CONTRACT DOCUMENTS

FOR THE CONSTRUCTION OF

MAGNA WRF REUSE PROJECT

Volume 4 OF 4
Appendices

Magna Water District

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December 2022

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Geotechnical Investigation

Reuse Facility
Magna Water District Water Reclamation Facility
Magna, Utah

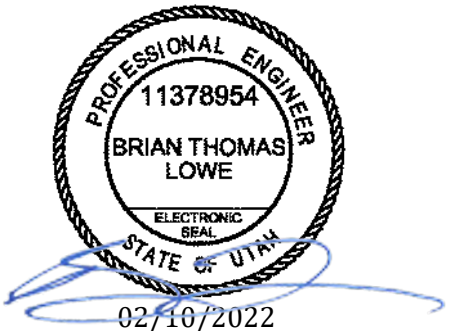
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List of Acronyms

AASHTO	American Association of State Highway and Transportation Officials
ASCE	American Society of Civil Engineers
ASTM	ASTM International (formerly American Society for Testing and Materials)
FEMA	Federal Emergency Management Agency
IBC	International Building Code
IGES	Intermountain GeoEnvironmental Services, Inc.
ISB	Intermountain Seismic Belt
MCE_R	Risk-Targeted Maximum Considered Earthquake
MWD(WRF)	Magna Water District (Water Reclamation Facility)
NCEER	National Center for Earthquake Engineering Research
OCR	Overconsolidation Ratio
PGA	Peak Ground Acceleration
SBT	Soil behavior type
sCPT	Seismic Cone Penetration Test
SGID	State Geographic Information Database
UGRC	Utah Geospatial Resource Center
USCS	Unified Soil Classification System
USGS	United States Geological Survey
UGS	Utah Geological Survey
WFZ	Wasatch Fault Zone
WVFZ	West Valley Fault Zone
*X*PE*Y*	*X* Percent Probability of exceedance in *Y* years

1 Executive Summary

This report presents the results of a geotechnical investigation conducted for the proposed Reuse Facility at the Magna Water District Water Reclamation Facility in Magna, 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 improvements. Based on the subsurface conditions encountered, it is our opinion that the natural site soils can be considered suitable to support the proposed structures provided that the recommendations presented in this report are completely incorporated into the design and construction.

- The subsurface conditions at the site can be described as undocumented fill materials consisting of sandy lean clay with gravel or poorly graded gravel with clay and sand to between 3.2 and 5.5 feet in depth overlying the native site soils. Beneath the surficial fill, the native subsurface conditions can be described as lean clay with occasional organics to a depth of 8 to 8.5 feet overlying a sandy lean clay layer to 11.5 feet. Beneath the sandy lean clay lean clay with varying amounts of sand was observed to depths ranging between 19 and 20.5 feet with sandy silty clay or silty sand layers between 6 inches and 2 feet interbedded within the lean clay to 25 feet. Beneath the interbedded zone, lean clay was observed to the extent of the boring. Although physical samples were not collected beneath 72 feet, cone penetration test soil behavior types between 72 and 101 feet indicate that interbedded sand mixtures, silt mixtures and clays with tip resistances between 25 and 35 tons per square foot were observed with tip resistance generally increasing with depth.

- Groundwater was encountered in the cone penetration test soundings with pore pressure dissipation testing at a depth of 5.4 feet below the ground surface (elevation 4223.7 feet) at the project sites. Artesian pressure was observed in PPD testing at approximately 95 feet with a pressure head of 4 feet above the existing grade. Seasonal and annual variations in precipitation, Great Salt Lake levels, irrigation, and rate of snowmelt will influence the depth-to-groundwater throughout the project site.

- Shallow spread or continuous wall footings founded at the frost depth, constructed entirely on 12 inches of structural fill over native earth materials may be proportioned utilizing a maximum net allowable bearing pressure of 1,500 pounds per square foot (psf) for long term load conditions. The allowable bearing capacity may be increased by one-third for short-term loading. It is estimated that total settlement will be 1 inch or less with ½ inch of differential settlement over a distance of 40 feet.

- Deeper mat foundations founded on 12 inches of structural fill over the native subsurface near elevation 4213 feet may be proportioned for a gross bearing capacity of 2,100 pounds per square foot (i.e. fully compensated) for long term loading conditions. The allowable bearing capacity may be increased by one-third for short-term loading. It is estimated that total settlement will range from approximately 1 ¼ to 2 ½ inches depending on the timing

of load application and dewatering. Differential settlement is expected to be as much as 1 to 1 ¾ inches between the point of approximate maximum settlement and the edge of the mat. The actual settlement will vary depending on load application staging and dewatering extent and duration. Rebound of the structure up to 1 ½ inches is estimated following return of the groundwater to preconstruction levels.

- The site is mapped within an area designated as having a high liquefaction hazard. Analysis indicates that up to 0.3-inches of post-liquefaction settlement could occur at the ground surface resulting from a design-level earthquake. half of the total settlement is estimated to occur over a horizontal distance of 40 feet as differential settlement. Lateral spread is not estimated to occur.
- 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 very strong to severe ground shaking should be anticipated in the event of an earthquake.
- The impacts of mapped geologic hazards at the site including flooding, shallow groundwater, and indoor geologic radon should be considered in the design.
- Mapped geologic hazard including collapsible soils, expansive soils, and surface fault rupture are not anticipated to adversely impact the project.

A summary of field and laboratory exploration programs and the subsurface conditions observed as well as recommendations regarding the design and construction of the proposed site improvements are provided in this report.

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

This report presents the results of a geotechnical investigation performed for the proposed Reuse Facility at the Magna Water District (MWD) Water Reclamation Facility (MRF, collectively the MWDWRF) in Magna, Utah. 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 the of the improvements. 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 September 22, 2021, and your signed authorization on November 10, 2021. 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.

2.1 Project Description

The project site is the existing MWDWRF located at approximately 7800 West 2100 South in Magna, Utah (see Figure A-1 for Site Vicinity Map). To assist in our preparation of this report, the following documents were provided:

- A drawing prepared by Stantec and Bow, Collins & Associates titled, “Magna Water District Reuse Project Preliminary Engineering Report Conceptual Site Plan Figure ES-6,” dated July 24, 2021.

Based on the referenced drawings the proposed Reuse Facility is situated approximately to the east of the existing secondary clarifier No. 3 and north on the existing Biobrox Facility. We understand that the plan area of the building is approximately 2100 square feet (70- x 30-feet) and that a 14-foot-deep wet will is proposed. Construction plans were not available at the time of this report; however, we understand the new building will founded approximately 16 feet below grade (assumed 2 foot thick mat) on a structural mat integrated with the walls. Based on correspondence with the project structural engineer, the net loading of the walls will likely not exceed 3 kips per linear foot and that the wet well will be fully compensated with a net negative load. Net cuts and fills of less than 1 foot are anticipated.

3 Method of Study

The subsurface conditions were investigated by means of a literature review, soil borings, and one cone penetrometer test sounding with shear wave velocity measurements. 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:

- Hintze (1980), Scott et al. (1983), Personius and Scott (1992) and Hintze (1988) provide regional geologic setting information.
- Scott et al. (1983), Personius and Scott (1992), Hintze (1988), Hintze (1980), and the Utah Geological Survey (UGS, UGS 1996) provide regional seismotectonic setting information.
- Solomon, et al. (2018) provides 1:24k-scale geologic mapping that covers the project site, in the geologic map of the Magna quadrangle.
- Clark et al. (2020) provides 1:62k-scale geologic mapping that covers the project site, in the geologic map of the Toole 30 by 60 minute quadrangle.
- Castleton et al. (2011) provides geologic hazard mapping of the area. Mapped hazards discussed include; liquefaction susceptibility, surface fault rupture, flood, landslide, rock fall, indoor radon, collapsible soil susceptibility, expansive soil and rock susceptibility, shallow bedrock, and shallow groundwater.
- The Utah Geological Hazards Portal (UGS 2020) provides earthquake ground shaking and Surface Fault Rupture Special Study Zone mapping.
- 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.
- Additional groundwater mapping and data including:
    - Jensen et. al. (1985)
    - Seiler and Waddell (1984)
- IGES has performed explorations in the vicinity of the project site in the past which are summarized in:
    - A report titled “Geotechnical Evaluation for Fine Screen Facility, Magna WRF Magna, Utah,” dated April 7, 2010.

- A report titled "Geotechnical Investigation Magna Wastewater Treatment Plant Improvements Chemical Building & Clarifier Project," dated September 7, 2017.
- A report titled "Geotechnical Investigation Magna Water District 6800 West 2700 South Magna, Utah," dated March 1, 2018.
- A report titled "Geotechnical Investigation Proposed Sewer Line Installation 8000 West 2100 South Magna, Utah," dated October 16, 2020.

3.2 Field Investigation

Characterization of the general subsurface conditions at the project site was undertaken with one seismic cone penetrometer test (sCPT) sounding and two mud rotary soil borings. Investigation locations were selected based on our understanding of the proposed construction at the time of the investigations. Explorations wee 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. Additionally, IGES reviewed and marked the located with MWDWRF personnel prior to the field program. Explorations were advanced in an area accessible to the equipment and clear of marked utilities. A summary of the explorations performed to date is presented in Table 1. The approximate locations of the explorations are shown in Figure A-2 in Appendix A.

3.2.1 Soil Borings

Two soil borings (designated B-01 and B-02) were performed between December 9 and December 10, 2021, to depths ranging between 49.5 and 72.0 feet below the existing grade. The borings were advanced by ConeTec, Inc. utilizing a truck-mounted CME 75 drill rig and mud rotary drilling techniques in general accordance with ASTM D5783. A 4.875-inch diameter drag bit and shallow casing were utilized to advance the boring. Samples were targeted for specific layers based on the sCPT trace. One of the borings was sampled continuously to supplement the liquefaction analysis. Split barrel type samples were collected with a split spoon or California sampler 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. The energy transfer ratio of the hammer was previously measured to be 79.2 percent. 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. Large diameter samplers (e.g. California) were corrected to a standard split spoon utilizing the method detailed in Fang (1991). Undisturbed samples were collected with thin-walled Shelby tubes in general accordance with ASTM D1587. Soil samples were packaged in sealed containers and transported in general accordance with ASTM D4220 to the IGES geotechnical laboratory to South Salt Lake for subsequent review and testing. A representative of IGES observed the boring being performed, visually classified the samples in general accordance with ASTM D2488 and prepared the

graphical boring logs shown in Figures A-11 through A-12. A key to the soil symbols and terminology is shown in as Figure A-13.

3.2.2 Cone Penetration Test Soundings

One sCPT soundings (designated sCPT-01) was performed on December 6, 2021 to a depth of 100.9 feet beneath the existing grade. The sounding was reportedly performed in accordance with ASTM D5778 by ConeTec, Inc. utilizing a 25-ton, truck-mounted CPT rig. Continuous data was collected during the soundings. Shear wave velocities were measured at 2-meter intervals through the depth of the exploration to aid in seismic site classification. Pore pressure dissipation (PPD) tests were performed throughout the depths of the sounding to estimate pore pressures within various strata. The ConeTec CPT report is provided in Appendix A. A summary of the sounding is presented in Table 1.

Table 1: Summary of Explorations

Field Exploration	Ground Surface Elevation[1] (feet)	Total Depth of Exploration (feet)	Encountered Groundwater Depth [Elevation[1]] (feet)	Encountered Artesian Pressure Depth [Pressure Head Above Ground Surface] (feet)
RF-B-01	4229.1	72.0	-- [2]	Not encountered
RF-B-02	4228.1	49.5	-- [2]	Not encountered
sCPT-01	4229.1	100.9	5.4 [4223.7]	95.1 [4.3]

Notes:

1) Approximate elevation provided onsite by EPIC
2) Groundwater not observed due to mud

Source: Compiled by IGES in 2022

3.2.3 Backfill and Surface Restoration

Following completion of the explorations, the boreholes were backfilled with cement-amended bentonite grout and topped with bentonite chips, while the sCPT sounding was backfilled with granular bentonite pellets. Excess cuttings and drilling fluids were disposed of onsite as directed by MWDWRF personnel.

3.3 Laboratory Investigation

Geotechnical laboratory tests were conducted by IGES on 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 *with hydrometer* (ASTM D6913, *ASTM D7928*)
  - Organic Matter Content (ASTM D2974)
- **Settlement Characteristics**
  - One-Dimensional Consolidation Properties of Soils (ASTM D2435)
  - One-Dimensional Consolidation Properties of Soils Using Controlled-Strain Loading (ASTM D4286)
- **Soil Strength Testing**
  - Unconfined Compressive Strength of Cohesive Soils (ASTM D2166)
  - Isotopically Consolidated Undrained Staged Triaxial Compression (ASTM D4767)
- **Corrosion Potential**
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  - 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 A. A summary table along with the full results of the laboratory testing are provided in Appendix B.

3.4 Previous Geotechnical Investigations

In February of 2013, IGES performed a site investigation for the fine screen building located on the southeastern portions of the facility to the south of the current project site. The field program consisted of two soil borings to a depth from 41.5 feet. Subsurface conditions were generalized lean clay with interbedded sandy silt and lean clay with sand. Groundwater was observed between 5 and 13 feet beneath the existing grade at the time of the investigations.

In July of 2017, IGES performed a site investigation for the east-most clarifier, chemical building and electrical building located centrally in the facility to the west and northwest of the current project site. The field program consisted of two soil borings to depths ranging from 49.5 to 122

feet. Subsurface conditions were generalized mainly as fine-grained soils with occasional seams and lenses of granular material from 1-inch to 2-feet in thickness. Silt and clay layers were generally 1.5 to 3 feet thick, occasionally up to 5-feet in thickness. Transitions between layers of the various material types showed some mixing of fine and coarse-grained soils. Soils were typically soft/loose and moist to wet up to a depth of ~110 feet below grade. Some gravelly soil was encountered at approximately 117 feet, sand and gravel continued to 121.5 feet below grade.

In October of 2017, IGES performed a site investigation for the pig retrieval vault to the northeast of the current project site and the brine pump located at a separate facility. The field program for the pig retrieval vault consisted of one soil boring to a depth of 51.5 feet. Subsurface conditions were generalized as Holocene-aged lacustrine deposits consisting primarily of soft to stiff, moist to wet of fine-grained soils The fine-grained soils were interbedded with granular soils including very loose to loose sands. Groundwater was observed at 7.5 feet beneath the existing grade at the time of the investigations.

In September of 2020, IGES performed a site investigation for the proposed sewer line along 2100 South to the south of the current project site. The field program consisted of four soil borings to depths ranging from 26.5 to 49.5 feet. Subsurface conditions in B-4 (most proximate to the current project site) were generalized very soft to very stiff, moist to wet, lean to fat clay or sandy silt to the extent of the boring. Stiffness generally increased with depth. Groundwater was observed at 7 feet beneath the existing grade at the time of the investigations.

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

The Salt Lake Valley represents a deep, sediment-filled structural basin of Cenozoic-age, flanked by two uplifted blocks, the Wasatch Range to the east and the Oquirrh Mountains to the west (Hintze 1980). The northern portion of the Salt Lake Valley extends beyond the northern limits of the Oquirrh Mountain Range and is bordered on the west by the southeastern shore of the Great Salt Lake. The Wasatch Range is the eastern-most expression of pronounced Basin and Range extension in north-central Utah.

The near-surface geology of the Salt Lake Valley is dominated by sediments that were deposited within the last 30,000 years by Lake Bonneville (Scott et al. 1983; Personius and Scott 1992; Hintze 1988). As the lake receded, streams began to incise the large deltas that were formed at the mouths of major canyons along the Wasatch Range. The eroded material was deposited in shallow lakes and marshes in the basin, in a series of recessional deltas and alluvial fans. Sediments toward the center of the valley are predominately deep-water deposits of clay, silt, and fine sand. However, these deep-water deposits are covered in places by a thin, post-Bonneville alluvial cover.

4.1.2 Seismotectonic Setting

The Wasatch Mountains, as part of the Middle Rocky Mountains Province, were uplifted as a fault block along the Wasatch Fault (Hintze, 1988). The Wasatch Fault and its associated segments are part of an approximately 230-mile-long zone of active normal faulting referred to collectively as the Wasatch Fault Zone (WFZ), which has well-documented evidence of late Pleistocene and Holocene movement (Lund, 1990; Hintze, 1988). The faults associated with the WFZ are nearly all normal faults, exhibiting block movement down to the west of the fault and up to the east. The WFZ is considered “active” and contained within a greater area of seismic activity known as the Intermountain Seismic Belt (ISB), which runs approximately north-south from northwestern Montana, along the Wasatch Front of Utah, through 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 West Valley Fault Zone (WVFZ) is located to the east of the site and is comprised of two main fault traces designated the Taylorsville and Granger faults (Personius and Scott, 1992). Both faults are mapped as normal faults (UGS, 2019). Based on the Utah Quaternary Fault and Fold Database, the nearest mapped extent of the Granger fault trace is located between 3.8 and 4 and miles to the northeast of the site (UGS 2019).

4.2 Surficial Site Geology from Literature

Solomon et al. (2018) provides geologic mapping of the vicinity at a 1:24,000 scale. The project area is mapped as young lacustrine and alluvial deposits (map unit Qlay) bordered by young lacustrine deposits (map unit Qly). The referenced mapping and unit descriptions are provided in the Figure A-3 in the appendices and are summarized below.

The young lacustrine and alluvial deposits are Holocene-aged and are described as "Silt, clay, and minor sand deposited by streams draining the Great Salt Lake flood plain, and in shallow lakes, ponds, and marshes associated with the streams; mapped in areas of standing water or where the water table is or has recently been at the ground surface; commonly organic rich; less than 10 feet (3 m) thick."

The young lacustrine deposits are Holocene-aged and are described as "Poorly sorted silt, clay, and minor sand deposited by Great Salt Lake regression of Lake Bonneville from the Gilbert shoreline; grades into deposits of lacustrine silt and clay of Lake Bonneville that are not mapped separately because of similar sediment type and appearance; generally, less than 15 feet (5 m) thick.

Clark et al. (2020) provides the most recent geologic mapping across the project area at a 1:62,500 scale, though the geologic contacts are virtually identical to the mapping by Solomon et al. (2018) the unit descriptions differ. The project area is mapped as stream alluvium (map unit Qal) bordered by young lacustrine deposits (map unit Qly). The referenced mapping and unit descriptions are provided in the Figure A-4 in the appendices and are summarized below.

The stream alluvium is Holocene-aged and is described as "Primarily clay, silt, and sand with some gravel lenses deposited by streams in channels and broad drainages, but in mountain valleys deposits are coarser grained and associated with more colluvium; locally merges with alluvial-fan deposits; locally includes alluvial-fan, colluvial, low-level terrace, lacustrine, and eolian deposits; thickness generally less than about 20 feet (6 m)."

The younger lacustrine deposits are Holocene-aged and are described as "Silt, clay, and minor sand from higher levels of Great Salt Lake; form islands at paleo Jordan River delta and mudflats northeast of Magna; gradational upslope with fine-grained regressive Lake Bonneville deposits and downslope with units Qlmy and Qldy; near Magna unit Qly is incised by post-Lake Bonneville alluvium; locally covered with a loess veneer; thickness generally less than 15 feet (5 m)."

4.3 Geologic Hazards from Literature

Based upon the available geologic literature and a review of the mapping provided by Castleton et al. (2011) and the Utah Geologic Hazards Portal (UGS, which incorporates the mapping by Castleton), hazards that impact the project site are; strong ground motions, liquefaction susceptibility, flood, indoor geologic radon, collapsible soil susceptibility, expansive soil and rock

susceptibility, and shallow groundwater. Surface fault rupture does not impact the site, but documentation relating to this condition is presented below for completeness.

4.3.1 Strong Ground Motions

The entire property is subject to earthquake-related ground shaking from a large earthquake generated along the active Wasatch Fault and surrounding fault zones. Given the distance proximity of the site to active faults (further discussed in Section 4.3.8), the ground shaking is expected to be very strong/severe (UGS, 2020).

4.3.2 Liquefaction

Liquefaction susceptibility mapping only considers the soil and ground-water conditions as they relate to liquefaction. It does not take into the consideration the anticipated ground motions (i.e. if liquefaction will be triggered). Based on mapping by Castleton et al. (2011), the site is depicted as *High* susceptibility for liquefaction. Susceptibility mapping is shown in Figure A-5.

4.3.3 Flooding

The FEMA flood map that covers the subject property (FEMA, 2009) shows the entire property as being located with an area mapped as an Area of Minimal Flood Hazard.

Mapping provided by Castleton et al. (2011) depicts the site as Very High flood hazard. Based on the mapping and accompanying documentation, the Very High flood hazard can likely be attributed to the Kersey Creek Canal creek canal which run in a north-south direction less than 100 feet to the east of the site. The report sites flash flood and sheet flooding as the result of cloudburst storms (a high precipitation amount in a short period of time) as the primary reason for the ratings in the map. Flood hazard mapping is shown in Figure A-6.

4.3.4 Indoor Geologic Radon

Based on mapping by Castleton et al. (2011), the risk for indoor geologic radon is Moderate. This is defined as, “where probable soil uranium concentrations range from 2 to 3 parts per million (ppm); groundwater depth is less than 30 feet below the surface, or uranium source is located at the surface/within groundwater table, and the soil is moderately permeable. In addition, indoor radon concentrations may range from 2 to 4 picocuries per liter (pCi/L) or higher.” If the District desires to address the hazard, a Radon specialist may be retained to quantify and provide mitigation options. Radon does not impact the geotechnical design aspects of the project.

4.3.5 Collapsible Soil

Based on mapping by Castleton et al. (2011), the project site is mapped as “Collapsible Soil 3” which is defined as “Unconsolidated deposits where no or limited geotechnical data are available, but which have a genesis or texture susceptible to collapse (chiefly geologically young alluvial,

colluvial, and eolian deposits). Collapsible soils are unlikely in areas continually subjected to saturation or flooding." Due to the mapped shallow groundwater (further discussed in section 4.3.7), collapsible soils are unlikely per the mapped rating. Collapsible Soil hazard mapping is shown in Figure A-7.

4.3.6 Expansive Soil

Based on mapping by Castleton et al. (2011), the site is susceptible for expansive soil. Expansive soils are defined in the report as, "Soils classified by the Natural Resources Conservation Service as having a high susceptibility for volumetric change; and/or have a liquid limit (LL) greater than or equal to 35 to 45, a plasticity index (PI) greater than or equal to 15 to 20, and a swell/collapse test (SCT) value of greater than or equal to 3 to 4 percent swell; and/or a linear extensibility potential greater than 6 percent. Soils are clay rich or weather to clay." Expansive Soil hazard mapping is shown in Figure A-8.

4.3.7 Shallow Groundwater

Historic groundwater mapping in the vicinity of the site from multiple sources was reviewed. Groundwater mapping is shown in Figure A-9. A summary of the reviewed mapping is presented in Table 2.

Table 2: Summary of Reviewed Groundwater Document Mapping

Data Source	Reported Depth (ft)	Figure	Notes
Castleton et al. (2011) [1]	≤ 10	A-9a	Designated "Unit 1"
Seiler and Waddell (1983)	0 – 5	A-9b	--
Jensen et al. (1985)	0 – 5	A-9c	--

Notes:

1) Incorporated into Utah State Geographic Information Database (SGID) groundwater mapping

Source: Compiled by IGES in 2022

4.3.8 Surface Fault Rupture

Based on a review of the mapping provided by Castleton et al. (2011), Solomon et al., (2018), Clark et al. (2020), and the Utah Quaternary Fault and Fold Database (UGS 2019), faults are not mapped beneath the project site and the project area is not currently located in a Surface Fault Rupture special study area. The nearest mapped extent of the Granger fault trace is located

between 3.8 and 4 and miles to the northeast of the site (UGS 2019). The most proximate faults and special study areas are shown in Figure A-10.

4.4 Seismicity

4.4.1 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 (Vs_{100}; or 30 meters, Vs_{30}); site classifications are identified in Table 20.3-1 of ASCE 7-16 (ASCE 2017, 2018).

Based on the field program performed by ConeTec, the Vs_{100} of the site was measured to be approximately 629 feet per second. Therefore, these subsurface materials classify as Site Class D. As the S_1 is greater than 0.2g, it has been assumed that Exception number 2 (ASCE-7-16 11.4.8) is considered acceptable for this structure. If it is later determined that Exception number 2 are not applicable to this project, IGES should be contacted regarding the completion of a ground motion hazard analysis, which would require additional field work, analysis and reporting.

4.4.2 Design Spectrum

Following the criteria outlined in the 2018 International Building Code (IBC, 2018), 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, 2018). The short- and long-period Design Spectral Response Accelerations for the site are presented below in Table 3 and Table 4 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 3: Spectral Accelerations for MCER, Risk-Targeted Values (Structural)

Mapped B/C Boundary S_a (g)		Site Coefficient (Site Class D)		Design Sa (g)	
S_S	S_1	F_a	F_v	S_{DS}	S_{D1}
1.064	0.378	1.074	**1.992** [1]	0.762	**0.484** [1]

Notes:

1) **ASCE 7-16 Section 11.4.8 Exception No. 2 taken. A ground-motion hazard analysis may be required for some structures.**

2) $T_L = 8$

Source: https://seismicmaps.org/

Table 4: Spectral Accelerations for MCE, Geo-Mean Values (Geotechnical)

Mapped B/C Boundary PGA (g)	Site Coefficient F_{PGA} (Site Class D)	PGA_M (g)
0.464	1.136	0.527

Notes:

Source: https://seismicmaps.org/

5 Generalized Site Conditions

5.1 Existing Conditions

The project site is located within the existing MWDWRF. Currently the site is relatively flat with an elevation of approximal 4228 feet (project datum). The surface is composed of gravel. There are currently several modular work trailers and miscellaneous materials stored within the footprint of the structure. Utilities were not delineated in the vicinity of the explorations, though onsite utilities are likely present within 50 feet of the proposed footprint.

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 Undocumented Fill

Likely undocumented fill materials were observed in the explorations in the vicinity of the Reuse Facility project site. Fill appeared to consist of very stiff to hard, moist sandy lean clay with gravel or dense, moist poorly graded gravel with clay and sand. The apparent fill was observed to extend between 3.2 and 5.5 feet in depth overlying the native site soils.

5.2.2 Earth Materials

Beneath the surficial fill, the native subsurface conditions can be described as soft to medium stiff, moist to wet lean clay with occasional organics to a depth of 8 to 8.5 feet overlying a medium to very stiff, moist to wet sandy lean clay layer to 11.5 feet. Beneath the sandy lean clay, very soft to medium stiff, wet lean clay with varying amounts of sand was observed to depths ranging between 19 and 20.5 feet. Medium to very stiff , wet, sandy silty clay and medium dense, wet silty sand layers between 6 inches and 2 feet were observed interbedded within the lean clay to 25 feet. Beneath the interbedded zone, stiff to very stiff, moist to wet lean clay was observed to a depth 42.5. Beneath the lean clay, stiff to very stiff, moist to wet lean clay was observed to the extent of the boring. Although physical samples were not collected beneath 72 feet, CPT soil behavior types (SBTs) between 72 and 101 feet indicate that interbedded sand mixtures, silt mixtures and clays with tip resistances between 25 and 35 tons per square foot were observed with tip resistance generally increasing with depth.

5.2.3 Groundwater Conditions

Groundwater was encountered in the CPT exploration with PPD testing at a depth of 5.4 feet below the ground surface (elevation 4223.7 feet) at the project sites. Artesian pressure was

observed in PPD testing at approximately 95 feet with a pressure head of 4 feet above the existing grade. Seasonal and annual variations in precipitation, Great Salt Lake levels, irrigation, and rate of snowmelt will influence the depth-to-groundwater throughout the project site.

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 Compressibility

One-dimensional and controlled rate of strain (CRS) laboratory consolidation testing was performed on several samples to estimate their performance under loading. To determine the preconsolidation pressure, the graphical method proposed by Casagrande (1936) was utilized. Using this method, the samples were estimated to have an over consolidation ratio between 2 and 4 with an overconsolidation margin between 3.5 and 3.8 ksf. Continuous data from CPT sounding were correlated to preconsolidation stress as detailed in Ozer et al. (2010) were also utilized to characterize the soil profile and validate the stress history obtained from the graphical methods.

5.5 Collapsible Soil

Although collapse/swell testing was not performed, significant pinholes, or low unit weight were not observed. Additionally, the groundwater was observed to be shallow, leading to inundation of the near surface soils. Based on these results, collapsible soils are not expected to pose a hazard to the structure.

5.6 Expansive Soil

Although collapse/swell testing was not performed, several one-dimensional laboratory consolidation tests were performed. During testing, one sample swelled less than 1 percent during inundation and during the first load step while the other sample was not observed to swell during testing. Additionally, the long-term loading of the structure will far exceed the pressure in which swelling was observed in the oedometer (i.e. load to prevent swell). Based on these results, the slightly expansive soils are not expected to pose a hazard to the structure.

5.7 Strength of Earth Material

One staged isotopically consolidated undrained triaxial compression test 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 5.

Table 5:Summary of Shear Strength Testing Results

Borehole	Sample Depth (feet)	Shear Testing Type [1]	Total Stress		Effective Stress	
			c (psf)	ϕ (degrees)	c ‘ (psf)	ϕ ‘ (degrees)
RF-B-01	15.0	Staged Isotropically Consolidated Undrained Triaxial Compression	393	17.8	212	29.4

Notes:

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

Source: Compiled by IGES in 2021

5.8 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 completed results of the corrosion testing for soils are presented in Table 6 and in Appendix B. The results are further discussed in Section.0.

Table 6: Corrosion Potential Indicator Testing Summary

Sample		Corrosion Potential Indicator			
Exploration	Depth (ft)	pH	Sulfate Potential (ppm)	Chloride Potential (ppm)	Electrical Resistivity (Ω-cm)
RF-B-02	2.5	8.95	170	40.9	1294
RF-B-02	15.0	9.76	563	169	442

Notes:

Source: Compiled by IGES in 2021

5.9 Liquefaction Analysis

Liquefaction is the loss of soil strength or stiffness due to a buildup of excess pore-water pressure and reduction of effective stress during strong ground shaking. Liquefaction is associated primarily with loose (low density), granular, submerged soil as well as nonplastic silts. Soils that are dense, above the groundwater table; or are primarily clay are not susceptible to liquefaction. Various screening procedures are utilized to delineate soils that are not liquefaction susceptible and are typically based on some combination of insitu moisture content, Atterberg limits, fines content and clay fraction. Effects of severe liquefaction can include sand boils, excessive settlement, bearing capacity failures, and lateral spreading.

Due to the *High* liquefaction susceptibility mapped at the site we have evaluated the liquefaction potential of the soil encountered at the site.

5.9.1 Liquefaction Triggering

5.9.1.1 Subsurface Parameters

Parameters utilized in the analysis include results of the field program, visual descriptions of soil samples retrieved from the test borings, and results of the laboratory testing program. Based on published regional groundwater records, supplemented by additional observations at the site, our analysis considered a groundwater level of 0 feet below existing grade during a design-level seismic event. This groundwater level represents the estimated historic high groundwater for the site. A factor of 1.4 (cyclic resistance ratio / cyclic stress ratio) was utilized in the analysis to define the boundary between potentially liquefiable soils and soil precluded from being susceptible to liquefaction.

5.9.1.2 Seismic Input

The analysis utilized the peak ground acceleration (PGA) for a seismic hazard with a 2 percent probability of exceedance in 50 years (2PE50). The probabilistic (PGA) for a 2PE50 event, corrected for assumed Site Class D, is mapped to be 0.527g. Our analysis also considers the deaggregated moment magnitude for the site which is the moment magnitude that has the highest contribution to the hazard for the ground motion. The mean earthquake magnitude and distance to the seismic source was based on the online USGS Unified Hazard Tool utilizing the *Dynamic: Conterminous U.S. 2014 (update) (v4.2.0)* model with a 2475-year return period (USGS) Based on the USGS Unified Hazard Tool the mean deaggregated moment magnitude corresponding to the 2PE50 event is estimated to be 6.79 Mw at a distance of 12.99 kilometers. The seismic information has been included in Appendix C.

5.9.1.3 Analysis Methodology

A soil's susceptibility to liquefaction is evaluated based on several factors, including its relative density (for coarse grained soils), fines content, plasticity, and clay content. The Chinese Criteria

(Youd et. al. 2001) was utilized in screening potentially liquefiable soils. By the Chinese Criteria, a soil is precluded from being susceptible to liquefaction if any one of the following three criteria are met:

1. The clay content (particles smaller than 5 μ) is greater than or equal to 15 percent by weight
2. The liquid limit is greater than 35 percent
3. The water content is less than 90 percent of the liquid limit

Analysis of RF-B-02 was performed according to the SPT methodology presented in the Youd et al. 2001 while the sCPT-01 was analyzed utilizing the CPT method presented in Martin and Lew (1999). The surficial soil in sCPT-01 was removed as it will be removed and sufficiently disturbed during construction activities. Boring RF-B-01 was not analyzed for liquefaction as samples were not taken continuously and were targeted for other analysis needs such as strength and settlement. Some representative index testing results of layers in RF-B-01 were applied to alike layers in RF-B-02. Analysis of sCPT-01 indicated that there is a layer of silty sand between 19 and 21 feet (elevation 4210 and 4208 feet) that was predicted to liquefy during the design event. While the sampling resolution of RF-B-02 is not as fine or as continuous as the sCPT sounding, two relatively thin layers between 23 and 26 feet (elevation 4205 and 4202 feet) were predicted to liquefy.

5.9.2 Liquefaction Induced Settlement

The settlement of the liquefiable layers in the Youd et. al analysis was estimated using the methods set forth by Tokimatsu and Seed (1987). Both methods of analysis resulted in relatively consistent results with marginal settlement predicted. The modeled sediment profile and settlement distribution along with the supporting tabular calculations, as required by Salt Lake County Code, are presented in Appendix C. Post liquefaction settlement estimates are presented in Table 7.

Table 7:Summary of Liquefaction Settlement Results

Triggering Methodology	Settlement Methodology	Exploration	Estimated Settlement at Ground Surface(inches)
Youd et. Al (2001)	Tokimatsu and Seed (1987)	RF-B-01	0.3
Martin and Lew (1999)		sCPT-01	0.2

Notes:

Source: Compiled by IGES in 2021

5.9.3 Lateral Spread

During a strong seismic event, liquefaction-induced lateral spreading may occur in relatively loose, submerged cohesionless soil. Based on the data collected in the field and laboratory, saturated cohesionless sediments with an equivalent, corrected blow counts ($(N_1)_{60}$) less than 15 are not present in the top 10 meters (~32 feet). Therefore, according to the analysis method presented by Bartlett and Youd (1995) with updates presented in Youd et al. (2002), significant lateral displacement is not likely for the expected design earthquake magnitude. Based on the analysis and investigations performed for this study the lateral spread risk is considered low for this site.

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 Foundation Recommendations

6.2.1 Bearing Capacity

6.2.1.1 Shallow Spread Footings

Shallow spread or continuous wall footings founded at a depth of 30 inches below existing grade on a minimum of 12 inches of properly compacted granular structural fill overlying competent native earth materials, may be proportioned utilizing a maximum net allowable bearing pressure of 1,500 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).

6.2.1.2 Mat Foundation

For a mat foundation constructed with its base approximately 16 feet below grade (elevation 4213 feet) over a properly prepared subgrade consisting of a minimum of 12 inches of compacted structural fill, a maximum allowable gross bearing pressure of 2.1 ksf (net of 200 psf) 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 above the existing effective stress at the foundation depth (i.e. near 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, any future changes in loading should be communicated to and reviewed by IGES for compatibility with these recommendations. Further analysis and reporting may be required.

6.2.2 Foundation Burial Depth and Size

Each conventional foundations 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 24 inches for continuous footings and 36 inches for isolated spread footings.

6.2.3 Sliding Resistance

If the foundations will be constructed primarily on clay, the sliding resistance will be either the smaller of the adhesion, or friction proportional to the effective normal force. If the foundation will be constructed on granular material, 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. An appropriate factor of safety (or resistance factor) against sliding should be applied to the resistance. The values presented in Table 8 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 8: Spread Footing Sliding Resistance

Material at Base of Foundation	Sliding Coefficient	Adhesion (psf)
Native Clay [1]	0.36	200
Native Sand	0.36	
Minimum 2 feet Structural Fill	0.45	--

Notes:

1) Sliding resistance is lesser of adhesion or effective normal force times the sliding friction coefficient

Source: Compiled by IGES in 2021

6.3 Settlement

Settlement of the structure was modeled utilizing the software Settle3. A subsurface profile was developed utilizing data from the field and laboratory testing programs and the following construction dewatering and load application assumptions were applied in the model:

- The site was dewatered to a depth of 18 feet beneath existing grade (2 feet below the base of the foundation) during the assumed duration of construction.

- Absent a detailed construction schedule, the full long-term loading was placed immediately after the excavation of soil to foundation grade, with 12 inches of structural fill in place beneath the base of the mat, and with groundwater suppressed 2 feet below the foundation elevation in the model. It is likely the load application during construction will be more gradual. This modeled rapid introduction of the full structural load represents a potential worst-case scenario as the effective stress increase from the dewatering (an increase of 811 psf) is applied concurrently with the introduction of the full long-term structure loading. The analysis was observed to be sensitive to dewatering as it relates to the application of the loading.

6.3.1 Static Settlement

The initiation of various types of settlement, is highly dependent on the staging of construction, dewatering/re-watering and application of the long-term loading. Initially, a small amount of elastic settlement is expected to occur in the granular layers, likely congruent with the initial application of load. Due to the unloading and reloading of the compressible soil at effective pressures lower than the maximum past pressure (preconsolidation pressure), recompression settlement and heave is expected to occur. At the analyzed loading condition, the maximum past pressure of the soil will not be exceeded, thus primary consolidation settlement is not expected to occur. Static settlements of a mat foundation, founded as described herein, are estimated to range from approximately 1 ¼ to 2 ½ inches depending on the timing of load application and dewatering. Differential settlement is expected to be as much as 1 to 1 ¾ inches between the point of approximate maximum settlement and the edge of the mat. The minimum value represents the long-term deformation of the subsurface due to the applied load, while the maximum represents the deformation of the subsurface if the settlement from the full design load manifests while the excavation is dewatered. The actual settlement will vary depending on load application staging and dewatering extent and duration. Graphical depictions for the minimum and maximum settlements are presented in Appendix C.

6.3.2 Rebound

If the full structure loads are applied when the project site is dewatered, the effective stress will decrease as the groundwater is allowed to return to preconstruction levels. If the full recompression settlement from loading occurs while the structure is dewatered, rebound (upward movement) on the order of 1 ½ inches is estimated to occur during and within several months following return of groundwater to preconstruction levels.

6.3.3 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.

We have performed analyses to estimate the potential dynamic settlement using the methods developed by Tokimatsu and Seed (1987), based on the 2PE50 ground motion. Based on the liquefaction analysis, we recommend that the structure be designed for ½ inches of total settlement and ¼ inches of differential settlement over a distance of 40 feet following the design earthquake event. Based on the Salt Lake County Code of Ordinances, a letter is required from the structural engineer stating that the building has been designed to protect life safety in the event of up ½ inch of liquefaction settlement.

6.4 Concrete Slab-on-Grade/Structural Mat

6.4.1 Modulus of Subgrade Reaction

Based on our understanding of the structure, the wet well portion of the Reuse Facility will consist of a reinforced structural mat integral with the walls. 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. Absent field plate load testing, the modulus of subgrade reaction provided below is based on field and laboratory test results, analysis, and observed soil types. 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. The recommended modulus of subgrade reaction is presented in Table 9.

Table 9:Summary of Modulus of Subgrade Reaction Values

Approximate Slab Depth [Elevation] (feet)	Representative Modulus of Subgrade Reaction (pci)
4,213	30

Notes:

Source: Compiled by IGES in 2021

6.4.2 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 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

The structure will have a below grade component 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 0.002H (0.2 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 displacements to mobilize both active and passive resistance.

The active seismic earth pressure increment coefficient (ΔK_{ae}) is 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 (ΔP_{ae}) and the static thrust component (P_a). Hence, the resulting dynamic thrust should be added to the static pressure to determine the total pressure on the wall ($P_{ae} = P_a + \Delta P_{ae}$). Based on the information presented in Mononobe and Matsuo (1929) and Okabe (1926), the dynamic earth pressure distribution is approximated as a triangular distribution with stress increasing with depth. The resultant may be applied at ⅓ of the buried wall height measured from the base of the wall (alike to static earth pressures).

The at-rest seismic earth pressure increment coefficient (ΔK_{oe}) provided in the table is based on the Wood (1973) approach. The at-rest dynamic horizontal thrust produced by ground motion (ΔP_{oe}) and the static thrust component (P_o) can be applied similarly to the active coefficients to determine the total pressure on the wall ($P_{oe} = \Delta P_{oe} + P_o$). Based on the information presented in Wood (1973), the resultant dynamic earth pressure may be approximated as a uniform stress and applied at 0.6 of the buried wall height measured from the base of the wall.

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 presented in The recommended lateral pressure coefficients are presented in Table 10.

Table 10: Lateral Pressure Coefficients

Material	Load Case	Total Unit Weight (pcf)		Earth Pressure Coefficient				
		Above Water Table	Below Water Table [B]	Active		At-Rest		Passive
				Static[1,3]	Seismic[1,3]	Static[1,3]	Seismic[2,4]	Static[1,3]
Native Sand	Drained	120.0	57.6	0.33	0.10	0.50	0.19	3.00
Native Cohesive	Drained (long-term)	120.0	57.6	0.34	--	0.51	--	2.93
	Undrained (short-term)	120.0 [A]	--	1.0 [A]	0.14	1.0 [A]	0.19	--
Structural Fill [B]	Drained	130.0	67.6	0.26	0.09	0.41	0.19	3.85

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

4) Height of Wall multiplied by 0.6

Source: Compiled by IGES in 2021

6.5.1 Uplift

The Reuse Building is proposed to be founded near or below the observed water table and possibly the design flood elevation. Accordingly, the structure may experience uplift due to buoyancy. It is recommended that structure be designed to resist buoyancy during each analysis case including when fluid loads not present during construction or are removed for maintenance (if applicable). Additional dead weight or extension of the base beyond the walls may be used to counteract buoyancy but may alter the results of the settlement analysis. If the base is extended

beyond the walls for added uplift resistance, the effective unit weight (also called buoyant unit weight, saturated unit weight minus unit weight of water) should be used to calculate the weight of the soil above the extensions. If the uplift forces are not able to be practically accommodated, deep foundations elements tied into the structure may be designed to provide uplift resistance.

6.6 Existing Utilities

Utilities were not delineated within the proposed footprint of the structure at the time of our field investigation. The presence of utilities beneath a structure could result in crushing of pipes and/or undermining of the proposed construction. Therefore, it is recommended that any identified existing utilities be removed and relocated outside the proposed building footprint prior to construction. Utilities may also be abandoned in-place and grouted full. The resulting excavations should be backfilled with structural fill, placed and compacted in accordance with the recommendations of this report. If the utilities cannot be relocated outside of the proposed building area, foundations should be designed to bear at or below the invert elevations of the utility and provide a suitable offset to protect the active utilities during construction.

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 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 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 Utility Connections

Based on the estimated total and differential settlement and the critical functionality of the structures, flexible connections capable of withstanding, at a minimum the total (static plus dynamic) predicted settlements, should be used for all utilities regardless of the foundation type supporting the structure.

6.9 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 Table 11, Table 12, and Table 13.

Table 11: Sulfate Based Corrosion Potential Indicator for Concrete

Soluble Sulfates		
Range (ppm)	**Corrosion Potential**	**Recommended Cement Type**
0 – 150	Low	I, II, V
150 – 1000	Moderate	II, V
1000 – 2000	Severe	V
> 2000	Very Severe	V

Table 12: Chloride Based Corrosion Potential Indicators for Metals

Soluble Chlorides	
Range (ppm)	**Corrosion Potential**
0 – 200	Low
200 – 700	Moderate
700 – 1,500	Severe
> 1,500	Very Severe

Table 13: Resistivity Based Corrosion Potential Indicators for Metals

Electric Resistivity	
Range (Ω-cm)	**Corrosion Potential**
> 30,000	Low or Noncorrosive
30,000 – 10,000	Mild
10,000 – 2,000	Moderate
2,000 – 500	Severe
500 – 0	Very Severe

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

Based on limited testing, site soils exhibit a moderate 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 severely to very severely corrosive to steel. Each pH results was above the typically expected range for soils. Results from this investigation were generally consistent with previously tested samples in the vicinity of the site. Chemical Test results for the clarifiers to the west of the project site had slightly higher soluble chloride content. Lab pH measurements at the site have consistently been observed to be generally higher than is typically expected in soils. Electrical resistivities are also consistently in the very severe range for potential corrosiveness to metals. Corrosion potential indicators for this investigation are summarized in Table 14.

Corrosion protection based on the above results should be considered for any buried 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 14: Corrosion Potential Indicator Testing Summary

Sample		Corrosion Potential			
Exploration	**Depth (ft)**	**pH**	**Sulfate Potential**	**Chloride Potential**	**Electrical Resistivity**
RF-B-02	2.5	Above typically expected range	Moderate	Low	Severe
RF-B-02	15.0	Above typically expected range	Moderate	Low	Very Severe

Notes:

Source: Compiled by IGES in 2021

7 Construction Recommendations

7.1 Project Specific Considerations

7.1.1 Undocumented Fill

Possible undocumented fill was encountered in each of the explorations. If undocumented fill is encountered during construction, it should be removed in its entirety and replaced with compacted structural fill as recommended herein.

7.2 Earthwork

7.2.1 Foundation Preparation

Based on our field observations and considering the presence of relatively soft native earth materials, we recommend that the footings for the proposed structures be founded on a minimum of 12 inches of compacted structural fill overlying native subgrade extending below any undocumented fill.

Where soft, loose, or otherwise deleterious earth materials such as undocumented fill are exposed at 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. Additional over-excavation may be required based on the actual subsurface conditions observed.

7.2.2 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.

7.2.3 Soft Soil Stabilization

Stabilization can be accomplished by placing a woven geotextile over the soft subgrade; seams should be overlapped a minimum of 18 inches or as recommended by the manufacturer. The geotextile should be covered with a minimum of 18 inches of crushed, angular ¾- to 4-inch diameter drain rock. Structural fill may then be placed and compacted as recommended in this report. The woven geotextile may consist of TenCate Mirafi ® HP570 or an approved substitute. The geotextile should be placed to cover the entire excavation bottom.

Alternatively, stabilization of soft or pumping subgrade can be accomplished using a clean, coarse angular material worked into the soft subgrade. We recommend the material be 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 design grade using structural fill. 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 wheel-rolled with heavy equipment 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. An IGES representative should be present during this evaluation.

The area of stabilization should extend a minimum of 3 feet beyond structural foundations, at least 5 feet beyond the observed soft spot if in a pavement area, and at least 2 times the depth of fill to be placed in areas of structural fill.

7.2.4 Structural Fill and Compaction

7.2.4.1 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.

7.2.4.2 Placement

Structural fill material shall be placed in maximum 8-inch loose lifts. Thinner lifts may be required to achieve required 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. The width of granular structural fill required at the bottom of footing excavations should be equal to the width of the footing plus one lateral foot for each foot of fill thickness below the footing (e.g., if the footing is 4 feet wide and the fill is 1 foot deep, then the total width of granular structural fill at the bottom of the excavation should be 5 feet). As a minimum, granular structural fill should extend at least 6 inches beyond the base of the footing in all directions. Each lift shall be spread evenly and be thoroughly mixed during the spreading to promote uniformity of material in each lift. 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. Material should be mechanically compacted to the required maximum dry density and optimum moisture content as indicated in Table 15. Compaction by water injection should not be permitted. Compaction dry of optimum is discouraged.

Table 15: Summary of Compaction Requirements

Backfill Area[1]	Percent of Maximum Dry Density[2]	Moisture Content at Time of Compaction
Fill beneath footings 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 2021

7.2.5 Reuse of Onsite Soils

Shallow site soils were observed to be primarily consist of undocumented fill or plastic fine-grained soil with high in situ moisture content. These soils are not considered suitable or practical for reuse onsite as 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.

7.2.6 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.

7.2.7 Excavation Stability and Shoring

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.

Based on the proposed depth of construction, shoring will likely be required at the project site. Design and monitoring of all shoring systems are the responsibility of the contractor. Care should be taken to consider the effects to existing structures due to shoring operations. All applicable regulations should be strictly adhered to regarding treatment and disposal of spoils generated by a construction and abandonment of a shoring system

7.2.8 Dewatering

Groundwater will likely be encountered in excavations at the project site. Depending on the extent and duration of the excavation, temporary dewatering will likely be required. Design and monitoring of all dewatering systems are the responsibility of the contractor. Care should be taken to consider the effects to existing structures due to dewatering operations. All applicable regulations should be strictly adhered to regarding treatment and disposal of spoils generated by a construction, operation and abandonment of a dewatering system.

7.3 Moisture Protection and Drainage

During construction, over-wetting the soils prior to, during or after construction may result in softening and pumping, causing equipment mobility problems and difficulty in achieving compaction. Every effort should be taken to ensure positive drainage away from construction areas. The recommended minimum slope is two percent in pavement areas. Moisture should not be allowed to infiltrate the soils in the vicinity of, or upslope from, the construction area. Moisture should not be allowed to accumulate in the construction area.

7.4 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.

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Appendix A

Maps



BASE IMAGE:
Google Earth 2018 Imagery accessed through
Utah Geospatial Resouce Center

0 500 1,000 2,000
Feet
1:12,000

N

Project Number - 00113-056

Geotechnical Investigation
Reuse Facility
Magna Water District Water Reclamation Facility
Magna, Utah

SITE VICINITY MAP

FIGURE

A-1



BASE IMAGE:
Google Earth 2018 Imagery accessed through
Utah Geospatial Resource Center

0 15 30 60
Feet
1:360

N

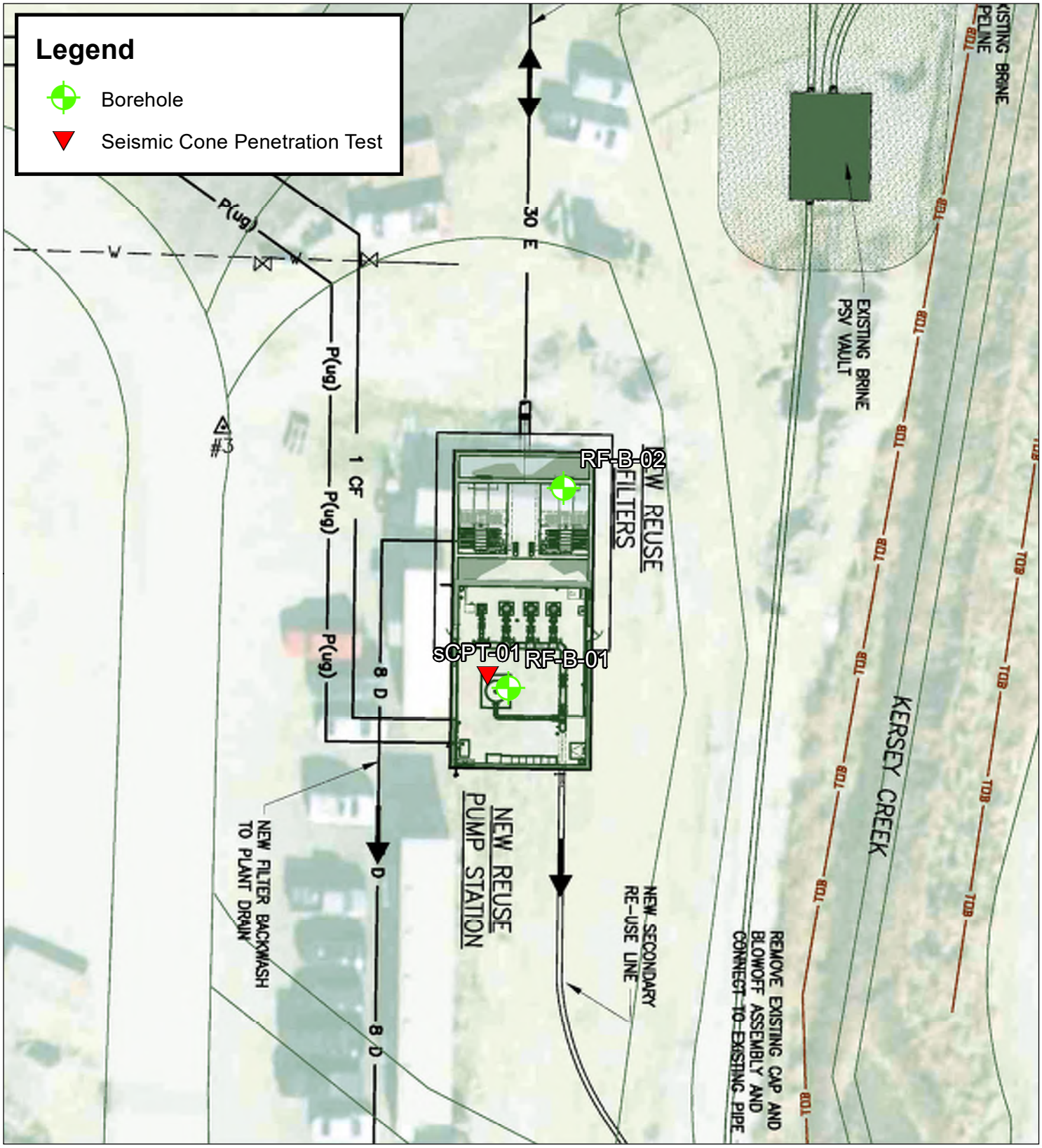
IGES
Project Number - 00113-056

Geotechnical Investigation
Reuse Facility
Magna Water District Water Reclamation Facility
Magna, Utah

GEOTECHNICAL MAP 1

FIGURE

A-2a



BASE IMAGE:
Concept drawing prepared by Stantec and
Bowen Collins & Associates dated 7/27/2021

0 15 30 60
Feet
1:360

N

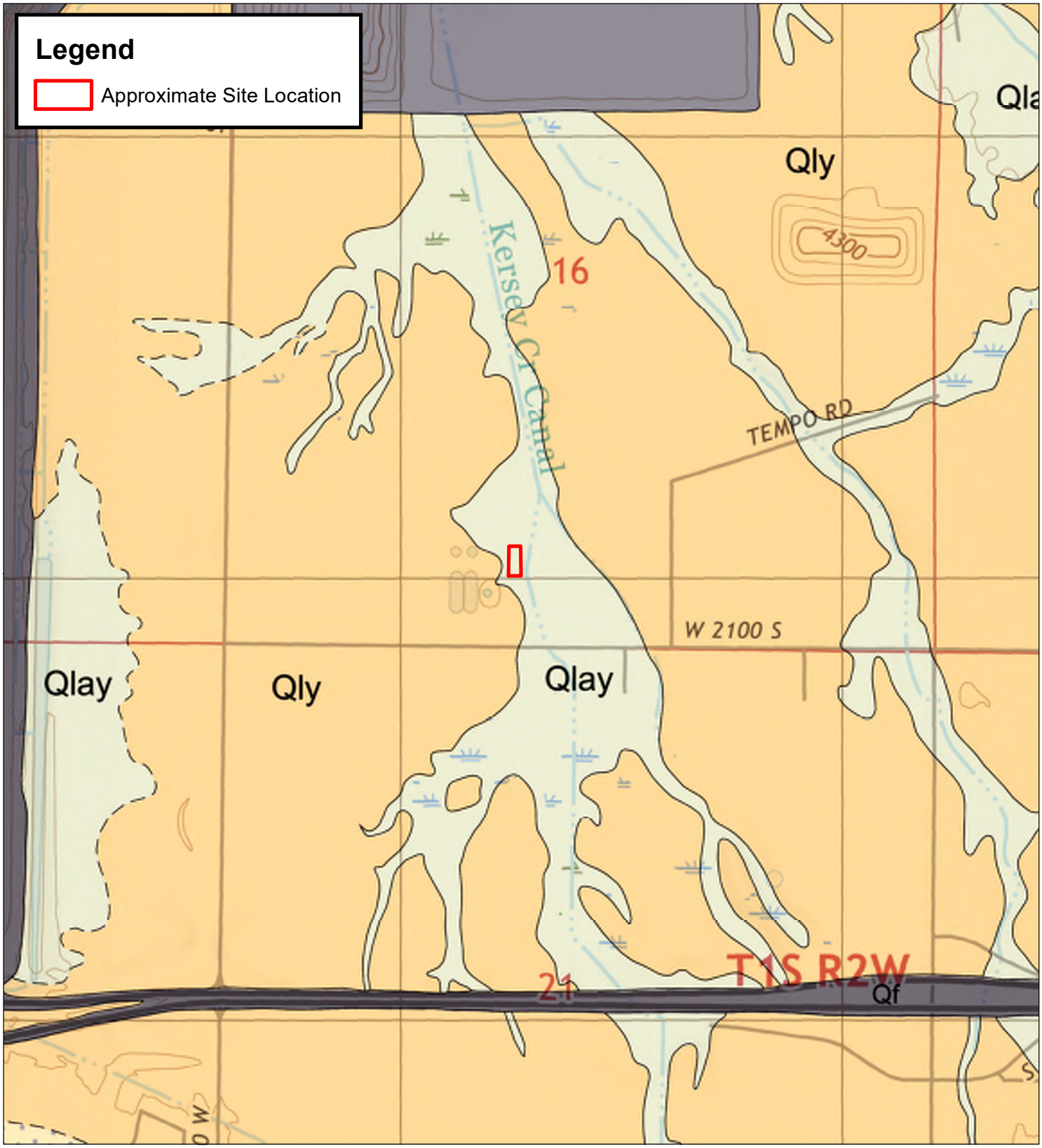
IGES
Project Number - 00113-056

Geotechnical Investigation
Reuse Facility
Magna Water District Water Reclamation Facility
Magna, Utah

GEOTECHNICAL MAP 2

FIGURE

A-2b



BASE IMAGE:
Geologic map of the Magna quadrangle,
UGS, Solomon et al. (2018)

0 500 1,000 2,000 Feet

1:12,000

N

IGES

Project Number - 00113-056

Geotechnical Investigation
Reuse Facility
Magna Water District Water Reclamation Facility
Magna, Utah

REGIONAL GEOLOGY MAP 1

FIGURE

A-3a

Lacustrine deposits

Deposits post-dating the Bonneville lake cycle (Curry and Oviatt, 1985):

Qly **Young lacustrine deposits** (Holocene) – Poorly sorted silt, clay, and minor sand deposited by Great Salt Lake after regression of Lake Bonneville from the Gilbert shoreline; grades into deposits of lacustrine silt and clay of Lake Bonneville that are not mapped separately because of similar sediment type and appearance; generally less than 15 feet (5 m) thick.

Mixed-environment deposits

Qlay **Young lacustrine and alluvial deposits** (Holocene) – Silt, clay, and minor sand deposited by streams draining the Great Salt Lake flood plain, and in shallow lakes, ponds, and marshes associated with the streams; mapped in areas of standing water or where the water table is or has recently been at the ground surface; commonly organic rich; less than 10 feet (3 m) thick.

GEOLOGIC SYMBOLS

Contact – Dashed where approximately located

Normal fault – Dashed where approximately located, dotted where concealed and approximately located; bar and ball on down-dropped side

Thrust fault – Dashed where approximately located, queried where uncertain; 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 syncline-- Dashed where approximately located, dotted where concealed and approximately located; arrow shows direction of plunge

Axial trace of overturned syncline – Dashed where approximately located, dotted where concealed and approximately located; arrow shows direction of plunge

GEOLOGIC SYMBOLS

Shorelines of the Bonneville lake cycle. Mapped at the top of the wave-cut platform; may coincide with geologic contacts –

Stansbury shoreline

Highest shoreline of the Bonneville (transgressive) phase

Highest shoreline of the Provo (regressive) phase

Other shorelines of the Provo phase

Gilbert shoreline

Holocene highstand shoreline of Great Salt Lake

5155

Elevation (in feet) of selected Lake Bonneville shoreline features; elevation determined photogrammetrically

Crest of Lake Bonneville barrier beach or spit

Landslide scarp – Hachures on down-dropped side

34 35

Strike and dip of inclined bedding – Red symbols indicate attitudes from Tooker and Roberts (1971a)

80

Strike and dip of overturned bedding

30

Approximate strike and dip of inclined bedding

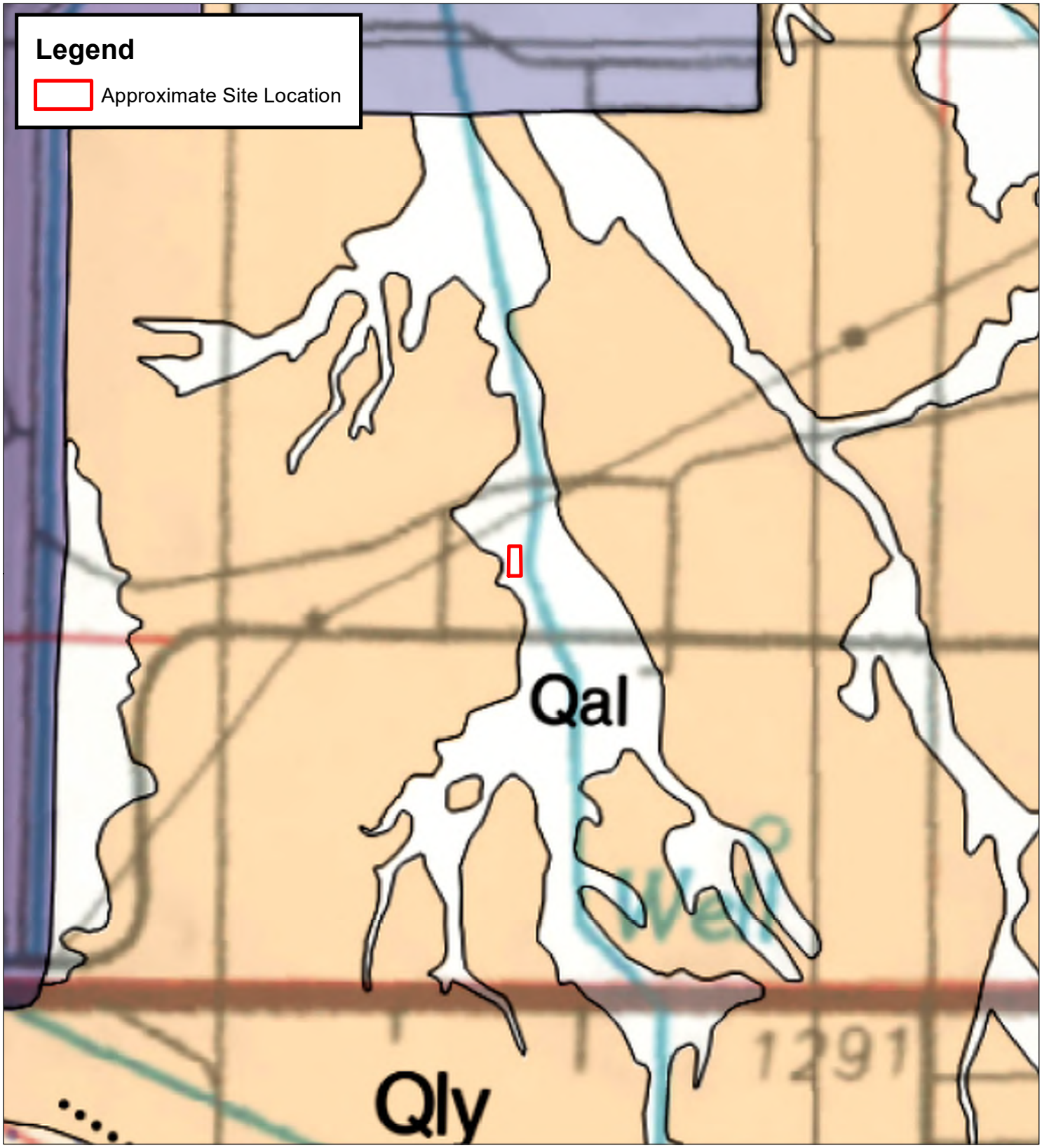
Strike of vertical bedding

Sand and gravel pit

Spring

Adit

UNIT DISCRIPTIONS:
Geologic map of the Magna quadrangle,
UGS, Solomon et al. (2018)



BASE IMAGE:
Geologic map of the Tooele 30' x 60' quadrangle,
UGS, Clark et al. (2020)

0 500 1,000 2,000
Feet
1:12,000

N

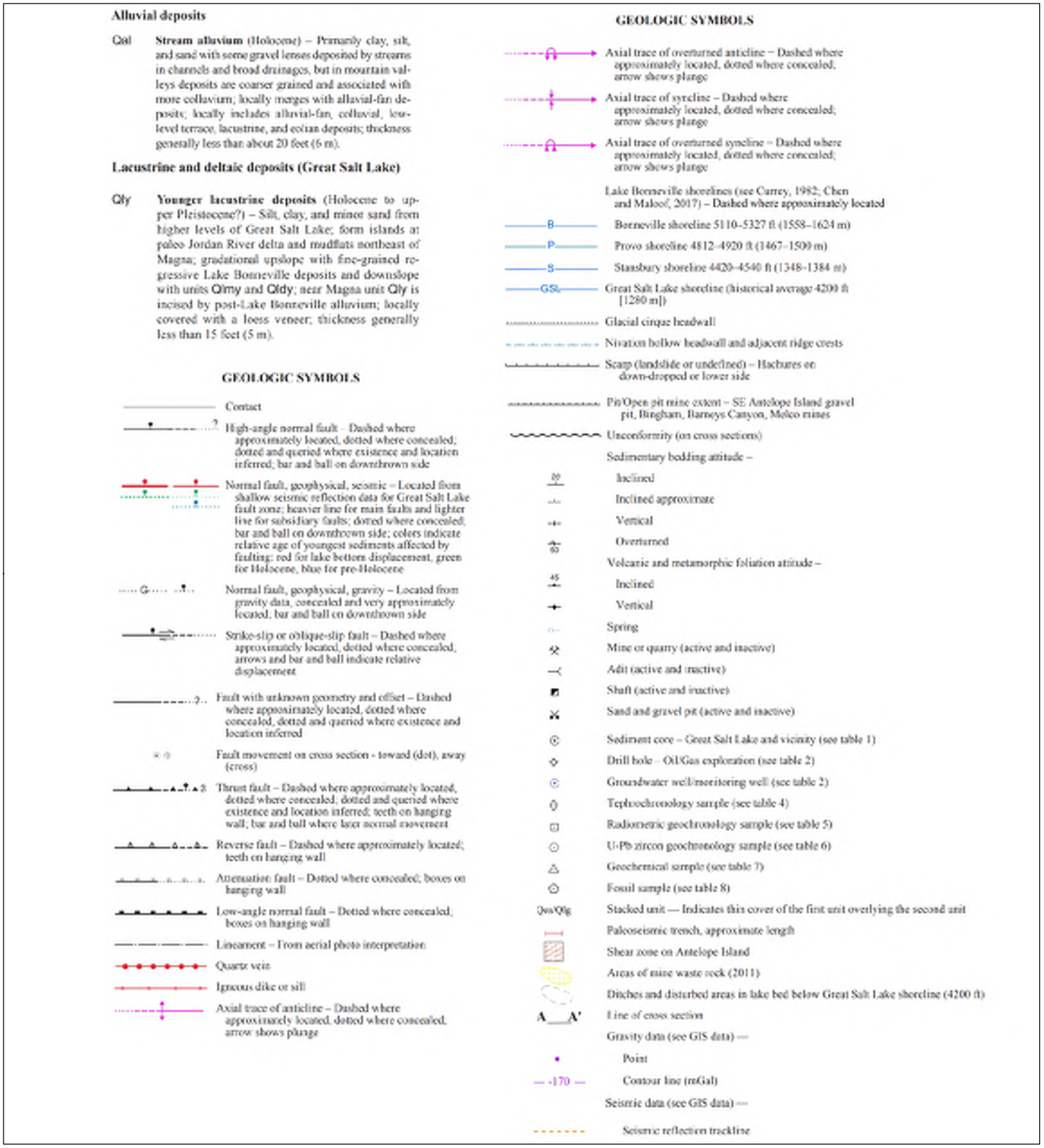
IGES
Project Number - 00113-056

Geotechnical Investigation
Reuse Facility
Magna Water District Water Reclamation Facility
Magna, Utah

REGIONAL GEOLOGY MAP 2

FIGURE

A-4a



UNIT DISCRIPTIONS:
Geologic map of the Tooele 30' x 60' quadrangle,
UGS, Clark et al. (2020)

IGES Project Number - 00113-056	Geotechnical Investigation Reuse Facility Magna Water District Water Reclamation Facility Magna, Utah **UNIT DISCRIPTIONS**	**FIGURE** **A-4b**



BASE IMAGE:
Google Earth 2018 Imagery accessed through
Utah Geospatial Resouce Center

OVERLAY:
UGS Hazards dataset accessed through
Utah Geospatial Resouce Center

0 500 1,000 2,000
Feet
1:12,000

N

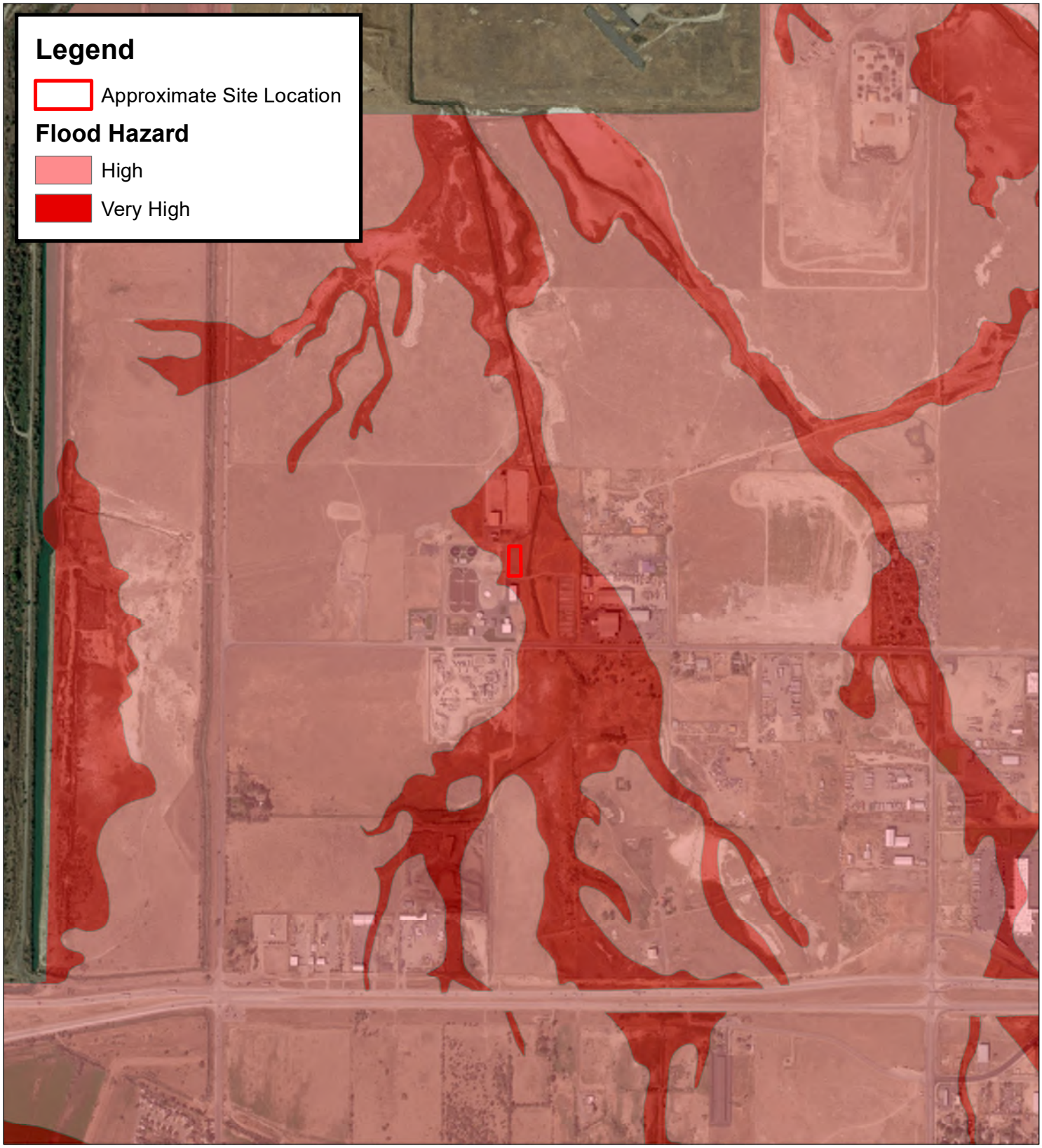
IGES
Project Number - 00113-056

Geotechnical Investigation
Reuse Facility
Magna Water District Water Reclamation Facility
Magna, Utah

LIQUEFACTION MAP

FIGURE

A-5



BASE IMAGE:
Google Earth 2018 Imagery accessed through
Utah Geospatial Resouce Center

OVERLAY:
UGS Hazards dataset accessed through
Utah Geospatial Resouce Center

0 500 1,000 2,000
Feet
1:12,000

N

IGES
Project Number - 00113-056

Geotechnical Investigation
Reuse Facility
Magna Water District Water Reclamation Facility
Magna, Utah

FLOODING MAP

FIGURE

A-6



BASE IMAGE:
Google Earth 2018 Imagery accessed through
Utah Geospatial Resouce Center

OVERLAY:
UGS Hazards dataset accessed through
Utah Geospatial Resouce Center

0 500 1,000 2,000
Feet
1:12,000

N

IGES
Project Number - 00113-056

Geotechnical Investigation
Reuse Facility
Magna Water District Water Reclamation Facility
Magna, Utah

COLLAPSIBLE SOIL MAP

FIGURE

A-7



BASE IMAGE:
Google Earth 2018 Imagery accessed through
Utah Geospatial Resouce Center

OVERLAY:
UGS Hazards dataset accessed through
Utah Geospatial Resouce Center

0 500 1,000 2,000
Feet
1:12,000

N

IGES
Project Number - 00113-056

Geotechnical Investigation
Reuse Facility
Magna Water District Water Reclamation Facility
Magna, Utah

EXPANSIVE SOIL MAP

FIGURE

A-8



BASE IMAGE:
Google Earth 2018 Imagery accessed through
Utah Geospatial Resouce Center

OVERLAY:
UGS Hazards dataset accessed through
Utah Geospatial Resouce Center

0 500 1,000 2,000
Feet
1:12,000

N

IGES
Project Number - 00113-056

Geotechnical Investigation
Reuse Facility
Magna Water District Water Reclamation Facility
Magna, Utah

GROUNDWATER MAP 1

FIGURE

A-9a



BASE IMAGE:
Google Earth 2018 Imagery accessed through
Utah Geospatial Resouce Center

OVERLAY:
Mapping Provided by Seiler and Waddell (1983)

0 500 1,000 2,000
Feet
1:12,000

N

Project Number - 00113-056

Geotechnical Investigation
Reuse Facility
Magna Water District Water Reclamation Facility
Magna, Utah

GROUNDWATER MAP 2

FIGURE

A-9b



BASE IMAGE:
Google Earth 2018 Imagery accessed through
Utah Geospatial Resouce Center

OVERLAY:
Mapping provided by Jensen et. al. (1985)

0 500 1,000 2,000
Feet
1:12,000

N

IGES
Project Number - 00113-056

Geotechnical Investigation
Reuse Facility
Magna Water District Water Reclamation Facility
Magna, Utah

GROUNDWATER MAP 3

FIGURE

A-9c



BASE IMAGE:
Google Earth 2018 Imagery accessed through
Utah Geospatial Resouce Center

0 1,500 3,000 6,000
Feet
1:36,000

N

OVERLAY:
UGS Hazards dataset accessed through Utah Geospatial Resouce Center; & Utah Quaternary Fault and Fold Map May 2019 Update

IGES
Project Number - 00113-056

Geotechnical Investigation
Reuse Facility
Magna Water District Water Reclamation Facility
Magna, Utah

FAULT MAPPING

FIGURE

A-10

Exploration Logs

DATE
STARTED: 12/10/21
COMPLETED: 12/10/21
BACKFILLED: 12/10/21

Geotechnical Investigation
Reuse Facility
MWDWRF
Magna Utah
IGES Project Number: 00113-056

IGES Rep: WCB
Drilling Co.: ConeTec
Drill Rig: Truck CME 75
Boring Type/Dia.: Mud Rotary/4.875in.
Hammer Type: Automatic/ETR=79.2%

BORING NO: RF-B-01
Sheet 1 of 4

LOCATION
LATITUDE: 40.727330 ° LONGITUDE: -112.074440 ° ELEVATION: 4,229 feet
Elevation surveyed by EPIC. Lat. and long. estimated

ELEVATION	FEET	SAMPLES	RECOVERY (IN.)	WATER LEVEL	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION	Blow Counts	N(field)	N(60)	Dry Density(pcf)	Moisture Content (%)	Percent minus 200	Liquid Limit	Plasticity Index
4225	0					GP-GC	**POSSIBLE FILL** Poorly graded GRAVEL with clay and sand - dense, slightly moist, moderate yellowish brown	19							
			22			CL	**NATIVE** Lean CLAY - medium stiff, dry to slightly moist, moderate yellowish brown, low plasticity, no obvious pinholes	20 17 12	37	49					
	5			▽			- Groundwater estimated at 5 feet								
			24			CL	Lean CLAY - medium stiff, moist to wet at 5.5 feet, light grayish brown, 5.5 to 6.0 feet with roots, organic material and thinly interbedded sand, low plasticity, no obvious pinholes	2 4 4 4	4	5		35			
						CL	Lean CLAY - soft, moist, light brown, low plasticity, no obvious pinholes	1 2							
4220			24			CL	Sandy Lean CLAY - medium stiff, moist to wet, light brown	1 2	3	4					
	10						NO RECOVERY	5							
			0					8 11	19	16					
4215	15					CL	Lean CLAY - wet, medium to dark gray, low plasticity, no obvious pinholes. 700 psi pressure				90.9	33	96	40	21
			24												
4210						SM	Silty SAND - medium dense, wet, moderate grayish brown, non plastic, with some thinly interbedded Lean CLAY	5 7							

Moisture Content and Atterberg Limits
Plastic Limit — Moisture Content — Liquid Limit
10 20 30 40 50 60 70 80 90

N FIELD - UNCORRECTED BLOW COUNT; N(60) - ENERGY CORRECT BLOW COUNT

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SAMPLE TYPE
- 2" O.D./1.38" I.D. Split Spoon Sampler
- 3.25" O.D./2.42" I.D. 'U' Sampler
- 3" O.D. Thin-Walled Shelby Sampler
- 3" O.D./2.375" I.D. California Sampler
- 2.5" O.D./1.875" I.D. Mod. Cal. Sampler
- Sample from Auger Cuttings

BORING LOG

NOTES:
- Water level estimated from sCPT-01

WATER LEVEL
▼ - MEASURED ▽ - ESTIMATED

FIGURE A-11a

BORING LOG LAT LONG EL NFIELD N60 00113-056 LOGS.GPJ IGES.GDT 1/18/22

DATE
STARTED: 12/10/21
COMPLETED: 12/10/21
BACKFILLED: 12/10/21

Geotechnical Investigation
Reuse Facility
MWDWRF
Magna Utah
IGES Project Number: 00113-056

IGES Rep: WCB
Drilling Co.: ConeTec
Drill Rig: Truck CME 75
Boring Type/Dia.: Mud Rotary/4.875in.
Hammer Type: Automatic/ETR=79.2%

BORING NO: RF-B-01

LOCATION
LATITUDE: 40.727330 ° LONGITUDE: -112.074440 ° ELEVATION: 4,229 feet
Elevation surveyed by EPIC. Lat. and long. estimated

ELEVATION FEET	SAMPLES	RECOVERY (IN.)	WATER LEVEL	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION	Blow Counts	N(field)	N(60)	Dry Density(pcf)	Moisture Content (%)	Percent minus 200	Liquid Limit	Plasticity Index
20		23			CL	Lean CLAY with sand - stiff, moist to wet, medium olive gray, low plasticity, no obvious pinholes. 700 psi	4 5	11	15		29	21	NP	NP
4205					CL-ML	Sandy SILTY CLAY- medium stiff, wet, medium olive gray, non plastic					31	62	23	4
25		23			CL	Lean CLAY with interbedded silty sand - medium stiff, wet, medium olive gray, low plasticity, no obvious pinholes	6 2 2 4	4	5					
4200														
30														
4195														
35		24			CL	Lean CLAY - moist to wet, medium olive gray, low plasticity, no obvious pinholes, 1200 psi				95.6	23	85	30	12
4190														

Moisture Content and Atterberg Limits
Plastic Limit | Moisture Content | Liquid Limit
10 20 30 40 50 60 70 80 90

N FIELD - UNCORRECTED BLOW COUNT; N(60) - ENERGY CORRECT BLOW COUNT

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SAMPLE TYPE
- 2" O.D./1.38" I.D. Split Spoon Sampler
- 3.25" O.D./2.42" I.D. 'U' Sampler
- 3" O.D. Thin-Walled Shelby Sampler
- 3" O.D./2.375" I.D. California Sampler
- 2.5" O.D./1.875" I.D. Mod. Cal. Sampler
- Sample from Auger Cuttings

BORING LOG

NOTES:
- Water level estimated from sCPT-01

WATER LEVEL
▼ - MEASURED ▽ - ESTIMATED

FIGURE A-11b

BORING LOG LAT LONG EL NFIELD N60 00113-056 LOGS.GPJ IGES.GDT 1/18/22

DATE
STARTED: 12/10/21
COMPLETED: 12/10/21
BACKFILLED: 12/10/21

Geotechnical Investigation
Reuse Facility
MWDWRF
Magna Utah
IGES Project Number: 00113-056

IGES Rep: WCB
Drilling Co.: ConeTec
Drill Rig: Truck CME 75
Boring Type/Dia.: Mud Rotary/4.875in.
Hammer Type: Automatic/ETR=79.2%

BORING NO: RF-B-01
Sheet 3 of 4

LOCATION
LATITUDE: 40.727330 ° LONGITUDE: -112.074440 ° ELEVATION: 4,229 feet
Elevation surveyed by EPIC. Lat. and long. estimated

ELEVATION FEET	SAMPLES	RECOVERY (IN.)	WATER LEVEL	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION	Blow Counts	N(field)	N(60)	Dry Density(pcf)	Moisture Content (%)	Percent minus 200	Liquid Limit	Plasticity Index	Moisture Content and Atterberg Limits (Plastic Limit / Moisture Content / Liquid Limit; 10 20 30 40 50 60 70 80 90)
4185 40															
45															
4180 50															
4175 55		24			CL	Lean CLAY - moist to wet, medium olive gray, low plasticity, no obvious pinholes, 1000 psi pressure				98.3	25	97	44	23	
4170															

N FIELD - UNCORRECTED BLOW COUNT; N(60) - ENERGY CORRECT BLOW COUNT

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SAMPLE TYPE
- 2" O.D./1.38" I.D. Split Spoon Sampler
- 3.25" O.D./2.42" I.D. 'U' Sampler
- 3" O.D. Thin-Walled Shelby Sampler
- 3" O.D./2.375" I.D. California Sampler
- 2.5" O.D./1.875" I.D. Mod. Cal. Sampler
- Sample from Auger Cuttings

BORING LOG

NOTES:
- Water level estimated from sCPT-01

WATER LEVEL
▼ - MEASURED ▽ - ESTIMATED

FIGURE
A-11c

BORING LOG LAT LONG EL NFIELD N60 00113-056 LOGS.GPJ IGES.GDT 1/18/22

DATE
STARTED: 12/10/21
COMPLETED: 12/10/21
BACKFILLED: 12/10/21

Geotechnical Investigation
Reuse Facility
MWDWRF
Magna Utah
IGES Project Number: 00113-056

IGES Rep: WCB
Drilling Co.: ConeTec
Drill Rig: Truck CME 75
Boring Type/Dia.: Mud Rotary/4.875in.
Hammer Type: Automatic/ETR=79.2%

BORING NO: RF-B-01
Sheet 4 of 4

LOCATION
LATITUDE: 40.727330 ° LONGITUDE: -112.074440 ° ELEVATION: 4,229 feet
Elevation surveyed by EPIC. Lat. and long. estimated

ELEVATION	FEET	SAMPLES	RECOVERY (IN.)	WATER LEVEL	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION	Blow Counts	N(field)	N(60)	Dry Density(pcf)	Moisture Content (%)	Percent minus 200	Liquid Limit	Plasticity Index	Moisture Content and Atterberg Limits
4165	60															Plastic Limit / Moisture Content / Liquid Limit
	65															10 20 30 40 50 60 70 80 90
4160	70		24			CL	Lean CLAY - moist to wet, medium grayish brown, low plasticity, no obvious pinholes, 800 psi pressure				90.9	30	94	40	22	
							- backfilled with bentonite grout slurry with bentonite chips at the ground surface - layer boundaries interpolated between samples. See adjacent sCPT-01 plot.									
4155	75						Bottom of Boring @ 72 Feet									
4150																

N FIELD - UNCORRECTED BLOW COUNT; N(60) - ENERGY CORRECT BLOW COUNT

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SAMPLE TYPE
- 2" O.D./1.38" I.D. Split Spoon Sampler
- 3.25" O.D./2.42" I.D. 'U' Sampler
- 3" O.D. Thin-Walled Shelby Sampler
- 3" O.D./2.375" I.D. California Sampler
- 2.5" O.D./1.875" I.D. Mod. Cal. Sampler
- Sample from Auger Cuttings

BORING LOG

NOTES:
- Water level estimated from sCPT-01

WATER LEVEL
▼ - MEASURED ▽ - ESTIMATED

FIGURE
A-11d

BORING LOG LAT LONG EL NFIELD N60 00113-056 LOGS.GPJ IGES.GDT 1/18/22

DATE
STARTED: 12/9/21
COMPLETED: 12/9/21
BACKFILLED: 12/9/21

Geotechnical Investigation
Reuse Facility
MWDWRF
Magna Utah
IGES Project Number: 00113-056

IGES Rep: WCB
Drilling Co.: ConeTec
Drill Rig: Truck CME 75
Boring Type/Dia.: Mud Rotary/4.875in.
Hammer Type: Automatic/ETR=79.2%

BORING NO: RF-B-02

LOCATION
LATITUDE: 40.727420 ° LONGITUDE: -112.074400 ° ELEVATION: 4,228 feet
Elevation surveyed by EPIC. Lat. and long. estimated

ELEVATION	FEET	SAMPLES	RECOVERY (IN.)	WATER LEVEL	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION	Blow Counts	N(field)	N(60)	Dry Density(pcf)	Moisture Content (%)	Percent minus 200	Liquid Limit	Plasticity Index
4225	0		10			SC	**POSSIBLE FILL** Sandy Lean CLAY with gravel - very stiff, moist, moderate yellowish brown	8 8 12 22	20	26					
			11			SC	Clayey SAND with gravel - dense, slightly moist, moderate yellowish brown	21 15 15 12	30	40		7	44		
	5			▽		SC	- groundwater estimated at 5 feet Clayey SAND with gravel - loose, slightly moist, moderate yellowish brown	2				34	89	45	25
4220			24			CL	**NATIVE** Lean CLAY - medium stiff, moist to wet at 5.5 feet, light brown to black at 5.5 to 6.0 feet with roots, organic material (2.8 percent by weight) and thinly interbedded sand, low plasticity, no obvious pinholes	2 3 2	5	7					
						CL	Lean CLAY - soft, moist, light grayish brown, low plasticity, no obvious pinholes	1							
			24			CL	Sandy Lean CLAY - medium stiff, wet, light grayish brown	1 2 2	3	4					
	10					CL	Sandy Lean CLAY - medium stiff, wet, light grayish brown	5							
			24					3 2 2	5	7		31	60	27	8
						CL	Lean CLAY with trace sand - medium stiff grading to very soft at 13 feet, wet, light grayish brown, low plasticity, no obvious pinholes								
4215						CL	Lean CLAY with trace sand - medium stiff grading to very soft at 13 feet, wet, dark grayish brown, low plasticity, no obvious pinholes	2 WH/1.5'	0	0					
			24												
	15					CL	Lean CLAY - very soft, wet, dark grayish brown, with thinly bedded sand 15 - 16.5 feet, low plasticity, no obvious pinholes	1 1 1 2	2	3					
			24												
4210						CL	Lean CLAY - very soft, wet, medium olive gray, feet, low plasticity, no obvious pinholes	WH 1 1 2	2	3					
			24												
							Lean CLAY - medium stiff, wet, medium olive gray, feet, low								

Moisture Content and Atterberg Limits
Plastic Limit — Moisture Content — Liquid Limit
10 20 30 40 50 60 70 80 90

N FIELD - UNCORRECTED BLOW COUNT; N(60) - ENERGY CORRECT BLOW COUNT

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SAMPLE TYPE
- 2" O.D./1.38" I.D. Split Spoon Sampler
- 3.25" O.D./2.42" I.D. 'U' Sampler
- 3" O.D. Thin-Walled Shelby Sampler
- 3" O.D./2.375" I.D. California Sampler
- 2.5" O.D./1.875" I.D. Mod. Cal. Sampler
- Sample from Auger Cuttings

BORING LOG

NOTES:
- Water level estimated from sCPT-01

WATER LEVEL
▼ - MEASURED ▽ - ESTIMATED

FIGURE A-12a

BORING LOG LAT LONG EL NFIELD N60 00113-056 LOGS.GPJ IGES.GDT 1/18/22

DATE
STARTED: 12/9/21
COMPLETED: 12/9/21
BACKFILLED: 12/9/21

Geotechnical Investigation
Reuse Facility
MWDWRF
Magna Utah
IGES Project Number: 00113-056

IGES Rep: WCB
Drilling Co.: ConeTec
Drill Rig: Truck CME 75
Boring Type/Dia.: Mud Rotary/4.875in.
Hammer Type: Automatic/ETR=79.2%

BORING NO: RF-B-02

LOCATION
LATITUDE: 40.727420 ° LONGITUDE: -112.074400 ° ELEVATION: 4,228 feet
Elevation surveyed by EPIC. Lat. and long. estimated

ELEVATION	FEET	SAMPLES	RECOVERY (IN.)	WATER LEVEL	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION	Blow Counts	N(field)	N(60)	Dry Density(pcf)	Moisture Content (%)	Percent minus 200	Liquid Limit	Plasticity Index
	20					CL	plasticity, no obvious pinholes	2							
			24			CL-ML	Sandy SILTY CLAY - medium stiff, wet, medium olive gray	2 3 5	5	7		28	71	26	7
4205						CL	Lean CLAY with interbedded silty sand - very stiff, wet, medium olive gray, low plasticity, no obvious pinholes	4							
			22			CL-ML	Sandy SILTY CLAY - very stiff, wet, medium olive gray	6 6 7	12	16					
						CL	Lean CLAY with interbedded silty sand - stiff, wet, medium olive gray, low plasticity, no obvious pinholes								
	25					CL-ML	Sandy SILTY CLAY - stiff, wet, medium olive gray	8							
			22			CL	Lean CLAY with trace sand - stiff, wet, medium olive gray, low plasticity, possible pinholes	4 4 8	8	11					
4200						CL	Lean CLAY with some thinly interbedded sand - stiff, wet, medium olive gray, low plasticity, no obvious pinholes	5							
			24					3 4 4	7	9					
	30					CL	Lean CLAY - stiff, moist to wet, light olive gray, low plasticity, possible small pinholes					31		42	23
			24					4 4 4 5	8	11					
4195						CL	Lean CLAY with some sand - very stiff, moist, light olive gray grading to light brown, low plasticity, no obvious pinholes	5							
			24					5 9 8	14	18					
	35					CL	Lean CLAY - stiff, moist to wet, light brownish gray, thinly interbedded sand 35.5 - 36 feet, low plasticity, no obvious pinholes					22		29	14
			24					4 7 4 4	11	15					
4190						CL	Lean CLAY - stiff, moist to wet, light brownish gray	5							
			24					5 5 8	10	13					
												23	90	27	10

Moisture Content and Atterberg Limits
Plastic Limit — Moisture Content — Liquid Limit
10 20 30 40 50 60 70 80 90

N FIELD - UNCORRECTED BLOW COUNT; N(60) - ENERGY CORRECT BLOW COUNT

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SAMPLE TYPE
- 2" O.D./1.38" I.D. Split Spoon Sampler
- 3.25" O.D./2.42" I.D. 'U' Sampler
- 3" O.D. Thin-Walled Shelby Sampler
- 3" O.D./2.375" I.D. California Sampler
- 2.5" O.D./1.875" I.D. Mod. Cal. Sampler
- Sample from Auger Cuttings

BORING LOG

NOTES:
- Water level estimated from sCPT-01

WATER LEVEL
▼ - MEASURED ▽ - ESTIMATED

FIGURE A-12b

BORING LOG LAT LONG EL NFIELD N60 00113-056 LOGS.GPJ IGES.GDT 1/18/22

DATE
STARTED: 12/9/21
COMPLETED: 12/9/21
BACKFILLED: 12/9/21

Geotechnical Investigation
Reuse Facility
MWDWRF
Magna Utah
IGES Project Number: 00113-056

IGES Rep: WCB
Drilling Co.: ConeTec
Drill Rig: Truck CME 75
Boring Type/Dia.: Mud Rotary/4.875in.
Hammer Type: Automatic/ETR=79.2%

BORING NO: RF-B-02

LOCATION
LATITUDE: 40.727420 ° LONGITUDE: -112.074400 ° ELEVATION: 4,228 feet
Elevation surveyed by EPIC. Lat. and long. estimated

ELEVATION FEET	SAMPLES	RECOVERY (IN.)	WATER LEVEL	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION	Blow Counts	N(field)	N(60)	Dry Density(pcf)	Moisture Content (%)	Percent minus 200	Liquid Limit	Plasticity Index	Moisture Content and Atterberg Limits (Plastic Limit / Moisture Content / Liquid Limit; 10 20 30 40 50 60 70 80 90)
40					CL	Lean CLAY - very stiff, moist, light brown	6 6 8 12	14	18						
4185		24													
					CL	Lean CLAY - stiff, moist, moderate yellowish brown, low plasticity, no obvious pinholes	3 4 4 7	8	11						
45		24													
					CL	Lean CLAY - very stiff, moist, moderate yellowish brown, 2" of SILT at 46 feet, low plasticity, no obvious pinholes	3 4 10 8	14	18		27	90	33	16	
4180		24													
					CL	Lean CLAY - stiff, moist, moderate yellowish brown, low plasticity, no obvious pinholes	3 4 5 6	9	12						
50						- backfilled with bentonite grout slurry with bentonite chips at the ground surface - layer boundaries interpolated between samples where not observed										
4175						Bottom of Boring @ 49.5 Feet										
55															
4170															

N FIELD - UNCORRECTED BLOW COUNT; N(60) - ENERGY CORRECT BLOW COUNT

Copyright (c) 2022, IGES, INC.

SAMPLE TYPE
- 2" O.D./1.38" I.D. Split Spoon Sampler
- 3.25" O.D./2.42" I.D. 'U' Sampler
- 3" O.D. Thin-Walled Shelby Sampler
- 3" O.D./2.375" I.D. California Sampler
- 2.5" O.D./1.875" I.D. Mod. Cal. Sampler
- Sample from Auger Cuttings

BORING LOG

NOTES:
- Water level estimated from sCPT-01

WATER LEVEL
▼ - MEASURED ▽ - ESTIMATED

FIGURE A-12c

BORING LOG LAT LONG EL NFIELD N60 00113-056 LOGS.GPJ IGES.GDT 1/18/22

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 & VERY FINE SANDS, SILTY OR CLAYEY FINE SANDS, CLAYEY SILTS WITH SLIGHT PLASTICITY
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, 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	THICKNESS
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		TORVANE	POCKET PENETROMETER	FIELD TEST
CONSISTENCY	SPT (blows/ft)	UNTRAINED 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 A-13

CPT Report

Prepared for Bowen, Collins & Associates
Prepared By IGES, Inc.
February 10, 2022

PRESENTATION OF SITE INVESTIGATION RESULTS

Magna Water District

Prepared for:

IGES

ConeTec Job No: 21-52-23422

Project Start Date: 2021-Dec-06
Project End Date: 2021-Dec-06
Report Date: 2021-Dec-14

Prepared by:

ConeTec Inc.

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Tel: (801) 973-3801
Fax: (801) 973-3802

ConeTecSLC@conetec.com
www.conetec.com
www.conetecdataservices.com



ABOUT THIS REPORT

The enclosed report presents the results of the site investigation program conducted by ConeTec, Inc. The program consisted of Seismic Piezocone Penetration Testing and Pore Pressure Dissipation Testing. Please note that this report, which also includes all accompanying data, are subject to the 3rd Party Disclaimer and Client Disclaimer that follow in the 'Limitations' section of this report.

Project Information	
Client	IGES
Project	Magna Water District
ConeTec Project Number	21-52-23422
Rig Description	25-ton Truck CPT Rig (C-7A)

Coordinates	
Collection Method	USB/Serial GPS
EPSG Number	4326 (WGS 84 / LatLong)

Cone Penetration Test (CPTu)	
Depth Reference	Existing ground surface at the time of the investigation
Sleeve data offset	0.1 Meters

Please refer to the list of attached documents following the text of this report. A test summary, location map, and plots are included. Thank you for the opportunity to work on this project.

LIMITATIONS

3rd Party Disclaimer

- The “Report” refers to this report titled Magna Water District
- The Report was prepared by ConeTec for IGES

The Report is confidential and may not be distributed to or relied upon by any third parties without the express written consent of ConeTec. Any third parties gaining access to the Report do not acquire any rights as a result of such access. Any use which a third party makes of the Report, or any reliance on or decisions made based on it, are the responsibility of such third parties. ConeTec accepts no responsibility for loss, damage and/or expense, if any, suffered by any third parties as a result of decisions made, or actions taken or not taken, which are in any way based on, or related to, the Report or any portion(s) thereof.

Client Disclaimer

- ConeTec was retained by IGES
- The “Report” refers to this report titled Magna Water District
- ConeTec was retained to collect and provide the raw data (“Data”) which is included in the Report.

ConeTec has collected and reported the Data in accordance with current industry standards. No other warranty, express or implied, with respect to the Data is made by ConeTec. In order to properly understand the Data included in the Report, reference must be made to the documents accompanying and other sources referenced in the Report in their entirety. Other than the Data, the contents of the Report (including any Interpretations) should not be relied upon in any fashion without independent verification and ConeTec is in no way responsible for any loss, damage or expense resulting from the use of, and/or reliance on, such material by any party.

CONTENTS

The following listed below are included in the report:

- **Site Map**
- **Piezocone Penetration Test (CPTu) Sounding Summary**
- **CPTu Plots**
- **Pore Pressure Dissipation (PPD) Summary**
- **PPD Test Plots**
- **Seismic CPTu Results, Plots, and Traces**
- **Methodology Statements**
- **Data File Formats**

SITE MAP



ConeTec Job Number: 21-52-23422

Client: IGES

Project: Magna Water District

Report Date: 2021-Dec-14

Sounding Location

All sounding locations are approximate

Cone Penetration Test Summary and Standard Cone Penetration Test Plots

CONETEC

Job No:	21-52-23422
Client:	IGES
Project:	Magna Water District
Start Date:	06-Dec-2021
End Date:	06-Dec-2021

CONE PENETRATION TEST SUMMARY

Sounding ID	File Name	Date	Cone	Cone Area (cm^2)	Final Depth (ft)	Latitude[1]	Longitude[1]	Elevation[2] (ft)	Refer to Notation Number
SCPT-01	21-52-23422_SP01	06-Dec-2021	EC825:T1500F15U35	15	100.89	40.727313	-112.074468	4233	

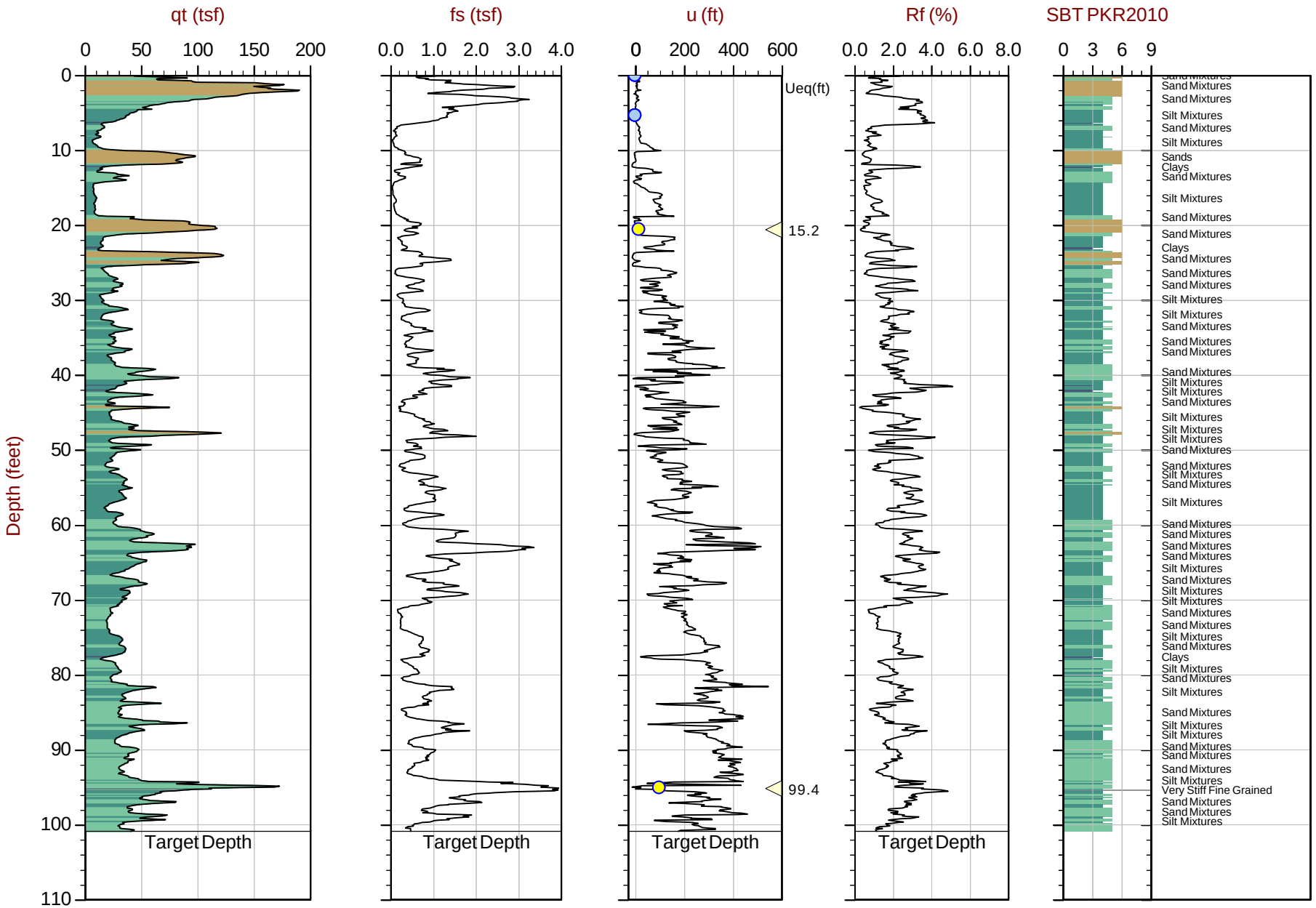
1. The coordinates were collected using consumer grade GPS and have an accuracy of ±30 feet. EPSG number: 4326 (WGS84 / LatLong).
2. Elevations are referenced to the ground surface at the time of testing and were collected using consumer grade GPS with an accuracy of ±50 feet.

CONETEC

IGES

Job No: 21-52-23422
Date: 2021-12-06 13:42
Site: Magna Water District

Sounding: SCPT-01
Cone: 825:T1500F15U35



Max Depth: 30.750 m / 100.88 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-52-23422_SP01.COR

SBT: Robertson, 2010 (CPT '10)
Coords: Lat: 40.727313 Long: -112.074468
Sheet No: 1 of 1

Equilibrium Pore Pressure (Ueq) Assumed Ueq Dissipation, Ueq achieved Dissipation, Ueq not achieved Hydrostatic Line

The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Pore Pressure Dissipation Summary and Pore Pressure Dissipation Plots

CONETEC

Job No:	21-52-23422
Client:	IGES
Project:	Magna Water District
Start Date:	06-Dec-2021
End Date:	06-Dec-2021

CPTu PORE PRESSURE DISSIPATION SUMMARY

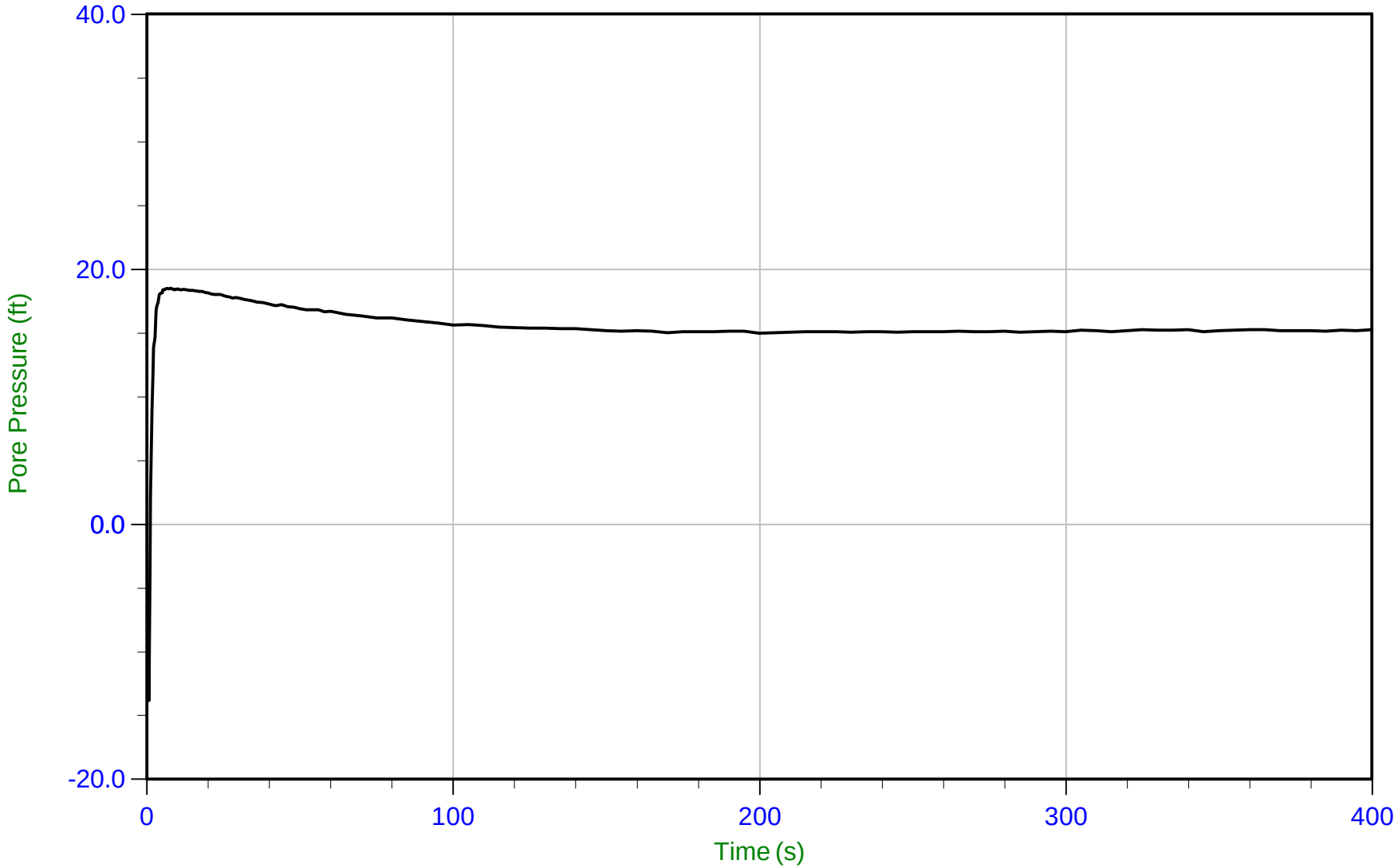
Sounding ID	File Name	Cone Area (cm^2)	Duration (s)	Test Depth (ft)	Estimated Equilibrium Pore Pressure U_{eq} (ft.)	Calculated Phreatic Surface (ft.)	Refer to Notation Number
SCPT-01	21-52-23422_SP01	15	400	20.59	15.2	5.4	
SCPT-01	21-52-23422_SP01	15	800	95.14	99.4	-4.3	

CONETEC

IGES

Job No: 21-52-23422
Date: 12/06/2021 13:42
Site: Magna Water District

Sounding: SCPT-01
Cone: 825:T1500F15U35 Area=15 cm²



Trace Summary:

Filename: 21-52-23422_SP01.ppd2
Depth: 6.275 m / 20.587 ft
Duration: 400.0 s

u Min: -13.8 ft
u Max: 18.5 ft
u Final: 15.2 ft

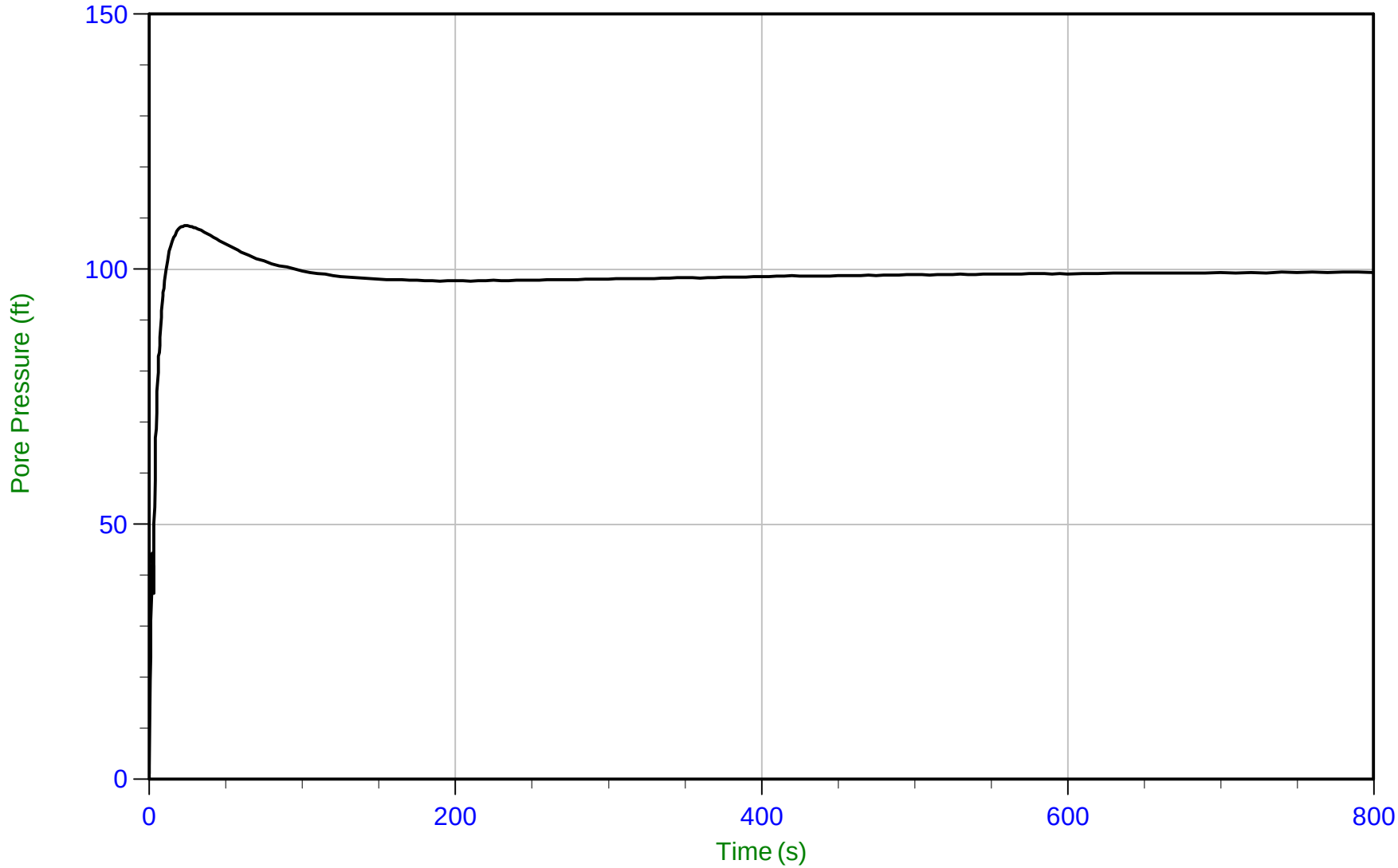
WT: 1.632 m / 5.353 ft
Ueq: 15.2 ft

CONETEC

IGES

Job No: 21-52-23422
Date: 12/06/2021 13:42
Site: Magna Water District

Sounding: SCPT-01
Cone: 825:T1500F15U35 Area=15 cm²



Trace Summary:

Filename: 21-52-23422_SP01.ppd2
Depth: 29.000 m / 95.143 ft
Duration: 800.0 s

u Min: 1.2 ft
u Max: 108.6 ft
u Final: 99.4 ft

WT: -1.310 m / -4.299 ft
Ueq: 99.4 ft

Seismic Cone Penetration Test Tabular Results



Job No:	21-52-23422
Client:	IGES
Project:	Magna Water District
Sounding ID:	SCPT-01
Date:	12:06:21 13:42
Seismic Source:	Beam
Seismic Offset (ft):	1.83
Source Depth (ft):	0.00
Geophone Offset (ft):	0.81

SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs

Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
2.46	1.65	2.46			
9.02	8.21	8.41	5.95	11.48	518
15.58	14.77	14.89	6.47	14.91	434
22.05	21.24	21.31	6.43	16.87	381
28.71	27.90	27.96	6.64	13.58	489
35.27	34.46	34.51	6.55	12.12	541
41.83	41.02	41.06	6.55	9.62	681
48.39	47.58	47.62	6.56	10.44	628
54.95	54.14	54.17	6.56	10.36	633
61.52	60.70	60.73	6.56	7.94	827
67.98	67.17	67.19	6.46	6.92	934
74.64	73.83	73.85	6.66	8.59	775
81.10	80.29	80.31	6.46	8.54	757
87.76	86.95	86.97	6.66	8.49	784
94.23	93.41	93.43	6.46	7.94	814
100.89	100.07	100.09	6.66	7.05	944

Seismic Cone Penetration Test Plots

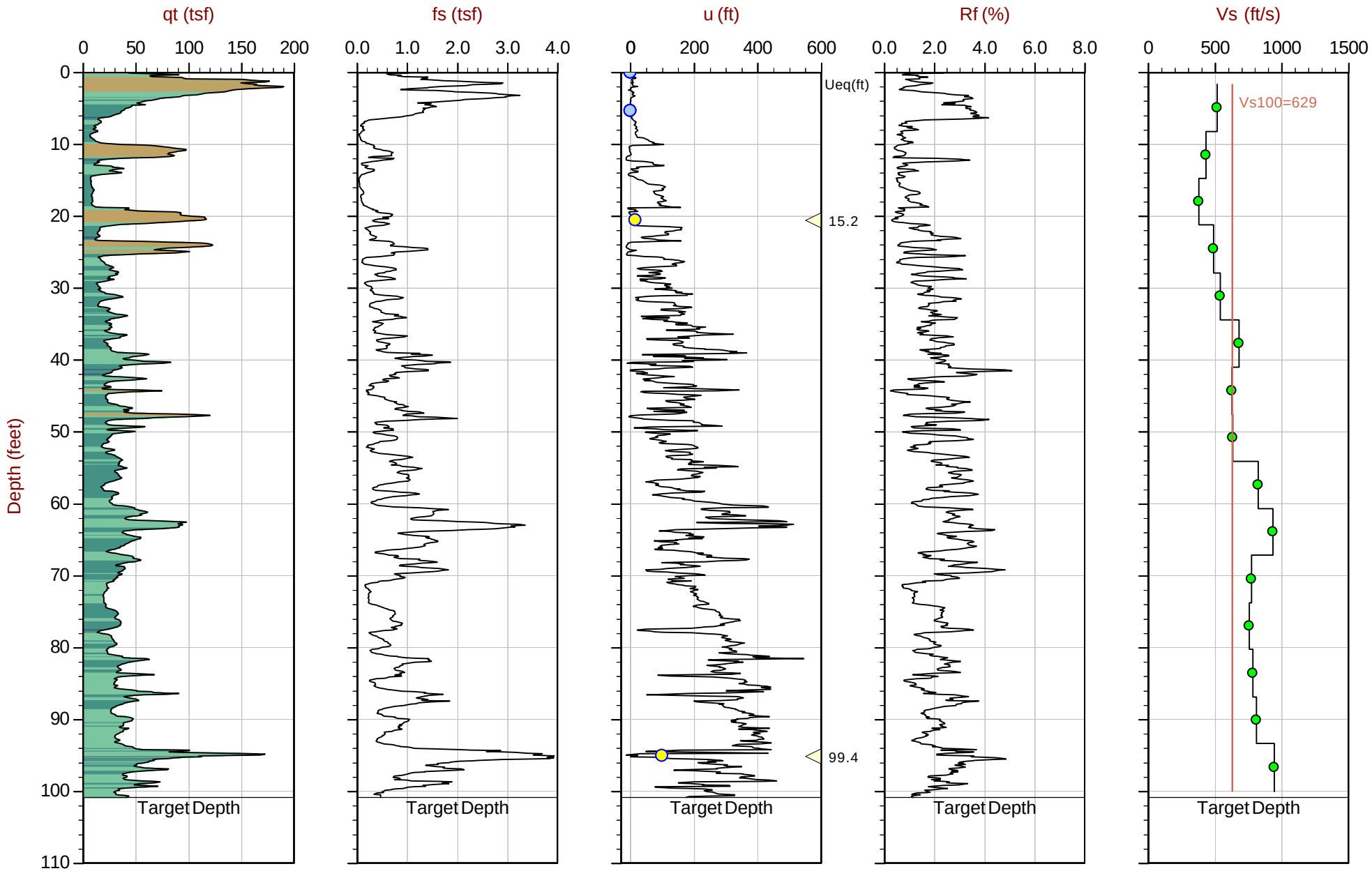


CONETEC

IGES

Job No: 21-52-23422
Date: 2021-12-06 13:42
Site: Magna Water District

Sounding: SCPT-01
Cone: 825:T1500F15U35



Max Depth: 30.750 m / 100.88 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-52-23422_SP01.COR

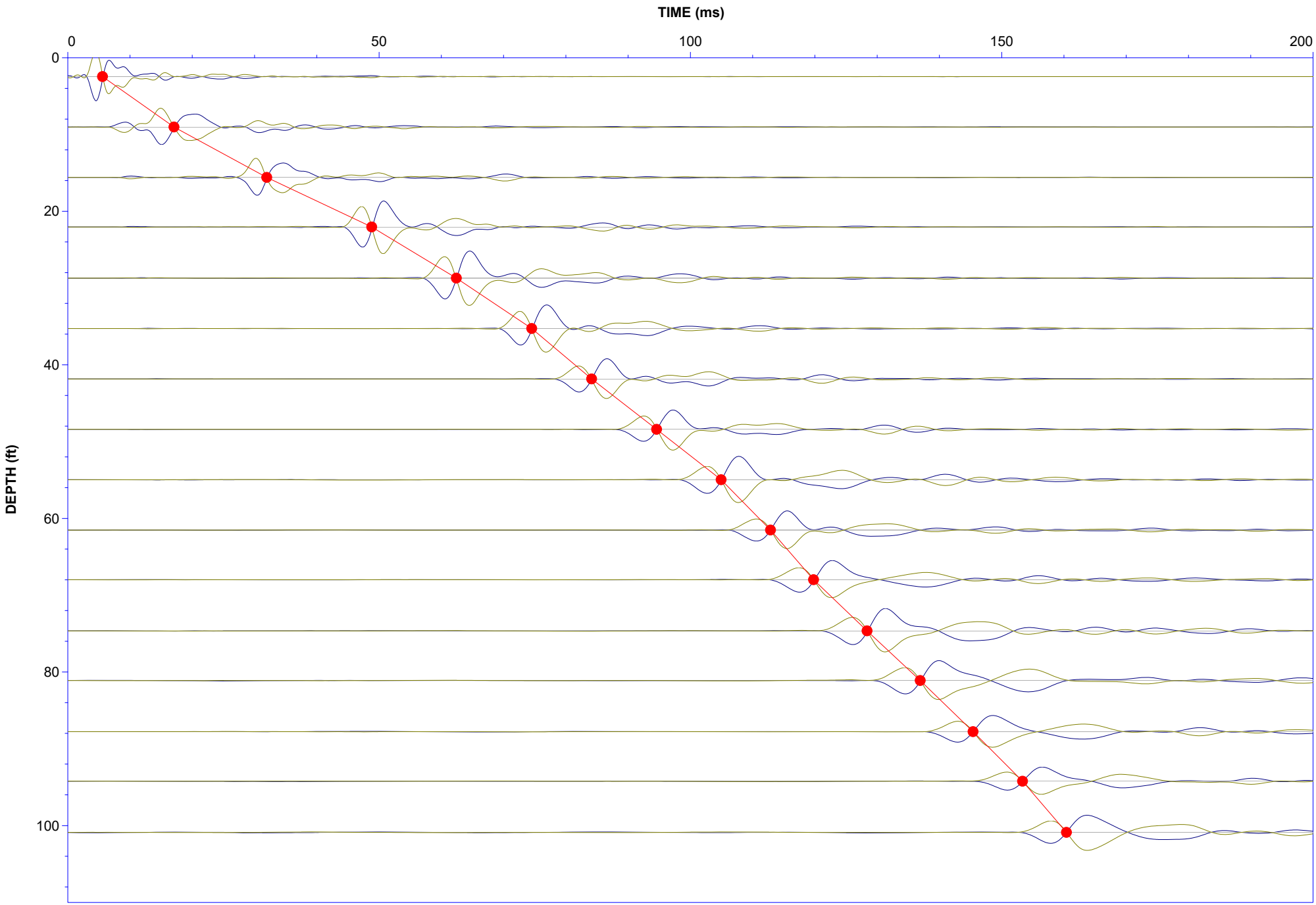
SBT: Robertson, 2010 (CPT '10)
Coords: Lat: 40.727313 Long: -112.074468
Sheet No: 1 of 1

Equilibrium Pore Pressure (Ueq) Assumed Ueq Dissipation, Ueq achieved Dissipation, Ueq not achieved Hydrostatic Line

The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Seismic Cone Penetration Test Shear Wave (Vs) Traces

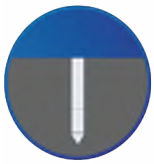
Job No: 21-52-23422 Client: IGES Project Title: Magna Water District Filter: BP 0-400 Hz Hole: SCPT-01 Date: 12:06:21 13:42
Cone: 825:T1500F15U35



Methodology Statements and Data File Formats

CONETEC

METHODOLOGY STATEMENTS



CONE PENETRATION TEST (CPTu) - eSeries

Cone penetration tests (CPTu) are conducted using an integrated electronic piezocone penetrometer and data acquisition system manufactured by Adara Systems Ltd., a subsidiary of ConeTec.

ConeTec's piezocone penetrometers are compression type designs in which the tip and friction sleeve load cells are independent and have separate load capacities. The piezocones use strain gauged load cells for tip and sleeve friction and a strain gauged diaphragm type transducer for recording pore pressure. The piezocones also have a platinum resistive temperature device (RTD) for monitoring the temperature of the sensors, an accelerometer type dual axis inclinometer and two geophone sensors for recording seismic signals. All signals are amplified and measured with minimum sixteen-bit resolution down hole within the cone body, and the signals are sent to the surface using a high bandwidth, error corrected digital interface through a shielded cable.

ConeTec penetrometers are manufactured with various tip, friction and pore pressure capacities in both 10 cm^2 and 15 cm^2 tip base area configurations in order to maximize signal resolution for various soil conditions. The specific piezocone used for each test is described in the CPT summary table. The 15 cm^2 penetrometers do not require friction reducers as they have a diameter larger than the deployment rods. The 10 cm^2 piezocones use a friction reducer consisting of a rod adapter extension behind the main cone body with an enlarged cross sectional area (typically 44 millimeters diameter over a length of 32 millimeters with tapered leading and trailing edges) located at a distance of 585 millimeters above the cone tip.

The penetrometers are designed with equal end area friction sleeves, a net end area ratio of 0.8 and cone tips with a 60 degree apex angle.

All ConeTec piezocones can record pore pressure at various locations. Unless otherwise noted, the pore pressure filter is located directly behind the cone tip in the "u_2" position (ASTM Type 2). The filter is six millimeters thick, made of porous plastic (polyethylene) having an average pore size of 125 microns (90-160 microns). The function of the filter is to allow rapid movements of extremely small volumes of water needed to activate the pressure transducer while preventing soil ingress or blockage.

The piezocone penetrometers are manufactured with dimensions, tolerances and sensor characteristics that are in general accordance with the current ASTM D5778 standard. ConeTec's calibration criteria also meets or exceeds those of the current ASTM D5778 standard. An illustration of the piezocone penetrometer is presented in Figure CPTu.

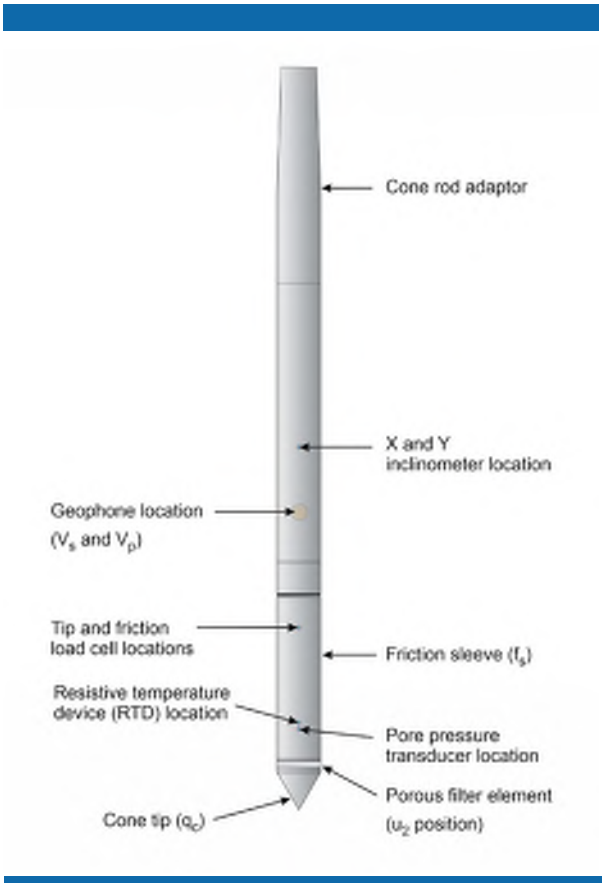


Figure CPTu. Piezocone Penetrometer (15 cm²)

The ConeTec data acquisition system consists of a Windows based computer, signal interface box, and power supply. The signal interface combines depth increment signals, seismic trigger signals and the downhole digital data. This combined data is then sent to the Windows based computer for collection and presentation. The data is recorded at fixed depth increments using a depth encoder that is either portable or integrated into the rig. The typical recording interval is 2.5 centimeters; custom recording intervals are possible.

The system displays the CPTu data in real time and records the following parameters to a storage media during penetration:

- Depth
- Uncorrected tip resistance (q_c)
- Sleeve friction (f_s)
- Dynamic pore pressure (u)
- Additional sensors such as resistivity, passive gamma, ultra violet induced fluorescence, if applicable

All testing is performed in accordance to ConeTec's CPTu operating procedures which are in general accordance with the current ASTM D5778 standard.

Prior to the start of a CPTu sounding a suitable cone is selected, the cone and data acquisition system are powered on, the pore pressure system is saturated with silicone oil and the baseline readings are recorded with the cone hanging freely in a vertical position.

The CPTu is conducted at a steady rate of two centimeters per second, within acceptable tolerances. Typically one meter length rods with an outer diameter of 1.5 inches are added to advance the cone to the sounding termination depth. After cone retraction final baselines are recorded.

Additional information pertaining to ConeTec's cone penetration testing procedures:

- Each filter is saturated in silicone oil under vacuum pressure prior to use
- Baseline readings are compared to previous readings
- Soundings are terminated at the client's target depth or at a depth where an obstruction is encountered, excessive rod flex occurs, excessive inclination occurs, equipment damage is likely to take place, or a dangerous working environment arises
- Differences between initial and final baselines are calculated to ensure zero load offsets have not occurred and to ensure compliance with ASTM standards

The interpretation of piezocone data for this report is based on the corrected tip resistance (q_t), sleeve friction (f_s) and pore water pressure (u). The interpretation of soil type is based on the correlations developed by Robertson, P.K., 2010. The Soil Behavior Type (SBT) classification chart developed by Robertson, P.K., 2010 is presented in Figure SBT. It should be noted that it is not always possible to accurately identify a soil behavior type based on these parameters. In these situations, experience, judgment and an assessment of other parameters may be used to infer soil behavior type.

