JORDAN VALLEY WATER CONSERVANCY DISTRICT

JORDAN VALLEY WATER CONSERVANCY DISTRICT
WEST JORDAN, UTAH

JORDAN VALLEY WATER TREATMENT PLANT FILTER AND CHEMICAL UPGRADES

CLIENT PROJECT NO. 202001

CONTRACT/TECHNICAL SPECIFICATIONS

100% SUBMITTAL

VOLUME 5 OF 6

APPENDICES

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JORDAN VALLEY WATER CONSERVANCY DISTRICT

JORDAN VALLEY WATER TREATMENT PLANT FILTER AND CHEMICAL UPGRADES

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Geotechnical Report

Jordan Valley Water Treatment Plant
Filter & Chemical Feed Upgrades
Herriman, Utah

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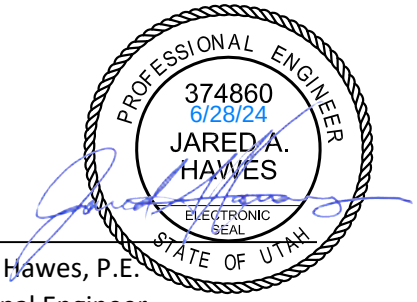

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Revision History

Revision	Revision Date	Comments
0	2/1/23	DRAFT
1	6/28/24	Final Geotechnical Investigation Report

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List of Acronyms

AASHTO	American Association of State Highway and Transportation Officials
Utah AGRC	Utah Automated Geographic Reference Center
ASCE	American Society of Civil Engineers
ASTM	ASTM International (formerly American Society for Testing and Materials)
EERI	Earthquake Engineering Research Institute
EPA	Environmental Protection Agency
IBC	International Building Code
IGES	Intermountain GeoEnvironmental Services, Inc.
ISB	Intermountain Seismic Belt
MCE_R	Risk-Targeted Maximum Considered Earthquake
NCEER	National Center for Earthquake Engineering Research
NSF	National Science Foundation
PGA	Peak Ground Acceleration
SGID	State Geographic Information Database
USCS	Unified Soil Classification System
USGS	United States Geological Survey
UGS	Utah Geological Survey
Utah SGID	Utah State Geographic Information Database
WFZ	Wasatch Fault Zone
#PE#	# Probability of exceedance in # years

1 Executive Summary

This report presents the results of a geotechnical investigation conducted for the proposed filter and chemical feed upgrades for the Jordan Valley Water Treatment Plant (JVWTP) in Herriman, Utah. The purpose of this investigation was to observe and document the subsurface conditions and provide recommendations for the design and construction of the proposed structures. **Based on the subsurface conditions encountered, it is our opinion that the native site soils are suitable to support the proposed structures provided that the recommendations presented in this report are completely incorporated into the design and construction.**

A summary of the field and laboratory exploration programs performed for this study, a discussion of the subsurface conditions observed, and recommendations regarding the design and construction of the proposed site improvements are provided in this report. Key findings and conclusions are presented in the following paragraphs.

- Site Characterization
    - The native subsurface conditions observed at the project site generally consisted of coarse-grained soil. Layers of fine grained soils about 3 to 5 feet thick were observed in B-03 at depths of 15 to 23 feet below existing grade. Fine grained soils were tested to be hard lean clay with varying amounts of coarse-grained material or low plasticity silts. Coarse grained layers were tested to be dense to very dense silty-sand with occasional gravel.
    - Groundwater was not observed during the investigation. Mapping shows groundwater is expected to be at depths greater than 30 feet. Seasonal and annual variations in precipitation, irrigation, and rate of snowmelt will influence the depth-to-groundwater across the project site.
- Geologic Hazard Conclusions
    - The site is not located within a surface fault rupture special study area, and no faults are known to be present on or across the subject property. However, Biek (2005) indicated the Jordan Narrows fault located to the north and east of the site. Subsequent studies discussed in Section 3.2 determined that the fault was not considered an active fault. As a result, the surface fault rupture hazard is not anticipated to adversely impact the subject property.
    - Earthquake ground shaking may affect the project area and is considered to pose a high risk. The site is situated within a seismically active area and severe to violent ground shaking should be anticipated in the event an earthquake occurs within the lifetime of the structure.

- The site is mapped as having a *Very Low* liquefaction hazard, liquefaction is therefore not anticipated to impact the project.
- The site is mapped as have a *High* risk for indoor radon.
- The site is not mapped for having a risk of expansive or collapsible soils, or landslides.

- Design and Construction Conclusions
  - The existing native silty sands are considered suitable or practical for reuse onsite as structural fill.
  - Total settlement of the across all structures on the site is expected to be less 0.1 inches.
  - Shallow spread or continuous wall footings on competent native subgrade or a minimum of two feet of properly compacted granular structural fill overlying competent native earth materials, may be proportioned utilizing a maximum net allowable bearing pressure of 4,000 pounds per square foot (psf).
  - We recommend active, at-rest, and passive lateral earth pressure coefficients of 0.33, 3.00, 0.50, respectively, and seismic active and seismic passive lateral earth pressure coefficients of 0.65 and 2.51, respectively for buried structures backfilled with native site soils.

NOTE: The scope of services provided within this report are limited to the assessment of the subsurface conditions at the subject site. The executive summary is provided solely for purposes of overview and is not intended to replace the report of which it is part and should not be used separately from the report.

2 Introduction

The purpose of our investigation was to assess the nature and engineering properties of the subsurface soils at the project site and to provide recommendations for the design and construction of foundations, buried structures, grading, and drainage. Additionally, geologic hazards have been reviewed for the project area. The scope of work completed for this study included literature review, subsurface exploration, laboratory testing, engineering analyses, and the preparation of this report.

Our services were performed in accordance with our proposal dated June 1, 2021, and your signed authorization. This report was prepared in accordance with the Salt Lake County Code of Ordinance Chapter 19.75 Geological Hazards Ordnance (Salt Lake County, 2021), and the industry *standard-of-care*. The recommendations presented in this report are subject to the limitations presented in Section 8.1.

2.1 Project Description

The project will includes additions to the JVWTP within existing property boundaries. The project is currently in the early planning stages; however, we have been told that the project will include construction of a 1Mgal prestressed concrete backwash tank (~75-ft diameter, 20-ft tall), two (2) Powdered Activated Carbon (PAC) Silos (each 44-ft tall) and two buildings for Caustic Soda (~2,800 sq-ft) and Chlorine Gas (~7,000 sq-ft) that are supported by a reinforced concrete slab foundation built on engineered fill. The two buildings and the PAC silos may be constructed with foundations at/near the current site grade, or they may be cut into the existing hillside; requiring construction of a retaining wall to limit the lateral extent of site grading.

Final construction plans were not available at the time of this report; however, we presume that the new buildings(s) will be on-grade structures (no basement) founded on conventional spread footings. Loading information was not available at the time of this report.

3 Methods of Study

The subsurface conditions were investigated by means of a literature review and soil borings. Samples were obtained during the field program and representative samples were tested during the laboratory investigation.

3.1 Literature Review

The following items were reviewed as part of this investigation:

- Stokes (1987), Milligan (2000), Hintze (1988), and Oviatt (2015) provide regional geologic setting information.
- Milligan, (2000), Hintze (1993), Lund (1990), Stokes (1987), and Utah Geological Survey (UGS, 1996, 2019) provide regional seismotectonic setting information.
- Biek (2005) provides the most recent 1:24,000-scale geologic mapping that covers the project site, in the geologic map of the Jordan Narrows Quadrangle, Salt Lake and Utah Counties, Utah.
- The Utah Geological Survey (UGS) Utah Quaternary Fault and Fold Map (UGS, 2019) was reviewed to identify the location of proximal faults that have had associated Quaternary-aged displacement.
- Groundwater mapping and data including:
    - Data provided by the Utah SGID (Utah AGRC)
- The Federal Emergency Management Agency (FEMA, 2021) flood insurance rate map that covers the subject property.
- McDonald (2018) provides fault mapping and surface fault rupture special study mapping in the project area.
- The Utah Geological Hazards Portal (UGS 2023) provides earthquake ground shaking and Surface Fault Rupture Special Study Zone mapping.

3.2 Previous Geotechnical Investigations

In January of 1985, Dames & Moore performed a site investigation for the purpose of evaluating the geoseismic setting of the water purification plant, develop a seismic risk for existing and proposed plant facilities, and provide supplemental soils and earthwork recommendations for final design. The field program consisted of two trenches situated to expose suspected fault zones. It was determined that the fault is “potentially active,” but not considered an active fault. It was determined that it was unlikely to move during the design life of the proposed water

purification plant (50-100 years).

In August of 2009, IGES performed a geotechnical investigation for the Chlorine Dioxide building for the purpose of providing recommendations for general site grading and the design and construction of foundations, slabs-on-grade, and exterior concrete flatwork. The field program consisted of two boreholes to depths varying from 10 to 25 feet below existing grade. Subsurface conditions were described as fill underlain by silty sand with gravel. Groundwater was not observed during the investigation.

In April of 2014, Gerhart Cole, Inc. performed a geotechnical study for the 3200 West access road for the purpose of developing geotechnical recommendations for roadway construction, maintenance, and repair. The field program consisted of 8 test holes to depths of 4 feet below existing grade, and 7 dynamic cone penetrometer (DCP) soundings. The subsurface conditions were identified as silty sands (SM). No groundwater was encountered during the investigation.

In May of 2015, Gerhart Cole, Inc. performed a geotechnical and geologic study for the finished water reservoir located at the treatment plant. The purpose of the study was to develop geotechnical recommendations for the reservoir. The field program consisted of two test holes to depths of 51.5 and 61 feet, and a fault trench. The subsurface conditions were described as about 27 to 31 feet of silty sand (SM) underlain by gravel with sand and silt. The study also noted that no observed evidence of faulting in the trenches conducted. They concluded that there have not been any surface fault rupture events in the past 22,000 years.

In February of 2020, Gerhart Cole, Inc. completed a technical memorandum for the design and construction of the upgrades at the water treatment plant. These consisted of updating seismic design parameters with IBC 2021, providing earth pressures for design of buried structures, providing recommendations for concrete lining of existing reclaim ponds, and assessing local slope stability associated with installation of new pipe. The field program consisted of 5 soil borings to depth varying from 17 to 30 feet below existing grade, and a geophysical survey to obtain a shear wave velocity profile. Subsurface conditions of native soil were described as silty to clayey sands (SM to SC) with gravel and cobbles/boulders. Groundwater was not encountered during the field investigation.

In November of 2022, Gerhart Cole, Inc. completed a technical memorandum for the design and construction of sedimentation basins for the water treatment plant. The field program consisted of one boring to a depth of 36 feet below the existing grade. Native soils were identified as being primarily medium dense to very dense silty sands and gravels (SM and GM). No groundwater was encountered during the field investigation.

3.3 Field Investigation

Characterization of the general subsurface conditions at the project site was undertaken with 4 ODEX soil borings. Investigation locations were selected based on our understanding of the

proposed construction at the time of the investigations. Explorations were located by IGES personnel based on offset from existing site features. Prior to the field program, a Blue Stakes of Utah request was submitted to delineate public utilities in the vicinity of the explorations. Explorations were advanced in areas accessible to the equipment and clear of marked utilities. A summary of the explorations performed to date is presented in Table 1.

3.3.1 Soil Borings

Four test borings (designated B-01 through B-04) were performed between December 14 and December 15, 2023, to depths ranging between 34.0 and 40.0 feet below the existing grade. The borings were advanced by ConeTec by a track-mounted Fraste drill rig equipped with ODEX 90 drill bit and casing (4-1/2 inch outside diameter). Groundwater was not encountered in any of the borings. Samples generally were obtained at 5-foot intervals continuously, except for B-01 where samples were obtained at 2.5-foot intervals for the first 10 feet and then 5-foot intervals thereafter. Samples were collected with split-barrel type SPT spoon or Modified California samplers in general accordance with ASTM D1586 and ASTM D3550 as applicable. Split barrel samplers were advanced utilizing an auto trip 140-pound hammer free falling 30 inches. Blow counts for these sampling events were recorded by an IGES representative and were corrected for hammer energy using the measured hammer energy transfer ratio. Blow counts for large diameter samplers (e.g. Modified California, Type-U) were corrected to a standard split spoon value utilizing the method detailed in Fang (1991). Soil samples were packaged in sealed containers and transported in general accordance with ASTM D4220 to the IGES geotechnical laboratory in South Salt Lake for subsequent review and testing. A representative of IGES observed the borings being performed, visually classified the samples in general accordance with ASTM D2488 and prepared the graphical boring logs shown in Figures B-1 through B-4. A key to the soil symbols and terminology is shown as Figure B-5.

Table 1: Summary of Explorations

Field Exploration	Ground Surface Elevation[1] (feet)	Total Depth of Exploration (feet)	Encountered Groundwater Depth [Elevation[1]] (feet)
B-01	4772	40.0	Not Encountered
B-02	4773	35.0	Not Encountered
B-03	4768	40.0	Not Encountered
B-04	4767	40.0	Not Encountered

Notes:

1) Approximate, based on Google Earth elevation

3.3.2 Additional Field Investigation

After the initial field investigation involving the borings, it was learned that material from an existing mound (location of the proposed backwash tank) is likely to be reused as grading or structural fill on the project. IGES representatives returned to the site and collected bulk samples of material from the existing mound in shallow hand-excavations. Additional testing was also performed to determine engineering properties of the mounded soil and whether it was suitable for reuse as fill. Bulk samples were mixed prior to testing based on the assumption that materials from the mound would be blended together prior to placement.

3.3.3 Backfill and Surface Restoration

Following completion of the explorations, the boreholes were backfilled using granular bentonite pellets. In grassy areas, excess cuttings were mounded over the borehole.

3.3.4 Geophysical Testing

A geophysical survey of the site was performed on December 11, 2023, by IGES. The survey was performed to measure the shear wave velocity profile to aid in seismic site classification. The geophysical survey report has been included in Appendix A.

3.4 Laboratory Investigation

Geotechnical laboratory tests were conducted by IGES on relatively undisturbed and bulk soil samples, obtained during the field investigation. The laboratory testing program was designed to

evaluate the engineering characteristics of on-site earth materials. Laboratory tests conducted during this investigation included the following:

- **Index Testing**
  - In situ Moisture Content *and Unit Weight* (ASTM D7263 *and D2216*)
  - Atterberg Limits (ASTM D4318)
  - Particle-Size Analysis(ASTM D6913)
  - Percent Fines (ASTM D1140)
- **Compaction Testing**
  - Laboratory Compaction Characteristics of Soil (Modified Effort, ASTM D1557)
- **Subgrade Pavement Support**
  - California Bearing Ratio (CBR, ASTM D1883)
- **Soil Strength Testing**
  - Drained Direct Shear (ASTM D3080)
- **Corrosion Potential**
  - Sulfate (ASTM C1580)
  - Chloride (ASTM D4327)
  - pH (American Association of State Highway and Transportation Officials [AASHTO] T289)
  - Electrical Resistivity (AASHTO T288)

Selected results have been presented on the attached boring logs in Appendix B. A summary table along with the full results of the laboratory testing are provided in Appendix C.

3.5 Engineering Analysis

Engineering analyses were performed using soil data obtained from the field program, laboratory test results, and empirical correlations from material density, depositional characteristics and classification. Appropriate factors of safety were applied to the results consistent with industry standards and Salt Lake County Ordinance.

4 Geologic Conditions

4.1 General Geologic Setting

4.1.1 Regional Geology From Literature

The near-surface geology of the Salt Lake Valley is dominated by sediments that were deposited within the last 30,000 years predominantly by the Pleistocene Lake Bonneville, which was as much as 1,000 feet deep (Hintze, 1993). The two most prominent Lake Bonneville shorelines are known as the Bonneville and Provo Shorelines. The Bonneville Shoreline is the highest shoreline of Lake Bonneville and was formed approximately 18,000 years ago (Oviatt, 2015). Not long after Lake Bonneville reached its highstand shoreline, the lake catastrophically drained through an outlet near Red Rock Pass in southeastern Idaho and into the Snake River Plain before stabilizing at the Provo level (Oviatt, 2015). The Bonneville Flood lowered the lake level approximately 350 feet from the Bonneville Shoreline to the Provo Shoreline. The Provo Shoreline developed over a considerably longer period, from between approximately 18,000 and 15,000 years ago.

The lacustrine sediments near the mountain front consist mostly of beach sand and gravel. Sediments toward the center of the valley are predominantly offshore deposits of clay, silt, and fine sand. Post-Bonneville alluvial and colluvial cover as well as mass-movement deposits are common along the Wasatch Front and in some places extend to the central part of the valley.

4.1.2 Seismotectonic Setting From Literature

The Wasatch Front forms the boundary between two seismically-active physiographic provinces, the Basin and Range Province to the west and the Middle Rocky Mountains Province to the east (Milligan, 2000). The Wasatch Mountains, as part of the Middle Rocky Mountains Province, were uplifted as a fault block along the Wasatch Fault (Hintze, 1993).

The Wasatch Fault and its associated segments are part of an approximately 230-mile-long zone of active normal faulting collectively referred to as the Wasatch Fault Zone (WFZ), which has well-documented evidence of late Pleistocene and Holocene (though not historic) movement (movement within the past ~15,000 years; Lund, 1990; Hintze, 1993). The faults associated with the WFZ are almost all normal faults, exhibiting block movement down to the west and up to the east. The WFZ is contained within a greater area of active seismic activity known as the Intermountain Seismic Belt (ISB) which runs approximately north-south from northwestern Montana, along the Wasatch Front of Utah and southern Nevada and into northern Arizona. In terms of earthquake risk and potential associated damage, the ISB ranks only second in North America to the San Andreas Fault Zone in California (Stokes, 1987).

The WFZ consists of a series of ten segments of the Wasatch Fault that each display different characteristics and past movement and are believed to have movement independent of one

another (UGS, 1996). The WFZ and its corresponding segments and splays are seismically active and capable of producing earthquakes in excess of moment magnitude of 7.0. Within the past 6,000 years, 19 earthquakes capable of generating surface-fault-rupture have been experienced along various parts of the WFZ (UGS, 1996). Mapping indicates that the Jordan Narrows and Traverse Mountain North traces are in close proximity to the site. The Jordan Narrows trace runs northwest directly adjacent to the fault and the Traverse Mountain North fault connects to the Jordan Narrows trace just east of the site.

4.2 Surficial Site Geology from Literature

According to Biek (2005, see Figure A-2a and A-2b) the project area is mapped as Lacustrine gravel and sand deposits (map unit Qlgp), and Lacustrine sand and silt deposits (map unit Qlsp). The referenced mapping and unit descriptions are provided in the Figure A-3 in the appendices and are summarized below.

The Lacustrine gravel and sand deposits are Upper Pleistocene aged and is described as "Moderately to well-sorted, moderately to well-rounded, clast-supported, pebble to cobble gravel and pebbly sand; thin to thick bedded; typically interbedded with or laterally gradational to sand and silt facies; gastropods locally common in sand lenses; locally partly cemented with calcium carbonate; typically forms well-developed wave-cut or wave-built benches, bars and spits, including the classic spit at Point of the Mountain; elsewhere forms veneer that drapes over pre=existing topography; some shoreline deposits characterized by abundant subangular boulders derived from nearby slopes; intermediate shorelines are locally well developed on these unites; Qlgb deposited at and below highest Bonneville shoreline but above the Provo shoreline, and Qlgp deposited at and below the Provo shoreline; Qlgbp denotes deposits near Jordan Narrows that likely contain both transgressive (Bonneville) and regressive (Provo) lacustrine sand and lesser gravel; Qlgp deposits north of Steep Mountain commonly form a veneer 1 to 10 feet (0.3-3 m) thick over highly fractured orthoquartzite; 0 to about 300 feet (0-90 m) thick."

The Lacustrine sand and silt deposits are Upper Pleistocene aged and is described as "Fine- to coarse-grained lacustrine sand and silt with minor gravel; typically thick bedded and well sorted; gastropods locally common; grades downslope from sandy nearshore deposits to finer grained offshore deposits; locally concealed by loess veneer; intermediate shorelines typically poorly developed on this facies; Qlsb deposited at and below highest Bonneville shoreline but above the Prove shoreline, and Qlsp deposited at and below the Provo shoreline; Qlsbp denotes deposits north of Jordan Narros that likely contain both transgressive (Bonneville) and regressive (Provo) sediments; exposed thickness less than 40 feet (12m)."

4.3 Hydrology

The Federal Emergency Management Agency (FEMA) flood map that covers the subject property (FEMA, 2021) does not show any associated 1% (100-year) special flood hazard areas within or adjacent to the subject property.

Mapping by the Utah SGID (Utah AGRC, dataset updated in 2022 and accessed 2024) indicates that groundwater is anticipated to be present at a depth of greater than 30 feet. It should be noted that this mapping is at a regional scale and does not typically incorporate relatively acute grade changes like those present at this site. No seeps or springs are known to be present on or near the subject property.

4.4 Geologic Hazards from Literature

Based on a review of the mapping provided by McDonald (2018), the project area is not currently located in a Surface Fault Rupture special study area. Proximate faults and special study areas are shown in Figure A-5.

4.4.1 Surface Fault Rupture

Based on a review of the mapping provided by the Utah Geologic Hazards Portal (UGS 2021), the project area is not currently located in a Surface Fault Rupture special study area. Biek (2005) indicated the Jordan Narrows fault located to the north and east of the site. As discussed in Section 3.2, the fault is not considered an active fault and has no evidence of faulting within the past 22,000 years. Therefore, surface fault rupture hazard is not anticipated to adversely affect the project.

4.4.2 Strong Ground Motions

The entire property is subject to earthquake-related ground shaking from a large earthquake generated along the active Wasatch Fault. Given the distance proximity of the site to active faults, the ground shaking is expected to be severe/violent (UGS, 2023).

4.4.3 Liquefaction

Liquefaction potential maps considers soil and ground-water conditions combined with earthquake ground-shaking probabilities to induce liquefaction. Anderson (1994) maps the project site as *Very Low* liquefaction hazards. As a result, liquefaction hazard is not considered a risk to the project.

4.4.4 Geologic Radon

Based on mapping by Black (1993), the risk for indoor geologic radon is designated as *High*. This designation is defined as an "Areas in which geologic factors are generally favorable for indoor-radon hazards."

4.5 Seismicity

4.5.1 Seismic Site Class

To account for site effects, site coefficients that vary with the magnitude of spectral acceleration and Site Class are used. Site Class is a parameter that accounts for site amplification effects of soft soils and is based on the average shear wave velocity of the upper 100 feet (30 meters, Vs_{30}); site classifications are identified in Table 20.3-1 of ASCE 7-16 (ASCE 2017, 2018).

Based on the geophysical field program performed by IGES, the Vs_{30} of the site was measured to be approximately 1,785 feet per second (544 meters per second). Therefore, these subsurface materials classify as Site Class C. This aligns with previous reports performed by Gerhart Cole (2015) which also stated that the site class was C (bordering C/D classification boundary).

4.5.2 Design Spectrum

Following the criteria outlined in the 2021 International Building Code (IBC, 2021), spectral response at the site was evaluated for the risk-targeted *Maximum Considered Earthquake* (MCE_R). This represents accelerations in the direction of maximum horizontal response represented by a 5 percent damped acceleration response spectrum that equates to a 1 percent probability of building collapse within a 50-year period. The MCE_R spectral accelerations were determined based on the location of the site using the Structural Engineers Association of California online seismic map application (https://seismicmaps.org/) which incorporates seismic hazard maps depicting probabilistic ground motions and spectral response data developed for the United States by the U. S. Geological Survey. These maps have been incorporated into the IBC (IBC, 2021). The short- and long-period Design Spectral Response Accelerations for the site are presented below in Table 2and Table 3 and have also been included in Appendix C. The PGA_M is based on a uniform hazard approach and represents the probabilistic PGA with a 2 percent probability of exceedance in a 50-year period (2PE50) as opposed to the risk-targeted MCE_R, which is based on a uniform risk approach.

Table 2: Spectral Accelerations for MCER, Risk-Targeted Values (Structural)

Mapped B/C Boundary S_a (g)		Site Coefficient (Site Class D Default)		Design Sa (g)		
Ss	S_1	F_a	F_v	PGA	S_{DS}	S_{D1}
1.171	0.424	1.2	**1.5**	0.519	0.937	**0.424**

Notes:

1) $T_L = 8$

Source: https://seismicmaps.org/

Table 3: Spectral Accelerations for MCE, Geo-Mean Values (Geotechnical)

Mapped B/C Boundary PGA (g)	Site Coefficient F_{PGA} (Site Class C Default)	PGA_M (g)
0.519	1.2	0.623

Notes:

Source: https://seismicmaps.org/

5 Generalized Site Conditions

5.1 Existing Conditions

The property is located at approximately 15300 South and 3200 West in Herriman, Utah. The site is comprised of the existing Jordan Valley Water Treatment Plant Facilities. Additional information provided by Jordan Valley indicates that existing utilities at the site include underground and power, underground communications. Private utilities including buried sight lighting power are also likely present.

5.2 Subsurface Conditions

Generalized descriptions of the subsurface soils that were encountered during the explorations are provided in the following sections. Soil conditions likely vary between each discrete exploration location. Referenced depths are relative the existing grade at the time of the explorations unless otherwise noted.

5.2.1 Earth Materials

The native subsurface conditions observed at the project site generally consisted of coarse-grained soil. Layers of fine grained soils about 3 to 5 feet thick were observed in B-03 at depths of 15 to 23 feet below existing grade. Fine grained soils were tested to be hard lean clay with varying amounts of coarse-grained material or low plasticity silts. Coarse grained layers were tested to be dense to very dense silty or sand with occasional gravel.

5.2.2 Groundwater Conditions

Groundwater was not encountered in any explorations completed during this investigation. According to Utah SGID (Utah AGRC, dataset updated 2022 and accessed 2024) groundwater is expected to be at depths greater than 30 feet according to mappingr. Seasonal and annual variations in precipitation, irrigation, and rate of snowmelt will influence the depth-to-groundwater throughout the project site. Proposed and future construction or alteration of hydrologic conditions in the area may alter the groundwater levels.

5.3 Environmental Conditions

Possible indications of impacted soil including odors or soil staining were not observed in the explorations performed as part of this investigation. A field or lab environmental characterization program was beyond the scope of this analysis. The absence of indications of environmental conditions does not serve as an evaluation or quantification of environmental conditions at the site.

5.4 Strength of Earth Material

Five consolidated drained direct shear tests was performed to further characterize and validate the strength of earth materials beyond the data obtained from field testing. The results of the testing are summarized in Table 4.

Table 4:Summary of Shear Strength Testing Results

Borehole/Sample ID	Sample Depth (feet)	Shear Testing Type [1]	Effective Stress	
			c ‘ (psf)	ϕ ‘ (degrees)
B-02	15.0	Consolidated Drained Direct Shear	367	40
B-03	15.0	Consolidated Drained Direct Shear	1040	30
B-04	15.0	Consolidated Drained Direct Shear	1757	40
Bulk-01	0-2’	Consolidated Drained Direct Shear	1001	33
Bulk-02	0-2’	Consolidated Drained Direct Shear	941	33

Notes:

1) See Appendix C for complete test results for further information

Source: Compiled by IGES in 2024

5.5 Soil Chemistry

Samples were tested for soil resistivity, soluble chloride and pH to evaluate the corrosion potential for ferrous metal in contact with onsite soil and tested for soluble sulfates to evaluate the potential for sulfate attack of cementitious concrete.

The results of the corrosion testing for soils along with the associated corrosion potential are presented in Table 5 and in Appendix C. The results are further discussed in Section 6.8.

Table 5: Corrosion Potential Indicator Testing Summary

Sample		Corrosion Potential Indicator			
Exploration/Sample ID	**Depth (ft)**	**pH**	**Soluble Sulfate (ppm)**	**Soluble Chloride (ppm)**	**Electrical Resistivity (Ω-cm)**
B-01	2.5 & 5.0	8.6	<11	<11	7102
B-03	10.0	8.9	16	<11	1621
B-04	5.0	9.0[a]	21	<12	1273
Bulk-01	0-2	8.0	<11	<11	3424
Bulk-02	0-2	8.1	<11	<11	2754

Notes:

a) Outside of typically expected range

Source: Compiled by IGES in 2024

6 Design Recommendations

6.1 General Conclusions

Based on the results of the field observations, laboratory testing, engineering analysis, and literature review, the subsurface conditions are considered suitable for the proposed development provided that the recommendations presented in this report are incorporated into the design and construction of the project.

Supporting data upon which the following conclusions and recommendations are based have been presented in the previous sections of this report. The recommendations presented herein are governed by the physical properties of the earth materials encountered in the subsurface explorations. If subsurface conditions other than those described herein are encountered in conjunction with construction, and/or if design and layout changes are initiated, IGES must be informed so that our recommendations can be reviewed and revised as deemed necessary.

6.2 Design Considerations

The foundation systems for specific structures should be selected by the design team based on consideration of the project schedule, the relative costs, and the risks associated with each alternative. At these project sites, the risks primarily are associated with installation complication and variable subsurface conditions leading to design changes.

6.3 Shallow Foundation Recommendations

Shallow foundations often are the preferred foundation type because of lower construction costs and ease of construction. However, at sites where soil conditions are not able to support reasonably sized shallow foundations, where high vertical and lateral loads are anticipated, or when consolidation or liquefaction settlement is significant, deep foundations often are preferred. Several shallow foundation systems are discussed in the following sections.

6.3.1 Spread Footings

Conventional spread footings typically consist of relatively shallow reinforced concrete masses in various arrangements, to support loads imposed by a structure. Typical arrangements of shallow foundations include square, rectangular, or round isolated footings, continuous footings, and ring walls. They typically are the foundation of choice to support relatively modest loads, where small total and differential settlements will be tolerable. Construction costs of spread footings are relatively low given that specialty equipment is typically not needed for installation.

6.3.2 Bearing Capacity

6.3.2.1 Shallow Spread Footings

Shallow spread or continuous wall footings on competent native subgrade or a minimum of two feet of properly compacted granular structural fill overlying competent native earth materials, may be proportioned utilizing a maximum net allowable bearing pressure of 4,000 pounds per square foot (psf) for dead load plus live load conditions. The allowable bearing capacity may be increased by one-third for short-term loading (wind and seismic).

6.3.2.2 Mat Foundation

For a mat foundation constructed for the PAC, over a properly prepared subgrade consisting of a minimum of 2 feet of compacted structural fill, a maximum allowable bearing pressure of 1.8 ksf may be used for design. This may be increased by one-third for transient loading (e.g. wind, seismic). This reflects the maximum loading and structure size. Based on our interpretation of the subsurface profile, it is near or slightly below the existing effective stress at the foundation depth (i.e. fully compensated). Based on effective and total stress strength parameters from in situ and laboratory testing, it appears that the geotechnical strength of the soil will have a factor of safety greater than 2 as compared to the settlement-controlled case. As the soil profile is overconsolidated, changes in loading, should be communicated to and reviewed by IGES. Further analysis and reporting may be required.

6.3.3 Foundation Burial Depth and Size

Each conventional foundation exposed to the full effects of frost should be established at a minimum depth of 30 inches below the lowest adjacent final grade. Interior footings, not subjected to the full effects of frost (i.e., a continuously heated structure), may be established at higher elevations, however, a minimum depth of embedment of 18 inches is recommended for confinement purposes. The minimum recommended footing width is 20 inches for continuous footings and 30 inches for isolated spread footings. The maximum recommended footing width is 4 feet for continuous footings and 7 feet for isolated spread footings. Larger sizes may be permitted but should be reviewed by IGES and accepted in writing.

6.3.4 Sliding Resistance

If the foundation will be constructed on native sand, it is anticipated that sliding resistance will develop from the friction between the structure base and foundation soil and will be proportional to the normal force. The following values can be utilized to calculate the ultimate sliding resistance. An appropriate factor of safety (or resistance factor) against sliding should be applied to the resistance. The values presented in Table 6 are for cast in place footings. If precast elements are proposed to be utilized, consideration should be given to reducing the sliding coefficient to reflect the smoother nature of the interface.

Table 6: Spread Footing Sliding Resistance

Material at Base of Foundation	Static Friction Coefficient	Seismic Friction Coefficient
Native Silty Sand[1]	0.35	0.23
Minimum 1 foot Structural Fill[1]	0.45	0.30

Notes:

1) Neglect adhesion

Source: Compiled by IGES in 2024

6.4 Settlement

Based on the subsurface soil profile, settlement of the structure is anticipated to only be elastic, immediate settlement that occurs as loads are applied. Long term and dynamic settlement were not considered an issue for the proposed construction since the native soils primarily consisted of very dense, coarse grained material that is not expected to be saturated by the groundwater.

6.4.1 Immediate Settlement

Immediate settlement was evaluated using SPT-based methods for calculating settlement of shallow foundation within sands. The methods used included those detailed by Meyerhof (1965) and Burland and Burbidge (1985). Both methods are based on the elasticity of sands and involve the average energy-corrected SPT blow counts (N_{60}) for the appropriate depths. The maximum settlement calculated for immediate settlement was less than 0.1 inches.

6.4.2 Dynamic Settlement

Dynamic settlement (or seismically-induced settlement) consists of dry dynamic settlement of unsaturated soils (above groundwater) and liquefaction-induced settlement (below groundwater). During a strong seismic event, dynamic settlement can occur within loose to moderately dense sandy soil due to reduction in volume during, and shortly after a seismic event. Settlement caused by ground shaking is often non-uniformly distributed, which can result in differential settlement. The project area is located in an area of “very low” risk for liquefaction and the groundwater is expected to be greater than 30 feet below the existing grade. Native soils at the site were also relatively dense. Therefore, dynamic settlement is not a concern and was not evaluated.

6.4.3 Modulus of Subgrade Reaction

Based on our understanding of the structures, the PAC silos foundation will consist of a reinforced structural mat. The modulus of subgrade reaction is a conceptual load-deflection property commonly used to simplify mat design and strip footing design. The value is constructed based on anticipated loading, size of the mat, stiffness of mat, soil type, and estimated soil deflection. In absence of field plate load testing, the modulus of subgrade reaction was based on field and laboratory test results and observed soil types. Based on the subsurface and foundation subgrade conditions as detailed in this report, a representative **modulus of subgrade reaction of 400 psi per inch (pci)** may be used for design of the mat. Consideration may be given to doubling the value along the edges of the mat if the mat is uniformly loaded with minimal column loads. The modulus of subgrade reaction should be appropriately modified based on the foundation size and stiffness.

6.4.4 Mat/Slab Detailing

To minimize settlement and cracking of slabs, and to aid in drainage beneath the concrete floor slabs, all concrete slabs should be founded on a minimum 4-inch layer of compacted gravel overlying properly prepared subgrade. The gravel should consist of free-draining gravel (1-inch max), or road base with a ¾-inch maximum particle size and no more than 5 percent passing the No. 200 mesh sieve. The layer should be compacted to at least 95 percent of the MDD as determined by ASTM D-1557.

All concrete slabs should be designed to minimize cracking as a result of shrinkage. Consideration should be given to reinforcing the slab with a welded wire fabric, re-bar, or fibermesh. Slab reinforcement should be designed by the structural engineer; however, as a minimum, slab reinforcement should consist of 4’’×4’’ W2.9×W2.9 welded wire mesh within the middle third of the slab. We recommend that concrete be tested to assess that the slump and/or air content is in compliance with the plans and specifications. We recommend that concrete be placed in general accordance with the requirements of the American Concrete Institute (ACI).

A moisture barrier (vapor retarder) consisting of 10-mil thick Visqueen (or equivalent) plastic sheeting should be placed below slabs-on-grade where moisture-sensitive floor coverings or equipment is planned. Prior to placing this moisture barrier, any objects that could puncture it, such as protruding gravel or rocks, should be removed from the building pad. Alternatively, the subgrade may be covered with 2 inches of clean sand, which will serve to minimize punctures through the Visqueen.

Our experience indicates that use of reinforcement in slabs and foundations can generally reduce the potential for drying and shrinkage cracking. However, some cracking can be expected as the concrete cures. Minor cracking is considered normal; however, it is often aggravated by a high water/cement ratio, high concrete temperature at the time of placement, small nominal

aggregate size, and rapid moisture loss due to hot, dry, and/or windy weather conditions during placement and curing. Cracking due to temperature and moisture fluctuations can also be expected. The use of low slump concrete can reduce the potential for shrinkage cracking; saw cuts in the concrete at strategic locations can help to control and reduce undesirable shrinkage cracks.

6.5 Lateral Support

Some of the proposed structures will have a below grade components requiring lateral forces to be considered in the design. Lateral pressure coefficients are presented for native material and structural fill. Appropriate earth pressure parameters should be selected based on the thickness of the backfill against wall and the type of movement expected of the wall. If structural fill parameters are to be utilized, the width of the structural backfill must be, at a minimum, equal to the buried height of the wall. If the foundation walls are to be restrained from lateral movement (i.e. braced at the bottom and top), or if the structure is movement sensitive, it is recommended that at-rest earth pressures be used for design. Mobilization of active earth pressures relatively dense cohesionless soil require horizontal deflections of at the top of the wall on the order of 0.001H (0.1 percent of the buried height of the wall). Mobilization of passive earth pressures in relatively dense cohesionless soil require horizontal deflections of at the top of the wall on the order of 0.02H (2 percent of the buried height of the wall). Predominantly cohesive materials require much larger, perhaps 5 to 10 times) displacements to fully mobilize active resistance but displacement required to fully mobilize passive resistance are comparable to those for cohesionless soil.

For seismic analyses, the *active* and *passive* earth pressure coefficients (K_{ae} & K_{pe} respectively) are based on the Mononobe-Okabe pseudo-static (M-O) approach (Mononobe and Matsuo 1929, Okabe 1926). The M-O approach accounts for the dynamic horizontal thrust produced by ground motion and the static thrust component. Hence, for seismic analysis the static and seismic values reported in Table 7 do not need to be added together, the seismic value alone can be used. Based on the information presented in Mononobe and Matsuo (1929) and Okabe (1926) along with results from more recent information presented in Lew et al. (2010) and Mikola and Sitar (2013), the dynamic earth pressure is approximated as a triangle with stress increasing with depth. The resultant may be applied at ⅓ of the buried wall height measured from the base of the wall (similar to static earth pressures).

Appropriate equivalent fluid densities should be used with regards to the location of the water table in various design cases. Hydrostatic pressure must be added where applicable. Surcharge loading should be added where applicable. If the ground conditions slope steeper than 10 horizontals to 1 vertical (10H:1V), or where surcharges are present within a horizontal distance equal to the wall system height (total height for tiered systems), global stability should be addressed as part of the wall design.

If removal of material in passive zone is possible (e.g. utilities, pavement section, scour) passive resistance should be neglected. Similarly, passive resistance is typically neglected for portions of the passive zone susceptible to frost action or volumetric change due to fluctuating groundwater levels. If passive resistance is calculated in conjunction with frictional resistance along the base of the structure, the passive resistance should be reduced by at least ½. Over- or uneven compaction of backfill against wall may impart excessive pressures of the wall and should be avoided.

Ultimate lateral earth pressures acting against vertical walls with level backfill may be computed from the equivalent fluid densities. The recommended lateral pressure coefficients are presented in Table 7.

Table 7: Lateral Pressure Coefficients

Material	Load Case	Total Unit Weight (pcf)		Earth Pressure Coefficient				
		Above Water Table	Below Water Table [B]	Active		Passive		At-Rest
				Static[1,3]	Seismic[1,3]	Static[1,3]	Seismic[2,4]	Static[1,3]
Native Silty Sand	Drained	37.0	16.2	0.33	0.65	3.00	2.51	0.50
Structural Fill [B]	Drained	36.9	17.7	0.31	0.49	3.25	2.75	0.47

Notes:

A) Includes water weight component and pressure

B) Assumed, should be modified based on applicable compacted, in-place unit weight and moisture content

Loading Profile

1) Triangular Distribution (stress increasing with depth)

2) Uniform Distribution

Height of Action measured from Base of Wall

3) Height of Wall divided by 3

Source: Compiled by IGES in 2024

6.6 Pavement recommendations

6.6.1 Pavement Design

Flexible pavement sections were analyzed for proposed pavement for the chlorine building. Based on correspondence with the project civil engineer, roadways were assumed to have minimal heavyweight vehicles and consist primarily of passenger cars resulting in targets of approximately 1,442,000 flexible and 1,381,000 rigid equivalent single axel loadings (ESALs) over a 20-year design life. The pavement section was analyzed using the pavement design software WinPAS 12 from the American Concrete Pavement Association which uses the AASHTO 1993 flexible pavement design methodology. The parameters utilized are presented in Table 8. The recommended pavement sections are presented in Table 9.

Table 8:Summary of Pavement Analysis

Analysis Parameter	Hot Mix Asphalt
Initial Serviceability	4.2
Terminal Serviceability	1.5
Target Reliability (percent)	50.0
Calculated Reliability (percent)	98.29
Standard Deviation	0.45
Subgrade Resilient Modulus (psi)	~ 23,413
Design Life (years)	20

Notes:

Source: Compiled by IGES in 2024

The hot mix asphalt (or concrete) and untreated base course are predicted to accommodate the assumed loading of much of the near-surface subgrade soil at the site is characterized as coarse grained and is considered suitable to re-use as engineered fill. In general, materials should have less than 25% passing the #200 sieve to be considered non frost susceptible. The recommended pavement section described in Table 9 can be constructed directly over native soils/engineered fill. Granular borrow may be imported if needed for grading purposes, but is not needed as part of the pavement section.

Table 9:Summary of Pavement Sections

Pavement Usage	Minimum Layer Thickness (inches)	
	Flexible[1]	
	Hot Mix Asphalt	Untreated Base Course
Chlorine Building Roadway	4	8

Notes:

Source: Compiled by IGES in 2024

6.6.2 Pavement Materials

UTBC (roadbase) should be a well graded granular material, with a minimum AASHTO A-1 classification and minimum CBR of 50. Asphalt has been assumed to be a high stability plant mix and should be compacted to a minimum of 96 percent of the Marshall maximum density before excessive cooling takes place. All materials and processes should conform to applicable local requirements where more stringent.

6.7 Moisture Protection and Drainage

Moisture should not be allowed to infiltrate into the soils in the vicinity of the foundations. Design strategies to minimize ponding and infiltration near the structures should be implemented. To this end, we recommend the following:

Desert or Xeriscape landscaping should be considered within 5 feet of foundations.

Rain gutters should be installed around the entire structure to capture and direct all roof runoff a minimum of 10 feet away from structures.

Irrigation valves should be placed a minimum of 5 feet from foundations.

The ground surface within 10 feet of structures should be constructed so as to slope a minimum of five percent away from the structures.

Pavement sections should be constructed to divert surface water away from the pavement into storm drains.

Parking strips and roadway shoulder areas should be constructed to prevent infiltration of water into the areas surrounding pavement.

6.8 Soil Chemistry

Limited testing to characterize the corrosion potential for various soil types at the site was performed. A summary of typical indicators for a soil's corrosion potential to concrete and metals is presented in the tables below.

Table 10: Sulfate Based Corrosion Potential Indicator for Concrete

Corrosion Potential	Soluble Sulfate (ppm)	Soluble Chlorides (ppm)	Electrical Resistivity (Ω-cm)
Low	0 – 150	0 – 200	> 30,000
Mild	--	--	30,000 – 10,000
Moderate	150 – 1,000	200 – 700	10,000 – 2,000
Severe	1,000 – 2,000	700 – 1,500	2,000 – 500
Very Severe	> 2,000	> 1,500	< 500

Notes:

1) pH values less than 5 or greater than 9 are outside range typically expected in soils.

Source: Compiled by IGES in 2022

In addition to the ranges presented, soil with a pH greater than 9 or less than 5 may indicate a problem soil in regard to contact with various construction materials.

Based on limited testing, site soils exhibit a low potential for sulfate attack to concrete and a low potential for chloride attack to steel, while resistivity testing results indicated that the soils at the site are moderately to severely corrosive to steel. Corrosion potential indicators are summarized in Table 11.

Corrosion protection based on the above results should be considered for any buried steel elements of the proposed project including the use of specialized coatings and sacrificial steel thicknesses depending on the nature and criticality of the specific element. Designers of structures with steel reinforcement should consider the corrosive nature of site soils in design. Where it is not practicable to minimize the use of buried steel, we recommend that a qualified corrosion engineer be consulted for any metals that are to be embedded at the site.

Table 11: Corrosion Potential Indicator Testing Summary

Sample		Corrosion Potential			
Exploration	**Depth (ft)**	**pH**	**Soluble Sulfate**	**Soluble Chloride**	**Electrical Resistivity**
B-01	2.5 & 5.0	Within typically expected range	Low	Low	Moderate
B-03	10.0	Within typically expected range	Low	Low	Severe
B-04	5.0	Within typically expected range	Low	Low	Severe
Bulk-01	0-2	Within typically expected range	Low	Low	Moderate
Bulk-02	0-2	Within typically expected range	Low	Low	Moderate

Notes:

Source: Compiled by IGES in 2024

7 Construction Recommendations

7.1 Earthwork

7.1.1 Foundation Preparation

Based on our field observations and considering the presence of relatively competent native earth materials, we recommend that the footings for the proposed structures be founded on competent native subgrade extending below any undocumented fill (if present).

Where soft, loose, or otherwise deleterious earth materials such as undocumented fill are exposed on the foundation subgrade, IGES recommends a minimum over-excavation of two feet for each footing and replacement with structural fill, such that each foundation of the structure is underlain by a relatively uniform fill layer (fill/native transition zones are not allowed). Alternatively, the foundations may be extended such that all foundations bear directly on competent native earth materials. We recommend that IGES review the foundation subgrade prior to the placement of structural fill, steel or concrete, to identify the competent native earth materials as well as unsuitable soils or transition zones.

7.1.2 General Site Preparation and Grading

Following rough grading of foundation areas, the exposed subgrade should be reviewed by trained personnel working under professional geotechnical engineer familiar with the recommendations of this report. Excavations should be performed in a manner that limits disturbance to the subgrade. Construction traffic should not be allowed on any unstabilized, soft, pumping or loose subgrade. Unsuitable material such as; frozen soils, construction debris or waste, soils containing organics or debris laden fill should be removed in their entirety and replaced with structural fill in accordance with the recommendations of this report. Stabilization of soft subgrade may be performed by utilization of an approved separation geotextile and a bridging process approved by the engineer to facilitate a stable working surface.

7.1.3 Soft Soil Stabilization

Although not anticipated at this site, if encountered subgrade conditions are poor or deteriorate from exposure, subgrade stabilization can be accomplished by over excavating a minimum of 12 inches and/or placing a nonwoven geotextile (minimum weight 8 oz) over the soft subgrade and up the sidewalls of the trench enough to eventually encase the depth of stabilization material (e.g., the thickness of the stabilization material plus 2/3 of the trench width for each sidewall). Adjacent panels of geotextile should be overlapped a minimum of 18 inches along the width of the trench, or as recommended by the manufacturer. The geotextile should then be covered with a minimum of 12 inches of crushed, angular ¾--to 4-inch diameter drain rock to the base elevation of any required engineered fill. The geotextile can then be laid atop the stabilization

rock and overlapped (transverse to sidewalls, fully encasing the rock) prior to placing and compacting engineered fill.

Alternatively, stabilization of soft or pumping subgrade (if necessary) can be accomplished using a clean, coarse, angular material worked into the soft subgrade. We recommend the material consist of crushed stone between 3 and 6 inches in nominal diameter. The stabilization material should be worked (pushed) into the soft subgrade soils until a relatively firm and unyielding surface is established. Once a relatively firm and unyielding surface is achieved, the area may be brought to final pipe subgrade using stabilization rock or pipe bedding material. Other earth materials not meeting aforementioned criteria may also be suitable; however, such material should be evaluated on a case-by-case basis and should be approved by IGES prior to use. The area should be inspected by a soils technician familiar with the requirements of this report to evaluate whether a firm working surface has been achieved and that soft/pumping soils have been bridged to the greatest extent reasonably possible based on existing subsurface conditions. We recommend that an IGES representative be present during this subgrade evaluation.

7.1.4 Structural Fill and Compaction

7.1.4.1 Materials

Fill placed for the support of structures or flatwork should consist of structural fill. Structural fill may consist of approved onsite soils or an approved imported granular soil. Fill materials should be accepted by the Geotechnical Engineer for the specific use of the fill. Imported structural fill should conform with the following requirements:

- Granular, well-graded material with a maximum particle size of 4 inches and a fines content between 5 and 15 percent when testing in accordance with ASTM D6913;
- Material having liquid limit less than 20 and a plasticity index less than 10 when tested in accordance with ASTM D4318;
- Hard, durable particles of stone or gravel; or crushed to the specific sized and gradations; free from organic matter, clay chunks, asphalt, construction debris and other deleterious material.
- Non-corrosive to metals, concrete or other building materials;
- Free of unsuitable material as described herein.

Imported fill material not meeting the aforementioned criteria may be acceptable; alternative fill materials must be reviewed and approved in writing by IGES prior to importing. Fill for material utilized within the pavement section should conform to all applicable materials and construction standards and specifications.

Capillary barrier material or drainage course under floor slabs should consist of hard, durable, clean gravel or crushed rock, with a maximum size of 1-inch containing less than 5 percent material passing the No. 200 sieve.

7.1.4.2 Placement

Structural fill material shall be placed in maximum 8-inch loose lifts. Thinner lifts may be required to achieve adequate compaction depending on the equipment and methods chosen by the contractor. All fill should be placed on a horizontal plane unless otherwise approved by the Geotechnical Engineer. Fill placed on existing fill or slopes steeper than four horizontal to one vertical (4H:1V) should be keyed and benched into firm native soil or properly compacted fill. Keying and benching can be conducted simultaneously with placement and compaction of engineered fill. Width of the benches should be determined based on the necessary width for compaction equipment to adequately fit on the bench, and the corresponding key height is based on width needed Permanent fill slopes should be no steeper than 2.5:1.

The width of granular structural fill required at the bottom of footing excavations should be equal to the width of the footing (B) plus one lateral foot for each foot of fill thickness (H) below the footing plus 6 inches on either side of the footing (i.e., minimum width of structural fill is equal to 2H+6 inches+6 inches+B). See Figure 1 below for a detail showing minimum fill width.

Backfill should be placed in even lifts on both sides of foundation walls to prevent excessive pressure on one side. Brace unsupported foundation walls, thoroughly before backfilling and leave bracing in place until supporting floors are in place.

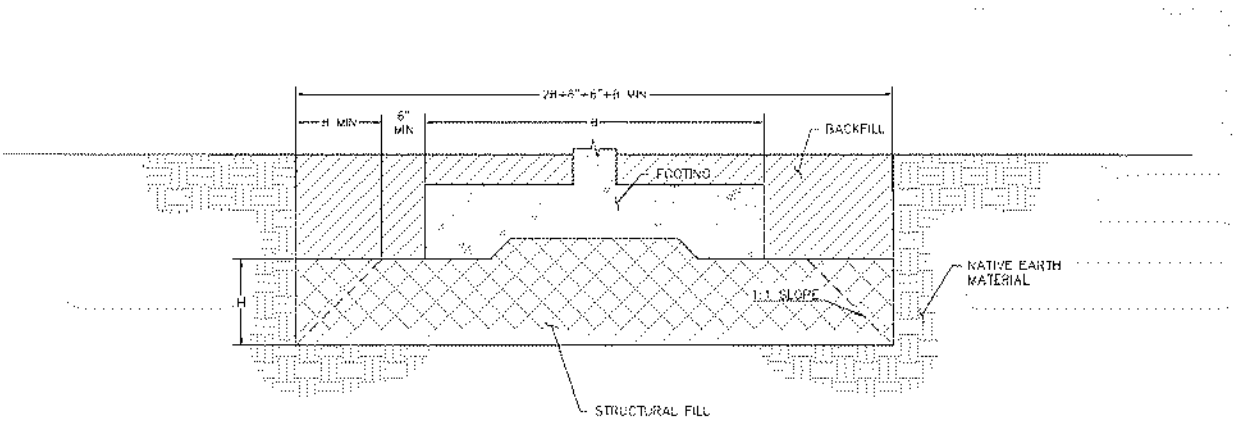

Figure 1 - Minimum Width of Structural Fill

Material should be mechanically compacted to the required maximum dry density and optimum moisture content as indicated in Table 12. Compaction by water injection should not be permitted. Compaction dry of optimum is discouraged.

Table 12: Summary of Compaction Requirements

Backfill Area[1]	Percent of Maximum Dry Density[2]	Moisture Content at Time of Compaction
Fill beneath footings Fill Beneath pile cap Fill beneath floor slabs Interior utility trench Pavement areas	95.0	Optimum[2] to + 2 percent of optimum
Foundation wall Landscaped area	90.0	

Notes:

1) Required compaction shall be determined considering proposed construction above fill (e.g. foundation walls backfilled beneath a proposed pavement area must be compacted to pavement area specification). Fill that will remain in place following surcharge should be compacted to the appropriate requirement of its future use.
2) As determined by ASTM D1557
3) Specification from authorities having precedence should be adhered to where more stringent.

Source: Compiled by IGES in 2024

7.1.5 Reuse of Onsite Soils

Shallow site soils were observed to be primarily consist of coarse-grained soil with a high fines content. Normally soils with high fines content are not suitable for reuse, however due to the relatively low plasticity of the soils, moisture conditioning will likely not be as problematic as with other fine-grained soils. These soils are considered suitable or practical for reuse onsite as grading or structural fill. All applicable regulations should be strictly adhered to regarding treatment and disposal of spoils generated by construction activities if spoils are to be disposed of.

7.1.6 Oversized Materials

Oversized material was not observed during the field exploration but has been encountered in previous investigations and construction in other areas of the site. If oversized material is encountered during construction, it may be included in embankment fill or fill slopes, at the discretion of the geotechnical engineer, if they are placed in a manner that will not result in voids, loose soils, honeycombing or uncompacted soils. Any material larger than 1 foot diameter should be scalped and removed from materials used in embankment fills or fill slopes. These oversized particles should not be placed within 5 feet of the top of any embankment or within 5 feet of the outer slope of the embankment. If oversized particles are used in embankment fill as discussed above, it is imperative that the contractor place and compact fill around oversized particles in accordance with the recommendations presented in the previous paragraphs. It is likely that the contractor will be need to compact soil in 4 to 6-inch lifts with small compaction equipment within a 2-foot radius of the oversized particle.

7.1.7 Utility Trench Backfill

Utility bedding and backfill should be specified to appropriately support the utility by the designer. Bedding should be in complete contact with the utility as required. It is recommended that bedding material has a Sand Equivalent (SE) of 30 or greater. Pipe bedding may be water-densified in-place if the subgrade or trench stability is not adversely impacted. Native earth materials can be used as backfill over the pipe bedding zone. In each case the utility bedding, utility zone backfill (immediately above the bedding) and remaining trench backfill should meet the design criteria of the manufacturer. Specifications from governing authorities having their own precedence for backfill and compaction should be followed where they are more stringent.

7.1.8 Excavation Stability

The contractor is responsible for site safety, including all temporary slopes and trenches excavated at the site and design of any required temporary shoring. The contractor is responsible for providing the competent person required by Occupational Safety and Health Administration (OSHA) standards to evaluate soil conditions and regularly perform excavation inspections. Sloping or benching for excavations greater than 5 feet deep shall comply with OSHA default requirements or be designed by a Professional Engineer registered in the State of Utah. The soils on site are anticipated to be Type B soils, which allow for a maximum allowable slope of 1:1 for excavations less than 20 feet. The stability of any excavation deeper than 20 feet should be evaluated by IGES or a qualified geotechnical engineer.

7.2 Monitoring of Existing Infrastructure

Structures sensitive to settlement resulting from dewatering or possible vibrations from the installation of shoring should be identified prior to construction. A structural and geotechnical instrumentation monitoring program should be implemented prior to and during construction to

monitor impacts to existing infrastructure. Instrumentation for temporary structures such as shoring should also be utilized. Instrumentation may include, but is not limited to; inclinometers, vibration monitoring, automated or manual surveying, crack meters and groundwater monitoring.

7.3 Construction Monitoring

It is recommended that the project budget include provisions for the cost for independent construction monitoring of the earthwork and foundation construction by a qualified engineering firm retained by the appropriate party to review conformance of construction with the recommendations of the project geotechnical evaluation, as well as the project plans and specifications.

8 Closure

8.1 Limitations

The concept of risk is a significant consideration of geotechnical analyses. The analytical means and methods used in performing geotechnical analyses and development of resulting recommendations do not constitute an exact science. Analytical tools used by geotechnical engineers are based on limited data, empirical correlations, engineering judgment, and experience. As such, the solutions and resulting conclusions and recommendations presented in this report cannot be considered risk-free and constitute IGES's best professional opinions and recommendations based on the available data and other design information available at the time they were developed. IGES has developed the preceding analyses, recommendations and opinions, at a minimum, in accordance with generally accepted professional geotechnical engineering practices and care being exercised in the project area at the time our services were performed. No warrantees, guarantees or other representations are made.

The information contained in this report is based on limited field data and understanding of the project. If any conditions are encountered at this site that are different from those described in this report, IGES must be immediately notified so that we may make any necessary revisions to recommendations and opinions contained in this report. In addition, if the scope of the proposed construction or grading changes from those described in this report, our firm must also be notified.

This report was prepared for our client's exclusive use on the project identified in the foregoing. Use of the data, recommendations, opinions, or design information contained herein for any other project or development of the site not as specifically described in this report is at the user's sole risk and without the approval of IGES, Inc. It is the client's responsibility to see that all parties to the project including the designer, contractor, subcontractors, etc. are made aware of this report in its entirety.

8.2 Additional Services

We recommend that IGES be retained to review the final design plans, grading plans and specifications to determine if our engineering recommendations have been properly incorporated in the project development documents. We also recommend that IGES be retained to evaluate construction performance and other geotechnical aspects of the projects as construction initiates, continues and progresses through its completion.

