0013	-	-	-
Fluorene	ND	0.0025	-	-	-
Hexachlorobenzene	ND	0.0013	-	-	-
Hexachlorobutadiene	ND	0.0025	-	-	-
Hexachlorocyclopentadiene	ND	2.0	-	-	-
Hexachloroethane	ND	0.0025	-	-	-
Indeno (1,2,3-cd) pyrene	ND	0.0025	-	-	-
Isophorone	ND	0.25	-	-	-
2-Methylnaphthalene	ND	0.0025	-	-	-
2-Methylphenol (o-Cresol)	ND	0.50	-	-	-
3 & 4-Methylphenol (m,p-Cresol)	ND	0.25	-	-	-
Naphthalene	ND	0.0013	-	-	-
2-Nitroaniline	ND	1.2	-	-	-
3-Nitroaniline	ND	1.2	-	-	-
4-Nitroaniline	ND	1.2	-	-	-
Nitrobenzene	ND	0.25	-	-	-
2-Nitrophenol	ND	1.2	-	-	-
4-Nitrophenol	ND	1.2	-	-	-
N-Nitrosodimethylamine	ND	1.2	-	-	-
N-Nitrosodiphenylamine	ND	0.25	-	-	-
N-Nitrosodi-n-propylamine	ND	0.25	-	-	-
Pentachlorophenol	ND	0.031	-	-	-
Phenanthrene	ND	0.0050	-	-	-
Phenol	ND	0.0050	-	-	-
Pyrene	ND	0.0025	-	-	-
Pyridine	ND	0.25	-	-	-
1,2,4-Trichlorobenzene	ND	0.25	-	-	-
2,4,5-Trichlorophenol	ND	0.0025	-	-	-
2,4,6-Trichlorophenol	ND	0.013	-	-	-

(Cont.)



Quality Control Report

Client: Langan
Date Prepared: 12/28/18
Date Analyzed: 12/28/18
Instrument: GC17
Matrix: Soil
Project: 750652601; 1051 Mission Road

WorkOrder: 1812D91
BatchID: 170678
Extraction Method: SW3550B/3640A
Analytical Method: SW8270C
Unit: mg/Kg
Sample ID: MB/LCS/LCSD-170678

QC Summary Report for SW8270C (Low Level) w/ GPC

Analyte	MB Result	RL	SPK Val	MB SS %REC	MB SS Limits
Surrogate Recovery					
2-Fluorophenol	1.0		1.25	82	30-130
Phenol-d5	0.88		1.25	70	30-130
Nitrobenzene-d5	0.80		1.25	64	30-130
2-Fluorobiphenyl	0.74		1.25	59	30-130
2,4,6-Tribromophenol	0.73		1.25	59	16-130
4-Terphenyl-d14	0.73		1.25	59	30-130



Quality Control Report

Client:	Langan	WorkOrder:	1812D91
Date Prepared:	12/28/18	BatchID:	170678
Date Analyzed:	12/28/18	Extraction Method:	SW3550B/3640A
Instrument:	GC17	Analytical Method:	SW8270C
Matrix:	Soil	Unit:	mg/Kg
Project:	750652601; 1051 Mission Road	Sample ID:	MB/LCS/LCSD-170678

QC Summary Report for SW8270C (Low Level) w/ GPC

Analyte	LCS Result	LCSD Result	SPK Val	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Limit
Acenaphthene	0.096	0.11	0.12	77	88	32-118	13.7	30
Acenaphthylene	0.10	0.11	0.12	80	91	32-122	13.0	30
Anthracene	0.099	0.12	0.12	80	92	36-125	14.8	30
Benzidine	4.2	4.3	12.5	34	34	4-83	0	30
Benzo (a) anthracene	0.094	0.10	0.12	75	83	35-117	10.5	30
Benzo (a) pyrene	0.090	0.11	0.12	72	85	42-138	16.8	30
Benzo (b) fluoranthene	0.093	0.10	0.12	75	84	37-125	11.5	30
Benzo (g,h,i) perylene	0.074	0.095	0.12	59	76	45-146	24.8	30
Benzo (k) fluoranthene	0.091	0.10	0.12	73	83	39-124	12.8	30
Benzyl Alcohol	9.9	11	12.5	80	90	5-105	12.3	30
Bis (2-chloroethoxy) Methane	1.9	2.0	2.5	77	81	35-115	4.66	30
Bis (2-chloroethyl) Ether	0.097	0.096	0.12	78	77	35-105	0.906	30
Bis (2-chloroisopropyl) Ether	0.079	0.095	0.12	63	76	34-119	17.6	30
Bis (2-ethylhexyl) Adipate	2.0	1.9	2.5	79	78	27-117	1.33	30
Bis (2-ethylhexyl) Phthalate	0.096	0.10	0.12	77	82	34-124	6.40	30
4-Bromophenyl Phenyl Ether	1.8	2.3	2.5	72	92	33-112	23.4	30
Butylbenzyl Phthalate	2.0	2.0	2.5	80	82	35-127	2.04	30
4-Chloroaniline	0.071	0.081	0.12	56	64	12-77	13.2	30
4-Chloro-3-methylphenol	2.2	2.5	2.5	86	99	35-123	14.1	30
2-Chloronaphthalene	1.9	2.1	2.5	76	85	28-109	11.3	30
2-Chlorophenol	0.10	0.11	0.12	82	87	38-116	6.08	30
4-Chlorophenyl Phenyl Ether	2.0	2.4	2.5	82	96	33-122	16.0	30
Chrysene	0.097	0.11	0.12	77	87	37-116	11.5	30
Dibenzo (a,h) anthracene	0.085	0.10	0.12	68	81	43-141	17.4	30
Dibenzofuran	2.0	2.3	2.5	81	90	33-117	11.0	30
Di-n-butyl Phthalate	0.10	0.12	0.12	83	93	38-126	11.8	30
1,2-Dichlorobenzene	1.8	1.9	2.5	72	77	34-105	7.20	30
1,3-Dichlorobenzene	1.8	1.9	2.5	70	77	33-104	8.28	30
1,4-Dichlorobenzene	1.8	1.9	2.5	73	77	31-102	5.75	30
3,3-Dichlorobenzidine	0.071	0.086	0.12	57	69	14-84	18.2	30
2,4-Dichlorophenol	0.11	0.13	0.12	88	104	31-124	16.1	30
Diethyl Phthalate	0.11	0.13	0.12	88	101	35-118	14.0	30
2,4-Dimethylphenol	2.1	2.4	2.5	83	95	30-120	13.4	30
Dimethyl Phthalate	0.11	0.12	0.12	86	96	33-118	10.2	30
4,6-Dinitro-2-methylphenol	9.2	11	12.5	74	92	12-126	22.0	30
2,4-Dinitrophenol	0.36	0.44	0.62	58	70	8-130	18.3	30
2,4-Dinitrotoluene	0.12	0.14	0.12	99	110	38-117	11.0	30
2,6-Dinitrotoluene	0.12	0.13	0.12	97	105	35-121	7.28	30

(Cont.)