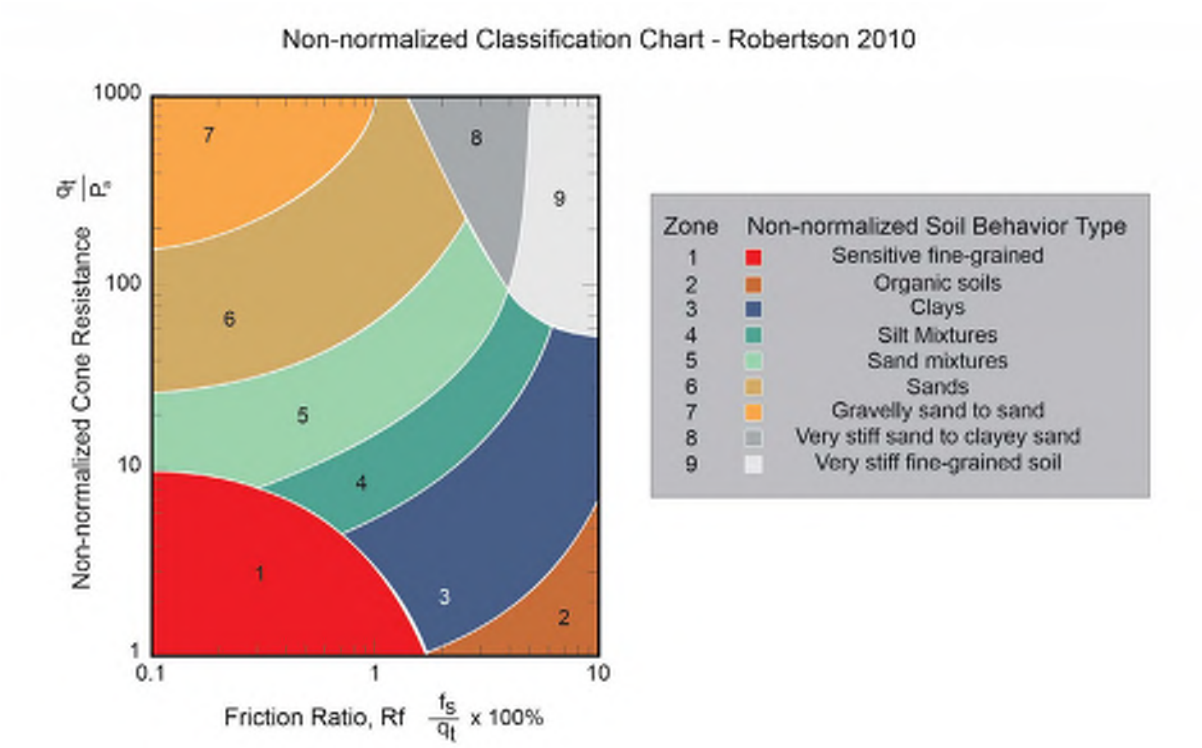


Figure SBT. Non-Normalized Soil Behavior Type Classification Chart (SBT)

The recorded tip resistance (q_c) is the total force acting on the piezocone tip divided by its base area. The tip resistance is corrected for pore pressure effects and termed corrected tip resistance (q_t) according to the following expression presented in Robertson et al. (1986):

$$q_t = q_c + (1-a) \bullet u_2$$

where: q_t is the corrected tip resistance
q_c is the recorded tip resistance
u_2 is the recorded dynamic pore pressure behind the tip (u_2 position)
a is the Net Area Ratio for the piezocone (0.8 for ConeTec probes)

The sleeve friction (f_s) is the frictional force on the sleeve divided by its surface area. As all ConeTec piezocones have equal end area friction sleeves, pore pressure corrections to the sleeve data are not required.

The dynamic pore pressure (u) is a measure of the pore pressures generated during cone penetration. To record equilibrium pore pressure, the penetration must be stopped to allow the dynamic pore pressures to stabilize. The rate at which this occurs is predominantly a function of the permeability of the soil and the diameter of the cone.

The friction ratio (Rf) is a calculated parameter. It is defined as the ratio of sleeve friction to the tip resistance expressed as a percentage. Generally, saturated cohesive soils have low tip resistance, high friction ratios and generate large excess pore water pressures. Cohesionless soils have higher tip resistances, lower friction ratios and do not generate significant excess pore water pressure.

For additional information on CPTu interpretations and calculated geotechnical parameters, refer to Robertson et al. (1986), Lunne et al. (1997), Robertson (2009), Mayne (2013, 2014) and Mayne and Peuchen (2012).

REFERENCES

ASTM D5778-20, 2020, "Standard Test Method for Performing Electronic Friction Cone and Piezocone Penetration Testing of Soils", ASTM International, West Conshohocken, PA. DOI: 10.1520/D5778-20.

Lunne, T., Robertson, P.K. and Powell, J. J. M., 1997, "Cone Penetration Testing in Geotechnical Practice", Blackie Academic and Professional.

Mayne, P.W., 2013, "Evaluating yield stress of soils from laboratory consolidation and in-situ cone penetration tests", Sound Geotechnical Research to Practice (Holtz Volume) GSP 230, ASCE, Reston/VA: 406-420. DOI: 10.1061/9780784412770.027.

Mayne, P.W. and Peuchen, J., 2012, "Unit weight trends with cone resistance in soft to firm clays", Geotechnical and Geophysical Site Characterization 4, Vol. 1 (Proc. ISC-4, Pernambuco), CRC Press, London: 903-910.

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Robertson, P.K., 2010. Soil behavior type from the CPT: an update. 2nd International Symposium on Cone Penetration Testing, CPT'10, Huntington Beach, CA, USA



PORE PRESSURE DISSIPATION TEST

The cone penetration test is halted at specific depths to carry out pore pressure dissipation (PPD) tests, shown in Figure PPD-1. For each dissipation test the cone and rods are decoupled from the rig and the data acquisition system measures and records the variation of the pore pressure (u) with time (t).

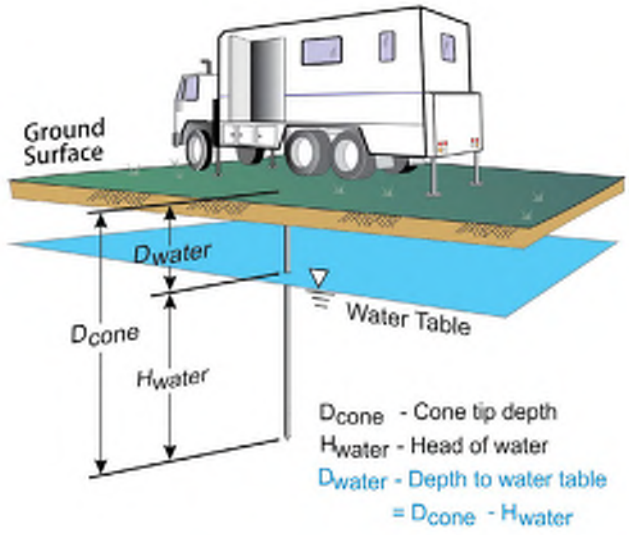


Figure PPD-1. Pore pressure dissipation test setup

Pore pressure dissipation data can be interpreted to provide estimates of ground water conditions, permeability, consolidation characteristics and soil behavior.

The typical shapes of dissipation curves shown in Figure PPD-2 are very useful in assessing soil type, drainage, in situ pore pressure and soil properties. A flat curve that stabilizes quickly is typical of a freely draining sand. Undrained soils such as clays will typically show positive excess pore pressure and have long dissipation times. Dilative soils will often exhibit dynamic pore pressures below equilibrium that then rise over time. Overconsolidated fine-grained soils will often exhibit an initial dilatory response where there is an initial rise in pore pressure before reaching a peak and dissipating.

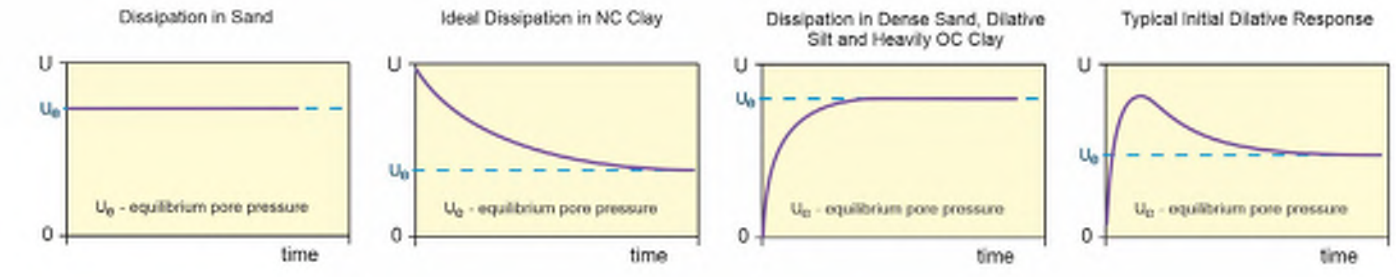
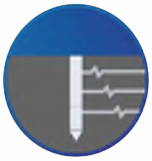


Figure PPD-2. Pore pressure dissipation curve examples

In order to interpret the equilibrium pore pressure (u_{eq}) and the apparent phreatic surface, the pore pressure should be monitored until such time as there is no variation in pore pressure with time as shown for each curve in Figure PPD-2.



SEISMIC CONE PENETRATION TEST (SCPTu) - eSeries

Shear wave velocity (Vs) testing is performed in conjunction with the piezocone penetration test (SCPTu) in order to collect interval velocities. For some projects seismic compression wave velocity (Vp) testing is also performed.

ConeTec's piezocone penetrometers are manufactured with one horizontally active geophone (28 hertz) and one vertically active geophone (28 hertz). Both geophones are rigidly mounted in the body of the cone penetrometer, 0.2 meters behind the cone tip. The vertically mounted geophone is more sensitive to compression waves.

Shear waves are typically generated by using an impact hammer horizontally striking a beam that is held in place by a normal load. In some instances, an auger source or an imbedded impulsive source may be used for both shear waves and compression waves. The hammer and beam act as a contact trigger that initiates the recording of the seismic wave traces. For impulsive devices an accelerometer trigger may be used. The traces are recorded in the memory of the cone using a fast analog to digital converter. The seismic trace is then transmitted digitally uphole to a Windows based computer through a signal interface box for recording and analysis. An illustration of the shear wave testing configuration is presented in Figure SCPTu-1.

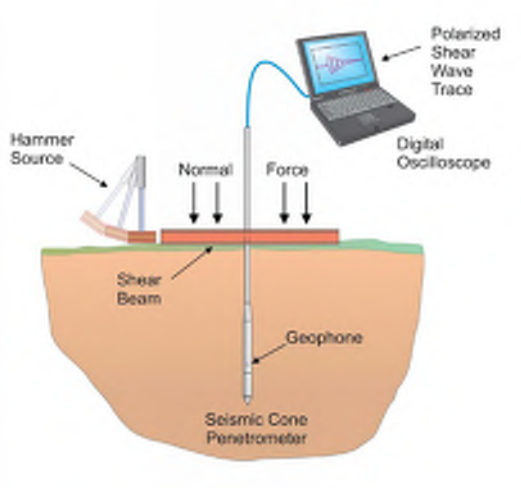


Figure SCPTu-1. Illustration of the SCPTu system

All testing is performed in accordance to ConeTec's SCPTu operating procedures which are in general accordance with the current ASTM D5778 and ASTM D7400 standards.

Prior to the start of a SCPTu sounding, the procedures described in the Cone Penetration Test section are followed. In addition, the active axis of the geophone is aligned parallel to the beam (or source) and the horizontal offset between the cone and the source is measured and recorded.

Prior to recording seismic waves at each test depth, cone penetration is stopped and the rods are decoupled from the rig to avoid transmission of rig energy down the rods. Typically, five wave traces for each orientation are recorded for quality control and uncertainty analysis purposes. After reviewing wave traces for consistency the cone is pushed to the next test depth (typically one meter intervals or as requested by the client). Figure SCPTu-2 presents an illustration of a SCPTu test.

For additional information on seismic cone penetration testing refer to Robertson et al. (1986).

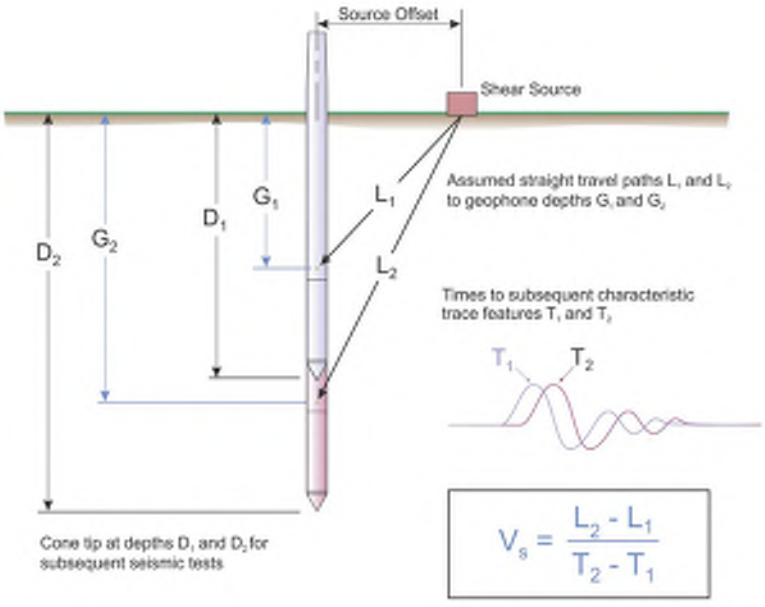


Figure SCPTu-2. Illustration of a seismic cone penetration test

Calculation of the interval velocities are performed by visually picking a common feature (e.g. the first characteristic peak, trough, or crossover) on all of the recorded wave sets and taking the difference in ray path divided by the time difference between subsequent features. Ray path is defined as the straight line distance from the seismic source to the geophone, accounting for beam offset, source depth and geophone offset from the cone tip.

REFERENCES

ASTM D5778-20, 2020, “Standard Test Method for Performing Electronic Friction Cone and Piezocone Penetration Testing of Soils”, ASTM International, West Conshohocken, PA. DOI: 10.1520/D5778-20.

ASTM D7400/D7400M-19, 2019, “Standard Test Methods for Downhole Seismic Testing”, ASTM International, West Conshohocken, PA. DOI: 10.1520/D7400_D7400M-19.

Robertson, P.K., Campanella, R.G., Gillespie D and Rice, A., 1986, “Seismic CPT to Measure In-Situ Shear Wave Velocity”, Journal of Geotechnical Engineering ASCE, Vol. 112, No. 8: 791-803. DOI: 10.1061/(ASCE)0733-9410(1986)112:8(791).

CONE PENETRATION DIGITAL FILE FORMATS - eSeries

CPT Data Files (COR Extension)

ConeTec CPT data files are stored in ASCII text files that are readable by almost any text editor. ConeTec file names start with the job number (which includes the two digit year number) an underscore as a separating character, followed by two letters based on the type of test and the sounding ID. The last character position is reserved for an identifier letter (such as b, c, d etc) used to uniquely distinguish multiple soundings at the same location. The CPT sounding file has the extension COR. As an example, for job number 21-02-00001 the first CPT sounding will have file name 21-02-00001_CP01.COR

The sounding (COR) file consists of the following components:

1. Two lines of header information
2. Data records
3. End of data marker
4. Units information

Header Lines

Line 1: Columns 1-6 may be blank or may indicate the version number of the recording software
Columns 7-21 contain the sounding Date and Time (Date is MM:DD:YY)
Columns 23-38 contain the sounding Operator
Columns 51-100 contain extended Job Location information

Line 2: Columns 1-16 contain the Job Location
Columns 17-32 contain the Cone ID
Columns 33-47 contain the sounding number
Columns 51-100 may contain extended sounding ID information

Data Records

The data records contain 4 or more columns of data in floating point format. A comma and spaces separate each data item:

Column 1: Sounding Depth (meters)
Column 2: Tip (q_c), recorded in units selected by the operator
Column 3: Sleeve (f_s), recorded in units selected by the operator
Column 4: Dynamic pore pressure (u), recorded in units selected by the operator
Column 5: Empty or may contain other requested data such as Gamma, Resistivity or UVIF data

End of Data Marker

After the last line of data there is a line containing an ASCII 26 (CTL-Z) character (small rectangular shaped character) followed by a newline (carriage return / line feed). This is used to mark the end of data.

Units Information

The last section of the file contains information about the units that were selected for the sounding. A separator bar makes up the first line. The second line contains the type of units used for depth, q_c, f_s and u. The third line contains the conversion values required for ConeTec's software to convert the recorded data to an internal set of base units (bar for q_c, bar for f_s and meters for u). Additional lines intended for internal ConeTec use may appear following the conversion values.

CPT Data Files (XLS Extension)

Excel format files of ConeTec CPT data are also generated from corresponding COR files. The XLS files have the same base file name as the COR file with a -BSC suffix. The information in the file is presented in table format and contains additional information about the sounding such as coordinate information, and tip net area ratio.

The BSCI suffix is given to XLS files which are enhanced versions of the BSC files and include the same data records in addition to inclination data collected for each sounding.

CPT Dissipation Files (XLS Extension)

Pore pressure dissipation files are provided in Excel format and contain each dissipation trace that exceeds a minimum duration (selected during post-processing) formatted column wise within the spreadsheet. The first column (Column A) contains the time in seconds and the second column (Column B) contains the time in minutes. Subsequent columns contain the dissipation trace data. The columns extend to the longest trace of the data set.

Detailed header information is provided at the top of the worksheet. The test depth in meters and feet, the number of points in the trace and the particular units are all presented at the top of each trace column.

CPT Dissipation files have the same naming convention as the CPT sounding files with a "–PPD" suffix.

Data Records

Each file will contain dissipation traces that exceed a minimum duration (selected during post-processing) in a particular column. The dissipation pore pressure values are typically recorded at varying time intervals throughout the trace; rapidly to start and increasing as the duration of the test lengthens. The test depth in meters and feet, the number of points in the trace and the trace number are identified at the top of each trace column.

Cone Type Designations

Cone ID	Cone Description	Tip Cross Sect. Area (cm^2)	Tip Capacity (bar)	Sleeve Area (cm^2)**	Sleeve Capacity (bar)	Pore Pressure Capacity (bar)
EC###	A15T1500F15U35	15	1500	225	15	35
EC###	A15T375F10U35	15	375	225	10	35
EC###	A10T1000F10U35	10	1000	150	10	35

refers to the Cone ID number
**Outer Cylindrical Area

Appendix B

Water Content and Unit Weight of Soil

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

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Project: Reuse Facility, MWDWRF
No: 00113-056
Location: Magna, Utah
Date: 1/11/2022
By: FB

Sample Info.	Boring No.	RF-B-01	RF-B-01	RF-B-01	RF-B-02	RF-B-02	RF-B-02	RF-B-02	RF-B-02
	Sample								
	Depth	19.0'	24.0'	70.0'	2.5'	5.0'	10.0'	20.0'	27.5&30.0'
	Split	No	No	No	Yes	Yes	No	No	No
	Split sieve				No.10	3/8"			
Total sample (g)					238.69	752.51			
Moist coarse fraction (g)					67.76	17.55			
Moist split fraction (g)					170.93	734.96			
Unit Weight Data	Sample height, H (in)			5.980					
	Sample diameter, D (in)			2.861					
	Mass rings + wet soil (g)			1195.71					
	Mass rings/tare (g)			0.00					
	Moist unit wt., γ_m (pcf)			118.5					
Coarse Fraction	Wet soil + tare (g)				220.79	146.92			
	Dry soil + tare (g)				217.49	146.37			
	Tare (g)				128.39	127.90			
	Water content (%)				3.7	3.0			
Split Fraction	Wet soil + tare (g)	253.81	208.79	738.95	12.95	330.55	355.01	416.72	553.29
	Dry soil + tare (g)	228.27	188.36	595.14	12.52	276.93	299.94	352.27	459.76
	Tare (g)	140.54	122.36	121.56	7.34	123.51	123.08	122.54	160.19
	Water content (%)	29.1	31.0	30.4	8.3	34.9	31.1	28.1	31.2
Water Content, w (%)		**29.1**	**31.0**	**30.4**	**7.0**	**34.0**	**31.1**	**28.1**	**31.2**
Dry Unit Wt., γ_d (pcf)				**90.9**					

Entered by:_____

Reviewed:_____

Water Content and Unit Weight of Soil

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

© IGES 2006, 2022

Project: Reuse Facility, MWDWRF
No: 00113-056
Location: Magna, Utah
Date: 1/14/2022
By: BFS/FB

Sample Info.	Boring No.	RF-B-02	RF-B-02	RF-B-02					
	Sample								
	Depth	32.5&35.0'	37.5&40.0'	45.0'					
	Split	No	No	No					
	Split sieve								
Total sample (g)									
Moist coarse fraction (g)									
Moist split fraction (g)									
	Sample height, H (in)								
	Sample diameter, D (in)								
	Mass rings + wet soil (g)								
	Mass rings/tare (g)								
	Moist unit wt., γ_m (pcf)								
	Wet soil + tare (g)								
	Dry soil + tare (g)								
	Tare (g)								
	Water content (%)								
Water Content Data	Wet soil + tare (g)	323.02	533.14	474.47					
	Dry soil + tare (g)	287.52	467.60	401.43					
	Tare (g)	128.97	182.17	127.53					
	Water content (%)	22.4	23.0	26.7					
Water Content, w (%)		**22.4**	**23.0**	**26.7**					
Dry Unit Wt., γ_d (pcf)									

Entered by:_____
Reviewed:_____

Liquid Limit, Plastic Limit, and Plasticity Index of Soils

(ASTM D4318)

© IGES 2004, 2022

Project: Reuse Facility, MWDWRF
No: 00113-056
Location: Magna, Utah
Date: 1/11/2022
By: BRR
Grooving tool type: Plastic
Liquid limit device: Mechanical
Rolling method: Hand

Boring No.: RF-B-01
Sample:
Depth: 15.0'
Description: Grey lean clay

Preparation method: Wet
Liquid limit test method: Multipoint
Screened over No.40: No
Larger particles removed: Not required

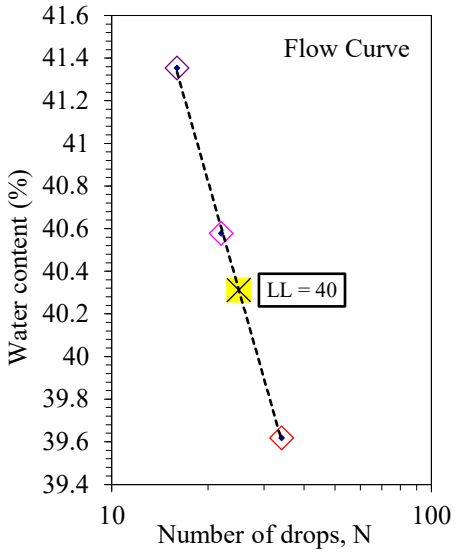
Plastic Limit

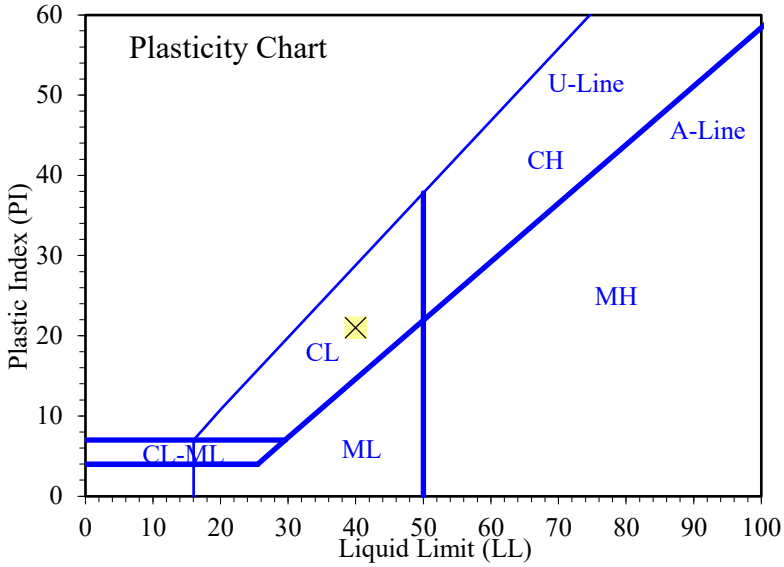
Determination No	1	2				
Wet Soil + Tare (g)	13.82	14.91				
Dry Soil + Tare (g)	12.76	13.73				
Water Loss (g)	1.06	1.18				
Tare (g)	7.09	7.48				
Dry Soil (g)	5.67	6.25				
Water Content, w (%)	18.69	18.88				

Liquid Limit

Determination No	1	2	3			
Number of Drops, N	34	22	16			
Wet Soil + Tare (g)	13.97	14.34	14.92			
Dry Soil + Tare (g)	12.10	12.23	12.72			
Water Loss (g)	1.87	2.11	2.20			
Tare (g)	7.38	7.03	7.40			
Dry Soil (g)	4.72	5.20	5.32			
Water Content, w (%)	39.62	40.58	41.35			
One-Point LL (%)		40				

Liquid Limit, LL (%)	**40**
Plastic Limit, PL (%)	**19**
Plasticity Index, PI (%)	**21**





Entered by:_____
Reviewed:_____

Liquid Limit, Plastic Limit, and Plasticity Index of Soils

(ASTM D4318)

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Project: Reuse Facility, MWDWRF
No: 00113-056
Location: Magna, Utah
Date: 1/7/2022
By: BRR
Grooving tool type: Plastic
Liquid limit device: Mechanical
Rolling method: Hand

Boring No.: RF-B-01
Sample:
Depth: 19.0'
Description: Grey silt

Preparation method: Air Dry
Liquid Limit: Could not be determined (N.P.)
Screened over No.40: Yes
Larger particles removed: Dry sieved

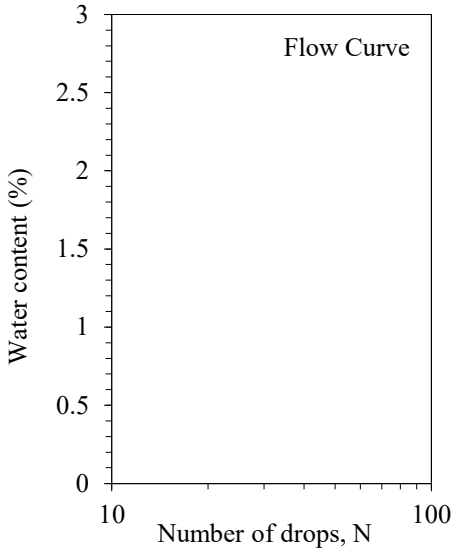
Plastic Limit

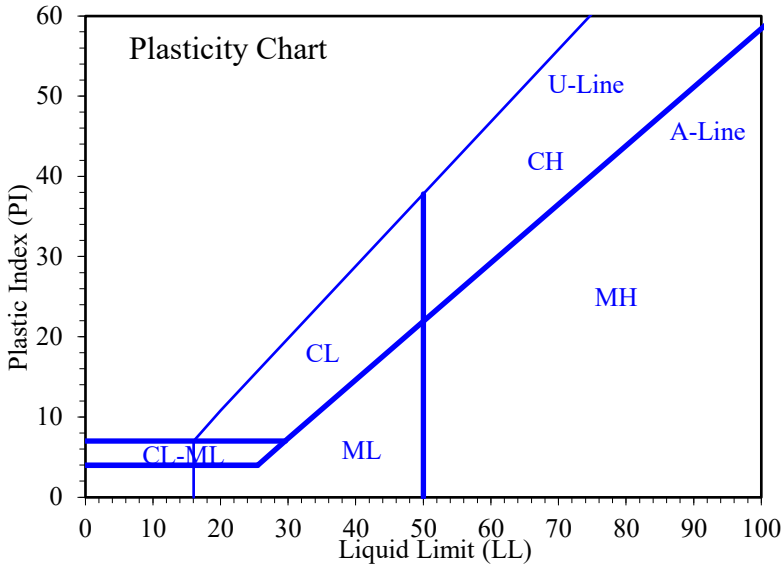
Determination No						
Wet Soil + Tare (g)						
Dry Soil + Tare (g)		Difficult to thread.				
Water Loss (g)						
Tare (g)						
Dry Soil (g)						
Water Content, w (%)						

Liquid Limit: Could not be determined (N.P.)

Determination No						
Number of Drops, N						
Wet Soil + Tare (g)	Unable to obtain an adequate blow count.					
Dry Soil + Tare (g)						
Water Loss (g)						
Tare (g)						
Dry Soil (g)						
Water Content, w (%)						
One-Point LL (%)						

Liquid Limit, LL (%)	**Nonplastic (N.P.)**
Plastic Limit, PL (%)	
Plasticity Index, PI (%)	





Entered by:_____
Reviewed:_____

Liquid Limit, Plastic Limit, and Plasticity Index of Soils

(ASTM D4318)

© IGES 2004, 2022

Project: Reuse Facility, MWDWRF
No: 00113-056
Location: Magna, Utah
Date: 1/11/2022
By: BRR
Grooving tool type: Plastic
Liquid limit device: Mechanical
Rolling method: Hand

Boring No.: RF-B-01
Sample:
Depth: 24.0'
Description: Grey silty clay

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

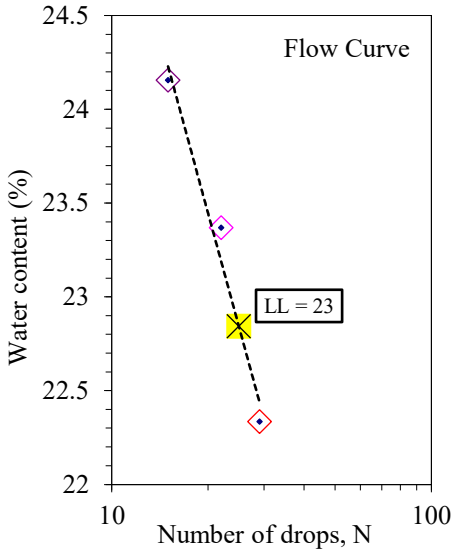
Plastic Limit

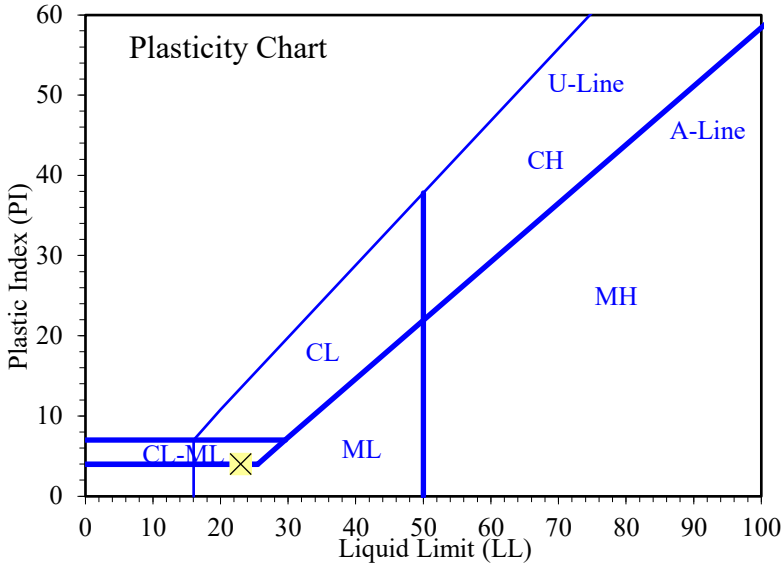
Determination No	1	2				
Wet Soil + Tare (g)	15.13	14.02				
Dry Soil + Tare (g)	13.83	12.91				
Water Loss (g)	1.30	1.11				
Tare (g)	7.04	7.08				
Dry Soil (g)	6.79	5.83				
Water Content, w (%)	19.15	19.04				

Liquid Limit

Determination No	1	2	3			
Number of Drops, N	29	22	15			
Wet Soil + Tare (g)	12.29	13.87	15.06			
Dry Soil + Tare (g)	11.41	12.58	13.56			
Water Loss (g)	0.88	1.29	1.50			
Tare (g)	7.47	7.06	7.35			
Dry Soil (g)	3.94	5.52	6.21			
Water Content, w (%)	22.34	23.37	24.15			
One-Point LL (%)	23	23				

Liquid Limit, LL (%)	**23**
Plastic Limit, PL (%)	**19**
Plasticity Index, PI (%)	**4**





Entered by:_____
Reviewed:_____

Liquid Limit, Plastic Limit, and Plasticity Index of Soils

(ASTM D4318)

© IGES 2004, 2022

Project: Reuse Facility, MWDWRF
No: 00113-056
Location: Magna, Utah
Date: 1/11/2022
By: BRR
Grooving tool type: Plastic
Liquid limit device: Mechanical
Rolling method: Hand

Boring No.: RF-B-01
Sample:
Depth: 35.0'
Description: Brown lean clay

Preparation method: Wet
Liquid limit test method: Multipoint
Screened over No.40: No
Larger particles removed: Not required

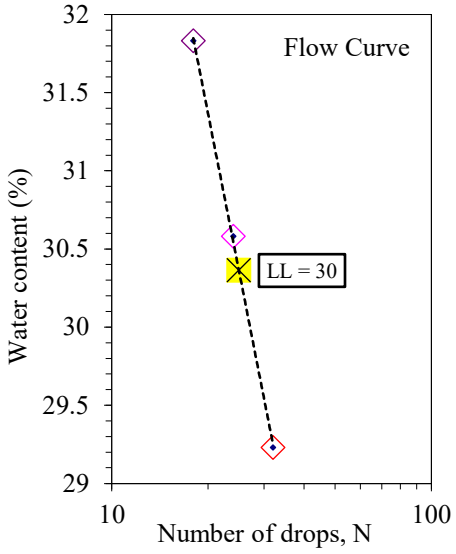
Plastic Limit

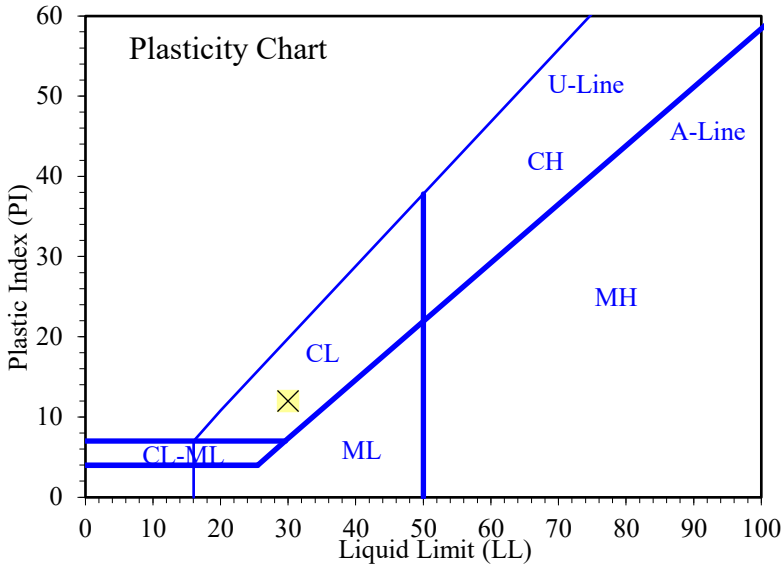
Determination No	1	2				
Wet Soil + Tare (g)	14.76	14.27				
Dry Soil + Tare (g)	13.67	13.24				
Water Loss (g)	1.09	1.03				
Tare (g)	7.50	7.47				
Dry Soil (g)	6.17	5.77				
Water Content, w (%)	17.67	17.85				

Liquid Limit

Determination No	1	2	3			
Number of Drops, N	32	24	18			
Wet Soil + Tare (g)	15.51	16.29	16.30			
Dry Soil + Tare (g)	13.61	14.29	14.18			
Water Loss (g)	1.90	2.00	2.12			
Tare (g)	7.11	7.75	7.52			
Dry Soil (g)	6.50	6.54	6.66			
Water Content, w (%)	29.23	30.58	31.83			
One-Point LL (%)		30				

Liquid Limit, LL (%)	**30**
Plastic Limit, PL (%)	**18**
Plasticity Index, PI (%)	**12**





Entered by:_____
Reviewed:_____

Liquid Limit, Plastic Limit, and Plasticity Index of Soils

(ASTM D4318)

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Project: Reuse Facility, MWDWRF
No: 00113-056
Location: Magna, Utah
Date: 1/11/2022
By: BRR
Grooving tool type: Plastic
Liquid limit device: Mechanical
Rolling method: Hand

Boring No.: RF-B-01
Sample:
Depth: 55.0'
Description: Brownish grey lean clay

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

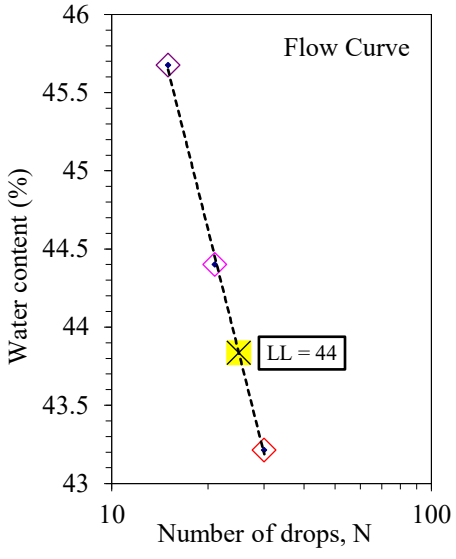
Plastic Limit

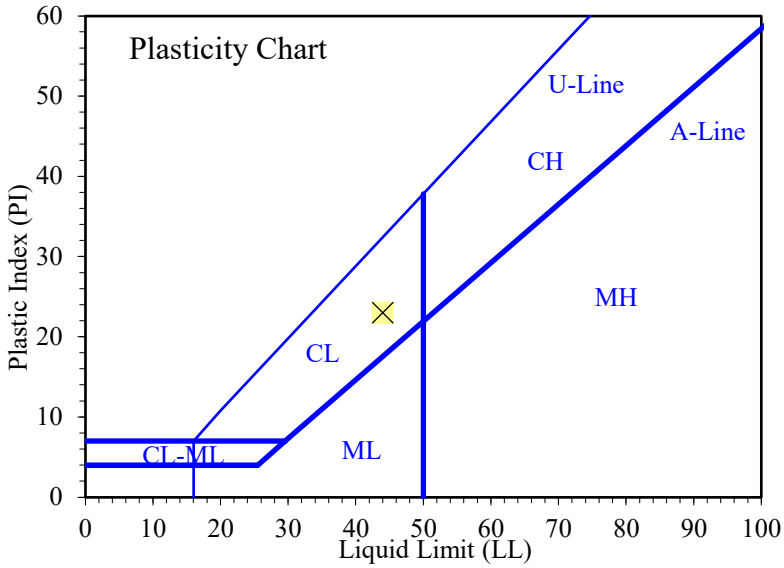
Determination No	1	2				
Wet Soil + Tare (g)	13.90	14.38				
Dry Soil + Tare (g)	12.69	13.10				
Water Loss (g)	1.21	1.28				
Tare (g)	6.97	7.09				
Dry Soil (g)	5.72	6.01				
Water Content, w (%)	21.15	21.30				

Liquid Limit

Determination No	1	2	3			
Number of Drops, N	30	21	15			
Wet Soil + Tare (g)	15.43	14.69	15.16			
Dry Soil + Tare (g)	13.01	12.47	12.73			
Water Loss (g)	2.42	2.22	2.43			
Tare (g)	7.41	7.47	7.41			
Dry Soil (g)	5.60	5.00	5.32			
Water Content, w (%)	43.21	44.40	45.68			
One-Point LL (%)	44	43				

Liquid Limit, LL (%)	**44**
Plastic Limit, PL (%)	**21**
Plasticity Index, PI (%)	**23**





Entered by:_____
Reviewed:_____

Liquid Limit, Plastic Limit, and Plasticity Index of Soils

(ASTM D4318)

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Project: Reuse Facility, MWDWRF
No: 00113-056
Location: Magna, Utah
Date: 1/11/2022
By: BRR
Grooving tool type: Plastic
Liquid limit device: Mechanical
Rolling method: Hand

Boring No.: RF-B-01
Sample:
Depth: 70.0'
Description: Brown lean clay

Preparation method: Wet
Liquid limit test method: Multipoint
Screened over No.40: No
Larger particles removed: Not required

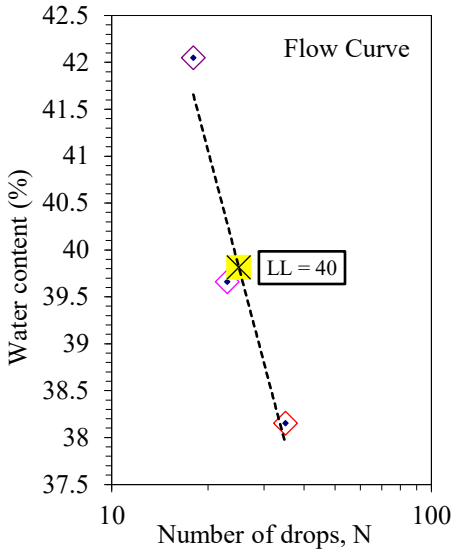
Plastic Limit

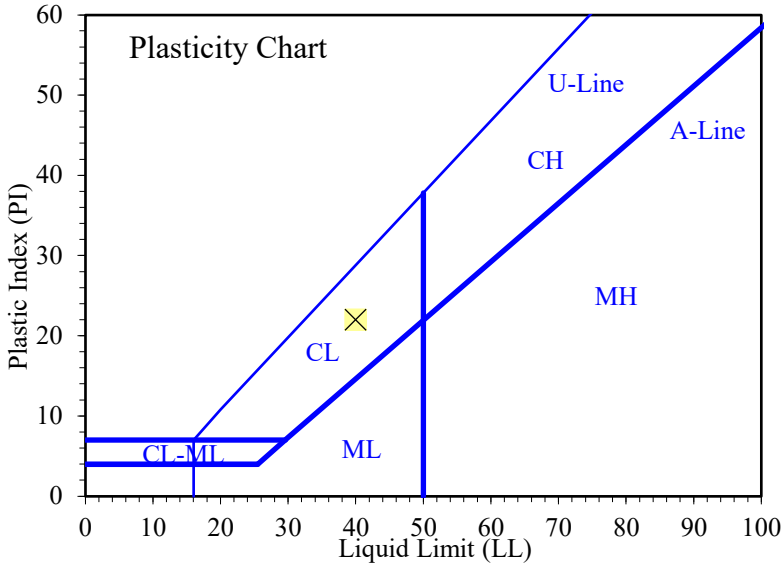
Determination No	1	2				
Wet Soil + Tare (g)	13.21	13.42				
Dry Soil + Tare (g)	12.28	12.46				
Water Loss (g)	0.93	0.96				
Tare (g)	7.09	7.05				
Dry Soil (g)	5.19	5.41				
Water Content, w (%)	17.92	17.74				

Liquid Limit

Determination No	1	2	3			
Number of Drops, N	35	23	18			
Wet Soil + Tare (g)	13.99	14.75	14.11			
Dry Soil + Tare (g)	12.09	12.64	12.10			
Water Loss (g)	1.90	2.11	2.01			
Tare (g)	7.11	7.32	7.32			
Dry Soil (g)	4.98	5.32	4.78			
Water Content, w (%)	38.15	39.66	42.05			
One-Point LL (%)		39				

Liquid Limit, LL (%)	**40**
Plastic Limit, PL (%)	**18**
Plasticity Index, PI (%)	**22**





Entered by:_____
Reviewed:_____

Liquid Limit, Plastic Limit, and Plasticity Index of Soils

(ASTM D4318)

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Project: Reuse Facility, MWDWRF
No: 00113-056
Location: Magna, Utah
Date: 1/6/2022
By: BRR
Grooving tool type: Plastic
Liquid limit device: Mechanical
Rolling method: Hand

Boring No.: RF-B-02
Sample:
Depth: 5.0'
Description: Brown lean clay

Preparation method: Wet
Liquid limit test method: Multipoint
Screened over No.40: No
Larger particles removed: By hand

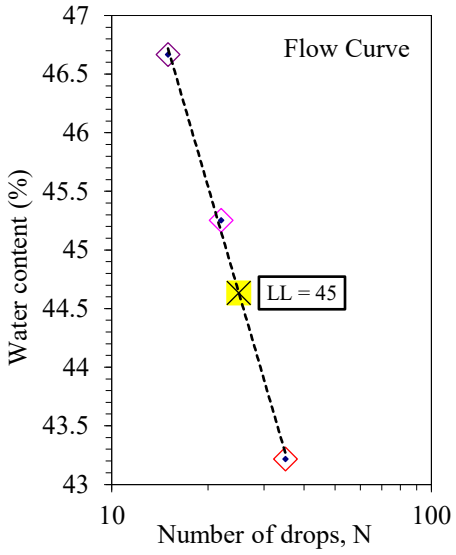
Plastic Limit

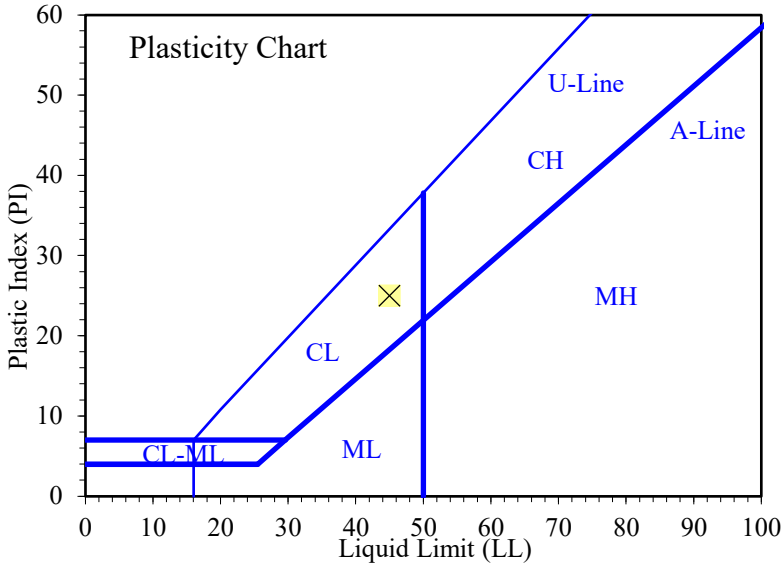
Determination No	1	2				
Wet Soil + Tare (g)	13.83	13.25				
Dry Soil + Tare (g)	12.71	12.24				
Water Loss (g)	1.12	1.01				
Tare (g)	7.08	7.07				
Dry Soil (g)	5.63	5.17				
Water Content, w (%)	19.89	19.54				

Liquid Limit

Determination No	1	2	3			
Number of Drops, N	35	22	15			
Wet Soil + Tare (g)	15.61	16.23	17.02			
Dry Soil + Tare (g)	13.03	13.37	14.08			
Water Loss (g)	2.58	2.86	2.94			
Tare (g)	7.06	7.05	7.78			
Dry Soil (g)	5.97	6.32	6.30			
Water Content, w (%)	43.22	45.25	46.67			
One-Point LL (%)		45				

Liquid Limit, LL (%)	**45**
Plastic Limit, PL (%)	**20**
Plasticity Index, PI (%)	**25**





Entered by:_____
Reviewed:_____

Liquid Limit, Plastic Limit, and Plasticity Index of Soils

(ASTM D4318)

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Project: Reuse Facility, MWDWRF
No: 00113-056
Location: Magna, Utah
Date: 1/7/2022
By: BRR
Grooving tool type: Plastic
Liquid limit device: Mechanical
Rolling method: Hand

Boring No.: RF-B-02
Sample:
Depth: 10.0'
Description: Brown lean clay

Preparation method: Wet
Liquid limit test method: Multipoint
Screened over No.40: No
Larger particles removed: Not required

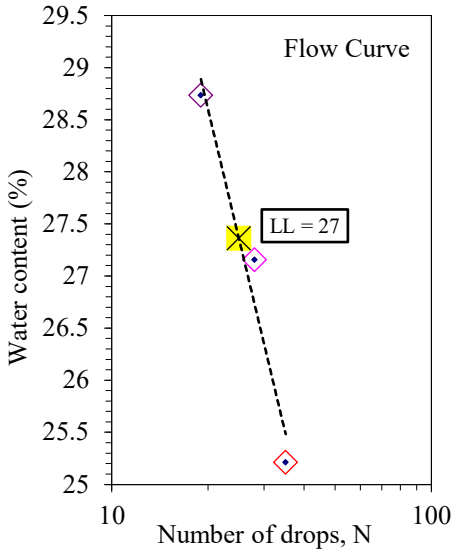
Plastic Limit

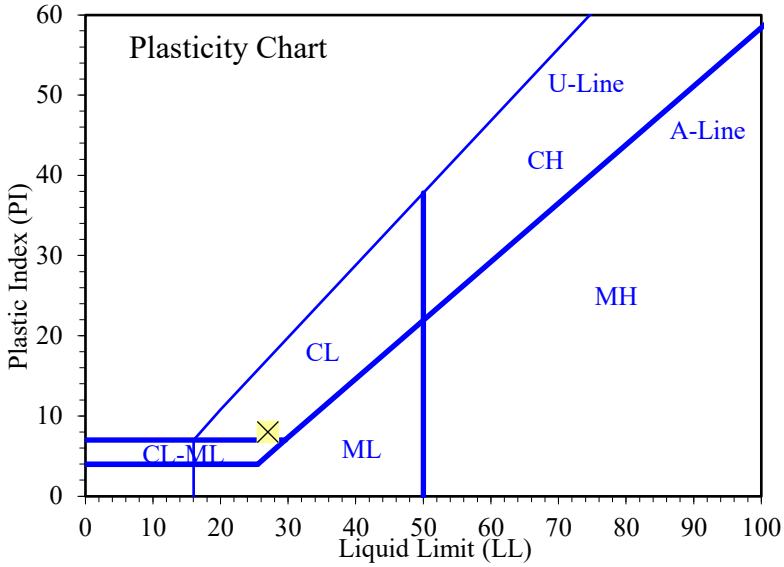
Determination No	1	2				
Wet Soil + Tare (g)	13.58	14.81				
Dry Soil + Tare (g)	12.57	13.64				
Water Loss (g)	1.01	1.17				
Tare (g)	7.12	7.51				
Dry Soil (g)	5.45	6.13				
Water Content, w (%)	18.53	19.09				

Liquid Limit

Determination No	1	2	3			
Number of Drops, N	35	28	19			
Wet Soil + Tare (g)	14.88	14.41	16.35			
Dry Soil + Tare (g)	13.40	12.93	14.35			
Water Loss (g)	1.48	1.48	2.00			
Tare (g)	7.53	7.48	7.39			
Dry Soil (g)	5.87	5.45	6.96			
Water Content, w (%)	25.21	27.16	28.74			
One-Point LL (%)		28				

Liquid Limit, LL (%)	**27**
Plastic Limit, PL (%)	**19**
Plasticity Index, PI (%)	**8**





Entered by:_____
Reviewed:_____

Liquid Limit, Plastic Limit, and Plasticity Index of Soils

(ASTM D4318)

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Project: Reuse Facility, MWDWRF
No: 00113-056
Location: Magna, Utah
Date: 1/11/2022
By: BRR
Grooving tool type: Plastic
Liquid limit device: Mechanical
Rolling method: Hand

Boring No.: RF-B-02
Sample:
Depth: 20.0'
Description: Grey silty clay

Preparation method: Wet
Liquid limit test method: Multipoint
Screened over No.40: No
Larger particles removed: Not required

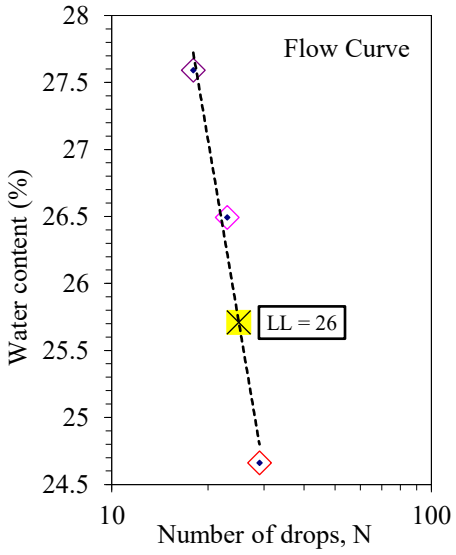
Plastic Limit

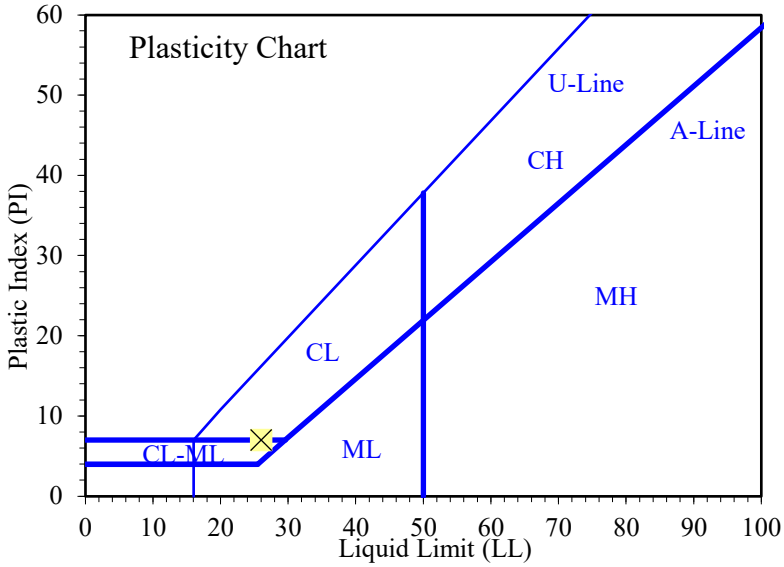
Determination No	1	2				
Wet Soil + Tare (g)	13.68	13.84				
Dry Soil + Tare (g)	12.61	12.76				
Water Loss (g)	1.07	1.08				
Tare (g)	7.08	7.12				
Dry Soil (g)	5.53	5.64				
Water Content, w (%)	19.35	19.15				

Liquid Limit

Determination No	1	2	3			
Number of Drops, N	29	23	18			
Wet Soil + Tare (g)	15.87	16.19	17.00			
Dry Soil + Tare (g)	14.24	14.37	14.95			
Water Loss (g)	1.63	1.82	2.05			
Tare (g)	7.63	7.50	7.52			
Dry Soil (g)	6.61	6.87	7.43			
Water Content, w (%)	24.66	26.49	27.59			
One-Point LL (%)	25	26				

Liquid Limit, LL (%)	**26**
Plastic Limit, PL (%)	**19**
Plasticity Index, PI (%)	**7**





Entered by:_____
Reviewed:_____

Liquid Limit, Plastic Limit, and Plasticity Index of Soils

(ASTM D4318)

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Project: Reuse Facility, MWDWRF
No: 00113-056
Location: Magna, Utah
Date: 1/6/2022
By: BRR
Grooving tool type: Plastic
Liquid limit device: Mechanical
Rolling method: Hand

Boring No.: RF-B-02
Sample: combined
Depth: 27.5' and 30.0'
Description: Grey lean clay

Preparation method: Wet
Liquid limit test method: Multipoint
Screened over No.40: No
Larger particles removed: Not required

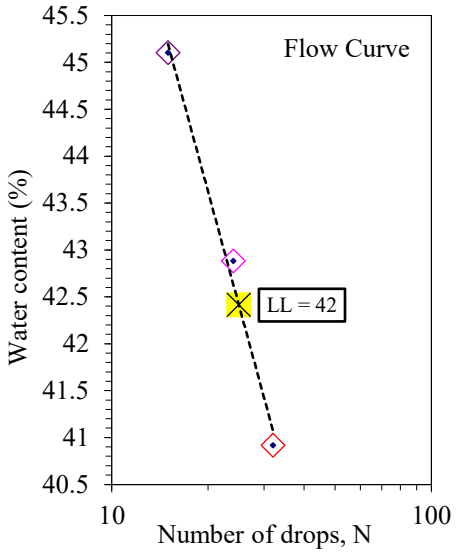
Plastic Limit

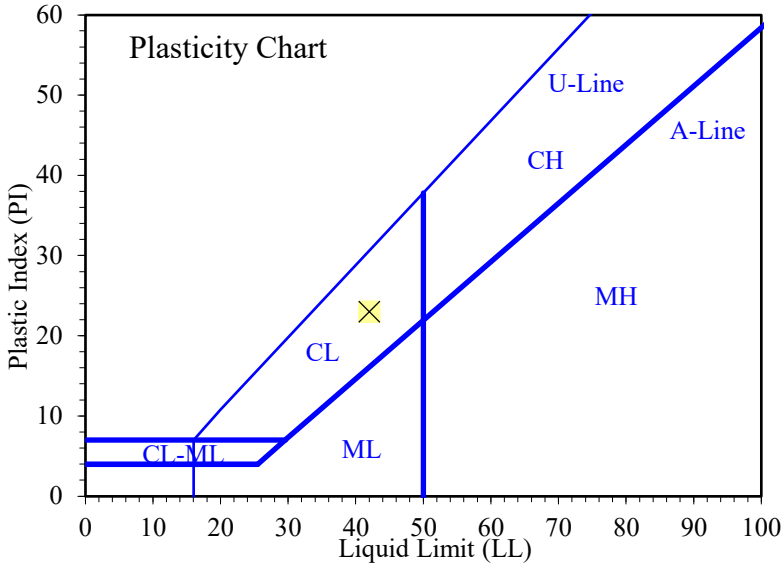
Determination No	1	2				
Wet Soil + Tare (g)	14.73	13.28				
Dry Soil + Tare (g)	13.50	12.30				
Water Loss (g)	1.23	0.98				
Tare (g)	7.04	7.11				
Dry Soil (g)	6.46	5.19				
Water Content, w (%)	19.04	18.88				

Liquid Limit

Determination No	1	2	3			
Number of Drops, N	32	24	15			
Wet Soil + Tare (g)	15.68	15.23	16.07			
Dry Soil + Tare (g)	13.18	12.76	13.26			
Water Loss (g)	2.50	2.47	2.81			
Tare (g)	7.07	7.00	7.03			
Dry Soil (g)	6.11	5.76	6.23			
Water Content, w (%)	40.92	42.88	45.10			
One-Point LL (%)		43				

Liquid Limit, LL (%)	**42**
Plastic Limit, PL (%)	**19**
Plasticity Index, PI (%)	**23**





Entered by:_____
Reviewed:_____

Liquid Limit, Plastic Limit, and Plasticity Index of Soils

(ASTM D4318)

© IGES 2004, 2022

Project: Reuse Facility, MWDWRF
No: 00113-056
Location: Magna, Utah
Date: 1/6/2022
By: BRR
Grooving tool type: Plastic
Liquid limit device: Mechanical
Rolling method: Hand

Boring No.: RF-B-02
Sample: combined
Depth: 32.5' and 35.0'
Description: Brown lean clay

Preparation method: Wet
Liquid limit test method: Multipoint
Screened over No.40: No
Larger particles removed: By hand

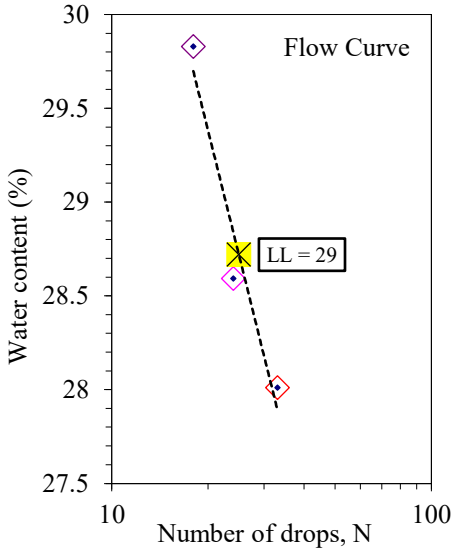
Plastic Limit

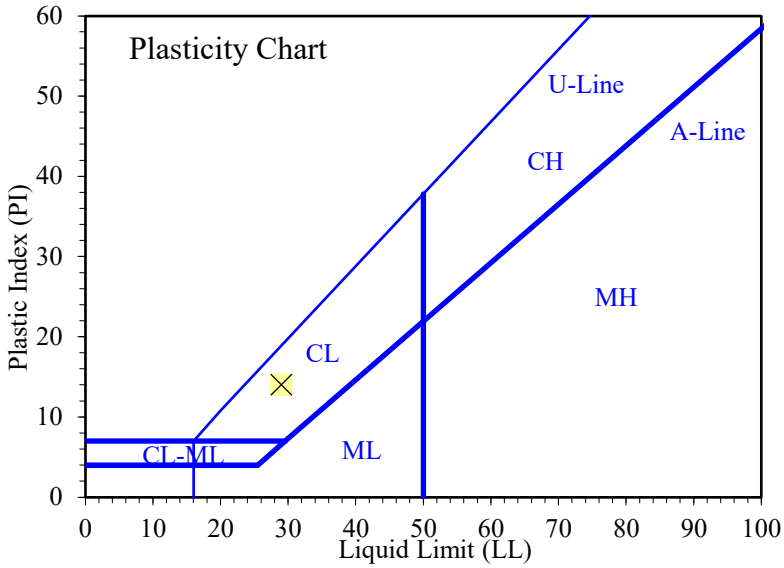
Determination No	1	2				
Wet Soil + Tare (g)	13.58	13.22				
Dry Soil + Tare (g)	12.72	12.41				
Water Loss (g)	0.86	0.81				
Tare (g)	7.08	7.05				
Dry Soil (g)	5.64	5.36				
Water Content, w (%)	15.25	15.11				

Liquid Limit

Determination No	1	2	3			
Number of Drops, N	33	24	18			
Wet Soil + Tare (g)	16.18	16.38	16.44			
Dry Soil + Tare (g)	14.18	14.45	14.34			
Water Loss (g)	2.00	1.93	2.10			
Tare (g)	7.04	7.70	7.30			
Dry Soil (g)	7.14	6.75	7.04			
Water Content, w (%)	28.01	28.59	29.83			
One-Point LL (%)		28				

Liquid Limit, LL (%)	**29**
Plastic Limit, PL (%)	**15**
Plasticity Index, PI (%)	**14**





Entered by:_____
Reviewed:_____

Liquid Limit, Plastic Limit, and Plasticity Index of Soils

(ASTM D4318)

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Project: Reuse Facility, MWDWRF
No: 00113-056
Location: Magna, Utah
Date: 1/6/2022
By: BRR
Grooving tool type: Plastic
Liquid limit device: Mechanical
Rolling method: Hand

Boring No.: RF-B-02
Sample: combined
Depth: 37.5' and 40.0'
Description: Brown lean clay

Preparation method: Wet
Liquid limit test method: Multipoint
Screened over No.40: No
Larger particles removed: Not required

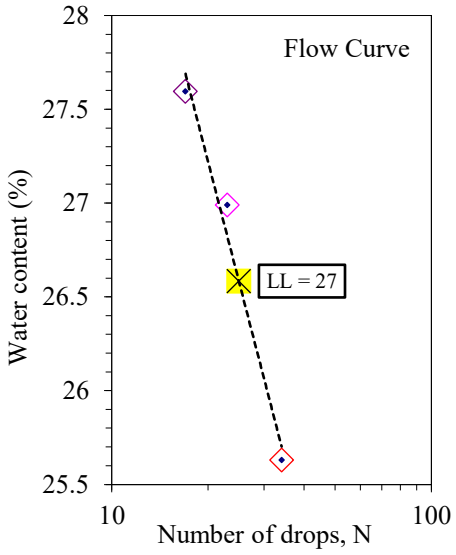
Plastic Limit

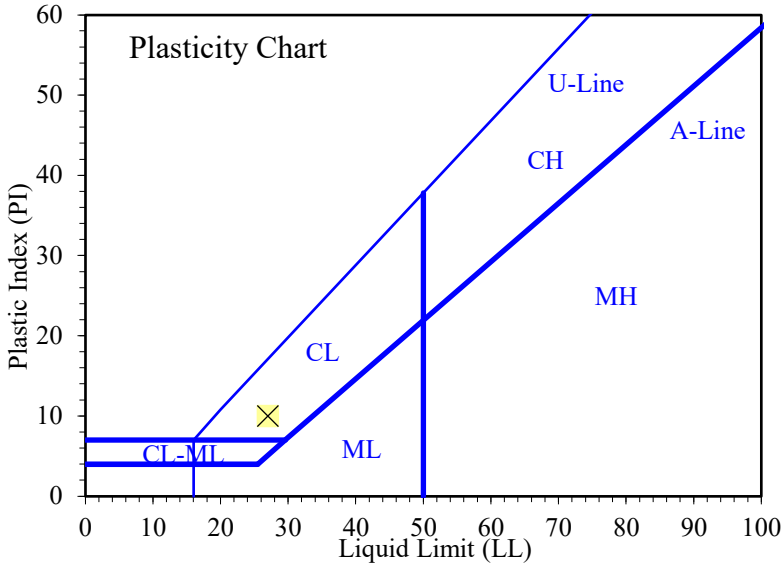
Determination No	1	2				
Wet Soil + Tare (g)	14.60	14.74				
Dry Soil + Tare (g)	13.58	13.62				
Water Loss (g)	1.02	1.12				
Tare (g)	7.54	7.09				
Dry Soil (g)	6.04	6.53				
Water Content, w (%)	16.89	17.15				

Liquid Limit

Determination No	1	2	3			
Number of Drops, N	34	23	17			
Wet Soil + Tare (g)	15.65	17.19	16.40			
Dry Soil + Tare (g)	13.92	15.19	14.46			
Water Loss (g)	1.73	2.00	1.94			
Tare (g)	7.17	7.78	7.43			
Dry Soil (g)	6.75	7.41	7.03			
Water Content, w (%)	25.63	26.99	27.60			
One-Point LL (%)		27				

Liquid Limit, LL (%)	**27**
Plastic Limit, PL (%)	**17**
Plasticity Index, PI (%)	**10**





Entered by:_____
Reviewed:_____

Liquid Limit, Plastic Limit, and Plasticity Index of Soils

(ASTM D4318)

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Project: Reuse Facility, MWDWRF
No: 00113-056
Location: Magna, Utah
Date: 1/7/2022
By: BRR
Grooving tool type: Plastic
Liquid limit device: Mechanical
Rolling method: Hand

Boring No.: RF-B-02
Sample:
Depth: 45.0'
Description: Brown lean clay

Preparation method: Wet
Liquid limit test method: Multipoint
Screened over No.40: No
Larger particles removed: Not required

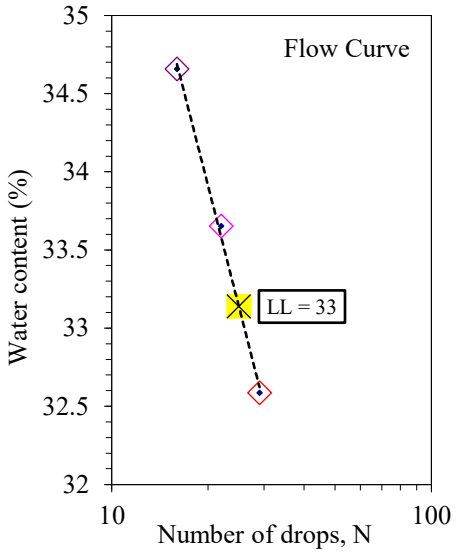
Plastic Limit

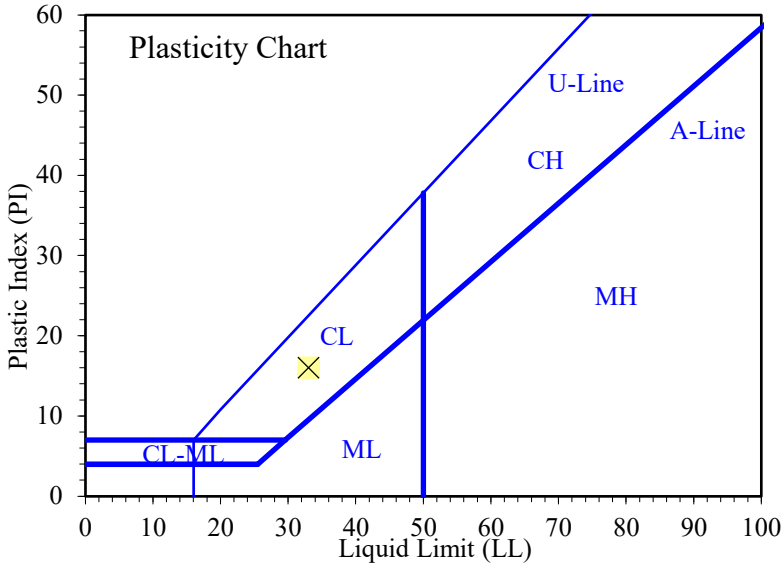
Determination No	1	2				
Wet Soil + Tare (g)	14.84	13.61				
Dry Soil + Tare (g)	13.72	12.65				
Water Loss (g)	1.12	0.96				
Tare (g)	7.11	7.06				
Dry Soil (g)	6.61	5.59				
Water Content, w (%)	16.94	17.17				

Liquid Limit

Determination No	1	2	3			
Number of Drops, N	29	22	16			
Wet Soil + Tare (g)	16.38	16.00	15.86			
Dry Soil + Tare (g)	14.20	13.89	13.68			
Water Loss (g)	2.18	2.11	2.18			
Tare (g)	7.51	7.62	7.39			
Dry Soil (g)	6.69	6.27	6.29			
Water Content, w (%)	32.59	33.65	34.66			
One-Point LL (%)	33	33				

Liquid Limit, LL (%)	**33**
Plastic Limit, PL (%)	**17**
Plasticity Index, PI (%)	**16**





Entered by:_____
Reviewed:_____

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

(ASTM D6913)

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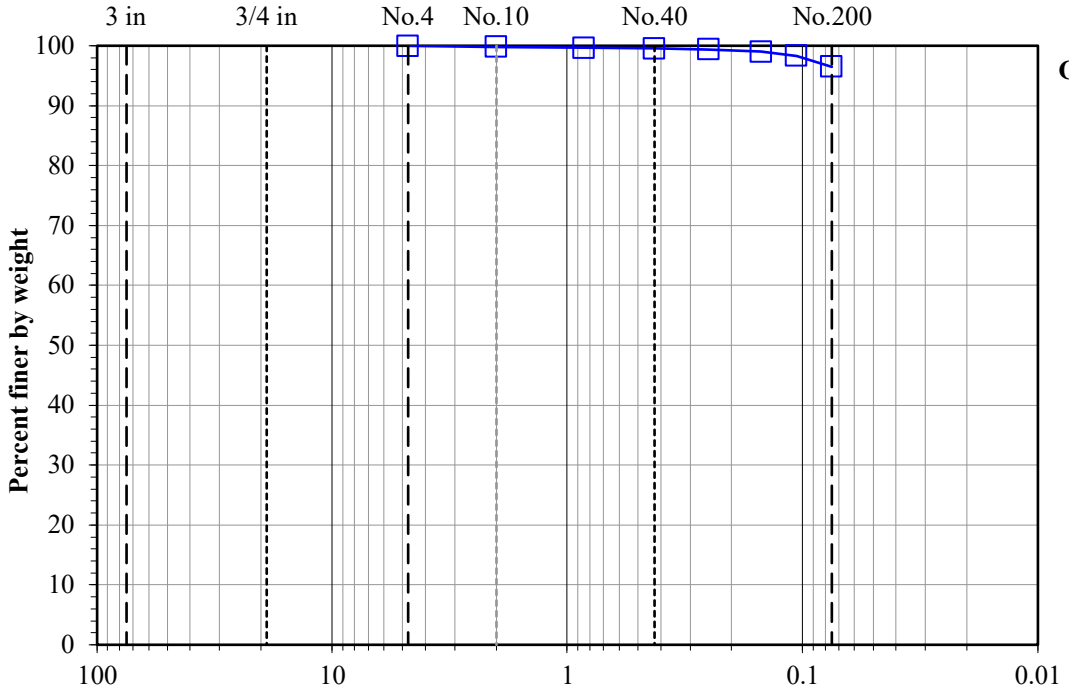
Project: Reuse Facility, MWDWRF
No: 00113-056
Location: Magna, Utah
Date: 1/11/2022
By: BRR

Boring No.: RF-B-01
Sample:
Depth: 55.0'
Description: Brownish grey clay

	Moist	Dry
Split:	No	
Total sample wt. (g):	119.64	95.06
	-	
Split fraction:	1.000	

Water content data		
Moist soil + tare (g):	-	247.32
Dry soil + tare (g):	-	222.74
Tare (g):	-	127.68
Water content (%):	0.0	25.9

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	-
No.4	-	4.75	100.0
No.10	0.17	2	99.8
No.20	0.31	0.85	99.7
No.40	0.44	0.425	99.5
No.60	0.59	0.25	99.4
No.100	0.95	0.15	99.0
No.140	1.61	0.106	98.3
No.200	3.34	0.075	96.5



Gravel (%): 0.0
Sand (%): 3.5
Fines (%): 96.5

Entered by:_____
Reviewed:_____

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

(ASTM D6913)

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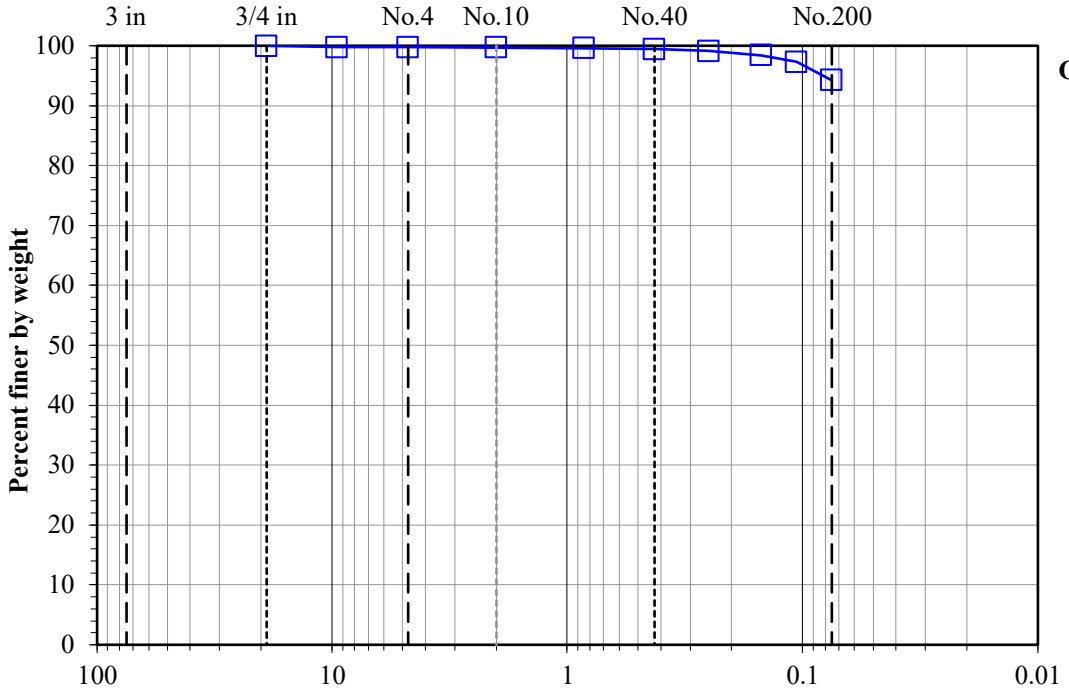
Project: Reuse Facility, MWDWRF
No: 00113-056
Location: Magna, Utah
Date: 1/11/2022
By: FB

Boring No.: RF-B-01
Sample:
Depth: 70.0'
Description: Brown clay

	Moist	Dry
Split:	Yes	
Split sieve:	3/8"	
Total sample wt. (g):	793.85	608.29
+3/8" Coarse fraction (g):	1.81	1.53
-3/8" Split fraction (g):	236.10	180.87
Split fraction:	0.997	

Water content data	C.F.(+3/8")	S.F.(-3/8")
Moist soil + tare (g):	9.27	358.28
Dry soil + tare (g):	8.99	303.05
Tare (g):	7.46	122.18
Water content (%):	18.3	30.5

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"	1.53	9.5	99.7	←Split
No.4	-	4.75	99.7	
No.10	0.05	2	99.7	
No.20	0.28	0.85	99.6	
No.40	0.59	0.425	99.4	
No.60	1.14	0.25	99.1	
No.100	2.41	0.15	98.4	
No.140	4.45	0.106	97.3	
No.200	9.90	0.075	94.3	



Gravel (%): 0.3
Sand (%): 5.5
Fines (%): 94.3

Entered by:_____
Reviewed:_____

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

(ASTM D6913)

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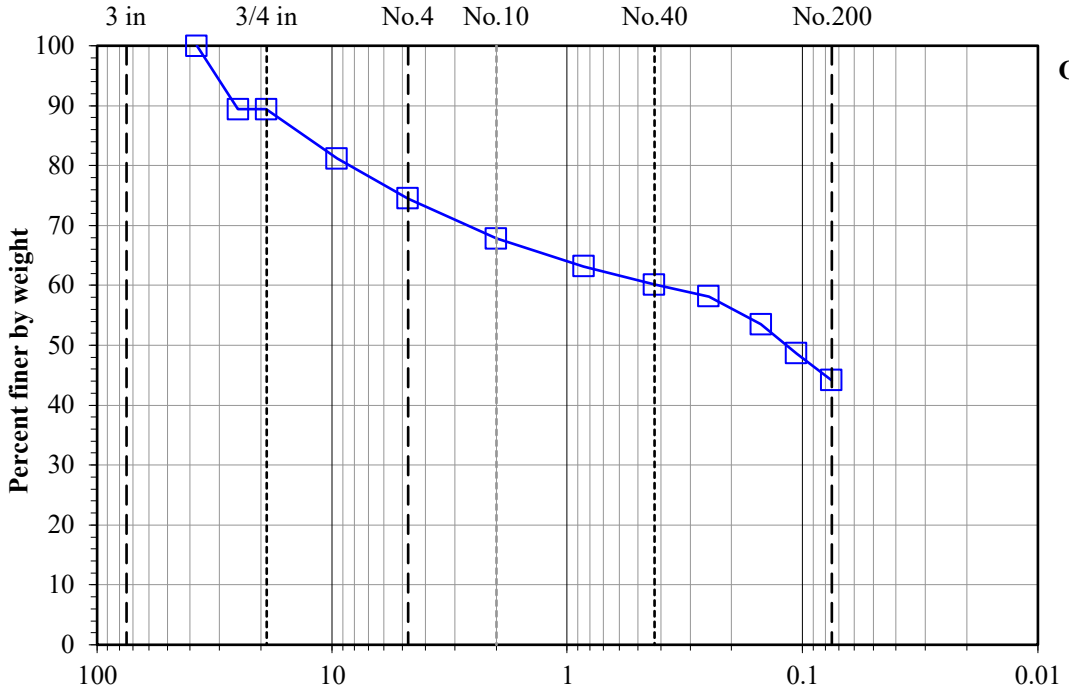
Project: Reuse Facility, MWDWRF
No: 00113-056
Location: Magna, Utah
Date: 1/7/2022
By: FB

Boring No.: RF-B-02
Sample:
Depth: 2.5'
Description: Brown sandy clay with gravel

Split:	Yes	
Split sieve:	No.10	
	Moist	Dry
Total sample wt. (g):	238.69	203.04
No.10 Coarse fraction (g):	67.76	65.34
-No.10 Split fraction (g):	65.99	53.16
Split fraction:	0.678	

Water content data	C.F.(+No.10)	S.F.(-No.10)
Moist soil + tare (g):	220.79	189.04
Dry soil + tare (g):	217.49	176.21
Tare (g):	128.39	123.05
Water content (%):	3.7	24.1

Sieve	Accum. Wt. Ret. (g)	Grain Size (mm)	Percent Finer	
6"	-	150	-	
4"	-	100	-	
3"	-	75	-	
1.5"	-	37.5	100.0	
1"	21.54	25	89.4	
3/4"	21.54	19	89.4	
3/8"	38.21	9.5	81.2	
No.4	51.84	4.75	74.5	
No.10	65.34	2	67.8	←Split
No.20	3.64	0.85	63.2	
No.40	6.02	0.425	60.1	
No.60	7.58	0.25	58.1	
No.100	11.23	0.15	53.5	
No.140	15.05	0.106	48.6	
No.200	18.52	0.075	44.2	



Gravel (%): 25.5
Sand (%): 30.3
Fines (%): 44.2

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

(In general accordance with ASTM D6913 and ASTM D7928)

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Project: Reuse Facility, MWDWFR
No: 00113-056
Location: Magna, Utah
Date: 1/13/2022
By: EH/BRR

Boring No.: RF-B-01
Sample:
Depth: 15.0'
Description: Grey clay

ASTM Standard(s): ASTM D6913 and ASTM D7928
Split: No
Second split: No

	Moist	Dry
Total sample wt. (g):	171.54	128.90
Hydrometer fraction (g):	75.97	57.31

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	-	
No.10		2	100.0	<=Split hyd.
No.20	0.07	0.85	99.9	
No.40	0.17	0.425	99.9	
No.60	0.34	0.25	99.7	
No.100	0.61	0.15	99.5	
No.140	1.20	0.106	99.1	
No.200	5.52	0.075	95.7	

Water content data

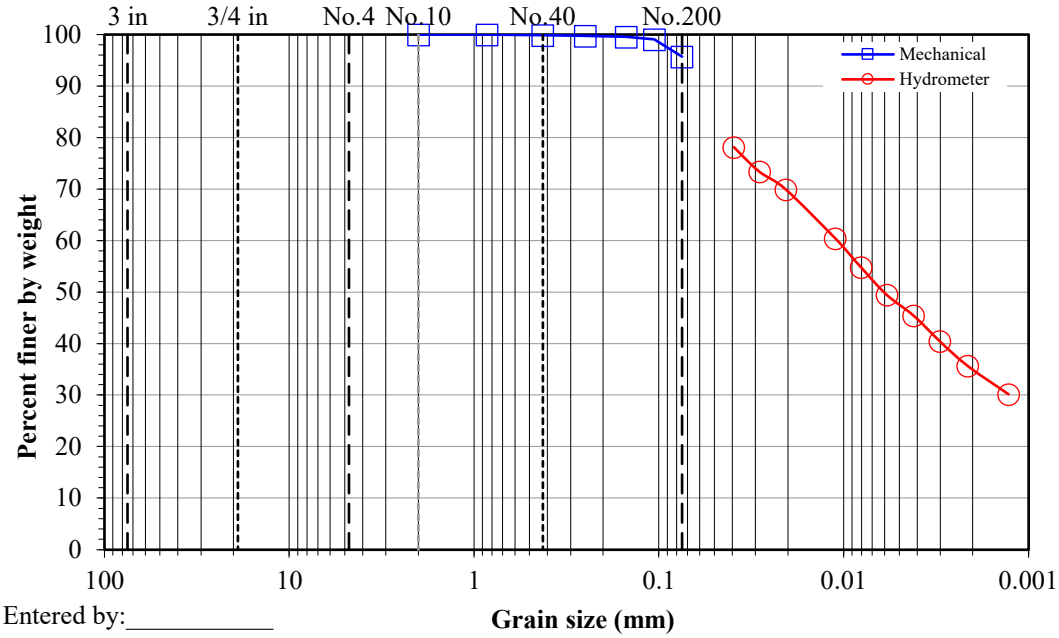
	S.F.	Hyd.(-No.10)
Moist soil + tare (g):	293.94	55.77
Dry soil + tare (g):	251.30	47.91
Tare (g):	122.40	23.77
Water content (%):	33.08	32.56

Hydrometer data

Hyd. split: No.10
Gs: 2.7 Assumed
Bulb No. 7 Hyd. fraction: 100.00
Cylinder ID: N18 Dispersion device: Air-jet

Elapsed time (min)	Temp. (°C)	Hydrometer Reading	Grain Size (mm)	% Soil in Suspension
1	22.2	49.75	0.0394	78.12
2	22.2	47	0.0286	73.37
4	22.2	45	0.0206	69.92
15	22.2	39.5	0.0111	60.43
30	22.2	36.25	0.0081	54.83
60	21.9	33.25	0.0058	49.46
120	21.7	31	0.0042	45.46
240	22	28	0.0030	40.47
500	21.9	25.25	0.0021	35.66
1440	22.1	22	0.0013	30.18

Gravel (%): 0.0
Sand (%): 4.3
Fines (%): 95.7



Entered by:_____
Reviewed:_____

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

(In general accordance with ASTM D6913 and ASTM D7928)

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Project: Reuse Facility, MWDWFR
No: 00113-056
Location: Magna, Utah
Date: 1/13/2022
By: FB/BRR

Boring No.: RF-B-01
Sample:
Depth: 19.0'
Description: Grey silty sand

ASTM Standard(s) ASTM D6913 and ASTM D7928
Split: No
Second split: No

	Moist	Dry
Total sample wt. (g):	113.27	87.73
Hydrometer fraction (g):	90.64	71.37

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	-	
No.10		2	100.0	<=Split hyd.
No.20	0.60	0.85	99.3	
No.40	3.88	0.425	95.6	
No.60	20.11	0.25	77.1	
No.100	42.70	0.15	51.3	
No.140	56.71	0.106	35.4	
No.200	69.15	0.075	21.2	

Water content data

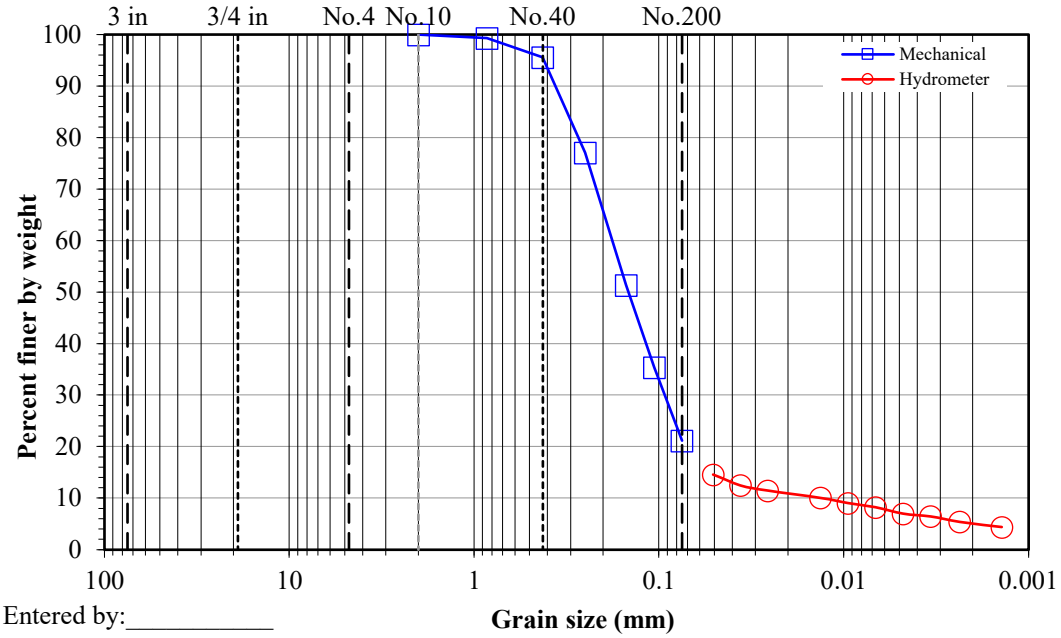
	S.F.	Hyd.(-No.10)
Moist soil + tare (g):	253.81	90.15
Dry soil + tare (g):	228.27	76.02
Tare (g):	140.54	23.68
Water content (%):	29.11	27.00

Hydrometer data

Hyd. split: No.10
Gs: 2.7 Assumed
Bulb No. 7 Hyd. fraction: 100.00
Cylinder ID: N10 Dispersion device: Air-jet

Elapsed time (min)	Temp. (°C)	Hydrometer Reading	Grain Size (mm)	% Soil in Suspension
1	22.2	15	0.0509	14.58
2	22.2	13.5	0.0363	12.50
4	22.2	12.75	0.0258	11.47
15	22.2	11.75	0.0134	10.08
30	22.2	11	0.0095	9.04
60	22	10.5	0.0067	8.25
120	21.6	9.75	0.0048	7.01
240	21.9	9.25	0.0034	6.47
500	21.9	8.5	0.0024	5.43
1440	21.9	7.75	0.0014	4.39

Gravel (%): 0.0
Sand (%): 78.8
Fines (%): 21.2



Entered by:_____
Reviewed:_____

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

(In general accordance with ASTM D6913 and ASTM D7928)

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Project: Reuse Facility, MWDWFR
No: 00113-056
Location: Magna, Utah
Date: 1/13/2022
By: FB/BRR

Boring No.: RF-B-01
Sample:
Depth: 24.0'
Description: Grey sandy silty clay

ASTM Standard(s): ASTM D6913 and ASTM D7928
Split: No
Second split: No

	Moist	Dry
Total sample wt. (g):	86.43	66.00
Hydrometer fraction (g):	75.40	58.38

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	-	
No.10		2	100.0	<=Split hyd.
No.20	0.05	0.85	99.9	
No.40	0.23	0.425	99.7	
No.60	1.70	0.25	97.4	
No.100	9.89	0.15	85.0	
No.140	16.18	0.106	75.5	
No.200	24.82	0.075	62.4	

Water content data

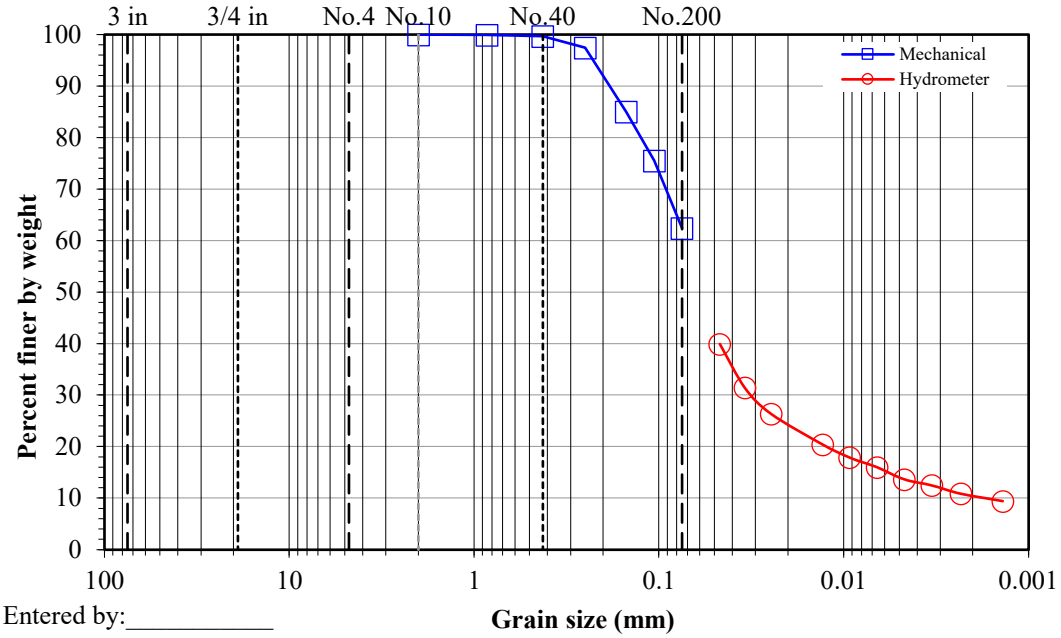
	S.F.	Hyd.(-No.10)
Moist soil + tare (g):	208.79	59.25
Dry soil + tare (g):	188.36	51.22
Tare (g):	122.36	23.68
Water content (%):	30.95	29.16

Hydrometer data

Hyd. split: No.10
Gs: 2.7 Assumed
Bulb No. 7 Hyd. fraction: 100.00
Cylinder ID: 11 Dispersion device: Air-jet

Elapsed time (min)	Temp. (°C)	Hydrometer Reading	Grain Size (mm)	% Soil in Suspension
1	22.3	28	0.0469	39.91
2	22.3	23	0.0342	31.44
4	22.3	20	0.0247	26.36
15	22.3	16.5	0.0130	20.43
30	22.3	15	0.0093	17.89
60	22	14	0.0066	16.01
120	21.6	12.75	0.0047	13.65
240	21.8	12	0.0033	12.50
500	21.9	11	0.0023	10.87
1440	22.3	10	0.0014	9.42

Gravel (%): 0.0
Sand (%): 37.6
Fines (%): 62.4



Entered by:_____
Reviewed:_____

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

(In general accordance with ASTM D6913 and ASTM D7928)

© IGES 2019, 2022

Project: Reuse Facility, MWDWFR
No: 00113-056
Location: Magna, Utah
Date: 1/13/2022
By: FB/BRR

Boring No.: RF-B-01
Sample:
Depth: 35.0'
Description: Brown clay

ASTM Standard(s): ASTM D6913 and ASTM D7928
Split: No
Second split: No

	Moist	Dry
Total sample wt. (g):	205.95	166.97
Hydrometer fraction (g):	71.95	58.57

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	-	
No.10		2	100.0	<=Split hyd.
No.20	0.03	0.85	100.0	
No.40	0.10	0.425	99.9	
No.60	0.34	0.25	99.8	
No.100	1.44	0.15	99.1	
No.140	7.74	0.106	95.4	
No.200	24.71	0.075	85.2	

Water content data

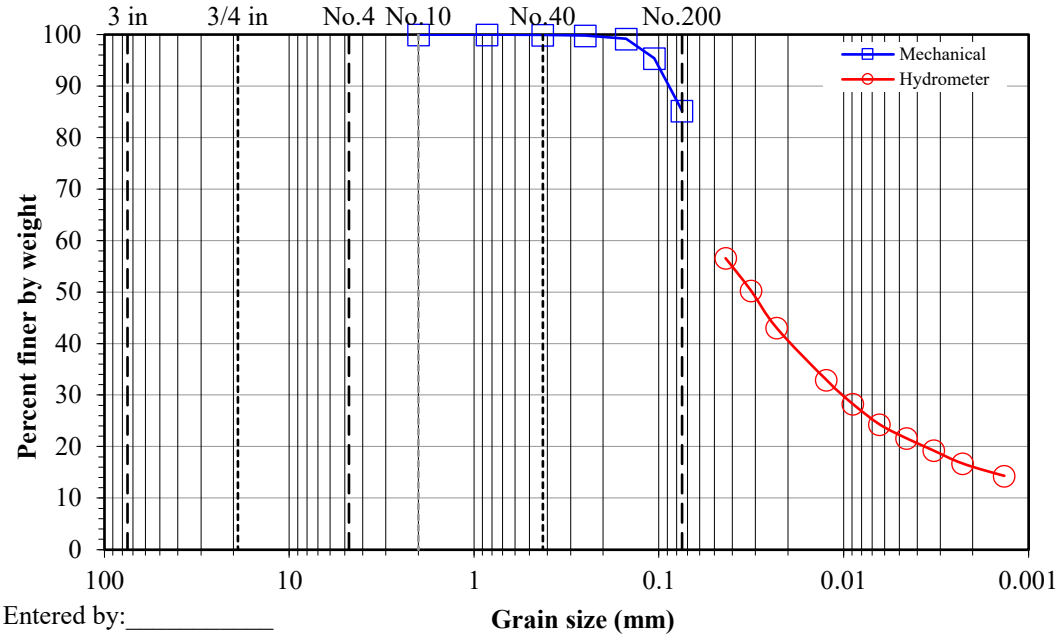
	S.F.	Hyd.(-No.10)
Moist soil + tare (g):	356.69	56.20
Dry soil + tare (g):	317.71	50.14
Tare (g):	150.74	23.61
Water content (%):	23.35	22.84

Hydrometer data

Hyd. split: No.10
Gs: 2.7 Assumed
Bulb No. 7 Hyd. fraction: 100.00
Cylinder ID: N3 Dispersion device: Air-jet

Elapsed time (min)	Temp. (°C)	Hydrometer Reading	Grain Size (mm)	% Soil in Suspension
1	22.2	38	0.0435	56.60
2	22.2	34.25	0.0317	50.27
4	22.2	30	0.0231	43.09
15	22.2	24	0.0124	32.96
30	22.2	21.25	0.0089	28.32
60	21.9	19	0.0064	24.34
120	21.6	17.5	0.0046	21.62
240	21.9	16	0.0033	19.27
500	21.9	14.5	0.0023	16.74
1440	22.1	13	0.0014	14.33

Gravel (%): 0.0
Sand (%): 14.8
Fines (%): 85.2



Entered by:_____
Reviewed:_____

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

(In general accordance with ASTM D6913 and ASTM D7928)

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Project: Reuse Facility, MWDWFR
No: 00113-056
Location: Magna, Utah
Date: 1/7/2022
By: FB/BRR

Boring No.: RF-B-02
Sample:
Depth: 5.0'
Description: Brown clay

ASTM Standard(s)	ASTM D6913 and ASTM D7928
Split:	Yes
First Split sieve:	3/8"
Second split:	No

	Moist	Dry
Total sample wt. (g):	752.51	561.66
+3/8" Coarse fraction (g):	17.55	17.04
-3/8" Split fraction (g):	207.04	153.42
Hydrometer fraction (g):	74.11	55.09
First Split fraction:	0.970	

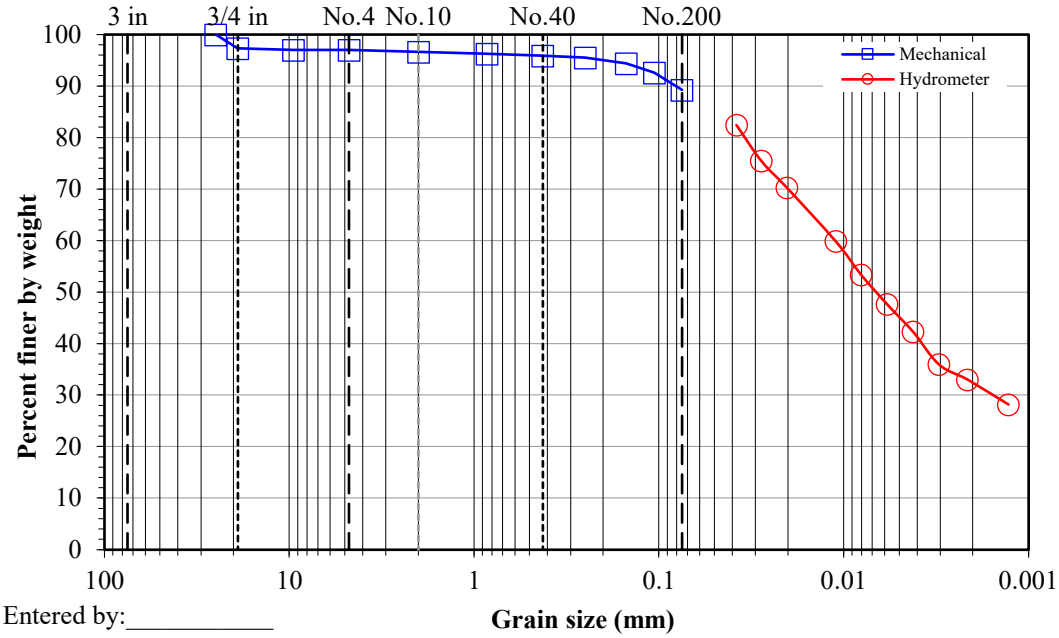
Sieve	Accum. Wt. Ret. (g)	Grain Size (mm)	Percent Finer
6"		150	-
4"		100	-
3"		75	-
1.5"		37.5	-
1"		25	100.0
3/4"	15.27	19	97.3
3/8"	17.04	9.5	97.0
No.4		4.75	97.0
No.10	0.58	2	96.6
No.20	1.14	0.85	96.2
No.40	1.70	0.425	95.9
No.60	2.35	0.25	95.5
No.100	4.08	0.15	94.4
No.140	6.94	0.106	92.6
No.200	12.22	0.075	89.2

Water content data	C.F.1(+3/8")	S.F.1(-3/8")	Hyd.(-No.10)
Moist soil + tare (g):	146.92	330.55	58.47
Dry soil + tare (g):	146.37	276.93	49.55
Tare (g):	127.90	123.51	23.72
Water content (%):	2.98	34.95	34.53

Hydrometer data

Hyd. split:	No.10			
Gs:	2.7	Assumed		
Bulb No.	6A		Hyd. fraction:	96.60
Cylinder ID:	N3		Dispersion device:	Air-jet

	Elapsed time (min)	Temp. (°C)	Hydrometer Reading	Grain Size (mm)	% Soil in Suspension
	1	22.2	51	0.0380	82.44
	2	22.2	47	0.0280	75.50
	4	22.2	44	0.0203	70.30
	15	22.2	38	0.0111	59.89
	30	22.2	34.25	0.0081	53.39
	60	22.1	31	0.0058	47.69
	120	21.8	28	0.0042	42.30
	240	21.4	24.5	0.0031	35.99
	500	21.5	22.75	0.0021	33.01
<=1st Split	1440	22.1	19.75	0.0013	28.18
<=Split hyd.					



Gravel (%): 3.0
Sand (%): 7.7
Fines (%): 89.2

Comments:
These results are in nonconformance with ASTM D6913 and ASTM D7928 because the minimum dry mass was not met.

Entered by:_____
Reviewed:_____

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

(In general accordance with ASTM D6913 and ASTM D7928)

© IGES 2019, 2022

Project: Reuse Facility, MWDWFR
No: 00113-056
Location: Magna, Utah
Date: 1/7/2022
By: FB/BRR

Boring No.: RF-B-02
Sample:
Depth: 10.0'
Description: Brown sandy clay

ASTM Standard(s)	ASTM D6913 and ASTM D7928
Split:	Yes
First Split sieve:	3/8"
Second split:	No

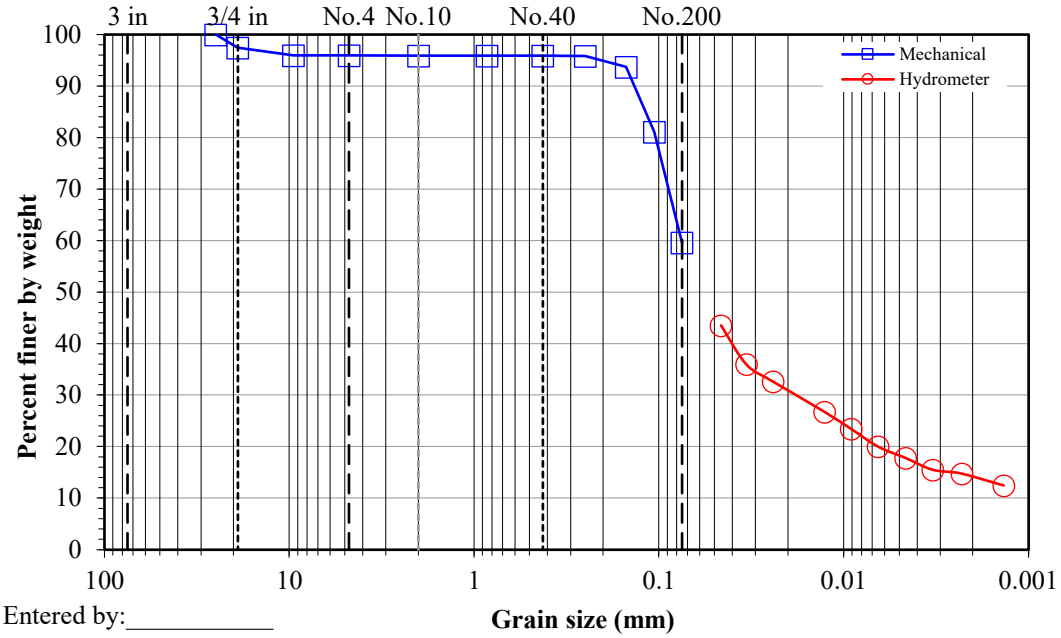
	Moist	Dry
Total sample wt. (g):	622.39	478.73
+3/8" Coarse fraction (g):	20.24	19.55
-3/8" Split fraction (g):	231.93	176.86
Hydrometer fraction (g):	73.86	56.64
First Split fraction:	0.959	

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"	12.17	19	97.5
3/8"	19.55	9.5	95.9
No.4		4.75	95.9
No.10	0.02	2	95.9
No.20	0.03	0.85	95.9
No.40	0.08	0.425	95.9
No.60	0.21	0.25	95.8
No.100	4.14	0.15	93.7
No.140	27.28	0.106	81.1
No.200	67.02	0.075	59.6

Water content data	C.F.1(+3/8")	S.F.1(-3/8")	Hyd.(-No.10)
Moist soil + tare (g):	174.82	355.01	54.01
Dry soil + tare (g):	174.07	299.94	46.88
Tare (g):	152.73	123.08	23.42
Water content (%):	3.51	31.14	30.39

Hydrometer data			
Hyd. split:	No.10		
Gs:	2.7	Assumed	
Bulb No.	7	Hyd. fraction:	95.90
Cylinder ID:	N10	Dispersion device:	Air-jet

	Elapsed time (min)	Temp. (°C)	Hydrometer Reading	Grain Size (mm)	% Soil in Suspension
	1	22.1	30.5	0.0461	43.51
	2	22.1	26	0.0336	35.98
	4	22.1	24	0.0241	32.63
	15	22.1	20.5	0.0127	26.77
	30	22.1	18.5	0.0091	23.42
	60	22	16.5	0.0065	20.01
	120	21.8	15.25	0.0046	17.80
	240	21.5	14	0.0033	15.53
	500	21.6	13.5	0.0023	14.75
<=1st Split	1440	22	12	0.0014	12.48
<=Split hyd.					



Gravel (%): 4.1
Sand (%): 36.3
Fines (%): 59.6

Comments:
These results are in nonconformance with ASTM D6913 and ASTM D7928 because the minimum dry mass was not met.

Entered by:_____
Reviewed:_____

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

(In general accordance with ASTM D6913 and ASTM D7928)

© IGES 2019, 2022

Project: Reuse Facility, MWDWFR
No: 00113-056
Location: Magna, Utah
Date: 1/11/2022
By: FB/BRR

Boring No.: RF-B-02
Sample:
Depth: 20.0'
Description: Grey silty clay with sand

ASTM Standard(s): ASTM D6913 and ASTM D7928
Split: No
Second split: No

	Moist	Dry
Total sample wt. (g):	294.18	229.73
Hydrometer fraction (g):	71.94	56.58

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	0.17	2	99.9
No.20	0.27	0.85	99.9
No.40	0.54	0.425	99.8
No.60	1.97	0.25	99.1
No.100	15.52	0.15	93.2
No.140	38.57	0.106	83.2
No.200	67.63	0.075	70.6

Water content data

	S.F.	Hyd.(-No.10)
Moist soil + tare (g):	416.72	76.62
Dry soil + tare (g):	352.27	65.27
Tare (g):	122.54	23.47
Water content (%):	28.05	27.15

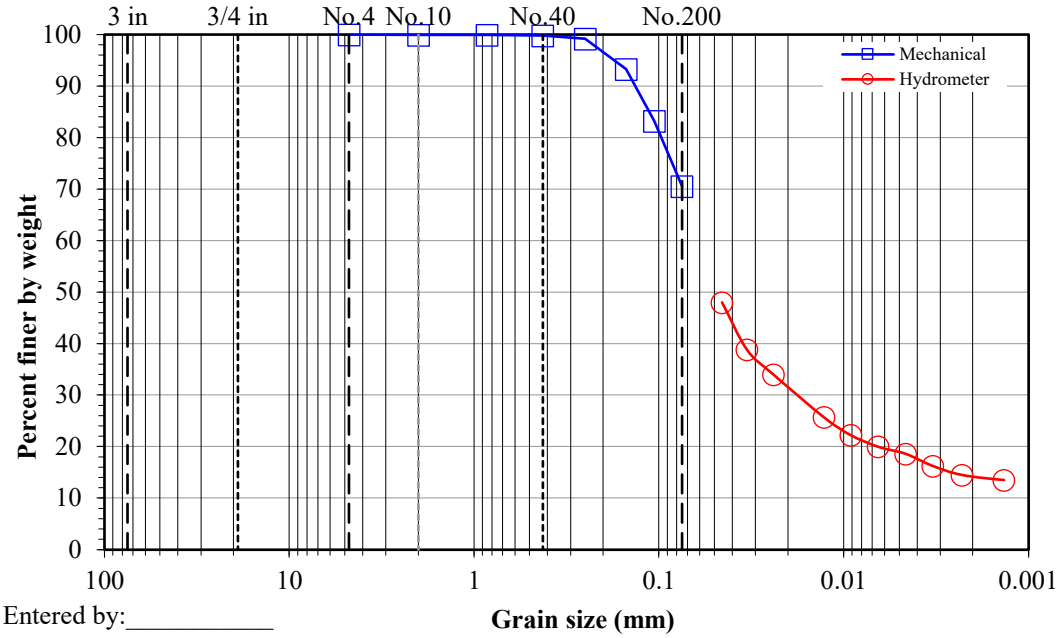
Hydrometer data

Hyd. split: No.10
Gs: 2.7 Assumed
Bulb No. 7 Hyd. fraction: 99.93
Cylinder ID: N30 Dispersion device: Air-jet

<=Split hyd.

Elapsed time (min)	Temp. (°C)	Hydrometer Reading	Grain Size (mm)	% Soil in Suspension
1	22.1	32	0.0456	48.01
2	22.1	26.75	0.0334	38.84
4	22.1	24	0.0240	34.04
15	22.1	19.25	0.0128	25.74
30	22.1	17.25	0.0092	22.25
60	22	16	0.0065	20.00
120	21.9	15.25	0.0046	18.63
240	21.6	14	0.0033	16.26
500	21.6	13	0.0023	14.51
1440	22.1	12.25	0.0014	13.52

Gravel (%): 0.0
Sand (%): 29.4
Fines (%): 70.6



Entered by:_____
Reviewed:_____

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

(In general accordance with ASTM D6913 and ASTM D7928)

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Project: Reuse Facility, MWDWFR
No: 00113-056
Location: Magna, Utah
Date: 1/7/2022
By: FB/BRR

Boring No.: RF-B-02
Sample: combined
Depth: 37.5' and 40.0'
Description: Grey clay

ASTM Standard(s): ASTM D6913 and ASTM D7928
Split: No
Second split: No

	Moist	Dry
Total sample wt. (g):	350.97	285.43
Hydrometer fraction (g):	70.47	57.39

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	-	
No.10		2	100.0	<=Split hyd.
No.20	0.08	0.85	100.0	
No.40	0.26	0.425	99.9	
No.60	0.97	0.25	99.7	
No.100	4.15	0.15	98.5	
No.140	12.56	0.106	95.6	
No.200	30.03	0.075	89.5	

Water content data

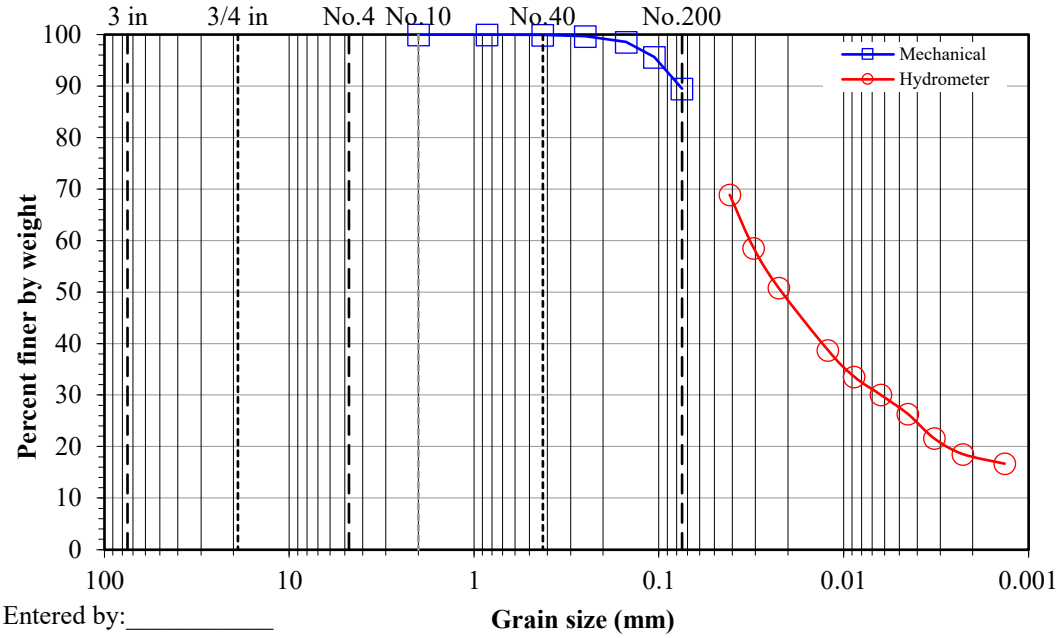
	S.F.	Hyd.(-No.10)
Moist soil + tare (g):	533.14	61.03
Dry soil + tare (g):	467.60	54.06
Tare (g):	182.17	23.48
Water content (%):	22.96	22.79

Hydrometer data

Hyd. split: No.10
Gs: 2.7 Assumed
Bulb No. 7 Hyd. fraction: 100.00
Cylinder ID: 11 Dispersion device: Air-jet

Elapsed time (min)	Temp. (°C)	Hydrometer Reading	Grain Size (mm)	% Soil in Suspension
1	22.1	44.5	0.0413	68.90
2	22.1	38.5	0.0307	58.56
4	22.1	34	0.0225	50.81
15	22.1	27	0.0122	38.75
30	22.1	24	0.0088	33.58
60	22	22	0.0063	30.07
120	21.6	20	0.0045	26.38
240	21.6	17.25	0.0032	21.64
500	21.5	15.5	0.0023	18.56
1440	22	14.25	0.0013	16.72

Gravel (%): 0.0
Sand (%): 10.5
Fines (%): 89.5



Entered by:_____
Reviewed:_____

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

(In general accordance with ASTM D6913 and ASTM D7928)

© IGES 2019, 2022

Project: Reuse Facility, MWDWFR
No: 00113-056
Location: Magna, Utah
Date: 1/7/2022
By: FB/BRR

Boring No.: RF-B-02
Sample:
Depth: 45.0'
Description: Brown clay

ASTM Standard(s): ASTM D6913 and ASTM D7928
Split: No
Second split: No

	Moist	Dry
Total sample wt. (g):	346.94	273.90
Hydrometer fraction (g):	71.53	56.44

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	0.13	2	100.0	<=Split hyd.
No.20	0.21	0.85	99.9	
No.40	0.37	0.425	99.9	
No.60	0.68	0.25	99.8	
No.100	2.05	0.15	99.3	
No.140	8.94	0.106	96.7	
No.200	27.29	0.075	90.0	

Water content data

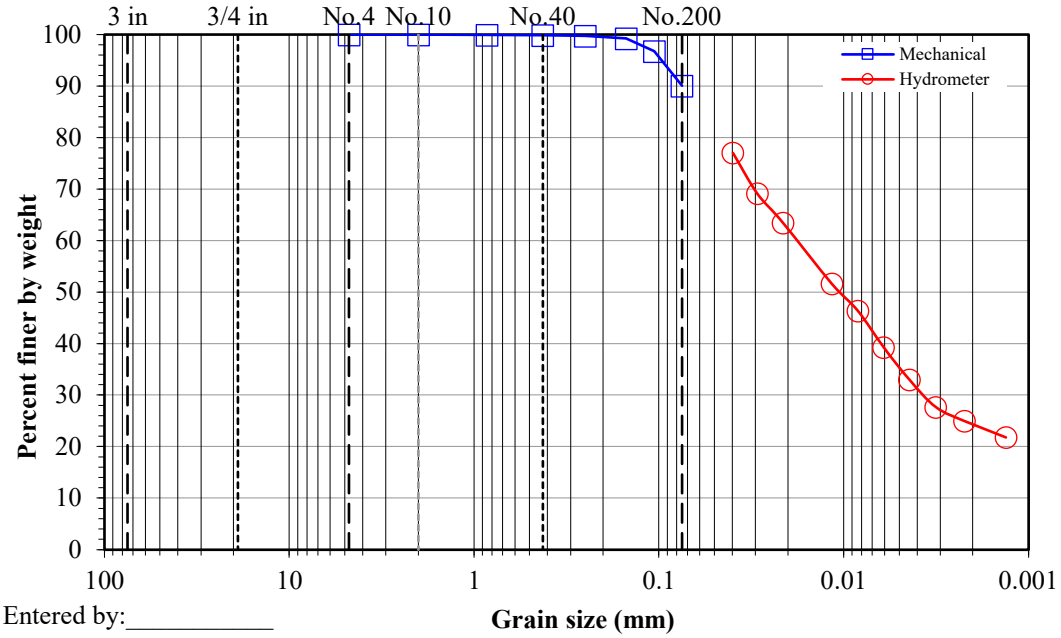
	S.F.	Hyd.(-No.10)
Moist soil + tare (g):	474.47	81.86
Dry soil + tare (g):	401.43	69.48
Tare (g):	127.53	23.16
Water content (%):	26.67	26.73

Hydrometer data

Hyd. split: No.10
Gs: 2.7 Assumed
Bulb No. 7 Hyd. fraction: 99.95
Cylinder ID: N18 Dispersion device: Air-jet

Elapsed time (min)	Temp. (°C)	Hydrometer Reading	Grain Size (mm)	% Soil in Suspension
1	22.1	48.5	0.0398	77.03
2	22.1	44	0.0293	69.15
4	22.1	40.75	0.0213	63.46
15	22.1	34	0.0116	51.64
30	22.1	31	0.0084	46.38
60	22	27	0.0061	39.32
120	21.7	23.5	0.0044	33.00
240	21.6	20.5	0.0032	27.68
500	21.5	19	0.0022	24.99
1440	22	17	0.0013	21.81

Gravel (%): 0.0
Sand (%): 10.0
Fines (%): 90.0



Entered by:_____
Reviewed:_____

One-Dimensional Consolidation Properties of Soils

(ASTM D2435)

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Project: Reuse Facility, MWDWRF
No: 00113-056
Location: Magna, Utah
Date: 1/14/2022
By: JAB

Boring No.: RF-B-01
Sample:
Depth: 35.0'
Sample Description: Brown clay
Engineering Classification: Not requested
Sample type: Undisturbed-trimmed from Shelby tube

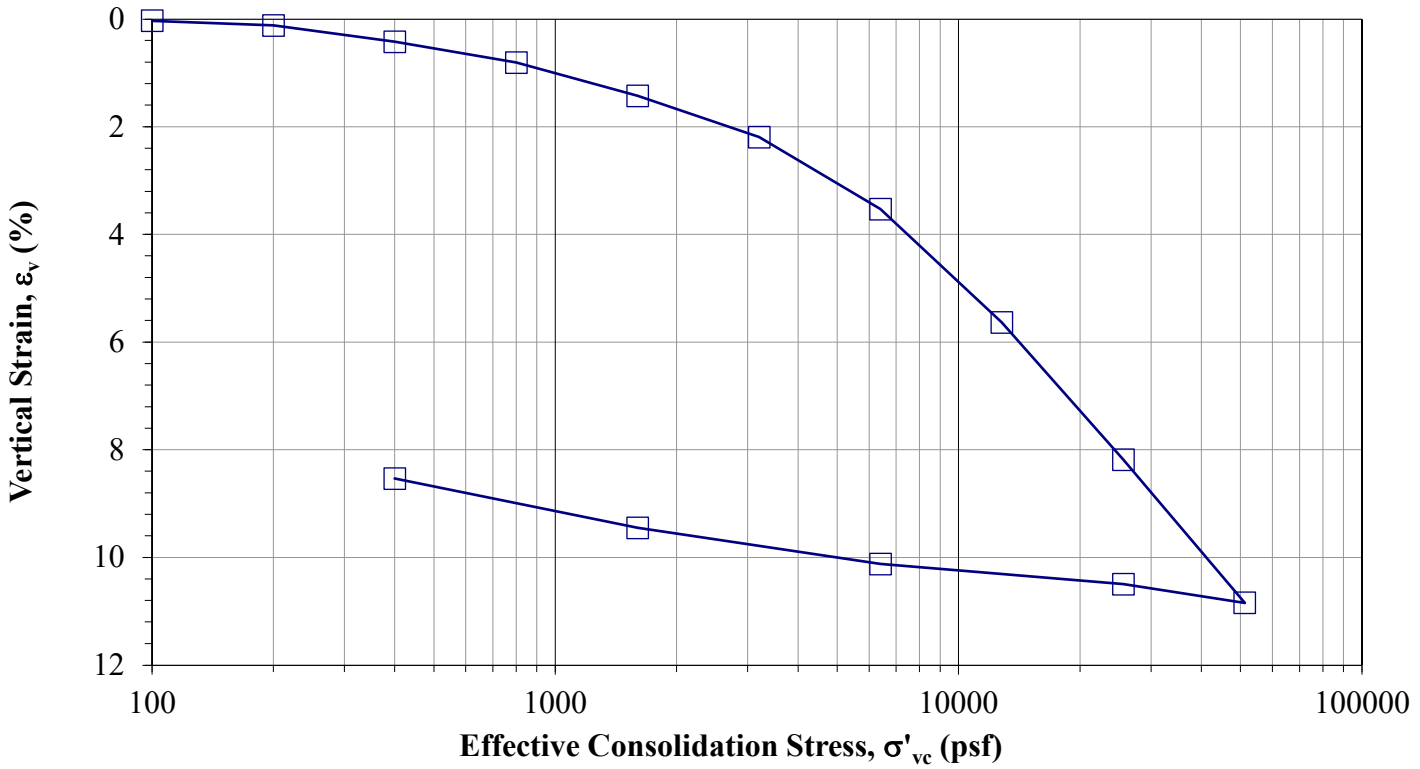
Test method:	A	
Inundation stress (psf), timing:	100	Beginning
Specific gravity, G_s	2.70	Assumed

Water type used for inundation: Tap

	Initial (o)	Final (f)
Sample height, H (in.)	0.926	0.847
Sample diameter, D (in.)	2.418	2.418
Wt. rings + wet soil (g)	176.73	176.46
Wt. rings/tare (g)	45.01	45.01
Moist unit wt., γ_m (pcf)	118.0	128.75
Wet soil + tare (g)	188.52	256.62
Dry soil + tare (g)	175.68	232.37
Tare (g)	120.86	127.69
Water content, w (%)	23.4	23.2
Dry unit wt., γ_d (pcf)	95.6	104.5
Saturation	0.83	1.00

*Note: C_v, C_c, C_r, and σ_p' to be determined by Geotechnical Engineer.

Stress (psf)	Dial (in.)	1-D ε_v (%)	H_c (in.)	e
Seating	0.0000	0.00	0.9260	0.7629
100	0.0003	0.03	0.9257	0.7623
200	0.0011	0.12	0.9249	0.7608
400	0.0039	0.42	0.9221	0.7554
800	0.0075	0.80	0.9185	0.7487
1600	0.0132	1.43	0.9128	0.7377
3200	0.0203	2.19	0.9057	0.7242
6400	0.0327	3.53	0.8933	0.7006
12800	0.0522	5.63	0.8738	0.6636
25600	0.0758	8.19	0.8502	0.6186
51200	0.1004	10.84	0.8256	0.5717
25600	0.0972	10.50	0.8288	0.5778
6400	0.0937	10.12	0.8323	0.5844
1600	0.0875	9.45	0.8385	0.5963
400	0.0790	8.54	0.8470	0.6124



Entered: _____
Reviewed: _____

One-Dimensional Consolidation Properties of Soils

(ASTM D2435)

© IGES 2006, 2022

Project: Reuse Facility, MWDWRF
No: 00113-056
Location: Magna, Utah
Date: 1/14/2022
By: JAB

Boring No.: RF-B-01
Sample:
Depth: 55.0'
Sample Description: Brownish grey clay
Engineering Classification: Not requested
Sample type: Undisturbed-trimmed from Shelby tube

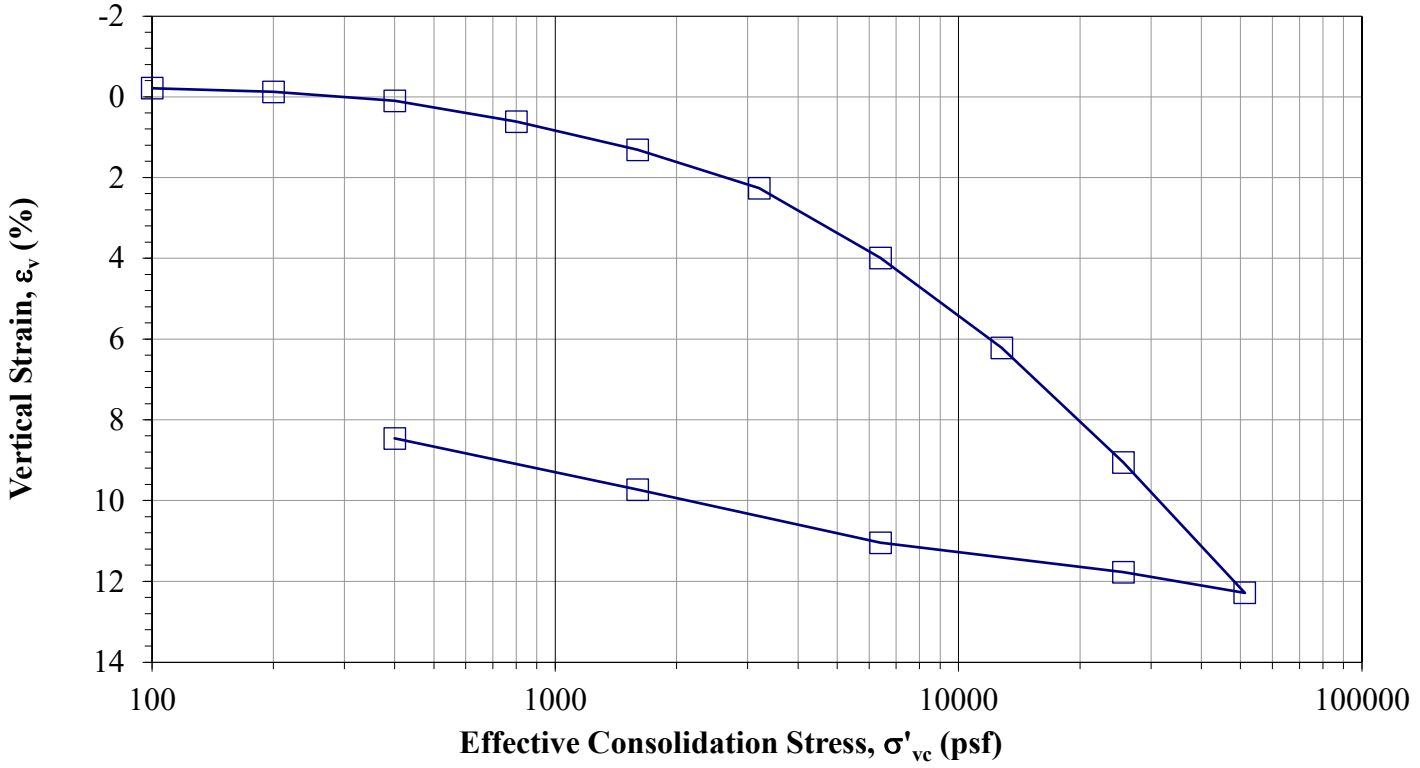
Test method:	A	
Inundation stress (psf), timing:	100	Beginning
Specific gravity, G_s	2.70	Assumed

Water type used for inundation: Tap

	Initial (o)	Final (f)
Sample height, H (in.)	0.920	0.842
Sample diameter, D (in.)	2.413	2.413
Wt. rings + wet soil (g)	180.95	178.02
Wt. rings/tare (g)	45.53	45.53
Moist unit wt., γ_m (pcf)	122.6	131.06
Wet soil + tare (g)	255.47	250.82
Dry soil + tare (g)	229.02	227.25
Tare (g)	121.89	120.08
Water content, w (%)	24.7	22.0
Dry unit wt., γ_d (pcf)	98.3	107.4
Saturation	0.93	1.00

*Note: C_v, C_c, C_r, and σ_p' to be determined by Geotechnical Engineer.

Stress (psf)	Dial (in.)	1-D ε_v (%)	H_c (in.)	e
Seating	0.0000	0.00	0.9200	0.7140
100	-0.0020	-0.22	0.9220	0.7177
200	-0.0011	-0.12	0.9211	0.7161
400	0.0009	0.10	0.9191	0.7123
800	0.0056	0.61	0.9144	0.7035
1600	0.0120	1.31	0.9080	0.6916
3200	0.0208	2.26	0.8992	0.6752
6400	0.0367	3.99	0.8833	0.6456
12800	0.0572	6.22	0.8628	0.6074
25600	0.0833	9.05	0.8367	0.5588
51200	0.1130	12.28	0.8070	0.5035
25600	0.1083	11.77	0.8117	0.5122
6400	0.1016	11.04	0.8184	0.5247
1600	0.0895	9.72	0.8305	0.5473
400	0.0779	8.46	0.8421	0.5689



Comments: Test specimen swelled upon inundation and at 100 psf load step.