9 References

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Appendix A

Maps

BY: REMY | 12/7/2023 X:\PROJECTS\00823 CARCLL\2023 GT_JVWTP FILTER & CHEM FEED UPGRADE\SIDRAW\NGS\AUTOCAD\00823-023 MAPPING.DWG

FIGURE A-1

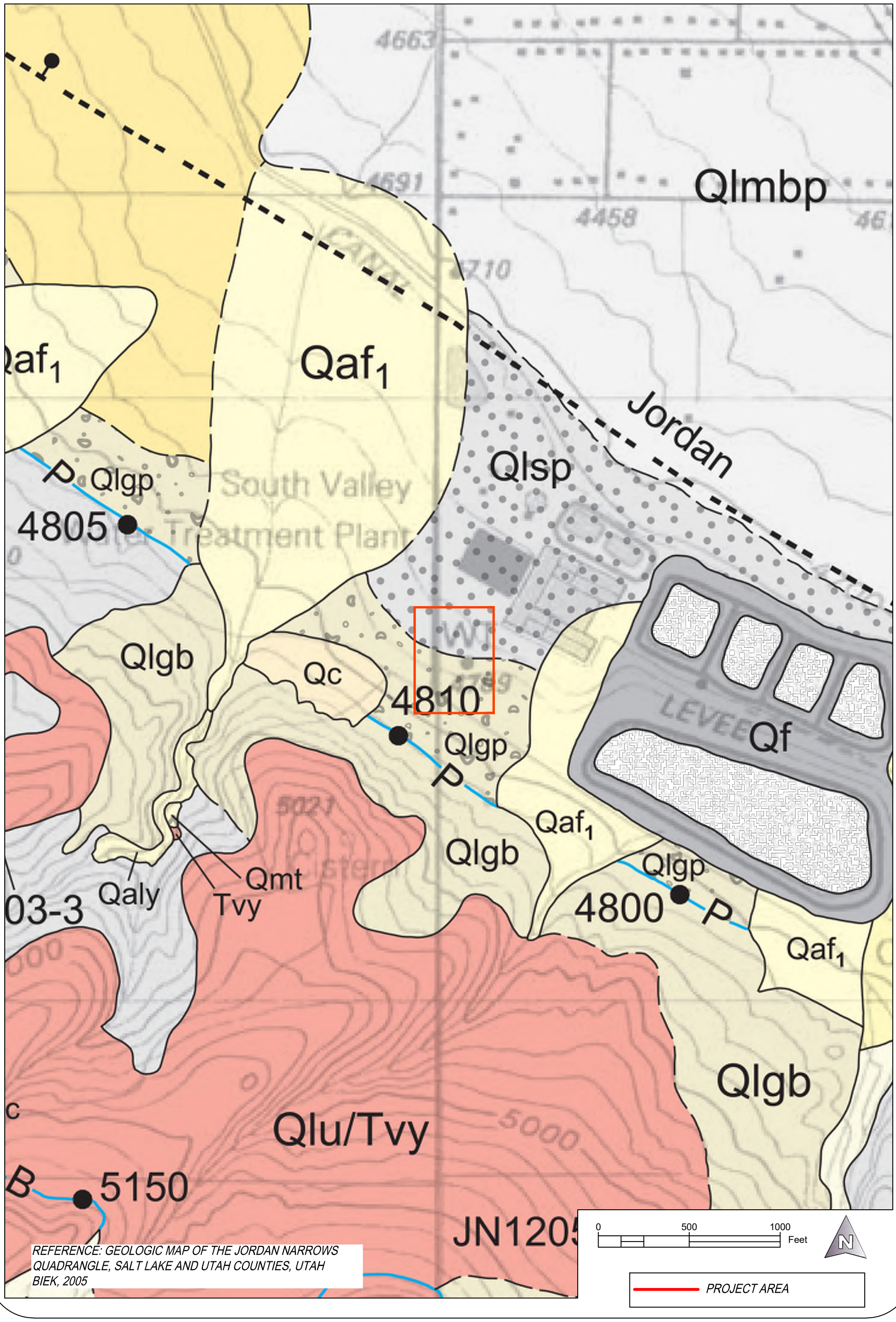
No.	Revision/Issue	Date

GEOTECHNICAL INVESTIGATION
JORDAN VALLEY WATER TREATMENT PLANT
FILTER & CHEM FEED UPGRADE
BLUFFDALE, UTAH

IGES Project #: 00823-023

SITE VICINITY MAP

Drawing Notes



REFERENCE: GEOLOGIC MAP OF THE JORDAN NARROWS QUADRANGLE, SALT LAKE AND UTAH COUNTIES, UTAH
BIEK, 2005

FIGURE
A-2a

No.	Revision/Issue	Date

GEOTECHNICAL INVESTIGATION
JORDAN VALLEY WATER TREATMENT PLANT
FILTER & CHEM FEED UPGRADE
BLUFFDALE, UTAH

IGES Project #: 00823-023

REGIONAL GEOLOGY MAP

Drawing Notes

MAP UNIT DESCRIPTIONS

Qlgp / Qlgbp / Qlgb — Lacustrine gravel and sand deposits (Upper Pleistocene) – *Moderately to well-sorted, moderately to well-rounded, clast-supported, pebble to cobble gravel and pebbly sand; thin to thick bedded; typically interbedded with or laterally gradational to sand and silt facies; gastropods locally common in sandy lenses; locally partly cemented with calcium carbonate; typically forms well-developed wave-cut or wave-built benches, bars, and spits, including the classic spit at Point of the Mountain; elsewhere forms veneer that drapes over pre-existing topography; some shoreline deposits characterized by abundant subangular boulders derived from nearby slopes; intermediate shorelines are locally well developed on these units; Qlgb deposited at and below highest Bonneville shoreline but above the Provo shoreline, and Qlgp deposited at and below the Provo shoreline; Qlgbp denotes deposits near Jordan Narrows that likely contain both transgressive (Bonneville) and regressive (Provo) lacustrine sand and lesser gravel; Qlgp deposits north of Steep Mountain commonly form a veneer 1 to 10 feet (0.3-3 m) thick over highly fractured orthoquartzite; 0 to about 300 feet (0-90 m) thick.*

Qlsp / Qlsbp / Qlsb — Lacustrine sand and silt deposits (Upper Pleistocene) – *Fine- to coarse-grained lacustrine sand and silt with minor gravel; typically thick bedded and well sorted; gastropods locally common; grades downslope from sandy nearshore deposits to finer grained offshore deposits; locally concealed by loess veneer; intermediate shorelines typically poorly developed on this facies; Qlsb deposited at and below highest Bonneville shoreline but above the Provo shoreline, and Qlsp deposited at and below the Provo shoreline; Qlsbp denotes deposits north of Jordan Narrows that likely contain both transgressive (Bonneville) and regressive (Provo) sediments; exposed thickness less than 40 feet (12 m).*

Map Symbols

Contact, dashed where approximately located

65 — Normal fault, dashed where approximately located, dotted where concealed and approximately located; query indicates uncertain presence; bar and ball on down-dropped side; arrow with number shows dip of fault

Normal fault inferred principally from gravity data; very approximately located; bar and ball on down-dropped side; also used for the inferred Cedar Valley tear fault

Thrust fault, dashed where approximately located, dotted where concealed and approximately located; teeth on upper plate

Axial trace of anticline, dashed where approximately located, dotted where concealed and approximately located; arrow shows direction of plunge

Axial trace of overturned anticline, dashed where approximately located, dotted where concealed and approximately located; arrow shows direction of plunge

Axial trace of syncline, dashed where approximately located, dotted where concealed and approximately located

Lake Bonneville shorelines - Major shorelines of the Bonneville lake cycle. Mapped at the top of the wave-cut platform, dashed where approximately located

B — Highest shoreline of the Bonneville (transgressive) phase

b — Other shorelines of the Bonneville phase – mostly transgressive

P — Highest shoreline of the Provo (regressive) phase

p — Other shorelines of the Provo phase – mostly regressive shorelines of the Provo phase, but may include some shorelines of the Bonneville (transgressive) phase

4800 — Elevation (in feet) of selected Lake Bonneville shoreline feature; elevation determined photogrammetrically

Crest of Lake Bonneville offshore bar or spit

Erosional scarp within terraces along Jordan River

35 — Strike and dip of inclined bedding (red symbols in the east Traverse Mountains indicate attitudes from J.E. Welsh, unpublished map, 1965; in the west Traverse Mountains red symbols indicate attitudes from Moore, 1973c)

Landslide scarp, hachures on down-dropped side

30 — Approximate strike and dip of inclined bedding

Approximate strike and dip direction of inclined bedding

Strike of vertical bedding (red symbols indicate attitudes from Moore, 1973c)

Horizontal bedding (red symbol in east Traverse Mountains indicates attitude from J.E. Welsh, unpublished map, 1965)

30 — Strike and dip of overturned bedding (red symbol in west Traverse Mountains indicates attitude from Moore, 1973c)

Sand and gravel pit

Quarry, cl = clay, no letter = crushed rock

X — Prospect, cl = clay, c = calcite, no letter = metals

Shaft

Spring

L32103-2 — Sample location and number (see table 1 for analytical data)

Area of colluvium (unmapped over shallow bedrock) locally exhibiting evidence of soil creep, northwest slope of Steep Mountain

FIGURE A-2b

No.	Revision/Issue	Date

GEOTECHNICAL INVESTIGATION
JORDAN VALLEY WATER TREATMENT PLANT
FILTER & CHEM FEED UPGRADE
BLUFFDALE, UTAH

IGES Project #: 00823-023

REGIONAL GEOLOGY MAP

Drawing Notes

FIGURE A-3

No.	Revision/Issue	Date

GEOTECHNICAL INVESTIGATION
JORDAN VALLEY WATER TREATMENT PLANT
FILTER & CHEM FEED UPGRADE
BLUFFDALE, UTAH

IGES Project #: 00823-023

Drawing Notes

EXPLORATION MAP

Appendix B

Exploration Logs

Jordan Valley Water Treatment Plant

15305 S 3200 W, Herriman 3200 W, Herriman, UT 84065, USA

B-01

Drilling Co.:	ConeTec	Project No.:	00823-023	Remarks: -
Driller:	RB	Date Drilled:	12/19/2023	
Logged By:	RT	Boring Depth:	40'	
Equipment:	Fraste	Boring Elevation:	~4772'	
Hammer Type:	Auto	Coordinates:	40.472065, -111.966778	
Drilling Method:	ODEX	Water Level At Time Of Drilling:	N/A	Delayed Water Level: N/A
		Cave-in At Time Of Drilling:	N/A	Delayed Water Observation Date: N/A

Depth (ft)	Elevation (ft)	Sample Graphic	% Recovery	Graphic Log	USCS	Visual Classification and Remarks	Samples: Blow Counts	Samples: Uncorrected N-Value	Samples: N60	Lab: Moisture Content (%)	Lab: % Fines
0	4770		33		CL	**Lean CLAY**, hard, dry, brown, trace sand and gravel present	5 14 23	37	51		
						2.5					
			35		SM	**Silty SAND**, very dense, dry, grey, trace clay and gravel present	20 50/5.5"	50	69	5.8	
5	4765		18			**Silty SAND**, very dense, dry, grey, low recovery	50/5.5"				
			100			**Silty SAND**, very dense, dry, grey, gravel up to 3/4 inches in diameter and angular No Recovery	36 32 30 50/1"	62 50	86 69		13.8
10	4760										
						15.0					
15	4755		33		GP	**GRAVEL with Sand**, very dense, moist, gravel up to 3/4 inches in diameter and angular, low recovery	80/3"				
						20.0					
20	4750		80		SM	**Silty SAND with Gravel**, very dense, moist, grey, gravel up to 3/4 inches in diameter and angular	30 37 50/5.5"	87	120	8.4	15.8
25	4745		73			**Silty SAND with Gravel**, very dense, dry, greyish brown, gravel up to 3/8 inches in diameter and angular, coarse sand particles present	50/5.5"				
						30.0					
30	4740					**Silty SAND with Gravel**, very dense, moist, brown, gravel up to 3/8 inches in diameter and angular	37 50/4"	50	69		
						35.0					
35	4735		55			**Silty SAND with Gravel**, very dense, moist, brown, gravel up to 3/16 inches in diameter and fractured, trace clay present	50/5.5"				
						40.0					
40	4730		67			**Silty SAND with Gravel**, very dense, moist, gravel up to 3/16 inches in diameter	50/3"			6.7	
						43.0 41.5					

End of Boring @ 40.0 Feet - No Groundwater Encountered

Graphics Legend

CL

SM

GP

SS - Small Split Spoon

Modified CA - Modified California Sampler

-

FIGURE

B-1

Jordan Valley Water Treatment Plant

15305 S 3200 W, Herriman 3200 W, Herriman, UT 84065, USA

B-02

Drilling Co.:	ConeTec	Project No.:	00823-023	Remarks: -
Driller:	RB	Date Drilled:	12/18/2023	
Logged By:	RT	Boring Depth:	35'	
Equipment:	Fraste	Boring Elevation:	~4773'	
Hammer Type:	Auto	Coordinates:	40.472333, -111.967194	
Drilling Method:	ODEX	Water Level At Time Of Drilling:	N/A	Delayed Water Level: N/A
		Cave-in At Time Of Drilling:	N/A	Delayed Water Observation Date: N/A

Depth (ft)	Elevation (ft)	Sample Graphic	% Recovery	Graphic Log	USCS	Visual Classification and Remarks	Samples: Blow Counts	Samples: Uncorrected N-Value	Samples: N60	Lab: Moisture Content (%)	Lab: % Fines
0	4770				SP	**Poorly Graded SAND with Gravel**, very dense, moist, brown, Gravel up to 3/4 inch in diameter and angular					
5	4765		67		SM	**Silty SAND with Gravel**, very dense, moist, brown, Gravel up to 3/4 inch in diameter and angular	25 28 37	65	90		
10	4760		55			**Silty SAND**, very dense, moist, brown, Gravel up to 3/4 inch in diameter and angular	32 50/5"	82	113	8.5	17.1
15	4755					**Silty SAND with Gravel**, very dense, moist, reddish brown, Gravel up to 1 inch in diameter and angular	60	60	83	16.6	
20	4750		55			**Silty SAND with Gravel**, very dense, moist, brown, Coarse sand particles present	38 50/5"	50	69		
25	4745		50			**Silty SAND with Gravel**, very dense, dry, brown, low recovery	50/4"			6.9	17.6
30	4740		40			**Silty SAND with Gravel**, very dense, moist, brown, low recovery	50/5"				
35											

Refusal at 34.0 Feet - No Groundwater Encountered

Graphics Legend

SP

SM

SS - Small Split Spoon

Modified CA - Modified California Sampler

FIGURE

B-2

Jordan Valley Water Treatment Plant

15305 S 3200 W, Herriman 3200 W, Herriman, UT 84065, USA

B-03

Drilling Co.:	ConeTec	Project No.:	00823-023	Remarks: -
Driller:	RB	Date Drilled:	12/18/2023	
Logged By:	RT	Boring Depth:	40'	
Equipment:	Fraste	Boring Elevation:	~4768'	
Hammer Type:	Auto	Coordinates:	40.472725, -111.967151	
Drilling Method:	ODEX	Water Level At Time Of Drilling:	N/A	Delayed Water Level: N/A
		Cave-in At Time Of Drilling:	N/A	Delayed Water Observation Date: N/A

Depth (ft)	Elevation (ft)	Sample Graphic	% Recovery	Graphic Log	USCS	Visual Classification and Remarks	Samples: Blow Counts	Samples: Uncorrected N-Value	Samples: N60	Lab: Moisture Content (%)	Lab: % Fines
0	4765					Topsoil: gravel and sand, some dead weeds					
5	4760		78		SM	**Silty SAND**, very dense, moist, brown	24 37 50/5"	87	120		
10	4755		78		SM	**Silty SAND**, very dense, moist, brown, Trace clay present	23 30 29	59	82	17.3	37.8
15	4750		100 100		ML	**Sandy SILT**, hard, moist, brown	27 45 50/3"	72	100	19.8 19.7	66.9
20	4745		100		CL	**Lean CLAY**, hard, moist, brown, trace sand and silt	32 31 48	79	109		
25	4740		89		SM	**Silty SAND**, very dense, moist, brown, trace fines present, coarse sand particles present	28 45 42	87	120		
30	4735		94		SM	**Silty SAND**, very dense, moist, brown	31 52 50/5"	83	115	7.4	17.4
35	4730		59		SM	**Silty SAND**, very dense, moist, brown, coarse sand particles present, trace gravel present	41 50/5" x	50	69		
40	4725		59		SM	**Silty SAND**, very dense, moist, brown	50 50/5" x	50	69		

15.0 — 20.0 — 23.0 — 30.0 — 35.0 — 40.0 — 41.5 — 43.0

Liquid Limit 0 25 50 · Plastic Limit 0 25 50 · Moisture Content 0 25 50

End of Boring at 41.5 Feet - No Groundwater Encountered

Graphics Legend

SM
ML
CL

SS - Small Split Spoon
Modified CA - Modified California Sampler
Grab

FIGURE
B-3

Jordan Valley Water Treatment Plant

15305 S 3200 W, Herriman 3200 W, Herriman, UT 84065, USA

B-04

Drilling Co.:	ConeTec	Project No.:	00823-023	Remarks: -
Driller:	RB	Date Drilled:	12/19/2023	
Logged By:	RT	Boring Depth:	-	
Equipment:	Fraste	Boring Elevation:	~4767'	
Hammer Type:	Auto	Coordinates:	40.472688, -111.966711	
Drilling Method:	ODEX	Water Level At Time Of Drilling:	N/A	Delayed Water Level: N/A
		Cave-in At Time Of Drilling:	N/A	Delayed Water Observation Date: N/A

Depth (ft)	Elevation (ft)	Sample Graphic	% Recovery	Graphic Log	USCS	Visual Classification and Remarks	Samples: Blow Counts	Samples: Uncorrected N-Value	Samples: N60	Lab: Moisture Content (%)	Lab: % Fines
0	4765		67		CL	**Lean CLAY**, very stiff, moist, brown, grass and roots present in topsoil	3 6 22	28	39		
						1.5					
5	4760		67			**Silty SAND**, dense, moist, brown	18 22 26	48	66		
10	4755		100			**Silty SAND**, very dense, moist, brown	26 28 39	67	93	18.3	
15	4750		82				38 50/5" x	88	122	19.8	34.3
20	4745		86		SM	**Silty SAND**, very dense, moist, brown	32 48 50/2"	98	136		
25	4740		106			**Silty SAND**, very dense, moist, brown, trace fine sand particles present	21 37 50/5"	87	120	27.8	
30	4735		133			**Silty SAND**, very dense, moist, brown, fine sand particles present	23 50/3"	50	69		40.9
35	4730		133			**Silty SAND with Gravel**, very dense, moist, brown, gravel up to 3/4 inch diameter and fractured	43 50/3"	50	69		
40	4725		109			**Silty SAND**, hard, moist, brown	37 50/5"	50	69	19.1	23.5
						41.5 43.0					

End of Boring at 41.5 Feet - No Groundwater Encountered

Liquid Limit 0 25 50
Plastic Limit 0 25 50
Moisture Content 0 25 50

Graphics Legend

CL

SM

SS - Small Split Spoon

Modified CA - Modified California Sampler

FIGURE
B-4

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			USCS SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS (More than half of material is larger than the #200 sieve)	GRAVELS (More than half coarse fraction is larger than the #4 sieve)	CLEAN GRAVELS WITH LITTLE OR NO FINES	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
			GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
		GRAVELS WITH OVER 12% FINES	GM	SILTY GRAVELS, GRAVEL-SILT-SAND MIXTURES
			GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
	SANDS (More than half coarse fraction is smaller than the #4 sieve)	CLEAN SANDS WITH LITTLE OR NO FINES	SW	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
			SP	POORLY-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
		SANDS WITH OVER 12% FINES	SM	SILTY SANDS, SAND-GRAVEL-SILT MIXTURES
			SC	CLAYEY SANDS SAND-GRAVEL-CLAY MIXTURES
FINE GRAINED SOILS (More than half of material is smaller than the #200 sieve)	SILTS AND CLAYS (Liquid limit less than 50)		ML	INORGANIC SILTS & CLAYEY SILTS WITH SLIGHT PLASTICITY
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, LEAN CLAYS
			OL	ORGANIC SILTS & ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS (Liquid limit greater than 50)		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILT
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH	ORGANIC CLAYS & ORGANIC SILTS OF MEDIUM-TO-HIGH PLASTICITY
HIGHLY ORGANIC SOILS			PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

GENERAL NOTES

1. Lines separating strata on the logs represent approximate boundaries only. Actual transitions may be gradual.
2. No warranty is provided as to the continuity of soil conditions between individual sample locations.
3. Logs represent general soil conditions observed at the point of exploration on the date indicated.
4. In general, Unified Soil Classification designations presented on the logs were evaluated by visual methods only. Therefore, actual designations (based on laboratory tests) may vary.

OTHER TESTS KEY

C	CONSOLIDATION	SA	SIEVE ANALYSIS
AL	ATTERBERG LIMITS	DS	DIRECT SHEAR
UC	UNCONFINED COMPRESSION	T	TRIAXIAL
S	SOLUBILITY	R	RESISTIVITY
O	ORGANIC CONTENT	RV	R-VALUE
CBR	CALIFORNIA BEARING RATIO	SU	SOLUBLE SULFATES
COMP	MOISTURE/DENSITY RELATIONSHIP	PM	PERMEABILITY
CI	CALIFORNIA IMPACT	-200	% FINER THAN #200
COL	COLLAPSE POTENTIAL	Gs	SPECIFIC GRAVITY
SS	SHRINK SWELL	SL	SWELL LOAD

CEMENTATION

DESCRIPTION	DESCRIPTION
WEAK	CRUMBLES OR BREAKS WITH HANDLING OR SLIGHT FINGER PRESSURE
MODERATE	CRUMBLES OR BREAKS WITH CONSIDERABLE FINGER PRESSURE
STRONG	WILL NOT CRUMBLE OR BREAK WITH FINGER PRESSURE

STRUCTURE

DESCRIPTION	DESCRIPTION
STRATIFIED	ALTERNATING LAYERS OF VARYING MATERIAL OR COLOR WITH LAYERS AT LEAST 6MM THICK
LAMINATED	ALTERNATING LAYERS OF VARYING MATERIAL OR COLOR WITH THE LAYERS LESS THAN 6 MM THICK
FISSURED	BREAKS ALONG DEFINITE PLANES OF FRACTURE WITH LITTLE RESISTANCE TO FRACTURING
SLICKENSIDED	FRACTURE PLANES APPEAR POLISHED OR GLOSSY, SOMETIMES STRIATED
BLOCKY	COHESIVE SOIL THAT CAN BE BROKEN DOWN INTO SMALL ANGULAR LUMPS WHICH RESIST FURTHER BREAKDOWN
LENSED	INCLUSION OF SMALL POCKETS OF DIFFERENT SOILS, SUCH AS SMALL LENSES OF SAND SCATTERED THROUGH A MASS OF CLAY
HOMOGENOUS	SAME COLOR AND APPEARANCE THROUGHOUT

MOISTURE CONTENT

DESCRIPTION	FIELD TEST
DRY	ABSENCE OF MOISTURE, DUSTY, DRY TO THE TOUCH
SLIGHTLY MOIST	CONTAINING A MINIMAL AMOUNT OF MOISTURE, NOT DRY OR MOIST
MOIST	DAMP BUT NO VISIBLE WATER
WET	VISIBLE FREE WATER, USUALLY SOIL BELOW WATER TABLE

MODIFIERS

DESCRIPTION	TRACE	FEW	LITTLE	SOME	MOSTLY
PERCENT	< 5	5 - 10	15 - 25	30 - 45	50 - 100

STRATIFICATION

DESCRIPTION	THICKNESS
SEAM	1/16-1/2"
LAYER	1/2-12"

DESCRIPTION	FREQUENCY
OCCASIONAL	ONE OR LESS PER FOOT OF THICKNESS
FREQUENT	MORE THAN ONE PER FOOT OF THICKNESS

APPARENT / RELATIVE DENSITY - COARSE-GRAINED SOIL

APPARENT DENSITY	SPT (blows/ft)	MODIFIED CA. SAMPLER (blows/ft)	CALIFORNIA SAMPLER (blows/ft)	RELATIVE DENSITY (%)	FIELD TEST
VERY LOOSE	<4	<4	<5	0 - 15	EASILY PENETRATED WITH 1/2-INCH REINFORCING ROD PUSHED BY HAND
LOOSE	4 - 10	5 - 12	5 - 15	15 - 35	DIFFICULT TO PENETRATE WITH 1/2-INCH REINFORCING ROD PUSHED BY HAND
MEDIUM DENSE	10 - 30	12 - 35	15 - 40	35 - 65	EASILY PENETRATED A FOOT WITH 1/2-INCH REINFORCING ROD DRIVEN WITH 5-LB HAMMER
DENSE	30 - 50	35 - 60	40 - 70	65 - 85	DIFFICULT TO PENETRATE 12" WITH 1/2-INCH REINFORCING ROD DRIVEN WITH 5-LB HAMMER
VERY DENSE	>50	>60	>70	85 - 100	PENETRATED ONLY FEW INCHES WITH 1/2-INCH REINFORCING ROD DRIVEN WITH 5-LB HAMMER

CONSISTENCY - FINE-GRAINED SOIL

CONSISTENCY	SPT (blows/ft)	TORVANE	POCKET PENETROMETER	FIELD TEST
		UNDRAINED SHEAR STRENGTH (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	
VERY SOFT	<2	<0.125	<0.25	EASILY PENETRATED SEVERAL INCHES BY THUMB. EXUDES BETWEEN THUMB AND FINGERS WHEN SQUEEZED BY HAND.
SOFT	2 - 4	0.125 - 0.25	0.25 - 0.5	EASILY PENETRATED ONE INCH BY THUMB. MOLDED BY LIGHT FINGER PRESSURE.
MEDIUM STIFF	4 - 8	0.25 - 0.5	0.5 - 1.0	PENETRATED OVER 1/2 INCH BY THUMB WITH MODERATE EFFORT. MOLDED BY STRONG FINGER PRESSURE.
STIFF	8 - 15	0.5 - 1.0	1.0 - 2.0	INDENTED ABOUT 1/2 INCH BY THUMB BUT PENETRATED ONLY WITH GREAT EFFORT.
VERY STIFF	15 - 30	1.0 - 2.0	2.0 - 4.0	READILY INDENTED BY THUMBNAIL.
HARD	>30	>2.0	>4.0	INDENTED WITH DIFFICULTY BY THUMBNAIL.

IGES

KEY TO SOIL SYMBOLS AND TERMINOLOGY

Figure B-5

Appendix C

Laboratory Results

Water Content and Unit Weight of Soil

(In General Accordance with ASTM D7263 Method B and D2216)

Project: **JVWTP Filter & Chem Feed Upgrade**
No: **00823-023**
Location: Bluffdale, Utah
Date: 1/3/2024
By: CJ/SE/PW

Sample Info.	Boring No.	B-01	B-01	B-01	B-02	B-02	B-02	B-03	B-03
	Sample								
	Depth	2.5'	20.0'	40.0'	10.0'	15.0'	25.0'	10.0'	15.0'
	Split	Yes	Yes	No	Yes	No	Yes	No	No
	Split sieve	No.10	3/8"		3/8"		No.10		
	Total sample (g)	377.82	562.53		334.61		122.04		
	Moist coarse fraction (g)	10.41	54.55		57.10		53.06		
	Moist split fraction (g)	367.41	507.98		277.51		68.98		
Unit Weight Data	Sample height, H (in)					2.715			2.998
	Sample diameter, D (in)					2.411			2.414
	Mass rings + wet soil (g)					500.78			496.50
	Mass rings/tare (g)					129.35			131.37
	Moist unit wt., γ_m (pcf)					114.2			101.4
Coarse Fraction	Wet soil + tare (g)	47.57	184.94		178.02		181.32		
	Dry soil + tare (g)	47.16	183.06		174.83		178.70		
	Tare (g)	37.16	127.32		118.61		124.38		
	Water content (%)	4.1	3.4		5.7		4.8		
Split Fraction	Wet soil + tare (g)	139.11	339.28	210.70	329.64	194.76	188.68	324.75	248.53
	Dry soil + tare (g)	138.47	321.57	205.53	312.87	185.17	183.53	294.58	228.71
	Tare (g)	127.44	124.51	127.86	127.53	127.57	123.58	119.90	128.60
	Water content (%)	5.8	9.0	6.7	9.0	16.6	8.6	17.3	19.8
	Water Content, w (%)	**5.8**	**8.4**	**6.7**	**8.5**	**16.6**	**6.9**	**17.3**	**19.8**
	Dry Unit Wt., γ_d (pcf)					**97.9**			**84.6**

Entered by:_____
Reviewed:_____

Water Content and Unit Weight of Soil

(In General Accordance with ASTM D7263 Method B and D2216)

Project: JVWTP Filter & Chem Feed Upgrade
No: 00823-023
Location: Bluffdale, Utah
Date: 1/8/2024
By: CJ/SE/PW

Sample Info.	Boring No.	B-03	B-03	B-04	B-04	B-04	B-04		
	Sample								
	Depth	15.0'	30.0'	10.0'	15.0'	25.0'	40.0'		
	Split	No	No	No	No	No	No		
	Split sieve								
	Total sample (g)								
	Moist coarse fraction (g)								
	Moist split fraction (g)								
Unit Weight Data	Sample height, H (in)		5.885		2.994				
	Sample diameter, D (in)		2.402		2.412				
	Mass rings + wet soil (g)		1033.29		494.49				
	Mass rings/tare (g)		271.99		135.48				
	Moist unit wt., γ_m (pcf)		108.8		99.9				
	Wet soil + tare (g)								
	Dry soil + tare (g)								
	Tare (g)								
	Water content (%)								
Water Content Data	Wet soil + tare (g)	361.74	380.49	471.83	251.45	344.71	248.00		
	Dry soil + tare (g)	327.18	355.18	433.61	230.85	296.76	228.19		
	Tare (g)	151.98	12.45	225.10	127.02	124.10	124.60		
	Water content (%)	19.7	7.4	18.3	19.8	27.8	19.1		
Water Content, w (%)		**19.7**	**7.4**	**18.3**	**19.8**	**27.8**	**19.1**		
Dry Unit Wt., γ_d (pcf)			**101.3**		**83.4**				

Entered by:_____

Reviewed:_____

Liquid Limit, Plastic Limit, and Plasticity Index of Soils

(ASTM D4318)

Project: JVWTP Filter & Chem Feed Upgrade
No: 00823-023
Location: Bluffdale, Utah
Date: 1/5/2024
By: RH
Grooving tool type: Plastic
Liquid limit device: Mechanical
Rolling method: Hand

Boring No.: B-03
Sample:
Depth: 20.0'
Description: Brown silt

Preparation method: Air Dry
Liquid limit test method: Multipoint
Screened over No.40: Yes
Larger particles removed: Dry sieved

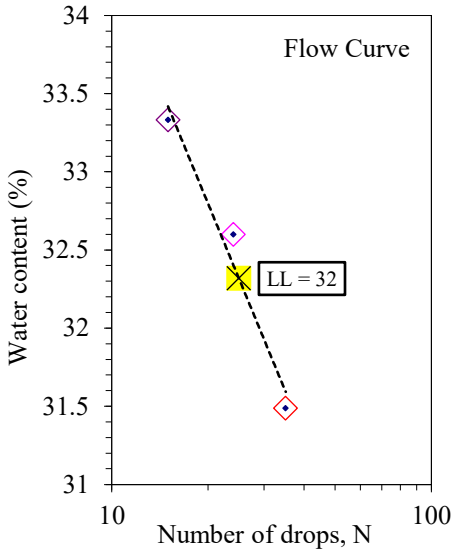
Plastic Limit

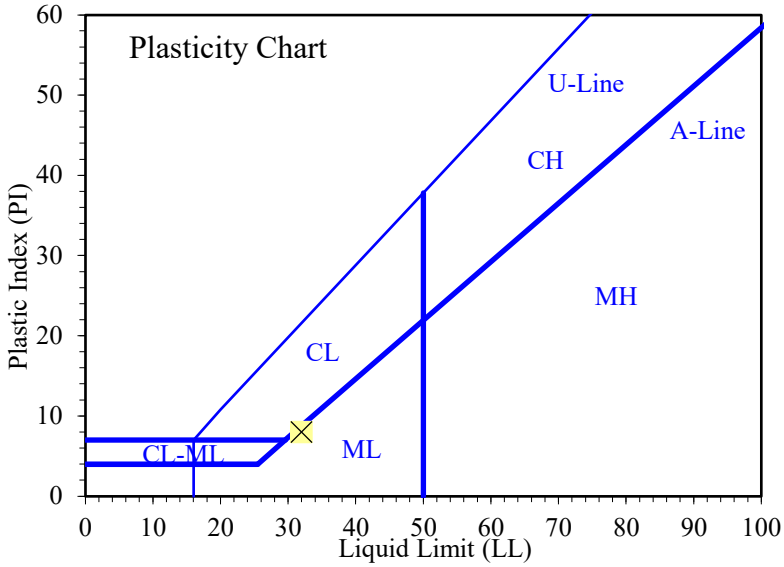
Determination No	1	2				
Wet Soil + Tare (g)	14.49	14.24				
Dry Soil + Tare (g)	13.03	12.93				
Water Loss (g)	1.46	1.31				
Tare (g)	7.11	7.53				
Dry Soil (g)	5.92	5.40				
Water Content, w (%)	24.66	24.26				

Liquid Limit

Determination No	1	2	3			
Number of Drops, N	35	24	15			
Wet Soil + Tare (g)	12.14	13.05	13.88			
Dry Soil + Tare (g)	11.06	11.57	12.26			
Water Loss (g)	1.08	1.48	1.62			
Tare (g)	7.63	7.03	7.40			
Dry Soil (g)	3.43	4.54	4.86			
Water Content, w (%)	31.49	32.60	33.33			
One-Point LL (%)		32				

Liquid Limit, LL (%)	**32**
Plastic Limit, PL (%)	**24**
Plasticity Index, PI (%)	**8**





Entered by:_____
Reviewed:_____

Liquid Limit, Plastic Limit, and Plasticity Index of Soils

(ASTM D4318)

Project: JVWTP Filter & Chem Feed Upgrade
No: 00823-023
Location: Bluffdale, Utah
Date: 1/8/2024
By: RH
Grooving tool type: Plastic
Liquid limit device: Mechanical
Rolling method: Hand

Boring No.: B-04
Sample:
Depth: 20.0'
Description: Light brown silt

Preparation method: Air Dry
Liquid limit test method: Multipoint
Screened over No.40: Yes
Larger particles removed: Dry sieved

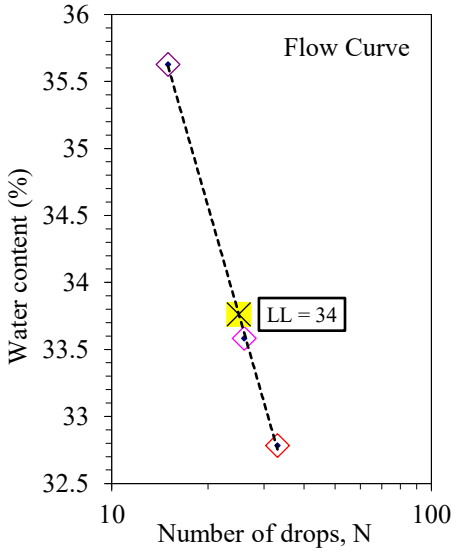
Plastic Limit

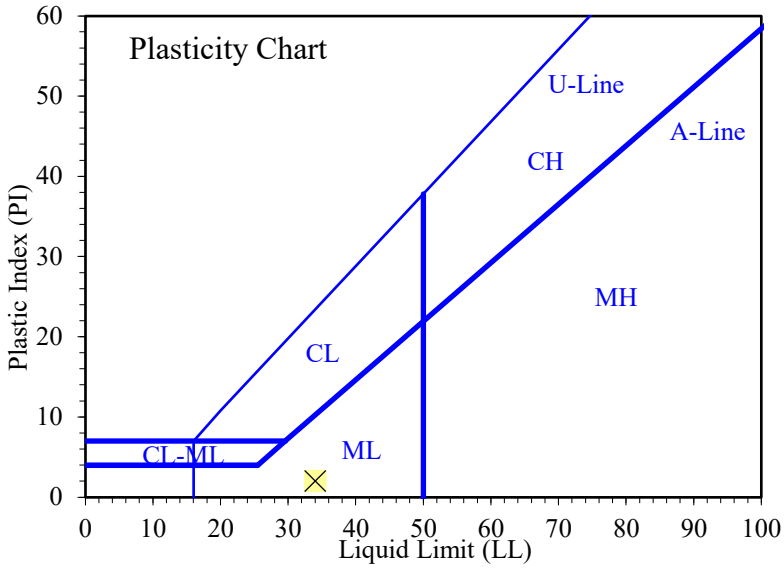
Determination No	1	2				
Wet Soil + Tare (g)	13.93	14.79				
Dry Soil + Tare (g)	12.26	12.99				
Water Loss (g)	1.67	1.80				
Tare (g)	7.02	7.44				
Dry Soil (g)	5.24	5.55				
Water Content, w (%)	31.87	32.43				

Liquid Limit

Determination No	1	2	3			
Number of Drops, N	33	26	15			
Wet Soil + Tare (g)	11.07	10.98	11.07			
Dry Soil + Tare (g)	10.08	10.08	10.19			
Water Loss (g)	0.99	0.90	0.88			
Tare (g)	7.06	7.40	7.72			
Dry Soil (g)	3.02	2.68	2.47			
Water Content, w (%)	32.78	33.58	35.63			
One-Point LL (%)		34				

Liquid Limit, LL (%)	**34**
Plastic Limit, PL (%)	**32**
Plasticity Index, PI (%)	**2**





Entered by:_____
Reviewed:_____

Liquid Limit, Plastic Limit, and Plasticity Index of Soils

(ASTM D4318)

Project: JVWTP Filter & Chem Feed Upgrade
No: 00823-023
Location: Bluffdale, Utah
Date: 1/5/2024
By: RH
Grooving tool type: Plastic
Liquid limit device: Mechanical
Rolling method: Hand

Boring No.: B-04
Sample:
Depth: 30.0'
Description: Brown silt

Preparation method: Air Dry
Liquid limit test method: Multipoint
Screened over No.40: Yes
Larger particles removed: Dry sieved

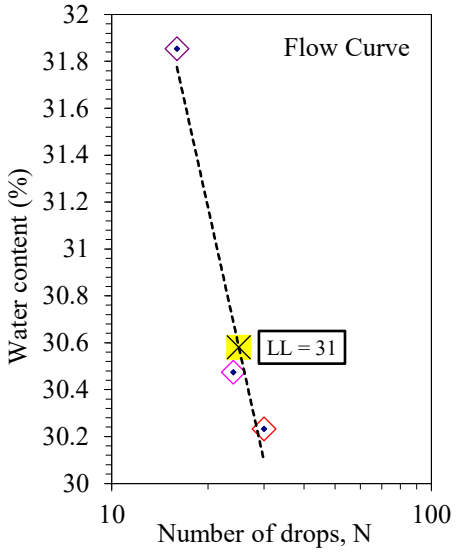
Plastic Limit

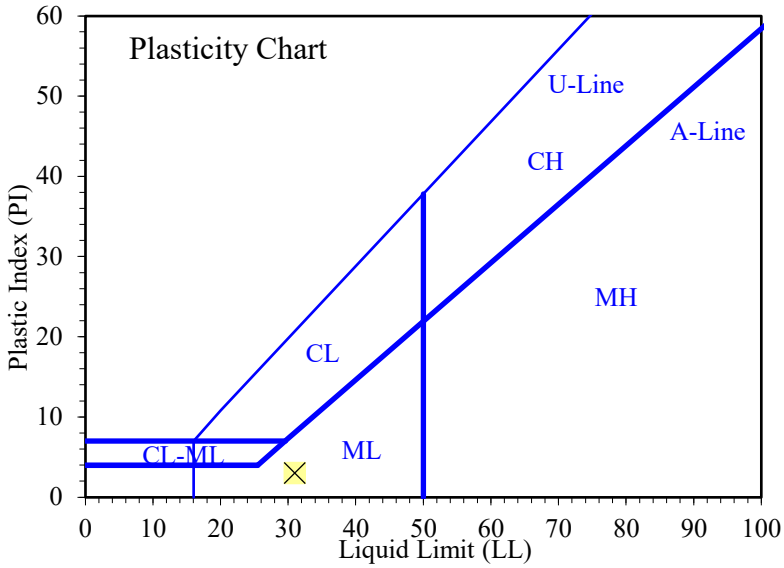
Determination No	1	2				
Wet Soil + Tare (g)	14.60	14.39				
Dry Soil + Tare (g)	12.93	12.78				
Water Loss (g)	1.67	1.61				
Tare (g)	7.05	7.05				
Dry Soil (g)	5.88	5.73				
Water Content, w (%)	28.40	28.10				

Liquid Limit

Determination No	1	2	3			
Number of Drops, N	30	24	16			
Wet Soil + Tare (g)	13.13	12.23	12.50			
Dry Soil + Tare (g)	11.70	11.20	11.28			
Water Loss (g)	1.43	1.03	1.22			
Tare (g)	6.97	7.82	7.45			
Dry Soil (g)	4.73	3.38	3.83			
Water Content, w (%)	30.23	30.47	31.85			
One-Point LL (%)	31	30				

Liquid Limit, LL (%)	**31**
Plastic Limit, PL (%)	**28**
Plasticity Index, PI (%)	**3**





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Liquid Limit, Plastic Limit, and Plasticity Index of Soils

(ASTM D4318)

Project: JVWTP Filter & Chem Feed Upgrade
No: 00823-023
Location: Bluffdale, Utah
Date: 1/5/2024
By: RH
Grooving tool type: Plastic
Liquid limit device: Mechanical
Rolling method: Hand

Boring No.: B-04
Sample:
Depth: 40.0'
Description: Reddish brown silt

Preparation method: Air Dry
Liquid limit test method: Multipoint
Screened over No.40: Yes
Larger particles removed: Dry sieved

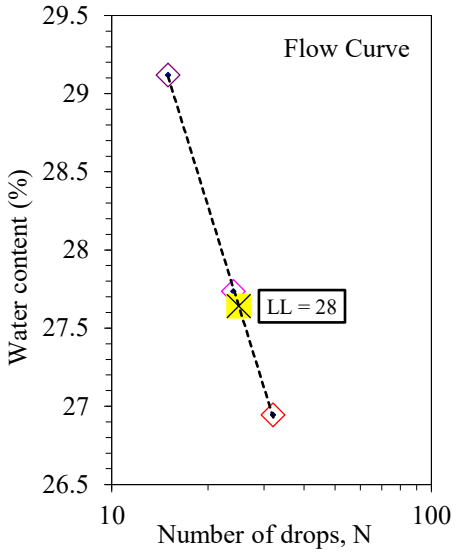
Plastic Limit

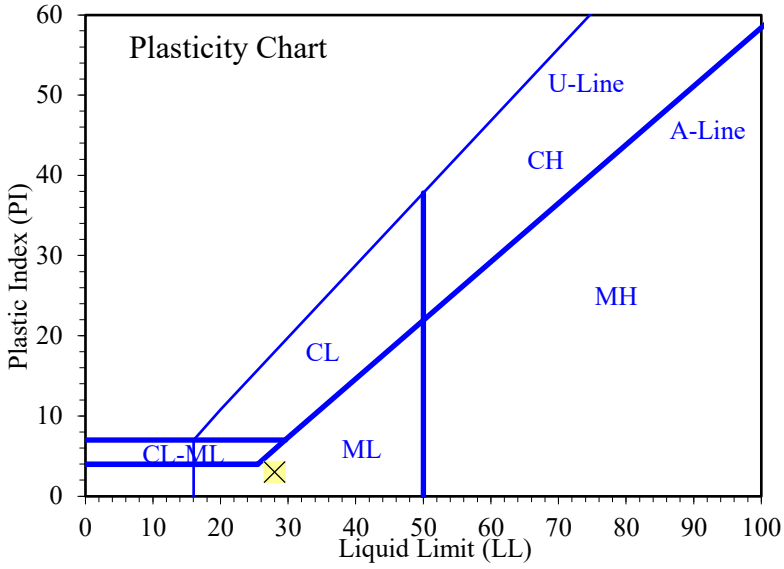
Determination No	1	2				
Wet Soil + Tare (g)	15.48	14.26				
Dry Soil + Tare (g)	13.78	12.83				
Water Loss (g)	1.70	1.43				
Tare (g)	7.08	7.11				
Dry Soil (g)	6.70	5.72				
Water Content, w (%)	25.37	25.00				

Liquid Limit

Determination No	1	2	3			
Number of Drops, N	32	24	15			
Wet Soil + Tare (g)	12.09	12.36	12.78			
Dry Soil + Tare (g)	11.12	11.27	11.49			
Water Loss (g)	0.97	1.09	1.29			
Tare (g)	7.52	7.34	7.06			
Dry Soil (g)	3.60	3.93	4.43			
Water Content, w (%)	26.94	27.74	29.12			
One-Point LL (%)		28				

Liquid Limit, LL (%)	**28**
Plastic Limit, PL (%)	**25**
Plasticity Index, PI (%)	**3**





Entered by:_____
Reviewed:_____

Liquid Limit, Plastic Limit, and Plasticity Index of Soils

(ASTM D4318)

Project: JVWTP Filter & Chem Feed Upgrade
No: 00823-023
Location: Bluffdale, Utah
Date: 1/8/2024
By: RH
Grooving tool type: Plastic
Liquid limit device: Mechanical
Rolling method: Hand

Boring No.: Bulk-01
Sample:
Depth: 0-2'
Description: Brown silty clay

Preparation method: Air Dry
Liquid limit test method: Multipoint
Screened over No.40: Yes
Larger particles removed: Dry sieved

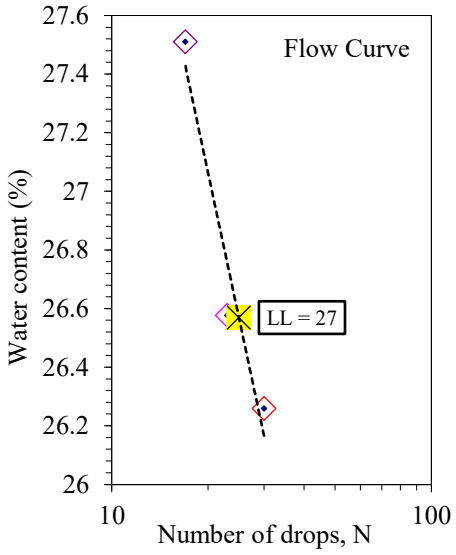
Plastic Limit

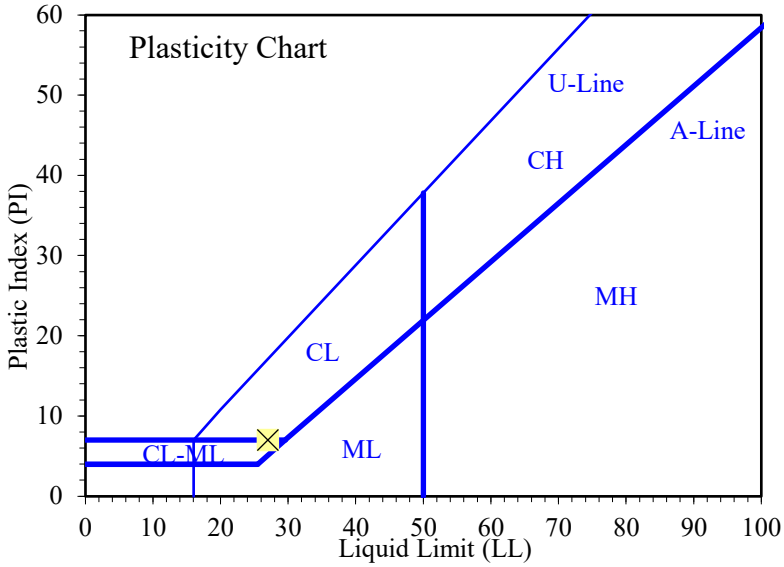
Determination No	1	2				
Wet Soil + Tare (g)	15.47	14.12				
Dry Soil + Tare (g)	14.04	12.94				
Water Loss (g)	1.43	1.18				
Tare (g)	7.10	7.05				
Dry Soil (g)	6.94	5.89				
Water Content, w (%)	20.61	20.03				

Liquid Limit

Determination No	1	2	3			
Number of Drops, N	30	23	17			
Wet Soil + Tare (g)	14.03	13.00	13.18			
Dry Soil + Tare (g)	12.57	11.82	11.92			
Water Loss (g)	1.46	1.18	1.26			
Tare (g)	7.01	7.38	7.34			
Dry Soil (g)	5.56	4.44	4.58			
Water Content, w (%)	26.26	26.58	27.51			
One-Point LL (%)	27	26				

Liquid Limit, LL (%)	**27**
Plastic Limit, PL (%)	**20**
Plasticity Index, PI (%)	**7**





Entered by:_____
Reviewed:_____

Liquid Limit, Plastic Limit, and Plasticity Index of Soils

(ASTM D4318)

Project: JVWTP Filter & Chem Feed Upgrade
No: 00823-023
Location: Bluffdale, Utah
Date: 1/5/2024
By: RH
Grooving tool type: Plastic
Liquid limit device: Mechanical
Rolling method: Hand

Boring No.: Bulk-02
Sample:
Depth: 0-2'
Description: Brown silty clay

Preparation method: Air Dry
Liquid limit test method: Multipoint
Screened over No.40: Yes
Larger particles removed: Dry sieved

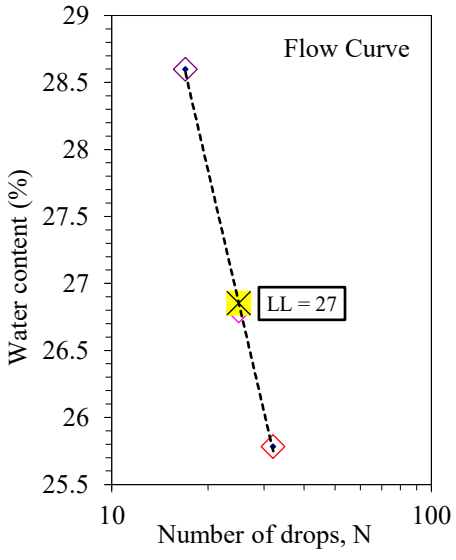
Plastic Limit

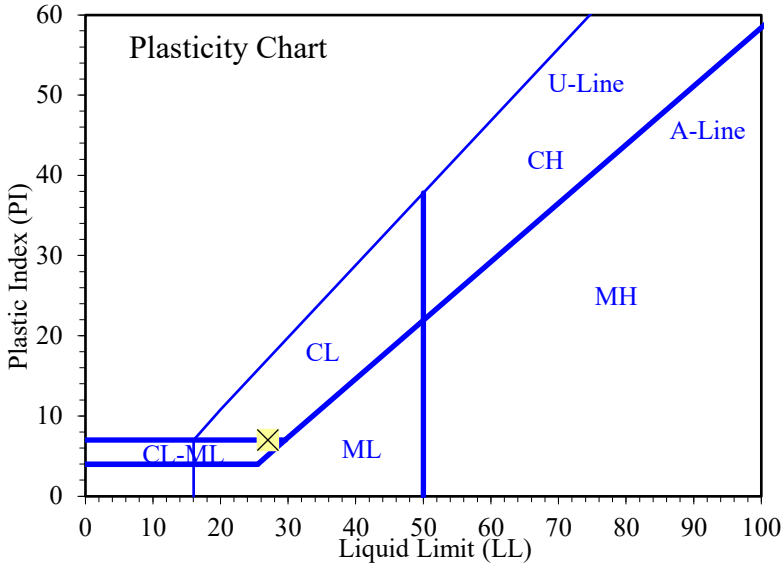
Determination No	1	2				
Wet Soil + Tare (g)	14.26	14.54				
Dry Soil + Tare (g)	13.05	13.25				
Water Loss (g)	1.21	1.29				
Tare (g)	7.05	7.01				
Dry Soil (g)	6.00	6.24				
Water Content, w (%)	20.17	20.67				

Liquid Limit

Determination No	1	2	3			
Number of Drops, N	32	25	17			
Wet Soil + Tare (g)	12.33	14.77	14.45			
Dry Soil + Tare (g)	11.26	13.24	12.90			
Water Loss (g)	1.07	1.53	1.55			
Tare (g)	7.11	7.53	7.48			
Dry Soil (g)	4.15	5.71	5.42			
Water Content, w (%)	25.78	26.80	28.60			
One-Point LL (%)		27				

Liquid Limit, LL (%)	**27**
Plastic Limit, PL (%)	**20**
Plasticity Index, PI (%)	**7**





Entered by:_____
Reviewed:_____

Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis

(ASTM D6913)

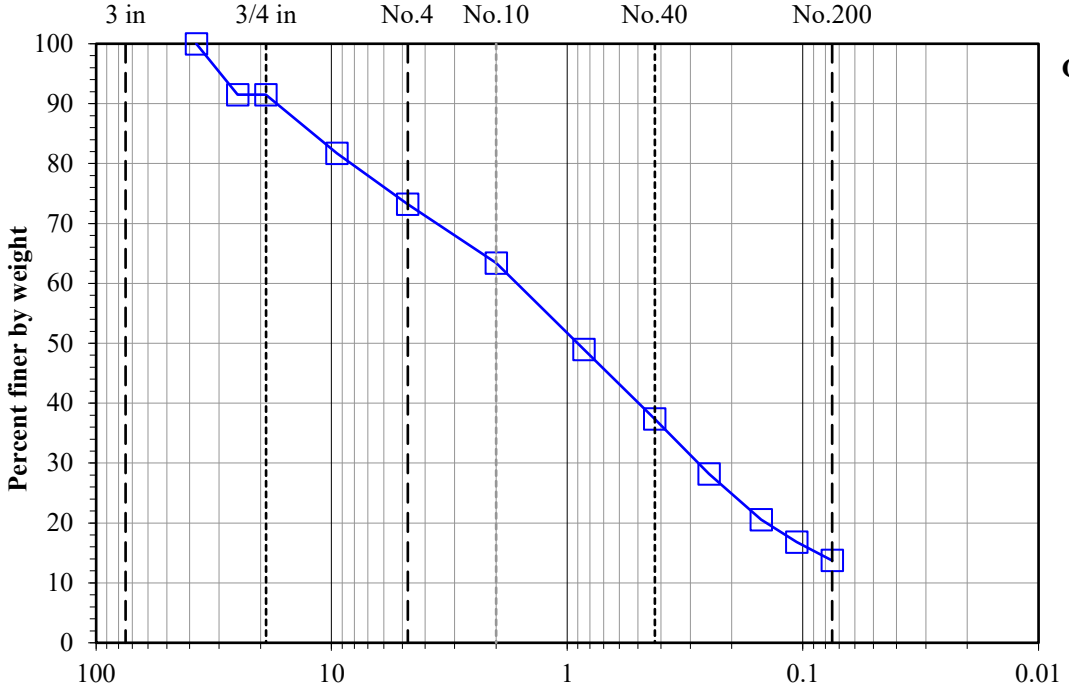
Project: JVWTP Filter & Chem Feed Upgrade
No: 00823-023
Location: Bluffdale, Utah
Date: 1/2/2024
By: CJ

Boring No.: B-01
Sample:
Depth: 7.5'
Description: Light brown silty sand with gravel

Split:	Yes	
Split sieve:	No.4	
	Moist	Dry
Total sample wt. (g):	410.66	385.02
+No.4 Coarse fraction (g):	106.57	103.06
-No.4 Split fraction (g):	129.04	119.65
Split fraction:	0.732	

Water content data	C.F.(+No.4)	S.F.(-No.4)
Moist soil + tare (g):	286.23	256.18
Dry soil + tare (g):	282.70	246.79
Tare (g):	179.17	127.14
Water content (%):	3.4	7.8

Sieve	Accum. Wt. Ret. (g)	Grain Size (mm)	Percent Finer	
6"	-	150	-	
4"	-	100	-	
3"	-	75	-	
1.5"	-	37.5	100.0	
1"	32.72	25	91.5	
3/4"	32.72	19	91.5	
3/8"	70.43	9.5	81.7	
No.4	103.06	4.75	73.2	←Split
No.10	16.02	2	63.4	
No.20	39.58	0.85	49.0	
No.40	58.59	0.425	37.4	
No.60	73.56	0.25	28.2	
No.100	86.05	0.15	20.6	
No.140	92.19	0.106	16.8	
No.200	97.15	0.075	13.8	



Gravel (%): 26.8
Sand (%): 59.5
Fines (%): 13.8

Comments:
These results are in nonconformance with Method D6913 because the minimum dry mass was not met.

Entered by:_____
Reviewed:_____

Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis

(ASTM D6913)

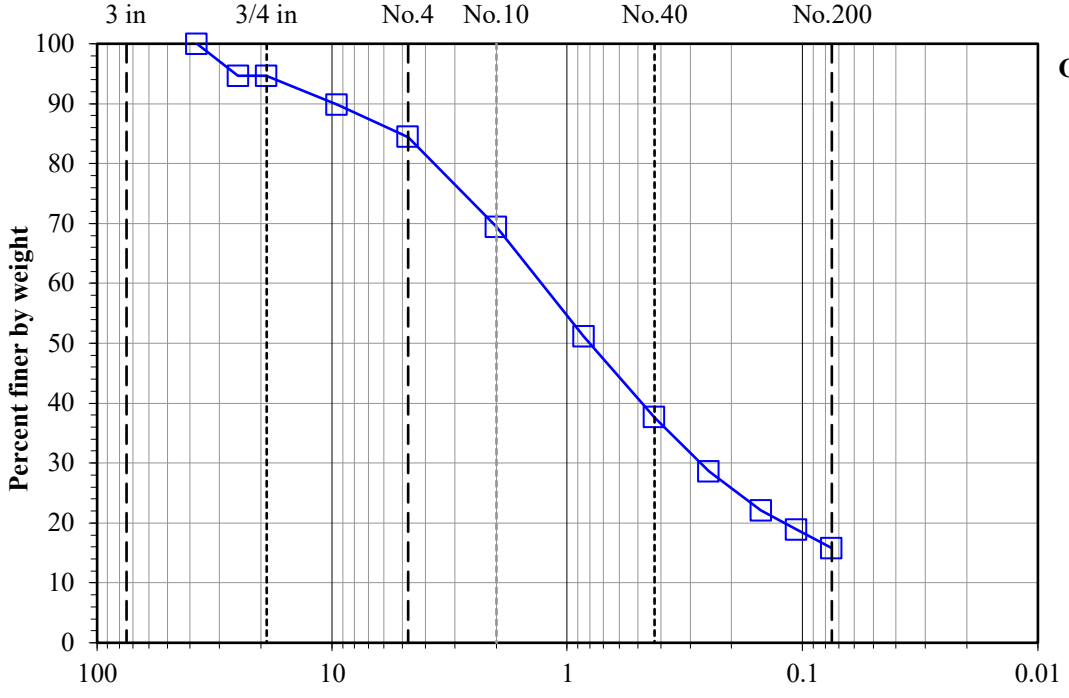
Project: JVWTP Filter & Chem Feed Upgrade
No: 00823-023
Location: Bluffdale, Utah
Date: 1/2/2024
By: CJ

Boring No.: B-01
Sample:
Depth: 20.0'
Description: Brown silty sand with gravel

Split:	Yes	
Split sieve:	3/8"	
	Moist	Dry
Total sample wt. (g):	562.53	518.86
+3/8" Coarse fraction (g):	54.55	52.77
-3/8" Split fraction (g):	214.77	197.06
Split fraction:	0.898	

Water content data	C.F.(+3/8")	S.F.(-3/8")
Moist soil + tare (g):	184.94	339.28
Dry soil + tare (g):	183.06	321.57
Tare (g):	127.32	124.51
Water content (%):	3.4	9.0

Sieve	Accum. Wt. Ret. (g)	Grain Size (mm)	Percent Finer	
6"	-	150	-	
4"	-	100	-	
3"	-	75	-	
1.5"	-	37.5	100.0	
1"	27.84	25	94.6	
3/4"	27.84	19	94.6	
3/8"	52.77	9.5	89.8	←Split
No.4	11.82	4.75	84.4	
No.10	44.74	2	69.4	
No.20	84.85	0.85	51.2	
No.40	114.54	0.425	37.6	
No.60	134.28	0.25	28.6	
No.100	148.55	0.15	22.1	
No.140	155.60	0.106	18.9	
No.200	162.38	0.075	15.8	



Gravel (%): 15.6
Sand (%): 68.6
Fines (%): 15.8

Comments:
These results are in nonconformance with Method D6913 because the minimum dry mass was not met.

Entered by:_____
Reviewed:_____

Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis

(ASTM D6913)

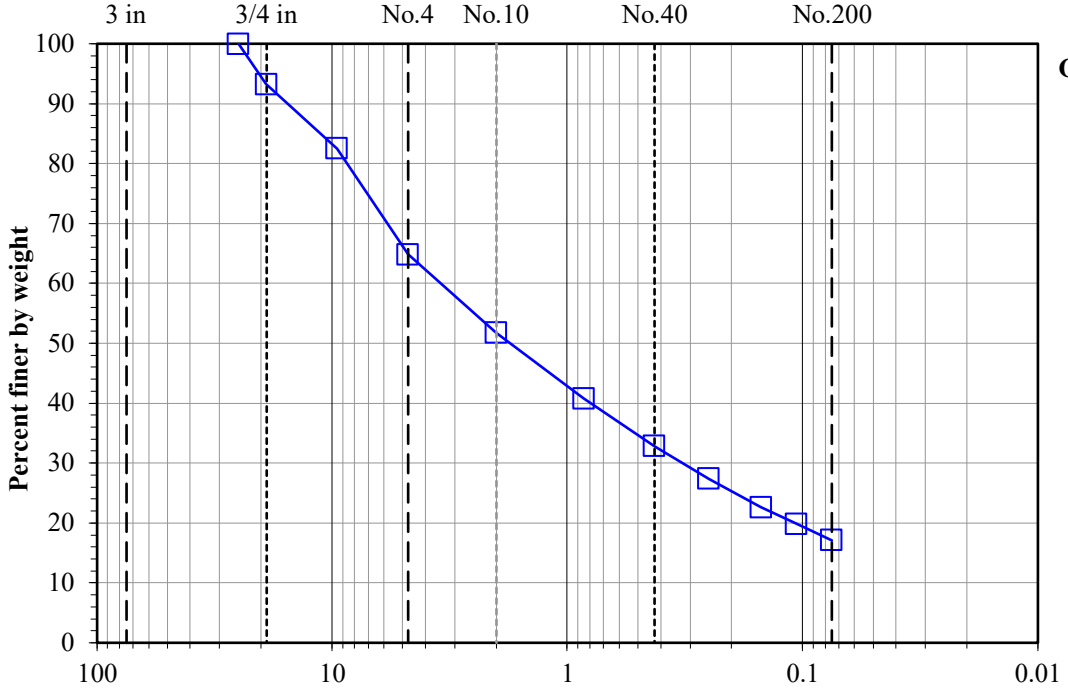
Project: JVWTP Filter & Chem Feed Upgrade
No: 00823-023
Location: Bluffdale, Utah
Date: 1/2/2024
By: CJ

Boring No.: B-02
Sample:
Depth: 10.0'
Description: Brown silty sand with gravel

Split:	Yes	
Split sieve:	3/8"	
	Moist	Dry
Total sample wt. (g):	334.61	308.52
+3/8" Coarse fraction (g):	57.10	54.03
-3/8" Split fraction (g):	202.11	185.34
Split fraction:	0.825	

Water content data	C.F.(+3/8")	S.F.(-3/8")
Moist soil + tare (g):	178.02	329.64
Dry soil + tare (g):	174.83	312.87
Tare (g):	118.61	127.53
Water content (%):	5.7	9.0

Sieve	Accum. Wt. Ret. (g)	Grain Size (mm)	Percent Finer	
6"	-	150	-	
4"	-	100	-	
3"	-	75	-	
1.5"	-	37.5	-	
1"	-	25	100.0	
3/4"	20.91	19	93.2	
3/8"	54.03	9.5	82.5	←Split
No.4	39.63	4.75	64.8	
No.10	69.15	2	51.7	
No.20	93.69	0.85	40.8	
No.40	111.53	0.425	32.8	
No.60	123.82	0.25	27.4	
No.100	134.48	0.15	22.6	
No.140	140.78	0.106	19.8	
No.200	146.84	0.075	17.1	



Gravel (%): 35.2
Sand (%): 47.7
Fines (%): 17.1

Comments:
These results are in nonconformance with Method D6913 because the minimum dry mass was not met.

Entered by:_____
Reviewed:_____

Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis

(ASTM D6913)

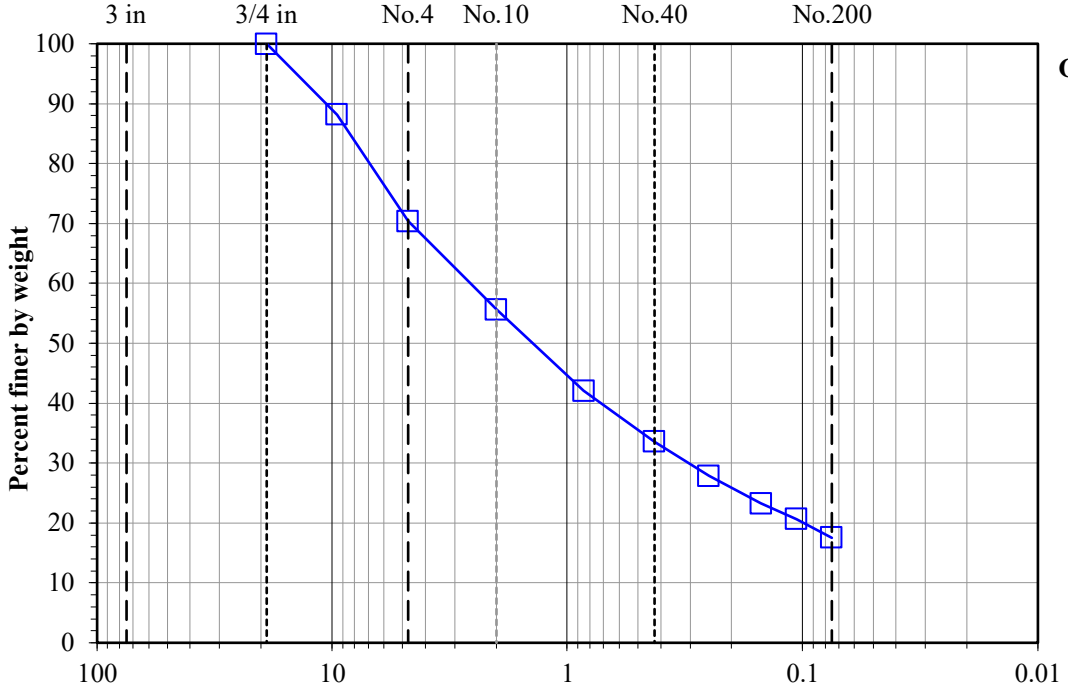
Project: JVWTP Filter & Chem Feed Upgrade
No: 00823-023
Location: Bluffdale, Utah
Date: 1/2/2024
By: CJ

Boring No.: B-02
Sample:
Depth: 25.0'
Description: Brown silty sand with gravel

Split:	Yes	
Split sieve:	No.10	
	Moist	Dry
Total sample wt. (g):	122.04	114.14
No.10 Coarse fraction (g):	53.06	50.62
-No.10 Split fraction (g):	65.10	59.95
Split fraction:	0.557	

Water content data	C.F.(+No.10)	S.F.(-No.10)
Moist soil + tare (g):	181.32	188.68
Dry soil + tare (g):	178.70	183.53
Tare (g):	124.38	123.58
Water content (%):	4.8	8.6

Sieve	Accum. Wt. Ret. (g)	Grain Size (mm)	Percent Finer	
6"	-	150	-	
4"	-	100	-	
3"	-	75	-	
1.5"	-	37.5	-	
1"	-	25	-	
3/4"	-	19	100.0	
3/8"	13.53	9.5	88.1	
No.4	33.82	4.75	70.4	
No.10	50.62	2	55.7	←Split
No.20	14.62	0.85	42.1	
No.40	23.80	0.425	33.6	
No.60	29.92	0.25	27.9	
No.100	34.87	0.15	23.3	
No.140	37.70	0.106	20.7	
No.200	40.99	0.075	17.6	



Gravel (%): 29.6
Sand (%): 52.8
Fines (%): 17.6

Comments:
These results are in nonconformance with Method D6913 because the minimum dry mass was not met.