Quality Control Report

Client: Langan
Date Prepared: 12/28/18
Date Analyzed: 12/28/18
Instrument: GC17
Matrix: Soil
Project: 750652601; 1051 Mission Road

WorkOrder: 1812D91
BatchID: 170678
Extraction Method: SW3550B/3640A
Analytical Method: SW8270C
Unit: mg/Kg
Sample ID: MB/LCS/LCSD-170678

QC Summary Report for SW8270C (Low Level) w/ GPC

Analyte	LCS Result	LCSD Result	SPK Val	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Limit
Di-n-octyl Phthalate	0.11	0.12	0.12	85	96	42-150	11.9	30
1,2-Diphenylhydrazine	1.8	1.8	2.5	72	72	30-117	0	30
Fluoranthene	0.11	0.12	0.12	87	96	38-126	10.2	30
Fluorene	0.11	0.13	0.12	91	102	34-118	11.5	30
Hexachlorobenzene	0.087	0.11	0.12	69	89	30-130	24.3	30
Hexachlorobutadiene	0.091	0.11	0.12	73	85	33-121	15.1	30
Hexachlorocyclopentadiene	7.2	8.5	12.5	58	68	8-89	15.6	30
Hexachloroethane	0.091	0.096	0.12	73	77	32-106	6.19	30
Indeno (1,2,3-cd) pyrene	0.084	0.10	0.12	67	80	43-138	17.5	30
Isophorone	1.9	2.0	2.5	75	81	26-92	7.68	30
2-Methylnaphthalene	0.099	0.12	0.12	79	92	30-121	14.8	30
2-Methylphenol (o-Cresol)	2.0	2.3	2.5	81	92	34-114	12.7	30
3 & 4-Methylphenol (m,p-Cresol)	2.2	2.4	2.5	88	96	26-130	9.03	30
Naphthalene	0.088	0.10	0.12	71	80	33-113	13.0	30
2-Nitroaniline	9.5	11	12.5	76	87	29-115	13.6	30
3-Nitroaniline	8.6	9.5	12.5	69	76	25-93	10.1	30
4-Nitroaniline	11	12	12.5	88	98	31-108	10.1	30
Nitrobenzene	1.7	1.8	2.5	69	74	33-122	5.65	30
2-Nitrophenol	10	12	12.5	84	97	32-121	14.3	30
4-Nitrophenol	10	14	12.5	84	110, F2	27-102	26.8	30
N-Nitrosodiphenylamine	1.8	2.2	2.5	73	86	45-110	15.8	30
N-Nitrosodi-n-propylamine	1.9	2.3	2.5	78	91	25-108	16.0	30
Pentachlorophenol	0.49	0.60	0.62	78	96	28-134	21.0	30
Phenanthrene	0.095	0.11	0.12	76	88	36-123	14.7	30
Phenol	0.068	0.068	0.12	55	54	33-107	1.12	30
Pyrene	0.10	0.10	0.12	80	81	38-124	0.915	30
Pyridine	1.4	1.3	2.5	54	53	30-130	1.92	30
1,2,4-Trichlorobenzene	1.9	2.3	2.5	75	90	34-121	17.9	30
2,4,5-Trichlorophenol	0.12	0.14	0.12	95	109	31-126	13.6	30
2,4,6-Trichlorophenol	0.11	0.12	0.12	84	98	32-128	15.0	30

(Cont.)



Quality Control Report

Client:	Langan	WorkOrder:	1812D91
Date Prepared:	12/28/18	BatchID:	170678
Date Analyzed:	12/28/18	Extraction Method:	SW3550B/3640A
Instrument:	GC17	Analytical Method:	SW8270C
Matrix:	Soil	Unit:	mg/Kg
Project:	750652601; 1051 Mission Road	Sample ID:	MB/LCS/LCSD-170678

QC Summary Report for SW8270C (Low Level) w/ GPC

Analyte	LCS Result	LCSD Result	SPK Val	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Limit
Surrogate Recovery								
2-Fluorophenol	1.1	1.1	1.25	89	92	31-108	2.58	30
Phenol-d5	1.1	1.0	1.25	89	82	32-106	7.25	30
Nitrobenzene-d5	0.99	1.1	1.25	79	84	27-109	6.89	30
2-Fluorobiphenyl	0.94	1.0	1.25	75	80	26-100	6.66	30
2,4,6-Tribromophenol	0.80	0.80	1.25	64	64	25-106	0	30
4-Terphenyl-d14	1.0	1.0	1.25	84	81	27-113	3.33	30



Quality Control Report

Client: Langan
Date Prepared: 12/28/18
Date Analyzed: 12/31/18
Instrument: ICP-MS3
Matrix: Soil
Project: 750652601; 1051 Mission Road

WorkOrder: 1812D91
BatchID: 170715
Extraction Method: SW3050B
Analytical Method: SW6020
Unit: mg/Kg
Sample ID: MB/LCS/LCSD-170715

QC Summary Report for Metals

Analyte	MB Result	RL	SPK Val	MB SS %REC	MB SS Limits
Antimony	ND	0.50	-	-	-
Arsenic	ND	0.50	-	-	-
Barium	ND	5.0	-	-	-
Beryllium	ND	0.50	-	-	-
Cadmium	ND	0.25	-	-	-
Chromium	ND	0.50	-	-	-
Cobalt	ND	0.50	-	-	-
Copper	ND	0.50	-	-	-
Lead	ND	0.50	-	-	-
Mercury	ND	0.050	-	-	-
Molybdenum	ND	0.50	-	-	-
Nickel	ND	0.50	-	-	-
Selenium	ND	0.50	-	-	-
Silver	ND	0.50	-	-	-
Thallium	ND	0.50	-	-	-
Vanadium	ND	0.50	-	-	-
Zinc	ND	5.0	-	-	-
Surrogate Recovery					
Terbium	510		500	102	70-130



Quality Control Report

Client: Langan
Date Prepared: 12/28/18
Date Analyzed: 12/31/18
Instrument: ICP-MS3
Matrix: Soil
Project: 750652601; 1051 Mission Road

WorkOrder: 1812D91
BatchID: 170715
Extraction Method: SW3050B
Analytical Method: SW6020
Unit: mg/Kg
Sample ID: MB/LCS/LCSD-170715

QC Summary Report for Metals

Analyte	LCS Result	LCSD Result	SPK Val	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Limit
Antimony	56	55	50	112	110	75-125	1.15	20
Arsenic	52	51	50	103	102	75-125	1.49	20
Barium	530	520	500	106	105	75-125	0.949	20
Beryllium	52	52	50	103	104	75-125	1.08	20
Cadmium	50	50	50	101	101	75-125	0	20
Chromium	52	50	50	105	101	75-125	3.44	20
Cobalt	51	51	50	101	101	75-125	0	20
Copper	53	52	50	105	104	75-125	1.43	20
Lead	52	51	50	104	103	75-125	1.74	20
Mercury	1.3	1.3	1.25	106	104	75-125	1.83	20
Molybdenum	53	52	50	106	105	75-125	1.55	20
Nickel	53	52	50	106	104	75-125	1.80	20
Selenium	52	50	50	105	101	75-125	3.89	20
Silver	52	52	50	105	104	75-125	0.884	20
Thallium	53	52	50	105	104	75-125	1.24	20
Vanadium	51	51	50	102	101	75-125	0.355	20
Zinc	520	510	500	103	103	75-125	0	20
Surrogate Recovery								
Terbium	520	520	500	105	103	70-130	1.38	20