Entered: _____
Reviewed: _____

One-Dimensional Consolidation Properties of Saturated Cohesive Soils Using Controlled-Strain Loading

(*ASTM D4186*)

© IGES 2010, 2022

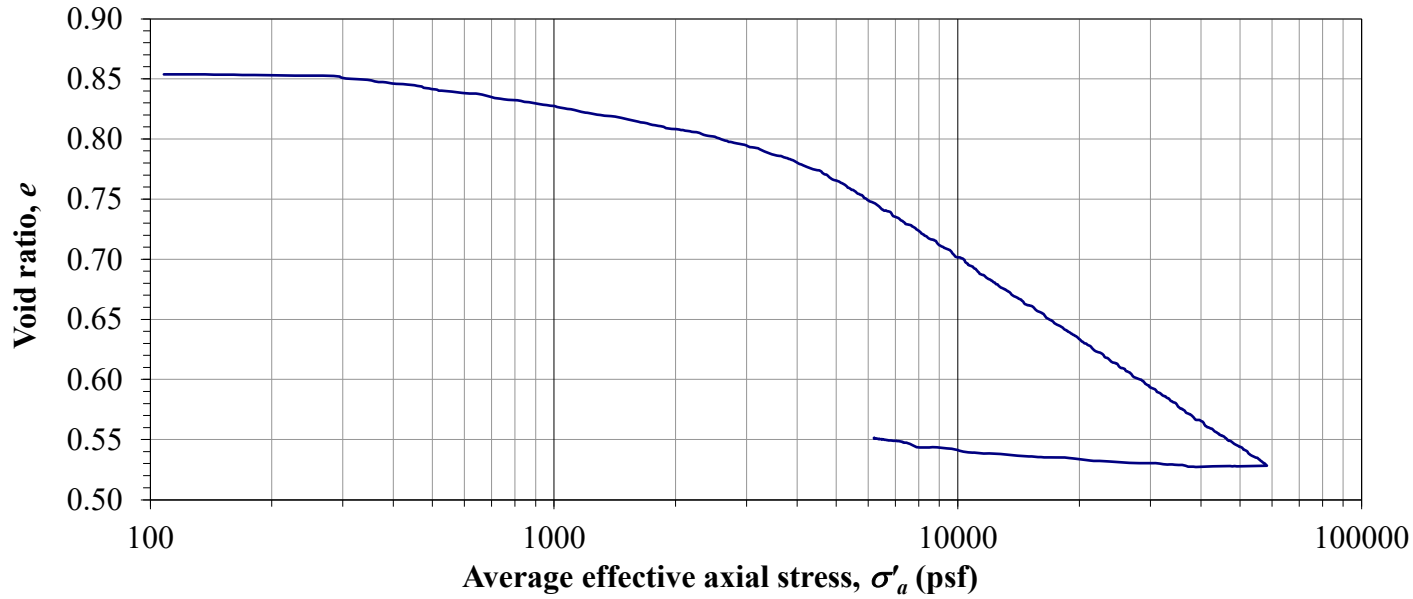
Project: Reuse Facility, MWDWRF
No: 00113-056
Location: Magna, Utah
Date: 1/14/2022
By: JDF/EH

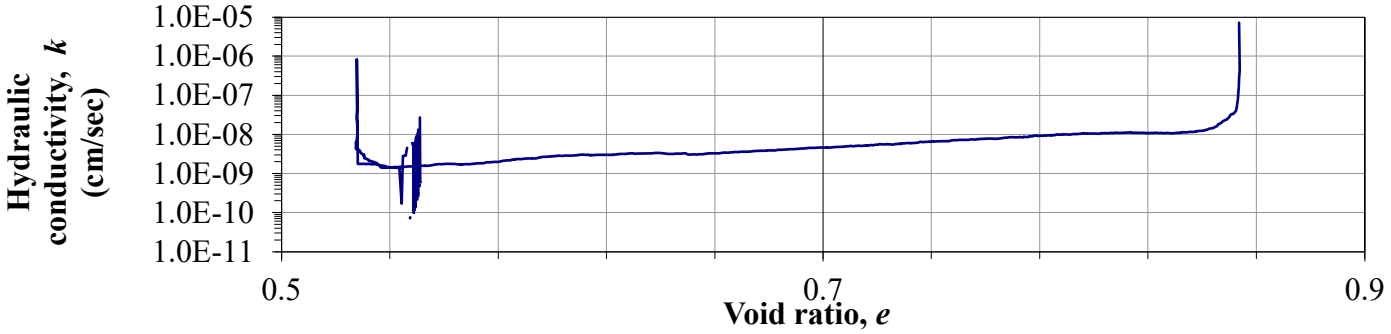
Boring No.: RF-B-01
Sample:
Depth: 15.0'
Sample Description: Grey clay
Engineering Classification: Not requested
Sample type: Undisturbed-trimmed from Shelby tube

Specific gravity, G_s	2.700	Assumed
	Initial (o)	Final (f)
Sample height, H (in.)	0.910	0.762
Sample diameter, D (in.)	2.500	2.500
Wt. rings + wet soil (g)	252.22	240.30
Wt. rings/tare (g)	110.38	110.38
Moist unit wt., γ_m (pcf)	120.96	132.38
Wet soil + tare (g)	293.94	343.11
Dry soil + tare (g)	251.30	319.54
Tare (g)	122.40	211.91
Water content, w (%)	33.08	21.90
Dry unit wt., γ_d (pcf)	90.90	108.60
Void ratio, e	0.854	0.551
Saturation ratio, S	1.05	1.00

Seating pressure (psf)	100
Backpressure (psf)	7200
Strain at end of saturation (%)	-0.0082
Height at end of saturation (in)	0.9101
Void ratio at end of saturation	0.8537
Average loading strain rate (%/hr)	0.85
Average unloading strain rate (%/hr)	-0.85

*Note: C_c, C_r, and σ_p' to be determined by Geotechnical Engineer.





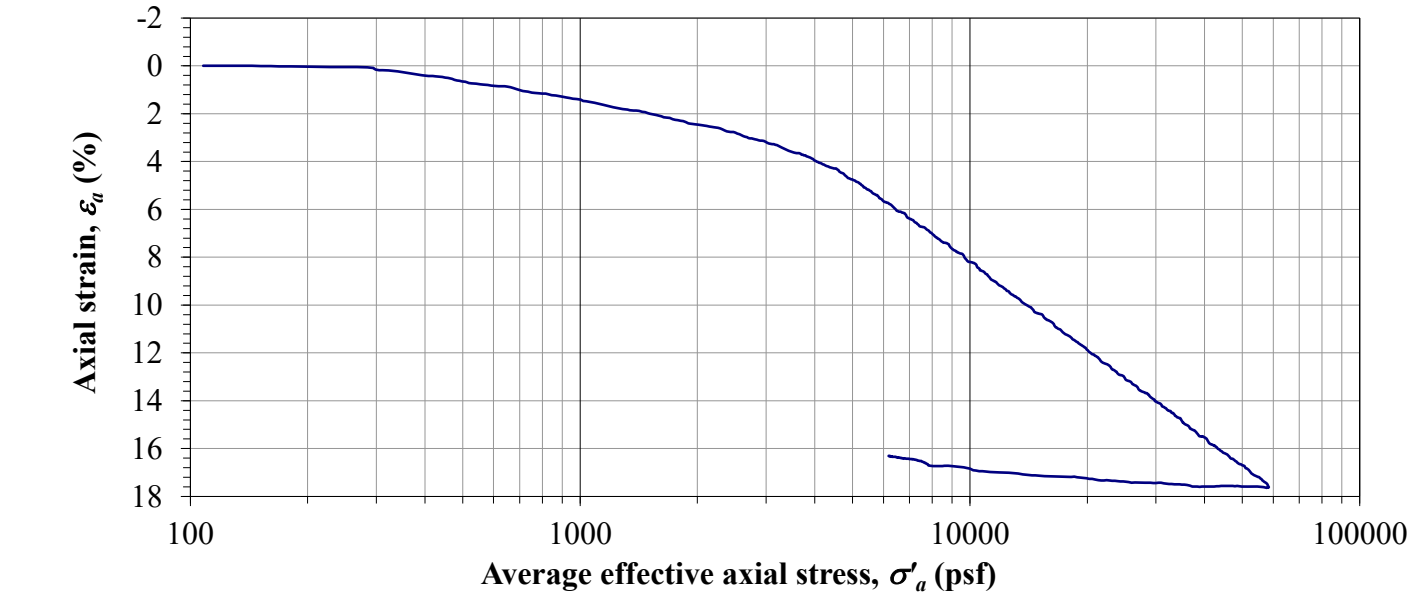
Entered: _____
Reviewed:

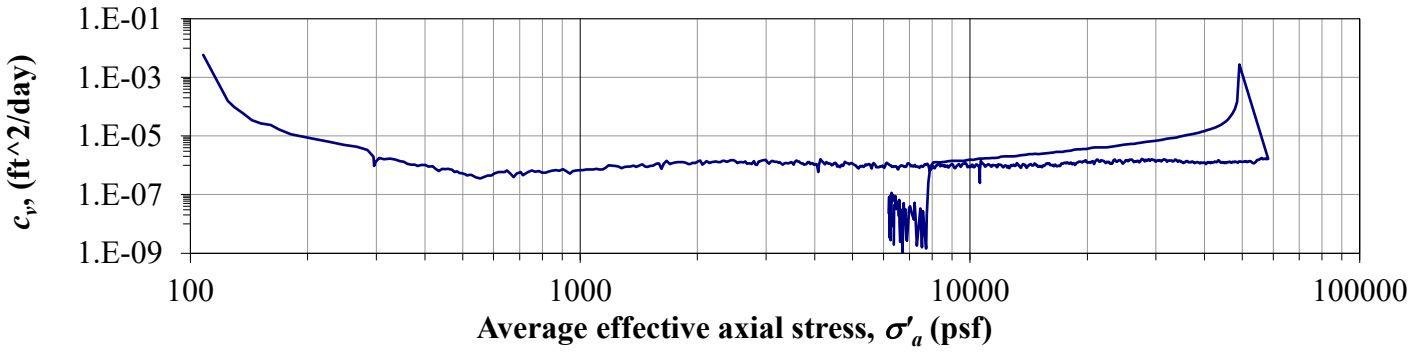
One-Dimensional Consolidation Properties of Saturated Cohesive Soils
Using Controlled-Strain Loading
(*ASTM D4186*)

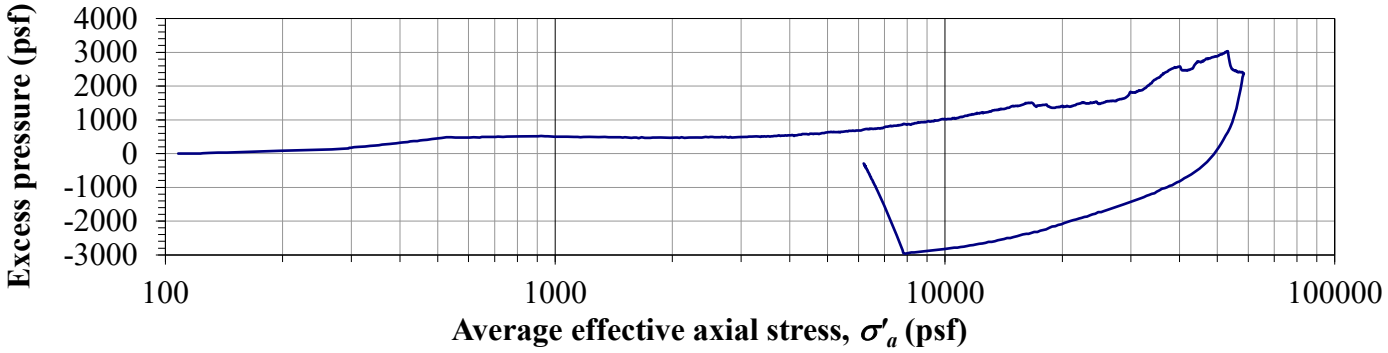
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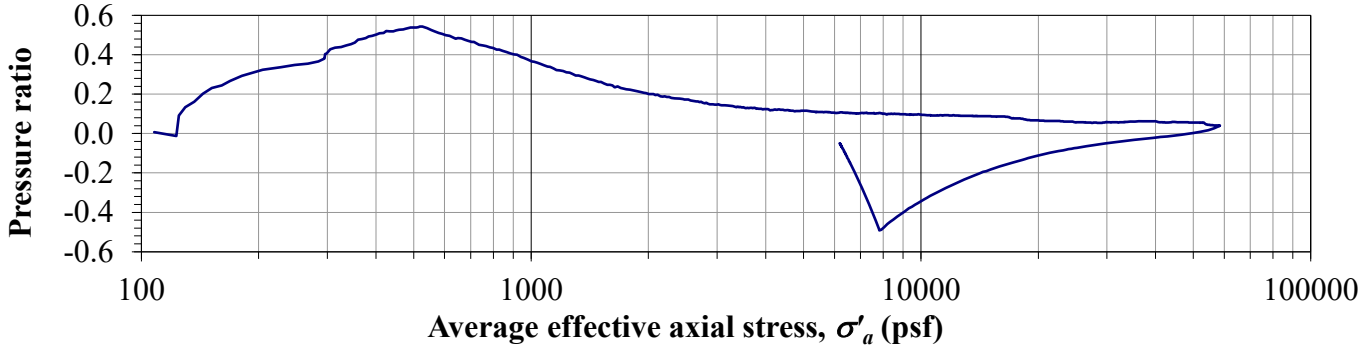
Project: Reuse Facility, MWDWRF
No: 00113-056
Location: Magna, Utah

Boring No.: RF-B-01
Sample:
Depth: 15.0'









Consolidated Undrained Triaxial Compression Test for Cohesive Soils

(*Staged*)

© IGES 2009, 2022

Project: Reuse Facility, MWDWRF
No: 00113-056
Location: Magna, Utah
Date: 1/25/2022
By: EH

Boring No.: RF-B-01
Sample:
Depth: 15.0'
Sample Description: Grey clay
Engineering Classification: Not requested
Sample type: Undisturbed-trimmed from Shelby tube

	Test Number:	S1	S2	S3
Initial	Height, H (in)	5.910	5.669	5.492
	Diameter, D (in)	2.855	2.918	2.953
	Water content, w (%)	35.3		
	Dry unit weight, γ_d (pcf)	88.3		
	Saturation (%)	104.8		
	Void ratio, e	0.91		
	Mounting	Wet		
Before shear	Water content, w (%)			33.1
	Dry unit weight, γ_d (pcf)			122.0
	Saturation[a] (%)			100.0
	Void ratio, e			0.38
	Area, A_{eoc} (in²)	6.42	6.58	6.68
	Area method	A	A	A
	B	0.95	0.95	0.95
	t_{50} (min)	127.01	82.55	93.80
	Back pressure (psf)	6192	6754	7630
	Strain rate[b] (%/min)	0.0031	0.0031	0.0031
	Time to failure (min)	1296.3	1199.5	1661.9
	Strain at failure[b], ε_f (%)	4.02	7.01	11.60
	Filter paper correction	No	No	No
	Membrane correction	Yes	Yes	Yes

Assumed specific gravity	2.70
Liquid limit (%)	40
Plastic limit (%)	19
Plasticity index (%)	21



[a] Saturation set to 100% for phase calculations

[b] Strain based on specimen height at the end of first consolidation

Summary of strength parameters at peak deviator stress		
Total stress	c (psf)	393
	ϕ (deg)	17.8
Effective stress	c' (psf)	212
	ϕ' (deg)	29.4

Entered by:_____

Reviewed:_____

Consolidated Undrained Triaxial Compression Test for Cohesive Soils

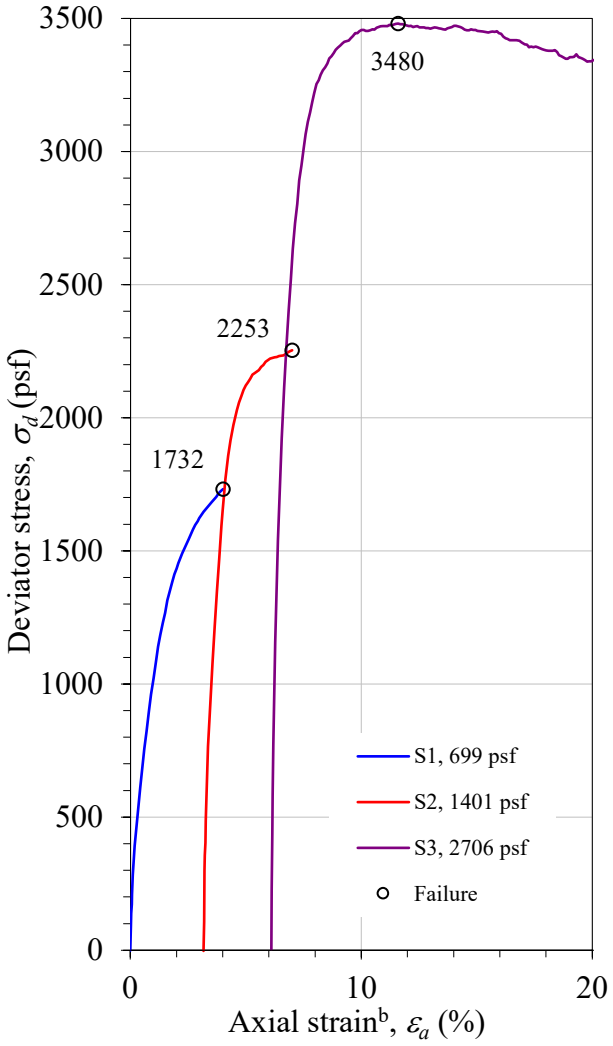
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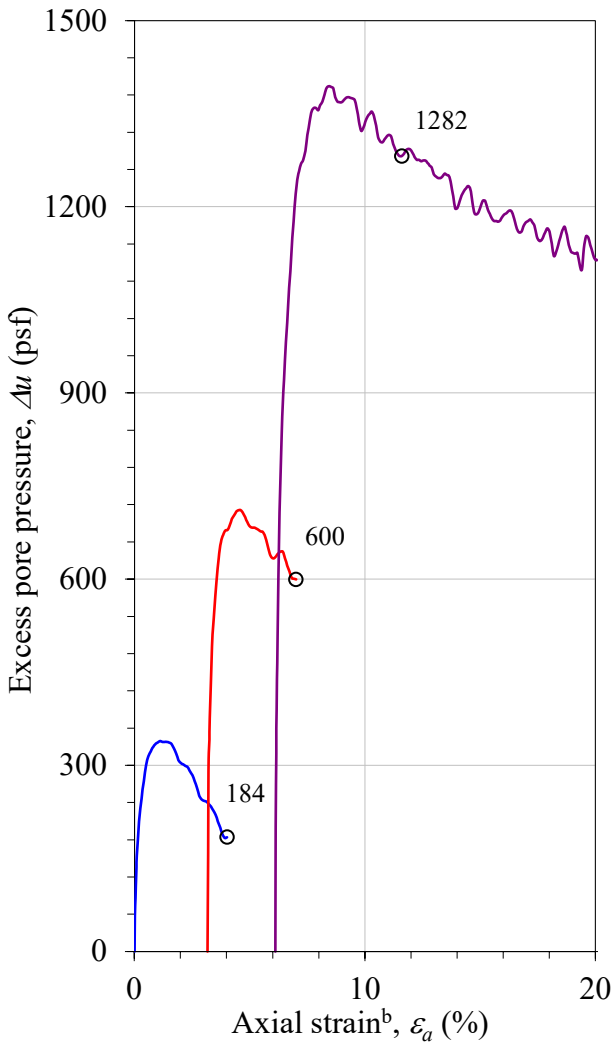
© IGES 2009, 2022

Project: Reuse Facility, MWDWRF
No: 00113-056
Location: Magna, Utah

Boring No.: RF-B-01
Sample:
Depth: 15.0'

	Test Number:	S1	S2	S3
Total stress	σ_3 (psf)	699	1401	2706
	σ_1-σ_3 (psf)	1732	2253	3480
	σ_1 (psf)	2431	3654	6186
	$q = (\sigma_1-\sigma_3)/2$ (psf)	866	1127	1740
	$p = (\sigma_1+\sigma_3)/2$ (psf)	1565	2528	4446
Effective stress	Δu (psf)	184	600	1282
	σ'_3 (psf)	515	801	1424
	σ'_1-σ'_3 (psf)	1732	2253	3480
	σ'_1 (psf)	2247	3054	4905
	$q = (\sigma'_1-\sigma'_3)/2$ (psf)	866	1127	1740
	$p' = (\sigma'_1+\sigma'_3)/2$ (psf)	1381	1928	3164
	σ'_1/σ'_3	4.36	3.81	3.44
	$A = \Delta u/(\sigma_1-\sigma_3)$	0.106	0.265	0.369





Consolidated Undrained Triaxial Compression Test for Cohesive Soils

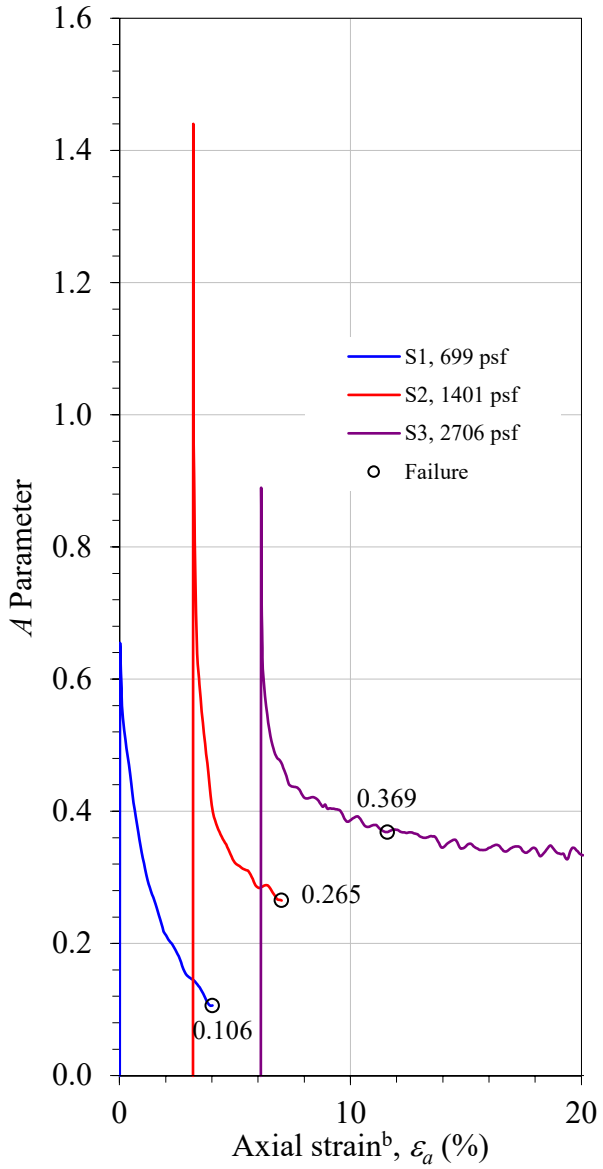
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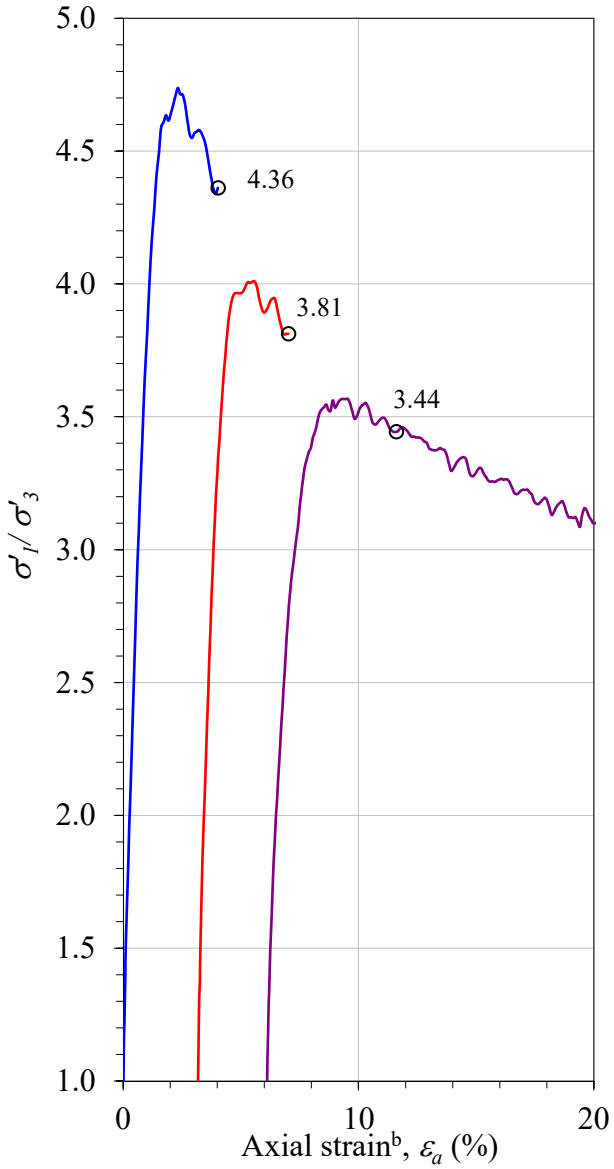
© IGES 2009, 2022

Project: Reuse Facility, MWDWRF
No: 00113-056
Location: Magna, Utah

Boring No.: RF-B-01
Sample:
Depth: 15.0'

Summary of strength parameters at peak deviator stress		
Total stress	c (psf)	393
	ϕ (deg)	17.8
Effective stress	c' (psf)	212
	ϕ' (deg)	29.4





Consolidated Undrained Triaxial Compression Test for Cohesive Soils

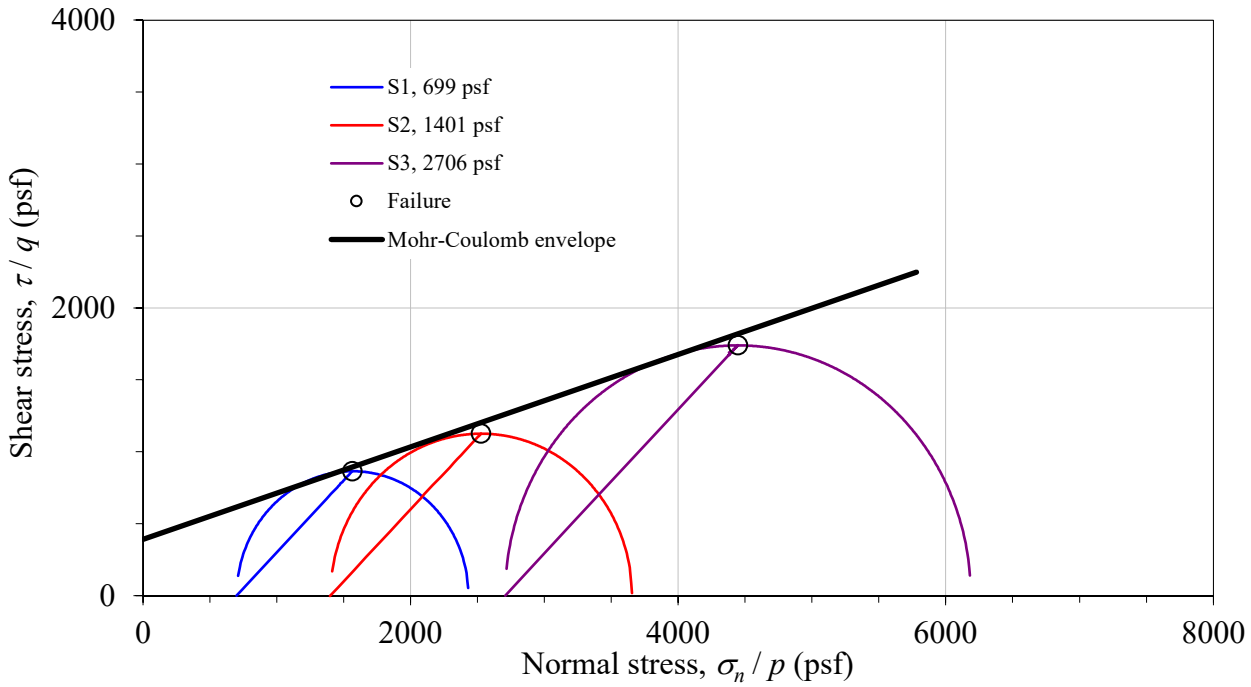
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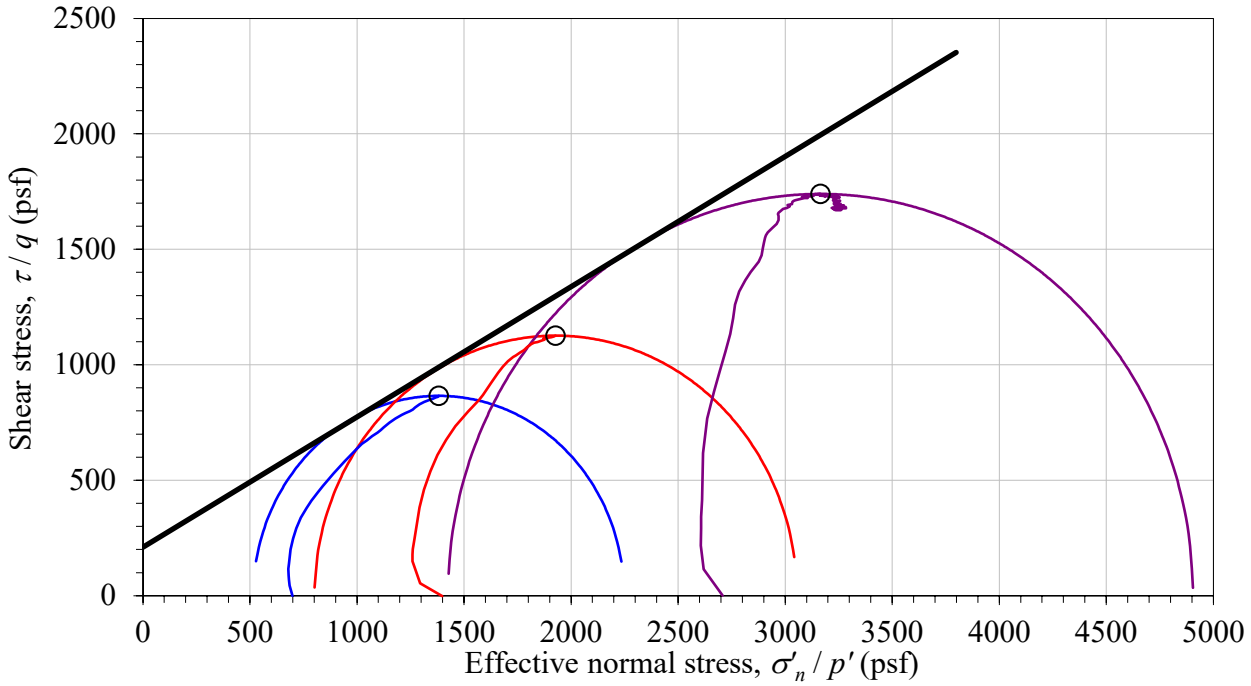
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Project: Reuse Facility, MWDWRF
No: 00113-056
Location: Magna, Utah

Boring No.: RF-B-01
Sample:
Depth: 15.0'

Summary of strength parameters at peak deviator stress		
Total stress	c (psf)	393
	ϕ (deg)	17.8
Effective stress	c' (psf)	212
	ϕ' (deg)	29.4





Moisture, Ash, and Organic Matter of Peat and Other Organic Soils

(ASTM D2974)

© IGES 2004, 2022

Project: Reuse Facility, MWDWRF
No: 00113-056
Location: Magna, Utah
Date: 1/7/2022
By: FB

Sample Info.	Boring No.	RF-B-02							
	Sample:								
	Depth:	5.0'							
	Test Method:	C							
	Furnace temp. (°C)	440							
Moisture	Wet soil + tare (g)	483.39							
	Dry soil + tare (g)	455.20							
	Tare (g)	374.91							
Ash / Organic Info	Mass of crucible and oven-dried sample (g)	455.20							
	Mass of crucible and ash (g)	452.96							
	Mass of crucible (g)	374.91							
Moisture Content, w (%) [a]		**35.1**							
Ash Content (%)		**97.2**							
Organic Matter (%)		**2.8**							

[a] Moisture contents are by proportion of oven-dried mass (geotechnical convention).

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)*

© IGES 2014, 2022

Project: **Reuse Facility, MWDWRF**
No: **00113-056**
Location: Magna, Utah
Date: 1/14/2022
By: BRR

Sample info.	Boring No.	RF-B-02				RF-B-02			
	Sample								
	Depth	2.5'				15.0'			
Water content data	Wet soil + tare (g)	12.95				45.36			
	Dry soil + tare (g)	12.52				43.03			
	Tare (g)	7.34				24.01			
	Water content (%)	8.3				12.3			
Chem. data	pH*	8.95				9.76			
	Soluble chloride* (ppm)	40.9				169			
	Soluble sulfate** (ppm)	170				563			
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	5820	0.67	3899	As Is	3300	0.67	2211
		+3	3046	0.67	2041	+3	1607	0.67	1077
		+6	2020	0.67	1353	+6	836	0.67	560
		+9	1932	0.67	1294	+9	674	0.67	452
		+12	1964	0.67	1316	+12	663	0.67	444
						+15	660	0.67	442
						+18	690	0.67	462
	Minimum resistivity (Ω-cm)	**1294**				**442**			

* Performed by AWAL using EPA 300.0

** Performed by AWAL using ASTM C1580

Entered by:_____
Reviewed:_____

Appendix C

Seismic Data

Latitude, Longitude: 40.727318, -112.074475



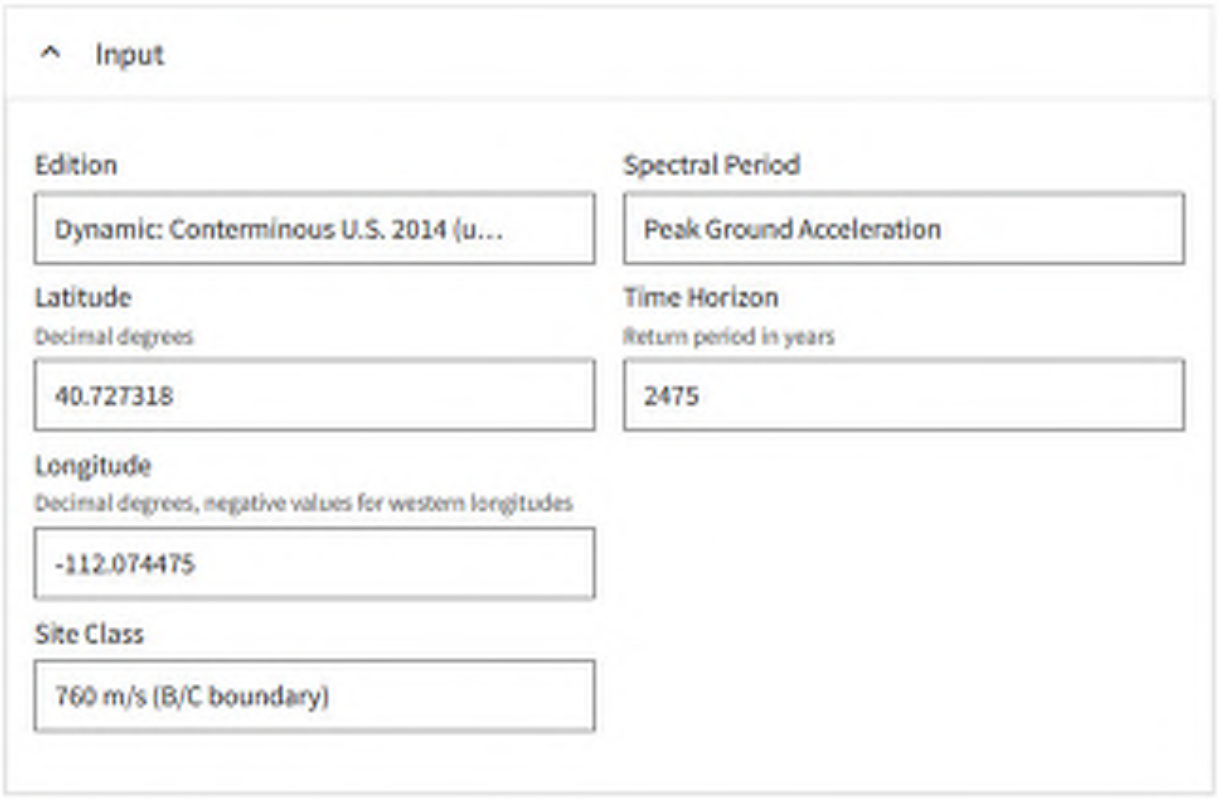
Date	12/16/2021, 3:37:43 PM
Design Code Reference Document	ASCE7-16
Risk Category	III
Site Class	D - Stiff Soil

Type	Value	Description
S_S	1.064	MCE_R ground motion. (for 0.2 second period)
S_1	0.378	MCE_R ground motion. (for 1.0s period)
S_{MS}	1.143	Site-modified spectral acceleration value
S_{M1}	null -See Section 11.4.8	Site-modified spectral acceleration value
S_{DS}	0.762	Numeric seismic design value at 0.2 second SA
S_{D1}	null -See Section 11.4.8	Numeric seismic design value at 1.0 second SA

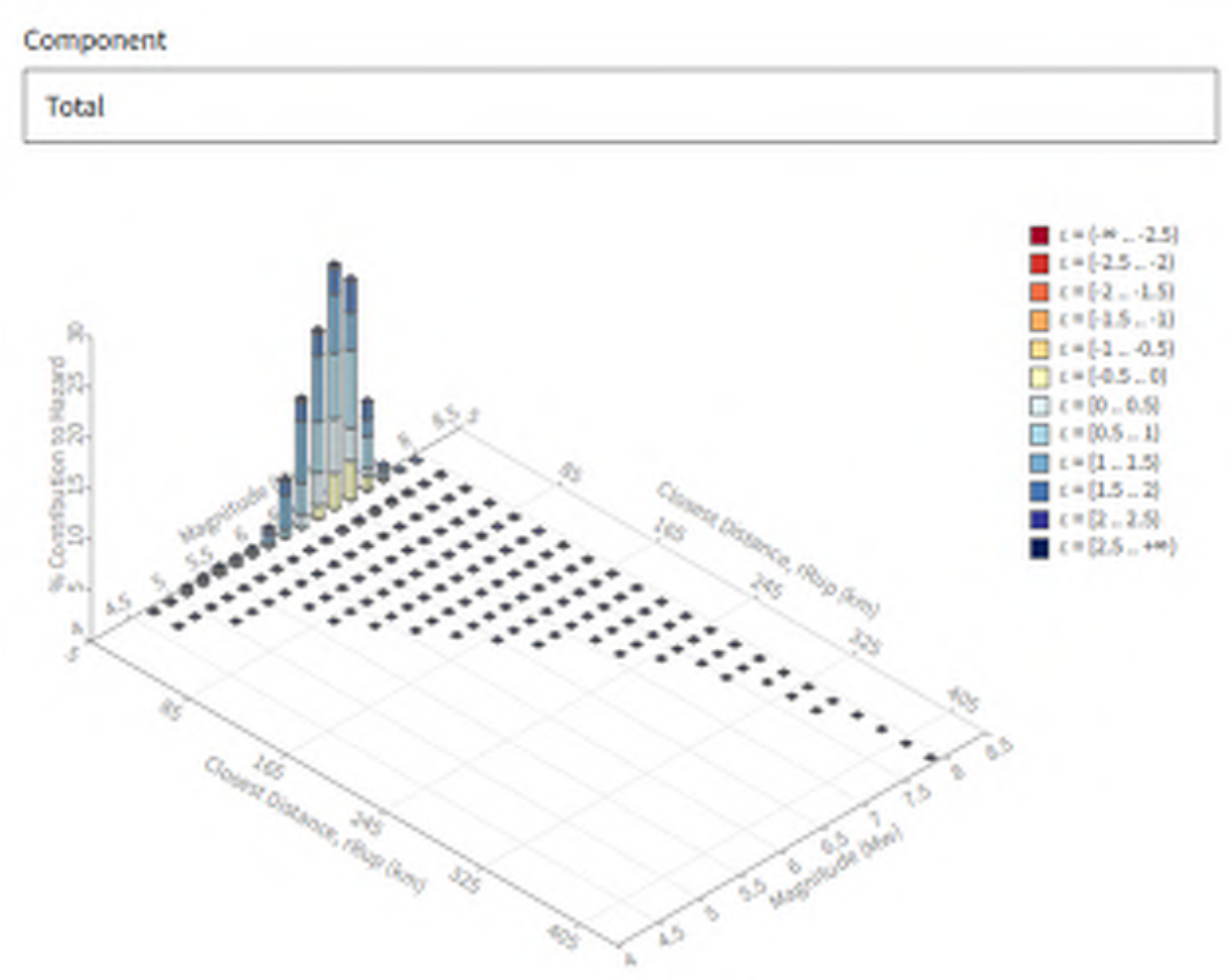
Type	Value	Description
SDC	null -See Section 11.4.8	Seismic design category
F_a	1.074	Site amplification factor at 0.2 second
F_v	null -See Section 11.4.8	Site amplification factor at 1.0 second
PGA	0.464	MCE_G peak ground acceleration
F_{PGA}	1.136	Site amplification factor at PGA
PGA_M	0.527	Site modified peak ground acceleration
T_L	8	Long-period transition period in seconds
SsRT	1.064	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	1.214	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	1.813	Factored deterministic acceleration value. (0.2 second)
S1RT	0.378	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.432	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	0.654	Factored deterministic acceleration value. (1.0 second)
PGAd	0.725	Factored deterministic acceleration value. (Peak Ground Acceleration)
C_{RS}	0.876	Mapped value of the risk coefficient at short periods
C_{R1}	0.876	Mapped value of the risk coefficient at a period of 1 s

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Source: USGS Unified Hazard Tool



Source: USGS Unified Hazard Tool

Summary statistics for, Deaggregation: Total

Deaggregation targets

Return period: 2475 yrs
Exceedance rate: 0.0004040404 yr^{-1}
PGA ground motion: 0.47635149 g

Recovered targets

Return period: 2606.1371 yrs
Exceedance rate: 0.00038370966 yr^{-1}

Totals

Binned: 100 %
Residual: 0 %
Trace: 0.52 %

Mean (over all sources)

m: 6.79
r: 11.97 km
ε: 0.92 σ

Mode (largest m-r bin)

m: 6.89
r: 12.1 km
ε: 0.76 σ
Contribution: 24.01 %

Mode (largest m-r-ε bin)

m: 7.08
r: 12.99 km
ε: 0.83 σ
Contribution: 7.66 %

Discretization

r: min = 0.0, max = 1000.0, Δ = 20.0 km
m: min = 4.4, max = 9.4, Δ = 0.2
ε: min = -3.0, max = 3.0, Δ = 0.5 σ

Epsilon keys

ε0: [-∞ .. -2.5)
ε1: [-2.5 .. -2.0)
ε2: [-2.0 .. -1.5)
ε3: [-1.5 .. -1.0)
ε4: [-1.0 .. -0.5)
ε5: [-0.5 .. 0.0)
ε6: [0.0 .. 0.5)
ε7: [0.5 .. 1.0)
ε8: [1.0 .. 1.5)
ε9: [1.5 .. 2.0)
ε10: [2.0 .. 2.5)
ε11: [2.5 .. +∞]

Source: USGS Unified Hazard Tool

Liquefaction Analysis

Source: USGS Unified Hazard Tool

Prepared for Bowen, Collins & Associates
Prepared By IGES, Inc.

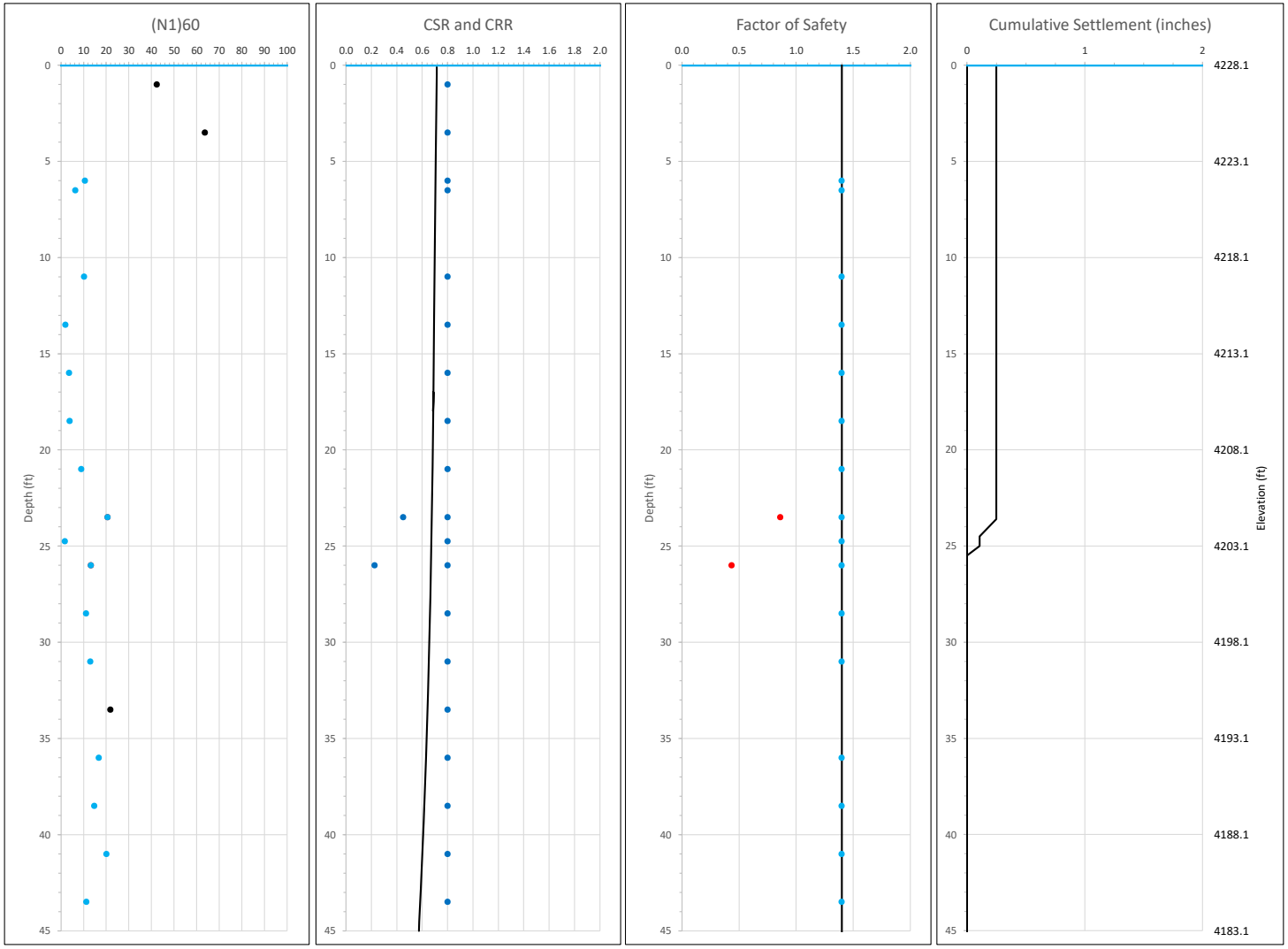
February 10, 2022

Liquefaction Analysis (RF-B-02)

Project Name: Reuse Facility
MWDWRF
Project No.: 00113-056
Client: Bowen Collins & Associates

Exploration: RF-B-02
Surface Elevation: 4228 ft
Analysis Depth: 45 ft
Analysis Groundwater Depth: 0 ft

Earthquake Magnitude (M): 6.79 (ASCE 7 Hazard Tool; USGS Unified Hazard Tool)
Peak Ground Acceleration: 0.527
Factor of Safety against Liquefaction: 1.4
Analysis Methodology: Youd et. al (2001)
Tokumatsu and Seed (1987)



- Groundwater
- Non Liquefiable Based on CRR
- Liquefiable
- Non Liquefiable Based on Screening

- Cyclic Stress Ratio (CSR)
- Cyclic Resistance Ratio (CRR)

- Factor of Safety > 1.4
- Factor of Safety ≤ 1.4
- Nonliquefiable Soil
- Factor of Safety = 1.4

- Cumulative Liquefaction Settlement

Estimated maximum liquefaction settlement = 0.3 in.

Project Name	Reuse Facility MWDWRF
Project No.	00113-056
Boring No.	RF-B-02
Date of Excavation	12/10/21
Depth to Groundwater During Sampling (ft)	5.4
Estimated Depth to Historic High Groundwater (ft)	0
***PHGA (g)**	0.527
***Moment Magnitude (Mw)**	6.79
Depth of Fill (ft)	0
Hole Diameter (inches)	5
Energy Ratio (ER, %)	79.2
Magnitude Scaling Factor MSF	1.29
Boring Diameter Correction Factory, C_B	1.05

MSF = $10^{2.24}/M_w^{2.56}$

Dry Settlement 0.0 **Pradel**

Total Settlement 0.3 **I&Y***

Liquefaction-induced Settlement 0.3

Total Settlement 0.3 **T&S**

Liquefaction-induced Settlement 0.3

*Probabilistic Values

$$CRR_{7.5} = \frac{1}{34-(N_1)_{60}} + \frac{(N_1)_{60}}{135} + \frac{50}{[10*(N_1)_{60}+45]^2} - \frac{1}{200}$$

Valid for $(N_1)_{60CS}$ < 30 Only

Cs: Sampling Method Correcton Factor
Cs=1.2 for liner-able split spoon without a liner
CS=1.0 for liner-able split spoon with a liner,
or standard split spoon with no room for liner
Cs=0.6 for Modified California Sampler
Alternative: set Cs to 1.0 and apply sampling method correction factor directly to raw field blowcount data

Test results from alike materials

Chinese Criteria:
clay < 15% by weight
LL < 35%
W% > 0.9*LL
Clay is <=0.005 mm

$$r_d = \frac{(1-0.4113*z0.5+0.04052*z+0.001753*z1.5)}{(1-0.4177*z0.5+0.05729*z-0.006205*z1.5+0.00121*z2)}$$ Stress Reduction Coefficient

CSR = $0.65(a_{max}/g)(\sigma_{vo}/\sigma'_{vo})r_d$ if FS < 1.1 layer will liquefy
if FS > 1.1 and < 1.4 layer may liquefy
if FS > 1.4 layer is safe from liquefaction
a_{max} in units of g

FS = $(CRR_{7.5}/CSR)$

layer #	Depth to Midlayer depth (ft)	Raw Field N (blows/ft)	unit wt.(pcf)	Fines %	Cs	% clay	W%	LL	Custom interval (ft.)		Layer thickness (ft)	At Midlayer During: σ_v psf	Sampling σ_v' psf	Liquefaction σ_v' psf	C_N	depth (m)	rod length (m)	C_R	N_{60}	$(N_1)_{60}$	f=0.75 α	B	$(N_1)_{60CS}$	Kσ	r_d	CSR	$CRR_{7.5}$	FS	inches Y&I + P [1]Settlement	T&S +P [2]Settlement	Pradel [3]Settlement
1	1.0	20	120	44	1.2	42	7		0.00	2.25	2.3	120	120	58	1.7	0.3	1.3	0.75	26.4	42.4	5.00	1.20	55.9	1.00	1.000	0.713	N60cs>30	-------			
2	3.5	30	120	44	1.2	42	7		2.25	5.50	3.3	420	420	202	1.7	1.1	2.1	0.75	39.6	63.6	5.00	1.20	81.3	1.00	0.994	0.709	N60cs>30	-------			
3	6.0	5	120	89	1.2		34	45	5.50	8.20	2.7	720	683	346	1.7	1.8	2.8	0.75	6.6	10.6	5.00	1.20	17.7	1.00	0.988	0.705	0.243	-------			
4	6.5	3	120	30	1.2	18	31	27	8.20	9.75	1.6	780	711	374	1.7	2.0	3.0	0.75	4.0	6.3	4.71	1.15	11.9	1.00	0.987	0.704	0.169	-------			
5	11.0	5	120	30	1.2	18	31	27	9.75	11.50	1.8	1,320	971	634	1.4	3.4	4.4	0.85	6.6	10.1	4.71	1.15	16.4	1.00	0.977	0.697	0.225	-------			
6	13.5	1	120	96	1.2	45			11.50	14.75	3.3	1,620	1,115	778	1.3	4.1	5.1	0.85	1.3	1.9	5.00	1.20	7.3	1.00	0.972	0.693	0.116	-------			
7	16.0	2	120	96	1.2	45			14.75	17.25	2.5	1,920	1,259	922	1.3	4.9	5.9	0.85	2.6	3.6	5.00	1.20	9.3	1.00	0.966	0.690	0.138	-------			
8	18.5	2	120	96	1.2	45			17.25	20.50	3.3	2,220	1,403	1,066	1.2	5.6	6.6	0.95	2.6	3.8	5.00	1.20	9.5	1.00	0.961	0.686	0.141	-------			
9	21.0	5	120	71	1.2	19	28	26	20.50	22.50	2.0	2,520	1,547	1,210	1.1	6.4	7.4	0.95	6.6	9.0	5.00	1.20	15.8	1.00	0.954	0.681	0.217	-------			
10	23.5	12	120	85	1.2	16			22.50	23.60	1.1	2,820	1,691	1,354	1.1	7.2	8.2	0.95	15.8	20.6	5.00	1.20	29.7	1.00	0.947	0.676	0.581	-------			
11	23.5	12	120	62	1.2	14	31	23	23.60	24.50	0.9	2,820	1,691	1,354	1.1	7.2	8.2	0.95	15.8	20.6	5.00	1.20	29.7	1.00	0.947	0.676	0.581	0.86	0.12	0.14	
12	24.8	1	120	85	1.2	16			24.50	25.00	0.5	2,970	1,763	1,426	1.1	7.5	8.5	0.95	1.3	1.7	5.00	1.20	7.0	1.00	0.943	0.673	0.113	-------			
13	26.0	8	120	62	1.2	14	31	23	25.00	25.50	0.5	3,120	1,835	1,498	1.0	7.9	8.9	0.95	10.6	13.2	5.00	1.20	20.8	1.00	0.938	0.670	0.292	0.44	0.14	0.11	
14	26.0	8	120	85	1.2	22	31	42	25.50	27.25	1.8	3,120	1,835	1,498	1.0	7.9	8.9	0.95	10.6	13.2	5.00	1.20	20.8	1.00	0.938	0.670	0.292	-------			
15	28.5	7	120	85	1.2	22	31	42	27.25	29.75	2.5	3,420	1,979	1,642	1.0	8.7	9.7	0.95	9.2	11.1	5.00	1.20	18.3	1.00	0.928	0.662	0.252	-------			
16	31.0	8	120	85	1.2	22	31	42	29.75	32.25	2.5	3,720	2,123	1,786	1.0	9.4	10.4	1.00	10.6	12.9	5.00	1.20	20.5	1.00	0.915	0.653	0.286	-------			
17	33.5	14	120	85	1.2	22	14	29	32.25	34.75	2.5	4,020	2,267	1,930	0.9	10.2	11.2	1.00	18.5	21.9	5.00	1.20	31.2	0.98	0.901	0.643	N60cs>30	-------			
18	36.0	11	120	85	1.2	22	14	29	34.75	37.25	2.5	4,320	2,411	2,074	0.9	11.0	12.0	1.00	14.5	16.7	5.00	1.20	25.0	0.97	0.883	0.630	0.376	-------			
19	38.5	10	120	90	1.2	26	23	27	37.25	39.75	2.5	4,620	2,555	2,218	0.9	11.7	12.7	1.00	13.2	14.7	5.00	1.20	22.7	0.95	0.864	0.616	0.325	-------			
20	41.0	14	120	90	1.2	26	23	27	39.75	42.25	2.5	4,920	2,699	2,362	0.9	12.5	13.5	1.00	18.5	20.0	5.00	1.20	29.1	0.94	0.842	0.601	0.532	-------			
21	43.5	8	120	90	1.2	33	27	33	42.25	44.75	2.5	5,220	2,843	2,506	0.8	13.3	14.3	1.00	10.6	11.2	5.00	1.20	18.4	0.93	0.818	0.584	0.253	-------			
22	46.0	14	120	90	1.2	33	27	33	44.75	47.25	2.5	5,520	2,987	2,650	0.8	14.0	15.0	1.00	18.5	19.1	5.00	1.20	27.9	0.92	0.794	0.566	0.471	-------			
23	49.5	9	120	90	1.2	33	27	33	47.25	50.00	2.8	5,940	3,188	2,851	0.8	15.1	16.1	1.00	11.9	11.9	5.00	1.20	19.2	0.90	0.758	0.541	0.266	-------			

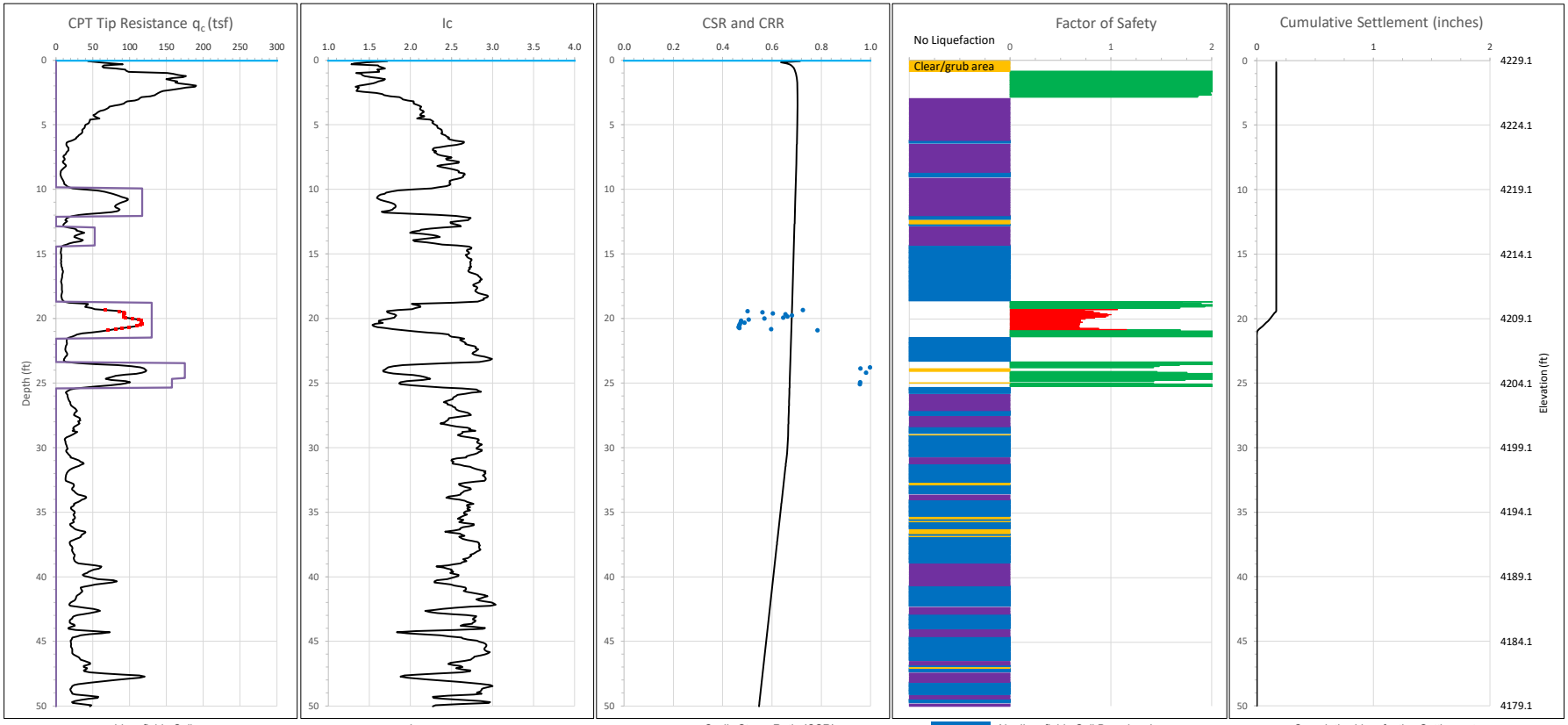
****** Soil is above or partially above the water table and is generally not considered liquefiable
------- Soil is not considered liquefiable if $(N_1)_{60CS}$ > 30 and/or it does not meet the Chinese Criteria

Liquefaction Analysis (sCPT-01)

Project Name: Reuse Facility
MWDWRF
Project No.: 00133-056
Client: Bowen Collins & Associates

Exploration: sCPT-01
Surface Elevation: 4229.1 ft
Analysis Depth: 50 ft
Analysis Groundwater Depth: 0 ft

Earthquake Magnitude (M): 6.79 (USGS Unified Hazard Tool)
Peak Ground Acceleration: 0.527 (ASCE 7 Hazard Tool)
Factor of Safety against Liquefaction: 1.4
Analysis Methodology: Martin and Lew (1999)
Tokimatsu and Seed (1987)



Project Name	Reuse Facility
Project No.	00133-056
Sounding No.	sCPT-01
Date of Sounding	12/06/21
Depth to Groundwater During Sampling (ft)	5.4
Estimated Depth to Historic High Groundwater (ft)	0.0
PHGA (g)	0.527
Moment Magnitude (Mw)	6.79
Depth of Fill (ft)	0.0
Magnitude Weighting Factor CM	1.289
Cone Diameter (mm)	43.7
Factor of Safety Against Liquefaction	1.4

$CM = 10^{2.24}/M_w^{2.56}$

(15 cm² Cone)

Dry Settlement 0.0 **Pradel**

Total Settlement 0.2 **I&Y**

Liquefaction-induced Settlement 0.2

Total Settlement 0.2 **T&S**

Liquefaction-induced Settlement 0.2

Chinese Criteria:
clay < 15% by weight
LL < 35%
W% > 0.9*LL
Clay is <=0.005 mm

** During Sampling
* During Liquefaction

******* Ic > 2.6, layer is probably too clay-rich to liquefy

----- Layer is above groundwater level and is unlikely to liquefy

Stress Reduction Coefficient
r_d=1.0 - 0.00765z for z <= 9.15m
r_d=1.174 - 0.0267z for 9.15m < z >= 23m

if FS < 1.1 layer will liquefy
if FS > 1.1 and < 1.4 layer may liquefy
if FS > 1.4 layer is safe from liquefaction

Layer #	Depth to Midlayer (ft)	qc tsf	fs tsf	γ pcf	Thickness (ft)	Depth to Bottom (ft)	W %	Fines %	LL	% clay	Screening	σ_{vo} tsf	σ'_{vo} tsf	σ'_{vo} tsf	σ_{vo} kPa	σ'_{vo} kPa	σ'_{vo} kPa	interpreted qc tsf	qc kPa	Thin-Layer Correction q_{cA}	K_H	fs kPa	F	Q	n	lc 1st	lc 2nd	lc 3rd	lc 4th	lc	Cq <=1.7	overburd. corection q_{cIN}	clean sand correction Kc	(q_{cIN})Cs	$CRR_{7.5}$	r_d	PSHA CSR	PSHA FS	Settlement Y&I	(inches) total	T&S	total	Pradel
1	0.08202	43.5	1.03	120	0.12	0.12					Too Thin	0.005	0.002	0.005	0.5	0.2	0.5	43.5	4,161			99	2.371	685.2	0.523	1.730	1.713	1.717	1.716	1.716	1.70	69.8	1.05	73.2	0.116	1.000	0.7139	*******	0.000	0.211	0.000	0.166	0.000
2	0.15404	58.8	0.66	120	0.08	0.21					Too Thin	0.011	0.006	0.011	1.1	0.6	1.1	58.8	5,635			63	1.127	432.4	0.500	1.467	1.467	1.467	1.467	1.467	1.70	94.5	1.00	94.5	0.159	1.000	0.6370	*******	0.000	0.211	0.000	0.166	0.000
3	0.24606	76.0	0.60	120	0.08	0.29					Too Thin	0.016	0.008	0.016	1.5	0.8	1.5	76.0	7,274			57	0.787	392.5	0.500	1.318	1.318	1.318	1.318	1.318	1.70	122.0	1.00	122.0	0.249	0.999	0.6587	*******	0.000	0.211	0.000	0.166	0.000
4	0.32808	90.8	0.66	120	0.08	0.37					Too Thin	0.021	0.011	0.021	2.0	1.0	2.0	90.8	8,698			63	0.727	402.0	0.500	1.278	1.278	1.278	1.278	1.278	1.70	145.9	1.00	145.9	0.369	0.999	0.6707	*******	0.000	0.211	0.000	0.166	0.000
5	0.4101	65.3	0.88	120	0.08	0.45					Too Thin	0.026	0.013	0.026	2.5	1.2	2.5	65.3	6,257			84	1.349	383.0	0.500	1.606	1.606	1.606	1.606	1.606	1.70	104.9	1.00	104.9	0.188	0.999	0.6783	*******	0.000	0.211	0.000	0.166	0.000
6	0.49212	63.2	0.81	120	0.08	0.53					Too Thin	0.031	0.015	0.031	2.9	1.5	2.9	63.2	6,053			78	1.285	344.4	0.500	1.618	1.618	1.618	1.618	1.618	1.70	101.5	1.00	101.5	0.177	0.999	0.6835	*******	0.000	0.211	0.000	0.166	0.000
7	0.57414	64.8	0.93	120	0.08	0.62					Too Thin	0.036	0.018	0.036	3.4	1.7	3.4	64.8	6,208			89	1.440	344.1	0.507	1.671	1.663	1.665	1.664	1.665	1.70	104.1	1.01	105.5	0.189	0.999	0.6874	*******	0.000	0.211	0.000	0.166	0.000
8	0.65616	81.5	1.41	120	0.08	0.70					Too Thin	0.041	0.020	0.041	3.9	1.9	3.9	81.5	7,802			135	1.735	415.1	0.515	1.700	1.687	1.690	1.690	1.690	1.70	130.9	1.03	134.9	0.308	0.998	0.6902	*******	0.000	0.211	0.000	0.166	0.000
9	0.73818	94.2	1.30	120	0.08	0.78					Too Thin	0.046	0.022	0.046	4.4	2.2	4.4	94.2	9,018			124	1.378	413.9	0.500	1.595	1.595	1.595	1.595	1.595	1.70	151.3	1.00	151.3	0.402	0.998	0.6925	*******	0.000	0.211	0.000	0.166	0.000
10	0.8202	95.4	1.35	120	0.08	0.86					Too Thin	0.050	0.025	0.050	4.8	2.4	4.8	95.4	9,134			130	1.420	406.1	0.500	1.615	1.615	1.615	1.615	1.615	1.70	153.2	1.00	153.2	0.414	0.998	0.6943	*******	0.000	0.211	0.000	0.166	0.000
11	0.92022	99.0	1.41	120	0.08	0.94					Too Thin	0.055	0.027	0.055	5.3	2.6	5.3	99.0	9,481			135	1.423	403.6	0.500	1.618	1.618	1.618	1.618	1.618	1.70	159.0	1.00	159.0	0.454	0.998	0.6957	*******	0.000	0.211	0.000	0.166	0.000
12	0.95424	151.0	1.38	120	0.08	1.03						0.060	0.030	0.060	5.8	2.8	5.8	151.0	14,462			122	0.845	464.9	0.500	1.339	1.339	1.339	1.339	1.339	1.70	242.6	1.00	242.6	1.407	0.998	0.6970	>1.4	0.000	0.211	0.000	0.166	0.000
13	1.06626	159.1	1.61	120	0.08	1.11						0.065	0.032	0.065	6.2	3.1	6.2	159.1	15,234			155	1.015	501.1	0.500	1.405	1.405	1.405	1.405	1.405	1.70	255.5	1.00	255.5	1.632	0.998	0.6980	>1.4	0.000	0.211	0.000	0.166	0.000
14	1.14828	165.8	1.71	120	0.08	1.19						0.070	0.034	0.070	6.7	3.3	6.7	165.8	15,881			163	1.029	507.9	0.500	1.409	1.409	1.409	1.409	1.409	1.70	266.4	1.00	266.4	1.838	0.997	0.6988	>1.4	0.000	0.211	0.000	0.166	0.000
15	1.2303	176.8	2.01	120	0.08	1.27						0.075	0.037	0.075	7.2	3.5	7.2	176.8	16,931			192	1.136	539.2	0.500	1.440	1.440	1.440	1.440	1.440	1.70	284.0	1.00	284.0	2.210	0.997	0.6995	>1.4	0.000	0.211	0.000	0.166	0.000
16	1.31232	172.6	2.36	120	0.08	1.35						0.080	0.039	0.080	7.7	3.7	7.7	172.6	16,523			226	1.371	545.8	0.500	1.524	1.524	1.524	1.524	1.524	1.70	277.1	1.00	277.1	2.060	0.997	0.7002	>1.4	0.000	0.211	0.000	0.166	0.000
17	1.39434	158.4	2.56	120	0.08	1.44						0.085	0.041	0.085	8.1	4.0	8.1	158.4	15,168			245	1.615	520.0	0.500	1.610	1.610	1.610	1.610	1.610	1.70	254.4	1.00	254.4	1.612	0.997	0.7007	>1.4	0.000	0.211	0.000	0.166	0.000
18	1.47636	149.8	2.91	120	0.08	1.52						0.090	0.044	0.090	8.6	4.2	8.6	149.9	14,350			279	1.945	507.9	0.515	1.699	1.690	1.692	1.691	1.691	1.70	240.7	1.03	248.4	1.506	0.997	0.7011	>1.4	0.000	0.211	0.000	0.166	0.000
19	1.55838	167.0	2.88	120	0.08	1.60						0.095	0.046	0.095	9.1	4.4	9.1	157.0	15,037			276	1.836	539.3	0.509	1.673	1.668	1.669	1.669	1.669	1.70	252.2	1.02	256.4	1.647	0.997	0.7015	>1.4	0.000	0.211	0.000	0.166	0.000
20	1.6404	164.8	2.60	120	0.08	1.68						0.100	0.048	0.100	9.5	4.6	9.5	164.8	15,779			249	1.578	499.8	0.500	1.610	1.610	1.610	1.610	1.610	1.70	264.7	1.00	264.7	1.804	0.996	0.7019	>1.4	0.000	0.211	0.000	0.166	0.000
21	1.72242	162.0	2.31	120	0.08	1.76						0.105	0.051	0.105	10.0	4.9	10.0	162.0	15,515			221	1.424	469.9	0.500	1.579	1.579	1.579	1.579	1.579	1.70	260.2	1.00	260.2	1.719	0.996	0.7022	>1.4	0.000	0.211	0.000	0.166	0.000
22	1.80444	167.3	2.18	120	0.08	1.85						0.109	0.053	0.109	10.5	5.1	10.5	167.3	16,023			209	1.303	463.4	0.500	1.544	1.544	1.544	1.544	1.544	1.70	268.7	1.00	268.7	1.885	0.996	0.7025	>1.4	0.000	0.211	0.000	0.166	0.000
23	1.88646	180.0	1.96	120	0.08	1.93						0.114	0.056	0.114	11.0	5.3	11.0	180.0	17,233			187	1.088	463.3	0.500	1.465	1.465	1.465	1.465	1.465	1.70	289.1	1.00	289.1	2.326	0.996	0.7027	>1.4	0.000	0.211	0.000	0.166	0.000
24	1.96848	190.2	1.68	120	0.08	2.01						0.119	0.058	0.119	11.4	5.5	11.4	190.2	18,214			161	0.884	454.8	0.500	1.381	1.381	1.381	1.381	1.381	1.70	305.5	1.00	305.5	2.732	0.995	0.7029	>1.4	0.000	0.211	0.000	0.166	0.000
25	2.0505	188.8	1.43	120	0.08	2.09						0.124	0.060	0.124	11.9	5.8	11.9	188.8	18,078			137	0.760	463.3	0.500	1.332	1.332	1.332	1.332	1.332	1.70	303.2	1.00	303.2	2.673	0.995	0.7031	>1.4	0.000	0.211	0.000	0.166	0.000
26	2.13282	176.8	1.41	120	0.08	2.17						0.129	0.063	0.129	12.4	6.0	12.4	176.6	16,907			135	0.797	405.8	0.500	1.371	1.371	1.371	1.371	1.371	1.70	283.6	1.00	283.6	2.201	0.995	0.7032	>1.4	0.000	0.211	0.000	0.166	0.000
27	2.21454	167.7	1.23	120	0.08	2.26						0.134	0.065	0.134	12.8	6.2	12.8	167.7	16,054			118	0.733	376.6	0.500	1.360	1.360	1.360	1.360	1.360	1.70	269.3	1.00	269.3	1.896	0.995	0.7033	>1.4	0.000	0.211	0.000	0.166	0.000
28	2.29656	167.1	1.05	120	0.08	2.34						0.139	0.067	0.139	13.3	6.4	13.3	167.1	15,044			101	0.669	345.6	0.500	1.351	1.351	1.351	1.351	1.351	1.70	252.3	1.00	252.3	1.574	0.995	0.7034	>1.4	0.000	0.211	0.000	0.166	0.000
29	2.37858	145.6	0.87	120	0.08	2.42						0.144	0.070	0.144	13.8	6.7	13.8	145.6	13,945			83	0.599	314.0	0.500	1.340	1.340	1.340	1.340	1.340	1.70	233.9	1.00	233.9	1.270	0.994	0.7035	>1.4	0.000	0.211	0.000	0.166	0.000
30	2.4606	142.3	1.06	120	0.08	2.50						0.149	0.072	0.149	14.3	6.9	14.3	142.3	13,630			101	0.745	317.7	0.500	1.423	1.423	1.423	1.423	1.423	1.70	228.6	1.00	228.6	1.191	0.994	0.7036	>1.4	0.000	0.211	0.000	0.166	0.000
31	2.54262	136.5	1.60	120	0.08	2.58						0.154	0.074	0.154	14.7	7.1	14.7	139.5	13,357			153	1.146	336.0	0.500	1.581	1.581	1.581	1.581	1.581	1.70	224.0	1.00	224.0	1.126	0.994	0.7037	>1.4	0.000	0.211	0.000	0.166	0.000
32	2.62464	136.6	1.89	120	0.08	2.67						0.159	0.077	0.159	15.2	7.4	15.2	136.6	13,083			181	1.386	338.1	0.505	1.657	1.655	1.655	1.655	1.655	1.70	219.4	1.01	221.0	1.084	0.994	0.7037	>1.4	0.000	0.211	0.000	0.166	0.000
33	2.70666	134.5	1.97	120	0.08	2.75						0.164	0.079	0.164	15.7	7.6	15.7	134.5	12,875			189	1.469	332.2	0.512	1.686	1.680	1.681	1.680	1.680	1.70	216.0	1.02	221.3	1.087	0.994	0.7038	>1.4	0.000	0.211	0.000	0.166	0.000
34	2.78868	128.2	2.29	120	0.08	2.83						0.169	0.082	0.169	16.1	7.8	16.1	128.2	12,275			291	1.785	325.1	0.535	1.771	1.754	1.756	1.756	1.756	1.70	205.9	1.08	221.5	1.090	0.993	0.7038	>1.4	0.000	0.211	0.000	0.166	0.000
35	2.8707	116.4	2.69	120	0.08	2.91						0.173	0.084	0.173	16.6	8.0	16.6	116.4	11,142			258	2.318	308.0	0.567	1.883	1.862	1.865	1.864	1.864	1.70	186.9	1.16	216.2	1.020	0.993	0.7038	>1.4	0.000	0.211	0.000	0.166	0.000
36	2.95272	113.9	2.79	120	0.08	2.99						0.178	0.086	0.178	17.1	8.3	17.1	113.9	10,907			267	2.455	301.0	0.575	1.909	1.889	1.891	1.891	1.891	1.70	182.9	1.18	215.9	1.016	0.993	0.7038	>1.4	0.000	0.211	0.000	0.166	0.000
37	3.03474	112.2	2.82	120	0.08	3.08	34.00	89.00	45.00	42.30	Screens Out	0.183	0.089	0.183	17.6	8.5	17.6	112.2	10,742			270	2.517	294.0	0.580	1.923	1.903	1.906	1.905	1.905	1.70	180.2	1.19	215.1	1.006	0.993	0.7038	*******	0.000	0.211	0.000	0.166	0.000
38	3.11676	107.1	3.11	120	0.08	3.16	34.00	89.00	45.00	42.30	Screens Out	0.188	0.091	0.188	18.0	8.7	18.0	107.1	10,258			298	2.910	285.2	0.598	1.982	1.964	1.966	1.966	1.966	1.70	172.1	1.26	216.5	1.023	0.993	0.7038	*******	0.000	0.211	0.000	0.166	0.000
39	3.19878	96.8	3.26	120	0.08	3.24	34.00	89.00	45.00	42.30	Screens Out	0.193	0.093	0.193	18.5	8.9	18.5	96.8	9,271			312	3.370	263.2	0.620	2.053	2.037	2.039	2.039	2.039	1.70	155.5	1.35	210.5	0.848	0.993	0.7038	*******	0.000	0.211	0.000	0.166	0.000
40	3.2808	93.8	3.06	120	0.08	3.32	34.00	89.00	45.00	42.30	Screens Out	0.198	0.096	0.198	19.0	9.2	19.0	93.8	8,980			293	3.273	251.0	0.620	2.053	2.037	2.039	2.039	2.039	1.70	150.6	1.35	203.9	0.868	0.992	0.7038	*******	0.000	0.211	0.000	0.166	0.000
41	3.36282	92.2	2.96	120	0.08	3.40	34.00	89.00	45.00	42.30	Screens Out	0.203	0.098	0.203	19.4	9.4	19.4	92.2	8,833			283	3.213	243.2	0.620	2.054	2.037	2.039	2.039	2.039	1.70	148.2	1.35	200.7	0.831	0.992	0.7038	*******	0.000	0.211	0.000	0.166	0.000
42	3.44484	86.5	2.96	120	0.08	3.49	34.00	89.00	45.00	42.30	Screens Out	0.208	0.100	0.208	19.9	9.6	19.9	86.5	8,286			285	3.446	228.1	0.632	2.093	2.077	2.079	2.079	2.079	1.70	139.0	1.42	197.0	0.811	0.992	0.7038	*******	0.000	0.211	0.000	0.166	0.000
43	3.52686	79.8	2.79	120	0.08	3.57	34.00	89.00	45.00	42.30	Screens Out	0.213	0.103	0.213	20.4	9.8	20.4	79.8	7,638			267	3.502	210.6	0.639	2.118	2.103	2.104	2.104	2.104	1.70	128.1	1.46	187.4	0.692	0.992	0.7037	*******	0.000	0.211	0.000	0.166	0.000
44	3.60888	72.7	2.57	120	0.08	3.65	34.00	89.00	45.00	42.30	Screens Out	0.218	0.105	0.218	20.9	10.1	20.9	72.7	6,959			246	3.550	191.5	0.648	2.146	2.130	2.132	2.132	2.132	1.70	116.7	1.52	176.9	0.595	0.992	0.7037	*******	0.000	0.211	0.000	0.166	0.000
45	3.6909	71.3	2.38	120	0.08	3.73	34.00	89.00	45.00	42.30	Screens Out	0.223	0.107	0.223	21.3	10.3	21.3	71.3	6,829			228	3.354	184.2	0.644	2.135	2.119	2.121	2.121	2.121	1.70	114.5	1.49	171.1	0.566	0.991	0.7037	*******	0.000	0.211	0.000	0.166	0.000
46	3.77292	68.7	2.17	120	0.08	3.81	34.00	89.00	45.00	42.30	Screens Out	0.228	0.110	0.228	21.8	10.5	21.8	68.7	6,579			207	3.163	174.4	0.642	2.129	2.112	2.114	2.114	2.114	1.70	110.3	1.48	163.3	0.485	0.991	0.7036	*******	0.000	0.211	0.000	0.166	0.000
47	3.85494	65.2	2.05	120	0.08	3.90	34.00	89.00	45.00	42.30	Screens Out	0.233	0.112	0.233	22.3	10.7	22.3	65.2	6,245			197	3.161	164.4	0.647	2.143	2.127	2.129	2.129	2.129	1.70	104.8	1.51	158.1	0.447	0.991	0.7036	*******	0.000	0.211	0.000	0.166	0.000
48	3.93696	60.3	1.93	120	0.08	3.98	34.00	89.00	45.00	42.30	Screens Out	0.237	0.115	0.237	22.7	11.0	22.7	60.3	5,773			184	3.207	151.6	0.654	2.169	2.153	2.155	2.155	2.155	1.70	96.8	1.56	151.3	0.406	0.990	0.7035	*******	0.000	0.211	0.000	0.166	0.000
49	4.01898	57.4	1.79	120	0.08	4.06	34.00	89.00	45.00	42.30	Screens Out	0.242	0.117	0.242	23.2	11.2	23.2	57.4	5,497			171	3.128	142.8	0.656	2.176	2.160	2.162	2.162	2.162	1.70	92.2	1.58	145.5	0.366	0.991	0.7035	*******	0.000	0.211	0.000	0.166	0.000
50	4.101	55.4	1.54	120	0.08	4.14	34.00	89.00	45.00	42.30	Screens Out	0.247	0.119	0.247	23.7	11.4	23.7	55.4	5,305			147	2.787	134.6	0.649	2.153	2.136	2.138	2.138	2.138	1.70	89.0	1.53	135.9	0.314	0.990	0.7034	*******	0.000	0.211	0.000	0.166	0.000
51	4.18302	53.4	1.26	120	0.08	4.22	34.00	89.00	45.00	42.30	Screens Out	0.252	0.122	0.252	24.2	11.6	24.2	53.4	5,116			129	2.539	127.3	0.646	2.138	2.120	2.122	2.122	2.122	1.70	85.8	1.50	128.4	0.277	0.990	0.7033	*******	0.000	0.211	0.000	0.166	0.000
52	4.26504	51.0	1.21	120	0.08	4.31	34.00	89.00	45.00	42.30	Screens Out	0.257	0.124	0.257	24.6	11.9	24.6	51.0	4,879			116	2.383	119.6	0.644	2.135	2.117	2.119	2.119	2.119	1.70	81.8	1.49	121.9	0.248	0.990	0.7033	*******	0.000	0.211	0.000	0.166	0.000
53	4.34706	52.3	1.48	120	0.08	4.39	34.00	89.00	45.00	42.30	Screens Out	0.262	0.126	0.262	25.1	12.1	25.1	52.3	5,004			142	2.844	123.7	0.658	2.182	2.166	2.168	2.168	2.168	1.70	83.9	1.59	133.6	0.302	0.990	0.7032	*******	0.000	0.211	0.000	0.166	0.000
54	4.42908	55.3	1.38	120	0.08	4.47	34.00	89.00	45.00	42.30	Screens Out	0.267	0.129	0.267	25.6	12.3	25.6	55.3	5,298			132	2.506	126.9	0.664	2.134	2.117	2.119	2.119	2.119	1.70	88.9	1.49	132.4	0.296	0.990	0.7031	*******	0.000	0.211	0.000	0.166	0.000
55	4.5111	59.2	1.68	120	0.08	4.55	34.00	89.00	45.00	42.30	Screens Out	0.272	0.131	0.272	26.0	12.6	26.0	59.2	5,673			130	2.550	132.1	0.632	2.094	2.077	2.079	2.079	2.079	1.70	95.2	1.42	134.9	0.308	0.990	0.7031	*******	0.000	0.211	0.000	0.166	0.000
56	4.59312	46.4	1.48	120	0.08	4.63	34.00	89.00	45.00	42.30	Screens Out	0.277	0.133	0.277	26.5	12.8	26.5	46.4	4,445			141	3.201	109.1	0.681	2.255	2.241	2.242	2.242	2.242	1.70	74.6	1.78	132.5	0.296	0.989	0.7030	*******	0.000	0.211	0.000	0.166	0.000
57	4.67514	46.4	1.55	120	0.08	4.72	34.00	89.00	45.00	42.30	Screens Out	0.282	0.136	0.282	27.0	13.0	27.0	46.4	4,442			148	3.351	108.4	0.686	2.271	2.258	2.259	2.259	2.259	1.70	74.5	1.82	136.0	0.314	0.989	0.7029	*******	0.000	0.211	0.000	0.166	0.000
58	4.75716	45.5	1.58	120	0.08	4.80	34.00	89.00	45.00	42.30	Screens Out	0.287	0.138	0.287	27.5	13.2	27.5	45.5	4,359			152	3.552	106.0	0.692	2.292	2.279	2.279	2.281	2.280	1.70	73.1	1.89	138.0	0.324	0.989	0.7028	*******	0.000	0.211	0.000	0.166	0.000
59	4.83918	45.0	1.47	120	0.08	4.88	34.00	89.00	45.00	42.30	Screens Out	0.292	0.141	0.292	27.9	13.5	27.9	45.0	4,307			140	3.278	102.9	0.688	2.278	2.265	2.267	2.266	2.266	1.70	72.2	1.85	133.3	0.300	0.989	0.7027	*******	0.000	0.211	0.000	0.166	0.000
60	4.9212	43.1	1.42	120	0.08	4.96	34.00	89.00	45.00	42.30	Screens Out	0.297	0.143	0.297	28.4	13.7	28.4	43.1	4,127			136	3.320	98.1	0.693	2.295	2.283	2.284	2.284	2.284	1.70	69.2	1.90	131.4	0.291	0.989	0.7027	*******	0.000	0.211	0.000	0.166	0.000
61	5.00322	40.4	1.32	120	0.08	5.04	34.00	89.00	45.00	42.30	Screens Out	0.301	0.145	0.301	28.9	13.9	28.9	40.4	3,873			126	3.291	91.5	0.698	2.312	2.300	2.301	2.301	2.301	1.70	65.0	1.95	126.8	0.269	0.988	0.7026	*******	0.000	0.211	0.000	0.166	0.000
62	5.08524	39.4	1.36	120	0.08	5.13	34.00	89.00	45.00	42.30	Screens Out	0.306	0.148	0.306	29.3	14.1	29.3	39.4	3,777			130	3.478	89.1	0.706	2.337	2.326	2.327	2.327	2.327	1.70	63.3	2.04	129.1	0.280	0.988	0.7025	*******	0.000	0.211	0.000	0.166	0.000
63	5.16726	39.2	1.34	120	0.08	5.21	34.00	89.00	45.00	42.30	Screens Out	0.311	0.150	0.311	29.8	14.4	29.8	39.2	3,758			128	3.445	87.7	0.706	2.338	2.327

Layer #	Depth to Midlayer (ft)	qc tsf	fs tsf	γ pcf	Thickness (ft)	Depth to Bottom (ft)	W %	Fines %	LL	% clay	Screening	σ_{vo} tsf	σ'_{vo} tsf	* τ_{st} tsf	** σ'_{vo} tsf	* σ_{vo} kPa	** σ'_{vo} kPa	interpreted qc tsf	Thin-Layer Correction q_{cA}	K_H	fs kPa	F	Q	n	Ic criteria by iteration 1st	2nd	3rd	4th	Ic	Cq <=1.7	overburd. correction q_{1N}	Kc	clean sand correction $(q_{1N})_{CS}$	$CRR_{7.5}$	r_d	PSHA CSR	PSHA FS	Settlement Y&I	total	T&S	total	Pradel
108	8.8588	6.3	0.05	120	0.08	8.90	34.00	89.00	45.00	42.30	Ic>2.6	0.533	0.256	0.425	51.0	24.5	40.7	6.3	607			5	0.809	11.5	0.806	2.668	2.660	2.661	2.661	2.661	1.70	10.2	3.72	37.9	0.082	0.979	0.6975	*******	0.000	0.211	0.000	0.166	0.000
109	8.94018	6.7	0.05	120	0.08	8.98	34.00	89.00	45.00	42.30	Ic>2.6	0.538	0.259	0.427	51.5	24.8	40.9	6.7	638			5	0.800	12.0	0.801	2.649	2.641	2.642	2.642	2.642	1.70	10.7	3.59	38.4	0.082	0.979	0.6974	*******	0.000	0.211	0.000	0.166	0.000
110	9.0222	6.9	0.06	120	0.08	9.06	34.00	89.00	45.00	42.30	Ic>2.6	0.543	0.261	0.429	52.0	25.0	41.1	6.9	660			5	0.866	12.4	0.801	2.651	2.643	2.644	2.644	2.644	1.70	11.1	3.61	39.9	0.083	0.979	0.6973	*******	0.000	0.211	0.000	0.166	0.000
111	9.10422	7.6	0.07	120	0.08	9.15	34.00	89.00	45.00	42.30	Ic>2.6	0.547	0.263	0.432	52.4	25.2	41.4	7.6	728			6	0.936	13.6	0.795	2.629	2.621	2.622	2.622	2.622	1.70	12.2	3.46	42.3	0.085	0.979	0.6972	*******	0.000	0.211	0.000	0.166	0.000
112	9.18624	8.4	0.07	120	0.08	9.23	34.00	89.00	45.00	42.30	Screens Out	0.552	0.266	0.434	52.9	25.4	41.6	8.4	808			7	0.862	15.0	0.779	2.577	2.569	2.570	2.570	2.570	1.70	13.6	3.15	42.6	0.086	0.979	0.6970	*******	0.000	0.211	0.000	0.166	0.000
113	9.26826	9.2	0.07	120	0.08	9.31	34.00	89.00	45.00	42.30	Screens Out	0.557	0.268	0.437	53.4	25.7	41.8	9.2	885			6	0.772	16.2	0.763	2.526	2.517	2.518	2.518	2.518	1.70	14.8	2.86	42.4	0.085	0.978	0.6969	*******	0.000	0.211	0.000	0.166	0.000
114	9.35028	10.1	0.07	120	0.08	9.39	34.00	89.00	45.00	42.30	Screens Out	0.562	0.270	0.439	53.8	25.9	42.0	10.1	964			7	0.726	17.5	0.751	2.485	2.476	2.476	2.476	2.476	1.70	16.2	2.65	42.9	0.086	0.978	0.6968	*******	0.000	0.211	0.000	0.166	0.000
115	9.4323	10.7	0.08	120	0.08	9.47	34.00	89.00	45.00	42.30	Screens Out	0.567	0.273	0.441	54.3	26.1	42.3	10.7	1,020			8	0.823	18.5	0.752	2.488	2.478	2.479	2.479	2.479	1.70	17.1	2.67	45.6	0.088	0.978	0.6967	*******	0.000	0.211	0.000	0.166	0.000
116	9.51432	11.1	0.09	120	0.08	9.56	34.00	89.00	45.00	42.30	Screens Out	0.572	0.275	0.444	54.8	26.3	42.5	11.1	1,066			9	0.871	19.2	0.751	2.483	2.474	2.475	2.475	2.475	1.70	17.9	2.65	47.3	0.089	0.978	0.6966	*******	0.000	0.211	0.000	0.166	0.000
117	9.59634	11.7	0.11	120	0.08	9.64	34.00	89.00	45.00	42.30	Screens Out	0.577	0.277	0.446	55.3	26.6	42.7	11.7	1,118			11	1.019	20.2	0.755	2.497	2.488	2.489	2.489	2.489	1.70	18.7	2.71	50.9	0.092	0.978	0.6964	*******	0.000	0.211	0.000	0.166	0.000
118	9.67836	13.3	0.15	120	0.08	9.72	34.00	89.00	45.00	42.30	Screens Out	0.582	0.280	0.448	55.7	26.8	42.9	13.3	1,276			15	1.201	23.0	0.751	2.484	2.476	2.476	2.476	2.476	1.70	21.4	2.65	56.7	0.097	0.977	0.6963	*******	0.000	0.211	0.000	0.166	0.000
119	9.76038	15.2	0.18	120	0.08	9.80	34.00	89.00	45.00	42.30	Screens Out	0.587	0.282	0.451	56.2	27.0	43.2	15.2	1,453			17	1.234	26.0	0.739	2.445	2.437	2.438	2.438	2.438	1.70	24.4	2.47	60.3	0.100	0.977	0.6962	*******	0.000	0.211	0.000	0.166	0.000
120	9.8424	17.9	0.17	120	0.08	9.88	34.00	89.00	45.00	42.30	Screens Out	0.592	0.285	0.453	56.7	27.2	43.4	17.9	1,711			17	1.009	29.9	0.709	2.346	2.337	2.338	2.338	2.338	1.70	28.7	2.08	59.6	0.100	0.977	0.6961	*******	0.000	0.211	0.000	0.166	0.000
121	9.92442	22.9	0.27	120	0.08	9.97	31.00	60.00	27.00	17.80	Screens Out	0.597	0.287	0.455	57.1	27.5	43.6	117.3	2,197	97.75	1.20	22	1.020	37.8	0.685	2.265	2.256	2.257	2.257	2.257	1.70	188.5	1.82	342.5	3.815	0.977	0.6959	*******	0.000	0.211	0.000	0.166	0.000
122	10.00644	35.1	0.28	120	0.08	10.05	31.00	60.00	27.00	17.80	Screens Out	0.602	0.289	0.458	57.6	27.7	43.8	117.3	3,361	97.75	1.20	26	0.800	55.4	0.626	2.070	2.059	2.060	2.060	2.060	1.69	187.3	1.39	259.7	1.710	0.977	0.6958	*******	0.000	0.211	0.000	0.166	0.000
123	10.08846	54.3	0.32	120	0.08	10.13	31.00	60.00	27.00	17.80	Screens Out	0.607	0.292	0.460	58.1	27.9	44.1	117.3	5,201	97.75	1.20	31	0.598	81.6	0.563	1.861	1.849	1.850	1.850	1.850	1.60	177.2	1.14	202.8	0.856	0.976	0.6957	*******	0.000	0.211	0.000	0.166	0.000
124	10.17048	84.1	0.34	120	0.08	10.21	31.00	60.00	27.00	17.80	Screens Out	0.611	0.294	0.463	58.6	28.2	44.3	117.3	6,135	97.75	1.20	32	0.531	94.2	0.539	1.781	1.768	1.769	1.769	1.769	1.56	173.2	1.08	187.9	0.697	0.976	0.6956	*******	0.000	0.211	0.000	0.166	0.000
125	10.2525	72.1	0.34	120	0.08	10.29	31.00	60.00	27.00	17.80	Screens Out	0.616	0.296	0.465	59.0	28.4	44.5	117.3	6,902	97.75	1.20	32	0.470	104.2	0.519	1.710	1.704	1.704	1.704	1.704	1.53	169.9	1.00	169.9	0.536	0.976	0.6954	*******	0.000	0.211	0.000	0.166	0.000
126	10.33462	75.8	0.35	120	0.08	10.38	31.00	60.00	27.00	17.80	Screens Out	0.621	0.299	0.467	59.5	28.6	44.7	117.3	7,261	97.75	1.20	34	0.471	108.9	0.514	1.693	1.688	1.688	1.688	1.688	1.52	168.8	1.00	168.8	0.527	0.976	0.6953	*******	0.000	0.211	0.000	0.166	0.000
127	10.41654	80.7	0.32	120	0.08	10.46	31.00	60.00	27.00	17.80	Screens Out	0.626	0.301	0.470	60.0	28.8	45.0	117.3	7,731	97.75	1.20	31	0.403	114.3	0.500	1.635	1.635	1.635	1.635	1.635	1.50	166.4	1.00	166.4	0.509	0.976	0.6952	*******	0.000	0.211	0.000	0.166	0.000
128	10.49856	85.2	0.34	120	0.08	10.54	31.00	60.00	27.00	17.80	Screens Out	0.631	0.303	0.472	60.4	29.1	45.2	117.3	8,162	97.75	1.20	32	0.397	119.7	0.500	1.612	1.612	1.612	1.612	1.612	1.50	166.0	1.00	166.0	0.505	0.976	0.6951	*******	0.000	0.211	0.000	0.166	0.000
129	10.58058	89.1	0.36	120	0.08	10.63	31.00	60.00	27.00	17.80	Screens Out	0.636	0.306	0.474	60.9	29.3	45.4	117.3	8,533	97.75	1.20	34	0.401	124.5	0.500	1.599	1.599	1.599	1.599	1.599	1.49	165.6	1.00	165.6	0.502	0.975	0.6949	*******	0.000	0.211	0.000	0.166	0.000
130	10.6626	94.2	0.40	120	0.08	10.70	31.00	60.00	27.00	17.80	Screens Out	0.641	0.308	0.477	61.4	29.5	45.7	117.3	9,024	97.75	1.20	38	0.423	131.1	0.500	1.591	1.591	1.591	1.591	1.591	1.49	165.2	1.00	165.2	0.499	0.975	0.6948	*******	0.000	0.211	0.000	0.166	0.000
131	10.74463	67.8	0.46	120	0.08	10.79	31.00	60.00	27.00	17.80	Screens Out	0.646	0.311	0.479	61.9	29.7	45.9	117.3	9,361	97.75	1.20	44	0.478	136.2	0.500	1.607	1.607	1.607	1.607	1.607	1.49	164.8	1.00	164.8	0.496	0.975	0.6947	*******	0.000	0.211	0.000	0.166	0.000
132	10.82664	97.6	0.52	120	0.08	10.87	31.00	60.00	27.00	17.80	Screens Out	0.651	0.313	0.481	62.3	30.0	46.1	117.3	9,349	97.75	1.20	49	0.531	136.6	0.500	1.635	1.635	1.635	1.635	1.635	1.48	164.4	1.00	164.4	0.493	0.975	0.6946	*******	0.000	0.211	0.000	0.166	0.000
133	10.90866	94.6	0.58	120	0.08	10.95	31.00	60.00	27.00	17.80	Screens Out	0.656	0.315	0.484	62.8	30.2	46.3	117.3	9,055	97.75	1.20	56	0.619	133.4	0.513	1.686	1.682	1.683	1.683	1.683	1.49	165.6	1.03	169.9	0.536	0.975	0.6944	*******	0.000	0.211	0.000	0.166	0.000
134	10.99068	90.1	0.65	120	0.08	11.03	31.00	60.00	27.00	17.80	Screens Out	0.661	0.318	0.486	63.3	30.4	46.6	117.3	8,631	97.75	1.20	62	0.727	126.4	0.530	1.746	1.738	1.739	1.738	1.738	1.51	167.4	1.06	178.0	0.605	0.974	0.6943	*******	0.000	0.211	0.000	0.166	0.000
135	11.0727	87.0	0.69	120	0.08	11.11	31.00	60.00	27.00	17.80	Screens Out	0.666	0.320	0.489	63.7	30.6	46.8	117.3	8,333	97.75	1.20	66	0.794	124.6	0.540	1.782	1.772	1.773	1.773	1.773	1.52	168.3	1.09	183.0	0.650	0.974	0.6942	*******	0.000	0.211	0.000	0.166	0.000
136	11.15472	84.1	0.72	120	0.08	11.20	31.00	60.00	27.00	17.80	Screens Out	0.671	0.322	0.491	64.2	30.9	47.0	117.3	8,055	97.75	1.20	68	0.857	121.0	0.549	1.812	1.803	1.804	1.804	1.804	1.52	169.0	1.11	187.5	0.693	0.974	0.6941	*******	0.000	0.211	0.000	0.166	0.000
137	11.23674	81.5	0.70	120	0.08	11.26	31.00	60.00	27.00	17.80	Screens Out	0.675	0.325	0.493	64.7	31.1	47.2	117.3	7,808	97.75	1.20	67	0.871	117.3	0.554	1.827	1.818	1.819	1.819	1.819	1.53	169.2	1.12	189.5	0.713	0.974	0.6939	*******	0.000	0.211	0.000	0.166	0.000
138	11.31876	80.4	0.68	120	0.08	11.36	31.00	60.00	27.00	17.80	Screens Out	0.680	0.327	0.496	65.2	31.3	47.5	117.3	7,699	97.75	1.20	65	0.855	115.3	0.554	1.828	1.819	1.819	1.819	1.819	1.52	168.7	1.12	189.2	0.710	0.974	0.6938	*******	0.000	0.211	0.000	0.166	0.000
139	11.40078	81.3	0.69	120	0.08	11.44	31.00	60.00	27.00	17.80	Screens Out	0.685	0.329	0.498	65.6	31.5	47.7	117.3	7,788	97.75	1.20	66	0.849	116.3	0.552	1.823	1.814	1.815	1.815	1.815	1.52	168.1	1.12	187.9	0.697	0.973	0.6937	*******	0.000	0.211	0.000	0.166	0.000
140	11.4828	84.2	0.68	120	0.08	11.52	31.00	60.00	27.00	17.80	Screens Out	0.690	0.332	0.500	66.1	31.8	47.9	117.3	8,066	97.75	1.20	65	0.818	119.6	0.546	1.803	1.794	1.795	1.795	1.795	1.51	166.9	1.10	184.1	0.660	0.973	0.6936	*******	0.000	0.211	0.000	0.166	0.000
141	11.56462	86.5	0.69	120	0.08	11.61	31.00	60.00	27.00	17.80	Screens Out	0.695	0.334	0.503	66.6	32.0	48.1	117.3	8,285	97.75	1.20	66	0.806	122.2	0.543	1.792	1.783	1.784	1.784	1.784	1.50	166.1	1.09	181.8	0.639	0.973	0.6934	*******	0.000	0.211	0.000	0.166	0.000
142	11.64684	85.1	0.56	120	0.08	11.69	31.00	60.00	27.00	17.80	Screens Out	0.700	0.336	0.505	67.0	32.2	48.4	117.3	8,147	97.75	1.20	54	0.664	118.8	0.530	1.749	1.741	1.741	1.741	1.741	1.48	164.1	1.07	174.9	0.578	0.973	0.6933	*******	0.000	0.211	0.000	0.166	0.000
143	11.72866	80.6	0.52	120	0.08	11.77	31.00	60.00	27.00	17.80	Screens Out	0.705	0.339	0.507	67.5	32.4	48.6	117.3	7,716	97.75	1.20	31	0.401	109.9	0.503	1.650	1.649	1.649	1.649	1.649	1.45	160.4	1.00	160.4	0.494	0.973	0.6932	*******	0.000	0.211	0.000	0.166	0.000
144	11.81068	68.1	0.23	120	0.08	11.85	31.00	60.00	27.00	17.80	Screens Out	0.710	0.341	0.510	68.0	32.7	48.8	117.3	6,521	97.75	1.20	22	0.343	93.2	0.512	1.683	1.680	1.680	1.680	1.680	1.45	161.1	1.00	161.1	0.469	0.972	0.6931	*******	0.000	0.211	0.000	0.166	0.000
145	11.8929	47.8	0.39	120	0.08	11.93	31.00	60.00	27.00	17.80	Screens Out	0.715	0.344	0.512	68.4	32.9	49.0	117.3	4,574	97.75	1.20	37	0.820	69.3	0.604	1.993	1.985	1.985	1.985	1.985	1.55	171.8	1.28	220.1	1.072	0.972	0.6929	*******	0.000	0.211	0.000	0.166	0.000
146	11.97492	35.5	0.34	120	0.08	12.02	31.00	60.00	27.00	17.80	Screens Out	0.720	0.346	0.514	68.9	33.1	49.3	117.3	3,403	97.75	1.20	71	2.128	54.9	0.705	2.336	2.322	2.322	2.322	2.322	1.52	184.3	2.02	272.3	1.966	0.972	0.6928	*******	0.000	0.211	0.000	0.166	0.000
147	12.05694	23.4	0.71	120	0.08	12.10	31.00	60.00	27.00	17.80	Screens Out	0.725	0.348	0.517	69.4	33.4	49.5	117.3	2,242	97.75	1.20	68	3.134	37.5	0.775	2.561	2.557	2.558	2.558	2.558	1.70	188.5	3.08	379.8	18.204	0.972	0.6927	*******	0.000	0.211	0.000	0.166	0.000
148	12.13896	19.1	0.61	120	0.08	12.18					Ic>2.6	0.730	0.351	0.519	69.9	33.6	49.7	19.1	1,828			58	3.301	30.7	0.799	2.640	2.637	2.637	2.637	2.637	1.70	30.7	3.56	109.2	0.201	0.972	0.6925	*******	0.000	0.211	0.000	0.166	0.000
149	12.22088	15.2	0.52	120	0.08	12.26					Ic>2.6	0.734	0.353	0.522	70.3	33.8	49.9	15.2	1,452			49	3.577	24.5	0.809	2.739	2.736	2.733	2.733	2.733	1.70	24.3	4.25	103.4	0.183	0.972	0.6924	*******	0.000	0.211	0.000	0.166	0.000
150	12.303	14.0	0.40	120	0.08	12.34					Ic>2.6	0.739	0.355	0.524	70.8	34.0	50.2	14.0	1,344			38	3.022	22.5	0.823	2.719	2.716	2.716	2.716	2.716	1.70	22.6	4.12	92.8	0.154	0.971	0.6923	*******	0.000	0.211	0.000	0.166	0.000
151	12.36502	12.9	0.31	120	0.08	12.43					Ic>2.6	0.744	0.358	0.526	71.3	34.3	50.4	12.9	1,236			30	2.540	20.4	0.819	2.706	2.703	2.703	2.703	2.703	1.70	20.7	4.02	83.3	0.134	0.971	0.6922	*******	0.000	0.211	0.000	0.166	0.000
152	12.46704	15.3	0.26	120	0.08	12.51					Too Thin	0.749	0.360	0.529	71.7	34.5	50.6	15.3	1,460			25	1.821	23.6	0.778	2.571	2.567	2.567	2.567	2.567	1.70	24.5	3.13	76.7	0.122	0.971	0.6920	*******	0.000	0.211	0.000	0.166	0.000
153	12.54906	13.9	0.14	120	0.08	12.59					Too Thin	0.754	0.362	0.531	72.2	34.7	50.9	13.9	1,330			14	1.089	21.0	0.755	2.494	2.489	2.489	2.489	2.489	1.68	22.1	2.71	60.0	0.105	0.971	0.6919	*******	0.000	0.211	0.000	0.166	0.000
154	12.63108	12.0	0.09	120	0.08	12.67					Too Thin	0.759	0.365	0.533	72.7	34.9	51.1	12.0	1,145			9	1.821	17.8	0.756	2.497	2.492	2.492	2.492	2.492	1.68	19.0	2.73	51.8	0.093	0.971	0.6918	*******	0.000	0.211	0.000	0.166	0.000
155	12.7131	10.4	0.08	120	0.08	12.75					Too Thin	0.764	0.367	0.536	73.2	35.2	51.3	10.4	998			8	0.839	15.5	0.773	2.555	2.550	2.551	2.551	2.551	1.69	16.7	3.04	50.6	0.092	0.970	0.6916	*******	0.000	0.211	0.000	0.166	0.000
156	12.79512	10.0	0.09	120	0.08	12.84					Ic>2.6	0.769	0.369	0.538	73.6	35.4	51.5	10.0	954			9	1.001	14.8	0.789	2.606	2.602	2.602	2.602	2.602	1.70	16.0	3.34	53.4	0.094	0.970	0.6915	*******	0.000	0.211	0.000	0.166	0.000
157	12.87714	10.0	0.10	120	0.08	12.92					Ic>2.6	0.774	0.372	0.540	74.1	35.6	51.8	10.0	961			9	1.068	14.9	0.792	2.617	2.613	2.613	2.613	2.613	1.70	16.1	3.41	55.0	0.095	0.970	0.6914	*******	0.000	0.211	0.000	0.166	0.000
158	12.95916	16.6	0.15	120	0.08	13.00	31.00	60.00	27.00	17.80	Screens Out	0.779	0.374	0.543	74.6	35.8	52.0	52.8	1,588	38.83	1.36	15	0.968	24.4	0.730	2.412	2.406	2.407	2.407	2.407	1.63	81.2	2.34	189.9	0.717	0.970	0.6913	*******	0.000	0.211	0.000	0.166	0.000
159	13.04118	24.9	0.22	120	0.08	13.08	31.00	60.00	27.00	17.80	Screens Out	0.784	0.377	0.545	75.0	36.1	52.2	52.8	2,383	38.83	1.36	21	0.892	36.9	0.681	2.249	2.243	2.244	2.244	2.244	1.57	78.3	1.78	139.5	0.332	0.970	0.6911	*******	0.000	0.211	0.000	0.166	0.000
160	13.1232	28.5	0.18	120	0.08	13.16	31.00	60.00	27.00	17.80	Screens Out	0.789	0.379	0.548	75.5	36.3	52.4	52.8	2,731	38.83	1.36	17	0.638	40.3	0.646	2.134	2.127	2.128	2.128	2.128	1.53	76.3	1.51	115.0	0.222	0.969	0.6910	*******	0.000	0.211	0.000	0.166	0.000
161	13.20522	28.1	0.16	120	0.08	13.25	31.00	60.00	27.00	17.80	Screens Out	0.794	0.381	0.550	76.0	36.5	52.7	52.8	2,691	38.83	1.36	15	0.579	39.5	0.643	2.122	2.115	2.116	2.115	2.115	1.52	75.9	1.48	112.6	0.213	0.969	0.6909	*******	0.000	0.211	0.000	0.166	0.000
162	13.28724	34.1	0.17	120	0.08	13.33	31.00	60.00	27.00	17.80	Screens Out	0.798	0.384	0.552	76.5	36.7	52.9	52.8	3,264	38.83	1.36	13	0.520	47.2	0.616	2.032	2.025	2.025	2.025	2.025	1.49	74.4	1.33	99.3	0.171	0.969	0.6907	*******	0.000	0.211	0.000	0.166	0.000
163	13.36926	38.8	0.17	120	0.08	13.41	31.00	60.00	27.00	17.80	Screens Out	0.803	0.386	0.555	76.9	37.0	53.1	52.8	3,718	38.83	1.36	20	0.563	54.4	0.606	2.001	1.994	1.994	1.994	1.994	1.48	73.8	1.29	95.3	0.161	0.969	0.6906	*******	0.000	0.211	0.000	0.166	0.000
164	13.45128	33.0	0.30	120	0.08	13.49	31.00	60.00	27.00	17.80	Screens Out	0.808	0.388	0.557	77.4	37.2	53.3	52.8	3,161	38.83	1.36	28	0.916	46.5	0.655	2.161	2.155	2.155	2.155	2.155	1.52	75.9	1.56	118.7	0.235	0.969	0.6905	*******	0.000	0.211	0.000	0.166	0.000
165	13.5333	28.9	0.34	120	0.08	13.57	31.00	60.00	27.00	17.80	Screens Out	0.813	0.391	0.559	77.9	37.4	53.6	52.8	2,764	38.83	1.36	33	1.219	41.3	0.688	2.273	2.268	2.268	2.268	2.268	1.55	77.3	1.85	143.1	0.352	0.968	0.6904	*******	0.000	0.211	0.000	0.166	0.000
166	13.61532	25.9	0.33	120	0.08	13.66	31.00	60.00	27.00	17.80	Screens Out	0.818	0.393	0.562	78.3	37.6	53.8	52.8	2,476	38.83	1.36	31	1.306	37.1	0.705	2.327	2.323	2.323	2.323	2.323	1.56	77.9	2.02	157.7	0.455	0.968	0.6902	*******	0.000	0.211	0.000	0.166	0.000
167	13.69734	24.8	0.34	120	0.08	13.74	31.00	60.00	27.00	17.80	Screens Out	0.823	0.396	0.564	78.8	37.9	54.0	52.8	2,378	38.83	1.36	33	1.416	35.7	0.715	2.361	2.357	2.357	2.357	2.357	1.57	78.2	2.15	167.7	0.519	0.968	0.6901	*******	0.000	0.211	0.000	0.166	0.000
168	13.77936	29.0	0.31	120	0.08	13.82	31.00	60.00	27.00	17.80	Screens Out	0.828	0.398	0.566	79.3	38.1	54.2	52.8	2,778	38.83	1.36	30	1.104	41.0	0.682	2.251	2.246	2.246	2.246	2.246	1.53	76.3	1.79	136.5	0.316	0.968	0.6900	*******	0.000	0.211	0.000	0.166	0.000
169	13.86138	31.3	0.29	120	0.08	13.90	31.00	60.00	27.00	17.80	Screens Out	0.833	0.400	0.569	79.