Entered by:_____
Reviewed:_____

Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis

(ASTM D6913)

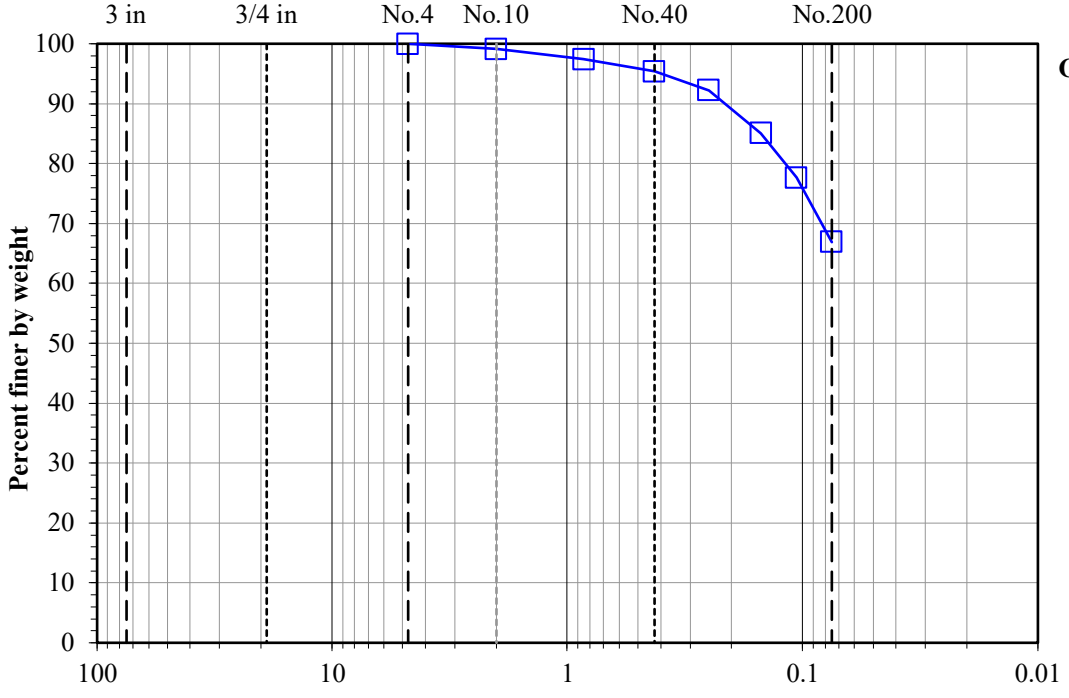
Project: JVWTP Filter & Chem Feed Upgrade
No: 00823-023
Location: Bluffdale, Utah
Date: 1/2/2024
By: CJ

Boring No.: B-03
Sample:
Depth: 15.0'
Description: Brown sandy silt

	Moist	Dry
Split:	No	
Total sample wt. (g):	209.76	175.20
	-	
Split fraction:	1.000	

Water content data		
Moist soil + tare (g):	-	361.74
Dry soil + tare (g):	-	327.18
Tare (g):	-	151.98
Water content (%):	0.0	19.7

Sieve	Accum. Wt. Ret. (g)	Grain Size (mm)	Percent Finer
6"	-	150	-
4"	-	100	-
3"	-	75	-
1.5"	-	37.5	-
1"	-	25	-
3/4"	-	19	-
3/8"	-	9.5	-
No.4	-	4.75	100.0
No.10	1.55	2	99.1
No.20	4.58	0.85	97.4
No.40	8.05	0.425	95.4
No.60	13.59	0.25	92.2
No.100	26.12	0.15	85.1
No.140	39.17	0.106	77.6
No.200	57.98	0.075	66.9



Gravel (%): 0.0
Sand (%): 33.1
Fines (%): 66.9

Entered by:_____
Reviewed:_____

Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis

(ASTM D6913)

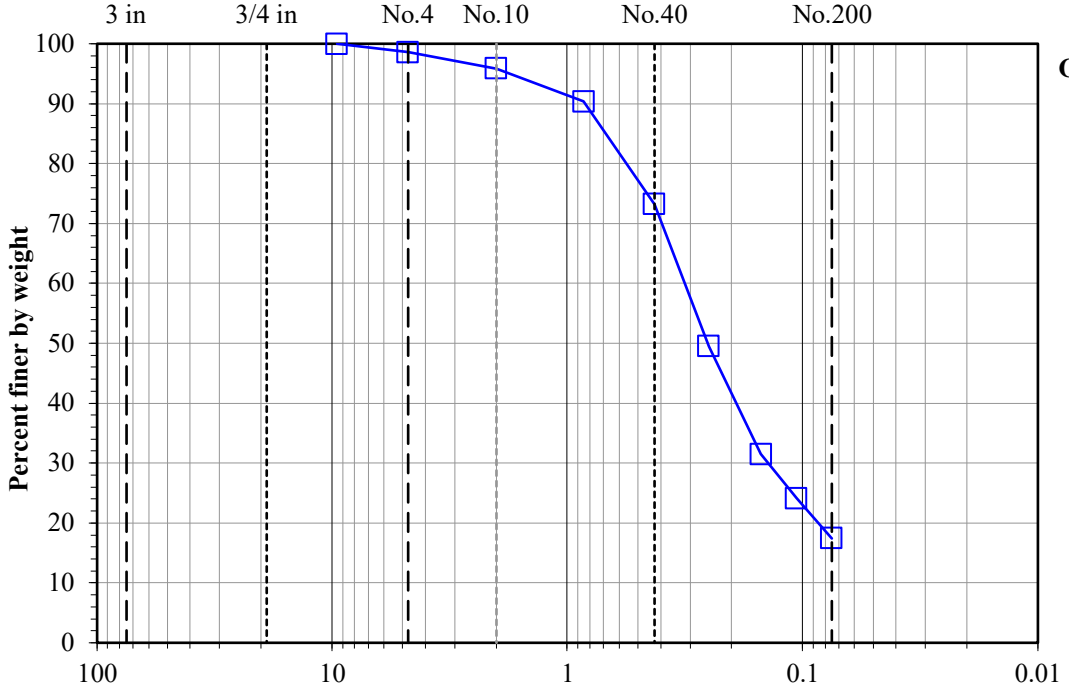
Project: JVWTP Filter & Chem Feed Upgrade
No: 00823-023
Location: Bluffdale, Utah
Date: 1/2/2024
By: CJ

Boring No.: B-03
Sample:
Depth: 30.0'
Description: Brown silty sand

	Moist	Dry
Split:	No	
Total sample wt. (g):	214.55	191.78
	-	
Split fraction:	1.000	

Water content data		
Moist soil + tare (g):	-	339.60
Dry soil + tare (g):	-	316.83
Tare (g):	-	125.05
Water content (%):	0.0	11.9

Sieve	Accum. Wt. Ret. (g)	Grain Size (mm)	Percent Finer
6"	-	150	-
4"	-	100	-
3"	-	75	-
1.5"	-	37.5	-
1"	-	25	-
3/4"	-	19	-
3/8"	-	9.5	100.0
No.4	2.69	4.75	98.6
No.10	7.99	2	95.8
No.20	18.49	0.85	90.4
No.40	51.37	0.425	73.2
No.60	96.87	0.25	49.5
No.100	131.38	0.15	31.5
No.140	145.51	0.106	24.1
No.200	158.32	0.075	17.4



Gravel (%): 1.4
Sand (%): 81.2
Fines (%): 17.4

Entered by:_____
Reviewed:_____

Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis

(ASTM D6913)

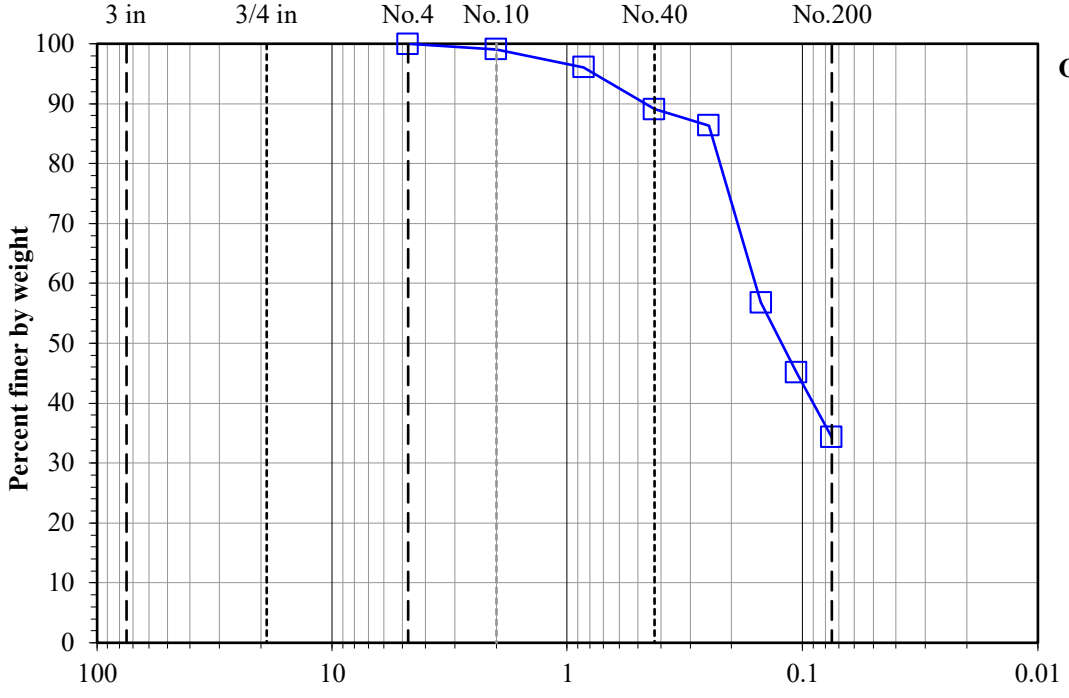
Project: JVWTP Filter & Chem Feed Upgrade
No: 00823-023
Location: Bluffdale, Utah
Date: 1/2/2024
By: JJ

Boring No.: B-04
Sample:
Depth: 15.0'
Description: Brown silty sand

Split:	No No.4	
	Moist	Dry
Total sample wt. (g):	213.51	190.40
	-	
Split fraction:	1.000	

Water content data		
Moist soil + tare (g):	-	338.51
Dry soil + tare (g):		315.40
Tare (g):		125.00
Water content (%):	0.0	12.1

Sieve	Accum. Wt. Ret. (g)	Grain Size (mm)	Percent Finer
6"	-	150	-
4"	-	100	-
3"	-	75	-
1.5"	-	37.5	-
1"	-	25	-
3/4"	-	19	-
3/8"	-	9.5	-
No.4	-	4.75	100.0
No.10	1.80	2	99.1
No.20	7.52	0.85	96.1
No.40	20.82	0.425	89.1
No.60	26.02	0.25	86.3
No.100	82.25	0.15	56.8
No.140	104.50	0.106	45.1
No.200	125.09	0.075	34.3



Gravel (%): 0.0
Sand (%): 65.7
Fines (%): 34.3

Entered by:_____
Reviewed:_____

Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis

(ASTM D6913)

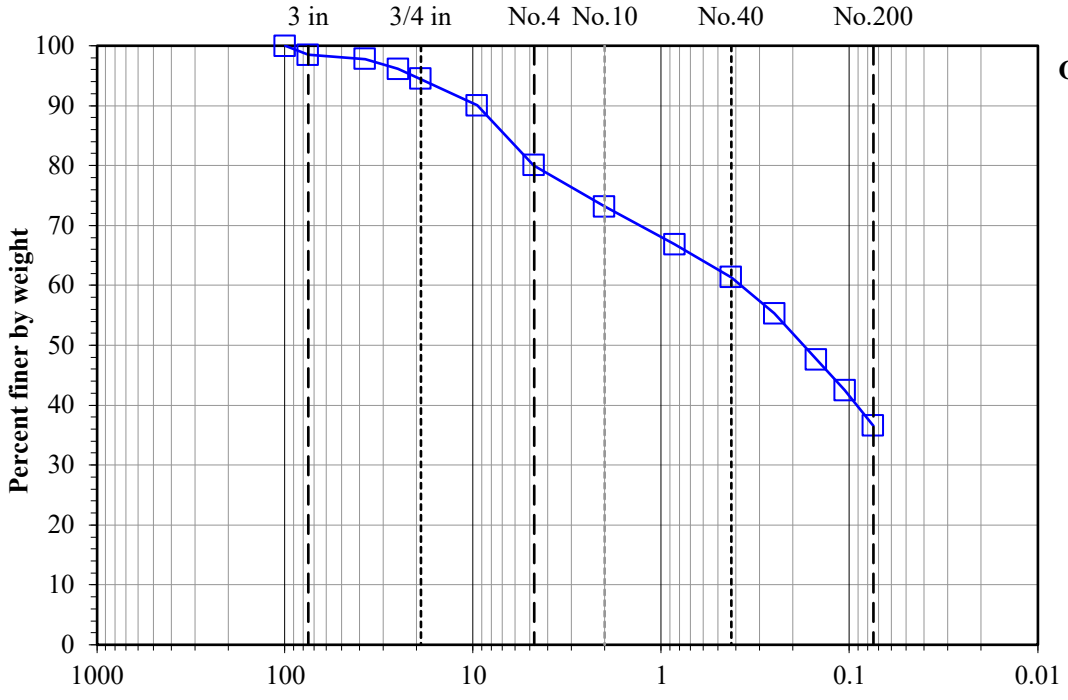
Project: JVWTP Filter & Chem Feed Upgrade
No: 00823-023
Location: Bluffdale, Utah
Date: 1/8/2024
By: KC

Boring No.: Bulk-01
Sample:
Depth: 0-2'
Description: Brown silty, clayey sand with gravel

	Moist	Dry
Split:	Yes	
Split sieve:	3/8"	
Total sample wt. (g):	49841.2	44841.0
+3/8" Coarse fraction (g):	4620.44	4470.51
-3/8" Split fraction (g):	222.64	198.76
Split fraction:	0.900	

Water content data	C.F.(+3/8")	S.F.(-3/8")
Moist soil + tare (g):	1721.71	349.76
Dry soil + tare (g):	1680.33	325.88
Tare (g):	446.47	127.12
Water content (%):	3.4	12.0

Sieve	Accum. Wt. Ret. (g)	Grain Size (mm)	Percent Finer	
6"	-	150	-	
4"	-	100	100.0	
3"	685.47	75	98.5	
1.5"	987.24	37.5	97.8	
1"	1733.52	25	96.1	
3/4"	2475.47	19	94.5	
3/8"	4470.51	9.5	90.0	←Split
No.4	22.00	4.75	80.1	
No.10	37.24	2	73.2	
No.20	51.22	0.85	66.8	
No.40	63.30	0.425	61.4	
No.60	76.65	0.25	55.3	
No.100	93.64	0.15	47.6	
No.140	104.94	0.106	42.5	
No.200	117.99	0.075	36.6	



Gravel (%): 19.9
Sand (%): 43.5
Fines (%): 36.6

Comments:
These results are in nonconformance with Method D6913 because the minimum dry mass was not met.

Entered by:_____
Reviewed:_____

Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis

(ASTM D6913)

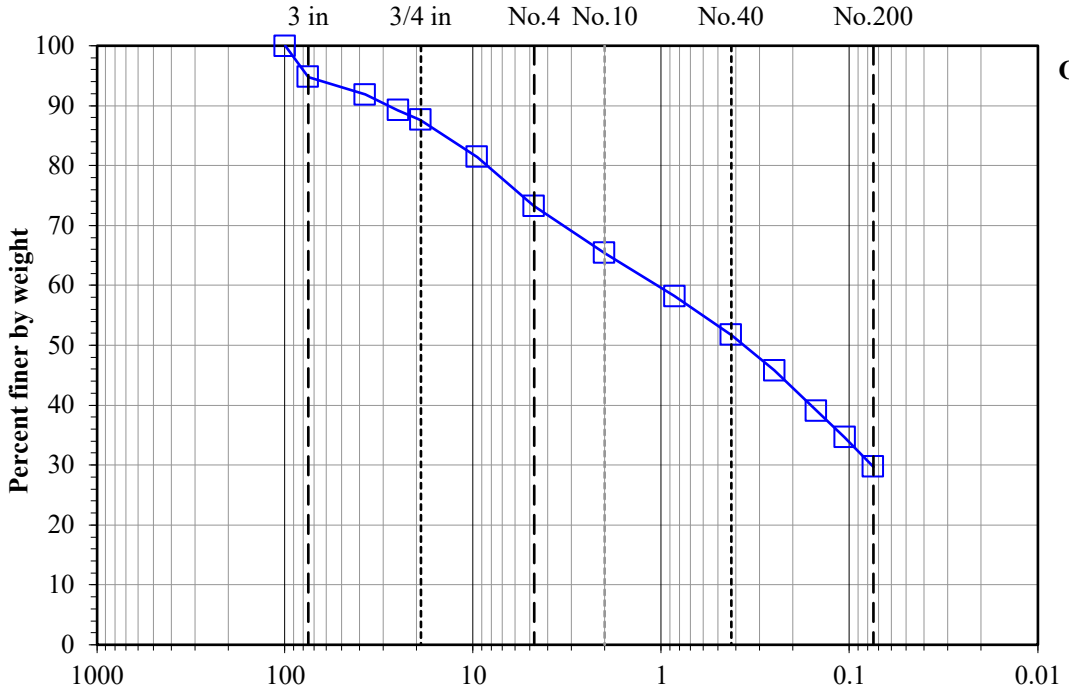
Project: JVWTP Filter & Chem Feed Upgrade
No: 00823-023
Location: Bluffdale, Utah
Date: 1/5/2024
By: JJ

Boring No.: Bulk-02
Sample:
Depth: 0-2'
Description: Brown silty, clayey sand with gravel

	Moist	Dry
Split:	Yes	
Split sieve:	3/8"	
Total sample wt. (g):	49378.6	44669.4
+3/8" Coarse fraction (g):	8646.5	8289.3
-3/8" Split fraction (g):	230.24	205.64
Split fraction:	0.814	

Water content data	C.F.(+3/8")	S.F.(-3/8")
Moist soil + tare (g):	1419.66	370.43
Dry soil + tare (g):	1373.80	345.83
Tare (g):	309.55	140.19
Water content (%):	4.3	12.0

Sieve	Accum. Wt. Ret. (g)	Grain Size (mm)	Percent Finer	
6"	-	150	-	
4"	-	100	100.0	
3"	2317.2	75	94.8	
1.5"	3640.0	37.5	91.9	
1"	4796.7	25	89.3	
3/4"	5514.9	19	87.7	
3/8"	8289.3	9.5	81.4	←Split
No.4	20.64	4.75	73.3	
No.10	40.46	2	65.4	
No.20	58.63	0.85	58.2	
No.40	74.99	0.425	51.7	
No.60	89.92	0.25	45.8	
No.100	107.02	0.15	39.1	
No.140	118.15	0.106	34.7	
No.200	130.41	0.075	29.8	



Gravel (%): 26.7
Sand (%): 43.5
Fines (%): 29.8

Comments:
These results are in nonconformance with Method D6913 because the minimum dry mass was not met.

Entered by:_____
Reviewed:_____

Amount of Material in Soil Finer than the No. 200 (75µm) Sieve

(ASTM D1140)

Project: JVWTP Filter & Chem Feed Upgrade
No: 00823-023
Location: Bluffdale, Utah
Date: 12/29/2023
By: SE/CJ

Sample Info.	Boring No.	B-01	B-03	B-04	B-04				
	Sample								
	Depth	30.0'	10.0'	30.0'	40.0'				
	Split	Yes	No	Yes	No				
	Split Sieve*	3/8"		No.4					
	Method	B	B	B	B				
Specimen soak time (min)		300	320	450	410				
Moist total sample wt. (g)		487.83	204.85	436.33	123.40				
Moist coarse fraction (g)		60.02		11.70					
Moist split fraction + tare (g)		394.71		266.20					
Split fraction tare (g)		180.27		126.69					
Dry split fraction (g)		181.35		113.29					
Dry retained No. 200 + tare (g)		305.61	228.55	192.20	203.84				
Wash tare (g)		180.27	119.90	126.69	124.60				
No. 200 Dry wt. retained (g)		125.34	108.65	65.51	79.24				
Split sieve* Dry wt. retained (g)		56.78		10.96					
Dry total sample wt. (g)		418.57	174.68	355.78	103.59				
Coarse Fraction	Moist soil + tare (g)	174.70		36.71					
	Dry soil + tare (g)	171.46		35.97					
	Tare (g)	114.69		25.01					
	Water content (%)	5.71		6.75					
Split Fraction	Moist soil + tare (g)	394.71	324.75	266.20	248.00				
	Dry soil + tare (g)	361.62	294.58	239.98	228.19				
	Tare (g)	180.27	119.90	126.69	124.60				
	Water content (%)	18.25	17.27	23.14	19.12				
Percent passing split sieve* (%)		**86.4**		**96.9**					
Percent passing No. 200 sieve (%)		**26.7**	**37.8**	**40.9**	**23.5**				

Comments: These results are in nonconformance with Method D1140 because the minimum dry mass was not met.

Entered by:_____

Reviewed:_____

Laboratory Compaction Characteristics of Soil

(ASTM D698 / D1557)

Project: JVWTP Filter & Chem Feed Upgrade
No: 00823-023
Location: Bluffdale, Utah
Date: 1/8/2024
By: KC

Boring No.: Bulk-01
Sample:
Depth: 0-2'
Sample Description: Brown silty, clayey sand with gravel
Engineering Classification: Not requested
As-received water content (%): Not requested

Method: ASTM D1557 B
Mold Id. INC 2
Mold volume (ft^3): 0.0333

Preparation method: Moist
Rammer: Mechanical-circular face
Rock Correction: Yes * See results below
Percent fraction retained, Pc (%) 10.0
Percent fraction passing, Pf (%) 90.0

Optimum water content (%): 11.9
Maximum dry unit weight (pcf): 120.6

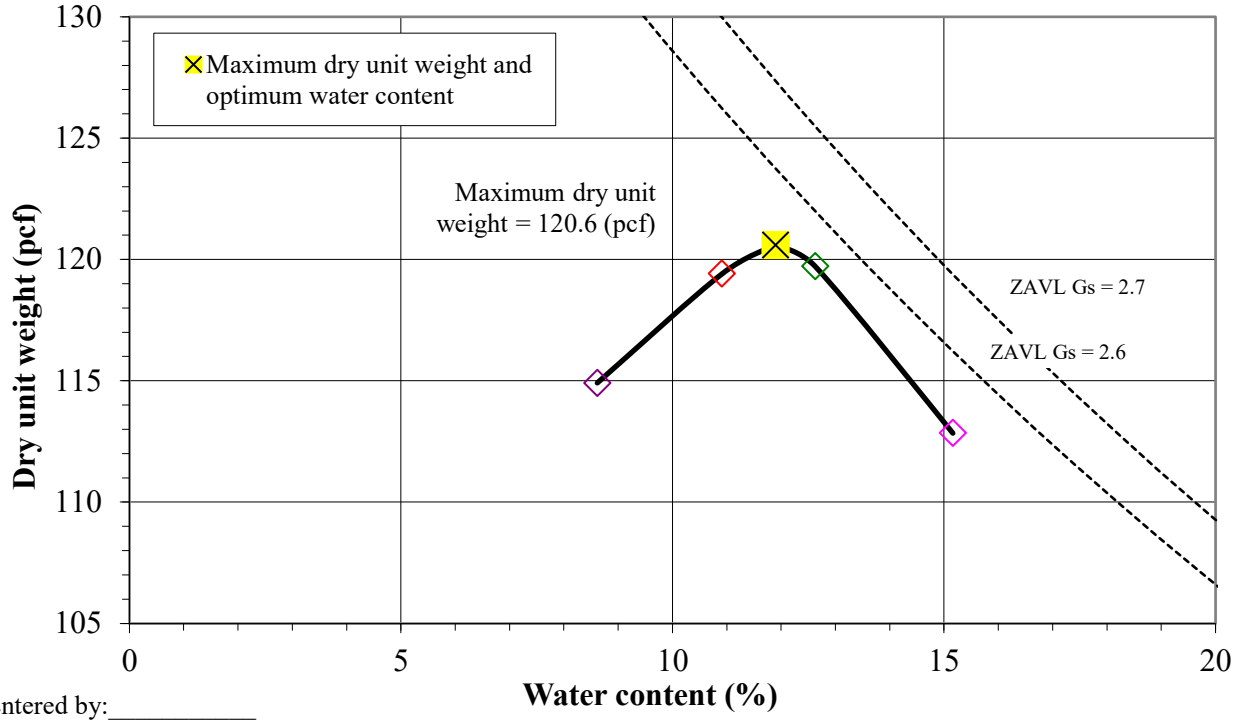
Point Number	-4%	-2%	As is	+2%				
Wt. Sample + Mold (g)	6102.4	6217.5	6253.6	6180.0				
Wt. of Mold (g)	4218.9	4218.9	4218.9	4218.9				
Wet Unit Wt., γ_m (pcf)	124.8	132.4	134.8	130.0				
Wet Soil + Tare (g)	410.24	453.24	396.78	477.79				
Dry Soil + Tare (g)	387.38	421.10	366.06	431.58				
Tare (g)	122.07	126.51	122.78	126.81				
Water Content, w (%)	**8.6**	**10.9**	**12.6**	**15.2**				
Dry Unit Wt., γ_d (pcf)	**114.9**	**119.4**	**119.7**	**112.9**				

*Correction of Unit Weight and Water Content for Soils Containing Oversize Particles

(ASTM D4718)

Corrected water content (%): 11.1
Corrected dry unit weight (pcf): 123.9

Oversized fraction, +3/8-in. (%): 10.0
Water content, +3/8-in. (%): 3.4
Sieve for oversized fraction: 3/8-in.
Bulk specific gravity, Gs: 2.65 Assumed



Entered by:_____

Reviewed:_____

Laboratory Compaction Characteristics of Soil

(ASTM D698 / D1557)

Project: JVWTP Filter & Chem Feed Upgrade
No: 00823-023
Location: Bluffdale, Utah
Date: 1/5/2024
By: JJ

Boring No.: Bulk-02
Sample:
Depth: 0-2'
Sample Description: Brown silty, clayey sand with gravel
Engineering Classification: Not requested
As-received water content (%): Not requested

Method: ASTM D1557 B
Mold Id. INC 3
Mold volume (ft^3): 0.0333

Preparation method: Moist
Rammer: Mechanical-circular face
Rock Correction: Yes * See results below
Percent fraction retained, Pc (%) 18.6
Percent fraction passing, Pf (%) 81.4

Optimum water content (%): 12.1
Maximum dry unit weight (pcf): 116.9

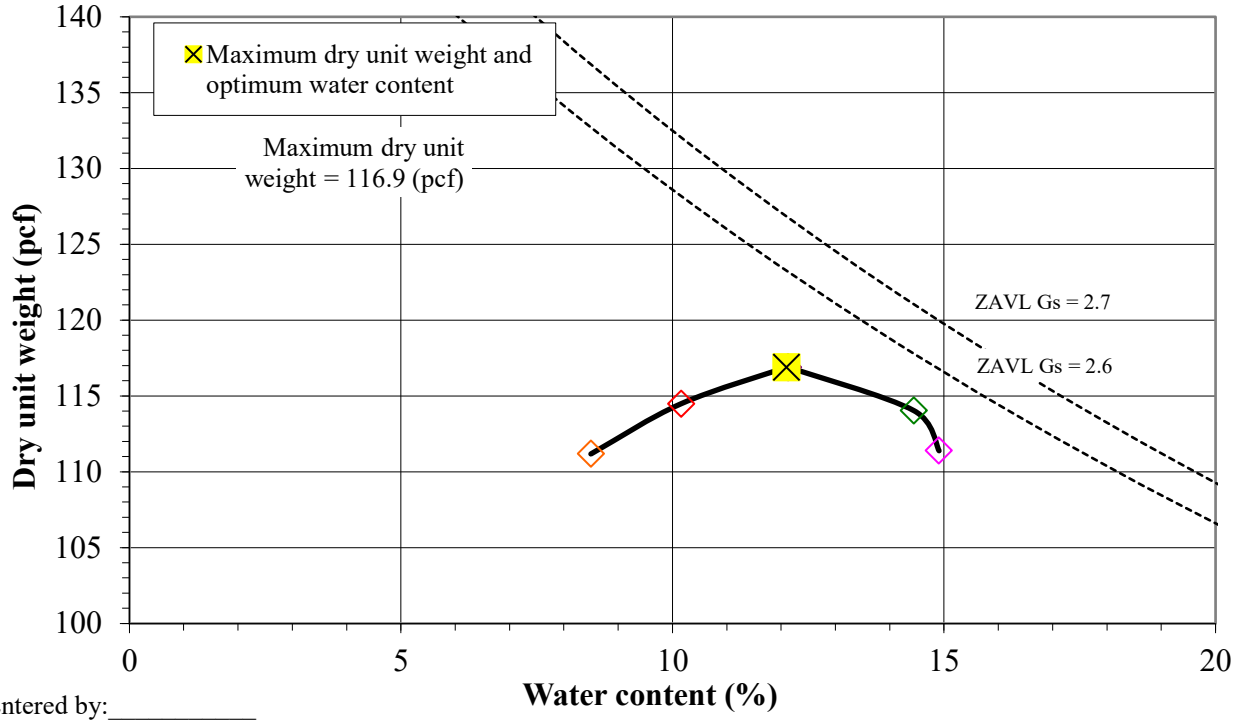
Point Number	As is	-2%	+2%	+4%	-4%			
Wt. Sample + Mold (g)	6183.9	6109.2	6175.4	6137.7	6026.5			
Wt. of Mold (g)	4205.6	4205.6	4205.6	4205.6	4205.6			
Wet Unit Wt., γ_m (pcf)	131.1	126.1	130.5	128.0	120.6			
Wet Soil + Tare (g)	649.25	670.95	627.51	631.00	573.96			
Dry Soil + Tare (g)	592.16	629.88	567.75	576.46	540.89			
Tare (g)	121.41	225.60	154.02	210.57	151.74			
Water Content, w (%)	**12.1**	**10.2**	**14.4**	**14.9**	**8.5**			
Dry Unit Wt., γ_d (pcf)	**116.9**	**114.5**	**114.0**	**111.4**	**111.2**			

*Correction of Unit Weight and Water Content for Soils Containing Oversize Particles

(ASTM D4718)

Corrected water content (%): 10.7
Corrected dry unit weight (pcf): 123.6

Oversized fraction, +3/8-in. (%): 18.6
Water content, +3/8-in. (%): 4.3
Sieve for oversized fraction: 3/8-in.
Bulk specific gravity, Gs: 2.65 Assumed



Entered by:_____

Reviewed:_____

California Bearing Ratio

(ASTM D 1883)

Project: JVWTP Filter & Chem Feed Upgrade
Number: 00823-023
Location: Bluffdale, Utah
Date: 1/9/2024
By: KC

Boring No.: Bulk-01
Sample:
Depth: 0-2'
Original Method: ASTM D1557 B
Engineering Classification: Not requested
Condition of Sample: Soaked
Scalp and Replace: No

Maximum Dry Unit Weight (pcf): 120.6
Optimum Water Content (%): 11.9
Relative Compaction (%): 100.2
0.1 in. Corrected CBR (%): 53.8
0.2 in. Corrected CBR (%): 66.1

As Compacted Data			Before	After
Mold Id.	A	Wet Soil + Tare (g)	2039.73	1789.76
Wt. of Mold + Sample (g)	11818.5	Dry Soil + Tare (g)	1875.01	1639.78
Wt. of Mold (g)	7231.3	Tare (g)	465.11	331.42
Dry Unit Weight (pcf)	120.8	Water Content (%)	11.7	11.5
After Soaking Data			**Average**	**Top 1 in.**
Wt. of Mold + Sample (g)	11861.9	Wet Soil + Tare (g)	2042.89	758.09
Dry Unit Weight (pcf)	121.6	Dry Soil + Tare (g)	1904.77	689.03
		Tare (g)	741.29	125.08
		Water Content (%)	11.9	12.2

Swell Data

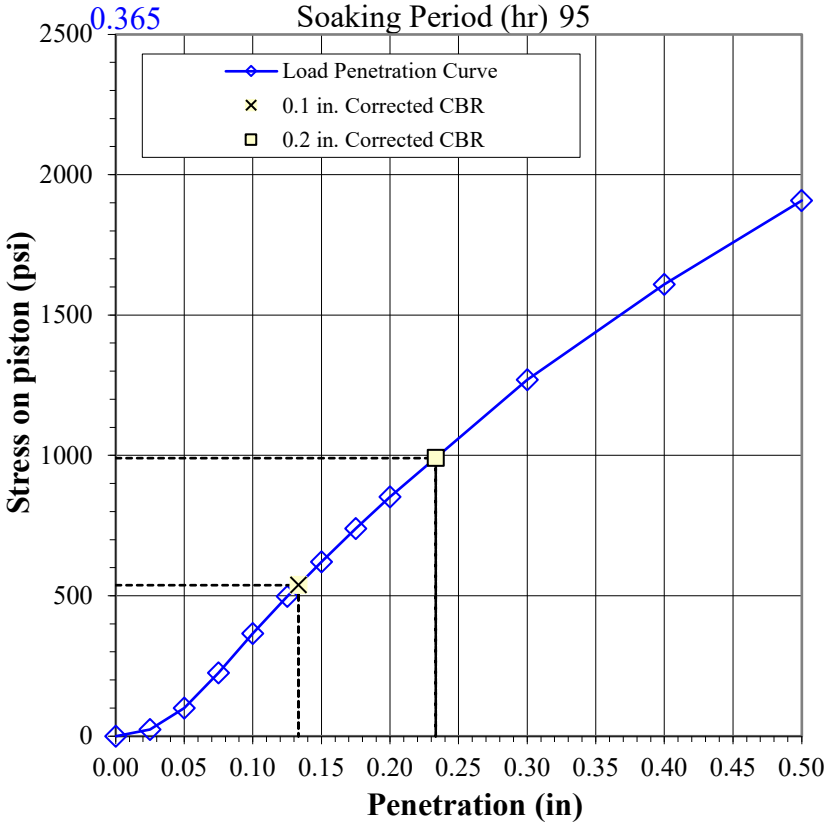
Date	Time	Dial
1/4/2024	9:18	0.364
1/8/2024	8:38	0.365

Surcharge (psf) 50
Swell (%) 0.02
Soaking Period (hr) 95

Penetration Data	Piston ID	CBR T1

Zero load (lb) = 0
Area of Piston (in^2) = 3.0

Penetration (in.)	Raw Load (lb)	Piston Stress (psi)	Std. Stress (psi)
0.000	0	0	
0.025	71	24	
0.050	301	100	
0.075	677	226	
0.100	1096	365	1000
0.125	1493	498	1125
0.150	1863	621	1250
0.175	2217	739	1375
0.200	2557	852	1500
0.300	3807	1269	1900
0.400	4827	1609	2300
0.500	5725	1908	2600



Entered By:_____
Reviewed:_____

California Bearing Ratio

(ASTM D 1883)

Project: JVWTP Filter & Chem Feed Upgrade
Number: 00823-023
Location: Bluffdale, Utah
Date: 1/9/2024
By: JJ

Boring No.: Bulk-02
Sample:
Depth: 0-2'
Original Method: ASTM D1557 B
Engineering Classification: Not requested
Condition of Sample: Soaked
Scalp and Replace: No

Maximum Dry Unit Weight (pcf): 116.9
Optimum Water Content (%): 12.1
Relative Compaction (%): 100.2
0.1 in. Corrected CBR (%): 56.3
0.2 in. Corrected CBR (%): 60.5

As Compacted Data			Before	After
Mold Id.	4	Wet Soil + Tare (g)	1061.85	1086.41
Wt. of Mold + Sample (g)	11628.2	Dry Soil + Tare (g)	978.83	1012.43
Wt. of Mold (g)	7165.8	Tare (g)	310.45	407.86
Dry Unit Weight (pcf)	117.1	Water Content (%)	12.4	12.2
After Soaking Data			**Average**	**Top 1 in.**
Wt. of Mold + Sample (g)	11722.3	Wet Soil + Tare (g)	1497.37	528.87
Dry Unit Weight (pcf)	117.2	Dry Soil + Tare (g)	1358.76	479.42
		Tare (g)	393.01	127.44
		Water Content (%)	14.4	14.0

Swell Data

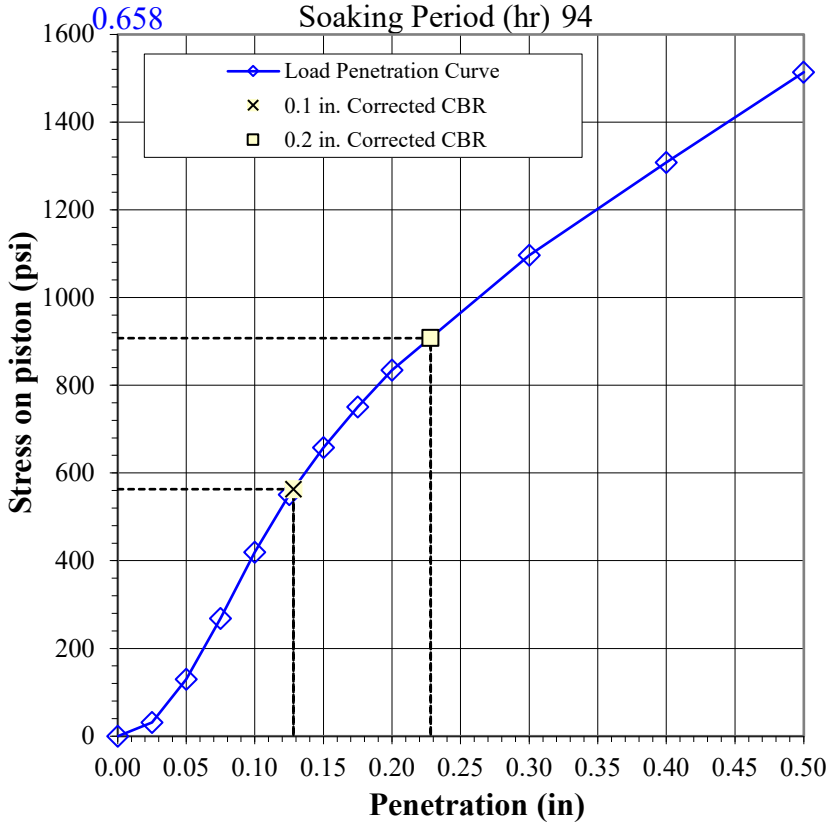
Date	Time	Dial
1/4/2024	16:00	0.649
1/8/2024	14:24	0.658

Surcharge (psf) 50
Swell (%) 0.20
Soaking Period (hr) 94

Penetration Data	Piston ID	CBR T1

Zero load (lb) = 0
Area of Piston (in^2) = 3.0

Penetration (in.)	Raw Load (lb)	Piston Stress (psi)	Std. Stress (psi)
0.000	0	0	
0.025	92	31	
0.050	388	129	
0.075	805	268	
0.100	1258	419	1000
0.125	1651	550	1125
0.150	1973	658	1250
0.175	2252	751	1375
0.200	2503	834	1500
0.300	3289	1096	1900
0.400	3923	1307	2300
0.500	4541	1514	2600



Entered By:_____
Reviewed:_____

Direct Shear Test for Soils Under Drained Conditions

(ASTM D3080)

Project: JVWTP Filter & Chem Feed Upgrade
No: 00823-023
Location: Bluffdale, Utah
Date: 1/8/2024
By: PW

Boring No.: B-02
Sample:
Depth: 15.0'
Sample Description: Brown gravel and sand
Sample type: Laboratory compacted
Dry unit weight 97.9 pcf
at 16.6 (%) w

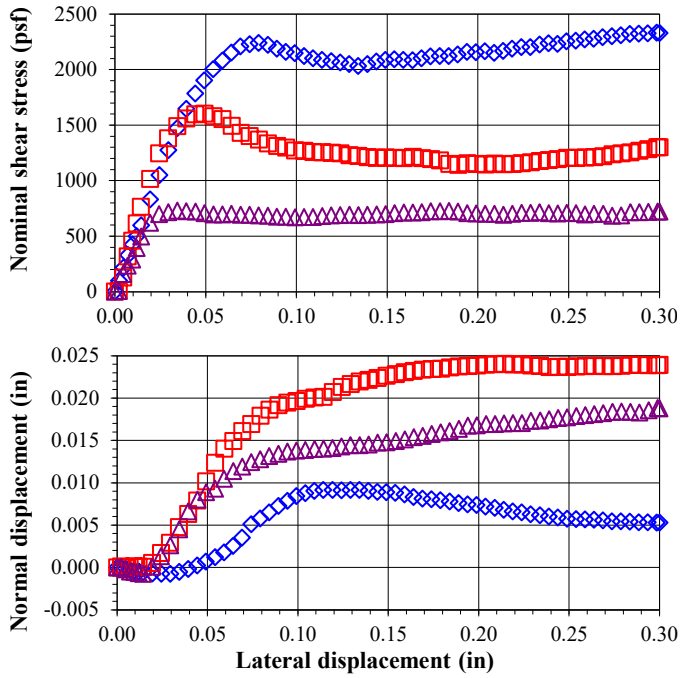
Test type: Inundated
Lateral displacement (in.): 0.3
Shear rate (in./min): 0.0200
Specific gravity, Gs: 2.70 Assumed

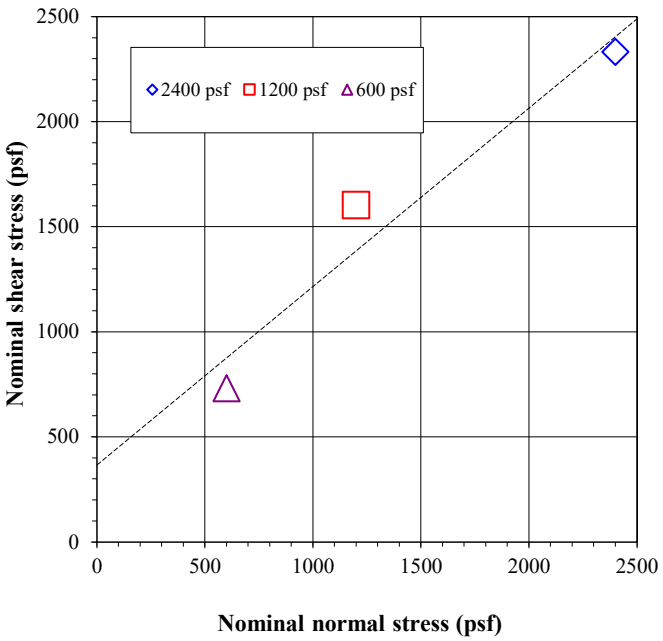
	Sample 1		Sample 2		Sample 3	
Nominal normal stress (psf)	2400		1200		600	
Peak shear stress (psf)	2332		1603		731	
Lateral displacement at peak (in)	0.299		0.049		0.034	
Load Duration (min)	1386		1400		1281	
	Initial	Pre-shear	Initial	Pre-shear	Initial	Pre-shear
Sample height (in)	0.999	0.971	0.998	0.983	0.997	0.987
Sample diameter (in)	2.412	2.412	2.413	2.413	2.411	2.411
Wt. rings + wet soil (g)	181.58	191.30	181.14	191.87	178.71	189.74
Wt. rings (g)	44.74	44.74	44.33	44.33	42.26	42.26
Wet soil + tare (g)	194.76		194.76		194.76	
Dry soil + tare (g)	185.17		185.17		185.17	
Tare (g)	127.57		127.57		127.57	
Water content (%)	16.6	24.9	16.6	25.8	16.6	26.1
Dry unit weight (pcf)	97.9	100.7	97.9	99.3	97.9	98.9
Void ratio, e, for assumed Gs	0.72	0.67	0.72	0.70	0.72	0.70
Saturation (%)*	62.3	100.0	62.3	100.0	62.3	100.0

ϕ' (deg)	40
c' (psf)	367

Average of 3 samples	Initial	Pre-shear
Water content (%)	16.6	25.6
Dry unit weight (pcf)	97.9	99.6

*Pre-shear saturation set to 100% for phase calculations





Comments:
Tube contained significant gravel; thus, test specimens were remolded to tube total unit weight at as-is water content using material passing the No. 4 sieve.
Test specimen #3 contained some material used in specimens 1 and 2 due to sample material constraints.

Entered by:_____
Reviewed:_____

Direct Shear Test for Soils Under Drained Conditions

(ASTM D3080)

Project: JVWTP Filter & Chem Feed Upgrade **Boring No.:** B-02

No: 00823-023 **Sample:**

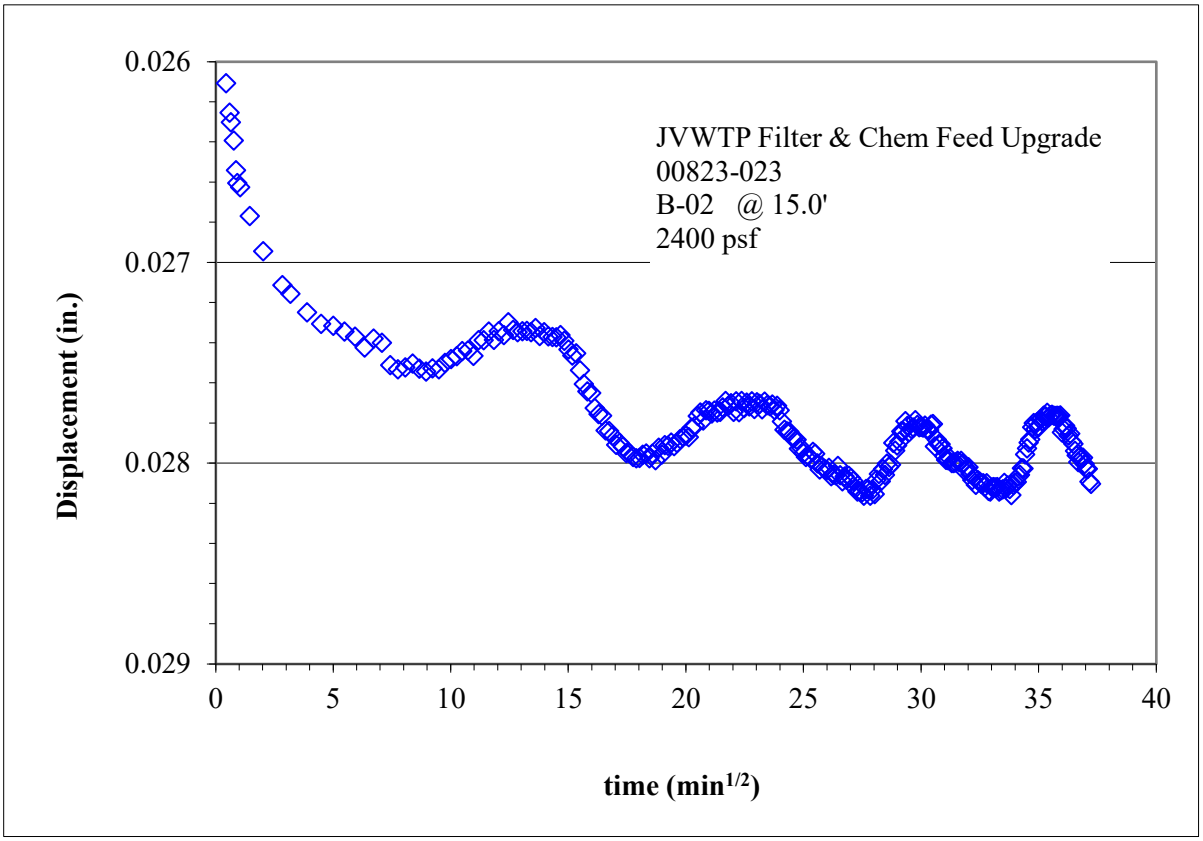
Location: Bluffdale, Utah **Depth:** 15.0'

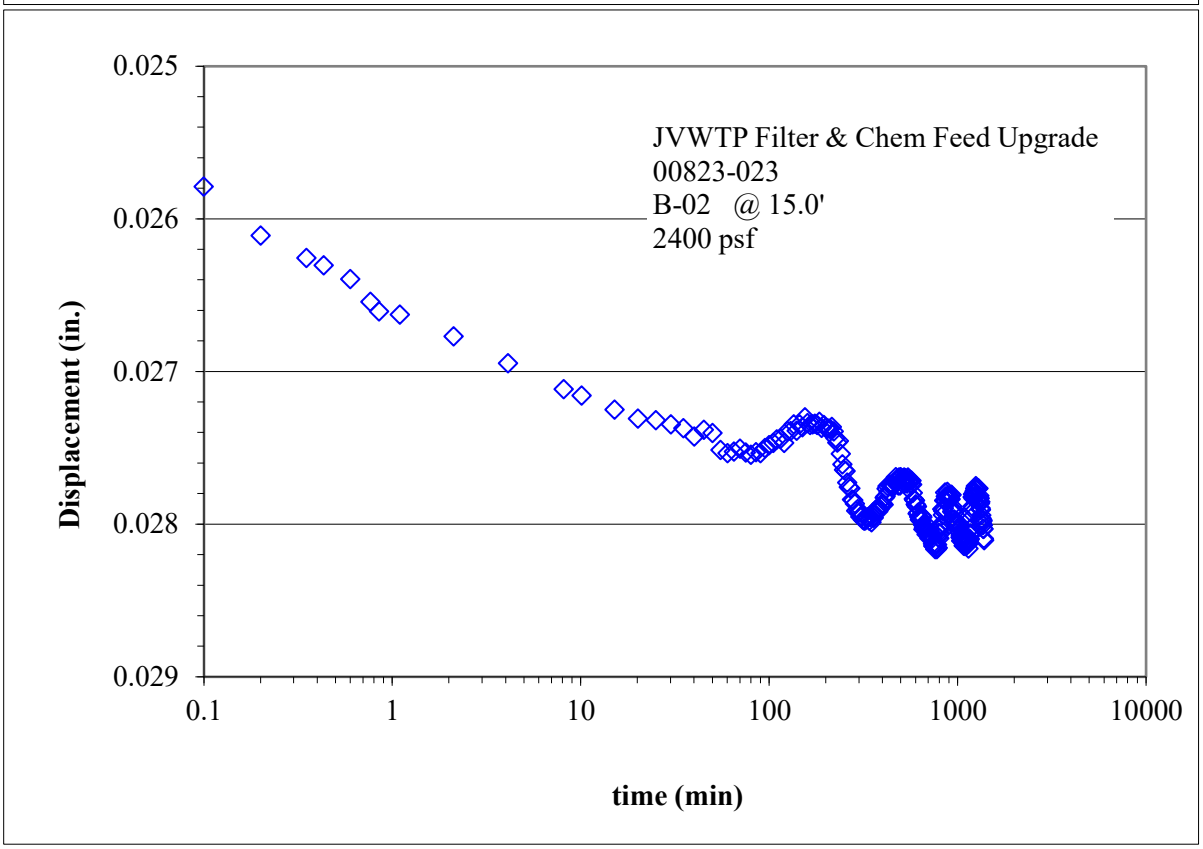
Nominal normal stress = 2400 psf			Nominal normal stress = 1200 psf			Nominal normal stress = 600 psf		
Lateral Displacement (in.)	Nominal Shear Stress (psf)	Normal Displacement (in.)	Lateral Displacement (in.)	Nominal Shear Stress (psf)	Normal Displacement (in.)	Lateral Displacement (in.)	Nominal Shear Stress (psf)	Normal Displacement (in.)
0.000	0	0.000	0.000	0	0.000	0.000	0	0.000
0.002	98	0.000	0.002	8	0.000	0.002	8	0.000
0.005	216	0.000	0.005	129	0.000	0.005	160	0.000
0.007	329	0.000	0.007	318	0.000	0.007	234	0.000
0.010	426	0.000	0.009	459	0.000	0.010	288	-0.001
0.012	499	0.000	0.012	614	0.000	0.012	393	-0.001
0.014	598	-0.001	0.014	763	0.000	0.014	495	-0.001
0.019	830	-0.001	0.019	1015	0.001	0.019	620	0.000
0.024	1050	-0.001	0.024	1246	0.002	0.024	698	0.001
0.029	1274	-0.001	0.029	1382	0.003	0.029	715	0.003
0.034	1473	-0.001	0.034	1490	0.005	0.034	731	0.004
0.039	1648	0.000	0.039	1559	0.006	0.039	725	0.007
0.044	1784	0.000	0.044	1599	0.008	0.044	721	0.008
0.049	1903	0.001	0.049	1603	0.010	0.049	708	0.009
0.054	2004	0.001	0.054	1581	0.012	0.054	695	0.009
0.059	2083	0.002	0.059	1554	0.014	0.059	695	0.010
0.064	2154	0.003	0.064	1494	0.015	0.064	700	0.011
0.069	2210	0.004	0.069	1431	0.016	0.069	693	0.012
0.074	2228	0.005	0.074	1403	0.017	0.074	693	0.012
0.079	2240	0.006	0.079	1370	0.018	0.079	688	0.013
0.084	2223	0.007	0.084	1335	0.019	0.084	683	0.013
0.089	2188	0.007	0.089	1313	0.019	0.089	674	0.013
0.094	2159	0.008	0.094	1298	0.019	0.094	676	0.014
0.099	2148	0.008	0.099	1273	0.020	0.099	670	0.014
0.104	2121	0.009	0.104	1269	0.020	0.104	672	0.014
0.109	2103	0.009	0.109	1257	0.020	0.109	672	0.014
0.114	2089	0.009	0.114	1255	0.020	0.114	681	0.014
0.119	2075	0.009	0.119	1253	0.021	0.119	687	0.014
0.124	2065	0.009	0.124	1245	0.021	0.124	689	0.014
0.129	2050	0.009	0.129	1230	0.022	0.129	692	0.014
0.134	2034	0.009	0.134	1224	0.022	0.134	689	0.014
0.139	2051	0.009	0.139	1212	0.022	0.139	693	0.015
0.144	2075	0.009	0.144	1206	0.022	0.144	694	0.015
0.149	2089	0.009	0.149	1209	0.023	0.149	699	0.015
0.154	2093	0.009	0.154	1205	0.023	0.154	708	0.015
0.159	2086	0.009	0.159	1202	0.023	0.159	713	0.015
0.164	2085	0.008	0.164	1215	0.023	0.164	714	0.015
0.169	2101	0.008	0.169	1204	0.023	0.169	716	0.016
0.174	2118	0.008	0.174	1195	0.023	0.174	723	0.016
0.179	2123	0.008	0.179	1183	0.023	0.179	726	0.016
0.184	2123	0.008	0.184	1151	0.024	0.184	728	0.016
0.189	2136	0.008	0.189	1143	0.024	0.189	722	0.016
0.194	2160	0.007	0.194	1156	0.024	0.194	707	0.017
0.199	2156	0.007	0.199	1152	0.024	0.199	703	0.017
0.204	2164	0.007	0.204	1145	0.024	0.204	700	0.017
0.209	2152	0.007	0.209	1155	0.024	0.209	701	0.017
0.214	2169	0.007	0.214	1147	0.024	0.214	693	0.017
0.219	2189	0.007	0.219	1150	0.024	0.219	702	0.017
0.224	2202	0.007	0.224	1158	0.024	0.224	709	0.017
0.229	2204	0.006	0.229	1164	0.024	0.229	711	0.017
0.234	2227	0.006	0.234	1176	0.024	0.234	715	0.017
0.239	2237	0.006	0.239	1186	0.024	0.239	707	0.017
0.244	2233	0.006	0.244	1193	0.024	0.244	705	0.018
0.249	2255	0.006	0.249	1206	0.024	0.249	711	0.018
0.254	2261	0.006	0.254	1206	0.024	0.254	708	0.018
0.259	2273	0.006	0.259	1209	0.024	0.259	697	0.018
0.264	2279	0.006	0.264	1211	0.024	0.264	701	0.018
0.269	2292	0.006	0.269	1220	0.024	0.269	702	0.018
0.274	2302	0.005	0.274	1237	0.024	0.274	685	0.018
0.279	2310	0.005	0.279	1245	0.024	0.279	686	0.018
0.284	2323	0.005	0.284	1255	0.024	0.284	715	0.018
0.289	2325	0.005	0.289	1268	0.024	0.289	717	0.018
0.294	2327	0.005	0.294	1285	0.024	0.294	717	0.019
0.299	2332	0.005	0.299	1301	0.024	0.299	721	0.019
0.300	2330	0.005	0.300	1301	0.024	0.300	721	0.019

Direct Shear Test for Soils Under Drained Conditions
(ASTM D3080)

Project: JVWTP Filter & Chem Feed Upgrade
No: 00823-023
Location: Bluffdale, Utah

Boring No.: B-02
Sample:
Depth: 15.0'





Direct Shear Test for Soils Under Drained Conditions

(ASTM D3080)

Project: JVWTP Filter & Chem Feed Upgrade
No: 00823-023
Location: Bluffdale, Utah
Date: 1/3/2024
By: PW

Boring No.: B-03
Sample:
Depth: 15.0'
Sample Description: Brown sandy silt
Sample type: Undisturbed-trimmed from ring

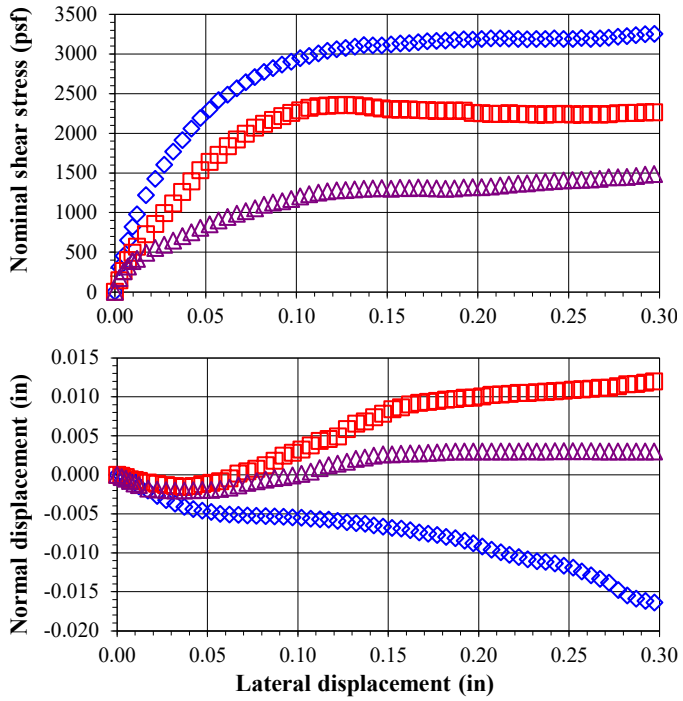
Test type: Inundated
Lateral displacement (in.): 0.3
Shear rate (in./min): 0.0086
Specific gravity, Gs: 2.70 Assumed

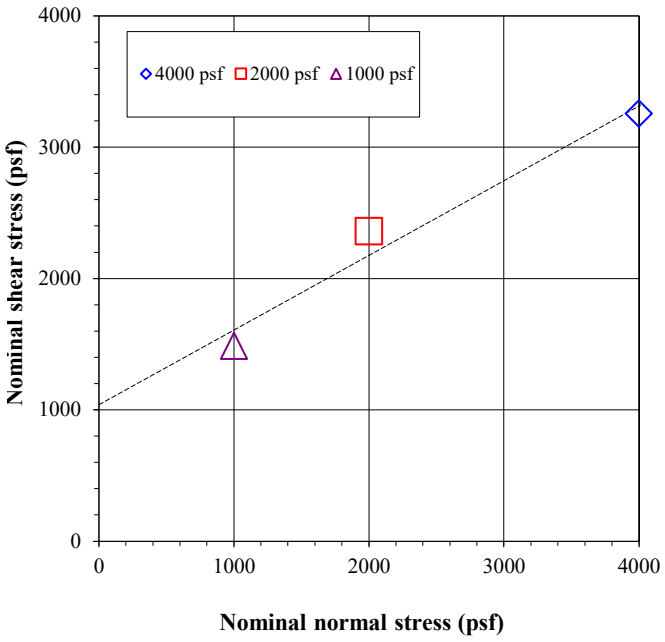
	Specimen 1		Specimen 2		Specimen 3	
Nominal normal stress (psf)	4000		2000		1000	
Peak shear stress (psf)	3255		2359		1488	
Lateral displacement at peak (in)	0.297		0.127		0.297	
Load Duration (min)	1200		1180		1206	
	Initial	Pre-shear	Initial	Pre-shear	Initial	Pre-shear
Specimen height (in)	1.000	0.922	0.998	0.968	1.000	0.981
Specimen diameter (in)	2.416	2.416	2.413	2.413	2.413	2.413
Wt. rings + wet soil (g)	168.14	179.52	164.54	178.99	163.82	180.07
Wt. rings (g)	46.06	46.06	42.17	42.17	43.14	43.14
Wet soil + tare (g)	248.53		248.53		248.53	
Dry soil + tare (g)	228.71		228.71		228.71	
Tare (g)	128.60		128.60		128.60	
Water content (%)	19.8	31.0	19.8	33.9	19.8	35.9
Dry unit weight (pcf)	84.7	91.8	85.3	87.9	83.9	85.5
Void ratio, e, for assumed Gs	0.99	0.84	0.98	0.92	1.01	0.97
Saturation (%)*	54.0	100.0	54.7	100.0	53.0	100.0

ϕ' (deg)	30
c' (psf)	1040

Average of 3 specimens	Initial	Pre-shear
Water content (%)	19.8	33.6
Dry unit weight (pcf)	84.6	88.4

*Pre-shear saturation set to 100% for phase calculations





Entered by:_____
Reviewed:_____

Direct Shear Test for Soils Under Drained Conditions

(ASTM D3080)

Project: JVWTP Filter & Chem Feed Upgrade **Boring No.:** B-03

No: 00823-023 **Sample:**

Location: Bluffdale, Utah **Depth:** 15.0'

