OWENS LAKE PIEZOMETER INSTALLATION AND HYDRAULIC TESTING

Prepared for:

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DISCLAIMER

This report was prepared for the sole use and benefit of Los Angeles Department of Water and Power (Client) and for the specific site known as Owens Lake (Site) in the Owens Valley on the eastern side of the Sierra Nevada in Inyo County, California. Neither this report, nor any of the information contained herein, shall be used or relied upon for any purpose by any person or entity other than the Client and for the Site.

This report was prepared mainly based on information supplied to Hushmand Associates, Inc. (HAI) from outside sources and partially based on the geotechnical engineering analyses HAI performed for the Site. Documentation for the statements made in this report is on file either at Client's or at HAI's Irvine, California office. HAI makes no warranty as to the accuracy of statements made by others which are contained in this report, nor are any other warranties or guarantees, expressed or implied, included or intended in this report with respect to information supplied by outside sources or conclusions or recommendations substantially based on information supplied by outside sources. This report has been prepared in accordance with the current generally accepted practices and standards consistent with the level of care and skill exercised under similar circumstances by other professional consultants or firms performing the same or similar services. Since the facts forming the basis for this report are subject to professional interpretation, differing conclusions could be reached.

None of the work performed hereunder shall constitute or be represented as a legal opinion of any kind or nature, but shall be a representation of findings of facts from records examined.

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September 4, 2015

Mr. Saeed Jorat, PhD, PE
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111 N Hope Street, Room 1468
Los Angeles, California 90012

SUBJECT: OWENS LAKE PIEZOMETER INSTALLATION AND HYDRAULIC TESTING
HAI Project No. LADWP 15-001

Dear Dr. Jorat:

This report provides the results of field observations and testing services provided by Hushmand Associates, Inc. (HAI) to Los Angeles Department of Water and Power (LADWP) during piezometer well installation and testing around the perimeter of Owens Lake (the "Site") in the Owens Valley on the eastern side of the Sierra Nevada in Inyo County, California.

HAI appreciates the opportunity of being of service to LADWP. Should you need additional information or any clarifications please call the undersigned.

Sincerely yours,

HUSHMAND ASSOCIATES, INC.

Ben Hushmand, PhD, PE
President, Principal Engineer

Don Terres, PG, CEG
Associate Geologist

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Associate Geologist

TABLE OF CONTENTS

Page No.

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

OWENS LAKE PIEZOMETER INSTALLATION AND HYDRAULIC TESTING
HAI Project No. LADWP-15-001

1.0 INTRODUCTION

This report documents the results of field observation and testing services provided by Hushmand Associates, Inc. (HAI) to Los Angeles Department of Water and Power (LADWP) during piezometer well installation and testing around the perimeter of Owens Lake (Site) in the Owens Valley on the eastern side of the Sierra Nevada Mountains in Inyo County, California. Site location map is shown in Figure 1.

The piezometer installation and construction activities were performed from April 21, 2015 through April 28, 2015. The piezometer development activities were performed from April 22, 2015 through April 30, 2015.The hydraulic testing activities at the piezometers were performed on April 24, 2015 and from May 11, 2015 through May 14, 2015.

The project consisted of performing site reconnaissance, installing nine (9) piezometer clusters at locations proposed by LADWP, logging and collecting samples from each borehole, laboratory testing of the material collected from the boreholes, developing wells, and hydraulic testing. The proposed locations for the piezometer clusters are shown in Figure 2.

2.0 SCOPE OF WORK

Our Scope of Work included providing and furnishing all labor, materials, equipment, transportation, and necessary services to perform, under the direction of LADWP, the tasks listed below:

2.1 Review of Existing Data, Coordination, and Planning

This task consisted of preparation work performed prior to and following our initial site visit for planning of the fieldwork. There were multiple site access and logistical issues due to property ownership and lease acquisition conditions, sensitive biological and archeological constraints, and significant distances between piezometer locations.

2.2 Site Reconnaissance

Our Project Manager (Ben Hushmand) and a California certified engineering geologist (Don Terres) conducted a site reconnaissance visit with representatives of the LADWP on October 20, 2014 to observe site logistics and field conditions at each of the nine (9) piezometer locations (sites P1 through P8, and 5A in Figure 2). After this site visit, HAI provided additional information on the site condition to the selected drilling firm for updating their cost proposal for piezometer installation.

2.3 Piezometer Installation

Our field geologist and Gregg Drilling & Testing, Inc. (Gregg, the selected subcontractor) mobilized to the site to conduct the piezometer installation work from April 21 to 30, 2015. A track-mounted hollow stem auger (HSA) drill rig was used for installation of the piezometers. Up to three separate piezometers were installed at each location. All piezometers were constructed with 2-inch diameter schedule 40 PVC casings. These were generally set at depths of approximately 5, 11, and 30 feet below ground surface (bgs). Short screened sections were used in each piezometer. Figure 3 shows a schematic of a set of piezometers. A piezometer construction summary is included as Table 1.

2.4 Geotechnical Laboratory Testing

Soil samples obtained during drilling were sent to HAI's geotechnical engineering laboratory in La Habra, California. HAI's laboratory is certified by the City of Los Angeles, Caltrans, DSA, and AASHTO. Visual Classification (ASTM D 2488) and Sieve Analysis (ASTM D422) tests were performed on selected soil samples and the data are presented in the boring logs. The summary of test results is presented in Appendix B.

2.5 Well Development

The piezometers were developed following installation by pumping and/or bailing until the water was clear. The purpose of the development was primarily to support ongoing sampling of the small-diameter piezometers in the project area. It also assisted to prepare the piezometers for hydraulic testing. A summary of the well development is included in Table 3.