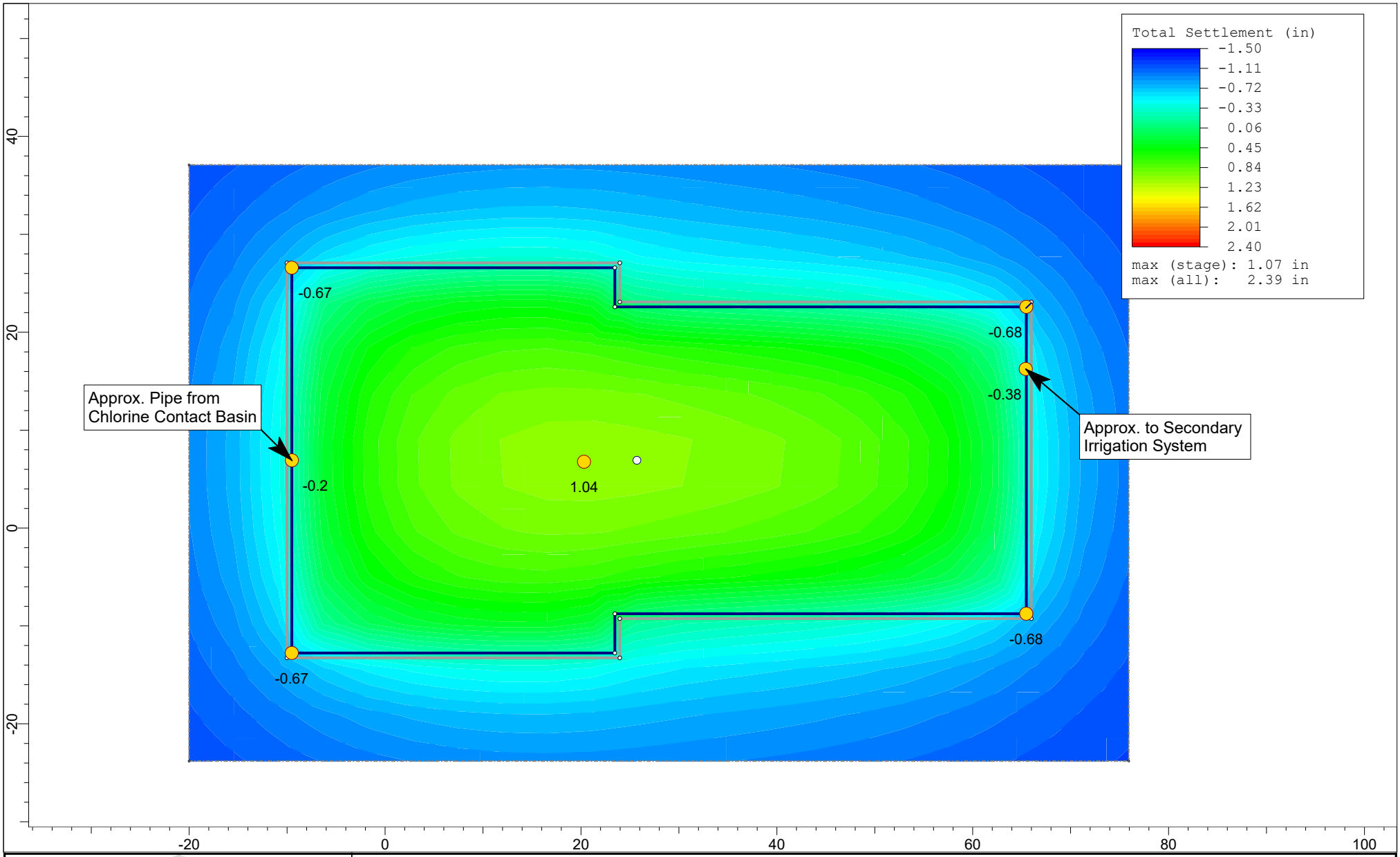
Layer #	Depth to Midlayer (ft)	qc tsf	fs tsf	γ pcf	Thickness (ft)	Depth to Bottom (ft)	W %	Fines %	LL	% clay	Screening	* σ_{vo} tsf	** σ'_{vo} tsf	σ'_{vo} kPa	* σ_{vo} kPa	** σ'_{vo} kPa	interpreted qc tsf	qc kPa	Thin-Layer Correction q_{cA}	K_H	fs kPa	F	Q	n	Ic criteria by iteration 1st	2nd	3rd	4th	Ic	overburd. correction Cq <=1.7	clean sand correction q_{cIN}	Kc	$(q_{c1N})cs$	$CRR_{7.5}$	r_d	PSHA CSR	PSHA FS	Settlement Y&I	total	T&S	total	Pradel
243	19.93086	95.1	0.70	120	0.08	19.97						1.197	0.575	0.744	114.6	55.1	71.2	130.0	9,110	117.27	1.11	67	0.745	108.4	0.549	1.805	1.803	1.803	1.803	1.803	1.21	149.1	1.11	165.4	0.501	0.954	0.6801	0.95	0.006	0.159	0.007	0.116	0.000
244	20.01288	104.4	0.67	120	0.08	20.05						1.202	0.577	0.746	115.1	55.3	71.4	130.0	9,996	117.27	1.11	64	0.650	118.1	0.529	1.740	1.738	1.738	1.738	1.738	1.20	147.9	1.06	157.3	0.442	0.953	0.6799	0.84	0.009	0.154	0.008	0.109	0.000
245	20.0549	112.9	0.63	120	0.08	20.14						1.207	0.580	0.748	115.6	55.5	71.6	130.0	10,810	117.27	1.11	60	0.561	126.8	0.511	1.677	1.676	1.676	1.676	1.676	1.19	146.7	1.02	149.8	0.392	0.953	0.6798	0.74	0.010	0.145	0.010	0.101	0.000
246	20.17692	115.7	0.61	120	0.08	20.22						1.212	0.582	0.751	116.0	55.7	71.9	130.0	11,075	117.27	1.11	49	0.447	128.9	0.500	1.614	1.614	1.614	1.614	1.614	1.19	145.9	1.00	145.9	0.369	0.953	0.6797	0.70	0.016	0.135	0.010	0.091	0.000
247	20.25894	115.6	0.51	120	0.08	20.30						1.217	0.584	0.753	116.5	56.0	72.1	130.0	11,073	117.27	1.11	49	0.448	128.7	0.500	1.615	1.615	1.615	1.615	1.615	1.19	145.6	1.00	145.6	0.367	0.953	0.6795	0.70	0.016	0.119	0.010	0.081	0.000
248	20.34096	116.1	0.63	120	0.08	20.38						1.222	0.587	0.755	117.0	56.2	72.3	130.0	11,118	117.27	1.11	61	0.550	129.6	0.507	1.664	1.663	1.663	1.663	1.663	1.19	145.8	1.01	147.6	0.379	0.953	0.6794	0.72	0.010	0.103	0.010	0.071	0.000
249	20.42298	117.3	0.64	120	0.08	20.46						1.227	0.589	0.758	117.5	56.4	72.6	130.0	11,230	117.27	1.11	42	0.375	129.6	0.500	1.570	1.570	1.570	1.570	1.570	1.18	145.2	1.00	145.2	0.365	0.952	0.6793	0.69	0.016	0.094	0.010	0.062	0.000
250	20.505	115.0	0.35	120	0.08	20.55						1.232	0.591	0.760	117.9	56.6	72.8	130.0	11,009	117.27	1.11	33	0.306	126.4	0.500	1.536	1.536	1.536	1.536	1.536	1.18	145.0	1.00	145.0	0.363	0.952	0.6791	0.69	0.016	0.078	0.010	0.052	0.000
251	20.58702	110.1	0.33	120	0.08	20.63						1.236	0.594	0.762	118.4	56.9	73.0	130.0	10,543	117.27	1.11	31	0.301	121.0	0.500	1.550	1.550	1.550	1.550	1.550	1.18	144.7	1.00	144.7	0.362	0.952	0.6790	0.69	0.016	0.062	0.010	0.042	0.000
252	20.66904	96.9	0.31	120	0.08	20.71						1.241	0.597	0.765	118.9	57.1	73.2	130.0	9,565	117.27	1.11	30	0.316	110.0	0.500	1.599	1.599	1.599	1.599	1.599	1.18	144.5	1.00	144.5	0.361	0.952	0.6789	0.69	0.016	0.046	0.010	0.032	0.000
253	20.75106	89.7	0.36	120	0.08	20.79						1.246	0.599	0.767	119.3	57.3	73.5	130.0	8,586	117.27	1.11	34	0.406	99.2	0.515	1.692	1.690	1.690	1.690	1.690	1.18	145.0	1.00	145.0	0.364	0.952	0.6787	0.69	0.016	0.031	0.010	0.022	0.000
254	20.83308	81.7	0.44	120	0.08	20.87						1.251	0.601	0.769	119.8	57.5	73.7	130.0	7,824	117.27	1.11	42	0.541	91.0	0.544	1.788	1.786	1.787	1.787	1.787	1.19	146.1	1.10	160.3	0.463	0.951	0.6786	0.88	0.009	0.015	0.007	0.012	0.000
255	20.9151	71.3	0.54	120	0.08	20.96						1.256	0.604	0.772	120.3	57.8	73.9	130.0	6,823	117.27	1.11	52	0.774	80.0	0.584	1.921	1.920	1.920	1.920	1.920	1.20	147.7	1.21	178.5	0.608	0.951	0.6785	1.16	0.006	0.005	0.005	0.005	0.000
256	20.99712	60.1	0.62	120	0.08	21.04						1.261	0.606	0.774	120.8	58.0	74.1	130.0	5,759	117.27	1.11	59	1.048	68.0	0.624	2.056	2.054	2.054	2.054	2.054	1.22	149.3	1.38	205.8	0.890	0.951	0.6783	>1.4	0.000	0.000	0.000	0.000	0.000
257	21.07914	48.0	0.65	120	0.08	21.12						1.266	0.608	0.777	121.2	58.2	74.4	130.0	4,600	117.27	1.11	62	1.392	54.6	0.669	2.206	2.205	2.205	2.205	2.205	1.23	151.1	1.68	253.7	1.599	0.951	0.6782	>1.4	0.000	0.000	0.000	0.000	0.000
258	21.16116	36.0	0.69	120	0.08	21.20						1.271	0.610	0.779	121.7	58.4	74.6	130.0	3,444	117.27	1.11	57	1.712	41.0	0.716	2.359	2.358	2.358	2.358	2.358	1.25	153.0	2.15	329.0	3.393	0.951	0.6781	>1.4	0.000	0.000	0.000	0.000	0.000
259	21.24318	28.8	0.53	120	0.08	21.28						1.276	0.613	0.781	122.2	58.7	74.8	130.0	2,762	117.27	1.11	51	1.930	32.8	0.748	2.468	2.467	2.467	2.467	2.467	1.25	154.2	2.61	401.9	6.116	0.950	0.6779	>1.4	0.000	0.000	0.000	0.000	0.000
260	21.3252	25.8	0.42	120	0.08	21.37						1.281	0.615	0.784	122.6	58.9	75.0	130.0	2,474	117.27	1.11	40	1.702	29.2	0.750	2.476	2.475	2.475	2.475	2.475	1.25	153.9	2.64	407.1	6.357	0.950	0.6778	>1.4	0.000	0.000	0.000	0.000	0.000
261	21.40722	22.1	0.31	120	0.08	21.45						1.286	0.617	0.786	123.1	59.1	75.3	130.0	2,112	117.27	1.11	29	1.478	24.7	0.758	2.500	2.500	2.500	2.500	2.500	1.25	153.9	2.77	425.8	7.262	0.950	0.6777	>1.4	0.000	0.000	0.000	0.000	0.000
262	21.48924	17.9	0.25	120	0.08	21.53						1.291	0.620	0.788	123.6	59.4	75.5	130.0	1,715	117.27	1.11	24	1.528	19.8	0.784	2.587	2.587	2.587	2.587	2.587	1.26	154.8	3.25	502.5	11.879	0.950	0.6775	>1.4	0.000	0.000	0.000	0.000	0.000
263	21.57126	15.1	0.21	120	0.08	21.61					Ic>2.6	1.296	0.622	0.791	124.1	59.6	75.7	15.1	1,450			20	1.546	16.6	0.805	2.656	2.655	2.655	2.655	2.655	1.26	18.1	3.68	66.6	0.107	0.950	0.6774	*******	0.000	0.000	0.000	0.000	0.000
264	21.65328	14.7	0.16	120	0.08	21.69					Ic>2.6	1.300	0.625	0.793	124.5	59.8	75.9	14.7	1,411			15	1.154	16.0	0.789	2.605	2.604	2.604	2.604	2.604	1.26	17.5	3.35	58.6	0.099	0.950	0.6773	*******	0.000	0.000	0.000	0.000	0.000
265	21.7353	14.8	0.17	120	0.08	21.78					Ic>2.6	1.305	0.627	0.795	125.0	60.0	76.2	14.8	1,414			16	1.263	16.0	0.795	2.623	2.623	2.623	2.623	2.623	1.25	17.5	3.47	60.7	0.101	0.949	0.6771	*******	0.000	0.000	0.000	0.000	0.000
266	21.81732	14.6	0.19	120	0.08	21.86					Ic>2.6	1.310	0.629	0.798	125.5	60.3	76.4	14.6	1,398			18	1.392	15.8	0.803	2.650	2.649	2.649	2.649	2.649	1.25	17.3	3.64	63.0	0.103	0.949	0.6770	*******	0.000	0.000	0.000	0.000	0.000
267	21.89934	15.0	0.22	120	0.08	21.94					Ic>2.6	1.315	0.632	0.800	125.9	60.5	76.6	15.0	1,434			21	1.597	16.2	0.809	2.671	2.671	2.671	2.671	2.671	1.25	17.7	3.79	67.2	0.108	0.949	0.6769	*******	0.000	0.000	0.000	0.000	0.000
268	21.98136	15.1	0.22	120	0.08	22.02					Ic>2.6	1.320	0.634	0.803	126.4	60.7	76.8	15.1	1,441			21	1.595	16.3	0.809	2.670	2.669	2.669	2.669	2.669	1.25	17.8	3.78	67.2	0.108	0.949	0.6767	*******	0.000	0.000	0.000	0.000	0.000
269	22.06338	14.4	0.24	120	0.08	22.10					Ic>2.6	1.325	0.636	0.805	126.9	60.9	77.1	14.4	1,376			23	1.801	15.5	0.823	2.717	2.716	2.716	2.716	2.716	1.25	17.0	4.11	70.0	0.112	0.949	0.6766	*******	0.000	0.000	0.000	0.000	0.000
270	22.1454	13.6	0.26	120	0.08	22.19					Ic>2.6	1.330	0.639	0.807	127.4	61.2	77.3	13.6	1,299			25	2.149	14.6	0.842	2.781	2.780	2.780	2.780	2.780	1.26	16.1	4.62	74.4	0.119	0.948	0.6765	*******	0.000	0.000	0.000	0.000	0.000
271	22.22742	13.2	0.28	120	0.08	22.27					Ic>2.6	1.335	0.641	0.810	127.8	61.4	77.5	13.2	1,265			25	2.198	14.1	0.847	2.798	2.797	2.797	2.797	2.797	1.25	15.7	4.76	74.6	0.119	0.948	0.6763	*******	0.000	0.000	0.000	0.000	0.000
272	22.30944	13.2	0.25	120	0.08	22.35					Ic>2.6	1.340	0.643	0.812	128.3	61.6	77.8	13.2	1,261			24	2.139	14.0	0.846	2.793	2.793	2.793	2.793	2.793	1.25	15.6	4.73	73.6	0.117	0.948	0.6762	*******	0.000	0.000	0.000	0.000	0.000
273	22.39146	12.8	0.27	120	0.08	22.43					Ic>2.6	1.345	0.646	0.814	128.8	61.8	78.0	12.8	1,224			25	2.317	13.5	0.855	2.825	2.825	2.825	2.825	2.825	1.25	15.1	5.00	75.5	0.120	0.948	0.6761	*******	0.000	0.000	0.000	0.000	0.000
274	22.47348	13.0	0.26	120	0.08	22.51					Ic>2.6	1.350	0.648	0.817	129.2	62.1	78.2	13.0	1,247			25	2.211	13.8	0.850	2.808	2.807	2.807	2.807	2.807	1.25	15.3	4.85	74.3	0.118	0.948	0.6759	*******	0.000	0.000	0.000	0.000	0.000
275	22.5555	13.5	0.27	120	0.08	22.60					Ic>2.6	1.355	0.650	0.819	129.7	62.3	78.4	13.5	1,288			26	2.216	14.2	0.847	2.797	2.796	2.796	2.796	2.796	1.24	15.8	4.75	75.0	0.119	0.947	0.6758	*******	0.000	0.000	0.000	0.000	0.000
276	22.63752	14.5	0.29	120	0.08	22.68					Ic>2.6	1.359	0.653	0.821	130.2	62.5	78.7	14.5	1,385			27	2.183	15.3	0.838	2.766	2.766	2.766	2.766	2.766	1.24	16.9	4.50	76.0	0.121	0.947	0.6757	*******	0.000	0.000	0.000	0.000	0.000
277	22.71954	15.4	0.32	120	0.08	22.76					Ic>2.6	1.364	0.655	0.824	130.7	62.7	78.9	15.4	1,475			31	2.287	16.4	0.834	2.754	2.754	2.754	2.754	2.754	1.23	17.9	4.40	79.0	0.126	0.947	0.6755	*******	0.000	0.000	0.000	0.000	0.000
278	22.80156	15.6	0.36	120	0.08	22.84					Ic>2.6	1.369	0.658	0.826	131.1	63.0	79.1	15.6	1,491			35	2.556	16.6	0.841	2.778	2.778	2.778	2.778	2.778	1.23	18.1	4.60	83.3	0.134	0.947	0.6754	*******	0.000	0.000	0.000	0.000	0.000
279	22.88358	14.5	0.39	120	0.08	22.92					Ic>2.6	1.374	0.660	0.828	131.6	63.2	79.3	14.5	1,391			37	2.957	15.4	0.860	2.841	2.841	2.841	2.841	2.841	1.23	16.9	5.14	87.2	0.142	0.947	0.6753	*******	0.000	0.000	0.000	0.000	0.000
280	22.9695	13.2	0.38	120	0.08	23.01					Ic>2.6	1.379	0.662	0.831	132.1	63.4	79.5	13.2	1,263			36	3.217	13.8	0.878	2.900	2.900	2.900	2.900	2.900	1.24	15.4	5.70	87.8	0.143	0.946	0.6751	*******	0.000	0.000	0.000	0.000	0.000
281	23.04762	12.7	0.37	120	0.08	23.09					Ic>2.6	1.384	0.665	0.833	132.5	63.6	79.8	12.7	1,170			36	3.451	12.7	0.892	2.948	2.948	2.948	2.948	2.948	1.24	14.3	6.18	88.4	0.144	0.946	0.6750	*******	0.000	0.000	0.000	0.000	0.000
282	23.12964	11.2	0.36	120	0.08	23.17					Ic>2.6	1.389	0.667	0.836	133.0	63.9	80.0	11.2	1,075			34	3.607	11.5	0.906	2.993	2.993	2.993	2.993	2.993	1.24	13.1	6.66	87.6	0.143	0.946	0.6749	*******	0.000	0.000	0.000	0.000	0.000
283	23.21166	10.8	0.29	120	0.08	23.25					Ic>2.6	1.394	0.669	0.838	133.5	64.1	80.2	10.8	1,031			28	3.072	10.9	0.899	2.971	2.971	2.971	2.971	2.971	1.23	12.6	6.42	80.6	0.129	0.946	0.6747	*******	0.000	0.000	0.000	0.000	0.000
284	23.29368	11.0	0.34	120	0.08	23.33					Ic>2.6	1.399	0.672	0.840	134.0	64.3	80.5	11.0	1,050			23	2.552	11.1	0.884	2.920	2.920	2.920	2.920	2.920	1.23	12.7	5.90	74.9	0.119	0.946	0.6746	*******	0.000	0.000	0.000	0.000	0.000
285	23.3757	13.9	0.33	120	0.08	23.42					Ic>2.6	1.404	0.674	0.843	134.4	64.6	80.7	13.9	1,334			32	2.650	14.4	0.859	2.836	2.836	2.836	2.836	2.836	1.22	16.0	5.10	81.6	0.130	0.945	0.6745	*******	0.000	0.000	0.000	0.000	0.000
286	23.45772	30.1	0.50	120	0.08	23.50						1.409	0.676	0.845	134.9	64.8	80.9	174.9	2,883	123.01	1.42	48	1.735	32.2	0.742	2.446	2.446	2.446	2.446	2.446	1.18	195.3	2.51	490.0	11.019	0.945	0.6743	>1.4	0.000	0.000	0.000	0.000	0.000
287	23.53974	55.7	0.63	120	0.08	23.58						1.414	0.679	0.847	135.4	65.0	81.1	174.9	5,337	123.01	1.42	61	1.167	39.5	0.687	2.129	2.129	2.129	2.129	2.129	1.19	190.8	1.51	287.9	2.298	0.945	0.6742	>1.4	0.000	0.000	0.000	0.000	0.000
288	23.62176	83.7	0.71	120	0.08	23.66						1.419	0.681	0.850	135.8	65.2	81.4	174.9	8,012	123.01	1.42	68	0.858	88.8	0.581	1.910	1.910	1.910	1.910	1.910	1.14	187.7	1.20	224.9	1.138	0.945	0.6741	>1.4	0.000	0.000	0.000	0.000	0.000
289	23.70378	102.8	0.72	120	0.08	23.74						1.423	0.684	0.852	136.3	65.5	81.6	174.9	9,840	123.01	1.42	69	0.713	108.4	0.546	1.793	1.792	1.792	1.792	1.792	1.13	186.0	1.10	204.7	0.878	0.945	0.6739	>1.4	0.000	0.000	0.000	0.000	0.000
290	23.7858	114.8	0.73	120	0.08	23.83						1.428	0.686	0.854	136.8	65.7	81.8	174.9	10,992	123.01	1.42	70	0.643	120.7	0.568	1.728	1.728	1.728	1.728	1.728	1.12	184.9	1.06	195.4	0.774	0.945	0.6738	>1.4	0.000	0.000	0.000	0.000	0.000
291	23.86782	120.0	0.75	120	0.08	23.91						1.433	0.688	0.857	137.3	65.9	82.0	174.9	11,494	123.01	1.42	72	0.632	125.9	0.521	1.709	1.709	1.709	1.709	1.709	1.12	184.5	1.04	192.5	0.743	0.944	0.6737	>1.4	0.000	0.000	0.000	0.000	0.000
292	23.94984	121.5	0.71	120	0.08	23.99					Too Thin	1.438	0.691	0.859	137.7	66.1	82.3	174.9	11,637	123.01	1.42	68	0.595	127.1	0.515	1.690	1.689	1.689	1.689	1.689	1.11	184.0	1.03	189.6	0.714	0.944	0.6735	*******	0.000	0.000	0.000	0.000	0.000
293	24.03186	123.0	0.67	120	0.08	24.07					Too Thin	1.443	0.693	0.862	138.2	66.4	82.5	174.9	11,779	123.01	1.42	64	0.552	128.4	0.508	1.668	1.667	1.667	1.667	1.667	1.11	183.5	1.02	186.3	0.681	0.944	0.6734	*******	0.000	0.000	0.000	0.000	0.000
294	24.11388	121.9	0.66	120	0.08	24.15					Too Thin	1.448	0.695	0.864	138.7	66.6	82.7	174.9	11,674	123.01	1.42	63	0.549	127.0	0.508	1.670	1.669	1.669	1.669	1.669	1.11	183.2	1.02	186.3	0.682	0.944	0.6733	*******	0.000	0.000	0.000	0.000	0.000
295	24.1959	117.3	0.77	120	0.08	24.24						1.453	0.698	0.866	139.1	66.8	83.0	174.9	11,236	123.01	1.42	73	0.660	122.4	0.527	1.730	1.729	1.729	1.729	1.729	1.11	183.6	1.06	194.2	0.761	0.943	0.6731	>1.4	0.000	0.000	0.000	0.000	0.000
296	24.27792	109.1	0.94	120	0.08	24.32						1.458	0.700	0.869	139.6	67.0	83.2	174.9	10,443	123.01	1.42	90	0.872	114.1	0.556	1.829	1.828	1.828	1.828	1.828	1.12	184.4	1.13	208.0	0.917	0.943	0.6730	>1.4	0.000	0.000	0.000	0.000	0.000
297	24.35994	94.2	1.12	120	0.08	24.40						1.463	0.702	0.871	140.1	67.3	83.4	174.9	9,019	123.01	1.42	107	1.205	96.0	0.598	1.967	1.966	1.966	1.966	1.966	1.12	185.7	1.26	233.6	1.266	0.943	0.6728	>1.4	0.000	0.000	0.000	0.000	0.000
298	24.44196	81.2	1.33	120	0.08	24.48						1.468	0.705	0.873	140.6	67.5	83.6	174.9	7,775	123.01	1.42	127	1.665	85.6	0.640	2.108	2.107	2.107	2.107	2.107	1.13	186.9	1.47	274.4	2.002	0.943	0.6727	>1.4	0.000	0.000	0.000	0.000	0.000
299	24.52398	76.2	1.41	120	0.08	24.56						1.473	0.707	0.876	141.0	67.7	83.9	174.9	7,298	123.01	1.42	135	1.881	80.3	0.657	2.164	2.164	2.164	2.164	2.164	1.13	187.2	1.58	296.3	2.498	0.943	0.6726	>1.4	0.000	0.000	0.000	0.000	0.000
300	24.6	70.3	1.37	120	0.08	24.65						1.478	0.710	0.878	141.5	67.9	84.1	174.9	6,732	123.01	1.42	135	2.050	74.1	0.703	2.216	2.215	2.215	2.215	2.215	1.13	187.4	1.71	319.5	3.113	0.943	0.6724	>1.4	0.000	0.000	0.000	0.000	0.000
301	24.68802	67.8	1.41	120	0.08	24.73						1.483	0.712	0.880	142.0	68.2	84.3	157.7	6,470	100.89	1.56	135	2.135	71.1	0.680	2.241	2.241	2.241	2.241	2.241	1.13	168.9	1.77	299.2	2.572	0.942	0.6723	>1.4	0.000	0.000	0.000	0.000	0.000
302	24.77004	75.0	1.30	120	0.08	24.81						1.487	0.714	0.883	142.4	68.4	84.5	157.7	7,185	100.89	1.56	125	1.773	78.6	0.654	2.154	2.153	2.153	2.153	2.153	1.13	167.8	1.56	261.7	1.746	0.942	0.6722	>1.4	0.000	0.000	0.000	0.000	0.000
303	24.85206	64.8	1.09	120	0.08	24.89						1.492	0.717	0.885	142.9	68.6	84.8	157.7	9,073	100.89	1.56	104	1.166	98.5	0.595	1.958	1.958	1.958	1.958	1.958	1.11	165.7	1.25	207.0	0.905	0.942	0.6720	>1.4	0.000	0.000	0.000	0.000	0.000
304	24.93408	100.9	1.03	120	0.08	24.98						1.497	0.719	0.888	143.4	68.8	85.0	157.7	9,861	100.89	1.56	89	0.936	104.4	0.571	1.878	1.877	1.877	1.877	1.877	1.11	164.8	1.17	192.5	0.743	0.942	0.6719	>1.4	0.000	0.000	0.000	0.000	0.000
305	25.0161	64.7	0.76	120	0.08	25.06					Too Thin	1.502	0.721	0.890	143.9	69.1	85.2	157.7	9,068	100.89	1.56	73	0.816	97.7	0.567	1.863	1.863	1.863	1.863	1.863	1.10	164.4	1.16	190.0	0.718	0.942	0.6718	*******	0.000	0.000	0.000	0.000	0.000
306	25.09812	88.0	0.68	120	0.08	25.14						1.507	0.724	0.892	144.3	69.3	85.4	157.7	8,423	100.89	1.56	65	0.788	90.6	0.572	1.881	1.880	1.880	1.880	1.880	1.10	164.3	1.17	192.3	0.742	0.941	0.6716	>1.4	0.000	0.000	0.000	0.000	0.000
307	25.18014	73.6	0.76	120	0.08	25.22						1.512	0.726	0.895	144.8	69.5	85.7	157.7	7,049	100.89	1.56	72	1.042	79.5	0.612	2.015	2.015	2.015	2.015	2.015	1.11	165.2	1.32	218.0	1.043	0.941	0.6715	>1.4	0.000	0.000	0.000	0.000	0.000
308	25.26216	54.4	0.74	120	0.08	25.30						1.517	0.728	0.897	145.3	69.8	85.9	157.7	5,206	100.89	1.56	71	1.408	56.0	0.668	2.200	2.199	2.199	2.199	2.199	1.12	166.4	1.67	277.1	2.058	0.941	0.6714	>1.4	0.000	0

Layer #	Depth to Midlayer (ft)	qc tsf	fs tsf	γ pcf	Thickness (ft)	Depth to Bottom (ft)	W %	Fines %	LL	% clay	Screening	σ'vo tsf	* σ'vo tsf	** σ'vo tsf	σ'vo kPa	* σ'vo kPa	** σ'vo kPa	interpreted qc tsf	qc kPa	Thin-Layer Correction q_{CA}	K_H	fs kPa	F	Q	n	lc criteria by iteration lc 1st	lc 2nd	lc 3rd	lc 4th	lc	Cq <=1.7	overburd. correction q_{1N}	clean sand correction Kc	$(q_{1N})_{CS}$	$CRR_{7.5}$	r_d	PSHA CSR	PSHA FS	Settlement Y&I	(inches) total	T&S	total	Pradel
378	31.00356	31.7	0.53	120	0.08	31.04	31.00	85.00	42.00	22.00	Screens Out	1.861	0.894	1.062	178.3	85.6	101.7	31.7	3,032			51	1.785	28.2	0.758	2.499	2.499	2.499	2.499	2.499	1.00	29.8	2.77	82.5	0.132	0.922	0.6576	********	0.000	0.000	0.000	0.000	0.000
379	31.08558	33.5	0.67	120	0.08	31.13	31.00	85.00	42.00	22.00	Screens Out	1.866	0.896	1.065	178.7	85.8	101.9	33.5	3,205			65	2.133	29.8	0.766	2.526	2.526	2.526	2.526	2.526	1.00	31.5	2.90	91.4	0.151	0.921	0.6572	********	0.000	0.000	0.000	0.000	0.000
380	31.1675	36.9	0.80	120	0.08	31.21	31.00	85.00	42.00	22.00	Screens Out	1.871	0.898	1.067	179.2	86.0	102.2	36.9	3,533			77	2.293	33.0	0.761	2.511	2.511	2.511	2.511	2.511	0.99	34.6	2.83	97.9	0.167	0.920	0.6567	********	0.000	0.000	0.000	0.000	0.000
381	31.24662	37.8	0.84	120	0.08	31.29	31.00	85.00	42.00	22.00	Screens Out	1.876	0.901	1.069	179.7	86.3	102.4	37.8	3,624			83	2.400	33.8	0.763	2.515	2.515	2.515	2.515	2.515	0.99	35.5	2.85	101.0	0.176	0.920	0.6562	********	0.000	0.000	0.000	0.000	0.000
382	31.33164	34.0	0.93	120	0.08	31.37	31.00	85.00	42.00	22.00	lc>2.6	1.881	0.903	1.072	180.1	86.5	102.6	34.0	3,257			89	2.879	30.1	0.789	2.604	2.604	2.604	2.604	2.604	0.99	31.8	3.35	106.7	0.193	0.919	0.6557	********	0.000	0.000	0.000	0.000	0.000
383	31.41366	31.2	0.91	120	0.08	31.45	31.00	85.00	42.00	22.00	lc>2.6	1.886	0.905	1.074	180.6	86.7	102.8	31.2	2,991			87	3.084	27.5	0.804	2.655	2.655	2.655	2.655	2.655	0.99	29.2	3.68	107.2	0.195	0.918	0.6553	********	0.000	0.000	0.000	0.000	0.000
384	31.49568	27.2	0.84	120	0.08	31.54	31.00	85.00	42.00	22.00	lc>2.6	1.891	0.908	1.076	181.1	86.9	103.1	27.2	2,600			81	3.330	23.6	0.826	2.727	2.727	2.727	2.727	2.727	0.99	25.3	4.19	106.1	0.191	0.918	0.6548	********	0.000	0.000	0.000	0.000	0.000
385	31.5777	24.0	0.70	120	0.08	31.62	31.00	85.00	42.00	22.00	lc>2.6	1.896	0.910	1.079	181.6	87.2	103.3	24.0	2,295			67	3.167	20.6	0.836	2.759	2.759	2.759	2.759	2.759	0.98	22.3	4.45	99.1	0.171	0.917	0.6543	********	0.000	0.000	0.000	0.000	0.000
386	31.65972	21.1	0.59	120	0.08	31.70	31.00	85.00	42.00	22.00	lc>2.6	1.901	0.913	1.081	182.0	87.4	103.5	21.1	2,022			57	3.085	17.9	0.848	2.800	2.800	2.800	2.800	2.800	0.98	19.6	4.79	93.8	0.157	0.916	0.6538	********	0.000	0.000	0.000	0.000	0.000
387	31.74174	18.4	0.51	120	0.08	31.78	31.00	85.00	42.00	22.00	lc>2.6	1.906	0.915	1.083	182.5	87.6	103.8	18.4	1,761			49	3.094	15.3	0.864	2.855	2.855	2.855	2.855	2.855	0.98	17.0	5.27	89.7	0.147	0.916	0.6534	********	0.000	0.000	0.000	0.000	0.000
388	31.82376	16.5	0.48	120	0.08	31.86	31.00	85.00	42.00	22.00	lc>2.6	1.911	0.917	1.086	183.0	87.8	104.0	16.5	1,575			46	3.281	13.5	0.882	2.915	2.915	2.915	2.915	2.915	0.98	15.2	5.84	88.8	0.145	0.915	0.6529	********	0.000	0.000	0.000	0.000	0.000
389	31.90578	15.4	0.37	120	0.08	31.95	31.00	85.00	42.00	22.00	lc>2.6	1.916	0.920	1.088	183.4	88.1	104.2	15.4	1,476			36	2.764	12.5	0.877	2.898	2.898	2.898	2.898	2.898	0.98	14.2	5.68	80.7	0.129	0.914	0.6524	********	0.000	0.000	0.000	0.000	0.000
390	31.9875	14.5	0.34	120	0.08	32.03	31.00	85.00	42.00	22.00	lc>2.6	1.920	0.922	1.091	183.9	88.3	104.4	14.5	1,391			32	2.688	11.6	0.883	2.916	2.916	2.916	2.916	2.916	0.97	13.4	5.86	79.3	0.125	0.914	0.6519	********	0.000	0.000	0.000	0.000	0.000
391	32.09862	14.2	0.30	120	0.08	32.11	31.00	85.00	42.00	22.00	lc>2.6	1.925	0.924	1.093	184.4	88.5	104.7	14.2	1,362			29	2.432	11.3	0.878	2.901	2.901	2.901	2.901	2.901	0.97	13.1	5.71	74.6	0.119	0.913	0.6515	********	0.000	0.000	0.000	0.000	0.000
392	32.15184	14.0	0.26	120	0.08	32.19	31.00	85.00	42.00	22.00	lc>2.6	1.930	0.927	1.095	184.8	88.7	104.9	14.0	1,338			25	2.160	11.1	0.872	2.881	2.881	2.881	2.881	2.881	0.97	12.8	5.52	70.7	0.113	0.912	0.6510	********	0.000	0.000	0.000	0.000	0.000
393	32.23386	13.6	0.26	120	0.08	32.27	31.00	85.00	42.00	22.00	lc>2.6	1.935	0.929	1.098	185.3	89.0	105.1	13.6	1,303			25	2.224	10.7	0.879	2.903	2.903	2.903	2.903	2.903	0.97	12.5	5.72	71.3	0.114	0.912	0.6505	********	0.000	0.000	0.000	0.000	0.000
394	32.31588	13.3	0.25	120	0.08	32.36	31.00	85.00	42.00	22.00	lc>2.6	1.940	0.931	1.100	185.8	89.2	105.3	13.3	1,276			24	2.214	10.4	0.881	2.910	2.909	2.909	2.909	2.909	0.97	12.2	5.79	70.5	0.113	0.911	0.6500	********	0.000	0.000	0.000	0.000	0.000
395	32.3979	13.0	0.25	120	0.08	32.44	31.00	85.00	42.00	22.00	lc>2.6	1.945	0.934	1.102	186.3	89.4	105.6	13.0	1,247			23	2.212	10.1	0.884	2.920	2.920	2.920	2.920	2.920	0.96	11.9	5.90	70.0	0.112	0.910	0.6496	********	0.000	0.000	0.000	0.000	0.000
396	32.47992	13.2	0.25	120	0.08	32.52	31.00	85.00	42.00	22.00	lc>2.6	1.950	0.936	1.105	186.7	89.6	105.8	13.2	1,267			24	2.216	10.3	0.882	2.914	2.914	2.914	2.914	2.914	0.96	12.0	5.84	70.3	0.112	0.910	0.6491	********	0.000	0.000	0.000	0.000	0.000
397	32.56194	13.4	0.28	120	0.08	32.60	31.00	85.00	42.00	22.00	lc>2.6	1.955	0.939	1.107	187.2	89.9	106.0	13.4	1,286			24	2.152	10.4	0.879	2.902	2.902	2.902	2.902	2.902	0.96	12.2	5.72	69.7	0.112	0.909	0.6486	********	0.000	0.000	0.000	0.000	0.000
398	32.64396	16.2	0.26	120	0.08	32.68	31.00	85.00	42.00	22.00	lc>2.6	1.960	0.941	1.109	187.7	90.1	106.2	16.2	1,547			25	1.859	12.9	0.845	2.790	2.790	2.790	2.790	2.790	0.96	14.7	4.70	68.9	0.110	0.908	0.6481	********	0.000	0.000	0.000	0.000	0.000
399	32.72598	20.5	0.31	120	0.08	32.77	31.00	85.00	42.00	22.00	lc>2.6	1.965	0.943	1.112	188.1	90.3	106.5	20.5	1,958			29	1.666	16.8	0.808	2.667	2.667	2.667	2.667	2.667	0.96	18.6	3.76	69.9	0.112	0.908	0.6477	********	0.000	0.000	0.000	0.000	0.000
400	32.808	23.8	0.34	120	0.08	32.85	31.00	85.00	42.00	22.00	Too Thin	1.970	0.946	1.114	188.6	90.6	106.7	23.8	2,277			32	1.545	19.9	0.785	2.589	2.589	2.589	2.589	2.589	0.96	21.6	3.26	70.4	0.112	0.907	0.6472	********	0.000	0.000	0.000	0.000	0.000
401	32.89002	24.6	0.38	120	0.08	32.93	31.00	85.00	42.00	22.00	Too Thin	1.975	0.948	1.117	189.1	90.8	106.9	24.6	2,359			37	1.686	20.6	0.787	2.597	2.597	2.597	2.597	2.597	0.96	22.3	3.31	73.8	0.117	0.906	0.6467	********	0.000	0.000	0.000	0.000	0.000
402	32.97204	24.6	0.43	120	0.08	33.01	31.00	85.00	42.00	22.00	lc>2.6	1.980	0.950	1.119	189.6	91.0	107.1	24.6	2,360			41	1.884	20.5	0.795	2.625	2.625	2.625	2.625	2.625	0.96	22.3	3.48	77.6	0.123	0.906	0.6462	********	0.000	0.000	0.000	0.000	0.000
403	33.05406	27.2	0.40	120	0.08	33.10	31.00	85.00	42.00	22.00	lc>2.6	1.984	0.953	1.121	190.0	91.2	107.4	23.7	2,269			43	2.082	19.6	0.808	2.666	2.666	2.666	2.666	2.666	0.95	21.4	3.76	80.2	0.128	0.905	0.6458	********	0.000	0.000	0.000	0.000	0.000
404	33.13608	22.2	0.48	120	0.08	33.18	31.00	85.00	42.00	22.00	lc>2.6	1.989	0.955	1.124	190.5	91.5	107.6	22.2	2,122			46	2.385	18.2	0.826	2.727	2.727	2.727	2.727	2.727	0.95	19.9	4.20	83.7	0.134	0.904	0.6453	********	0.000	0.000	0.000	0.000	0.000
405	33.2181	21.8	0.48	120	0.08	33.26	31.00	85.00	42.00	22.00	lc>2.6	1.994	0.957	1.126	191.0	91.7	107.8	21.8	2,090			46	2.425	17.8	0.829	2.738	2.738	2.738	2.738	2.738	0.95	19.6	4.28	83.9	0.135	0.904	0.6448	********	0.000	0.000	0.000	0.000	0.000
406	33.30012	22.8	0.48	120	0.08	33.34	31.00	85.00	42.00	22.00	lc>2.6	1.999	0.960	1.128	191.4	91.9	108.0	22.8	2,184			46	2.287	18.7	0.820	2.707	2.707	2.707	2.707	2.707	0.95	20.4	4.04	82.7	0.133	0.903	0.6443	********	0.000	0.000	0.000	0.000	0.000
407	33.38214	24.8	0.48	120	0.08	33.42	31.00	85.00	42.00	22.00	lc>2.6	2.004	0.962	1.131	191.9	92.1	108.3	24.8	2,374			46	2.098	20.5	0.804	2.653	2.653	2.653	2.653	2.653	0.95	22.2	3.67	81.4	0.130	0.902	0.6439	********	0.000	0.000	0.000	0.000	0.000
408	33.46416	26.3	0.52	120	0.08	33.51	31.00	85.00	42.00	22.00	lc>2.6	2.009	0.964	1.133	192.4	92.4	108.5	26.3	2,514			50	2.153	21.7	0.799	2.638	2.638	2.638	2.638	2.638	0.95	23.5	3.57	83.8	0.135	0.902	0.6434	********	0.000	0.000	0.000	0.000	0.000
409	33.54618	26.0	0.56	120	0.08	33.59	31.00	85.00	42.00	22.00	lc>2.6	2.014	0.967	1.135	192.9	92.6	108.7	26.0	2,677			53	2.139	23.3	0.792	2.613	2.613	2.613	2.613	2.613	0.95	25.0	3.41	85.1	0.137	0.901	0.6429	********	0.000	0.000	0.000	0.000	0.000
410	33.6282	30.3	0.67	120	0.08	33.67	31.00	85.00	42.00	22.00	lc>2.6	2.019	0.969	1.138	193.3	92.8	109.0	30.3	2,900			64	2.374	25.3	0.791	2.611	2.611	2.611	2.611	2.611	0.94	27.0	3.40	91.8	0.152	0.900	0.6424	********	0.000	0.000	0.000	0.000	0.000
411	33.71022	35.2	0.83	120	0.08	33.75	31.00	85.00	42.00	22.00	Screens Out	2.024	0.972	1.140	193.8	93.0	109.2	35.2	3,367			79	2.493	29.6	0.779	2.570	2.570	2.570	2.570	2.570	0.94	31.3	3.15	98.7	0.170	0.900	0.6420	********	0.000	0.000	0.000	0.000	0.000
412	33.79224	40.6	0.80	120	0.08	33.83	31.00	85.00	42.00	22.00	Screens Out	2.029	0.974	1.143	194.2	93.3	109.4	40.6	3,886			77	2.743	34.5	0.749	2.469	2.469	2.469	2.468	2.468	0.94	36.2	2.61	94.7	0.159	0.899	0.6415	********	0.000	0.000	0.000	0.000	0.000
413	33.87426	41.5	0.75	120	0.08	33.92	31.00	85.00	42.00	22.00	Screens Out	2.034	0.976	1.145	194.7	93.5	109.6	41.5	3,971			71	1.889	35.3	0.739	2.436	2.436	2.436	2.436	2.436	0.94	37.0	2.47	91.2	0.150	0.898	0.6410	********	0.000	0.000	0.000	0.000	0.000
414	33.95628	39.2	0.85	120	0.08	34.00	31.00	85.00	42.00	22.00	Screens Out	2.039	0.979	1.147	195.2	93.7	109.9	39.2	3,749			82	2.298	33.1	0.761	2.511	2.511	2.511	2.511	2.511	0.94	34.8	2.82	98.3	0.168	0.898	0.6405	********	0.000	0.000	0.000	0.000	0.000
415	34.0083	35.8	0.94	120	0.08	34.08	31.00	85.00	42.00	22.00	Screens Out	2.044	0.981	1.150	195.7	93.9	110.1	35.8	3,424			92	2.782	29.9	0.787	2.597	2.597	2.597	2.597	2.597	0.94	31.7	3.31	104.8	0.187	0.897	0.6400	********	0.000	0.000	0.000	0.000	0.000
416	34.12032	33.1	0.86	120	0.08	34.16	31.00	85.00	42.00	22.00	lc>2.6	2.048	0.983	1.152	196.2	94.2	110.3	33.1	3,173			95	3.014	27.5	0.807	2.663	2.663	2.663	2.663	2.663	0.93	29.2	3.74	109.2	0.201	0.896	0.6396	********	0.000	0.000	0.000	0.000	0.000
417	34.20234	30.5	0.90	120	0.08	34.24	31.00	85.00	42.00	22.00	lc>2.6	2.053	0.986	1.154	196.6	94.4	110.5	30.5	2,921			86	3.146	25.1	0.815	2.690	2.690	2.690	2.690	2.690	0.93	26.9	3.92	105.4	0.189	0.896	0.6391	********	0.000	0.000	0.000	0.000	0.000
418	34.28436	26.9	0.78	120	0.08	34.33	31.00	85.00	42.00	22.00	lc>2.6	2.058	0.988	1.157	197.1	94.6	110.8	26.9	2,578			74	3.121	21.9	0.828	2.734	2.734	2.734	2.734	2.734	0.93	23.6	4.25	100.5	0.174	0.895	0.6386	********	0.000	0.000	0.000	0.000	0.000
419	34.34638	24.6	0.70	120	0.08	34.41	31.00	85.00	42.00	22.00	lc>2.6	2.063	0.990	1.159	197.6	94.8	111.0	24.6	2,351			67	3.108	19.7	0.838	2.768	2.768	2.768	2.768	2.768	0.93	21.5	4.52	97.0	0.168	0.894	0.6381	********	0.000	0.000	0.000	0.000	0.000
420	34.4484	24.9	0.54	120	0.08	34.49	31.00	85.00	42.00	22.00	lc>2.6	2.068	0.993	1.161	198.0	95.1	111.2	24.9	2,388			52	2.352	20.1	0.815	2.689	2.689	2.689	2.689	2.689	0.93	21.8	3.91	85.5	0.138	0.894	0.6377	********	0.000	0.000	0.000	0.000	0.000
421	34.53042	23.5	0.48	120	0.08	34.57	31.00	85.00	42.00	22.00	lc>2.6	2.073	0.995	1.164	198.5	95.3	111.4	23.5	2,247			44	2.141	18.8	0.815	2.689	2.689	2.689	2.689	2.689	0.93	20.5	3.92	80.4	0.128	0.893	0.6372	********	0.000	0.000	0.000	0.000	0.000
422	34.61244	24.6	0.51	120	0.08	34.65	31.00	85.00	42.00	22.00	lc>2.6	2.078	0.998	1.166	199.0	95.5	111.7	24.6	1,974			36	2.059	19.1	0.826	2.728	2.728	2.728	2.728	2.728	0.92	18.0	4.21	75.6	0.120	0.892	0.6367	********	0.000	0.000	0.000	0.000	0.000
423	34.69446	20.3	0.31	120	0.08	34.74	31.00	85.00	42.00	22.00	lc>2.6	2.083	1.000	1.168	199.5	95.8	111.9	20.3	1,944			30	1.713	15.9	0.816	2.694	2.694	2.694	2.694	2.694	0.92	17.7	3.95	69.9	0.112	0.892	0.6362	********	0.000	0.000	0.000	0.000	0.000
424	34.77648	21.3	0.36	120	0.08	34.82	23.00	85.00	30.00	22.00	lc>2.6	2.088	1.002	1.171	199.9	96.0	112.1	21.3	2,036			34	1.862	16.7	0.817	2.696	2.696	2.696	2.696	2.696	0.92	18.5	3.97	73.4	0.117	0.891	0.6358	********	0.000	0.000	0.000	0.000	0.000
425	34.8585	22.8	0.42	120	0.08	34.90	23.00	85.00	30.00	22.00	lc>2.6	2.093	1.005	1.173	200.4	96.2	112.3	22.8	2,187			47	2.367	18.0	0.826	2.728	2.728	2.728	2.728	2.728	0.92	19.8	4.20	83.3	0.144	0.890	0.6353	********	0.000	0.000	0.000	0.000	0.000
426	34.94052	25.4	0.52	120	0.08	34.98	23.00	85.00	30.00	22.00	lc>2.6	2.098	1.007	1.176	200.9	96.4	112.6	25.4	2,428			50	2.235	20.2	0.810	2.673	2.673	2.673	2.673	2.673	0.92	23.0	3.80	83.7	0.135	0.890	0.6348	********	0.000	0.000	0.000	0.000	0.000
427	35.02254	25.8	0.60	120	0.08	35.06	23.00	85.00	30.00	22.00	lc>2.6	2.103	1.009	1.178	201.3	96.7	112.8	25.8	2,473			48	2.117	20.6	0.804	2.653	2.653	2.653	2.653	2.653	0.92	22.4	3.66	82.0	0.131	0.889	0.6343	********	0.000	0.000	0.000	0.000	0.000
428	35.10456	25.5	0.49	120	0.08	35.15	23.00	85.00	30.00	22.00	lc>2.6	2.108	1.012	1.180	201.8	96.9	113.0	25.5	2,441			46	2.070	20.3	0.804	2.653	2.653	2.653	2.653	2.653	0.92	22.1	3.66	80.8	0.129	0.888	0.6339	********	0.000	0.000	0.000	0.000	0.000
429	35.18658	23.8	0.47	120	0.08	35.23	23.00	85.00	30.00	22.00	lc>2.6	2.112	1.014	1.183	202.3	97.1	113.2	23.8	2,276			45	2.152	18.7	0.815	2.691	2.691	2.691	2.691	2.691	0.91	20.5	3.93	80.6	0.129	0.888	0.6334	********	0.000	0.000	0.000	0.000	0.000
430	35.2686	24.7	0.44	120	0.08	35.31	23.00	85.00	30.00	22.00	lc>2.6	2.117	1.016	1.185	202.8	97.3	113.5	24.7	2,364			42	1.940	19.5	0.803	2.650	2.650	2.650	2.650	2.650	0.91	21.3	3.65	77.7	0.124	0.887	0.6329	********	0.000	0.000	0.000	0.000	0.000
431	35.35082	25.6	0.43	120	0.08	35.39	23.00	85.00	30.00	22.00	lc>2.6	2.122	1.019	1.187	203.2	97.6	113.7	25.6	2,452			41	1.818	20.3	0.794	2.620	2.620	2.620	2.620	2.620	0.91	22.1	3.45	76.2	0.121	0.886	0.6324	********	0.000	0.000	0.000	0.000	0.000
432	35.43264	25.9	0.39	120	0.08	35.47	23.00	85.00	30.00	22.00	Too Thin	2.127	1.021	1.190	203.7	97.8	113.9	25.9	2,479			38	1.658	20.5	0.786	2.594	2.594	2.594	2.594	2.594	0.91	22.3	3.29	73.4	0.117	0.886	0.6320	********	0.000	0.000	0.000	0.000	0.000
433	35.51466	25.5	0.35	120	0.08	35.56	23.00	85.00	30.00	22.00	Too Thin	2.132	1.024	1.192	204.2	98.0	114.2	25.5	2,440			34	1.508	20.2	0.781	2.578	2.578	2.578	2.578	2.578	0.91	21.9	3.19	70.0	0.112	0.885	0.6315	********	0.000	0.000	0.000	0.000	0.000
434	35.59668	23.1	0.35	120	0.08	35.64	23.00	85.00	30.00	22.00	lc>2.6	2.137	1.026	1.194	204.6	98.2	114.4	23.1	2,213			34	1.688	18.0	0.802	2.645	2.645	2.645	2.645	2.645	0.91	19.8	3.61	71.6	0.114	0.884	0.6310	********	0.000	0.000	0.000	0.000	0.000
435	35.67867	23.7	0.34	120	0.08	35.72	23.00	85.00	30.00	22.00	lc>2.6	2.142	1.028	1.197	205.1	98.5	114.6	23.7	2,270			32	1.595	18.5	0.795	2.622	2.622	2.622	2.622	2.622	0.91	20.3	3.46	72.3	0.114	0.884	0.6305	********	0.000	0.000	0.000	0.000	0.000
436	35.76072	24.5	0.33	120	0.08	35.80	23.00	85.00	30.00	22.00	Too Thin	2.147	1.031	1.199	205.6	98.7	114.8	24.5	2,344			32	1.491	19.2	0.786	2.593	2.593	2.593	2.593	2.593	0.91	21.0	3.29	68.9	0.110	0.883	0.6301	********	0.000	0.000	0.000	0.000	0.000
437	35.84274	22.3	0.32	120	0.08	35.88	23.00	85.00	30.00	22.00	lc>2.6	2.152	1.033	1.202	206.1	98.9	115.1	22.3	2,135			31	1.588	17.2	0.802	2.647	2.647	2.647	2.647	2.647	0.90	19.0	3.63	69.0	0.111	0.882	0.6296	********	0.000	0.000	0.000	0.000	0.000
438	35.92476	19.1	0.25	120	0.08	35.97	23.00	85.00	30.00	22.00	lc>2.6	2.157	1.035	1.204	206.5	99.1	115.3	19.1	1,833			33	2.037	14.4	0.839	2.771	2.771	2.771	2.771	2.771	0.90	16.2	4.54	73.7	0.117	0.882	0.6291	********	0.000	0.000	0.000	0.000	0.000
439	36.00678	19.6	0.37	120	0.08	36.05	23.00	85.00	30.00	22.00	lc>2.6	2.162	1.038	1.206	207.0	99.4	115.5	19.6	1,874			35	2.120	14.8	0.840	2.772	2.772	2.772	2.772	2.772	0.90	16.6	4.55	75.4	0.120	0.881	0

Layer #	Depth to Midlayer (ft)	q_c tsf	f_s tsf	γ pcf	Thickness (ft)	Depth to Bottom (ft)	W %	Fines %	LL	% clay	Screening	σ_{vo} tsf	* σ'_{vo} tsf	** σ'_{vo} tsf	σ_{vo} kPa	* σ'_{vo} kPa	** σ'_{vo} kPa	interpreted q_c tsf	q_c kPa	Thin-Layer Correction q_{cA}	K_H	f_s kPa	F	Q	n	Ic criteria by iteration Ic 1st	Ic 2nd	Ic 3rd	Ic 4th	Ic	Cq <=1.7	overburd. corection q_{cIN}	clean sand correction $(q_{c1N})cs$	$CRR_{7.5}$	r_d	PSHA CSR	PSHA FS	Settlement Y&I	(inches) total	T&S	total	Pradel
513	42.07626	19.0	0.71	120	0.08	42.12	23.00	90.00	27.00	26.00	Ic>2.6	2.526	1.212	1.381	241.9	116.1	132.2	19.0	1,818			68	4.306	12.2	0.914	3.020	3.019	3.019	3.019	3.019	0.78	14.1	6.96	98.0	0.167	0.832	0.5934	*******	0.000	0.000	0.000	0.000	0.000
514	42.15828	18.0	0.65	120	0.08	42.20	23.00	90.00	27.00	26.00	Ic>2.6	2.531	1.215	1.383	242.3	116.3	132.5	18.0	1,721			62	4.204	11.4	0.919	3.036	3.036	3.036	3.036	3.036	0.78	13.3	7.16	95.0	0.160	0.831	0.5930	*******	0.000	0.000	0.000	0.000	0.000
515	42.2483	19.7	0.66	120	0.08	42.28	23.00	90.00	27.00	26.00	Ic>2.6	2.536	1.217	1.386	242.8	116.6	132.7	19.7	1,886			63	3.828	12.7	0.900	2.974	2.974	2.974	2.974	2.974	0.78	14.6	6.46	94.3	0.158	0.830	0.5925	*******	0.000	0.000	0.000	0.000	0.000
516	42.32232	28.4	0.89	120	0.08	42.36	33.00	90.00	33.00	33.00	Ic>2.6	2.541	1.219	1.388	243.3	116.8	132.9	28.4	2,716			66	2.672	19.5	0.827	2.732	2.731	2.731	2.731	2.731	0.80	21.4	4.23	90.6	0.149	0.830	0.5920	*******	0.000	0.000	0.000	0.000	0.000
517	42.40434	39.1	0.77	120	0.08	42.45	33.00	90.00	33.00	33.00	Screens Out	2.545	1.222	1.390	243.8	117.0	133.1	39.1	3,743			74	2.118	28.1	0.772	2.546	2.545	2.545	2.545	2.545	0.81	29.9	3.01	90.0	0.148	0.829	0.5915	*******	0.000	0.000	0.000	0.000	0.000
518	42.48626	50.9	0.84	120	0.08	42.53	33.00	90.00	33.00	33.00	Screens Out	2.550	1.224	1.393	244.2	117.2	133.4	50.9	4,875			81	1.741	37.6	0.726	2.394	2.393	2.393	2.393	2.393	0.82	39.4	2.28	90.0	0.148	0.828	0.5911	*******	0.000	0.000	0.000	0.000	0.000
519	42.56838	57.3	0.75	120	0.08	42.61	33.00	90.00	33.00	33.00	Screens Out	2.555	1.227	1.395	244.7	117.5	133.6	57.3	5,487			72	1.365	42.9	0.693	2.284	2.283	2.283	2.283	2.283	0.83	44.7	1.90	84.8	0.137	0.828	0.5906	*******	0.000	0.000	0.000	0.000	0.000
520	42.6504	60.0	0.56	120	0.08	42.69	33.00	90.00	33.00	33.00	Screens Out	2.560	1.229	1.397	245.2	117.7	133.8	60.0	5,741			54	0.981	45.3	0.662	2.182	2.181	2.181	2.181	2.181	0.83	47.1	1.62	76.4	0.122	0.827	0.5901	*******	0.000	0.000	0.000	0.000	0.000
521	42.73242	53.8	0.52	120	0.08	42.77	33.00	90.00	33.00	33.00	Screens Out	2.565	1.231	1.400	245.6	117.9	134.0	53.8	5,151			50	1.013	40.2	0.678	2.233	2.232	2.232	2.232	2.232	0.83	42.0	1.75	73.6	0.117	0.826	0.5896	*******	0.000	0.000	0.000	0.000	0.000
522	42.81444	46.2	0.52	120	0.08	42.86	33.00	90.00	33.00	33.00	Screens Out	2.570	1.234	1.402	246.1	118.1	134.3	46.2	4,425			49	1.182	33.9	0.707	2.332	2.331	2.331	2.331	2.331	0.82	35.8	2.05	73.4	0.117	0.826	0.5892	*******	0.000	0.000	0.000	0.000	0.000
523	42.89646	37.0	0.60	120	0.08	42.94	33.00	90.00	33.00	33.00	Screens Out	2.575	1.236	1.405	246.6	118.4	134.5	37.0	3,544			57	1.734	26.3	0.763	2.517	2.516	2.516	2.516	2.516	0.81	28.2	2.85	80.4	0.128	0.825	0.5887	*******	0.000	0.000	0.000	0.000	0.000
524	42.97848	29.4	0.63	120	0.08	43.02	33.00	90.00	33.00	33.00	Ic>2.6	2.580	1.238	1.407	247.1	118.6	134.7	29.4	2,819			60	2.349	20.2	0.814	2.687	2.687	2.687	2.687	2.687	0.79	22.1	3.90	86.1	0.139	0.824	0.5882	*******	0.000	0.000	0.000	0.000	0.000
525	43.0605	24.4	0.60	120	0.08	43.10	33.00	90.00	33.00	33.00	Ic>2.6	2.585	1.241	1.409	247.5	118.8	135.0	24.4	2,335			57	2.744	16.2	0.849	2.804	2.804	2.804	2.804	2.804	0.78	18.1	4.82	87.0	0.141	0.824	0.5877	*******	0.000	0.000	0.000	0.000	0.000
526	43.14252	22.6	0.46	120	0.08	43.18	33.00	90.00	33.00	33.00	Ic>2.6	2.590	1.243	1.412	248.0	119.0	135.2	22.6	2,160			44	2.303	14.8	0.845	2.792	2.791	2.791	2.791	2.791	0.78	16.7	4.71	78.7	0.125	0.823	0.5873	*******	0.000	0.000	0.000	0.000	0.000
527	43.22454	22.1	0.39	120	0.08	43.27	33.00	90.00	33.00	33.00	Ic>2.6	2.595	1.245	1.414	248.5	119.3	135.4	22.1	2,119			38	2.007	14.5	0.838	2.766	2.765	2.765	2.765	2.765	0.78	16.4	4.50	73.7	0.117	0.822	0.5868	*******	0.000	0.000	0.000	0.000	0.000
528	43.30656	20.0	0.29	120	0.08	43.35	33.00	90.00	33.00	33.00	Ic>2.6	2.600	1.248	1.416	248.9	119.5	135.6	20.0	1,913			27	1.640	12.9	0.836	2.762	2.761	2.761	2.761	2.761	0.78	14.8	4.47	66.1	0.107	0.822	0.5863	*******	0.000	0.000	0.000	0.000	0.000
529	43.38858	18.9	0.27	120	0.08	43.43	33.00	90.00	33.00	33.00	Ic>2.6	2.605	1.250	1.419	249.4	119.7	135.9	18.9	1,814			26	1.677	12.1	0.845	2.792	2.791	2.791	2.791	2.791	0.78	14.0	4.71	65.8	0.106	0.821	0.5858	*******	0.000	0.000	0.000	0.000	0.000
530	43.4706	18.9	0.27	120	0.08	43.51	33.00	90.00	33.00	33.00	Ic>2.6	2.609	1.253	1.421	249.9	119.9	136.1	18.9	1,811			26	1.650	12.0	0.845	2.789	2.789	2.789	2.789	2.789	0.78	13.9	4.69	65.3	0.106	0.820	0.5854	*******	0.000	0.000	0.000	0.000	0.000
531	43.55262	19.0	0.24	120	0.08	43.59	33.00	90.00	33.00	33.00	Ic>2.6	2.614	1.255	1.423	250.4	120.2	136.3	19.0	1,816			23	1.474	12.1	0.837	2.763	2.762	2.762	2.762	2.762	0.78	14.0	4.47	62.5	0.103	0.820	0.5849	*******	0.000	0.000	0.000	0.000	0.000
532	43.63464	21.1	0.32	120	0.08	43.68	33.00	90.00	33.00	33.00	Ic>2.6	2.619	1.257	1.426	250.8	120.4	136.5	21.1	2,019			30	1.712	13.6	0.833	2.751	2.751	2.751	2.751	2.751	0.78	15.5	4.38	68.1	0.109	0.819	0.5844	*******	0.000	0.000	0.000	0.000	0.000
533	43.71666	25.9	0.34	120	0.08	43.76	33.00	90.00	33.00	33.00	Ic>2.6	2.624	1.260	1.428	251.3	120.6	136.8	25.0	2,389			32	1.514	16.6	0.803	2.650	2.649	2.649	2.649	2.649	0.79	18.5	3.64	67.5	0.109	0.818	0.5839	*******	0.000	0.000	0.000	0.000	0.000
534	43.79868	25.7	0.31	120	0.08	43.84	33.00	90.00	33.00	33.00	Ic>2.6	2.629	1.262	1.431	251.8	120.8	137.0	25.7	2,463			30	1.360	17.2	0.791	2.613	2.612	2.612	2.612	2.612	0.79	19.1	3.40	65.1	0.106	0.818	0.5835	*******	0.000	0.000	0.000	0.000	0.000
535	43.8607	20.8	0.34	120	0.08	43.92	33.00	90.00	33.00	33.00	Ic>2.6	2.634	1.264	1.433	252.2	121.1	137.2	20.8	1,995			32	1.858	13.4	0.841	2.778	2.777	2.777	2.777	2.778	0.78	15.3	4.59	70.1	0.112	0.817	0.5830	*******	0.000	0.000	0.000	0.000	0.000
536	43.96272	17.0	0.32	120	0.08	44.00	33.00	90.00	33.00	33.00	Ic>2.6	2.639	1.267	1.435	252.7	121.3	137.4	17.0	1,632			30	2.194	10.4	0.880	2.907	2.907	2.907	2.907	2.907	0.76	12.3	5.77	71.0	0.113	0.816	0.5825	*******	0.000	0.000	0.000	0.000	0.000
537	44.04474	17.3	0.30	120	0.08	44.09	33.00	90.00	33.00	33.00	Ic>2.6	2.644	1.269	1.438	253.2	121.5	137.7	17.3	1,656			29	2.055	10.6	0.874	2.886	2.885	2.885	2.885	2.885	0.77	12.5	5.56	69.4	0.111	0.816	0.5820	*******	0.000	0.000	0.000	0.000	0.000
538	44.12676	27.0	0.28	120	0.08	44.17	33.00	90.00	33.00	33.00	Screens Out	2.649	1.271	1.440	253.7	121.8	137.9	27.0	2,586			27	1.145	18.2	0.774	2.554	2.554	2.553	2.553	2.553	0.79	20.1	3.05	61.4	0.102	0.815	0.5816	*******	0.000	0.000	0.000	0.000	0.000
539	44.20878	50.8	0.20	120	0.08	44.25	33.00	90.00	33.00	33.00	Screens Out	2.654	1.274	1.442	254.1	122.0	138.1	50.8	4,867			19	0.405	37.7	0.628	2.069	2.067	2.067	2.067	2.067	0.82	39.5	1.00	39.5	0.083	0.814	0.5811	*******	0.000	0.000	0.000	0.000	0.000
540	44.2609	73.2	0.19	120	0.08	44.33	33.00	90.00	33.00	33.00	Screens Out	2.659	1.276	1.445	254.6	122.2	138.3	73.2	7,008			18	0.264	56.3	0.558	1.837	1.835	1.835	1.835	1.835	0.84	58.1	1.00	58.1	0.098	0.814	0.5806	*******	0.000	0.000	0.000	0.000	0.000
541	44.37382	82.3	0.22	120	0.08	44.41	33.00	90.00	33.00	33.00	Screens Out	2.664	1.279	1.447	255.1	122.4	138.6	82.3	5,961			21	0.368	47.0	0.597	1.964	1.962	1.962	1.962	1.962	0.83	48.8	1.00	48.8	0.091	0.813	0.5801	*******	0.000	0.000	0.000	0.000	0.000
542	44.45484	45.7	0.19	120	0.08	44.50	33.00	90.00	33.00	33.00	Screens Out	2.669	1.281	1.449	255.5	122.7	138.8	45.7	4,379			18	0.439	33.4	0.647	2.131	2.129	2.129	2.129	2.129	0.82	35.3	1.00	35.3	0.079	0.812	0.5796	*******	0.000	0.000	0.000	0.000	0.000
543	44.53686	33.7	0.23	120	0.08	44.58	33.00	90.00	33.00	33.00	Screens Out	2.673	1.283	1.452	256.0	122.9	139.0	33.7	3,227			22	0.741	23.5	0.718	2.367	2.366	2.366	2.366	2.366	0.80	25.4	2.18	55.3	0.096	0.812	0.5792	*******	0.000	0.000	0.000	0.000	0.000
544	44.61888	29.0	0.24	120	0.08	44.66	33.00	90.00	33.00	33.00	Screens Out	2.678	1.286	1.454	256.5	123.1	139.2	29.0	2,774			23	0.901	19.6	0.750	2.475	2.474	2.474	2.474	2.474	0.79	21.6	2.64	56.9	0.097	0.811	0.5787	*******	0.000	0.000	0.000	0.000	0.000
545	44.7009	22.8	0.22	120	0.08	44.74	33.00	90.00	33.00	33.00	Ic>2.6	2.683	1.288	1.457	257.0	123.3	139.5	22.8	2,179			21	1.106	14.7	0.796	2.627	2.626	2.626	2.626	2.626	0.78	16.7	3.49	58.1	0.098	0.810	0.5782	*******	0.000	0.000	0.000	0.000	0.000
546	44.78292	22.0	0.21	120	0.08	44.82	33.00	90.00	33.00	33.00	Ic>2.6	2.688	1.290	1.459	257.4	123.6	139.7	22.0	2,103			20	1.069	14.1	0.798	2.636	2.635	2.635	2.635	2.635	0.77	16.1	3.55	56.9	0.097	0.810	0.5777	*******	0.000	0.000	0.000	0.000	0.000
547	44.86494	21.7	0.26	120	0.08	44.91	33.00	90.00	33.00	33.00	Ic>2.6	2.693	1.293	1.461	257.9	123.8	139.9	21.7	2,074			25	1.196	13.8	0.817	2.696	2.696	2.695	2.695	2.695	0.77	15.7	3.96	62.3	0.103	0.809	0.5773	*******	0.000	0.000	0.000	0.000	0.000
548	44.94696	20.0	0.33	120	0.08	44.99	33.00	90.00	33.00	33.00	Ic>2.6	2.698	1.295	1.464	258.4	124.0	140.2	20.0	1,911			31	1.900	12.4	0.851	2.810	2.810	2.810	2.810	2.810	0.76	14.3	4.87	69.7	0.111	0.808	0.5768	*******	0.000	0.000	0.000	0.000	0.000
549	45.02898	20.4	0.40	120	0.08	45.07	33.00	90.00	33.00	33.00	Ic>2.6	2.703	1.297	1.466	258.8	124.2	140.4	20.4	1,957			38	2.233	12.7	0.860	2.840	2.839	2.839	2.839	2.839	0.76	14.6	5.13	74.9	0.119	0.808	0.5763	*******	0.000	0.000	0.000	0.000	0.000
550	45.111	20.3	0.47	120	0.08	45.15	33.00	90.00	33.00	33.00	Ic>2.6	2.708	1.300	1.468	259.3	124.5	140.6	20.3	1,941			45	2.688	12.5	0.875	2.891	2.891	2.891	2.891	2.891	0.75	14.4	5.61	80.6	0.129	0.807	0.5758	*******	0.000	0.000	0.000	0.000	0.000
551	45.19302	20.6	0.53	120	0.08	45.23	33.00	90.00	33.00	33.00	Ic>2.6	2.713	1.302	1.471	259.8	124.7	140.8	20.6	1,968			51	2.971	12.6	0.881	2.912	2.911	2.911	2.911	2.911	0.75	14.5	5.81	84.4	0.136	0.806	0.5754	*******	0.000	0.000	0.000	0.000	0.000
552	45.27504	20.7	0.56	120	0.08	45.32	33.00	90.00	33.00	33.00	Ic>2.6	2.718	1.304	1.473	260.3	124.9	141.1	20.7	1,977			54	3.134	12.7	0.885	2.924	2.924	2.924	2.924	2.924	0.75	14.6	5.94	86.4	0.140	0.806	0.5749	*******	0.000	0.000	0.000	0.000	0.000
553	45.35706	20.4	0.55	120	0.08	45.40	33.00	90.00	33.00	33.00	Ic>2.6	2.723	1.307	1.475	260.7	125.1	141.3	20.4	1,954			53	3.104	12.5	0.886	2.927	2.927	2.927	2.927	2.927	0.75	14.4	5.97	85.7	0.139	0.805	0.5744	*******	0.000	0.000	0.000	0.000	0.000
554	45.43908	20.8	0.50	120	0.08	45.48	33.00	90.00	33.00	33.00	Ic>2.6	2.728	1.309	1.478	261.2	125.4	141.5	20.8	1,993			53	3.036	12.7	0.882	2.914	2.914	2.914	2.914	2.914	0.74	14.6	5.83	85.4	0.138	0.804	0.5739	*******	0.000	0.000	0.000	0.000	0.000
555	45.5211	21.4	0.57	120	0.08	45.56	33.00	90.00	33.00	33.00	Ic>2.6	2.732	1.312	1.480	261.7	125.6	141.7	21.4	2,049			55	3.053	13.2	0.879	2.905	2.904	2.904	2.904	2.904	0.74	15.1	5.74	86.4	0.140	0.804	0.5735	*******	0.000	0.000	0.000	0.000	0.000
556	45.60312	22.3	0.62	120	0.08	45.64	33.00	90.00	33.00	33.00	Ic>2.6	2.737	1.314	1.482	262.1	125.8	142.0	22.3	2,137			60	3.187	13.8	0.878	2.899	2.898	2.898	2.898	2.898	0.74	15.7	5.68	89.2	0.146	0.803	0.5730	*******	0.000	0.000	0.000	0.000	0.000
557	45.68514	22.3	0.65	120	0.08	45.73	33.00	90.00	33.00	33.00	Ic>2.6	2.742	1.316	1.485	262.6	126.0	142.2	22.3	2,138			62	3.308	13.8	0.881	2.909	2.909	2.909	2.909	2.909	0.74	15.7	5.79	90.6	0.149	0.802	0.5725	*******	0.000	0.000	0.000	0.000	0.000
558	45.76716	22.2	0.68	120	0.08	45.81	33.00	90.00	33.00	33.00	Ic>2.6	2.747	1.319	1.487	263.1	126.3	142.4	22.2	2,126			65	3.501	13.6	0.886	2.928	2.927	2.927	2.927	2.927	0.74	15.5	5.97	92.6	0.154	0.802	0.5720	*******	0.000	0.000	0.000	0.000	0.000
559	45.84918	22.2	0.79	120	0.08	45.89	33.00	90.00	33.00	33.00	Ic>2.6	2.752	1.321	1.490	263.5	126.5	142.6	22.2	2,126			75	4.052	13.5	0.898	2.968	2.968	2.968	2.968	2.968	0.74	15.4	6.39	98.7	0.169	0.801	0.5716	*******	0.000	0.000	0.000	0.000	0.000
560	45.9312	22.4	0.75	120	0.08	45.97	33.00	90.00	33.00	33.00	Ic>2.6	2.757	1.323	1.492	264.0	126.7	142.9	22.4	2,149			71	3.785	13.7	0.892	2.946	2.945	2.945	2.945	2.945	0.74	15.6	6.16	96.1	0.163	0.800	0.5711	*******	0.000	0.000	0.000	0.000	0.000
561	46.01322	23.9	0.77	120	0.08	46.05	33.00	90.00	33.00	33.00	Ic>2.6	2.762	1.326	1.494	264.5	127.0	143.1	23.9	2,291			74	3.635	14.8	0.881	2.909	2.909	2.909	2.909	2.909	0.74	16.7	5.79	96.5	0.164	0.800	0.5706	*******	0.000	0.000	0.000	0.000	0.000
562	46.09524	26.4	0.80	120	0.08	46.14	33.00	90.00	33.00	33.00	Ic>2.6	2.767	1.328	1.497	265.0	127.2	143.3	26.4	2,527			77	3.395	16.6	0.863	2.852	2.851	2.851	2.851	2.851	0.74	18.5	5.24	96.8	0.164	0.799	0.5701	*******	0.000	0.000	0.000	0.000	0.000
563	46.17726	29.6	0.82	120	0.08	46.22	33.00	90.00	33.00	33.00	Ic>2.6	2.772	1.330	1.499	265.4	127.4	143.5	29.6	2,834			79	3.061	18.9	0.841	2.779	2.778	2.778	2.778	2.778	0.75	20.9	4.60	96.0	0.162	0.798	0.5697	*******	0.000	0.000	0.000	0.000	0.000
564	46.25928	31.3	0.93	120	0.08	46.30	33.00	90.00	33.00	33.00	Ic>2.6	2.777	1.333	1.501	265.9	127.6	143.8	31.3	3,001			89	3.249	20.2	0.840	2.773	2.773	2.773	2.773	2.773	0.75	22.1	4.56	100.6	0.175	0.798	0.5692	*******	0.000	0.000	0.000	0.000	0.000
565	46.3413	32.5	0.94	120	0.08	46.38	33.00	90.00	33.00	33.00	Ic>2.6	2.782	1.335	1.504	266.4	127.9	144.0	32.5	3,107			90	3.165	21.0	0.834	2.753	2.752	2.752	2.752	2.752	0.75	22.9	4.39	100.5	0.174	0.797	0.5687	*******	0.000	0.000	0.000	0.000	0.000
566	46.42332	33.5	0.95	120	0.08	46.46	33.00	90.00	33.00	33.00	Ic>2.6	2.787	1.338	1.506	266.8	128.1	144.2	33.5	3,209			91	3.102	21.7	0.838	2.736	2.735	2.735	2.735	2.735	0.75	23.6	4.26	100.6	0.175	0.796	0.5682	*******	0.000	0.000	0.000	0.000	0.000
567	46.50534	38.5	1.02	120	0.08	46.55	33.00	90.00	33.00	33.00	Ic>2.6	2.792	1.340	1.508	267.3	128.3	144.4	38.5	3,685			98	2.869	25.4	0.806	2.662	2.661	2.661	2.661	2.661	0.75	27.3	3.72	101.6	0.178	0.796	0.5678	*******	0.000	0.000	0.000	0.000	0.000
568	46.58736	41.6	0.95	120	0.08	46.63	33.00	90.00	33.00	33.00	Screens Out	2.796	1.342	1.511	267.8	128.5	144.7	41.6	3,986			91	2.444	27.8	0.784	2.587	2.586	2.586	2.586	2.586	0.76	29.8	3.24	96.5	0.164	0.795	0.5673	*******	0.000	0.000	0.000	0.000	0.000
569	46.66938	46.2	0.85	120	0.08	46.71	33.00	90.00	33.00	33.00	Screens Out	2.801	1.345	1.513	268.3	128.8	144.9	46.2	4,424			82	1.963	31.4	0.754	2.487	2.486	2.486	2.486	2.486	0.76	33.3	2.70	90.0	0.148	0.794	0.5668	*******	0.000	0.000	0.000	0.000	0.000
570	46.7514	46.5	0.79	120	0.08	46.79	33.00	90.00	33.00	33.00	Screens Out	2.806	1.347	1.516	268.7	129.0	145.1	46.5	4,455			75	1.796	31.7	0.746	2.461	2.460	2.460	2.460	2.460	0.77	33.6	2.57	86.5	0.140	0.793	0.5663	*******	0.000	0.000	0.000	0.000	0.000
571	46.83342	42.2	0.76	120	0.08	46.87	33.00	90.00	33.00	33.00	Screens Out	2.811	1.349	1.518	269.2	129.2	145.4	42.2	4,038			73	1.926	28.3	0.763	2.518	2.517	2.517	2.517	2.517	0.76	30.3	2.86	86.4	0.140	0.793	0.5658	*******	0.000	0.000	0.000	0.000	0.000
572	46.91544	37.9	0.81	120	0.08	46.96	33.00	90.00	33.00	33.00	Ic>2.6	2.816	1.352	1.520	269.7	129.4	145.6	37.9	3,627			77	2.302	25.0	0.790	2.609	2.608	2.608	2.608	2.608	0.75	26.9	3.37	90.7	0.149	0.792	0.5654	*******	0.000	0.000	0.000	0.000	0.000
573	46.99746	37.9	0.89	120	0.08	47.04	33.00	90.00	33.00	33.00	Ic>2.6	2.821	1.354	1.523	270.1	129.7	145.8	37.9	3,629			85	2.531	24.9	0.798	2.635	2.634	2.634	2.634	2.634	0.75	26.8	3.54	94.9	0.159	0.791	0.5649	*******	0.000	0.000	0.000	0.000	0.000
574	47.07948	42.4	0.89	120	0.08	47.12	33.00	90.00	33.00	33.00	Too Thin	2.826	1.356	1.525	270.6	129.9	146.0	42.

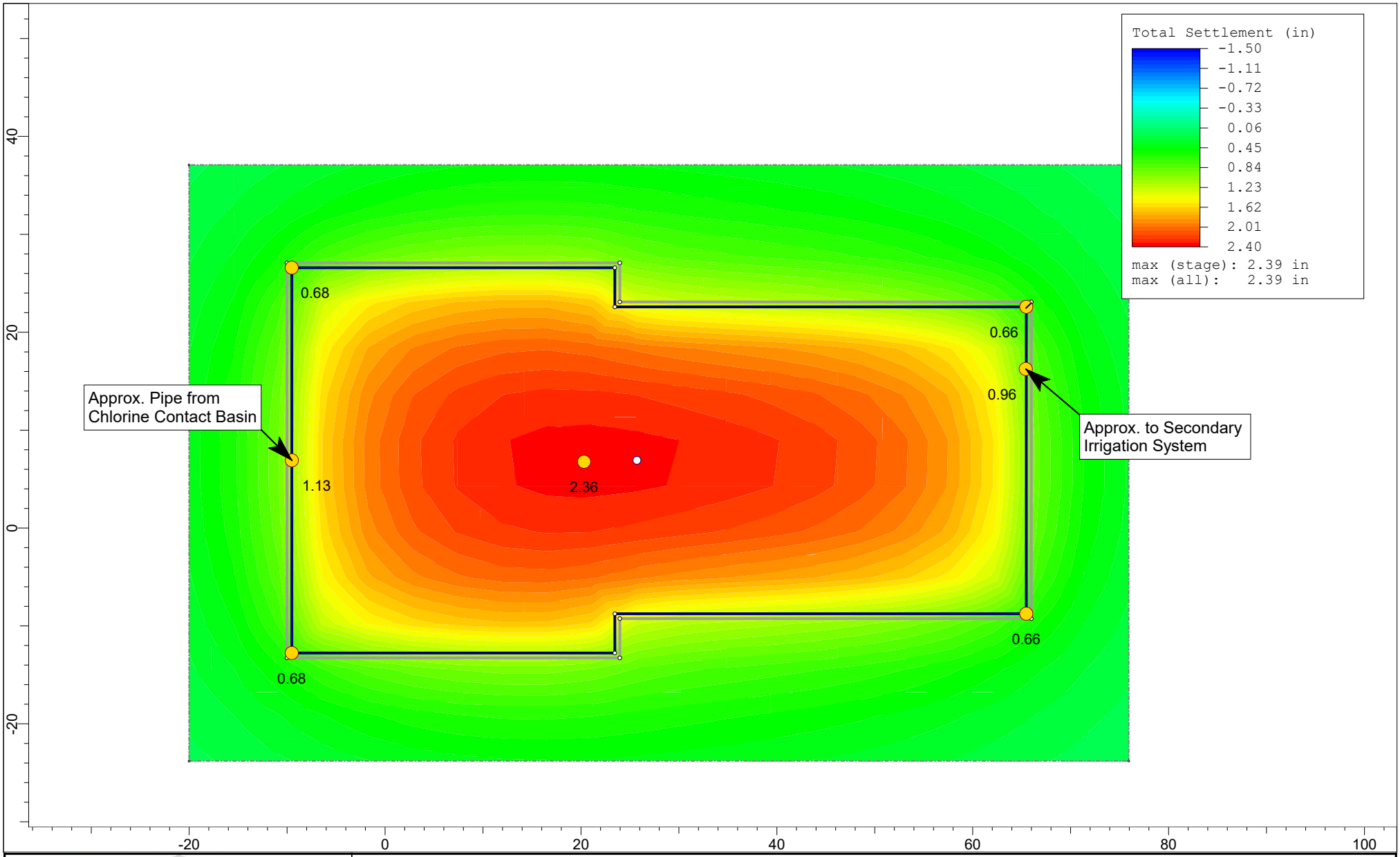
Settlement Analysis

Prepared for Bowen, Collins & Associates
Prepared By IGES, Inc.
February 10, 2022



IGES	*Project*	MWDWRF Reuse Building	
	Analysis Description	Estimated Long Term Settlement Following Return of Groundwater to Preconstruction Level	
	Analysis By	BTL	*IGES Project No.* 00113-056
	Date	2/9/2022	*Client* Bowen, Collins & Associates

SETTLE3 5.012



	Project	MWDWRF Reuse Building	
	Analysis Description	Estimated Settlement if Long Term Load is Applied While Dewatered	
	Analysis By	BTL	*IGES Project No.* 00113-056
SETTLE3 5.012	*Date*	2/9/2022	*Client* Bowen, Collins & Associates

APPENDIX B

OWNER PRE-SELECTED EQUIPMENT

AQUA AEROBIC SYSTEMS

CLOTH DISK FILTERS

SECTION 00 51 00
NOTICE OF AWARD

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Date of Issuance:	April 21, 2022		
Owner:	Magna Water District	Owner's Contract No.:	
Engineer:	Bowen Collins/ Stantec	Engineer's Project No.:	483-20-02
Project:	Reuse Facilities Project	Contract Name:	Magna WRF Filter Equipment Supply
Bidder:	Aqua-Aerobic Systems, Inc.		
Bidder's Address:	6306 N. Alpine Rd. Loves Park, IL 61111		

Engineering Submittal to be paid by Owner

TO BIDDER:

You are notified that the Owner has accepted your Bid dated March 3, 2022 along with Amendment No. 1 dated March 22, 2022 for the above Contract, and that you are the Successful Bidder and are awarded a Contract for:

Magna WRF Filter Equipment Supply including cost for Filter Equipment ($395,202.26), Engineering Submittals ($43,131.73), Sales Tax ($29,443.99), Bonds ($7,016.67), and one additional year of warranty beyond required 12 month warranty ($13,438.18) for a total price of $488,232.83.

The Contract Price of the awarded Contract is: $ 488,232.83. Minus $43,131.73 for Engineering Submittal

[1] unexecuted counterparts of the Agreement accompany this Notice of Award, and one copy of the Contract Documents accompanies this Notice of Award, or has been transmitted or made available to Bidder electronically.

You must comply with the following conditions precedent within 15 days of the date of receipt of this Notice of Award:

1. Deliver to Owner [1] counterparts of the Agreement, fully executed by Bidder.
2. Deliver with the executed Agreement(s) the Contract security *[e.g., performance and payment bonds]* and insurance documentation as specified in the Instructions to Bidders and General Conditions, Articles 2 and 6.
3. Other conditions precedent (if any):

Failure to comply with these conditions within the time specified will entitle Owner to consider you in default, annul this Notice of Award, and declare your Bid security forfeited.

Within ten days after you comply with the above conditions, Owner will return to you one fully executed counterpart of the Agreement, together with any additional copies of the Contract Documents as indicated in Paragraph 2.02 of the General Conditions.

Owner: _____
Authorized Signature

By: CLINT DILLEY

Title: GENERAL MANAGER

Copy: Engineer

END OF SECTION

AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

March 22, 2022

Correspondence ID#: AAL-43958
Magna Water District
Attn: Trevor Andra
8885 West 3500 South
Magna, Utah 84004
USA
Ph# 801/250-2118

Project: MAGNA WRF, UT

RE: Consultant Project No: 483-20-02 Magna WRF Filter Procurement Project
AASI Project ID 107127B Amendment Number 1

AMENDMENT NUMBER 1 TO AQUA-AEROBIC SYSTEMS' PROPOSAL:

This letter amends and is an integral part of the above referenced Aqua-Aerobic Systems, Inc. proposal. The proposal, is amended as follows.

PROPOSAL AMENDMENT(S):

1. Section 6.A Process Performance Guarantee is to be replaced with the Process Performance Guarantee in this amendment.

2. Section 6.B Process Performance Test Protocol should be replaced with the Process Performance Test Protocol in this amendment.

3. The adder for the a 1 year of additional warranty is $13,438.18 which includes taxes and an additional year of bonding.

4. Aqua-Aerobic Systems would like to clarify that our understanding of the Utah tax code is that no deduction is allowed from the sales price for the cost of the item itself, its raw materials, or the labor expended to create it. If there is a Utah tax code which explains that engineering services should not be taxed please send us that code and we will review it and revise if necessary.

If you have any questions regarding this amendment, please do not hesitate to

6306 N. Alpine Rd. Loves Park, IL 61111-7655 p 815.654.2501 f 815.654.2508 www.aqua-aerobic.com

contact our local representative, listed below.

Sincerely,



Corey O'Brien
Project Application Engineer

CC: Aqua-Aerobic Systems, Inc.
Scott Kelly / SKelly@aqua-aerobic.com

Davidson Sales & Engineering / ph#: 801-977-9200 / fx#: 801-977-9300
Paul Mora

AquaDisk®Cloth Media Filter
Process Performance Guarantee
for
Magna WRF, UT
2/28/2022

Aqua-Aerobic Systems, Inc. (Aqua-Aerobic) guarantees the AquaDisk® Cloth Media Filters in accordance with Specification Section 46 61 24 dated February 2022 and Addenda #1, Aqua-Aerobic's Design #167138 and Design Notes dated March 24, 2021 shall provide an average monthly filtered effluent of 5 mg/L TSS and 2 NTU.

The guarantee shall apply under the following conditions:

1. The influent flow is supplied to the filter(s) on a continuous basis not to exceed a rate of 4.65 MGD and:
    a. Filter influent TSS concentration shall not exceed 10 mg/l (daily average) and 20 mg/l maximum.
    b. Filter influent Turbidity concentration shall not exceed 5 NTU (daily average).
    c. Daily average TSS concentrations are based on 24-hour composite samples. Maximum TSS concentrations are based upon grab samples at any time.
    d. Filter influent solids loading shall not exceed 2.0 lbs TSS/ft^2/day.
    e. Hydraulic loading to the Cloth Media Filter shall not exceed 5.0 gpm/ft^2 of media area.
    f. Wastewater entering the Cloth Media Filter is effluent from a secondary biological process.
2. The filter is installed, operated and maintained in accordance with instructions supplied by Aqua-Aerobic.
3. The equipment has been paid for in accordance with contract terms.

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4. A performance test is conducted according to the approved Field Process Performance Test Protocol, dated 2/28/2022, as submitted by Aqua-Aerobic.
5. Data during the performance test shall be sent to Aqua-Aerobic within one week of said testing.
6. The process guarantee shall be considered satisfied upon successful completion of the performance test. The process guarantee shall be enforced throughout Aqua-Aerobic's warranty for a period of 12 months after certificate of proper installation.
7. Start-up shall be defined by the date stated on Aqua-Aerobic's "Manufacturers Certificate of Inspection" form executed upon completion of start-up services.
8. Should the filter system not meet the guaranteed performance:
    a. The guarantee shall be considered invalid if the influent parameters do not conform to Conditions 1.
    b. In the event that the influent parameters are within the limits specified under Conditions 1, Aqua-Aerobic shall have up to 30 days to modify the filters as necessary to achieve the guaranteed performance.
9. If failure to produce the guaranteed effluent is due to influent quality not in conformance with Conditions 1, the Owner shall have up to 30 days to bring the filter influent to specified limits. If the Owner is unable to produce the specified influent conditions within 30 days, the guarantee will be considered to be satisfied.
10. This guarantee shall no longer be applicable or valid if any product, including any software program, supplied by Aqua-Aerobic, is modified or altered without the written approval of Aqua-Aerobic.
11. In the event of continued failure of the equipment to produce the guaranteed effluent characteristics at no fault of the owner, Aqua-Aerobic shall have the option to modify the filter(s) as necessary to achieve the guaranteed performance. The maximum cumulative liability to Aqua-Aerobic for the modification or supply of additional equipment shall be limited to 100% of the initial sales price of the equipment supplied.

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Aqua-Aerobic Systems, Inc.

Kristy Chycota Process Engineer - Filtration	Execution Date
Customer / Owner Company Name	
Authorized Signature	Execution Date
Title	

NOTE: Aqua-Aerobic Systems, Inc. will execute the process performance guarantee upon receipt of a purchase order, acceptance of terms and conditions and approved submittal drawings.

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Aqua MiniDisk® Cloth Media Filter
Field Process Performance Test Protocol
for
Magna WRF, UT
2/28/2022

Introduction:

To satisfy Specification Section 46 61 24, dated February 2022 and Addendum 1, the following field process performance test shall be performed.

Protocol:

1) The filter(s) will be tested for a period of one eight hour day to assess process performance. The field performance testing shall be conducted no later than sixty (60) days after startup or beneficial use. The start date shall be mutually agreed upon by the Engineer, Owner, Installing Contractor, and Aqua-Aerobic Systems. Under supervision of Aqua-Aerobic Systems' field service representative, the Installing Contractor will conduct the testing and shall employ the services of a local certified laboratory facility to perform sample analysis in accordance with this testing procedure. The Engineer and the Owner shall have the right to witness the performance test.
2) The performance test shall be executed using plant secondary effluent after the plant processes have stabilized and the plant is performing according to the design specified operating requirements. The filter influent loading conditions shall be in accordance with the values stated in the project bid specifications as referenced in the "Performance and Design Parameters" section of this document. In the event that the filter influent does not meet this criteria, the testing shall be postponed or the performance expectations adjusted as mutually agreed to by the Owner, the Engineer, and Aqua-Aerobic Systems.
3) Testing will be done simultaneously on all filter(s). The filter(s) will be tested for one eight hour day. The actual flow at the time of testing will be monitored and equally split to all filter(s) units. If the flow rate does not reach the targeted flow

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conditions, filter(s) will be taken offline as needed to simulate target flow conditions. If the target flow conditions cannot be achieved while a single filter is in operation, the test will be conducted on a single filter with the available flow. During the test period, the filter(s) will be tested at the peak flow rate for a maximum of 2 hours if such flow rates exist at time of test.

4) Composite one litter TSS samples consisting of a minimum of four (4) grab samples per hour will be taken from either the secondary clarifier effluent box (mid-depth) or the influent weir (mid-depth) and from each of the filter(s) outlets (mid-depth). Composite samples shall be collected, stored, and analyzed for TSS according to the latest edition of Standard Methods for the Examination of Water and Wastewater. Testing shall be done by a local certified laboratory. Expedited service from the laboratory shall be requested to ensure that results return within the period of the performance test. Effluent water quality will be monitored and reported by a continuous online turbidimeter that draws a sample from the Reuse Pump Station Wet Well. The turbidimeter shall be calibrated before the start of the test. The Installing Contractor, or Aqua-Aerobic Systems shall furnish all labor, materials, equipment, auto samplers, laboratory services, instrumentation, and any other equipment and services necessary for conducting the field performance testing. The Installing Contractor shall furnish all electric, water and other utilities.

5) The party responsible for conducting the field performance test shall compile all influent and effluent TSS and turbidity data onto an Excel® spreadsheet and graph the data to clearly show performance compliance. Any data collected by the contractor, the owner, or the manufacturer during the performance testing shall be submitted to the party responsible for conducting the field performance test to be incorporated into this summary.

6) The party responsible for conducting the filter performance test shall compile the filter(s) influent flow rates using the influent flowmeter and the conversion to filtration rates shall be summarized on an Excel® spreadsheet. NOTE: Alternatives to an influent flowmeter are measuring the nappe over the influent weir or readings from an effluent flowmeter. However, these alternatives are less desirable.

7) A testing day will run from 8:00 am until 8:00 am of the following day.

8) In the event of failure of the equipment to produce the required effluent characteristics during the performance testing, Aqua-Aerobic Systems shall have the option to modify the filter(s) as necessary to achieve the guaranteed performance testing. The maximum liability to Aqua-Aerobic Systems for the modification or supply of additional equipment shall be limited to 100% of the initial sales price of the equipment supplied.

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Evaluation:

The AquaDisk® Cloth Media Filter(s) shall have demonstrated the following specified performance parameters based upon the following specified filter(s) influent conditions:

Performance and Design Parameters:

a. Wastewater Flow:

Design Flow: 2.33 MGD per filter

b. Filter Influent Characteristics:

	Filter Influent
Average Daily TSS (mg/l)	10
Max. TSS (mg/l)	20
Max. turbidity (NTU)	5

c. Filter Effluent Characteristics:

	Filter Effluent
Average Daily TSS (mg/l)	5
Average Daily Turbidity (NTU)	2

Reporting of Results:

Aqua-Aerobic Systems, Inc. shall receive the test data from the Installing Contractor and Aqua-Aerobic Systems shall write a report to show the individual and average flow rates, TSS and turbidity recorded during the field process performance test and shall conclude whether the filter(s) have met the performance as specified.

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AquaDisk® Cloth Media Filter(s) Field Performance Testing

Performance Test Data

Test Unit [___]

Witnessed By: _____ Date: _____

_____

_____

_____

Time	Influent Flow rate (MGD)	Influent TSS (mg/l)	Effluent TSS (mg/l)	Influent NTU (mg/l)	Effluent NTU (mg/l)

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AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

MAGNA WRF, UT
Filter Procurement Project

March 3, 2022

(Copy)

Project Contact:
Corey O'Brien, Project Application Engineer
Phone: 815-639-4465 | Fax: 815-654-8258
Email: cobrien@aqua-aerobic.com

AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

March 1, 2022

Correspondence ID#: AAL-43804
Magna Water District
Attn: Trevor Andra
8885 West 3500 South
Magna, Utah 84004
USA
Ph# 801/250-2118

Project: MAGNA WRF, UT
RE: Consultant Project No: 483-20-02 Magna WRF Filter Procurement Project
AASI Project ID 107127B

Greetings,

Enclosed please find our proposal package for the AquaDisk® Cloth Media Filter equipment, freight, and supervision services for the above referenced project.

Aqua-Aerobic Systems, Inc. is offering the proposed equipment to meet the referenced specification(s), including Addendum Number 1, unless otherwise noted on our Exceptions/Clarifications document included with our proposal package, subject to approval by the Owner or the Consulting Engineer. Please take a moment to review our Exceptions/Clarifications document, proposal notes, and standard drawings for Aqua-Aerobic Systems' equipment terminations and items not included in Aqua-Aerobic Systems' scope of supply which are to be provided by the Buyer or Buyer's Installation Contractor. Please also note that while our standard drawings show our typical pump configuration, Aqua-Aerobic Systems can provide pumping through the effluent chamber as previously discussed, if that is an option that the site would like to pursue.

Aqua-Aerobic Systems has been meeting the needs of our clients since 1969 when the first AquaJet® Aerator was installed. As outlined within our Company Profile and Capabilities found in Section 7.A, our knowledge and products have significantly expanded since that time, but the dedication we have to making sure that every installation is a success has not diminished.

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Aqua-Aerobic Systems is recognized as the world leader in cloth media filtration technology, proven by our experience. The over 1,300 AquaDisk units installed in the United States make up a portion of the 1,400 OptiFiber® Pile Cloth Media installations worldwide, and benefit from design expertise, quality control, and the continued innovation of our products. We have highlighted some of these installations with a similar disk configuration to this project in Section 2.B and included a list of references in Section 2.C. We encourage that the referenced installations be contacted during the evaluation process so that the evaluating team can receive an unbiased account of how the AquaDisk System operates, what the system offers, and why it is the best fit for this site.

Aqua-Aerobic Systems' cloth media is certified to meet California Title 22 reuse requirements as outlined in Section 2.D. Our experience in water reuse applications is well documented with over 100 installations meeting R-1 and California Title 22 reuse standards. Section 3.E highlights some of these installations.

We would also like to draw attention to the features and benefits of the AquaDisk in section 7.B. When comparing technologies, we encourage engineers and owners to look at the filter media, the backwash method, and the way that water flows through the unit for each technology. The media is the most important aspect of any filtration technology. OptiFiber® pile cloth filtration media is the only media engineered for wastewater applications. After testing hundreds of media options over the past 30 years, Aqua-Aerobic Systems can safely say that it is relatively easy to make a media that removes particles, but very difficult to make one that backwashes effectively and lasts over time. All OptiFiber® media options have been through an extensive test protocol including long term operation, endurance testing, and tensile strength certification to ensure that this media will stand the test of time. Out of the five pile cloth media options available from Aqua-Aerobic Systems, OptiFiber PES-14® cloth filtration media has been selected for this site. This media has a nominal filtration rating of 5 µm. For this facility, a nominal 5 µm media offers the additional assurance in meeting the effluent water reuse requirements compared to the standard 10 µm options.

Unlike knit filter media options, the woven pile cloth media used by Aqua-Aerobic Systems features an open backing design that eliminates the potential for solids accumulation on the backing, which is the primary reason for premature cloth failures. In addition, this media has almost no elongation under the potential stresses during backwash. Minimizing elongation prevents folding or other media movement, which can lead to weak spots in the filter media.

Although allowed by the specification, Aqua-Aerobic Systems does not employ the use of butterfly valves and instead use ball valves and gate valves for backwash and solids waste. While butterfly valves are considered cost efficient, our testing has shown that they do not hold up well in high solids environments, which cause seat failures.

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We appreciate the opportunity to submit our proposal for this project and look forward to discussing it with you in detail. Please feel free to contact me (phone: 815-639-4465; email: Cobrien@aqua-aerobic.com), or our sales representative firm (listed below) if you have any questions regarding our proposal offering.

Sincerely,



Corey O'Brien
Project Application Engineer

CC: Aqua-Aerobic Systems - Regional Manager / ph#: 815/639-4467 / fx#: 815/654-2508
Scott Kelly / skelly@Aqua-Aerobic.com

Davidson Sales & Engineering / ph#: 801-977-9200 / fx#: 801-977-9300
Paul Mora

AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

Magna WRF, UT

Filter Procurement Project

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6306 N. Alpine Rd. Loves Park, IL 61111-7655 **p** 815.654.2501 **f** 815.654.2508 **www.aqua-aerobic.com**

SECTION 00 40 00
BID FORM

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Magna Water District (MWD)

Magna WRF Filter Procurement Project

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BID FORM

ARTICLE 1 - BID RECIPIENT

1.01 This Bid is submitted to:

Magna Water District
8885 West 3500 South
Magna, UT 84044

See Section 00 20 00 – Instruction to Bidder for submittal requirements.

1.02 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into a Contract with Buyer in the form included in the Bidding Documents to furnish the Goods and Special Services as specified or indicated in the Bidding Documents, for the prices and within the times indicated in this Bid, and in accordance with the other terms and conditions of the Bidding Documents.

ARTICLE 2 - BIDDER'S ACKNOWLEDGMENTS

2.01 Bidder accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. This Bid will remain subject to acceptance for 90 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Buyer.

2.02 Bidder accepts the provisions of the Agreement as to the assignment of the Contract for furnishing Goods and Special Services.

2.03 Bidder accepts that the Buyer (or assignee) retains the right to issue a Notice to Commence Fabrication for the Filtration Equipment for a period up to **500 days** after the final approval of shop drawings and submittals as part of the Special Services. The Bidder acknowledges that until the Notice to Commence Fabrication is issued; the Buyer is not obligated to any monetary committed associate with this Contract beyond that associated with the Special Services.

ARTICLE 3 - BIDDER'S REPRESENTATIONS

3.01 In submitting this Bid, Bidder represents that:

A. Bidder has examined and carefully studied the Bidding Documents, the related data identified in the Bidding Documents, and the following Addenda, receipt of which is hereby acknowledged:

Addendum No.	Addendum. Date
One	2-25-2022

B. Bidder understands the site where the Goods are to be installed or Special Services will be provided and become familiar with and is satisfied as to the observable local conditions that may affect cost, progress, or the furnishing of Goods and Special Services, if required to do so by the Bidding Documents, or if, in Bidder's judgment, any local condition may affect cost, progress, or the furnishing of Goods and Special Services.

C. Bidder is familiar with and is satisfied as to all Laws and Regulations in effect as of the date of the Bid that may affect cost, progress, and the furnishing of Goods and Special Services.

D. Bidder has carefully studied, considered, and correlated the information known to Bidder; information commonly known to sellers of similar goods doing business in the locality of the Point of Destination and the site where the Goods will be installed or where Special Services will be provided; information and observations obtained from Bidder's visits, if any, to the Point of Destination and the site where the Goods will be installed or Special Services will be provided; and any reports and drawings identified in the Bidding Documents regarding the Point of Destination and the site where the Goods will be installed or where Special Services will be provided, with respect to the effect of such information, observations, and documents on the cost, progress, and performance of Seller's obligations under the Bidding Documents.

E. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, and discrepancies that Bidder has discovered in the Bidding Documents, and the written resolution (if any) thereof by Engineer is acceptable to Bidder.

F. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for furnishing the Goods and Special Services for which this Bid is submitted.

ARTICLE 4 - BIDDER'S CERTIFICATIONS

4.01 Bidder certifies that:

A. This Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any collusive agreement or rules of any group, association, organization, or corporation;

B. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid;

C. Bidder has not solicited or induced any individual or entity to refrain from bidding; and

D. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this Paragraph 4.01.D:

1. "corrupt practice" means the offering, giving, receiving, or soliciting of any thing of value likely to influence the action of a public official in the bidding process;

2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process to the detriment of Buyer, (b) to establish bid prices at artificial non-competitive levels, or (c) to deprive Buyer of the benefits of free and open competition;

3. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Buyer, a purpose of which is to establish bid prices at artificial, non-competitive levels; and

4. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process.

ARTICLE 5 - BASIS OF BID

5.01 Bidder will furnish the Goods and Special Services in accordance with the Contract Documents for the following price(s):

Item	Description	No. of Units	Lump Sum Price ($ Numerals)
1	**Engineering Submittal**: Prepare complete shop drawings and related submittals, and coordinate with Owner and Engineer during design. The Contract Price for this Item shall not exceed 10% of the total contract price of Items 1 - 3.	Lump Sum	$43,131.73
2	**Filter Equipment:** Disk Filter Equipment as described in Specification 46 21 25 including equipment, controls, delivery, start-up services, warranties and other services specified.	Lump Sum	$395,202.26
3	Sales Tax on Filter Equipment (Item 2)	Lump Sum	$29,443.99
	Total Base Bid Amount (Summary of Items 1-3)	$467,777.98	

Additional Optional Bid Items			
Item	**Description**	**No. of Units**	**Lump Sum Price ($ Numerals)**
A1	Performance Bond Per Section 00 61 00	Lump Sum	$7,016.67
A2	Payment Bond per Section 00 61 50	Lump Sum	$0 (Included in performance bond)
A3	Annual Equipment Storage Cost: Annual cost to store equipment following completion of fabrication.	Lump Sum	*$49,158.87
A4	2 Year Extended Warranty: Cost to provide additional 2 year of warranty beyond required warranty.	Lump Sum	*$33,747.87
	Total Bid Amount (Summary of Items 1-3 plus Items A1-A4)	$557,701.31	

Five hundred fifty-seven thousand, seven hundred one dollars and thirty one cents

Total Bid Amount in Words

*Includes sales tax and additional two years of bonding.

ARTICLE 6 - TIME OF COMPLETION

6.01 Bidder agrees that the furnishing of Goods and Special Services will conform to the schedule set forth in Article 5 of the Agreement.

6.02 Bidder accepts the provisions of the Agreement as to liquidated damages.

ARTICLE 7 - ATTACHMENTS TO THIS BID

7.01 The following documents are attached to and made a condition of this Bid:

A. The Bid Requirements as described in section 00 20 00 – Instruction to Bidders.

ARTICLE 8 - DEFINED TERMS

8.01 The terms used in this Bid with initial capital letters have the meanings stated in the Instructions to Bidders, the General Conditions, and the Supplementary Conditions.

ARTICLE 9 - BID SUBMITTAL

9.01 This Bid submitted by:

If Bidder is:

An Individual

Name (typed or printed): _____

By: _____
(Individual's signature)

Doing business as: _____

Business address: _____
_____Phone: _____
_____Facsimile: _____E-mail address:
_____

A Partnership

Partnership Name: _____ (SEAL)

By: _____
(Signature of general partner - attach evidence of authority to sign)

Name (typed or printed): _____
Business address: _____

_____

Phone: _____ Facsimile: _____
E-mail address: _____

A Corporation

Corporation Name: Aqua-Aerobic Systems, Inc.
State of Incorporation: Illinois
Type (General Business, Professional, Service, other): General Business

By: _____
(Signature - attach evidence of authority to sign)

Name (typed or printed): James Horton
Title: Vice President - Process Group

Attest _____ (CORPORATE SEAL)
(Signature of Corporate Secretary)

AQUA-AEROBIC SYSTEMS, INC. CORPORATE SEAL ILLINOIS

Business address: 6306 N Alpine Rd
Loves Park, IL 61111

Phone: 815-639-4524 Facsimile: _____
E-mail address: JHorton@aqua-aerobic.com

A Limited Liability Company (LLC)

LLC Name: _____
State in which organized: _____

By: _____
(Signature - attach evidence of authority to sign)

Name (typed or printed): _____
Title: _____
Business address: _____

_____

Phone: _____ Facsimile: _____
E-mail address: _____

A Joint Venture

First Joint Venturer Name: _____ (SEAL)

By: _____

(Signature - attach evidence of authority to sign)

Name (typed or printed): _____

Title: _____

Business address: _____

_____

Phone: _____ Facsimile: _____

E-mail address: _____

Second Joint Venturer Name: _____ (SEAL)

By: _____

(Signature - attach evidence of authority to sign)

Name (typed or printed): _____

Title: _____

Business address: _____

_____

Phone: _____ Facsimile: _____

E-mail address: _____

Phone and Facsimile Number, and Address for receipt of official communications to Joint Venture: _____

_____

(Each joint venturer must sign. The manner of signing for each individual, partnership, corporation, and limited liability company that is a party to the joint venture should be in the manner indicated above.)

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SECTION 00 43 13
BID BOND (PENAL SUM FORM)

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Any singular reference to Bidder, Surety, Owner or other party shall be considered plural where applicable.

BIDDER (Name and Address):

Aqua-Aerobic Systems, Inc.
6306 N. Alpine Road
Loves Park, IL 61111

SURETY (Name, and Address of Principal Place of Business):

Fidelity and Deposit Company of Maryland
1299 Zurich Way, 5th Floor
Schaumburg, IL 60196

OWNER (Name and Address):

Magna Water District
8885 West 35000 South
Magna, UT 84044

BID

Bid Due Date: March 3, 2022

Description (Project Name— Include Location): Magna WRF Filter Procurement Project, Magna, Utah

BOND

This bid bond is valid only if Aqua-Aerobic Exceptions/Clarifications are accepted & become an integral part of the contract. In the event the Exceptions/Clarifications are not acceptable, this bid should be deemed non-responsive & the bid bond returned to Aqua-Aerobic.

Bond Number: N/A

Date: February 22, 2022

Penal sum Five Percent of Amount Bid ($ 5% of Amount Bid)

(Words) (Figures)

Surety and Bidder, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Bid Bond to be duly executed by an authorized officer, agent, or representative.

BIDDER	SURETY
Aqua-Aerobic Systems, Inc. (Seal)	Fidelity and Deposit Company of Maryland (Seal)
Bidder's Name and Corporate Seal	Surety's Name and Corporate Seal
By: Signature	By: Signature (Attach Power of Attorney)
Kevin Heasley	April D. Perez
Print Name	Print Name
Vice President, Operations	Attorney-In-Fact
Title	Title
Attest: Signature	Attest: Signature Annette Audinot
Title Supervisor, Contract Admin.	Title Witness

AQUA-AEROBIC SYSTEMS, INC. CORPORATE SEAL ILLINOIS

Note: Addresses are to be used for giving any required notice.
Provide execution by any additional parties, such as joint venturers, if necessary.

1. Bidder and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to pay to Owner upon default of Bidder the penal sum set forth on the face of this Bond. Payment of the penal sum is the extent of Bidder's and Surety's liability. Recovery of such penal sum under the terms of this Bond shall be Owner's sole and exclusive remedy upon default of Bidder.

2. Default of Bidder shall occur upon the failure of Bidder to deliver within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents.

3. This obligation shall be null and void if:

3.1 Owner accepts Bidder's Bid and Bidder delivers within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents, or

3.2 All Bids are rejected by Owner, or

3.3 Owner fails to issue a Notice of Award to Bidder within the time specified in the Bidding Documents (or any extension thereof agreed to in writing by Bidder and, if applicable, consented to by Surety when required by Paragraph 5 hereof).

4. Payment under this Bond will be due and payable upon default of Bidder and within 30 calendar days after receipt by Bidder and Surety of written notice of default from Owner, which notice will be given with reasonable promptness, identifying this Bond and the Project and including a statement of the amount due.

5. Surety waives notice of any and all defenses based on or arising out of any time extension to issue Notice of Award agreed to in writing by Owner and Bidder, provided that the total time for issuing Notice of Award including extensions shall not in the aggregate exceed 120 days from the Bid due date without Surety's written consent.

6. No suit or action shall be commenced under this Bond prior to 30 calendar days after the notice of default required in Paragraph 4 above is received by Bidder and Surety and in no case later than one year after the Bid due date.

7. Any suit or action under this Bond shall be commenced only in a court of competent jurisdiction located in the state in which the Project is located.

8. Notices required hereunder shall be in writing and sent to Bidder and Surety at their respective addresses shown on the face of this Bond. Such notices may be sent by personal delivery, commercial courier, or by United States Registered or Certified Mail, return receipt requested, postage pre-paid, and shall be deemed to be effective upon receipt by the party concerned.

9. Surety shall cause to be attached to this Bond a current and effective Power of Attorney evidencing the authority of the officer, agent, or representative who executed this Bond on behalf of Surety to execute, seal, and deliver such Bond and bind the Surety thereby.

10. This Bond is intended to conform to all applicable statutory requirements. Any applicable requirement of any applicable statute that has been omitted from this Bond shall be deemed to be included herein as if set forth at length. If any provision of this Bond conflicts with any applicable statute, then the provision of said statute shall govern and the remainder of this Bond that is not in conflict therewith shall continue in full force and effect.

11. The term "Bid" as used herein includes a Bid, offer, or proposal as applicable.

END OF SECTION

ZURICH AMERICAN INSURANCE COMPANY
COLONIAL AMERICAN CASUALTY AND SURETY COMPANY
FIDELITY AND DEPOSIT COMPANY OF MARYLAND
POWER OF ATTORNEY

KNOW ALL MEN BY THESE PRESENTS: That the ZURICH AMERICAN INSURANCE COMPANY, a corporation of the State of New York, the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY, a corporation of the State of Illinois, and the FIDELITY AND DEPOSIT COMPANY OF MARYLAND a corporation of the State of Illinois (herein collectively called the "Companies"), by **Robert D. Murray, Vice President**, in pursuance of authority granted by Article V, Section 8, of the By-Laws of said Companies, which are set forth on the reverse side hereof and are hereby certified to be in full force and effect on the date hereof, do hereby nominate, constitute, and appoint April D. Perez, its true and lawful agent and Attorney-in-Fact, to make, execute, seal and deliver, for, and on its behalf as surety, and as its act and deed: **any and all bonds and undertakings,** and the execution of such bonds or undertakings in pursuance of these presents, shall be as binding upon said Companies, as fully and amply, to all intents and purposes, as if they had been duly executed and acknowledged by the regularly elected officers of the ZURICH AMERICAN INSURANCE COMPANY at its office in New York, New York., the regularly elected officers of the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY at its office in Owings Mills, Maryland., and the regularly elected officers of the FIDELITY AND DEPOSIT COMPANY OF MARYLAND at its office in Owings Mills, Maryland., in their own proper persons.

The said Vice President does hereby certify that the extract set forth on the reverse side hereof is a true copy of Article V, Section 8, of the By-Laws of said Companies, and is now in force.

IN WITNESS WHEREOF, the said Vice-President has hereunto subscribed his/her names and affixed the Corporate Seals of the said **ZURICH AMERICAN INSURANCE COMPANY, COLONIAL AMERICAN CASUALTY AND SURETY COMPANY, and FIDELITY AND DEPOSIT COMPANY OF MARYLAND**, this 11th day of July, A.D. 2019.

ATTEST:
ZURICH AMERICAN INSURANCE COMPANY
COLONIAL AMERICAN CASUALTY AND SURETY COMPANY
FIDELITY AND DEPOSIT COMPANY OF MARYLAND

By: Robert D. Murray
Vice President

By: Dawn E. Brown
Secretary

State of Maryland
County of Baltimore

On this 11th day of July, A.D. 2019, before the subscriber, a Notary Public of the State of Maryland, duly commissioned and qualified, **Robert D. Murray, Vice President and Dawn E. Brown, Secretary** of the Companies, to me personally known to be the individuals and officers described in and who executed the preceding instrument, and acknowledged the execution of same, and being by me duly sworn, deposeth and saith, that he/she is the said officer of the Company aforesaid, and that the seals affixed to the preceding instrument are the Corporate Seals of said Companies, and that the said Corporate Seals and the signature as such officer were duly affixed and subscribed to the said instrument by the authority and direction of the said Corporations.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed my Official Seal the day and year first above written.

Constance A. Dunn, Notary Public
My Commission Expires: July 9, 2023

EXTRACT FROM BY-LAWS OF THE COMPANIES

"Article V, Section 8, Attorneys-in-Fact. The Chief Executive Officer, the President, or any Executive Vice President or Vice President may, by written instrument under the attested corporate seal, appoint attorneys-in-fact with authority to execute bonds, policies, recognizances, stipulations, undertakings, or other like instruments on behalf of the Company, and may authorize any officer or any such attorney-in-fact to affix the corporate seal thereto; and may with or without cause modify of revoke any such appointment or authority at any time."

CERTIFICATE

I, the undersigned, Vice President of the ZURICH AMERICAN INSURANCE COMPANY, the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY, and the FIDELITY AND DEPOSIT COMPANY OF MARYLAND, do hereby certify that the foregoing Power of Attorney is still in full force and effect on the date of this certificate; and I do further certify that Article V, Section 8, of the By-Laws of the Companies is still in force.

This Power of Attorney and Certificate may be signed by facsimile under and by authority of the following resolution of the Board of Directors of the ZURICH AMERICAN INSURANCE COMPANY at a meeting duly called and held on the 15th day of December 1998.

RESOLVED: "That the signature of the President or a Vice President and the attesting signature of a Secretary or an Assistant Secretary and the Seal of the Company may be affixed by facsimile on any Power of Attorney...Any such Power or any certificate thereof bearing such facsimile signature and seal shall be valid and binding on the Company."

This Power of Attorney and Certificate may be signed by facsimile under and by authority of the following resolution of the Board of Directors of the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY at a meeting duly called and held on the 5th day of May, 1994, and the following resolution of the Board of Directors of the FIDELITY AND DEPOSIT COMPANY OF MARYLAND at a meeting duly called and held on the 10th day of May, 1990.

RESOLVED: "That the facsimile or mechanically reproduced seal of the company and facsimile or mechanically reproduced signature of any Vice-President, Secretary, or Assistant Secretary of the Company, whether made heretofore or hereafter, wherever appearing upon a certified copy of any power of attorney issued by the Company, shall be valid and binding upon the Company with the same force and effect as though manually affixed.

IN TESTIMONY WHEREOF, I have hereunto subscribed my name and affixed the corporate seals of the said Companies, this 22nd day of February, 2022.



Brian M. Hodges, Vice President

TO REPORT A CLAIM WITH REGARD TO A SURETY BOND, PLEASE SUBMIT A COMPLETE DESCRIPTION OF THE CLAIM INCLUDING THE PRINCIPAL ON THE BOND, THE BOND NUMBER, AND YOUR CONTACT INFORMATION TO:

Zurich Surety Claims
1299 Zurich Way
Schaumburg, IL 60196-1056
www.reportsfclaims@zurichna.com
800-626-4577

DocuSign Envelope ID: 25267642-AE1F-41D6-A122-FF1E8CB2CB63

THE FIDELITY AND DEPOSIT COMPANY

OF MARYLAND
1299 Zurich Way Schaumburg, IL 60196

Statement of Financial Condition
As Of December 31, 2020

ASSETS

Bonds		$ 262,624,334
Stocks		19,715,392
Cash and Short-Term Investments		3,219,781
Reinsurance Recoverable		17,293,466
Federal Income Tax Recoverable		114,253
Other Accounts Receivable		29,083,530
TOTAL ADMITTED ASSETS		$ 332,050,756

LIABILITIES, SURPLUS AND OTHER FUNDS

Reserve for Taxes and Expenses		$ 539,588
Ceded Reinsurance Premiums Payable		43,847,005
Remittances and Items Unallocated		0
Payable to parents, subs and affiliates		0
Securities Lending Collateral Liability		0
TOTAL LIABILITIES		$ 44,413,593
Capital Stock, Paid Up	$ 5,000,000	
Surplus	282,637,163	
Surplus as regards Policyholders		287,637,163
TOTAL		$ 332,050,756

Securities carried at $165,065,329 in the above statement are deposited with various states as required by law.

Securities carried on the basis prescribed by the National Association of Insurance Commissioners. On the basis of market quotations for all bonds and stocks owned, the Company's total admitted assets at December 31, 2020 would be $346,439,970 and surplus as regards policyholders $302,026,377.

I, LAURA J. LAZARCZYK, Corporate Secretary of the FIDELITY AND DEPOSIT COMPANY OF MARYLAND, do hereby certify that the foregoing statement is a correct exhibit of the assets and liabilities of the said Company on the 31st day of December, 2020.

DocuSigned by:
Laura J. Lazarczyk
42DF6DB4713748B...
Corporate Secretary

State of Illinois
City of Schaumburg } SS:

Subscribed and sworn to, before me, a Notary Public of the State of Illinois, in the City of Schaumburg, this 15th day of March, 2021.

RYAN HORGAN
Official Seal
Notary Public - State of Illinois
My Commission Expires Dec 10, 2024

Notary Public

CHANGE ORDER NO.: 1

Owner: Magna Water District
Engineer: Bowen Collins & Associates/Stantec
Supplier: Aqua-Aerobic Systems Inc.
Project: Magna Reuse Project
Contract Name: Magna WRF Filter Equipment Supply
Date Issued: 06/20/2022

Engineer's Project No.: 483-20-02
Supplier's Project No.: 107127B

The Contract (00 52 00 Agreement – executed on May 4, 2022) is hereby modified as follows upon execution of this Change Order:

Description:

Magna Water District has requested that the future peak flow capacity for the disk filters be increased from 4.66 MGD to 6.60 MGD. Aqua-Aerobic Systems, Inc. has responded with a proposal that includes two (2) 10/6-Disk AquaDisk®, Cloth Media Filter(s), in concrete tanks. The filter units will have 6-Disks originally with four empty disk slots allowing them to expand to 10-Disk units to handle the increased flow of 6.6 MGD. The price of this total change is $87,004.17 and includes taxes, one year of bonding, and cost increases for engineering submittals (up from $ 43,131.73 to $52,900) and 12 months of additional warranty on top of the required warranty (up from $13,438.18 to $14,985). The total cost of the disk filter contract between Magna Water District and Aqua-Aerobics is increased to $575,237.00 upon acceptance of this change order. No change to the Contract Times as outlined in Section 00 52 00 Agreement occurs with this change order.

Attachments:

Amendment Letter from Aqua-Aerobic Systems, INC., dated May 11, 2022

Change in Contract Price

Original Contract Price: $ 488,232.83
Increase from previously approved Change Orders $ N/A
Contract Price prior to this Change Order: $ 488,232.83
Increase this Change Order: $ 87,004.17
Contract Price incorporating this Change Order: $ 575,237.00

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	Recommended by Engineer (if required)	Accepted by Contractor
By:	Clint Rogers, PE	
Title:	Vice President	
Date:	06/20/2022	
	Authorized by Owner	
By:	Clint Dilley, PE	
Title:	General Manager	
Date:	06/20/2022	

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AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

May 11, 2022

Correspondence ID#: AAL-44240
Magna Water District
Attn: Trevor Andra, PE, District Engr.
8885 West 3500 South
Magna, Utah 84004
USA
Ph# 801/250-6279 (Office)
Email: trevor@magnawater.com

Project: MAGNA WRF, UT

RE: Consultant Project No: 483-20-02 Magna WRF Filter Procurement Project
AASI Project ID 107127B Amendment Number 3

AMENDMENT NUMBER 3 TO AQUA-AEROBIC SYSTEMS' PROPOSAL:

This letter amends and is an integral part of the above referenced Aqua-Aerobic Systems, Inc. proposal and replaces amendement number 2. The proposal is amended as follows.

PROPOSAL AMENDMENT(S):

For the purpose of evaluating an increase in flow to 6.6 MGD, Aqua-Aerobic Systems is providing the following options:

1. The total price for two (2) 10-Disk AquaDisk®, Cloth Media Filter(s), in concrete tanks, is $604,886. These units will be able to handle the increased design flow of 6.6 MGD. This price includes taxes and one year of bonding. Also note that included in this total price is engineering submittals ($55,710) and 12 months of additional warranty on top of the required warranty ($15,705).

2. The price for two (2) 10/6-Disk AquaDisk®, Cloth Media Filter(s), in concrete tanks, is $575,237. The filter units will have 6-Disks originally with four empty disk slots allowing them to expand to 10-Disk units to handle the increased flow of 6.6 MGD. Note that this price includes taxes and one year of bonding. This price includes taxes

and one year of bonding. Also note that included in this total price is engineering submittals ($52,900) and 12 months of additional warranty on top of the required warranty ($14,985).

If you have any questions regarding this amendment, please do not hesitate to contact our local representative, listed below.

Sincerely,



Corey O'Brien
Project Application Engineer

CC: Aqua-Aerobic Systems, Inc.
Scott Kelly / SKelly@aqua-aerobic.com

Davidson Sales & Engineering / ph#: 801-977-9200 / fx#: 801-977-9300
Paul Mora

AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

Equipment List: 167138

TO:	**Magna Water District**	**PROJECT:**	**MAGNA WRF, UT**
	8885 West 3500 South		
	Magna		
	Utah 84004		
	USA		**BID DATE: March 3, 2022**
ATN:	**Trevor Andra**		**DATE: March 1, 2022**
CC:	**MISCOwater North / ph#: 925-225-1900 / fx#: N/A**		
	Nate Miller		
	Aqua-Aerobic Systems - Regional Manager / ph#: 815/639-4467 / fx#: 815/654-2508		
	Scott Kelly		

Cloth Media Filters

AquaDisk Tanks/Basins

2 AquaDisk Model # ADFSC-54x6E-PC Concrete Filter Basin Accessories consisting of:

- Concrete basin(s) (by others).

- Overall footprint will be dependent on influent, effluent, and overflow chamber configurations.
- 304 stainless steel support brackets.
- 304 stainless steel effluent seal plate weldment(s).
- Stainless steel anchors.
- 3" wafer style butterfly valve(s) with lever operator as manufacturer by Nibco or equal.

2 Influent Weir Installation(s) consisting of:

- 304 stainless steel influent weir / flow separation baffle(s).
- Stainless steel anchors.

AquaDisk Centertube Assemblies

2 Centertube(s) consisting of:

- 304 stainless steel centertube weldment(s).

- U.H.M.W. polyethylene multi segment driven sprocket(s).
- Dual wheel assembly(ies).
- Rider wheel bracket assembly(ies).
- 304 stainless steel centertube support beam(s).
- Centertube bearing kit(s).
- Viton V-ring effluent port\centertube seal(s).
- Pile cloth media and non-corrosive support frame assemblies.
- Disk segment 304 stainless steel support rods.
- Media sealing gaskets.

2 Cloth set(s) will have the following feature:

- Cloth will be OptiFiber PES-14.

AquaDisk Drive Assemblies

2 Drive System(s) consisting of:

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- AGMA class I gearbox(es) with three phase 3/4 HP drive motor(s).
- Nylon drive sprocket(s).
- Acetal drive chain(s) with 316 stainless steel link pins.
- Stationary drive bracket weldment(s).
- Adjustable drive bracket weldment(s).
- Chain guard weldment(s).
- Warning label(s).

AquaDisk Backwash/Sludge Assemblies

2 Backwash System(s) consisting of:

- 304 stainless steel backwash shoe weldments.
- UHMW polyethylene backwash shoe nozzle plates.
- 304 stainless steel backwash shoe support weldment(s).
- 1 1/2" flexible hose.
- Stainless steel backwash shoe springs.
- Stainless steel hose clamps.
- 304 stainless steel union(s).
- 304 stainless steel backwash floor plate(s).
- 304 stainless steel backwash collection manifold(s).
- PVC solids manifold installation(s).

2 Backwash/Solids Waste Pump(s) consisting of:

- Gorman Rupp model T2C60SC, 5 HP, premium efficient, 3 phase externally mounted centrifugal pump(s).
- Painted steel backwash pump stand(s).
- Stainless steel anchors.
- 0 to 15 psi pressure gauge(s).
- Bronze throttling gate valve(s).
- 3" threaded brass ball valve(s).

AquaDisk Instrumentation

2 Pressure Transducer Assembly(ies) each consisting of:

- 304 stainless steel mounting bracket weldment(s).
- 304 stainless steel transducer pipe weldment(s).
- Pressure transducer(s).
- Stainless steel anchors.
- Nylon electrical cable tie wrap(s).

2 Vacuum Gauge with Transmitter(s) consisting of:

- 0 to 30 inches mercury vacuum gauge(s).
- Vacuum transmitter(s).
- 1/4" Threaded bronze ball valve.

2 Float Switch(es) consisting of:

- 316 stainless steel float switch mounting bracket(s).
- Float switch(es).
- Stainless steel anchor(s).

AquaDisk Valves

2 Set(s) of Backwash Valves consisting of:

- 2" full port, two piece, ASTM A351 Grade CF8M stainless steel body ball valve(s), flanged end connections with single phase electric actuator(s). Valve / actuator combination shall be TCI / RCI (RCI, a division of Rotork).

2 Solids Waste Valve(s) consisting of:

- 2" full port, two piece, ASTM A351 Grade CF8M stainless steel body ball valve(s), flanged end connections with single phase electric actuator(s). Valve / actuator combination shall be TCI / RCI (RCI, a division of Rotork).

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AquaDisk Misc/Spare Parts

1 Lot of Recommended Spare Parts consisting of:

- (12) Pile cloth media socks.
- (1) Media non-corrosive support frame assemblies.
- (1) Viton V-ring effluent port\centertube seal.
- (1) Backwash/solids valve.
- At least 1 of each fuse(s), control relay(s), and indicating light replacement bulb(s).

AquaDisk Controls w/Starters

2 Control Panel(s) consisting of:

- NEMA 4X fiberglass enclosure(s).
- Circuit breaker with handle.
- 2 KVA Transformer(s).
- Fuses and fuse blocks.
- Single phase circuit breaker(s).
- Line filter(s).
- GFI convenience outlet(s).
- Control relay(s).
- Selector switch(es).
- Indicating pilot light(s).
- Compactlogix Processor.
- Power supply(s).
- Input card(s)
- Output card(s).
- Analog input card(s).
- Ethernet switch(es).
- PanelView Plus 7 15" color touch screen display(s).
- Power supply(ies).
- Motor starter(s).
- Terminal blocks.
- UL label(s).

AquaDisk Engineering

1 Set(s) Documentation for the AquaDisk will be provided as described:

- Engineer's Approval Data (English language) in electronic format.

1 Set(s) Documentation for the AquaDisk will be provided as described:

- Operation & Maintenance Manuals (English language) in electronic format.

AquaDisk Supervision/Freight Domestic

1 Supervision Services and Freight Package(s) for the AquaDisk will be provided as follows:

- 6 Day(s) for onsite services.
- 3 Trip(s) for onsite services.
- FREIGHT TO JOBSITE

The Following General Notes apply to Aqua-Aerobic Systems' Proposal:

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- SCHEDULE: We expect PRELIMINARY CONCEPT drawings will be completed and in transit to you within 4-5* weeks after receipt of order with acceptable terms and conditions and credit approval/guarantee of payment. Following finalization of the preliminary concept and our receipt of Purchaser vendor's basin detail drawings, site layout, hydraulic profile and building drawings (if applicable) we expect engineer's submittal data will be completed and in transit to you within approximately 3-4* weeks. At time of order placement, if it is determined preliminary concept drawings are not needed in order to proceed with preparation of engineer's submittal data, we expect submittals to be completed and in transit to you within 8-10* weeks after receipt of order with acceptable terms and conditions and guarantee of payment. We expect receipt of approved engineer's submittal with release for manufacture within 4-8 weeks of our transmittal of submittal data. We expect shipment of equipment (transit time excluded) to be approximately 16-22* weeks from our receipt of approved engineer's submittal data and release for manufacture. Schedules may be adjusted at time of order placement, depending upon existing order backlog.
*Weeks quoted are actual working weeks.
- Aqua-Aerobic Systems will be closed for the Christmas Holidays beginning approximately December 24, through approximately January 2nd.
- We expect shipment of control panels (transit time excluded) to be approximately 24-28 weeks* from our receipt of approved engineer's submittal data and release for manufacture. The extended delivery on control panels is based on unprecedented supply chain delays associated with the COVID-19 pandemic. Schedules will be updated as new information becomes available.
- Schedule changes due to supply chain disruption may impact the above quoted times. Aqua-Aerobic Systems will advise if/when any such disruption applies.
- PRICE ESCALATION INDEX: Aqua-Aerobic Systems, Inc. reserves the right to re-evaluate the pricing quoted prior to order acceptance if; 1) a purchase order is received after the validity date stated in this proposal or, 2) the lead times stated in this proposal are exceeded. Any pricing adjustments required shall be based on a published materials cost index specific to the materials proposed.
- TARIFF PRICE ESCALATION NOTE: The proposed goods may be affected by the recent U.S. Government proposed tariffs on imported steel and aluminum. Because of this, Aqua-Aerobic reserves the right to re-evaluate the pricing quoted prior to order acceptance if; 1) a purchase order is received past the validity date stated in the proposal or, 2) the total of the quoted lead times stated in this proposal are exceeded. Any pricing adjustments required due to tariff impacts will be based on published material cost indices specific to the affected materials.
- CONTROLS NON-DISCLOSURE / CONFIDENTIALITY AGREEMENT: If applicable, Aqua-Aerobic Systems will provide information relating to software documentation to control the treatment system supplied using Aqua-Aerobic Systems' proprietary and/or trade secret information subject to execution of an Aqua-Aerobic "Controls Non-Disclosure / Confidentiality Agreement".
- INTEGRAL DOCUMENTS: The following documents are an integral part of Aqua-Aerobic Systems' proposal:
1. Aqua-Aerobics' Design # 167138 and Design Notes dated March 24, 2021.
2. Aqua-Aerobics' Exceptions/Clarifications document dated March 1, 2022.
3. All documents listed on Aqua-Aerobics' proposal/bid package "Table of Contents" document dated March 3, 2022.
- Additional supervision services can be provided for an additional charge of $1450/day plus travel and living expenses.
- TRADEMARKS: Aqua-Jet®, Aqua-Jet II®, AquaDDM®, ThermoFlo®, Endura® Series, OxyMix®, OxyStar®, Fold-a-Float®, SAF-T Float®, Aqua MixAir®, AquaCAM-D®, AquaSBR®, Aqua MSBR®, AquaPASS®, Aqua BioMax®, AquaEnsure®, Aqua EnduraTube®, Aqua EnduraDisc®, Aqua CB-24®, AquaDisk®, AquaDiamond®, AquaDrum®, Aqua MiniDisk®, Aqua MegaDisk®, AquaPrime®, AquaStorm®, OptiComb® OptiFiber®, OptiFiber PES-13®, OptiFiber PA2-13®, OptiFiber PES-14®, OptiFiber PF-14®, OptiFiber UFS-9®, Trust the Tag®, AquaABF®, AquaMB Process®, Aqua-Aerobic® MBR, Aqua MultiBore®, Aqua Multibore® C-Series, Aqua Multibore® P-Series, Aqua ElectrOzone®, Aqua ElectrOzone® M-Series, IntelliPro®, AquaPRS™, AquaPR-206™, Aqua-Aerobic®, and the Aqua-Aerobic Corporate logo artwork are registered trademarks or pending trademarks of Aqua-Aerobic Systems, Inc. Nereda®, AquaNereda® Aerobic Granular Sludge Technology, and the AquaNereda Product logo artwork are a registered trademark of Royal HaskoningDHV. All other products and services mentioned are trademarks of their respective owners.

The Following Mechanical and/or Electrical Notes apply to Aqua-Aerobic Systems' Proposal:

- Valve and line sizes are to be verified by the engineer based on actual line losses.
- Pumps and valves ship loose, unless otherwise specified.
- Filter flow hydraulics and plant's capability to handle the intermittent backwash flow is to be confirmed by the purchaser/purchaser's consulting engineer.

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- Three phase motors will be 460 volt.
- Single phase motors will be 115 volt.

The Following Scope Exclusion Notes apply to Aqua-Aerobic Systems' Proposal:

- Materials and Services not specifically described/itemized in this proposal are not included in the quoted total price, and are to be supplied by the installing contractor/purchaser.
- Freeze protection may be required for outdoor installation in cold weather climates. All such protection, including but not limited to, heat tracing and insulation of pumps and piping, as well as protection against internal tank freezing, shall be provided and installed by the installing contractor.

SCOPE BY PURCHASER/CONTRACTOR:

*Note this is not intended as a complete listing and is provided as a courtesy.

- Unloading and on-site storage.
- Provisions for equipment access.
- Concrete, handrail and all civil works.
- All piping, spool pieces, supports, gaskets and hardware beyond Aqua-Aerobic's equipment terminations.
- Interconnecting piping, wiring and installation.
- All flanges and/or unions in the piping to service the equipment.
- Unless specifically stated above, weir(s) for each filter.
- Electrical conduit, hardware, supports, attachment of cables, wiring, j-boxes and local disconnects (if any) between motors, electrical valves, instruments and the control panel.
- Installation/field wiring of the control panel(s) that ship loose.
- Electrical wiring and supply power.

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FORM 00 31 00C - EXPERIENCE SUMMARY (SUBMIT AS FIRST PAGE OF TAB C)

Bidder to complete the following table; additional supporting information can also be included in this Tab.

Question/Criteria	Bidder's Response	Score (0-5)	Importance Factor (1-5)	Score Subtotal (Score x Importance Factor)	Maximum Points Possible
History: List the first year that the proposed model was placed into service. For example, "2005".	1993		2		10
Number of Units - Cloth Disc Filters: List the total number of units of the proposed model and type currently installed as of the date of the proposal. This count is discrete units not projects or sites (i.e. a single location with three units would count for three, not one).	Aqua-Aerobic Systems currently has 1,300 AquaDisk models installed throughout the United States.		3		15
Installation List - Cloth Disc Filters: Manufacturer shall have a minimum of 10 years design and manufacturing experience with at least 25 units installed in the United States Provide installation list that includes the following, at a minimum: Name of facility, location, date of start-up, model number, number/size of discs, design flow (gpm/sf), and total number of filters installed at the facility.	See Section 2.B for Aqua-Aerobic Systems' installation list.		5		25
Reference List / Feedback - Cloth Disc Filters: For the Installation List - Cloth Disc Filters provided above, provide facility contact (name, phone number, email and plant address) for at least 3 references.	See Section2.C for Aqua-Aerobic Systems' reference list.		5		25
California Title 22 Certification: Manufacturer shall verify that proposed cloth disc filter equipment has been certified for tertiary filtration by submitting Title 22 documentation. Certification should be for proposed equipment. Certifications from other states may be included or listed but scoring is dependent upon Title 22.	See Section 2.D which verifies Aqua-Aerobic Systems' California 's Title 22 water recycling criteria.		5		25

Section Total Score=		**100**
Section Total Score % =		

Score (0-5); completed by Buyer/Engineer	
0	Fail: The proposal fails to address the requirements described in the RFP.
1	Poor: The proposal addresses the requirements inaccurately or poorly.
2	Fair: The proposal addresses the requirements described in the RFP in an unsatisfactory manner.
3	Good: The proposal addresses all the requirements described in the RFP in a satisfactory manner.
4	Very Good: The proposal addresses all the requirements described in the RFP and, in some respects, exceeds them.
5	Excellent: the proposal addresses and exceeds all of the requirements described in the RFP.

AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

Reference List
6 Disk Filters
Package and Concrete
29 Sites, 58 Filters

ALAFAYA UTILITIES **105984**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	02/07/2002
Avg. Daily Flow(MGD):	1
Max. Design Flow(MGD):	2
Equipment:	1 Tertiary Filter(s) 6/4 Disks,Classic,ADF Disk Package Filter(s),Model 54,PS Package

CONDFIDENTIAL INDUSTRIAL **102216E**

Waste Characteristics:	Industrial / Agriculture
Treatment Objective:	TSS
StartUp Date:	06/01/1997
Avg. Daily Flow(MGD):	1.39
Max. Design Flow(MGD):	2.78
Equipment:	1 Tertiary Filter(s) ADF Disk Package Filter(s),6 Disks

BURNT STORE WWTP EXPANSION, FL **106377**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	05/19/2004
Avg. Daily Flow(MGD):	1
Max. Design Flow(MGD):	1.33
Equipment:	1 Tertiary Filter(s) 6 Disks,Model 54,ADF Disk Package Filter(s),Classic,PES-14

BUXAHATCHEE TREATMENT PLANT, AL **106470A**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	Nitrification , DeNitrification , Phosphorus
StartUp Date:	03/24/2005
Avg. Daily Flow(MGD):	1.5
Max. Design Flow(MGD):	1.5
Equipment:	2 Tertiary Filter(s) 6 Disks,Model 54,PA2-13,PS Package

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CABIN CREEK WWTF GA **114490**

Waste Characteristics:		Municipal / Domestic
Treatment Objective:		TSS
StartUp Date:		08/15/2019
Avg. Daily Flow(MGD):		1.5
Max. Design Flow(MGD):		3
Equipment:	2	Tertiary Filter(s) PA2-13,Model 54,6 Disks,ADF Disk Concrete Filter(s)

CANAL STREET WWTF UPGRADE, FL **100872B**

Waste Characteristics:		Municipal / Domestic
Treatment Objective:		TSS , Reuse
StartUp Date:		04/12/2007
Avg. Daily Flow(MGD):		3.5
Equipment:	1	Tertiary Filter(s) 6 Disks,Classic,Model 54,PES-13,SS Package

CANBY WTF IMPROVEMENTS **106303**

Waste Characteristics:		Municipal / Domestic
Treatment Objective:		TSS
StartUp Date:		08/21/2003
Max. Design Flow(MGD):		2.789
Equipment:	1	Tertiary Filter(s) ADF 6-Disk Concrete Filter(s)

CLEAR LAKE SANITARY DISTRICT **104927**

Waste Characteristics:		Municipal / Domestic
Treatment Objective:		Nitrification
StartUp Date:		12/15/1996
Max. Design Flow(MGD):		8.17
Equipment:	3	Tertiary Filter(s) 6 Disks,Classic,Model 54,SS Package,PA2-13

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CONDIFENTIAL INDUSTRIAL **110791**

Waste Characteristics:		Industrial / Potato
Treatment Objective:		TSS
StartUp Date:		09/29/2016
Avg. Daily Flow(MGD):		1.2
Max. Design Flow(MGD):		1.2
Equipment:	1	Tertiary Filter(s) PES-14,Model 54,ADF Disk Concrete Filter(s),6 Disks

EUSTIS WWTP **102375C**

Waste Characteristics:		Municipal / Domestic
Treatment Objective:		TSS , Reuse
StartUp Date:		03/03/2000
Avg. Daily Flow(MGD):		4.5
Equipment:	4	Tertiary Filter(s) ADF 6-Disk Concrete Filter(s)

FORT BEND CNTY MUD 182 TX **114830/B**

Waste Characteristics:		Municipal / Municipal
Treatment Objective:		Reuse
StartUp Date:		07/09/2019
Avg. Daily Flow(MGD):		0.3
Equipment:	2	Tertiary Filter(s) 6/4 Disks,Model 54,PES-13,PS Package

FORT BEND MUD 146 TX **112554**

Waste Characteristics:		Municipal / Domestic
Treatment Objective:		NTU
StartUp Date:		02/28/2019
Avg. Daily Flow(MGD):		1.2
Max. Design Flow(MGD):		3
Equipment:	1	Tertiary Filter(s) 6 Disks,Model 54,Concrete,PES-13

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GAINEY RANCH WRP, AZ **107929A**

Waste Characteristics:		Municipal / Domestic
Treatment Objective:		TSS , NTU
StartUp Date:		04/01/2009
Avg. Daily Flow(MGD):		1.7
Max. Design Flow(MGD):		1.7
Equipment:	2	Tertiary Filter(s) 6 Disks,ADF Disk Package Filter(s),PES-13

HARTVILLE WWTP IMPROVEMENTS, OH **109876**

Waste Characteristics:		Municipal / Domestic
Treatment Objective:		TSS
StartUp Date:		06/19/2014
Avg. Daily Flow(MGD):		0.6
Max. Design Flow(MGD):		2
Equipment:	2	Tertiary Filter(s) PA2-13,Model 54,Concrete,6 Disks

HAUGHTON LA **114383**

Waste Characteristics:		Municipal / Municipal
StartUp Date:		11/15/2017
Max. Design Flow(MGD):		2
Equipment:	1	Tertiary Filter(s) PA2-13,Model 54,ADF Disk Concrete Filter(s),6 Disks

CONFIDENTIAL INDUSTRIAL **113646**

Waste Characteristics:		Industrial / Agriculture
StartUp Date:		01/07/2016
Avg. Daily Flow(MGD):		1.5
Max. Design Flow(MGD):		3
Equipment:	1	Tertiary Filter(s) 6 Disks,Model 54,PS Package,PA2-13

LAKE HARMONY WWTP PA **114839**

Waste Characteristics:		Municipal / Municipal TSS
Startup Date		2/23/2022
Treatment Objective:		0.5
Avg. Daily Flow(MGD):		1.65
Max. Design Flow(MGD):		
Equipment:	2	Tertiary Filter(s) 6 Disks,SS Package,Model 54,PES-13

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NORTH CHAUTAUQUA WWTP NY **113521**

Waste Characteristics:		Municipal / Municipal
Treatment Objective:		Phosphorus / TSS
StartUp Date:		09/26/2018
Avg. Daily Flow(MGD):		0.301
Max. Design Flow(MGD):		2.0016
Equipment:	2	Tertiary Filter(s) PES-14,Model 54,ADF Disk Package Filter(s),6 Disks

ORLEANS MA **110167A**

Waste Characteristics:		Municipal / Municipal
Treatment Objective:		BOD / Denitrification / Nitrification / TSS
Startup Date:		10/25/2021
Avg. Daily Flow(MGD):		0.535928
Max. Design Flow(MGD):		0.957
Equipment:	2	Tertiary Filter(s) 6 Disks,ADF Disk Package Filter(s),Model 54,PES-13,SS Package

PALM BAY REUSE FACILITY, FL **108628**

Waste Characteristics:		Municipal / Domestic
Treatment Objective:		TSS
StartUp Date:		08/19/2009
Avg. Daily Flow(MGD):		3
Max. Design Flow(MGD):		6
Equipment:	2	Tertiary Filter(s) PES-13,Model 54,ADF Disk Concrete Filter(s),Classic,6 Disks

PASO ROBLES CA **113400**

Waste Characteristics:		Municipal / Domestic
Treatment Objective:		NTU
StartUp Date:		11/15/2018
Avg. Daily Flow(MGD):		3.66
Max. Design Flow(MGD):		5.5
Equipment:	3	Tertiary Filter(s) 6 Disks,Concrete,PA2-13,Model 54

CONFIDENTIAL INDUSTRIAL **109425/A**

Waste Characteristics:		Industrial / Refining
Treatment Objective:		TSS
StartUp Date:		01/28/2009
Avg. Daily Flow(MGD):		0.108
Max. Design Flow(MGD):		0.108
Equipment:	2	Tertiary Filter(s) ADF 6-Disk Package Filter(s)

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RIVERCHASE WWTP EXPANSION, AL **103433A**

Waste Characteristics:		Municipal / Domestic
Treatment Objective:		Phosphorus / TSS
StartUp Date:		10/16/2008
Avg. Daily Flow(MGD):		3
Max. Design Flow(MGD):		4.5
Equipment:	2	Tertiary Filter(s) 6 Disks,Classic,SS Package,PES-14,Model 54

STOCKBRIDGE WWTP EXPANSION GA **104161C**

Waste Characteristics:		Municipal / Municipal
Treatment Objective:		BOD / Phos / TSS
StartUp Date:		11/21/2019
Avg. Daily Flow(MGD):		1.5
Max. Design Flow(MGD):		1.9
Equipment:	2	Tertiary Filter(s) PES-14,6 Disks,Model 54

UXBRIDGE WWTF UPGD MA **111652**

Waste Characteristics:		Municipal / Municipal
Treatment Objective:		Phosphorus / TSS
StartUp Date:		12/19/2019
Avg. Daily Flow(MGD):		2.4
Max. Design Flow(MGD):		3.1
Equipment:	3	Tertiary Filter(s) 6 Disks,Model 54,PES-14,PS Package

WILBARGER CREEK MUD 2 TX **116452**

Waste Characteristics:		Municipal / Domestic
Treatment Objective:		TSS / NTU
Startup Date:		Spring 2022
Avg. Daily Flow(MGD):		1
Max. Design Flow(MGD):		2
Equipment:	2	Tertiary Filter(s) PES-14,Concrete,Model 54,6/4 Disks

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WILBARGER CREEK WWTF TX **111004C**

Waste Characteristics:		Municipal / Municipal
Treatment Objective:		TSS
StartUp Date:		09/10/2020
Avg. Daily Flow(MGD):		1.33
Max. Design Flow(MGD):		5.32
Equipment:	3	Tertiary Filter(s) 6 Disks,PS Package,Model 54,PES-13

WINDERMERE UTILITY COMPANY TX **105452B**

Waste Characteristics:		Municipal / Municipal
Treatment Objective:		TSS
StartUp Date:		06/08/2020
Avg. Daily Flow(MGD):		3
Max. Design Flow(MGD):		7.5
Equipment:	3	Tertiary Filter(s) PA2-13,Model 54,SS Package,6 Disks,Classic

WINDERMERE UTILITY WWTP **105452**

Waste Characteristics:		Municipal / Domestic
Treatment Objective:		BOD , TSS
StartUp Date:		10/21/1999
Avg. Daily Flow(MGD):		2
Max. Design Flow(MGD):		5
Equipment:	2	Tertiary Filter(s) SS Package,6 Disks
	1	Tertiary Filter(s) 6 Disks,SS Package

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AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

Reference List

Plant Name: Central Valley WRF / 113968A

Filter Units: (3) 10-Disk ADFSP-54 12/10 (Package)

Address: 100 West Central Valley Rd

Salt Lake City, UT 84119

Phone: 801-973-9100

Contact: Gary Faulkner

Plant Name: South Valley WRF 107688A

Filter Units: (2) 8-Disk ADFP54x8EPC in Package SS

Address: 7495 South 1300 West

West Jordan, UT 84084

Phone: 801-566-7711

Cell: 801-232-6274

Contact: Taigon Worthen

Plant Name: City of Burley ID 106538

Filter Units: (3) 12-Disk AquaDisk in Concrete

Address: 1410 Overland Ave

PO Box 1090

Burley ID 83318

Phone: 208-878-2224

Contact: Dee Hodge

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State Water Resources Control Board
Division of Drinking Water

April 24, 2017

Onder Caliskaner, Ph.D., PE
National Technologist
Kennedy/Jenks Consultants
10850 Gold Center Drive, Suite 350
Rancho Cordova, CA 95670

Dear Mr. Caliskaner,

Subject: Conditional Acceptance of the Cloth Media Filters PA-13, PES-13, and PES-14 to comply with California Water Recycling Criteria at Higher Filter Loading Rates (3190001-706)

The Division of Drinking Water's (Division) Recycled Water Unit has reviewed a request, dated January 20, 2017, from Kennedy/Jenks Consultants to consider the Cloth Media Filters PA-13, PES-13, and PES-14 (used at high filtration rates) as alternative filtration technologies for compliance with the California Water Recycling Criteria (Title 22), Section 60320.5. Accompanying the request was a report entitled, "Title 22 Re-Rating of Aqua-Aerobic Systems, Inc. Cloth Media Filters PA-13, PES-13, and PES-14 for Wastewater Recycling Applications in California", dated January 2017. The report outlines findings from a study conducted at the Pleasant Grove wastewater treatment plant located in the City of Roseville, CA. The testing was conducted using the single-disk Aqua MiniDisk MD-5 filter pilot plant treating secondary clarified effluent having turbidity levels averaging 4-5 NTU with spikes up to 10 NTU. Over 30 tests were done with filter flowrates ranging from 6 to 22-gpm/ft^2.