Quality Control Report

Client: Langan
Date Prepared: 12/28/18
Date Analyzed: 12/31/18
Instrument: ICP-MS3
Matrix: Soil
Project: 750652601; 1051 Mission Road

WorkOrder: 1812D91
BatchID: 170719
Extraction Method: SW3050B
Analytical Method: SW6020
Unit: mg/Kg
Sample ID: MB/LCS/LCSD-170719
1812D91-007AMS/MSD

QC Summary Report for Metals

Analyte	MB Result	RL	SPK Val	MB SS %REC	MB SS Limits
Antimony	ND	0.50	-	-	-
Arsenic	ND	0.50	-	-	-
Barium	ND	5.0	-	-	-
Beryllium	ND	0.50	-	-	-
Cadmium	ND	0.25	-	-	-
Chromium	ND	0.50	-	-	-
Cobalt	ND	0.50	-	-	-
Copper	ND	0.50	-	-	-
Lead	ND	0.50	-	-	-
Mercury	ND	0.050	-	-	-
Molybdenum	ND	0.50	-	-	-
Nickel	ND	0.50	-	-	-
Selenium	ND	0.50	-	-	-
Silver	ND	0.50	-	-	-
Thallium	ND	0.50	-	-	-
Vanadium	ND	0.50	-	-	-
Zinc	ND	5.0	-	-	-
Surrogate Recovery					
Terbium	510		500	103	70-130



Quality Control Report

Client: Langan
Date Prepared: 12/28/18
Date Analyzed: 12/31/18
Instrument: ICP-MS3
Matrix: Soil
Project: 750652601; 1051 Mission Road

WorkOrder: 1812D91
BatchID: 170719
Extraction Method: SW3050B
Analytical Method: SW6020
Unit: mg/Kg
Sample ID: MB/LCS/LCSD-170719
1812D91-007AMS/MSD

QC Summary Report for Metals

Analyte	LCS Result	LCSD Result	SPK Val	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Limit
Antimony	57	55	50	114	110	75-125	4.18	20
Arsenic	52	52	50	104	103	75-125	0.251	20
Barium	540	520	500	108	104	75-125	3.60	20
Beryllium	52	51	50	105	103	75-125	2.29	20
Cadmium	51	49	50	102	99	75-125	3.07	20
Chromium	52	50	50	104	101	75-125	3.37	20
Cobalt	51	50	50	102	100	75-125	2.44	20
Copper	52	51	50	104	103	75-125	1.54	20
Lead	53	51	50	105	102	75-125	3.30	20
Mercury	1.3	1.3	1.25	105	103	75-125	1.85	20
Molybdenum	54	52	50	108	104	75-125	3.42	20
Nickel	52	51	50	104	103	75-125	1.03	20
Selenium	52	50	50	104	100	75-125	3.81	20
Silver	53	51	50	106	102	75-125	3.69	20
Thallium	53	52	50	106	103	75-125	2.79	20
Vanadium	51	50	50	103	101	75-125	1.77	20
Zinc	520	510	500	104	102	75-125	2.33	20

Surrogate Recovery

Terbium	540	520	500	107	103	70-130	4.03	20
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Analyte	MS DF	MS Result	MSD Result	SPK Val	SPKRef Val	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD Limit
Antimony	1	56	54	50	ND	112	109	75-125	3.15	20
Arsenic	1	54	51	50	1.273	105	99	75-125	5.10	20
Barium	1	570	550	500	21.98	109	106	75-125	3.18	20
Beryllium	1	52	50	50	ND	103	99	75-125	4.36	20
Cadmium	1	51	48	50	ND	101	96	75-125	5.25	20
Chromium	1	76	71	50	19.64	113	102	75-125	7.21	20
Cobalt	1	52	50	50	2.100	101	95	75-125	5.59	20
Copper	1	55	52	50	2.948	104	98	75-125	5.82	20
Lead	1	55	52	50	1.849	105	100	75-125	5.23	20
Mercury	1	1.3	1.3	1.25	ND	104	102	75-125	1.68	20
Molybdenum	1	53	51	50	ND	105	102	75-125	2.68	20
Nickel	1	69	64	50	12.85	113	102	75-125	7.91	20
Selenium	1	50	49	50	ND	100	97	75-125	3.10	20
Silver	1	52	50	50	ND	105	101	75-125	4.17	20

(Cont.)



Quality Control Report

Client: Langan
Date Prepared: 12/28/18
Date Analyzed: 12/31/18
Instrument: ICP-MS3
Matrix: Soil
Project: 750652601; 1051 Mission Road

WorkOrder: 1812D91
BatchID: 170719
Extraction Method: SW3050B
Analytical Method: SW6020
Unit: mg/Kg
Sample ID: MB/LCS/LCSD-170719
1812D91-007AMS/MSD

QC Summary Report for Metals

Analyte	MS DF	MS Result	MSD Result	SPK Val	SPKRef Val	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD Limit
Thallium	1	53	51	50	ND	106	101	75-125	4.68	20
Vanadium	1	73	67	50	15.83	114	102	75-125	8.78	20
Zinc	1	530	510	500	18.49	103	98	75-125	5.27	20
Surrogate Recovery										
Terbium	1	530	510	500		106	102	70-130	3.70	20

Analyte	DLT Result	DLTRef Val	%D	%D Limit
Antimony	ND<2.5	ND	-	-
Arsenic	ND<2.5	1.273	-	-
Barium	ND<25	21.98	-	-
Beryllium	ND<2.5	ND	-	-
Cadmium	ND<1.2	ND	-	-
Chromium	20	19.64	1.83	20
Cobalt	ND<2.5	2.100	-	-
Copper	2.8	2.948	5.02	-
Lead	ND<2.5	1.849	-	-
Mercury	ND<0.25	ND	-	-
Molybdenum	ND<2.5	ND	-	-
Nickel	12	12.85	6.61	-
Selenium	ND<2.5	ND	-	-
Silver	ND<2.5	ND	-	-
Thallium	ND<2.5	ND	-	-
Vanadium	16	15.83	1.07	20
Zinc	ND<25	18.49	-	-

%D Control Limit applied to analytes with concentrations greater than 25 times the reporting limits.