Nominal normal stress = 4000 psf			Nominal normal stress = 2000 psf			Nominal normal stress = 1000 psf		
Lateral Displacement (in.)	Nominal Shear Stress (psf)	Normal Displacement (in.)	Lateral Displacement (in.)	Nominal Shear Stress (psf)	Normal Displacement (in.)	Lateral Displacement (in.)	Nominal Shear Stress (psf)	Normal Displacement (in.)
0.000	0	0.000	0.000	0	0.000	0.000	0	0.000
0.002	312	0.000	0.002	145	0.000	0.002	175	0.000
0.005	452	0.000	0.005	265	0.000	0.005	260	-0.001
0.007	651	-0.001	0.007	399	-0.001	0.007	322	-0.001
0.010	818	-0.001	0.010	494	-0.001	0.010	388	-0.001
0.012	976	-0.001	0.012	570	-0.001	0.012	419	-0.001
0.017	1221	-0.002	0.017	727	-0.001	0.017	495	-0.002
0.022	1424	-0.003	0.022	858	-0.001	0.022	554	-0.002
0.027	1603	-0.003	0.027	992	-0.001	0.027	593	-0.002
0.032	1768	-0.004	0.032	1116	-0.001	0.032	646	-0.002
0.037	1915	-0.004	0.037	1261	-0.002	0.037	702	-0.002
0.042	2057	-0.004	0.042	1392	-0.001	0.042	750	-0.002
0.047	2191	-0.005	0.047	1534	-0.001	0.047	809	-0.002
0.052	2300	-0.005	0.052	1638	-0.001	0.052	853	-0.002
0.057	2418	-0.005	0.057	1727	-0.001	0.057	901	-0.002
0.062	2488	-0.005	0.062	1836	0.000	0.062	944	-0.002
0.067	2568	-0.005	0.067	1923	0.000	0.067	987	-0.001
0.072	2643	-0.005	0.072	1994	0.000	0.072	1017	-0.001
0.077	2707	-0.005	0.077	2071	0.001	0.077	1056	-0.001
0.082	2772	-0.005	0.082	2119	0.001	0.082	1097	-0.001
0.087	2821	-0.005	0.087	2166	0.002	0.087	1128	0.000
0.092	2865	-0.005	0.092	2217	0.002	0.092	1144	0.000
0.097	2904	-0.005	0.097	2257	0.003	0.097	1171	0.000
0.102	2945	-0.006	0.102	2287	0.003	0.102	1204	0.000
0.107	2976	-0.006	0.107	2320	0.004	0.107	1233	0.000
0.112	3009	-0.006	0.112	2342	0.004	0.112	1252	0.001
0.117	3040	-0.006	0.117	2348	0.005	0.117	1267	0.001
0.122	3058	-0.006	0.122	2353	0.005	0.122	1279	0.001
0.127	3074	-0.006	0.127	2359	0.006	0.127	1283	0.002
0.132	3092	-0.006	0.132	2352	0.007	0.132	1294	0.002
0.137	3113	-0.006	0.137	2343	0.007	0.137	1302	0.002
0.142	3107	-0.006	0.142	2324	0.007	0.142	1305	0.002
0.147	3110	-0.007	0.147	2311	0.008	0.147	1309	0.003
0.152	3120	-0.007	0.152	2300	0.008	0.152	1300	0.003
0.157	3131	-0.007	0.157	2301	0.009	0.157	1311	0.003
0.162	3136	-0.007	0.162	2300	0.009	0.162	1309	0.003
0.167	3149	-0.007	0.167	2293	0.009	0.167	1315	0.003
0.172	3159	-0.008	0.172	2288	0.009	0.172	1308	0.003
0.177	3164	-0.008	0.177	2283	0.009	0.177	1304	0.003
0.182	3167	-0.008	0.182	2283	0.010	0.182	1302	0.003
0.187	3175	-0.008	0.187	2286	0.010	0.187	1303	0.003
0.192	3185	-0.008	0.192	2286	0.010	0.192	1318	0.003
0.197	3180	-0.009	0.197	2258	0.010	0.197	1320	0.003
0.202	3188	-0.009	0.202	2254	0.010	0.202	1321	0.003
0.207	3195	-0.010	0.207	2245	0.010	0.207	1330	0.003
0.212	3195	-0.010	0.212	2244	0.010	0.212	1340	0.003
0.217	3193	-0.010	0.217	2251	0.010	0.217	1355	0.003
0.222	3188	-0.011	0.222	2243	0.011	0.222	1365	0.003
0.227	3185	-0.011	0.227	2241	0.011	0.227	1369	0.003
0.232	3188	-0.011	0.232	2236	0.011	0.232	1380	0.003
0.237	3188	-0.011	0.237	2237	0.011	0.237	1391	0.003
0.242	3195	-0.011	0.242	2242	0.011	0.242	1396	0.003
0.247	3188	-0.012	0.247	2243	0.011	0.247	1404	0.003
0.252	3190	-0.012	0.252	2237	0.011	0.252	1408	0.003
0.257	3200	-0.012	0.257	2237	0.011	0.257	1415	0.003
0.262	3190	-0.013	0.262	2241	0.011	0.262	1419	0.003
0.267	3195	-0.013	0.267	2238	0.011	0.267	1427	0.003
0.272	3203	-0.014	0.272	2242	0.011	0.272	1444	0.003
0.277	3218	-0.015	0.277	2251	0.011	0.277	1446	0.003
0.282	3226	-0.015	0.282	2256	0.012	0.282	1451	0.003
0.287	3237	-0.016	0.287	2258	0.012	0.287	1462	0.003
0.292	3249	-0.016	0.292	2263	0.012	0.292	1477	0.003
0.297	3255	-0.016	0.297	2263	0.012	0.297	1488	0.003

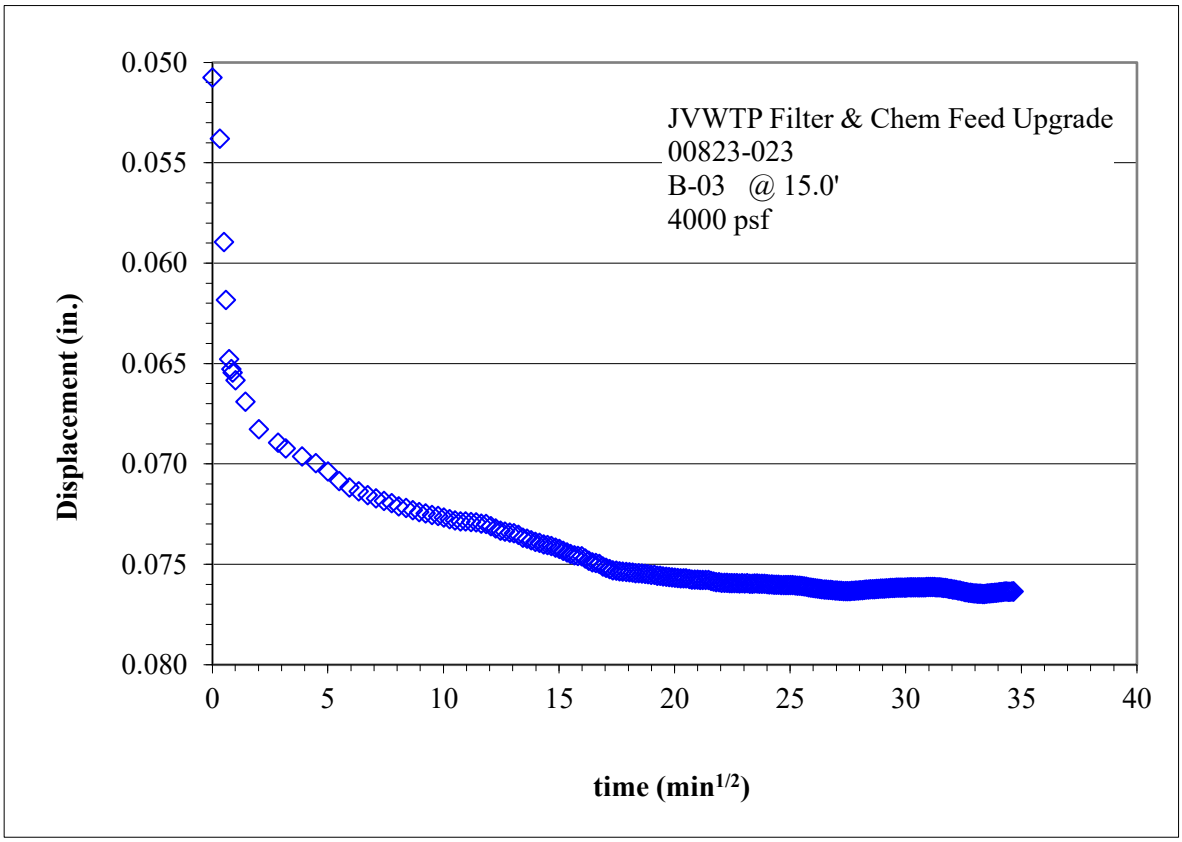
Direct Shear Test for Soils Under Drained Conditions

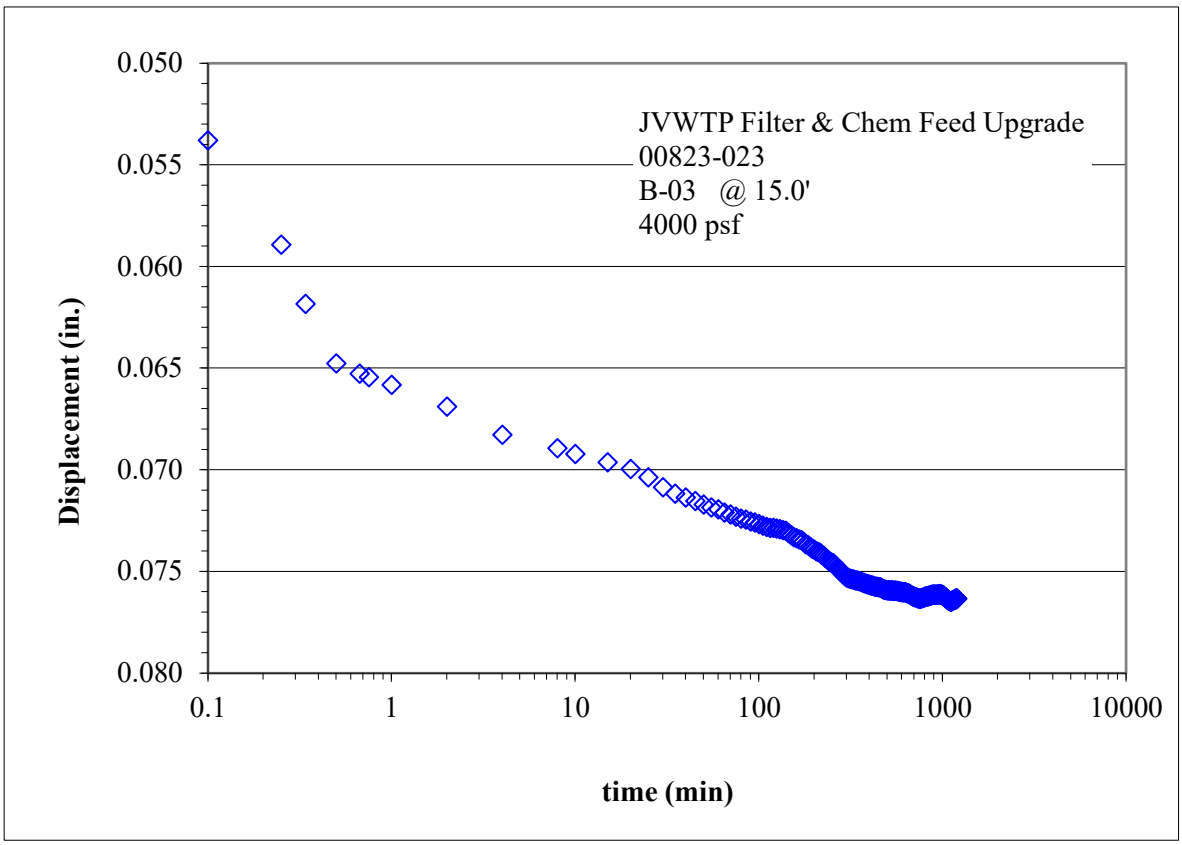
(ASTM D3080)

Project: JVWTP Filter & Chem Feed Upgrade **Boring No.:** B-03

No: 00823-023 **Sample:**

Location: Bluffdale, Utah **Depth:** 15.0'





Direct Shear Test for Soils Under Drained Conditions

(ASTM D3080)

Project: JVWTP Filter & Chem Feed Upgrade
No: 00823-023
Location: Bluffdale, Utah
Date: 1/4/2024
By: PW

Boring No.: B-04
Sample:
Depth: 15.0'
Sample Description: Brown silty sand
Sample type: Undisturbed-trimmed from ring

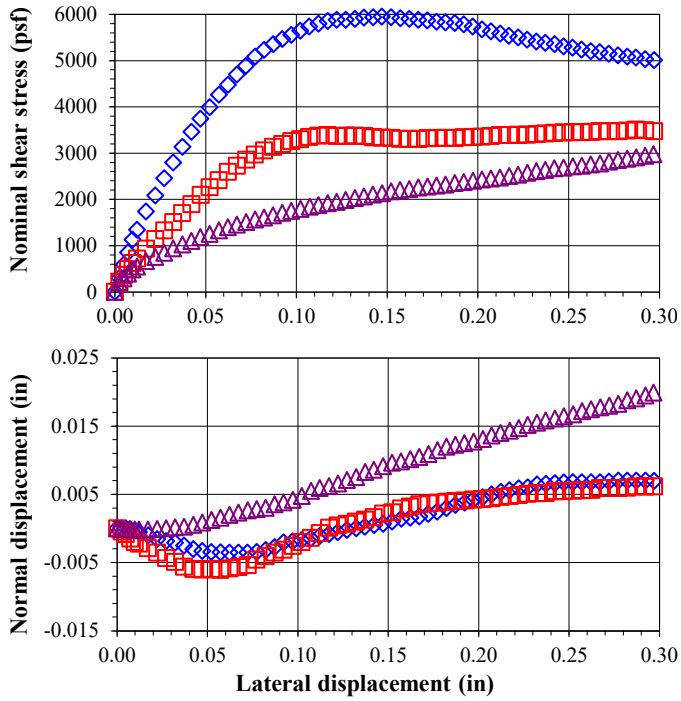
Test type: Inundated
Lateral displacement (in.): 0.3
Shear rate (in./min): 0.0172
Specific gravity, Gs: 2.70 Assumed

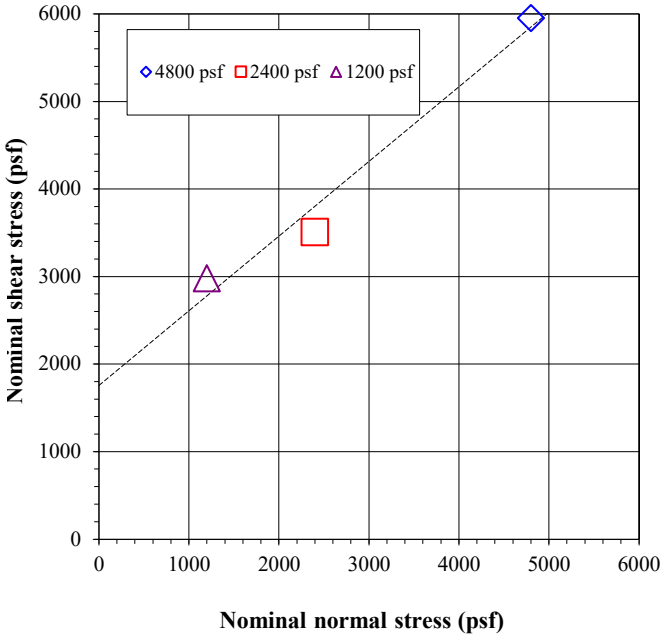
	Specimen 1		Specimen 2		Specimen 3	
Nominal normal stress (psf)	4800		2400		1200	
Peak shear stress (psf)	5952		3508		2979	
Lateral displacement at peak (in)	0.147		0.287		0.297	
Load Duration (min)	1202		1266		1273	
	Initial	Pre-shear	Initial	Pre-shear	Initial	Pre-shear
Specimen height (in)	0.999	0.965	0.993	0.954	1.002	0.971
Specimen diameter (in)	2.415	2.415	2.409	2.409	2.413	2.413
Wt. rings + wet soil (g)	165.36	179.58	166.53	180.49	162.60	180.51
Wt. rings (g)	42.75	42.75	45.78	45.78	46.95	46.95
Wet soil + tare (g)	251.45		251.45		251.45	
Dry soil + tare (g)	230.85		230.85		230.85	
Tare (g)	127.02		127.02		127.02	
Water content (%)	19.8	33.7	19.8	33.7	19.8	38.4
Dry unit weight (pcf)	85.2	88.2	84.8	88.2	80.2	82.7
Void ratio, e, for assumed Gs	0.98	0.91	0.99	0.91	1.10	1.04
Saturation (%)*	54.7	100.0	54.3	100.0	48.7	100.0

ϕ' (deg)	40
c' (psf)	1757

Average of 3 specimens	Initial	Pre-shear
Water content (%)	19.8	35.3
Dry unit weight (pcf)	83.4	86.4

*Pre-shear saturation set to 100% for phase calculations





Entered by:_____
Reviewed:_____

Direct Shear Test for Soils Under Drained Conditions

(ASTM D3080)

Project: JVWTP Filter & Chem Feed Upgrade **Boring No.:** B-04

No: 00823-023 **Sample:**

Location: Bluffdale, Utah **Depth:** 15.0'

Nominal normal stress = 4800 psf			Nominal normal stress = 2400 psf			Nominal normal stress = 1200 psf		
Lateral Displacement (in.)	Nominal Shear Stress (psf)	Normal Displacement (in.)	Lateral Displacement (in.)	Nominal Shear Stress (psf)	Normal Displacement (in.)	Lateral Displacement (in.)	Nominal Shear Stress (psf)	Normal Displacement (in.)
0.000	0	0.000	0.000	0	0.000	0.000	0	0.000
0.002	302	0.000	0.002	206	0.000	0.002	207	0.000
0.005	592	0.000	0.005	369	-0.001	0.005	292	0.000
0.007	850	0.000	0.007	496	-0.001	0.007	393	0.000
0.010	1126	0.000	0.010	625	-0.002	0.010	485	0.000
0.012	1343	-0.001	0.012	722	-0.002	0.012	549	0.000
0.017	1736	-0.001	0.017	935	-0.003	0.017	665	0.000
0.022	2082	-0.002	0.022	1145	-0.004	0.022	756	0.000
0.027	2457	-0.002	0.027	1328	-0.004	0.027	849	0.000
0.032	2798	-0.002	0.032	1508	-0.005	0.032	940	0.000
0.037	3134	-0.002	0.037	1704	-0.006	0.037	1027	0.000
0.042	3464	-0.003	0.042	1898	-0.006	0.042	1105	0.001
0.047	3743	-0.003	0.047	2098	-0.006	0.047	1188	0.001
0.052	3991	-0.003	0.052	2267	-0.006	0.052	1257	0.001
0.057	4263	-0.004	0.057	2418	-0.006	0.057	1327	0.002
0.062	4477	-0.004	0.062	2599	-0.006	0.062	1397	0.002
0.067	4699	-0.004	0.067	2727	-0.006	0.067	1458	0.002
0.072	4885	-0.004	0.072	2856	-0.005	0.072	1510	0.003
0.077	5084	-0.003	0.077	2969	-0.005	0.077	1563	0.003
0.082	5229	-0.003	0.082	3063	-0.004	0.082	1608	0.003
0.087	5353	-0.003	0.087	3135	-0.004	0.087	1654	0.004
0.092	5469	-0.002	0.092	3197	-0.003	0.092	1708	0.004
0.097	5554	-0.002	0.097	3260	-0.003	0.097	1753	0.004
0.102	5645	-0.002	0.102	3302	-0.002	0.102	1794	0.005
0.107	5740	-0.001	0.107	3349	-0.001	0.107	1841	0.006
0.112	5797	-0.001	0.112	3375	-0.001	0.112	1878	0.006
0.117	5854	-0.001	0.117	3392	0.000	0.117	1918	0.006
0.122	5885	-0.001	0.122	3370	0.000	0.122	1948	0.007
0.127	5882	0.000	0.127	3375	0.001	0.127	1989	0.007
0.132	5900	0.000	0.132	3379	0.001	0.132	2027	0.008
0.137	5929	0.000	0.137	3371	0.001	0.137	2065	0.008
0.142	5939	0.001	0.142	3343	0.002	0.142	2104	0.009
0.147	5952	0.001	0.147	3336	0.002	0.147	2136	0.009
0.152	5939	0.001	0.152	3332	0.002	0.152	2173	0.010
0.157	5919	0.001	0.157	3306	0.003	0.157	2200	0.010
0.162	5903	0.002	0.162	3307	0.003	0.162	2226	0.010
0.167	5880	0.002	0.167	3308	0.004	0.167	2258	0.010
0.172	5867	0.002	0.172	3322	0.004	0.172	2279	0.011
0.177	5841	0.002	0.177	3328	0.004	0.177	2296	0.011
0.182	5828	0.003	0.182	3332	0.004	0.182	2321	0.012
0.187	5815	0.003	0.187	3327	0.004	0.187	2353	0.012
0.192	5787	0.004	0.192	3341	0.004	0.192	2373	0.012
0.197	5738	0.004	0.197	3353	0.004	0.197	2400	0.013
0.202	5673	0.005	0.202	3359	0.004	0.202	2432	0.013
0.207	5632	0.005	0.207	3373	0.004	0.207	2453	0.014
0.212	5588	0.005	0.212	3394	0.005	0.212	2474	0.014
0.217	5539	0.006	0.217	3394	0.005	0.217	2504	0.014
0.222	5500	0.006	0.222	3400	0.005	0.222	2537	0.015
0.227	5456	0.006	0.227	3402	0.005	0.227	2572	0.015
0.232	5412	0.006	0.232	3415	0.005	0.232	2611	0.015
0.237	5386	0.007	0.237	3427	0.005	0.237	2637	0.016
0.242	5358	0.007	0.242	3437	0.005	0.242	2669	0.016
0.247	5311	0.007	0.247	3448	0.005	0.247	2689	0.016
0.252	5278	0.007	0.252	3454	0.006	0.252	2716	0.017
0.257	5236	0.007	0.257	3454	0.006	0.257	2726	0.017
0.262	5203	0.007	0.262	3461	0.006	0.262	2754	0.018
0.267	5182	0.007	0.267	3472	0.006	0.267	2776	0.018
0.272	5151	0.007	0.272	3475	0.006	0.272	2821	0.018
0.277	5112	0.007	0.277	3475	0.006	0.277	2854	0.018
0.282	5087	0.007	0.282	3492	0.006	0.282	2883	0.019
0.287	5063	0.007	0.287	3508	0.006	0.287	2906	0.019
0.292	5032	0.007	0.292	3495	0.006	0.292	2942	0.020
0.297	5007	0.007	0.297	3474	0.006	0.297	2979	0.020

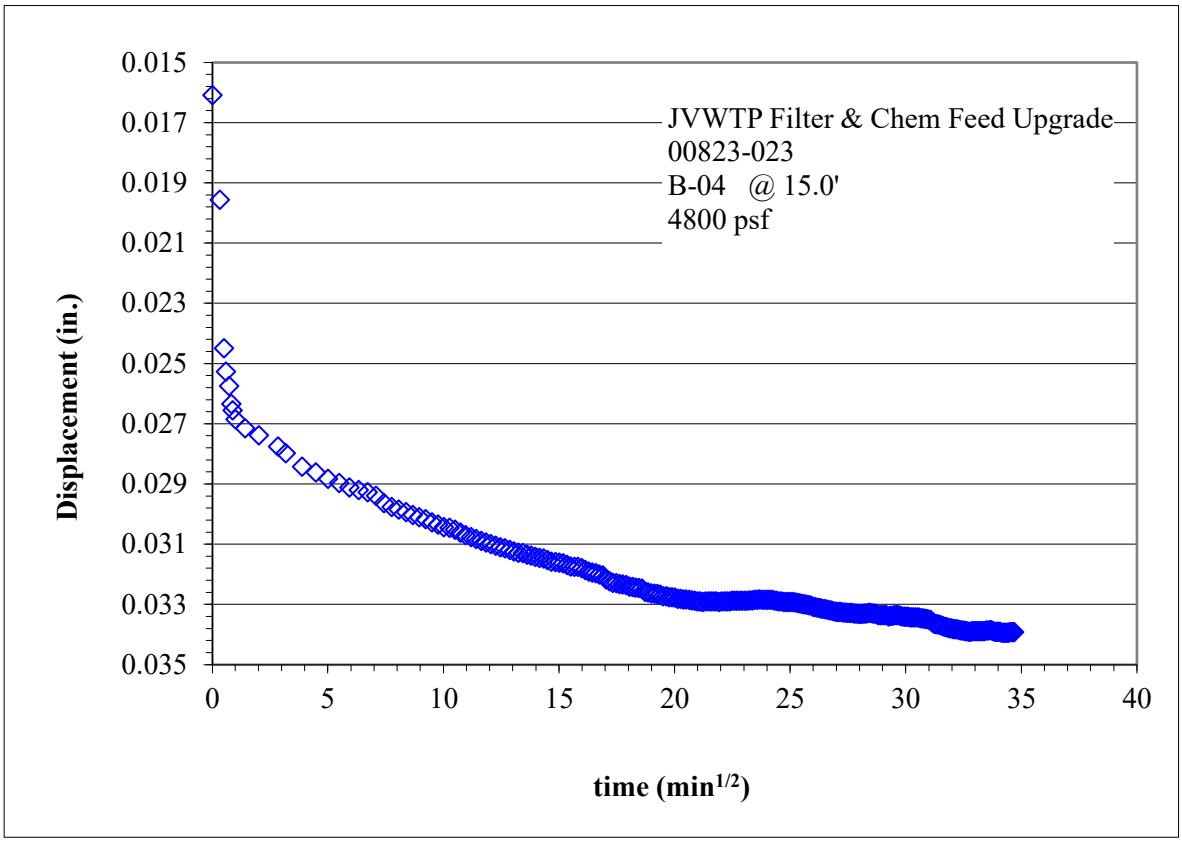
Direct Shear Test for Soils Under Drained Conditions

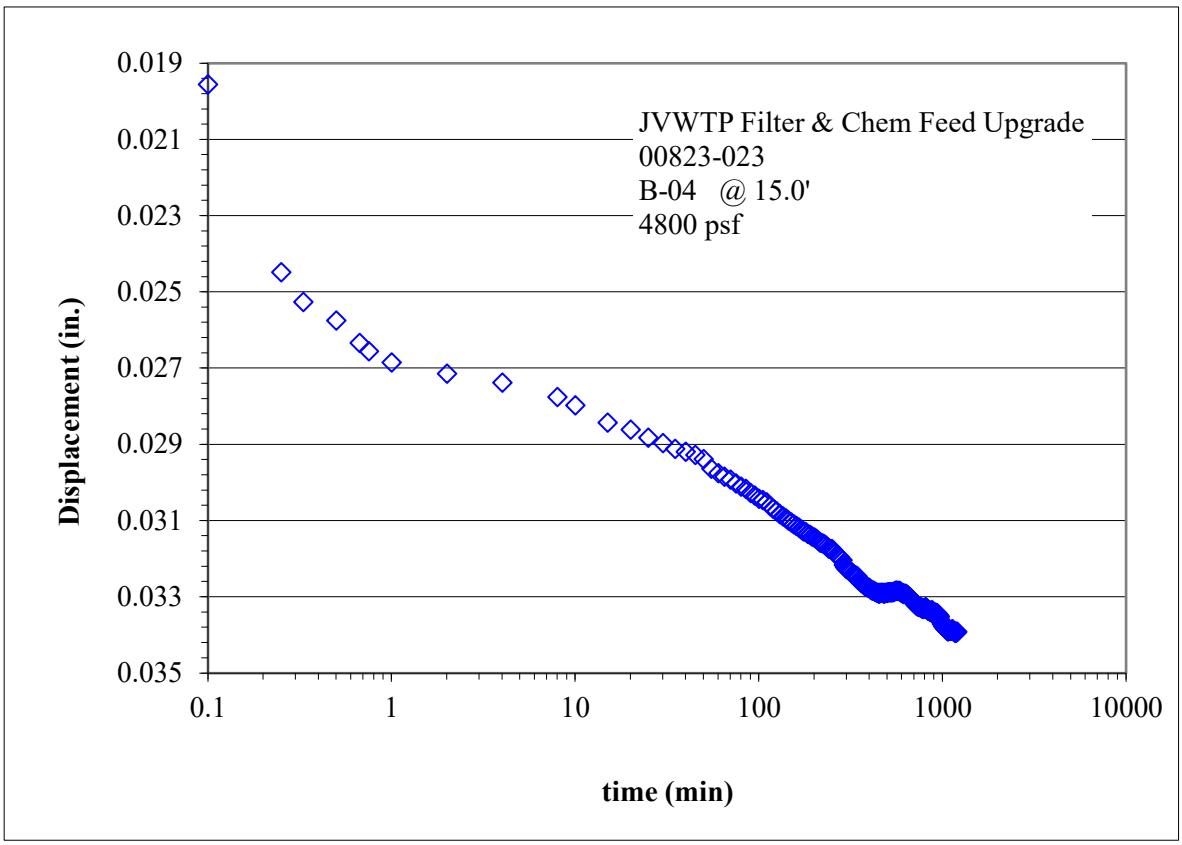
(ASTM D3080)

Project: JVWTP Filter & Chem Feed Upgrade **Boring No.:** B-04

No: 00823-023 **Sample:**

Location: Bluffdale, Utah **Depth:** 15.0'





Direct Shear Test for Soils Under Drained Conditions

(ASTM D3080)

Project: JVWTP Filter & Chem Feed Upgrade
No: 00823-023
Location: Bluffdale, Utah
Date: 1/8/2024
By: PW

Boring No.: Bulk-01
Sample:
Depth: 0-2'
Sample Description: Brown silty, clayey sand with gravel
Sample type: Laboratory compacted
Dry unit weight 114.6 pcf
at 11.9 (%) w
Compaction specifications: 95% of ASTM D1557B

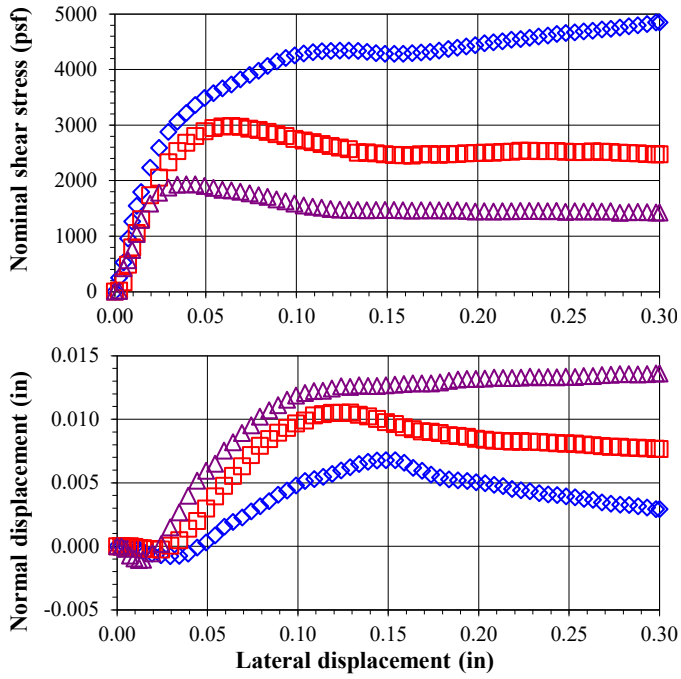
Test type: Inundated
Lateral displacement (in.): 0.3
Shear rate (in./min): 0.0082
Specific gravity, Gs: 2.70 Assumed

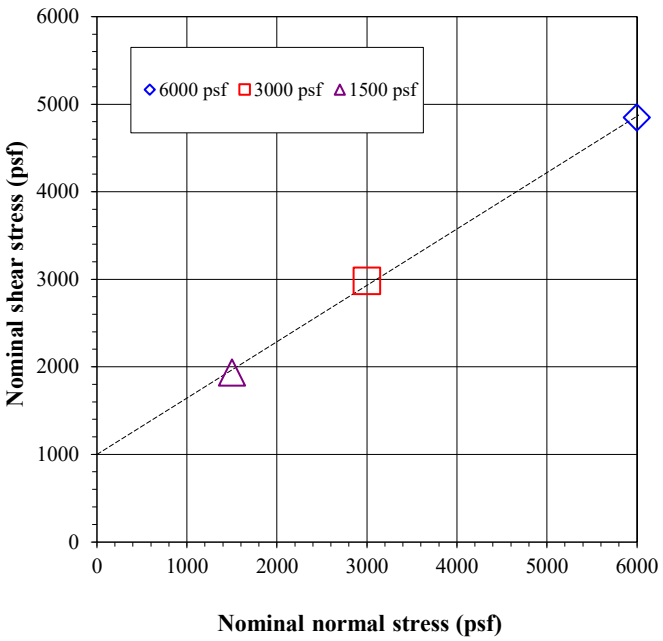
	Sample 1		Sample 2		Sample 3	
Nominal normal stress (psf)	6000		3000		1500	
Peak shear stress (psf)	4849		2982		1934	
Lateral displacement at peak (in)	0.300		0.064		0.039	
Load Duration (min)	1281		1296		1311	
	Initial	Pre-shear	Initial	Pre-shear	Initial	Pre-shear
Sample height (in)	1.003	0.964	1.003	0.954	1.001	0.982
Sample diameter (in)	2.413	2.413	2.408	2.408	2.413	2.413
Wt. rings + wet soil (g)	198.18	202.46	198.49	202.04	199.67	205.46
Wt. rings (g)	43.28	43.28	44.22	44.22	45.08	45.08
Wet soil + tare (g)	299.37		299.37		299.37	
Dry soil + tare (g)	280.84		280.84		280.84	
Tare (g)	128.63		128.63		128.63	
Water content (%)	12.2	15.3	12.2	14.8	12.2	16.4
Dry unit weight (pcf)	114.7	119.3	114.7	120.5	114.7	116.8
Void ratio, e, for assumed Gs	0.47	0.41	0.47	0.40	0.47	0.44
Saturation (%)*	70.0	100.0	70.0	100.0	70.0	100.0

ϕ' (deg)	33
c' (psf)	1001

Average of 3 samples	Initial	Pre-shear
Water content (%)	12.2	15.5
Dry unit weight (pcf)	114.7	118.9

*Pre-shear saturation set to 100% for phase calculations





Comments:
Test specimens remolded to 95% of maximum dry unit weight at optimum water content using material passing the No. 4 sieve. Test specimens swelled upon inundation and at 100 psf load steps.

Entered by:_____
Reviewed:_____

Direct Shear Test for Soils Under Drained Conditions

(ASTM D3080)

Project: JVWTP Filter & Chem Feed Upgrade **Boring No.:** Bulk-01

No: 00823-023 **Sample:**

Location: Bluffdale, Utah **Depth:** 0-2'

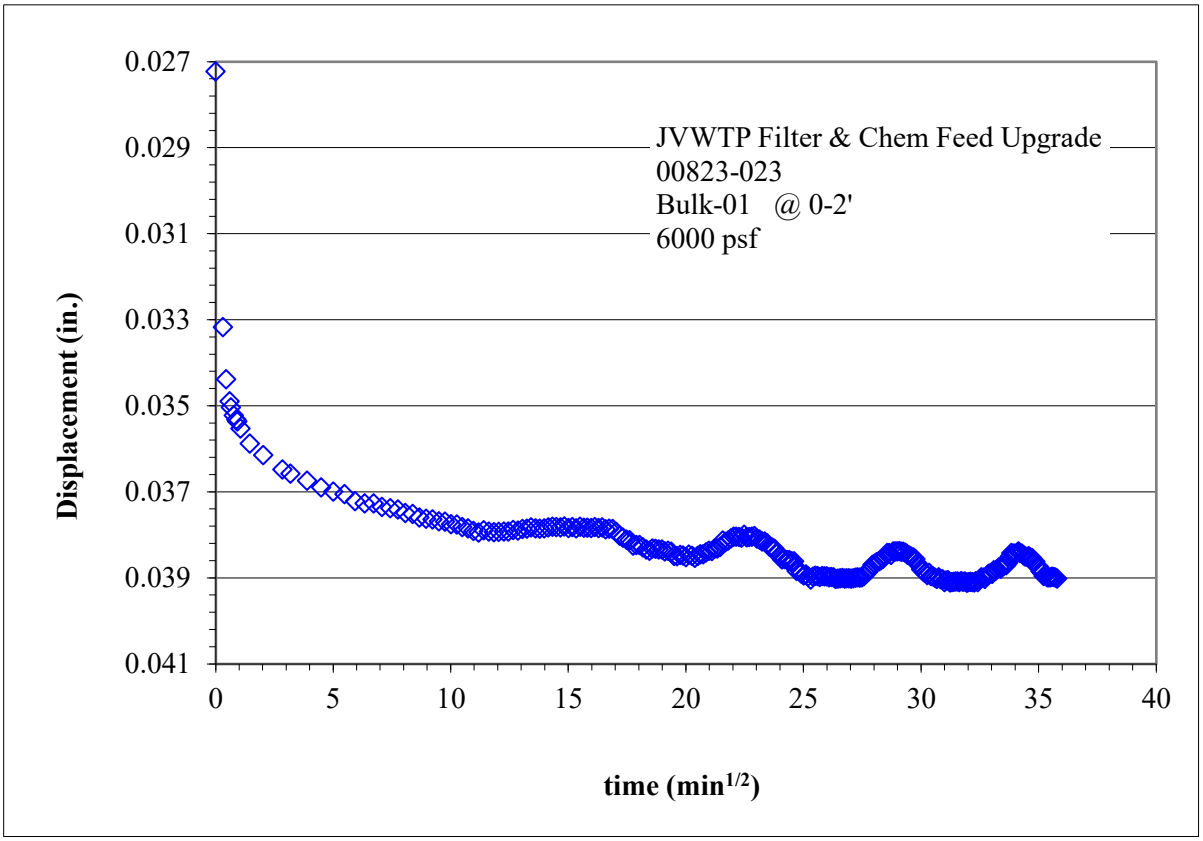
Nominal normal stress = 6000 psf			Nominal normal stress = 3000 psf			Nominal normal stress = 1500 psf		
Lateral Displacement (in.)	Nominal Shear Stress (psf)	Normal Displacement (in.)	Lateral Displacement (in.)	Nominal Shear Stress (psf)	Normal Displacement (in.)	Lateral Displacement (in.)	Nominal Shear Stress (psf)	Normal Displacement (in.)
0.000	0	0.000	0.000	0	0.000	0.000	0	0.000
0.002	252	0.000	0.002	20	0.000	0.002	12	0.000
0.005	524	0.000	0.005	170	0.000	0.005	422	0.000
0.007	957	0.000	0.007	487	0.000	0.007	568	-0.001
0.010	1265	0.000	0.010	796	0.000	0.010	750	-0.001
0.012	1545	0.000	0.012	1057	0.000	0.012	1038	-0.001
0.014	1795	0.000	0.014	1306	0.000	0.014	1292	-0.001
0.019	2233	-0.001	0.019	1738	0.000	0.019	1587	-0.001
0.024	2592	-0.001	0.024	2054	0.000	0.024	1780	0.000
0.029	2876	-0.001	0.029	2330	0.000	0.029	1875	0.001
0.034	3064	-0.001	0.034	2534	0.000	0.034	1926	0.003
0.039	3220	-0.001	0.039	2683	0.001	0.039	1934	0.004
0.044	3364	0.000	0.044	2802	0.002	0.044	1934	0.005
0.049	3488	0.000	0.049	2889	0.003	0.049	1905	0.006
0.054	3576	0.001	0.054	2950	0.004	0.054	1871	0.006
0.059	3663	0.002	0.059	2975	0.005	0.059	1837	0.008
0.064	3733	0.002	0.064	2982	0.006	0.064	1824	0.008
0.069	3824	0.002	0.069	2968	0.006	0.069	1801	0.009
0.074	3904	0.003	0.074	2938	0.007	0.074	1773	0.010
0.079	3982	0.003	0.079	2911	0.008	0.079	1737	0.010
0.084	4066	0.004	0.084	2877	0.008	0.084	1706	0.011
0.089	4149	0.004	0.089	2836	0.009	0.089	1664	0.011
0.094	4208	0.004	0.094	2801	0.009	0.094	1630	0.012
0.099	4254	0.005	0.099	2754	0.010	0.099	1585	0.012
0.104	4291	0.005	0.104	2725	0.010	0.104	1554	0.012
0.109	4313	0.005	0.109	2692	0.010	0.109	1532	0.012
0.114	4330	0.005	0.114	2659	0.010	0.114	1510	0.012
0.119	4338	0.006	0.119	2623	0.011	0.119	1488	0.012
0.124	4340	0.006	0.124	2595	0.011	0.124	1478	0.013
0.129	4342	0.006	0.129	2565	0.011	0.129	1471	0.013
0.134	4336	0.006	0.134	2502	0.010	0.134	1470	0.013
0.139	4318	0.007	0.139	2510	0.010	0.139	1468	0.013
0.144	4298	0.007	0.144	2489	0.010	0.144	1472	0.013
0.149	4284	0.007	0.149	2477	0.010	0.149	1471	0.013
0.154	4283	0.007	0.154	2464	0.010	0.154	1471	0.013
0.159	4286	0.007	0.159	2459	0.009	0.159	1466	0.013
0.164	4294	0.006	0.164	2449	0.009	0.164	1458	0.013
0.169	4305	0.006	0.169	2472	0.009	0.169	1464	0.013
0.174	4322	0.006	0.174	2472	0.009	0.174	1463	0.013
0.179	4345	0.005	0.179	2471	0.009	0.179	1465	0.013
0.184	4369	0.005	0.184	2473	0.009	0.184	1461	0.013
0.189	4393	0.005	0.188	2483	0.009	0.189	1465	0.013
0.194	4417	0.005	0.193	2491	0.009	0.194	1453	0.013
0.199	4443	0.005	0.198	2497	0.008	0.199	1444	0.013
0.204	4475	0.005	0.203	2501	0.008	0.204	1448	0.013
0.209	4490	0.005	0.208	2506	0.008	0.208	1441	0.013
0.214	4511	0.005	0.213	2518	0.008	0.213	1449	0.013
0.218	4537	0.005	0.218	2523	0.008	0.218	1449	0.013
0.224	4552	0.004	0.223	2536	0.008	0.223	1452	0.013
0.228	4574	0.004	0.228	2536	0.008	0.228	1453	0.013
0.233	4597	0.004	0.233	2533	0.008	0.233	1456	0.013
0.238	4612	0.004	0.238	2532	0.008	0.238	1450	0.013
0.243	4640	0.004	0.243	2531	0.008	0.243	1452	0.013
0.248	4659	0.004	0.248	2521	0.008	0.248	1440	0.013
0.253	4672	0.004	0.253	2517	0.008	0.253	1448	0.013
0.258	4687	0.004	0.258	2516	0.008	0.258	1445	0.013
0.263	4702	0.004	0.263	2526	0.008	0.263	1450	0.013
0.268	4722	0.003	0.268	2524	0.008	0.268	1444	0.013
0.273	4736	0.003	0.273	2515	0.008	0.273	1446	0.014
0.278	4760	0.003	0.278	2504	0.008	0.278	1422	0.014
0.283	4780	0.003	0.283	2497	0.008	0.283	1434	0.014
0.288	4798	0.003	0.288	2490	0.008	0.288	1436	0.014
0.293	4820	0.003	0.293	2483	0.008	0.293	1429	0.014
0.298	4847	0.003	0.298	2474	0.008	0.298	1424	0.014
0.300	4849	0.003	0.300	2475	0.008	0.300	1427	0.014

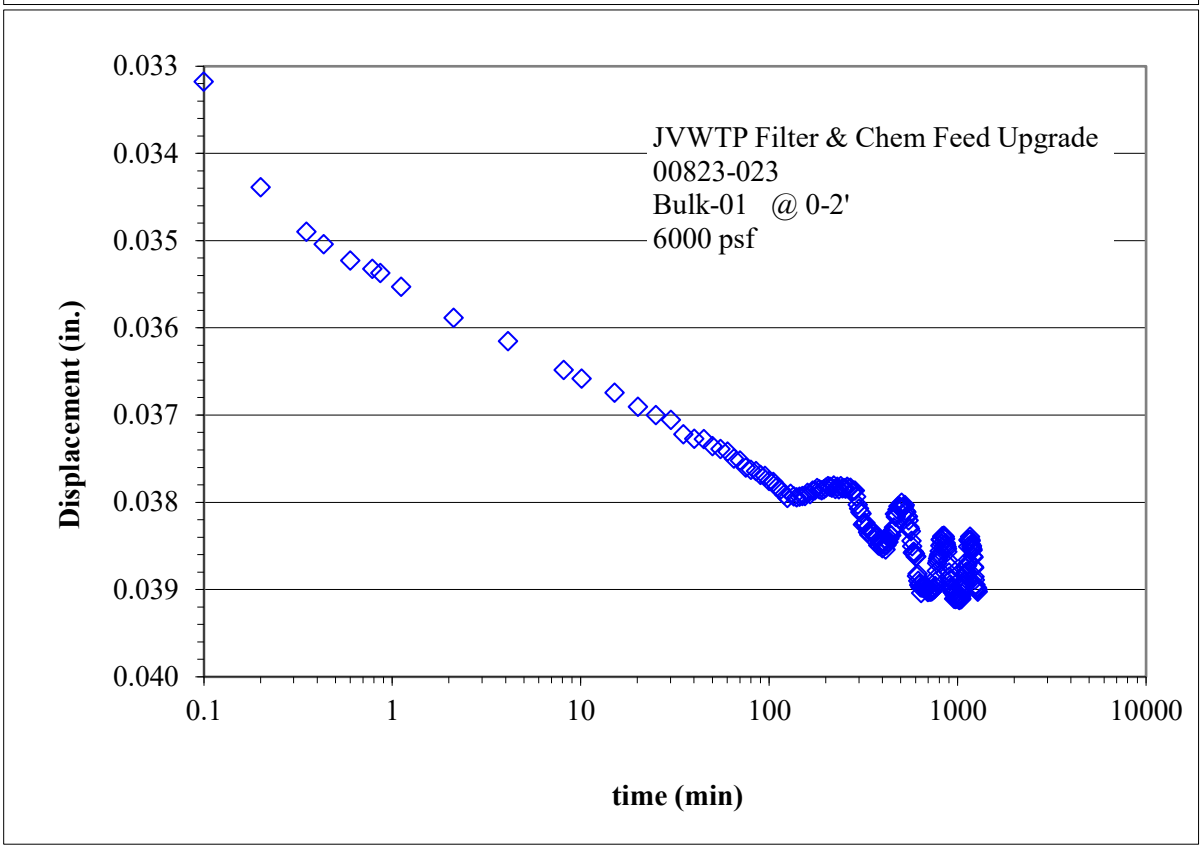
Direct Shear Test for Soils Under Drained Conditions

(ASTM D3080)

Project: JVWTP Filter & Chem Feed Upgrade
No: 00823-023
Location: Bluffdale, Utah

Boring No.: Bulk-01
Sample:
Depth: 0-2'





Direct Shear Test for Soils Under Drained Conditions

(ASTM D3080)

Project: JVWTP Filter & Chem Feed Upgrade
No: 00823-023
Location: Bluffdale, Utah
Date: 1/8/2024
By: PW

Boring No.: Bulk-02
Sample:
Depth: 0-2'
Sample Description: Brown silty, clayey sand with gravel
Sample type: Laboratory compacted
Dry unit weight 111.1 pcf
at 11.9 (%) w
Compaction specifications: 95% of ASTM D1557B

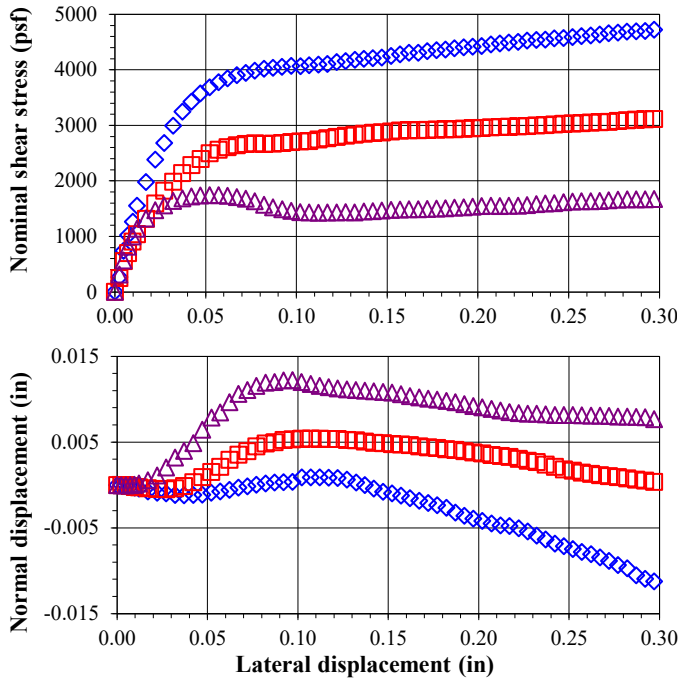
Test type: Inundated
Lateral displacement (in.): 0.3
Shear rate (in./min): 0.0086
Specific gravity, Gs: 2.70 Assumed

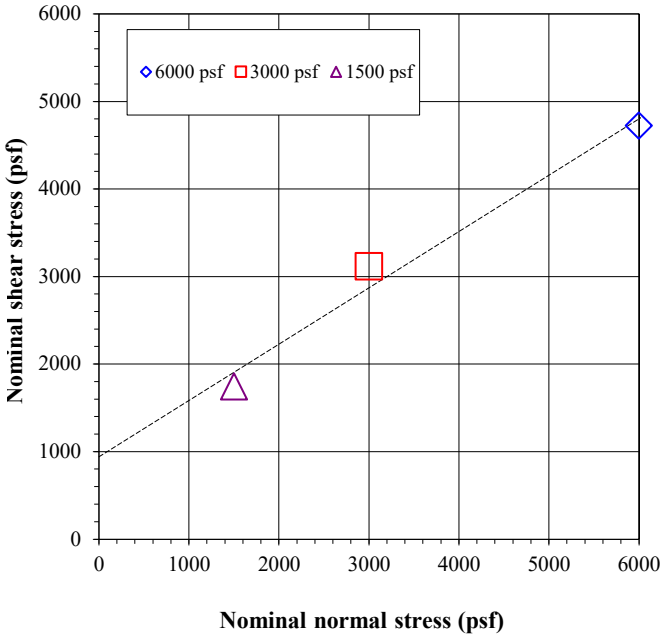
	Specimen 1		Specimen 2		Specimen 3	
Nominal normal stress (psf)	6000		3000		1500	
Peak shear stress (psf)	4723		3115		1745	
Lateral displacement at peak (in)	0.297		0.297		0.052	
Load Duration (min)	1447		1455		1476	
	Initial	Pre-shear	Initial	Pre-shear	Initial	Pre-shear
Specimen height (in)	1.003	0.980	0.997	0.980	0.998	0.994
Specimen diameter (in)	2.413	2.413	2.412	2.412	2.414	2.414
Wt. rings + wet soil (g)	193.39	201.16	195.48	203.65	194.33	203.48
Wt. rings (g)	43.27	43.27	46.37	46.37	44.81	44.81
Wet soil + tare (g)	198.63		198.63		198.63	
Dry soil + tare (g)	191.17		191.17		191.17	
Tare (g)	128.58		128.58		128.58	
Water content (%)	11.9	17.7	11.9	18.0	11.9	18.8
Dry unit weight (pcf)	111.4	114.0	111.4	113.3	111.4	111.8
Void ratio, e, for assumed Gs	0.51	0.48	0.51	0.49	0.51	0.51
Saturation (%)*	62.7	100.0	62.7	100.0	62.8	100.0

ϕ' (deg)	33
c' (psf)	941

Average of 3 specimens	Initial	Pre-shear
Water content (%)	11.9	18.2
Dry unit weight (pcf)	111.4	113.0

*Pre-shear saturation set to 100% for phase calculations





Comments:
Test specimens swelled upon inundation and at 125 and 375 psf load steps.

Entered by:_____
Reviewed:_____

Direct Shear Test for Soils Under Drained Conditions

(ASTM D3080)

Project: JVWTP Filter & Chem Feed Upgrade **Boring No.:** Bulk-02

No: 00823-023 **Sample:**

Location: Bluffdale, Utah **Depth:** 0-2'

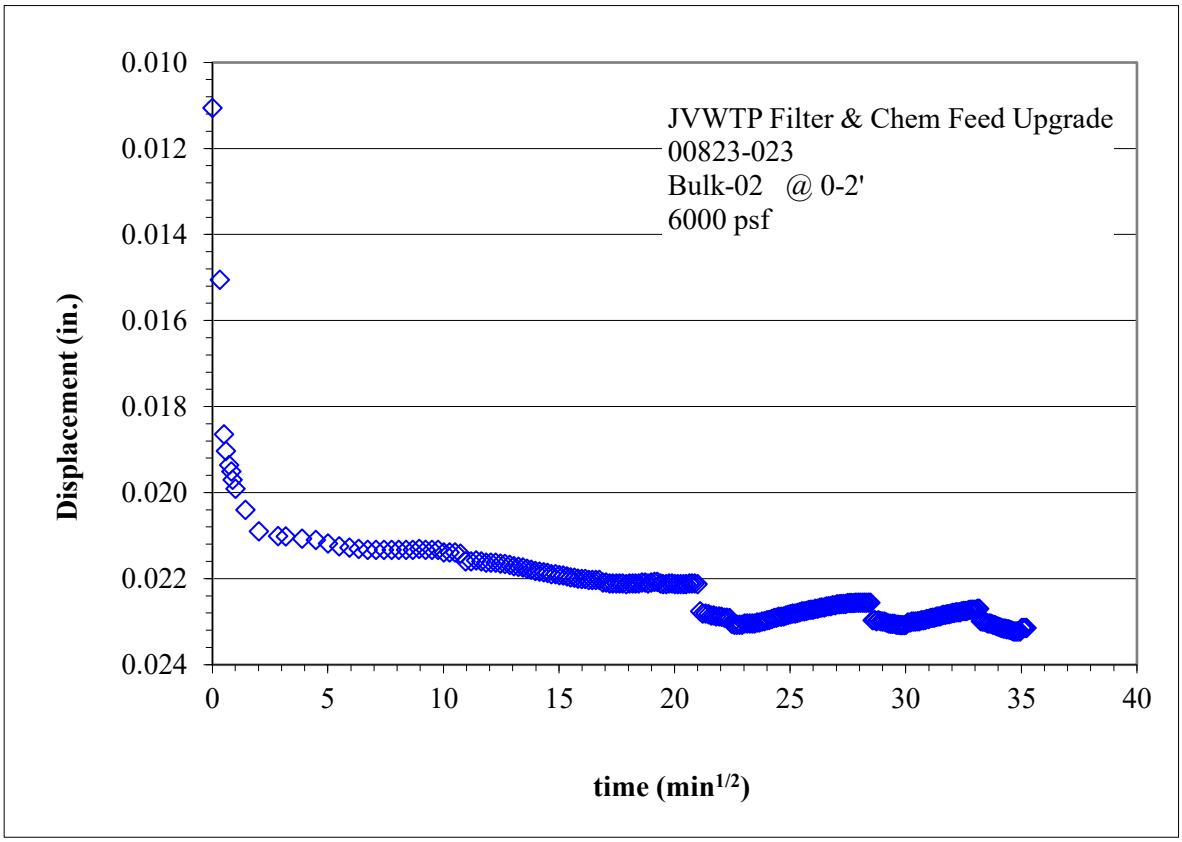
Nominal normal stress = 6000 psf			Nominal normal stress = 3000 psf			Nominal normal stress = 1500 psf		
Lateral Displacement (in.)	Nominal Shear Stress (psf)	Normal Displacement (in.)	Lateral Displacement (in.)	Nominal Shear Stress (psf)	Normal Displacement (in.)	Lateral Displacement (in.)	Nominal Shear Stress (psf)	Normal Displacement (in.)
0.000	0	0.000	0.000	0	0.000	0.000	0	0.000
0.002	264	0.000	0.002	248	0.000	0.002	311	0.000
0.005	738	0.000	0.005	555	0.000	0.005	564	0.000
0.007	1022	0.000	0.007	698	0.000	0.007	817	0.000
0.010	1265	0.000	0.010	909	0.000	0.010	1001	0.000
0.012	1550	0.000	0.012	1040	0.000	0.012	1139	0.000
0.017	1977	-0.001	0.017	1317	0.000	0.017	1324	0.001
0.022	2381	-0.001	0.022	1591	0.000	0.022	1471	0.001
0.027	2683	-0.001	0.027	1825	0.000	0.027	1560	0.002
0.032	2991	-0.001	0.032	1985	0.000	0.032	1637	0.003
0.037	3248	-0.001	0.037	2141	0.000	0.037	1684	0.004
0.042	3424	-0.001	0.042	2282	0.000	0.042	1720	0.005
0.047	3574	-0.001	0.047	2395	0.001	0.047	1736	0.006
0.052	3685	-0.001	0.052	2498	0.002	0.052	1745	0.008
0.057	3778	-0.001	0.057	2561	0.002	0.057	1744	0.008
0.062	3845	-0.001	0.062	2610	0.003	0.062	1731	0.010
0.067	3902	0.000	0.067	2642	0.004	0.067	1709	0.011
0.072	3944	0.000	0.072	2665	0.004	0.072	1678	0.011
0.077	3985	0.000	0.077	2678	0.004	0.077	1633	0.012
0.082	4019	0.000	0.082	2667	0.005	0.082	1569	0.012
0.087	4039	0.000	0.087	2673	0.005	0.087	1526	0.012
0.092	4055	0.000	0.092	2684	0.005	0.092	1487	0.012
0.097	4073	0.000	0.097	2699	0.005	0.097	1458	0.012
0.102	4065	0.001	0.102	2710	0.005	0.102	1438	0.012
0.107	4083	0.001	0.107	2719	0.005	0.107	1429	0.012
0.112	4096	0.001	0.112	2746	0.005	0.112	1428	0.012
0.117	4107	0.001	0.117	2769	0.005	0.117	1434	0.011
0.122	4140	0.001	0.122	2793	0.005	0.122	1433	0.011
0.127	4156	0.001	0.127	2815	0.005	0.127	1438	0.011
0.132	4179	0.000	0.132	2835	0.005	0.132	1434	0.011
0.137	4197	0.000	0.137	2851	0.005	0.137	1448	0.011
0.142	4210	0.000	0.142	2868	0.005	0.142	1455	0.011
0.147	4223	-0.001	0.147	2875	0.005	0.147	1467	0.011
0.152	4252	-0.001	0.152	2891	0.005	0.152	1478	0.011
0.157	4280	-0.001	0.157	2905	0.005	0.157	1486	0.011
0.162	4306	-0.002	0.162	2911	0.005	0.162	1488	0.010
0.167	4306	-0.002	0.167	2911	0.005	0.167	1491	0.010
0.172	4334	-0.002	0.172	2917	0.004	0.172	1494	0.010
0.177	4355	-0.002	0.177	2927	0.004	0.177	1502	0.010
0.182	4368	-0.003	0.182	2932	0.004	0.182	1509	0.010
0.187	4389	-0.003	0.187	2933	0.004	0.187	1515	0.010
0.192	4407	-0.004	0.192	2941	0.004	0.192	1523	0.009
0.197	4420	-0.004	0.197	2947	0.004	0.197	1533	0.009
0.202	4430	-0.004	0.202	2955	0.004	0.202	1544	0.009
0.207	4456	-0.005	0.207	2962	0.004	0.207	1552	0.009
0.212	4474	-0.005	0.212	2968	0.003	0.212	1549	0.009
0.217	4492	-0.005	0.217	2976	0.003	0.217	1551	0.009
0.222	4505	-0.005	0.222	2981	0.003	0.222	1552	0.008
0.227	4529	-0.005	0.227	2989	0.003	0.227	1565	0.008
0.232	4539	-0.006	0.232	2997	0.003	0.232	1579	0.008
0.237	4547	-0.006	0.237	3003	0.002	0.237	1593	0.008
0.242	4565	-0.007	0.242	3017	0.002	0.242	1601	0.008
0.247	4575	-0.007	0.247	3027	0.002	0.247	1618	0.008
0.252	4591	-0.007	0.252	3033	0.002	0.252	1629	0.008
0.257	4609	-0.008	0.257	3041	0.001	0.257	1631	0.008
0.262	4622	-0.008	0.262	3049	0.001	0.262	1633	0.008
0.267	4637	-0.008	0.267	3057	0.001	0.267	1638	0.008
0.272	4661	-0.009	0.272	3065	0.001	0.272	1651	0.008
0.277	4671	-0.009	0.277	3082	0.001	0.277	1661	0.008
0.282	4686	-0.010	0.282	3090	0.001	0.282	1667	0.008
0.287	4697	-0.011	0.287	3101	0.001	0.287	1666	0.008
0.292	4699	-0.011	0.292	3108	0.001	0.292	1669	0.008
0.297	4723	-0.011	0.297	3115	0.000	0.297	1674	0.008

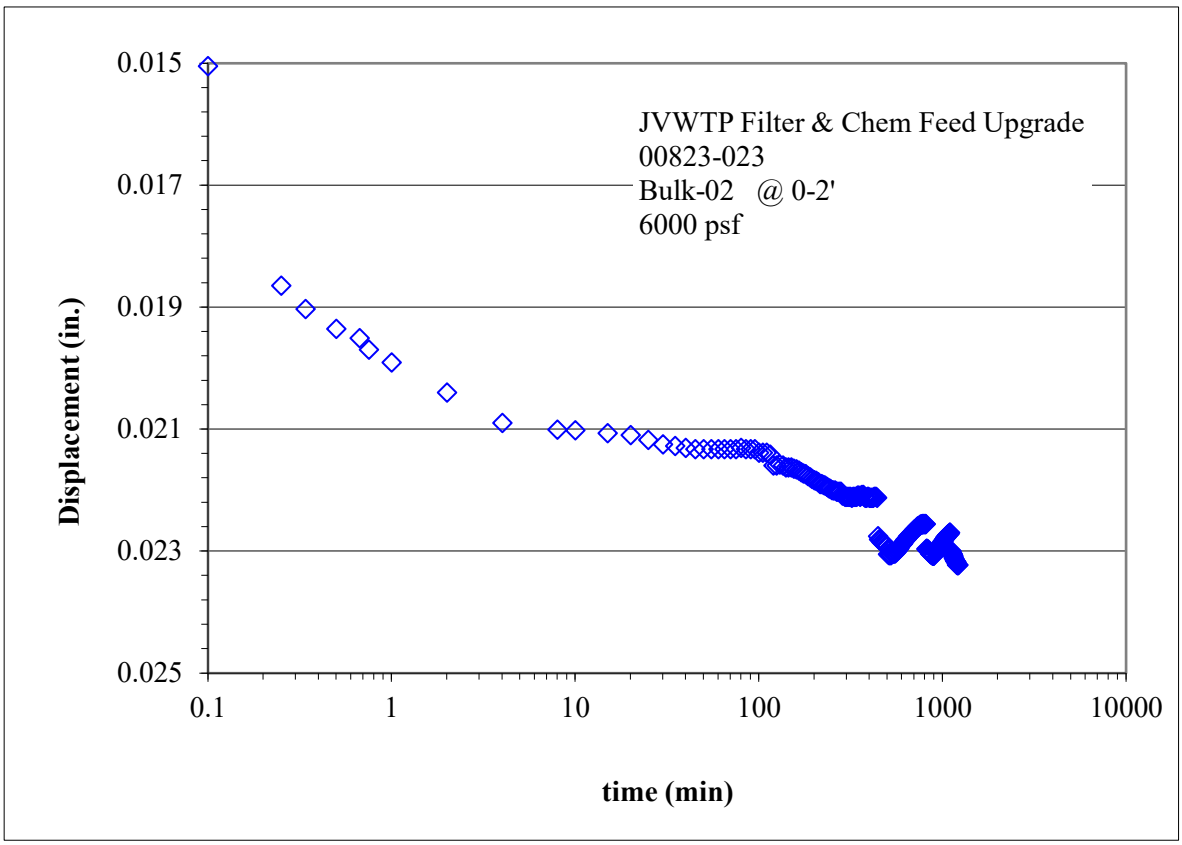
Direct Shear Test for Soils Under Drained Conditions

(ASTM D3080)

Project: JVWTP Filter & Chem Feed Upgrade
No: 00823-023
Location: Bluffdale, Utah

Boring No.: Bulk-02
Sample:
Depth: 0-2'





Minimum Laboratory Soil Resistivity, pH of Soil for Use in Corrosion Testing, and Ions in Water by Chemically Suppressed Ion Chromatography *(AASHTO T 288, T 289, ASTM D4327, and C1580)*

Project: JVVWTP Filter & Chem Feed Upgrade
No: 00823-023
Location: Bluffdale, Utah
Date: 1/8/2024
By: JJ/SE

Sample info.	Boring No.	B-01				B-03			
	Sample								
	Depth	2.5' and 5.0'				10.0'			
Water content data	Wet soil + tare (g)	44.00				43.92			
	Dry soil + tare (g)	41.39				41.68			
	Tare (g)	23.96				23.58			
	Water content (%)	15.0				12.4			
Chem. data	pH	8.6				8.9			
	Soluble chloride* (ppm)	<11				<11			
	Soluble sulfate** (ppm)	<11				16			
Resistivity data	Pin method	2				2			
	Soil box	Miller Small				Miller Small			
		Approximate Soil condition (%)	Resistance Reading (Ω)	Soil Box Multiplier (cm)	Resistivity (Ω-cm)	Approximate Soil condition (%)	Resistance Reading (Ω)	Soil Box Multiplier (cm)	Resistivity (Ω-cm)
		As is	17300	0.67	11591	As is	5990	0.67	4013
		+3	11400	0.67	7638	+3	4290	0.67	2874
		+6	10600	0.67	7102	+6	3160	0.67	2117
		+9	11200	0.67	7504	+9	2580	0.67	1729
						+12	2420	0.67	1621
						+15	2510	0.67	1682
	Minimum resistivity (Ω-cm)	**7102**				**1621**			

* Performed by Chemtech-Ford using EPA 300.0

** Performed by Chemtech-Ford using ASTM C1580

Entered by:_____
Reviewed:_____

Minimum Laboratory Soil Resistivity, pH of Soil for Use in Corrosion Testing, and Ions in Water by Chemically Suppressed Ion Chromatography *(AASHTO T 288, T 289, ASTM D4327, and C1580)*

Project: JVVWTP Filter & Chem Feed Upgrade
No: 00823-023
Location: Bluffdale, Utah
Date: 1/8/2024
By: JJ/SE

Sample info.	Boring No.	B-04				Bulk-01			
	Sample								
	Depth	5.0'				0-2'			
Water content data	Wet soil + tare (g)	44.66				44.82			
	Dry soil + tare (g)	41.97				42.71			
	Tare (g)	23.49				23.37			
	Water content (%)	14.6				10.9			
Chem. data	pH	9.0				8.0			
	Soluble chloride* (ppm)	<12				<11			
	Soluble sulfate** (ppm)	21				<11			
Resistivity data	Pin method	2				2			
	Soil box	Miller Small				Miller Small			
		Approximate Soil condition (%)	Resistance Reading (Ω)	Soil Box Multiplier (cm)	Resistivity (Ω-cm)	Approximate Soil condition (%)	Resistance Reading (Ω)	Soil Box Multiplier (cm)	Resistivity (Ω-cm)
		As is	4990	0.67	3343	As is	11740	0.67	7866
		+3	3570	0.67	2392	+3	8620	0.67	5775
		+6	3550	0.67	2379	+6	5790	0.67	3879
		+9	2460	0.67	1648	+9	5110	0.67	3424
		+12	2200	0.67	1474	+12	5110	0.67	3424
		+15	1900	0.67	1273				
		+18	2090	0.67	1400				
	Minimum resistivity (Ω-cm)	**1273**				**3424**			

* Performed by Chemtech-Ford using EPA 300.0

** Performed by Chemtech-Ford using ASTM C1580

Entered by:_____
Reviewed:_____

Minimum Laboratory Soil Resistivity, pH of Soil for Use in Corrosion Testing, and Ions in Water by Chemically Suppressed Ion Chromatography *(AASHTO T 288, T 289, ASTM D4327, and C1580)*

Project: JVVWTP Filter & Chem Feed Upgrade
No: 00823-023
Location: Bluffdale, Utah
Date: 1/8/2024
By: JJ/SE

Sample info.	Boring No.	Bulk-02							
	Sample								
	Depth	0-2'							
Water content data	Wet soil + tare (g)	44.06							
	Dry soil + tare (g)	41.87							
	Tare (g)	23.48							
	Water content (%)	11.9							
Chem. data	pH	8.1							
	Soluble chloride* (ppm)	<11							
	Soluble sulfate** (ppm)	<11							
Resistivity data	Pin method	2							
	Soil box	Miller Small							
		Approximate Soil condition (%)	Resistance Reading (Ω)	Soil Box Multiplier (cm)	Resistivity (Ω-cm)	Approximate Soil condition (%)	Resistance Reading (Ω)	Soil Box Multiplier (cm)	Resistivity (Ω-cm)
		As is	13390	0.67	8971				
		+3	10150	0.67	6801				
		+6	5130	0.67	3437				
		+9	4510	0.67	3022				
		+12	4220	0.67	2827				
		+15	4110	0.67	2754				
		+18	4340	0.67	2908				
	Minimum resistivity (Ω-cm)	**2754**							

* Performed by Chemtech-Ford using EPA 300.0

** Performed by Chemtech-Ford using ASTM C1580

Entered by:_____
Reviewed:_____

Appendix D

Geophysics Report

Prepared for Carollo Engineers
Prepared By IGES, Inc.