These filters are currently conditionally accepted in California at lower filtration rates.

1. PA-13 at 6-gpm/ft^2 via DDW letter dated January 13, 2009.
2. PES-13 at 6-gpm/ft^2 via DDW letter dated November 14, 2007.
3. PES-14 at 7-gpm/ft^2 via DDW letter dated February 1, 2013.

Demonstration studies conducted using the Cloth Media Filters PA-13, PES-13, and PES-14 at higher filtration rates have satisfactorily shown an equal degree of treatment and reliability as those technologies listed in Title 22. Based on a review of the materials submitted, the Division grants conditional acceptance of the Cloth Media Filters PA-13, PES-13, and PES-14 at the higher filtration rates as alternative treatment technologies for recycled water filtration applications, subject to the following conditions:

1. Use of the identical materials and manufacturing for each filter as described in the January 2017 report.

2. Instantaneous loading rates shall not exceed 22-gpm/ft^2.

3. Turbidity in the filtered water shall not exceed an average of 2 NTU within a 24-hour period, 5 NTU more than 5 percent of the time within a 24-hour period, and 10 NTU at any time.

4. Coagulation, per Title 22, Section 60349, shall be added upstream of the alternative filtration technology to meet the requirement of Title 22, Section 60301.320(a) whenever the filter effluent supplies recycled water for a cooling use area as per Title 22, Section 60306.

5. Acceptance of this technology is contingent on it being complimented with a disinfection process which is compliant with Title 22, Section 60301.230.

6. Each operations plan shall include a performance goal that adequate backwash duration is provided to ensure effective solids removal ('in' and 'on' the cloth media). The operations plan shall describe how this goal will be met under all conditions.

7. Each operations plan shall include scheduled inspections and assessments of the cloth condition as an operational safeguard. This should include a routine visual inspection at least monthly, and a more in-depth assessment of the cloth condition at least annually. Inspection frequencies may change as media condition and performance experience is gained with time.

8. Each operations plan shall provide for assurances that adequate sludge wasting is practiced to ensure against excessive solids buildup in the filter vessel.

Conditional acceptance is specific to the Cloth Media Filters PA-13, PES-13, and PES-14 detailed in the report dated January 2017 described above. The Division must review in advance any future proposed changes made in the physical attributes or characteristics of these treatment technologies to determine whether the modifications will require additional testing to ensure Title 22 equivalency.

Review and approval of all proposed water recycling projects using the Cloth Media Filters PA-13, PES-13, and PES-14 are provided through the Regional Water Quality Control Board's Water Reclamation permitting process. The Division's local district offices will also review all proposed water recycling projects using the Cloth Media Filters PA-13, PES-13, and PES-14 on a case-by-case basis to confirm full compliance with all applicable treatment and reliability features required by Title 22 for the specific treatment facilities.

If you have any questions regarding this letter, please contact Randy Barnard at (619) 525-4022 or via email at Randy.Barnard@waterboards.ca.gov.

Sincerely,

Randy Barnard, P.E.
Recycled Water Unit Chief
Division of Drinking Water
State Water Resources Control Board
1350 Front St., Rm. 2050
San Diego, CA 92101

FORM 00 31 00D - DESIGN AND PERFORMANCE SUMMARY (SUBMIT AS FIRST PAGE OF TAB D)

Bidder to complete the following table; additional supporting information can also be included in this Tab.

Question/Criteria	Bidder's Response	Score (0-5)	Importance Factor (1-5)	Score Subtotal (Score x Importance Factor)	Maximum Points Possible
List name of Cloth Media Filter Manufacturer.	Aqua-Aerobic Systems, Inc.		1		5
Include a copy of the specification(s) listed below with each paragraph check-marked to indicate specification compliance or marked to indicate requested deviations from specification requirements. If deviations are noted, written justification shall be provided for each deviation. •46 61 25 Cloth Media Filters	See Section 3.B. for the notated specification and Section 3.B.a for Aqua-Aerobic Systems' exceptions and clarifications.		5		25
Provide a decription of the number and size of discs in each filter train at both initial and buildout flow conditions, where each train is sized for 50 percent of the flow (2+0): •Initial Flow = 4.0 mgd •Buildout Flow = 4.65 mgd For the initial and buildout flow conditions as outlined above, verify that maximum loading rate of 5 gpm/ft is not exceeded.	Initial Flow: Two (2) 6-Disk AquaDisk®, Cloth Media Filters with a max loading rate of 4.3 gpm/ft^2. Buildout Flow: Two (2) 6-Disk AquaDisk®, Cloth Media Filters with a max loading rate of 5 gpm/ft^2		5		25
Provide dimensioned drawing(s) of the proposed units, i.e. filter trains showing disc number and sizing, space requirements for the concrete tank, backwash pumps and piping, valve locations, and control panels.	See Section 3.D for dimensioned drawings.		5		25
Secondary Effluent applied to the cloth media filter equipment will have the average water quality as outlined in Specification 46 61 25 including continuous chlorine as result of the proposed filters being downstream of the existing chlorine contact basin. Additionally, MWD adds Alum upstream of the secondary clarifiers. The design of the filter building will include provision for polymer dosing at the filters if needed to meet Utah Type 1 Reuse requirments. Cloth Disc Filter Manufacturer shall acknowledge these conditions as well as describe experience in treating similar conditions at existing installs.	Aqua-Aerobic Systems acknowledges the design criteria outlined and water quality outlined in Specification 46 61 25. Aqua-Aerobic Systems' currently has over 100 facilities meeting California Title 22 requirements, which per the Title 22 requirement must include provisions for coagulant addition. Please refer to Section 3.E for a list of installations where Aqua-Aerobic Systems' cloth media filter is used in water reuse applications.		3		15
Provide estimates of water quality results from the cloth media filter based on the influent water quality provided, filter equipment configurations outlined, estimated backwash frequency, and manufacturer experience under similar conditions. After selection does the manufacturer recommend that a pilot test be conducted to verify cloth media filter performance? If so, please provide a decription of the set-up, duration, and not to exceed cost for pilot testing.	See Section 3.C shows the process design which gives the estimated water quality results from the filter as well as the filter equipment configurations. Estimated backwash frequency can be found in Section 3.H. and Aqua-Aerobic Systems' experience under similar conditions is referenced in Section 3.E. Aqua-Aerobic Systems will not require piloting to verify cloth media filter performance, however, if piloting information is desired it can be found in Section 3.F.b.		3		15
Describe how backwash would be configured and occur for each filter train at the initial flow condition and then again later with more discs added for the buildout flow condition. Does backwash occur for the whole train or is there a split where only a portion of each train is backwashed? MWD is open to recommendations on backwash configuration and sequencing.	Aqua-Aerobic Systems' backwash configuration is outlined in Section 3.G. The filter units are configured to backwash 2 of the 6 disks at a time.		1		5
Indicate power requirements for the filter train motor and backwash pumps, and estimated backwash waste washwater flowrate (max gpm).	The power requirements and backwash flow rates can be found in Section 3.H.		1		5

NOTE: Submit additional information as Part of Tab E to show features of the system. Submit descriptions, scope of supply, drawings, P&IDs, control descriptions, control panel information, or narratives to address the items above, as applicable.

Section Score=		**120**
Section Total Score % =		

Score (0-5); completed by Buyer/Engineer	
0	Fail: The proposal fails to address the requirements described in the RFP.
1	Poor: The proposal addresses the requirements inaccurately or poorly.
2	Fair: The proposal addresses the requirements described in the RFP in an unsatisfactory manner.
3	Good: The proposal addresses all the requirements described in the RFP in a satisfactory manner.
4	Very Good: The proposal addresses all the requirements described in the RFP and, in some respects, exceeds them.
5	Excellent: the proposal addresses and exceeds all of the requirements described in the RFP.

SECTION 46 61 25
CLOTH MEDIA FILTERS

PART 1 -- GENERAL

1.1 THE SUMMARY

A. This specification details the performance and design requirements for the Cloth Media Filtration System at the Magna Water District (OWNER) to provide reuse water in accordance with State of Utah requirements. The Filtration System Supplier (FSS) shall provide cloth media filters, complete and operable, in accordance with the Contract Documents

1.2 MANUFACTURER SUBMITTALS

A. Furnish submittals in compliance with Section 01 33 20 – Submittal Procedures.

B. Shop Drawings

1. Drawings and technical information for equipment, piping, valves, and controls.

2. Electrical single line diagrams, schematic diagrams, interconnection diagrams, internal wiring diagrams of the filter system including control panel and any auxiliary control or termination panels. Component ratings such as main circuit breaker, branch circuit breakers, and feeder sizes shall be included. Operating characteristics of electrical and control equipment including power consumption, operating voltage, and amperage tolerances, and ancillary electrical services shall be shown.

3. A complete listing of the PLC control logic with cross-reference listings, data table listings, including symbolic and descriptive names, labels, and comments.

4. Operator interface screen layouts, with identification of data to be displayed.

C. Technical Manual: The Technical Manual shall contain the required information per Section 01 33 20 – Submittal Procedures.

1.3 SPECIAL CORRECTION OF DEFECTS REQUIREMENT

A. The CONTRACTOR shall furnish a written warranty that the filter will meet the performance and capacity requirements. The warranty shall state that in the event of defects, the CONTRACTOR will make necessary adjustments and repairs to meet the requirements at no cost to OWNER.

B. If it is determined that the filter is unable to meet the performance and capacity requirements or if the filter controls are unsuitable for the ambient environment, the CONTRACTOR shall be responsible to provide a filter system that will comply.

C. It is expected that additional project requirements, including some changes, will be required as the design progresses. The DESIGN-BUILDER (DB) will make every effort to coordinate changes that will affect the Filtration System, but ultimately the FSS is required to comply with these design progression updates.

D. The FSS must provide a complete and functional system that fully complies with the requirements defined in the RFP. The FSS is also responsible for ensuring that their package does not compromise or interfere with the performance of the Magna Reuse Facility.

E. The CONTRACTOR shall correct defective WORK for 12 months from the date of Substantial Completion.

1.4 EXPERIENCE

A. The filter supplier shall furnish documentation of a comprehensive test performed on the filter system by an independent third party in the State of California to show capabilities with the Title 22 requirements.

B. Refer to Section 00 31 00 – Experience for relevant FSS experience requirements.

PART 2 -- PRODUCTS

2.1 GENERAL SYSTEM DESCRIPTION

A. The filtration system shall be a tertiary cloth media disk filtration by gravity flow. The system shall consist of two filter modules installed in concrete basins to ensure gravity flow compatibility with the existing plant hydraulic profile.

2.2 PERFORMANCE AND CAPACITY REQUIREMENTS

A. Each filter shall meet or exceed the following performance and capacity requirements:

Parameter	Initial	Buildout
Design Flow, mgd	4.0	4.65
Number of Filter Trains, #	2	2
Capacity of each train, mgd (each train to treat 50% of flow for 2+0 system)	2.0	2.33
Maximum Hydraulic Loading Rate, gpm/sq-ft	5.0	5.0
Minimum Disks per Filter Train, each (each train to include space to add disks to achieve buildout capacity)	4	5
Influent Water Quality to the Filters		

Maximum Total Suspended Solids, TSS mg/L	20	
Maximum Chlorine, mg/L	1.5	
Minimum Temperature, degrees C	10	
Filter Effluent Requirements		
Effluent Turbidity, NTU	Max Instantaneous – 5 NTU Max Daily Arithmetic Mean – 2 NTU	Max Instantaneous – 5 NTU Max Daily Arithmetic Mean – 2 NTU
Maximum TSS, mg/l	5	5

2.3 DESIGN AND CONSTRUCTION

A. System Components. Each manufacturer shall provide the components to their standard system in order to meet the performance and capacity requirements discussed herein.

1. Filter Tank: Each tank assembly shall be concrete and designed by others.

C

See Section 3.B.a exception/clarification #1.

2. Drive Assembly: The drive assembly shall be designed to rotate the backwash assembly and center shaft during the backwash cycle, if required. Each filter shall include an adjustable drive assembly with a gearbox, drive sprocket, drive chain, and a Type 304 stainless steel chain guard. Belt drive systems will not be acceptable. The gearbox shall be parallel in-line helical type, AGMA class 1 drive motor rated for control by suppliers PLC. The drive sprocket shall be nylon. The chain shall be nylon with Type 316 stainless steel pins.

3. Center Tube Assembly: If applicable, each center tube assembly shall include a Type 304 stainless steel center tube weldment, driven sprocket, wheel assemblies, and frame and cloth assemblies. The cloth media disk filter may also consist of a centrally located rotating shaft with mounted vacuum shoe assemblies. Each center tube assembly shall also include a chlorine-resistant Viton V-Ring effluent port seal, if required. The driven sprocket shall be multi segment made of UHMW polyethylene. Fasteners shall be type 316 stainless steel.

4. Filter Cloth Assemblies: Each module shall include sufficient cloth disk assemblies per manufacturers standards to handle initial flows with the capability to expand to handle buildout flows. Each cloth disk assembly shall be comprised of a cloth media sock supported by an injection molded polyethylene copolymer frame or Type 304 stainless steel frame. Cloth/frame assemblies shall be constructed such that each segment is easily removable from the center tube without special tools to allow for removal and replacement of the cloth at the point of installation or maintenance. Systems requiring

special tools and/or the return of media segments to the factory for replacement shall not be acceptable.

a. Cloths shall be of woven nylon or polyester fiber pile construction with polyester backing material having a nominal filtration rating of 5-14 microns. Granular media and screens having structured identical openings will not be allowed. The cloth media shall have an active filter depth of 3- to 5-mm. The cloth depth shall also provide storage of captured solids, reducing backwash volumes while maintaining an operational headloss. Woven mesh or microstrainer type disk with no filtration depth are not acceptable.

b. Each cloth disk assembly shall have a minimum of 54 - 72 square feet of effective submerged filtration area.

c. Effluent filtration area is defined as only the portion of the disk that is submerged during filtration. Any disk area that is not submerged shall not be considered as effective area.

d. During filtration, the filter unit shall operate in a static condition with no moving parts. The filter system shall provide for the collection of filtered solids on the outside of the cloth media surface to allow for the direct contact of cleaning systems. The filter flow path shall be from the outside of the disk to the inside. Systems with flow paths from the inside to the outside of the disk collecting filtered solids on the interior surfaces of the disk are not acceptable.

5. Effluent Trough: If applicable to the FSS standard, disks may be attached to the effluent trough independently to allow for disk isolation. Disks that are attached to the effluent trough independently shall incorporate a permanently mounted valve for complete isolation and shutoff while the disk is removed from the operating filter. The disk filter design shall sample filtrate from each disk independently or from a common effluent trough, as required.

6. Anchor Bolts: Anchor bolts shall be Type 316 stainless steel. Anchor bolts to be provided by the FSS but installed by the CONTRACTOR.

B. Backwash/Sludge Discharge Assembly: The backwash function shall incorporate a pump that draws filter effluent through the cloth, thereby removing accumulated solids from the cloth surface. Designs that utilize high pressure spray as the sole means of solids removal are not acceptable. The backwash disk filter system shall be suitable for filtering domestic wastewater after conventional treatment. Each filter shall be designed to operate on a continuous basis at peak flow rate and shall be designed to operate while receiving varying flow rates. Backwash can service individual disks or an entire filter system, as required.

1. Each backwash/sludge discharge assembly shall include an external piping assembly, backwash system assembly, and at least one backwash pump. The external piping assembly shall include both automated and manual backwash valves as required for automated operation. Automated backwash valves shall be operated and controlled by the PLC. The backwash assembly shall include molded polyethylene or Type 304 stainless steel backwash shoe supports with end springs if applicable, UHMW backwash shoes, Type 304 stainless steel or wire-reinforced flexible hose, Type 304 or 316

stainless steel backwash manifold with stainless steel hose clamps, and a PVC sludge collection manifold as required. The backwash shoe shall have minimal contact with the cloth media across the entire suction zone in order to reduce wear and solids impingement on the cloth media.

2. Ball valve manufacturers shall be the following or equal:

   a. DeZURIK

   b. GA Industries

   c. Neles-Jamesbury, Inc.

   d. NIBCO, Inc.

   e. Henry Pratt Company

   f. Conbraco Industries, Inc. (Apollo)

   g. ITT Engineered Valves

   h. Watts Regulator

   i. Worcester Controls

   j. Ta Chen International (TCI), Inc.

3. Gate valve manufacturers shall be the following or equal:

   a. Clow Valve Co.

   b. Kennedy Valve

   c. M & H Valve Company

   d. Milwaukee Valve Company, Inc.

   e. DeZURIK

   f. Fabri-Valves

   g. Mueller Company

   h. NIBCO, Inc.

4. Butterfly valve manufacturers shall be the following or equal:

   a. Bray Series 31 Electric Actuated Lug-Style Butterfly Valves for automatic valves

   b. Bray Series 31 Lug-Style for manual valves

5. The backwash pumps shall be manufacturer's standard and controlled by the supplier's control panel.

6. Filtering shall not be interrupted during normal backwashing and sludge discharge.

7. Each filter shall include backwash control valves and sludge valves as required for automated operation. If applicable, valves shall be 2-inch, 3-piece, grooved or flanged end, 351 CF8M stainless steel body, Type 316 stainless steel ball and stem, full port, installed with cast iron Victaulic couplings and open/close service electric actuator. Valve actuator shall include a compartment heater and thermostat with limit switch feedback to the microprocessor in both the open and closed positions.

C. Swivel Joints

1. If applicable, swivel joints shall be designed to allow rotation of the backwash assembly and center shaft during the backwash cycle.

2. Construction of the swivel joints shall be 304 stainless steel with a permanently lubricated bearing designed for submerged service. Stainless steel shafts shall be precision ground with the machined bearing to insure a precise tolerance.

D. Level Transmitter: A submersible pressure transducer shall be supplied for each filter basin. The pressure transducer shall have stainless steel wetted parts and provide a 4-20 mA signal. Units shall monitor the water level in the filter basin. Pressure transducer shall be provided with a mounting bracket and Type 316 stainless steel anchors. Electrical connection shall be 2-wire, loop powered through a shielded integral cable. The CONTRACTOR shall provide junction box, bellows mounting and interconnecting wiring. Transducers shall be the following or equal:

1. KPSI Model 710 series

2. Endress + Hauser FMX 21 series

3. Rosemount model 3051

E. High Level Switch: A high level mechanical float switch shall be provided to indicate level in the filter modules. Mercury switches are not acceptable. The switch shall be the following or equal:

1. MAGNETROL T20-4 or T21-4

2. Madison M5600

F. Control System: Each disk filter shall have its own control system and shall be supplied by the FSS. The automatic and manual controls for operation of the filter system shall be furnished fully assembled, wired, and pre-programmed in a stainless steel NEMA 4X rated control enclosure. The control system, including equipment, enclosures, and display screens shall be suitably designed for indoor installation in the ambient environment. Controls shall be provided to control and monitor equipment as indicated. The control panel shall be suitable for connection to a single 480 volt, 3 phase, 60 Hz power supply, and shall be equipped with a main circuit breaker disconnect switch, full voltage non-reversing NEMA-

rated motor starters, control power transformer, power supplies, and other controls required for a complete and operating system. The control panel shall be equipped with transient voltage surge protection, voltage imbalance protection, motor overload protection, and phase loss protection.

G. Programmable Logic Controller: Automatic operation of the filter shall be controlled through a programmable logic controller (PLC) mounted inside each filter local control panel. The control panel shall be equipped with a PLC suitable for control and protection of the filter systems. PLC shall be an Allen-Bradley 1769 Compactlogix PLC with I/O modules as required by the application. The filter system shall provide hardware I/O points to wire into the plant PLC system to allow for the following data and alarms to be taken directly from the filter controller and imported to the plant PLC and SCADA networks.

1. Status signals

    a. Filter on-line status.

    b. Filter in backwash status.

2. Alarm signals

    a. Filter high level alarm.

    b. Filter drive failure alarm.

    c. Backwash pump failure alarm.

3. The CONTRACTOR shall require the filter manufacturer to coordinate its WORK so that the filter controls are fully integrated with the plant PLC and SCADA system.

H. Operator Interface Terminal: The control system shall be equipped with an operator interface that provides control display screens for the operator to monitor and control filter status, setpoint, and alarm information.

1. The interface shall allow the operator to adjust the following operating parameters:

    a. Time of day, date, year

    b. Backwash interval

    c. Backwash duration

    d. Sludge waste interval

    e. Sludge waste duration

    f. Number of backwashes between sludge wasting

2. The interface shall provide information to assist the operator in assessing the status of the filter system. The interface screen shall display, at minimum, the following parameters:

a. Time of day, date, year

b. Water level in the filter

c. Time since last backwash

d. Time since last sludge withdrawal

e. Elapsed time on the drive motor

f. Elapsed time on the backwash pump

g. Total backwash time

h. Total sludge withdrawal time

3. The interface shall display the alarm history. The alarm history shall include the time and date of the most recent 25 alarms along with the description each alarm. The interface shall also display current alarms, including the date, time, and a description of each alarm. As a diagnostic aid to the operator, the interface shall display the time between backwashes for the most recent 40 backwashes.

I. Filter Supports, Walkways, Handrails and Stairs: Shall be designed and provided by others.

J. The filter supplier shall provide appropriate supports to support backwash piping and utility water piping.

K. Fiberglass Removable Cover: Not required, filters to be located in a covered building designed and provided by others

L. Spare Parts: The CONTRACTOR shall provide spare parts suitably packaged and labeled. As a minimum, the spare parts shall include:

1 spare cloth per complete disk or wedges of a cloth for a complete disk per train	Filter cloths
1	Filter media support frame
1	Viton V-ring effluent port \ centertube seal
1	Actuated valve of each size if applicable

2.4 FILTER MANUFACTURERS

A. Aqua-Aerobic Systems, Inc.

B. Five Star Filtration, LLC.

C. Nexom.

PART 3 -- EXECUTION

3.1 INSTALLATION

A. Installation shall be per the manufacturer's printed recommendations and as indicated. Installation shall be under the supervision of a qualified manufacturer representative.

3.2 START-UP SUPERVISION AND INSTRUCTION

A. The equipment manufacturer shall furnish the services of a factory trained representative for a minimum of 3 trips and six 8-hour Days at the Site to inspect the installation, supervise the initial operation of the equipment, instruct the plant operating personnel in proper operation and maintenance, and provide process assistance during performance testing.

B. The Technical Manual shall be furnished at least 60 Days prior to startup.

3.3 FIELD TESTING

A. Testing: In conjunction with the requirements of Section 01 91 14 – Equipment Testing and Startup, a Performance Test shall be performed once the filters are installed. The CONTRACTOR shall send a 5-gallon filter influent sample to the filter manufacturer a minimum of 2 weeks prior to onsite sampling. This sample will provide the manufacturer a representative sample to perform a laboratory filterability test. Testing shall be conducted by the CONTRACTOR through a testing laboratory approved by the ENGINEER prior to testing. The ENGINEER shall be notified at least 3 Days before the start of any test.

1. Hydraulic Loading Test

a. In separate tests, each filter module shall be loaded continuously at the peak flow rate of 2.0 mgd for a continuous 4-hour period. The effluent turbidity shall not exceed an average of 2 NTU over the testing period. If the filter does not meet this performance requirement, the filter shall be inspected, tuned, and retested. The Performance Testing below shall not commence until the requirements of this test have been satisfied by each of the filter modules.

b. Effluent water quality shall be monitored and reported by a continuous online turbidimeter that draws a sample from the filter effluent chamber. The turbidimeter shall be calibrated immediately before the start of the test.

2. Performance Test

a. Influent water quality: The performance test shall be conducted on each filter module using plant secondary effluent after the plant processes have stabilized and the plant is operating normally. Test duration for each module shall be 8 continuous hours at a flow rate of 1.0 to 2.0 mgd with at least 2 continuous hours at 2.0 mgd. The average filter influent TSS concentration will not exceed 20 mg/l during the test period. Composite one liter TSS samples will be taken every hour. A TSS analysis for each sample shall be performed by a certified lab.

b. Effluent water quality: Effluent water quality will be monitored and reported by a continuous online turbidimeter that draws a sample from the Reuse Pump Station Wet Well. The turbidimeter shall be calibrated immediately before the start of the test.

3. Performance test outcome: The performance test will result in one of 3 outcomes, pass, fail, or process upset. These are described below as well as follow-up procedures for each outcome.

   a. Pass: The pass outcome demonstrates that the filters met the required turbidity requirements during the performance test period with no filter equipment failure during the test. The follow-up for this outcome is to draft the Performance Test Report defined below.

   b. Fail: If the filter was unable to meet the effluent requirements with all influent water quality requirements satisfied, the CONTRACTOR may conduct a maximum of 2 additional performance tests. If the filters fail either of those tests, they will be considered defective WORK.

   c. Process Upset: If there is a process upset that compromises the influent water quality and interrupts the performance test, the upset shall be noted and documented in the Performance Test Report. The tests shall be repeated after process stability is reestablished.

4. Performance test report: A performance test report shall be drafted to describe the results of each performance test conducted. The report shall include the following:

   a. Title Page

   b. Table of Contents

   c. Executive Summary: This section shall contain a brief introduction describing the purpose of the test. The summary shall also include the flow rate and resulting hydraulic loading rate, average influent TSS concentration (mg/l), average effluent turbidity values (NTU), volume of the waste washwater as percent of influent flow as well as total number of waste washwater cycles. A graph shall show both influent TSS (mg/l) and effluent turbidity versus time. A general statement comparing the overall performance of the filters to the requirements shall also be included.

   d. Hydraulic Loading Rate: The flow rate (mgd) and hydraulic loading rate (gpm/ft^2) shall be discussed in this section. Average turbidity results shall be presented. Flow data will be included in the Appendix. The results of the hydraulic loading test shall be presented and discussed.

   e. TSS data: This section shall display the influent TSS values (mg/l) graphically over the test period. The lab reports shall be included in an Appendix. A brief narrative about the data shall also be part of this section.

   f. Turbidity data: This section shall present graphically the continuous turbidity measurements (influent and effluent) over the performance test time period. A graph shall also be included showing both influent TSS (mg/l) and effluent

turbidity versus time. The reported effluent turbidity will be measured by the turbidimeter located at the Reuse Pump Station Wet Well. A brief narrative about the turbidity data shall be given in this section as well. The rate of chemical addition shall be included in the report.



g. Waste washwater: The volume of waste washwater as percent of influent flow shall be presented in this section. The number of waste washwater cycles and a brief narrative describing the overall effectiveness of the cycle shall also be given in this section.



h. Overall performance: This section shall describe the reason for any performance test restarts resulting from either test fail outcomes or process upsets. The section will also provide a general summary of the overall performance of the filters and any problems that were encountered during the testing.



i. Appendix: The Appendix shall contain continuous influent flow data and graph, as well as the certified lab data and reports and any other important information pertaining to the performance test not already included in the report.

END OF SECTION

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Aqua-Aerobic Systems, Inc.

Exceptions / Clarifications Document: 3/1/22

Project: MAGNA WRF, UT

The following clarifications apply to Aqua-Aerobic Systems, Inc.'s offering:

1) **Reference: Section 46 61 25 Cloth Media Filters**

   2.3 Design and Construction. A.2 Drive Assembly:"The chain shall be nylon with Type 316 Stainless steel pins".

   Aqua's Exception/Clarification
   Aqua-Aerobic Systems would like to clarify that we will provide an acetal chain in lieu of a nylon chain.

2) **Reference: 00 80 00 SUPPLEMENTARY CONDITIONS**
   SC-4.02.G.1.
   SC-4.02.H.2.

   SC-4.02.G.1. .with respect to insurance required by Paragraphs SC-4.02.F.3 through SC-4.02.F.6 inclusive, include as additional insureds (subject to any customary exclusion in respect of professional liability) Buyer, Engineer, their consultants, all of whom shall be listed as additional insureds....

   SC-4.02.H.2. Seller's General Liability under Paragraphs SC-4.02.F.3 through F.6 which shall include completed operations and product liability coverages, and eliminate the exclusion with respect to property under the care, custody and control of Seller"

   Aqua's Exception/Clarification
   SC-4.02.G.1. We clarify Aqua-Aerobic insurance includes blanket policy endorsements for additional insured coverage. These blanket endorsement(s) state "Where Required by written Contract" in lieu of listing the specific additional insured names.

   SC-4.02.H.2. We clarify Aqua-Aerobic insurance will not include the "eliminate the exclusion with respect to property under the care, custody and control of Seller". We confirm the goods are fully insured by Aqua-Aerobic until risk of loss transfers to the Buyer in accordance with General Condition 6.03.

3) **Reference: 00 40 00 BID FORM**
   ARTICLE 5 - BASIS OF BID,
   Item 3. Sales Tax
   Addendum 1 - CLARIFICATIONS 1.

   3. Sales Tax on Filter Equipment (Item 2)

   Addendum 1, CLARIFICATIONS 1; Response - Taxes are only to be applied to equipment that is provided by the Bidder.

   Aqua's Exception/Clarification
   We clarify it is our understanding the tax code requires taxes to be applied to all items except freight to jobsite and field services because the engineering in item 1 is required in order to produce the tangible personal property (i.e. the equipment). Aqua-Aerobic has applied 7.25% sales tax to the engineering and equipment excluding only freight to jobsite and field services.

4) **Reference: 00 52 00 AGREEMENT**
   ARTICLE 10, 10.01.a.9.c.

   c. Sellers Bid, solely as to the prices set forth therein.

Aqua-Aerobic Systems, Inc.

Exceptions / Clarifications Document: 3/1/22

Project: MAGNA WRF, UT

Aqua's Exception/Clarification

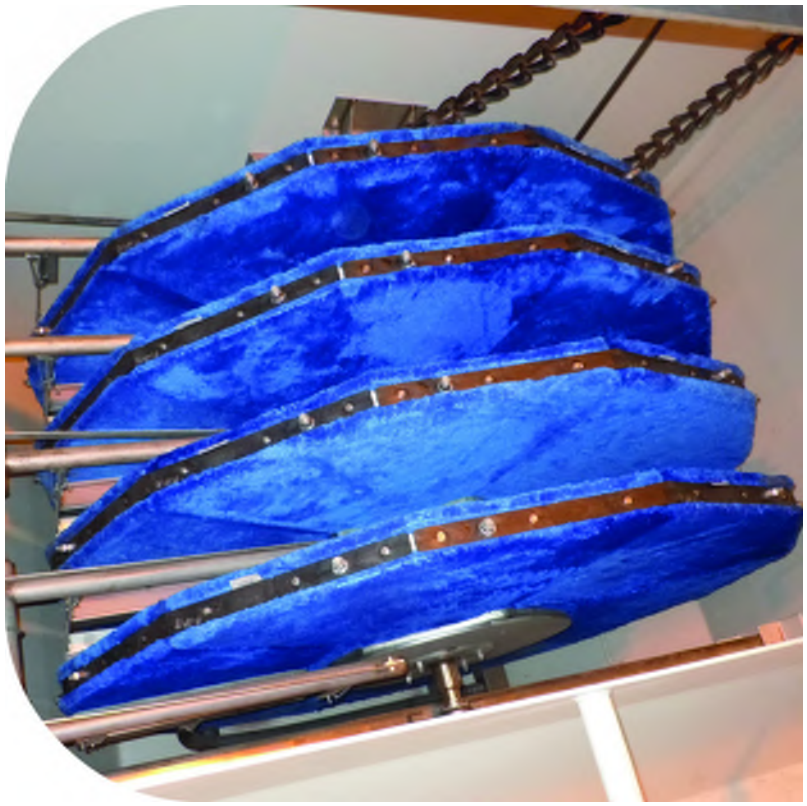
We clarify Aqua-Aerobic Systems, Inc. offer is as described in our proposal package, including all documents listed on the Table of Contents. Therefore, we request Seller's Bid package form an Exhibit to the Agreement.

AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

Process Design Report

MAGNA WWTP, UT

Design# 167138
Option: Bid Design



AquaDisk®

Cloth Media Filter

March 24, 2021
Designed By: Jonathon Kelsey

6306 N. Alpine Rd Loves Park, IL 61111
(815) 654-2501 www.aqua-aerobic.com

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Design Notes

Process/Site

- The average and maximum design flow and loading conditions, shown within the report, are based on maximum month average and peak hour conditions, respectively.

Filtration

- The cloth media filter recommendation and anticipated effluent quality are based upon influent water quality conditions as shown under "Design Parameters" of this Process Design Report.

- The filter influent should be free of algae and other solids that are not filterable through a nominal 5 micron pore size media. Provisions to treat algae and condition the solids to be filterable are the responsibility of others.

Equipment

- Scope of supply includes freight, installation supervision and start-up services.

- Equipment selection is based upon the use of Aqua-Aerobic Systems' standard materials of construction and electrical components, suitable for non-classified electrical environments.

- Aqua-Aerobic Systems, Inc. is familiar with various “Buy American” Acts (i.e. AIS, ARRA, Federal FAR 52.225, EXIM Bank, USAid, PA Steel Products Act, etc.). As the project develops Aqua-Aerobic Systems can work with you to ensure full compliance of our goods with various Buy American provisions if they are applicable/required for the project. When applicable, please provide us with the specifics of the project’s “Buy American” provisions.

- If the cloth media filter will be offline for extended periods of time, protection from sunlight is required.

AquaDisk® Tertiary Filtration - Design Summary - Initial Design Conditions

DESIGN INFLUENT CONDITIONS

Pre-Filter Treatment: Secondary

Avg. Design Flow	= 2.00 MGD	= 1388.89 gpm	= 7570.82 m³/day
Max Design Flow	= 4.00 MGD	= 2777.78 gpm	= 15141.65 m³/day

DESIGN PARAMETERS	Influent	mg/l	Effluent Required	<= mg/l	Effluent Anticipated	<= mg/l
Avg. Total Suspended Solids:	TSSa	10	TSSa	5	TSSa	5
Max. Total Suspended Solids:	TSSm	20	--	--	--	--
***Turbidity:**	--	--	NTU	2	NTU	2

*Note: Tubidity represented in Nephelometric Turbidity Units (NTU's) in lieu of mg/l.

AquaDisk FILTER RECOMMENDATION

Qty Of Filter Units Recommended	= 2
Number Of Disks Per Unit	= 6
Total Number Of Disks Recommended	= 12
Total Filter Area Provided	= 645.6 ft² = (59.98 m²)
Filter Model Recommended	= AquaDisk Concrete: Model ADFSC-54 x 6E-PC
Filter Media Cloth Type	= OptiFiber PES-14®

AquaDisk FILTER CALCULATIONS

Filter Type:

Vertically Mounted Cloth Media Disks featuring automatically operated vacuum backwash.

Average Flow Conditions:

Average Hydraulic Loading = Avg. Design Flow (gpm) / Recommended Filter Area (ft²)
= 1388.9 / 645.6 ft²
= 2.15 gpm/ft² (5.26 m/hr) at Avg. Flow

Maximum Flow Conditions:

Maximum Hydraulic Loading = Max. Design Flow (gpm) / Recommended Filter Area (ft²)
= 2777.8 / 645.6 ft²
= 4.30 gpm/ft² (10.52 m/hr) at Max. Flow

Solids Loading:

Solids Loading Rate = (lbs TSS/day at max flow and max TSS loading) / Recommended Filter Area (ft²)
= 667.2 lbs/day / 645.6 ft²
= 1.03 lbs. TSS /day/ft² (5.04 kg. TSS/day/m²)

The above recommendation is based upon the provision to maintain a satisfactory hydraulic surface loading at 50% of the Maximum Design Flow with (1) unit out of service. The resultant hydraulic loading rate at 50% of the Maximum Design Flow is: 4.3 gpm / ft² = (10.5 m/hr)

AquaDisk® Tertiary Filtration - Design Summary - Buildout Design Conditions

DESIGN INFLUENT CONDITIONS

Pre-Filter Treatment: Secondary

Avg. Design Flow	= 2.33 MGD	= 1614.58 gpm	= 8801.08 m³/day
Max Design Flow	= 4.65 MGD	= 3229.17 gpm	= 17602.16 m³/day

DESIGN PARAMETERS

	Influent	mg/l	Effluent Required	<= mg/l	Effluent Anticipated	<= mg/l
Avg. Total Suspended Solids:	TSSa	10	TSSa	5	TSSa	5
Max. Total Suspended Solids:	TSSm	20	--	--	--	--
***Turbidity:**	--	--	NTU	2	NTU	2

*Note: Tubidity represented in Nephelometric Turbidity Units (NTU's) in lieu of mg/l.

AquaDisk FILTER RECOMMENDATION

Qty Of Filter Units Recommended	= 2
Number Of Disks Per Unit	= 6
Total Number Of Disks Recommended	= 12
Total Filter Area Provided	= 645.6 ft² = (59.98 m²)
Filter Model Recommended	= AquaDisk Concrete: Model ADFSC-54 x 6E-PC
Filter Media Cloth Type	= OptiFiber PES-14®

AquaDisk FILTER CALCULATIONS

Filter Type:

Vertically Mounted Cloth Media Disks featuring automatically operated vacuum backwash.

Average Flow Conditions:

Average Hydraulic Loading = Avg. Design Flow (gpm) / Recommended Filter Area (ft²)
= 1614.6 / 645.6 ft²
= 2.50 gpm/ft² (6.11 m/hr) at Avg. Flow

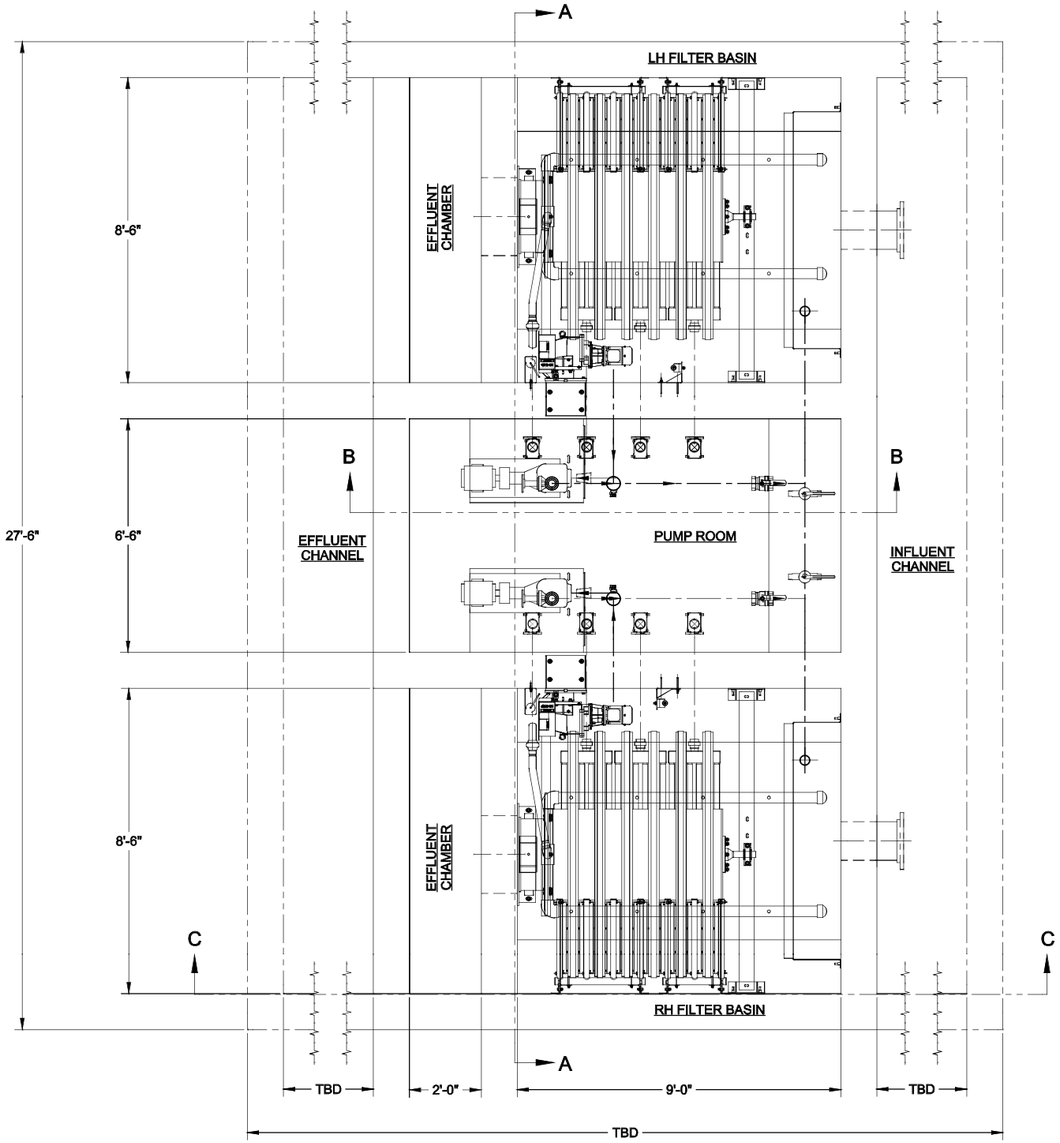
Maximum Flow Conditions:

Maximum Hydraulic Loading = Max. Design Flow (gpm) / Recommended Filter Area (ft²)
= 3229.2 / 645.6 ft²
= 5 gpm/ft² (12.23 m/hr) at Max. Flow

Solids Loading:

Solids Loading Rate = (lbs TSS/day at max flow and max TSS loading) / Recommended Filter Area (ft²)
= 775.6 lbs/day / 645.6 ft²
= 1.20 lbs. TSS /day/ft² (5.86 kg. TSS/day/m²)

The above recommendation is based upon the provision to maintain a satisfactory hydraulic surface loading at 50% of the Maximum Design Flow with (1) unit out of service. The resultant hydraulic loading rate at 50% of the Maximum Design Flow is: 5 gpm / ft² = (12.2 m/hr)



ITEM WEIGHTS
EFFLUENT SEAL PLATE = 217 LBS.
CENTERTUBE = 829 LBS.
INFLUENT WEIR WELDMENT = 367 LBS.
DRIVE MOTOR ASSEMBLY = 249 LBS.
DISK SEGMENT ASSEMBLY = 24 LBS.
PUMP WITH MOTOR MOUNTED ON BASE = 200 LBS.
WALL MOUNT PUMP BASE = 234 LBS.

1. DRAWING FOR REFERENCE ONLY.
   ALL WALLS ARE SHOWN AT 1'.
   ALL DIMENSIONS TO BE VERIFIED BY CUSTOMER.

2. AQUA-AEROBIC SYSTEMS PROVIDES PUMPS AND VALVES LOOSE FOR INSTALLATION BY THE INSTALLING CONTRACTOR. ALL INTERCONNECTING PIPING, WIRING, AND WALL SPOOL PIPES ARE PROVIDED BY THE INSTALLING CONTRACTOR.

3. IF FREEZING IS A CONCERN, AQUA-AEROBIC SYSTEMS RECOMMENDS THE FILTERS BE PLACED IN A HEATED BUILDING. IF A BUILDING IS NOT PROVIDED, ANY NECESSARY PROTECTION, INCLUDING BUT NOT LIMITED TO, HEAT TRACING AND INSULATION OF PUMPS AND PIPING, AS WELL AS PROTECTION AGAINST INTERNAL TANK FREEZING, SHALL BE PROVIDED BY THE INSTALLING CONTRACTOR.

4. THE GRAPHIC ELEMENTS OF THIS COMPUTER GENERATED DRAWING ARE DRAWN FULL SIZE. THE DIMENSIONS ARE ASSOCIATIVE. IF THE SIZE OF THE GRAPHIC ELEMENTS IS CHANGED THE DIMENSIONS WILL NOT BE CORRECT.

5. TBD THE INFLUENT AND EFFLUENT CHANNELS TO BE SIZED BY THE INSTALLING CONTRACTOR BASED ON THE PLANT FLOW.

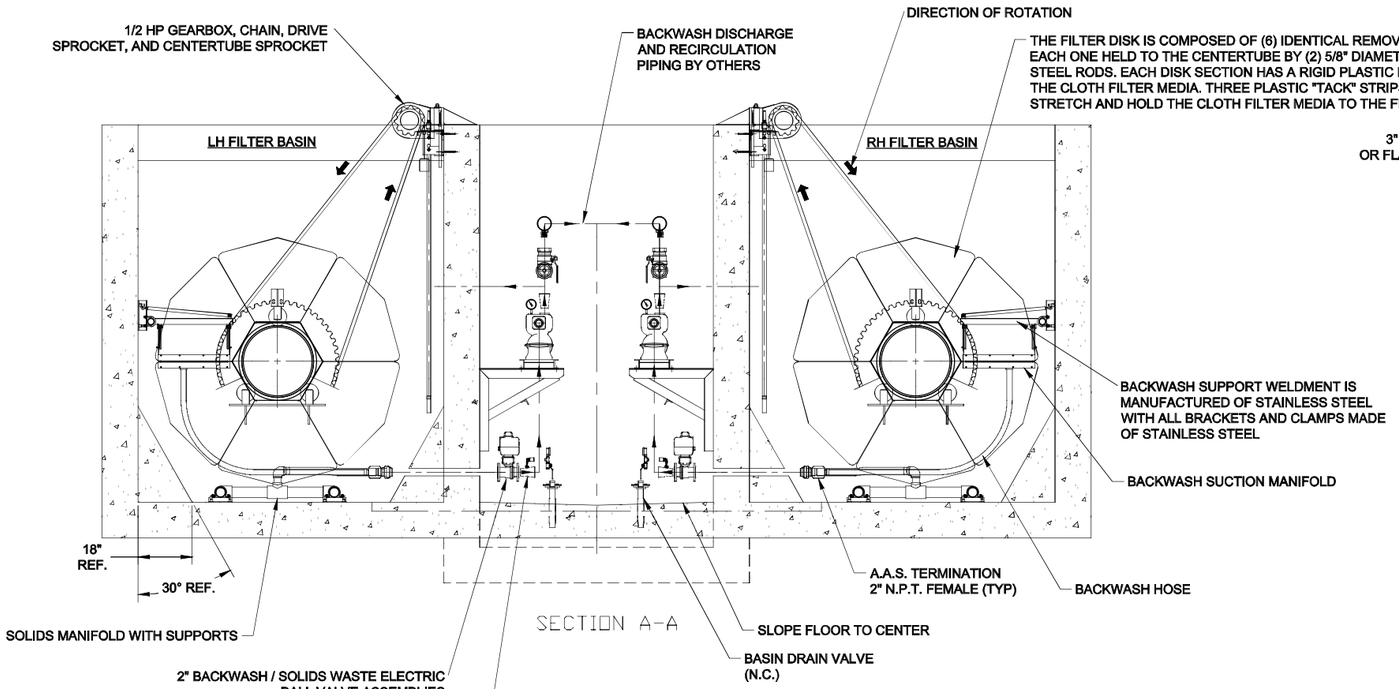
6. AN INFLUENT VALVE IS REQUIRED FOR ISOLATION / MAINTENANCE OF EACH FILTER UNIT. INFLUENT VALVES SHALL BE PROVIDED BY OTHERS AND INSTALLED BY OTHERS.

7. WALL SPOOL PIPING SHALL BE STAINLESS STEEL. PROVIDED BY OTHERS AND INSTALLED BY OTHERS.

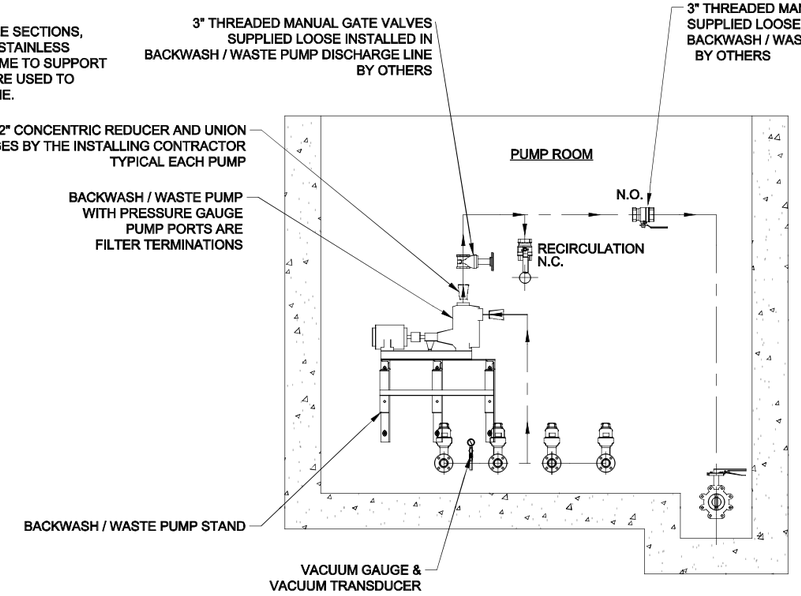
NOT FOR CONSTRUCTION

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JOB LOCATION:					
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					MATERIAL:
					SIMILAR TO:
					TYPE:
					DRAWN BY: SLT — DATE: 3-29-2011
					CHECKED BY: — DATE:
REV	ERN / ECO	DATE	BY	REVISION DESCRIPTION	WEIGHT: — SHEET: 1 OF 4
DRAWING NAME: AQUADISK FILTER MODEL ADFSC-54 X 6E-PC					DRAWING NUMBER: 2801945 — SCALE: — SIZE: D

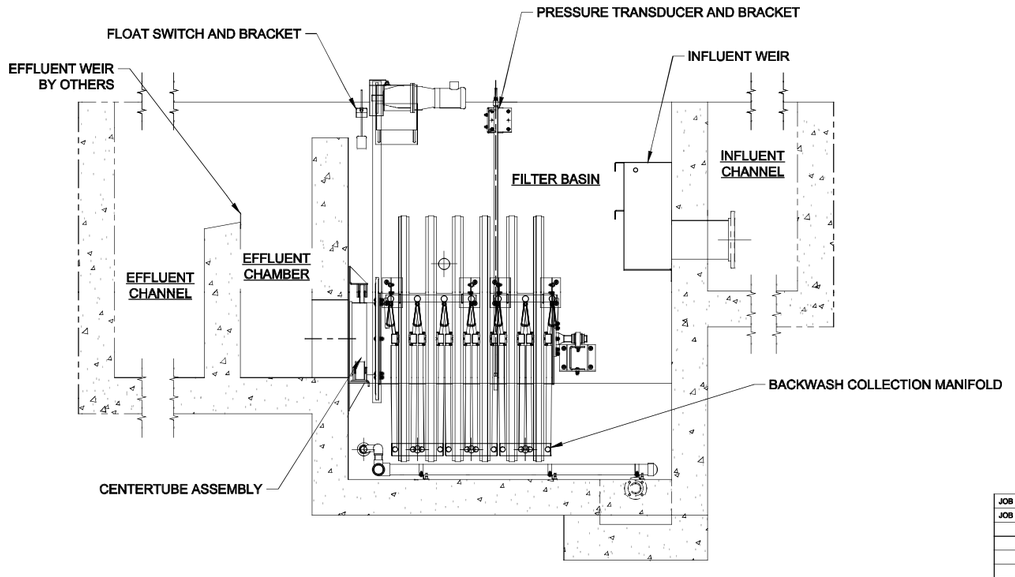
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SECTION A-A



SECTION B-B



SECTION C-C

1 ALL PIPING AND FITTINGS SHALL BE PROVIDED BY OTHERS ACTUAL PIPING LAYOUT AND PUMP LOCATION TO BE DETERMINED BY OTHERS WHEN THREADED OR WELDED PIPE IS USED IN LIEU OF FLANGED PIPE, UNIONS SHALL BE USED AT EACH PUMP AND VALVE CONNECTION TO FACILITATE SERVICE.

2 2 H.P. BACKWASH / WASTE PUMP CONNECTIONS ARE 2" N.P.T. BACKWASH / WASTE PIPING IS 3" DIAMETER. 3" TO 2" CONCENTRIC REDUCER FITTINGS SHALL BE PROVIDED AND INSTALLED BY OTHERS AT EACH PUMP PORT.

3 THE BACKWASH / WASTE PUMP CAPABILITIES ARE AS FOLLOWS:

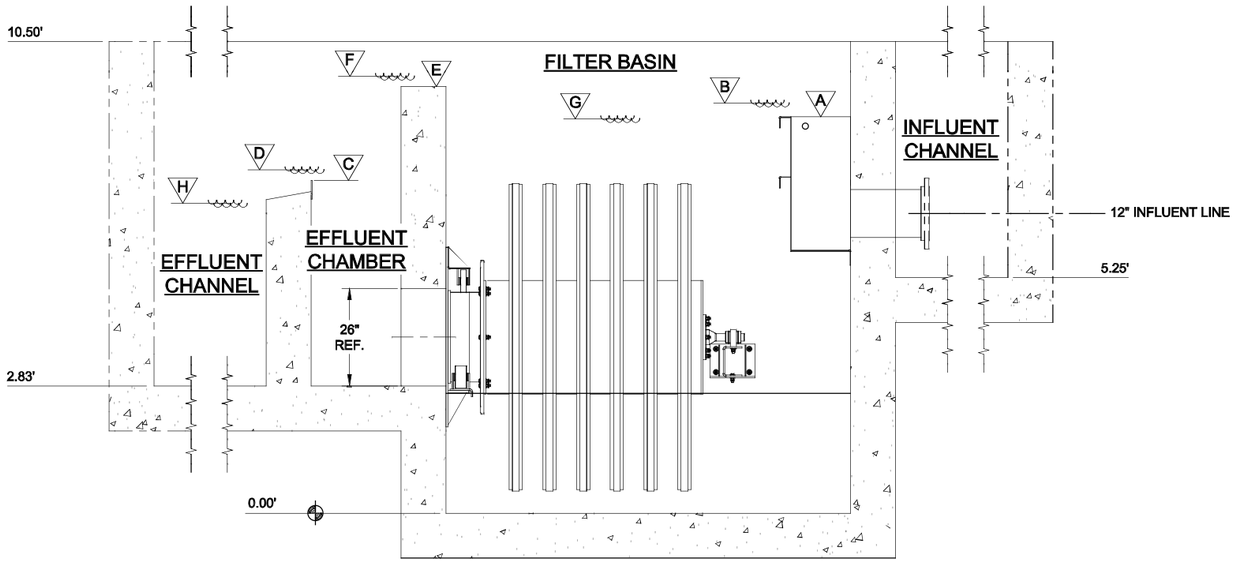
- HORSEPOWER: 2 HP
- FLOW: 130 GPM
- TOTAL DYNAMIC HEAD: 23.2 FT
- ALLOWABLE DISCHARGE HEAD, AFTER FILTER LOSSES: 12 FT

FOR INSTALLATIONS THAT REQUIRE MORE DISCHARGE HEAD, ALTERNATIVE PUMPS ARE AVAILABLE. PLEASE CONSULT ENGINEERING TO VERIFY THE SUITABILITY OF THE DISCHARGE PIPING OR FOR SPECIAL PUMP REQUIREMENTS.

NOT FOR CONSTRUCTION

JOB NAME:					AQUA-AEROBIC SYSTEMS, INC.	
JOB LOCATION:						
					DO NOT SCALE DRAWING	UNLESS OTHERWISE SPECIFIED: FRACTIONAL DIMENSIONS +/- 1/16; ALL TWO PLACE DECIMALS +/- 0.010; ALL THREE PLACE DECIMALS +/- 0.005; ALL ANGLES +/- 1/2°; ANSI
					MATERIAL:	
					SIMILAR TO:	
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REV	ERN / ECO	DATE	BY	REVISION DESCRIPTION	WEIGHT:	SHEET: 2 OF 4
DRAWING NAME: AQUADISK FILTER MODEL ADFSC-54 X 6E-PC					DRAWING NUMBER: 2801945	SCALE: SIZE: D

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ELEVATION

A	8.82'	INFLUENT WEIR ELEVATION
B	9.05'	NAPPE OVER INFLUENT WEIR AVERAGE FLOW
	9.18'	NAPPE OVER INFLUENT WEIR MAXIMUM FLOW
C	7.41'	EFFLUENT WEIR ELEVATION
D	7.59'	NAPPE OVER EFFLUENT WEIR AVERAGE FLOW
	7.70'	NAPPE OVER EFFLUENT WEIR MAXIMUM FLOW
E	9.50'	OVERFLOW WEIR ELEVATION
F	9.69'	NAPPE OVER OVERFLOW WEIR AVERAGE FLOW
	9.80'	NAPPE OVER OVERFLOW WEIR MAXIMUM FLOW
G	8.78'	BACKWASH START LEVEL
H	6.91'	MAXIMUM AVAILABLE LIQUID LEVEL FOR EFFLUENT CONVEYANCE

HYDRAULIC PROFILE
BASED UPON AVERAGE FLOW RATE OF 3.25 GPM PER SQUARE FOOT (1.5 MGD)
BASED UPON MAXIMUM FLOW RATE OF 6.5 GPM PER SQUARE FOOT (3.0 MGD)

WEIR LENGTHS
INFLUENT = 6.58'
EFFLUENT = 8.50'
OVERFLOW = 8.50'

NOT FOR CONSTRUCTION

JOB NAME:
JOB LOCATION:

AQUA-AEROBIC SYSTEMS, INC.

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ALL THREE PLACE DECIMALS +/- 0.005
ALL ANGLES +/- 1/2°
ANSI

MATERIAL:
SIMILAR TO:
TYPE:
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CHECKED BY: DATE:
WEIGHT: SHEET: 3 OF 4

REV	ERN / ECO	DATE	BY	REVISION DESCRIPTION

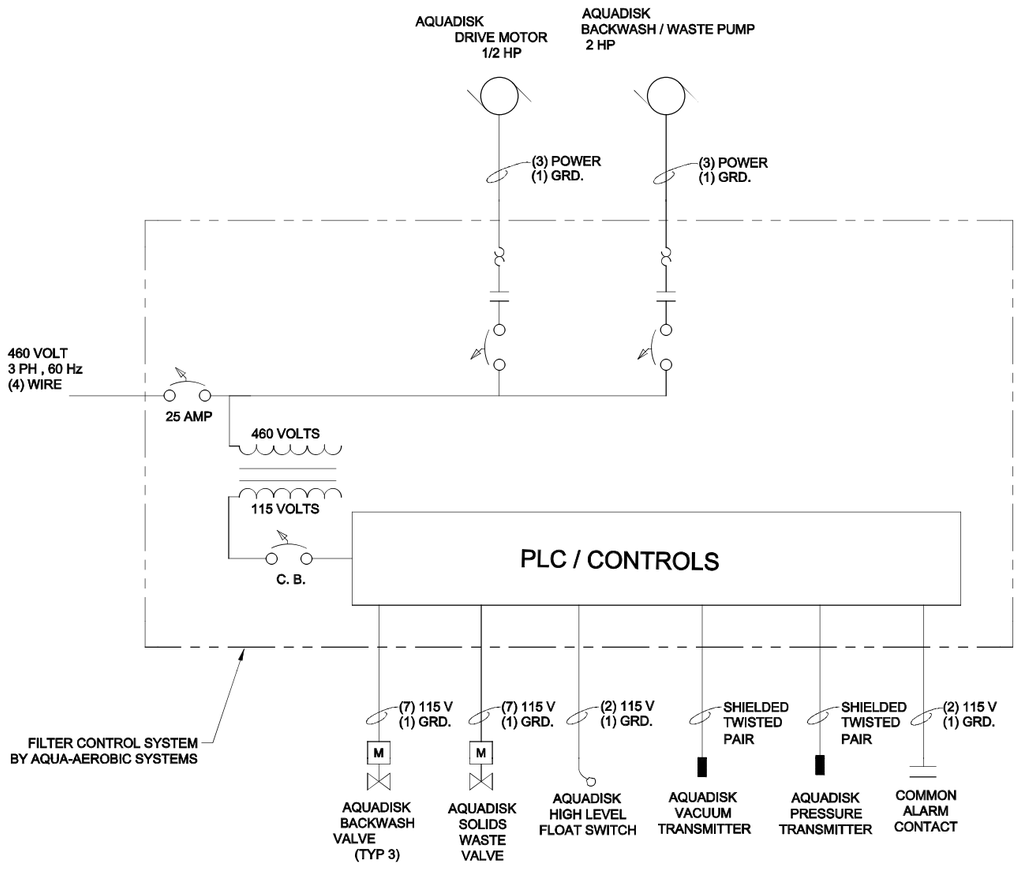
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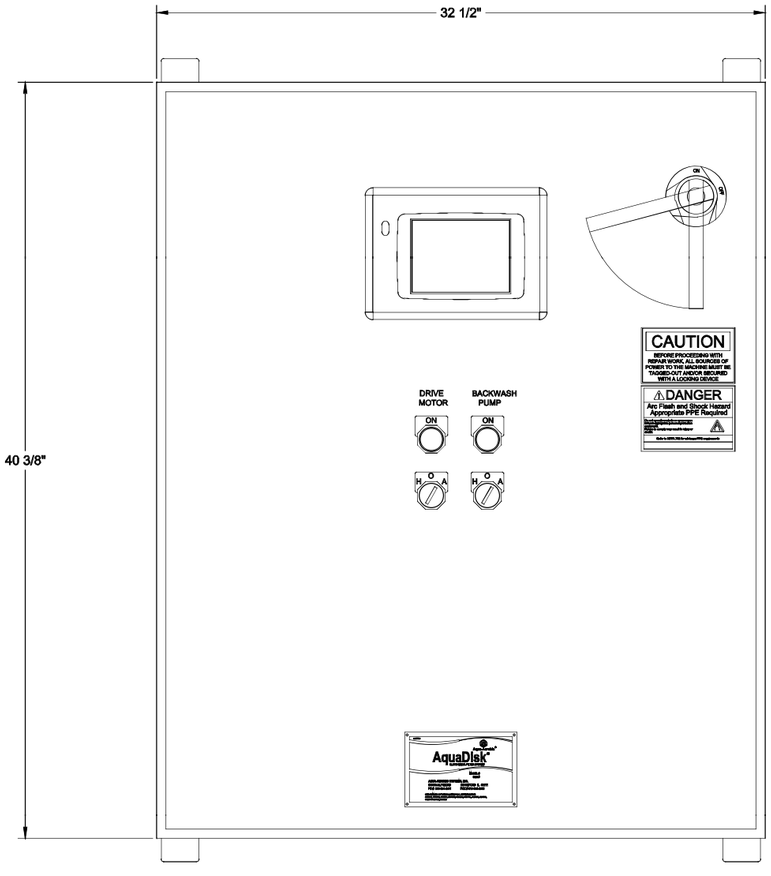
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SYMBOL KEY

	MOTOR		CIRCUIT BREAKER		ELECTRICAL DISCONNECT	VFD	VARIABLE FREQUENCY DRIVE		TRANSDUCER		STARTER CONTACTOR
M	MOTOR OPERATED VALVE		TRANSFORMER		MOTOR OVERLOAD	P	PNEUMATIC OPERATED VALVE		FUSE		FLOAT SWITCH

NOTE: SOME SYMBOLS MAY NOT BE APPLICABLE





1 CONTROL PANEL
ENCLOSURE NEMA 4X WALL MOUNTED TYPE FIBERGLASS
FACTORY ASSEMBLED AND SHIPPED LOOSE. INSTALLED BY OTHERS.
MUST BE LOCATED WITHIN 50 FEET OF THE PRESSURE TRANSMITTER.
FACING NORTH TO LIMIT THE H.M.I. EXPOSURE TO DIRECT SUNLIGHT.
FLOOR MOUNTING IS AVAILABLE WITH STEEL OR STAINLESS STEEL ENCLOSURES.

2 STANDARD CONTROL PANEL SIZE
40" HEIGHT X 32" WIDE X 12" DEEP

3 (1) CONTROL PANEL PER FILTER

NOT FOR CONSTRUCTION

JOB NAME:
JOB LOCATION:

AQUA-AEROBIC SYSTEMS, INC.

DO NOT SCALE DRAWING

UNLESS OTHERWISE SPECIFIED
FRACTIONAL DIMENSIONS +/- 1/16
ALL TWO PLACE DECIMALS +/- 0.010
ALL THREE PLACE DECIMALS +/- 0.005
ALL ANGLES +/- 1/2°
ANSI

MATERIAL:
SIMILAR TO:
TYPE:
DRAWN BY: SLT DATE: 3-29-2011
CHECKED BY: DATE:
WEIGHT: SHEET: 4 OF 4

REV	ERN / ECO	DATE	BY	REVISION DESCRIPTION

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A Metawater Company

Cloth Media Filter Installations for Reuse

ALAFAYA UTILITIES **105984**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	02/07/2002
Avg. Daily Flow(MGD):	1
Max. Design Flow(MGD):	2
Equipment:	1 Tertiary Filter(s) 6/4 Disks,ADF Disk Package Filter(s),Classic,Model 54,PS Package

ALEXANDER AVE-DELTONA FL **112282A**

Waste Characteristics:	Municipal / Domestic
StartUp Date:	12/13/2018
Equipment:	2 Tertiary Filter(s) 8 Disks,ADF Disk Package Filter(s),PES-14

ANASTASIA ISLAND WRF FL **113984**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	Reuse / TSS / NTU
StartUp Date:	05/03/2018
Equipment:	2 Tertiary Filter(s) 8/4 Disks,ADF Disk Concrete Filter(s),Model 54,PES-14

APALACHICOLA (CITY OF) WWTP IMPROVEMENTS **105836/A**

Waste Characteristics:	Municipal / Domestic
StartUp Date:	08/01/2001
Avg. Daily Flow(MGD):	1
Max. Design Flow(MGD):	2
Equipment:	1 Tertiary Filter(s) 6 Disks,ADF Disk Package Filter(s),Classic,Model 54,PES-13,PS Package

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AQUA UTILITIES SO. SEAS PLANTATION RESORT, FL **107636**

Waste Characteristics:	Municipal / Resort
Treatment Objective:	TSS
StartUp Date:	01/03/2007
Avg. Daily Flow(MGD):	0.264
Max. Design Flow(MGD):	0.66
Equipment:	2 Tertiary Filter(s) 6 Disks,ADF Disk SS Package Filter(s),Model 12,PA2-

ASANTE WRF, AZ - SPA II (PHASE 1) **108286**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	08/16/2007
Avg. Daily Flow(MGD):	1.2
Max. Design Flow(MGD):	2.4
Equipment:	2 Tertiary Filter(s) ADF Disk Concrete Filter(s)

ATWATER BERT CRANE WWTP, CA **110199**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	01/26/2012
Avg. Daily Flow(MGD):	6
Max. Design Flow(MGD):	11.2
Equipment:	3 Tertiary Filter(s) ADF Disk SS Package Filter(s)

AUSTIN RANCH, SURPRISE WRF SPA III PH 1, AZ **108327**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	11/05/2008
Avg. Daily Flow(MGD):	1.8
Max. Design Flow(MGD):	3.6
Equipment:	3 Tertiary Filter(s) ADF Disk Concrete Filter(s)

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BAKERSFIELD WWTP NO3 2007 EXP, CA **102346C**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	02/19/2010
Avg. Daily Flow(MGD):	2
Max. Design Flow(MGD):	2
Equipment:	1 Tertiary Filter(s) ADF Disk Concrete Filter(s)

BAYOU MARCUS WRF, FL **108435**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	06/24/2008
Avg. Daily Flow(MGD):	8.2
Max. Design Flow(MGD):	18
Equipment:	2 Tertiary Filter(s) (8) Laterals,40' Long,ADIFC AquaDiamond Concrete

BERMUDA (SOUTH) WRF FILTER EXP. (TOHO), FL **107263**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	11/16/2006
Avg. Daily Flow(MGD):	8
Max. Design Flow(MGD):	13.2
Equipment:	4 Tertiary Filter(s) 12 Disks,ADF Disk Concrete Filter(s),Classic,Model

BLOUNTSTOWN WWTP **105166**

Waste Characteristics:	Municipal / Domestic
StartUp Date:	10/25/1998
Max. Design Flow(MGD):	3
Equipment:	2 Tertiary Filter(s) ADF Disk Package Filter(s)

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BODEGA BAY **103441a**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	10/22/2003
Avg. Daily Flow(MGD):	0.928
Max. Design Flow(MGD):	1.858
Equipment:	1 Tertiary Filter(s) ADF Disk SS Package Filter(s)

BONIFAY WWTP CITY OF UPGRADE FL **103506G**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	02/27/2013
Avg. Daily Flow(MGD):	1.4
Max. Design Flow(MGD):	3.5
Equipment:	2 Tertiary Filter(s) 8 Disks,Classic,Model 54,PES-13,PS Package

BONIFAY WWTP (CITY OF) **103506**

Waste Characteristics:	Municipal / Domestic
StartUp Date:	07/12/1990
Avg. Daily Flow(MGD):	0.55
Max. Design Flow(MGD):	2.5
Equipment:	1 Tertiary Filter(s) ADF Disk Package Filter(s)

BUCKEYE 3.0 MGD EXPANSION, AZ (CENTRAL) **107006**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	02/26/2007
Avg. Daily Flow(MGD):	3
Max. Design Flow(MGD):	8
Equipment:	3 Tertiary Filter(s) ADF Disk Concrete Filter(s)

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BUCKEYE WWTP PH2 EXP, AZ (CENTRAL) **107006B**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	04/06/2011
Avg. Daily Flow(MGD):	1.5
Max. Design Flow(MGD):	3.77
Equipment:	1 Tertiary Filter(s) ADF Disk Concrete Filter(s)

BULLHEAD CITY WWTP **106477**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	02/03/2005
Max. Design Flow(MGD):	3.6
Equipment:	1 Tertiary Filter(s) ADF Disk Package Filter(s)

BURNT STORE WWTP EXPANSION, FL **106377**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	05/19/2004
Avg. Daily Flow(MGD):	1
Max. Design Flow(MGD):	1.33
Equipment:	1 Tertiary Filter(s) 6/4 Disks,ADF Disk Package Filter(s),Classic,Model 54

CAMARILLO WWTP UPGRADES, CA **107007**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	12/06/2006
Avg. Daily Flow(MGD):	11.2
Max. Design Flow(MGD):	11.2
Equipment:	3 Tertiary Filter(s) ADF Disk SS Package Filter(s)

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CAMP PENDLETON WWTP, CA **106630**

Waste Characteristics:	Municipal / Domestic
StartUp Date:	05/19/2006
Avg. Daily Flow(MGD):	5
Max. Design Flow(MGD):	10
Equipment:	3 Tertiary Filter(s) ADF Disk Concrete Filter(s)

CANAL STREET WWTF UPGRADE, FL **100872B**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , Reuse
StartUp Date:	04/12/2007
Avg. Daily Flow(MGD):	3.5
Equipment:	1 Tertiary Filter(s) 6 Disks,Classic,Model 54,PES-13,SS Package

CASA GRANDE WRF PHASE 3 EXP, AZ **103585D**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	05/13/2011
Avg. Daily Flow(MGD):	12
Max. Design Flow(MGD):	24
Equipment:	6 Tertiary Filter(s) ADF Disk Concrete Filter(s)

CENTURY FL **106347B**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	10/04/2012
Avg. Daily Flow(MGD):	0.5
Max. Design Flow(MGD):	1
Equipment:	1 Tertiary Filter(s) 2 Disks,Classic,Model 54,PA2-13,PS Package

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CENTURY WWTP IMPROVEMENTS **106347**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	12/11/2003
Avg. Daily Flow(MGD):	0.5
Equipment:	1 Tertiary Filter(s) ADF Disk Package Filter(s)

CHARLOTTE COUNTY (WEST PORT) UTILITIES **105776**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , Reuse
StartUp Date:	09/04/2001
Avg. Daily Flow(MGD):	1
Equipment:	3 Tertiary Filter(s) ADF Disk Package Filter(s)

CHARLOTTE COUNTY UTIL (BURNT STORE) **106377A**

Waste Characteristics:	Municipal / Municipal
Treatment Objective:	TSS
Avg. Daily Flow(MGD):	1.5
Equipment:	1 Tertiary Filter(s) 2 Disks,PES-14

CHIQUITA WATER RECLAMATION PHASE III EXPANSION **101317c**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU , Reuse
StartUp Date:	06/11/2004
Avg. Daily Flow(MGD):	7.5
Max. Design Flow(MGD):	7.5
Equipment:	3 Tertiary Filter(s) ADF Disk Concrete Filter(s)

CHULUOTA WWTF EXPANSION, FL **107166**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	10/17/2006
Avg. Daily Flow(MGD):	1
Max. Design Flow(MGD):	2
Equipment:	1 Tertiary Filter(s) 4 Disks,ADF Disk Package Filter(s),Classic,PA2-13,PS

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CLEAR CREEK WWTF, CA **103657A**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	11/15/2012
Avg. Daily Flow(MGD):	9.4
Max. Design Flow(MGD):	24
Equipment:	5 Tertiary Filter(s) 12 Disks,Classic,Model 54,PA2-13,SS Package

COLUSA **107788**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	08/07/2008
Avg. Daily Flow(MGD):	1.26
Max. Design Flow(MGD):	1.26
Equipment:	2 Tertiary Filter(s) ADF Disk Concrete Filter(s)

CUDJOE KEY WWTP, FL **110307**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	04/29/2015
Avg. Daily Flow(MGD):	0.94
Max. Design Flow(MGD):	2.35
Equipment:	2 Tertiary Filter(s) 4 Disks,ADF Disk SS Package Filter(s),Model 54,PA2-13

D.C. TILLMAN WRF (CIP 6150), CA **106317E**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU , Reuse
StartUp Date:	04/21/2010
Avg. Daily Flow(MGD):	96
Max. Design Flow(MGD):	192
Equipment:	8 Tertiary Filter(s) ADIFC AquaDiamond Concrete Filter(s)

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DADE CITY UTILITY SYSTEM IMPROVEMENTS **106161**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	12/12/2002
Avg. Daily Flow(MGD):	2.79
Max. Design Flow(MGD):	5.58
Equipment:	2 Tertiary Filter(s) ADF Disk Package Filter(s),PES-13,SS Package

DEER CREEK WWTP, CA **106367**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	01/23/2004
Avg. Daily Flow(MGD):	3.6
Max. Design Flow(MGD):	10.3
Equipment:	2 Tertiary Filter(s) ADF Disk SS Package Filter(s)

DESERT DIAMOND CASINO AZ **111282**

Waste Characteristics:	Municipal / Resort
StartUp Date:	10/04/2010
Avg. Daily Flow(MGD):	0.025
Max. Design Flow(MGD):	0.055
Equipment:	1 Tertiary Filter(s) ADF Model 12 Disk SS Package Filter(s)

DESERT MTN AQUIFER STORAGE AND RECOVERY (AKA CAP) **106311**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	03/03/2004
Avg. Daily Flow(MGD):	2.125
Max. Design Flow(MGD):	4.25
Equipment:	3 Tertiary Filter(s) ADF Disk SS Package Filter(s)

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DUCK KEY WWTP IMPROVEMENTS, FL **105148A**

Waste Characteristics:	Municipal / Resort
Treatment Objective:	TSS
StartUp Date:	05/23/2011
Avg. Daily Flow(MGD):	0.273
Max. Design Flow(MGD):	0.342
Equipment:	2 Tertiary Filter(s) ADF Model 12 Disk SS Package Filter(s)

EAST LAKE TOHO RECLAIM AUGMENT, FL **107626**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	08/08/2007
Avg. Daily Flow(MGD):	5.5
Max. Design Flow(MGD):	11
Equipment:	2 Tertiary Filter(s) 12 Disks,ADF Disk SS Package Filter(s),Classic,Model

EL TORO WATER DISTRICT WATER RECYLING PLANT CA **101951B**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	10/14/2014
Avg. Daily Flow(MGD):	1.1
Max. Design Flow(MGD):	3.3
Equipment:	2 Tertiary Filter(s) 12/8 Disks,Model 54,PES-14,SS Package

ENGLEWOOD WATER DISTRICT **106327**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	10/13/2004
Avg. Daily Flow(MGD):	3
Max. Design Flow(MGD):	6
Equipment:	1 Tertiary Filter(s) ADF Disk SS Package Filter(s)

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EUSTIS WWTP **102375C**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , Reuse
StartUp Date:	03/03/2000
Avg. Daily Flow(MGD):	4.5
Equipment:	4 Tertiary Filter(s) ADF Disk Concrete Filter(s)

FORT IRWIN WWTP TERTIARY UPGRADE, CA **106425**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	12/12/2006
Avg. Daily Flow(MGD):	2
Max. Design Flow(MGD):	2.3
Equipment:	2 Tertiary Filter(s) ADF Disk Package Filter(s)

FORT MYERS CENTRAL ADVANCED WWTF IMPROVEMENTS, FL **107358**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	03/29/2007
Avg. Daily Flow(MGD):	6
Max. Design Flow(MGD):	12
Equipment:	2 Tertiary Filter(s) ADF Disk SS Package Filter(s)

FOUNTAIN HILLS SANITARY DISTRICT **102125E**

Waste Characteristics:	Municipal / Domestic
StartUp Date:	02/13/1997
Equipment:	3 Tertiary Filter(s) ADF Disk Concrete Filter(s)

FOUNTAIN HILLS SANITARY DISTRICT WWTP **102125G**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU , Reuse
StartUp Date:	02/01/2001
Avg. Daily Flow(MGD):	3.2
Equipment:	3 Tertiary Filter(s) ADF Disk Concrete Filter(s)

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FREEPORT WWTP RE-USE IMPROVEMENTS, FL **108368**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	01/21/2009
Avg. Daily Flow(MGD):	1
Equipment:	1 Tertiary Filter(s) ADF Disk Package Filter(s)

GAINEY RANCH WRP, AZ **107929A**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	04/01/2009
Avg. Daily Flow(MGD):	1.7
Max. Design Flow(MGD):	1.7
Equipment:	2 Tertiary Filter(s) 6 Disks,ADF Disk Package Filter(s),PES-13

GASPARILLA ISLAND WWTP, FL **106490**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	02/08/2005
Avg. Daily Flow(MGD):	0.62
Max. Design Flow(MGD):	1.24
Equipment:	1 Tertiary Filter(s) ADF Disk SS Package Filter(s)

GLENDALE WRF **109661B**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	Reuse / NTU
StartUp Date:	04/16/2015
Avg. Daily Flow(MGD):	12
Max. Design Flow(MGD):	24
Equipment:	4 Tertiary Filter(s) 12 Disks,Model 54,PES-13,PS Package

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GLENDALE-ARROWHEAD RANCH AZ **107291**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	NTU
Avg. Daily Flow(MGD):	4.5
Max. Design Flow(MGD):	9
Equipment:	3 Tertiary Filter(s) 10 Disks,Concrete,Model 54,PA2-13

GOLD CANYON WRF EXPANSION PHASE 3 **106524**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	11/24/2004
Avg. Daily Flow(MGD):	2
Max. Design Flow(MGD):	3.2
Equipment:	2 Tertiary Filter(s) ADF Disk Concrete Filter(s)

GRACEVILLE WWTP **105240**

Waste Characteristics:	Municipal / Domestic
StartUp Date:	02/03/1999
Avg. Daily Flow(MGD):	1.1
Max. Design Flow(MGD):	1.46
Equipment:	2 Tertiary Filter(s) ADF Disk Package Filter(s)

GREAT OUTDOORS PREMIER RV/GOLF RESORT, INC. **105858**

Waste Characteristics:	Municipal / Resort
Treatment Objective:	TSS , Reuse
StartUp Date:	02/01/2001
Avg. Daily Flow(MGD):	0.2
Equipment:	1 Tertiary Filter(s) ADF Disk SS Package Filter(s)

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GREEN COVE SPRINGS IMPROVEMENTS, FL **106180A**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	06/07/2005
Avg. Daily Flow(MGD):	0.5
Max. Design Flow(MGD):	2
Equipment:	1 Tertiary Filter(s) 4 Disks,ADF Disk Package Filter(s),PA2-13,PS

GREEN COVE SPRINGS, HARBOR ROAD WWTP **106180**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	12/10/2002
Avg. Daily Flow(MGD):	0.93
Max. Design Flow(MGD):	1.859
Equipment:	1 Tertiary Filter(s) ADF Disk Package Filter(s)

GRETNA **105194A**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	11/01/1998
Avg. Daily Flow(MGD):	0.464
Max. Design Flow(MGD):	0.929
Equipment:	1 Tertiary Filter(s) ADF Disk Package Filter(s)

HILLIARD WWTP **105300**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , Phos
StartUp Date:	05/17/1999
Avg. Daily Flow(MGD):	1
Equipment:	1 Tertiary Filter(s) ADF Disk SS Package Filter(s)

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HOPLAND BAND OF POMO INDIANS WRTP CA **106068/A**

Waste Characteristics:	Municipal / Resort
StartUp Date:	10/24/2002
Avg. Daily Flow(MGD):	0.12
Max. Design Flow(MGD):	0.24
Equipment:	2 Tertiary Filter(s) ADF Model 12 Disk Package Filter(s)

HUME LAKE CHRISTIAN CAMP **104097**

Waste Characteristics:	Municipal / Resort
Treatment Objective:	BOD , TSS
StartUp Date:	11/12/1992
Avg. Daily Flow(MGD):	0.2
Max. Design Flow(MGD):	0.2
Equipment:	1 Tertiary Filter(s) ADF Disk Package Filter(s)

HUME LAKE CHRISTIAN CAMPS (FILTER) **104097B**

Waste Characteristics:	Municipal / Resort
Treatment Objective:	BOD , TSS
StartUp Date:	11/02/1994
Avg. Daily Flow(MGD):	0.025
Equipment:	1 Tertiary Filter(s) ADF Disk Package Filter(s)

HYPERION WWTP CA **112153**

Waste Characteristics:	Municipal / Domestic
StartUp Date:	07/15/2016
Avg. Daily Flow(MGD):	25
Max. Design Flow(MGD):	25
Equipment:	6 Tertiary Filter(s) 20 Disks,ADF Disk Concrete Filter(s),Model 54,PES-13

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IMPERIAL IRRIGATION DISTRICT, EL CENTRO, CA **112119**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	03/19/2013
Avg. Daily Flow(MGD):	0.072
Max. Design Flow(MGD):	1.44
Equipment:	2 Tertiary Filter(s) 4 Disks,ADF Disk Package Filter(s),PES-14,PS

INLAND EMPIRE UTILITIES AGENCY, REG PLANT NO 4, CA **106670**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	10/25/2007
Avg. Daily Flow(MGD):	7
Max. Design Flow(MGD):	16.1
Equipment:	1 Tertiary Filter(s) ADF Disk Concrete Filter(s)

INVERNESS WWTP UPGRADE, FL **108433**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	09/17/2009
Avg. Daily Flow(MGD):	1.5
Max. Design Flow(MGD):	4.32
Equipment:	2 Tertiary Filter(s) ADF Disk SS Package Filter(s)

JACKSON RANCHERIA WWTP, CA **106350a**

Waste Characteristics:	Municipal / Resort
Treatment Objective:	TSS , NTU , Reuse
StartUp Date:	04/14/2004
Avg. Daily Flow(MGD):	0.24
Max. Design Flow(MGD):	0.464
Equipment:	2 Tertiary Filter(s) ADF Disk SS Package Filter(s)

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JACKSONVILLE ELECTRIC AUTHORITY ARLINGTON EAST WRF **102490A**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	08/01/2000
Max. Design Flow(MGD):	3.7
Equipment:	1 Tertiary Filter(s) ADF Disk SS Package Filter(s)

JEA, DISTRICT II, WATER RECLAMATION FACILITY **105927**

Waste Characteristics:	Municipal
Treatment Objective:	TSS , Reuse
StartUp Date:	05/28/2001
Avg. Daily Flow(MGD):	6
Max. Design Flow(MGD):	11.2
Equipment:	2 Tertiary Filter(s) ADF Disk SS Package Filter(s)

KEARNY WWTP, AZ **102573A**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	05/10/2000
Avg. Daily Flow(MGD):	0.175
Equipment:	1 Tertiary Filter(s) ADF Disk Concrete Filter(s)

KEY LARGO WWTF EXPANSION, FL **107437**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	Nitrification , DeNitrification , Phosphorus
StartUp Date:	09/03/2010
Avg. Daily Flow(MGD):	2.88
Max. Design Flow(MGD):	5.75
Equipment:	2 Tertiary Filter(s) ADF Disk SS Package Filter(s)

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LIVE OAK WWTP 2007 UPGRADE, CA **105419B**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	08/18/2011
Avg. Daily Flow(MGD):	4.27
Max. Design Flow(MGD):	4.27
Equipment:	2 Tertiary Filter(s) ADF Disk SS Package Filter(s)

LODI - WHITE SLOUGH WPCF **106372A**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	12/10/2004
Avg. Daily Flow(MGD):	8.5
Max. Design Flow(MGD):	16.3
Equipment:	4 Tertiary Filter(s) ADF Disk SS Package Filter(s)

LOMPOC REGIONAL WWRP, CA **108280**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	11/06/2008
Avg. Daily Flow(MGD):	5.5
Max. Design Flow(MGD):	5.5
Equipment:	3 Tertiary Filter(s) ADF Disk Package Filter(s)

LOS OSOS WRF CA **112293**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	Reuse , TSS
StartUp Date:	02/25/2016
Avg. Daily Flow(MGD):	1.2
Max. Design Flow(MGD):	4.032
Equipment:	2 Tertiary Filter(s) 10 Disks,ADF Disk SS Package Filter(s),Model 54,PES-

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LYNN HAVEN **104579**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , Reuse
StartUp Date:	09/01/1995
Avg. Daily Flow(MGD):	2.5
Equipment:	1 Tertiary Filter(s) ADF Disk Package Filter(s)

MANATEE CO. NRWTP, FL **102724C**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	05/24/2005
Avg. Daily Flow(MGD):	6
Max. Design Flow(MGD):	12
Equipment:	2 Tertiary Filter(s) ADF Disk Concrete Filter(s)

MANATEE COUNTY SW REGIONAL WWTP EXP, FL **102724D**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , Reuse
StartUp Date:	05/22/2008
Avg. Daily Flow(MGD):	9
Max. Design Flow(MGD):	18
Equipment:	1 Tertiary Filter(s) ADIFC AquaDiamond Concrete Filter(s)

MANTECA WQCF-PHASE III SCHEDULE D, CA **106403A**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU , Reuse
StartUp Date:	02/09/2007
Avg. Daily Flow(MGD):	9.87
Max. Design Flow(MGD):	19.15
Equipment:	6 Tertiary Filter(s) ADF Disk Concrete Filter(s)

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MARCH WWRF - PHASE 2 EXP, CA **107194**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	02/24/2011
Avg. Daily Flow(MGD):	3
Max. Design Flow(MGD):	5
Equipment:	3 Tertiary Filter(s) ADF Disk SS Package Filter(s)

MARION CORRECTIONAL WWTP EXP., FL **109881**

Waste Characteristics:	Municipal / Prison / Correctional Facility
Treatment Objective:	TSS
StartUp Date:	08/26/2010
Avg. Daily Flow(MGD):	0.9
Max. Design Flow(MGD):	1.1
Equipment:	2 Tertiary Filter(s) ADF Disk Concrete Filter(s)

MARSH LANDING **104418A**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	Reuse , TSS , NTU
StartUp Date:	09/12/1996
Avg. Daily Flow(MGD):	1
Equipment:	1 Tertiary Filter(s) ADF Disk Package Filter(s)

MEADOWCREST WWTP EXPANSION, FL **108379**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	06/24/2009
Avg. Daily Flow(MGD):	2
Max. Design Flow(MGD):	5
Equipment:	2 Tertiary Filter(s) ADF Disk SS Package Filter(s)

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MERCED WWTF PHASE IV UPGRADE AND EXP, CA **105867B**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	01/20/2011
Avg. Daily Flow(MGD):	13.7
Max. Design Flow(MGD):	19.1
Equipment:	6 Tertiary Filter(s) ADF Disk Package Filter(s)

MESA GREENFIELD WRF EXP AZ **113260**

Waste Characteristics:	Municipal / Municipal
Treatment Objective:	NTU
Avg. Daily Flow(MGD):	30
Max. Design Flow(MGD):	39
Equipment:	8 Tertiary Filter(s) 14 Disks,Concrete,Model 54,PES-13

MESA NW WRP AZ **112591**

Waste Characteristics:	Municipal / Domestic
StartUp Date:	08/18/2016
Avg. Daily Flow(MGD):	12
Max. Design Flow(MGD):	18
Equipment:	3 Tertiary Filter(s) (8) Laterals,47' Long,ADIFC AquaDiamond Concrete Filter(s),PES-13

MILTON WWTF EXPANSION **102332A**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	09/07/2006
Max. Design Flow(MGD):	4
Equipment:	2 Tertiary Filter(s) ADF Disk SS Package Filter(s)

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MORENO VALLEY RWRF SCATT EXP, CA **107190A**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU , Reuse
StartUp Date:	08/24/2011
Avg. Daily Flow(MGD):	12
Max. Design Flow(MGD):	22.3
Equipment:	4 Tertiary Filter(s) ADF Disk SS Package Filter(s),Pump(s)

MOUNTAIN HOUSE WWTP PHASE II EXPANSION, CA **106451**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	05/19/2005
Avg. Daily Flow(MGD):	3
Max. Design Flow(MGD):	5.4
Equipment:	3 Tertiary Filter(s) ADF Disk Concrete Filter(s)

OAKDALE WWTP UPGRADE, CA **107972**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	01/13/2011
Avg. Daily Flow(MGD):	4
Max. Design Flow(MGD):	10
Equipment:	1 Tertiary Filter(s) ADF Disk Concrete Filter(s)

OCALA WRF 2 REUSE IMPRV. **106118A**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	05/10/2006
Avg. Daily Flow(MGD):	1
Max. Design Flow(MGD):	2
Equipment:	1 Tertiary Filter(s) ADF Disk Package Filter(s)

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OCALA WRF 3 **106118**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	04/30/2003
Avg. Daily Flow(MGD):	3
Max. Design Flow(MGD):	6
Equipment:	1 Tertiary Filter(s) ADF Disk Concrete Filter(s)

ON TOP OF THE WORLD SOUTH WWTF PHASE II, FL **109546**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	08/05/2009
Avg. Daily Flow(MGD):	2.5
Max. Design Flow(MGD):	4.7
Equipment:	1 Tertiary Filter(s) ADF Disk Package Filter(s)

ORANGE COUNTY FL **103295K**

Waste Characteristics:	Municipal / Domestic
Avg. Daily Flow(MGD):	2.5
Max. Design Flow(MGD):	5
Equipment:	1 Tertiary Filter(s) ADF Disk Package Filter(s)

ORANGE COUNTY SOUTH WATER RECLAM FAC **103295B**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	10/02/2003
Avg. Daily Flow(MGD):	29.749
Max. Design Flow(MGD):	59.498
Equipment:	8 Tertiary Filter(s) 12 Disks,ADF Disk SS Package Filter(s),Model 54,PA2-

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ORANGE COUNTY WATER DIST RWSR, CA **105612A**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	07/12/2012
Avg. Daily Flow(MGD):	3.232
Max. Design Flow(MGD):	5.171
Equipment:	1 Tertiary Filter(s) 12 Disks,ADF Disk Package Filter(s),Classic,Model 54,PES-14,PS Package

ORANGE COUNTY WATER RECL. FACILITY (SAND LAKE RD) **103295A**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , Reuse
StartUp Date:	10/02/2003
Avg. Daily Flow(MGD):	24
Equipment:	8 Tertiary Filter(s) ADF Disk Package Filter(s)

ORANGE TREE UTILITY, FL **108469**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	10/02/2008
Avg. Daily Flow(MGD):	1
Max. Design Flow(MGD):	1.6
Equipment:	2 Tertiary Filter(s) ADF Disk SS Package Filter(s)

PALM BAY REUSE FACILITY, FL **108628**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	08/19/2009
Avg. Daily Flow(MGD):	3
Max. Design Flow(MGD):	6
Equipment:	2 Tertiary Filter(s) 6 Disks,ADF Disk Concrete Filter(s),Classic,Model

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PALM BEACH COUNTY SOUTHERN REGION WRF **105108A**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU , Reuse
StartUp Date:	07/01/1999
Max. Design Flow(MGD):	22
Equipment:	6 Tertiary Filter(s) ADF Disk SS Package Filter(s)

PALM VALLEY WRF **106039**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU , Reuse
StartUp Date:	03/07/2002
Avg. Daily Flow(MGD):	4.1
Max. Design Flow(MGD):	8.2
Equipment:	3 Tertiary Filter(s) ADF Disk Package Filter(s)

PALM VALLEY WRF AZ **106039C**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	NTU
StartUp Date:	10/19/2016
Avg. Daily Flow(MGD):	2
Equipment:	1 Tertiary Filter(s) 8 Disks,Classic,Model 54,PES-13

PALM VALLEY WWTF, LITCHFIELD PARK, AZ **106039B**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	08/24/2012
Avg. Daily Flow(MGD):	5.1
Max. Design Flow(MGD):	2
Equipment:	1 Tertiary Filter(s) 8 DIsks,Classic,Model 54,PES-13,PS Package

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PALMDALE WRP STAGE 5 EXP-PH I, CA **108814**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	09/08/2011
Avg. Daily Flow(MGD):	12
Max. Design Flow(MGD):	15
Equipment:	6 Tertiary Filter(s) ADF Disk Package Filter(s)

PALO VERDE UTILITY CO. CAMPUS 1 WRF PHS 3A EXP, AZ **108094E**

Waste Characteristics:	Municipal
StartUp Date:	11/15/2010
Max. Design Flow(MGD):	1.211
Equipment:	1 Tertiary Filter(s) ADF Disk Package Filter(s)

PASO ROBLES CA **113400**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	NTU
StartUp Date:	11/15/2018
Avg. Daily Flow(MGD):	3.66
Max. Design Flow(MGD):	5.5
Equipment:	3 Tertiary Filter(s) 6 Disks,Concrete,Model 54,PA2-13

PERRIS VALLEY RWRF TERTIARY EXPANSION, CA **106518A**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	03/27/2008
Avg. Daily Flow(MGD):	20.5
Max. Design Flow(MGD):	33
Equipment:	4 Tertiary Filter(s) 12 Disks,ADF Disk SS Package Filter(s),Model 54,PA2-13,SS Package

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PERRIS VALLEY RWRF, CA **106518**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	01/06/2005
Avg. Daily Flow(MGD):	4.16
Max. Design Flow(MGD):	4.16
Equipment:	2 Tertiary Filter(s) ADF Disk SS Package Filter(s)

PINE ISLAND WTP & WWTP, FL **106500**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	09/11/2006
Avg. Daily Flow(MGD):	0.25
Max. Design Flow(MGD):	0.5
Equipment:	2 Tertiary Filter(s) ADF Disk Package Filter(s)

PLAYERS CLUB **xxxxxx**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , Reuse
StartUp Date:	06/01/1997
Avg. Daily Flow(MGD):	1
Equipment:	1 Tertiary Filter(s) ADF Disk Package Filter(s)

PLAYERS CLUB WRF FL **114409**

Waste Characteristics:	Municipal / Municipal
Treatment Objective:	TSS
Avg. Daily Flow(MGD):	2.4
Max. Design Flow(MGD):	6.5
Equipment:	2 Tertiary Filter(s) 10 Disks,Model 54,PES-13,PS Package

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POINT WASHINGTON FL **113289B**

Treatment Objective:	TSS
StartUp Date:	03/03/2016
Avg. Daily Flow(MGD):	2.5
Max. Design Flow(MGD):	5
Equipment:	1 Tertiary Filter(s) 10 Disks,ADF Disk Package Filter(s),Model 54,PES-13

PRESCOTT VALLEY WWTP UPGRADE AND EXP., AZ **105428B**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	11/08/2006
Avg. Daily Flow(MGD):	3.75
Max. Design Flow(MGD):	7.5
Equipment:	2 Tertiary Filter(s) ADF Disk Concrete Filter(s)

RAY BULLARD WRF FL **113770**

Waste Characteristics:	Municipal /
StartUp Date:	07/12/2017
Equipment:	1 Tertiary Filter(s) 10 Disks,ADF Disk Package Filter(s),PES-13,PS

RIALTO RECLAMATION PHII EXP CA **107583**

Waste Characteristics:	Municipal / Municipal
Treatment Objective:	NTU
Avg. Daily Flow(MGD):	12
Max. Design Flow(MGD):	18
Equipment:	3 Tertiary Filter(s) 12 Disks,Model 54,PA2-13,Pump(s)

RICHARD A. HEYMAN ENV. PROT. FAC. (AKA KEY WEST) **105906A**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , Phos
StartUp Date:	10/04/2001
Avg. Daily Flow(MGD):	12
Max. Design Flow(MGD):	22.4
Equipment:	4 Tertiary Filter(s) ADF Disk Concrete Filter(s)

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RUSSIAN RIVER, CA **103816C**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	09/23/2004
Avg. Daily Flow(MGD):	0.4
Max. Design Flow(MGD):	3.675
Equipment:	2 Tertiary Filter(s) ADF Disk Package Filter(s)

SAN ANDREAS 2008 WWTP UPGRADES, CA **108722**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	05/07/2010
Avg. Daily Flow(MGD):	0.47
Max. Design Flow(MGD):	1.97
Equipment:	2 Tertiary Filter(s) 8/6 Disks,PA2-13,ADF Disk Concrete Filter(s)

SAN BERNARDINO (CITY OF) MUNICIPAL WATER DEPT, CA **106168A**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU , Reuse
StartUp Date:	07/29/2008
Avg. Daily Flow(MGD):	7
Max. Design Flow(MGD):	11
Equipment:	2 Tertiary Filter(s) ADF Disk Package Filter(s)

SAN JACINTO VALLEY RWRF, CA **106640**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	01/04/2006
Avg. Daily Flow(MGD):	12.4
Max. Design Flow(MGD):	22
Equipment:	4 Tertiary Filter(s) ADF Disk Package Filter(s)

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SAN JACINTO VALLEY TITLE 22 TERTIARY TRTMT, CA **106640A**

Waste Characteristics: Municipal / Domestic
Treatment Objective: TSS , Algae
StartUp Date: 06/06/2012
Avg. Daily Flow(MGD): 6
Max. Design Flow(MGD): 11
Equipment: 2 Tertiary Filter(s)
ADF Disk SS Package Filter(s),Pump(s)

SANDESTIN FL **114628**

Waste Characteristics: NULL /
Max. Design Flow(MGD): 8
Equipment: 2 Tertiary Filter(s)
8 Disks,ADF Disk Package Filter(s),Model 54,PES-13

SARASOTA WWTP FL **102494D**

Waste Characteristics: Municipal /
Max. Design Flow(MGD): 48
Equipment: 2 Tertiary Filter(s)
16' Wide,80' Long,ADIFC AquaDiamond Concrete Filter(s),PES-14

SAUSALITO-MARIN CITY CA **111906**

Waste Characteristics: Municipal / Municipal
Treatment Objective: TSS
Avg. Daily Flow(MGD): 3
Max. Design Flow(MGD): 6
Equipment: 2 Tertiary Filter(s)
8 Disks,Concrete,Model 54,PES-13,PES-14

SCHELLVILLE TERT TRT PLT SONOMA VALLEY CO SAN DIST **107986**

Waste Characteristics: Municipal / Domestic
Treatment Objective: TSS , NTU
StartUp Date: 01/17/2008
Avg. Daily Flow(MGD): 3.2
Max. Design Flow(MGD): 16
Equipment: 4 Tertiary Filter(s)
ADF Disk Concrete Filter(s)

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SEACOAST UTILITY AUTHORITY WWTP RWFE, FL **106509**

Treatment Objective: TSS
StartUp Date: 03/15/2007
Avg. Daily Flow(MGD): 12
Max. Design Flow(MGD): 19.8
Equipment: 5 Tertiary Filter(s)
ADF Disk SS Package Filter(s)

SEACREST WWTP FL **114229**

Waste Characteristics: NULL /
StartUp Date: 02/22/2018
Equipment: 3 Tertiary Filter(s)
PES-13,PS Package

SILVER BELL ARMY HELIPORT WWTP II , AZ - FILTERS **106618B**

Waste Characteristics: Municipal / Domestic
Treatment Objective: TSS , NTU
StartUp Date: 10/06/2010
Avg. Daily Flow(MGD): 0.1
Max. Design Flow(MGD): 0.16
Equipment: 1 Tertiary Filter(s)
ADF Disk SS Package Filter(s)

SOUTH WALTON WWTP AWT IMPROVEMENTS, FL **104074D**

Waste Characteristics: Municipal / Domestic
Treatment Objective: TSS
StartUp Date: 01/07/2010
Avg. Daily Flow(MGD): 3
Max. Design Flow(MGD): 6
Equipment: 2 Tertiary Filter(s)
ADF Disk Concrete Filter(s)

SOUTHPORT 1.5 MGD WWTF, FL **107811**

Waste Characteristics: Municipal / Domestic
Treatment Objective: Nitrification , DeNitrification , Phosphorus
StartUp Date: 11/09/2007
Avg. Daily Flow(MGD): 1.5
Max. Design Flow(MGD): 3
Equipment: 1 Tertiary Filter(s)
ADF Disk SS Package Filter(s)

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SOUTHSIDE WWTF EXPANSION, FL **107961**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	06/04/2008
Avg. Daily Flow(MGD):	6
Max. Design Flow(MGD):	18
Equipment:	4 Tertiary Filter(s) ADF Disk SS Package Filter(s)

SPENCER'S WWTP, FL INTERIM EXPANSION **106200**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	01/29/2003
Avg. Daily Flow(MGD):	0.5
Max. Design Flow(MGD):	1
Equipment:	1 Tertiary Filter(s) ADF Disk Package Filter(s)

SPRINGVILLE EFFLUENT DISPOSAL, CA **106570**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	01/24/2006
Avg. Daily Flow(MGD):	0.108
Max. Design Flow(MGD):	0.108
Equipment:	1 Tertiary Filter(s) ADF Model 12 Disk Package Filter(s)

ST. ANDREWS WWTP EXPANSION FL **106213B**

Waste Characteristics:	Municipal / Municipal
Avg. Daily Flow(MGD):	7.5
Max. Design Flow(MGD):	13.1
Equipment:	3 Tertiary Filter(s) 12 Disks,Model 54,PES-14,PS Package

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STARKE WWTP UPGRADES, FL **107703**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	08/12/2008
Avg. Daily Flow(MGD):	1.25
Max. Design Flow(MGD):	2.5
Equipment:	2 Tertiary Filter(s) ADF Disk SS Package Filter(s)

SUNDANCE WATER RECLAMATION FACILITY **106173**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	11/21/2002
Avg. Daily Flow(MGD):	1.2
Max. Design Flow(MGD):	2.4
Equipment:	2 Tertiary Filter(s) ADF Disk Package Filter(s)

SURPRISE WRF EXPANSION, AZ (SPA-I MAIN PLNT) **107418**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	01/26/2007
Avg. Daily Flow(MGD):	16
Max. Design Flow(MGD):	48
Equipment:	10 Tertiary Filter(s) ADF Disk Concrete Filter(s),12 Disks,Concrete,Model

TARTESSO WRF, AZ **106569**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	03/23/2006
Avg. Daily Flow(MGD):	1.2
Max. Design Flow(MGD):	2.4
Equipment:	2 Tertiary Filter(s) ADF Disk Concrete Filter(s)

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TEMECULA VALLEY REGIONAL WRF, CA **106489**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	10/20/2004
Avg. Daily Flow(MGD):	12.49
Max. Design Flow(MGD):	12.49
Equipment:	4 Tertiary Filter(s) ADF Disk SS Package Filter(s)

TURLOCK WQCF, CA **101007B**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	08/12/2005
Avg. Daily Flow(MGD):	22.3
Max. Design Flow(MGD):	35.4
Equipment:	6 Tertiary Filter(s) ADF Disk SS Package Filter(s) 2 Tertiary Filter(s) ADF Disk SS Package Filter(s)

UC DAVIS CAMPUS WWTP EXP PH1, CA (PSOMAS) **102558A**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	11/07/2007
Avg. Daily Flow(MGD):	2
Max. Design Flow(MGD):	5.1
Equipment:	1 Tertiary Filter(s) ADF Disk Package Filter(s)

VENICE GARDENS WRF PHASE 5 IMPROVEMENTS **106328A**

Waste Characteristics:	Municipal / Municipal
Treatment Objective:	TSS
StartUp Date:	05/10/2017
Avg. Daily Flow(MGD):	0.6
Max. Design Flow(MGD):	1.2
Equipment:	1 Tertiary Filter(s) 12 Disks,Model 54,PES-13,SS Package

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VENICE GARDENS WRF, PHASE 3 IMPROVEMENTS **106328**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	01/28/2004
Avg. Daily Flow(MGD):	3
Max. Design Flow(MGD):	6
Equipment:	1 Tertiary Filter(s) ADF Disk SS Package Filter(s)

VERNON WWTF IMPROVEMENTS, FL **107078**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	11/01/2006
Avg. Daily Flow(MGD):	0.2
Max. Design Flow(MGD):	0.4
Equipment:	2 Tertiary Filter(s) ADF Model 12 Disk SS Package Filter(s)

WATER CAMPUS - FILTER COMPLEX IMPROVEMENTS, AZ **106226A**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	05/27/2004
Avg. Daily Flow(MGD):	25
Max. Design Flow(MGD):	44
Equipment:	10 Tertiary Filter(s) ADF Disk Concrete Filter(s)

WEDGEFIELD WWTF **105581**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU , Reuse
StartUp Date:	07/02/2000
Avg. Daily Flow(MGD):	0.929
Max. Design Flow(MGD):	1.85
Equipment:	1 Tertiary Filter(s) ADF Disk Package Filter(s)

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WILEY NASH WRF FL **103704B**

Waste Characteristics:	Municipal
Treatment Objective:	TSS
StartUp Date:	01/13/2016
Avg. Daily Flow(MGD):	5
Max. Design Flow(MGD):	10
Equipment:	2 Tertiary Filter(s) (8) Laterals,16' Width,40' Long,ADIFC AquaDiamond Concrete Filter(s),PES-14

WILLIAMS (CITY OF), CA **104861A**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	05/20/2011
Avg. Daily Flow(MGD):	2.32
Max. Design Flow(MGD):	2.32
Equipment:	2 Tertiary Filter(s) ADF Disk Concrete Filter(s)

WOODLAND WPCF, CA **106553A**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU , Reuse
StartUp Date:	04/12/2006
Avg. Daily Flow(MGD):	10.4
Max. Design Flow(MGD):	15.6
Equipment:	4 Tertiary Filter(s) ADF Disk SS Package Filter(s)

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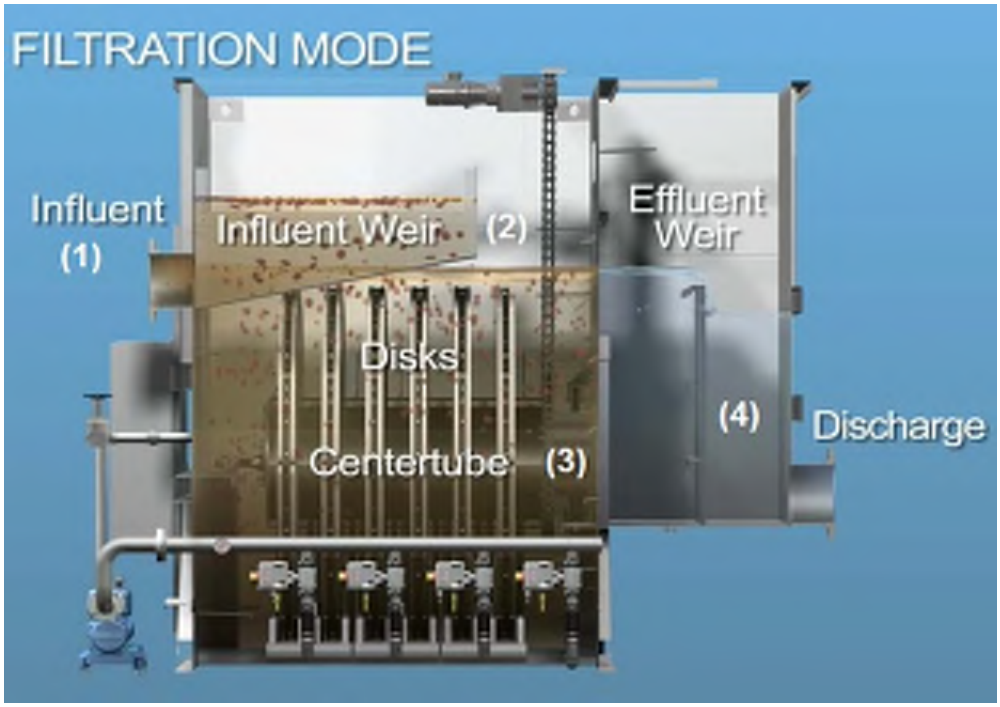
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AquaDisk® Cloth Media Filter
Operational Description

The AquaDisk® Cloth Media Filter is a complete system for continuously removing particulates from a flow stream. The system's operational strategy consists of three modes: Filtration, Backwash, and Solids Wasting. A programmable logic controller (PLC) based control system provides for automatic operation of all process modes.

Filtration Mode

The influent pipe (1) routes flow to the filter basin (2), where filtration occurs. The filter basin contains a series of circular disks covered with a unique pile cloth media. As water passes through the media via an outside-in flow path, some particulates are removed and stored within the depth of the pile cloth media while others are deposited on the pile cloth media surface. Filtered water, or filtrate, is collected in a centertube (3) and flows, via gravity, over the effluent weir and into the effluent chamber (4) prior to discharge. It is important to note that during filtration, the disks do not rotate.



Normal Operation

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As more particulates are deposited on and within the pile cloth media, the pressure required to drive water through the pile cloth media (headloss) increases. This results in a rise in the water level within the filter basin and increased differential pressure on the pile cloth media. Upon reaching a specific basin water level set point, the PLC automatically initiates the backwash mode to clean the pile cloth media.

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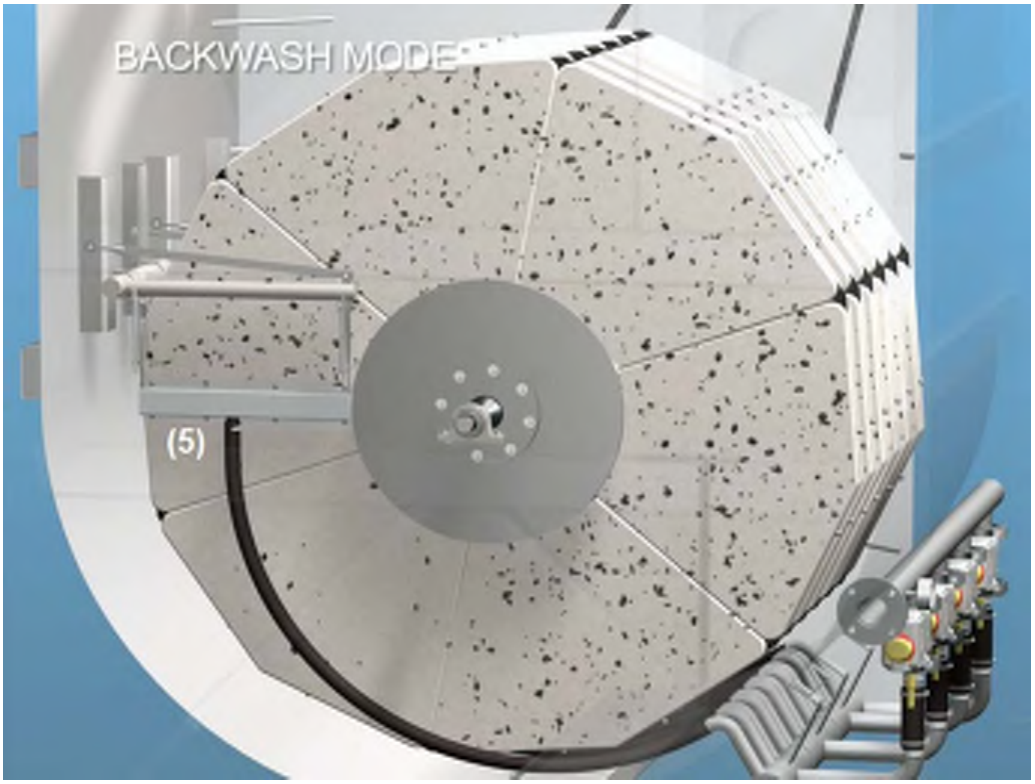
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Backwash Mode

As the amount of particulates on and within the pile cloth media increases, the static pressure required to pass water through the pile cloth media increases. This results in an increased water level within the filter basin and increased differential pressure on the pile cloth media. Upon reaching a specific basin level or elapsed time period, the backwash mode will be automatically initiated to clean the pile cloth media.

Solids are backwashed from the pile cloth media surface by liquid suction through backwash shoes (5) positioned on both sides of each disk. These spring loaded backwash shoes contact the pile cloth media to provide the necessary suction for optimum cleaning efficiency. During backwash, disks are cleaned in groups. The number of disks in each group will depend on the size of the unit. Disks rotate slowly while a backwash/waste pump (not shown) draws filtered water from the centertube through the pile cloth media on an inside-to-outside, or reversed, flow path. This provides effective cleaning of the pile cloth media over the entire disk. By the end of the backwash cycle, the basin water level returns to its normal operating level. Backwash water is typically directed to the headworks.

Filtration continues while the filter is in backwash mode. This feature allows continuous filtration while maintaining efficient filter performance.



Backwash Shoes Clean Media

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Solids Wasting Mode

A quiescent environment during filtration, combined with the outside-in filtration flow path, allows heavier particulates to settle to the bottom of the filter basin. Upon reaching a specific number of backwash cycles performed, or an elapsed time, the solids waste mode will be automatically initiated. The solids waste mode utilizes the backwash/waste pump to provide suction of the settled solids through a perforated solids collection manifold (6). Since solids wasting occurs immediately after a backwash cycle is completed, the backwash/waste pump remains on during the backwash-to-solids waste mode transition. The solids are pumped on an intermittent basis, typically to the headworks.

Filtration continues while the filter is in solids waste mode. This feature allows continuous filtration while maintaining efficient filter performance.



Settled Solids Removal

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Control System

AquaDisk filter operation is automatically controlled by a programmable logic controller (PLC). For multiple filter installations, the PLC based control systems are networked with the SCADA for monitoring or intercommunication purposes.

PLC Equipment Description

The PLC system monitors, regulates and sequences all automatic functions. The PLC controllers are Allen-Bradley MicroLogix Controllers. PLC inputs are via 16 point (120 VAC) discrete or 8 point (4-20mA) analog input modules, while outputs are via 16 point discrete (Relay) or 4 point (4-20mA) analog output modules. In the case of a power loss, the system will resume operation at the point from where they left off as soon as power is restored. On power-up, any multiple motor starts will commence at 10-second intervals. The PLC processors are equipped with a battery to provide ladder program and data table memory support in case of a power failure.

Automatic Operation

PLC systems allow the AquaDisk filter system to perform all the standard functions and provide maximum flexibility for variation in control strategies. Aqua-Aerobic Systems, Inc. provides all standard and customized programs through our in-house Electrical Engineering group. For the AquaDisk filter, these systems are level based with time overrides. They also provide a complement of fully adjustable set points in addition to filter system monitoring.

Manual Override

Aqua-Aerobic Systems control panels are equipped with Hand/Off/Auto motor switches that will allow for switching the respective hand switch from auto to the desired position to operate any motor independent of the current PLC command.

Local Operator Interface Panel

Each PLC control panel is equipped with a Panelview Plus Human Machine Interface (HMI) unit manufactured by Allen-Bradley. The operator interface unit features a color LCD touch screen display and communicates directly to the PLC. This HMI unit will allow the changing of counter and timer values to adjust the various plant controls. The ability to monitor basic system status throughout the plant is also provided at this unit.

This display contains various display pages used to provide the operator with filter status and alarm information. There are also pages from which the operator enters changes to process variables and timers to control the automatic sequencing.

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Interface Operation

Some of the various screens available through the local operator control panel are listed below:

- System status
- Backwash interval/duration adjust
- Sludge waste interval/duration adjust
- Elapsed time meters and totalizers (motors and process)
- Backwash interval history
- Alarm display
- Alarm history

Controls Programming Documentation

As a standard procedure, Aqua-Aerobic Systems will provide a written control strategy with the equipment submittal information. In addition to the control strategy, we can also provide the PLC programming documentation for onsite troubleshooting purposes. Due to the proprietary nature of the program, a confidentially agreement is necessary if this information is provided.

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AQUA-AEROBIC SYSTEMS, INC.

OptiFiber® Cloth Media Filtration Pilot System

OptiFiber® Cloth Media Filtration Pilot System

More than 20 years ago, Aqua-Aerobic Systems was first in the industry with cloth media filtration and continues to lead through innovation and experience. We offer more application and cloth media construction knowledge than any other supplier offering fabric media or microscreens. Technology pilot demonstrations can be beneficial to wastewater treatment plants by providing a snapshot of essential process operating conditions and allowing the customer to interact with the technology and factory personnel. The OptiFiber® Cloth Media Filtration Pilot System provides our customers with the most comprehensive on-site testing and analytical services available. Our unique approach is designed to provide prompt operational feedback, allowing immediate fine tuning of operating parameters for the most effective pilot/demonstration experience.

Features and Advantages

- Totally enclosed, drop-deck trailer housing a full-scale 1-disk Aqua MiniDisk® cloth media filter with monitoring and analyzing equipment
- OptiFiber PA2-13®, OptiFiber PES-13® (chlorine resistant) and OptiFiber PES-14® (Microfiber) pile cloth media available for testing
- Flexible variable speed influent pump for custom influent needs
- Supervisory Control and Data Acquisition (SCADA) system
- Integrated, fully equipped laboratory for on-site analysis
- Industry leading filter pilot services including test protocol, Aqua-Aerobic pilot technician, and comprehensive pilot study report



Controls and monitoring equipment



1-disk Aqua MiniDisk® filter

Filtration, Monitoring, and Analysis Equipment

- Influent and waste flow meters
- Chemical feed and flocculation systems
- Influent pump with VFD control to vary hydraulic loading rates, and pH adjustment prior to the filter
- Influent and effluent online turbidimeters
- Spectrophotometer for phosphorus analysis and speciation
- Phipps and Bird jar tester
- 1-disk Aqua MiniDisk cloth media filter
- Control system with SCADA for continuous monitoring and recording of process data
- Laboratory for on-site analysis of most operating parameters

Industry Leading Pilot Services



Fully equipped laboratory

- Customized Test Protocol: Outlines performance objectives and testing methods
- Services of an experienced Aqua-Aerobic pilot unit technician from start to finish for:
  - Supervised placement of the cloth media pilot trailer and necessary hydraulic and electrical connections
  - Process and mechanical operation of the pilot equipment for the duration of the test
  - Sampling, laboratory testing and analysis
  - Training plant personnel on operation and maintenance of the pilot unit
  - Decommissioning of the pilot unit at the close of testing
- A comprehensive pilot study report which includes:
  - Daily operating conditions
  - Influent and effluent turbidity charts
  - Influent and backwash flow rates
  - Particle size, suspended solids, phosphorus analysis (including speciation)
  - Other specific data, per customer request



OptiFiber® Cloth Media Pilot Trailer

Contact Aqua-Aerobic Systems to design a customized OptiFiber Cloth Media Filtration Pilot Study for your specific application.

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Bulletin #670B 7/13

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A Metawater Company

Backwash Configuration

Drive Motor

The drive motor rotates the centertube during the backwash mode through the stationary backwash shoes such that the entire pile cloth media area is cleaned by the backwash system.

Level Sensor

The level sensor measures the liquid level in the filter tank, verifies sufficient level for backwash/waste pump(s) and triggers specific modes based on water level.

Backwash System

The backwash assembly consists of backwash shoes, associated plumbing, and backwash/waste pump(s). The stationary backwash shoes draw water at high velocity from the clean water side of the pile cloth media. The drive motor rotates the centertube such that the entire pile cloth media area passes under the backwash shoes. The backwash/waste pump(s) provides the necessary suction and discharges the flow to the designated location.

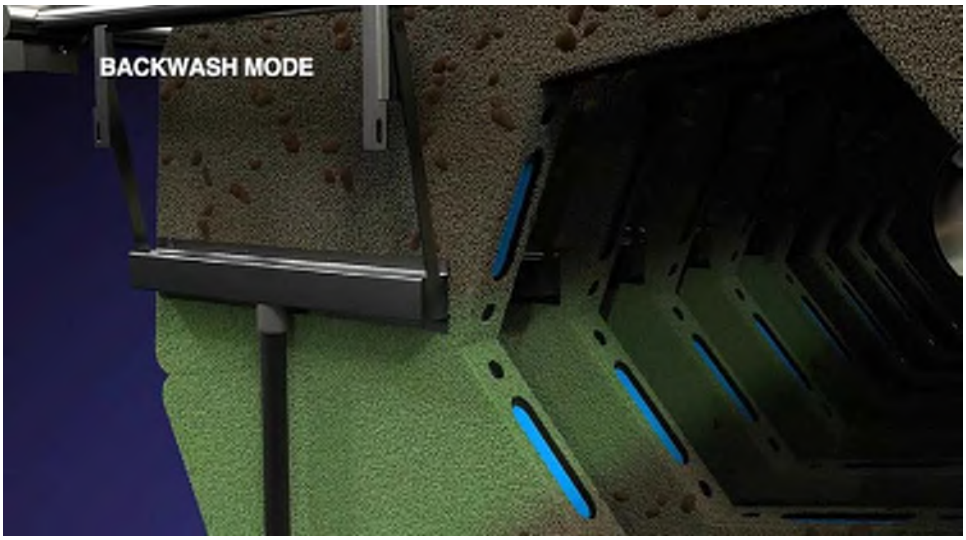
As the amount of particulates on and within the pile cloth media increases, the static pressure required to pass water through the pile cloth media increases. This results in an increased water level within the filter basin and increased differential pressure on the pile cloth media. Upon reaching a specific basin level or elapsed time period, the backwash mode will be automatically initiated to clean the pile cloth media.

Solids are backwashed from the pile cloth media surface by liquid suction through backwash shoes (5) positioned on both sides of each disk. These spring loaded backwash shoes contact the pile cloth media to provide the necessary suction for optimum cleaning efficiency. During backwash, disks are cleaned in multiples of two, unless the filter has only one disk. The disks rotate slowly while a backwash/waste pump (not shown) draws filtered water from the

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centertube through the pile cloth media on an inside-to-outside, or reversed, flow path. This provides effective cleaning of the pile cloth media over the entire disk. By the end of the backwash cycle, the basin water level returns to its normal operating level. Backwash water is typically directed to the headworks.

Filtration continues while the filter is in backwash mode. This feature allows continuous filtration while maintaining efficient filter performance.



Backwash Shoes Clean Media

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Power and Backwash Estimates

Applied Solids	167	lb / day
Applied Solids / Filter	83.5	lb / day - filter
Applied Solids Loading Rate	0.259	lb / ft^2 - day
Filtered Solids	167	lb / day
Filtered Solids / Filter	83.5	lb / day - filter
Filtered Solids Loading Rate	0.259	lb / ft^2 - day
Flux Rate	2.15	gpm / ft^2
Total Disk Count	12	
Total Disk Area	645.6	ft^2
Backwash Time / Day / Filter	231	min / day - filter
Backwash Flow / Day / Basin	22504	gpm / day - filter
Backwash Flow / Day	45007	gpm / day
Backwash % of Forward Flow	2.25%	%
Backwash Duration	4.80	min / each
Backwash Cycles / Day	48.1	
TOTAL kWhr/Year/Filter	14444	kW - hr / year
TOTAL kWhr/Year	28889	kW - hr / year

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FORM 00 31 00E - MAINTENANCE SUMMARY (SUBMIT AS FIRST PAGE OF TAB E)

Bidder to complete the following table; additional supporting information can also be included in this Tab.

Question/Criteria	Bidder's Response	Score (0-5)	Importance Factor (1-5)	Score Subtotal (Score x Importance Factor)	Maximum Points Possible
Identify number of certified service representatives in the United States for proposed equipment; include representative's name and "home" office. Indicate if service representative is directly employed by Bidder or functions as an independent contractor. Provide name and location of nearest certified service representative expected to serve this project.	See Section 4.B which provides information on our field service representatives. Aqua-Aerobic Systems currently has 7 different field service representatives throughout the US. The service representative to serve this project will be determined once the job is awarded.		5		25
Where are the cloth media filter components manufactured? Indicate state and country.	The filter components are manufactured in Rockford, Illinois.		3		15
Where are spare parts inventoried?	Spare parts are inventoried in Rockford, Illinois.		4		20
How many motors are required for each filter train?	Each filter train will have two (2) motors.		3		15
Provide example maintenance schedule(s) from standard Vendor O&M manual. Include manufacturer's schedule for routine preventive maintenance, inspections, tests, and adjustments required to ensure proper and economical operation and to minimize corrective maintenance and repair.	See Section 4.D which contains the equipment maintenance and service schedule.		5		25

NOTE: Bidder may submit additional information in Tab F to show maintenance needs, parts lists, maintenance procedures, O&M manuals, or other information related to maintenance.