Quality Control Report

Client: Langan
Date Prepared: 12/28/18
Date Analyzed: 12/30/18 - 1/2/19
Instrument: GC7
Matrix: Soil
Project: 750652601; 1051 Mission Road

WorkOrder: 1812D91
BatchID: 170703
Extraction Method: SW5030B
Analytical Method: SW8021B/8015Bm
Unit: mg/Kg
Sample ID: MB/LCS/LCSD-170703

QC Summary Report for SW8021B/8015Bm

Analyte	MB Result	RL	SPK Val	MB SS %REC	MB SS Limits
TPH(g) (C6-C12)	ND	1.0	-	-	-
MTBE	ND	0.050	-	-	-
Benzene	ND	0.0050	-	-	-
Toluene	ND	0.0050	-	-	-
Ethylbenzene	ND	0.0050	-	-	-
m,p-Xylene	ND	0.010	-	-	-
o-Xylene	ND	0.0050	-	-	-
Xylenes	ND	0.0050	-	-	-
Surrogate Recovery					
2-Fluorotoluene	0.078		0.10	78	75-134

Analyte	LCS Result	LCSD Result	SPK Val	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Limit
TPH(btex)	0.56	0.52	0.60	93	87	82-118	6.54	20
MTBE	0.084	0.085	0.10	84	85	61-119	0.605	20
Benzene	0.11	0.11	0.10	109	106	77-128	2.96	20
Toluene	0.11	0.11	0.10	109	107	74-132	1.42	20
Ethylbenzene	0.10	0.10	0.10	103	103	84-127	0	20
m,p-Xylene	0.22	0.22	0.20	111	112	80-120	0.825	20
o-Xylene	0.10	0.11	0.10	103	105	80-120	2.86	20
Xylenes	0.32	0.33	0.30	108	109	86-129	1.47	20
Surrogate Recovery								
2-Fluorotoluene	0.081	0.079	0.10	81	79	75-134	2.64	20

(Cont.)



Quality Control Report

Client: Langan
Date Prepared: 12/28/18
Date Analyzed: 12/30/18
Instrument: GC7
Matrix: Soil
Project: 750652601; 1051 Mission Road

WorkOrder: 1812D91
BatchID: 170721
Extraction Method: SW5030B
Analytical Method: SW8021B/8015Bm
Unit: mg/Kg
Sample ID: MB/LCS/LCSD-170721
1812D91-008AMS/MSD

QC Summary Report for SW8021B/8015Bm

Analyte	MB Result	RL	SPK Val	MB SS %REC	MB SS Limits
TPH(g) (C6-C12)	ND	1.0	-	-	-
MTBE	ND	0.050	-	-	-
Benzene	ND	0.0050	-	-	-
Toluene	ND	0.0050	-	-	-
Ethylbenzene	ND	0.0050	-	-	-
m,p-Xylene	ND	0.010	-	-	-
o-Xylene	ND	0.0050	-	-	-
Xylenes	ND	0.0050	-	-	-
Surrogate Recovery					
2-Fluorotoluene	0.079		0.10	79	75-134

(Cont.)



Quality Control Report

Client: Langan
Date Prepared: 12/28/18
Date Analyzed: 12/30/18
Instrument: GC7
Matrix: Soil
Project: 750652601; 1051 Mission Road

WorkOrder: 1812D91
BatchID: 170721
Extraction Method: SW5030B
Analytical Method: SW8021B/8015Bm
Unit: mg/Kg
Sample ID: MB/LCS/LCSD-170721
1812D91-008AMS/MSD

QC Summary Report for SW8021B/8015Bm

Analyte	LCS Result	LCSD Result	SPK Val	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Limit
TPH(btex)	0.55	0.51	0.60	92, F16	86	82-118	7.36	20
MTBE	0.089	0.099	0.10	89	99	61-119	10.1	20
Benzene	0.11	0.11	0.10	106	106	77-128	0	20
Toluene	0.10	0.10	0.10	105	105	74-132	0	20
Ethylbenzene	0.10	0.099	0.10	102	99	84-127	3.17	20
m,p-Xylene	0.22	0.21	0.20	110	106	80-120	4.01	20
o-Xylene	0.10	0.10	0.10	105	103	80-120	1.68	20
Xylenes	0.33	0.32	0.30	109	105	86-129	3.25	20
Surrogate Recovery								
2-Fluorotoluene	0.079	0.077	0.10	79	77	75-134	2.74	20

Analyte	MS DF	MS Result	MSD Result	SPK Val	SPKRef Val	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD Limit
TPH(btex)	1	0.58	0.59	0.60	ND	97	98	58-129	0.862	20
MTBE	1	0.086	0.087	0.10	ND	83	83	47-118	0	20
Benzene	1	0.10	0.10	0.10	ND	103	102	55-129	1.35	20
Toluene	1	0.10	0.10	0.10	ND	102	103	56-130	1.03	20
Ethylbenzene	1	0.099	0.099	0.10	ND	99	99	63-129	0	20
m,p-Xylene	1	0.21	0.21	0.20	ND	106	107	80-120	0.726	20
o-Xylene	1	0.10	0.10	0.10	ND	100	100	80-120	0	20
Xylenes	1	0.31	0.31	0.30	ND	104	105	64-131	0.761	20
Surrogate Recovery										
2-Fluorotoluene	1	0.076	0.076	0.10		76	76	62-126	0	20



Quality Control Report

Client: Langan
Date Prepared: 12/28/18
Date Analyzed: 12/29/18
Instrument: GC11A, GC6B
Matrix: Soil
Project: 750652601; 1051 Mission Road

WorkOrder: 1812D91
BatchID: 170714
Extraction Method: SW3550B
Analytical Method: SW8015B
Unit: mg/Kg
Sample ID: MB/LCS/LCSD-170714

QC Report for SW8015B w/out SG Clean-Up

Analyte	MB Result	RL	SPK Val	MB SS %REC	MB SS Limits
TPH-Diesel (C10-C23)	ND	1.0	-	-	-
TPH-Motor Oil (C18-C36)	ND	5.0	-	-	-
Surrogate Recovery					
C9	24		25	97	72-122

Analyte	LCS Result	LCSD Result	SPK Val	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Limit
TPH-Diesel (C10-C23)	43	43	40	108	107	75-128	0.716	30
Surrogate Recovery								
C9	24	24	25	95	96	72-122	0.810	30



Quality Control Report

Client: Langan
Date Prepared: 12/31/18
Date Analyzed: 12/31/18
Instrument: GC11A, GC6A
Matrix: Soil
Project: 750652601; 1051 Mission Road

WorkOrder: 1812D91
BatchID: 170759
Extraction Method: SW3550B
Analytical Method: SW8015B
Unit: mg/Kg
Sample ID: MB/LCS/LCSD-170759

QC Report for SW8015B w/out SG Clean-Up

Analyte	MB Result	RL	SPK Val	MB SS %REC	MB SS Limits
TPH-Diesel (C10-C23)	ND	1.0	-	-	-
TPH-Motor Oil (C18-C36)	ND	5.0	-	-	-

Surrogate Recovery

C9	24	25	97	72-122
----	----	----	----	--------

Analyte	LCS Result	LCSD Result	SPK Val	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Limit
TPH-Diesel (C10-C23)	39	39	40	97	98	75-128	1.04	30

Surrogate Recovery

C9	24	24	25	95	96	72-122	0.723	30
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1534 Willow Pass Rd
Pittsburg, CA 94565-1701
(925) 252-9262

☐ WaterTrax ☐ WriteOn ☐ EDF

CHAIN-OF-CUSTODY RECORD

Page 1 of 1

WorkOrder: 1812D91

ClientCode: TWRF

☐ Excel ☐ EQuIS ☒ Email ☐ HardCopy ☐ ThirdParty ☐ J-flag
☐ Detection Summary ☐ Dry-Weight

Report to:

Peter Cusack
Langan

555 Montgomery St., Suite 1300

San Francisco, CA 94111

(415) 955-5244 FAX: (415) 955-9041

Email: pcusack@langan.com

cc/3rd Party:

PO:

Project: 750652601; 1051 Mission Road

Bill to:

Accounts Payable

Langan

555 Montgomery St., Suite 1300

San Francisco, CA 94111

Langan_InvoiceCapture@concursolutio

Requested TAT: 5 days;

Date Received: 12/28/2018

Date Logged: 12/28/2018

Lab ID	Client ID	Matrix	Collection Date	Hold	Requested Tests (See legend below)											
					1	2	3	4	5	6	7	8	9	10	11	12
1812D91-001	B1-E1-2.5'	Soil	12/18/2018 00:00	<input type="checkbox"/>	A		A	A	A		A	A				
1812D91-002	B1-E2-7.5'	Soil	12/18/2018 00:00	<input type="checkbox"/>		A			A		A	A				
1812D91-003	B1-E3-10'	Soil	12/18/2018 00:00	<input type="checkbox"/>			A	A	A	A	A	A				
1812D91-004	B1-E4-12.5'	Soil	12/18/2018 00:00	<input type="checkbox"/>					A		A	A				
1812D91-005	B2-E1-2.5'	Soil	12/18/2018 00:00	<input type="checkbox"/>	A		A	A	A		A	A				
1812D91-006	B2-E2-5'	Soil	12/18/2018 00:00	<input type="checkbox"/>		A			A		A	A				
1812D91-007	B2-E3-7.5	Soil	12/18/2018 00:00	<input type="checkbox"/>			A	A	A	A	A	A				
1812D91-008	B2-E4-10'	Soil	12/18/2018 00:00	<input type="checkbox"/>					A		A	A				

Test Legend:

1	8081pcB_ESL_LL_S
5	CAM17MS_TTLC_S
9	

2	8082_PCB_ESL_S [J]
6	CARB435_400
10	

3	8260B_Scan-SIM_S
7	G-MBTEx_S
11	

4	8270_SCSM_GPC_S
8	TPH(DMO)_S
12	

Prepared by: Nancy Palacios

The following SampleIDs: 001A, 002A, 003A, 004A, 005A, 006A, 007A, 008A contain testgroup Multi Range_S.

Comments:

NOTE: Soil samples are discarded 60 days after results are reported unless other arrangements are made (Water samples are 30 days).
Hazardous samples will be returned to client or disposed of at client expense.



McC Campbell Analytical, Inc.

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1534 Willow Pass Road, Pittsburg, CA 94565-1701
Toll Free Telephone: (877) 252-9262 / Fax: (925) 252-9269
http://www.mccampbell.com / E-mail: main@mccampbell.com

WORK ORDER SUMMARY

Client Name: LANGAN

Client Contact: Peter Cusack

Contact's Email: pcusack@languan.com

Project: 750652601; 1051 Mission Road

Comments:

Work Order: 1812D91

QC Level: LEVEL 2

Date Logged: 12/28/2018

☐ WaterTrax

☐ WriteOn

☐ EDF

☐ Excel

☒ EQUIS

☒ Email

☐ HardCopy

☐ ThirdParty

☐ J-flag

Lab ID	Client ID	Matrix	Test Name	Containers /Composites	Bottle & Preservative	De- chlorinated	Collection Date & Time	TAT	Sediment Content	Hold	SubOut
1812D91-001A	B1-E1-2.5'	Soil	Multi-Range TPH(g,d,mo)	1	Stainless Steel tube 2"x6"	<input type="checkbox"/>	12/18/2018	5 days		<input type="checkbox"/>	
			SW6020 (CAM 17)			<input type="checkbox"/>		5 days		<input type="checkbox"/>	
			SW8270C (Low Level SVOCs) with GPC Cleanup			<input type="checkbox"/>		5 days		<input type="checkbox"/>	
			SW8260B (VOCs, Scan- SIM)			<input type="checkbox"/>		5 days		<input type="checkbox"/>	
			SW8081A/8082 (OC Pesticides+PCBs) ESLs			<input type="checkbox"/>		5 days		<input type="checkbox"/>	
1812D91-002A	B1-E2-7.5'	Soil	Multi-Range TPH(g,d,mo)	1	Stainless Steel tube 2"x6"	<input type="checkbox"/>	12/18/2018	5 days		<input type="checkbox"/>	
			SW6020 (CAM 17)			<input type="checkbox"/>		5 days		<input type="checkbox"/>	
			SW8082 (PCBs Only)			<input type="checkbox"/>		5 days		<input type="checkbox"/>	
1812D91-003A	B1-E3-10'	Soil	Multi-Range TPH(g,d,mo)	1	Stainless Steel tube 2"x6"	<input type="checkbox"/>	12/18/2018	5 days		<input type="checkbox"/>	
			Asbestos, CARB 435, 400 Point			<input type="checkbox"/>		5 days		<input type="checkbox"/>	
			SW6020 (CAM 17)			<input type="checkbox"/>		5 days		<input type="checkbox"/>	
			SW8270C (Low Level SVOCs) with GPC Cleanup			<input type="checkbox"/>		5 days		<input type="checkbox"/>	
			SW8260B (VOCs, Scan- SIM)			<input type="checkbox"/>		5 days		<input type="checkbox"/>	
1812D91-004A	B1-E4-12.5'	Soil	Multi-Range TPH(g,d,mo)	1	Stainless Steel tube 2"x6"	<input type="checkbox"/>	12/18/2018	5 days		<input type="checkbox"/>	
			SW6020 (CAM 17)			<input type="checkbox"/>		5 days		<input type="checkbox"/>	

NOTES: - STLC and TCLP extractions require 2 days to complete; therefore, all TATs begin after the extraction is completed (i.e., One-day TAT yields results in 3 days from sample submission).

- MAI assumes that all material present in the provided sampling container is considered part of the sample - MAI does not exclude any material from the sample prior to sample preparation unless requested in writing by the client.



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http://www.mcccampbell.com / E-mail: main@mcccampbell.com

WORK ORDER SUMMARY

Client Name: LANGAN

Client Contact: Peter Cusack

Contact's Email: pcusack@langan.com

Project: 750652601; 1051 Mission Road

Comments:

Work Order: 1812D91

QC Level: LEVEL 2

Date Logged: 12/28/2018

☐ WaterTrax ☐ WriteOn ☐ EDF ☐ Excel ☐ EQUIS ☒ Email ☐ HardCopy ☐ ThirdParty ☐ J-flag