June, 2024

Intermountain GeoEnvironmental Services, Inc.
2702 South 1030 West, Suite 10, South Salt Lake, Utah 84119
(801) 270-9400

5 January 2024

Jared Hawes
IGES, Inc.
2702 S 1030 W, Suite 10
South Salt Lake, UT 84119
jaredh@igesinc.com
(801) 270-9400

RE: **SEISMIC VELOCITY SURVEY (V_{S100}) – Bluffdale, UT**

Based on the project objective and site conditions, IGES conducted a shear wave velocity survey at the water treatment facility in Bluffdale, UT (Figure 1). The objective of the test is to determine the shear wave velocity profile of the near surface V_{S100} for the purpose of determining the seismic site class and ground motion studies.

Seismic Shear Wave Velocity Survey
Seismic Surface Waves methods such as MASW (Multichannel Analysis of Surface Waves), MAM (Microtremor Array Measurements), and ReMi (Refraction Microtremor) use the dispersive characteristics of surface waves to determine the variation of the seismic shear wave velocity with depth. Velocity data are derived by analyzing seismic surface waves generated by a controlled impulse or by random ambient sources and received by an array of geophones. The ambient MAM data is supplemented with 10 minutes of hammer blows to produce a smooth broad-spectrum curve.

The recording parameters used for the survey are shown in Table 1 with the approximate location shown in Figure 1. The V_{S100} sounding is centered at approximately 40.47227°, -111.96710°.

Figure A1 shows the dispersion curve of the data from the Vs_{100} with phase velocity (ft/s) of the surface wave as a function of frequency (Hz). Figure A2 shows the shear wave velocity profile (a 1-D sounding of velocity as a function of depth) modeled from the dispersion curve. The average shear wave velocity for the near surface is calculated to be 1,784.6 ft/s.

Table 1: Test recording parameters.

Test location	Bluffdale, UT
Test Date	12/11/2023
Recording instrument	Summit II Compact
S/N	SUX1018
Geophone natural period	4.5 Hz.
Geophone/station spacing	16.4 feet
Number of channels	24
Spread length / geometry	377 feet
Sample rate	4 milliseconds
Number of samples	15,000/trace
Record length	60 seconds
Total recording time / records	30 minutes
Low pass filter	½ Nyquist
Low cut filter	1 Hz.
Seismic source	12 lb. hammer (10 minutes)
Source location	-30 foot offset
Analysis software	SeisImager™ Geometrics, Inc.

Figure 1: Shear wave velocity (V_{S100}) survey at the water treatment facility in Bluffdale, UT The test array length is 377 ft.

Limitations

The concept of risk is a significant consideration of geophysical analyses. The analytical means and methods used in performing geophysical analyses and development of resulting data set does not constitute an exact science. Analytical tools used by geophysicists are based on limited data, empirical correlations, judgment, and experience. As such the solutions and resulting data set presented in this report cannot be considered risk-free and constitute IGES's best professional opinion based on the available data at the time they were developed. IGES has developed the preceding analyses, at a minimum, in accordance with generally accepted professional geophysical practices and care being exercised in the project area at the time our services were performed. No warrantees, guarantees or other representations are made.

The information contained in this report is based on limited field testing and understanding of the project. The data used in the preparation of this report were obtained by IGES for this project. It is very likely that variations in the soil, rock, and groundwater conditions exist between and beyond the points explored. The nature and extent of the variations may not be evident until construction occurs and/or additional explorations are completed.

This report was prepared for our client's exclusive use on the project identified in the foregoing. Use of the data contained herein for any other project described in this report is at the user's sole risk. It is the client's responsibility to see that all parties to the project including the designer, contractor, subcontractors, etc. are made aware of this report in its entirety. The use of information contained in this report for bidding purposes should be done at the contractor's option and risk.

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We appreciate the opportunity to provide you with our services. If you have any questions, please contact the undersigned at your convenience at (801) 270-9400.

Respectfully submitted,

IGES, Inc.

Yanni Philopoulos
Geophysicist

Attachments:
Appendix A

APPENDIX A

Shear Wave Velocity Soundings

Microtremor Array Measurement (MAM)

(Depth is measured in feet below ground surface. Velocity is reported in feet per second.)

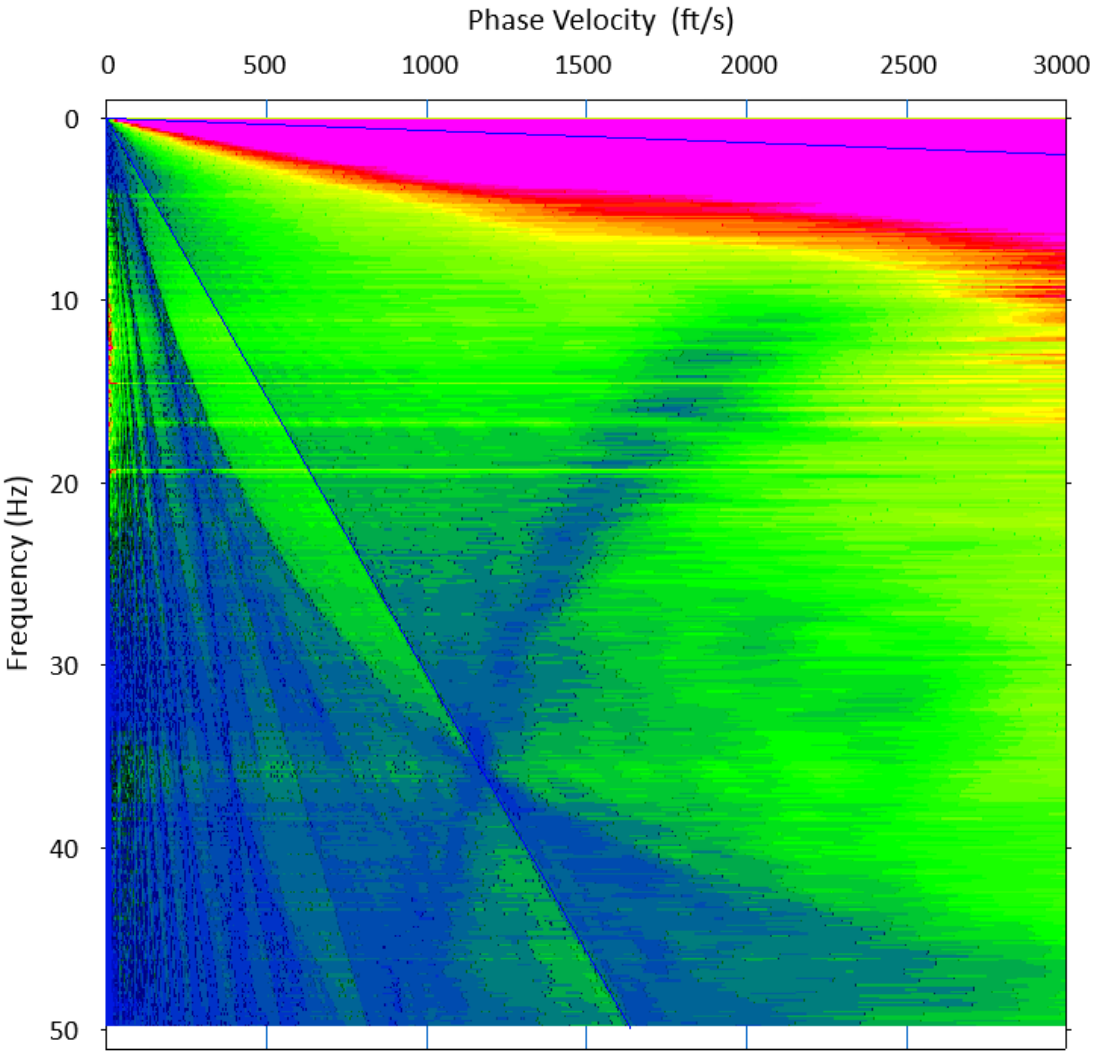


Figure A1*:* Dispersion curve of V_{S100} showing phase velocity (ft/s) as a function of frequency (Hz).

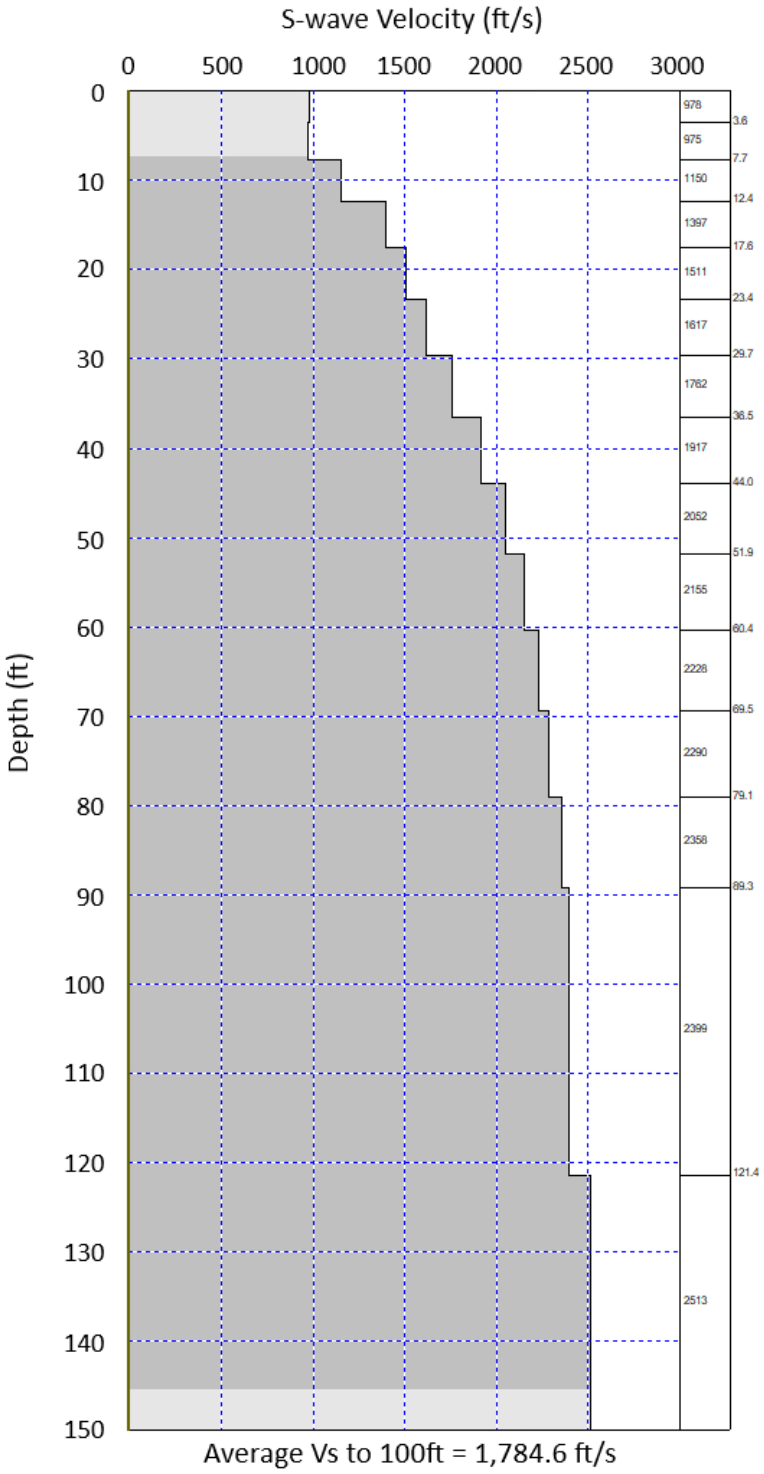
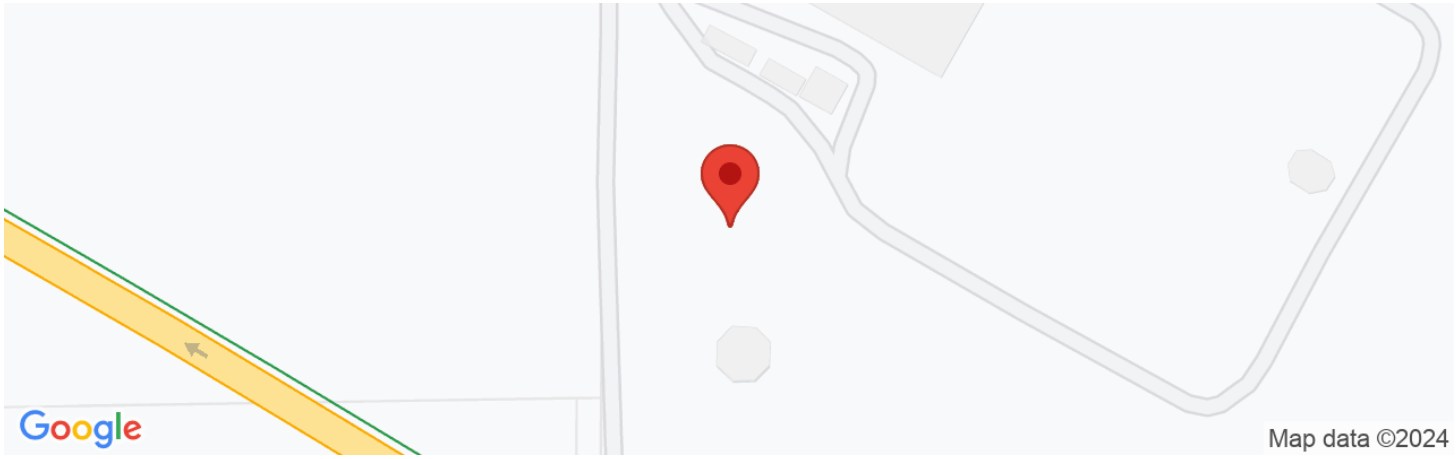


Figure A2: Shear wave velocity profile (a 1-D sounding of velocity as a function of depth) of the V_{S100} modeled from the dispersion curve. The shear velocity of the near surface is calculated to be 1,784.6 ft/s.

Seismic Data

USGS web services were down for some period of time and as a result this tool wasn't operational, resulting in *timeout* error.
USGS web services are now operational so this tool should work as expected.

Latitude, Longitude: 40.47222334, -111.96682622



Date	1/12/2024, 11:16:14 AM
Design Code Reference Document	ASCE7-16
Risk Category	II
Site Class	C - Very Dense Soil and Soft Rock

Type	Value	Description
S_S	1.171	MCE_R ground motion. (for 0.2 second period)
S_1	0.424	MCE_R ground motion. (for 1.0s period)
S_{MS}	1.405	Site-modified spectral acceleration value
S_{M1}	0.637	Site-modified spectral acceleration value
S_{DS}	0.937	Numeric seismic design value at 0.2 second SA
S_{D1}	0.424	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	D	Seismic design category
F_a	1.2	Site amplification factor at 0.2 second
F_v	1.5	Site amplification factor at 1.0 second
PGA	0.519	MCE_G peak ground acceleration
F_{PGA}	1.2	Site amplification factor at PGA
PGA_M	0.623	Site modified peak ground acceleration
T_L	8	Long-period transition period in seconds
SsRT	1.171	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	1.346	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	2.418	Factored deterministic acceleration value. (0.2 second)
S1RT	0.424	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.484	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	0.9	Factored deterministic acceleration value. (1.0 second)
PGAd	0.945	Factored deterministic acceleration value. (Peak Ground Acceleration)
PGA_{UH}	0.519	Uniform-hazard (2% probability of exceedance in 50 years) Peak Ground Acceleration
C_{RS}	0.87	Mapped value of the risk coefficient at short periods

Type	Value	Description
C_{R1}	0.877	Mapped value of the risk coefficient at a period of 1 s
C_V	1.134	Vertical coefficient

DISCLAIMER

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SITE GROUND MOTION (ASCE 7-16 with Supplement 1)

Project: JVWTP Filter & Chem Feed Upgrades
Latitude: 40.47222334
Longitude: -111.96682622
Number: 00823-023
Date: 1/12/24
By: RT

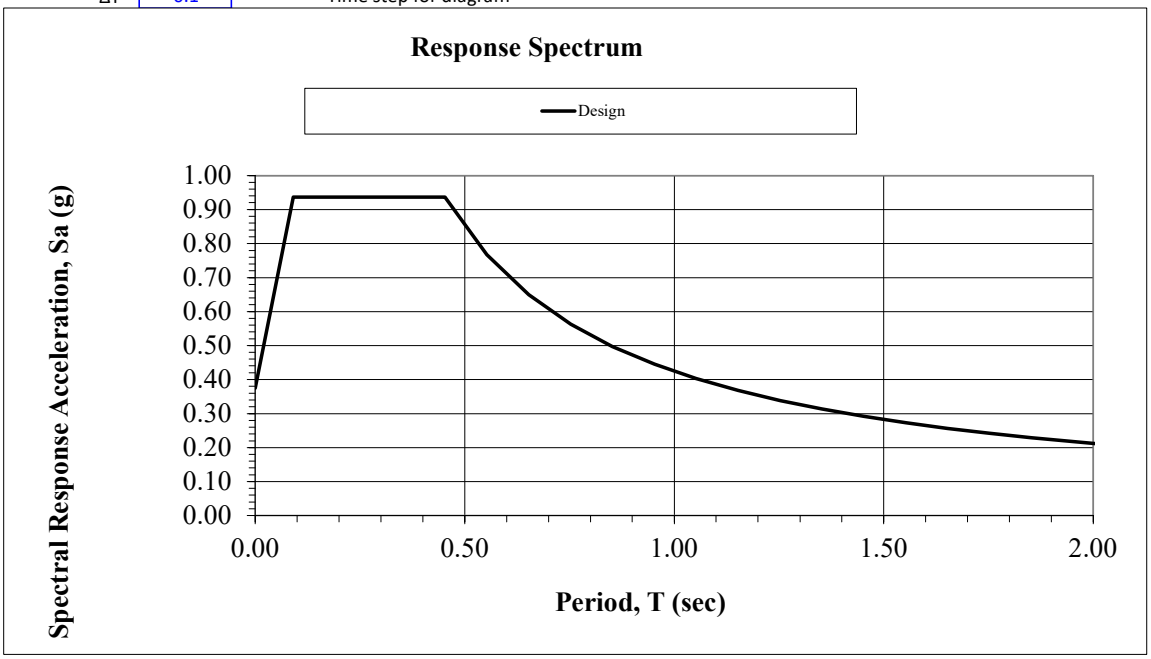
PGA	0.519	(g)	Mapped Peak Ground Acceleration at 0 second period
S_s =	1.171	(g)	Mapped spectral acceleration for short periods
S_1 =	0.424	(g)	Mapped spectral acceleration for a 1-second period

Site Class =	C	ASCE 7-16 Table 20.3-1
F_{PGA} =	1.200	ASCE 7-16 Table 11.8-1
F_a =	1.200	ASCE 7-16 Table 11.4-1
F_v =	1.500	ASCE 7-16 Table 11.4-2

PGA_M =	**0.623**	**F_{pga}*PGA**
S_{DS} =	**0.937**	**S_{DS} = Fa*Ss**
S_{D1} =	**0.424**	**S_{D1} = Fv*S_1**

*The maximum considered spectral response accelerations for short and 1-second periods

T_0 =	0.091	$T_0 = 0.2*S_{D1}/S_{DS}$
T_s =	0.453	$T_s = S_{D1}/S_{DS}$
T_L =	8	Long period transition period (Mapped Value)
ΔT =	0.1	Time step for diagram



T (sec)	Sa (g)
0.00	0.37
0.09	0.94
0.45	0.94
0.55	0.77
0.65	0.65
0.75	0.56
0.85	0.50
0.95	0.45
1.05	0.40
1.15	0.37
1.25	0.34
1.35	0.31
1.45	0.29
1.55	0.27
1.65	0.26
1.75	0.24
1.85	0.23
1.95	0.22
2.05	0.21
2.15	0.20
2.25	0.19
2.35	0.18

Source: https://asce7hazardtool.online/

APPENDIX B - HAZARDOUS MATERIALS REPORT

Hazardous Materials Inspection

Filter Building at the Jordan Valley Water Treatment Plant

15305 S 3200 W Herriman, Utah 84065

February 3, 2025 | Terracon Project No. 61247358

Prepared for:

Carollo Engineers
Salt Lake City, Utah, 84065

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Midvale, Utah 84047
P (801) 545-8500
Terracon.com

February 3, 2025

Carollo Engineers
7090 South Union Park Avenue, Suite 600
Salt Lake City, Utah, 84065

Attn: Mr. Alan Domonoske
P: (801)233-2532
E: adomonoske@carollo.com

Re: Asbestos, Lead, and Hazardous Materials Inspections
Filter Building at the Jordan Valley Water Treatment Plant
15305 S 3200 W
Herriman, Utah 84065
Terracon Project No. 61247358

Dear Mr. Domonoske,

The purpose of this report is to present the results of an asbestos inspection, lead coating screen, and hazardous materials assessment performed on January 7 and January 31, 2025, at the Filter Building at the Jordan Valley Water Treatment Plant in Herriman, Utah. This inspection was conducted in accordance with Terracon proposal No. P61247358 dated December 19, 2025. We understand that this inspection was requested in preparation for the planned renovation of the above-referenced building.

Asbestos containing materials were not identified during this assessment. Lead-containing coatings, universal waste, and other hazardous materials were identified during the assessment. Please refer to the attached report for details. Terracon appreciates the opportunity to provide this service to Carollo Engineers. If there are questions regarding this report, or if any further assistance is needed, please contact Terracon at (801) 545-8500.

Sincerely,

Terracon Consultants, Inc.

Prepared By:

Mr. Bracken Snyder
Staff Industrial Hygienist
State of Utah Inspector
Certification No. ASB-8613

Reviewed by:

John Murphy, CIH, CSP
Industrial Hygiene and Asbestos
Program Manager
State of Utah Asbestos Company
Certification No. 289

Executive Summary

Terracon Consultants, Inc. (Terracon) conducted a pre-demolition hazardous materials inspection including asbestos, lead, and other hazardous materials at the Jordan Valley Water Treatment Plant located at 15305 S 3200 W Herriman, Utah 84065. The inspection was conducted on January 7 and January 31, 2025, by Mr. Bracken Snyder, Terracon employee, and State of Utah-certified Asbestos Inspector. The inspection was conducted at the request of Mr. Domonoske with Carollo Engineers.

Samples of suspect Asbestos-Containing Materials were collected from the chlorine room, loading dock, maintenance office, boiler room and filter gallery, as per the proposal, to determine asbestos content. Based on laboratory analysis, asbestos was not identified in samples collected.

Lead was detected on 27 of the 88 surfaces tested. Contractors doing any work in the building that may generate lead dust or fume should be informed of the presence of lead so that they may make appropriate decisions about protecting their workers from lead exposure.

Universal hazardous wastes and other hazardous materials were identified and quantified, but no samples were collected. These materials should be properly disposed of or recycled prior to renovation / demolition of the building.

The report that follows this Executive Summary should be read in its entirety because it includes important information, such as more specific details about findings, regulatory requirements, and recommendations.

Table Of Contents

Appendices

1.0 Introduction

Terracon Consultants, Inc. (Terracon) conducted an asbestos inspection, lead coating screen, and universal waste and hazardous materials assessment at the Filter Building at the Jordan Valley Water Treatment Plant located at 15305 S 3200 W Herriman, Utah. The inspection was conducted on January 7 and January 31, 2025, by Mr. Bracken Snyder, State of Utah-certified Asbestos Inspector.

Samples of suspect ACM were collected to determine asbestos content. Measurements for lead-in-paint were made using an Olympus Delta Premium X-ray Fluorescence (XRF) Analyzer. Universal wastes and other hazardous materials were identified and quantified, so that they can be recycled or properly disposed of prior to renovation of the building.

1.1 Project Objective

The objective of this project was to identify the presence or absence of asbestos, lead-containing coatings, universal waste, and other hazardous materials on the interior and exterior spaces of the building.

2.0 Building/Area Description

The Filter Building at the Jordan Valley Water Treatment Plant was constructed in 1971 with an addition constructed in the 1980s. The renovation will impact the chlorine room, loading dock, filter deck, filter gallery, maintenance office, and boiler room. Construction materials consisted of concrete masonry unit (CMU) block, concrete, drywall, and caulking.

3.0 Inspection Procedures

An asbestos inspection, lead coating screening, and universal waste and hazardous materials assessment were conducted by Mr. Bracken Snyder, Utah-certified Asbestos Inspector, who is qualified to evaluate lead coatings in residential and commercial buildings in Utah. Copies of asbestos inspector certifications are attached as Appendix G.

3.1 Visual Assessment for Asbestos

Terracon began the asbestos sampling activities with a visual assessment, including identification and inventory of readily visible and accessible Homogeneous Areas (HAs) of suspect ACM. A HAs consists of a material that appears similar throughout in terms of color, texture, and date of application. The assessment was conducted throughout visually accessible areas of the site. Materials identified as glass, wood, masonry, metal, plastic, or rubber were not considered suspect ACM.

3.2 Physical Assessment for Asbestos

A physical assessment of each HA of suspect ACM was conducted to assess the friability and condition of the materials. A friable material is defined by the United States Environmental Protection Agency (EPA) as a material that can be crumbled, pulverized, or reduced to powder by hand pressure when dry. Friability was assessed by physically touching suspect materials.

3.3 Sample Collection

3.3.1 Asbestos

Based on results of the visual observation of each building, bulk samples of suspect ACM were collected from the accessible interior and exterior building spaces. Bulk samples of suspect ACM were collected in accordance with AHERA sampling protocols using wet methods as applicable to reduce the potential for fiber release. Samples were placed in sealable containers and labeled with unique sample numbers using an indelible marker. Terracon collected 43 samples from 14 HAs of suspect ACM.

A table presenting suspect material descriptions, sample locations, and sample results are summarized in Appendix A. An asbestos sampling location drawing is provided in Appendix B. Although reasonable effort was made to inspect accessible suspect materials, additional suspect but unsampled materials could be in walls, in voids, or in other concealed areas.

3.3.2 Lead-Containing Coatings

Measurements for lead in paint were made using an Olympus Delta Premium XRF Analyzer (Serial Number 510179) with an X-ray tube source. The Olympus Delta XRF nondestructively measures lead concentrations in painted surfaces, regardless of the number of paint layers present. According to Olympus Delta, the lower limit of reliable quantitation for this instrument is 0.0001 milligrams of lead per square centimeter of surface area (mg/cm^2) using the Olympus Delta tube-based Silicon Drift Detector (SDD) technology on surface coatings and materials based on a 120-second test time.

3.3.3 Lead-Containing Coatings

Universal wastes and other hazardous materials were identified and quantified, so that they can be recycled or properly disposed of prior to renovation or demolition, per EPA requirements. The Terracon inspectors visually inspected the building to identify and quantify the following materials but no samples were collected:

- batteries
- pesticides
- mercury-containing equipment

- lamps
- aerosol cans
- equipment containing chlorofluorocarbon (CFC) refrigerants
- equipment containing polychlorinated biphenyls (PCBs)

3.4 Sample Analysis

3.4.1 Asbestos

Samples of suspect ACM were delivered under standard chain-of-custody protocol to Eurofins EMLab P&K (NVLAP #500031-0) in Phoenix, Arizona, for analysis by Polarized Light Microscopy using EPA Method 600/R-93/116. The asbestos content, where applicable, was determined by microscopic visual estimation. A copy of the laboratory analytical report and chain-of-custody forms are provided in Appendix C.

3.4.2 Lead-Containing Coatings

Before and after the testing, the internal calibration of the Olympus Delta was checked by taking a minimum of two consecutive measurements on a red (1.0 to 1.2-mg/cm^2) National Institute for Standards and Technology (NIST #2573) standard paint film. The calibration values obtained were compared to the calibration check tolerance values to ensure that the XRF was operating within the stated tolerance limits.

4.0 Regulatory Overview

4.1 Asbestos

The Utah Division of Air Quality (UDAQ) enforces the Asbestos NESHAP adopted by reference in the Utah Air Conservation Rules R307 Section 214-1. The owner or operator must provide UDAQ with written notification at least ten working days prior to the commencement of asbestos abatement activities that will disturb Regulated Asbestos Containing Material (RACM) in amounts greater than or equal to 3 square feet or 3 linear feet.

The asbestos NESHAP (40 CFR Part 61, Subpart M) regulates asbestos fiber emissions and asbestos waste disposal practices. The asbestos NESHAP regulation also requires the identification and classification of existing ACM according to friability prior to demolition or renovation activity. Friable ACM is a material containing more than 1% asbestos that, when dry, can be crumbled, pulverized, or reduced to powder by hand pressure. All friable ACM is considered RACM.

The asbestos NESHAP regulation classifies ACM as either RACM, Category I nonfriable ACM, or Category II nonfriable ACM. RACM includes all friable ACM; Category I nonfriable ACM that has become friable or has been or will be sanded, ground, cut, or abraded; and Category II nonfriable ACM that has been or is likely to become crumbled, pulverized, or

reduced to powder. Category I nonfriable ACM are asbestos-containing packings, gaskets, resilient floor coverings, resilient floor covering mastics, and asphalt roofing products that contain more than 1% asbestos. Category II nonfriable ACM are all other nonfriable materials other than Category I nonfriable ACM that contain more than 1% asbestos.

The Occupational Safety and Health Administration (OSHA) asbestos standard for construction (29 CFR 1926.1101) regulates workplace exposure to asbestos. The OSHA standard requires that employee exposure to airborne asbestos must not exceed established Permissible Exposure Limits (PELs). The OSHA standard classifies construction and maintenance activities that could disturb ACM and specifies work practices and precautions that employers must follow when engaging in each class of regulated work. The standard also specifies requirements for disturbing and handling materials with asbestos concentrations less than or equal to one percent.

4.2 Lead-Containing Coatings

According to the UDAQ, even though there is measurable lead in coated surfaces within a building, as long as the express purpose of future renovation or demolition work is not to "remove or abate lead," the work need not be treated as a lead abatement project. However, OSHA states that coatings having any measurable level of lead may pose a substantial exposure hazard during renovation or demolition work, depending upon the work performed.

The OSHA Lead in Construction Standard (29 CFR 1926.62) must be followed for work involving coated surfaces with any measurable concentration of lead. The standard requires, among other things, the following:

- initial worker training on the hazards of lead exposure, proper work practices, respiratory protection, and other topics
- an initial exposure assessment, by air monitoring
- hand-washing facilities and designated clean change and eating areas

The Lead in Construction Standard specifies that employers are responsible for ensuring that their employees are not exposed to airborne lead concentrations exceeding the PELs.[1]

The presence of lead in demolition debris from nonresidential buildings has the potential to impose limitations on where and how the debris may be disposed. The Resource Conservation and Recovery Act (RCRA) requires each waste generator to determine if their wastes are hazardous. This can be determined either through generator knowledge or by

[1] See 29 CFR 1926(d) (2) Protection of employees during assessment of exposure.

testing. Toxicity Characteristic Leaching Procedure (TCLP) testing is the preferred method for determining if wastes are hazardous. The demolition wastes, if any, from this project should undergo TCLP testing prior to disposal to determine if they are hazardous.

4.3 Hazardous Materials

EPA's universal waste regulations streamline the hazardous waste management standards for certain categories of hazardous waste that are commonly generated by a wide variety of facilities. The streamlined regulations promote the collection and recycling of universal waste, ease the regulatory burden on generators that wish to collect these wastes and transporters of these wastes, and encourage the development of municipal and commercial programs to reduce the quantity of these wastes going to municipal solid waste landfills or combustors. The federal universal waste regulations are found in Title 40 of the Code of Federal Regulations (CFR) in part 273. and apply to five types of universal waste:

- Batteries
- Pesticides
- Mercury-Containing Equipment
- Lamps
- Aerosol Cans

The universal waste regulations require that these materials be managed in a way that prevents releases to the environment.

The EPA also regulates other types of wastes as hazardous, including CFC refrigerants, PCB-containing materials, and others.

5.0 Findings And Recommendations

5.1 Asbestos

Terracon collected samples from suspect ACM HAs identified in the areas of renovation. Terracon collected 43 samples from 14 HAs from the building. Laboratory analysis indicates that asbestos was not identified in any of the HAs sampled.

Tables presenting suspect material descriptions, sample locations, and sample results for the/each building are presented in Appendix A. Asbestos sampling location drawings are provided in Appendix B. The laboratory analytical reports of sample results are provided in Appendix C. A photo log of HAs sampled from the/each building is provided in Appendix D.

5.2 Lead-Containing Coatings

One hundred and two measurements were taken with the XRF, including calibration. Twenty-seven surfaces contained lead according to the XRF measurement results.

OSHA regulates lead in construction work in any measurable concentration. Therefore, if workers perform sanding, grinding, welding, cutting, or any other activities that may create lead-containing dust or fume from surfaces containing lead, they must follow the requirements of the OSHA Lead in Construction Standard, 29 CFR 1926.62. It should be noted that OSHA does not accept XRF sampling data for determining that there is no lead present in a coating, as lead may be present at a concentration lower than the detection limit of the XRF instrument. Tables 1 and 2 in Appendix E show the results of surface coatings tested for lead.

Terracon recommends that personnel performing demolition or renovation activities that may disturb components with concentrations of lead above the designated analytical detection limit comply with the OSHA Lead in Construction Standard in order to minimize employee exposure.

5.3 Hazardous Materials

The following universal and hazardous waste materials were identified in the building during this assessment:

Quantity	Universal and Hazardous Waste Materials
136	Fluorescent lamps, 4-foot or less
68	Light ballasts
34	Light-Emitting Diode (LED)
6	Motion sensors
7	Electric heaters
1	Hot water heater
1	Emergency exit signs
1	Cationic polymer tote

1	Poly-aluminum chloride tote
18	Chlorine tanks
10	Misc chemicals

These materials should be recycled or properly disposed of prior to building renovation. A table estimating the costs associated with the removal and proper disposal of these items is presented in Appendix F.

5.4 Inaccessible Areas and Assumed Materials

Although all areas of the building were inspected, there is the potential for hidden, inaccessible materials that can be buried behind walls or underneath the concrete slab.

6.0 General Comments

This inspection was conducted in a manner consistent with the level of care and skill ordinarily exercised by members of the profession currently practicing under similar conditions in the same locale. The results, findings, conclusions, and recommendations expressed in this report are based on conditions observed during our inspection of the building. The information contained in this report is relevant to the date on which this inspection was performed and should not be relied upon to represent conditions at a later date. This report has been prepared on behalf of and exclusively for use by Carollo Engineers. This report is not a bidding document. Contractors or consultants reviewing this report must draw their own conclusions regarding further investigation or remediation deemed necessary. Terracon does not warrant the work of regulatory agencies, laboratories, or other third parties supplying information that may have been used in the preparation of this report. No warranty, express or implied, is made.

Appendix A
Table 1: Asbestos Survey Sample Location Summary

Appendix A Table 1: Asbestos Survey Sample Location Summary
Jordan Valley Water Treatment Plant—Filter Building | Herriman, Utah
February 3, 2025 | Terracon Project No. 61247358

Homogeneous Area (HA)	Description	Sample No.	Sample Location	Estimated Quantity	Lab Results
HA-01	Concrete Masonry Unit block	7358-01	Chlorine room, west wall, North end centered	2,650 SF	All Layers - ND
		7358-02	Chlorine room, northwest corner		
		7358-03	Chlorine room, east wall, centered		
		7358-04	Chlorine room, southeast corner		
		7358-05	Chlorine room, West wall centered		
HA-02	Concrete/Cement	7358-06	Chlorine room, chlorine tub wall, southeast corner	5000 SF	All Layers - ND
		7358-07	Chlorine room, West wall, centered		
		7358-08	Chlorine room, south entryway step		
HA-03	Black cove base and mastic	7358-09	Chlorine room, east wall, south end centered	200 LF	All Layers - ND
		7358-10	Chlorine room, east wall, south end centered		
		7358-11	Chlorine room, east wall, south end centered		
HA-04	Tan cove base and mastic	7358-12	Chlorine room pump room, South centered	100 LF	All Layers - ND
		7358-13	Chlorine room pump room, South centered		
		7358-14	Chlorine room pump room, South centered		
HA-05	White door caulking	7358-15	Chlorine room west entry door	100 LF	All Layers - ND
		7358-16	Chlorine room west entry door		
		7358-17	Chlorine room west entry door		

Appendix A Table 1: Asbestos Survey Sample Location Summary
Jordan Valley Water Treatment Plant—Filter Building | Herriman, Utah
February 3, 2025 | Terracon Project No. 61247358

Homogeneous Area (HA)	Description	Sample No.	Sample Location	Estimated Quantity	Lab Results
HA-06	Pipe gasket material	7358-18	Chlorine room, south end on piping	10 SF	All Layers - ND
		7358-19	Chlorine room, south end on piping		
		7358-20	Chlorine room, south end on piping		
HA-07	Gap filler	7358-21	Chlorine room, east wall south end center on support beam	100 LF	All Layers - ND
		7358-22	Chlorine room, east wall south end center on support beam		
		7358-23	Chlorine room, west wall south end on support beam		
HA-08	Brick and mortar	7358-24	Chlorine loading dock, southeast corner	500 SF	All Layers - ND
		7358-25	Chlorine loading dock, southeast corner		
		7358-26	Chlorine loading dock, southeast corner		
HA-09	Concrete/Cement	7358-27	Chlorine loading dock, east side, south end centered	2,200 SF	All Layers - ND
		7358-28	Chlorine loading dock, east side, south end centered		
HA-10	Drywall system	7358-29	Maintenance office, southeast corner	460 SF	All Layers - ND
		7358-30	Maintenance office, southeast corner		
		7358-31	Maintenance office, southeast corner		

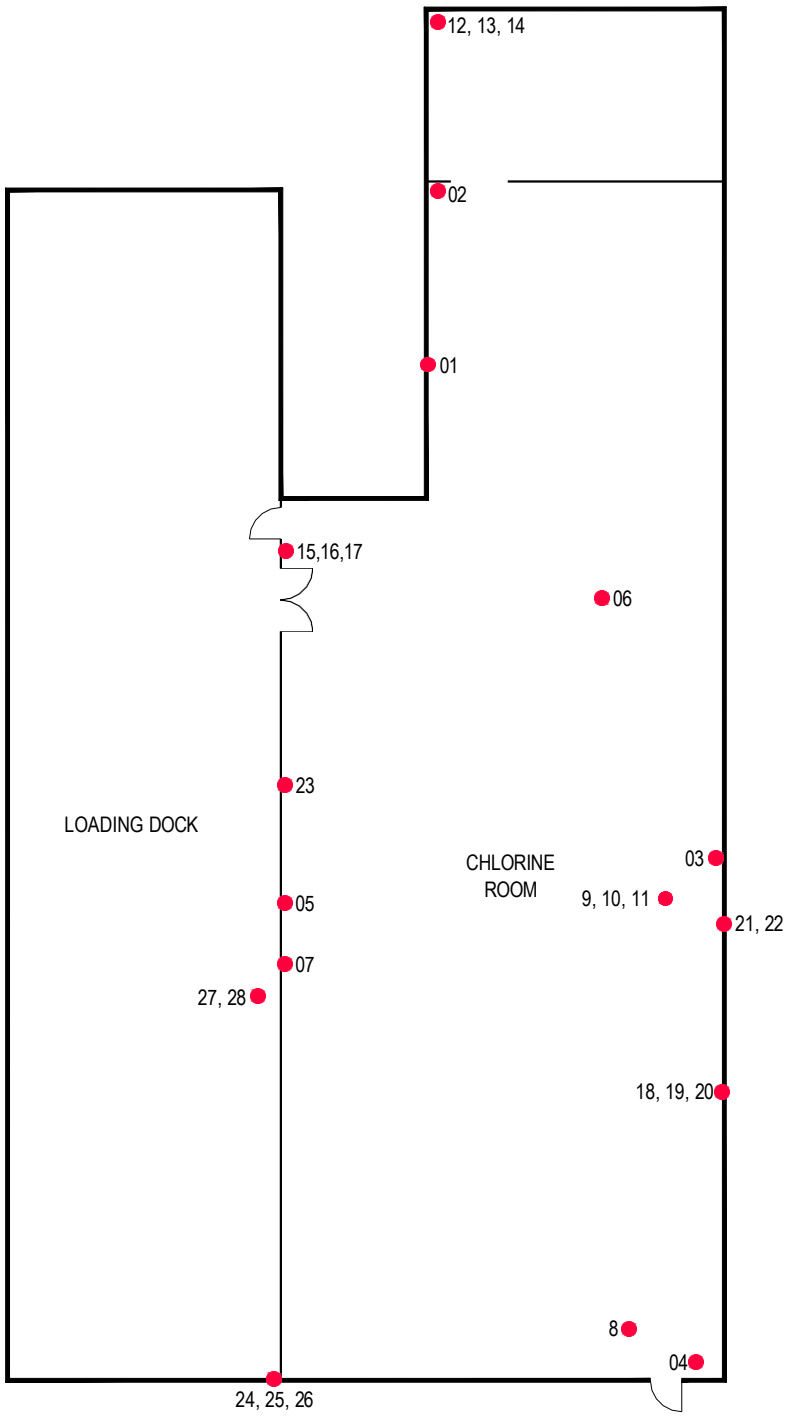
Appendix A Table 1: Asbestos Survey Sample Location Summary
Jordan Valley Water Treatment Plant—Filter Building | Herriman, Utah
February 3, 2025 | Terracon Project No. 61247358

Homogeneous Area (HA)	Description	Sample No.	Sample Location	Estimated Quantity	Lab Results
HA-11	Concrete/Cement	7358-32	Boiler room, west wall centered	11,000 SF	All Layers - ND
		7358-33	Filter gallery, room 1, northeast corner		
		7358-34	Filter gallery, room 2, northeast corner		
HA-12	Epoxy floor	7358-35	Maintenance office, east centered	650 SF	All Layers - ND
		7358-36	Maintenance office, east centered		
		7358-37	Maintenance office, east centered		
HA-13	Gap filler	7358-38	Boiler room, west centered	100 SF	All Layers - ND
		7358-39	Filter gallery, doorway between room 1 and room 2		
		7358-40	Filter gallery, doorway between room 1 and room		
HA-14	Pipe gasket material	7358-41	Boiler room, west centered	10 SF	All Layers - ND
		7358-42	Filter gallery, room 1, southeast corner		
		7358-43	Filter gallery, room 2, southeast corner		

Key:

ND = none detected SF = square feet LF = linear feet NA = not applicable

Appendix B
Asbestos Sample Location Drawing



LEGEND

● SAMPLE LOCATION

N

NOT TO SCALE

THIS DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

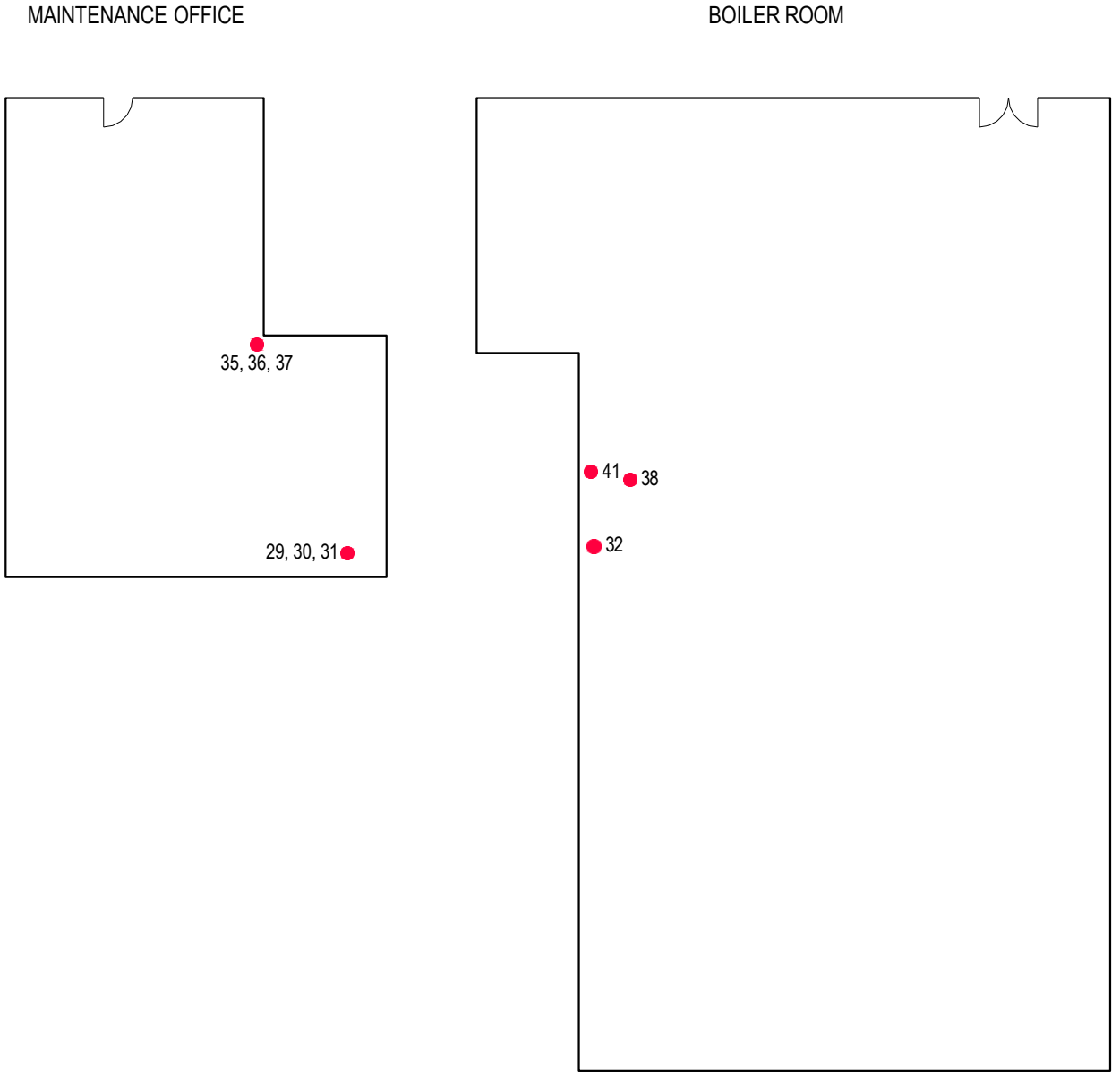
Project Mngr:	JH
Drawn By:	RLW
Checked By:	JH/MRF
Approved By:	JH
Project No.	61247358
Scale:	AS SHOWN
File No.	61247358-1
Date:	JAN. 2025

Terracon
6952 S. High Tech Drive, Ste. B Midvale, UT 84047
(801) 545-8500 (801) 545-8600

SAMPLE LOCATION DIAGRAM

ASBESTOS INSPECTION
JORDAN VALLEY WATER TREATMENT PLANT
15305 SOUTH 3200 WEST
HERRIMAN, UT

EXHIBIT 1



NOT TO SCALE

LEGEND

● SAMPLE LOCATION

THIS DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

Project Mngr:	JH
Drawn By:	RLW
Checked By:	JH/MRF
Approved By:	JH

Project No.	61247358
Scale:	AS SHOWN
File No.	61247358-2
Date:	JAN. 2025

terracon
6952 S. High Tech Drive, Ste. B Midvale, UT 84047
(801) 545-8500 (801) 545-8600

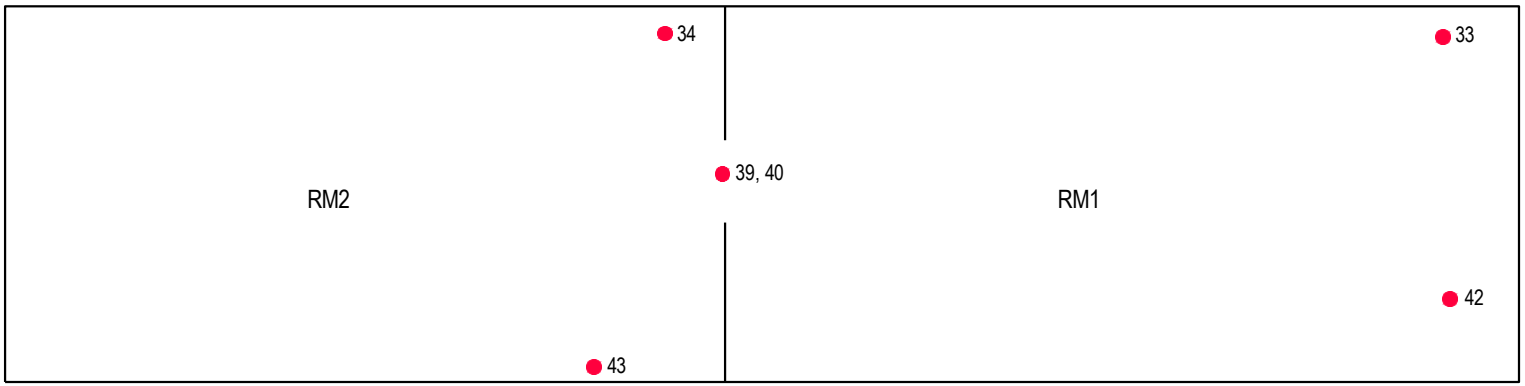
SAMPLE LOCATION DIAGRAM

ASBESTOS INSPECTION
JORDAN VALLEY WATER TREATMENT PLANT
15305 SOUTH 3200 WEST
HERRIMAN, UT

EXHIBIT

2

FILTER GALLERY



N

NOT TO SCALE

LEGEND

● SAMPLE LOCATION

THIS DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

Project Mngr: JH	Project No. 61247358
Drawn By: RLW	Scale: AS SHOWN
Checked By: JH/MRF	File No. 61247358-3
Approved By: JH	Date: JAN. 2025

terracon
6952 S. High Tech Drive, Ste. B Midvale, UT 84047
(801) 545-8500 (801) 545-8600

SITE DIAGRAM

ASBESTOS INSPECTION
JORDAN VALLEY WATER TREATMENT PLANT
15305 SOUTH 3200 WEST
HERRIMAN, UT

EXHIBIT

3

Appendix C
Laboratory Analytical Reports

eurofins | Built Environment Testing

Report for:

Bracken Snyder
Terracon Consultants, Inc. - Utah
6952 S. High Tech Dr., Suite B
Midvale, UT 84047

Regarding: Eurofins Aerotech Built Environment Testing, LLC
Project: 61247358
EML ID: 3906210

Approved by:

Renee Luna-Trepczynski

Approved Signatory
Renee Luna-Trepczynski

Dates of Analysis:
Asbestos PLM: 01-16-2025

Service SOPs: Asbestos PLM (EPA 40CFR App E to Sub E of Part 763 & EPA METHOD 600/R-93-116, SOP EM-AS-S-1267)
NVLAP Lab Code 500031-0

Eurofins Aerotech Built Environment Testing, LLC
1501 West Knudsen Drive, Phoenix, AZ 85027
(800) 651-4802 www.eurofinsus.com/Built

Client: Terracon Consultants, Inc. - Utah
C/O: Bracken Snyder
Re: 61247358

Date of Sampling: 01-07-2025
Date of Receipt: 01-08-2025
Date of Report: 01-16-2025

ASBESTOS PLM REPORT

Total Samples Submitted:	44
Total Samples Analyzed:	44
Total Samples with Layer Asbestos Content > 1%:	0

Location: 7358-01, CMU Block Filler Lab ID-Version‡: 19366037-1

Sample Layers	Asbestos Content
Gray Block with Paint	ND
Sample Composite Homogeneity:	Good

Location: 7358-02, CMU Block Filler Lab ID-Version‡: 19366038-1

Sample Layers	Asbestos Content
Gray Block with Paint	ND
Sample Composite Homogeneity:	Good

Location: 7358-03, CMU Block Filler Lab ID-Version‡: 19366039-1

Sample Layers	Asbestos Content
Gray Block with Paint	ND
Sample Composite Homogeneity:	Good

Location: 7358-04, CMU Block Filler Lab ID-Version‡: 19366040-1

Sample Layers	Asbestos Content
Gray Block with Paint	ND
Sample Composite Homogeneity:	Good

All components not quantified as asbestos content and non-asbestos content are considered to be non-fibrous matrix components. Matrix components may include, but are not limited to, gypsum, paint, silicate minerals, vinyl, binder, calcium carbonate, tar, and foam.

Inhomogeneous samples are separated into homogeneous subsamples and analyzed individually. ND means no fibers were detected. When detected, the minimum detection and reporting limit is less than 1% unless point counting is performed. Floor tile samples may contain large amounts of interference material and it is recommended that the sample be analyzed by gravimetric point count analysis to lower the detection limit and to aid in asbestos identification.
‡ A "Version" indicated by -"x" after the Lab ID# with a value greater than 1 indicates a sample with amended data. The revision number is reflected by the value of "x".

Eurofins Aerotech Built Environment Testing, LLC
1501 West Knudsen Drive, Phoenix, AZ 85027
(800) 651-4802 www.eurofinsus.com/Built

Client: Terracon Consultants, Inc. - Utah
C/O: Bracken Snyder
Re: 61247358

Date of Sampling: 01-07-2025
Date of Receipt: 01-08-2025
Date of Report: 01-16-2025

ASBESTOS PLM REPORT

Location: 7358-05, CMU Block Filler Lab ID-Version‡: 19366041-1

Sample Layers	Asbestos Content
Gray Block with Paint	ND
Sample Composite Homogeneity:	Good

Location: 7358-06, Cement/Concrete Lab ID-Version‡: 19366042-1

Sample Layers	Asbestos Content
Gray Concrete	ND
Sample Composite Homogeneity:	Good

Location: 7358-07, Cement/Concrete Lab ID-Version‡: 19366043-1

Sample Layers	Asbestos Content
Gray Concrete	ND
Sample Composite Homogeneity:	Good

Location: 7358-08, Cement/Concrete Lab ID-Version‡: 19366044-1

Sample Layers	Asbestos Content
Gray Concrete	ND
Sample Composite Homogeneity:	Good

All components not quantified as asbestos content and non-asbestos content are considered to be non-fibrous matrix components. Matrix components may include, but are not limited to, gypsum, paint, silicate minerals, vinyl, binder, calcium carbonate, tar, and foam.

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1501 West Knudsen Drive, Phoenix, AZ 85027
(800) 651-4802 www.eurofinsus.com/Built

Client: Terracon Consultants, Inc. - Utah
C/O: Bracken Snyder
Re: 61247358

Date of Sampling: 01-07-2025
Date of Receipt: 01-08-2025
Date of Report: 01-16-2025

ASBESTOS PLM REPORT

Location: 7358-09, Black Cove Base & Adhesive Lab ID-Version‡: 19366045-1

Sample Layers	Asbestos Content
Black Baseboard	ND
Dark Brown Mastic	ND
Yellow Mastic	ND
Semi-Transparent Mastic	ND
Composite Non-Asbestos Content:	< 1% Wollastonite
Sample Composite Homogeneity:	Poor

Location: 7358-10, Black Cove Base & Adhesive Lab ID-Version‡: 19366046-1

Sample Layers	Asbestos Content
Black Baseboard	ND
Dark Brown Mastic	ND
Yellow Mastic	ND
Semi-Transparent Mastic	ND
Composite Non-Asbestos Content:	< 1% Wollastonite
Sample Composite Homogeneity:	Poor

Location: 7358-11, Black Cove Base & Adhesive Lab ID-Version‡: 19366047-1

Sample Layers	Asbestos Content
Black Baseboard	ND
Dark Brown Mastic	ND
Yellow Mastic	ND
Semi-Transparent Mastic	ND
Composite Non-Asbestos Content:	< 1% Wollastonite
Sample Composite Homogeneity:	Poor

All components not quantified as asbestos content and non-asbestos content are considered to be non-fibrous matrix components. Matrix components may include, but are not limited to, gypsum, paint, silicate minerals, vinyl, binder, calcium carbonate, tar, and foam.