Section Score=		100
Section Total Score % =		

Score (0-5); completed by Buyer/Engineer	
0	Fail: The proposal fails to address the requirements described in the RFP.
1	Poor: The proposal addresses the requirements inaccurately or poorly.
2	Fair: The proposal addresses the requirements described in the RFP in an unsatisfactory manner.
3	Good: The proposal addresses all the requirements described in the RFP in a satisfactory manner.
4	Very Good: The proposal addresses all the requirements described in the RFP and, in some respects, exceeds them.
5	Excellent: the proposal addresses and exceeds all of the requirements described in the RFP.

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Equipment and Services Group

William Decker, Vice President & General Manager, Equipment and Services Group

PROFILE	LOCATION
Tyrone Pratt Technical Support Coordinator B.S. in Marketing from Southern Illinois University. Worked as a Journeyman Electrician for 14 years. Specialized in the wiring of PLC systems and as a field representative/project manager for plant construction. Provides technical support for all products.	*Loves Park, IL Factory since 2011*
Michael Spragg Technical Support Specialist Experience with submarine maintenance for 20 years in the Navy. Experience as a Field Service Engineer for 13 years. Experience in wastewater since 2019.	*Loves Park, IL Factory*
Dean Woyak Customer Service Process Specialist B.S. degree in Water Resources/University of Wisconsin-Stevens Point. Experience in waster and wastewater since 1994.	*Powell, WY*
John Edelen *Field Service Specialist* B.S. in Business Administration/Computer Science from University of Central Florida. Worked as an Electrical Technician for National Oilwell Varco for 5 years and an Elevator/Escalator Mechanic for 10 years. Specialized in troubleshooting, repair, calibration, installation and commissioning of electrical and computer systems. Provides repair, troubleshooting and start-up supervision for Ozone and Membrane products.	*Atlanta, GA since 2008*

Curt Larson
Field Service Specialist *Raeford, NC since 2006*
Experience in wastewater treatment since 2003. Worked for 16 years in the design, installation and commissioning of controls on a project level for the paper industry. Experienced In the wastewater industry since 2000. Performs plant equipment start-up, operator training and system troubleshooting.

Skip Morton *Hermitage, PA since 2016*
Field Service Specialist
Holds PA DEP Waste Water Certification. Experienced in electrical systems test equipment, plant operation, lab testing, plant maintenance and motor/pump installation. Wastewater Operator and Facilities Manager for 17 years. Performs repairs, troubleshooting, start-up and training on Filtration, SBR and Ozone products.

Tom Mowery *Columbia, PA since 2007*
Field Service Specialist
Experience in wastewater treatment since 1996. Experienced in wastewater treatment industry since 1996. Worked in field construction since 1987 including site supervisor/electrician for yard wiring, electrical devices and complete wiring systems for wastewater treatment plants.

William Sims *Lineville, AL since 2016*
Field Service Specialist
Education and training from MaComb Community College, American Military University, Electronics Technology, Defense Acquisition University and West Central Technical Institute. Experience includes Information Technology systems, general troubleshooting and repair, Water Treatment equipment and systems. Performs repair and maintenance of AquaDisk Filtration systems including commissioning, testing, maintenance and decommissioning of Filtration Pilot systems.

Tony Smith *Maineville, OH since 2005*
Field Service Specialist
Specialized in commissioning, troubleshooting, testing and training of Ozone Generation Systems.

Ohta Watson *Long Beach, CA since 2015*
Field Service Specialist
Specialized in assembly, troubleshooting and repair of Ozone Generation Systems.

AquaDisk®: Operation & Maintenance Requirements

Design# 167138

Initial Flows

AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

Project: **MAGNA WRF, UT**

Qty / Model#: **2 / ADFSC54x6E-PC**

Description: **AquaDisk Concrete: Model ADFSC-54 x 6E-PC**

Avg Flow (Gal):	2,000,000
Influent TSS (mg/l):	10
Qty Of Disks Per Unit:	6
Area Provided/Disk:	53.8

I. LUBRICATION REQUIREMENTS

	# of Units		Minutes/Unit		Times/Year		Hours/Year
1) Backwash / Solids Waste Pump - Routine Lubrication:	2	x	5	x	12	/ 60 =	2.00
2) Backwash / Solids Waste Pump - Drain and Refill:	2	x	30	x	1	/ 60 =	1.00
3) Drive Gear Box:	2	x	30	x	0.25	/ 60 =	0.25
4) Drive Motor:	2	x	5	x	0.25	/ 60 =	0.04
						TOTAL LUBRICATION REQUIREMENTS:	3.29

II. PARTS REPLACEMENT

	Replace Interval (Years)	# of Units		Minutes/Unit		Hours Per Replacement	Material Cost Per Unit	Total Material Cost
1) Main "V-Ring" Seal:	10	2	x	240	=	8.0	$1,051	$2,103
2) Filter Media Cloths (6/Disk):	7	72	x	15	=	18.0	$299	$21,528

III. POWER CONSUMPTION

1) Backwash / Solids Waste Pump (kW Hours/Year):	3,843.8
2) Disk Drive Motor (kW Hours/Year):	826.9
3) Power Control Panel (kW Hours/Year):	2,800.0
Total Annual Power Usage (kW Hours/Year):	7,470.7

AquaDisk®: Operation & Maintenance Requirements

Design# 167145

Buildout Flows

AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

Project: MAGNA WRF, UT

Qty / Model#: 2 / ADFSC54x6E-PC

Description: AquaDisk Concrete: Model ADFSC-54 x 6E-PC

Avg Flow (Gal):	2,325,000
Influent TSS (mg/l):	10
Qty Of Disks Per Unit:	6
Area Provided/Disk:	53.8

I. LUBRICATION REQUIREMENTS

	# of Units		Minutes/Unit		Times/Year		Hours/Year
1) Backwash / Solids Waste Pump - Routine Lubrication:	2	x	5	x	12	/ 60 =	2.00
2) Backwash / Solids Waste Pump - Drain and Refill:	2	x	30	x	1	/ 60 =	1.00
3) Drive Gear Box:	2	x	30	x	0.25	/ 60 =	0.25
4) Drive Motor:	2	x	5	x	0.25	/ 60 =	0.04
TOTAL LUBRICATION REQUIREMENTS:							3.29

II. PARTS REPLACEMENT

	Replace Interval (Years)	# of Units		Minutes/Unit		Hours Per Replacement	Material Cost Per Unit	Total Material Cost
1) Main "V-Ring" Seal:	10	2	x	240	=	8.0	$1,051	$2,103
2) Filter Media Cloths (6/Disk):	7	72	x	15	=	18.0	$299	$21,528

III. POWER CONSUMPTION

1) Backwash / Solids Waste Pump (kW Hours/Year):	4,468.4
2) Disk Drive Motor (kW Hours/Year):	961.2
3) Power Control Panel (kW Hours/Year):	2,800.0
Total Annual Power Usage (kW Hours/Year):	8,229.6

AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

Equipment Maintenance and Service Schedule

The proposed equipment included in this proposal package is designed to be accessible. Below is a list of equipment and access requirements:

- **Valves:** Operators can access the valves without special need of access. Check actuators every 6 months, calibrate as needed
- **Backwash/Solids pumps** Lubrication once a year.
- **Drive:** Lubrication once a year. Motor bearings are sealed.
- **Effluent Seal:** The seal is located at the around the diamond frame at the effluent wall. Estimated replaced in 10 years.
- **Control Panel:** Replace microprocessor battery every 3 years if needed.
- **Pile Cloth Media:** Every 7 years.

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FORM 00 31 00F - COST SUMMARY (SUBMIT AS FIRST PAGE OF TAB F)

Question/Criteria	Bidder's Response
Total cost for Goods and Special Services (from Bid Form)	*Cost to be entered by Buyer / Engineer based on data provided by Bidder on the Bid Form.*
Total cost for pilot test (Optional cost that MWD may or may not execute on)	*Cost to be entered by Buyer / Engineer based on data provided by others Bidder on respective Bid Forms.*
HIGHEST COST (from other bids)	*Cost to be entered by Buyer / Engineer based on data provided by others Bidder on respective Bid Forms.*
LOWEST COST (from other bids)	*Cost to be entered by Buyer / Engineer based on data provided by others Bidder on respective Bid Forms.*
COST SCORE	*Ratio to be determined by Buyer / Engineer. The highest score will be given to the Bidder with the lowest total cost and the cost scores of other Bidders will be proportional to the difference in costs.*

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AquaDisk®Cloth Media Filter
Process Performance Guarantee
for
Magna WRF, UT
2/28/2022

Aqua-Aerobic Systems, Inc. (Aqua-Aerobic) guarantees the AquaDisk® Cloth Media Filters in accordance with Specification Section 46 61 24 dated February 2022 and Addenda #1, Aqua-Aerobic's Design #167138 and Design Notes dated March 24, 2021 shall provide an average monthly filtered effluent of 5 mg/L TSS and 2 NTU.

The guarantee shall apply under the following conditions:

1. The influent flow is supplied to the filter(s) on a continuous basis at an average daily flow not to exceed a rate of 2.0 MGD and a peak flow rate not to exceed 4.0 MGD and:
   a. Filter influent TSS concentration shall not exceed 10 mg/l (daily average) and 20 mg/l maximum.
   b. Filter influent Turbidity concentration shall not exceed 5 NTU (daily average).
   c. Daily average TSS concentrations are based on 24-hour composite samples. Maximum TSS concentrations are based upon grab samples at any time.
   d. Filter influent solids loading shall not exceed 2.0 lbs TSS/ft^2/day.
   e. Hydraulic loading to the Cloth Media Filter shall not exceed 3.25 gpm/ft^2 of disk area at average daily flow and 5.0 gpm/ft^2 at peak flow. The sustained peak flow shall not exceed 3 hours.
   f. Wastewater entering the Cloth Media Filter is effluent from a secondary biological process.

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2. The influent TSS and Turbidity are capable of being removed by filtration as determined by an Aqua-Aerobic approved bench pilot filter operated at the proportionate filter design flow and solids loading rate and equipped with media identical to the installed equipment.
3. The filter is installed, operated and maintained in accordance with instructions supplied by Aqua-Aerobic.
4. The equipment has been paid for in accordance with contract terms.
5. A performance test is conducted according to the approved Field Process Performance Test Protocol, dated 2/28/2022, as submitted by Aqua-Aerobic.
6. Data during the performance test shall be sent to Aqua-Aerobic within one week of said testing.
7. The process guarantee shall be considered satisfied upon successful completion of the performance test.
8. Start-up shall be defined by the date stated on Aqua-Aerobic's "Manufacturers Certificate of Inspection" form executed upon completion of start-up services.
9. Should the filter system not meet the guaranteed performance:
    a. The guarantee shall be considered invalid if the influent parameters do not conform to Conditions 1 and 2.
    b. In the event that the influent parameters are within the limits specified under Conditions 1 and 2, Aqua-Aerobic shall have up to 30 days to modify the filters as necessary to achieve the guaranteed performance.
10. If failure to produce the guaranteed effluent is due to influent quality not in conformance with Conditions 1 or 2, the Owner shall have up to 30 days to bring the filter influent to specified limits. If the Owner is unable to produce the specified influent conditions within 30 days, the guarantee will be considered to be satisfied.
11. This guarantee shall no longer be applicable or valid if any product, including any software program, supplied by Aqua-Aerobic, is modified or altered without the written approval of Aqua-Aerobic.

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12. In the event of continued failure of the equipment to produce the guaranteed effluent characteristics at no fault of the owner, Aqua-Aerobic shall have the option to modify the filter(s) as necessary to achieve the guaranteed performance. The maximum cumulative liability to Aqua-Aerobic for the modification or supply of additional equipment shall be limited to 100% of the initial sales price of the equipment supplied.

Aqua-Aerobic Systems, Inc.

_____ _____

Kristy Chycota Execution Date
Process Engineer - Filtration

_____

Customer / Owner Company Name

_____ _____

Authorized Signature Execution Date

_____

Title

NOTE: Aqua-Aerobic Systems, Inc. will execute the process performance guarantee upon receipt of a purchase order, acceptance of terms and conditions and approved submittal drawings.

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AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

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Aqua MiniDisk® Cloth Media Filter
Field Process Performance Test Protocol
for
Magna WRF, UT
2/28/2022

Introduction:

To satisfy Specification Section 46 61 24, dated February 2022 and Addendum 1, the following field process performance test shall be performed.

Protocol:

1) The filter(s) will be tested for a period of one eight hour day to assess process performance. The field performance testing shall be conducted no later than sixty (60) days after startup or beneficial use. The start date shall be mutually agreed upon by the Engineer, Owner, Installing Contractor, and Aqua-Aerobic Systems. Under supervision of Aqua-Aerobic Systems' field service representative, the Installing Contractor will conduct the testing and shall employ the services of a local certified laboratory facility to perform sample analysis in accordance with this testing procedure. The Engineer and the Owner shall have the right to witness the performance test.
2) The performance test shall be executed using plant secondary effluent after the plant processes have stabilized and the plant is performing according to the design specified operating requirements. The filter influent loading conditions shall be in accordance with the values stated in the project bid specifications as referenced in the "Performance and Design Parameters" section of this document. In the event that the filter influent does not meet this criteria, the testing shall be postponed or the performance expectations adjusted as mutually agreed to by the Owner, the Engineer, and Aqua-Aerobic Systems.
3) Testing will be done simultaneously on all filter(s). The filter(s) will be tested for one eight hour day. The actual flow at the time of testing will be monitored and equally split to all filter(s) units. If the flow rate does not reach the targeted flow

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conditions, filter(s) will be taken offline as needed to simulate target flow conditions. If the target flow conditions cannot be achieved while a single filter is in operation, the test will be conducted on a single filter with the available flow. During the test period, the filter(s) will be tested at the peak flow rate for a maximum of 2 hours if such flow rates exist at time of test.

4) Composite one litter TSS samples consisting of a minimum of four (4) grab samples per hour will be taken from either the secondary clarifier effluent box (mid-depth) or the influent weir (mid-depth) and from each of the filter(s) outlets (mid-depth). Composite samples shall be collected, stored, and analyzed for TSS according to the latest edition of Standard Methods for the Examination of Water and Wastewater. Testing shall be done by a local certified laboratory. Expedited service from the laboratory shall be requested to ensure that results return within the period of the performance test. Effluent water quality will be monitored and reported by a continuous online turbidimeter that draws a sample from the Reuse Pump Station Wet Well. The turbidimeter shall be calibrated before the start of the test. The Installing Contractor, or Aqua-Aerobic Systems shall furnish all labor, materials, equipment, auto samplers, laboratory services, instrumentation, and any other equipment and services necessary for conducting the field performance testing. The Installing Contractor shall furnish all electric, water and other utilities.

5) The party responsible for conducting the field performance test shall compile all influent and effluent TSS and turbidity data onto an Excel® spreadsheet and graph the data to clearly show performance compliance. Any data collected by the contractor, the owner, or the manufacturer during the performance testing shall be submitted to the party responsible for conducting the field performance test to be incorporated into this summary.

6) The party responsible for conducting the filter performance test shall compile the filter(s) influent flow rates using the influent flowmeter and the conversion to filtration rates shall be summarized on an Excel® spreadsheet. NOTE: Alternatives to an influent flowmeter are measuring the nappe over the influent weir or readings from an effluent flowmeter. However, these alternatives are less desirable.

7) A testing day will run from 8:00 am until 8:00 am of the following day.

8) In the event of failure of the equipment to produce the required effluent characteristics during the performance testing, Aqua-Aerobic Systems shall have the option to modify the filter(s) as necessary to achieve the guaranteed performance testing. The maximum liability to Aqua-Aerobic Systems for the modification or supply of additional equipment shall be limited to 100% of the initial sales price of the equipment supplied.

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Evaluation:

The AquaDisk® Cloth Media Filter(s) shall have demonstrated the following specified performance parameters based upon the following specified filter(s) influent conditions:

Performance and Design Parameters:

a. Wastewater Flow:

Average Daily Flow:	2.0 MGD per filter
Max Daily Flow:	4.0 MGD per filter

b. Filter Influent Characteristics:

	Filter Influent
Average Daily TSS (mg/l)	10
Max. TSS (mg/l)	20
Max. turbidity (NTU)	5

c. Filter Effluent Characteristics:

	Filter Effluent
Average Daily TSS (mg/l)	5
Average Daily Turbidity (NTU)	2

Reporting of Results:

Aqua-Aerobic Systems, Inc. shall receive the test data from the Installing Contractor and Aqua-Aerobic Systems shall write a report to show the individual and average flow rates, TSS and turbidity recorded during the field process performance test and shall conclude whether the filter(s) have met the performance as specified.

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AquaDisk® Cloth Media Filter(s) Field Performance Testing

Performance Test Data

Test Unit [___]

Witnessed By: _____ Date: _____

_____

_____

_____

Time	Influent Flow rate (MGD)	Influent TSS (mg/l)	Effluent TSS (mg/l)	Influent NTU (mg/l)	Effluent NTU (mg/l)

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AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

COMPANY PROFILE AND CAPABILITIES

GENERAL INFORMATION

ABOUT OUR COMPANY

Aqua-Aerobic Systems is an applied engineering company specializing in adaptive water management solutions including aeration/mixing, biological processes, cloth media filtration, membranes, oxidation/disinfection and process control. Since 1969, the company has served the water and wastewater industry by providing both municipal and industrial customers around the world with advanced technologies and treatment solutions that easily adapt to changing demands. From enhanced nutrient removal to primary filtration, ultra low phosphorus removal or water reuse, Aqua-Aerobic has proven solutions that offer the lowest cost of ownership with life-time customer service.

MISSION

Make a Good Company a Great One!

STRATEGIC INTENT

To build Aqua-Aerobic Systems, Inc. into a global technology leader that provides water treatment solutions for aeration/mixing, biological processes, filtration, disinfection, and aftermarket sales and services. To grow our company through technological leadership and partnerships with our customers. To uphold the values that have been the key to the success of Aqua-Aerobic Systems, Inc.



Peter G. Baumann, MBA
President & CEO



Kevin L. Heasley, EIT
Vice President, Operations



James Horton
Vice President, Process Group



William G. Decker, E.I.T.
Vice President & General Manager, Equipment and Services Group



Scott R. Willis
Vice President & Chief Financial Officer

FACILITY / TEST FACILITY

125,000 square feet office and manufacturing (25% office space and 75% manufacturing space)

250,000 gallon (950 m^3) test tank
55,000 gallon (209 m^3) test tank

RESEARCH & TECHNOLOGY CENTER

Located at the Rock River Water Reclamation District, this on-site research facility allows Aqua-Aerobic to conduct extensive research and testing on new products and process concepts.

REPRESENTATION

150 Sales Representatives in the US, Canada, Mexico and throughout the world. Most are graduate engineers and have design capabilities.

MARKETS

85% United States, Canada, Virgin Islands
15% International

INSTALLATIONS

More than 10,000 installations worldwide

GENERAL INFORMATION

ENGINEERING & TECHNICAL EXPERTISE

Aqua-Aerobic Systems, Inc. has a full staff of process, mechanical and electrical engineers, product managers, R&D staff, customer service and field service specialists.

Total Employees	160 (Office and Manufacturing)
Administration	10 Technical Managers & Officers
Process Group	1 Vice President 1 Director of Product Management
Cloth Media Filtration	1 Product Manager 1 Process Engineer
Biological Processes	2 Product Managers 2 Senior Process Engineers
Domestic Sales	4 Regional Managers
International Sales	1 International Business Manager
Industrial Sales	1 Industrial Business Manager
Applications Engineering	1 Manager 5 Project Applications Engineers 5 Applications Engineers
Equipment & Services Group	1 Vice President
Aeration & Mixing	1 Manager 4 Support Personnel
Oxidation & Disinfection	1 Manager 1 Support Person
Customer Service/ Field Service	1 Manager 13 Employee Outside Service Providers 12 Authorized Service Providers 3 Inside Personnel
Aftermarket Service	1 Manager 7 Support Personnel

Operations	1 Vice President
Manufacturing	1 Manager 13 Shop Employees
Project Management	1 Senior Project Managers 2 Project Managers
Research & Development	1 Director 1 Manager 6 Degreed Engineers/Support Personnel
Engineering	1 Director 4 Managers 28 Degreed Engineers/Support Personnel



FINANCIAL INFORMATION

Aqua-Aerobic Systems, Inc. is a well financed company with sales approaching $100 Million. Aqua-Aerobic Systems, Inc. also has extensive bonding capabilities.

Primary Banking	BMO Harris Bank, Rockford, Illinois
Auditors	RSM McGladrey, Rockford, Illinois

COMPANY HISTORY

In 1919, Rockford, Illinois was a rapidly growing riverfront community. Race Street, in the center of town, was home to Solem Machine Company, a respected manufacturer of woodworking equipment. As the city grew and thrived, so did the company. In 1958, larger facilities were needed and the company moved to 6306 N. Alpine Road.

In 1964, a group of investors, including Aqua-Aerobic Systems, Inc. President, John D. Brubaker (retired), purchased this well established manufacturing firm. With an eye toward the future, these investors considered the changing market needs and began expanding the product line. Soon after, the company was positioned to meet the demands of a new and growing environmental industry. In 1969, Solem Machine Company purchased Aqua-Aerobic Systems and began manufacturing its own line of surface aerators, the Aqua-Jet®. The Aqua-Jet® aerator quickly revolutionized the aerator industry, which led to the company phasing out its other product lines and shifting its focus exclusively to wastewater treatment. In 1976, that commitment resulted in Solem Machine Company's decision to legally adopt the name Aqua-Aerobic Systems, Inc.

In 1989, an additional 35,000 square feet of office and manufacturing space was constructed to accommodate the company's rapid growth. Due to increased requests for Aqua's technical seminars and an increase in local business due to growth of the Chicago suburbs, Aqua-Aerobic once again expanded its facilities. In April 2005, another 25,000 square feet was added to the existing building for new, state-of-the-art seminar facilities, more meeting areas, a formal lunchroom, and new offices. The exterior of the new building is environmentally friendly, utilizing glass to promote natural heat and lighting. The existing building was renovated and included conversion of 4,800 square feet of office space into manufacturing space. Existing office areas were also remodeled to coincide with the interior of the new building. Construction was complete in Spring 2006 and included space for company growth. The new high-tech facilities allow Aqua-Aerobic to accommodate larger seminar audiences and to provide remote webcasts.

In 2016, Aqua-Aerobic Systems merged with Metawater Co., Ltd., (Tokyo, Japan) an international company and leading supplier of advanced water and wastewater solutions. Currently, Aqua-Aerobic employs approximately 160 persons in manufacturing, engineering, sales/marketing and administration. The company's product line includes: surface aerators, diffused aeration systems, surface spray coolers, direct-drive mixers, batch reactor systems, cloth media filters, sand media filters, membrane systems, control panels, and process management control systems.

The company's dedication to research and development ensure the availability of products to meet unique applications and changing requirements. Aqua-Aerobic has gained recognition for quality products. Our commitment to environmental preservation and product integrity ensures continued success well into the 21st century.

TRADEMARKS & PRODUCT LINE

PATENTS

Aqua-Aerobic Systems, Inc. holds 45 patents for processes and equipment used in wastewater treatment systems.

PRODUCTS AND SYSTEMS

Aeration & Mixing

Aqua-Jet® Surface Mechanical Aerator
Aqua-Jet II® Contained Flow Aerator
AquaDDM® Direct-drive Mixer
ThermoFlo® Surface Spray Cooler
Endura® Series Limited Maintenance Product
OxyMix® Pure Oxygen Mixer
OxyStar® Aspirating Aerator
Fold-a-Float® Self-deploying Segmented Float
SAF-T Float® Safe Accessible Float Technology

Biological Processes

Aqua MixAir® Aeration System
AquaCAM-D® Combination Aerator/Mixer/Decanter
AquaSBR® Sequencing Batch Reactor
AquaNereda® Aerobic Granular Sludge Technology
Aqua MSBR® Modified Sequencing Batch Reactor
AquaPASS® Phased Activated Sludge System
Aqua BioMax® Dual Treatment System
AquaEnsure® Ballast Decanter
Aqua EnduraTube® Fine-bubble Tube Diffuser
Aqua EnduraDisc® Fine-bubble Disc Diffuser
Aqua CB-24® Coarse-bubble Diffuser

Filtration

AquaDisk® Cloth Media Filter
AquaDiamond® Cloth Media Filter
AquaDrum® Cloth Media Filter
Aqua MiniDisk® Cloth Media Filter
Aqua MegaDisk® Cloth Media Filter
AquaPrime® Cloth Media Filter
AquaStorm™ Cloth Media Filter
OptiComb™ Backwash System
OptiFiber® Cloth Filtration Media
OptiFiber PES-13® Cloth Filtration Media
OptiFiber PA2-12® Cloth Filtration Media
OptiFiber PES-14® Cloth Filtration Media

TYPICAL INDUSTRIES SERVED

- Pulp & Paper
- Food/Dairy
- Beverage
- Chemical
- Petroleum/Petrochemical
- Textile
- Energy/Utility
- Pharmaceutical

Filtration (continued)

OptiFiber PF-14® Cloth Filtration Media
OptiFiber UFS-9™ Cloth Filtration Media
AquaABF® Automatic Backwash Filter

Membranes

Aqua MultiBore® P-Series Polymeric Membrane System
Aqua MultiBore® C-Series Ceramic Membrane System
AquaMB Process® Multiple-Barrier Membrane System
Aqua-Aerobic® MBR Membrane Bioreactor System

Disinfection

Aqua ElectrOzone® F-Series Ozone Generator
Aqua ElectrOzone® M-Series Modular Ozone Generator

Controls and Monitoring

IntelliPro® Monitoring and Control System



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COMMUNITY INVOLVEMENT

Aqua-Aerobic Systems takes pride in its donations to over 90 organizations.

MEMBERSHIPS

American Membrane Technology Association (AMTA)
American Society for Quality
American Water Works Association (AWWA)
Business for the Bay
Illinois Chamber of Commerce
Illinois Manufacturers' Association
International Association on Water Quality (IAWQ)
International Desalination Association (IDA)
International Ozone Association (IOA)
National Association of Manufacturers
National Association of Clean Water Agencies
Technical Association of Pulp & Paper Industry (TAPPI)
Water Environment Federation (WEF)
Water & Wastewater Equipment Manufacturers Association (WWEMA)
WateReuse Association
Water Design-Build Council

RECOGNITIONS

Northern Illinois Business Hall of Fame
Exporter Continuing Excellence Award
Manufacturer of the Year Award from Rockford Chamber of Commerce
Special Congressional Recognition
WWEMA Diamond Award
Outstanding Corporation Award from the City of Rockford
Innovative Technology Award from WEF - 2008, 2011
Export Achievement Certificate from the U.S. Dept. of Commerce
Confluence Partnership Honors - Aqua-Rock Business Development Project (2018)

TRAINING AND EDUCATION

Structured training seminars are conducted by Aqua-Aerobic personnel monthly, May through September. More than 30 Consulting Engineers, Plant Operators, and Municipal Officials typically attend these training seminars each month to learn about Aqua-Aerobic equipment and systems. Aqua-Aerobic Systems' engineering staff attends company sponsored seminars and workshops relating to the wastewater industry.



EMPLOYEE PROFILES

OFFICERS

Peter Baumann, MBA
President & CEO
M.S. degree in Business Administration, B.S. degree in Engineering/University of Wisconsin - Milwaukee. Experience in wastewater since 1976, including 20 years at Envirex Corp.

William Decker, E.I.T.
Vice President & General Manager, Equipment and Services Group
B.S. degree in Civil Engineering/USAF Academy, EIT/ State of Colorado. Project Engineer since 1990. Experience in wastewater since 1994, including Vice President of Biosolids at Ashbrook Simon-Hartley, and 2 years as President of Aquionics.

Kevin L. Heasley, E.I.T.
Vice President, Operations
B.S. degree in Structural Design & Construction Technology/Penn State University, Harrisburg, EIT/State of Pennsylvania. Experience in large underground piping systems and wastewater since 1984.

James Horton
Vice President, Process Group
M.S. degree in Civil Engineering/Queensland University of Technology, Australia. B.S. degree in Chemical / Environmental Engineering/University of Queensland, Australia. Domestic and International experience in wastewater engineering since 1996 including positions with consulting engineer and specialty wastewater contractor.

Scott Willis
Vice President & Chief Financial Officer
M.S. degree in Business Administration and B.S. degree in Accounting/Northern Illinois University, DeKalb, IL AAS degree in Business/Rock Valley College, Rockford, IL.

ADMINISTRATIVE MANAGERS

Pamela Appino, P.H.R.
Director of Human Resources
B.S. degree in Administration of Criminal Justice/Bradley University, Peoria, IL. P.H.R. Certification from HR Certification Institute. Human Resources experience since 1991.

EMPLOYEE PROFILES

PROCESS GROUP

James Horton
Vice President, Process Group
M.S. degree in Civil Engineering/Queensland University of Technology, Australia. B.S. degree in Chemical / Environmental Engineering/University of Queensland, Australia. Domestic and International experience in wastewater engineering since 1996 including positions with consulting engineer and specialty wastewater contractor.

PRODUCT MANAGEMENT

Mark Hughes, P.E.
Director of Product Management
M.S. degree in Environmental and Water Resources Engineering/The University of Texas - Austin. B.S. degree in Civil Engineering/University of Iowa, Iowa City, IA. Experience in wastewater since 2008.

Kristy Chycota
Process Engineer - Filtration
B.S. degree in Paper Engineering - Environmental Processes/Western Michigan University, Kalamazoo, MI. 2 years experience in Product Management at Englewood and 4 years at Beloit Corporation as a process engineer. Experience in wastewater since 2019.

Manuel de los Santos
Product Manager - Biological Processes
M.S. degree in Sanitary and Environmental Engineering/Universidad de Cantabria, Spain. B.S. degree in Civil Engineering/Universidad Nacional Pedro Henriquez Ureña, Santo Domingo, DR. Experience in wastewater since 2000.

Paula Dorn
Process Engineer
M.S. degree in Environmental Engineering, B.S. degree in Civil Engineering/University of Illinois, Urbana-Champaign, IL. Experience in wastewater since 2018.

John Dyson
Product Manager - AquaPrime® / AquaStorm™
B.S. degree in Chemistry/Longwood College, Farmville, VA. Experience in water/wastewater since 1991.

Dave Holland
Senior Process Engineer
A.A.S. degree in Technical writing/Rock Valley College, Rockford, IL. Experience in wastewater since 1979.

Brett Quimby
Senior Process Engineer - AquaNereda®
B.A. degree in Japanese Language and Literature/ University of Wisconsin, Madison, WI. Experience in wastewater since 2016.

Joe Tardio
Product Manager - AquaNereda®
M.S. degree in Environmental & Waste Management/ Stony Brook University, Stony Brook, NY. B.A. degree in Biological Sciences & Chemistry/University of Delaware, Newark, DE. Experience in wastewater since 2006.

MARKETING

Cheryl Kunz
Director of Marketing
B.A. degree in Business Management/Ashford University, Clinton, IA. Experience in wastewater and marketing since 1989.

APPLICATIONS ENGINEERING

Tamera Knapp
Applications Engineering Manager
B.S. degree in Environmental Engineering/Michigan Technological University. B.S. degree in Environmental Liberal Arts/Northland College, Ashland, WI. Experience in wastewater since 2004.

Angelica Davila, E.I.T.
Senior Project Applications Engineer
B.S. degree in Environmental Engineering/University of Central Florida. Experience in wastewater since 2013.

Thea Davis
Project Applications Engineer
B.S. degree in Chemical Engineering and M.S. degree in Chemical Engineering/Illinois Institute of Technology, Chicago, IL. Water Innovation Research Intern at Current Innovation. Experience in wastewater since 2019.

Harrison DeBruler
Applications Engineer
B.S. degree in Mechanical Engineering/University of Alabama, Tuscaloosa, AL. Experience in wastewater since 2021.

Nicholas Fortsas
Applications Engineer
B.S. degree in Chemical Engineering/University of Illinois at Urbana-Champaign, Champaign, IL. Experience in wastewater since 2019.

EMPLOYEE PROFILES

APPLICATIONS ENGINEERING (continued)

Michael Jacobson
Applications Engineer
B.S degree in Agriculture and Biological Engineering/ University of Illinois, Champaign, IL. Experience in water or wastewater since 2020.

Rungrod Jittawattanarat, Ph.D.
Project Applications Engineer
Ph.D. degree in Civil Engineering/Polytechic Institute of New York University. M.S. degree in Water and Wastewater Engineering/ Asia Institute of Technology, Thailand. B.S. degree in Environmental Engineering/ Chiang-Mai University,Thailand. Experience in wastewater since 1990.

Jonathon Kelsey
Applications Engineer
Biomolecular Engineering degree/Milwaukee School of Engineering (MSOE), Milwaukee, WI. Experience in water or wastewater since 2020.

Tatiana Mazzei
Project Applications Engineer
M.S. degree in Engineering/University of Wisconsin-Milwaukee, WI. B.S. degree in Chemical Engineering/ Universidad Metropolitana, Caracas, Venezuela Experience in wastewater since 2007.

Jakob Nowicki
Project Applications Engineer
B.S. degree in Chemical Engineering/Michigan Technological University, Houghton, MI. Experience in wastewater since 2017.

Corey O'Brien
Project Applications Engineer
B.S. degree in Environmental Engineering/University of Iowa, Iowa City, IA. Past experience in U.S. Navy as Aviation Technician. Experience in wastewater since 2016.

REGIONAL MANAGERS

Scott Kelly
Regional Sales Manager, West
B.S. degree in Chemical Engineering and Petroleum Refining/Colorado School of Mines, Golden, CO. Experience in wastewater since 1991.

Hui Lin, P.E.
Director of International Business
M.S. degree in Environmental Engineering/Polytechnic University of New York. M.E. degree in Environmental Engineering/National University of Singapore. B.S. degree in Biochemical Engineering/Beijing Institute of Chemical Technology. 6 years at Beijing Organic Chemical Works and 1 year at M&W Zander as Process Engineer. Experience in wastewater since 2002.

Jeff McCormick
Director of Industrial Sales
B.S. degree in Chemical Engineering/Grove City College, Grove City, PA. Experience in water or wastewater since 1985. Market Experience: Ultrapure water for medical research, semi-conductor manufacturing and steam generation. Wastewater treatment for food and beverage manufacturing, steel production, oil refining and specialty chemical manufacturing. Work experience: Sales leadership, Business Development, Operations Management, Product Management and Acquisition Integration.

Tom Miles
Regional Sales Manager, Northeast
B.S. degree in Chemical Engineering/Penn State University, State College, PA. Experience in wastewater since 1986.

Paul Nelson
Regional Sales Manager, Southeast
B.S. degree in Business and Economics/Elmhurst College, Elmhurst, IL. Experience in wastewater since 1978.

Steve Stanish
Regional Sales Manager, Midwest
B.A. degree in Business Administration/Washington & Jefferson College, Washington, PA. Experience in wastewater since 1996.

EMPLOYEE PROFILES

OPERATIONS

Kevin L. Heasley, E.I.T.
Vice President, Operations
B.S. degree in Structural Design & Construction Technology/Penn State University, Harrisburg, EIT/ State of Pennsylvania. Experience in large underground piping systems and wastewater since 1984.

PROJECT MANAGEMENT

David Cornford
Project Manager
Attended University of Wisconsin. Experience in wastewater since 1975, including 10 years at Welles Products Corp.

Tom Fenton
Senior Project Manager
A.A.S. degree in Civil Engineering/Williamsport College, Williamsport, PA. Experience in Project Management (including Accounting, Field Service, and Manufacturing) since 1994.

Shareef Khoga
Project Manager
B.S. in Manufacturing Engineering/Northern Illinois University, Dekalb, IL.

RESEARCH & DEVELOPMENT

Terrence Reid, P.E.
Director of Research & Development
M.S. degree in Product Design and Development/ Northwestern University, Evanston, IL. B.S. degree in Civil & Environmental Engineering/University of Wisconsin-Madison, WI. Experience in wastewater since 1989.

Blake Hoffman
Manager, Research & Development
B.S. degree in Business Management and Marketing/ Edgewood College, Madison, WI. B.S degree in Mechanical Engineering/University of Wisconsin-Platteville, WI. Experience in wastewater since 2018.

Joe Campanaro
Senior R&D Engineer
M.S. degree in Environmental Engineering/New York University, New York, NY. B.S. degree in Biology/Stony Brook University, Stony Brook, NY.

Darryl Gravagno
Senior Research & Development Engineer
B.S. degree in Environmental Engineering/University of Wisonconsin, Platteville, WI. A.A.S. degree in Science, Rock Valley College, Rockford, IL. Experience in wastewater since 2015.

Chris Kurshinsky
Research & Development Technical Systems Supervisor
Experience with product development since 1995. Engineering Supervisor R&C Test Lab from 2010-2017 and named as inventor of several patents. Experience as Technical Center Supervisor in the automotive industry 1995-2010. Experience in wastewater since 2017.

Lynn Peterson
Senior Research & Development Specialist
A.A.S. degree/Rock Valley College, Rockford, IL. Experience in wastewater since 2015.

Evan Price
Research & Development Engineer
M.S. degree and B.S. degree in Biological Systems Engineering/University of Wisconsin-Madison, WI. Experience in wastewater since 2018.

ENGINEERING

Robert Wiegand
Engineering Director
M.B.A. degree/University of Wisconsin-Madison. B.S degree in Electrical Engineering Technology/Bradley University, Peoria, IL. 10+ years experience in paper industry with Beloit Corp. Experience in wastewater since 2000.

ELECTRICAL STANDARDS

Gerald Schneider, P.E.
Electrical Standards Supervisor
B.S. degree in Electrical Engineering/University of Wisconsin, Madison, WI. Experience in wastewater treatment since 1989.

William Brundige
Electrical Design Engineer
A.A. degree in Mechanical Drafting/Iowa Central Community College, Fort Dodge, IA. Experience in electrical and pneumatic control systems design and drawing standards since 1979, with 20 years in the paper industry with Beloit Corporation.

EMPLOYEE PROFILES

ELECTRICAL STANDARDS (continued)

Mike Hevey
Senior Electrical Engineer
A.A.S. degree in Electromechanical Technology/ Chippewa Valley Technical College, Eau Claire, WI. 16+ years electrical controls engineering experience including control system and software validation and design, development and implementation of systems incorporating PLC, HMI, SCADA, hardware design, power distribution and MCC specification.

Junji Sakashita
Services & Electrical Engineer
Attended the Institute of Technology. Experience in the wastewater treatment industry, specifically Ozone, since 2011 at Fuji Electric Corp. of America/Metawater USA.

ELECTRICAL CONTRACT

Gary Lightfoot
Electrical Engineering Manager
A.A.S. degree in Electrical Technology/Rock Valley College, Rockford, IL. Experience in Electrical Engineering since 1978.

Mondi Anderson
Controls Engineer
B.S. degree in Computer Science/Neumont University, Salt Lake City, UT. Experience in wastewater since 1998.

Brian Pass
Electrical Design Engineer
A.A.S. degree in Electrical/Electronic Drafting/Herzing Institute of Technology, Madison, WI. Experience in wastewater since 2000.

Kent Campbell
Electrical Engineer
Degree in Engineering Electronic Technician/Radio College of Canada (RCC), Toronto, Calanda. Experience in wastewater since 2019.

Brad Christian
Electrical Engineer
A.A.S degree Robotics/ Automation Technology, Indian Hills community College, Ottumwa, IA.

Dan Crews
Senior Electrical Engineer
A.S. degree in Electronic Technology/Rock Valley College, Rockford, IL. Experience in engineering since 1982.

Bill Douglas
Electrical Designer
B.S. degree in Electrical Engineering/University of Wisconsin-Platteville. A.A.S. degree in Mathematics and Science/University of Wisconsin at Rock County. A.S. degree in Electronic/Electrical Drafting/Wisconsin School of Electronics. Experience in electrical engineering since 2003.

Dave Johnson
Senior Electrical Engineer
B.S. degree in Electrical Engineering/Milwaukee School of Engineering, Milwaukee, WI. Experience in wastewater since 2000.

Deborah Lewis
Electrical Designer
Experience in wastewater/water since 2021.

SooMin Loh
Electrical Engineer
B.S degree in Electrical Engineering/Wright State University. 5 years in Power Design with ME Engineering Consultant and experience in Ozone application with drinking/wastewater industry since 1991.

Jeremy Try
Senior Electrical Engineer
B.S. degree in Electrical Engineering/Southern Illinois University, Carbondale, IL. A.A.S. degree in Engineering/ Rock Valley College, Rockford, IL. Experience in engineering since 1983.

MECHANICAL STANDARDS

David Smith
Mechanical Engineering Manager
B.S. degree in Mechanical Engineering/University of Wisconsin-Madison. Experience in wastewater since 2000. Experience in mechanical design engineering and development since 1996, including 4 years at Beloit Corporation. Received patents for tissue machine equipment.

Devon Bockhop
Mechanical Designer
A.A.S. degree in Drafting and Design/Morrison Institute of Technology, Morrison, IL. Experience in wastewater since 2019.

Noah Dellamater
Mechanical Engineer
B.S. degree in Mechanical Engineering/Olivet Nazarene University, Bourbonnais, IL. Experience in wastewater since 2019.

EMPLOYEE PROFILES

MECHANICAL STANDARDS (continued)

Jerry Machula
Senior Mechanical Designer
A.A.S. degree in Mechanical Design and CAD/ Dunwoody Industrial College, Minneapolis, MN. Experience in custom product design for mechanical, electrical, pneumatic, and hydraulic products. Experience in the wastewater since 2002.

Michael McCormick
Senior Mechanical Engineer
B.S. degree in Mechanical Engineering/University of Wisconsin-Madison, WI. Experience in wastewater since 2010.

Mike Schmitz
Principal Engineer
B.S. degree in Mechanical Engineering/University of Wisconsin, Milwaukee, WI. Experience in wastewater since 2008.

MECHANICAL CONTRACT

Dan Durdan
Manager, Contract Engineering & Estimating
A.A.S. degree in Mechanical Engineering/IL Valley Community College, Oglesby, IL. Experience in wastewater since 2006.

Tim Austin
Senior Mechanical Designer
A.A.S. degree in Computer Aided Mechanical Design/ Rock Valley College, Rockford, IL. Experience in design engineering since 1997.

Beth Bahr
Mechanical Designer
A.A.S. degree in Mechanical Engineering/Blackhawk Technical College, Janesville, WI. Experience in wastewater since 2001.

Chris Carlson
Senior Mechanical Designer
A.A.S degree in Engineering Technology-Design and Drafting/Morrison Institute of Technology, Morrison, IL. Experience in wastewater since 2007.

Mitchell Cook
Mechanical Designer
Attended College of Lake County, Grayslake, IL. SolidWorks Mechanical Design Certification. Experience in wastewater since 2021.

Scott Howarth
Senior Mechanical Designer
A.A.S. degree in Mechanical Drafting/Morrison Institute of Technology, Morrison, IL. Drafting experience since 2002.

Joseph Massari
Senior Mechanical Designer
A.A.S. degree in Machine Design Technology/Rock Valley College, Rockford, IL. Mechanical and design experience since 1979. Experience in wastewater since 2002.

Bryce Worley
Mechanical Designer
Attended ITT Tech-online. Attended Morrison Institute of Technology, Morrison, IL. Experience in wastewater since 2021.

Stephen Yalung
Mechanical Designer
A.A.S. degree in Design and Drafting/Illinois Valley Community College, Oglesby, IL. Experience in wastewater since 2019.

ESTIMATING

Gordy Brown
Senior Design Analyst
B.S. degree in Civil Engineering/Southern Illinois University. 6 years civil construction and mechanical design. Experience with PLC's, AutoCAD and RVC.

Ali Groen
Design Analyst
A.A.S. degree in Construction Technology/Morrison Institute of Technology, Morrison, IL.
Experience in the wastewater since 2008.

Scott Tripp
Design Analyst
Experience in Engineering since 1989. Experience in wastewater since 1995.

EMPLOYEE PROFILES

EQUIPMENT AND SERVICES GROUP

William Decker, E.I.T.
Vice President & General Manager, Equipment and Services Group
B.S. degree in Civil Engineering/USAF Academy, EIT/ State of Colorado. Project Engineer since 1990. Experience in wastewater since 1994, including Vice President of Biosolids at Ashbrook Simon-Hartley, and 2 years as President of Aquionics.

AERATION & MIXING

James Knight
Senior Engineer - Aeration & Mixing
A.A.S. degree in Mechanical Design/Southeastern Iowa Community College, West Burlington, IA. Experience in design field since 1970. Experience in wastewater since 1975.

Loryn Martin
Product Manager - Aeration & Mixing Technologies
M.B.A. degree in Business Administration/University of Phoenix, Phoenix, AZ. B.A. degree in Communication with emphasis on Public Speaking/ Loyola University, Chicago, IL. A.A.S. degree/Rock Valley College, Rockford, IL. Experience in water/wastewater since 2013.

OXIDATION & DISINFECTION

Dawn Brady, P.E.
Senior Application Engineer - Oxidation & Disinfection
M.S. degree in Civil Engineering/Southern Illinois University Carbondale, IL. M.S. degree in Hydraulic and Ocean Engineering/National Cheng Kung University, Tainan, Taiwan. B.S. degree in Civil Engineering/Southern Illinois University, Carbondale, IL.

Erich DeLang
Product Manager - Oxidation & Disinfection
B.A. degree in Political Science/Marquette University, Milwaukee, WI. MWS - Master Water Specialist (a Water Quality Association credential). Experience in the wastewater since 2004.

CUSTOMER SERVICE/FIELD SERVICE

CUSTOMER SERVICE

Tyrone Pratt
Customer Service Manager
B.S. degree in Marketing/Southern Illinois University, Carbondale, IL. Experience in Field Service / Journeyman Electrician for industrial, commercial and residential since 1987.

Shawn Butterfield
Technical Support Specialist
A.A.S. degree in Science Engineering (Electronic/ Electrical Drafting)/Wisconsin School of Electronics (now Herzing University). Experience in water and wastewater since 2018.

Michael Spragg
Technical Support Specialist
Experience with submarine maintenance for 20 years in the Navy. Experience as a Field Service Engineer for 13 years. Experience in wastewater since 2019.

Dean Woyak
Customer Service Process Specialist
B.S. degree in Water Resources/University of Wisconsin-Stevens Point. Experience in waster and wastewater since 1994.

FIELD SERVICE

John Edelen
Field Service Specialist
B.S. degree in Science & Business Administration/ University of Central Florida, Orlando, FL. Experience in Field Service since 1998.

Josh Frieze
Field Service Specialist
B.S. degree in EET/Grantham University, Lenexa, KS. 10 years of combined experience as an Instrumentation and Controls Engineer and Field Service Tech/Engineer since 2008.

Curt Larson
Field Service Specialist
Experience in wastewater since 2003.

Benjamin Morton
Field Service Specialist
PA DEP Wastewater Certificate. Experience in wastewater since 1998.

EMPLOYEE PROFILES

FIELD SERVICE (continued)

Tom Mowery
Field Service Specialist
Experience in wastewater since 1996.

Edward Sanchez
Field Service Specialist
Certified in Mechanical Technology. Experience in Field Service since 2000.

William Sims
Field Service Specialist
Served in the U.S. Army as reverse osmosis water treatment supervisor for 10 years. Experienced in Field Service and Training Specialist with Department of Defence. Experienced in start-up, troubleshooting, and operator training for aerators, mixers, filters since 2016. Experiences in mechanical and electrical checkout/ inspection for 10 years. Experience in water treatment since 2001.

Geoffrey Smith
Field Service Specialist
B.S. degree in Electronics Engineering Technology/ Grantham University, Lenexa, KS. Experience in Field Service since 2014 with wastewater experience since 2015.

Tony Smith
Field Service Specialist
A.A.S. degree in Electronics Engineering Technology/ ITT Technical Institute, Norwood, OH. Experience in wastewater since 2003.

Jerry Tucker
Field Service Specialist
Certified in Electrical/Mechanical Technology Electrician experience since 2008 with experience in wastewater since 2018.

Ohta Watson
Field Service Engineer
Kasukabe Technical High School Electricity Department, Japan. Experience in water and wastewater since 2010.

AFTERMARKET SERVICES

Paul Klebs
Aftermarket Sales Manager
B.S. degree in Chemistry/University of Wisconsin-Madison, WI. Graduate coursework in Environmental Studies/University of Wisconsin-Green Bay, WI. Certified operator in the state of Wisconsin. Experience in wastewater since 1992.

Denise Boehm
Aftermarket Sales Representative
Experience in Customer Service in HVAC, packaging and processing equipment and wastewater since 2000.

Barb Kinroth
Contract Administrator
A.A.S. degree/Rock Valley College, Rockford, IL. Experience in water and wastewater since 1989.

Tim Lamont
Senior Aftermarket Sales Representative
B.S. degree in Geology/University of Illinois, Urbana-Champagin, IL. Experience in Sales and Customer Service since 2000. 5 years experience with retail and manufacturing in the electrical industry.

Jeff Ogle
Aftermarket External Sales Representative
B.S. degree from Western Illinois University, M.B.A. degree from Keller Graduate School of Management. Experience in water treatment industry, including operations, sales and management since 1991.

Leann Torrisi
Administration Assistant for Aftermarket Sales
Experience in administrative assistance since 2004.

Denise Uchacz
Aftermarket Sales Representative
Associates in Arts degree. Experience in the wastewater since 2015 with previous experience in Inside Sales and Customer Service.

Michaela Villarreal
Aftermarket Sales Representative
B.A. degree in Business Administration from Ashford University. Experience in Sales and Customer Service since 2010. Experience in Water and Wastewater Sales and Customer Service since 2018.



AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

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Bulletin #110 9/21

AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

Cloth Media Filtration

Featuring OptiFiber® Pile Cloth Media

Aqua-Aerobic® Cloth Media Filtration

Featuring OptiFiber® Pile Cloth Media

In the early 1990s, Aqua-Aerobic Systems revolutionized tertiary treatment by introducing Pile Cloth Media Filtration utilizing a disk configuration. Since then, over 3,000 pile cloth media filtration units have been installed worldwide, and hundreds of different media have been researched and tested with a select few that are currently being applied to six mechanical configurations in a variety of applications including: water reuse, low level phosphorus, stormwater and primary treatment.

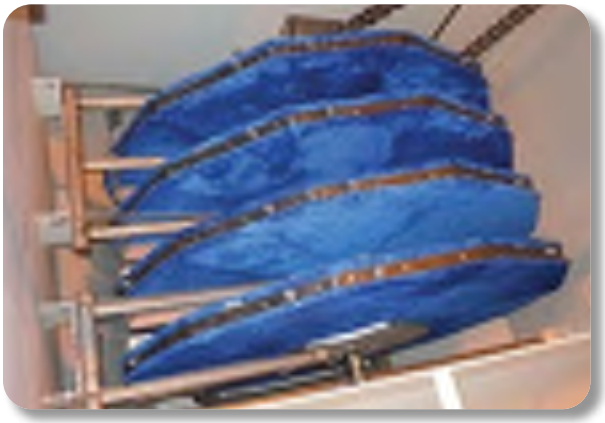
Effective Depth Filtration

The original OptiFiber® pile cloth media is specifically engineered for water and wastewater applications and designed to maximize solids removal over a wide range of particle sizes. Deep, thick, pile fibers capture particles for the most effective depth filtration. Perhaps as important, the media is engineered to backwash effectively and last over time. OptiFiber media is exclusive to the entire line of cloth media filter configurations including:

- AquaDisk®
- Aqua MegaDisk®
- AquaPrime®
- AquaStorm™
- AquaDiamond®
- Aqua MiniDisk®

OptiFiber® Media Advantages

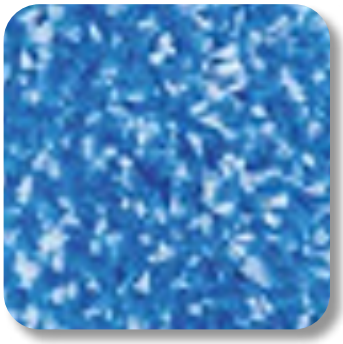
- Woven, precision fibers provide strength and durability
- Discrete pile fibers effectively release solids during backwash
- Open backing minimizes potential for biofouling
- Low backwash volume results in water savings and energy reduction
- Variety of application-specific cloth including 2, 5 & 10 µm nominal pore size media
- Phosphorus removal to 0.075 mg/l or less
- Ability to handle high solids conditions



An AquaDisk® filter with OptiFiber PES-14® treats cooling tower blow-down.



OptiFiber PA2-13®



OptiFiber PES-13®



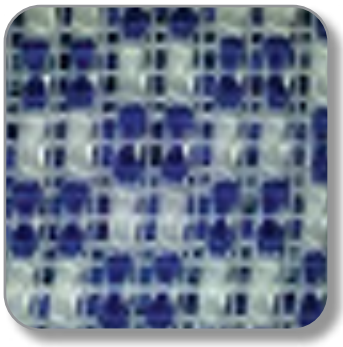
OptiFiber PES-14®



OptiFiber UFS-9™



OptiFiber PF-14®



Unique Backing Design

OptiFiber® Cloth Filtration Media

Awarded BlueTech® Research Innovation Badge

Engineered Cloth Media

The media is the most important aspect in any filter design. Today's OptiFiber® pile cloth filtration media is the result of over 30 years of continuous engineering and improvement. Each aspect of the pile cloth is design is engineered to provide an optimal design to maximize particle removal, allow for effective backwash, and maximize media life.

Hundreds of media options have been tested as part of this continuous development process. Only five of these options have made it through the rigorous testing process and met the quality standards set forth by Aqua-Aerobic Systems, Inc.



A cloth media display showcases samples of tested media with the far left panel featuring OptiFiber® media.

OptiFiber® Cloth Media Technology Timeline

1993	2000	2004	2006	2011	2013	2016	2017	Continued Innovation
AquaDisk® Filter	OptiFiber PA2-13® Media	AquaDiamond® Filter	OptiFiber PES-13® Media	OptiFiber PES-14® Microfiber Media	Aqua MegaDisk® Filter	AquaPrime® & AquaStorm™ Filter with OptiFiber PF-14® Media	OptFiber UFS-9® Ultrafiber Media	

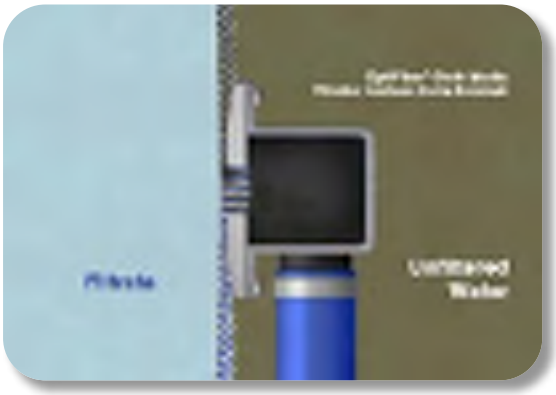
Backwash System

EFFECTIVE CLEANING WITH LESS WATER AND ENERGY

Maximum cleaning of the OptiFiber® cloth media is accomplished with a unique backwash system. The backwash shoe makes direct contact with the cloth media and solids are vacuumed from the surface. During backwash, fibers fluidize to provide an efficient release of stored solids deep within the fiber depth.

Backwash System Advantages

- Filtration continues during backwash
- Initiated at a pre-determined liquid level or time
- Low backwash rates
- Less water volume required
- Low energy consumption



Backwash shoe makes direct contact with the media.



Shown is pile cloth media in its natural state (left) and its conditioned state (right).

Configurations

AquaDisk®
CLOTH MEDIA FILTER

The cloth media “Disk” configuration was the first to enter the marketplace as an alternative to conventional granular media filtration technologies. This original configuration comprises the majority of Aqua-Aerobic cloth media filters installed today. A history of exceptional operating experience in a variety of municipal and industrial applications continues to make the AquaDisk® the tertiary filter of choice.

Features and Benefits

- Vertically oriented cloth media disks reduce required footprint
- Each disk has six lightweight, removable segments for ease of maintenance
- Low hydraulic profile
- Higher solids and hydraulic loading rates
- Low backwash rate
- Available in painted steel, stainless steel or concrete tanks
- Fully automatic PLC control system with color touchscreen HMI
- Low cost of ownership



Modes of Operation

Aqua-Aerobic cloth media filter configurations operate on the same (3) modes of operation: **FILTRATION, BACKWASH** and **SOLIDS WASTING.**



Filtration Mode

- Inlet wastewater enters filter
- Cloth media is completely submerged
- Disks are stationary
- Solids deposit on outside of cloth media forming a mat as filtrate flows through the media
- Tank liquid level rises
- Flow enters the filter by gravity and filtrate is collected inside the disks and discharged
- Heavier solids settle to the tank bottom



Backwash Mode

- Solids are backwashed at a predetermined liquid level or time
- Backwash shoes contact the media directly and solids are removed by vacuum pressure using the backwash pump
- Two disks are backwashed at a time (unless a single disk is utilized)
- Disks rotate slowly
- Filtration is not interrupted
- Backwash water is directed to headworks



Solids Wasting Mode

- Heavier solids on the tank bottom are removed on an intermittent basis
- Solids are pumped back to the headworks, digester or other solids collection area of the treatment plant

Aqua MegaDisk®

CLOTH MEDIA FILTER

The Aqua MegaDisk® cloth media filter expands on the reliability and exceptional performance of the original AquaDisk filter, but on a larger scale. Each disk is approximately 10' in diameter. The unit features all of the same benefits and (3) modes of operation as the AquaDisk but with larger disks.

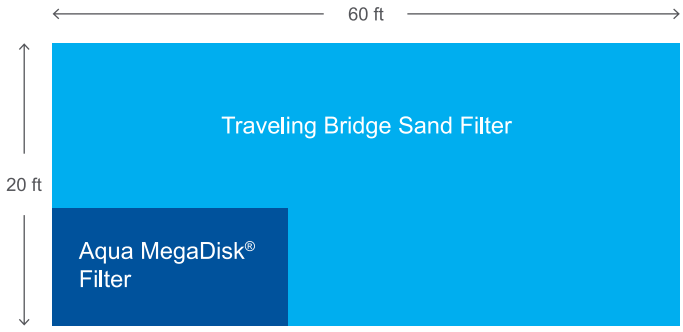
Additional Features and Benefits

- Smallest footprint, operating in 80% less space than sand filters with comparable hydraulic capacity
- Up to 24 disks in a single filter, capable of treating 24 MGD
- Ideal for deep bed sand filter retrofits, new plants or expansions
- Lightweight segments removable without a crane



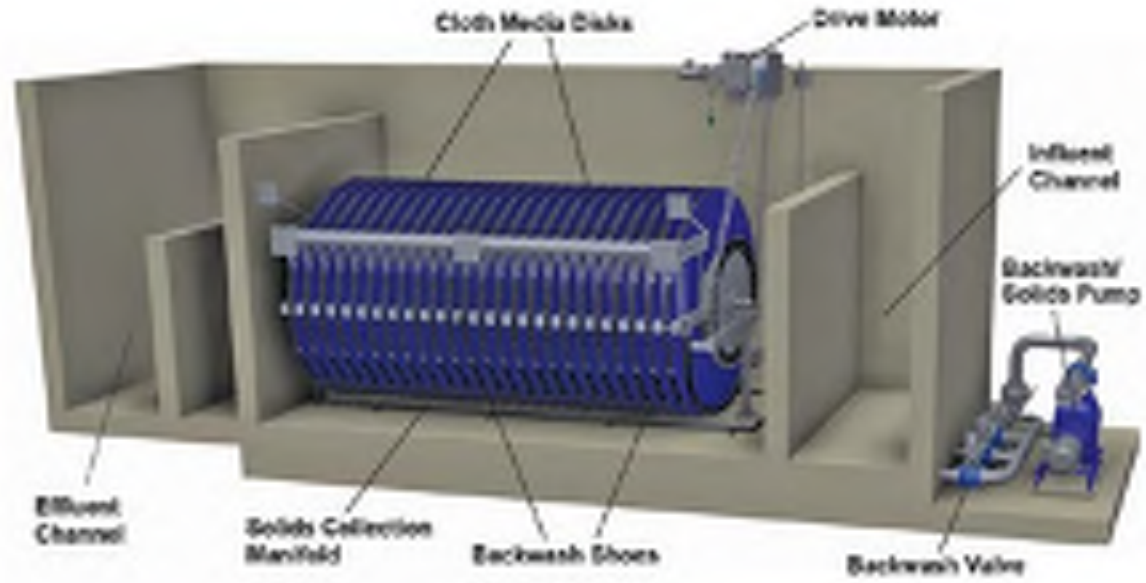
Aqua MegaDisk® (left) compared to AquaDisk® (right).

Footprint Savings Compared to Sand Filters





Internal view of the Aqua MegaDisk®



Configurations

Aqua MiniDisk®

CLOTH MEDIA FILTER

The Aqua MiniDisk® cloth media filter features all of the same benefits and (3) modes of operation as the original AquaDisk. The configurations are designed to provide economical treatment of smaller flows and easily retrofit into existing traveling bridge sand filters.



The Aqua MiniDisk® cloth media filter is available as packaged unit(s) or concrete basin(s).



The modular design of the Aqua MiniDisk® filter retrofits neatly into existing 9 ft. (2.74 m) wide concrete traveling bridge filter basins, providing more than two times the hydraulic capacity of the original sand filters.

Filter IntelliPro®

Filtration Optimization System

Building from a decade of experience in applying advanced process control, Filter IntelliPro® is a control system for cloth media filters that uses real time data to optimize chemical usage for phosphorus removal prior to filtration. Among its many features, the system includes automatic optimal dose selection for metal salt, polymer, and pH control.

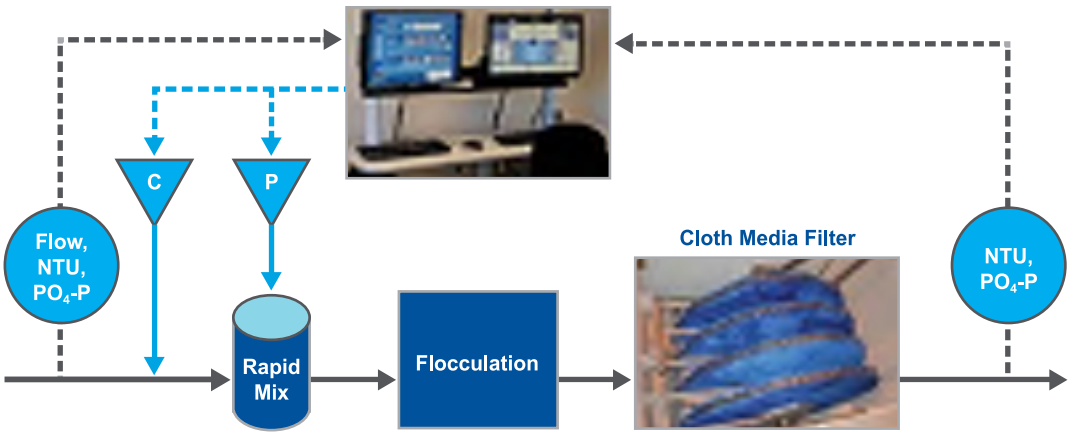
System Features

- PC with IntelliPro software developed by Aqua-Aerobic Systems, Inc.
- Network settings to allow communication between the instruments, the PLC and the PC
- Process, instrumentation and software on-site training

System Advantages

- Chemical savings through load based control
- Automatic chemical dose response curves replace jar testing
- Improved process reliability using real time information
- Multi-point analysis of key process parameters

IntelliPro® System Layout for Ultra-Low Phosphorus



AquaDiamond®

CLOTH MEDIA FILTER



An AquaDiamond® filter with Microfiber cloth polishes phosphorus to < 0.1 mg/l.

The AquaDiamond® cloth media filter is a unique combination of two proven technologies: traveling bridge and cloth media filters. The result is two to three times the flow capacity of a traveling bridge filter within an equivalent footprint, making it ideal for sand filter retrofits. The unit features all of the same benefits and (3) modes of operation as the AquaDisk but with vertically oriented diamond laterals and a traveling platform.



Additional Features and Benefits

- Up to eight diamond laterals per unit
- Fits neatly into existing traveling bridge filter profile with minimal civil work
- Variable speed drive platform and backwash pump provide immediate response to influent solids excursions
- Advanced drive and tracking system prevents misalignment

Modes of Operation







Filtration Mode

- Inlet wastewater enters the filter
- Cloth media is completely submerged
- No moving parts
- Solids deposit on outside of cloth media forming a mat as filtrate flows through the media
- Flow enters the filter by gravity and filtrate is collected inside the diamond laterals and discharged
- Heavier solids settle to the basin floor

Backwash Mode

- Periodic backwashing is initiated by increased headloss due to solids deposits
- The platform traverses the length of the cloth media diamond laterals during backwashing
- Backwash shoes contact the media directly and solids are removed by vacuum pressure using the backwash pump
- The platform only operates during backwash and solids collection

Filtrate Collection and Discharge

- Heavier solids on the tank bottom are removed on an intermittent basis
- Small suction headers collect and discharge settled solids
- The backwash pump is utilized for solids removal

High Solids Applications

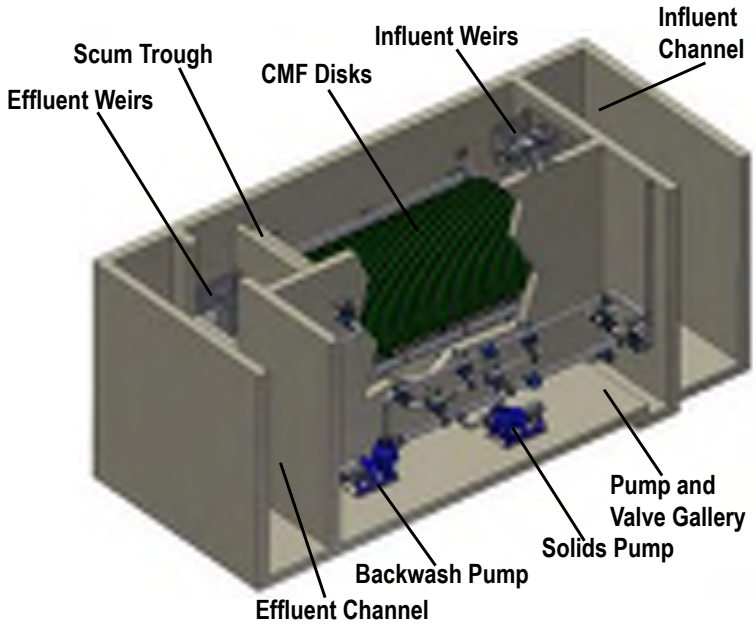
Primary Filtration and Wet Weather Treatment

AquaPrime®
CLOTH MEDIA FILTER

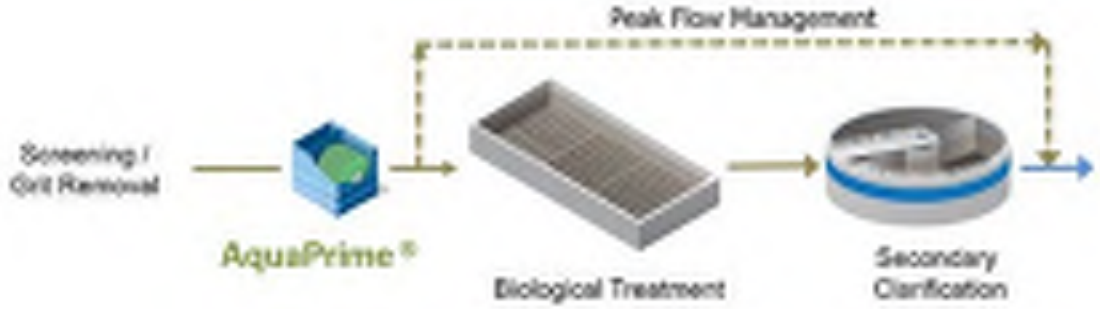
The AquaPrime® cloth media filter is ideal for primary wastewater treatment due to its proven removal efficiencies. The main advantages include extremely small footprint, reduced energy costs in the secondary process due to a reduction in organic loading and more solids for increased gas production in anaerobic digesters for primary applications.

AquaPrime® Features and Benefits

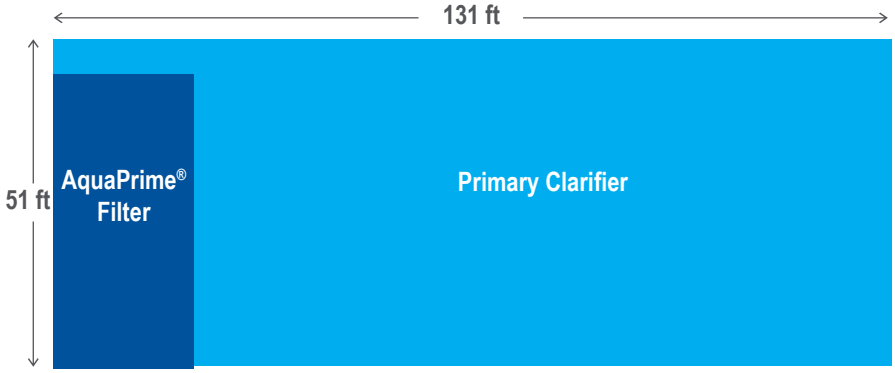
- Vertically oriented cloth media disks reduce required footprint to 15% to 20% of primary clarification
- Provides enhanced solids and BOD removal resulting in:
  - Less aeration energy for secondary process due to reduced organic loading
  - More solids for increased biogas production in anaerobic digesters
  - Increased capacity in existing secondary process basin
- Three methods of solids removal with specifically designed floatable, filtration and solids removal zones
- Dual use applications of advanced primary treatment and wet weather treatment
- Major capital construction savings



Flow Diagram for Advanced Primary Treatment



80-85% Footprint Savings Compared to Primary Clarifier





Linda County Water District, Olivehurst, CA

- Primary Filtration Application
- TSS removal greater than 75%
- BOD removal up to 60%

AquaStorm™

CLOTH MEDIA FILTER

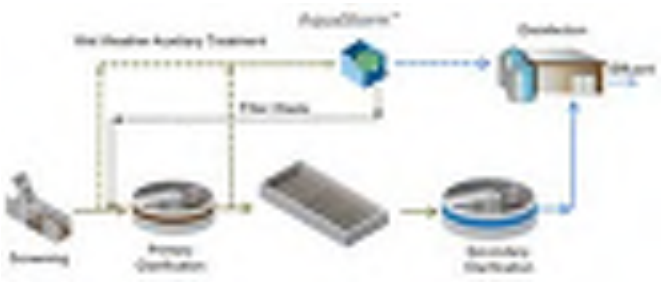
The AquaStorm™ cloth media filter features a similar mechanical configuration as the AquaPrime® filter, as well as offers inherent advantages related to wet weather treatment for stormwater, Combined Sewer Overflow (CSO) and Sanitary Sewer Overflow (SSO), including the ability to be configured for dual-use applications for tertiary and wet weather operation. Also, differences in controls specifically designed to handle intermittent operation and need for lower effluent requirements for wet weather applications

AquaStorm™ Features and Benefits

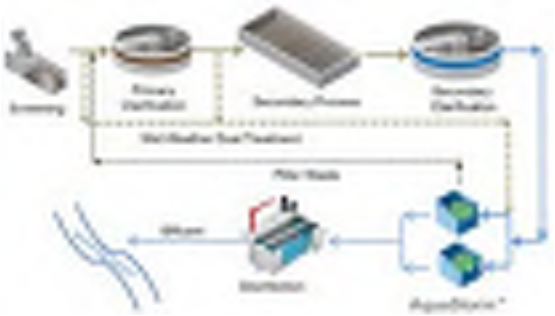
- High quality effluent similar to secondary standards
- Use with or without chemical, depending on site-specific effluent water quality requirements
- Can be configured for dual-use application for tertiary or wet weather operation
- Simple start-up and shutdown with unattended operation for remote locations
- Provides the treatment facility with resiliency during wet weather events
- Maximizes the wet weather flows to be treated
- Protects the biological portion of the facility
- Can be used at remote CSO/SSO sites
- Improves disinfection of wet weather flows

Flow Diagrams for Wet Weather Treatment

Side Stream



Dual Treatment



Modes of Operation

The AquaPrime® and AquaStorm™ cloth media filtration system operates on four (4) modes of operation: **FILTRATION, BACKWASH, SOLIDS WASTING** and **FLOATABLE WASTING**.



Filtration Mode

- Inlet wastewater enters filter by gravity
- Cloth media is completely submerged and stationary
- Solids deposit on outside of cloth media forming a mat as filtrate flows through the media
- Filtrate is collected inside the disks and discharged
- Heavier solids settle to the tank bottom
- Tank liquid level rises



Backwash Mode

- Solids are backwashed at a predetermined liquid level or time
- Backwash shoes contact the media directly and solids are removed by vacuum pressure using the backwash pump
- 2 to 8 disks are backwashed at a time
- Disks rotate slowly
- Filtration is not interrupted
- Backwash water is directed to the waste handling facility or headworks (AquaStorm)



Solids Wasting Mode

- Heavier solids are collected in the hoppers and are removed on an intermittent basis
- After a preset number of backwashes, a solids wasting occurs
- Backwash/Solids Pump provides suction to the solids collection manifold for wasting of settled solids
- Solids are pumped back to the waste handling facility or headworks (AquaStorm)



Floatable Wasting Mode

- Floatable scum is allowed to collect on the water surface
- After a preset amount of time, the water level is allowed to rise above the preset floatable setpoint
- As the water level increases, floating scum is removed by flowing over the scum removal weir
- Scum wasting water is directed to the plant's waste handling facility

Cloth Media Filtration

Mobile Pilot Systems

Technology pilot demonstrations can be beneficial to wastewater treatment plants by providing a snapshot of essential process operating conditions and allowing the customer to interact with the technology and Aqua-Aerobic personnel. OptiFiber cloth media filter pilot systems provide customers with the most comprehensive on-site testing and analytical services available. Our unique approach is designed to provide prompt operational feedback, allowing immediate fine-tuning of parameters for the most effective pilot/demonstration experience.



Fully Equipped Laboratory



Mobile Primary Filtration Pilot System

Aqua-Aerobic Research & Technology Center

In 2011, Aqua-Aerobic Systems, Inc. in partnership with the Rock River Water Reclamation District (Rockford, IL) built a new Research & Technology Center at the District's central treatment plant. The facility was constructed for the purpose of conducting applied research and demonstration of new products and processes for treating wastewater. The Center is integral in developing and testing cloth filtration media for future commercialization and application, both domestically and internationally.



OptiFiber® media development: an eight step, three year process



Customers visit the R&T Center as part of the technical seminar program.

All Aqua-Aerobic® cloth media filtration products offer a "green" advantage including lower energy consumption and reduced water usage.

Application Profiles



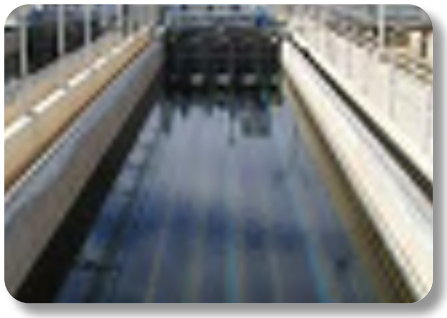
Municipal Recycle/ Reuse

- Hundreds of installations
- Title 22 approved
- Multiple cloths capable of producing effluent below 1.0 NTU



Phosphorus Removal

- Achieve phosphorus removal below 0.075 mg/l
- Depth of filtration means less chemical/ flocculation and energy



Traveling Bridge Filter Retrofits

- 2-3 times hydraulic capacity within existing footprint
- Minimal mechanical components and no civil changes



Deep Bed Filter Retrofits

- 3-4 times hydraulic capacity within existing footprint
- Minimal mechanical components and no civil changes



Industrial

- Robust cloth media handles high industrial solids
- Applied in several industrial applications including: Energy, Food/Beverage, Textile and Pharmaceutical



Large Flows

- Ideal application for Aqua MegaDisk® and AquaDiamond® filters
- Smallest footprint when compared to hydraulic capacity
- Experience in large flow filter designs over 50 MGD



Power and Energy

- Removes coal ash and coal fines from runoff or wastewater streams
- Reduces TSS and NTU for process water
- Provides reuse water for cooling



Stormwater/CSO/SSO

- Effectively removes TSS without chemicals
- Easily accommodates varying flows
- Can provide tertiary treatment between rain events



Primary Filtration

- Reduce organic load to secondary process
- Lower energy consumption
- Replace existing primary clarifiers
- Increased biogas production

Providing TOTAL Water Management Solutions

Visit our website at www.aqua-aerobic.com to learn more about Aqua-Aerobic Cloth Media Filtration and our complete line of products and services:

Aeration & Mixing

Biological Processes

Filtration

Oxidation & Disinfection

Membranes

Controls & Monitoring Systems

Aftermarket Products and Services

AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

6306 N. Alpine Rd. Loves Park, IL 61111-7655
p 815.654.2501 f 815.654.2508
www.aqua-aerobic.com
solutions@aqua-aerobic.com

The information contained herein relative to data, dimensions and recommendations as to size, power and assembly are for purpose of estimation only. These values should not be assumed to be universally applicable to specific design problems. Particular designs, installations and plants may call for specific requirements. Consult Aqua-Aerobic Systems, Inc. for exact recommendations or specific needs. Patents Apply.

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Bulletin #601B 6/21

AQUA-AEROBIC SYSTEMS, INC.

Aqua Service

PROGRAMS, PARTS AND COST SAVING SOLUTIONS

Aqua Service

PROGRAMS, PARTS AND COST SAVING SOLUTIONS

From process start-up to aftermarket products and services, Aqua-Aerobic® Customer Services provide you with the experience and expertise required to ensure your plant is operating at optimum efficiency.

Whether you need technical support at 2:00 a.m., specialized operator training or critical parts shipped overnight, Aqua-Aerobic Systems has the team of dedicated customer service personnel and a national network of experienced field technicians that are available to service your needs - 24/7.

Valued customers have come to know that when you purchase from Aqua-Aerobic Systems, you are gaining a partner for the life of your plant.



ONGOING
TRAINING AND EDUCATION

- Mechanical, process or maintenance related
- Factory or on-site training available
- Earn PDH credits
- Learn from the experts



FLEXIBLE
RENTAL & LEASE PROGRAMS

- Affordable alternative to purchasing new equipment
- Short or long term options
- New & reconditioned units
- Programs tailored to meet your needs



COST-EFFECTIVE
REHAB & UPGRADES

- Economical option versus replacing with new system
- Professional analysis by our qualified technicians
- Recommended solutions that fit your budget



ORIGINAL
REPLACEMENT PARTS

- SpareCare® original OEM parts
- Fast shipment from stocked inventory
- On-site installation assistance



PREVENTATIVE
MAINTENANCE PROGRAMS

- Designed to extend equipment life
- Reduces or eliminates downtime
- Lowers overall operating costs



RELIABLE
RENTAL FILTER UNITS

- Package AquaDisk® cloth media filter units
- Temporary municipal or industrial filtration
- Low monthly rental rate
- Start-up and training available

Aqua-Aerobic Systems, Inc. 6306 N. Alpine Rd. Loves Park, IL 61111 P 877.271.9694 F 815.654.2508 www.aqua-aerobic.com solutions@aqua-aerobic.com

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Bulletin #450B 8/14

SECTION 00 52 00
AGREEMENT
BETWEEN BUYER AND SELLER FOR TREATMENT EQUIPMENT

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SECTION 00 52 00
AGREEMENT

THIS AGREEMENT is by and between Magna Water District ("Buyer") and Aqua-Aerobic Systems, Inc. ("Seller").

Buyer and Seller hereby agree as follows:

ARTICLE 1 – GOODS AND SPECIAL SERVICES

1.01 Seller shall furnish the Goods and Special Services as specified or indicated in the Contract Documents.

ARTICLE 2 – THE PROJECT

2.01 The Project, of which the Goods and Special Services may be the whole or only a part, is identified as follows:

A. Provide Goods and Special Services to furnish the Filtration Equipment as specified in the proposal documents.

2.02 The Buyer will execute the Agreement and administer the Contract for Special Services associated with preparation of Shop Drawings and other submittals required for the project. The guaranteed money for the Special Services shall not exceed 10% of the total equipment costs.

2.03 The Buyer shall execute the Agreement beyond Special Services unit it issues a "Notice to Commence Fabrication" to the seller. A Notice to Commence Fabrication may be issued at any time for a maximum period of 500 days after the final approval of shop drawings and submittals as part to the Special Services. The Buyer will assign the remainder of the contract to the Contract period to issuing the Notice to Commence Fabrication.

2.04 The Sell shall deliver the required Bonds and insurance certificates, if required by Buyer, in accordance with Article 4 of the General Conditions.

ARTICLE 3 – ENGINEER

3.01 The Contract Documents for the Goods and Special Services have been prepared by Bowen Collins & Associates ("Engineer"), which is to act as Buyer's representative, assume all duties and

responsibilities, and have the rights and authority assigned to Engineer in the Contract Documents in connection with Seller's furnishing of Goods and Special Services.

ARTICLE 4 – POINT OF DESTINATION

4.01 The Point of Destination is designated as:

Magna WRF
7764 West 2100 South
Magna, UT 84044

ARTICLE 5 – CONTRACT TIMES

5.01 *Time of the Essence*

A. All time limits for Milestones, if any, including the submittal of Shop Drawings and Samples, the delivery of Goods, and the furnishing of Special Services as stated in the Contract Documents, are of the essence of the Contract.

5.02 *Milestones*

A. *Days for Deliver of Special Services (Submittal of Shop Drawings and Samples):* Seller shall submit all Shop Drawings and Samples required by the Contract Documents to Buyer for Engineer's review and approval on or before **30 days** after Notice to Proceed – Supply of Special Goods. It is the intent of the parties that (1) Engineer conduct such review and issue its approval, or a denial accompanied by substantive comments regarding information needed to gain approval, within **14 days** of Seller's submittal of such Shop Drawings and Samples; and resubmittal shall be provided with **14 days** of receiving Buyers Comments. Resubmittals will be limited whenever possible. If more than one resubmittal is necessary for reasons not the fault and beyond the control of Seller, then Seller shall be entitled to seek appropriate relief under Paragraph 7.02.B of the General Conditions.

B. *Days for Delivery of Goods:* A Notice to Commence Fabrication may be issued at any time for a maximum period of **500 days** after the final approval of shop drawings and submittals as part to the Special Services. The Goods are to be delivered to the Point of Destination and ready for Buyer's receipt of delivery on or before **130 days** from Notice to Commence Fabrication.

5.03 *Liquidated Damages*

A. Buyer and Seller recognize that Buyer will suffer financial loss if the Goods are not delivered at the Point of Destination and ready for receipt of delivery by Buyer within the times specified in Paragraph 5.02 above, plus any extensions thereof allowed in accordance with Article 7 of the General Conditions. The parties also recognize that the timely performance of services by others involved in the Project is materially dependent upon Seller's specific compliance with the requirements of Paragraph 5.02. Further, they recognize the delays, expense, and difficulties involved in proving the actual loss suffered by Buyer if complete acceptable Goods are not delivered on time. Accordingly, instead of requiring such proof, Buyer and Seller agree that as liquidated damages for delay (but not as a penalty) Seller shall pay Buyer **$300** for each calendar day that expires after the time specified in Paragraph 5.02.A for delivery of Special Services and **$500** for each calendar day that expires after the time specified in Paragraph 5.02.B for Delivery of Goods.

ARTICLE 6 – CONTRACT PRICE

6.01 Buyer shall pay Seller for furnishing the Goods and Special Services in accordance with the Contract Documents as follows:

A. A Lump Sum of $_____ for Special Services.

B. A Lump Sum of $_____ for the Goods.

6.02 Cost Escalation

A. If during the performance of the contract, the price of labor, material, freight, and other costs significantly increase, through no fault of the Seller, the contract price can be equitably adjusted and subject to escalation not to exceed 25% of the original contract price. A significant price increase shall mean any price increase from proposal date to material procurement greater than 5.0% from stated prices. Any request for escalation to be reviewed and approved by Buyer and Engineer. Escalation to be based on cost increases, (without additional profit, overhead or margin) and shall include labor, material, freight, and other costs to the Seller that occur in the specified time period. Such price increases shall be documented through third party sources. Carbon material escalation will be based on the US Midwest Domestic Index, current flats and longs indexes, in effect at the time of bid. Stainless material escalation will be based the Argus Metals Stainless Steel ex works US base price plus surcharge for flat and bar (per design specified alloy), in effect at the time of bid. Aluminum material escalation will be based on the S&P Global Platts US Aluminum Transaction Assessment, current sheet and plate indexes, in effect at the time of bid.

ARTICLE 7 – PAYMENT PROCEDURES

7.01 *Submittal and Processing of Payment*

A. Seller shall submit Applications for Payment in accordance with Article 10 of the General Conditions. Applications for Payment will be processed by Engineer as provided in the General Conditions.

7.02 *Progress Payments; Retainage*

A. Buyer shall make progress payments on account of the Contract Price on the basis of Seller's Applications for Payment as follows:

Special Services (Engineering Submittal)		
Payment	**Milestone**	**Maximum Allowable Payment**
First Special Services Payment	Execution of Agreement, including delivery of bonds and insurance	25 percent of Contract Price for Special Services
Second Special Services Payment	Engineers Approval of submittals and shop drawings with response of No	75 percent of Contract Price for Special Services

	Exceptions Taken or Make Corrections Noted.	

Goods (Supply of Equipment with Field Services)		
Payment	**Milestone**	**Maximum Allowable Payment**
First Goods Payment	Issuance of Notice to Commence Fabrication of Filtration Equipment	10 percent of Contract Price for Goods
Second Goods Payment	Delivery of Goods to Point of Destination	70 percent of Contract Price for Goods
Third Goods Payment	Completion of commissioning, startup, field services, O&M manuals.	10 percent of Contract Price for Goods
Fourth Goods Payment	Successful completion of performance testing.	10 percent of Contract Price for Goods

ARTICLE 8 – INTEREST

8.01 All monies not paid when due as provided in Article 10 of the General Conditions shall bear interest at the statutory rate.

ARTICLE 9 – SELLER'S REPRESENTATIONS

9.01 In order to induce Buyer to enter into this Agreement, Seller makes the following representations:

A. Seller has examined and carefully studied the Contract Documents and the other related data identified in the Bidding Documents, as applicable to Seller's obligations identified in Article 1 above.

B. If required by the Bidding Documents to visit the Point of Destination and site where the Goods are to be installed or Special Services will be provided, or if, in Seller's judgment, any local condition may affect cost, progress, or the furnishing of the Goods and Special Services, Seller has visited the Point of Destination and site where the Goods are to be installed or Special Services will be provided and become familiar with and is satisfied as to the observable local conditions that may affect cost, progress, and the furnishing of the Goods and Special Services.

C. Seller is familiar with and is satisfied as to all Laws and Regulations that may affect cost, progress, and the furnishing of the Goods and Special Services.

D. Seller has carefully studied, considered, and correlated the information known to Seller; information commonly known to sellers of similar goods doing business in the locality of the Point of Destination and the site where the Goods will be installed or where Special Services will be provided; information and observations obtained from Seller's visits, if any, to the Point of Destination and site where the Goods are to be installed or Services will be provided; and any reports and drawings identified in the Bidding Documents regarding the Point of

Destination and the site where the Goods will be installed or where Special Services will be provided, with respect to the effect of such information, observations, and documents on the cost, progress, and performance of Seller's obligations under the Contract Documents.

E. Seller has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Seller has discovered in the Contract Documents, and the written resolution (if any) thereof by Engineer is acceptable to Seller.

F. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for furnishing Goods and Special Services.

ARTICLE 10 – CONTRACT DOCUMENTS

10.01 *Contents*

A. The Contract Documents consist of the following:

1. This Agreement
2. Performance Bond
3. Payment Bond
4. General Conditions
5. Supplementary Conditions
6. Specifications as listed in table of contents of the Project Manual;
7. Drawings, included in Appendix A bearing the following general title: Magna Water District Secondary Reuse Project
8. Addenda (Numbers 1 to 1, inclusive)
9. Exhibits to this Agreement (enumerated as follows)
    a. Exhibit A-1 to the Agreement between Buyer and Seller dated TBD, Assignment of Contract; Consent to Assignment; and Acceptance of Assignment.
    b. Exhibit A-2 to the Agreement between Buyer and Seller dated TBD, Agreement to Assignment by Sellers Surety.
    c. Sellers Bid, solely as to the prices set forth therein
    d. Documentation submitted by the Seller prior to Notice of Award.
10. The following which may be delivered or issued on or after the Effective Date of the Agreement and are not attached hereto:
    a. Notice to Award;
    b. Notice to Commence Fabrication;

b. Change Order(s);

c. Work Change Directive(s).

B. The documents listed in Paragraph 10.01.A are attached to this Agreement (except as expressly noted otherwise above).

C. There are no Contract Documents other than those listed above in this Article 10.

D. The Contract Documents may only be amended, or supplemented as provided in Paragraph 3.04 of the General Conditions.

ARTICLE 11 – MISCELLANEOUS

11.01 *Terms*

A. Terms used in this Agreement will have the meanings indicated in the General Conditions and the Supplementary Conditions.

11.02 *Assignment of Contract*

A. Buyer has the right to assign this Contract for furnishing Goods and Special Services, but only to a person or entity with sufficient ability to satisfy all of Buyer's obligations under this Contract, and Seller hereby consents to such assignment. Forms documenting the assignment of the Contract, and consent of Seller's surety to the assignment, have been executed by Buyer, Seller, and Seller's surety, and are attached as exhibits to this Agreement.

1. The Contract will be executed in the name of Buyer initially, and will be assigned to a construction contractor designated by Buyer. Such construction contractor's responsibilities will include the installation of the Goods. The assignment will occur on the effective date of the agreement between Buyer and the construction contractor, which is expected to occur following approval of shop drawings and submittals. As of the date of acceptance of assignment by the construction contractor, all references in the Contract Documents to Buyer shall mean the designated construction contractor.

2. The assignment of the Contract shall relieve the assignor from all further obligations and liabilities under this Contract. After assignment, Seller shall become a subcontractor or supplier to the assignee and, except as noted herein, all rights, duties, and obligations of Buyer under the Contract shall become the rights, duties, and obligations of the assignee.

3. After assignment:

a. All performance warranties, guarantees, and indemnifications required by the Contract Documents will continue to run for the benefit of assignor and, in addition, for the benefit of the assignee. However, if assignor and assignee make the same warranty or guarantee claim, then Seller shall only be liable once for such claim.

b. Except as provided in this Paragraph 11.02.A.3.b, all rights, duties, and obligations of Engineer to assignee and Seller under this Contract will cease.

1) Engineer will review Seller's Applications for Payment and make recommendations to assignee for payments as provided in Paragraphs 10.02 and 10.06 of the General Conditions.

2) Upon the written request of either the assignee or Seller, Engineer will issue with reasonable promptness clarifications or interpretations of the Contract Documents pursuant to the terms of Paragraph 9.02.A of the General Conditions.

B. No other assignment by a party hereto of any rights under or interests in the Contract Documents will be binding on another party hereto without the written consent of the party sought to be bound. Specifically but without limitation, moneys that may become due and moneys that are due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by Laws and Regulations). Unless specifically stated to the contrary in any written consent to such an assignment, such an assignment will not release or discharge the assignor from any duty or responsibility under the Contract Documents.

11.03 *Successors and Assigns*

A. Buyer and Seller each binds itself, its partners, successors, assigns, and legal representatives to the other party hereto, its partners, successors, assigns, and legal representatives in respect to all covenants, agreements, and obligations contained in the Contract Documents.

11.04 *Severability*

A. Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation shall be deemed stricken, and all remaining provisions shall continue to be valid and binding upon Buyer and Seller. The Contract Documents shall be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.

11.05 *Seller's Certifications*

A. Seller certifies that it has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for or in executing the Contract. For the purposes of this Paragraph 11.05:

1. "corrupt practice" means the offering, giving, receiving, or soliciting of any thing of value likely to influence the action of a public official in the bidding process or in the Contract execution;

2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process or the execution of the Contract to the detriment of Buyer, (b) to establish Bid or Contract prices at artificial non-competitive levels, or (c) to deprive Buyer of the benefits of free and open competition;

3. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Buyer, a purpose of which is to establish Bid prices at artificial, non-competitive levels; and

4. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

11.06 *Limitations*

A. Buyer and Seller waive against each other, and against the other's officers, directors, members, partners, employees, agents, consultants, and subcontractors, any and all claims for or entitlement to incidental, indirect, or consequential damages arising out of, resulting from, or related to the Contract. Upon assignment the terms of this Paragraph 11.06.A shall be binding upon the assignee with respect to Seller and assignor. The terms of this mutual waiver do not apply to or limit any claim by either Buyer or Seller against the other based on any of the following: (a) contribution or indemnification, (b) costs, losses, or damages attributable to personal or bodily injury, sickness, disease, or death, or to injury to or destruction of the tangible property of others, (c) intentional or reckless wrongful conduct, or (d) rights conferred by any bond provided by Seller under this Contract.

B. Upon assignment the terms of this Paragraph 11.06.B shall be binding upon both the assignor and assignee with respect to Seller's liability, and upon Seller with respect to both assignor's and assignee's liabilities. The terms of this mutual limitation do not apply to or limit any claim by either Buyer or Seller against the other based on any of the following: (a) contribution or indemnification with respect to third-party claims, losses, and damages; (b) costs, losses, or damages attributable to personal or bodily injury, sickness, disease, or death, or to injury to or destruction of the tangible property of others, (c) intentional or reckless wrongful conduct, or (d) rights conferred by any bond provided by Seller under this Contract.

11.07 *Other Provisions (NOT USED)*

IN WITNESS WHEREOF, Buyer and Seller have signed this Agreement. Counterparts have been delivered to Buyer and Seller. All portions of the Contract Documents have been signed or identified by Buyer and Seller or on their behalf.

This Agreement will be effective on _____ (which is the Effective Date of the Agreement).

Buyer: MAGNA WATER DISTRICT

By: _____

[Corporate Seal]

Attest: _____

Address for giving notice:
8885 West 3500 South
Magna, UT 84004

(If Buyer is a corporation, attach evidence of authority to sign. If Buyer is a public body, attach evidence of authority to sign and resolution or other documents authorizing execution of Buyer-Seller Agreement.)

Designated Representative:
Name: Clint Dilley
Title: General Manager
Address: 8885 West 3500 South, Magna UT 84004
Phone: (801) 250-2118
Facsimile: N/A

Seller: _____

By: _____

[Corporate Seal]

Attest: _____

Address for giving notice:

Agent for service of process:

(If Seller is a corporation or a partnership, attach evidence of authority to sign.)

Designated Representative:
Name: _____
Title: _____
Address: _____
Phone: _____
Facsimile: _____

EXHIBIT A-1 to Agreement
Between Buyer and Seller
dated _____

ASSIGNMENT OF CONTRACT; CONSENT TO ASSIGNMENT;
AND ACCEPTANCE OF ASSIGNMENT

This assignment will be effective on the Effective Date of the Agreement between Buyer and Construction Contractor.

The Contract between _____("Buyer") and _____("Seller")
for furnishing Goods and Special Services under the Contract Documents entitled _____
is hereby assigned, transferred, and set over to _____ ("Construction Contractor"). Construction Contractor shall be totally responsible for the performance of Seller and for the duties, rights and obligations of Buyer, not otherwise retained by Buyer, under the terms of the Contract between Buyer and Seller.

ASSIGNMENT DIRECTED BY: _____
Buyer

(If Buyer is a corporation, attach evidence of authority to sign. If Buyer is a public body, attach evidence of authority to sign and resolution or other documents authorizing execution of Buyer-Seller Agreement.)

By: _____
(Signature) (Title)

ASSIGNMENT
ACKNOWLEDGED AND ACCEPTED BY: _____
Seller

(If Seller is a corporation, attach evidence of authority to sign.)

By: _____
(Signature) (Title)

ASSIGNMENT ACCEPTED BY: _____
Construction Contractor

(If Construction Contractor is a corporation, attach evidence of authority to sign.)

By: _____

EXHIBIT A-2 to Agreement
Between Buyer and Seller
dated _____

AGREEMENT TO ASSIGNMENT BY SELLER'S SURETY

Surety hereby acknowledges and agrees that the Contract for furnishing Goods and Special Services under the Contract Documents entitled_____
by and between _____("Buyer") and _____ ("Seller") may be assigned, transferred, and set over to _____ ("Construction Contractor"), in accordance with Paragraph 11.02 of Agreement between Buyer and Seller.

Surety further agrees that, upon assignment of the Contract, the Construction Contractor shall have all the rights of the Buyer under the Performance Bond.

(Corporate Seal)

Surety

Company: _____

By: _____
Signature and Title
(Attach Power of Attorney)

SECTION 00 51 00
NOTICE OF AWARD

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Date of Issuance:	April 21, 2022		
Owner:	Magna Water District	Owner's Contract No.:	
Engineer:	Bowen Collins/ Stantec	Engineer's Project No.:	483-20-02
Project:	Reuse Facilities Project	Contract Name:	Magna WRF Filter Equipment Supply
Bidder:	Aqua-Aerobic Systems, Inc.		
Bidder's Address:	6306 N. Alpine Rd. Loves Park, IL 61111		

TO BIDDER:

You are notified that the Owner has accepted your Bid dated March 3, 2022 along with Amendment No. 1 dated March 22, 2022 for the above Contract, and that you are the Successful Bidder and are awarded a Contract for:

Magna WRF Filter Equipment Supply including cost for Filter Equipment ($395,202.26), Engineering Submittals ($43,131.73), Sales Tax ($29,443.99), Bonds ($7,016.67), and one additional year of warranty beyond required 12 month warranty ($13,438.18) for a total price of $488,232.83.

The Contract Price of the awarded Contract is: $ 488,232.83.

[1] unexecuted counterparts of the Agreement accompany this Notice of Award, and one copy of the Contract Documents accompanies this Notice of Award, or has been transmitted or made available to Bidder electronically.

You must comply with the following conditions precedent within 15 days of the date of receipt of this Notice of Award:

1. Deliver to Owner [1] counterparts of the Agreement, fully executed by Bidder.
2. Deliver with the executed Agreement(s) the Contract security *[e.g., performance and payment bonds]* and insurance documentation as specified in the Instructions to Bidders and General Conditions, Articles 2 and 6.
3. Other conditions precedent (if any):

Failure to comply with these conditions within the time specified will entitle Owner to consider you in default, annul this Notice of Award, and declare your Bid security forfeited.

Within ten days after you comply with the above conditions, Owner will return to you one fully executed counterpart of the Agreement, together with any additional copies of the Contract Documents as indicated in Paragraph 2.02 of the General Conditions.

Owner:

Authorized Signature

By: CLINT DILLEY

Title: GENERAL MANAGER

Copy: Engineer

END OF SECTION

AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

March 22, 2022

Correspondence ID#: AAL-43958
Magna Water District
Attn: Trevor Andra
8885 West 3500 South
Magna, Utah 84004
USA
Ph# 801/250-2118

Project: MAGNA WRF, UT

RE: Consultant Project No: 483-20-02 Magna WRF Filter Procurement Project
AASI Project ID 107127B Amendment Number 1

AMENDMENT NUMBER 1 TO AQUA-AEROBIC SYSTEMS' PROPOSAL:

This letter amends and is an integral part of the above referenced Aqua-Aerobic Systems, Inc. proposal. The proposal, is amended as follows.

PROPOSAL AMENDMENT(S):

1. Section 6.A Process Performance Guarantee is to be replaced with the Process Performance Guarantee in this amendment.

2. Section 6.B Process Performance Test Protocol should be replaced with the Process Performance Test Protocol in this amendment.

3. The adder for the a 1 year of additional warranty is $13,438.18 which includes taxes and an additional year of bonding.

4. Aqua-Aerobic Systems would like to clarify that our understanding of the Utah tax code is that no deduction is allowed from the sales price for the cost of the item itself, its raw materials, or the labor expended to create it. If there is a Utah tax code which explains that engineering services should not be taxed please send us that code and we will review it and revise if necessary.

If you have any questions regarding this amendment, please do not hesitate to

6306 N. Alpine Rd. Loves Park, IL 61111-7655 p 815.654.2501 f 815.654.2508 www.aqua-aerobic.com

contact our local representative, listed below.

Sincerely,



Corey O'Brien
Project Application Engineer

CC: Aqua-Aerobic Systems, Inc.
Scott Kelly / SKelly@aqua-aerobic.com

Davidson Sales & Engineering / ph#: 801-977-9200 / fx#: 801-977-9300
Paul Mora

AquaDisk®Cloth Media Filter
Process Performance Guarantee
for
Magna WRF, UT
2/28/2022

Aqua-Aerobic Systems, Inc. (Aqua-Aerobic) guarantees the AquaDisk® Cloth Media Filters in accordance with Specification Section 46 61 24 dated February 2022 and Addenda #1, Aqua-Aerobic's Design #167138 and Design Notes dated March 24, 2021 shall provide an average monthly filtered effluent of 5 mg/L TSS and 2 NTU.

The guarantee shall apply under the following conditions:

1. The influent flow is supplied to the filter(s) on a continuous basis not to exceed a rate of 4.65 MGD and:
    a. Filter influent TSS concentration shall not exceed 10 mg/l (daily average) and 20 mg/l maximum.
    b. Filter influent Turbidity concentration shall not exceed 5 NTU (daily average).
    c. Daily average TSS concentrations are based on 24-hour composite samples. Maximum TSS concentrations are based upon grab samples at any time.
    d. Filter influent solids loading shall not exceed 2.0 lbs TSS/ft^2/day.
    e. Hydraulic loading to the Cloth Media Filter shall not exceed 5.0 gpm/ft^2 of media area.
    f. Wastewater entering the Cloth Media Filter is effluent from a secondary biological process.
2. The filter is installed, operated and maintained in accordance with instructions supplied by Aqua-Aerobic.
3. The equipment has been paid for in accordance with contract terms.

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4. A performance test is conducted according to the approved Field Process Performance Test Protocol, dated 2/28/2022, as submitted by Aqua-Aerobic.
5. Data during the performance test shall be sent to Aqua-Aerobic within one week of said testing.
6. The process guarantee shall be considered satisfied upon successful completion of the performance test. The process guarantee shall be enforced throughout Aqua-Aerobic's warranty for a period of 12 months after certificate of proper installation.
7. Start-up shall be defined by the date stated on Aqua-Aerobic's "Manufacturers Certificate of Inspection" form executed upon completion of start-up services.
8. Should the filter system not meet the guaranteed performance:
    a. The guarantee shall be considered invalid if the influent parameters do not conform to Conditions 1.
    b. In the event that the influent parameters are within the limits specified under Conditions 1, Aqua-Aerobic shall have up to 30 days to modify the filters as necessary to achieve the guaranteed performance.
9. If failure to produce the guaranteed effluent is due to influent quality not in conformance with Conditions 1, the Owner shall have up to 30 days to bring the filter influent to specified limits. If the Owner is unable to produce the specified influent conditions within 30 days, the guarantee will be considered to be satisfied.
10. This guarantee shall no longer be applicable or valid if any product, including any software program, supplied by Aqua-Aerobic, is modified or altered without the written approval of Aqua-Aerobic.
11. In the event of continued failure of the equipment to produce the guaranteed effluent characteristics at no fault of the owner, Aqua-Aerobic shall have the option to modify the filter(s) as necessary to achieve the guaranteed performance. The maximum cumulative liability to Aqua-Aerobic for the modification or supply of additional equipment shall be limited to 100% of the initial sales price of the equipment supplied.

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Aqua-Aerobic Systems, Inc.

Kristy Chycota Process Engineer - Filtration	Execution Date
Customer / Owner Company Name	
Authorized Signature	Execution Date
Title	

NOTE: Aqua-Aerobic Systems, Inc. will execute the process performance guarantee upon receipt of a purchase order, acceptance of terms and conditions and approved submittal drawings.

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Aqua MiniDisk® Cloth Media Filter
Field Process Performance Test Protocol
for
Magna WRF, UT
2/28/2022

Introduction:

To satisfy Specification Section 46 61 24, dated February 2022 and Addendum 1, the following field process performance test shall be performed.

Protocol:

1) The filter(s) will be tested for a period of one eight hour day to assess process performance. The field performance testing shall be conducted no later than sixty (60) days after startup or beneficial use. The start date shall be mutually agreed upon by the Engineer, Owner, Installing Contractor, and Aqua-Aerobic Systems. Under supervision of Aqua-Aerobic Systems' field service representative, the Installing Contractor will conduct the testing and shall employ the services of a local certified laboratory facility to perform sample analysis in accordance with this testing procedure. The Engineer and the Owner shall have the right to witness the performance test.
2) The performance test shall be executed using plant secondary effluent after the plant processes have stabilized and the plant is performing according to the design specified operating requirements. The filter influent loading conditions shall be in accordance with the values stated in the project bid specifications as referenced in the "Performance and Design Parameters" section of this document. In the event that the filter influent does not meet this criteria, the testing shall be postponed or the performance expectations adjusted as mutually agreed to by the Owner, the Engineer, and Aqua-Aerobic Systems.
3) Testing will be done simultaneously on all filter(s). The filter(s) will be tested for one eight hour day. The actual flow at the time of testing will be monitored and equally split to all filter(s) units. If the flow rate does not reach the targeted flow

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conditions, filter(s) will be taken offline as needed to simulate target flow conditions. If the target flow conditions cannot be achieved while a single filter is in operation, the test will be conducted on a single filter with the available flow. During the test period, the filter(s) will be tested at the peak flow rate for a maximum of 2 hours if such flow rates exist at time of test.

4) Composite one litter TSS samples consisting of a minimum of four (4) grab samples per hour will be taken from either the secondary clarifier effluent box (mid-depth) or the influent weir (mid-depth) and from each of the filter(s) outlets (mid-depth). Composite samples shall be collected, stored, and analyzed for TSS according to the latest edition of Standard Methods for the Examination of Water and Wastewater. Testing shall be done by a local certified laboratory. Expedited service from the laboratory shall be requested to ensure that results return within the period of the performance test. Effluent water quality will be monitored and reported by a continuous online turbidimeter that draws a sample from the Reuse Pump Station Wet Well. The turbidimeter shall be calibrated before the start of the test. The Installing Contractor, or Aqua-Aerobic Systems shall furnish all labor, materials, equipment, auto samplers, laboratory services, instrumentation, and any other equipment and services necessary for conducting the field performance testing. The Installing Contractor shall furnish all electric, water and other utilities.

5) The party responsible for conducting the field performance test shall compile all influent and effluent TSS and turbidity data onto an Excel® spreadsheet and graph the data to clearly show performance compliance. Any data collected by the contractor, the owner, or the manufacturer during the performance testing shall be submitted to the party responsible for conducting the field performance test to be incorporated into this summary.

6) The party responsible for conducting the filter performance test shall compile the filter(s) influent flow rates using the influent flowmeter and the conversion to filtration rates shall be summarized on an Excel® spreadsheet. NOTE: Alternatives to an influent flowmeter are measuring the nappe over the influent weir or readings from an effluent flowmeter. However, these alternatives are less desirable.

7) A testing day will run from 8:00 am until 8:00 am of the following day.

8) In the event of failure of the equipment to produce the required effluent characteristics during the performance testing, Aqua-Aerobic Systems shall have the option to modify the filter(s) as necessary to achieve the guaranteed performance testing. The maximum liability to Aqua-Aerobic Systems for the modification or supply of additional equipment shall be limited to 100% of the initial sales price of the equipment supplied.

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Evaluation:

The AquaDisk® Cloth Media Filter(s) shall have demonstrated the following specified performance parameters based upon the following specified filter(s) influent conditions:

Performance and Design Parameters:

a. Wastewater Flow:

Design Flow: 2.33 MGD per filter

b. Filter Influent Characteristics:

	Filter Influent
Average Daily TSS (mg/l)	10
Max. TSS (mg/l)	20
Max. turbidity (NTU)	5

c. Filter Effluent Characteristics:

	Filter Effluent
Average Daily TSS (mg/l)	5
Average Daily Turbidity (NTU)	2

Reporting of Results:

Aqua-Aerobic Systems, Inc. shall receive the test data from the Installing Contractor and Aqua-Aerobic Systems shall write a report to show the individual and average flow rates, TSS and turbidity recorded during the field process performance test and shall conclude whether the filter(s) have met the performance as specified.

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AquaDisk® Cloth Media Filter(s) Field Performance Testing

Performance Test Data

Test Unit [___]

Witnessed By: _____ Date: _____

_____

_____

_____

Time	Influent Flow rate (MGD)	Influent TSS (mg/l)	Effluent TSS (mg/l)	Influent NTU (mg/l)	Effluent NTU (mg/l)

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AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

MAGNA WRF, UT
Filter Procurement Project

March 3, 2022

(Copy)

Project Contact:
Corey O'Brien, Project Application Engineer
Phone: 815-639-4465 | Fax: 815-654-8258
Email: cobrien@aqua-aerobic.com

AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

March 1, 2022

Correspondence ID#: AAL-43804
Magna Water District
Attn: Trevor Andra
8885 West 3500 South
Magna, Utah 84004
USA
Ph# 801/250-2118

Project: MAGNA WRF, UT
RE: Consultant Project No: 483-20-02 Magna WRF Filter Procurement Project
AASI Project ID 107127B

Greetings,

Enclosed please find our proposal package for the AquaDisk® Cloth Media Filter equipment, freight, and supervision services for the above referenced project.

Aqua-Aerobic Systems, Inc. is offering the proposed equipment to meet the referenced specification(s), including Addendum Number 1, unless otherwise noted on our Exceptions/Clarifications document included with our proposal package, subject to approval by the Owner or the Consulting Engineer. Please take a moment to review our Exceptions/Clarifications document, proposal notes, and standard drawings for Aqua-Aerobic Systems' equipment terminations and items not included in Aqua-Aerobic Systems' scope of supply which are to be provided by the Buyer or Buyer's Installation Contractor. Please also note that while our standard drawings show our typical pump configuration, Aqua-Aerobic Systems can provide pumping through the effluent chamber as previously discussed, if that is an option that the site would like to pursue.

Aqua-Aerobic Systems has been meeting the needs of our clients since 1969 when the first AquaJet® Aerator was installed. As outlined within our Company Profile and Capabilities found in Section 7.A, our knowledge and products have significantly expanded since that time, but the dedication we have to making sure that every installation is a success has not diminished.

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Aqua-Aerobic Systems is recognized as the world leader in cloth media filtration technology, proven by our experience. The over 1,300 AquaDisk units installed in the United States make up a portion of the 1,400 OptiFiber® Pile Cloth Media installations worldwide, and benefit from design expertise, quality control, and the continued innovation of our products. We have highlighted some of these installations with a similar disk configuration to this project in Section 2.B and included a list of references in Section 2.C. We encourage that the referenced installations be contacted during the evaluation process so that the evaluating team can receive an unbiased account of how the AquaDisk System operates, what the system offers, and why it is the best fit for this site.

Aqua-Aerobic Systems' cloth media is certified to meet California Title 22 reuse requirements as outlined in Section 2.D. Our experience in water reuse applications is well documented with over 100 installations meeting R-1 and California Title 22 reuse standards. Section 3.E highlights some of these installations.

We would also like to draw attention to the features and benefits of the AquaDisk in section 7.B. When comparing technologies, we encourage engineers and owners to look at the filter media, the backwash method, and the way that water flows through the unit for each technology. The media is the most important aspect of any filtration technology. OptiFiber® pile cloth filtration media is the only media engineered for wastewater applications. After testing hundreds of media options over the past 30 years, Aqua-Aerobic Systems can safely say that it is relatively easy to make a media that removes particles, but very difficult to make one that backwashes effectively and lasts over time. All OptiFiber® media options have been through an extensive test protocol including long term operation, endurance testing, and tensile strength certification to ensure that this media will stand the test of time. Out of the five pile cloth media options available from Aqua-Aerobic Systems, OptiFiber PES-14® cloth filtration media has been selected for this site. This media has a nominal filtration rating of 5 µm. For this facility, a nominal 5 µm media offers the additional assurance in meeting the effluent water reuse requirements compared to the standard 10 µm options.

Unlike knit filter media options, the woven pile cloth media used by Aqua-Aerobic Systems features an open backing design that eliminates the potential for solids accumulation on the backing, which is the primary reason for premature cloth failures. In addition, this media has almost no elongation under the potential stresses during backwash. Minimizing elongation prevents folding or other media movement, which can lead to weak spots in the filter media.

Although allowed by the specification, Aqua-Aerobic Systems does not employ the use of butterfly valves and instead use ball valves and gate valves for backwash and solids waste. While butterfly valves are considered cost efficient, our testing has shown that they do not hold up well in high solids environments, which cause seat failures.

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We appreciate the opportunity to submit our proposal for this project and look forward to discussing it with you in detail. Please feel free to contact me (phone: 815-639-4465; email: Cobrien@aqua-aerobic.com), or our sales representative firm (listed below) if you have any questions regarding our proposal offering.

Sincerely,



Corey O'Brien
Project Application Engineer

CC: Aqua-Aerobic Systems - Regional Manager / ph#: 815/639-4467 / fx#: 815/654-2508
Scott Kelly / skelly@Aqua-Aerobic.com

Davidson Sales & Engineering / ph#: 801-977-9200 / fx#: 801-977-9300
Paul Mora

AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

Magna WRF, UT

Filter Procurement Project

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SECTION 00 40 00
BID FORM

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Magna Water District (MWD)

Magna WRF Filter Procurement Project

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BID FORM

ARTICLE 1 - BID RECIPIENT

1.01 This Bid is submitted to:

Magna Water District
8885 West 3500 South
Magna, UT 84044

See Section 00 20 00 – Instruction to Bidder for submittal requirements.

1.02 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into a Contract with Buyer in the form included in the Bidding Documents to furnish the Goods and Special Services as specified or indicated in the Bidding Documents, for the prices and within the times indicated in this Bid, and in accordance with the other terms and conditions of the Bidding Documents.

ARTICLE 2 - BIDDER'S ACKNOWLEDGMENTS

2.01 Bidder accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. This Bid will remain subject to acceptance for 90 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Buyer.

2.02 Bidder accepts the provisions of the Agreement as to the assignment of the Contract for furnishing Goods and Special Services.

2.03 Bidder accepts that the Buyer (or assignee) retains the right to issue a Notice to Commence Fabrication for the Filtration Equipment for a period up to **500 days** after the final approval of shop drawings and submittals as part of the Special Services. The Bidder acknowledges that until the Notice to Commence Fabrication is issued; the Buyer is not obligated to any monetary committed associate with this Contract beyond that associated with the Special Services.

ARTICLE 3 - BIDDER'S REPRESENTATIONS

3.01 In submitting this Bid, Bidder represents that:

A. Bidder has examined and carefully studied the Bidding Documents, the related data identified in the Bidding Documents, and the following Addenda, receipt of which is hereby acknowledged:

Addendum No.	Addendum. Date
One	2-25-2022

B. Bidder understands the site where the Goods are to be installed or Special Services will be provided and become familiar with and is satisfied as to the observable local conditions that may affect cost, progress, or the furnishing of Goods and Special Services, if required to do so by the Bidding Documents, or if, in Bidder's judgment, any local condition may affect cost, progress, or the furnishing of Goods and Special Services.

C. Bidder is familiar with and is satisfied as to all Laws and Regulations in effect as of the date of the Bid that may affect cost, progress, and the furnishing of Goods and Special Services.

D. Bidder has carefully studied, considered, and correlated the information known to Bidder; information commonly known to sellers of similar goods doing business in the locality of the Point of Destination and the site where the Goods will be installed or where Special Services will be provided; information and observations obtained from Bidder's visits, if any, to the Point of Destination and the site where the Goods will be installed or Special Services will be provided; and any reports and drawings identified in the Bidding Documents regarding the Point of Destination and the site where the Goods will be installed or where Special Services will be provided, with respect to the effect of such information, observations, and documents on the cost, progress, and performance of Seller's obligations under the Bidding Documents.

E. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, and discrepancies that Bidder has discovered in the Bidding Documents, and the written resolution (if any) thereof by Engineer is acceptable to Bidder.

F. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for furnishing the Goods and Special Services for which this Bid is submitted.

ARTICLE 4 - BIDDER'S CERTIFICATIONS

4.01 Bidder certifies that:

A. This Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any collusive agreement or rules of any group, association, organization, or corporation;

B. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid;

C. Bidder has not solicited or induced any individual or entity to refrain from bidding; and

D. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this Paragraph 4.01.D:

1. "corrupt practice" means the offering, giving, receiving, or soliciting of any thing of value likely to influence the action of a public official in the bidding process;

2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process to the detriment of Buyer, (b) to establish bid prices at artificial non-competitive levels, or (c) to deprive Buyer of the benefits of free and open competition;

3. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Buyer, a purpose of which is to establish bid prices at artificial, non-competitive levels; and

4. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process.

ARTICLE 5 - BASIS OF BID

5.01 Bidder will furnish the Goods and Special Services in accordance with the Contract Documents for the following price(s):

Item	Description	No. of Units	Lump Sum Price ($ Numerals)
1	**Engineering Submittal**: Prepare complete shop drawings and related submittals, and coordinate with Owner and Engineer during design. The Contract Price for this Item shall not exceed 10% of the total contract price of Items 1 - 3.	Lump Sum	$43,131.73
2	**Filter Equipment:** Disk Filter Equipment as described in Specification 46 21 25 including equipment, controls, delivery, start-up services, warranties and other services specified.	Lump Sum	$395,202.26
3	Sales Tax on Filter Equipment (Item 2)	Lump Sum	$29,443.99
	Total Base Bid Amount (Summary of Items 1-3)	$467,777.98	

Additional Optional Bid Items			
Item	**Description**	**No. of Units**	**Lump Sum Price ($ Numerals)**
A1	Performance Bond Per Section 00 61 00	Lump Sum	$7,016.67
A2	Payment Bond per Section 00 61 50	Lump Sum	$0 (Included in performance bond)
A3	Annual Equipment Storage Cost: Annual cost to store equipment following completion of fabrication.	Lump Sum	*$49,158.87
A4	2 Year Extended Warranty: Cost to provide additional 2 year of warranty beyond required warranty.	Lump Sum	*$33,747.87
	Total Bid Amount (Summary of Items 1-3 plus Items A1-A4)	$557,701.31	

Five hundred fifty-seven thousand, seven hundred one dollars and thirty one cents

Total Bid Amount in Words

*Includes sales tax and additional two years of bonding.

ARTICLE 6 - TIME OF COMPLETION

6.01 Bidder agrees that the furnishing of Goods and Special Services will conform to the schedule set forth in Article 5 of the Agreement.

6.02 Bidder accepts the provisions of the Agreement as to liquidated damages.

ARTICLE 7 - ATTACHMENTS TO THIS BID

7.01 The following documents are attached to and made a condition of this Bid:

A. The Bid Requirements as described in section 00 20 00 – Instruction to Bidders.

ARTICLE 8 - DEFINED TERMS

8.01 The terms used in this Bid with initial capital letters have the meanings stated in the Instructions to Bidders, the General Conditions, and the Supplementary Conditions.

ARTICLE 9 - BID SUBMITTAL

9.01 This Bid submitted by:

If Bidder is:

An Individual

Name (typed or printed): _____

By: _____
(Individual's signature)

Doing business as: _____

Business address: _____
_____Phone: _____
_____Facsimile: _____E-mail address:
_____

A Partnership

Partnership Name: _____ (SEAL)

By: _____
(Signature of general partner - attach evidence of authority to sign)

Name (typed or printed): _____
Business address: _____

_____

Phone: _____ Facsimile: _____
E-mail address: _____

A Corporation

Corporation Name: Aqua-Aerobic Systems, Inc.
State of Incorporation: Illinois
Type (General Business, Professional, Service, other): General Business

By: _____
(Signature - attach evidence of authority to sign)

Name (typed or printed): James Horton
Title: Vice President - Process Group

Attest _____ (CORPORATE SEAL)
(Signature of Corporate Secretary)

AQUA-AEROBIC SYSTEMS, INC. CORPORATE SEAL ILLINOIS

Business address: 6306 N Alpine Rd
Loves Park, IL 61111

Phone: 815-639-4524 Facsimile: _____
E-mail address: JHorton@aqua-aerobic.com

A Limited Liability Company (LLC)

LLC Name: _____
State in which organized: _____

By: _____
(Signature - attach evidence of authority to sign)

Name (typed or printed): _____
Title: _____
Business address: _____

_____

Phone: _____ Facsimile: _____
E-mail address: _____

A Joint Venture

First Joint Venturer Name: _____ (SEAL)

By: _____

(Signature - attach evidence of authority to sign)

Name (typed or printed): _____

Title: _____

Business address: _____

_____

Phone: _____ Facsimile: _____

E-mail address: _____

Second Joint Venturer Name: _____ (SEAL)

By: _____

(Signature - attach evidence of authority to sign)

Name (typed or printed): _____

Title: _____

Business address: _____

_____

Phone: _____ Facsimile: _____

E-mail address: _____

Phone and Facsimile Number, and Address for receipt of official communications to Joint Venture: _____

_____

(Each joint venturer must sign. The manner of signing for each individual, partnership, corporation, and limited liability company that is a party to the joint venture should be in the manner indicated above.)

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SECTION 00 43 13
BID BOND (PENAL SUM FORM)

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Any singular reference to Bidder, Surety, Owner or other party shall be considered plural where applicable.

BIDDER (Name and Address):

Aqua-Aerobic Systems, Inc.
6306 N. Alpine Road
Loves Park, IL 61111

SURETY (Name, and Address of Principal Place of Business):

Fidelity and Deposit Company of Maryland
1299 Zurich Way, 5th Floor
Schaumburg, IL 60196

OWNER (Name and Address):

Magna Water District
8885 West 35000 South
Magna, UT 84044

BID

Bid Due Date: March 3, 2022

Description (Project Name— Include Location): Magna WRF Filter Procurement Project, Magna, Utah

BOND

This bid bond is valid only if Aqua-Aerobic Exceptions/Clarifications are accepted & become an integral part of the contract. In the event the Exceptions/Clarifications are not acceptable, this bid should be deemed non-responsive & the bid bond returned to Aqua-Aerobic.

Bond Number: N/A

Date: February 22, 2022

Penal sum Five Percent of Amount Bid ($ 5% of Amount Bid)

(Words) (Figures)

Surety and Bidder, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Bid Bond to be duly executed by an authorized officer, agent, or representative.

BIDDER	SURETY
Aqua-Aerobic Systems, Inc. (Seal)	Fidelity and Deposit Company of Maryland (Seal)
Bidder's Name and Corporate Seal	Surety's Name and Corporate Seal
By: Signature	By: Signature (Attach Power of Attorney)
Kevin Heasley	April D. Perez
Print Name	Print Name
Vice President, Operations	Attorney-In-Fact
Title	Title
Attest: Signature	Attest: Signature Annette Audinot
Title Supervisor, Contract Admin.	Title Witness

AQUA-AEROBIC SYSTEMS, INC. CORPORATE SEAL ILLINOIS

Note: Addresses are to be used for giving any required notice.
Provide execution by any additional parties, such as joint venturers, if necessary.

1. Bidder and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to pay to Owner upon default of Bidder the penal sum set forth on the face of this Bond. Payment of the penal sum is the extent of Bidder's and Surety's liability. Recovery of such penal sum under the terms of this Bond shall be Owner's sole and exclusive remedy upon default of Bidder.

2. Default of Bidder shall occur upon the failure of Bidder to deliver within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents.

3. This obligation shall be null and void if:

3.1 Owner accepts Bidder's Bid and Bidder delivers within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents, or

3.2 All Bids are rejected by Owner, or

3.3 Owner fails to issue a Notice of Award to Bidder within the time specified in the Bidding Documents (or any extension thereof agreed to in writing by Bidder and, if applicable, consented to by Surety when required by Paragraph 5 hereof).

4. Payment under this Bond will be due and payable upon default of Bidder and within 30 calendar days after receipt by Bidder and Surety of written notice of default from Owner, which notice will be given with reasonable promptness, identifying this Bond and the Project and including a statement of the amount due.

5. Surety waives notice of any and all defenses based on or arising out of any time extension to issue Notice of Award agreed to in writing by Owner and Bidder, provided that the total time for issuing Notice of Award including extensions shall not in the aggregate exceed 120 days from the Bid due date without Surety's written consent.

6. No suit or action shall be commenced under this Bond prior to 30 calendar days after the notice of default required in Paragraph 4 above is received by Bidder and Surety and in no case later than one year after the Bid due date.

7. Any suit or action under this Bond shall be commenced only in a court of competent jurisdiction located in the state in which the Project is located.

8. Notices required hereunder shall be in writing and sent to Bidder and Surety at their respective addresses shown on the face of this Bond. Such notices may be sent by personal delivery, commercial courier, or by United States Registered or Certified Mail, return receipt requested, postage pre-paid, and shall be deemed to be effective upon receipt by the party concerned.

9. Surety shall cause to be attached to this Bond a current and effective Power of Attorney evidencing the authority of the officer, agent, or representative who executed this Bond on behalf of Surety to execute, seal, and deliver such Bond and bind the Surety thereby.

10. This Bond is intended to conform to all applicable statutory requirements. Any applicable requirement of any applicable statute that has been omitted from this Bond shall be deemed to be included herein as if set forth at length. If any provision of this Bond conflicts with any applicable statute, then the provision of said statute shall govern and the remainder of this Bond that is not in conflict therewith shall continue in full force and effect.

11. The term "Bid" as used herein includes a Bid, offer, or proposal as applicable.

END OF SECTION

ZURICH AMERICAN INSURANCE COMPANY
COLONIAL AMERICAN CASUALTY AND SURETY COMPANY
FIDELITY AND DEPOSIT COMPANY OF MARYLAND
POWER OF ATTORNEY

KNOW ALL MEN BY THESE PRESENTS: That the ZURICH AMERICAN INSURANCE COMPANY, a corporation of the State of New York, the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY, a corporation of the State of Illinois, and the FIDELITY AND DEPOSIT COMPANY OF MARYLAND a corporation of the State of Illinois (herein collectively called the "Companies"), by **Robert D. Murray, Vice President**, in pursuance of authority granted by Article V, Section 8, of the By-Laws of said Companies, which are set forth on the reverse side hereof and are hereby certified to be in full force and effect on the date hereof, do hereby nominate, constitute, and appoint April D. Perez, its true and lawful agent and Attorney-in-Fact, to make, execute, seal and deliver, for, and on its behalf as surety, and as its act and deed: **any and all bonds and undertakings,** and the execution of such bonds or undertakings in pursuance of these presents, shall be as binding upon said Companies, as fully and amply, to all intents and purposes, as if they had been duly executed and acknowledged by the regularly elected officers of the ZURICH AMERICAN INSURANCE COMPANY at its office in New York, New York., the regularly elected officers of the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY at its office in Owings Mills, Maryland., and the regularly elected officers of the FIDELITY AND DEPOSIT COMPANY OF MARYLAND at its office in Owings Mills, Maryland., in their own proper persons.

The said Vice President does hereby certify that the extract set forth on the reverse side hereof is a true copy of Article V, Section 8, of the By-Laws of said Companies, and is now in force.

IN WITNESS WHEREOF, the said Vice-President has hereunto subscribed his/her names and affixed the Corporate Seals of the said **ZURICH AMERICAN INSURANCE COMPANY, COLONIAL AMERICAN CASUALTY AND SURETY COMPANY, and FIDELITY AND DEPOSIT COMPANY OF MARYLAND**, this 11th day of July, A.D. 2019.

ATTEST:
ZURICH AMERICAN INSURANCE COMPANY
COLONIAL AMERICAN CASUALTY AND SURETY COMPANY
FIDELITY AND DEPOSIT COMPANY OF MARYLAND

By: Robert D. Murray
Vice President

By: Dawn E. Brown
Secretary

State of Maryland
County of Baltimore

On this 11th day of July, A.D. 2019, before the subscriber, a Notary Public of the State of Maryland, duly commissioned and qualified, **Robert D. Murray, Vice President and Dawn E. Brown, Secretary** of the Companies, to me personally known to be the individuals and officers described in and who executed the preceding instrument, and acknowledged the execution of same, and being by me duly sworn, deposeth and saith, that he/she is the said officer of the Company aforesaid, and that the seals affixed to the preceding instrument are the Corporate Seals of said Companies, and that the said Corporate Seals and the signature as such officer were duly affixed and subscribed to the said instrument by the authority and direction of the said Corporations.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed my Official Seal the day and year first above written.

Constance A. Dunn, Notary Public
My Commission Expires: July 9, 2023

EXTRACT FROM BY-LAWS OF THE COMPANIES

"Article V, Section 8, Attorneys-in-Fact. The Chief Executive Officer, the President, or any Executive Vice President or Vice President may, by written instrument under the attested corporate seal, appoint attorneys-in-fact with authority to execute bonds, policies, recognizances, stipulations, undertakings, or other like instruments on behalf of the Company, and may authorize any officer or any such attorney-in-fact to affix the corporate seal thereto; and may with or without cause modify of revoke any such appointment or authority at any time."