Lab ID	Client ID	Matrix	Test Name	Containers /Composites	Bottle & Preservative	De-chlorinated	Collection Date & Time	TAT	Sediment Content	Hold	SubOut
1812D91-005A	B2-E1-2.5'	Soil	Multi-Range TPH(g,d,mo)	1	Stainless Steel tube 2"x6"	<input type="checkbox"/>	12/18/2018	5 days		<input type="checkbox"/>	
			SW6020 (CAM 17)			<input type="checkbox"/>		5 days		<input type="checkbox"/>	
			SW8270C (Low Level SVOCs) with GPC Cleanup			<input type="checkbox"/>		5 days		<input type="checkbox"/>	
			SW8260B (VOCs, Scan- SIM)			<input type="checkbox"/>		5 days		<input type="checkbox"/>	
			SW8081A/8082 (OC Pesticides+PCBs) ESLs			<input type="checkbox"/>		5 days		<input type="checkbox"/>	
1812D91-006A	B2-E2-5'	Soil	Multi-Range TPH(g,d,mo)	1	Stainless Steel tube 2"x6"	<input type="checkbox"/>	12/18/2018	5 days		<input type="checkbox"/>	
			SW6020 (CAM 17)			<input type="checkbox"/>		5 days		<input type="checkbox"/>	
			SW8082 (PCBs Only)			<input type="checkbox"/>		5 days		<input type="checkbox"/>	
1812D91-007A	B2-E3-7.5	Soil	Multi-Range TPH(g,d,mo)	1	Stainless Steel tube 2"x6"	<input type="checkbox"/>	12/18/2018	5 days		<input type="checkbox"/>	
			Asbestos, CARB 435, 400 Point			<input type="checkbox"/>		5 days		<input type="checkbox"/>	
			SW6020 (CAM 17)			<input type="checkbox"/>		5 days		<input type="checkbox"/>	
			SW8270C (Low Level SVOCs) with GPC Cleanup			<input type="checkbox"/>		5 days		<input type="checkbox"/>	
			SW8260B (VOCs, Scan- SIM)			<input type="checkbox"/>		5 days		<input type="checkbox"/>	
1812D91-008A	B2-E4-10'	Soil	Multi-Range TPH(g,d,mo)	1	Stainless Steel tube 2"x6"	<input type="checkbox"/>	12/18/2018	5 days		<input type="checkbox"/>	
			SW6020 (CAM 17)			<input type="checkbox"/>		5 days		<input type="checkbox"/>	

NOTES: - STLC and TCLP extractions require 2 days to complete; therefore, all TATs begin after the extraction is completed (i.e., One-day TAT yields results in 3 days from sample submission).

- MAI assumes that all material present in the provided sampling container is considered part of the sample - MAI does not exclude any material from the sample prior to sample preparation unless requested in writing by the client.



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WORK ORDER SUMMARY

Client Name: LANGAN

Client Contact: Peter Cusack

Contact's Email: pcusack@langan.com

Project: 750652601; 1051 Mission Road

Comments:

Work Order: 1812D91

QC Level: LEVEL 2

Date Logged: 12/28/2018

☐ WaterTrax

☐ WriteOn

☐ EDF

☐ Excel

☐ EQUIS

☒ Email

☐ HardCopy

☐ ThirdParty

☐ J-flag

Lab ID	Client ID	Matrix	Test Name	Containers /Composites	Bottle & Preservative	De- chlorinated	Collection Date & Time	TAT	Sediment Content	Hold	SubOut
1812D91-009A	B2-E5-12.5'	Soil		1	Stainless Steel tube 2"x6"	<input type="checkbox"/>	12/18/2018			<input checked="" type="checkbox"/>	

NOTES: - STLC and TCLP extractions require 2 days to complete; therefore, all TATs begin after the extraction is completed (i.e., One-day TAT yields results in 3 days from sample submission).

- MAI assumes that all material present in the provided sampling container is considered part of the sample - MAI does not exclude any material from the sample prior to sample preparation unless requested in writing by the client.

1812D91

Page 1 of 1

CHAIN OF CUSTODY RECORD

- | | |
|-------------------------------------|--|
| <input checked="" type="checkbox"/> | 555 Montgomery Street, Suite 1300, San Francisco, CA 94111 |
| <input type="checkbox"/> | 501 14th Street, Third Floor, Oakland, CA 94612 |
| <input type="checkbox"/> | 3320 Data Drive, Suite 350, Rancho Cordova, CA 95670-7982 |
| <input type="checkbox"/> | 1 Almaden Boulevard, Suite 590, San Jose, CA 95113 |

1051 Mission Road

750652601

PCSnack

ct: B Sanders

PCUSA/2

Analysis Requested

Turnaround

Time

Time
Normal

No. Containers

Matrix

& Preservative

Field Sample Identification No.	Date	Time	Lab Sample No.	Soil	Water	Air	Other	HCL	H ₂ SO ₄	HNO ₃	Ice									Silica gel	Hold	Remarks
B1-E1-2.5'	12/18/18			X							X											
B1-E2-7.5'	12/18/18			X							X											
B1-E3-10'	12/18/18			X							X											
B1-E4-12.5'	12/18/18			X							X											
B2-E1-2.5'	12/18/18			X							X											
B2-E2-5'	12/18/18			X							X											
B2-E3-7.5'	12/18/18			X							X											
B2-E4-10'	12/18/18			X							X											
B2-E5-12.5'	12/18/18			X							X									X		
Relinquished by: (Signature) <i>[Signature]</i>				Date: 12/28/18		Time: 1100		Received by: (Signature) <i>[Signature]</i>				Date: 12/28/18		Time: 1100								
Relinquished by: (Signature) <i>[Signature]</i>				Date: 12/28/18		Time: 1245		Received by: (Signature) <i>[Signature]</i>				Date: 12-28-18		Time: 1245								
Relinquished by: (Signature)				Date:		Time:		Received by Lab: (Signature)				Date:		Time:								
Sent to Laboratory (Name): <i>McCampbell</i>				Method of Shipment <input checked="" type="checkbox"/> Lab courier <input type="checkbox"/> Fed Ex <input type="checkbox"/> Airborne <input type="checkbox"/> UPS																		
Laboratory Comments/Notes:				<input type="checkbox"/> Hand Carried <input type="checkbox"/> Private Courier (Co. Name)																		

White Copy - Original

Yellow Copy - Laboratory

Pink Copy - Field

COC Number:

COC Number: 1-8 WPT



Sample Receipt Checklist

Client Name: **Langan**
Project: **750652601; 1051 Mission Road**

Date and Time Received: **12/28/2018 12:45**

Date Logged: **12/28/2018**

Received by: **Nancy Palacios**

Logged by: **Nancy Palacios**

WorkOrder No: **1812D91** Matrix: Soil

Carrier: Lorenzo Perez (MAI Courier)

Chain of Custody (COC) Information

Chain of custody present?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Chain of custody signed when relinquished and received?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Chain of custody agrees with sample labels?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Sample IDs noted by Client on COC?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Date and Time of collection noted by Client on COC?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Sampler's name noted on COC?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
COC agrees with Quote?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	NA <input checked="" type="checkbox"/>

Sample Receipt Information

Custody seals intact on shipping container/cooler?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	NA <input checked="" type="checkbox"/>
Shipping container/cooler in good condition?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Samples in proper containers/bottles?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Sample containers intact?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Sufficient sample volume for indicated test?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	

Sample Preservation and Hold Time (HT) Information

All samples received within holding time?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	NA <input type="checkbox"/>
Samples Received on Ice?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	

(Ice Type: WET ICE)

Sample/Temp Blank temperature	Temp: 1.8°C	NA <input type="checkbox"/>
Water - VOA vials have zero headspace / no bubbles?	Yes <input type="checkbox"/> No <input type="checkbox"/>	NA <input checked="" type="checkbox"/>
Sample labels checked for correct preservation?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	
pH acceptable upon receipt (Metal: <2; Nitrate 353.2/4500NO ₃ : <2; 522: <4; 218.7: >8)?	Yes <input type="checkbox"/> No <input type="checkbox"/>	NA <input checked="" type="checkbox"/>

UCMR Samples:

pH tested and acceptable upon receipt (200.8: ≤2; 525.3: ≤4; 530: ≤7; 541: <3; 544: <6.5 & 7.5)?	Yes <input type="checkbox"/> No <input type="checkbox"/>	NA <input checked="" type="checkbox"/>
--	--	--

Free Chlorine tested and acceptable upon receipt (<0.1mg/L)?	Yes <input type="checkbox"/> No <input type="checkbox"/>	NA <input checked="" type="checkbox"/>
--	--	--

Comments:



McC Campbell Analytical, Inc.