Inhomogeneous samples are separated into homogeneous subsamples and analyzed individually. ND means no fibers were detected. When detected, the minimum detection and reporting limit is less than 1% unless point counting is performed. Floor tile samples may contain large amounts of interference material and it is recommended that the sample be analyzed by gravimetric point count analysis to lower the detection limit and to aid in asbestos identification.
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Client: Terracon Consultants, Inc. - Utah
C/O: Bracken Snyder
Re: 61247358

Date of Sampling: 01-07-2025
Date of Receipt: 01-08-2025
Date of Report: 01-16-2025

ASBESTOS PLM REPORT

Location: 7358-12, Tan Cove Base & Adhesive

Lab ID-Version‡: 19366048-1

Sample Layers	Asbestos Content
Tan Cove Base	ND
Black/Yellow Mastic	ND
Composite Non-Asbestos Content:	< 1% Cellulose
Sample Composite Homogeneity:	Moderate

All components not quantified as asbestos content and non-asbestos content are considered to be non-fibrous matrix components. Matrix components may include, but are not limited to, gypsum, paint, silicate minerals, vinyl, binder, calcium carbonate, tar, and foam.

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(800) 651-4802 www.eurofinsus.com/Built

Client: Terracon Consultants, Inc. - Utah
C/O: Bracken Snyder
Re: 61247358

Date of Sampling: 01-07-2025
Date of Receipt: 01-08-2025
Date of Report: 01-16-2025

ASBESTOS PLM REPORT

Location: 7358-13, Tan Cove Base & Adhesive Lab ID-Version‡: 19366049-1

Sample Layers	Asbestos Content
Tan Cove Base	ND
Black/Yellow Mastic	ND
Composite Non-Asbestos Content:	< 1% Cellulose
Sample Composite Homogeneity:	Moderate

Location: 7358-14, Tan Cove Base & Adhesive Lab ID-Version‡: 19366050-1

Sample Layers	Asbestos Content
Tan Cove Base	ND
Black/Yellow Mastic	ND
Composite Non-Asbestos Content:	< 1% Cellulose
Sample Composite Homogeneity:	Moderate

Location: 7358-15, White Door Caulking Lab ID-Version‡: 19366051-1

Sample Layers	Asbestos Content
White Caulk	ND
Sample Composite Homogeneity:	Good

Location: 7358-16, White Door Caulking Lab ID-Version‡: 19366052-1

Sample Layers	Asbestos Content
White Caulk	ND
Sample Composite Homogeneity:	Good

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ASBESTOS PLM REPORT

Location: 7358-17, White Door Caulking Lab ID-Version‡: 19366053-1

Sample Layers	Asbestos Content
White Caulk	ND
Sample Composite Homogeneity:	Good

Location: 7358-18, Pipe Gasket Material Lab ID-Version‡: 19366054-1

Sample Layers	Asbestos Content
Black Gasket	ND
Sample Composite Homogeneity:	Good

Location: 7358-19, Pipe Gasket Material Lab ID-Version‡: 19366055-1

Sample Layers	Asbestos Content
Black Gasket	ND
Sample Composite Homogeneity:	Good

Location: 7358-20, Pipe Gasket Material Lab ID-Version‡: 19366056-1

Sample Layers	Asbestos Content
Black Gasket	ND
Sample Composite Homogeneity:	Good

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ASBESTOS PLM REPORT

Location: 7358-21, Gap Filler Lab ID-Version‡: 19366057-1

Sample Layers	Asbestos Content
Gray Sealant with White Surface	ND
Sample Composite Homogeneity:	Good

Location: 7358-22, Gap Filler Lab ID-Version‡: 19366058-1

Sample Layers	Asbestos Content
Gray Sealant with White Surface	ND
Sample Composite Homogeneity:	Good

Location: 7358-23, Gap Filler Lab ID-Version‡: 19366059-1

Sample Layers	Asbestos Content
Gray Sealant with White Surface	ND
Sample Composite Homogeneity:	Good

Location: 7358-24, Brick & Mortar Lab ID-Version‡: 19366060-1

Sample Layers	Asbestos Content
Red Brick	ND
Gray Mortar	ND
Sample Composite Homogeneity:	Moderate

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ASBESTOS PLM REPORT

Location: 7358-25, Brick & Mortar Lab ID-Version‡: 19366061-1

Sample Layers	Asbestos Content
Red Brick	ND
Gray Mortar	ND
Sample Composite Homogeneity:	Moderate

Location: 7358-26, Brick & Mortar Lab ID-Version‡: 19366062-1

Sample Layers	Asbestos Content
Red Brick	ND
Gray Mortar	ND
Sample Composite Homogeneity:	Moderate

Location: 7358-27, Concrete Lab ID-Version‡: 19366063-1

Sample Layers	Asbestos Content
Gray Concrete	ND
Sample Composite Homogeneity:	Moderate

Location: 7358-28, Concrete Lab ID-Version‡: 19366064-1

Sample Layers	Asbestos Content
Gray Concrete	ND
Sample Composite Homogeneity:	Moderate

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Date of Sampling: 01-07-2025
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ASBESTOS PLM REPORT

Location: 7358-29, Drywall Lab ID-Version‡: 19366065-1

Sample Layers	Asbestos Content
White Drywall with Brown Paper and Paint	ND
Composite Non-Asbestos Content:	10% Cellulose
Sample Composite Homogeneity:	Good

Location: 7358-30, Drywall Lab ID-Version‡: 19366066-1

Sample Layers	Asbestos Content
White Drywall with Brown Paper and Paint	ND
Composite Non-Asbestos Content:	10% Cellulose
Sample Composite Homogeneity:	Good

Location: 7358-31, Drywall Lab ID-Version‡: 19366067-1

Sample Layers	Asbestos Content
White Drywall with Brown Paper and Paint	ND
Composite Non-Asbestos Content:	10% Cellulose
Sample Composite Homogeneity:	Good

Location: 7358-32, Cement Lab ID-Version‡: 19366068-1

Sample Layers	Asbestos Content
Gray Cementitious Material	ND
Sample Composite Homogeneity:	Good

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ASBESTOS PLM REPORT

Location: 7358-33, Cement Lab ID-Version‡: 19366069-1

Sample Layers	Asbestos Content
Gray Cementitious Material with Paint	ND
Sample Composite Homogeneity:	Good

Location: 7358-34, Cement Lab ID-Version‡: 19366070-1

Sample Layers	Asbestos Content
Gray Cementitious Material	ND
Sample Composite Homogeneity:	Good

Location: 7358-35, Epoxy Floor Lab ID-Version‡: 19366071-1

Sample Layers	Asbestos Content
Gray Flooring with Paint	ND
Sample Composite Homogeneity:	Good

Location: 7358-36, Epoxy Floor Lab ID-Version‡: 19366072-1

Sample Layers	Asbestos Content
Gray Flooring with Paint	ND
Sample Composite Homogeneity:	Good

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ASBESTOS PLM REPORT

Location: 7358-37, Epoxy Floor Lab ID-Version‡: 19366073-1

Sample Layers	Asbestos Content
Gray Flooring with Paint	ND
Sample Composite Homogeneity:	Good

Location: 7358-38, Gap Filler Lab ID-Version‡: 19366074-1

Sample Layers	Asbestos Content
Gray Non-Fibrous Material	ND
Sample Composite Homogeneity:	Good

Location: 7358-39, Gap Filler Lab ID-Version‡: 19366075-1

Sample Layers	Asbestos Content
Black Semi-Fibrous Material	ND
Composite Non-Asbestos Content:	< 1% Cellulose
Sample Composite Homogeneity:	Good

Location: 7358-40, Gap Filler Lab ID-Version‡: 19366076-1

Sample Layers	Asbestos Content
Black Semi-Fibrous Material	ND
Composite Non-Asbestos Content:	< 1% Cellulose
Sample Composite Homogeneity:	Good

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ASBESTOS PLM REPORT

Location: 7358-41, Pipe Gasket Materia Lab ID-Version‡: 19366077-1

Sample Layers	Asbestos Content
Black Gasket	ND
Sample Composite Homogeneity:	Good

Location: 7358-42, Pipe Gasket Materia Lab ID-Version‡: 19366078-1

Sample Layers	Asbestos Content
Orange Gasket with Paint	ND
Sample Composite Homogeneity:	Good

Location: 7358-43, Pipe Gasket Materia Lab ID-Version‡: 19366079-1

Sample Layers	Asbestos Content
Orange Gasket with Paint	ND
Sample Composite Homogeneity:	Good

Location: 7358-46, Insulation Tape Lab ID-Version‡: 19366082-1

Sample Layers	Asbestos Content
Semi-Transparent Mastic	ND
Silver Tape	ND
Composite Non-Asbestos Content:	15% Cellulose
Sample Composite Homogeneity:	Moderate

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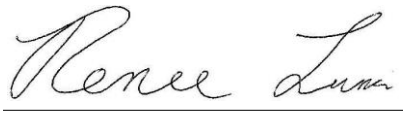
ASBESTOS PLM REPORT

PROJECT ANALYSTS AND SIGNATORY REPORT

Project Analysts

Analyst: Aaron Agajanian

Analyst: Jason Bosse



Analyst: Renee Luna-Trepczynski

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Built Environment Testing

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Central: (800) 651-4802
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003906210

ASBESTOS ANALYSIS

REQUESTED SERVICES (Check boxes below)

CONTACT INFORMATION

Company:	Terracon	Address:	6952 High Tech Dr. Midvale, Utah
Contact:	Bracken Snyder	Special Instructions:	Please email results to bracken.snyder@terracon.com
Phone:	(407) 840-7545		

PROJECT INFORMATION

Project ID:	61247358		
Project Description:	Jordan Valley water treatment plant Filter Building		
Project Zip Code:	84065	Sampling Date & Time:	1/7/25
PO Number:	61247358	Sampled By:	Bracken Snyder

TURN AROUND TIME CODES (TAT)

- **STD** – Standard (DEFAULT)
- **ND** – Next Business Day
- **SD** – Same Business Day Rush*

*Please call Client Services for locations with Rush services

Rushes received after 2pm or on weekends, will be considered received the next business day. Please alert us in advance of weekend analysis needs.

Sample ID	Description	Sample Type (Below)	TAT (Above)	Total Volume (Air Samples only)	Notes	Air: Fiber Count (NIOSH 7400)	Air: OSHA with TWA	PLM Bulk: Asbestos Bulk PLM	PLM Bulk: EPA Point Count (200 Point Count)	PLM Bulk: EPA Point Count (400 Point Count)	PLM Bulk: EPA Point Count (1000 Point Count)	PLM Bulk: Gravimetric Point Count (400 Pt Count)	PLM Bulk: Gravimetric Point Count (1000 Pt Count)	Rock & Soil: CARB 435 Method (400 Point Count)	Rock & Soil: CARB 435 Method (1000 Point Count)	Other Requests: Lead Analysis – Flame AA	Other Requests	Other Requests
358-#	Please see attached Chain for Sample ID's + Descriptions	B	STD	—		☐	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

SAMPLE TYPE CODES		RELINQUISHED BY	DATE & TIME	RECEIVED BY	DATE & TIME
A – Air	W – Wipe	[signature]	1/7/25 15:30	Dyan Zamora	1/8/25 1030AM
B – Bulk	T – Tape				
D – Dust	R – Rock				
SO – Soil	O – Other				

By submitting this Chain of Custody, you agree to be bound by the terms and conditions set forth at: https://www.eurofinsus.com/environment-testing/built-environment/resources/sampling-guides-and-forms/

Project # / Task 0184735

Project Name Jordan Valley Water Treatment Plant Filter Building

Inspector(s) Bracken Snyder

Date 1/7/2025

Terracon

HA	Material Description	Material Location	Sample #	Sample Locatic	Category	Quantity
1	CMU Block Filler	Chlorine Room - Throughout	7358- 01	[redacted] Wall, Centered		2650SF
			7358- 02	NW Corner		
			7358- 03	E wall Centered		
			7358- 04	SE Corner		
			7358- 05	W wall Centered		
2	Cement / Concrete	Throughout (Chlorine Room)	7358- 06	Tub wall, Semi East corner		~500SF
			7358- 07	West wall, Centered		
			7358- 08	Semi entry Step		
3	Black cove base + adhesive	Chlorine Room	7358- 09	East wall, South Centered		200LF
			7358- 10	"		
			7358- 11	"		
4	Tan cove base + adhesive	Chlorine Room	7358- 12	Pump Room, NW Corner		100LF
			7358- 13	"		
			7358- 14	"		
5	White Door Caulking	Chlorine Room	7358- 15	West Entry Door		100LF
			7358- 16	"		
			7358- 17	"		

003906210

Dyani Zamora 1/8/25

LOCATION

1 = Category I non-friable asbestos-containing material (packings, gaskets, resilient floor coverings and asphalt roofing products)
2 = Category II non-friable asbestos-containing material (any material not specified in Category I)
3 = Regulated asbestos-containing material (RACM) (friable material or none friable but likely to become friable)

Project # / Task
Project Name
Inspector(s)
Date

Terracon

003906210

HA	Material Description	Material Location	Sample #	Sample Location	Category	Quantity
6	Pipe Gasket Material	Chlorine Room	7358- 18	East wall, South end on ductwork		10 SF
			-19	"		
			-20	"		
7	[redacted] Gasp Filter	Chlorine Room	-21	East wall, South corner on pipe		100 LF
			-22	" " "		
			-23	West wall " " "		
8	Brick & Mortar	Chlorine Dock	-24	Chlorine Dock, SE corner		
			-25	"		
			-26	"		
9	Concrete	Chlorine Dock	-27	Chlorine Dock, East wall, South corner		
			-28	" "		
10	Drywall	Maintenance office	-29	Maintenance office - SEC		
			-30	" " "		
			-31	" " "		

Dyan Zamora 4/8/25
10304pm

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3 = Regulated asbestos-containing material (RACM) (friable material or none friable but likely to become friable)

Project # / Task
Project Name
Inspector(s)
Date

Terracon

HA	Material Description	Material Location	Sample #	Sample Location		
11	Cement	Maintenance office, Boiler Room, Filter Gallery	7358 - 32	Boiler Room - W wall Centered		
			- 33	Filter Gallery - RM 1 NE C		
			- 34	Filter Gallery - RM2 NE C		
12	epoxy Floor	Maintenance office	- 35	Mechanic Office E Centered		
			- 36	" " "		
			- 37	" " "		
13	Gap Filter	Throughout	- 38	Boiler Room, west Centered		
			- 39	Filter Gallery - doorway between RM1 & RM2		
			- 40	" " "		
14	Pipe gasket Material	Throughout	- 41	Boiler Room, west Centered		
			- 42	Filter Gallery - RM1, SE corner		
			- 43	" " - RM2, SE corner		
15	Insulation Tape	Throughout	- 44	Filter Gallery, RM2 - SE corner		
			- 45	" " "		
			- 46	" " NE corner		

003906210

Dyani Zamora 10/8/25 1030AM

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Appendix D
Photo Logs

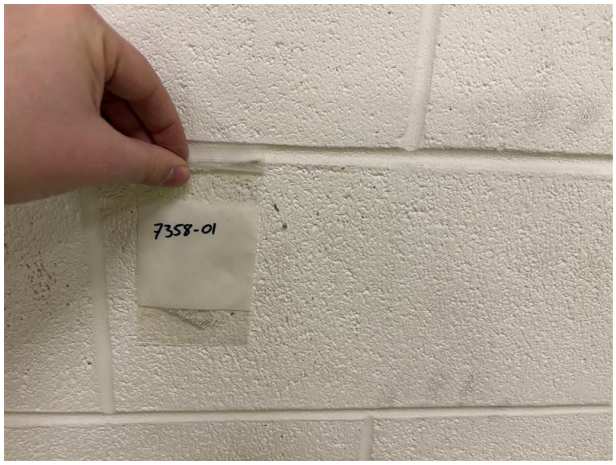


Photo #1 HA-01: CMU Block Filler, not asbestos containing

Photo #2 HA-02: Cement in Chlorine Room, not asbestos containing

Photo #3 HA-03: Black cove base and mastic, not asbestos containing

Photo #4 HA-04: Tan cove base and mastic, not asbestos containing

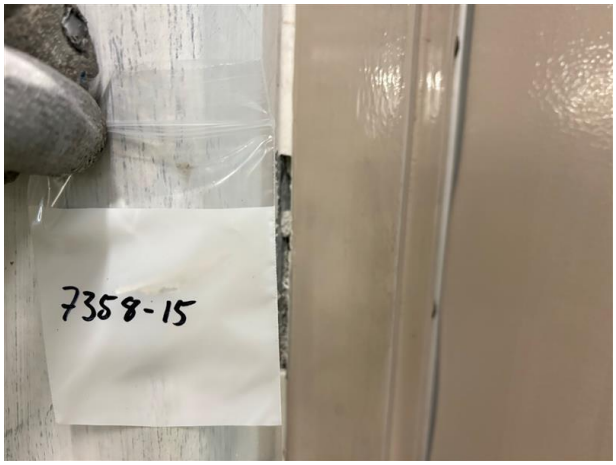


Photo #5 HA-05: White door caulking, not asbestos containing

Photo #6 HA-06: Pipe gasket material in Chlorine Room, not asbestos containing

Photo #7 HA-07: Gap filler in Chlorine Room, not asbestos containing

Photo #8 HA-08: Brick and mortar, not asbestos containing

Photo #9 HA-09: Concrete in Loading Dock, not asbestos containing

Photo #10 HA-10: Drywall system, not asbestos containing

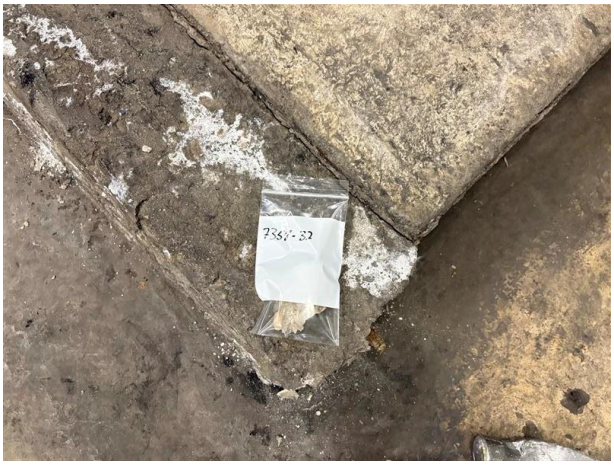


Photo #11 HA-11: Cement in basement, not asbestos containing

Photo #12 HA-12: Epoxy floor, not asbestos containing

Photo #13 HA-13: Gap filler in basement, not asbestos containing

Photo #14 HA-14: Pipe gasket material in basement, not asbestos containing

Photo #15 Chlorine storage rack—Lead concentration: 0.11 mg/cm^2

Photo #16 Chlorine storage rack anchor—Lead concentration: 0.10 mg/cm^2

Photo #17 Chlorine room big doors—Lead concentration: 0.07 mg/cm^2

Photo #18 Chlorine storage room hoist rail—Lead concentration: 0.08 mg/cm^2

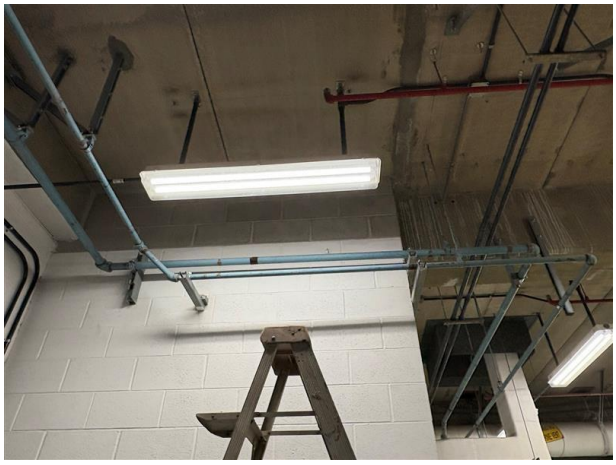


Photo #19 Chlorine room boiler piping—Lead concentration: 1.53 mg/cm^2

Photo #20 Chlorine room blue valve—Lead concentration: 1.00 mg/cm^2

Photo #21 Chlorine loading dock bollard—Lead concentration: 5.00 mg/cm^2

Photo #22 Chlorine loading dock valve—Lead concentration: 5.00 mg/cm^2

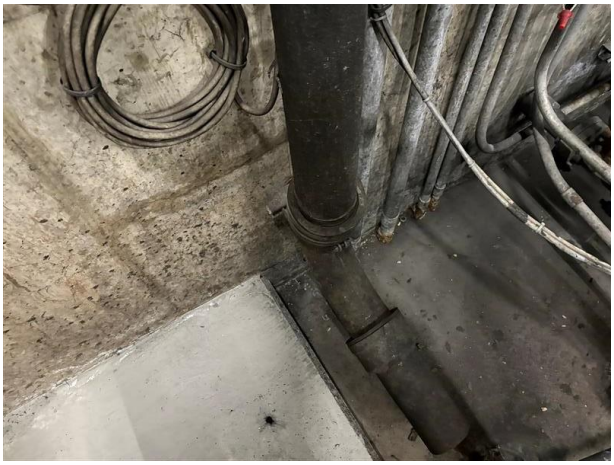


Photo #23 Maintenance office black piping—Lead concentration: 0.06 mg/cm^2

Photo #24 Maintenance office purple compressed air line—Lead concentration: 2.99 mg/cm^2

Photo #25 Filter gallery blue valve—Lead concentration 0.04 mg/cm^2

Photo #26 Filter gallery light blue and gray pump—Lead concentration: Light blue 0.04 mg/cm^2, dark gray 0.03 mg/cm^2

Photo #27 Filter gallery light blue pipe—Lead concentration 0.04 mg/cm^2

Photo #28 Filter gallery light blue valve—Lead concentration: 0.05 mg/cm^2

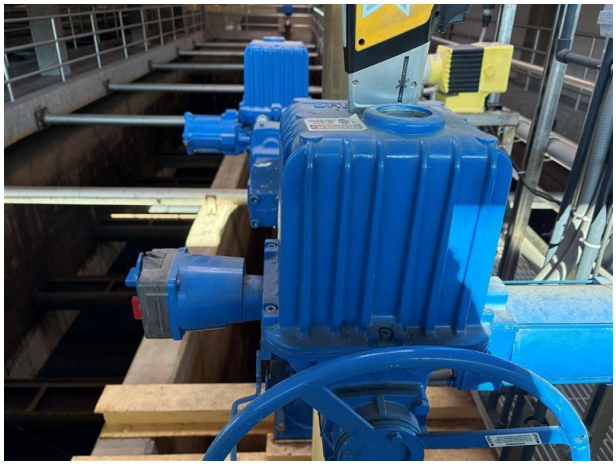


Photo #29 Filter deck blue valve—Lead concentration: 0.26 mg/cm^2

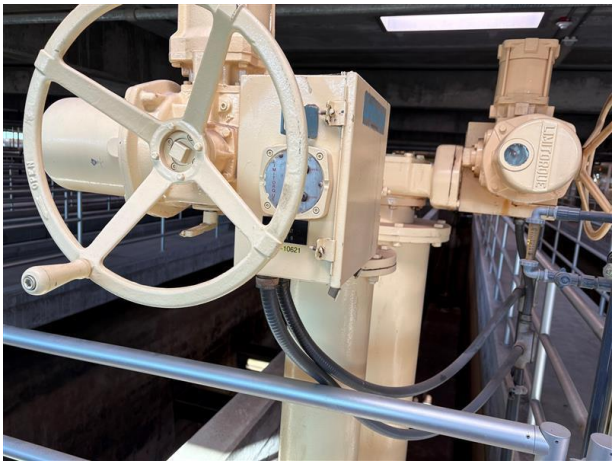


Photo #30 Filter deck tan valve—Lead concentration: 0.06 mg/cm^2

Photo #31 January 31, 2025: Filter Gallery old side, south side teal backwash header pipe running north-south—Lead concentration: 3.70 mg/cm^2

Photo #32 January 31, 2025: Filter Gallery old side, south side teal backwash header pipe running east-west—Lead concentration: 3.72 mg/cm^2

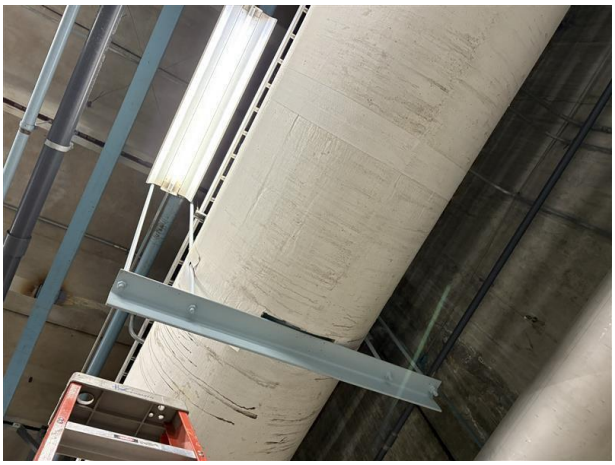


Photo #33 January 31, 2025: Filter Gallery old side, north side teal backwash header pipe running east-west—Lead concentration: 0.06 mg/cm^2

Photo #34 January 31, 2025: Filter gallery old side, two tone pipe –Lead concentration: White 0.47 mg/cm^2, light blue 0.24 mg/cm^2

Photo #35 January 31, 2025: Filter Gallery old side, light blue electrics cover on gray pump—Lead concentration: 0.32 mg/cm^2

Photo #36 January 31, 2025: Filter gallery new side, gray pipe hanger on south backwash header—Lead concentration: 0.11 mg/cm^2

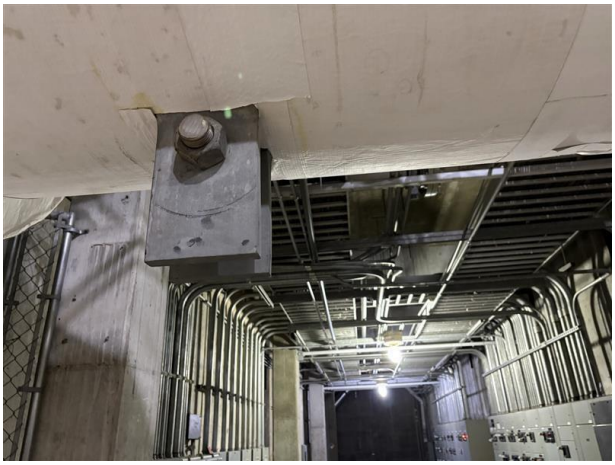


Photo #37 January 31, 2025: Filter gallery new side, gray pipe hanger on south backwash header—Lead concentration: 0.09 mg/cm^2

Photo #38 January 31, 2025: Filter gallery new side, gray pipe hanger on north backwash header—Lead concentration: 0.10 mg/cm^2

Appendix E
Lead Inspection Data Sheets

Measurement	Location	Component	Substrate	Color	Side	Result (mg/cm^2)
1	internal calibration	-	-	-	-	PASS
2	calibration	-	-	-	-	1.02
3	calibration	-	-	-	-	1.04
4	calibration	-	-	-	-	1.06
5	Chlorine room	Wall	CMU	White	D	0.00
6	Chlorine room	Wall	Cement	White	D	0.00
7	Chlorine room	Window	Metal	Brown	D	0.00
8	Chlorine room	Door frame	Metal	Brown	D	0.00
9	Chlorine room	Wall	Plater	White	D	0.00
10	Chlorine room	Wall	CMU	White	B	0.00
11	Chlorine room	Potable water pipe	Metal	Blue	A	0.00
12	Chlorine room	Chlorine tub wall (north)	Cement	Yellow	-	0.00
13	Chlorine room	Chlorine tub wall (south)	Cement	Yellow	-	0.00
14	Chlorine room	Fire suppression piping	Metal	Red	B	0.00
15	Chlorine room	Power outlet	Metal	Black	B	0.00
16	Chlorine room	Wall	CMU	White	B	0.00
17	Chlorine room	Ventilation	Fiberglass	White	B	0.00
18	Chlorine room	Support beam	Metal	White	B	0.00
19	Chlorine room	Entry step	Cement	Yellow	-	0.00
20	Chlorine room	Entry door	Metal	Brown	C	0.00
21	Chlorine room	Metal support	Metal	White	C	0.00
22	Chlorine room	Wall	CMU	White	C	0.00
23	Chlorine room	Storage racks	Metal	Gray	-	**0.11**

Measurement	Location	Component	Substrate	Color	Side	Result (mg/cm^2)
24	Chlorine room	Storage rack anchor	Metal	Gray	-	**0.10**
25	Chlorine room	Storage rack anchor	Metal	Green	-	0.00
26	Chlorine room	Big door bar	Metal	Orange	-	0.00
27	Chlorine room	Big door	Metal	Brown	-	**0.07**
28	Chlorine room	Hoist rail	Metal	Brown	-	**0.08**
29	Chlorine room	Boiler piping	Metal	Blue	-	**1.53**
30	Chlorine room	Wall	Cove base	Black	D	0.00
31	Chlorine room	Wall	Cove base	Tan	D	0.00
32	Chlorine room	Valve	Metal	Blue	-	**1.00**
33	Clorine loading dock	Floor	Concrete	Red	-	0.00
34	Clorine loading dock	Floor	Concrete	Yellow	-	0.00
35	Clorine loading dock	Bollard	Metal	Yellow	D	**5.00**
36	Clorine loading dock	Valve and pipe	Metal	Yellow	D	0.00
37	Clorine loading dock	Valve	Metal	Yellow	D	**5.00**
38	Clorine loading dock	Eye wash station	Metal	Yellow	D	0.00
39	Clorine loading dock	Teal pipe	Metal	Teal	D	0.00
40	Clorine loading dock	Collapsable barrier	Metal	Yellow	-	0.00
41	Clorine loading dock	Barrier base	Metal	Yellow	-	0.00
42	Maintenance room	Pump	Metal	Red	C	0.00
43	Maintenance room	Piping	Metal	Green	C	0.00
44	Maintenance room	Motor	Metal	Red	C	0.00
45	Maintenance room	Piping	Metal	Black	C	**0.06**
46	Maintenance room	Piping	Metal	Blue	C	0.00

Measurement	Location	Component	Substrate	Color	Side	Result (mg/cm^2)
47	Maintenance room	Compressed air line	Metal	Purple	C	**2.99**
48	Maintenance room	Natural gas line	Metal	Yellow	C	0.00
49	Boiler room	Water line	Metal	Teal	D	0.00
50	Boiler room	Valve	Metal	Red	D	0.00
51	Boiler room	Valve	Metal	Gray	D	0.00
52	Boiler room	Feeder tank	Cement	White	-	0.00
53	Boiler room	Blue line	Metal	Blue	-	0.00
54	Filter gallery	Flow to waste line	Metal	Tan	-	0.00
55	Filter gallery	Valve	Metal	Blue	-	**0.04**
56	Filter gallery	Valve	Metal	Blue	-	**0.06**
57	Filter gallery	Floor	Cement	Yellow	-	0.00
58	Filter gallery	Gray pump	Metal	Gray	-	0.00
59	Filter gallery	Gray pump	Metal	Gray	-	0.00
60	Filter gallery	Well	Cement	Blue	-	0.00
61	Filter gallery	Well	Cement	Yellow	-	0.00
62	Filter gallery	Pump	Metal	Dark gray	-	**0.03**
63	Filter gallery	Pump	Metal	Light blue	-	**0.04**
64	Filter gallery	Light blue line	Metal	Light blue	-	0.00
65	Filter gallery	Pump base	Metal	White	-	0.00
66	Filter gallery	Light blue pipe	Metal	Blue	-	**0.04**
67	Filter gallery	Light blue valve	Metal	Blue	-	**0.05**
68	Filter gallery	Pump	Metal	Blue	-	0.00
69	Filter gallery	Pump base	Metal	Blue	-	0.00
70	Filter gallery	Piping	Metal	Tan	-	0.00
71	Filter gallery	Pipe base	Metal	Tan	-	0.00

Measurement	Location	Component	Substrate	Color	Side	Result (mg/cm^2)
72	Filter gallery	Pipe tub	Cement	Gray	-	0.00
73	Filter deck	Beige valve	Metal	Beige	-	**0.06**
74	Filter deck	Blue valve	Metal	Blue	-	**0.26**
75	Calibration	-	-	-	-	1.09
76	Calibration	-	-	-	-	1.07
77	Calibration	-	-	-	-	1.06

Key:

A = North, B = East, C = South, D = West

mg/cm^2 = milligrams per square centimeter of surface area

Measurement	Location	Component	Substrate	Color	Side	Result (mg/cm^2)
1	internal calibration	-	-	-	-	PASS
2	calibration	-	-	-	-	1.02
3	calibration	-	-	-	-	1.02
4	calibration	-	-	-	-	1.03
5	Filter gallery, east side (old side)	Backwash header, south end; pipe running north-south	Metal	Teal	B	**3.70**
6	Filter gallery, east side (old side)	Backwash header, south end; pipe running east-west	Metal	Teal	C	**3.72**
7	Filter gallery, east side (old side)	Backwash header, south end; pipe running east-west	Metal	Light blue	C	0.00
8	Filter gallery, east side (old side)	Pipe hanger: backwash header, south side	Metal	Light blue	C	0.00
9	Filter gallery, east side (old side)	Pipe hanger: backwash header, north side	Metal	Light blue	A	0.03
10	Filter gallery, east side (old side)	Backwash Header, north side; pipe running east-west	Metal	Light blue	A	**0.06**

Measurement	Location	Component	Substrate	Color	Side	Result (mg/cm^2)
11	Filter galley, east side (old side)	Electronics cover on gray pump	Metal	Light blue	A	**0.32**
12	Filter galley, east side (old side)	Two tone (light blue/white) pipe	Metal	White	C	**0.47**
13	Filter galley, east side (old side)	Light blue (light blue/white) pipe	Metal	Light blue	C	**0.24**
14	Filter galley, east side (old side)	Light blue filtered water pipe	Metal	Light blue	C	0.00
15	Filter gallery, west side (new side)	Backwash header, south side: pipe running east–west	Metal	Red	C	0.00
16	Filter gallery, west side (new side)	Backwash header, south side: pipe running east–west	Metal	Red	C	0.00
17	Filter gallery, west side (new side)	Backwash header, north side: pipe running east–west	Metal	Red	A	0.00
18	Filter gallery, west side (new side)	Pipe exiting filter tank, south side	Metal	Red	A	0.00
19	Filter gallery, west side (new side)	Pipe exiting filter tank, north side	Metal	Red	C	0.00

Measurement	Location	Component	Substrate	Color	Side	Result (mg/cm^2)
20	Filter gallery, west side (new side)	Pipe hanger: backwash header, south side	Metal	Gray	C	**0.11**
21	Filter gallery, west side (new side)	Pipe hanger: backwash header, south side	Metal	Gray	C	**0.09**
22	Filter gallery, west side (new side)	Pipe hanger: backwash header, north side	Metal	Gray	A	**0.10**
23	Calibration	-	-	-	-	1.03
24	Calibration	-	-	-	-	1.04
25	Calibration	-	-	-	-	1.01

Key:

A = North, B = East, C = South, D = West,

mg/cm^2 = milligrams per square centimeter of surface area

Appendix F
Universal Hazardous Waste Removal Cost Estimates

Material	Location	Quantity	Approximate Removal Cost
Fluorescent lamps, 4-foot or less	Throughout	136	$238.00
Light ballasts	Throughout	68	$1,269.56
Light-Emitting Diode (LED)	Loading dock and filter gallery	34	$340.00
Motion sensors	Throughout	6	$60.00
Electric heaters	Throughout	7	$111.77
Hot water heater	Boiler room	1	$150.00
Emergency exit signs	Basement	1	$250.00
Cationic polymer tote	Boiler room	330 Gal	$7,500.00
Poly-aluminum chloride tote	Boiler room	330 Gal	$7,500.00
Chlorine tanks	Chlorine room	18	$12,150.00
Misc chemicals	Throughout	10	$225.00
		Total	**$29,794.33**

Notes:

1. Terracon can provide a follow-up visit to ensure these materials were removed and properly disposed of or recycled for a minimal additional cost.

2. Terracon can provide services to bid for removal of these items to local qualified contractors at an additional cost.

Appendix G

Certifications

State of Utah

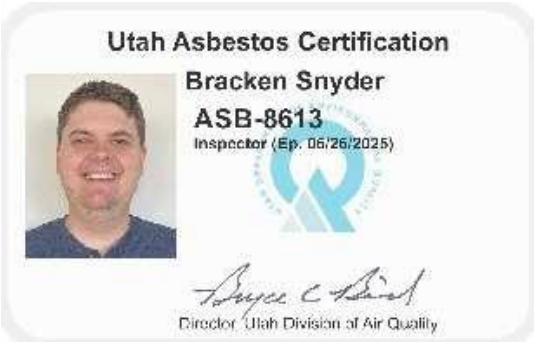
SPENCER J. COX
Governor

DEIDRE HENDERSON
Lieutenant Governor

Department of
Environmental Quality

Kimberly D. Shelley
Executive Director

DIVISION OF AIR QUALITY
Bryce C. Bird
Director



July 11, 2024

DAQA-001-24

Bracken Snyder
Terracon Consultants
6952 South High Tech Drive, Suite B
Midvale, UT 84047

Dear Mr. Snyder:

Re: Utah Asbestos Program Individual Certification Card

The Utah Division of Air Quality (DAQ) has reviewed your Utah Asbestos Program Certification Application for Individuals and we are pleased to inform you that your application has been approved. Your new asbestos program individual certification card is enclosed with this letter and this card is the sole method of individual certification documentation that you will receive from the DAQ.

Please check the information on your asbestos program certification card carefully. Please confirm that the photograph, name, and certification discipline(s) are correct. Also, please remember to keep your current asbestos program certification card with you at all times when you are performing regulated asbestos work activities.

Please contact Barbara Perkins at (801) 536-0221 or at bperkins@utah.gov if you have any questions regarding this letter or the enclosed asbestos program certification card.

Sincerely,

Leonard Wright (Jul 10, 2024 14:47 MDT)

Leonard Wright, Manager
Air Toxics, Lead-Based Paint, and Asbestos Section

LW:BP:lr

State of Utah

GARY R. HERBERT
Governor

SPENCER J. COX
Lieutenant Governor

Department of
Environmental Quality

L. Scott Baird
Executive Director

DIVISION OF AIR QUALITY
Btyce C. Bird
Director

Utah Department of Environmental Quality
Division of Air Quality
The Utah Division of Air Quality certifies that:
Terracoli Consultants, Inc
is hereby **certified as an asbestos company in** accordance **with the provisions of Utah Administrative Code R307-801**
Certification number: **ASB-289**
Expiration date: **03/31/25**
Director, Utah Division of Air Quality

March 19, 2020 DAQA-003-20

John Murphy
Terracon Consultants
6949 South High Tech Drive
Midvale, UT 84047

Dear Mr. Murphy:

Re: Utah Asbestos Company Certification Card

The Utah Division of Air Quality (DAQ) has received your Certification Application for Asbestos Company and we are pleased to inform you that your application has been approved. Your new Asbestos company certification card is enclosed with this letter and this card is the sole method of Asbestos company certification documentation that you will receive from the DAQ. Please check the information on your asbestos company certification card carefully and please confirm that the company name and certification expiration date are correct.

Please be aware that your company is certified to perform asbestos projects in accordance with applicable state and federal rules and the use of Utah certified individuals is mandatory. Also, your certification may be revoked or suspended if the Utah certified individual or company are found to be in violation of the asbestos certification and work practices standards found in Utah Administrative Code R307-801 or the National Emission Standard for Asbestos found in Title 40 Code of Federal Regulations Part 61 Subpart M.

Please contact Tamie Call at (801) 536-4007 or at twcall@utah.gov if you have any questions about this letter or the enclosed asbestos company certification card.

Sincerely,

Leonard Wright, Manager
Air Toxics, Lead-Based Paint, and Asbestos Section

LW:TC:lr

APPENDIX C - GATE OPERATOR INSTALLATION AND OPERATION MANUAL

AutoGate, Inc.

7306 Driver Road

P.O. Box 50

Berlin Heights, OH 44814

PH: 1.800.944.4283

FAX: 419.588.3514

www.AutoGate.com

Installation & Operation Manual

Vertical Pivot (VP) Gate System

VPL-24

This product is to be installed and serviced by a trained Gate Systems Technician only. Contact AutoGate for a local professional in your area.

Before attempting to install, operate or maintain the operator you MUST read and fully understand this manual and follow all safety instructions.

Table of Contents

WARNING!

TO REDUCE THE RISK OF INJURY OR DEATH, READ AND FOLLOW ALL INSTRUCTIONS!

REDUCE RISK

1. Never let children operate or play with gate controls. Keep the remote control away from children.
2. At NO time should the gate panel be modified in any way.
3. Any mounted signs should weigh less than 4 lbs. Contact AutoGate prior to mounting on gate panel for guidance.
4. Always keep people and objects away from the gate. NO PERSON NOR OBJECT SHOULD CROSS THE PATH OF THE MOVING GATE.
5. Test the gate operator monthly. The gate MUST reverse on contact with a rigid object or stop when an object activates the non-contact sensors or contact sensor. After adjusting the force or the limit of travel, reset the gate operator. Failure to adjust and reset the gate operator properly can increase the risk of injury or death. Use the belt tension lever release only when the gate is not moving and powered down.
6. KEEP GATES PROPERLY MAINTAINED. Read the owner's manual. Have a qualified service person make repairs to gate hardware.
7. This gate system is for vehicles only. PEDESTRIANS MUST USE A SEPARATE ENTRANCE!

SAVE THESE INSTRUCTIONS

AUTOMATIC GATE OPERATORS CAN PRODUCE HIGH LEVELS OF FORCE, THEREFORE IT IS VERY IMPORTANT THAT ALL GATE OPERATOR SYSTEM INSTALLERS AND DESIGNERS ARE FULLY AWARE OF POTENTIAL HAZARDS THAT EXIST WITH AN INCORRECTLY INSTALLED OR DESIGNED SYSTEM. THE INTERNAL SAFETY CAPABILITIES OF A GATE OPERATOR SYSTEM ARE NOT ENOUGH TO REDUCE THE RISK OF INJURY. THE OPERATOR IS ONLY ONE PART OF A PROPERLY INSTALLED SYSTEM WHICH WHEN COMBINED WITH CORRECTLY INSTALLED REVERSING DEVICES WILL YIELD A COMPLETE UL-325/CSA 22.2 NO. 247 LISTED SYSTEM THAT WILL NOT ONLY PROVIDE CONVENIENCE AND SECURITY, BUT WILL BE SAFER WITH A MINIMAL RISK OF INJURY. THE FOLLOWING INFORMATION CONTAINED IN THIS MANUAL ALONG WITH THE INSTALLATION CHECKLIST PROVIDED TO MAKE YOU AWARE OF POTENTIAL AREAS THAT ARE OF A SAFETY CONCERN. DISREGARDING ANY OF THE FOLLOWING MAY RESULT IN **SERIOUS INJURY OR DEATH!**

WARNING!

TO REDUCE THE RISK OF INJURY OR DEATH, READ AND FOLLOW ALL INSTRUCTIONS!

ADDITIONAL SAFETY INSTRUCTIONS FOR INSTALLER AND OWNER

Proper design is important in your system layout and installation. Reversing devices must be used at all available points where injury or property damage may occur. For protection from injury to persons, use Photo Electric Eye(s) or optional Pressure Sensing Edge on the leading edge of the gate. Reversing Loops (Vehicle Detectors) should be installed in front of and behind the gate to provide a reverse signal or stop signal to the gate operator. All Reversing devices should be tested and inspected weekly. If a Reversing device appears to not operate correctly, the unit should be disabled until repair can be made by a properly trained/experienced service company.

As the system installer, you must advise your customer/end user on the correct usage of the gate operator and the system. In providing the service of design/installation of the operator and system, you are responsible for proper training of the customer as well as for the proper SAFE OPERATION. All precautions to eliminate ALL hazards MUST be taken before the unit can be put into operation. You MUST advise and warn your customer of any hazards that remain or if they choose not to use any of the recommended Reversing devices in the installation and not to put the system into operation until safety and risk concerns have been resolved.

- Check the National, State & local building/fire codes **BEFORE** installation
- If you did not order a ***Reversing Edge*** (for along the bottom rail of your gate), or an ***Infra-Red Modulated Photocell*** (Reversing Beam), you will not be in compliance with March 2000 UL 325 Code, rev VI. Consult your dealer for additional information.
- Pedestrians ***must use*** a separate entrance/exit ***and never*** the vehicular entrance/exit gate.
- ***NEVER*** activate the gate from long distances where visibility of the gate cannot be seen. Anyone operating the gate should always operate it in a safe manner.
- ***NEVER*** allow children or anyone to play on or around the gate at any time.
- ***DO NOT*** affix any adhesive material within 30 days of receipt.
- ***DO NOT*** attach anything to gate over 4 pounds total weight or 4 square feet without consulting the factory re-balancing instructions. ***The gate must remain balanced to ensure safe and reliable operation.***
- The gate and operator are designed to work together. ***Do not*** attempt to install an unauthorized gate without factory authorization.
- ***DO NOT ALLOW*** any Access Control Devices to be mounted within 6 feet of the moving gate or in such a way that someone could reach their hand or arm through to gate to activate it.

WARNING!

THE GATE OPERATOR IS DESIGNED AND FACTORY BALANCED FOR THE SPECIFIC GATE IT WAS SUPPLIED WITH.

DO NOT MODIFY THE GATE IN ANY WAY OR ADD SIGNS WEIGHING MORE THAN 4 LBS TOTAL OR 4 SQUARE FT.

FAILURE TO COMPLY WITH THIS REQUIREMENT WILL VOID THE WARRANTY AND MAY RESULT IN SERIOUS INJURY OR DEATH.

INSTALLATION CHECK OFF LIST

IT IS RECOMMENDED THAT EACH ITEM ON THIS INSTALLATION CHECKOFF LIST BE DISCUSSED WITH THE CUSTOMER.

____FOUR WARNING SIGNS SECURELY INSTALLED, TWO ON EACH SIDE OF GATE VISABLE IN BOTH OPEN AND CLOSED POSTION..(REQUIRED)

____1 OR 2 REVERSING PHOTO BEAMS INSTALLED ACCORDING TO THEIR INSTRUCTIONS, ONE ACROSS EACH SIDE OF GATE OPENING IN AREAS THAT POSE ENTRAPMENT RISK. IF USING HARD WIRED CONTACT SENSORS, THE SENSOR(S)/WIRING MUST BE LOCATED /WIRED TO AVOID ANY MECHANICAL DAMAGE.

____INSTALL TWO GROUP 24, 12 VDC BATTERIES (REQUIRED) - DEEP CYCLE MARINE RECOMMENDED.

____CUSTOMER ADVISED THAT GATE IS FOR VEHICULAR TRAFFIC ONLY. (REQUIRED)

____A SEPARATE PEDESTRIAN ENTRY AND/OR EXIT IS PROVIDED. (REQUIRED)

____GATE GUARD / FENCED OFF AREA INSTALLED ON BACK SIDE OF OPERATOR. (REQUIRED)

____KICK PLATE INSTALLED ON DOOR SIDE OF OPERATOR. (REQUIRED)

____ALL ACTUATING CONTROLS LOCATED FAR OUT OF REACH OF OPERATOR & GATE (MINIMAL 6 feet). (REQUIRED)

____ENSURE THE CLASS OF OPERATOR IS APPROVED FOR THE APPLICATION OF THE OPERATOR (CLASS 1,2,3,4) (REQUIRED)

____ CONTROLS INTENDED TO RESET GATE AFTER OBSTRUCTED INSTALLED IN LINE OF SIGHT (REQUIRED)

____ FIELD WIRING SECURED TO AVOID PINCHING DAMAGE.

____CUSTOMER INSTRUCTED AND IS CLEAR ON PROPER USE OF GATE OPERATOR. (REQUIRED)

____CUSTOMER INSTRUCTED ON PROPER USE OF ALL CONTROL DEVICES USED WITH OPERATOR.

____SAFETY INSTRUCTIONS WERE REVIEWED AND LEFT WITH CUSTOMER. (REQUIRED)

____DISCUSS THE POTENTIAL FOR A PREVENTATIVE SERVICE AND MAINTENANCE CONTRACT.

____A PHOTO OF COMPLETED INSTALLATION TAKEN FROM FRONT AND BACK OF GATE & DATED.

____CUSTOMER TRAINED ON MANUAL OPERATION OF THE GATE. ADVISE CUSTOMER THAT FOR MANUAL OPERATION, THEY MUST DISCONNECT BATTERIES AND AC POWER.

____CUSTOMER ADVISED NOT TO DISCONECT THE UL 325 entrapment ALARM IN ANY WAY—SWITCH S1#6 AND S1#8 MUST STAY ON AT ALL TIMES.

____ARE UL 325 PEDESTRIAN WARNING SIGNS VISIABLE FROM BOTH SIDES OF GATE IN BOTH OPEN & CLOSED POSTIONS?

(TAMPERING WITH THE ALARM SWITCH SETTINGS MAY POSE THE RISK OF SERIOUS INJURY OR DEATH)

THIS GATE OPERATOR IS INSTALLED FOR USE AS A CLASS _____ INSTALLATION.

Operator Class Designation

CLASS I - RESIDENTIAL VEHICULAR GATE OPERATOR – A vehicular gate operator (or system) intended for use in garages or parking areas associated with a residence of one to four single families.

CLASS II – COMMERCIAL / GENERAL ACCESS VEHICULAR GATE OPERATOR – A vehicular gate operator (or system) intended for use in a commercial location or building such as a multi-family housing unit (five or more single family units), hotel, garages, retail store or other buildings accessible by or servicing the general public.

CLASS III – INDUSTRIAL / LIMITED ACCESS VEHICULAR GATE OPERATOR – A vehicular gate operator (or system) intended for use in an industrial location or building such as a factory or loading dock area or other locations not accessible by or intended to service the general public.

CLASS IV - RESTRICTED ACCESS VEHICULAR GATE OPERATOR – A vehicular gate operator (or system) intended for use in a guarded industrial location or building such as an airport security area or other restricted access locations not servicing the general public, in which unauthorized access is prevented via supervision by security personnel.

IT IS RECOMMENDED THAT CUSTOMER & INSTALLER MUST RETAIN A COPY OF THIS CHECK OFF LIST FOR THEIR RECORDS

SAFETY INSTRUCTIONS REGARDING PRIMARY & SECONDARY ENTRAPMENT PROTECTION

THIS UNIT IS EQUIPED WITH ONE PRIMARY MEANS OF ENTRAPMENT PROTECTION (SEE UL-325 SECTION 30 - A GATE OPERATOR SHALL PROVIDE 1 **PRIMARY** (INHERENT) AND 1 **SECONDARY** ENTRAPMENT FEATURE.

PRIMARY: TYPE A – INHERENT ENTRAPMENT SENSING SYSTEMS - THE VPL-24 WILL REVERSE DIRECTION WHEN THE INHERENT TYPE A DEVICE SENSES AN OBSTRUCTION.

SECONDARY: TYPE B1 – PROVISION FOR CONNECTION OF A NON-CONTACT SENSOR (PHOTOELECTRIC OR THE EQUIV-ALENT). TYPE B2— PROVISION FOR CONNECTION OF A CONTACT SENSOR (EDGE DEVICE OR EQUIVALENT).

NOTE: UNIT SHIPS WITH S1-6 ON & S1-8 OFF. DO NOT CHANGE THESE SETTINGS (SEE PAGE 12 FOR ILLISTRATION)

PRIMARY PROTECTION DESIGNATED TYPE A INHERENT PROTECTION. THE UNIT WILL REVERSE DIRECTION WHEN AN OBSTRUCTION IS SENSED WHILE MOVING IN EITHER DIRECTION. SENSITIVITY IS ADJUSTED AT IRD1 ON THE CONTROL BOARD. WHILE CLOSING, IF AN OBSTRUCTION IS SENSED BY THE PRIMARY INHERENT SENSOR, THE GATE WILL REVERSE AND OPEN TO THE FULL OPEN POSITION. THE GATE WILL REMAIN THERE UNTIL A CLOSE COMMAND IS RECEIVED OR WILL CLOSE BY TIMER AFTER NEW INPUT IS RECEIVED. IN ORDER FOR THE GATE TO CLOSE BY TIMER (IF ACTIVATED) A NEW INPUT ON TERMINALS J5 1-8 MUST BE GIVEN. IF AN INPUT IS STILL PRESENT WHEN THE GATE REACHED THE FULL OPEN POSITION, THIS INPUT WILL NEED TO BE RENEWED OR REMOVED AND ANOTHER INPUT GIVEN BEFORE THE CLOSE TIMER WILL CLOSE THE GATE.

ENTRAPMENT ALARM WILL ACTIVATE UPON THE PRIMARY INHERENT SENSOR SENSING A SECOND OBSTRUCTION BEFORE REACHING A LIMIT SWITCH. ONCE ACTIVATED, GATE WILL RE-MAIN AT REST, ALARM WILL SOUND. THIS CONDITION CAN ONLY BE CLEARED BY AN INPUT APPLIED TO J5#4. THE WIRING USED TO RESET THE OPERATOR MUST BE IN THE LINE OF SIGHT AND MUST BE AN “INTENDED” RESET. ACCESS CONTROL DEVICES OF ANY KIND THAT REQUIRE AN INTENDED (ON PURPOSE) ACTIVATION MAY BE USED FOR THIS RESET. DEVICES THAT WILL CAUSE AN INCIDENTAL RESET (VEHICLE DETECTORS, PROBES, TIMERS, MOTION SENSORS, PHOTO BEAMS, ECT…) MUST **NOT** BE USED. TURNING OFF DC BATTERY POWER **AND** TURNING OFF AC POWER AT THE GFCI SERVICE OUTLET WILL ALSO RESET THE CONTROL BOARD.

FAILURE TO COMPLY WITH THIS REQUIREMENT MAY RESULT IN SERIOUS INJURY OR DEATH.

IMPORTANT!

The secondary entrapment device must comply with UL 325, 6th edition effective criteria of Oct 14, 2013.

RECOMMENDED SECONDARY ENTRAPMENT DEVICES

PHOTO BEAMS

1)EMX INDUSTRIES	MODEL#: IRB-325	TRANSMITTER / RECEIVER TYPE
2)ALLEN BRADLEY	MODEL#: 60-2728	RETRO-REFLECTIVE TYPE
3)OMRON / MMTC	MODEL#: E3K-R10K4-NR	RETRO-REFLECTIVE TYPE

REVERSING EDGES (CONTACT EDGES)

MILLER EDGE MODEL— ME-120

WARNING!

DO NOT REMOVE THE TRANSPORT/MAINTENANCE SAFETY PIN UNTIL THE GATE IS SECURELY ATTACHED AND OPERATOR IS FASTENED TO THE CONCRETE PAD. THE OPERATOR ARM IS UNDER A GREAT DEAL OF TENSION & CAN CAUSE EXTREME DAMAGE AND INJURY IF RELEASED PREMATURELY!

Preparations Prior to Installation

SITE PREPARATION

Concrete Pads:

Concrete pads are required to install your VP Operator, & Yoke (See Dwg. #101), Along with securing the operator to the entry/exit point the pad provides a fixed and adequate foundation to resist many years of wind resistance and stability for many years of operation. Prior to pouring the concrete for the operator pad ensure the soil is undisturbed or compacted to local or governing standards.

4' X 7' Operator Pad Options:

1. Full Pad, Minimum depth of 36" or below *local* frost line (See Dwg. #102P).
2. 10"-12" thick pad with five (5) 12" dia. x 36" deep holes or below *local* frost line (See Dwg. #101).

NOTE: Operator pad MUST be poured level. Any exceptions MUST be communicated to AutoGate Engineering to ensure proper installation and operation. Yoke pad elevation details are special to your site conditions. Refer to your site drawings for specific information.

NOTE: All pads need to be level and smooth for ease of installation. Refer to (Dwg. #101) for all applicable conduit locations.

NOTE: Allow concrete to cure a min. of (3) three days before setting Operator & Gate Assembly.

INSTALLING GATE SYSTEM & ACCESSORIES

Recommended Installation Tools and Equipment for installing Gate, Operator, & Accessories

Lifting Strap	**Multi-Meter (DCV & AMPS)**
Hammer & Level	**Hammer Drill, 1/2 & 5/8 Bits**
Grease Gun, Lithium Grease	**Tape Measure**
Screwdriver Sets (Flat & Phillips)	**½" Drive Socket Set: 9/16", 3/4", 15/16", 1-1/8"**
Open End Wrenches: 9/16", 3/4", 15/16", 1-5/16"	
Wire Cutters/Strippers	**Electrical Tape**
Misc. Electrical Connectors	**Misc. 18 GA Strand**
Chalk Line	**Batteries**

NOTE: Refer to manufacturer's instructions of Accessory Equipment for correct wire size and type.
NOTE: (2) 12 VDC batteries are required and are not provided. Group 24 Deep cycle marine batteries are recommended.

RECEIVING YOUR VP GATE AND OPERATOR

Unloading & Unpacking - Gate weight per foot varies with gate style & height.

Product	**Approx. Weight**
Operator	1150 #
Steel Gate	24# / Ft.
Aluminum Gate	19# / Ft.

1. Have adequate equipment ready to unload your Gate & Operator safely (Forklift, Crane, Front End Loader or Wrecker with Telescoping Boom, see below Lifting Gate & Operator). (Utilize a Liftgate when available)
2. Before removing your Gate and Operator from the truck, inspect it for any visible damage and make sure the Gate Box was shipped upright. (**DO NOT DROP EITHER GATE OR OPERATOR BOX**) Photograph and retain if damaged in shipping. Note all damages on delivery receipt before unpacking, look for hidden damage as well.
3. After uncrating your operator, locate and remove the door lock keys attached to the Transport /Maintenance (T/M) Safety Pin (See Dwg. #103). DO NOT REMOVE T/M PIN, ONLY REMOVE HAIR PIN RETAINER.
4. The Transmitters, Antenna, ordered accessories, and Shipping Packet will be enclosed inside your operator.
5. Unpack Gate Panel crate in the same careful manner. Note and photograph any damages.

WARNING!

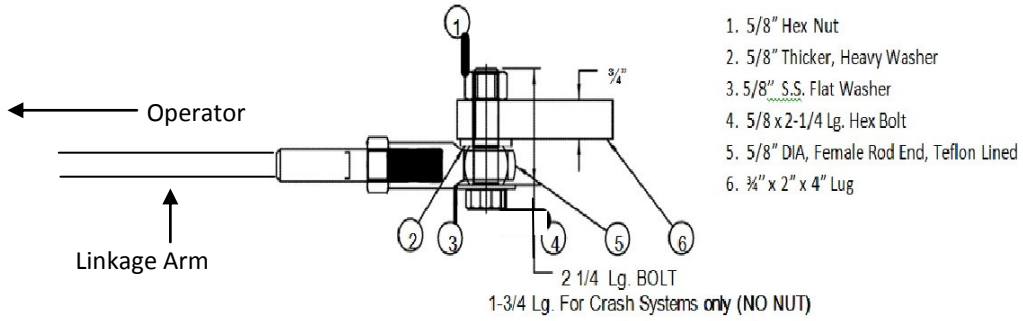
DO NOT REMOVE THE T/M SAFETY PIN UNTIL THE GATE IS SECURELY ATTACHED & OPERATOR IS FASTENED TO THE CONCRETE PAD. THE OPERATOR ARM IS UNDER A GREAT DEAL OF TENSION & CAN CAUSE EXTREME DAMAGE & INJURY IF RELEASED PREMATURELY!

INSTALLATION

INSTALLING VP GATE AND OPERATOR

Attaching the Gate to the Operator:

1. Position Gate on Operator Arm.
2. Use (1) 3/4"-10 x 4 1/2" (STEEL) or (1) 3/4"-10 x 5" (ALUMINUM) Bolt for the top connection. Use (4) 1/2 x 1-1/2" Bolts for the bottom connection.
3. Insert the top bolt first and then the bottom (4) bolts finger tight. Be certain gate is properly aligned before tightening. Tighten bottom bolts first, then tighten top bolt.
4. Locate washers and Linkage Pivot Bolt (5/8" x 2-1/4") and insert through rod end fitting and tighten bolt into the gate lug hole as shown below. You may have to push down on the gate to insert Linkage Bolt.



Lifting Gate & Operator:

To lift Gate & Operator, (Crane, Front End Loader, Forklift or Wrecker with Telescoping Boom) use a lifting strap. The strap should be secured around Operator Arm and T/M Safety Pin or the top rail of the gate near the operator arm. (See Dwg. #103).

NOTE: It is recommended to attach Gate to Operator Arm ***before*** lifting (for better balance), but it is not mandatory. If using a Forklift to position Operator only, lift from *sides* only! *Do not try to lift gate and operator together from the side* (See Dwg. #103).

Positioning Operator & Gate:

Refer to the site drawing for your specific order as there may be details unique to the installation.

1. Place Gate & Operator Assembly on pad so the end of the Gate is centered over the Yoke pad or intended yoke position for the site (for yoke styles mounted to posts, buildings, etc.). Allow a minimum 3" from edge of pad to bolt holes to prevent concrete damage (See Dwg. #101 & #102).
2. Position and align Pad Yoke and center under gate. (See Dwg. #101).
3. Secure ***Operator*** with (1) 5/8" dia. Wedge Bolt in rear; check alignment on pad as well as gate panel alignment.
4. Install remaining 3 or 4 5 1/2" x 5/8" dia. Concrete Anchor Bolts provided, (***level Gate & Operator on pad,*** if necessary.
5. Secure Yoke with 1/2" dia. Anchor bolts (provided).

NOTE: If installing a Ground Yoke, allow a minimum space of 2" between bottom of Gate and Yoke.