CERTIFICATE

I, the undersigned, Vice President of the ZURICH AMERICAN INSURANCE COMPANY, the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY, and the FIDELITY AND DEPOSIT COMPANY OF MARYLAND, do hereby certify that the foregoing Power of Attorney is still in full force and effect on the date of this certificate; and I do further certify that Article V, Section 8, of the By-Laws of the Companies is still in force.

This Power of Attorney and Certificate may be signed by facsimile under and by authority of the following resolution of the Board of Directors of the ZURICH AMERICAN INSURANCE COMPANY at a meeting duly called and held on the 15th day of December 1998.

RESOLVED: "That the signature of the President or a Vice President and the attesting signature of a Secretary or an Assistant Secretary and the Seal of the Company may be affixed by facsimile on any Power of Attorney...Any such Power or any certificate thereof bearing such facsimile signature and seal shall be valid and binding on the Company."

This Power of Attorney and Certificate may be signed by facsimile under and by authority of the following resolution of the Board of Directors of the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY at a meeting duly called and held on the 5th day of May, 1994, and the following resolution of the Board of Directors of the FIDELITY AND DEPOSIT COMPANY OF MARYLAND at a meeting duly called and held on the 10th day of May, 1990.

RESOLVED: "That the facsimile or mechanically reproduced seal of the company and facsimile or mechanically reproduced signature of any Vice-President, Secretary, or Assistant Secretary of the Company, whether made heretofore or hereafter, wherever appearing upon a certified copy of any power of attorney issued by the Company, shall be valid and binding upon the Company with the same force and effect as though manually affixed.

IN TESTIMONY WHEREOF, I have hereunto subscribed my name and affixed the corporate seals of the said Companies, this 22nd day of February, 2022.



Brian M. Hodges, Vice President

TO REPORT A CLAIM WITH REGARD TO A SURETY BOND, PLEASE SUBMIT A COMPLETE DESCRIPTION OF THE CLAIM INCLUDING THE PRINCIPAL ON THE BOND, THE BOND NUMBER, AND YOUR CONTACT INFORMATION TO:

Zurich Surety Claims
1299 Zurich Way
Schaumburg, IL 60196-1056
www.reportsfclaims@zurichna.com
800-626-4577

DocuSign Envelope ID: 25267642-AE1F-41D6-A122-FF1E8CB2CB63

THE FIDELITY AND DEPOSIT COMPANY

OF MARYLAND
1299 Zurich Way Schaumburg, IL 60196

Statement of Financial Condition
As Of December 31, 2020

ASSETS

Bonds		$ 262,624,334
Stocks		19,715,392
Cash and Short-Term Investments		3,219,781
Reinsurance Recoverable		17,293,466
Federal Income Tax Recoverable		114,253
Other Accounts Receivable		29,083,530
TOTAL ADMITTED ASSETS		$ 332,050,756

LIABILITIES, SURPLUS AND OTHER FUNDS

Reserve for Taxes and Expenses		$ 539,588
Ceded Reinsurance Premiums Payable		43,847,005
Remittances and Items Unallocated		0
Payable to parents, subs and affiliates		0
Securities Lending Collateral Liability		0
TOTAL LIABILITIES		$ 44,413,593
Capital Stock, Paid Up	$ 5,000,000	
Surplus	282,637,163	
Surplus as regards Policyholders		287,637,163
TOTAL		$ 332,050,756

Securities carried at $165,065,329 in the above statement are deposited with various states as required by law.

Securities carried on the basis prescribed by the National Association of Insurance Commissioners. On the basis of market quotations for all bonds and stocks owned, the Company's total admitted assets at December 31, 2020 would be $346,439,970 and surplus as regards policyholders $302,026,377.

I, LAURA J. LAZARCZYK, Corporate Secretary of the FIDELITY AND DEPOSIT COMPANY OF MARYLAND, do hereby certify that the foregoing statement is a correct exhibit of the assets and liabilities of the said Company on the 31st day of December, 2020.

DocuSigned by:
Laura J. Lazarczyk
42DF6DB4713748B...
Corporate Secretary

State of Illinois
City of Schaumburg } SS:

Subscribed and sworn to, before me, a Notary Public of the State of Illinois, in the City of Schaumburg, this 15th day of March, 2021.

RYAN HORGAN
Official Seal
Notary Public - State of Illinois
My Commission Expires Dec 10, 2024

Notary Public

AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

Equipment List: 167138

TO:	**Magna Water District**	**PROJECT:**	**MAGNA WRF, UT**
	8885 West 3500 South		
	Magna		
	Utah 84004		
	USA		**BID DATE: March 3, 2022**
ATN:	**Trevor Andra**		**DATE: March 1, 2022**
CC:	**MISCOwater North / ph#: 925-225-1900 / fx#: N/A**		
	Nate Miller		
	Aqua-Aerobic Systems - Regional Manager / ph#: 815/639-4467 / fx#: 815/654-2508		
	Scott Kelly		

Cloth Media Filters

AquaDisk Tanks/Basins

2 AquaDisk Model # ADFSC-54x6E-PC Concrete Filter Basin Accessories consisting of:

- Concrete basin(s) (by others).

- Overall footprint will be dependent on influent, effluent, and overflow chamber configurations.
- 304 stainless steel support brackets.
- 304 stainless steel effluent seal plate weldment(s).
- Stainless steel anchors.
- 3" wafer style butterfly valve(s) with lever operator as manufacturer by Nibco or equal.

2 Influent Weir Installation(s) consisting of:

- 304 stainless steel influent weir / flow separation baffle(s).
- Stainless steel anchors.

AquaDisk Centertube Assemblies

2 Centertube(s) consisting of:

- 304 stainless steel centertube weldment(s).

- U.H.M.W. polyethylene multi segment driven sprocket(s).
- Dual wheel assembly(ies).
- Rider wheel bracket assembly(ies).
- 304 stainless steel centertube support beam(s).
- Centertube bearing kit(s).
- Viton V-ring effluent port\centertube seal(s).
- Pile cloth media and non-corrosive support frame assemblies.
- Disk segment 304 stainless steel support rods.
- Media sealing gaskets.

2 Cloth set(s) will have the following feature:

- Cloth will be OptiFiber PES-14.

AquaDisk Drive Assemblies

2 Drive System(s) consisting of:

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- AGMA class I gearbox(es) with three phase 3/4 HP drive motor(s).
- Nylon drive sprocket(s).
- Acetal drive chain(s) with 316 stainless steel link pins.
- Stationary drive bracket weldment(s).
- Adjustable drive bracket weldment(s).
- Chain guard weldment(s).
- Warning label(s).

AquaDisk Backwash/Sludge Assemblies

2 Backwash System(s) consisting of:

- 304 stainless steel backwash shoe weldments.
- UHMW polyethylene backwash shoe nozzle plates.
- 304 stainless steel backwash shoe support weldment(s).
- 1 1/2" flexible hose.
- Stainless steel backwash shoe springs.
- Stainless steel hose clamps.
- 304 stainless steel union(s).
- 304 stainless steel backwash floor plate(s).
- 304 stainless steel backwash collection manifold(s).
- PVC solids manifold installation(s).

2 Backwash/Solids Waste Pump(s) consisting of:

- Gorman Rupp model T2C60SC, 5 HP, premium efficient, 3 phase externally mounted centrifugal pump(s).
- Painted steel backwash pump stand(s).
- Stainless steel anchors.
- 0 to 15 psi pressure gauge(s).
- Bronze throttling gate valve(s).
- 3" threaded brass ball valve(s).

AquaDisk Instrumentation

2 Pressure Transducer Assembly(ies) each consisting of:

- 304 stainless steel mounting bracket weldment(s).
- 304 stainless steel transducer pipe weldment(s).
- Pressure transducer(s).
- Stainless steel anchors.
- Nylon electrical cable tie wrap(s).

2 Vacuum Gauge with Transmitter(s) consisting of:

- 0 to 30 inches mercury vacuum gauge(s).
- Vacuum transmitter(s).
- 1/4" Threaded bronze ball valve.

2 Float Switch(es) consisting of:

- 316 stainless steel float switch mounting bracket(s).
- Float switch(es).
- Stainless steel anchor(s).

AquaDisk Valves

2 Set(s) of Backwash Valves consisting of:

- 2" full port, two piece, ASTM A351 Grade CF8M stainless steel body ball valve(s), flanged end connections with single phase electric actuator(s). Valve / actuator combination shall be TCI / RCI (RCI, a division of Rotork).

2 Solids Waste Valve(s) consisting of:

- 2" full port, two piece, ASTM A351 Grade CF8M stainless steel body ball valve(s), flanged end connections with single phase electric actuator(s). Valve / actuator combination shall be TCI / RCI (RCI, a division of Rotork).

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AquaDisk Misc/Spare Parts

1 Lot of Recommended Spare Parts consisting of:

- (12) Pile cloth media socks.
- (1) Media non-corrosive support frame assemblies.
- (1) Viton V-ring effluent port\centertube seal.
- (1) Backwash/solids valve.
- At least 1 of each fuse(s), control relay(s), and indicating light replacement bulb(s).

AquaDisk Controls w/Starters

2 Control Panel(s) consisting of:

- NEMA 4X fiberglass enclosure(s).
- Circuit breaker with handle.
- 2 KVA Transformer(s).
- Fuses and fuse blocks.
- Single phase circuit breaker(s).
- Line filter(s).
- GFI convenience outlet(s).
- Control relay(s).
- Selector switch(es).
- Indicating pilot light(s).
- Compactlogix Processor.
- Power supply(s).
- Input card(s)
- Output card(s).
- Analog input card(s).
- Ethernet switch(es).
- PanelView Plus 7 15" color touch screen display(s).
- Power supply(ies).
- Motor starter(s).
- Terminal blocks.
- UL label(s).

AquaDisk Engineering

1 Set(s) Documentation for the AquaDisk will be provided as described:

- Engineer's Approval Data (English language) in electronic format.

1 Set(s) Documentation for the AquaDisk will be provided as described:

- Operation & Maintenance Manuals (English language) in electronic format.

AquaDisk Supervision/Freight Domestic

1 Supervision Services and Freight Package(s) for the AquaDisk will be provided as follows:

- 6 Day(s) for onsite services.
- 3 Trip(s) for onsite services.
- FREIGHT TO JOBSITE

The Following General Notes apply to Aqua-Aerobic Systems' Proposal:

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- SCHEDULE: We expect PRELIMINARY CONCEPT drawings will be completed and in transit to you within 4-5* weeks after receipt of order with acceptable terms and conditions and credit approval/guarantee of payment. Following finalization of the preliminary concept and our receipt of Purchaser vendor's basin detail drawings, site layout, hydraulic profile and building drawings (if applicable) we expect engineer's submittal data will be completed and in transit to you within approximately 3-4* weeks. At time of order placement, if it is determined preliminary concept drawings are not needed in order to proceed with preparation of engineer's submittal data, we expect submittals to be completed and in transit to you within 8-10* weeks after receipt of order with acceptable terms and conditions and guarantee of payment. We expect receipt of approved engineer's submittal with release for manufacture within 4-8 weeks of our transmittal of submittal data. We expect shipment of equipment (transit time excluded) to be approximately 16-22* weeks from our receipt of approved engineer's submittal data and release for manufacture. Schedules may be adjusted at time of order placement, depending upon existing order backlog.
*Weeks quoted are actual working weeks.
- Aqua-Aerobic Systems will be closed for the Christmas Holidays beginning approximately December 24, through approximately January 2nd.
- We expect shipment of control panels (transit time excluded) to be approximately 24-28 weeks* from our receipt of approved engineer's submittal data and release for manufacture. The extended delivery on control panels is based on unprecedented supply chain delays associated with the COVID-19 pandemic. Schedules will be updated as new information becomes available.
- Schedule changes due to supply chain disruption may impact the above quoted times. Aqua-Aerobic Systems will advise if/when any such disruption applies.
- PRICE ESCALATION INDEX: Aqua-Aerobic Systems, Inc. reserves the right to re-evaluate the pricing quoted prior to order acceptance if; 1) a purchase order is received after the validity date stated in this proposal or, 2) the lead times stated in this proposal are exceeded. Any pricing adjustments required shall be based on a published materials cost index specific to the materials proposed.
- TARIFF PRICE ESCALATION NOTE: The proposed goods may be affected by the recent U.S. Government proposed tariffs on imported steel and aluminum. Because of this, Aqua-Aerobic reserves the right to re-evaluate the pricing quoted prior to order acceptance if; 1) a purchase order is received past the validity date stated in the proposal or, 2) the total of the quoted lead times stated in this proposal are exceeded. Any pricing adjustments required due to tariff impacts will be based on published material cost indices specific to the affected materials.
- CONTROLS NON-DISCLOSURE / CONFIDENTIALITY AGREEMENT: If applicable, Aqua-Aerobic Systems will provide information relating to software documentation to control the treatment system supplied using Aqua-Aerobic Systems' proprietary and/or trade secret information subject to execution of an Aqua-Aerobic "Controls Non-Disclosure / Confidentiality Agreement".
- INTEGRAL DOCUMENTS: The following documents are an integral part of Aqua-Aerobic Systems' proposal:
1. Aqua-Aerobics' Design # 167138 and Design Notes dated March 24, 2021.
2. Aqua-Aerobics' Exceptions/Clarifications document dated March 1, 2022.
3. All documents listed on Aqua-Aerobics' proposal/bid package "Table of Contents" document dated March 3, 2022.
- Additional supervision services can be provided for an additional charge of $1450/day plus travel and living expenses.
- TRADEMARKS: Aqua-Jet®, Aqua-Jet II®, AquaDDM®, ThermoFlo®, Endura® Series, OxyMix®, OxyStar®, Fold-a-Float®, SAF-T Float®, Aqua MixAir®, AquaCAM-D®, AquaSBR®, Aqua MSBR®, AquaPASS®, Aqua BioMax®, AquaEnsure®, Aqua EnduraTube®, Aqua EnduraDisc®, Aqua CB-24®, AquaDisk®, AquaDiamond®, AquaDrum®, Aqua MiniDisk®, Aqua MegaDisk®, AquaPrime®, AquaStorm®, OptiComb® OptiFiber®, OptiFiber PES-13®, OptiFiber PA2-13®, OptiFiber PES-14®, OptiFiber PF-14®, OptiFiber UFS-9®, Trust the Tag®, AquaABF®, AquaMB Process®, Aqua-Aerobic® MBR, Aqua MultiBore®, Aqua Multibore® C-Series, Aqua Multibore® P-Series, Aqua ElectrOzone®, Aqua ElectrOzone® M-Series, IntelliPro®, AquaPRS™, AquaPR-206™, Aqua-Aerobic®, and the Aqua-Aerobic Corporate logo artwork are registered trademarks or pending trademarks of Aqua-Aerobic Systems, Inc. Nereda®, AquaNereda® Aerobic Granular Sludge Technology, and the AquaNereda Product logo artwork are a registered trademark of Royal HaskoningDHV. All other products and services mentioned are trademarks of their respective owners.

The Following Mechanical and/or Electrical Notes apply to Aqua-Aerobic Systems' Proposal:

- Valve and line sizes are to be verified by the engineer based on actual line losses.
- Pumps and valves ship loose, unless otherwise specified.
- Filter flow hydraulics and plant's capability to handle the intermittent backwash flow is to be confirmed by the purchaser/purchaser's consulting engineer.

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- Three phase motors will be 460 volt.
- Single phase motors will be 115 volt.

The Following Scope Exclusion Notes apply to Aqua-Aerobic Systems' Proposal:

- Materials and Services not specifically described/itemized in this proposal are not included in the quoted total price, and are to be supplied by the installing contractor/purchaser.
- Freeze protection may be required for outdoor installation in cold weather climates. All such protection, including but not limited to, heat tracing and insulation of pumps and piping, as well as protection against internal tank freezing, shall be provided and installed by the installing contractor.

SCOPE BY PURCHASER/CONTRACTOR:

*Note this is not intended as a complete listing and is provided as a courtesy.

- Unloading and on-site storage.
- Provisions for equipment access.
- Concrete, handrail and all civil works.
- All piping, spool pieces, supports, gaskets and hardware beyond Aqua-Aerobic's equipment terminations.
- Interconnecting piping, wiring and installation.
- All flanges and/or unions in the piping to service the equipment.
- Unless specifically stated above, weir(s) for each filter.
- Electrical conduit, hardware, supports, attachment of cables, wiring, j-boxes and local disconnects (if any) between motors, electrical valves, instruments and the control panel.
- Installation/field wiring of the control panel(s) that ship loose.
- Electrical wiring and supply power.

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FORM 00 31 00C - EXPERIENCE SUMMARY (SUBMIT AS FIRST PAGE OF TAB C)

Bidder to complete the following table; additional supporting information can also be included in this Tab.

Question/Criteria	Bidder's Response	Score (0-5)	Importance Factor (1-5)	Score Subtotal (Score x Importance Factor)	Maximum Points Possible
History: List the first year that the proposed model was placed into service. For example, "2005".	1993		2		10
Number of Units - Cloth Disc Filters: List the total number of units of the proposed model and type currently installed as of the date of the proposal. This count is discrete units not projects or sites (i.e. a single location with three units would count for three, not one).	Aqua-Aerobic Systems currently has 1,300 AquaDisk models installed throughout the United States.		3		15
Installation List - Cloth Disc Filters: Manufacturer shall have a minimum of 10 years design and manufacturing experience with at least 25 units installed in the United States Provide installation list that includes the following, at a minimum: Name of facility, location, date of start-up, model number, number/size of discs, design flow (gpm/sf), and total number of filters installed at the facility.	See Section 2.B for Aqua-Aerobic Systems' installation list.		5		25
Reference List / Feedback - Cloth Disc Filters: For the Installation List - Cloth Disc Filters provided above, provide facility contact (name, phone number, email and plant address) for at least 3 references.	See Section2.C for Aqua-Aerobic Systems' reference list.		5		25
California Title 22 Certification: Manufacturer shall verify that proposed cloth disc filter equipment has been certified for tertiary filtration by submitting Title 22 documentation. Certification should be for proposed equipment. Certifications from other states may be included or listed but scoring is dependent upon Title 22.	See Section 2.D which verifies Aqua-Aerobic Systems' California 's Title 22 water recycling criteria.		5		25

Section Total Score=		**100**
Section Total Score % =		

Score (0-5); completed by Buyer/Engineer	
0	Fail: The proposal fails to address the requirements described in the RFP.
1	Poor: The proposal addresses the requirements inaccurately or poorly.
2	Fair: The proposal addresses the requirements described in the RFP in an unsatisfactory manner.
3	Good: The proposal addresses all the requirements described in the RFP in a satisfactory manner.
4	Very Good: The proposal addresses all the requirements described in the RFP and, in some respects, exceeds them.
5	Excellent: the proposal addresses and exceeds all of the requirements described in the RFP.

AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

Reference List
6 Disk Filters
Package and Concrete
29 Sites, 58 Filters

ALAFAYA UTILITIES **105984**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	02/07/2002
Avg. Daily Flow(MGD):	1
Max. Design Flow(MGD):	2
Equipment:	1 Tertiary Filter(s) 6/4 Disks,Classic,ADF Disk Package Filter(s),Model 54,PS Package

CONDFIDENTIAL INDUSTRIAL **102216E**

Waste Characteristics:	Industrial / Agriculture
Treatment Objective:	TSS
StartUp Date:	06/01/1997
Avg. Daily Flow(MGD):	1.39
Max. Design Flow(MGD):	2.78
Equipment:	1 Tertiary Filter(s) ADF Disk Package Filter(s),6 Disks

BURNT STORE WWTP EXPANSION, FL **106377**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	05/19/2004
Avg. Daily Flow(MGD):	1
Max. Design Flow(MGD):	1.33
Equipment:	1 Tertiary Filter(s) 6 Disks,Model 54,ADF Disk Package Filter(s),Classic,PES-14

BUXAHATCHEE TREATMENT PLANT, AL **106470A**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	Nitrification , DeNitrification , Phosphorus
StartUp Date:	03/24/2005
Avg. Daily Flow(MGD):	1.5
Max. Design Flow(MGD):	1.5
Equipment:	2 Tertiary Filter(s) 6 Disks,Model 54,PA2-13,PS Package

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CABIN CREEK WWTF GA **114490**

Waste Characteristics:		Municipal / Domestic
Treatment Objective:		TSS
StartUp Date:		08/15/2019
Avg. Daily Flow(MGD):		1.5
Max. Design Flow(MGD):		3
Equipment:	2	Tertiary Filter(s) PA2-13,Model 54,6 Disks,ADF Disk Concrete Filter(s)

CANAL STREET WWTF UPGRADE, FL **100872B**

Waste Characteristics:		Municipal / Domestic
Treatment Objective:		TSS , Reuse
StartUp Date:		04/12/2007
Avg. Daily Flow(MGD):		3.5
Equipment:	1	Tertiary Filter(s) 6 Disks,Classic,Model 54,PES-13,SS Package

CANBY WTF IMPROVEMENTS **106303**

Waste Characteristics:		Municipal / Domestic
Treatment Objective:		TSS
StartUp Date:		08/21/2003
Max. Design Flow(MGD):		2.789
Equipment:	1	Tertiary Filter(s) ADF 6-Disk Concrete Filter(s)

CLEAR LAKE SANITARY DISTRICT **104927**

Waste Characteristics:		Municipal / Domestic
Treatment Objective:		Nitrification
StartUp Date:		12/15/1996
Max. Design Flow(MGD):		8.17
Equipment:	3	Tertiary Filter(s) 6 Disks,Classic,Model 54,SS Package,PA2-13

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CONDIFENTIAL INDUSTRIAL **110791**

Waste Characteristics:		Industrial / Potato
Treatment Objective:		TSS
StartUp Date:		09/29/2016
Avg. Daily Flow(MGD):		1.2
Max. Design Flow(MGD):		1.2
Equipment:	1	Tertiary Filter(s) PES-14,Model 54,ADF Disk Concrete Filter(s),6 Disks

EUSTIS WWTP **102375C**

Waste Characteristics:		Municipal / Domestic
Treatment Objective:		TSS , Reuse
StartUp Date:		03/03/2000
Avg. Daily Flow(MGD):		4.5
Equipment:	4	Tertiary Filter(s) ADF 6-Disk Concrete Filter(s)

FORT BEND CNTY MUD 182 TX **114830/B**

Waste Characteristics:		Municipal / Municipal
Treatment Objective:		Reuse
StartUp Date:		07/09/2019
Avg. Daily Flow(MGD):		0.3
Equipment:	2	Tertiary Filter(s) 6/4 Disks,Model 54,PES-13,PS Package

FORT BEND MUD 146 TX **112554**

Waste Characteristics:		Municipal / Domestic
Treatment Objective:		NTU
StartUp Date:		02/28/2019
Avg. Daily Flow(MGD):		1.2
Max. Design Flow(MGD):		3
Equipment:	1	Tertiary Filter(s) 6 Disks,Model 54,Concrete,PES-13

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GAINEY RANCH WRP, AZ **107929A**

Waste Characteristics:		Municipal / Domestic
Treatment Objective:		TSS , NTU
StartUp Date:		04/01/2009
Avg. Daily Flow(MGD):		1.7
Max. Design Flow(MGD):		1.7
Equipment:	2	Tertiary Filter(s) 6 Disks,ADF Disk Package Filter(s),PES-13

HARTVILLE WWTP IMPROVEMENTS, OH **109876**

Waste Characteristics:		Municipal / Domestic
Treatment Objective:		TSS
StartUp Date:		06/19/2014
Avg. Daily Flow(MGD):		0.6
Max. Design Flow(MGD):		2
Equipment:	2	Tertiary Filter(s) PA2-13,Model 54,Concrete,6 Disks

HAUGHTON LA **114383**

Waste Characteristics:		Municipal / Municipal
StartUp Date:		11/15/2017
Max. Design Flow(MGD):		2
Equipment:	1	Tertiary Filter(s) PA2-13,Model 54,ADF Disk Concrete Filter(s),6 Disks

CONFIDENTIAL INDUSTRIAL **113646**

Waste Characteristics:		Industrial / Agriculture
StartUp Date:		01/07/2016
Avg. Daily Flow(MGD):		1.5
Max. Design Flow(MGD):		3
Equipment:	1	Tertiary Filter(s) 6 Disks,Model 54,PS Package,PA2-13

LAKE HARMONY WWTP PA **114839**

Waste Characteristics:		Municipal / Municipal TSS
Startup Date		2/23/2022
Treatment Objective:		0.5
Avg. Daily Flow(MGD):		1.65
Max. Design Flow(MGD):		
Equipment:	2	Tertiary Filter(s) 6 Disks,SS Package,Model 54,PES-13

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NORTH CHAUTAUQUA WWTP NY **113521**

Waste Characteristics:		Municipal / Municipal
Treatment Objective:		Phosphorus / TSS
StartUp Date:		09/26/2018
Avg. Daily Flow(MGD):		0.301
Max. Design Flow(MGD):		2.0016
Equipment:	2	Tertiary Filter(s) PES-14,Model 54,ADF Disk Package Filter(s),6 Disks

ORLEANS MA **110167A**

Waste Characteristics:		Municipal / Municipal
Treatment Objective:		BOD / Denitrification / Nitrification / TSS
Startup Date:		10/25/2021
Avg. Daily Flow(MGD):		0.535928
Max. Design Flow(MGD):		0.957
Equipment:	2	Tertiary Filter(s) 6 Disks,ADF Disk Package Filter(s),Model 54,PES-13,SS Package

PALM BAY REUSE FACILITY, FL **108628**

Waste Characteristics:		Municipal / Domestic
Treatment Objective:		TSS
StartUp Date:		08/19/2009
Avg. Daily Flow(MGD):		3
Max. Design Flow(MGD):		6
Equipment:	2	Tertiary Filter(s) PES-13,Model 54,ADF Disk Concrete Filter(s),Classic,6 Disks

PASO ROBLES CA **113400**

Waste Characteristics:		Municipal / Domestic
Treatment Objective:		NTU
StartUp Date:		11/15/2018
Avg. Daily Flow(MGD):		3.66
Max. Design Flow(MGD):		5.5
Equipment:	3	Tertiary Filter(s) 6 Disks,Concrete,PA2-13,Model 54

CONFIDENTIAL INDUSTRIAL **109425/A**

Waste Characteristics:		Industrial / Refining
Treatment Objective:		TSS
StartUp Date:		01/28/2009
Avg. Daily Flow(MGD):		0.108
Max. Design Flow(MGD):		0.108
Equipment:	2	Tertiary Filter(s) ADF 6-Disk Package Filter(s)

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RIVERCHASE WWTP EXPANSION, AL **103433A**

Waste Characteristics:		Municipal / Domestic
Treatment Objective:		Phosphorus / TSS
StartUp Date:		10/16/2008
Avg. Daily Flow(MGD):		3
Max. Design Flow(MGD):		4.5
Equipment:	2	Tertiary Filter(s) 6 Disks,Classic,SS Package,PES-14,Model 54

STOCKBRIDGE WWTP EXPANSION GA **104161C**

Waste Characteristics:		Municipal / Municipal
Treatment Objective:		BOD / Phos / TSS
StartUp Date:		11/21/2019
Avg. Daily Flow(MGD):		1.5
Max. Design Flow(MGD):		1.9
Equipment:	2	Tertiary Filter(s) PES-14,6 Disks,Model 54

UXBRIDGE WWTF UPGD MA **111652**

Waste Characteristics:		Municipal / Municipal
Treatment Objective:		Phosphorus / TSS
StartUp Date:		12/19/2019
Avg. Daily Flow(MGD):		2.4
Max. Design Flow(MGD):		3.1
Equipment:	3	Tertiary Filter(s) 6 Disks,Model 54,PES-14,PS Package

WILBARGER CREEK MUD 2 TX **116452**

Waste Characteristics:		Municipal / Domestic
Treatment Objective:		TSS / NTU
Startup Date:		Spring 2022
Avg. Daily Flow(MGD):		1
Max. Design Flow(MGD):		2
Equipment:	2	Tertiary Filter(s) PES-14,Concrete,Model 54,6/4 Disks

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WILBARGER CREEK WWTF TX **111004C**

Waste Characteristics:		Municipal / Municipal
Treatment Objective:		TSS
StartUp Date:		09/10/2020
Avg. Daily Flow(MGD):		1.33
Max. Design Flow(MGD):		5.32
Equipment:	3	Tertiary Filter(s) 6 Disks,PS Package,Model 54,PES-13

WINDERMERE UTILITY COMPANY TX **105452B**

Waste Characteristics:		Municipal / Municipal
Treatment Objective:		TSS
StartUp Date:		06/08/2020
Avg. Daily Flow(MGD):		3
Max. Design Flow(MGD):		7.5
Equipment:	3	Tertiary Filter(s) PA2-13,Model 54,SS Package,6 Disks,Classic

WINDERMERE UTILITY WWTP **105452**

Waste Characteristics:		Municipal / Domestic
Treatment Objective:		BOD , TSS
StartUp Date:		10/21/1999
Avg. Daily Flow(MGD):		2
Max. Design Flow(MGD):		5
Equipment:	2	Tertiary Filter(s) SS Package,6 Disks
	1	Tertiary Filter(s) 6 Disks,SS Package

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AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

Reference List

Plant Name: Central Valley WRF / 113968A

Filter Units: (3) 10-Disk ADFSP-54 12/10 (Package)

Address: 100 West Central Valley Rd

Salt Lake City, UT 84119

Phone: 801-973-9100

Contact: Gary Faulkner

Plant Name: South Valley WRF 107688A

Filter Units: (2) 8-Disk ADFP54x8EPC in Package SS

Address: 7495 South 1300 West

West Jordan, UT 84084

Phone: 801-566-7711

Cell: 801-232-6274

Contact: Taigon Worthen

Plant Name: City of Burley ID 106538

Filter Units: (3) 12-Disk AquaDisk in Concrete

Address: 1410 Overland Ave

PO Box 1090

Burley ID 83318

Phone: 208-878-2224

Contact: Dee Hodge

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State Water Resources Control Board
Division of Drinking Water

April 24, 2017

Onder Caliskaner, Ph.D., PE
National Technologist
Kennedy/Jenks Consultants
10850 Gold Center Drive, Suite 350
Rancho Cordova, CA 95670

Dear Mr. Caliskaner,

Subject: Conditional Acceptance of the Cloth Media Filters PA-13, PES-13, and PES-14 to comply with California Water Recycling Criteria at Higher Filter Loading Rates (3190001-706)

The Division of Drinking Water's (Division) Recycled Water Unit has reviewed a request, dated January 20, 2017, from Kennedy/Jenks Consultants to consider the Cloth Media Filters PA-13, PES-13, and PES-14 (used at high filtration rates) as alternative filtration technologies for compliance with the California Water Recycling Criteria (Title 22), Section 60320.5. Accompanying the request was a report entitled, "Title 22 Re-Rating of Aqua-Aerobic Systems, Inc. Cloth Media Filters PA-13, PES-13, and PES-14 for Wastewater Recycling Applications in California", dated January 2017. The report outlines findings from a study conducted at the Pleasant Grove wastewater treatment plant located in the City of Roseville, CA. The testing was conducted using the single-disk Aqua MiniDisk MD-5 filter pilot plant treating secondary clarified effluent having turbidity levels averaging 4-5 NTU with spikes up to 10 NTU. Over 30 tests were done with filter flowrates ranging from 6 to 22-gpm/ft^2.

These filters are currently conditionally accepted in California at lower filtration rates.

1. PA-13 at 6-gpm/ft^2 via DDW letter dated January 13, 2009.
2. PES-13 at 6-gpm/ft^2 via DDW letter dated November 14, 2007.
3. PES-14 at 7-gpm/ft^2 via DDW letter dated February 1, 2013.

Demonstration studies conducted using the Cloth Media Filters PA-13, PES-13, and PES-14 at higher filtration rates have satisfactorily shown an equal degree of treatment and reliability as those technologies listed in Title 22. Based on a review of the materials submitted, the Division grants conditional acceptance of the Cloth Media Filters PA-13, PES-13, and PES-14 at the higher filtration rates as alternative treatment technologies for recycled water filtration applications, subject to the following conditions:

1. Use of the identical materials and manufacturing for each filter as described in the January 2017 report.

2. Instantaneous loading rates shall not exceed 22-gpm/ft^2.

3. Turbidity in the filtered water shall not exceed an average of 2 NTU within a 24-hour period, 5 NTU more than 5 percent of the time within a 24-hour period, and 10 NTU at any time.

4. Coagulation, per Title 22, Section 60349, shall be added upstream of the alternative filtration technology to meet the requirement of Title 22, Section 60301.320(a) whenever the filter effluent supplies recycled water for a cooling use area as per Title 22, Section 60306.

5. Acceptance of this technology is contingent on it being complimented with a disinfection process which is compliant with Title 22, Section 60301.230.

6. Each operations plan shall include a performance goal that adequate backwash duration is provided to ensure effective solids removal ('in' and 'on' the cloth media). The operations plan shall describe how this goal will be met under all conditions.

7. Each operations plan shall include scheduled inspections and assessments of the cloth condition as an operational safeguard. This should include a routine visual inspection at least monthly, and a more in-depth assessment of the cloth condition at least annually. Inspection frequencies may change as media condition and performance experience is gained with time.

8. Each operations plan shall provide for assurances that adequate sludge wasting is practiced to ensure against excessive solids buildup in the filter vessel.

Conditional acceptance is specific to the Cloth Media Filters PA-13, PES-13, and PES-14 detailed in the report dated January 2017 described above. The Division must review in advance any future proposed changes made in the physical attributes or characteristics of these treatment technologies to determine whether the modifications will require additional testing to ensure Title 22 equivalency.

Review and approval of all proposed water recycling projects using the Cloth Media Filters PA-13, PES-13, and PES-14 are provided through the Regional Water Quality Control Board's Water Reclamation permitting process. The Division's local district offices will also review all proposed water recycling projects using the Cloth Media Filters PA-13, PES-13, and PES-14 on a case-by-case basis to confirm full compliance with all applicable treatment and reliability features required by Title 22 for the specific treatment facilities.

If you have any questions regarding this letter, please contact Randy Barnard at (619) 525-4022 or via email at Randy.Barnard@waterboards.ca.gov.

Sincerely,

Randy Barnard, P.E.
Recycled Water Unit Chief
Division of Drinking Water
State Water Resources Control Board
1350 Front St., Rm. 2050
San Diego, CA 92101

FORM 00 31 00D - DESIGN AND PERFORMANCE SUMMARY (SUBMIT AS FIRST PAGE OF TAB D)

Bidder to complete the following table; additional supporting information can also be included in this Tab.

Question/Criteria	Bidder's Response	Score (0-5)	Importance Factor (1-5)	Score Subtotal (Score x Importance Factor)	Maximum Points Possible
List name of Cloth Media Filter Manufacturer.	Aqua-Aerobic Systems, Inc.		1		5
Include a copy of the specification(s) listed below with each paragraph check-marked to indicate specification compliance or marked to indicate requested deviations from specification requirements. If deviations are noted, written justification shall be provided for each deviation. •46 61 25 Cloth Media Filters	See Section 3.B. for the notated specification and Section 3.B.a for Aqua-Aerobic Systems' exceptions and clarifications.		5		25
Provide a decription of the number and size of discs in each filter train at both initial and buildout flow conditions, where each train is sized for 50 percent of the flow (2+0): •Initial Flow = 4.0 mgd •Buildout Flow = 4.65 mgd For the initial and buildout flow conditions as outlined above, verify that maximum loading rate of 5 gpm/ft is not exceeded.	Initial Flow: Two (2) 6-Disk AquaDisk®, Cloth Media Filters with a max loading rate of 4.3 gpm/ft^2. Buildout Flow: Two (2) 6-Disk AquaDisk®, Cloth Media Filters with a max loading rate of 5 gpm/ft^2		5		25
Provide dimensioned drawing(s) of the proposed units, i.e. filter trains showing disc number and sizing, space requirements for the concrete tank, backwash pumps and piping, valve locations, and control panels.	See Section 3.D for dimensioned drawings.		5		25
Secondary Effluent applied to the cloth media filter equipment will have the average water quality as outlined in Specification 46 61 25 including continuous chlorine as result of the proposed filters being downstream of the existing chlorine contact basin. Additionally, MWD adds Alum upstream of the secondary clarifiers. The design of the filter building will include provision for polymer dosing at the filters if needed to meet Utah Type 1 Reuse requirments. Cloth Disc Filter Manufacturer shall acknowledge these conditions as well as describe experience in treating similar conditions at existing installs.	Aqua-Aerobic Systems acknowledges the design criteria outlined and water quality outlined in Specification 46 61 25. Aqua-Aerobic Systems' currently has over 100 facilities meeting California Title 22 requirements, which per the Title 22 requirement must include provisions for coagulant addition. Please refer to Section 3.E for a list of installations where Aqua-Aerobic Systems' cloth media filter is used in water reuse applications.		3		15
Provide estimates of water quality results from the cloth media filter based on the influent water quality provided, filter equipment configurations outlined, estimated backwash frequency, and manufacturer experience under similar conditions. After selection does the manufacturer recommend that a pilot test be conducted to verify cloth media filter performance? If so, please provide a decription of the set-up, duration, and not to exceed cost for pilot testing.	See Section 3.C shows the process design which gives the estimated water quality results from the filter as well as the filter equipment configurations. Estimated backwash frequency can be found in Section 3.H. and Aqua-Aerobic Systems' experience under similar conditions is referenced in Section 3.E. Aqua-Aerobic Systems will not require piloting to verify cloth media filter performance, however, if piloting information is desired it can be found in Section 3.F.b.		3		15
Describe how backwash would be configured and occur for each filter train at the initial flow condition and then again later with more discs added for the buildout flow condition. Does backwash occur for the whole train or is there a split where only a portion of each train is backwashed? MWD is open to recommendations on backwash configuration and sequencing.	Aqua-Aerobic Systems' backwash configuration is outlined in Section 3.G. The filter units are configured to backwash 2 of the 6 disks at a time.		1		5
Indicate power requirements for the filter train motor and backwash pumps, and estimated backwash waste washwater flowrate (max gpm).	The power requirements and backwash flow rates can be found in Section 3.H.		1		5

NOTE: Submit additional information as Part of Tab E to show features of the system. Submit descriptions, scope of supply, drawings, P&IDs, control descriptions, control panel information, or narratives to address the items above, as applicable.

Section Score=		**120**
Section Total Score % =		

Score (0-5); completed by Buyer/Engineer	
0	Fail: The proposal fails to address the requirements described in the RFP.
1	Poor: The proposal addresses the requirements inaccurately or poorly.
2	Fair: The proposal addresses the requirements described in the RFP in an unsatisfactory manner.
3	Good: The proposal addresses all the requirements described in the RFP in a satisfactory manner.
4	Very Good: The proposal addresses all the requirements described in the RFP and, in some respects, exceeds them.
5	Excellent: the proposal addresses and exceeds all of the requirements described in the RFP.

SECTION 46 61 25
CLOTH MEDIA FILTERS

PART 1 -- GENERAL

1.1 THE SUMMARY

A. This specification details the performance and design requirements for the Cloth Media Filtration System at the Magna Water District (OWNER) to provide reuse water in accordance with State of Utah requirements. The Filtration System Supplier (FSS) shall provide cloth media filters, complete and operable, in accordance with the Contract Documents

1.2 MANUFACTURER SUBMITTALS

A. Furnish submittals in compliance with Section 01 33 20 – Submittal Procedures.

B. Shop Drawings

1. Drawings and technical information for equipment, piping, valves, and controls.

2. Electrical single line diagrams, schematic diagrams, interconnection diagrams, internal wiring diagrams of the filter system including control panel and any auxiliary control or termination panels. Component ratings such as main circuit breaker, branch circuit breakers, and feeder sizes shall be included. Operating characteristics of electrical and control equipment including power consumption, operating voltage, and amperage tolerances, and ancillary electrical services shall be shown.

3. A complete listing of the PLC control logic with cross-reference listings, data table listings, including symbolic and descriptive names, labels, and comments.

4. Operator interface screen layouts, with identification of data to be displayed.

C. Technical Manual: The Technical Manual shall contain the required information per Section 01 33 20 – Submittal Procedures.

1.3 SPECIAL CORRECTION OF DEFECTS REQUIREMENT

A. The CONTRACTOR shall furnish a written warranty that the filter will meet the performance and capacity requirements. The warranty shall state that in the event of defects, the CONTRACTOR will make necessary adjustments and repairs to meet the requirements at no cost to OWNER.

B. If it is determined that the filter is unable to meet the performance and capacity requirements or if the filter controls are unsuitable for the ambient environment, the CONTRACTOR shall be responsible to provide a filter system that will comply.

C. It is expected that additional project requirements, including some changes, will be required as the design progresses. The DESIGN-BUILDER (DB) will make every effort to coordinate changes that will affect the Filtration System, but ultimately the FSS is required to comply with these design progression updates.

D. The FSS must provide a complete and functional system that fully complies with the requirements defined in the RFP. The FSS is also responsible for ensuring that their package does not compromise or interfere with the performance of the Magna Reuse Facility.

E. The CONTRACTOR shall correct defective WORK for 12 months from the date of Substantial Completion.

1.4 EXPERIENCE

A. The filter supplier shall furnish documentation of a comprehensive test performed on the filter system by an independent third party in the State of California to show capabilities with the Title 22 requirements.

B. Refer to Section 00 31 00 – Experience for relevant FSS experience requirements.

PART 2 -- PRODUCTS

2.1 GENERAL SYSTEM DESCRIPTION

A. The filtration system shall be a tertiary cloth media disk filtration by gravity flow. The system shall consist of two filter modules installed in concrete basins to ensure gravity flow compatibility with the existing plant hydraulic profile.

2.2 PERFORMANCE AND CAPACITY REQUIREMENTS

A. Each filter shall meet or exceed the following performance and capacity requirements:

Parameter	Initial	Buildout
Design Flow, mgd	4.0	4.65
Number of Filter Trains, #	2	2
Capacity of each train, mgd (each train to treat 50% of flow for 2+0 system)	2.0	2.33
Maximum Hydraulic Loading Rate, gpm/sq-ft	5.0	5.0
Minimum Disks per Filter Train, each (each train to include space to add disks to achieve buildout capacity)	4	5
Influent Water Quality to the Filters		

Maximum Total Suspended Solids, TSS mg/L	20	
Maximum Chlorine, mg/L	1.5	
Minimum Temperature, degrees C	10	
Filter Effluent Requirements		
Effluent Turbidity, NTU	Max Instantaneous – 5 NTU Max Daily Arithmetic Mean – 2 NTU	Max Instantaneous – 5 NTU Max Daily Arithmetic Mean – 2 NTU
Maximum TSS, mg/l	5	5

2.3 DESIGN AND CONSTRUCTION

A. System Components. Each manufacturer shall provide the components to their standard system in order to meet the performance and capacity requirements discussed herein.

1. Filter Tank: Each tank assembly shall be concrete and designed by others.

C

See Section 3.B.a exception/clarification #1.

2. Drive Assembly: The drive assembly shall be designed to rotate the backwash assembly and center shaft during the backwash cycle, if required. Each filter shall include an adjustable drive assembly with a gearbox, drive sprocket, drive chain, and a Type 304 stainless steel chain guard. Belt drive systems will not be acceptable. The gearbox shall be parallel in-line helical type, AGMA class 1 drive motor rated for control by suppliers PLC. The drive sprocket shall be nylon. The chain shall be nylon with Type 316 stainless steel pins.

3. Center Tube Assembly: If applicable, each center tube assembly shall include a Type 304 stainless steel center tube weldment, driven sprocket, wheel assemblies, and frame and cloth assemblies. The cloth media disk filter may also consist of a centrally located rotating shaft with mounted vacuum shoe assemblies. Each center tube assembly shall also include a chlorine-resistant Viton V-Ring effluent port seal, if required. The driven sprocket shall be multi segment made of UHMW polyethylene. Fasteners shall be type 316 stainless steel.

4. Filter Cloth Assemblies: Each module shall include sufficient cloth disk assemblies per manufacturers standards to handle initial flows with the capability to expand to handle buildout flows. Each cloth disk assembly shall be comprised of a cloth media sock supported by an injection molded polyethylene copolymer frame or Type 304 stainless steel frame. Cloth/frame assemblies shall be constructed such that each segment is easily removable from the center tube without special tools to allow for removal and replacement of the cloth at the point of installation or maintenance. Systems requiring

special tools and/or the return of media segments to the factory for replacement shall not be acceptable.

a. Cloths shall be of woven nylon or polyester fiber pile construction with polyester backing material having a nominal filtration rating of 5-14 microns. Granular media and screens having structured identical openings will not be allowed. The cloth media shall have an active filter depth of 3- to 5-mm. The cloth depth shall also provide storage of captured solids, reducing backwash volumes while maintaining an operational headloss. Woven mesh or microstrainer type disk with no filtration depth are not acceptable.

b. Each cloth disk assembly shall have a minimum of 54 - 72 square feet of effective submerged filtration area.

c. Effluent filtration area is defined as only the portion of the disk that is submerged during filtration. Any disk area that is not submerged shall not be considered as effective area.

d. During filtration, the filter unit shall operate in a static condition with no moving parts. The filter system shall provide for the collection of filtered solids on the outside of the cloth media surface to allow for the direct contact of cleaning systems. The filter flow path shall be from the outside of the disk to the inside. Systems with flow paths from the inside to the outside of the disk collecting filtered solids on the interior surfaces of the disk are not acceptable.

5. Effluent Trough: If applicable to the FSS standard, disks may be attached to the effluent trough independently to allow for disk isolation. Disks that are attached to the effluent trough independently shall incorporate a permanently mounted valve for complete isolation and shutoff while the disk is removed from the operating filter. The disk filter design shall sample filtrate from each disk independently or from a common effluent trough, as required.

6. Anchor Bolts: Anchor bolts shall be Type 316 stainless steel. Anchor bolts to be provided by the FSS but installed by the CONTRACTOR.

B. Backwash/Sludge Discharge Assembly: The backwash function shall incorporate a pump that draws filter effluent through the cloth, thereby removing accumulated solids from the cloth surface. Designs that utilize high pressure spray as the sole means of solids removal are not acceptable. The backwash disk filter system shall be suitable for filtering domestic wastewater after conventional treatment. Each filter shall be designed to operate on a continuous basis at peak flow rate and shall be designed to operate while receiving varying flow rates. Backwash can service individual disks or an entire filter system, as required.

1. Each backwash/sludge discharge assembly shall include an external piping assembly, backwash system assembly, and at least one backwash pump. The external piping assembly shall include both automated and manual backwash valves as required for automated operation. Automated backwash valves shall be operated and controlled by the PLC. The backwash assembly shall include molded polyethylene or Type 304 stainless steel backwash shoe supports with end springs if applicable, UHMW backwash shoes, Type 304 stainless steel or wire-reinforced flexible hose, Type 304 or 316

stainless steel backwash manifold with stainless steel hose clamps, and a PVC sludge collection manifold as required. The backwash shoe shall have minimal contact with the cloth media across the entire suction zone in order to reduce wear and solids impingement on the cloth media.

2. Ball valve manufacturers shall be the following or equal:

   a. DeZURIK

   b. GA Industries

   c. Neles-Jamesbury, Inc.

   d. NIBCO, Inc.

   e. Henry Pratt Company

   f. Conbraco Industries, Inc. (Apollo)

   g. ITT Engineered Valves

   h. Watts Regulator

   i. Worcester Controls

   j. Ta Chen International (TCI), Inc.

3. Gate valve manufacturers shall be the following or equal:

   a. Clow Valve Co.

   b. Kennedy Valve

   c. M & H Valve Company

   d. Milwaukee Valve Company, Inc.

   e. DeZURIK

   f. Fabri-Valves

   g. Mueller Company

   h. NIBCO, Inc.

4. Butterfly valve manufacturers shall be the following or equal:

   a. Bray Series 31 Electric Actuated Lug-Style Butterfly Valves for automatic valves

   b. Bray Series 31 Lug-Style for manual valves

5. The backwash pumps shall be manufacturer's standard and controlled by the supplier's control panel.

6. Filtering shall not be interrupted during normal backwashing and sludge discharge.

7. Each filter shall include backwash control valves and sludge valves as required for automated operation. If applicable, valves shall be 2-inch, 3-piece, grooved or flanged end, 351 CF8M stainless steel body, Type 316 stainless steel ball and stem, full port, installed with cast iron Victaulic couplings and open/close service electric actuator. Valve actuator shall include a compartment heater and thermostat with limit switch feedback to the microprocessor in both the open and closed positions.

C. Swivel Joints

1. If applicable, swivel joints shall be designed to allow rotation of the backwash assembly and center shaft during the backwash cycle.

2. Construction of the swivel joints shall be 304 stainless steel with a permanently lubricated bearing designed for submerged service. Stainless steel shafts shall be precision ground with the machined bearing to insure a precise tolerance.

D. Level Transmitter: A submersible pressure transducer shall be supplied for each filter basin. The pressure transducer shall have stainless steel wetted parts and provide a 4-20 mA signal. Units shall monitor the water level in the filter basin. Pressure transducer shall be provided with a mounting bracket and Type 316 stainless steel anchors. Electrical connection shall be 2-wire, loop powered through a shielded integral cable. The CONTRACTOR shall provide junction box, bellows mounting and interconnecting wiring. Transducers shall be the following or equal:

1. KPSI Model 710 series

2. Endress + Hauser FMX 21 series

3. Rosemount model 3051

E. High Level Switch: A high level mechanical float switch shall be provided to indicate level in the filter modules. Mercury switches are not acceptable. The switch shall be the following or equal:

1. MAGNETROL T20-4 or T21-4

2. Madison M5600

F. Control System: Each disk filter shall have its own control system and shall be supplied by the FSS. The automatic and manual controls for operation of the filter system shall be furnished fully assembled, wired, and pre-programmed in a stainless steel NEMA 4X rated control enclosure. The control system, including equipment, enclosures, and display screens shall be suitably designed for indoor installation in the ambient environment. Controls shall be provided to control and monitor equipment as indicated. The control panel shall be suitable for connection to a single 480 volt, 3 phase, 60 Hz power supply, and shall be equipped with a main circuit breaker disconnect switch, full voltage non-reversing NEMA-

rated motor starters, control power transformer, power supplies, and other controls required for a complete and operating system. The control panel shall be equipped with transient voltage surge protection, voltage imbalance protection, motor overload protection, and phase loss protection.

G. Programmable Logic Controller: Automatic operation of the filter shall be controlled through a programmable logic controller (PLC) mounted inside each filter local control panel. The control panel shall be equipped with a PLC suitable for control and protection of the filter systems. PLC shall be an Allen-Bradley 1769 Compactlogix PLC with I/O modules as required by the application. The filter system shall provide hardware I/O points to wire into the plant PLC system to allow for the following data and alarms to be taken directly from the filter controller and imported to the plant PLC and SCADA networks.

1. Status signals

    a. Filter on-line status.

    b. Filter in backwash status.

2. Alarm signals

    a. Filter high level alarm.

    b. Filter drive failure alarm.

    c. Backwash pump failure alarm.

3. The CONTRACTOR shall require the filter manufacturer to coordinate its WORK so that the filter controls are fully integrated with the plant PLC and SCADA system.

H. Operator Interface Terminal: The control system shall be equipped with an operator interface that provides control display screens for the operator to monitor and control filter status, setpoint, and alarm information.

1. The interface shall allow the operator to adjust the following operating parameters:

    a. Time of day, date, year

    b. Backwash interval

    c. Backwash duration

    d. Sludge waste interval

    e. Sludge waste duration

    f. Number of backwashes between sludge wasting

2. The interface shall provide information to assist the operator in assessing the status of the filter system. The interface screen shall display, at minimum, the following parameters:

a. Time of day, date, year

b. Water level in the filter

c. Time since last backwash

d. Time since last sludge withdrawal

e. Elapsed time on the drive motor

f. Elapsed time on the backwash pump

g. Total backwash time

h. Total sludge withdrawal time

3. The interface shall display the alarm history. The alarm history shall include the time and date of the most recent 25 alarms along with the description each alarm. The interface shall also display current alarms, including the date, time, and a description of each alarm. As a diagnostic aid to the operator, the interface shall display the time between backwashes for the most recent 40 backwashes.

I. Filter Supports, Walkways, Handrails and Stairs: Shall be designed and provided by others.

J. The filter supplier shall provide appropriate supports to support backwash piping and utility water piping.

K. Fiberglass Removable Cover: Not required, filters to be located in a covered building designed and provided by others

L. Spare Parts: The CONTRACTOR shall provide spare parts suitably packaged and labeled. As a minimum, the spare parts shall include:

1 spare cloth per complete disk or wedges of a cloth for a complete disk per train	Filter cloths
1	Filter media support frame
1	Viton V-ring effluent port \ centertube seal
1	Actuated valve of each size if applicable

2.4 FILTER MANUFACTURERS

A. Aqua-Aerobic Systems, Inc.

B. Five Star Filtration, LLC.

C. Nexom.

PART 3 -- EXECUTION

3.1 INSTALLATION

A. Installation shall be per the manufacturer's printed recommendations and as indicated. Installation shall be under the supervision of a qualified manufacturer representative.

3.2 START-UP SUPERVISION AND INSTRUCTION

A. The equipment manufacturer shall furnish the services of a factory trained representative for a minimum of 3 trips and six 8-hour Days at the Site to inspect the installation, supervise the initial operation of the equipment, instruct the plant operating personnel in proper operation and maintenance, and provide process assistance during performance testing.

B. The Technical Manual shall be furnished at least 60 Days prior to startup.

3.3 FIELD TESTING

A. Testing: In conjunction with the requirements of Section 01 91 14 – Equipment Testing and Startup, a Performance Test shall be performed once the filters are installed. The CONTRACTOR shall send a 5-gallon filter influent sample to the filter manufacturer a minimum of 2 weeks prior to onsite sampling. This sample will provide the manufacturer a representative sample to perform a laboratory filterability test. Testing shall be conducted by the CONTRACTOR through a testing laboratory approved by the ENGINEER prior to testing. The ENGINEER shall be notified at least 3 Days before the start of any test.

1. Hydraulic Loading Test

a. In separate tests, each filter module shall be loaded continuously at the peak flow rate of 2.0 mgd for a continuous 4-hour period. The effluent turbidity shall not exceed an average of 2 NTU over the testing period. If the filter does not meet this performance requirement, the filter shall be inspected, tuned, and retested. The Performance Testing below shall not commence until the requirements of this test have been satisfied by each of the filter modules.

b. Effluent water quality shall be monitored and reported by a continuous online turbidimeter that draws a sample from the filter effluent chamber. The turbidimeter shall be calibrated immediately before the start of the test.

2. Performance Test

a. Influent water quality: The performance test shall be conducted on each filter module using plant secondary effluent after the plant processes have stabilized and the plant is operating normally. Test duration for each module shall be 8 continuous hours at a flow rate of 1.0 to 2.0 mgd with at least 2 continuous hours at 2.0 mgd. The average filter influent TSS concentration will not exceed 20 mg/l during the test period. Composite one liter TSS samples will be taken every hour. A TSS analysis for each sample shall be performed by a certified lab.

b. Effluent water quality: Effluent water quality will be monitored and reported by a continuous online turbidimeter that draws a sample from the Reuse Pump Station Wet Well. The turbidimeter shall be calibrated immediately before the start of the test.

3. Performance test outcome: The performance test will result in one of 3 outcomes, pass, fail, or process upset. These are described below as well as follow-up procedures for each outcome.

   a. Pass: The pass outcome demonstrates that the filters met the required turbidity requirements during the performance test period with no filter equipment failure during the test. The follow-up for this outcome is to draft the Performance Test Report defined below.

   b. Fail: If the filter was unable to meet the effluent requirements with all influent water quality requirements satisfied, the CONTRACTOR may conduct a maximum of 2 additional performance tests. If the filters fail either of those tests, they will be considered defective WORK.

   c. Process Upset: If there is a process upset that compromises the influent water quality and interrupts the performance test, the upset shall be noted and documented in the Performance Test Report. The tests shall be repeated after process stability is reestablished.

4. Performance test report: A performance test report shall be drafted to describe the results of each performance test conducted. The report shall include the following:

   a. Title Page

   b. Table of Contents

   c. Executive Summary: This section shall contain a brief introduction describing the purpose of the test. The summary shall also include the flow rate and resulting hydraulic loading rate, average influent TSS concentration (mg/l), average effluent turbidity values (NTU), volume of the waste washwater as percent of influent flow as well as total number of waste washwater cycles. A graph shall show both influent TSS (mg/l) and effluent turbidity versus time. A general statement comparing the overall performance of the filters to the requirements shall also be included.

   d. Hydraulic Loading Rate: The flow rate (mgd) and hydraulic loading rate (gpm/ft^2) shall be discussed in this section. Average turbidity results shall be presented. Flow data will be included in the Appendix. The results of the hydraulic loading test shall be presented and discussed.

   e. TSS data: This section shall display the influent TSS values (mg/l) graphically over the test period. The lab reports shall be included in an Appendix. A brief narrative about the data shall also be part of this section.

   f. Turbidity data: This section shall present graphically the continuous turbidity measurements (influent and effluent) over the performance test time period. A graph shall also be included showing both influent TSS (mg/l) and effluent

turbidity versus time. The reported effluent turbidity will be measured by the turbidimeter located at the Reuse Pump Station Wet Well. A brief narrative about the turbidity data shall be given in this section as well. The rate of chemical addition shall be included in the report.



g. Waste washwater: The volume of waste washwater as percent of influent flow shall be presented in this section. The number of waste washwater cycles and a brief narrative describing the overall effectiveness of the cycle shall also be given in this section.



h. Overall performance: This section shall describe the reason for any performance test restarts resulting from either test fail outcomes or process upsets. The section will also provide a general summary of the overall performance of the filters and any problems that were encountered during the testing.



i. Appendix: The Appendix shall contain continuous influent flow data and graph, as well as the certified lab data and reports and any other important information pertaining to the performance test not already included in the report.

END OF SECTION

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Aqua-Aerobic Systems, Inc.

Exceptions / Clarifications Document: 3/1/22

Project: MAGNA WRF, UT

The following clarifications apply to Aqua-Aerobic Systems, Inc.'s offering:

1) **Reference: Section 46 61 25 Cloth Media Filters**

   2.3 Design and Construction. A.2 Drive Assembly:"The chain shall be nylon with Type 316 Stainless steel pins".

   Aqua's Exception/Clarification
   Aqua-Aerobic Systems would like to clarify that we will provide an acetal chain in lieu of a nylon chain.

2) **Reference: 00 80 00 SUPPLEMENTARY CONDITIONS**
   SC-4.02.G.1.
   SC-4.02.H.2.

   SC-4.02.G.1. .with respect to insurance required by Paragraphs SC-4.02.F.3 through SC-4.02.F.6 inclusive, include as additional insureds (subject to any customary exclusion in respect of professional liability) Buyer, Engineer, their consultants, all of whom shall be listed as additional insureds....

   SC-4.02.H.2. Seller's General Liability under Paragraphs SC-4.02.F.3 through F.6 which shall include completed operations and product liability coverages, and eliminate the exclusion with respect to property under the care, custody and control of Seller"

   Aqua's Exception/Clarification
   SC-4.02.G.1. We clarify Aqua-Aerobic insurance includes blanket policy endorsements for additional insured coverage. These blanket endorsement(s) state "Where Required by written Contract" in lieu of listing the specific additional insured names.

   SC-4.02.H.2. We clarify Aqua-Aerobic insurance will not include the "eliminate the exclusion with respect to property under the care, custody and control of Seller". We confirm the goods are fully insured by Aqua-Aerobic until risk of loss transfers to the Buyer in accordance with General Condition 6.03.

3) **Reference: 00 40 00 BID FORM**
   ARTICLE 5 - BASIS OF BID,
   Item 3. Sales Tax
   Addendum 1 - CLARIFICATIONS 1.

   3. Sales Tax on Filter Equipment (Item 2)

   Addendum 1, CLARIFICATIONS 1; Response - Taxes are only to be applied to equipment that is provided by the Bidder.

   Aqua's Exception/Clarification
   We clarify it is our understanding the tax code requires taxes to be applied to all items except freight to jobsite and field services because the engineering in item 1 is required in order to produce the tangible personal property (i.e. the equipment). Aqua-Aerobic has applied 7.25% sales tax to the engineering and equipment excluding only freight to jobsite and field services.

4) **Reference: 00 52 00 AGREEMENT**
   ARTICLE 10, 10.01.a.9.c.

   c. Sellers Bid, solely as to the prices set forth therein.

Aqua-Aerobic Systems, Inc.

Exceptions / Clarifications Document: 3/1/22

Project: MAGNA WRF, UT

Aqua's Exception/Clarification

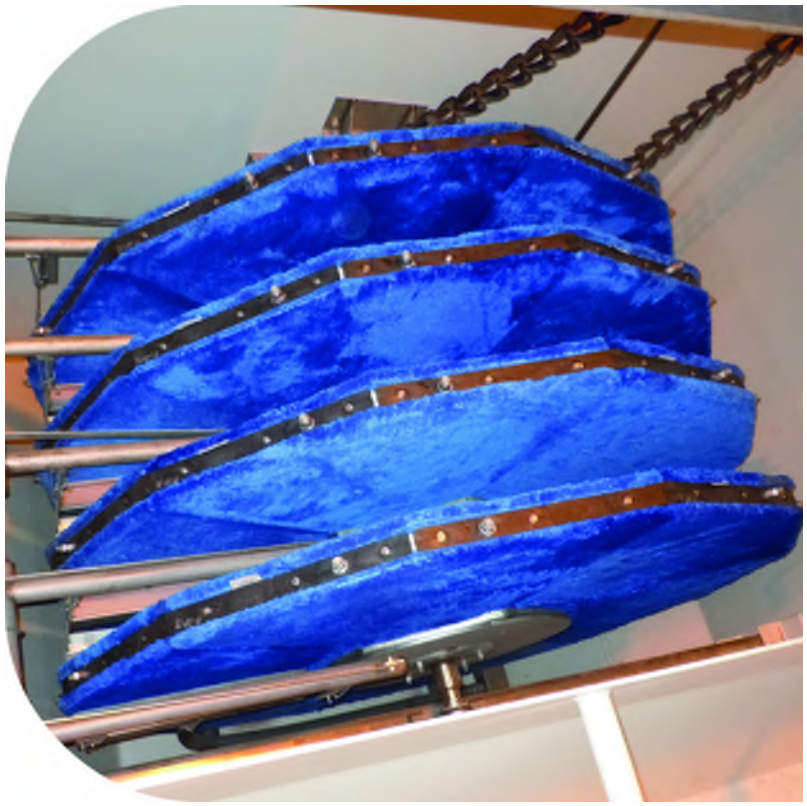
We clarify Aqua-Aerobic Systems, Inc. offer is as described in our proposal package, including all documents listed on the Table of Contents. Therefore, we request Seller's Bid package form an Exhibit to the Agreement.

AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

Process Design Report

MAGNA WWTP, UT

Design# 167138
Option: Bid Design



AquaDisk®

Cloth Media Filter

March 24, 2021
Designed By: Jonathon Kelsey

6306 N. Alpine Rd Loves Park, IL 61111
(815) 654-2501 www.aqua-aerobic.com

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Design Notes

Process/Site

- The average and maximum design flow and loading conditions, shown within the report, are based on maximum month average and peak hour conditions, respectively.

Filtration

- The cloth media filter recommendation and anticipated effluent quality are based upon influent water quality conditions as shown under "Design Parameters" of this Process Design Report.

- The filter influent should be free of algae and other solids that are not filterable through a nominal 5 micron pore size media. Provisions to treat algae and condition the solids to be filterable are the responsibility of others.

Equipment

- Scope of supply includes freight, installation supervision and start-up services.

- Equipment selection is based upon the use of Aqua-Aerobic Systems' standard materials of construction and electrical components, suitable for non-classified electrical environments.

- Aqua-Aerobic Systems, Inc. is familiar with various “Buy American” Acts (i.e. AIS, ARRA, Federal FAR 52.225, EXIM Bank, USAid, PA Steel Products Act, etc.). As the project develops Aqua-Aerobic Systems can work with you to ensure full compliance of our goods with various Buy American provisions if they are applicable/required for the project. When applicable, please provide us with the specifics of the project’s “Buy American” provisions.

- If the cloth media filter will be offline for extended periods of time, protection from sunlight is required.

AquaDisk® Tertiary Filtration - Design Summary - Initial Design Conditions

DESIGN INFLUENT CONDITIONS

Pre-Filter Treatment: Secondary

Avg. Design Flow	= 2.00 MGD	= 1388.89 gpm	= 7570.82 m³/day
Max Design Flow	= 4.00 MGD	= 2777.78 gpm	= 15141.65 m³/day

DESIGN PARAMETERS	Influent	mg/l	Effluent Required	<= mg/l	Effluent Anticipated	<= mg/l
Avg. Total Suspended Solids:	TSSa	10	TSSa	5	TSSa	5
Max. Total Suspended Solids:	TSSm	20	--	--	--	--
***Turbidity:**	--	--	NTU	2	NTU	2

*Note: Tubidity represented in Nephelometric Turbidity Units (NTU's) in lieu of mg/l.

AquaDisk FILTER RECOMMENDATION

Qty Of Filter Units Recommended	= 2
Number Of Disks Per Unit	= 6
Total Number Of Disks Recommended	= 12
Total Filter Area Provided	= 645.6 ft² = (59.98 m²)
Filter Model Recommended	= AquaDisk Concrete: Model ADFSC-54 x 6E-PC
Filter Media Cloth Type	= OptiFiber PES-14®

AquaDisk FILTER CALCULATIONS

Filter Type:

Vertically Mounted Cloth Media Disks featuring automatically operated vacuum backwash.

Average Flow Conditions:

Average Hydraulic Loading = Avg. Design Flow (gpm) / Recommended Filter Area (ft²)
= 1388.9 / 645.6 ft²
= 2.15 gpm/ft² (5.26 m/hr) at Avg. Flow

Maximum Flow Conditions:

Maximum Hydraulic Loading = Max. Design Flow (gpm) / Recommended Filter Area (ft²)
= 2777.8 / 645.6 ft²
= 4.30 gpm/ft² (10.52 m/hr) at Max. Flow

Solids Loading:

Solids Loading Rate = (lbs TSS/day at max flow and max TSS loading) / Recommended Filter Area (ft²)
= 667.2 lbs/day / 645.6 ft²
= 1.03 lbs. TSS /day/ft² (5.04 kg. TSS/day/m²)

The above recommendation is based upon the provision to maintain a satisfactory hydraulic surface loading at 50% of the Maximum Design Flow with (1) unit out of service. The resultant hydraulic loading rate at 50% of the Maximum Design Flow is: 4.3 gpm / ft² = (10.5 m/hr)

AquaDisk® Tertiary Filtration - Design Summary - Buildout Design Conditions

DESIGN INFLUENT CONDITIONS

Pre-Filter Treatment: Secondary

Avg. Design Flow	= 2.33 MGD	= 1614.58 gpm	= 8801.08 m³/day
Max Design Flow	= 4.65 MGD	= 3229.17 gpm	= 17602.16 m³/day

DESIGN PARAMETERS

	Influent	mg/l	Effluent Required	<= mg/l	Effluent Anticipated	<= mg/l
Avg. Total Suspended Solids:	TSSa	10	TSSa	5	TSSa	5
Max. Total Suspended Solids:	TSSm	20	--	--	--	--
***Turbidity:**	--	--	NTU	2	NTU	2

*Note: Tubidity represented in Nephelometric Turbidity Units (NTU's) in lieu of mg/l.

AquaDisk FILTER RECOMMENDATION

Qty Of Filter Units Recommended	= 2
Number Of Disks Per Unit	= 6
Total Number Of Disks Recommended	= 12
Total Filter Area Provided	= 645.6 ft² = (59.98 m²)
Filter Model Recommended	= AquaDisk Concrete: Model ADFSC-54 x 6E-PC
Filter Media Cloth Type	= OptiFiber PES-14®

AquaDisk FILTER CALCULATIONS

Filter Type:

Vertically Mounted Cloth Media Disks featuring automatically operated vacuum backwash.

Average Flow Conditions:

Average Hydraulic Loading = Avg. Design Flow (gpm) / Recommended Filter Area (ft²)
= 1614.6 / 645.6 ft²
= 2.50 gpm/ft² (6.11 m/hr) at Avg. Flow

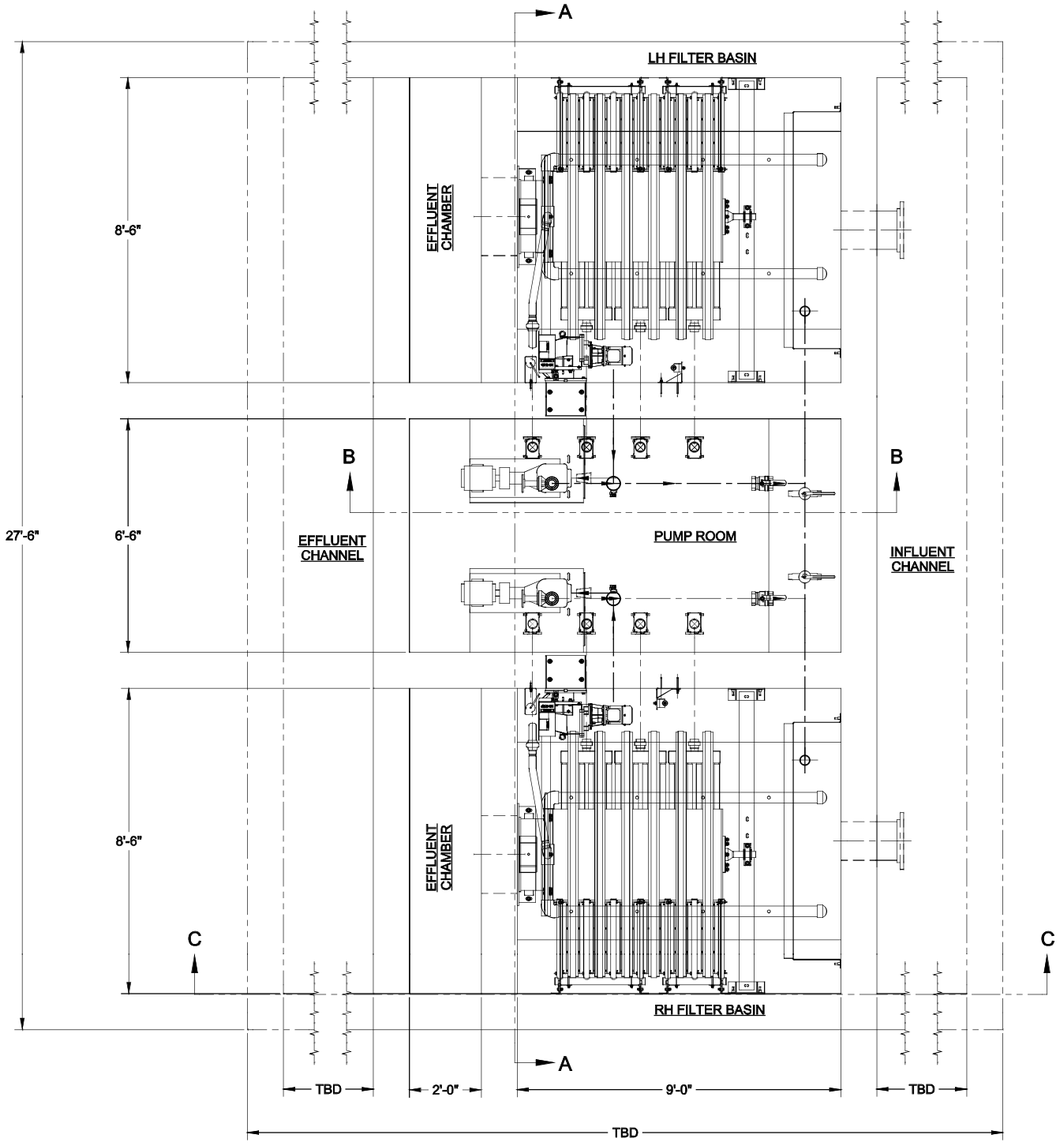
Maximum Flow Conditions:

Maximum Hydraulic Loading = Max. Design Flow (gpm) / Recommended Filter Area (ft²)
= 3229.2 / 645.6 ft²
= 5 gpm/ft² (12.23 m/hr) at Max. Flow

Solids Loading:

Solids Loading Rate = (lbs TSS/day at max flow and max TSS loading) / Recommended Filter Area (ft²)
= 775.6 lbs/day / 645.6 ft²
= 1.20 lbs. TSS /day/ft² (5.86 kg. TSS/day/m²)

The above recommendation is based upon the provision to maintain a satisfactory hydraulic surface loading at 50% of the Maximum Design Flow with (1) unit out of service. The resultant hydraulic loading rate at 50% of the Maximum Design Flow is: 5 gpm / ft² = (12.2 m/hr)



ITEM WEIGHTS
EFFLUENT SEAL PLATE = 217 LBS.
CENTERTUBE = 829 LBS.
INFLUENT WEIR WELDMENT = 367 LBS.
DRIVE MOTOR ASSEMBLY = 249 LBS.
DISK SEGMENT ASSEMBLY = 24 LBS.
PUMP WITH MOTOR MOUNTED ON BASE = 200 LBS.
WALL MOUNT PUMP BASE = 234 LBS.

1. DRAWING FOR REFERENCE ONLY.
   ALL WALLS ARE SHOWN AT 1'.
   ALL DIMENSIONS TO BE VERIFIED BY CUSTOMER.

2. AQUA-AEROBIC SYSTEMS PROVIDES PUMPS AND VALVES LOOSE FOR INSTALLATION BY THE INSTALLING CONTRACTOR. ALL INTERCONNECTING PIPING, WIRING, AND WALL SPOOL PIPES ARE PROVIDED BY THE INSTALLING CONTRACTOR.

3. IF FREEZING IS A CONCERN, AQUA-AEROBIC SYSTEMS RECOMMENDS THE FILTERS BE PLACED IN A HEATED BUILDING. IF A BUILDING IS NOT PROVIDED, ANY NECESSARY PROTECTION, INCLUDING BUT NOT LIMITED TO, HEAT TRACING AND INSULATION OF PUMPS AND PIPING, AS WELL AS PROTECTION AGAINST INTERNAL TANK FREEZING, SHALL BE PROVIDED BY THE INSTALLING CONTRACTOR.

4. THE GRAPHIC ELEMENTS OF THIS COMPUTER GENERATED DRAWING ARE DRAWN FULL SIZE. THE DIMENSIONS ARE ASSOCIATIVE. IF THE SIZE OF THE GRAPHIC ELEMENTS IS CHANGED THE DIMENSIONS WILL NOT BE CORRECT.

5. TBD THE INFLUENT AND EFFLUENT CHANNELS TO BE SIZED BY THE INSTALLING CONTRACTOR BASED ON THE PLANT FLOW.

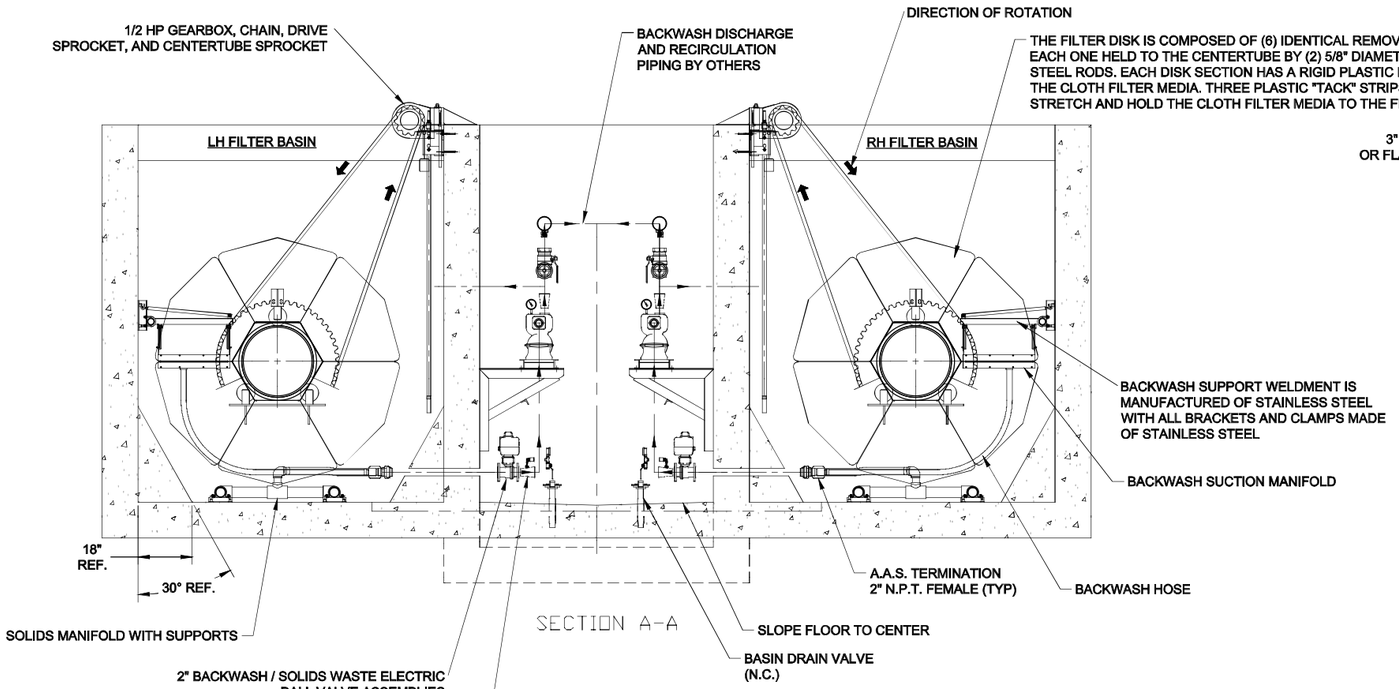
6. AN INFLUENT VALVE IS REQUIRED FOR ISOLATION / MAINTENANCE OF EACH FILTER UNIT. INFLUENT VALVES SHALL BE PROVIDED BY OTHERS AND INSTALLED BY OTHERS.

7. WALL SPOOL PIPING SHALL BE STAINLESS STEEL. PROVIDED BY OTHERS AND INSTALLED BY OTHERS.

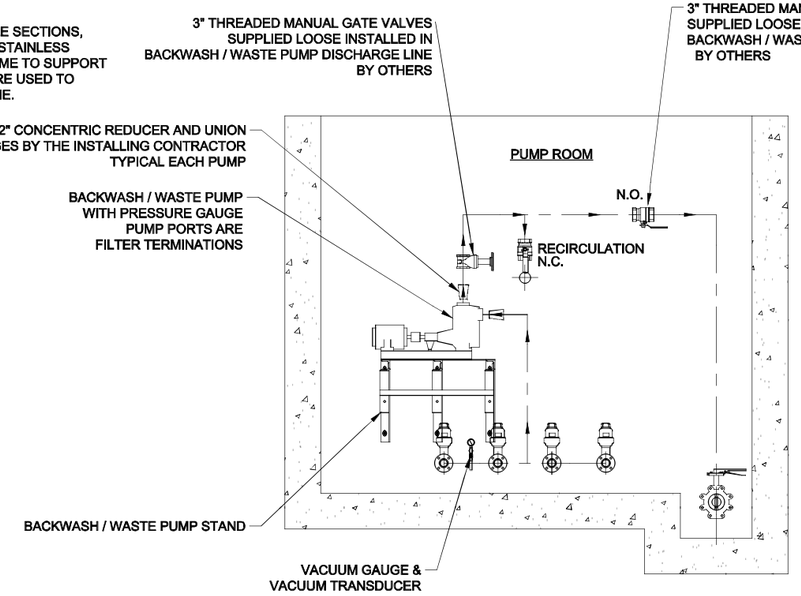
NOT FOR CONSTRUCTION

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JOB LOCATION:					
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					UNLESS OTHERWISE SPECIFIED: FRACTIONAL DIMENSIONS +/- 1/16; ALL TWO PLACE DECIMALS +/- 0.010; ALL THREE PLACE DECIMALS +/- 0.005; ALL ANGLES +/- 1/2°; ANSI
					MATERIAL:
					SIMILAR TO:
					TYPE:
					DRAWN BY: SLT — DATE: 3-29-2011
					CHECKED BY: — DATE:
REV	ERN / ECO	DATE	BY	REVISION DESCRIPTION	WEIGHT: — SHEET: 1 OF 4
DRAWING NAME: AQUADISK FILTER MODEL ADFSC-54 X 6E-PC					DRAWING NUMBER: 2801945 — SCALE: — SIZE: D

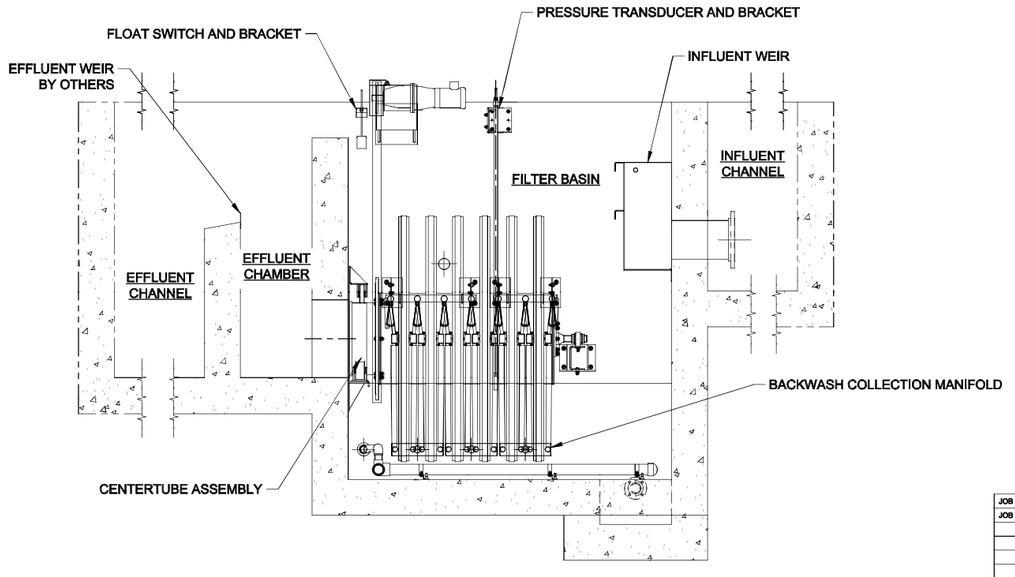
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SECTION A-A



SECTION B-B



SECTION C-C

1 ALL PIPING AND FITTINGS SHALL BE PROVIDED BY OTHERS ACTUAL PIPING LAYOUT AND PUMP LOCATION TO BE DETERMINED BY OTHERS WHEN THREADED OR WELDED PIPE IS USED IN LIEU OF FLANGED PIPE, UNIONS SHALL BE USED AT EACH PUMP AND VALVE CONNECTION TO FACILITATE SERVICE.

2 2 H.P. BACKWASH / WASTE PUMP CONNECTIONS ARE 2" N.P.T. BACKWASH / WASTE PIPING IS 3" DIAMETER. 3" TO 2" CONCENTRIC REDUCER FITTINGS SHALL BE PROVIDED AND INSTALLED BY OTHERS AT EACH PUMP PORT.

3 THE BACKWASH / WASTE PUMP CAPABILITIES ARE AS FOLLOWS:

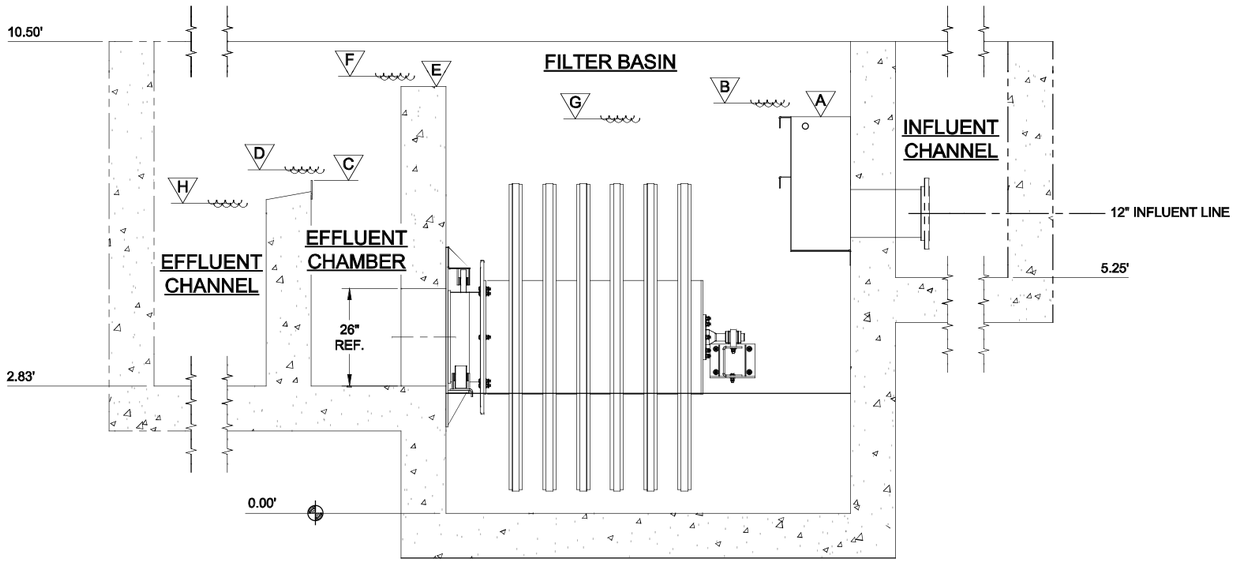
- HORSEPOWER: 2 HP
- FLOW: 130 GPM
- TOTAL DYNAMIC HEAD: 23.2 FT
- ALLOWABLE DISCHARGE HEAD, AFTER FILTER LOSSES: 12 FT

FOR INSTALLATIONS THAT REQUIRE MORE DISCHARGE HEAD, ALTERNATIVE PUMPS ARE AVAILABLE. PLEASE CONSULT ENGINEERING TO VERIFY THE SUITABILITY OF THE DISCHARGE PIPING OR FOR SPECIAL PUMP REQUIREMENTS.

NOT FOR CONSTRUCTION

JOB NAME:					AQUA-AEROBIC SYSTEMS, INC.	
JOB LOCATION:						
					DO NOT SCALE DRAWING	UNLESS OTHERWISE SPECIFIED: FRACTIONAL DIMENSIONS +/- 1/16; ALL TWO PLACE DECIMALS +/- 0.010; ALL THREE PLACE DECIMALS +/- 0.005; ALL ANGLES +/- 1/2°; ANSI
					MATERIAL:	
					SIMILAR TO:	
					TYPE:	
					DRAWN BY: SLT	DATE: 3-29-2011
					CHECKED BY:	DATE:
REV	ERN / ECO	DATE	BY	REVISION DESCRIPTION	WEIGHT:	SHEET: 2 OF 4
DRAWING NAME: AQUADISK FILTER MODEL ADFSC-54 X 6E-PC					DRAWING NUMBER: 2801945	SCALE: SIZE: D

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ELEVATION

A	8.82'	INFLUENT WEIR ELEVATION
B	9.05'	NAPPE OVER INFLUENT WEIR AVERAGE FLOW
	9.18'	NAPPE OVER INFLUENT WEIR MAXIMUM FLOW
C	7.41'	EFFLUENT WEIR ELEVATION
D	7.59'	NAPPE OVER EFFLUENT WEIR AVERAGE FLOW
	7.70'	NAPPE OVER EFFLUENT WEIR MAXIMUM FLOW
E	9.50'	OVERFLOW WEIR ELEVATION
F	9.69'	NAPPE OVER OVERFLOW WEIR AVERAGE FLOW
	9.80'	NAPPE OVER OVERFLOW WEIR MAXIMUM FLOW
G	8.78'	BACKWASH START LEVEL
H	6.91'	MAXIMUM AVAILABLE LIQUID LEVEL FOR EFFLUENT CONVEYANCE

HYDRAULIC PROFILE
BASED UPON AVERAGE FLOW RATE OF 3.25 GPM PER SQUARE FOOT (1.5 MGD)
BASED UPON MAXIMUM FLOW RATE OF 6.5 GPM PER SQUARE FOOT (3.0 MGD)

WEIR LENGTHS
INFLUENT = 6.58'
EFFLUENT = 8.50'
OVERFLOW = 8.50'

NOT FOR CONSTRUCTION

JOB NAME:
JOB LOCATION:

AQUA-AEROBIC SYSTEMS, INC.

DO NOT SCALE DRAWING

UNLESS OTHERWISE SPECIFIED
FRACTIONAL DIMENSIONS +/- 1/16
ALL TWO PLACE DECIMALS +/- 0.010
ALL THREE PLACE DECIMALS +/- 0.005
ALL ANGLES +/- 1/2°
ANSI

MATERIAL:
SIMILAR TO:
TYPE:
DRAWN BY: SLT DATE: 3-29-2011
CHECKED BY: DATE:
WEIGHT: SHEET: 3 OF 4

REV	ERN / ECO	DATE	BY	REVISION DESCRIPTION

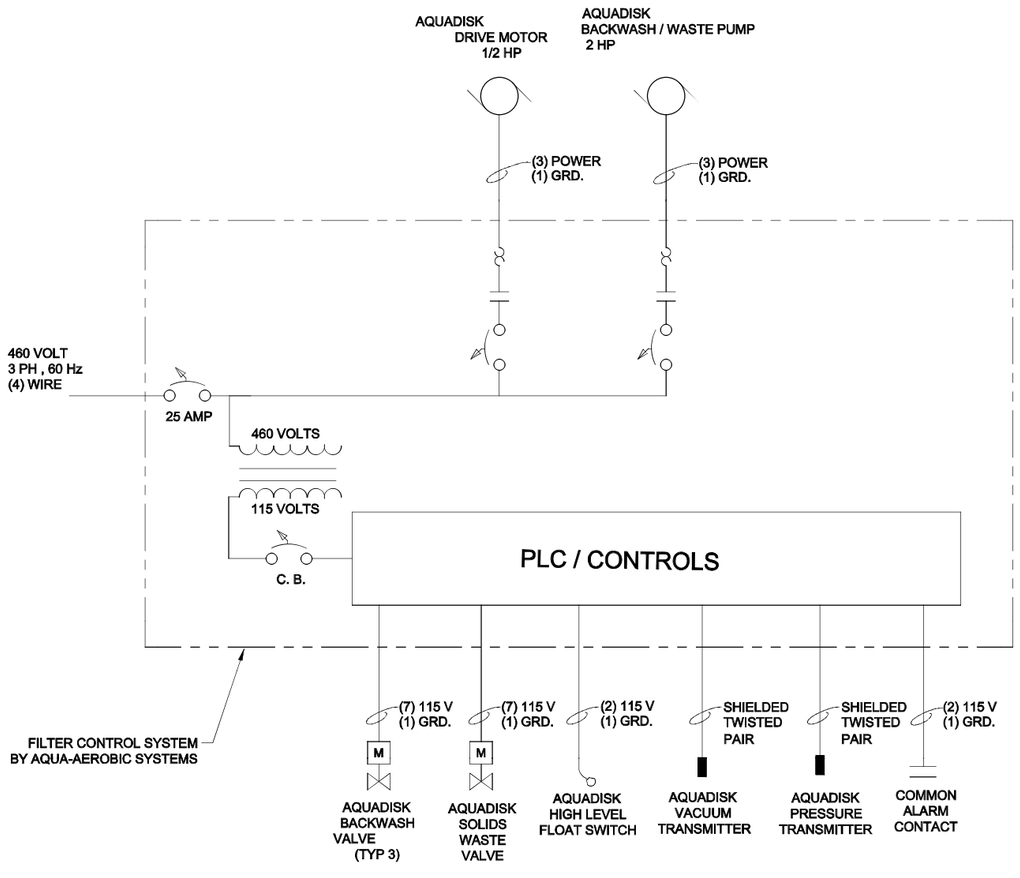
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SIZE: D

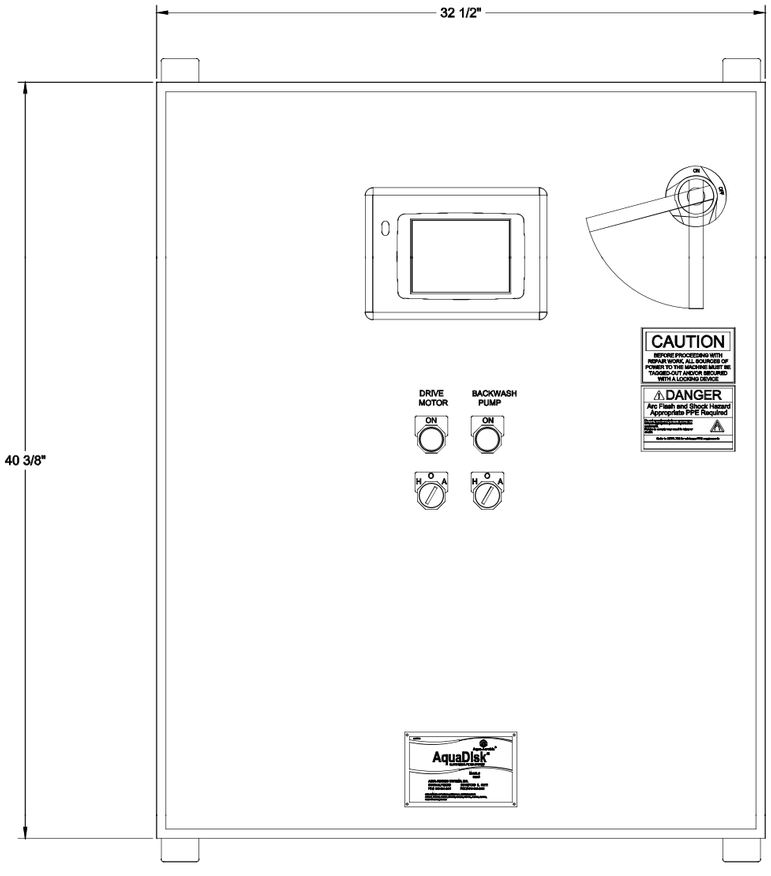
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SYMBOL KEY

	MOTOR		CIRCUIT BREAKER		ELECTRICAL DISCONNECT	VFD	VARIABLE FREQUENCY DRIVE		TRANSDUCER		STARTER CONTACTOR
M	MOTOR OPERATED VALVE		TRANSFORMER		MOTOR OVERLOAD	P	PNEUMATIC OPERATED VALVE		FUSE		FLOAT SWITCH

NOTE: SOME SYMBOLS MAY NOT BE APPLICABLE





1 CONTROL PANEL
ENCLOSURE NEMA 4X WALL MOUNTED TYPE FIBERGLASS
FACTORY ASSEMBLED AND SHIPPED LOOSE. INSTALLED BY OTHERS.
MUST BE LOCATED WITHIN 50 FEET OF THE PRESSURE TRANSMITTER.
FACING NORTH TO LIMIT THE H.M.I. EXPOSURE TO DIRECT SUNLIGHT.
FLOOR MOUNTING IS AVAILABLE WITH STEEL OR STAINLESS STEEL ENCLOSURES.

2 STANDARD CONTROL PANEL SIZE
40" HEIGHT X 32" WIDE X 12" DEEP

3 (1) CONTROL PANEL PER FILTER

NOT FOR CONSTRUCTION

JOB NAME:
JOB LOCATION:

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DO NOT SCALE DRAWING

UNLESS OTHERWISE SPECIFIED
FRACTIONAL DIMENSIONS +/- 1/16
ALL TWO PLACE DECIMALS +/- 0.010
ALL THREE PLACE DECIMALS +/- 0.005
ALL ANGLES +/- 1/2°
ANSI

MATERIAL:
SIMILAR TO:
TYPE:
DRAWN BY: SLT DATE: 3-29-2011
CHECKED BY: DATE:
WEIGHT: SHEET: 4 OF 4

REV	ERN / ECO	DATE	BY	REVISION DESCRIPTION

DRAWING NAME: AQUADISK FILTER MODEL ADFSC-54 X 6E-PC
DRAWING NUMBER: 2801945
SCALE:
SIZE: D

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A Metawater Company

Cloth Media Filter Installations for Reuse

ALAFAYA UTILITIES **105984**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	02/07/2002
Avg. Daily Flow(MGD):	1
Max. Design Flow(MGD):	2
Equipment:	1 Tertiary Filter(s) 6/4 Disks,ADF Disk Package Filter(s),Classic,Model 54,PS Package

ALEXANDER AVE-DELTONA FL **112282A**

Waste Characteristics:	Municipal / Domestic
StartUp Date:	12/13/2018
Equipment:	2 Tertiary Filter(s) 8 Disks,ADF Disk Package Filter(s),PES-14

ANASTASIA ISLAND WRF FL **113984**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	Reuse / TSS / NTU
StartUp Date:	05/03/2018
Equipment:	2 Tertiary Filter(s) 8/4 Disks,ADF Disk Concrete Filter(s),Model 54,PES-14

APALACHICOLA (CITY OF) WWTP IMPROVEMENTS **105836/A**

Waste Characteristics:	Municipal / Domestic
StartUp Date:	08/01/2001
Avg. Daily Flow(MGD):	1
Max. Design Flow(MGD):	2
Equipment:	1 Tertiary Filter(s) 6 Disks,ADF Disk Package Filter(s),Classic,Model 54,PES-13,PS Package

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AQUA UTILITIES SO. SEAS PLANTATION RESORT, FL **107636**

Waste Characteristics:	Municipal / Resort
Treatment Objective:	TSS
StartUp Date:	01/03/2007
Avg. Daily Flow(MGD):	0.264
Max. Design Flow(MGD):	0.66
Equipment:	2 Tertiary Filter(s) 6 Disks,ADF Disk SS Package Filter(s),Model 12,PA2-

ASANTE WRF, AZ - SPA II (PHASE 1) **108286**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	08/16/2007
Avg. Daily Flow(MGD):	1.2
Max. Design Flow(MGD):	2.4
Equipment:	2 Tertiary Filter(s) ADF Disk Concrete Filter(s)

ATWATER BERT CRANE WWTP, CA **110199**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	01/26/2012
Avg. Daily Flow(MGD):	6
Max. Design Flow(MGD):	11.2
Equipment:	3 Tertiary Filter(s) ADF Disk SS Package Filter(s)

AUSTIN RANCH, SURPRISE WRF SPA III PH 1, AZ **108327**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	11/05/2008
Avg. Daily Flow(MGD):	1.8
Max. Design Flow(MGD):	3.6
Equipment:	3 Tertiary Filter(s) ADF Disk Concrete Filter(s)

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BAKERSFIELD WWTP NO3 2007 EXP, CA **102346C**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	02/19/2010
Avg. Daily Flow(MGD):	2
Max. Design Flow(MGD):	2
Equipment:	1 Tertiary Filter(s) ADF Disk Concrete Filter(s)

BAYOU MARCUS WRF, FL **108435**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	06/24/2008
Avg. Daily Flow(MGD):	8.2
Max. Design Flow(MGD):	18
Equipment:	2 Tertiary Filter(s) (8) Laterals,40' Long,ADIFC AquaDiamond Concrete

BERMUDA (SOUTH) WRF FILTER EXP. (TOHO), FL **107263**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	11/16/2006
Avg. Daily Flow(MGD):	8
Max. Design Flow(MGD):	13.2
Equipment:	4 Tertiary Filter(s) 12 Disks,ADF Disk Concrete Filter(s),Classic,Model

BLOUNTSTOWN WWTP **105166**

Waste Characteristics:	Municipal / Domestic
StartUp Date:	10/25/1998
Max. Design Flow(MGD):	3
Equipment:	2 Tertiary Filter(s) ADF Disk Package Filter(s)

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BODEGA BAY **103441a**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	10/22/2003
Avg. Daily Flow(MGD):	0.928
Max. Design Flow(MGD):	1.858
Equipment:	1 Tertiary Filter(s) ADF Disk SS Package Filter(s)

BONIFAY WWTP CITY OF UPGRADE FL **103506G**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	02/27/2013
Avg. Daily Flow(MGD):	1.4
Max. Design Flow(MGD):	3.5
Equipment:	2 Tertiary Filter(s) 8 Disks,Classic,Model 54,PES-13,PS Package

BONIFAY WWTP (CITY OF) **103506**

Waste Characteristics:	Municipal / Domestic
StartUp Date:	07/12/1990
Avg. Daily Flow(MGD):	0.55
Max. Design Flow(MGD):	2.5
Equipment:	1 Tertiary Filter(s) ADF Disk Package Filter(s)

BUCKEYE 3.0 MGD EXPANSION, AZ (CENTRAL) **107006**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	02/26/2007
Avg. Daily Flow(MGD):	3
Max. Design Flow(MGD):	8
Equipment:	3 Tertiary Filter(s) ADF Disk Concrete Filter(s)

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BUCKEYE WWTP PH2 EXP, AZ (CENTRAL) **107006B**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	04/06/2011
Avg. Daily Flow(MGD):	1.5
Max. Design Flow(MGD):	3.77
Equipment:	1 Tertiary Filter(s) ADF Disk Concrete Filter(s)

BULLHEAD CITY WWTP **106477**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	02/03/2005
Max. Design Flow(MGD):	3.6
Equipment:	1 Tertiary Filter(s) ADF Disk Package Filter(s)

BURNT STORE WWTP EXPANSION, FL **106377**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	05/19/2004
Avg. Daily Flow(MGD):	1
Max. Design Flow(MGD):	1.33
Equipment:	1 Tertiary Filter(s) 6/4 Disks,ADF Disk Package Filter(s),Classic,Model 54

CAMARILLO WWTP UPGRADES, CA **107007**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	12/06/2006
Avg. Daily Flow(MGD):	11.2
Max. Design Flow(MGD):	11.2
Equipment:	3 Tertiary Filter(s) ADF Disk SS Package Filter(s)

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CAMP PENDLETON WWTP, CA **106630**

Waste Characteristics:	Municipal / Domestic
StartUp Date:	05/19/2006
Avg. Daily Flow(MGD):	5
Max. Design Flow(MGD):	10
Equipment:	3 Tertiary Filter(s) ADF Disk Concrete Filter(s)

CANAL STREET WWTF UPGRADE, FL **100872B**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , Reuse
StartUp Date:	04/12/2007
Avg. Daily Flow(MGD):	3.5
Equipment:	1 Tertiary Filter(s) 6 Disks,Classic,Model 54,PES-13,SS Package

CASA GRANDE WRF PHASE 3 EXP, AZ **103585D**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	05/13/2011
Avg. Daily Flow(MGD):	12
Max. Design Flow(MGD):	24
Equipment:	6 Tertiary Filter(s) ADF Disk Concrete Filter(s)

CENTURY FL **106347B**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	10/04/2012
Avg. Daily Flow(MGD):	0.5
Max. Design Flow(MGD):	1
Equipment:	1 Tertiary Filter(s) 2 Disks,Classic,Model 54,PA2-13,PS Package

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CENTURY WWTP IMPROVEMENTS **106347**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	12/11/2003
Avg. Daily Flow(MGD):	0.5
Equipment:	1 Tertiary Filter(s) ADF Disk Package Filter(s)

CHARLOTTE COUNTY (WEST PORT) UTILITIES **105776**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , Reuse
StartUp Date:	09/04/2001
Avg. Daily Flow(MGD):	1
Equipment:	3 Tertiary Filter(s) ADF Disk Package Filter(s)

CHARLOTTE COUNTY UTIL (BURNT STORE) **106377A**

Waste Characteristics:	Municipal / Municipal
Treatment Objective:	TSS
Avg. Daily Flow(MGD):	1.5
Equipment:	1 Tertiary Filter(s) 2 Disks,PES-14

CHIQUITA WATER RECLAMATION PHASE III EXPANSION **101317c**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU , Reuse
StartUp Date:	06/11/2004
Avg. Daily Flow(MGD):	7.5
Max. Design Flow(MGD):	7.5
Equipment:	3 Tertiary Filter(s) ADF Disk Concrete Filter(s)

CHULUOTA WWTF EXPANSION, FL **107166**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	10/17/2006
Avg. Daily Flow(MGD):	1
Max. Design Flow(MGD):	2
Equipment:	1 Tertiary Filter(s) 4 Disks,ADF Disk Package Filter(s),Classic,PA2-13,PS

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CLEAR CREEK WWTF, CA **103657A**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	11/15/2012
Avg. Daily Flow(MGD):	9.4
Max. Design Flow(MGD):	24
Equipment:	5 Tertiary Filter(s) 12 Disks,Classic,Model 54,PA2-13,SS Package

COLUSA **107788**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	08/07/2008
Avg. Daily Flow(MGD):	1.26
Max. Design Flow(MGD):	1.26
Equipment:	2 Tertiary Filter(s) ADF Disk Concrete Filter(s)

CUDJOE KEY WWTP, FL **110307**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	04/29/2015
Avg. Daily Flow(MGD):	0.94
Max. Design Flow(MGD):	2.35
Equipment:	2 Tertiary Filter(s) 4 Disks,ADF Disk SS Package Filter(s),Model 54,PA2-13

D.C. TILLMAN WRF (CIP 6150), CA **106317E**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU , Reuse
StartUp Date:	04/21/2010
Avg. Daily Flow(MGD):	96
Max. Design Flow(MGD):	192
Equipment:	8 Tertiary Filter(s) ADIFC AquaDiamond Concrete Filter(s)

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DADE CITY UTILITY SYSTEM IMPROVEMENTS **106161**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	12/12/2002
Avg. Daily Flow(MGD):	2.79
Max. Design Flow(MGD):	5.58
Equipment:	2 Tertiary Filter(s) ADF Disk Package Filter(s),PES-13,SS Package

DEER CREEK WWTP, CA **106367**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	01/23/2004
Avg. Daily Flow(MGD):	3.6
Max. Design Flow(MGD):	10.3
Equipment:	2 Tertiary Filter(s) ADF Disk SS Package Filter(s)

DESERT DIAMOND CASINO AZ **111282**

Waste Characteristics:	Municipal / Resort
StartUp Date:	10/04/2010
Avg. Daily Flow(MGD):	0.025
Max. Design Flow(MGD):	0.055
Equipment:	1 Tertiary Filter(s) ADF Model 12 Disk SS Package Filter(s)

DESERT MTN AQUIFER STORAGE AND RECOVERY (AKA CAP) **106311**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	03/03/2004
Avg. Daily Flow(MGD):	2.125
Max. Design Flow(MGD):	4.25
Equipment:	3 Tertiary Filter(s) ADF Disk SS Package Filter(s)

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DUCK KEY WWTP IMPROVEMENTS, FL **105148A**

Waste Characteristics:	Municipal / Resort
Treatment Objective:	TSS
StartUp Date:	05/23/2011
Avg. Daily Flow(MGD):	0.273
Max. Design Flow(MGD):	0.342
Equipment:	2 Tertiary Filter(s) ADF Model 12 Disk SS Package Filter(s)

EAST LAKE TOHO RECLAIM AUGMENT, FL **107626**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	08/08/2007
Avg. Daily Flow(MGD):	5.5
Max. Design Flow(MGD):	11
Equipment:	2 Tertiary Filter(s) 12 Disks,ADF Disk SS Package Filter(s),Classic,Model

EL TORO WATER DISTRICT WATER RECYLING PLANT CA **101951B**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	10/14/2014
Avg. Daily Flow(MGD):	1.1
Max. Design Flow(MGD):	3.3
Equipment:	2 Tertiary Filter(s) 12/8 Disks,Model 54,PES-14,SS Package

ENGLEWOOD WATER DISTRICT **106327**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	10/13/2004
Avg. Daily Flow(MGD):	3
Max. Design Flow(MGD):	6
Equipment:	1 Tertiary Filter(s) ADF Disk SS Package Filter(s)

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EUSTIS WWTP **102375C**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , Reuse
StartUp Date:	03/03/2000
Avg. Daily Flow(MGD):	4.5
Equipment:	4 Tertiary Filter(s) ADF Disk Concrete Filter(s)

FORT IRWIN WWTP TERTIARY UPGRADE, CA **106425**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	12/12/2006
Avg. Daily Flow(MGD):	2
Max. Design Flow(MGD):	2.3
Equipment:	2 Tertiary Filter(s) ADF Disk Package Filter(s)

FORT MYERS CENTRAL ADVANCED WWTF IMPROVEMENTS, FL **107358**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	03/29/2007
Avg. Daily Flow(MGD):	6
Max. Design Flow(MGD):	12
Equipment:	2 Tertiary Filter(s) ADF Disk SS Package Filter(s)

FOUNTAIN HILLS SANITARY DISTRICT **102125E**

Waste Characteristics:	Municipal / Domestic
StartUp Date:	02/13/1997
Equipment:	3 Tertiary Filter(s) ADF Disk Concrete Filter(s)

FOUNTAIN HILLS SANITARY DISTRICT WWTP **102125G**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU , Reuse
StartUp Date:	02/01/2001
Avg. Daily Flow(MGD):	3.2
Equipment:	3 Tertiary Filter(s) ADF Disk Concrete Filter(s)

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FREEPORT WWTP RE-USE IMPROVEMENTS, FL **108368**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	01/21/2009
Avg. Daily Flow(MGD):	1
Equipment:	1 Tertiary Filter(s) ADF Disk Package Filter(s)

GAINEY RANCH WRP, AZ **107929A**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	04/01/2009
Avg. Daily Flow(MGD):	1.7
Max. Design Flow(MGD):	1.7
Equipment:	2 Tertiary Filter(s) 6 Disks,ADF Disk Package Filter(s),PES-13

GASPARILLA ISLAND WWTP, FL **106490**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	02/08/2005
Avg. Daily Flow(MGD):	0.62
Max. Design Flow(MGD):	1.24
Equipment:	1 Tertiary Filter(s) ADF Disk SS Package Filter(s)

GLENDALE WRF **109661B**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	Reuse / NTU
StartUp Date:	04/16/2015
Avg. Daily Flow(MGD):	12
Max. Design Flow(MGD):	24
Equipment:	4 Tertiary Filter(s) 12 Disks,Model 54,PES-13,PS Package

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GLENDALE-ARROWHEAD RANCH AZ **107291**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	NTU
Avg. Daily Flow(MGD):	4.5
Max. Design Flow(MGD):	9
Equipment:	3 Tertiary Filter(s) 10 Disks,Concrete,Model 54,PA2-13

GOLD CANYON WRF EXPANSION PHASE 3 **106524**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	11/24/2004
Avg. Daily Flow(MGD):	2
Max. Design Flow(MGD):	3.2
Equipment:	2 Tertiary Filter(s) ADF Disk Concrete Filter(s)

GRACEVILLE WWTP **105240**

Waste Characteristics:	Municipal / Domestic
StartUp Date:	02/03/1999
Avg. Daily Flow(MGD):	1.1
Max. Design Flow(MGD):	1.46
Equipment:	2 Tertiary Filter(s) ADF Disk Package Filter(s)

GREAT OUTDOORS PREMIER RV/GOLF RESORT, INC. **105858**

Waste Characteristics:	Municipal / Resort
Treatment Objective:	TSS , Reuse
StartUp Date:	02/01/2001
Avg. Daily Flow(MGD):	0.2
Equipment:	1 Tertiary Filter(s) ADF Disk SS Package Filter(s)

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GREEN COVE SPRINGS IMPROVEMENTS, FL **106180A**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	06/07/2005
Avg. Daily Flow(MGD):	0.5
Max. Design Flow(MGD):	2
Equipment:	1 Tertiary Filter(s) 4 Disks,ADF Disk Package Filter(s),PA2-13,PS

GREEN COVE SPRINGS, HARBOR ROAD WWTP **106180**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	12/10/2002
Avg. Daily Flow(MGD):	0.93
Max. Design Flow(MGD):	1.859
Equipment:	1 Tertiary Filter(s) ADF Disk Package Filter(s)

GRETNA **105194A**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	11/01/1998
Avg. Daily Flow(MGD):	0.464
Max. Design Flow(MGD):	0.929
Equipment:	1 Tertiary Filter(s) ADF Disk Package Filter(s)

HILLIARD WWTP **105300**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , Phos
StartUp Date:	05/17/1999
Avg. Daily Flow(MGD):	1
Equipment:	1 Tertiary Filter(s) ADF Disk SS Package Filter(s)

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HOPLAND BAND OF POMO INDIANS WRTP CA **106068/A**

Waste Characteristics:	Municipal / Resort
StartUp Date:	10/24/2002
Avg. Daily Flow(MGD):	0.12
Max. Design Flow(MGD):	0.24
Equipment:	2 Tertiary Filter(s) ADF Model 12 Disk Package Filter(s)

HUME LAKE CHRISTIAN CAMP **104097**

Waste Characteristics:	Municipal / Resort
Treatment Objective:	BOD , TSS
StartUp Date:	11/12/1992
Avg. Daily Flow(MGD):	0.2
Max. Design Flow(MGD):	0.2
Equipment:	1 Tertiary Filter(s) ADF Disk Package Filter(s)

HUME LAKE CHRISTIAN CAMPS (FILTER) **104097B**

Waste Characteristics:	Municipal / Resort
Treatment Objective:	BOD , TSS
StartUp Date:	11/02/1994
Avg. Daily Flow(MGD):	0.025
Equipment:	1 Tertiary Filter(s) ADF Disk Package Filter(s)

HYPERION WWTP CA **112153**

Waste Characteristics:	Municipal / Domestic
StartUp Date:	07/15/2016
Avg. Daily Flow(MGD):	25
Max. Design Flow(MGD):	25
Equipment:	6 Tertiary Filter(s) 20 Disks,ADF Disk Concrete Filter(s),Model 54,PES-13

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IMPERIAL IRRIGATION DISTRICT, EL CENTRO, CA **112119**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	03/19/2013
Avg. Daily Flow(MGD):	0.072
Max. Design Flow(MGD):	1.44
Equipment:	2 Tertiary Filter(s) 4 Disks,ADF Disk Package Filter(s),PES-14,PS

INLAND EMPIRE UTILITIES AGENCY, REG PLANT NO 4, CA **106670**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	10/25/2007
Avg. Daily Flow(MGD):	7
Max. Design Flow(MGD):	16.1
Equipment:	1 Tertiary Filter(s) ADF Disk Concrete Filter(s)

INVERNESS WWTP UPGRADE, FL **108433**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	09/17/2009
Avg. Daily Flow(MGD):	1.5
Max. Design Flow(MGD):	4.32
Equipment:	2 Tertiary Filter(s) ADF Disk SS Package Filter(s)

JACKSON RANCHERIA WWTP, CA **106350a**

Waste Characteristics:	Municipal / Resort
Treatment Objective:	TSS , NTU , Reuse
StartUp Date:	04/14/2004
Avg. Daily Flow(MGD):	0.24
Max. Design Flow(MGD):	0.464
Equipment:	2 Tertiary Filter(s) ADF Disk SS Package Filter(s)

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JACKSONVILLE ELECTRIC AUTHORITY ARLINGTON EAST WRF **102490A**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	08/01/2000
Max. Design Flow(MGD):	3.7
Equipment:	1 Tertiary Filter(s) ADF Disk SS Package Filter(s)

JEA, DISTRICT II, WATER RECLAMATION FACILITY **105927**

Waste Characteristics:	Municipal
Treatment Objective:	TSS , Reuse
StartUp Date:	05/28/2001
Avg. Daily Flow(MGD):	6
Max. Design Flow(MGD):	11.2
Equipment:	2 Tertiary Filter(s) ADF Disk SS Package Filter(s)

KEARNY WWTP, AZ **102573A**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	05/10/2000
Avg. Daily Flow(MGD):	0.175
Equipment:	1 Tertiary Filter(s) ADF Disk Concrete Filter(s)

KEY LARGO WWTF EXPANSION, FL **107437**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	Nitrification , DeNitrification , Phosphorus
StartUp Date:	09/03/2010
Avg. Daily Flow(MGD):	2.88
Max. Design Flow(MGD):	5.75
Equipment:	2 Tertiary Filter(s) ADF Disk SS Package Filter(s)

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LIVE OAK WWTP 2007 UPGRADE, CA **105419B**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	08/18/2011
Avg. Daily Flow(MGD):	4.27
Max. Design Flow(MGD):	4.27
Equipment:	2 Tertiary Filter(s) ADF Disk SS Package Filter(s)

LODI - WHITE SLOUGH WPCF **106372A**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	12/10/2004
Avg. Daily Flow(MGD):	8.5
Max. Design Flow(MGD):	16.3
Equipment:	4 Tertiary Filter(s) ADF Disk SS Package Filter(s)

LOMPOC REGIONAL WWRP, CA **108280**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	11/06/2008
Avg. Daily Flow(MGD):	5.5
Max. Design Flow(MGD):	5.5
Equipment:	3 Tertiary Filter(s) ADF Disk Package Filter(s)

LOS OSOS WRF CA **112293**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	Reuse , TSS
StartUp Date:	02/25/2016
Avg. Daily Flow(MGD):	1.2
Max. Design Flow(MGD):	4.032
Equipment:	2 Tertiary Filter(s) 10 Disks,ADF Disk SS Package Filter(s),Model 54,PES-

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LYNN HAVEN **104579**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , Reuse
StartUp Date:	09/01/1995
Avg. Daily Flow(MGD):	2.5
Equipment:	1 Tertiary Filter(s) ADF Disk Package Filter(s)

MANATEE CO. NRWTP, FL **102724C**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	05/24/2005
Avg. Daily Flow(MGD):	6
Max. Design Flow(MGD):	12
Equipment:	2 Tertiary Filter(s) ADF Disk Concrete Filter(s)

MANATEE COUNTY SW REGIONAL WWTP EXP, FL **102724D**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , Reuse
StartUp Date:	05/22/2008
Avg. Daily Flow(MGD):	9
Max. Design Flow(MGD):	18
Equipment:	1 Tertiary Filter(s) ADIFC AquaDiamond Concrete Filter(s)

MANTECA WQCF-PHASE III SCHEDULE D, CA **106403A**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU , Reuse
StartUp Date:	02/09/2007
Avg. Daily Flow(MGD):	9.87
Max. Design Flow(MGD):	19.15
Equipment:	6 Tertiary Filter(s) ADF Disk Concrete Filter(s)

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MARCH WWRF - PHASE 2 EXP, CA **107194**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	02/24/2011
Avg. Daily Flow(MGD):	3
Max. Design Flow(MGD):	5
Equipment:	3 Tertiary Filter(s) ADF Disk SS Package Filter(s)

MARION CORRECTIONAL WWTP EXP., FL **109881**

Waste Characteristics:	Municipal / Prison / Correctional Facility
Treatment Objective:	TSS
StartUp Date:	08/26/2010
Avg. Daily Flow(MGD):	0.9
Max. Design Flow(MGD):	1.1
Equipment:	2 Tertiary Filter(s) ADF Disk Concrete Filter(s)

MARSH LANDING **104418A**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	Reuse , TSS , NTU
StartUp Date:	09/12/1996
Avg. Daily Flow(MGD):	1
Equipment:	1 Tertiary Filter(s) ADF Disk Package Filter(s)

MEADOWCREST WWTP EXPANSION, FL **108379**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	06/24/2009
Avg. Daily Flow(MGD):	2
Max. Design Flow(MGD):	5
Equipment:	2 Tertiary Filter(s) ADF Disk SS Package Filter(s)

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MERCED WWTF PHASE IV UPGRADE AND EXP, CA **105867B**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	01/20/2011
Avg. Daily Flow(MGD):	13.7
Max. Design Flow(MGD):	19.1
Equipment:	6 Tertiary Filter(s) ADF Disk Package Filter(s)

MESA GREENFIELD WRF EXP AZ **113260**

Waste Characteristics:	Municipal / Municipal
Treatment Objective:	NTU
Avg. Daily Flow(MGD):	30
Max. Design Flow(MGD):	39
Equipment:	8 Tertiary Filter(s) 14 Disks,Concrete,Model 54,PES-13

MESA NW WRP AZ **112591**

Waste Characteristics:	Municipal / Domestic
StartUp Date:	08/18/2016
Avg. Daily Flow(MGD):	12
Max. Design Flow(MGD):	18
Equipment:	3 Tertiary Filter(s) (8) Laterals,47' Long,ADIFC AquaDiamond Concrete Filter(s),PES-13

MILTON WWTF EXPANSION **102332A**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	09/07/2006
Max. Design Flow(MGD):	4
Equipment:	2 Tertiary Filter(s) ADF Disk SS Package Filter(s)

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MORENO VALLEY RWRF SCATT EXP, CA **107190A**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU , Reuse
StartUp Date:	08/24/2011
Avg. Daily Flow(MGD):	12
Max. Design Flow(MGD):	22.3
Equipment:	4 Tertiary Filter(s) ADF Disk SS Package Filter(s),Pump(s)

MOUNTAIN HOUSE WWTP PHASE II EXPANSION, CA **106451**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	05/19/2005
Avg. Daily Flow(MGD):	3
Max. Design Flow(MGD):	5.4
Equipment:	3 Tertiary Filter(s) ADF Disk Concrete Filter(s)

OAKDALE WWTP UPGRADE, CA **107972**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	01/13/2011
Avg. Daily Flow(MGD):	4
Max. Design Flow(MGD):	10
Equipment:	1 Tertiary Filter(s) ADF Disk Concrete Filter(s)

OCALA WRF 2 REUSE IMPRV. **106118A**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	05/10/2006
Avg. Daily Flow(MGD):	1
Max. Design Flow(MGD):	2
Equipment:	1 Tertiary Filter(s) ADF Disk Package Filter(s)

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OCALA WRF 3 **106118**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	04/30/2003
Avg. Daily Flow(MGD):	3
Max. Design Flow(MGD):	6
Equipment:	1 Tertiary Filter(s) ADF Disk Concrete Filter(s)

ON TOP OF THE WORLD SOUTH WWTF PHASE II, FL **109546**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	08/05/2009
Avg. Daily Flow(MGD):	2.5
Max. Design Flow(MGD):	4.7
Equipment:	1 Tertiary Filter(s) ADF Disk Package Filter(s)

ORANGE COUNTY FL **103295K**

Waste Characteristics:	Municipal / Domestic
Avg. Daily Flow(MGD):	2.5
Max. Design Flow(MGD):	5
Equipment:	1 Tertiary Filter(s) ADF Disk Package Filter(s)

ORANGE COUNTY SOUTH WATER RECLAM FAC **103295B**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	10/02/2003
Avg. Daily Flow(MGD):	29.749
Max. Design Flow(MGD):	59.498
Equipment:	8 Tertiary Filter(s) 12 Disks,ADF Disk SS Package Filter(s),Model 54,PA2-

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ORANGE COUNTY WATER DIST RWSR, CA **105612A**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	07/12/2012
Avg. Daily Flow(MGD):	3.232
Max. Design Flow(MGD):	5.171
Equipment:	1 Tertiary Filter(s) 12 Disks,ADF Disk Package Filter(s),Classic,Model 54,PES-14,PS Package

ORANGE COUNTY WATER RECL. FACILITY (SAND LAKE RD) **103295A**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , Reuse
StartUp Date:	10/02/2003
Avg. Daily Flow(MGD):	24
Equipment:	8 Tertiary Filter(s) ADF Disk Package Filter(s)

ORANGE TREE UTILITY, FL **108469**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	10/02/2008
Avg. Daily Flow(MGD):	1
Max. Design Flow(MGD):	1.6
Equipment:	2 Tertiary Filter(s) ADF Disk SS Package Filter(s)

PALM BAY REUSE FACILITY, FL **108628**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	08/19/2009
Avg. Daily Flow(MGD):	3
Max. Design Flow(MGD):	6
Equipment:	2 Tertiary Filter(s) 6 Disks,ADF Disk Concrete Filter(s),Classic,Model

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PALM BEACH COUNTY SOUTHERN REGION WRF **105108A**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU , Reuse
StartUp Date:	07/01/1999
Max. Design Flow(MGD):	22
Equipment:	6 Tertiary Filter(s) ADF Disk SS Package Filter(s)

PALM VALLEY WRF **106039**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU , Reuse
StartUp Date:	03/07/2002
Avg. Daily Flow(MGD):	4.1
Max. Design Flow(MGD):	8.2
Equipment:	3 Tertiary Filter(s) ADF Disk Package Filter(s)

PALM VALLEY WRF AZ **106039C**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	NTU
StartUp Date:	10/19/2016
Avg. Daily Flow(MGD):	2
Equipment:	1 Tertiary Filter(s) 8 Disks,Classic,Model 54,PES-13

PALM VALLEY WWTF, LITCHFIELD PARK, AZ **106039B**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	08/24/2012
Avg. Daily Flow(MGD):	5.1
Max. Design Flow(MGD):	2
Equipment:	1 Tertiary Filter(s) 8 DIsks,Classic,Model 54,PES-13,PS Package

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PALMDALE WRP STAGE 5 EXP-PH I, CA **108814**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	09/08/2011
Avg. Daily Flow(MGD):	12
Max. Design Flow(MGD):	15
Equipment:	6 Tertiary Filter(s) ADF Disk Package Filter(s)

PALO VERDE UTILITY CO. CAMPUS 1 WRF PHS 3A EXP, AZ **108094E**

Waste Characteristics:	Municipal
StartUp Date:	11/15/2010
Max. Design Flow(MGD):	1.211
Equipment:	1 Tertiary Filter(s) ADF Disk Package Filter(s)

PASO ROBLES CA **113400**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	NTU
StartUp Date:	11/15/2018
Avg. Daily Flow(MGD):	3.66
Max. Design Flow(MGD):	5.5
Equipment:	3 Tertiary Filter(s) 6 Disks,Concrete,Model 54,PA2-13

PERRIS VALLEY RWRF TERTIARY EXPANSION, CA **106518A**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	03/27/2008
Avg. Daily Flow(MGD):	20.5
Max. Design Flow(MGD):	33
Equipment:	4 Tertiary Filter(s) 12 Disks,ADF Disk SS Package Filter(s),Model 54,PA2-13,SS Package

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PERRIS VALLEY RWRF, CA **106518**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	01/06/2005
Avg. Daily Flow(MGD):	4.16
Max. Design Flow(MGD):	4.16
Equipment:	2 Tertiary Filter(s) ADF Disk SS Package Filter(s)

PINE ISLAND WTP & WWTP, FL **106500**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	09/11/2006
Avg. Daily Flow(MGD):	0.25
Max. Design Flow(MGD):	0.5
Equipment:	2 Tertiary Filter(s) ADF Disk Package Filter(s)

PLAYERS CLUB **xxxxxx**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , Reuse
StartUp Date:	06/01/1997
Avg. Daily Flow(MGD):	1
Equipment:	1 Tertiary Filter(s) ADF Disk Package Filter(s)

PLAYERS CLUB WRF FL **114409**

Waste Characteristics:	Municipal / Municipal
Treatment Objective:	TSS
Avg. Daily Flow(MGD):	2.4
Max. Design Flow(MGD):	6.5
Equipment:	2 Tertiary Filter(s) 10 Disks,Model 54,PES-13,PS Package

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POINT WASHINGTON FL **113289B**

Treatment Objective:	TSS
StartUp Date:	03/03/2016
Avg. Daily Flow(MGD):	2.5
Max. Design Flow(MGD):	5
Equipment:	1 Tertiary Filter(s) 10 Disks,ADF Disk Package Filter(s),Model 54,PES-13

PRESCOTT VALLEY WWTP UPGRADE AND EXP., AZ **105428B**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	11/08/2006
Avg. Daily Flow(MGD):	3.75
Max. Design Flow(MGD):	7.5
Equipment:	2 Tertiary Filter(s) ADF Disk Concrete Filter(s)

RAY BULLARD WRF FL **113770**

Waste Characteristics:	Municipal /
StartUp Date:	07/12/2017
Equipment:	1 Tertiary Filter(s) 10 Disks,ADF Disk Package Filter(s),PES-13,PS

RIALTO RECLAMATION PHII EXP CA **107583**

Waste Characteristics:	Municipal / Municipal
Treatment Objective:	NTU
Avg. Daily Flow(MGD):	12
Max. Design Flow(MGD):	18
Equipment:	3 Tertiary Filter(s) 12 Disks,Model 54,PA2-13,Pump(s)

RICHARD A. HEYMAN ENV. PROT. FAC. (AKA KEY WEST) **105906A**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , Phos
StartUp Date:	10/04/2001
Avg. Daily Flow(MGD):	12
Max. Design Flow(MGD):	22.4
Equipment:	4 Tertiary Filter(s) ADF Disk Concrete Filter(s)

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RUSSIAN RIVER, CA **103816C**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	09/23/2004
Avg. Daily Flow(MGD):	0.4
Max. Design Flow(MGD):	3.675
Equipment:	2 Tertiary Filter(s) ADF Disk Package Filter(s)

SAN ANDREAS 2008 WWTP UPGRADES, CA **108722**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	05/07/2010
Avg. Daily Flow(MGD):	0.47
Max. Design Flow(MGD):	1.97
Equipment:	2 Tertiary Filter(s) 8/6 Disks,PA2-13,ADF Disk Concrete Filter(s)

SAN BERNARDINO (CITY OF) MUNICIPAL WATER DEPT, CA **106168A**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU , Reuse
StartUp Date:	07/29/2008
Avg. Daily Flow(MGD):	7
Max. Design Flow(MGD):	11
Equipment:	2 Tertiary Filter(s) ADF Disk Package Filter(s)

SAN JACINTO VALLEY RWRF, CA **106640**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	01/04/2006
Avg. Daily Flow(MGD):	12.4
Max. Design Flow(MGD):	22
Equipment:	4 Tertiary Filter(s) ADF Disk Package Filter(s)

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SAN JACINTO VALLEY TITLE 22 TERTIARY TRTMT, CA **106640A**

Waste Characteristics: Municipal / Domestic
Treatment Objective: TSS , Algae
StartUp Date: 06/06/2012
Avg. Daily Flow(MGD): 6
Max. Design Flow(MGD): 11
Equipment: 2 Tertiary Filter(s)
ADF Disk SS Package Filter(s),Pump(s)

SANDESTIN FL **114628**

Waste Characteristics: NULL /
Max. Design Flow(MGD): 8
Equipment: 2 Tertiary Filter(s)
8 Disks,ADF Disk Package Filter(s),Model 54,PES-13

SARASOTA WWTP FL **102494D**

Waste Characteristics: Municipal /
Max. Design Flow(MGD): 48
Equipment: 2 Tertiary Filter(s)
16' Wide,80' Long,ADIFC AquaDiamond Concrete Filter(s),PES-14

SAUSALITO-MARIN CITY CA **111906**

Waste Characteristics: Municipal / Municipal
Treatment Objective: TSS
Avg. Daily Flow(MGD): 3
Max. Design Flow(MGD): 6
Equipment: 2 Tertiary Filter(s)
8 Disks,Concrete,Model 54,PES-13,PES-14

SCHELLVILLE TERT TRT PLT SONOMA VALLEY CO SAN DIST **107986**

Waste Characteristics: Municipal / Domestic
Treatment Objective: TSS , NTU
StartUp Date: 01/17/2008
Avg. Daily Flow(MGD): 3.2
Max. Design Flow(MGD): 16
Equipment: 4 Tertiary Filter(s)
ADF Disk Concrete Filter(s)

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SEACOAST UTILITY AUTHORITY WWTP RWFE, FL **106509**

Treatment Objective: TSS
StartUp Date: 03/15/2007
Avg. Daily Flow(MGD): 12
Max. Design Flow(MGD): 19.8
Equipment: 5 Tertiary Filter(s)
ADF Disk SS Package Filter(s)

SEACREST WWTP FL **114229**

Waste Characteristics: NULL /
StartUp Date: 02/22/2018
Equipment: 3 Tertiary Filter(s)
PES-13,PS Package

SILVER BELL ARMY HELIPORT WWTP II , AZ - FILTERS **106618B**

Waste Characteristics: Municipal / Domestic
Treatment Objective: TSS , NTU
StartUp Date: 10/06/2010
Avg. Daily Flow(MGD): 0.1
Max. Design Flow(MGD): 0.16
Equipment: 1 Tertiary Filter(s)
ADF Disk SS Package Filter(s)

SOUTH WALTON WWTP AWT IMPROVEMENTS, FL **104074D**

Waste Characteristics: Municipal / Domestic
Treatment Objective: TSS
StartUp Date: 01/07/2010
Avg. Daily Flow(MGD): 3
Max. Design Flow(MGD): 6
Equipment: 2 Tertiary Filter(s)
ADF Disk Concrete Filter(s)

SOUTHPORT 1.5 MGD WWTF, FL **107811**

Waste Characteristics: Municipal / Domestic
Treatment Objective: Nitrification , DeNitrification , Phosphorus
StartUp Date: 11/09/2007
Avg. Daily Flow(MGD): 1.5
Max. Design Flow(MGD): 3
Equipment: 1 Tertiary Filter(s)
ADF Disk SS Package Filter(s)

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SOUTHSIDE WWTF EXPANSION, FL **107961**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	06/04/2008
Avg. Daily Flow(MGD):	6
Max. Design Flow(MGD):	18
Equipment:	4 Tertiary Filter(s) ADF Disk SS Package Filter(s)

SPENCER'S WWTP, FL INTERIM EXPANSION **106200**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	01/29/2003
Avg. Daily Flow(MGD):	0.5
Max. Design Flow(MGD):	1
Equipment:	1 Tertiary Filter(s) ADF Disk Package Filter(s)

SPRINGVILLE EFFLUENT DISPOSAL, CA **106570**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	01/24/2006
Avg. Daily Flow(MGD):	0.108
Max. Design Flow(MGD):	0.108
Equipment:	1 Tertiary Filter(s) ADF Model 12 Disk Package Filter(s)

ST. ANDREWS WWTP EXPANSION FL **106213B**

Waste Characteristics:	Municipal / Municipal
Avg. Daily Flow(MGD):	7.5
Max. Design Flow(MGD):	13.1
Equipment:	3 Tertiary Filter(s) 12 Disks,Model 54,PES-14,PS Package

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STARKE WWTP UPGRADES, FL **107703**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	08/12/2008
Avg. Daily Flow(MGD):	1.25
Max. Design Flow(MGD):	2.5
Equipment:	2 Tertiary Filter(s) ADF Disk SS Package Filter(s)

SUNDANCE WATER RECLAMATION FACILITY **106173**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	11/21/2002
Avg. Daily Flow(MGD):	1.2
Max. Design Flow(MGD):	2.4
Equipment:	2 Tertiary Filter(s) ADF Disk Package Filter(s)

SURPRISE WRF EXPANSION, AZ (SPA-I MAIN PLNT) **107418**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	01/26/2007
Avg. Daily Flow(MGD):	16
Max. Design Flow(MGD):	48
Equipment:	10 Tertiary Filter(s) ADF Disk Concrete Filter(s),12 Disks,Concrete,Model

TARTESSO WRF, AZ **106569**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	03/23/2006
Avg. Daily Flow(MGD):	1.2
Max. Design Flow(MGD):	2.4
Equipment:	2 Tertiary Filter(s) ADF Disk Concrete Filter(s)

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TEMECULA VALLEY REGIONAL WRF, CA **106489**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	10/20/2004
Avg. Daily Flow(MGD):	12.49
Max. Design Flow(MGD):	12.49
Equipment:	4 Tertiary Filter(s) ADF Disk SS Package Filter(s)

TURLOCK WQCF, CA **101007B**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	08/12/2005
Avg. Daily Flow(MGD):	22.3
Max. Design Flow(MGD):	35.4
Equipment:	6 Tertiary Filter(s) ADF Disk SS Package Filter(s) 2 Tertiary Filter(s) ADF Disk SS Package Filter(s)

UC DAVIS CAMPUS WWTP EXP PH1, CA (PSOMAS) **102558A**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	11/07/2007
Avg. Daily Flow(MGD):	2
Max. Design Flow(MGD):	5.1
Equipment:	1 Tertiary Filter(s) ADF Disk Package Filter(s)

VENICE GARDENS WRF PHASE 5 IMPROVEMENTS **106328A**

Waste Characteristics:	Municipal / Municipal
Treatment Objective:	TSS
StartUp Date:	05/10/2017
Avg. Daily Flow(MGD):	0.6
Max. Design Flow(MGD):	1.2
Equipment:	1 Tertiary Filter(s) 12 Disks,Model 54,PES-13,SS Package

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VENICE GARDENS WRF, PHASE 3 IMPROVEMENTS **106328**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	01/28/2004
Avg. Daily Flow(MGD):	3
Max. Design Flow(MGD):	6
Equipment:	1 Tertiary Filter(s) ADF Disk SS Package Filter(s)

VERNON WWTF IMPROVEMENTS, FL **107078**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS
StartUp Date:	11/01/2006
Avg. Daily Flow(MGD):	0.2
Max. Design Flow(MGD):	0.4
Equipment:	2 Tertiary Filter(s) ADF Model 12 Disk SS Package Filter(s)

WATER CAMPUS - FILTER COMPLEX IMPROVEMENTS, AZ **106226A**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	05/27/2004
Avg. Daily Flow(MGD):	25
Max. Design Flow(MGD):	44
Equipment:	10 Tertiary Filter(s) ADF Disk Concrete Filter(s)

WEDGEFIELD WWTF **105581**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU , Reuse
StartUp Date:	07/02/2000
Avg. Daily Flow(MGD):	0.929
Max. Design Flow(MGD):	1.85
Equipment:	1 Tertiary Filter(s) ADF Disk Package Filter(s)

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WILEY NASH WRF FL **103704B**

Waste Characteristics:	Municipal
Treatment Objective:	TSS
StartUp Date:	01/13/2016
Avg. Daily Flow(MGD):	5
Max. Design Flow(MGD):	10
Equipment:	2 Tertiary Filter(s) (8) Laterals,16' Width,40' Long,ADIFC AquaDiamond Concrete Filter(s),PES-14

WILLIAMS (CITY OF), CA **104861A**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU
StartUp Date:	05/20/2011
Avg. Daily Flow(MGD):	2.32
Max. Design Flow(MGD):	2.32
Equipment:	2 Tertiary Filter(s) ADF Disk Concrete Filter(s)

WOODLAND WPCF, CA **106553A**

Waste Characteristics:	Municipal / Domestic
Treatment Objective:	TSS , NTU , Reuse
StartUp Date:	04/12/2006
Avg. Daily Flow(MGD):	10.4
Max. Design Flow(MGD):	15.6
Equipment:	4 Tertiary Filter(s) ADF Disk SS Package Filter(s)

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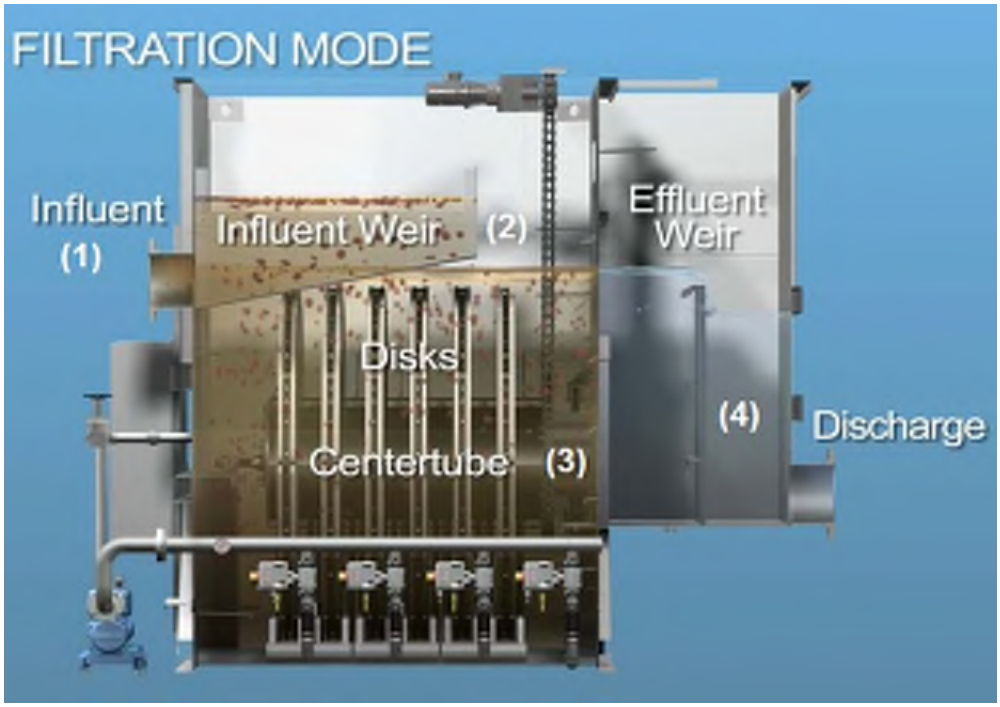
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AquaDisk® Cloth Media Filter
Operational Description

The AquaDisk® Cloth Media Filter is a complete system for continuously removing particulates from a flow stream. The system's operational strategy consists of three modes: Filtration, Backwash, and Solids Wasting. A programmable logic controller (PLC) based control system provides for automatic operation of all process modes.