"When Quality Counts"

Analytical Report

WorkOrder: 1812D91 A

Report Created for: Langan

555 Montgomery St., Suite 1300
San Francisco, CA 94111

Project Contact: Peter Cusack

Project P.O.:

Project: 750652601; 1051 Mission Road

Project Received: 12/28/2018

Analytical Report reviewed & approved for release on 01/17/2019 by:

Jennifer Lagerbom
Project Manager

The report shall not be reproduced except in full, without the written approval of the laboratory. The analytical results relate only to the items tested. Results reported conform to the most current NELAP standards, where applicable, unless otherwise stated in the case narrative.





Glossary of Terms & Qualifier Definitions

Client: Langan
Project: 750652601; 1051 Mission Road
WorkOrder: 1812D91 A

Glossary Abbreviation

%D	Serial Dilution Percent Difference
95% Interval	95% Confident Interval
DF	Dilution Factor
DI WET	(DISTLC) Waste Extraction Test using DI water
DISS	Dissolved (direct analysis of 0.45 µm filtered and acidified water sample)
DLT	Dilution Test (Serial Dilution)
DUP	Duplicate
EDL	Estimated Detection Limit
ERS	External reference sample. Second source calibration verification.
ITEF	International Toxicity Equivalence Factor
LCS	Laboratory Control Sample
MB	Method Blank
MB % Rec	% Recovery of Surrogate in Method Blank, if applicable
MDL	Method Detection Limit
ML	Minimum Level of Quantitation
MS	Matrix Spike
MSD	Matrix Spike Duplicate
N/A	Not Applicable
ND	Not detected at or above the indicated MDL or RL
NR	Data Not Reported due to matrix interference or insufficient sample amount.
PDS	Post Digestion Spike
PDSD	Post Digestion Spike Duplicate
PF	Prep Factor
RD	Relative Difference
RL	Reporting Limit (The RL is the lowest calibration standard in a multipoint calibration.)
RPD	Relative Percent Deviation
RRT	Relative Retention Time
SPK Val	Spike Value
SPKRef Val	Spike Reference Value
SPLP	Synthetic Precipitation Leachate Procedure
ST	Sorbent Tube
TCLP	Toxicity Characteristic Leachate Procedure
TEQ	Toxicity Equivalents
TZA	TimeZone Net Adjustment for sample collected outside of MAI's UTC.
WET (STLC)	Waste Extraction Test (Soluble Threshold Limit Concentration)



Analytical Report

Client: Langan
Date Received: 12/28/18 12:45
Date Prepared: 1/14/19
Project: 750652601; 1051 Mission Road

WorkOrder: 1812D91
Extraction Method: CA Title 22
Analytical Method: SW6020
Unit: mg/L

Metals (STLC)

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
B1-E1-2.5'	1812D91-001A	Soil	12/18/2018	ICP-MS2 151SMPL.D	171389

Analytes	Result	RL	DF	Date Analyzed
Chromium	0.43	0.10	1	01/17/2019 00:52

Analyst(s): JC

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
B1-E2-7.5'	1812D91-002A	Soil	12/18/2018	ICP-MS2 152SMPL.D	171389

Analytes	Result	RL	DF	Date Analyzed
Chromium	0.31	0.10	1	01/17/2019 00:58

Analyst(s): JC

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
B1-E4-12.5'	1812D91-004A	Soil	12/18/2018	ICP-MS2 138SMPL.D	171427

Analytes	Result	RL	DF	Date Analyzed
Chromium	0.43	0.10	1	01/16/2019 23:32

Analyst(s): JC



Quality Control Report

Client:	Langan	WorkOrder:	1812D91
Date Prepared:	1/14/19	BatchID:	171389
Date Analyzed:	1/16/19	Extraction Method:	CA Title 22
Instrument:	ICP-MS2	Analytical Method:	SW6020
Matrix:	Soil	Unit:	mg/L
Project:	750652601; 1051 Mission Road	Sample ID:	MB/LCS/LCSD-171389

QC Summary Report for Metals (STLC)

Analyte	MB Result	MDL	RL			
Chromium	ND	0.10	0.10	-	-	-

Analyte	LCS Result	LCSD Result	SPK Val	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Limit
Chromium	9.2	9.2	10	92	92	75-125	0	20

(Cont.)



Quality Control Report

Client: Langan
Date Prepared: 1/14/19
Date Analyzed: 1/16/19
Instrument: ICP-MS2
Matrix: Soil
Project: 750652601; 1051 Mission Road

WorkOrder: 1812D91
BatchID: 171427
Extraction Method: CA Title 22
Analytical Method: SW6020
Unit: mg/L
Sample ID: MB/LCS/LCSD-171427
1812D91-004AMS/MSD

QC Summary Report for Metals (STLC)

Analyte	MB Result	MDL	RL			
Chromium	ND	0.10	0.10	-	-	-

Analyte	LCS Result	LCSD Result	SPK Val	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Limit
Chromium	9.5	9.3	10	95	93	75-125	2.22	20

Analyte	MS DF	MS Result	MSD Result	SPK Val	SPKRef Val	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD Limit
Chromium	1	9.5	9.5	10	0.4258	91	90	75-125	0.190	20

Analyte	DLT Result	DLTRef Val	%D	%D Limit
Chromium	ND<0.50	0.4258	-	-

%D Control Limit applied to analytes with concentrations greater than 25 times the reporting limits.



1534 Willow Pass Rd
Pittsburg, CA 94565-1701
(925) 252-9262

☐ WaterTrax ☐ WriteOn ☐ EDF

CHAIN-OF-CUSTODY RECORD

Page 1 of 1

WorkOrder: 1812D91 A ClientCode: TWRF

☐ Excel ☐ EQuIS ☒ Email ☐ HardCopy ☐ ThirdParty ☐ J-flag
☐ Detection Summary ☐ Dry-Weight

Report to:

Peter Cusack
Langan
555 Montgomery St., Suite 1300
San Francisco, CA 94111
(415) 955-9040 FAX: (415) 955-9041

Email: pcusack@langan.com
cc/3rd Party:
PO:
Project: 750652601; 1051 Mission Road

Bill to:

Accounts Payable
Langan
555 Montgomery St., Suite 1300
San Francisco, CA 94111
Langan_InvoiceCapture@concursolutio

Requested TAT: 5 days;

Date Received: 12/28/2018

Date Logged: 12/28/2018

Date Add-On: 01/11/2019

Lab ID	Client ID	Matrix	Collection Date	Hold	Requested Tests (See legend below)											
					1	2	3	4	5	6	7	8	9	10	11	12
1812D91-001	B1-E1-2.5'	Soil	12/18/2018 00:00	<input type="checkbox"/>	A											
1812D91-002	B1-E2-7.5'	Soil	12/18/2018 00:00	<input type="checkbox"/>	A											
1812D91-004	B1-E4-12.5'	Soil	12/18/2018 00:00	<input type="checkbox"/>	A											

Test Legend:

1	CRMS_STLC_S	2		3		4	
5		6		7		8	
9		10		11		12	

Prepared by: Nancy Palacios

Add-On Prepared By: Kena Ponce

Comments:

NOTE: Soil samples are discarded 60 days after results are reported unless other arrangements are made (Water samples are 30 days).
Hazardous samples will be returned to client or disposed of at client expense.