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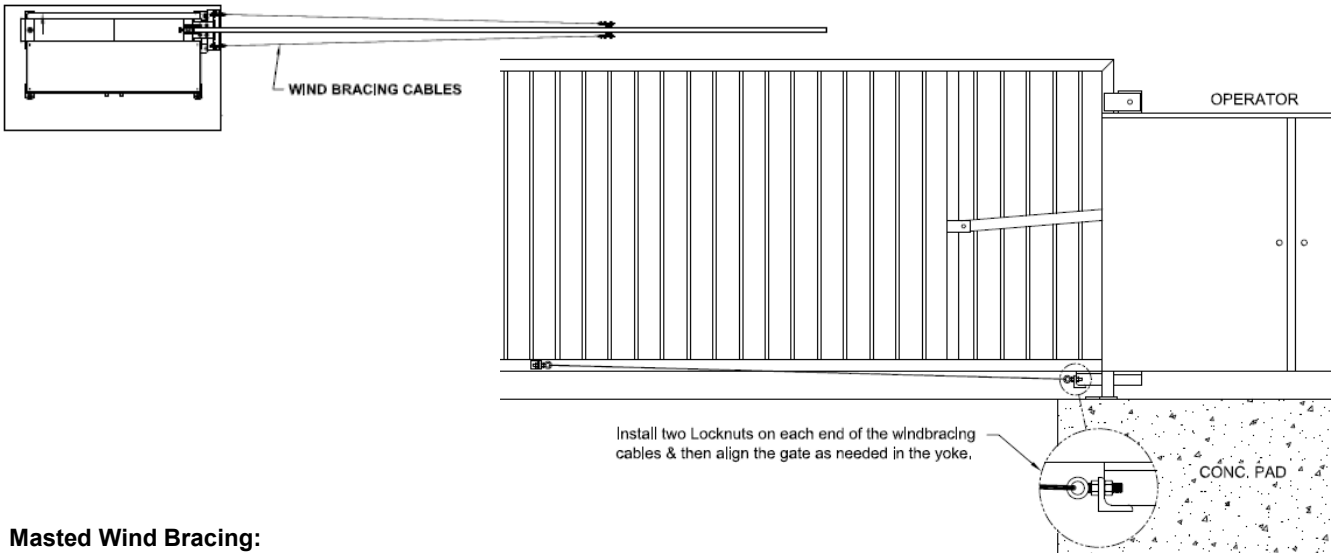
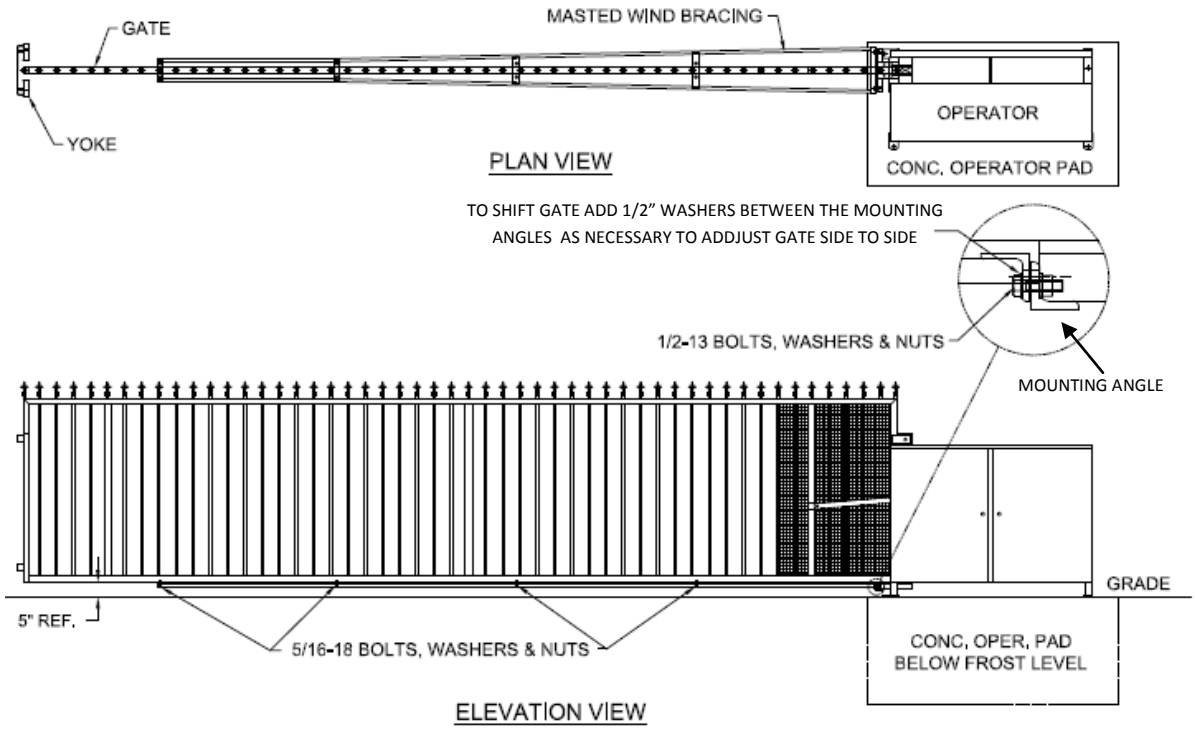
INSTALLATION—cont'd

Installing Other Components:

Cable Wind bracing:
If ordered, attach cable wind bracing to gate with Galvanized Nuts provided on the rods or cables; one nut attached near operator and one attached at gate bracket (See Dwg. #I-105-1 & 2.). Tighten each side equally.



Masted Wind Bracing:



WARNING!

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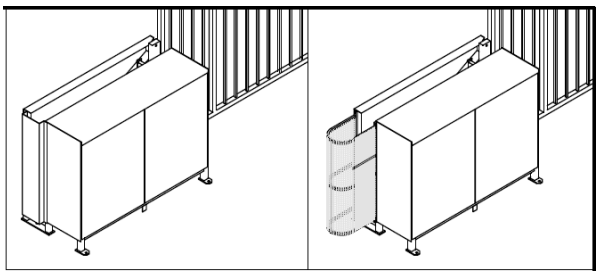
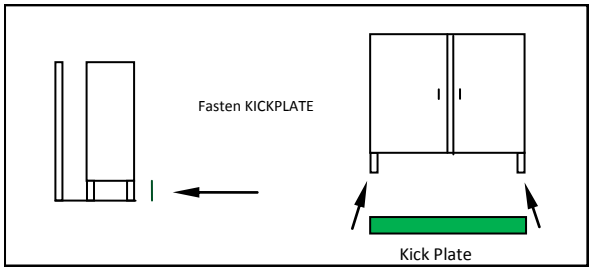
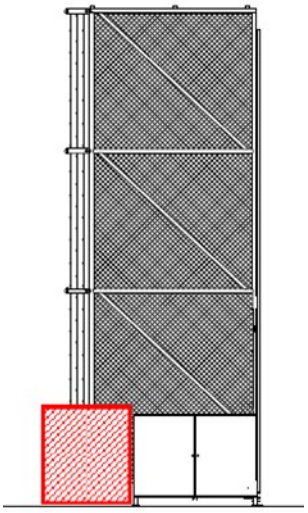
INSTALLATION—cont'd

Gate Guard & Rear of Operator Entrapment Area:



Kick Plate: Attach the kick plate to the door side of the operator using the 3 # 12 x 3/4 tek screws. See **green** example kick Plate below.

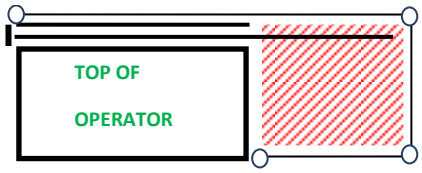




NOTE: The area behind the operator is an entrapment zone. The installer must prevent or protect pedestrian access to this area by at least one or more of the following:

- **Install factory supplied Gate Guard**
- **Site installed fencing**
- **Utilize Recommended Entrapment Protection Devices**

Open installation (No Fence)

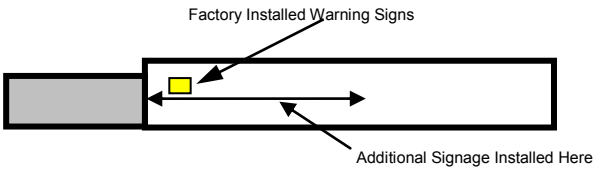


Gate in "OPEN" position above (shaded area) requires installer consideration such as: Fencing off or installation of entrapment protection devices.

Gate in closed position

Additional Signage Installation:
We recommend any additional signage be installed between the operator and the center of the gate. The total weight of all signs cannot exceed 4 pounds or 4 SQ. FT. Contact AutoGate if you require clarification.

Note: AutoGate provided UL 325 pedestrian safety signs that must be visible from both sides of the gate in the closed AND open position.



WARNING!

TO REDUCE THE RISK OF ELECTRICAL SHOCK, THIS EQUIPMENT HAS A GFCI TYPE PLUG THAT HAS A THIRD (GROUNDING) PIN. THIS PLUG WILL ONLY FIT INTO A GROUNDING TYPE OUTLET. IF THE PLUG DOES NOT FIT IN THE OUTLET, CONTACT A QUALIFIED ELECTRICIAN TO INSTALL THE PROPER OUTLET. DO NOT CHANGE THE PLUG IN ANY WAY.

OPERATOR WIRING & TESTING

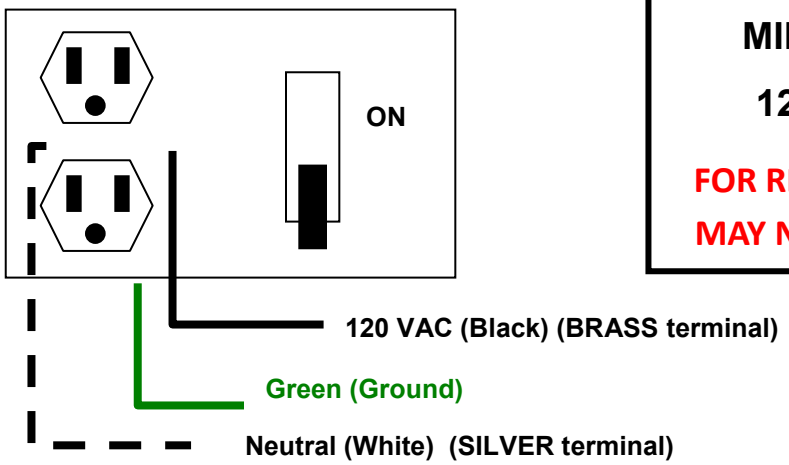
Connecting AC Power (See Dwg. # 103)

1. Turn Off DC power.
2. Wire incoming AC power to the 4 x 4 Box provided and turn on the breaker from your AC Source.
3. Turn AC Power Switch on at the 4 x 4 Box.

NOTE: The A/C Power must be connected by a qualified, licensed Electrician, according to the **National Electric Code**, and all State and local codes. Refer to electrical block diagram for additional information.

Pre-Mounted 120vac Electrical Outlet & AC Power Switch Electrical Connection

Operator Main AC Power Switch (pre-wired to outlet)



A/C ELECTRICAL SUPPLY

MINIMAL REQUIREMENTS:

120 VAC, 15AMP CIRCUIT

FOR RESIDENTIAL APPLICATIONS YOU MAY NOT EXCEED A 15 AMP CIRCUIT!

WARNING!

ADDITIONAL 120 VAC SURGE PROTECTION IS RECOMMENDED BUT NOT REQUIRED. SURGE UNIT *MUST* BE GROUNDED TO A TRUE EARTH GROUND.

AC OUTLETS ARE HOT AT ALL TIMES. OUTLETS ARE FOR SERVICE USE ONLY.

OPERATOR MUST BE GROUNDED TO TRUE EARTH GROUND LUG LOCATED ON FRAME (See Dwg. # 103)

WARNING!

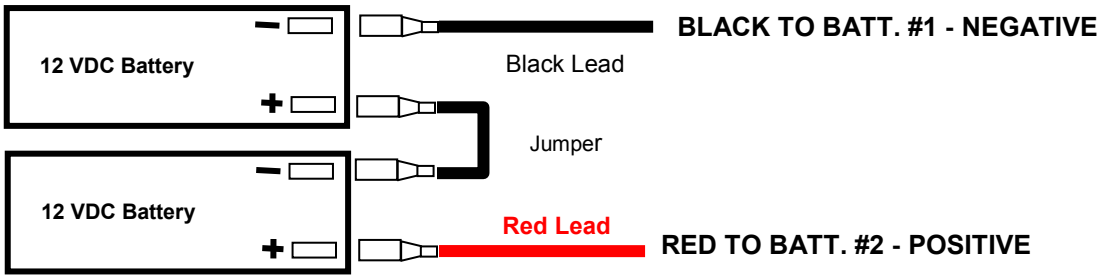
DO NOT ATTEMPT TO CONNECT BATTERIES OR POWER-UP GATE & OPERATOR UNTIL ALL ACCESSORIES HAVE BEEN COMPLETELY CONNECTED & CHECKED.

OPERATOR WIRING & TESTING (con't)

Connecting Batteries - Required

1. Install (2) 12 VDC Batteries **(not provided by AutoGate)** on the battery shelf. AutoGate recommends Group 24, 100 Amp hour deep cycle marine batteries for extended battery back up. At a minimum use 7 AH batteries for battery back up. See drawing below for proper battery and jumper hook up.
2. Install Jumper Wire (provided) from **Batt. #1 - POSITIVE** to **Batt. #2 - NEGATIVE (**See Below).
3. Locate **RED** and **BLACK** Power Wires and connect:

NOTE: Battery back up duration will depend on the size of batteries, number of accessories and open/close cycles while being powered by the batteries.



Testing System Wiring

1. Remove T/M Safety Pin from front of Operator and hang it on the hook provided inside access door.

NOTE: It may be necessary to push down on end of gate in order to take pressure off T/M Safety Pin.

2. Temporarily remove any wires in the main circuit board Terminal #5 (rev. / safety) to disable any Reversing devices not installed from preventing the gate from closing. (See Board Dwg. #113)

3. Turn Main DC Power Switch "on". (Located under the Control Box) Use the S3 manual open/close switch on the control board, (See Dwg. #103-R) to test your gate system (refer to Dwg #113 for wiring schematic).

4. After testing the DC, turn off the DC toggle switch, turn on AC back to "on" and repeat the testing.

NOTE: Your gate should activate and open in approximately 10-12 seconds. If your gate does not lift properly, refer to "Troubleshooting Tips" on page 12.

Testing Accessory Wiring (Ref. Electrical block diagram for additional information)

1. Turn off AC & DC power switches while connecting accessory wiring.
2. Reattach ALL wires removed from main circuit board Terminal #5 (reversing).
3. Complete the ***wiring & testing*** of each accessory component one at a time.

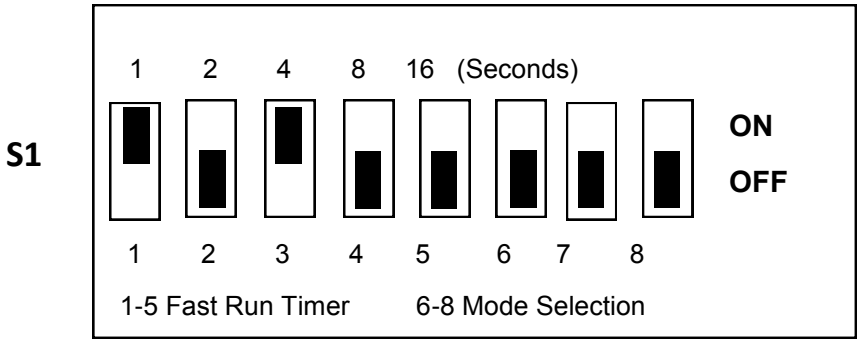
Note: See optional accessories installation instructions included with each product purchased. For example, to test the Reversing Beam, interrupt the beam when the gate is on the way down. The gate should stop and reverse when the beam has been broken or interrupted. Do the same for the Loops, Keypads, etc.

OPERATOR WIRING & TESTING (con't)

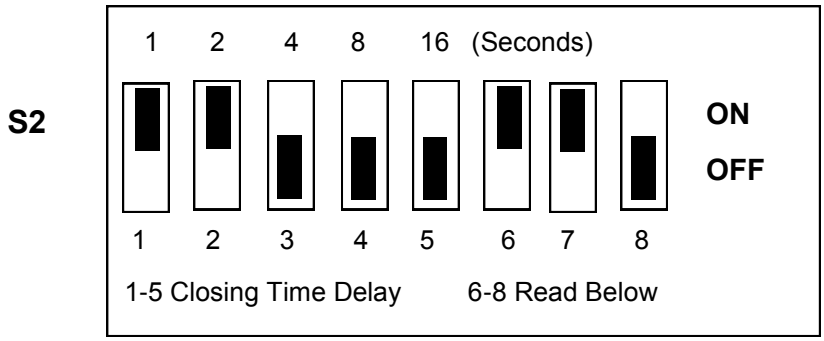
CONTROL BOARD

Your VP gate has many features and options. Most are controlled by an electronic circuit board inside the Control Box. Your circuit board is factory-set and should not be altered in any way or the Warranty may be voided. If an adjustment has to be made, consult your "Gate Board Instructions" for details. If you need any further assistance, please contact your local AutoGate Dealer or call AutoGate at 1-800-944-4283.

Timers and Mode Selections (S1) SEE DIAGRAM BELOW
Full Speed Run Timer – Switch Pack S1 (1-5) Switches 1 through 5 are FACTORY PRESET. ***DO NOT CHANGE!***



Mode Selections – Switch Pack S1 (6-8). SEE DIAGRAM ABOVE
SWITCH 6 – "On". This is set for the UL 325 Alarm. ***(DO NOT CHANGE!).***
SWITCH 7 - FACTORY PRESET. ***(DO NOT CHANGE!).***
SWITCH 8 – "Off" Not used on this system



Timers & Mode Selections – Switch Pack S2 (1-8). **SEE DIAGRAM ABOVE**
Switches 1-5 on S2 are for the closing timer delay. Default is S2-4 "ON" to provide a 8 second delay if activated. If S2-7 is on, the gate will auto close by timer.
SWITCH 6 – Sets aux. Open input terminal #4 at J5 to be pulse open-pulse close (Default is On).
SWITCH 7 – AUTO CLOSE TIMER – Default is ON. When on, use S2 1-5 to set close time delay. When close timer is selected, you MUST install vehicle and pedestrian detection devices.
SWITCH 8 – AUTO OPEN ON POWER FAILURE – When switch 8 is in the ON position, the operator will automatically open the gate approximately 15 seconds after the loss of power. Once power is restored, the operator will resume normal operation. Factory setting is "OFF" allowing the operator to function normally until the battery power has diminished. Once A/C has been restored, the operator will function normally.

Note: If batteries were completely discharged, remove from operator and recharge with a commercial grade battery charger.

WARNING!
INHERENT REVERSE DEVICE (IRD) SHOULD BE TESTED PERIODICALY TO INSURE PROPER OPERATION.

WARNING!

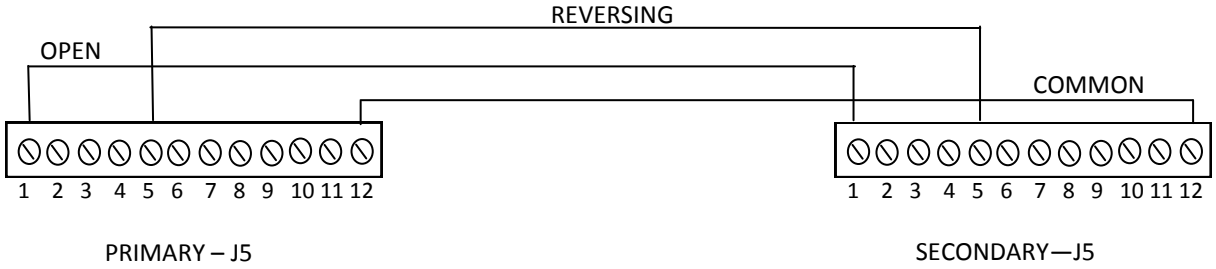
INHERENT REVERSE DEVICE (IRD) SHOULD BE TESTED PERIODICALY TO INSURE PROPER OPERATION.

Inherent Reverse Device (IRD)

The *Instant Reverse Device* is an internal circuit that continuously monitors the motors current for increase draw. This is factory preset for your specific gate size. To test for proper operation, position yourself approximately 2/3 of the way across the driveway. With the gate descending, carefully catch the gate to simulate an obstruction and it should stop and reverse within two (2) seconds. If the gate does not reverse, call the factory for technical assistance. If obstructed while closing, the gate will stop and reverse to the open position, time out (using the time delay set at S2 switches 1-5) and then close. If gate is opening when obstructed, the gate will stop its open travel. If inputs are present, gate will remain stopped. If no inputs are present or existing are cleared, the gate will time out and

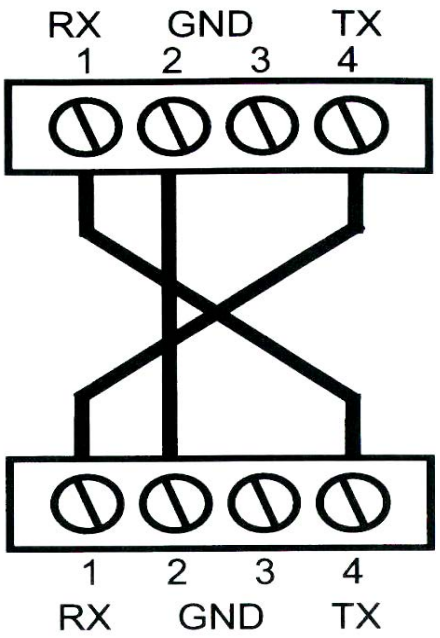
Primary—Secondary Wiring (two systems designed to work together and an entry or exit point)

In a primary/secondary configuration, either unit can be the primary. Choose one unit to be the master and then direct all control wiring to it (also install vehicle detector and receivers in it). At the PRIMARY **any input (at J5) with control (detectors, receivers, keypads, timers, etc...) wires to it must also be run to the same terminals of the secondary system.** Along with these control wires, both operators MUST share a common ground connection from chassis to chassis (or from common to common , i.e. master gate J5 terminal #12 to secondary unit J5 terminal #12).



EXAMPLE: If only open and reversing are used at master then three wires will run between gates.

If it is required that if one gate senses an obstruction, the other reverses also, then 3 additional wires must be run between the primary **J3** and secondary **J3** as shown below. These connections are for transmitting IRD (obstruction signals) between both units. This will allow the primary or secondary to inform the other that a closing obstruction has occurred and for it to also reverse and open. **SET** switches on **S2, 1-8** the same on both gates.



PRIMARY - J3

SECONDARY - J3

IRD - OBSTRUCTION

SIGNAL CONNECTIONS

THE CONNECTIONS TO THE LEFT MUST BE DONE IN ORDER FOR GATE IRD'S TO WORK CORRECTLY. TERMINAL 1 OF PRIMARY MUST GO TO TERMINAL 4 OF SECONDARY AND TERMINAL 1 OF SECONDARY MUST GO TO TERMINAL 4 OF PRIMARY. TERMINAL 2 OF PRIMARY WILL GO TO TERMINAL 2 OF SECONDARY.

WARNING!

WARNING: DISCONNECT BATTERIES AND AC POWER BEFORE SERVICING ANY MECHANICAL OR MOVING COMPONENTS! WARNING: FOR CONTINUED PROTECTION AGAINST FIRE, ONLY REPLACE WITH THE SAME TYPE AND RATING OF FUSE.

TROUBLE SHOOTING & CHECKING CONTROL BOARD

BATTERY CHECKOUT – When the batteries become weak the gate can begin to run noticeably slower. (NOTE: Batteries should only be checked when you are sure they have had adequate time to fully charge.) Turn off the AC power and run gate for 5 to 10 cycles while observing low battery indicator LED D12. If LED 12 comes ON, batteries are too weak to function properly. If LED 12 does not light, then voltage should be checked as they still may be near failure. Correct voltage is a minimum of 25VDC. (NOTE: If LED D12 does light, gate will open to conserve batteries in this test or in a real power loss, even if mode switch 8 is on S2 is off.) Return of AC power will clear the low battery indicator. If the batteries are not completely drained, you may have to charge the batteries as they may be too weak. Correct charge voltage is 27.5 VDC with batteries not connected (adjustment is at R63).

GATE WILL NOT CLOSE - Check for any active inputs on terminal inputs D15-D24 , AC power loss, AC power switch is off or weak batteries. Check that batteries are connected properly. Is switch S3 in "ON" position (this is manual open switch). Check if S2 switch number 8 is in "ON" position and if AC power is lost, See LED D14. Check LED D12, if lit and AC power is off, then batteries need to be charged or replaced.

GATE WILL NOT OPEN - Check for AC power loss at D14 (check AC power switch) and that batteries are fully charged. Check fuses and if inputs are wired correctly, test S3 manual open switch.

GATE DEAD – NO OPERATION

1. Make sure both DC Power Toggle Switch and A/C Power switch are on. If no LED lights are "lit" on the board proceed to #2. If LED lights are "lit" verify HBEAT (D11) is flashing? If flashing proceed and D12 BAT LOW LED is off proceed to #2 . If HBEAT (D11) is not flashing and other LED's are "lit" the control board is bad (contact AutoGate for replacement).
2. Check A/C indicator light on cabinet, is it on? Yes, go to step #3, no, Check 3 amp fuse on battery tray, if good, go to step #3, if bad replace and check again, if no A/C, source external power problem back to fuse box.
3. Check F3 & F4 fuses on control board. If bad, replace. If they continue to blow the control board is bad.
4. If D14 (AC) & D5 (BRAKE) are on, then gate has repeatedly sensed obstructions. Clear obstruction, turn off AC and DC power. Now turn AC and DC power back on and test system.
5. If steps above do not restore operation contact AutoGate Tech Support

IRD (D2) LED IS FLASHING, MRT (Maximum Run Timer) has expired. Gate was unable to reach the closed limit switch. Check that fast run timer is set to run as long as possible.

FUSE(S) ARE BLOWN - F3 (15 AMP AC) AND/OR F4 (15 AMP DC) Check for shorts in wiring. If F3 AC fuse is blown, then batteries may also be dead. If you continue to blow fuses and no apparent shortages are visible, you most likely have a blown circuit board and it will need to be replaced.

GATE CLOSES THEN REVERSES - See IRD adjustments, also check for obstacles in gate travel, such as trees, sticks, etc. Charge voltage to batteries too low, adjust at R63. If gate closes an motor continues to run the limit switch may need adjustment or replacement. With batteries disconnected, set to 27.5.

IRD OBSTRUCTION SIGNAL TO OTHER GATE NOT WORKING CORRECTLY - Remove connector at J3, obstruct gate, LED D13 should go off for a few seconds. This indicates signal was transmitted. Be sure gates have a common ground.

MANUAL OPERATION
Your VP gate is easily operated manually in the event of total power or component failure.

1. Turn main power switches off (both A/C & D/C).
2. Release the belt tension lever located under the gear motor to remove the belt tension.
3. Position yourself in front of operator and lift up on Linkage Arm at the pivot point 1"-2". (See dwg. #103).
4. Walk out to end of gate and lift gate to the open position.
5. Place the T/M pin through the bracket holes to prevent the gate from lowering.
6. Secure the belt tension lever in the locked position to re-apply tension to the belts.

NOTE: It only takes 16 - 30 lb. of force to open gate. If more is required, contact your dealer or factory.

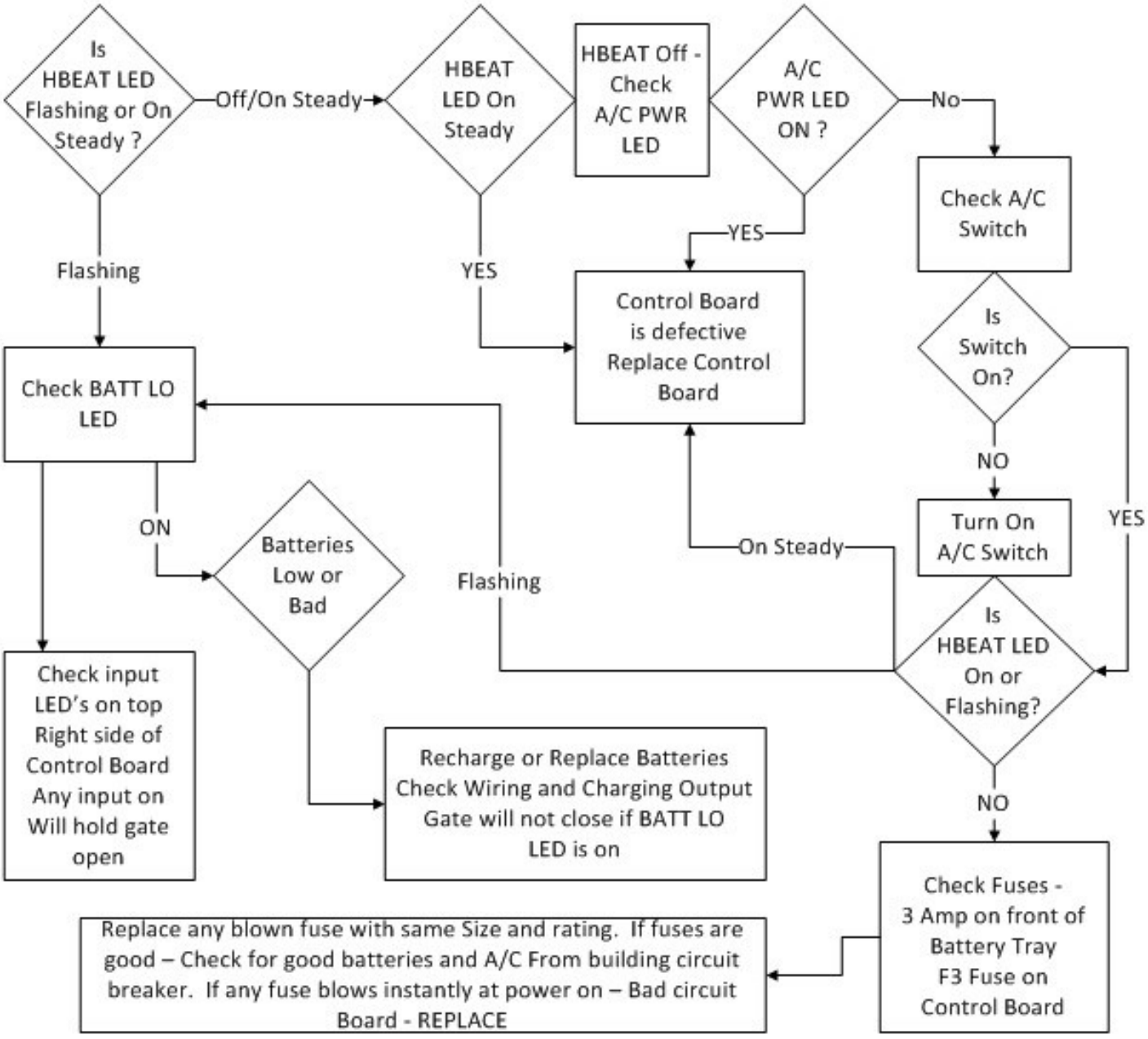
VPL 24 ELECTRICAL QUICK CHECK

Please follow this Check List to see if you can restore gate operation.

Checks	Actions
Open Cabinet door and control box door	Follow these actions to solve problems
On Control Board-Lower Left-Hand Corner Is Heartbeat(HBEAT) Light Flashing or ON Steady and AC PWR Light on	NO → If light is Flashing, Continue with Checks If Not Flashing, follow down this chart If ON steady – REPLACE Control Board
	Check F3 & F4 Fuses on Control Board (15 Amp ATC/ATO Fuses) Check 3 Amp glass fuse on Battery Tray Replace any fuses that are bad Make sure A/C switch is ON Make sure D/C switch is ON
Is BAT LO Light on? If it is, batteries are weak and may affect gate operation, further diagnonsis may be neccessary	If HBEAT Light is flashing and the AC PWR Light is on, continue with checks. If HBEAT Light is flashing and AC PWR Light is off, then the operator is running on DC Power only and a complete diagnosis may be neccessary using the Diagnose and Repair Chart (DRC)
Check F1 Fuse (1Amp Glass Fuse) This is for Accessory Power Replace if bad	
Check Input Control Lights - Located in the Upper Right-Hand Corner - 8 Lights Are any ot these Lights On?? Open Input - 1 (D-15) **Accessory Inputs** Open Input - 2 (D-16) **Such as : Keypads,** Open Input - 3 (D-17) **Cardreaders, etc.** Aux. Input - 4 (D-18) Push-Button & Radio Receiver Safety Input - 5 (D19) Reversing Devices Such As : Loop Detectors, IFR Beams, Miller Edge, etc. Close Input - 6 (D-22) Not Used Back Away - 7 (D23) Not Used Shadow Loop - 8 (D-24) Not Used	YES → If any of these lights are on, the gate will not close. Remove wire(s) from corrosponding terminal(s) and see if gate closes. If it does, trace wires back to device causing problem.
	The following are typical causes : Stuck Keypad Stuck Relay on Accessory (Keypad, Card Reader, Radio Receiver, etc.) "Hold Open" switch left in the open position Loop Detector in Default (Push the RESET button on the Detector)

VPL 24 Electrical Quick Check

Follow the steps in this chart to see if you can restore service of your gate.
This is a visual check without the use of a voltmeter.
Start by opening the cabinet door to the operator.
Then open the electrical control box and look on the control board for the HBEAT LED, located at the lower left corner of the control board.



MAINTENANCE

The Basic electric and mechanical systems require only minimum routine maintenance. The following items should be checked and serviced periodically depending on amount of use. (See Dwg. #103 for lube locations).

ITEM	RECOMMENDED MAINTENANCE
Grease pivot points on Linkage Assembly ("LUBRIPLATE 'R' LOW TEMP" Grease)	10,000 cycles or 6 months
Grease all bearings: (2) Operator Arm, (4) Bullwheel Shafts	Every 6 months
Grease Chain Tension Bolt and Lube Chain & lightly coat springs	Every 6 months
Check belts for wear and tightness. (Belt flex between motor and Intermediate sheaves is 1/4" deflection & between intermediate and final drive sheaves should be tightened to minimum deflection). Belt(s) loose or worn require replacement.	Every 6 months
Charge voltage for batteries should be 27.5 VDC with batteries disconnected check at battery terminals on control board (set at R63).	Every 6 months
Check battery water level, use distilled water only (Not required on maintenance -free)	Every 6 months
Clean snow/ice off of gate (Balance Correctly, gate will temporarily tolerate an add'l 10 lb. of wt.)	As needed
Clean lenses on Photocells or Reflectors	As needed
Lubricate (Graphite Oil) all lock cylinders and mechanisms	Every 6 months
Check and verify proper operation of all ***secondary*** entrapment devices.	Every month
Check and verify proper operation of all ***primary*** reversing feature. (see Section V, Item #2-A)	Every month

Touch-Up Paint - For scratches and following minor repairs use Rustoleum® Painters Touch 2x Ultra Cover (Gloss) to match the AutoGate Standard Colors: Black, Dark Gray, Kona Brown, Hunter Green, & White.

Balancing a Gate

Recommended four months after installation, then annually. It is recommended to check the balance of your VP Operator. It is mandatory to re-check the balance if you change spring(s). You can monitor it on the amp meter installed on the control box door. It is recommended to follow the instructions below for accurate balancing numbers using a commercial grade AMP meter. Remove the wire nut on the **RED** motor lead and hook up one Amp Meter lead to the **RED** wire and the other Amp Meter lead to the **ORANGE** wire. Cycle the gate up and down and record the highest amp reading in both directions (reading should be in the 2.0 to 6.0 range). The highest reading for both the up and down cycles should be very close to the same. If not, you will have to adjust the SLIDE ASSY. (see Dwg. # 107).

Loosen the 1 1/8" nuts on either side of the Slide Assy. Angle on the Threaded Rod. *If the gate Amps are too high in the OPEN mode, move the Slide Assy. UP to help it OPEN*. (This is the most common adj. Made). *If the gate is flying open and struggling to close, move the Slide Assy. DOWN.* Only adjust the Slide Assy. 1/4" (3 to 4 turns) at a time when adjusting. After each adjustment, check your amp readings.

When you have the gate back in balance (within a half amp (.5) is minimal), tighten both nuts on Slide Assembly threaded rod.

Board Replacement

Turn ALL power off ***(AC & DC)*** to the board.
Remove (slide off) J2 "Open & Close" Limit Switch Terminal strip.
Remove (slide off) Accessories 1 through 12 Terminal strip.
Carefully remove the wires for the 24vdc Acc. Power, Battery Power, AC Power & Motor wires.
Take the board off the Standoffs and remove the (2) mounting bolts and replace with your NEW circuit board and put all wires and connections back in the same place.
Double check the D.I.P. switch settings to be sure they are the same as your original board.

VIII. OPTIONAL ACCESSORIES INSTALLATION INSTRUCTIONS

(Your gate order may not have included any or all of these accessories)

CAUTION! Failure to completely install any Reversing Devices may cause your gate to default Open. (Ex.: Hooking up your Loop Wires to the Socket Base while not having the Detector plugged in, or having your IFR Receiver hooked up and not the IFR Transmitter.)

NOTE: Refer to electrical block diagram for additional information on all accessory wiring.

A. Reversing/Free Exit Loops and Detectors:

1. Locate your "Homerun" lead-in Loop wires and connect the Free Exit Loop to Socket Base connections #7 & #8 (Free Exit Device).
2. Locate your "Homerun" lead-in Loop wires and connect the Reversing Loop(s) to Socket Base connections #7 & #8. You can wire (2) two Reversing Loops to (1) one Socket Base (Reversing Device). Check the loop instructions for proper phasing.
3. Plug in your Loop Detector in the pre-wired socket base(s).

B. Photoelectric Sensors:

Refer to page 7 of this guide for the list of UL 325 approved components and to the manufacturer's instructions for their proper installation.

1. Verify voltage compatibility, 24 VDC is required.
2. Connect signal wire N.O. (normally open) to terminal #5 on your control board.
3. Connect the ground wire to terminal 9, 10, 11 or 12 (commons).
4. Connect the power wires to the terminal strip located inside the control box.

C. Contact Sensor Edge:

Refer to page 10 of this guide for the list of UL 325 approved components and to the manufacturer's instructions for their proper installation.

1. Connect signal wire N.O. (normally open) to terminal #5 on your control board.
2. Connect the ground wire to terminal 9, 10, 11 or 12 (commons).
3. Be certain all wires are secured to prevent damage to the gate during operation.

D. Vehicle Sensor Probe (Car-Sense 101):

1. Locate the Car-Sense 101 Vehicle Sensing Probe either along the edge of the Exit Drive or install in the pavement as shown on Dwg. # 108.
2. Once installed, run the 2-conductor cable to Socket Base connections #6, 7 & 8 (Free Exit Device). Refer to manufacturer's instructions for proper wiring.
3. Connect the power wires to the terminal strip located inside the control box.
4. Connect signal wire to an open terminal – 1, 2, 3.
5. Connect the ground wire to terminal 9, 10, 11 or 12 (commons).
6. Plug in you Car Sense Detector in the pre-wired socket base. Refer to Manufacturer's Instructions.

E. Gate Auto Timer:

Install your timer in the electrical box.

Run a power wire from the timer terminal "A" to the "Positive" on the control board, run a power wire from the timer terminal "B" to the "Negative" on the control board.

Run a power wire from the timer terminal "1" to "1", "2", or "3" on the control board, run a power wire from the timer terminal "2" to "9", "10", "11" or "12" on the control board.

F. Keypads:

1. Refer to your Keypad Manufacturers Instructions for complete wiring.
2. Run the power wires to Terminal Strip main power (+ and -).
3. The ***N.O. & Common*** signal wires to open the gate need to be attached to the Circuit Board #'s 1, 2 or 3 (Open) & 9, 10, 11 or 12 (Common) (Refer to Manufacturer's Instructions).

G. Card Readers:

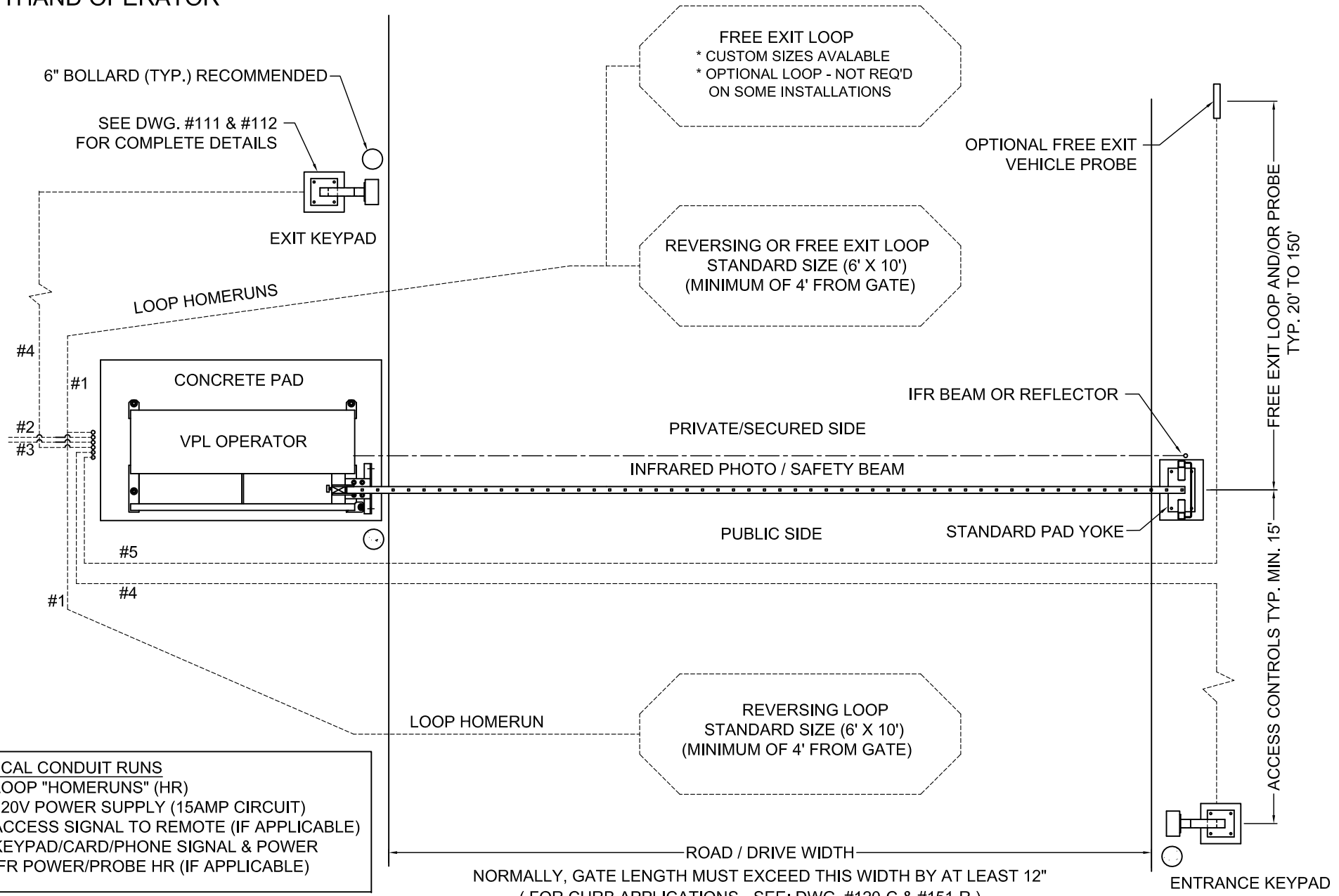
1. Refer to your Card Reader Manufacturer's Instructions for complete wiring.
2. Run the power wires to Terminal Strip main power (+ and -).
3. The ***N.O. & Common*** signal wires to open the gate need to be attached to the Circuit Board #'s 1, 2 or 3 (Open) & 9, 10, 11 or 12 (Common) (Refer to Manufacturer's Instructions).
4. We recommend using a grounding rod to minimize lightning damage.

H. Phone Systems:

1. Refer to your Phone System Manufacturers Instructions for complete wiring
2. Most phone systems require a dedicated power supply and therefore they may not function during a power outage.
3. The ***N.O. & Common*** signal wires to open the gate need to be attached to the Circuit Board #'s 1, 2 or 3 (Open) & 9, 10, 11 or 12 (Common) (Refer to Manufacturer's Instructions).
4. We recommend using a grounding rod to minimize lightning damage.

NOTE: Refer to bottom of page 5 for approved UL 325 Compliant components.

RIGHTHAND OPERATOR



TYPICAL CONDUIT RUNS
#1. LOOP "HOMERUNS" (HR)
#2. 120V POWER SUPPLY (15AMP CIRCUIT)
#3. ACCESS SIGNAL TO REMOTE (IF APPLICABLE)
#4. KEYPAD/CARD/PHONE SIGNAL & POWER
#5. IFR POWER/PROBE HR (IF APPLICABLE)

DO NOT SCALE

Rev.:	Description:	Date:	Drn. By:	Ckd. By:
.	.	.	.	
A	UPDATED DRAWING	01/22/13	SLD	KLL

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
ANGLES ± 1°
X/X ± 1/32, .XX ± .01, .XXX ± .005

Date: 12/20/05
Drn. By: MKS
Ckd. By: DMR

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Berlin Heights, Ohio
FAX (419) 588-3514

Dwg.: 100-R

Title: Operator & Accessory Site Layout (R/H)

√ MKS 06/06/14

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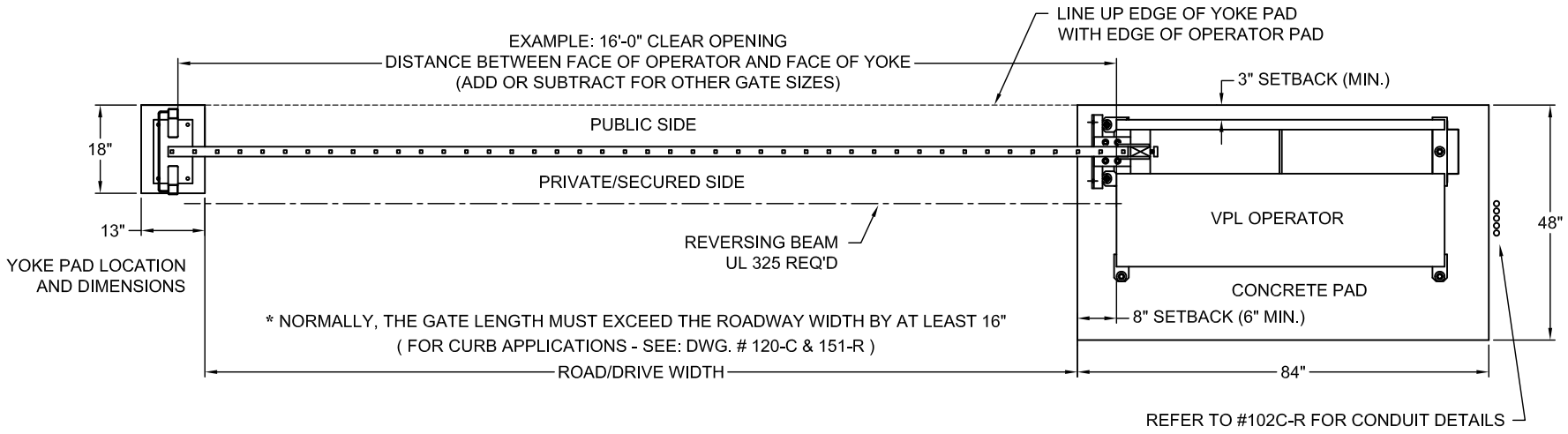
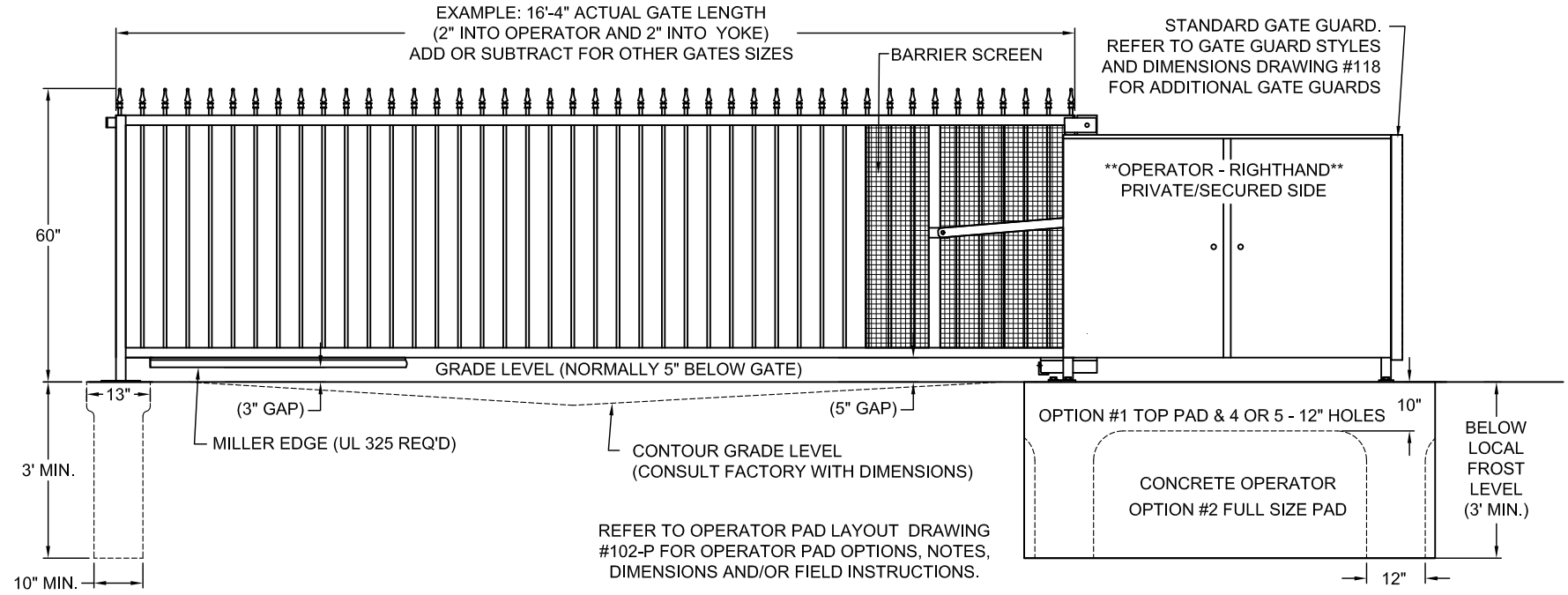
RIGHTHAND OPERATOR

EXAMPLE SHOWN: 16' X 5' BUCKEYE STYLE 500 GATE
(GATE SIZE AND STYLE MAY VARY)





REFER TO OPERATOR PAD LAYOUT DRAWING #102-P FOR OPERATOR PAD OPTIONS, NOTES, DIMENSIONS AND/OR FIELD INSTRUCTIONS.

PAD FOR YOKE STYLES "E" & "F" ONLY.
REFER TO YOKE STYLES DRAWING #105
FOR ADDITIONAL MOUNTING METHODS,
DIMENSIONS AND/OR INSTRUCTIONS.

DO NOT SCALE

Rev.:	Description:	Date:	Drn. By:	Ckd. By:
.	.	.	.	
A	UPDATED DRAWING	01/22/13	SLD	KLL

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
ANGLES ± 1°
X/X ± 1/32, .XX ± .01, .XXX ± .005

Date: 12/21/05
Drn. By: MKS
Ckd. By: DMR

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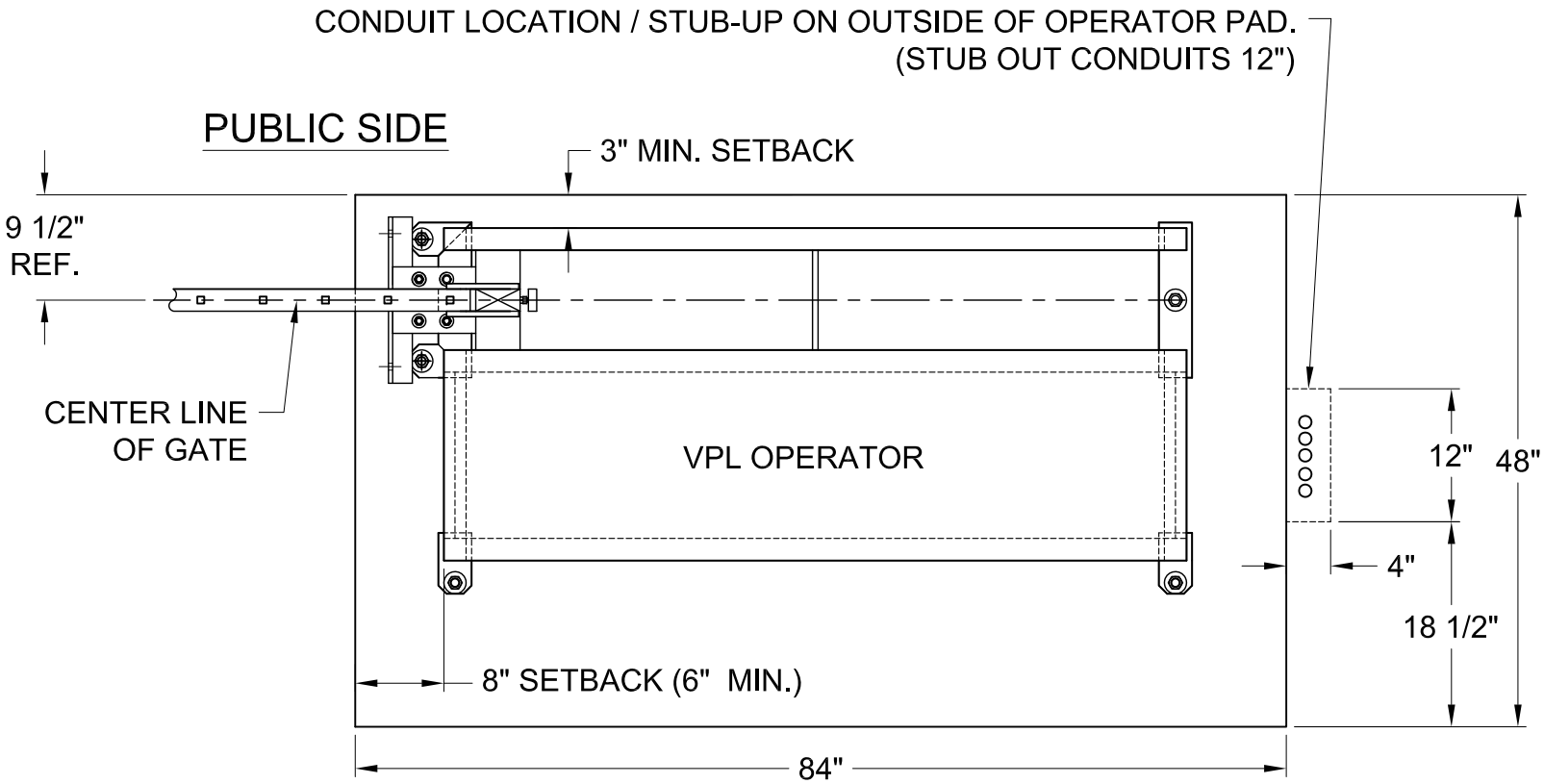
Dwg.: 101-R

Title: Standard Layout Dimensions - Righthand

√ MKS 06/06/14

E:\AUTOCAD DRAWINGS\LAYOUT AND SITE DRAWINGS\STANDARD VPL DRAWINGS\101-R STANDARD LAYOUT DIMENSIONS RH.DWG

RIGHTHAND OPERATOR



PRIVATE/SECURED SIDE

* NOTE: USE 3/4" CONDUIT ONLY

POSSIBLE CONDUITS

* 120 VAC, MIN. 15 AMP CIRCUIT
* "ENTRANCE" KEYPAD
* "EXIT" KEYPAD
* REVERSING/SAFETY LOOPS
* FREE EXIT LOOP
* OFFICE COMMUNICATION
* IFR BEAM POWER
* OPTIONAL SPARES

DO NOT SCALE

Rev.:	Description:	Date:	Drn. By:	Ckd. By:
B	Updated drawing	1/24/13	SLD	
A	Conduit locations were moved outside the pad	07/18/08	MKS	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
ANGLES ± 1°
X/X ± 1/32, .XX ± .01, .XXX ± .005

Date: 12/07/05
Drn. By: MKS
Ckd. By: DMR
Dwg.: 102C-R
Title: Conduit Pad Location (Righthand)

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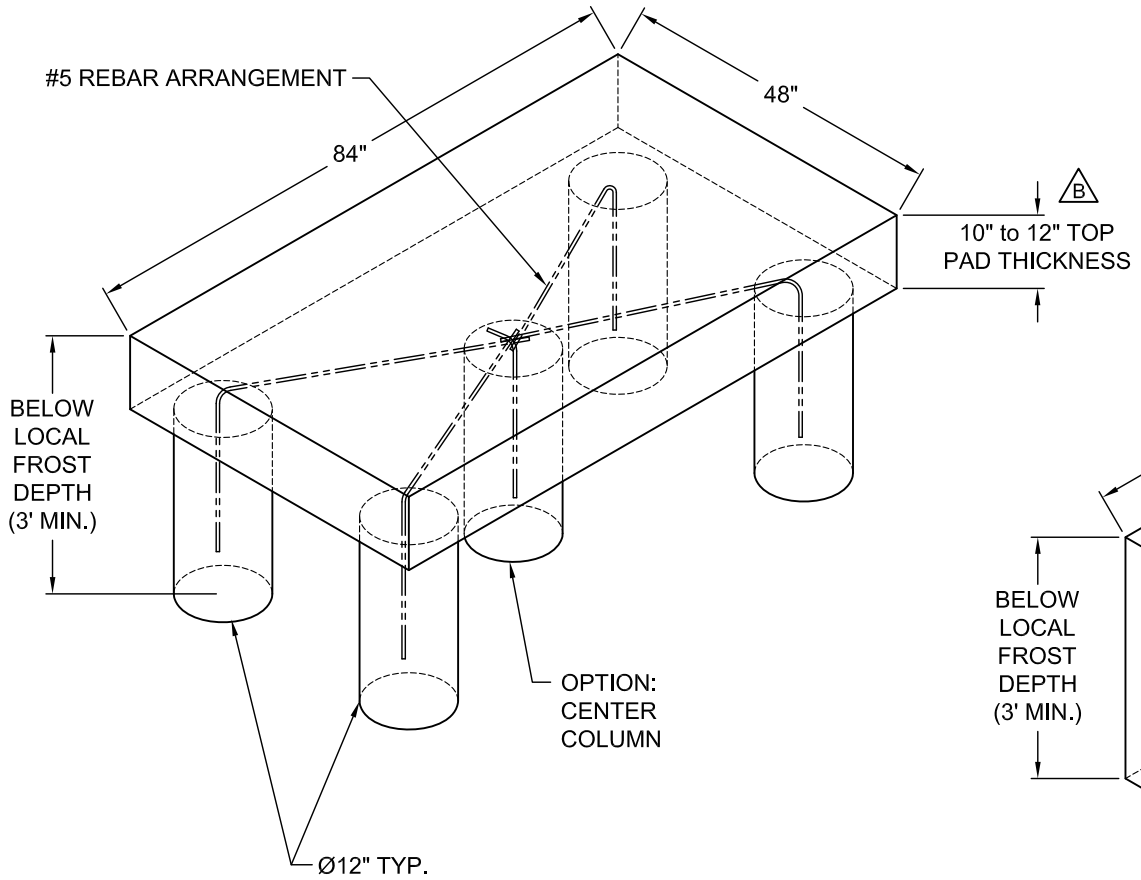
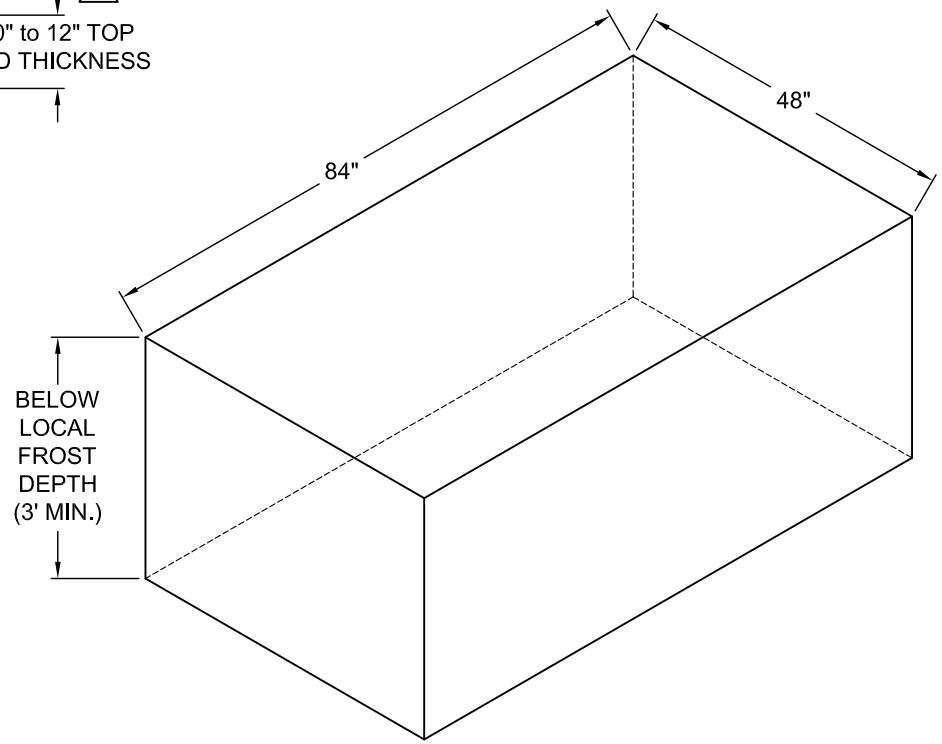
OPTION #1:

(4) or (5) MIN. 12" AUGURED HOLES, RE-BAR, AND A 10" TO 12" TOP PAD





OPTION #2:

FULL CONCRETE PAD WITH RE-BAR WHERE APPLICABLE PER GOVERNING CODE OR STANDARD.

NOTES:

1) ALL PAD DEPTHS SHOULD BE BELOW LOCAL FROST DEPTH
2) TOP OF PAD MUST BE FLAT AND LEVEL
3) USE REBAR THAT CONFORMS WITH LOCAL CODES OR JOB SPECS.