Filtration Mode

The influent pipe (1) routes flow to the filter basin (2), where filtration occurs. The filter basin contains a series of circular disks covered with a unique pile cloth media. As water passes through the media via an outside-in flow path, some particulates are removed and stored within the depth of the pile cloth media while others are deposited on the pile cloth media surface. Filtered water, or filtrate, is collected in a centertube (3) and flows, via gravity, over the effluent weir and into the effluent chamber (4) prior to discharge. It is important to note that during filtration, the disks do not rotate.



Normal Operation

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As more particulates are deposited on and within the pile cloth media, the pressure required to drive water through the pile cloth media (headloss) increases. This results in a rise in the water level within the filter basin and increased differential pressure on the pile cloth media. Upon reaching a specific basin water level set point, the PLC automatically initiates the backwash mode to clean the pile cloth media.

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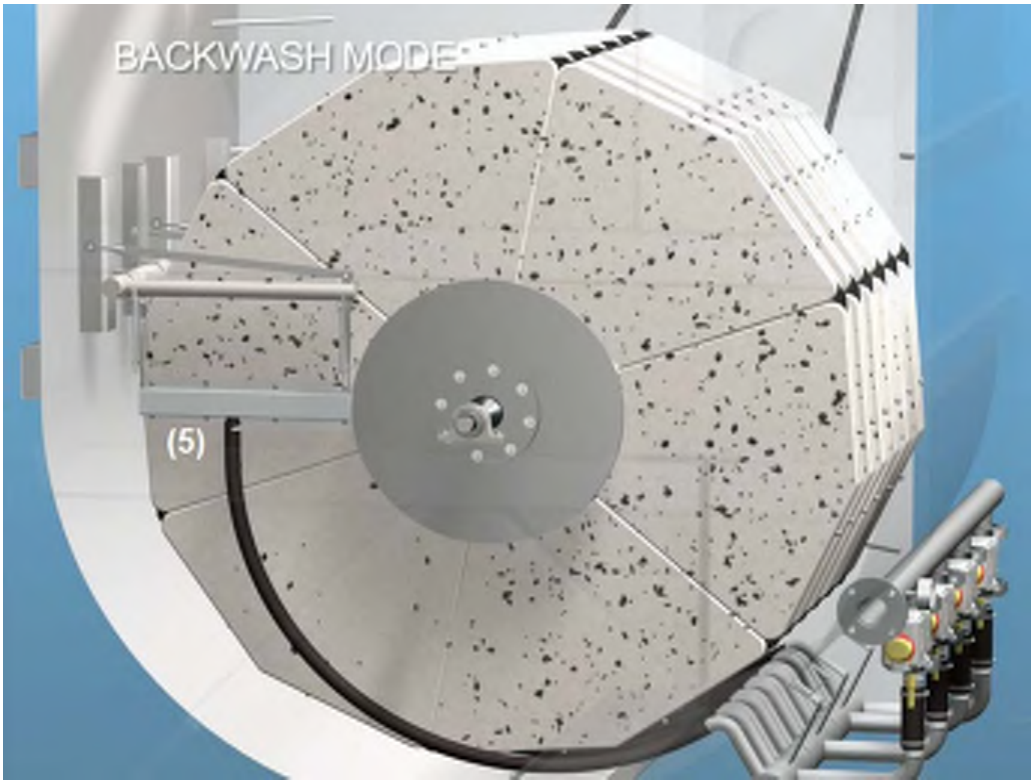
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Backwash Mode

As the amount of particulates on and within the pile cloth media increases, the static pressure required to pass water through the pile cloth media increases. This results in an increased water level within the filter basin and increased differential pressure on the pile cloth media. Upon reaching a specific basin level or elapsed time period, the backwash mode will be automatically initiated to clean the pile cloth media.

Solids are backwashed from the pile cloth media surface by liquid suction through backwash shoes (5) positioned on both sides of each disk. These spring loaded backwash shoes contact the pile cloth media to provide the necessary suction for optimum cleaning efficiency. During backwash, disks are cleaned in groups. The number of disks in each group will depend on the size of the unit. Disks rotate slowly while a backwash/waste pump (not shown) draws filtered water from the centertube through the pile cloth media on an inside-to-outside, or reversed, flow path. This provides effective cleaning of the pile cloth media over the entire disk. By the end of the backwash cycle, the basin water level returns to its normal operating level. Backwash water is typically directed to the headworks.

Filtration continues while the filter is in backwash mode. This feature allows continuous filtration while maintaining efficient filter performance.



Backwash Shoes Clean Media

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Solids Wasting Mode

A quiescent environment during filtration, combined with the outside-in filtration flow path, allows heavier particulates to settle to the bottom of the filter basin. Upon reaching a specific number of backwash cycles performed, or an elapsed time, the solids waste mode will be automatically initiated. The solids waste mode utilizes the backwash/waste pump to provide suction of the settled solids through a perforated solids collection manifold (6). Since solids wasting occurs immediately after a backwash cycle is completed, the backwash/waste pump remains on during the backwash-to-solids waste mode transition. The solids are pumped on an intermittent basis, typically to the headworks.

Filtration continues while the filter is in solids waste mode. This feature allows continuous filtration while maintaining efficient filter performance.



Settled Solids Removal

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Control System

AquaDisk filter operation is automatically controlled by a programmable logic controller (PLC). For multiple filter installations, the PLC based control systems are networked with the SCADA for monitoring or intercommunication purposes.

PLC Equipment Description

The PLC system monitors, regulates and sequences all automatic functions. The PLC controllers are Allen-Bradley MicroLogix Controllers. PLC inputs are via 16 point (120 VAC) discrete or 8 point (4-20mA) analog input modules, while outputs are via 16 point discrete (Relay) or 4 point (4-20mA) analog output modules. In the case of a power loss, the system will resume operation at the point from where they left off as soon as power is restored. On power-up, any multiple motor starts will commence at 10-second intervals. The PLC processors are equipped with a battery to provide ladder program and data table memory support in case of a power failure.

Automatic Operation

PLC systems allow the AquaDisk filter system to perform all the standard functions and provide maximum flexibility for variation in control strategies. Aqua-Aerobic Systems, Inc. provides all standard and customized programs through our in-house Electrical Engineering group. For the AquaDisk filter, these systems are level based with time overrides. They also provide a complement of fully adjustable set points in addition to filter system monitoring.

Manual Override

Aqua-Aerobic Systems control panels are equipped with Hand/Off/Auto motor switches that will allow for switching the respective hand switch from auto to the desired position to operate any motor independent of the current PLC command.

Local Operator Interface Panel

Each PLC control panel is equipped with a Panelview Plus Human Machine Interface (HMI) unit manufactured by Allen-Bradley. The operator interface unit features a color LCD touch screen display and communicates directly to the PLC. This HMI unit will allow the changing of counter and timer values to adjust the various plant controls. The ability to monitor basic system status throughout the plant is also provided at this unit.

This display contains various display pages used to provide the operator with filter status and alarm information. There are also pages from which the operator enters changes to process variables and timers to control the automatic sequencing.

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Interface Operation

Some of the various screens available through the local operator control panel are listed below:

- System status
- Backwash interval/duration adjust
- Sludge waste interval/duration adjust
- Elapsed time meters and totalizers (motors and process)
- Backwash interval history
- Alarm display
- Alarm history

Controls Programming Documentation

As a standard procedure, Aqua-Aerobic Systems will provide a written control strategy with the equipment submittal information. In addition to the control strategy, we can also provide the PLC programming documentation for onsite troubleshooting purposes. Due to the proprietary nature of the program, a confidentially agreement is necessary if this information is provided.

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AQUA-AEROBIC SYSTEMS, INC.

OptiFiber® Cloth Media Filtration Pilot System

OptiFiber® Cloth Media Filtration Pilot System

More than 20 years ago, Aqua-Aerobic Systems was first in the industry with cloth media filtration and continues to lead through innovation and experience. We offer more application and cloth media construction knowledge than any other supplier offering fabric media or microscreens. Technology pilot demonstrations can be beneficial to wastewater treatment plants by providing a snapshot of essential process operating conditions and allowing the customer to interact with the technology and factory personnel. The OptiFiber® Cloth Media Filtration Pilot System provides our customers with the most comprehensive on-site testing and analytical services available. Our unique approach is designed to provide prompt operational feedback, allowing immediate fine tuning of operating parameters for the most effective pilot/demonstration experience.

Features and Advantages

- Totally enclosed, drop-deck trailer housing a full-scale 1-disk Aqua MiniDisk® cloth media filter with monitoring and analyzing equipment
- OptiFiber PA2-13®, OptiFiber PES-13® (chlorine resistant) and OptiFiber PES-14® (Microfiber) pile cloth media available for testing
- Flexible variable speed influent pump for custom influent needs
- Supervisory Control and Data Acquisition (SCADA) system
- Integrated, fully equipped laboratory for on-site analysis
- Industry leading filter pilot services including test protocol, Aqua-Aerobic pilot technician, and comprehensive pilot study report



Controls and monitoring equipment



1-disk Aqua MiniDisk® filter

Filtration, Monitoring, and Analysis Equipment

- Influent and waste flow meters
- Chemical feed and flocculation systems
- Influent pump with VFD control to vary hydraulic loading rates, and pH adjustment prior to the filter
- Influent and effluent online turbidimeters
- Spectrophotometer for phosphorus analysis and speciation
- Phipps and Bird jar tester
- 1-disk Aqua MiniDisk cloth media filter
- Control system with SCADA for continuous monitoring and recording of process data
- Laboratory for on-site analysis of most operating parameters

Industry Leading Pilot Services



Fully equipped laboratory

- Customized Test Protocol: Outlines performance objectives and testing methods
- Services of an experienced Aqua-Aerobic pilot unit technician from start to finish for:
  - Supervised placement of the cloth media pilot trailer and necessary hydraulic and electrical connections
  - Process and mechanical operation of the pilot equipment for the duration of the test
  - Sampling, laboratory testing and analysis
  - Training plant personnel on operation and maintenance of the pilot unit
  - Decommissioning of the pilot unit at the close of testing
- A comprehensive pilot study report which includes:
  - Daily operating conditions
  - Influent and effluent turbidity charts
  - Influent and backwash flow rates
  - Particle size, suspended solids, phosphorus analysis (including speciation)
  - Other specific data, per customer request



OptiFiber® Cloth Media Pilot Trailer

Contact Aqua-Aerobic Systems to design a customized OptiFiber Cloth Media Filtration Pilot Study for your specific application.

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Bulletin #670B 7/13

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A Metawater Company

Backwash Configuration

Drive Motor

The drive motor rotates the centertube during the backwash mode through the stationary backwash shoes such that the entire pile cloth media area is cleaned by the backwash system.

Level Sensor

The level sensor measures the liquid level in the filter tank, verifies sufficient level for backwash/waste pump(s) and triggers specific modes based on water level.

Backwash System

The backwash assembly consists of backwash shoes, associated plumbing, and backwash/waste pump(s). The stationary backwash shoes draw water at high velocity from the clean water side of the pile cloth media. The drive motor rotates the centertube such that the entire pile cloth media area passes under the backwash shoes. The backwash/waste pump(s) provides the necessary suction and discharges the flow to the designated location.

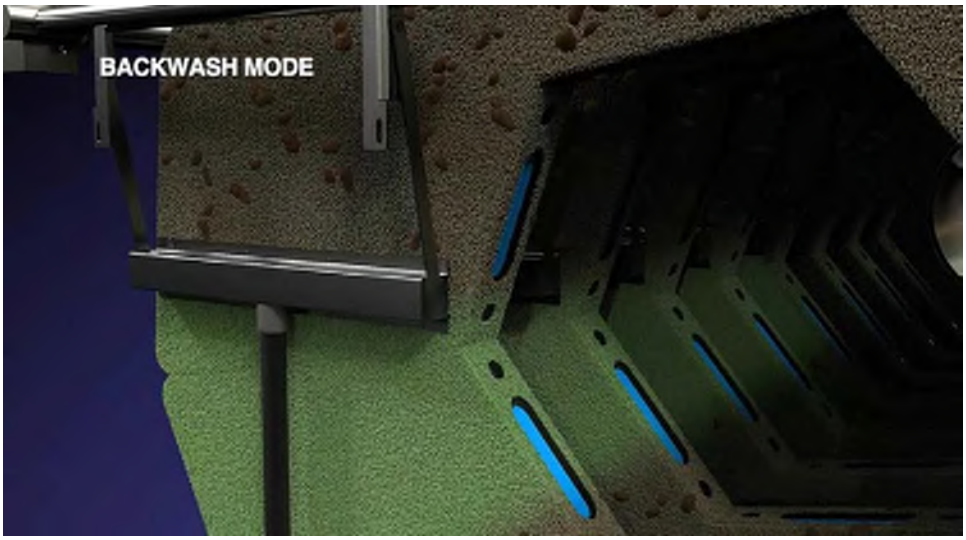
As the amount of particulates on and within the pile cloth media increases, the static pressure required to pass water through the pile cloth media increases. This results in an increased water level within the filter basin and increased differential pressure on the pile cloth media. Upon reaching a specific basin level or elapsed time period, the backwash mode will be automatically initiated to clean the pile cloth media.

Solids are backwashed from the pile cloth media surface by liquid suction through backwash shoes (5) positioned on both sides of each disk. These spring loaded backwash shoes contact the pile cloth media to provide the necessary suction for optimum cleaning efficiency. During backwash, disks are cleaned in multiples of two, unless the filter has only one disk. The disks rotate slowly while a backwash/waste pump (not shown) draws filtered water from the

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centertube through the pile cloth media on an inside-to-outside, or reversed, flow path. This provides effective cleaning of the pile cloth media over the entire disk. By the end of the backwash cycle, the basin water level returns to its normal operating level. Backwash water is typically directed to the headworks.

Filtration continues while the filter is in backwash mode. This feature allows continuous filtration while maintaining efficient filter performance.



Backwash Shoes Clean Media

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Power and Backwash Estimates

Applied Solids	167	lb / day
Applied Solids / Filter	83.5	lb / day - filter
Applied Solids Loading Rate	0.259	lb / ft^2 - day
Filtered Solids	167	lb / day
Filtered Solids / Filter	83.5	lb / day - filter
Filtered Solids Loading Rate	0.259	lb / ft^2 - day
Flux Rate	2.15	gpm / ft^2
Total Disk Count	12	
Total Disk Area	645.6	ft^2
Backwash Time / Day / Filter	231	min / day - filter
Backwash Flow / Day / Basin	22504	gpm / day - filter
Backwash Flow / Day	45007	gpm / day
Backwash % of Forward Flow	2.25%	%
Backwash Duration	4.80	min / each
Backwash Cycles / Day	48.1	
TOTAL kWhr/Year/Filter	14444	kW - hr / year
TOTAL kWhr/Year	28889	kW - hr / year

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FORM 00 31 00E - MAINTENANCE SUMMARY (SUBMIT AS FIRST PAGE OF TAB E)

Bidder to complete the following table; additional supporting information can also be included in this Tab.

Question/Criteria	Bidder's Response	Score (0-5)	Importance Factor (1-5)	Score Subtotal (Score x Importance Factor)	Maximum Points Possible
Identify number of certified service representatives in the United States for proposed equipment; include representative's name and "home" office. Indicate if service representative is directly employed by Bidder or functions as an independent contractor. Provide name and location of nearest certified service representative expected to serve this project.	See Section 4.B which provides information on our field service representatives. Aqua-Aerobic Systems currently has 7 different field service representatives throughout the US. The service representative to serve this project will be determined once the job is awarded.		5		25
Where are the cloth media filter components manufactured? Indicate state and country.	The filter components are manufactured in Rockford, Illinois.		3		15
Where are spare parts inventoried?	Spare parts are inventoried in Rockford, Illinois.		4		20
How many motors are required for each filter train?	Each filter train will have two (2) motors.		3		15
Provide example maintenance schedule(s) from standard Vendor O&M manual. Include manufacturer's schedule for routine preventive maintenance, inspections, tests, and adjustments required to ensure proper and economical operation and to minimize corrective maintenance and repair.	See Section 4.D which contains the equipment maintenance and service schedule.		5		25

NOTE: Bidder may submit additional information in Tab F to show maintenance needs, parts lists, maintenance procedures, O&M manuals, or other information related to maintenance.

Section Score=		100
Section Total Score % =		

Score (0-5); completed by Buyer/Engineer	
0	Fail: The proposal fails to address the requirements described in the RFP.
1	Poor: The proposal addresses the requirements inaccurately or poorly.
2	Fair: The proposal addresses the requirements described in the RFP in an unsatisfactory manner.
3	Good: The proposal addresses all the requirements described in the RFP in a satisfactory manner.
4	Very Good: The proposal addresses all the requirements described in the RFP and, in some respects, exceeds them.
5	Excellent: the proposal addresses and exceeds all of the requirements described in the RFP.

AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

Equipment and Services Group

William Decker, Vice President & General Manager, Equipment and Services Group

PROFILE	LOCATION
Tyrone Pratt Technical Support Coordinator B.S. in Marketing from Southern Illinois University. Worked as a Journeyman Electrician for 14 years. Specialized in the wiring of PLC systems and as a field representative/project manager for plant construction. Provides technical support for all products.	*Loves Park, IL Factory since 2011*
Michael Spragg Technical Support Specialist Experience with submarine maintenance for 20 years in the Navy. Experience as a Field Service Engineer for 13 years. Experience in wastewater since 2019.	*Loves Park, IL Factory*
Dean Woyak Customer Service Process Specialist B.S. degree in Water Resources/University of Wisconsin-Stevens Point. Experience in waster and wastewater since 1994.	*Powell, WY*
John Edelen *Field Service Specialist* B.S. in Business Administration/Computer Science from University of Central Florida. Worked as an Electrical Technician for National Oilwell Varco for 5 years and an Elevator/Escalator Mechanic for 10 years. Specialized in troubleshooting, repair, calibration, installation and commissioning of electrical and computer systems. Provides repair, troubleshooting and start-up supervision for Ozone and Membrane products.	*Atlanta, GA since 2008*

Curt Larson
Field Service Specialist *Raeford, NC since 2006*
Experience in wastewater treatment since 2003. Worked for 16 years in the design, installation and commissioning of controls on a project level for the paper industry. Experienced In the wastewater industry since 2000. Performs plant equipment start-up, operator training and system troubleshooting.

Skip Morton *Hermitage, PA since 2016*
Field Service Specialist
Holds PA DEP Waste Water Certification. Experienced in electrical systems test equipment, plant operation, lab testing, plant maintenance and motor/pump installation. Wastewater Operator and Facilities Manager for 17 years. Performs repairs, troubleshooting, start-up and training on Filtration, SBR and Ozone products.

Tom Mowery *Columbia, PA since 2007*
Field Service Specialist
Experience in wastewater treatment since 1996. Experienced in wastewater treatment industry since 1996. Worked in field construction since 1987 including site supervisor/electrician for yard wiring, electrical devices and complete wiring systems for wastewater treatment plants.

William Sims *Lineville, AL since 2016*
Field Service Specialist
Education and training from MaComb Community College, American Military University, Electronics Technology, Defense Acquisition University and West Central Technical Institute. Experience includes Information Technology systems, general troubleshooting and repair, Water Treatment equipment and systems. Performs repair and maintenance of AquaDisk Filtration systems including commissioning, testing, maintenance and decommissioning of Filtration Pilot systems.

Tony Smith *Maineville, OH since 2005*
Field Service Specialist
Specialized in commissioning, troubleshooting, testing and training of Ozone Generation Systems.

Ohta Watson *Long Beach, CA since 2015*
Field Service Specialist
Specialized in assembly, troubleshooting and repair of Ozone Generation Systems.

AquaDisk®: Operation & Maintenance Requirements

Design# 167138

Initial Flows

AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

Project: **MAGNA WRF, UT**

Qty / Model#: **2 / ADFSC54x6E-PC**

Description: **AquaDisk Concrete: Model ADFSC-54 x 6E-PC**

Avg Flow (Gal):	2,000,000
Influent TSS (mg/l):	10
Qty Of Disks Per Unit:	6
Area Provided/Disk:	53.8

I. LUBRICATION REQUIREMENTS

	# of Units		Minutes/Unit		Times/Year		Hours/Year
1) Backwash / Solids Waste Pump - Routine Lubrication:	2	x	5	x	12	/ 60 =	2.00
2) Backwash / Solids Waste Pump - Drain and Refill:	2	x	30	x	1	/ 60 =	1.00
3) Drive Gear Box:	2	x	30	x	0.25	/ 60 =	0.25
4) Drive Motor:	2	x	5	x	0.25	/ 60 =	0.04
						TOTAL LUBRICATION REQUIREMENTS:	3.29

II. PARTS REPLACEMENT

	Replace Interval (Years)	# of Units		Minutes/Unit		Hours Per Replacement	Material Cost Per Unit	Total Material Cost
1) Main "V-Ring" Seal:	10	2	x	240	=	8.0	$1,051	$2,103
2) Filter Media Cloths (6/Disk):	7	72	x	15	=	18.0	$299	$21,528

III. POWER CONSUMPTION

1) Backwash / Solids Waste Pump (kW Hours/Year):	3,843.8
2) Disk Drive Motor (kW Hours/Year):	826.9
3) Power Control Panel (kW Hours/Year):	2,800.0
Total Annual Power Usage (kW Hours/Year):	7,470.7

AquaDisk®: Operation & Maintenance Requirements

Design# 167145

Buildout Flows

AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

Project: MAGNA WRF, UT

Qty / Model#: 2 / ADFSC54x6E-PC

Description: AquaDisk Concrete: Model ADFSC-54 x 6E-PC

Avg Flow (Gal):	2,325,000
Influent TSS (mg/l):	10
Qty Of Disks Per Unit:	6
Area Provided/Disk:	53.8

I. LUBRICATION REQUIREMENTS

	# of Units		Minutes/Unit		Times/Year		Hours/Year
1) Backwash / Solids Waste Pump - Routine Lubrication:	2	x	5	x	12	/ 60 =	2.00
2) Backwash / Solids Waste Pump - Drain and Refill:	2	x	30	x	1	/ 60 =	1.00
3) Drive Gear Box:	2	x	30	x	0.25	/ 60 =	0.25
4) Drive Motor:	2	x	5	x	0.25	/ 60 =	0.04
TOTAL LUBRICATION REQUIREMENTS:							3.29

II. PARTS REPLACEMENT

	Replace Interval (Years)	# of Units		Minutes/Unit		Hours Per Replacement	Material Cost Per Unit	Total Material Cost
1) Main "V-Ring" Seal:	10	2	x	240	=	8.0	$1,051	$2,103
2) Filter Media Cloths (6/Disk):	7	72	x	15	=	18.0	$299	$21,528

III. POWER CONSUMPTION

1) Backwash / Solids Waste Pump (kW Hours/Year):	4,468.4
2) Disk Drive Motor (kW Hours/Year):	961.2
3) Power Control Panel (kW Hours/Year):	2,800.0
Total Annual Power Usage (kW Hours/Year):	8,229.6

AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

Equipment Maintenance and Service Schedule

The proposed equipment included in this proposal package is designed to be accessible. Below is a list of equipment and access requirements:

- **Valves:** Operators can access the valves without special need of access. Check actuators every 6 months, calibrate as needed
- **Backwash/Solids pumps** Lubrication once a year.
- **Drive:** Lubrication once a year. Motor bearings are sealed.
- **Effluent Seal:** The seal is located at the around the diamond frame at the effluent wall. Estimated replaced in 10 years.
- **Control Panel:** Replace microprocessor battery every 3 years if needed.
- **Pile Cloth Media:** Every 7 years.

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FORM 00 31 00F - COST SUMMARY (SUBMIT AS FIRST PAGE OF TAB F)

Question/Criteria	Bidder's Response
Total cost for Goods and Special Services (from Bid Form)	*Cost to be entered by Buyer / Engineer based on data provided by Bidder on the Bid Form.*
Total cost for pilot test (Optional cost that MWD may or may not execute on)	*Cost to be entered by Buyer / Engineer based on data provided by others Bidder on respective Bid Forms.*
HIGHEST COST (from other bids)	*Cost to be entered by Buyer / Engineer based on data provided by others Bidder on respective Bid Forms.*
LOWEST COST (from other bids)	*Cost to be entered by Buyer / Engineer based on data provided by others Bidder on respective Bid Forms.*
COST SCORE	*Ratio to be determined by Buyer / Engineer. The highest score will be given to the Bidder with the lowest total cost and the cost scores of other Bidders will be proportional to the difference in costs.*

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AquaDisk®Cloth Media Filter
Process Performance Guarantee
for
Magna WRF, UT
2/28/2022

Aqua-Aerobic Systems, Inc. (Aqua-Aerobic) guarantees the AquaDisk® Cloth Media Filters in accordance with Specification Section 46 61 24 dated February 2022 and Addenda #1, Aqua-Aerobic's Design #167138 and Design Notes dated March 24, 2021 shall provide an average monthly filtered effluent of 5 mg/L TSS and 2 NTU.

The guarantee shall apply under the following conditions:

1. The influent flow is supplied to the filter(s) on a continuous basis at an average daily flow not to exceed a rate of 2.0 MGD and a peak flow rate not to exceed 4.0 MGD and:
   a. Filter influent TSS concentration shall not exceed 10 mg/l (daily average) and 20 mg/l maximum.
   b. Filter influent Turbidity concentration shall not exceed 5 NTU (daily average).
   c. Daily average TSS concentrations are based on 24-hour composite samples. Maximum TSS concentrations are based upon grab samples at any time.
   d. Filter influent solids loading shall not exceed 2.0 lbs TSS/ft^2/day.
   e. Hydraulic loading to the Cloth Media Filter shall not exceed 3.25 gpm/ft^2 of disk area at average daily flow and 5.0 gpm/ft^2 at peak flow. The sustained peak flow shall not exceed 3 hours.
   f. Wastewater entering the Cloth Media Filter is effluent from a secondary biological process.

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2. The influent TSS and Turbidity are capable of being removed by filtration as determined by an Aqua-Aerobic approved bench pilot filter operated at the proportionate filter design flow and solids loading rate and equipped with media identical to the installed equipment.
3. The filter is installed, operated and maintained in accordance with instructions supplied by Aqua-Aerobic.
4. The equipment has been paid for in accordance with contract terms.
5. A performance test is conducted according to the approved Field Process Performance Test Protocol, dated 2/28/2022, as submitted by Aqua-Aerobic.
6. Data during the performance test shall be sent to Aqua-Aerobic within one week of said testing.
7. The process guarantee shall be considered satisfied upon successful completion of the performance test.
8. Start-up shall be defined by the date stated on Aqua-Aerobic's "Manufacturers Certificate of Inspection" form executed upon completion of start-up services.
9. Should the filter system not meet the guaranteed performance:
    a. The guarantee shall be considered invalid if the influent parameters do not conform to Conditions 1 and 2.
    b. In the event that the influent parameters are within the limits specified under Conditions 1 and 2, Aqua-Aerobic shall have up to 30 days to modify the filters as necessary to achieve the guaranteed performance.
10. If failure to produce the guaranteed effluent is due to influent quality not in conformance with Conditions 1 or 2, the Owner shall have up to 30 days to bring the filter influent to specified limits. If the Owner is unable to produce the specified influent conditions within 30 days, the guarantee will be considered to be satisfied.
11. This guarantee shall no longer be applicable or valid if any product, including any software program, supplied by Aqua-Aerobic, is modified or altered without the written approval of Aqua-Aerobic.

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12. In the event of continued failure of the equipment to produce the guaranteed effluent characteristics at no fault of the owner, Aqua-Aerobic shall have the option to modify the filter(s) as necessary to achieve the guaranteed performance. The maximum cumulative liability to Aqua-Aerobic for the modification or supply of additional equipment shall be limited to 100% of the initial sales price of the equipment supplied.

Aqua-Aerobic Systems, Inc.

_____ _____

Kristy Chycota Execution Date
Process Engineer - Filtration

_____

Customer / Owner Company Name

_____ _____

Authorized Signature Execution Date

_____

Title

NOTE: Aqua-Aerobic Systems, Inc. will execute the process performance guarantee upon receipt of a purchase order, acceptance of terms and conditions and approved submittal drawings.

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Aqua MiniDisk® Cloth Media Filter
Field Process Performance Test Protocol
for
Magna WRF, UT
2/28/2022

Introduction:

To satisfy Specification Section 46 61 24, dated February 2022 and Addendum 1, the following field process performance test shall be performed.

Protocol:

1) The filter(s) will be tested for a period of one eight hour day to assess process performance. The field performance testing shall be conducted no later than sixty (60) days after startup or beneficial use. The start date shall be mutually agreed upon by the Engineer, Owner, Installing Contractor, and Aqua-Aerobic Systems. Under supervision of Aqua-Aerobic Systems' field service representative, the Installing Contractor will conduct the testing and shall employ the services of a local certified laboratory facility to perform sample analysis in accordance with this testing procedure. The Engineer and the Owner shall have the right to witness the performance test.
2) The performance test shall be executed using plant secondary effluent after the plant processes have stabilized and the plant is performing according to the design specified operating requirements. The filter influent loading conditions shall be in accordance with the values stated in the project bid specifications as referenced in the "Performance and Design Parameters" section of this document. In the event that the filter influent does not meet this criteria, the testing shall be postponed or the performance expectations adjusted as mutually agreed to by the Owner, the Engineer, and Aqua-Aerobic Systems.
3) Testing will be done simultaneously on all filter(s). The filter(s) will be tested for one eight hour day. The actual flow at the time of testing will be monitored and equally split to all filter(s) units. If the flow rate does not reach the targeted flow

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conditions, filter(s) will be taken offline as needed to simulate target flow conditions. If the target flow conditions cannot be achieved while a single filter is in operation, the test will be conducted on a single filter with the available flow. During the test period, the filter(s) will be tested at the peak flow rate for a maximum of 2 hours if such flow rates exist at time of test.

4) Composite one litter TSS samples consisting of a minimum of four (4) grab samples per hour will be taken from either the secondary clarifier effluent box (mid-depth) or the influent weir (mid-depth) and from each of the filter(s) outlets (mid-depth). Composite samples shall be collected, stored, and analyzed for TSS according to the latest edition of Standard Methods for the Examination of Water and Wastewater. Testing shall be done by a local certified laboratory. Expedited service from the laboratory shall be requested to ensure that results return within the period of the performance test. Effluent water quality will be monitored and reported by a continuous online turbidimeter that draws a sample from the Reuse Pump Station Wet Well. The turbidimeter shall be calibrated before the start of the test. The Installing Contractor, or Aqua-Aerobic Systems shall furnish all labor, materials, equipment, auto samplers, laboratory services, instrumentation, and any other equipment and services necessary for conducting the field performance testing. The Installing Contractor shall furnish all electric, water and other utilities.

5) The party responsible for conducting the field performance test shall compile all influent and effluent TSS and turbidity data onto an Excel® spreadsheet and graph the data to clearly show performance compliance. Any data collected by the contractor, the owner, or the manufacturer during the performance testing shall be submitted to the party responsible for conducting the field performance test to be incorporated into this summary.

6) The party responsible for conducting the filter performance test shall compile the filter(s) influent flow rates using the influent flowmeter and the conversion to filtration rates shall be summarized on an Excel® spreadsheet. NOTE: Alternatives to an influent flowmeter are measuring the nappe over the influent weir or readings from an effluent flowmeter. However, these alternatives are less desirable.

7) A testing day will run from 8:00 am until 8:00 am of the following day.

8) In the event of failure of the equipment to produce the required effluent characteristics during the performance testing, Aqua-Aerobic Systems shall have the option to modify the filter(s) as necessary to achieve the guaranteed performance testing. The maximum liability to Aqua-Aerobic Systems for the modification or supply of additional equipment shall be limited to 100% of the initial sales price of the equipment supplied.

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Evaluation:

The AquaDisk® Cloth Media Filter(s) shall have demonstrated the following specified performance parameters based upon the following specified filter(s) influent conditions:

Performance and Design Parameters:

a. Wastewater Flow:

Average Daily Flow:	2.0 MGD per filter
Max Daily Flow:	4.0 MGD per filter

b. Filter Influent Characteristics:

	Filter Influent
Average Daily TSS (mg/l)	10
Max. TSS (mg/l)	20
Max. turbidity (NTU)	5

c. Filter Effluent Characteristics:

	Filter Effluent
Average Daily TSS (mg/l)	5
Average Daily Turbidity (NTU)	2

Reporting of Results:

Aqua-Aerobic Systems, Inc. shall receive the test data from the Installing Contractor and Aqua-Aerobic Systems shall write a report to show the individual and average flow rates, TSS and turbidity recorded during the field process performance test and shall conclude whether the filter(s) have met the performance as specified.

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AquaDisk® Cloth Media Filter(s) Field Performance Testing

Performance Test Data

Test Unit [___]

Witnessed By: _____ Date: _____

_____

_____

_____

Time	Influent Flow rate (MGD)	Influent TSS (mg/l)	Effluent TSS (mg/l)	Influent NTU (mg/l)	Effluent NTU (mg/l)

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AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

COMPANY PROFILE AND CAPABILITIES

GENERAL INFORMATION

ABOUT OUR COMPANY

Aqua-Aerobic Systems is an applied engineering company specializing in adaptive water management solutions including aeration/mixing, biological processes, cloth media filtration, membranes, oxidation/disinfection and process control. Since 1969, the company has served the water and wastewater industry by providing both municipal and industrial customers around the world with advanced technologies and treatment solutions that easily adapt to changing demands. From enhanced nutrient removal to primary filtration, ultra low phosphorus removal or water reuse, Aqua-Aerobic has proven solutions that offer the lowest cost of ownership with life-time customer service.

MISSION

Make a Good Company a Great One!

STRATEGIC INTENT

To build Aqua-Aerobic Systems, Inc. into a global technology leader that provides water treatment solutions for aeration/mixing, biological processes, filtration, disinfection, and aftermarket sales and services. To grow our company through technological leadership and partnerships with our customers. To uphold the values that have been the key to the success of Aqua-Aerobic Systems, Inc.



Peter G. Baumann, MBA
President & CEO



Kevin L. Heasley, EIT
Vice President, Operations



James Horton
Vice President, Process Group



William G. Decker, E.I.T.
Vice President & General Manager, Equipment and Services Group



Scott R. Willis
Vice President & Chief Financial Officer

FACILITY / TEST FACILITY

125,000 square feet office and manufacturing (25% office space and 75% manufacturing space)

250,000 gallon (950 m^3) test tank
55,000 gallon (209 m^3) test tank

RESEARCH & TECHNOLOGY CENTER

Located at the Rock River Water Reclamation District, this on-site research facility allows Aqua-Aerobic to conduct extensive research and testing on new products and process concepts.

REPRESENTATION

150 Sales Representatives in the US, Canada, Mexico and throughout the world. Most are graduate engineers and have design capabilities.

MARKETS

85% United States, Canada, Virgin Islands
15% International

INSTALLATIONS

More than 10,000 installations worldwide

GENERAL INFORMATION

ENGINEERING & TECHNICAL EXPERTISE

Aqua-Aerobic Systems, Inc. has a full staff of process, mechanical and electrical engineers, product managers, R&D staff, customer service and field service specialists.

Total Employees	160 (Office and Manufacturing)
Administration	10 Technical Managers & Officers
Process Group	1 Vice President 1 Director of Product Management
Cloth Media Filtration	1 Product Manager 1 Process Engineer
Biological Processes	2 Product Managers 2 Senior Process Engineers
Domestic Sales	4 Regional Managers
International Sales	1 International Business Manager
Industrial Sales	1 Industrial Business Manager
Applications Engineering	1 Manager 5 Project Applications Engineers 5 Applications Engineers
Equipment & Services Group	1 Vice President
Aeration & Mixing	1 Manager 4 Support Personnel
Oxidation & Disinfection	1 Manager 1 Support Person
Customer Service/ Field Service	1 Manager 13 Employee Outside Service Providers 12 Authorized Service Providers 3 Inside Personnel
Aftermarket Service	1 Manager 7 Support Personnel

Operations	1 Vice President
Manufacturing	1 Manager 13 Shop Employees
Project Management	1 Senior Project Managers 2 Project Managers
Research & Development	1 Director 1 Manager 6 Degreed Engineers/Support Personnel
Engineering	1 Director 4 Managers 28 Degreed Engineers/Support Personnel



FINANCIAL INFORMATION

Aqua-Aerobic Systems, Inc. is a well financed company with sales approaching $100 Million. Aqua-Aerobic Systems, Inc. also has extensive bonding capabilities.

Primary Banking	BMO Harris Bank, Rockford, Illinois
Auditors	RSM McGladrey, Rockford, Illinois

COMPANY HISTORY

In 1919, Rockford, Illinois was a rapidly growing riverfront community. Race Street, in the center of town, was home to Solem Machine Company, a respected manufacturer of woodworking equipment. As the city grew and thrived, so did the company. In 1958, larger facilities were needed and the company moved to 6306 N. Alpine Road.

In 1964, a group of investors, including Aqua-Aerobic Systems, Inc. President, John D. Brubaker (retired), purchased this well established manufacturing firm. With an eye toward the future, these investors considered the changing market needs and began expanding the product line. Soon after, the company was positioned to meet the demands of a new and growing environmental industry. In 1969, Solem Machine Company purchased Aqua-Aerobic Systems and began manufacturing its own line of surface aerators, the Aqua-Jet®. The Aqua-Jet® aerator quickly revolutionized the aerator industry, which led to the company phasing out its other product lines and shifting its focus exclusively to wastewater treatment. In 1976, that commitment resulted in Solem Machine Company's decision to legally adopt the name Aqua-Aerobic Systems, Inc.

In 1989, an additional 35,000 square feet of office and manufacturing space was constructed to accommodate the company's rapid growth. Due to increased requests for Aqua's technical seminars and an increase in local business due to growth of the Chicago suburbs, Aqua-Aerobic once again expanded its facilities. In April 2005, another 25,000 square feet was added to the existing building for new, state-of-the-art seminar facilities, more meeting areas, a formal lunchroom, and new offices. The exterior of the new building is environmentally friendly, utilizing glass to promote natural heat and lighting. The existing building was renovated and included conversion of 4,800 square feet of office space into manufacturing space. Existing office areas were also remodeled to coincide with the interior of the new building. Construction was complete in Spring 2006 and included space for company growth. The new high-tech facilities allow Aqua-Aerobic to accommodate larger seminar audiences and to provide remote webcasts.

In 2016, Aqua-Aerobic Systems merged with Metawater Co., Ltd., (Tokyo, Japan) an international company and leading supplier of advanced water and wastewater solutions. Currently, Aqua-Aerobic employs approximately 160 persons in manufacturing, engineering, sales/marketing and administration. The company's product line includes: surface aerators, diffused aeration systems, surface spray coolers, direct-drive mixers, batch reactor systems, cloth media filters, sand media filters, membrane systems, control panels, and process management control systems.

The company's dedication to research and development ensure the availability of products to meet unique applications and changing requirements. Aqua-Aerobic has gained recognition for quality products. Our commitment to environmental preservation and product integrity ensures continued success well into the 21st century.

TRADEMARKS & PRODUCT LINE

PATENTS

Aqua-Aerobic Systems, Inc. holds 45 patents for processes and equipment used in wastewater treatment systems.

PRODUCTS AND SYSTEMS

Aeration & Mixing

Aqua-Jet® Surface Mechanical Aerator
Aqua-Jet II® Contained Flow Aerator
AquaDDM® Direct-drive Mixer
ThermoFlo® Surface Spray Cooler
Endura® Series Limited Maintenance Product
OxyMix® Pure Oxygen Mixer
OxyStar® Aspirating Aerator
Fold-a-Float® Self-deploying Segmented Float
SAF-T Float® Safe Accessible Float Technology

Biological Processes

Aqua MixAir® Aeration System
AquaCAM-D® Combination Aerator/Mixer/Decanter
AquaSBR® Sequencing Batch Reactor
AquaNereda® Aerobic Granular Sludge Technology
Aqua MSBR® Modified Sequencing Batch Reactor
AquaPASS® Phased Activated Sludge System
Aqua BioMax® Dual Treatment System
AquaEnsure® Ballast Decanter
Aqua EnduraTube® Fine-bubble Tube Diffuser
Aqua EnduraDisc® Fine-bubble Disc Diffuser
Aqua CB-24® Coarse-bubble Diffuser

Filtration

AquaDisk® Cloth Media Filter
AquaDiamond® Cloth Media Filter
AquaDrum® Cloth Media Filter
Aqua MiniDisk® Cloth Media Filter
Aqua MegaDisk® Cloth Media Filter
AquaPrime® Cloth Media Filter
AquaStorm™ Cloth Media Filter
OptiComb™ Backwash System
OptiFiber® Cloth Filtration Media
OptiFiber PES-13® Cloth Filtration Media
OptiFiber PA2-12® Cloth Filtration Media
OptiFiber PES-14® Cloth Filtration Media

TYPICAL INDUSTRIES SERVED

- Pulp & Paper
- Food/Dairy
- Beverage
- Chemical
- Petroleum/Petrochemical
- Textile
- Energy/Utility
- Pharmaceutical

Filtration (continued)

OptiFiber PF-14® Cloth Filtration Media
OptiFiber UFS-9™ Cloth Filtration Media
AquaABF® Automatic Backwash Filter

Membranes

Aqua MultiBore® P-Series Polymeric Membrane System
Aqua MultiBore® C-Series Ceramic Membrane System
AquaMB Process® Multiple-Barrier Membrane System
Aqua-Aerobic® MBR Membrane Bioreactor System

Disinfection

Aqua ElectrOzone® F-Series Ozone Generator
Aqua ElectrOzone® M-Series Modular Ozone Generator

Controls and Monitoring

IntelliPro® Monitoring and Control System



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COMMUNITY INVOLVEMENT

Aqua-Aerobic Systems takes pride in its donations to over 90 organizations.

MEMBERSHIPS

American Membrane Technology Association (AMTA)
American Society for Quality
American Water Works Association (AWWA)
Business for the Bay
Illinois Chamber of Commerce
Illinois Manufacturers' Association
International Association on Water Quality (IAWQ)
International Desalination Association (IDA)
International Ozone Association (IOA)
National Association of Manufacturers
National Association of Clean Water Agencies
Technical Association of Pulp & Paper Industry (TAPPI)
Water Environment Federation (WEF)
Water & Wastewater Equipment Manufacturers Association (WWEMA)
WateReuse Association
Water Design-Build Council

RECOGNITIONS

Northern Illinois Business Hall of Fame
Exporter Continuing Excellence Award
Manufacturer of the Year Award from Rockford Chamber of Commerce
Special Congressional Recognition
WWEMA Diamond Award
Outstanding Corporation Award from the City of Rockford
Innovative Technology Award from WEF - 2008, 2011
Export Achievement Certificate from the U.S. Dept. of Commerce
Confluence Partnership Honors - Aqua-Rock Business Development Project (2018)

TRAINING AND EDUCATION

Structured training seminars are conducted by Aqua-Aerobic personnel monthly, May through September. More than 30 Consulting Engineers, Plant Operators, and Municipal Officials typically attend these training seminars each month to learn about Aqua-Aerobic equipment and systems. Aqua-Aerobic Systems' engineering staff attends company sponsored seminars and workshops relating to the wastewater industry.



EMPLOYEE PROFILES

OFFICERS

Peter Baumann, MBA
President & CEO
M.S. degree in Business Administration, B.S. degree in Engineering/University of Wisconsin - Milwaukee. Experience in wastewater since 1976, including 20 years at Envirex Corp.

William Decker, E.I.T.
Vice President & General Manager, Equipment and Services Group
B.S. degree in Civil Engineering/USAF Academy, EIT/ State of Colorado. Project Engineer since 1990. Experience in wastewater since 1994, including Vice President of Biosolids at Ashbrook Simon-Hartley, and 2 years as President of Aquionics.

Kevin L. Heasley, E.I.T.
Vice President, Operations
B.S. degree in Structural Design & Construction Technology/Penn State University, Harrisburg, EIT/State of Pennsylvania. Experience in large underground piping systems and wastewater since 1984.

James Horton
Vice President, Process Group
M.S. degree in Civil Engineering/Queensland University of Technology, Australia. B.S. degree in Chemical / Environmental Engineering/University of Queensland, Australia. Domestic and International experience in wastewater engineering since 1996 including positions with consulting engineer and specialty wastewater contractor.

Scott Willis
Vice President & Chief Financial Officer
M.S. degree in Business Administration and B.S. degree in Accounting/Northern Illinois University, DeKalb, IL AAS degree in Business/Rock Valley College, Rockford, IL.

ADMINISTRATIVE MANAGERS

Pamela Appino, P.H.R.
Director of Human Resources
B.S. degree in Administration of Criminal Justice/Bradley University, Peoria, IL. P.H.R. Certification from HR Certification Institute. Human Resources experience since 1991.

EMPLOYEE PROFILES

PROCESS GROUP

James Horton
Vice President, Process Group
M.S. degree in Civil Engineering/Queensland University of Technology, Australia. B.S. degree in Chemical / Environmental Engineering/University of Queensland, Australia. Domestic and International experience in wastewater engineering since 1996 including positions with consulting engineer and specialty wastewater contractor.

PRODUCT MANAGEMENT

Mark Hughes, P.E.
Director of Product Management
M.S. degree in Environmental and Water Resources Engineering/The University of Texas - Austin. B.S. degree in Civil Engineering/University of Iowa, Iowa City, IA. Experience in wastewater since 2008.

Kristy Chycota
Process Engineer - Filtration
B.S. degree in Paper Engineering - Environmental Processes/Western Michigan University, Kalamazoo, MI. 2 years experience in Product Management at Englewood and 4 years at Beloit Corporation as a process engineer. Experience in wastewater since 2019.

Manuel de los Santos
Product Manager - Biological Processes
M.S. degree in Sanitary and Environmental Engineering/Universidad de Cantabria, Spain. B.S. degree in Civil Engineering/Universidad Nacional Pedro Henriquez Ureña, Santo Domingo, DR. Experience in wastewater since 2000.

Paula Dorn
Process Engineer
M.S. degree in Environmental Engineering, B.S. degree in Civil Engineering/University of Illinois, Urbana-Champaign, IL. Experience in wastewater since 2018.

John Dyson
Product Manager - AquaPrime® / AquaStorm™
B.S. degree in Chemistry/Longwood College, Farmville, VA. Experience in water/wastewater since 1991.

Dave Holland
Senior Process Engineer
A.A.S. degree in Technical writing/Rock Valley College, Rockford, IL. Experience in wastewater since 1979.

Brett Quimby
Senior Process Engineer - AquaNereda®
B.A. degree in Japanese Language and Literature/ University of Wisconsin, Madison, WI. Experience in wastewater since 2016.

Joe Tardio
Product Manager - AquaNereda®
M.S. degree in Environmental & Waste Management/ Stony Brook University, Stony Brook, NY. B.A. degree in Biological Sciences & Chemistry/University of Delaware, Newark, DE. Experience in wastewater since 2006.

MARKETING

Cheryl Kunz
Director of Marketing
B.A. degree in Business Management/Ashford University, Clinton, IA. Experience in wastewater and marketing since 1989.

APPLICATIONS ENGINEERING

Tamera Knapp
Applications Engineering Manager
B.S. degree in Environmental Engineering/Michigan Technological University. B.S. degree in Environmental Liberal Arts/Northland College, Ashland, WI. Experience in wastewater since 2004.

Angelica Davila, E.I.T.
Senior Project Applications Engineer
B.S. degree in Environmental Engineering/University of Central Florida. Experience in wastewater since 2013.

Thea Davis
Project Applications Engineer
B.S. degree in Chemical Engineering and M.S. degree in Chemical Engineering/Illinois Institute of Technology, Chicago, IL. Water Innovation Research Intern at Current Innovation. Experience in wastewater since 2019.

Harrison DeBruler
Applications Engineer
B.S. degree in Mechanical Engineering/University of Alabama, Tuscaloosa, AL. Experience in wastewater since 2021.

Nicholas Fortsas
Applications Engineer
B.S. degree in Chemical Engineering/University of Illinois at Urbana-Champaign, Champaign, IL. Experience in wastewater since 2019.

EMPLOYEE PROFILES

APPLICATIONS ENGINEERING (continued)

Michael Jacobson
Applications Engineer
B.S degree in Agriculture and Biological Engineering/ University of Illinois, Champaign, IL. Experience in water or wastewater since 2020.

Rungrod Jittawattanarat, Ph.D.
Project Applications Engineer
Ph.D. degree in Civil Engineering/Polytechic Institute of New York University. M.S. degree in Water and Wastewater Engineering/ Asia Institute of Technology, Thailand. B.S. degree in Environmental Engineering/ Chiang-Mai University,Thailand. Experience in wastewater since 1990.

Jonathon Kelsey
Applications Engineer
Biomolecular Engineering degree/Milwaukee School of Engineering (MSOE), Milwaukee, WI. Experience in water or wastewater since 2020.

Tatiana Mazzei
Project Applications Engineer
M.S. degree in Engineering/University of Wisconsin-Milwaukee, WI. B.S. degree in Chemical Engineering/ Universidad Metropolitana, Caracas, Venezuela Experience in wastewater since 2007.

Jakob Nowicki
Project Applications Engineer
B.S. degree in Chemical Engineering/Michigan Technological University, Houghton, MI. Experience in wastewater since 2017.

Corey O'Brien
Project Applications Engineer
B.S. degree in Environmental Engineering/University of Iowa, Iowa City, IA. Past experience in U.S. Navy as Aviation Technician. Experience in wastewater since 2016.

REGIONAL MANAGERS

Scott Kelly
Regional Sales Manager, West
B.S. degree in Chemical Engineering and Petroleum Refining/Colorado School of Mines, Golden, CO. Experience in wastewater since 1991.

Hui Lin, P.E.
Director of International Business
M.S. degree in Environmental Engineering/Polytechnic University of New York. M.E. degree in Environmental Engineering/National University of Singapore. B.S. degree in Biochemical Engineering/Beijing Institute of Chemical Technology. 6 years at Beijing Organic Chemical Works and 1 year at M&W Zander as Process Engineer. Experience in wastewater since 2002.

Jeff McCormick
Director of Industrial Sales
B.S. degree in Chemical Engineering/Grove City College, Grove City, PA. Experience in water or wastewater since 1985. Market Experience: Ultrapure water for medical research, semi-conductor manufacturing and steam generation. Wastewater treatment for food and beverage manufacturing, steel production, oil refining and specialty chemical manufacturing. Work experience: Sales leadership, Business Development, Operations Management, Product Management and Acquisition Integration.

Tom Miles
Regional Sales Manager, Northeast
B.S. degree in Chemical Engineering/Penn State University, State College, PA. Experience in wastewater since 1986.

Paul Nelson
Regional Sales Manager, Southeast
B.S. degree in Business and Economics/Elmhurst College, Elmhurst, IL. Experience in wastewater since 1978.

Steve Stanish
Regional Sales Manager, Midwest
B.A. degree in Business Administration/Washington & Jefferson College, Washington, PA. Experience in wastewater since 1996.

EMPLOYEE PROFILES

OPERATIONS

Kevin L. Heasley, E.I.T.
Vice President, Operations
B.S. degree in Structural Design & Construction Technology/Penn State University, Harrisburg, EIT/ State of Pennsylvania. Experience in large underground piping systems and wastewater since 1984.

PROJECT MANAGEMENT

David Cornford
Project Manager
Attended University of Wisconsin. Experience in wastewater since 1975, including 10 years at Welles Products Corp.

Tom Fenton
Senior Project Manager
A.A.S. degree in Civil Engineering/Williamsport College, Williamsport, PA. Experience in Project Management (including Accounting, Field Service, and Manufacturing) since 1994.

Shareef Khoga
Project Manager
B.S. in Manufacturing Engineering/Northern Illinois University, Dekalb, IL.

RESEARCH & DEVELOPMENT

Terrence Reid, P.E.
Director of Research & Development
M.S. degree in Product Design and Development/ Northwestern University, Evanston, IL. B.S. degree in Civil & Environmental Engineering/University of Wisconsin-Madison, WI. Experience in wastewater since 1989.

Blake Hoffman
Manager, Research & Development
B.S. degree in Business Management and Marketing/ Edgewood College, Madison, WI. B.S degree in Mechanical Engineering/University of Wisconsin-Platteville, WI. Experience in wastewater since 2018.

Joe Campanaro
Senior R&D Engineer
M.S. degree in Environmental Engineering/New York University, New York, NY. B.S. degree in Biology/Stony Brook University, Stony Brook, NY.

Darryl Gravagno
Senior Research & Development Engineer
B.S. degree in Environmental Engineering/University of Wisonconsin, Platteville, WI. A.A.S. degree in Science, Rock Valley College, Rockford, IL. Experience in wastewater since 2015.

Chris Kurshinsky
Research & Development Technical Systems Supervisor
Experience with product development since 1995. Engineering Supervisor R&C Test Lab from 2010-2017 and named as inventor of several patents. Experience as Technical Center Supervisor in the automotive industry 1995-2010. Experience in wastewater since 2017.

Lynn Peterson
Senior Research & Development Specialist
A.A.S. degree/Rock Valley College, Rockford, IL. Experience in wastewater since 2015.

Evan Price
Research & Development Engineer
M.S. degree and B.S. degree in Biological Systems Engineering/University of Wisconsin-Madison, WI. Experience in wastewater since 2018.

ENGINEERING

Robert Wiegand
Engineering Director
M.B.A. degree/University of Wisconsin-Madison. B.S degree in Electrical Engineering Technology/Bradley University, Peoria, IL. 10+ years experience in paper industry with Beloit Corp. Experience in wastewater since 2000.

ELECTRICAL STANDARDS

Gerald Schneider, P.E.
Electrical Standards Supervisor
B.S. degree in Electrical Engineering/University of Wisconsin, Madison, WI. Experience in wastewater treatment since 1989.

William Brundige
Electrical Design Engineer
A.A. degree in Mechanical Drafting/Iowa Central Community College, Fort Dodge, IA. Experience in electrical and pneumatic control systems design and drawing standards since 1979, with 20 years in the paper industry with Beloit Corporation.

EMPLOYEE PROFILES

ELECTRICAL STANDARDS (continued)

Mike Hevey
Senior Electrical Engineer
A.A.S. degree in Electromechanical Technology/ Chippewa Valley Technical College, Eau Claire, WI. 16+ years electrical controls engineering experience including control system and software validation and design, development and implementation of systems incorporating PLC, HMI, SCADA, hardware design, power distribution and MCC specification.

Junji Sakashita
Services & Electrical Engineer
Attended the Institute of Technology. Experience in the wastewater treatment industry, specifically Ozone, since 2011 at Fuji Electric Corp. of America/Metawater USA.

ELECTRICAL CONTRACT

Gary Lightfoot
Electrical Engineering Manager
A.A.S. degree in Electrical Technology/Rock Valley College, Rockford, IL. Experience in Electrical Engineering since 1978.

Mondi Anderson
Controls Engineer
B.S. degree in Computer Science/Neumont University, Salt Lake City, UT. Experience in wastewater since 1998.

Brian Pass
Electrical Design Engineer
A.A.S. degree in Electrical/Electronic Drafting/Herzing Institute of Technology, Madison, WI. Experience in wastewater since 2000.

Kent Campbell
Electrical Engineer
Degree in Engineering Electronic Technician/Radio College of Canada (RCC), Toronto, Calanda. Experience in wastewater since 2019.

Brad Christian
Electrical Engineer
A.A.S degree Robotics/ Automation Technology, Indian Hills community College, Ottumwa, IA.

Dan Crews
Senior Electrical Engineer
A.S. degree in Electronic Technology/Rock Valley College, Rockford, IL. Experience in engineering since 1982.

Bill Douglas
Electrical Designer
B.S. degree in Electrical Engineering/University of Wisconsin-Platteville. A.A.S. degree in Mathematics and Science/University of Wisconsin at Rock County. A.S. degree in Electronic/Electrical Drafting/Wisconsin School of Electronics. Experience in electrical engineering since 2003.

Dave Johnson
Senior Electrical Engineer
B.S. degree in Electrical Engineering/Milwaukee School of Engineering, Milwaukee, WI. Experience in wastewater since 2000.

Deborah Lewis
Electrical Designer
Experience in wastewater/water since 2021.

SooMin Loh
Electrical Engineer
B.S degree in Electrical Engineering/Wright State University. 5 years in Power Design with ME Engineering Consultant and experience in Ozone application with drinking/wastewater industry since 1991.

Jeremy Try
Senior Electrical Engineer
B.S. degree in Electrical Engineering/Southern Illinois University, Carbondale, IL. A.A.S. degree in Engineering/ Rock Valley College, Rockford, IL. Experience in engineering since 1983.

MECHANICAL STANDARDS

David Smith
Mechanical Engineering Manager
B.S. degree in Mechanical Engineering/University of Wisconsin-Madison. Experience in wastewater since 2000. Experience in mechanical design engineering and development since 1996, including 4 years at Beloit Corporation. Received patents for tissue machine equipment.

Devon Bockhop
Mechanical Designer
A.A.S. degree in Drafting and Design/Morrison Institute of Technology, Morrison, IL. Experience in wastewater since 2019.

Noah Dellamater
Mechanical Engineer
B.S. degree in Mechanical Engineering/Olivet Nazarene University, Bourbonnais, IL. Experience in wastewater since 2019.

EMPLOYEE PROFILES

MECHANICAL STANDARDS (continued)

Jerry Machula
Senior Mechanical Designer
A.A.S. degree in Mechanical Design and CAD/ Dunwoody Industrial College, Minneapolis, MN. Experience in custom product design for mechanical, electrical, pneumatic, and hydraulic products. Experience in the wastewater since 2002.

Michael McCormick
Senior Mechanical Engineer
B.S. degree in Mechanical Engineering/University of Wisconsin-Madison, WI. Experience in wastewater since 2010.

Mike Schmitz
Principal Engineer
B.S. degree in Mechanical Engineering/University of Wisconsin, Milwaukee, WI. Experience in wastewater since 2008.

MECHANICAL CONTRACT

Dan Durdan
Manager, Contract Engineering & Estimating
A.A.S. degree in Mechanical Engineering/IL Valley Community College, Oglesby, IL. Experience in wastewater since 2006.

Tim Austin
Senior Mechanical Designer
A.A.S. degree in Computer Aided Mechanical Design/ Rock Valley College, Rockford, IL. Experience in design engineering since 1997.

Beth Bahr
Mechanical Designer
A.A.S. degree in Mechanical Engineering/Blackhawk Technical College, Janesville, WI. Experience in wastewater since 2001.

Chris Carlson
Senior Mechanical Designer
A.A.S degree in Engineering Technology-Design and Drafting/Morrison Institute of Technology, Morrison, IL. Experience in wastewater since 2007.

Mitchell Cook
Mechanical Designer
Attended College of Lake County, Grayslake, IL. SolidWorks Mechanical Design Certification. Experience in wastewater since 2021.

Scott Howarth
Senior Mechanical Designer
A.A.S. degree in Mechanical Drafting/Morrison Institute of Technology, Morrison, IL. Drafting experience since 2002.

Joseph Massari
Senior Mechanical Designer
A.A.S. degree in Machine Design Technology/Rock Valley College, Rockford, IL. Mechanical and design experience since 1979. Experience in wastewater since 2002.

Bryce Worley
Mechanical Designer
Attended ITT Tech-online. Attended Morrison Institute of Technology, Morrison, IL. Experience in wastewater since 2021.

Stephen Yalung
Mechanical Designer
A.A.S. degree in Design and Drafting/Illinois Valley Community College, Oglesby, IL. Experience in wastewater since 2019.

ESTIMATING

Gordy Brown
Senior Design Analyst
B.S. degree in Civil Engineering/Southern Illinois University. 6 years civil construction and mechanical design. Experience with PLC's, AutoCAD and RVC.

Ali Groen
Design Analyst
A.A.S. degree in Construction Technology/Morrison Institute of Technology, Morrison, IL.
Experience in the wastewater since 2008.

Scott Tripp
Design Analyst
Experience in Engineering since 1989. Experience in wastewater since 1995.

EMPLOYEE PROFILES

EQUIPMENT AND SERVICES GROUP

William Decker, E.I.T.
Vice President & General Manager, Equipment and Services Group
B.S. degree in Civil Engineering/USAF Academy, EIT/ State of Colorado. Project Engineer since 1990. Experience in wastewater since 1994, including Vice President of Biosolids at Ashbrook Simon-Hartley, and 2 years as President of Aquionics.

AERATION & MIXING

James Knight
Senior Engineer - Aeration & Mixing
A.A.S. degree in Mechanical Design/Southeastern Iowa Community College, West Burlington, IA. Experience in design field since 1970. Experience in wastewater since 1975.

Loryn Martin
Product Manager - Aeration & Mixing Technologies
M.B.A. degree in Business Administration/University of Phoenix, Phoenix, AZ. B.A. degree in Communication with emphasis on Public Speaking/ Loyola University, Chicago, IL. A.A.S. degree/Rock Valley College, Rockford, IL. Experience in water/wastewater since 2013.

OXIDATION & DISINFECTION

Dawn Brady, P.E.
Senior Application Engineer - Oxidation & Disinfection
M.S. degree in Civil Engineering/Southern Illinois University Carbondale, IL. M.S. degree in Hydraulic and Ocean Engineering/National Cheng Kung University, Tainan, Taiwan. B.S. degree in Civil Engineering/Southern Illinois University, Carbondale, IL.

Erich DeLang
Product Manager - Oxidation & Disinfection
B.A. degree in Political Science/Marquette University, Milwaukee, WI. MWS - Master Water Specialist (a Water Quality Association credential). Experience in the wastewater since 2004.

CUSTOMER SERVICE/FIELD SERVICE

CUSTOMER SERVICE

Tyrone Pratt
Customer Service Manager
B.S. degree in Marketing/Southern Illinois University, Carbondale, IL. Experience in Field Service / Journeyman Electrician for industrial, commercial and residential since 1987.

Shawn Butterfield
Technical Support Specialist
A.A.S. degree in Science Engineering (Electronic/ Electrical Drafting)/Wisconsin School of Electronics (now Herzing University). Experience in water and wastewater since 2018.

Michael Spragg
Technical Support Specialist
Experience with submarine maintenance for 20 years in the Navy. Experience as a Field Service Engineer for 13 years. Experience in wastewater since 2019.

Dean Woyak
Customer Service Process Specialist
B.S. degree in Water Resources/University of Wisconsin-Stevens Point. Experience in waster and wastewater since 1994.

FIELD SERVICE

John Edelen
Field Service Specialist
B.S. degree in Science & Business Administration/ University of Central Florida, Orlando, FL. Experience in Field Service since 1998.

Josh Frieze
Field Service Specialist
B.S. degree in EET/Grantham University, Lenexa, KS. 10 years of combined experience as an Instrumentation and Controls Engineer and Field Service Tech/Engineer since 2008.

Curt Larson
Field Service Specialist
Experience in wastewater since 2003.

Benjamin Morton
Field Service Specialist
PA DEP Wastewater Certificate. Experience in wastewater since 1998.

EMPLOYEE PROFILES

FIELD SERVICE (continued)

Tom Mowery
Field Service Specialist
Experience in wastewater since 1996.

Edward Sanchez
Field Service Specialist
Certified in Mechanical Technology. Experience in Field Service since 2000.

William Sims
Field Service Specialist
Served in the U.S. Army as reverse osmosis water treatment supervisor for 10 years. Experienced in Field Service and Training Specialist with Department of Defence. Experienced in start-up, troubleshooting, and operator training for aerators, mixers, filters since 2016. Experiences in mechanical and electrical checkout/ inspection for 10 years. Experience in water treatment since 2001.

Geoffrey Smith
Field Service Specialist
B.S. degree in Electronics Engineering Technology/ Grantham University, Lenexa, KS. Experience in Field Service since 2014 with wastewater experience since 2015.

Tony Smith
Field Service Specialist
A.A.S. degree in Electronics Engineering Technology/ ITT Technical Institute, Norwood, OH. Experience in wastewater since 2003.

Jerry Tucker
Field Service Specialist
Certified in Electrical/Mechanical Technology Electrician experience since 2008 with experience in wastewater since 2018.

Ohta Watson
Field Service Engineer
Kasukabe Technical High School Electricity Department, Japan. Experience in water and wastewater since 2010.

AFTERMARKET SERVICES

Paul Klebs
Aftermarket Sales Manager
B.S. degree in Chemistry/University of Wisconsin-Madison, WI. Graduate coursework in Environmental Studies/University of Wisconsin-Green Bay, WI. Certified operator in the state of Wisconsin. Experience in wastewater since 1992.

Denise Boehm
Aftermarket Sales Representative
Experience in Customer Service in HVAC, packaging and processing equipment and wastewater since 2000.

Barb Kinroth
Contract Administrator
A.A.S. degree/Rock Valley College, Rockford, IL. Experience in water and wastewater since 1989.

Tim Lamont
Senior Aftermarket Sales Representative
B.S. degree in Geology/University of Illinois, Urbana-Champagin, IL. Experience in Sales and Customer Service since 2000. 5 years experience with retail and manufacturing in the electrical industry.

Jeff Ogle
Aftermarket External Sales Representative
B.S. degree from Western Illinois University, M.B.A. degree from Keller Graduate School of Management. Experience in water treatment industry, including operations, sales and management since 1991.

Leann Torrisi
Administration Assistant for Aftermarket Sales
Experience in administrative assistance since 2004.

Denise Uchacz
Aftermarket Sales Representative
Associates in Arts degree. Experience in the wastewater since 2015 with previous experience in Inside Sales and Customer Service.

Michaela Villarreal
Aftermarket Sales Representative
B.A. degree in Business Administration from Ashford University. Experience in Sales and Customer Service since 2010. Experience in Water and Wastewater Sales and Customer Service since 2018.



AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

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Bulletin #110 9/21

AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

Cloth Media Filtration

Featuring OptiFiber® Pile Cloth Media

Aqua-Aerobic® Cloth Media Filtration

Featuring OptiFiber® Pile Cloth Media

In the early 1990s, Aqua-Aerobic Systems revolutionized tertiary treatment by introducing Pile Cloth Media Filtration utilizing a disk configuration. Since then, over 3,000 pile cloth media filtration units have been installed worldwide, and hundreds of different media have been researched and tested with a select few that are currently being applied to six mechanical configurations in a variety of applications including: water reuse, low level phosphorus, stormwater and primary treatment.

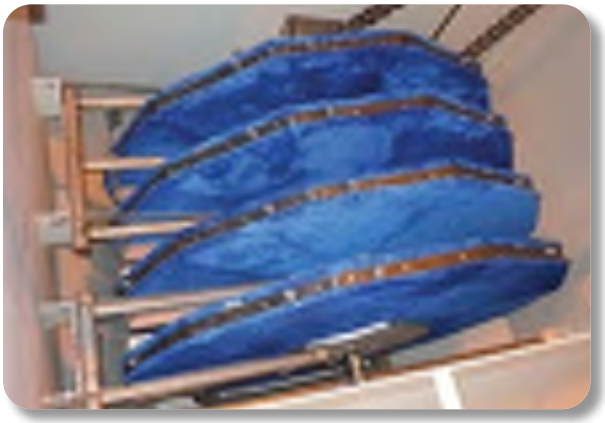
Effective Depth Filtration

The original OptiFiber® pile cloth media is specifically engineered for water and wastewater applications and designed to maximize solids removal over a wide range of particle sizes. Deep, thick, pile fibers capture particles for the most effective depth filtration. Perhaps as important, the media is engineered to backwash effectively and last over time. OptiFiber media is exclusive to the entire line of cloth media filter configurations including:

- AquaDisk®
- Aqua MegaDisk®
- AquaPrime®
- AquaStorm™
- AquaDiamond®
- Aqua MiniDisk®

OptiFiber® Media Advantages

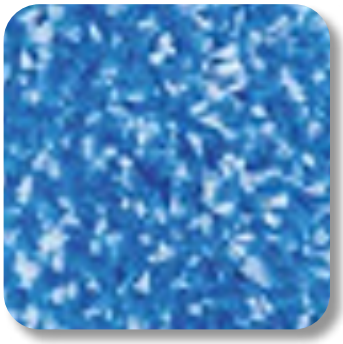
- Woven, precision fibers provide strength and durability
- Discrete pile fibers effectively release solids during backwash
- Open backing minimizes potential for biofouling
- Low backwash volume results in water savings and energy reduction
- Variety of application-specific cloth including 2, 5 & 10 µm nominal pore size media
- Phosphorus removal to 0.075 mg/l or less
- Ability to handle high solids conditions



An AquaDisk® filter with OptiFiber PES-14® treats cooling tower blow-down.



OptiFiber PA2-13®



OptiFiber PES-13®



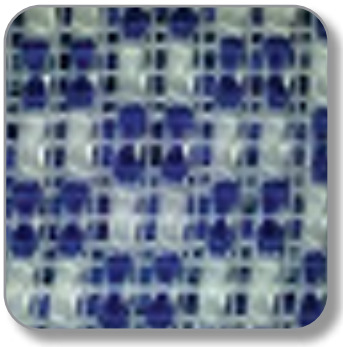
OptiFiber PES-14®



OptiFiber UFS-9™



OptiFiber PF-14®



Unique Backing Design

OptiFiber® Cloth Filtration Media

Awarded BlueTech® Research Innovation Badge

Engineered Cloth Media

The media is the most important aspect in any filter design. Today's OptiFiber® pile cloth filtration media is the result of over 30 years of continuous engineering and improvement. Each aspect of the pile cloth is design is engineered to provide an optimal design to maximize particle removal, allow for effective backwash, and maximize media life.

Hundreds of media options have been tested as part of this continuous development process. Only five of these options have made it through the rigorous testing process and met the quality standards set forth by Aqua-Aerobic Systems, Inc.



A cloth media display showcases samples of tested media with the far left panel featuring OptiFiber® media.

OptiFiber® Cloth Media Technology Timeline

1993	2000	2004	2006	2011	2013	2016	2017	Continued Innovation
AquaDisk® Filter	OptiFiber PA2-13® Media	AquaDiamond® Filter	OptiFiber PES-13® Media	OptiFiber PES-14® Microfiber Media	Aqua MegaDisk® Filter	AquaPrime® & AquaStorm™ Filter with OptiFiber PF-14® Media	OptFiber UFS-9® Ultrafiber Media	

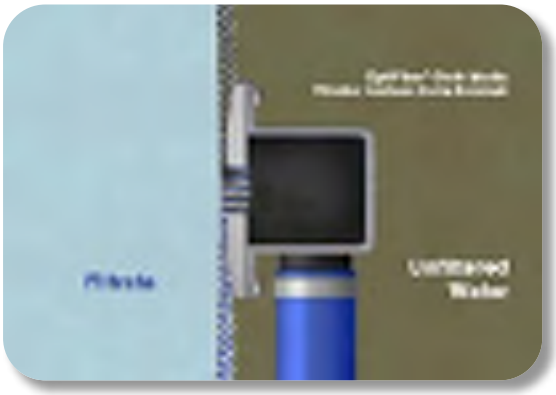
Backwash System

EFFECTIVE CLEANING WITH LESS WATER AND ENERGY

Maximum cleaning of the OptiFiber® cloth media is accomplished with a unique backwash system. The backwash shoe makes direct contact with the cloth media and solids are vacuumed from the surface. During backwash, fibers fluidize to provide an efficient release of stored solids deep within the fiber depth.

Backwash System Advantages

- Filtration continues during backwash
- Initiated at a pre-determined liquid level or time
- Low backwash rates
- Less water volume required
- Low energy consumption



Backwash shoe makes direct contact with the media.



Shown is pile cloth media in its natural state (left) and its conditioned state (right).

Configurations

AquaDisk®
CLOTH MEDIA FILTER

The cloth media “Disk” configuration was the first to enter the marketplace as an alternative to conventional granular media filtration technologies. This original configuration comprises the majority of Aqua-Aerobic cloth media filters installed today. A history of exceptional operating experience in a variety of municipal and industrial applications continues to make the AquaDisk® the tertiary filter of choice.

Features and Benefits

- Vertically oriented cloth media disks reduce required footprint
- Each disk has six lightweight, removable segments for ease of maintenance
- Low hydraulic profile
- Higher solids and hydraulic loading rates
- Low backwash rate
- Available in painted steel, stainless steel or concrete tanks
- Fully automatic PLC control system with color touchscreen HMI
- Low cost of ownership



Modes of Operation

Aqua-Aerobic cloth media filter configurations operate on the same (3) modes of operation: **FILTRATION, BACKWASH** and **SOLIDS WASTING.**



Filtration Mode

- Inlet wastewater enters filter
- Cloth media is completely submerged
- Disks are stationary
- Solids deposit on outside of cloth media forming a mat as filtrate flows through the media
- Tank liquid level rises
- Flow enters the filter by gravity and filtrate is collected inside the disks and discharged
- Heavier solids settle to the tank bottom



Backwash Mode

- Solids are backwashed at a predetermined liquid level or time
- Backwash shoes contact the media directly and solids are removed by vacuum pressure using the backwash pump
- Two disks are backwashed at a time (unless a single disk is utilized)
- Disks rotate slowly
- Filtration is not interrupted
- Backwash water is directed to headworks



Solids Wasting Mode

- Heavier solids on the tank bottom are removed on an intermittent basis
- Solids are pumped back to the headworks, digester or other solids collection area of the treatment plant

Aqua MegaDisk®

CLOTH MEDIA FILTER

The Aqua MegaDisk® cloth media filter expands on the reliability and exceptional performance of the original AquaDisk filter, but on a larger scale. Each disk is approximately 10' in diameter. The unit features all of the same benefits and (3) modes of operation as the AquaDisk but with larger disks.

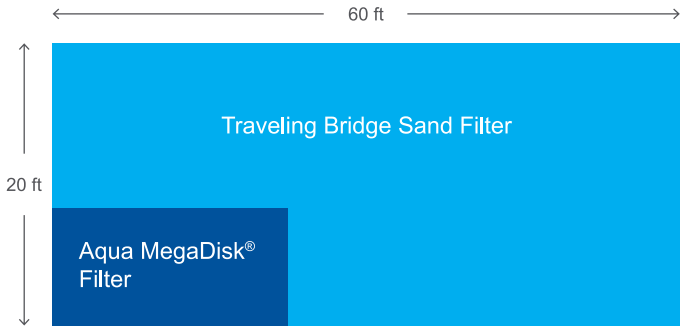
Additional Features and Benefits

- Smallest footprint, operating in 80% less space than sand filters with comparable hydraulic capacity
- Up to 24 disks in a single filter, capable of treating 24 MGD
- Ideal for deep bed sand filter retrofits, new plants or expansions
- Lightweight segments removable without a crane



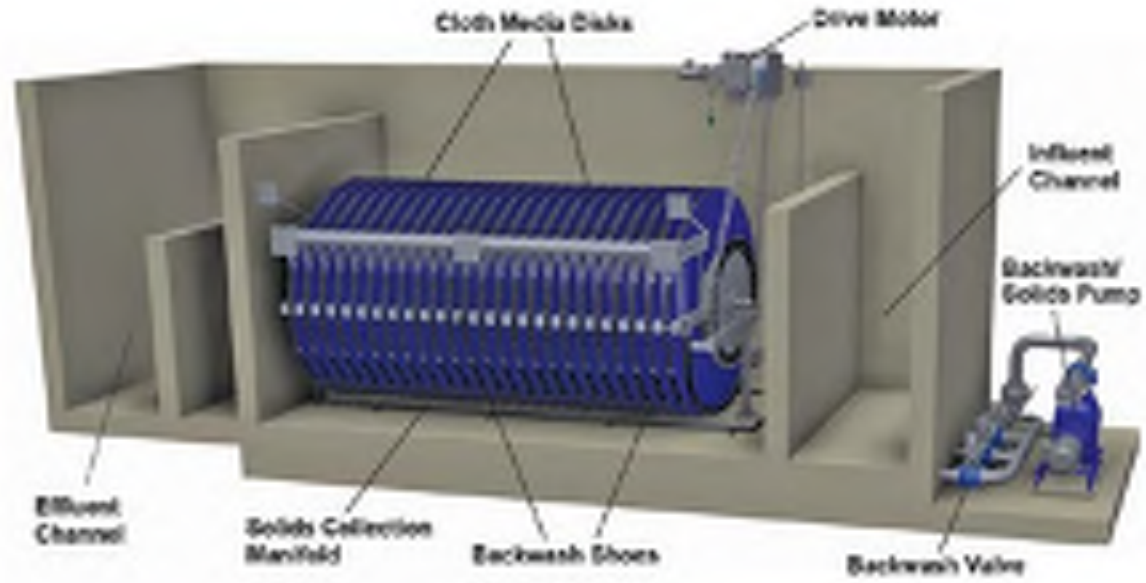
Aqua MegaDisk® (left) compared to AquaDisk® (right).

Footprint Savings Compared to Sand Filters





Internal view of the Aqua MegaDisk®



Configurations

Aqua MiniDisk®

CLOTH MEDIA FILTER

The Aqua MiniDisk® cloth media filter features all of the same benefits and (3) modes of operation as the original AquaDisk. The configurations are designed to provide economical treatment of smaller flows and easily retrofit into existing traveling bridge sand filters.



The Aqua MiniDisk® cloth media filter is available as packaged unit(s) or concrete basin(s).



The modular design of the Aqua MiniDisk® filter retrofits neatly into existing 9 ft. (2.74 m) wide concrete traveling bridge filter basins, providing more than two times the hydraulic capacity of the original sand filters.

Filter IntelliPro®

Filtration Optimization System

Building from a decade of experience in applying advanced process control, Filter IntelliPro® is a control system for cloth media filters that uses real time data to optimize chemical usage for phosphorus removal prior to filtration. Among its many features, the system includes automatic optimal dose selection for metal salt, polymer, and pH control.

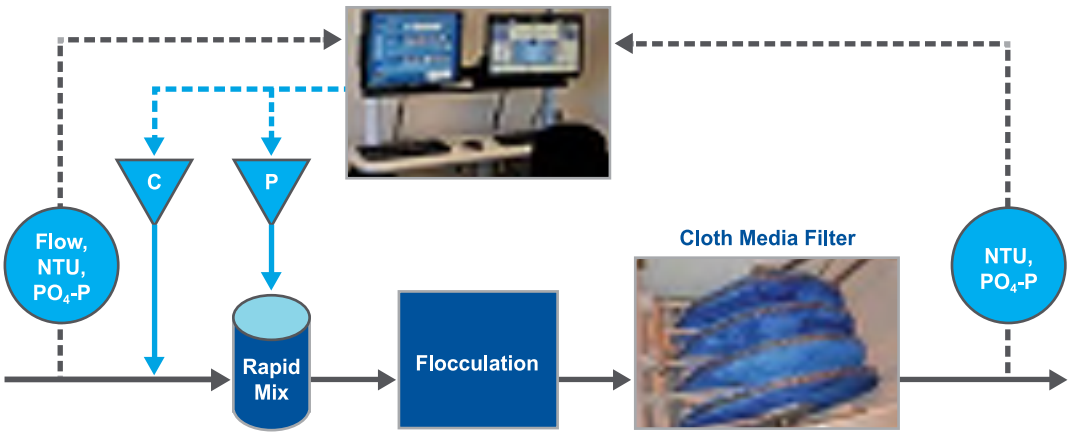
System Features

- PC with IntelliPro software developed by Aqua-Aerobic Systems, Inc.
- Network settings to allow communication between the instruments, the PLC and the PC
- Process, instrumentation and software on-site training

System Advantages

- Chemical savings through load based control
- Automatic chemical dose response curves replace jar testing
- Improved process reliability using real time information
- Multi-point analysis of key process parameters

IntelliPro® System Layout for Ultra-Low Phosphorus



AquaDiamond®

CLOTH MEDIA FILTER



An AquaDiamond® filter with Microfiber cloth polishes phosphorus to < 0.1 mg/l.

The AquaDiamond® cloth media filter is a unique combination of two proven technologies: traveling bridge and cloth media filters. The result is two to three times the flow capacity of a traveling bridge filter within an equivalent footprint, making it ideal for sand filter retrofits. The unit features all of the same benefits and (3) modes of operation as the AquaDisk but with vertically oriented diamond laterals and a traveling platform.



Additional Features and Benefits

- Up to eight diamond laterals per unit
- Fits neatly into existing traveling bridge filter profile with minimal civil work
- Variable speed drive platform and backwash pump provide immediate response to influent solids excursions
- Advanced drive and tracking system prevents misalignment

Modes of Operation







Filtration Mode

- Inlet wastewater enters the filter
- Cloth media is completely submerged
- No moving parts
- Solids deposit on outside of cloth media forming a mat as filtrate flows through the media
- Flow enters the filter by gravity and filtrate is collected inside the diamond laterals and discharged
- Heavier solids settle to the basin floor

Backwash Mode

- Periodic backwashing is initiated by increased headloss due to solids deposits
- The platform traverses the length of the cloth media diamond laterals during backwashing
- Backwash shoes contact the media directly and solids are removed by vacuum pressure using the backwash pump
- The platform only operates during backwash and solids collection

Filtrate Collection and Discharge

- Heavier solids on the tank bottom are removed on an intermittent basis
- Small suction headers collect and discharge settled solids
- The backwash pump is utilized for solids removal

High Solids Applications

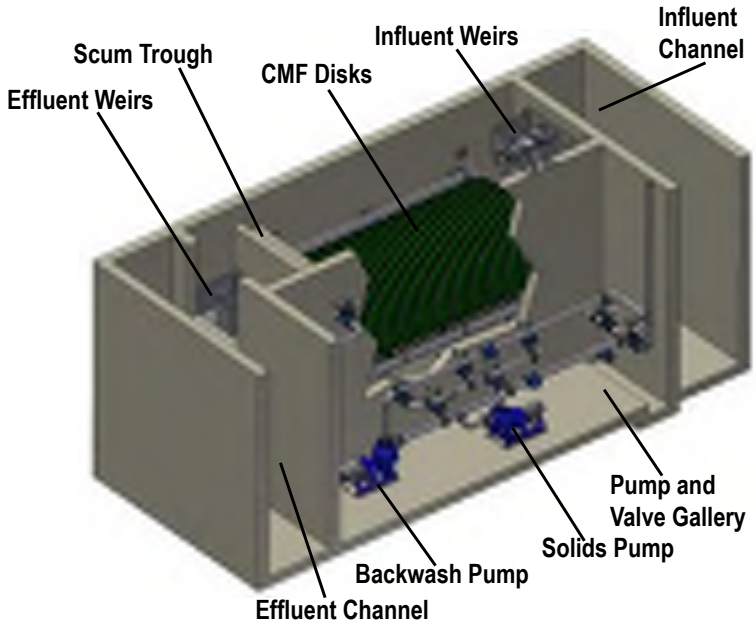
Primary Filtration and Wet Weather Treatment

AquaPrime®
CLOTH MEDIA FILTER

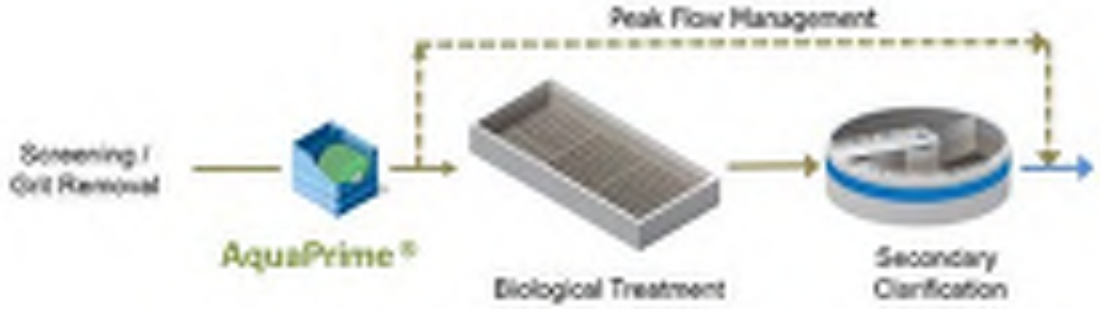
The AquaPrime® cloth media filter is ideal for primary wastewater treatment due to its proven removal efficiencies. The main advantages include extremely small footprint, reduced energy costs in the secondary process due to a reduction in organic loading and more solids for increased gas production in anaerobic digesters for primary applications.

AquaPrime® Features and Benefits

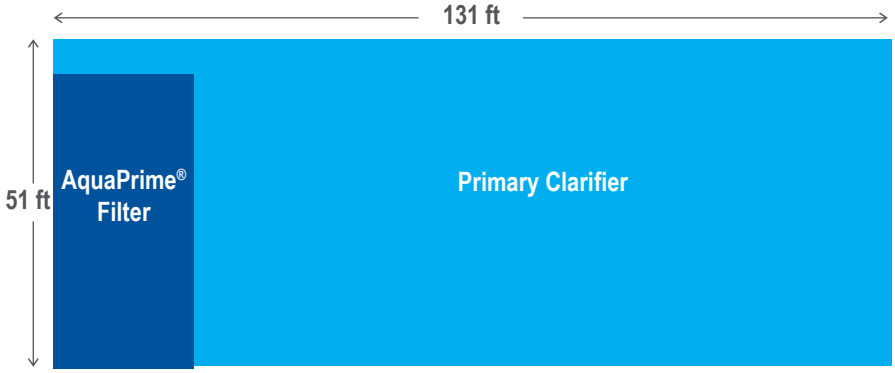
- Vertically oriented cloth media disks reduce required footprint to 15% to 20% of primary clarification
- Provides enhanced solids and BOD removal resulting in:
  - Less aeration energy for secondary process due to reduced organic loading
  - More solids for increased biogas production in anaerobic digesters
  - Increased capacity in existing secondary process basin
- Three methods of solids removal with specifically designed floatable, filtration and solids removal zones
- Dual use applications of advanced primary treatment and wet weather treatment
- Major capital construction savings



Flow Diagram for Advanced Primary Treatment



80-85% Footprint Savings Compared to Primary Clarifier





Linda County Water District, Olivehurst, CA

- Primary Filtration Application
- TSS removal greater than 75%
- BOD removal up to 60%

AquaStorm™

CLOTH MEDIA FILTER

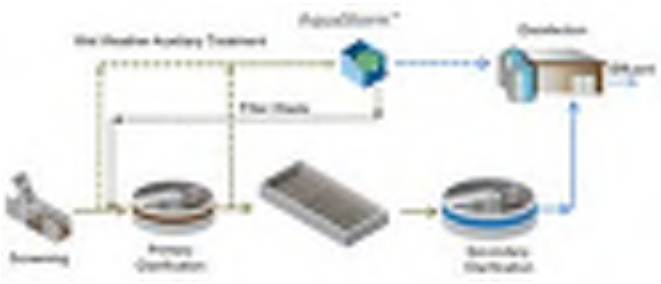
The AquaStorm™ cloth media filter features a similar mechanical configuration as the AquaPrime® filter, as well as offers inherent advantages related to wet weather treatment for stormwater, Combined Sewer Overflow (CSO) and Sanitary Sewer Overflow (SSO), including the ability to be configured for dual-use applications for tertiary and wet weather operation. Also, differences in controls specifically designed to handle intermittent operation and need for lower effluent requirements for wet weather applications

AquaStorm™ Features and Benefits

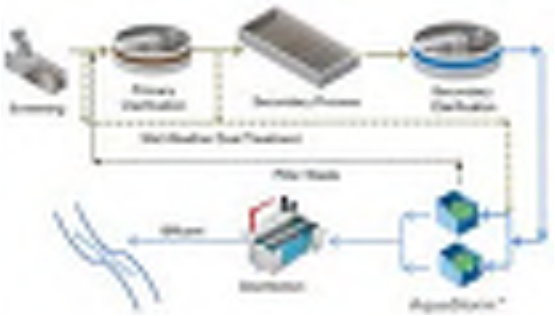
- High quality effluent similar to secondary standards
- Use with or without chemical, depending on site-specific effluent water quality requirements
- Can be configured for dual-use application for tertiary or wet weather operation
- Simple start-up and shutdown with unattended operation for remote locations
- Provides the treatment facility with resiliency during wet weather events
- Maximizes the wet weather flows to be treated
- Protects the biological portion of the facility
- Can be used at remote CSO/SSO sites
- Improves disinfection of wet weather flows

Flow Diagrams for Wet Weather Treatment

Side Stream



Dual Treatment



Modes of Operation

The AquaPrime® and AquaStorm™ cloth media filtration system operates on four (4) modes of operation: **FILTRATION, BACKWASH, SOLIDS WASTING** and **FLOATABLE WASTING**.



Filtration Mode

- Inlet wastewater enters filter by gravity
- Cloth media is completely submerged and stationary
- Solids deposit on outside of cloth media forming a mat as filtrate flows through the media
- Filtrate is collected inside the disks and discharged
- Heavier solids settle to the tank bottom
- Tank liquid level rises



Backwash Mode

- Solids are backwashed at a predetermined liquid level or time
- Backwash shoes contact the media directly and solids are removed by vacuum pressure using the backwash pump
- 2 to 8 disks are backwashed at a time
- Disks rotate slowly
- Filtration is not interrupted
- Backwash water is directed to the waste handling facility or headworks (AquaStorm)



Solids Wasting Mode

- Heavier solids are collected in the hoppers and are removed on an intermittent basis
- After a preset number of backwashes, a solids wasting occurs
- Backwash/Solids Pump provides suction to the solids collection manifold for wasting of settled solids
- Solids are pumped back to the waste handling facility or headworks (AquaStorm)



Floatable Wasting Mode

- Floatable scum is allowed to collect on the water surface
- After a preset amount of time, the water level is allowed to rise above the preset floatable setpoint
- As the water level increases, floating scum is removed by flowing over the scum removal weir
- Scum wasting water is directed to the plant's waste handling facility

Cloth Media Filtration

Mobile Pilot Systems

Technology pilot demonstrations can be beneficial to wastewater treatment plants by providing a snapshot of essential process operating conditions and allowing the customer to interact with the technology and Aqua-Aerobic personnel. OptiFiber cloth media filter pilot systems provide customers with the most comprehensive on-site testing and analytical services available. Our unique approach is designed to provide prompt operational feedback, allowing immediate fine-tuning of parameters for the most effective pilot/demonstration experience.



Fully Equipped Laboratory



Mobile Primary Filtration Pilot System

Aqua-Aerobic Research & Technology Center

In 2011, Aqua-Aerobic Systems, Inc. in partnership with the Rock River Water Reclamation District (Rockford, IL) built a new Research & Technology Center at the District's central treatment plant. The facility was constructed for the purpose of conducting applied research and demonstration of new products and processes for treating wastewater. The Center is integral in developing and testing cloth filtration media for future commercialization and application, both domestically and internationally.



OptiFiber® media development: an eight step, three year process



Customers visit the R&T Center as part of the technical seminar program.

All Aqua-Aerobic® cloth media filtration products offer a "green" advantage including lower energy consumption and reduced water usage.

Application Profiles



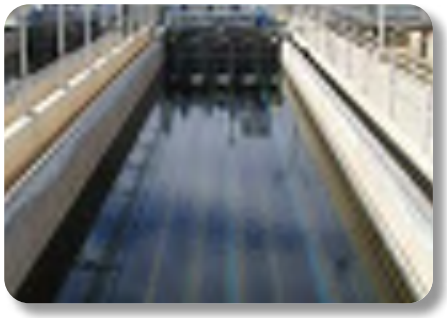
Municipal Recycle/ Reuse

- Hundreds of installations
- Title 22 approved
- Multiple cloths capable of producing effluent below 1.0 NTU



Phosphorus Removal

- Achieve phosphorus removal below 0.075 mg/l
- Depth of filtration means less chemical/ flocculation and energy



Traveling Bridge Filter Retrofits

- 2-3 times hydraulic capacity within existing footprint
- Minimal mechanical components and no civil changes



Deep Bed Filter Retrofits

- 3-4 times hydraulic capacity within existing footprint
- Minimal mechanical components and no civil changes



Industrial

- Robust cloth media handles high industrial solids
- Applied in several industrial applications including: Energy, Food/Beverage, Textile and Pharmaceutical



Large Flows

- Ideal application for Aqua MegaDisk® and AquaDiamond® filters
- Smallest footprint when compared to hydraulic capacity
- Experience in large flow filter designs over 50 MGD



Power and Energy

- Removes coal ash and coal fines from runoff or wastewater streams
- Reduces TSS and NTU for process water
- Provides reuse water for cooling



Stormwater/CSO/SSO

- Effectively removes TSS without chemicals
- Easily accommodates varying flows
- Can provide tertiary treatment between rain events



Primary Filtration

- Reduce organic load to secondary process
- Lower energy consumption
- Replace existing primary clarifiers
- Increased biogas production

Providing TOTAL Water Management Solutions

Visit our website at www.aqua-aerobic.com to learn more about Aqua-Aerobic Cloth Media Filtration and our complete line of products and services:

Aeration & Mixing

Biological Processes

Filtration

Oxidation & Disinfection

Membranes

Controls & Monitoring Systems

Aftermarket Products and Services

AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

6306 N. Alpine Rd. Loves Park, IL 61111-7655
p 815.654.2501 f 815.654.2508
www.aqua-aerobic.com
solutions@aqua-aerobic.com

The information contained herein relative to data, dimensions and recommendations as to size, power and assembly are for purpose of estimation only. These values should not be assumed to be universally applicable to specific design problems. Particular designs, installations and plants may call for specific requirements. Consult Aqua-Aerobic Systems, Inc. for exact recommendations or specific needs. Patents Apply.

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Bulletin #601B 6/21

AQUA-AEROBIC SYSTEMS, INC.

Aqua Service

PROGRAMS, PARTS AND COST SAVING SOLUTIONS

Aqua Service

PROGRAMS, PARTS AND COST SAVING SOLUTIONS

From process start-up to aftermarket products and services, Aqua-Aerobic® Customer Services provide you with the experience and expertise required to ensure your plant is operating at optimum efficiency.

Whether you need technical support at 2:00 a.m., specialized operator training or critical parts shipped overnight, Aqua-Aerobic Systems has the team of dedicated customer service personnel and a national network of experienced field technicians that are available to service your needs - 24/7.

Valued customers have come to know that when you purchase from Aqua-Aerobic Systems, you are gaining a partner for the life of your plant.



ONGOING
TRAINING AND EDUCATION

- Mechanical, process or maintenance related
- Factory or on-site training available
- Earn PDH credits
- Learn from the experts



FLEXIBLE
RENTAL & LEASE PROGRAMS

- Affordable alternative to purchasing new equipment
- Short or long term options
- New & reconditioned units
- Programs tailored to meet your needs



COST-EFFECTIVE
REHAB & UPGRADES

- Economical option versus replacing with new system
- Professional analysis by our qualified technicians
- Recommended solutions that fit your budget



ORIGINAL
REPLACEMENT PARTS

- SpareCare® original OEM parts
- Fast shipment from stocked inventory
- On-site installation assistance



PREVENTATIVE
MAINTENANCE PROGRAMS

- Designed to extend equipment life
- Reduces or eliminates downtime
- Lowers overall operating costs



RELIABLE
RENTAL FILTER UNITS

- Package AquaDisk® cloth media filter units
- Temporary municipal or industrial filtration
- Low monthly rental rate
- Start-up and training available

Aqua-Aerobic Systems, Inc. 6306 N. Alpine Rd. Loves Park, IL 61111 P 877.271.9694 F 815.654.2508 www.aqua-aerobic.com solutions@aqua-aerobic.com

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Bulletin #450B 8/14

CHANGE ORDER NO.: 1

Owner: Magna Water District
Engineer: Bowen Collins & Associates/Stantec
Supplier: Aqua-Aerobic Systems Inc.
Project: Magna Reuse Project
Contract Name: Magna WRF Filter Equipment Supply
Date Issued: 06/20/2022

Engineer's Project No.: 483-20-02
Supplier's Project No.: 107127B

The Contract (00 52 00 Agreement – executed on May 4, 2022) is hereby modified as follows upon execution of this Change Order:

Description:

Magna Water District has requested that the future peak flow capacity for the disk filters be increased from 4.66 MGD to 6.60 MGD. Aqua-Aerobic Systems, Inc. has responded with a proposal that includes two (2) 10/6-Disk AquaDisk®, Cloth Media Filter(s), in concrete tanks. The filter units will have 6-Disks originally with four empty disk slots allowing them to expand to 10-Disk units to handle the increased flow of 6.6 MGD. The price of this total change is $87,004.17 and includes taxes, one year of bonding, and cost increases for engineering submittals (up from $ 43,131.73 to $52,900) and 12 months of additional warranty on top of the required warranty (up from $13,438.18 to $14,985). The total cost of the disk filter contract between Magna Water District and Aqua-Aerobics is increased to $575,237.00 upon acceptance of this change order. No change to the Contract Times as outlined in Section 00 52 00 Agreement occurs with this change order.

Attachments:

Amendment Letter from Aqua-Aerobic Systems, INC., dated May 11, 2022

Change in Contract Price

Original Contract Price: $ 488,232.83
Increase from previously approved Change Orders $ N/A
Contract Price prior to this Change Order: $ 488,232.83
Increase this Change Order: $ 87,004.17
Contract Price incorporating this Change Order: $ 575,237.00

Minus $43,131.73 for Engineering Submittal

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	Recommended by Engineer (if required)	Accepted by Contractor
By:	Clint Rogers, PE	
Title:	Vice President	
Date:	06/20/2022	
	Authorized by Owner	
By:	Clint Dilley, PE	
Title:	General Manager	
Date:	06/20/2022	

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AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

May 11, 2022

Correspondence ID#: AAL-44240
Magna Water District
Attn: Trevor Andra, PE, District Engr.
8885 West 3500 South
Magna, Utah 84004
USA
Ph# 801/250-6279 (Office)
Email: trevor@magnawater.com

Project: MAGNA WRF, UT

RE: Consultant Project No: 483-20-02 Magna WRF Filter Procurement Project
AASI Project ID 107127B Amendment Number 3

AMENDMENT NUMBER 3 TO AQUA-AEROBIC SYSTEMS' PROPOSAL:

This letter amends and is an integral part of the above referenced Aqua-Aerobic Systems, Inc. proposal and replaces amendement number 2. The proposal is amended as follows.

PROPOSAL AMENDMENT(S):

For the purpose of evaluating an increase in flow to 6.6 MGD, Aqua-Aerobic Systems is providing the following options:

1. The total price for two (2) 10-Disk AquaDisk®, Cloth Media Filter(s), in concrete tanks, is $604,886. These units will be able to handle the increased design flow of 6.6 MGD. This price includes taxes and one year of bonding. Also note that included in this total price is engineering submittals ($55,710) and 12 months of additional warranty on top of the required warranty ($15,705).

2. The price for two (2) 10/6-Disk AquaDisk®, Cloth Media Filter(s), in concrete tanks, is $575,237. The filter units will have 6-Disks originally with four empty disk slots allowing them to expand to 10-Disk units to handle the increased flow of 6.6 MGD. Note that this price includes taxes and one year of bonding. This price includes taxes

and one year of bonding. Also note that included in this total price is engineering submittals ($52,900) and 12 months of additional warranty on top of the required warranty ($14,985).

If you have any questions regarding this amendment, please do not hesitate to contact our local representative, listed below.

Sincerely,



Corey O'Brien
Project Application Engineer

CC: Aqua-Aerobic Systems, Inc.
Scott Kelly / SKelly@aqua-aerobic.com

Davidson Sales & Engineering / ph#: 801-977-9200 / fx#: 801-977-9300
Paul Mora

APPENDIX C

OWNER'S SYSTEM INTEGRATOR - SKM

SCOPE OF WORK AND FEE

SAVE TIME • SAVE ENERGY • SAVE MONEY
533 W 2600 S, Suite 25, Bountiful, UT 84010
(801)677-0011 www.skmeng.com

SCOPE OF SERVICES PROPOSAL

TO: Clint Rogers

DATE: December 15, 2022

FROM: Mark Taylor

RE: Magna Filter Building Reuse Project – System Integration Scope and Fee Rev 1

We are pleased to present this proposal to provide System Integration Services for Magna Water Company's Filter Building Reuse Project. This proposal has been broken up into the following sections: 1) Project Assumptions, 2) Proposed Scope of Services, and 3) Cost Breakdown. Please feel free to comment on the information presented as necessary.

1. Project Assumptions

The following assumptions have been made in the development of this proposal:

- HVAC, security (cameras), and fire systems will be provided by others
- All electrical terminations (including fiber optics) will be provided by the electrical contractor
- SKM will provide LCP 70-PLC-0100, float override panel, and wet analyzer panel. These panels will be mounted by the contractor
- On pressure instrumentation (transducers, switches, gauges) SKM provides, and manual gauges. SKM does not provide piping or isolation valves- those will be provided by the contractor
- SKM will provide loop drawings for PLC points on LCP 70-PLC-0100, as well as for instruments that are provided as part of SKM's scope. Vendors will provide loop drawings for their PLC panels and instrumentation
- LCP 70-PLC-0100 will include a base radio for communications with a level sensor at the irrigation reservoir. SKM will provide the antenna and antenna cabling for this base radio. The electrical contractor will provide conduit in between the PLC panel and the roof of the building, as well as an antenna mast as per the engineer's details. SKM will provide and mount the antenna and provide and terminate the antenna cables
- The proposal includes sales tax on all equipment and software

2. Proposed Scope of Services

Task 1. Project Management

1. Provide overall project management including managing SKM staff, project communications, deliverables, and quality control.

Task 2. System Engineering

1. Design Filter Building Plant PLC Control Panel (LCP 70-PLC-0100)

2. Design Float Override Control Panel
3. Submit Control Panel Engineering Submittal to engineer and client for review
4. Provide Loop Drawings

Task 3. System Integration

1. Provide PLC programming for 70-PLC-0100
2. Provide HMI database programming and development for 70-PLC-0100, as well as for vendor provided PLCs (Filter 1 and Filter 2)
3. Provide HMI SCADA screens for 70-PLC-0100 and for all vendor provided PLCs. Develop a cohesive graphical user interface and review/revise with client and operations staff
4. Test HMI/SCADA with operations staff during commissioning
5. Perform initial hardware setup on PLC panel, network switches, and SCADA client. Equipment will be tested at the shop before being delivered to the site

Task 4. Startup and Commissioning

1. Coordinate with vendors regarding data to be displayed on SCADA- and clarify security and control policies. Coordinate PLC to PLC communications where required
2. Coordinate with instrument supplier on scaling, and operational and alarm settings. Assist in troubleshooting when necessary. NOTE- $0 shown in fee schedule as SKM will be providing instruments
3. Setup network switches for a fully functional and secure network
4. Perform point to point IO checks on all points wired to 70-PLC-0100. Perform functional tests on all equipment controlled by 70-PLC-0100. NOTE: functional and IO tests on vendor provided equipment to be performed by vendor and contractor
5. Provide startup and commissioning services on processes controlled by 70-PLC-0100. Test and tune processes with operators. Coordinate with vendors, and verify vendor data on SCADA during commissioning phase
6. Install and test SCADA client

Task 5. O&M Manuals

1. Provide a complete O&M Manual. Include As-Built drawings and programming

Task 6. Training

1. Train operators on PLC panel troubleshooting and drawings
2. Train operators on SCADA system: Monitoring, Control, Alarming, Notification, Trending, Reporting, and Login Access. It is anticipated that plant staff will be involved in startup and commissioning- and will get hands on training during that phase. After commissioning, SKM will hold 2 training sessions using the O&M Manuals and live SCADA system
3. Train operators on auto sampler and wet panel analyzer

Task 7. PLC Panel Equipment

1. Provide 70-LCP-0100 (Filter Building PLC panel). This panel is 36” wide, 72” tall, and 18” deep. NEMA 12 rated, UL Listed
2. Provide float override control panel, NEMA 12 rated, UL Listed. More detail will be available after the 100% drawings are released Provide 1 each PLC and network spare parts
3. Provide 1 each PLC and network spare parts

Task 8. Instruments

1. Provide instruments as listed in Appendix A Instrument List

2. Provide submittal and O&M labor for all SKM instruments provided by SKM
3. Provide startup and calibration/configuration labor on instruments
4. Provide assembled wet panel analyzer panel with chlorine analyzer, turbidity analyzer, and controller transmitter. Startup and training included

3. Cost Breakdown

This project will be performed as a lump sum in accordance with the scope of work described above for Tasks 1-8. Any additions or variations to the work are subject to additional costs.

Magna Reuse Project
System Integration Cost Breakdown

Task ID	Task Description	Project Manager ($160/Hr)	Electrical Engineer ($160/Hr)	Senior Controls Engineer ($155/Hr)	Programmer ($145/Hr)	CAD Designer ($115/Hour)	Controls Electrician ($120/Hour)	Clerical ($95/Hr)	Total	Sub-Total Price
Task #1 - Project Management										
1.1	Client Meetings	6	2	2	2				12	$1,880
1.2	Contractor Construction Meetings	8	4	4	4				20	$3,120
1.3	Interdiscipline Coordination	8							8	$1,280
1.4	Clerical							2	2	$190
Task #1 - Totals		22	6	6	6	0	0	2	42	$6,470
Task #2 - System Engineering										
2.1	Filter Building LCP Design (70-PLC-100)	4	12			20			36	$4,860
2.2	Float Override Panel LCP Design		4			6				$1,330
2.3	Control Panel Engineering Submittal (CPES)	2	8						10	$1,600
2.4	Loop Drawings	4		16		12			32	$4,500
Task #2 - Totals		10	24	16	0	38	0	0	78	$12,290
Task #3 - System Integration										
3.1	PLC Programming	6		6	32				44	$6,530
3.2	HMI Database	6		10	30				46	$6,860
3.3	HMI Screen Development	4		16	30				50	$7,470
3.4	HMI Testing	4			20				24	$3,540
3.5	Hardware Setup	4		2	6				12	$1,820
Task #3 - Totals		24	0	34	118	0	0	0	176	$26,220
Task #4 - Startup and Commissioning										
4.1	Vendor Equipment Coordination	4		4	8				16	$2,420
4.2	Instrument Coordination									$0
4.3	Network Switches Setup			8					8	$1,240
4.4	Functional Loop Testing	10		12	12				34	$5,200
4.5	Commissioning	10		32					42	$6,560
4.6	Computer Hardware Installation and Setup	2			2					$610
4.7	Per Diem Costs (Mileage)									$475
Task #4 - Totals		26	0	56	22	0	0	0	100	$16,505
Task #5 - O&M Manuals										
5.1	As-Builts	2		6		8			16	$2,170
5.2	O&M Manual Preparation	2	4					2	8	$1,150
5.3	O&M Submittal and Revisions	2	4					2	8	$1,150
Task #5 - Totals		6	8	6	0	8	0	4	32	$4,470
Task #6 - Training										
6.1	PLC Panel Training				2				2	$290
6.2	HMI System Training	2			8				10	$1,480
6.3	Documentation Training				2				2	$290
6.4	System Troubleshooting Training				2				2	$290
Task #6 - Totals		2	0	0	14	0	0	0	16	$2,350
	Labor Totals:	**90**	**38**	**118**	**160**	**46**		**6**	**444**	**$68,305**

Task ID	Task Description	Cost
Task #7 - PLC Panel Equipment		
7.1	Filter Building LCP (70-PLC-1000)	$45,580
7.2	Float Override Panel	$7,500
7.3	Spare PLC and Network Equipment	$8,846
Task #7 - Totals		$61,927

Equipment SubTotals:	$61,927
Sales Tax (7.25%):	$4,489.69
Eqiupment Total	**$66,417**

Task ID	Task Description	Cost
Task #8 - Instruments		
8.1	Instruments (See appendix for scope of supply)	$80,980
8.2	Submittal and O&M Labor	$10,295
8.3	Startup, Calibration, Configuration Labor	$2,830
8.4	Wet Panel Buildup and Construction/Startup/Training	$17,500
Task #8 - Totals		$111,605

Instrumentation Package Totals:	$111,605
Sales Tax on Equipment (7.25%):	$7,386.00
Instrument Total	**$118,991.00**

Project Total:	**$253,713**

skm
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533 W 2600 S, Suite 25, Bountiful, UT 84010
(801)677-0011 www.skmeng.com

Appendix A (Instrument Scope of Supply)

Instrument Tag	Description	Model
70-LIT-0030	Reuse Wet Well Level Transmitter	VegaPuls 6X/VEGADIS 81
70-LSLL-0030	Reuse Wet Well Lo Lo Level Switch	KARI KA-1C
70-PIT-0030	Sec Reuse Header Pressure Transmitter	E+H Cerabar S PMP71
70-PI-0030	Sec Reuse Header Pressure Gauge	Ashcroft 1279
70-FIT-0030	Sec Reuse Flow Transmitter	E+H Promag W 400
70-PI-0031	Sec Reuse P1 Disch Press Gauge	Ashcroft 1279
70-PSH-0031	Sec Reuse P1 Disch Press Switch	Ashcroft L Series
70-PI-0032	Sec Reuse P2 Disch Press Gauge	Ashcroft 1279
70-PSH-0032	Sec Reuse P2 Disch Press Switch	Ashcroft L Series
70-PI-0033	Sec Reuse P3 Disch Press Gauge	Ashcroft 1279
70-PSH-0033	Sec Reuse P3 Disch Press Switch	Ashcroft L Series
70-PI-0034	Sec Reuse P4 Disch Press Gauge	Ashcroft 1279
70-PSH-0034	Sec Reuse P4 Disch Press Switch	Ashcroft L Series
70-AE-0031	Sec Reuse CL2 Analyzer	Hach CL17
70-AE-0032	Effluent Turbidity	Hach TU5400 with SC4500
70-PIT-0040	Effluent Return Disch Pressure Transmitter	E+H Cerabar S PMP71
70-PI-0040	Effluent Return Disch Pressure Gauge	Ashcroft 1279
70-FIT-0040	Effluent Return Disch Flow Transmitter	E+H Promag W 400
70-PI-0041	Eff Return P1 Disch Press Gauge	Ashcroft 1279
70-PSH-0041	Eff Return P1 Disch Press Switch	Ashcroft L Series
70-PI-0042	Eff Return P2 Disch Press Gauge	Ashcroft 1279
70-PSH-0042	Eff Return P2 Disch Press Switch	Ashcroft L Series
70-PI-0043	Eff Return P3 Disch Press Gauge	Ashcroft 1279
70-PSH-0043	Eff Return P3 Disch Press Switch	Ashcroft L Series
70-AE-0033	Auto Sampler	Hach AS950 Ref Sampler
70-PI0035	Surge Tank Pressure Gauge	Ashcroft 1279
70-LSHH-0070	Reuse Building Basement Flood Swtich	Gem LS-1700TFE
70-FSH-0030	Reuse Building Eyewash Shower	Inst in Eyewash package

SKM Engineering, LLC
Articles of Terms and Conditions

I. SCOPE
SKM Engineering, LLC (SKM) agrees to perform the services described in the proposal attached hereto which incorporates these terms and conditions. Unless modified in writing by the parties hereto, the duties of SKM shall not be construed to exceed those services specifically set forth in the proposal. These terms and conditions and the proposal, when executed by Client, shall constitute a binding agreement on both parties (hereinafter the "Agreement').

II. COMPENSATION
Client agrees to pay for the services in Article I in accordance with the compensation provisions in the proposal. Payment to SKM will be made within 30 days after the date of billing. Interest on the unpaid balance will accrue beginning on the 31st day at the maximum interest rate permitted by law.

Time-related charges will be made in accordance with the billing rate referenced in the proposal or Agreement. Direct expenses and Subcontractor services shall be billed in accordance with the proposal or compensation exhibit attached to this Agreement. Otherwise, SKM's standard billing rates shall apply.

Ill. RESPONSIBILITY
SKM is employed to render a professional service only, and any payments made by Client are compensation solely for such services rendered and recommendations made in carrying out the Work. SKM shall perform the services in accordance with generally accepted engineering practices and standards in effect when the services are rendered. SKM does not expressly or impliedly warrant or guarantee its services.

In performing construction management services, SKM shall act as agent of Client. SKM's review or supervision of work prepared or performed by other individuals or firms employed by Client shall not relieve those individuals or firms of complete responsibility for the adequacy of their work.

The presence of SKM's personnel at a construction site, whether as on-site representative, resident engineer or construction manager, shall be for the sole purpose of determining that the work is generally proceeding in conformance with the intent of the project specifications and contract documents and does not constitute any form of guarantee or assurance with respect to contractor's performance. SKM shall have no responsibility for the contractor's means, methods, techniques, sequences, for safety precautions and programs incident to the contractor's work, or for any failure of contractor to comply with laws and regulations applicable to performing its work.

IV. INDEMNIFICATION
SKM agrees to indemnify, defend, and hold Client harmless from and against any liability to the extent arising out of the negligent acts, errors or omissions of SKM, its agents, employees, or representatives, in the performance of duties under the Agreement. Regardless of any other term of this Agreement, in no event shall SKM be responsible or liable to the other for any incidental, consequential, or other indirect damages.

V. ATTORNEYS' FEES
In the event of any litigation arising from or related to this Agreement or the services provided under this Agreement, the prevailing party shall be entitled to recover from the nonprevailing party all reasonable costs incurred, including staff time, court costs, attorneys' fees and all other related expenses in such litigation.

VI. INSURANCE
SKM shall maintain during the life of the Agreement the following minimum insurance:

1. **Comprehensive general liability** insurance, including personal injury liability, blanket contractual liability, and broad form property damage liability. The combined single limit for bodily injury and property damage shall be not less than $1,000,000.
2. **Automobile bodily injury and property damage liability** insurance covering owned, non-owned, rented, and hired cars. The combined single limit for bodily injury and property damage shall be not less than $1,000,000
3. **Statutory Worker's compensation and employers' liability** insurance as required by state law.
4. **Professional liability** insurance with limits of not less than $1,000,000.

VII. SUBCONTRACTS
SKM shall be entitled, to the extent determined to be appropriate by SKM, to subcontract any portion of the Work to be performed under this Agreement.

VIII. ASSIGNMENT
This Agreement is binding on the heirs, successors, and assigns of the parties hereto. The Agreement is not to be assigned by either Client or SKM without the prior written consent of the other.

IX. INTEGRATION
These terms and conditions and the proposal to which they are attached represent the entire understanding of Client and SKM as to those matters contained herein. No prior oral or written understanding shall be of any force or effect with respect to those matters covered herein. The Agreement may not be modified or altered except in writing signed by both parties, provided further that any terms and conditions in any Task Order or purchase order issued in connection or under the Agreement which are inconsistent with the Agreement are deemed null and void.

X. CHOICE OF LAW/JURISDICTION
This Agreement shall be administered and interpreted under the laws of the state in which the SKM office responsible for the project is located. Jurisdiction of litigation arising from the Agreement shall be in that state.

XI. SEVERABILITY
If any part of the Agreement is found unenforceable under applicable laws, such part shall be inoperative, null and void insofar as it is in conflict with said laws, but the remainder of the Agreement shall be in full force and effect.

XII. NO BENEFIT FOR THIRD PARTIES
The services to be performed by SKM hereunder are intended solely for the benefit of Client, and no right or benefit is conferred on, nor any contractual relationship intended or established with any person or entity not a party to this Agreement No such person or entity shall be entitled to rely on SKM's performance of its services hereunder.

XIII. WORK PRODUCT
SKM and Client recognize that SKM's work product submitted in performance of this Agreement is intended only for the Client's benefit and use. Change, alteration, or reuse on another project by Client shall be at Clients sole risk, and Client shall hold harmless and indemnify SKM against all losses, damages, costs and expense, including attorneys' fees, arising out of or related to any such unauthorized change, alteration or reuse.

Any signed, stamped and dated Construction Documents prepared by the Consultant are the Work Product. CADD files are furnished for convenience only. The transfer of the CADD files for use by the Client shall not be deemed a sale and the Consultant makes no warranty, either express or implied, of merchantability or fitness for any particular purpose.

XIV. SUSPENSION OF WORK
Work under this Agreement may be suspended as follows:

1. **BY Client**. By written notice to SKM, Client may suspend all or a portion of the Work under this Agreement if unforeseen circumstances beyond Client's control make normal progress of the Work impracticable. SKM shall be compensated for its reasonable expenses resulting from such suspension including mobilization and de-mobilization. If suspension is greater than 30 days, then SKM shall have the right to terminate this Agreement in accordance with Article XIV, Termination of Work.
2. **By SKM.** By written notice to Client, SKM may suspend the Work if SKM reasonably determines that working conditions at the Site (outside SKM's control) are unsafe, or in violation of applicable laws, or for other circumstances not caused by SKM that are interfering with the normal progress of the Work. SKM's suspension of Work hereunder shall be without prejudice to any other remedy of SKM at law or equity.

XV. TERMINATION OF WORK
This Agreement may be terminated as follows

1. **Client** (a) for its convenience on 30 days' notice to SKM, or (b) for materially breaches this Agreement through no fault of Client and SKM neither cures such material breach nor makes reasonable progress toward cure within 15 days after Client has given written notice of the alleged breach to SKM.
2. **By SKM** (a) for cause, if Client materially breaches this Agreement through no fault of SKM and Client neither cures such material breach nor makes reasonable progress toward cure within 15 days after SKM has given written notice of the alleged breach to Client, or (b) upon five days' notice if Work under this Agreement has been suspended by either Client or SKM in the aggregate for more than 30 days.
3. **Payment upon Termination.** In the event of termination, SKM shall perform such additional work as is reasonably necessary for the orderly closing of the Work. SKM shall be compensated for all work performed prior to the effective date of termination, plus work required for the orderly closing of the Work. Except for termination of SKM by Client for cause, SKM shall also receive a termination fee equal to 15 percent of the total compensation yet to be earned under existing authorizations at the time of termination.

XVI. NOTICES
All notices required under this Agreement shall be by personal delivery, facsimile or mail to the SKM Project Manager and to the person signing the proposal on behalf of the Client, and shall be effective upon delivery to the addressed stated in the proposal.