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1534 Willow Pass Road, Pittsburg, CA 94565-1701
Toll Free Telephone: (877) 252-9262 / Fax: (925) 252-9269
<http://www.mccampbell.com> / E-mail: main@mccampbell.com

WORK ORDER SUMMARY

Client Name: LANGAN

Client Contact: Peter Cusack

Contact's Email pcusack@langan.com

Project: 750652601; 1051 Mission Road

Comments:

Work Order: 1812D91

QC Level: LEVEL 2

Date Logged: 12/28/2018

Date Add-On: 1/11/2019

Lab ID	Client ID	Matrix	Test Name	Containers /Composites	Bottle & Preservative	Collection Date & Time	TAT	Sediment Content	Hold	SubOut
1812D91-001A	B1-E1-2.5'	Soil	SW6020 (Chromium) (STLC)	1	Stainless Steel tube 2"x6"	12/18/2018	5 days*		<input type="checkbox"/>	
1812D91-002A	B1-E2-7.5'	Soil	SW6020 (Chromium) (STLC)	1	Stainless Steel tube 2"x6"	12/18/2018	5 days*		<input type="checkbox"/>	
1812D91-004A	B1-E4-12.5'	Soil	SW6020 (Chromium) (STLC)	1	Stainless Steel tube 2"x6"	12/18/2018	5 days*		<input type="checkbox"/>	

NOTES: - STLC and TCLP extractions require 2 days to complete; therefore, all TATs begin after the extraction is completed (i.e., One-day TAT yields results in 3 days from sample submission).

- MAI assumes that all material present in the provided sampling container is considered part of the sample - MAI does not exclude any material from the sample prior to sample preparation unless requested in writing by the client.

1812D91

Page 1 of 1

LANGAN

CHAIN OF CUSTODY RECORD

- | | |
|---|--|
|  | 555 Montgomery Street, Suite 1300, San Francisco, CA 94111 |
|  | 501 14th Street, Third Floor, Oakland, CA 94612 |
|  | 3320 Data Drive, Suite 350, Rancho Cordova, CA 95670-7982 |
|  | 1 Almaden Boulevard, Suite 590, San Jose, CA 95113 |

Site Name: 1031 Mission Road

Job Number: 750652601

Project Manager/Contact: P. W. SACK

Samplers: B SANDERS

Recorder (Signature Required): PCW/SAEP

Analysis Requested

Turnaround

Time

Normal

No. Containers

& Preservative

[illegible]

Relinquished by: (Signature) *[Signature]*

Date: 12/28/18

Time 1160

Received by: (Signature)

Date 12/28/18 Time 1100

Relinquished by: (Signature)

Date: 12/28/18

Time
1245

Received by: (Signature) Nancy Palacios

Date 12.28.18 Time 1245

Relinquished by: (Signature)

Date:

Time

Received by Lab: (Signature) _____

Date	Time
------	------

Sent to Laboratory (Name):

McCampbell

Laboratory Comments/Notes:

Method of Shipment

☒ Lab courier ☐ Fed Ex ☐ Airborne ☐ UPS☐ Hand Carried ☐ Private Courier (Co. Name)

White Copy - Original

Yellow Copy - Laboratory

Pink Copy - Field

COC Number:

COC Number: 1-8 WET

APPENDIX G
BART GENERAL GUIDELINES

GENERAL GUIDELINES FOR DESIGN AND CONSTRUCTION OVER OR ADJACENT TO BART'S SUBWAY STRUCTURES

1. Structures over or adjacent to BART's subway structures shall be designed and constructed so as not to impose any temporary or permanent adverse effects on subway. The minimum clearance between any part of the adjacent structures to exterior face of substructures shall be 7'-6". Minimum cover of 8 feet shall be maintained wherever possible.
2. In general, cut-and-cover subway structures were designed with an area surcharge applied at the ground surface both over and adjacent to the structures. The area surcharge was considered static uniform load with the following value:

D (ft)	Additional Average Vertical Loading (psf)
D>20	0
5<D<20	800-40D
D<5	600

Where **D** is the vertical distance from the top of the subway roof to the ground surface.

3. In general, steel-lined tunnels were designed to support the weight of 35 feet of earth above the roof of the tunnel. Whenever the actual depth of cover is less than this amount, construction may be added imposing an additional average vertical loading of 120 lbs. per square foot for each foot of depth of reduced cover. Where basements are excavated, the allowable additional average vertical loading can be increased to the extent that it is balanced by the weight of the removed material. The effects of soil rebound in such cases shall be fully analyzed.
4. Shoring is required for excavations in the Zone of Influence. Zone of Influence is defined as the area above a Line of Influence which is a line from the critical point of substructure at a slope of 1 ½ horizontal to 1 vertical (line sloping towards ground level).
5. Shoring shall be required to maintain at-rest soil condition and monitored for movement.
6. Soil redistribution caused by temporary shoring or permanent foundation system shall be analyzed.
7. Dewatering shall be monitored for changes in groundwater level. Recharging will be required if existing groundwater level is expected to drop more than 2 feet.

GENERAL GUIDELINES FOR DESIGN AND CONSTRUCTION OVER OR ADJACENT TO BART'S SUBWAY STRUCTURES

8. Piles shall be predrilled to a minimum of 10 feet below the Line of Influence. Piles shall be driven in a sequence away from BART structures. No pile will be allowed between steel-lined tunnels.
9. Subway structures shall be monitored for vibration during pile driving operations for all piles within 100 feet of the structures. Steel –lined tunnels shall also be monitored for movement and deformation. Requirements for monitoring will be provided upon request.
10. Excavation shall be done with extreme care to prevent damage to the waterproofing membrane and the structure itself. Hand excavation shall be performed for the final one foot above the subway roof.

The above shall be considered as general information only and is not intended to cover all situations. Notwithstanding these guidelines, pertinent design and construction documents shall be submitted to BART for review and approval. In addition, the following shall be submitted as applicable:

- Geologic Hazards Evaluation and Geotechnical Investigation reports. The reports shall include engineering geology map, site plan showing the location of subway structures, BART easement, soil reworking plan and the geological conclusion and recommendations.
- Dewatering monitoring and recharging plans.
- Vibration monitoring plan and/or movement and deformation monitoring plans for steel-lined tunnels. Plans shall include locations and details of instruments in subways.
- Foundation plan showing the anticipated total foundation loads.
- Excavation plan for area within the Zone of Influence showing excavation slope or shoring system.
- Procedures and control of soil compaction operation.