DO NOT SCALE

Rev.:	Description:	Date:	Drn. By:	Ckd. By:
.	.	.	.	.
B	10" TO 12" PAD THICKNESS WAS 8" TO 10"	01/24/13	SLD	KLL
A	CONDUIT LOCATIONS WERE MOVED OUTSIDE THE PAD	07/18/08	MKS	DMR

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
ANGLES ± 1°
X/X ± 1/32, .XX ± .01, .XXX ± .005

Date: 12/21/05
Drn. By: MKS
Ckd. By: DMR

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Dwg.: 102-P

Title: Operator PAD Layout / Options

√ MKS 07/01/14

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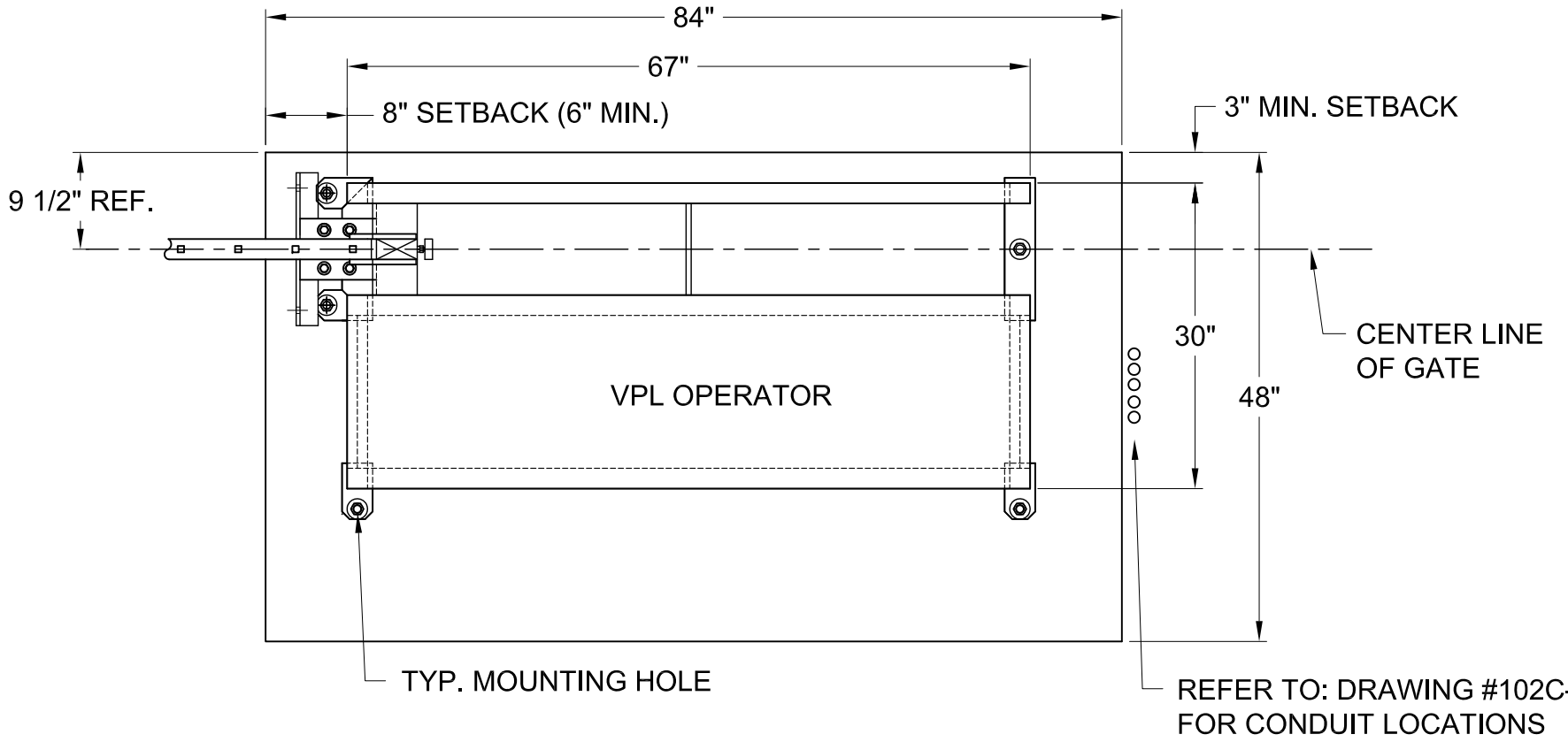
RIGHTHAND OPERATOR

PUBLIC SIDE



PRIVATE/SECURED SIDE

NOTES:

1) PAD DIMENSIONS CAN VARY PER SITE
2) LEAVE AT LEAST 3" BETWEEN ANCHOR AND EDGE OF PAD
3) ALL PADS MUST BE POURED LEVEL AND BELOW LOCAL FROST LINE DEPTH

Rev.:	Description:	Date:	Drn. By:	Ckd. By:
C	Updated drawing	1/24/13	SLD	
B	Removed "Stub conduits under operator when possible" note	02/04/10	MKS	
A	Conduit locations were moved outside the pad	07/18/08	MKS	

DO NOT SCALE

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
ANGLES ± 1°
X/X ± 1/32, .XX ± .01, .XXX ± .005

Date: 12/07/05
Drn. By: MKS
Ckd. By: DMR
Dwg.: 102-R
Title: Standard Pad Layout (Righthand)

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√ MKS 06/06/14

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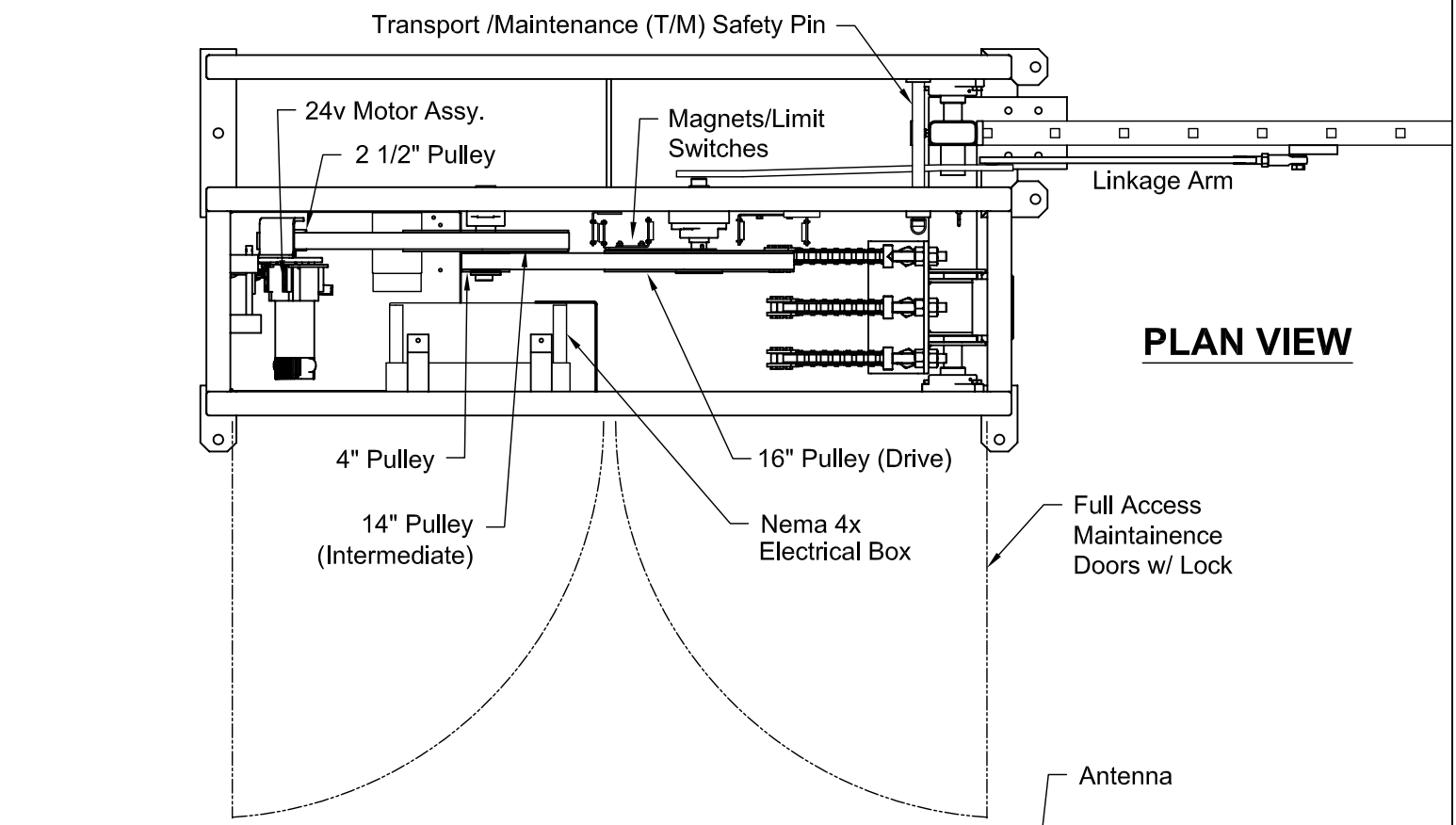
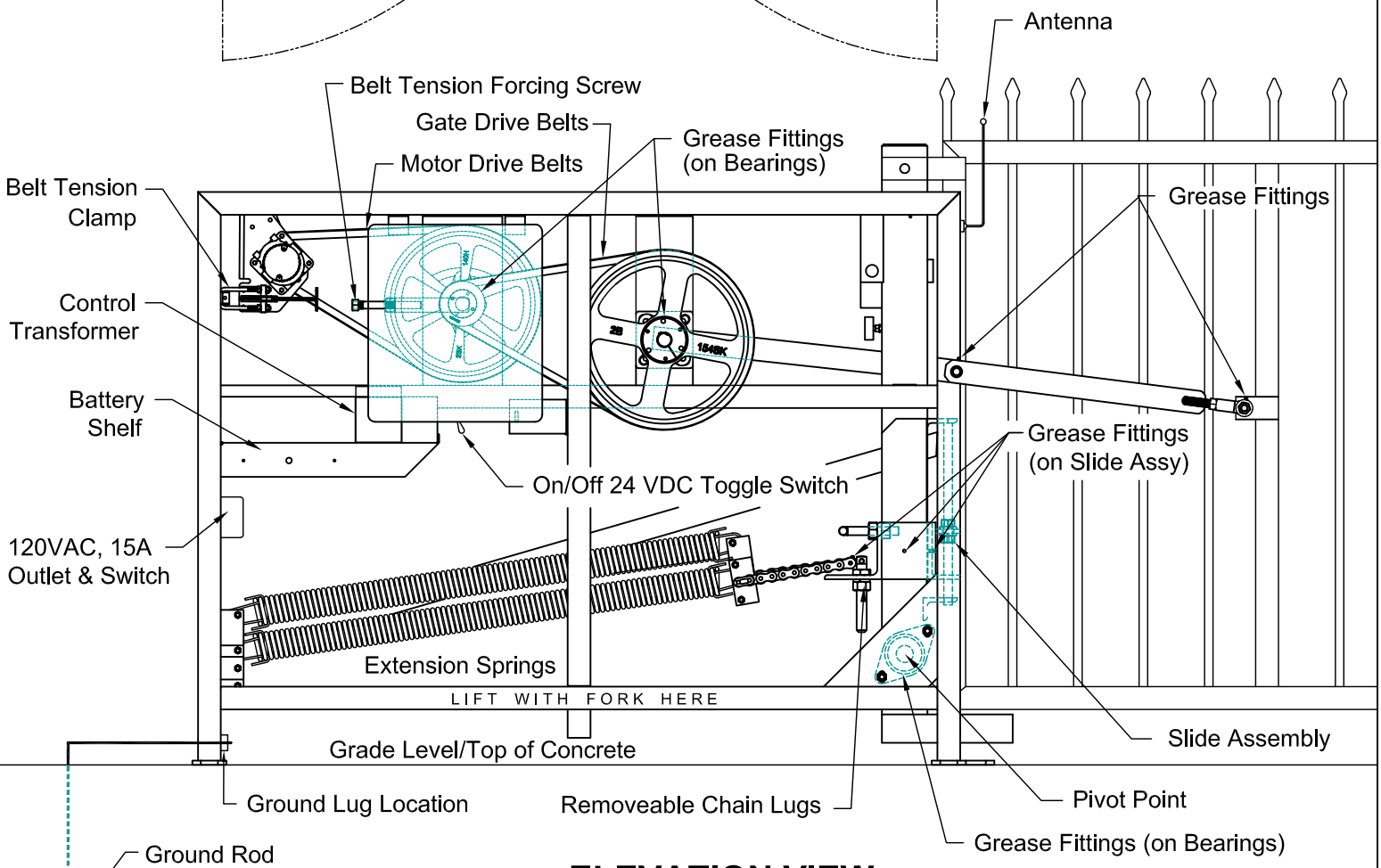


PLAN VIEW



ELEVATION VIEW

Rev.:	Description:	Date:	Drn. By:	Ckd. By:
C	ADDED GROUND LUG, TRANSFORMER & REVISED NOTES	12/29/10	MKS	DMR
B	REVISED SHOWING NEW ARM AND SPRING LOCATIONS	07/09/09	MKS	DMR
A	REVISED TO SHOW NEW REAR MAGNET PLATE DESIGN	10/17/08	MKS	DMR

DO NOT SCALE

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
ANGLES ± 1°
X/X ± 1/32, .XX ± .01, .XXX ± .005

Date: 11/23/05
Drn. By: MKS
Chk. By: DMR

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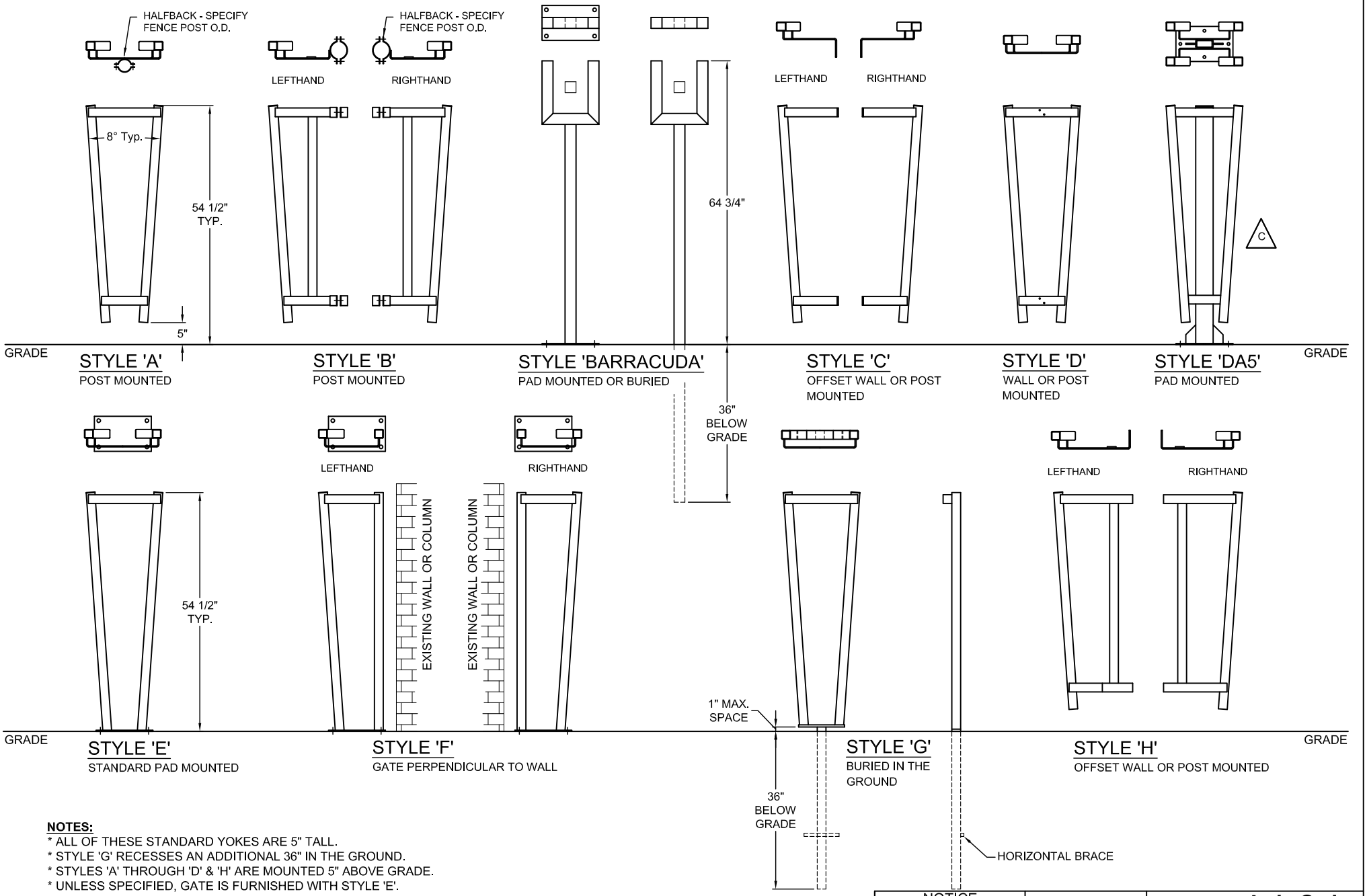
Dwg.: 103-DR

Title: 24V Gate Operator Details (Double Reduction)

√ MKS 07/01/14



NOTES:

* ALL OF THESE STANDARD YOKES ARE 5" TALL.
* STYLE 'G' RECESSES AN ADDITIONAL 36" IN THE GROUND.
* STYLES 'A' THROUGH 'D' & 'H' ARE MOUNTED 5" ABOVE GRADE.
* UNLESS SPECIFIED, GATE IS FURNISHED WITH STYLE 'E'.

Rev.:	Description:	Date:	Drn. By:	Ckd. By:
C	ADDED "DA5" STYLE YOKE (DOUBLE PAD MOUNTED)	07/01/14	MKS	EGS
B2	ADDED "H" STYLE YOKE	01/17/13	SLD	KLL
B1	ADDED BARRACUDA STYLE YOKE	01/17/13	SLD	SLD
A	ADDED FLATBAR TO STYLE "B" YOKE	08/27/10	MKS	DMR

DO NOT SCALE

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
ANGLES ± 1°
X/X ± 1/32, .XX ± .01, .XXX ± .005

Date: 12/21/05
Drn. By: MKS
Ckd. By: DMR

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Dwg.: 105

Title: YOKE STYLES (5' STANDARD)

√ MKS 07/01/14

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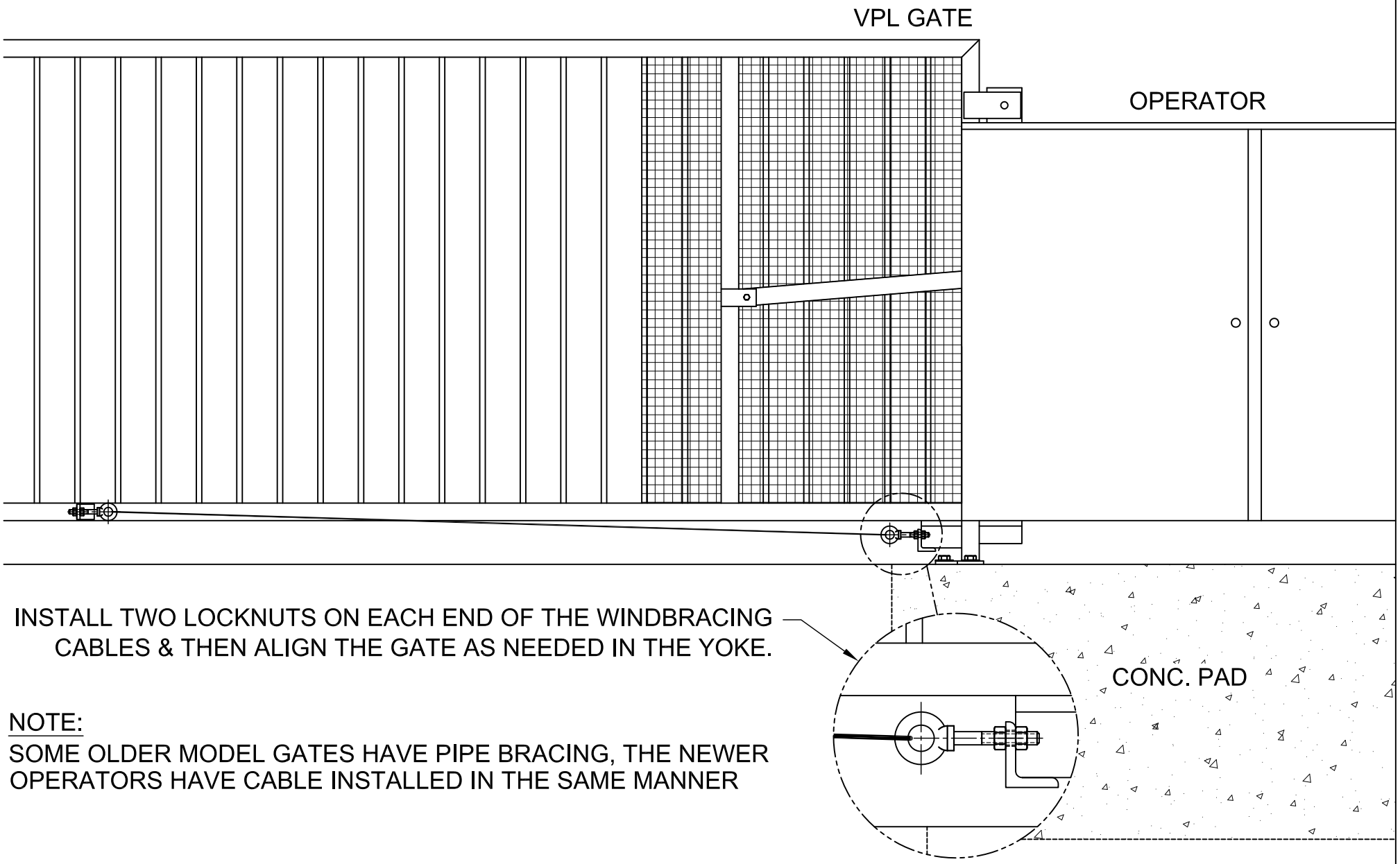

INSTALL TWO LOCKNUTS ON EACH END OF THE WINDBRACING CABLES & THEN ALIGN THE GATE AS NEEDED IN THE YOKE.

NOTE:
SOME OLDER MODEL GATES HAVE PIPE BRACING, THE NEWER OPERATORS HAVE CABLE INSTALLED IN THE SAME MANNER

Rev.:	Description:	Date:	Drn. By:	Ckd. By:
			DO NOT SCALE	
B	Updated drawing	01/24/13	SLD	KLL
A	Revised by adding more detail on fasteners, gate and operator	01/01/11	MKS	MKS

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
ANGLES ± 1°
X/X ± 1/32, .XX ± .01, .XXX ± .005

Date: 04/03/07
Drn. By: MKS
Ckd. By: DMR
Dwg.: 105-1
Title: Wind Bracing Assembly - Cables

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√ MKS 06/06/14

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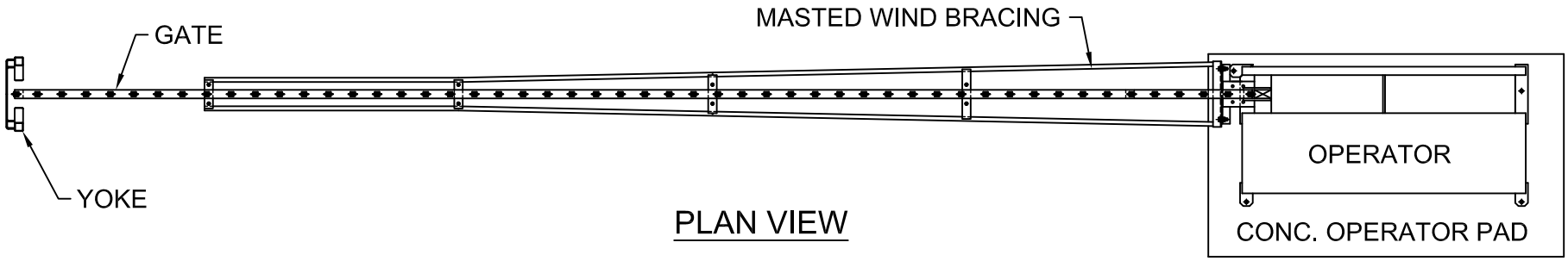
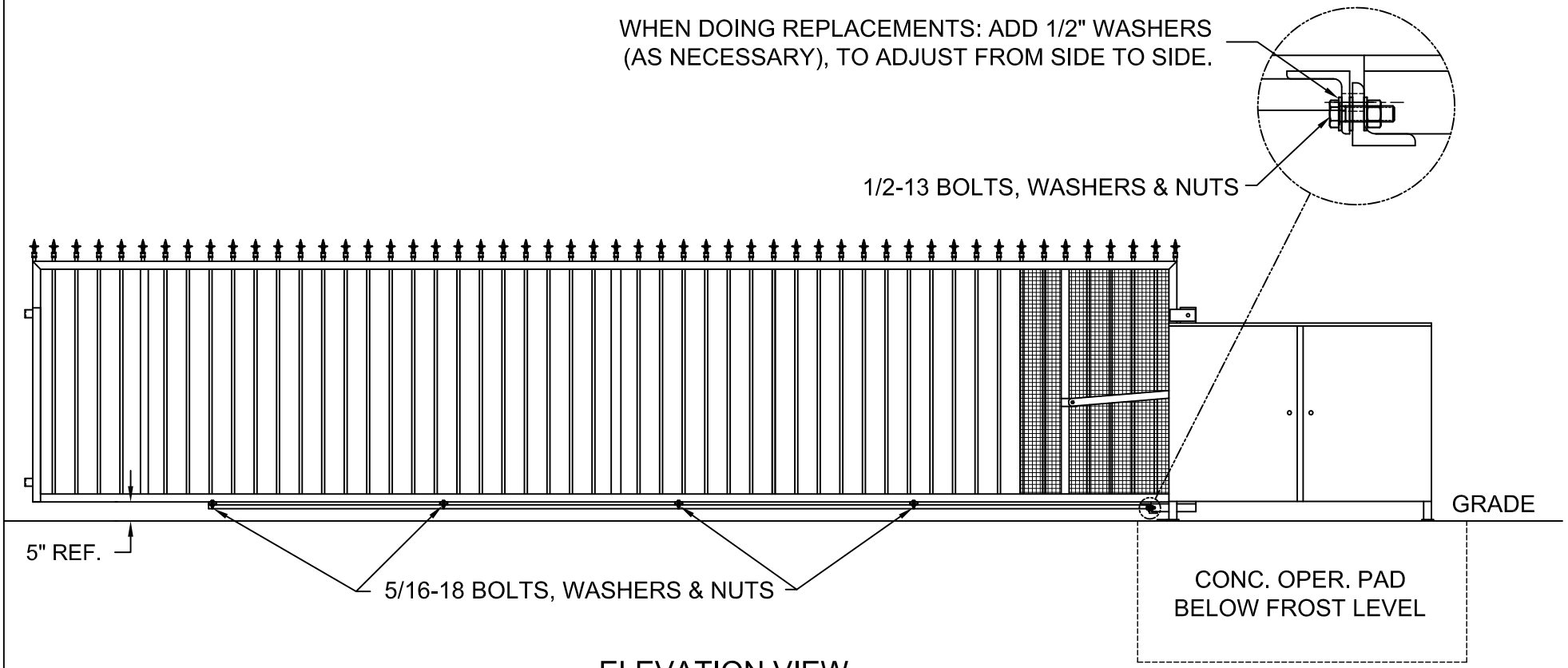


PLAN VIEW



ELEVATION VIEW

Rev.:	Description:	Date:	Drn. By:	Ckd. By:
B	Updated drawing	01/24/13	SLD	KLL
A	Added detail of Windbracing connection	12/29/10	MKS	DMR

DO NOT SCALE

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
ANGLES ± 1°
X/X ± 1/32, .XX ± .01, .XXX ± .005

Date: 12/03/08
Drn. By: MKS
Ckd By: DMR
Dwg.: 105-2
Title: Wind Bracing Assembly - Masted

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Berlin Heights, Ohio
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√ MKS 06/06/14

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TESTING AMPERAGE:

1. CONNECT AMP METER IN SERIES BY REMOVING THE WIRE NUT FROM THE RED MOTOR LEAD.

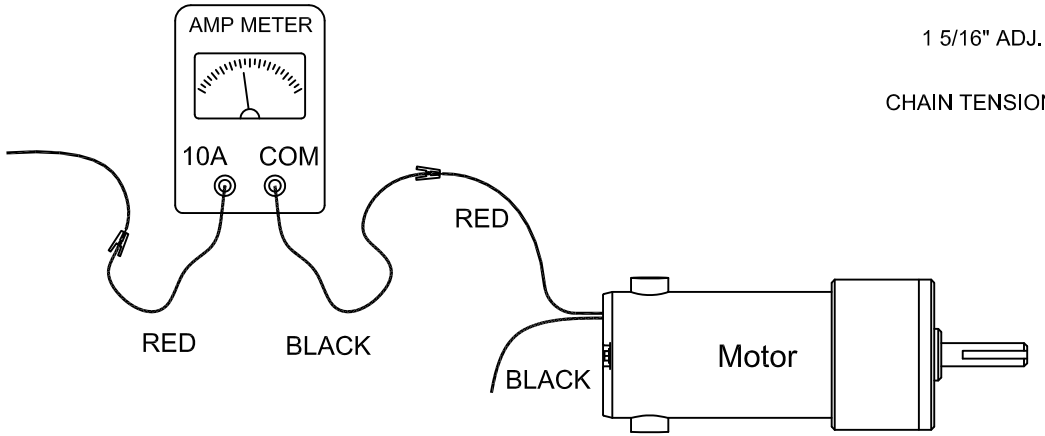
2. CYCLE GATE UP AND DOWN RECORDING THE HIGHEST AMPERAGE IN THE SPACE PROVIDED, AND ADJUST IF NECESSARY. HIGHEST UP & DOWN READING SHOULD NOT EXCEED 1 AMP DIFFERENCE. FOR EXAMPLE: IF YOUR HIGHEST READING IS 6.5 IN THE UP, AND THE HIGHEST READING IN THE DOWN WAS 6.0... THAT WOULD BE ACCEPTABLE. UN-ACCEPTABLE WOULD BE 3.0 IN THE UP AND 8.1 IN THE DOWN.

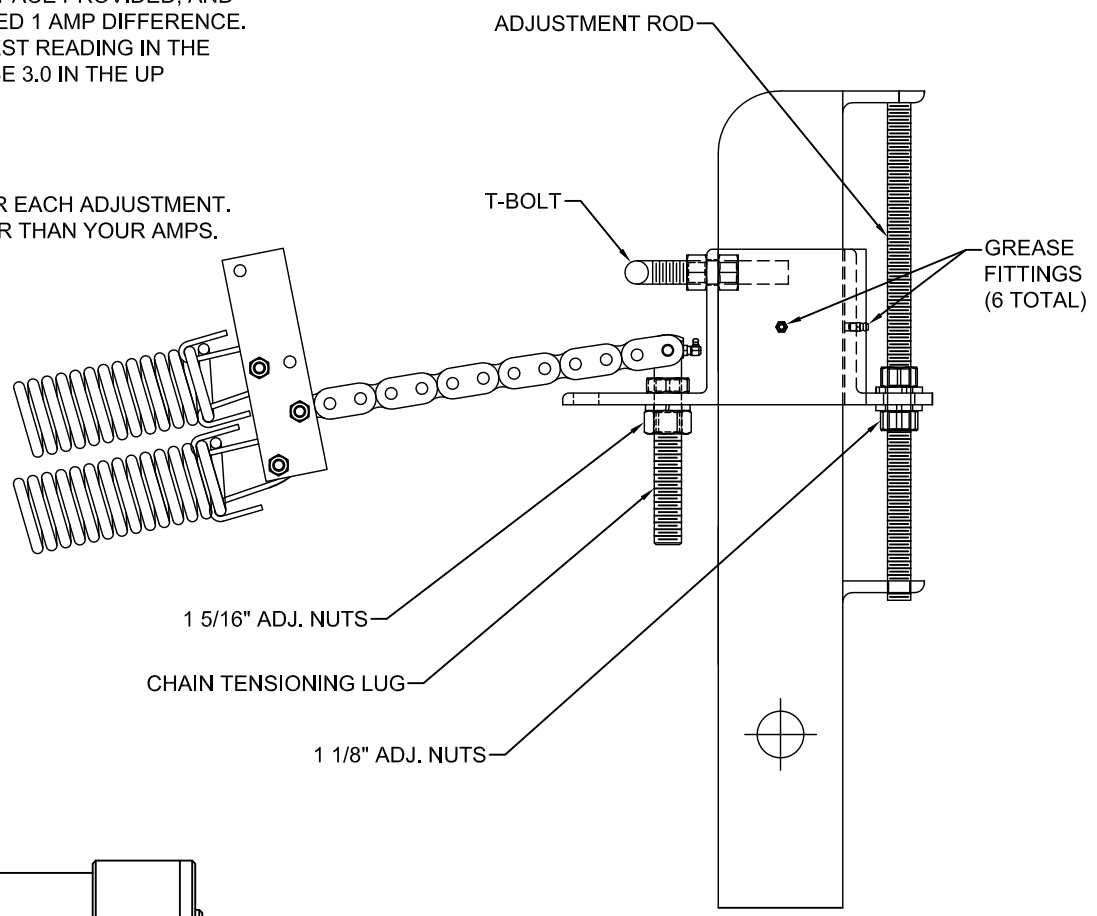
3. LOOSEN ADJ. 1 1/8" NUTS ON BOTH SIDES OF THE SLIDE ASSEMBLY ANGLE.

4. ONLY ADJUST 3 TO 4 TURNS (1/4") AT A TIME AND CHECK YOUR AMPS. AFTER EACH ADJUSTMENT. NOTE: YOUR AMPS. UP, OPENING, SHOULD BE AT LEAST 1/2 (.5) AMPS LOWER THAN YOUR AMPS. DOWN, CLOSING.

5. IF GATE OPENS SLOW, RAISE THE SLIDE ASSEMBLY.
   IF GATE WILL NOT CLOSE, LOWER THE SLIDE ASSEMBLY.
   IF GATE STALLS IN EITHER DIRECTION, YOU OVER-ADJUSTED.
   BACK OFF YOUR LAST ADJUSTMENT AND CHECK AMPS.

6. IF GATE IS SLOW TO CLOSE FROM THE OPEN POSITION, INCREASE LENGTH OF T-BOLT.





SLIDE ASSEMBLY

UP: _____ 10° _____ 55° _____ 85°

DOWN: _____ 10° _____ 55° _____ 85°

DO NOT SCALE

Rev.:	Description:	Date:	Drn. By:	Ckd. By:
C	Black motor wire was blue and added thread details	06/18/14	MKS	DMR
B	Revised motor and slide assembly to current style	04/07/09	MKS	DMR
A	General Revision , new Title Block	04/07/09	MKS	DMR

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
ANGLES ± 1°
X/X ± 1/32, .XX ± .01, .XXX ± .005

Date: 04/03/07
Drn. By: MKS
Ckd. By: DMR

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Gate Entry Systems
Berlin Heights, Ohio
FAX (419) 588-3514

Dwg.: 107

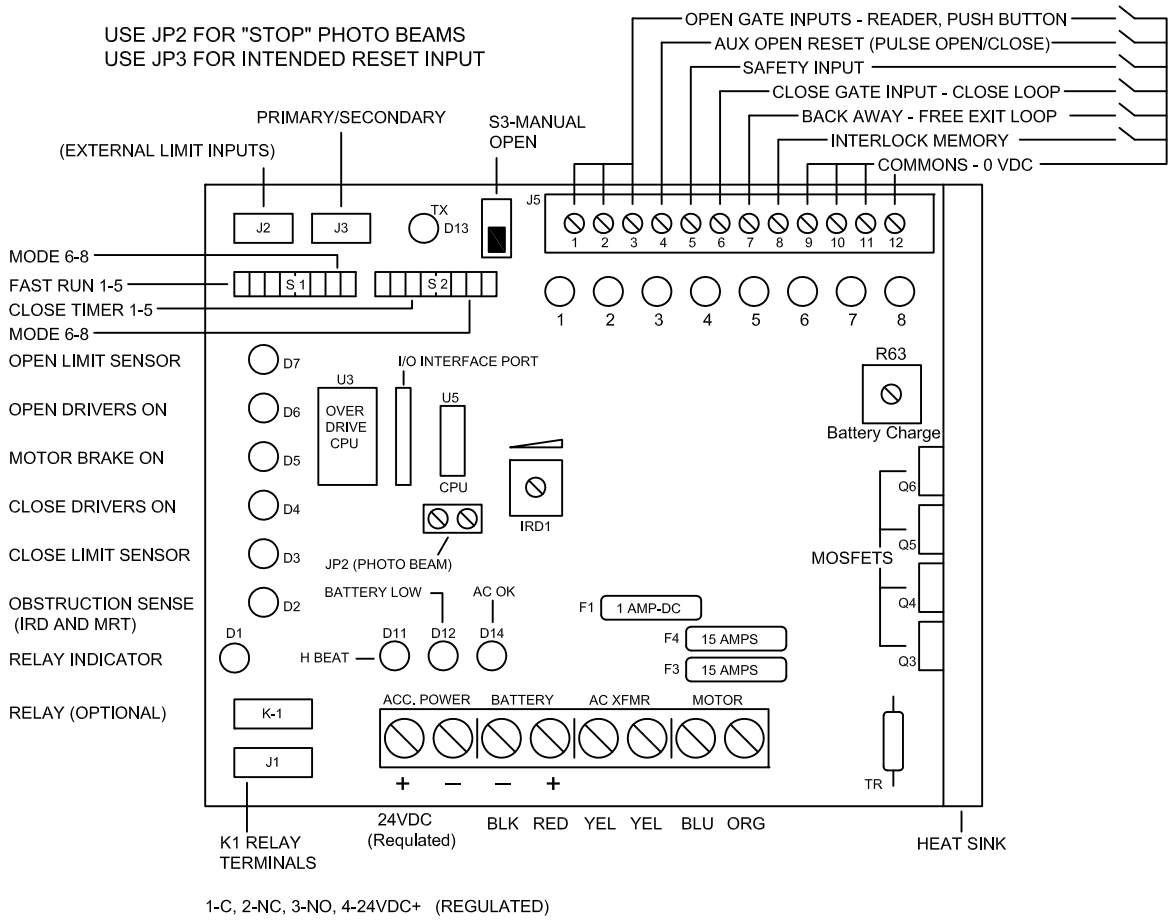
Title: Balancing Slide Assembly

√ MKS 06/18/14

E:\AutoCAD Drawings\Layout and Site Drawings\Standard VPL Drawings\107 Balancing Slide Assembly.dwg

CONTROL BOARD LAYOUT

READ SAFETY INSTRUCTIONS BEFORE WIRING



ACCESSORY POWER IS 24VDC REGULATED RATED AT 500 ma. [1/2 AMP]
{ POWER AT ACCESSORY+ AND AT REALY PIN-4+ IS FUSED AT F1 WITH A 1 AMP FAST-BLO FUSE }

J5 #4 FOR USE WITH HARD WIRED LINE OF SIGHT DEVICES TO OPEN GATE AND RESET UNIT

D11 - HEART BEAT - SHOWS THAT PROCESSOR AND PROGRAM ROUTINE ARE RUNNING PROPERLY

D12 - BATTERY STATUS - SEE DIAGNOSTIC PROCEDURES

D14 - AC POWER INDICATOR - SHOWS THAT AC POWER IS PRESENT

S3 - MANUAL OPEN - TO ALLOW GATE TO BE OPENED OR CLOSED DURING SERVICE OF UNIT

F1 - 1 AMP FAST BLO FUSE (5mm x 20 mm). MAXIMUM CONTINUOUS DRAW IS 1/2 AMP (U.L. LISTED FUSE ONLY)

F3 - 15 AMP ATO TYPE FUSE FOR 24VAC INPUT POWER (U.L. LISTED FUSE ONLY)

F4 - 15 AMP ATO TYPE FUSE FOR 24VDC BATTERY INPUT POWER (U.L. LISTED FUSE ONLY)

JP2 - INPUT FOR PHOT BEAM AS A SECONDARY ENTRAPMENT PROTECTION

7306 Driver Rd, PO Box 50
Berlin Heights, Ohio 44814
Phone: 1 (800) 944-GATE
(419) 588-2796
Fax: (419) 588-3514

Rev.:	Description:	Date:	Drn. By:	Ckd. By:
B	Primary/Secondary "J3" was labeled as Master/Slave	06/06/14	MKS	DMR
A	General revisions, new Title Block	04/07/09	MKS	DMR

DO NOT SCALE

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
ANGLES ± 1°
X/X ± 1/32, .XX ± .01, .XXX ± .005

Date: 11/15/05
Drn. By: MKS
Supercedes: 8/23/04
Dwg.: 109
Title: DC Control Board Layout

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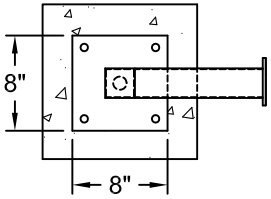
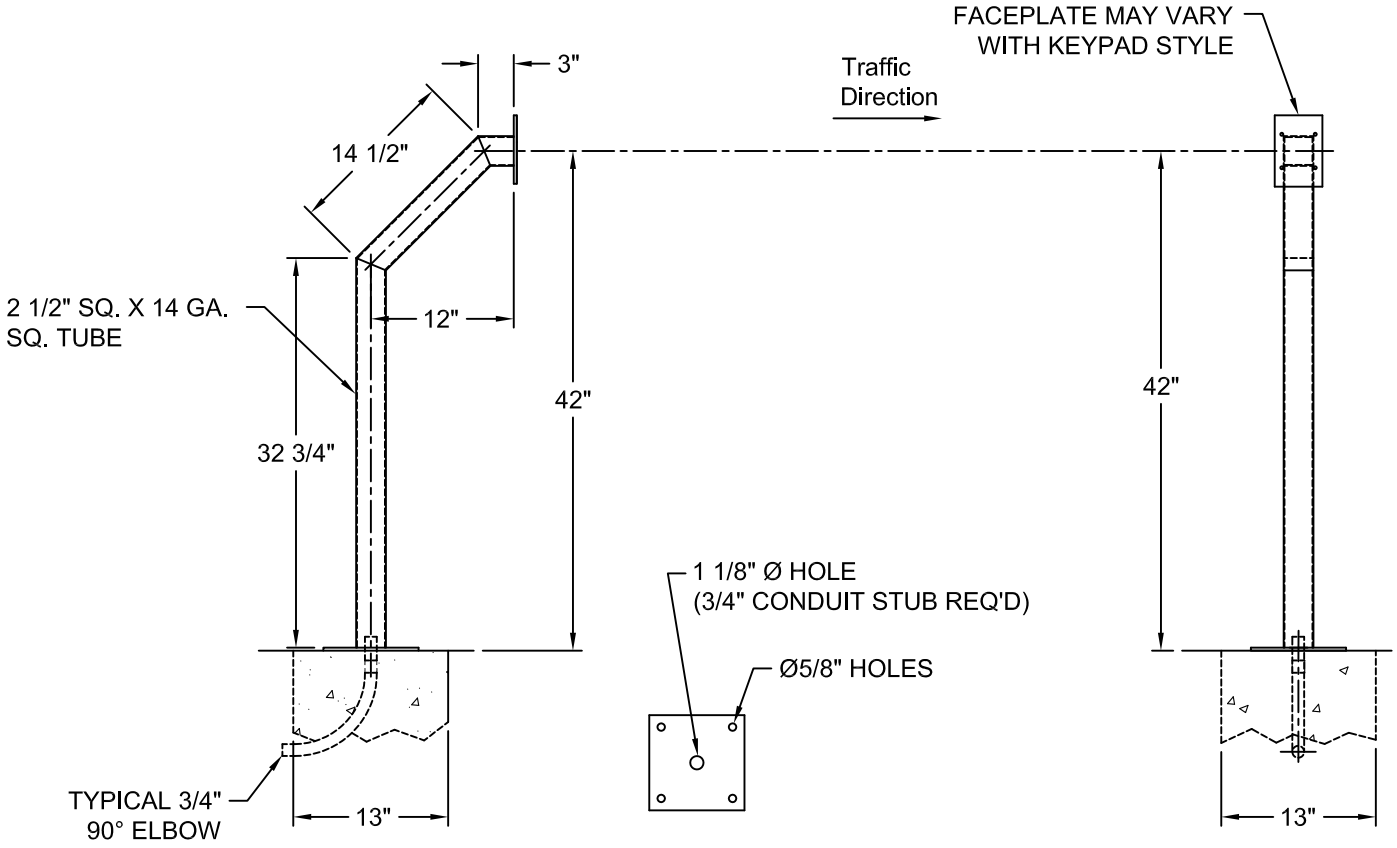
√ MKS 06/06/14

E:\AutoCAD Drawings\Layout and Site Drawings\Standard VPL Drawings\109 Control Board Layout.dwg

Bill Of Material

Item No.	Qty.	Description	Material
	50 1/2"	2 1/2" SQ. X 14GA TUBING	A-0131
	1	STD. BASE PLATE	X-0101





NOTE:
TYPICAL LAYOUT. CHECK THE MANUFACTURERS SPECIFICATIONS FOR THE ACTUAL DIMENSIONS.

STD. 8" BASE PL. (X-0101)

NOTES:
* 1/2" CONCRETE ANCHORS PROVIDED
* POUR PADS BELOW LOCAL FROST LINE
* POSITION BOLLARDS TO PROTECT KEYPAD

DO NOT SCALE

Rev.:	Description:	Date:	Drn. By:	Ckd. By:
B	ADDED "TYPICAL NOTE"	08/15/14	MKS	DMR
A	Added the foundation to the top view	01/03/11	MKS	DMR

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
ANGLES ± 1°
X/X ± 1/32, .XX ± .01, .XXX ± .005

Date: 08/10/05
Drn. By: MKS
Supercedes: 7/9/04

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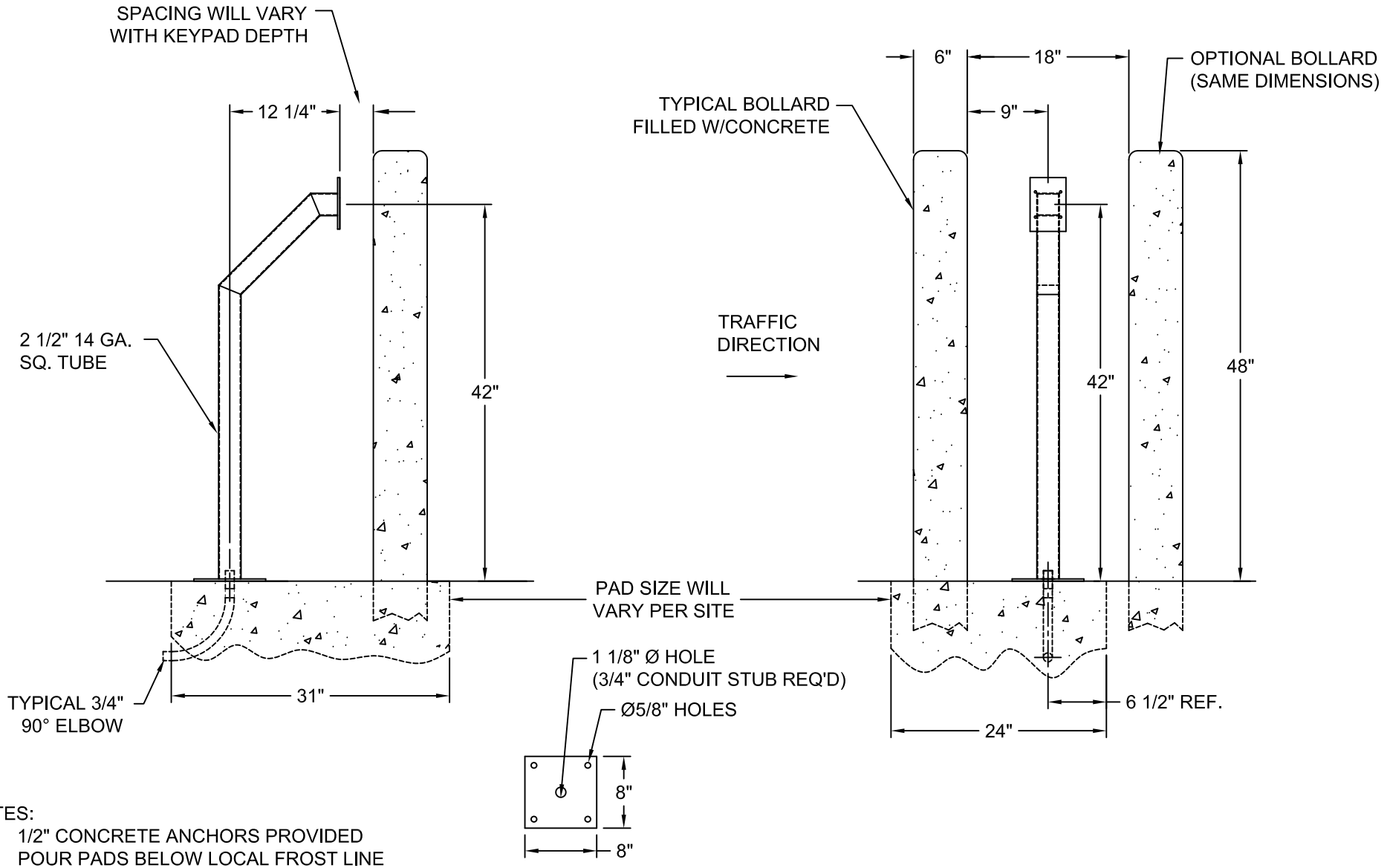
Berlin Heights, Ohio
FAX (419) 588-3514

Dwg.: 111
Title: Gooseneck

KAY 09/15/2014

E:\AutoCAD Drawings\Layout and Site Drawings\Standard VPL Drawings\111 & 112 Std Goosenecks.dwg



NOTES:

1) 1/2" CONCRETE ANCHORS PROVIDED
2) POUR PADS BELOW LOCAL FROST LINE
3) POSITION BOLLARDS TO PROTECT KEYPAD
4) TYP. LAYOUT - CHECK MANUFACTURER SPECIFICATIONS FOR ACTUAL DIMENSIONS.

STD. 8" BASE PL. (4020-B)

DO NOT SCALE

Rev.:	Description:	Date:	Drn. By:	Ckd. By:
B	ADDED TYPICAL NOTE	09/15/14	KAY	MKS
A	Updated drawing	1/24/13	SLD	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
ANGLES ± 1°
X/X ± 1/32, .XX ± .01, .XXX ± .005

Date: 12/07/05
Drn. By: MKS
Supercedes: 8/10/05

AutoGate
Gate Entry Systems
Berlin Heights, Ohio
FAX (419) 588-3514

Dwg.: 112

Title: Gooseneck with Bollards

KAY 9/15/2014

E:\AutoCAD Drawings\Layout and Site Drawings\Standard VPL Drawings\111 & 112 Std Goosenecks.dwg

NOTE: ALL ACC. ARE
OPTIONAL EQUIPMENT

DETAIL: A
LIMIT SWITCH DETAIL

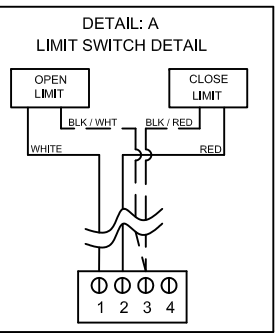


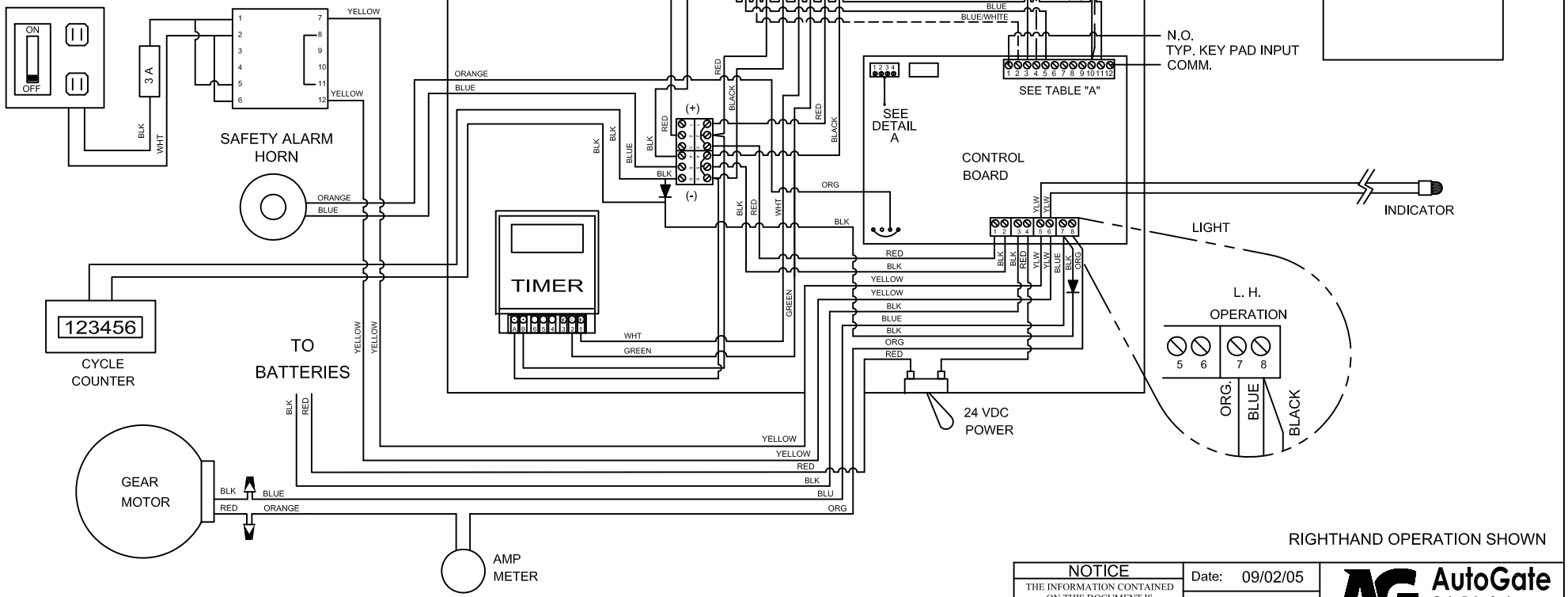
TABLE "A"

1, 2 & 3 - OPEN INPUTS
4 - AUXILARY OPEN INPUT
5 - REVERSING/SAFETY INPUT

6 - CLOSE GATE INPUT (CLOSE LOOP)
7 - BACK AWAY - FREE EXIT LOOP
8 - SHADOW LOOP
9, 10, 11, & 12 - COMMON (0vdc)

120V AC/15A
SERVICE USE ONLY!

TRANSFORMER



RIGHTHAND OPERATION SHOWN

NOTICE

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UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
ANGLES ± 1°
X/X ± 1/32, .XX ± .01, .XXX ± .005

DO NOT SCALE

Rev.:	Description:	Date:	Drn. By:	Ckd. By:
A	REVISED TO MATCH CURRENT ASSEMBLY	06/02/14	EGS	MKS

Date: 09/02/05
Drn. By: MKS
Ckd. By: DMR

AutoGate
Gate Entry Systems
Berlin Heights, Ohio
FAX (419) 588-3514

Dwg.: 113

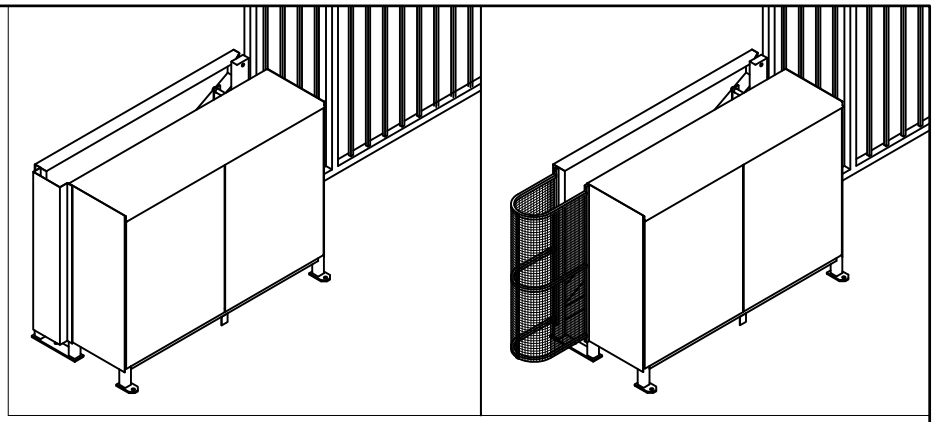
Title: 24V DC Control Board Wiring Diagram

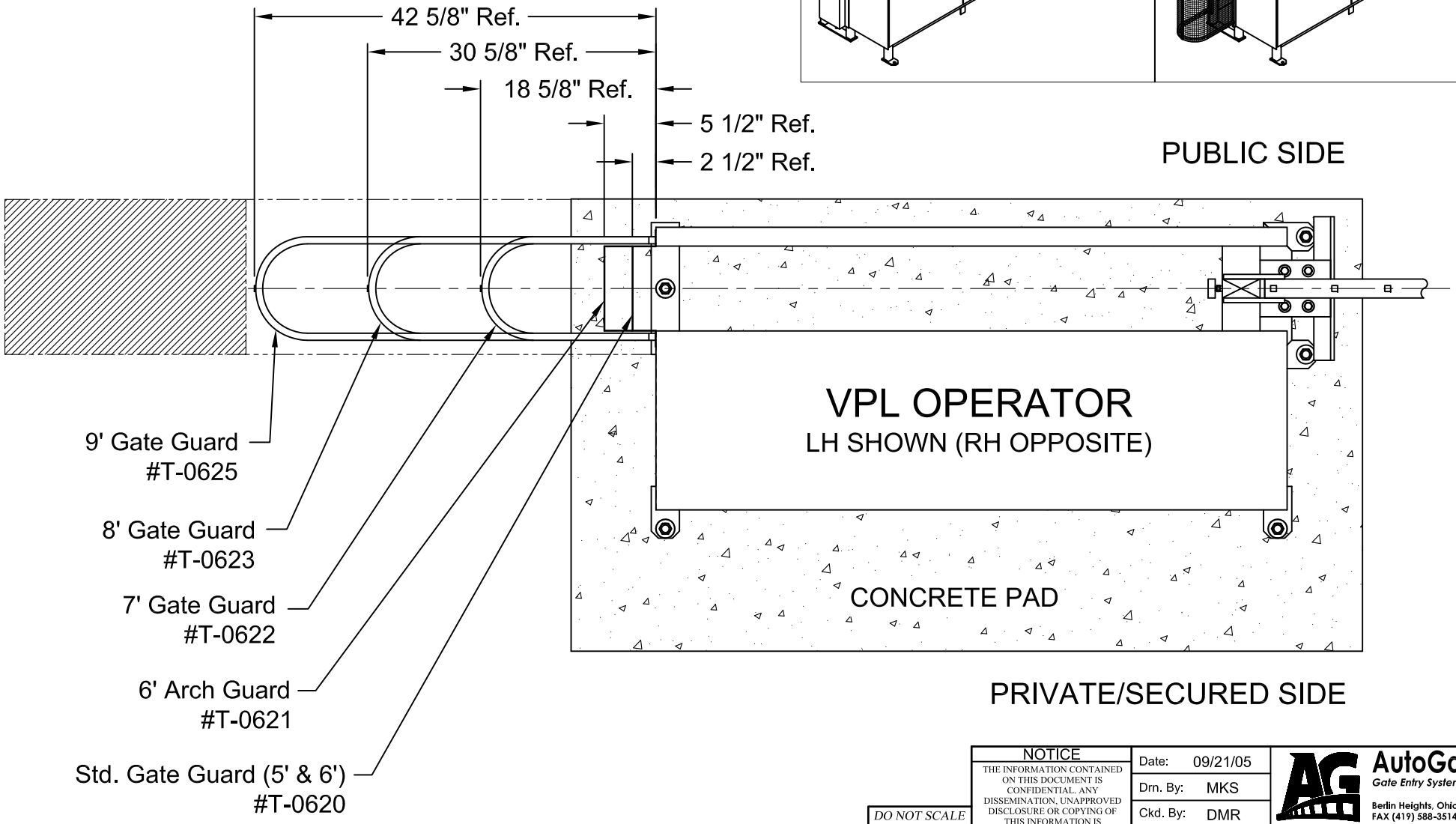
√ MKS 06/06/14

E:\AUTOCAD DRAWINGS\LAYOUT AND SITE DRAWINGS\STANDARD VPL DRAWINGS\113-24V CONTROL BOARD WIRING DIAGRAM.DWG

NOTES:

1) Gates over 9' tall will require local fencing (See shaded area).
2) Scale is in inches
3) Reference dwg. #'s 100, 101, 102, 103





Rev.:	Description:	Date:	Drn. By:	Ckd. By:
.	.	.	.	.
A	ADDED 9' GATE GUARD AND ADDITIONAL NOTES	08/21/13	MKS	B.F.

DO NOT SCALE

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
ANGLES ± 1°
X/X ± 1/32, .XX ± .01, .XXX ± .005

Date: 09/21/05
Drn. By: MKS
Ckd. By: DMR

AutoGate
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Dwg.: 118

Title: Standard Gate Guards and Dimensions

√ MKS 07/01/14

E:\AutoCAD Drawings\Layout and Site Drawings\Standard VPL Drawings\118 Gate Guards and Dimensions.dwg

CONCRETE PAD FOR GATE OPERATOR (3)

732 APWA 1.5" ELECTRICAL CONDUIT REQ'D (1)(2)

736 APWA LIGHT POLE REQ'D SECURITY CAMERA INSTALLED BY OTHERS

732 APWA 1.5" ELECTRICAL CONDUIT REQ'D (2)(1)(2)

731 APWA JUNCTION BOX, TYPE I REQ'D (3)

732 APWA 1.5" ELECTRICAL CONDUIT REQ'D (2)(1)(2)

CONCRETE PAD FOR CALL BOX PEDESTAL 5' x 3' x 4" (3)

18+00

732 APWA 1.5" ELECTRICAL CONDUIT REQ'D (2)(1)(2)

731 APWA JUNCTION BOX, TYPE I REQ'D (3)

732 APWA 1.5" ELECTRICAL CONDUIT REQ'D (2)(1)(2)

CONCRETE PAD FOR GATE OPERATOR (3)

CONCRETE MARKER LABELED "4" CONDUIT END

MIN. 2 FOOT RADIUS BEND

CONCRETE MARKER LABLED "4" CONDUIT END

19+00

732 APWA 4" ELECTRICAL CONDUIT REQ'D (2)(1)(5)

Existing Junction Box

732 APWA 4" ELECTRICAL CONDUIT REQ'D (2)(1)(5)

731 APWA JUNCTION BOX, TYPE I REQ'D (3)

732 APWA 1.5" ELECTRICAL CONDUIT REQ'D (2)(1)(2)

JUNCTION BOX OR CONCRETE PAD

MIN. 1 FOOT RADIUS BEND

EXTEND 6" ABOVE CONCRETE. PAD OR FLOOR OF JUNCTION BOX

DETAIL A

FILL

SD

sd

PAVE CUT

LEGEND:

UNTREATED BASE COURSE

NOTES:

1. ELECTRICAL CONDUIT SHALL BE SCHEDULE 40 PVC.
2. ELECTRICAL CONDUIT SHALL BE PLACED A MIN. OF 18" BELOW GRADE AND A MAX OF 30" BELOW GRADE.
3. STUB CONDUITS UNDER PULL BOXES AND CONCRETE PAD WITH A 90° ELBOW POINTED UP (SEE DETAIL A).
4. INSTALL 4" SCHEDULE 40 PVC DRAIN PIPE FROM BOTTOM OF ELECTRICAL PULL BOX TO STORM DRAIN MANHOLE. CORE DRILL MANHOLE AND ELECTRICAL PULL BOX REQ'D. MINIMUM SLOPE = 1/4"/FT TOWARD MANHOLE.
5. 30" MIN, 48" MAX BURIAL TO TOP OF CONDUIT

REV	DATE	BY	DESCRIPTION
1	6/12/14	TJY	JVWCD COMMENTS

REVISIONS

SCALE
HORIZONTAL 1" = 10'
VERTICAL N/A

WARNING
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

HORROCKS ENGINEERS

2162 West Grove Parkway
Suite 400
Pleasant Grove, UT 84062
(801) 763-5100

3200 WEST ACCESS ROAD

ELECTRICAL PLAN

DESIGNED TJY	DATE 05/01/2014	PROJECT NO.
DRAWN LAU	DATE 05/01/2014	SHEET NO. 16 OF 18
CHECKED BRJ	DATE 05/05/2014	DRAWING NO. DT-2