2.6 Hydraulic Testing (Pump Testing)

Hydraulic testing of the lowermost and middle interval piezometers was conducted, with water level observations being made in all three intervals. Short-term (30 minute) constant discharge tests were conducted. Both drawdown and recovery data were recorded for each test using continuously-recording Solinst pressure transducers placed in each of the piezometers. In some instances the yields were very limited and the piezometers rapidly dewatered, so the primary data obtained are those from water level recovery. Artesian conditions were also observed at some locations with three of the piezometers flowing at rates ranging between approximately 0.5 and 4 gpm. The testing program is summarized in Table 3 and a summary of the hydraulic testing interpretation is included in Tables 4 and 5. The water quality monitoring data (includes TD, temperature, pH etc.) are attached in Appendix C.

2.7 Data Analysis and Report Preparation

Field data including boring logs and pump test data have been organized and analyzed in Sections 4, 5, and 6 of this report. This report also includes copies of site access maps and aerial photographs (in Appendix A) necessary to locate the piezometer locations. LADWP survey data are included in this report and shown on the boring logs for each piezometer location, including top of casing elevation data (in Appendix A).

3.0 OWENS LAKE GEOLOGY, HYDROLOGY AND HYDROGEOLOGY

3.1 Regional Geology

Owens Lake is part of one of the western most down dropped graben blocks of the Basin and Range provinces and is important because it forms the boundary between the Sierra Nevada Mountain Range and the Great Basin Regions. The Owens Lake area forms the southern portion of Owens Valley, which is located to the south of Long Valley and the Mono Basin to the north. Owens Lake is flanked on the West by the Sierra Nevada Mountain Range, on the east by the Inyo Mountains and on the south by the Coso Range. The Sierra Nevada mountain Range is dominated by pre-Tertiary grantoid, meta-sedimentary and meta-volcanic bedrock. The Inyo Mountains are primarily pre-Tertiary sedimentary rocks, and the Coso Range is primarily meta-sedimentary and volcanic bedrock. The Owens lake area is bounded on the west by the Owens Valley / Lone Pine Fault system and on the east by a steeply dipping normal Fault system which has been buried by the deep alluvial sediments (Babb, 1991; Lee et al., 2001; and Wilkerson et al., 2007).

The Valley Lake deposits which have eroded from the adjacent mountains are reportedly greater than 8,000 feet in depth (Pakiser et. al., 1964). They consist of alternating sand silt clay and gravels formed by

deposition within the lake and the alluvial fan deposits. Along the perimeter of the lake are reworked fan deposits. The deeper alluvial deposits are relatively consolidated and more recent unconsolidated finer grained lake deposits are generally found in the central portions of the lake and are more than 1000 feet in depth. Along the perimeter of the lake are the coarser sand and gravel deposits.

The lake itself had a depth of approximately 51 feet prior to approximately 1905 and a maximum depth of over 250 feet, approximately 4000 years ago when it last flowed into the Panamint basin area (Babb, 1991; and Hollet, 1991). The recent sediments along the perimeter of the Owens Lake are from alluvial fan deposits originating in the nearby mountains (Danskin, 1998; and Lee, 1906).

In general during the excavations for the subject project the borings excavated along the northeastern side of the lake were finer grained lake deposits consisting of silts and clays with occasional sand layers. Similar deposits were found in the borings excavated along the southeastern edge of the lake; however these borings encountered more sand layers. The borings excavated along the western edge of the lake were generally coarser grained with occasional fine grained deposits. The coarse sand deposits along the western edge contained abundant Ostracod fossil remnants and were likely former lake-beach deposits.

3.2 Hydrology and Hydrogeology

Owens Lake is located at the southern end of the Owens Valley. The Owens River has been diverted and used as a source of water for Los Angeles since 1913. Prior to water diversion, the lake was reportedly as large as 108 square miles. As a result of the diversion, a small brine pond remains within the dry lake bed. The US Geological Survey has done numerous studies and has a website that provides a discussion of Owens Valley conditions (http://ca.water.usgs.gov/projects/owens/overview.html) and an extensive technical reference list (http://ca.water.usgs.gov/owens/resources/refs.html).

Hydrologic and hydrogeologic conditions within and adjacent to Owens Lake have been extensively studied and these studies have revealed significant complexities. For example, *The Owens Lake Shallow Hydrology and Monitoring Data and Chemistry (1992-2004) Report* published by the Great Basin Unified Air Pollution Control District, dated February 2009, presents an interpretation of the Site hydrologic conditions based on over 200 monitoring sites conducted over a 12-year period. Figure 4 shows subareas defined in the Report. As noted in the Executive Summary:

"In general, the shallow groundwater system of Owens Lake is characterized by having water levels close to the lake bed surface and high salinity. However, within these generalities, the water level and electrical conductivity data show that the shallow groundwater is varied across the lake bed both spatially as well as temporally. Groundwater levels from monitored piezometers range from flowing artesian to, at times, greater than twenty-five feet below the surface. The depth of the shallow groundwater generally increases from the shoreline and wetland areas out onto the lake bed with the deepest levels occurring in the southeastern portion of the playa between the shoreline wetlands and the brine pool. Salinity, as measured by electrical conductivity, ranges from fresh near some of the springs to concentrated brine that can be more than five times more saline than sea water. Monitoring sites located within wetland areas tend to show greater seasonal and diurnal variability than sites located on the barren playa because of higher evapotranspiration demands within the vegetated areas.

The District monitoring program includes both naturally occurring springs as well as artificial springs formed from the uncontrolled flow of abandoned artesian wells. The majority of the natural springs and associated wetlands are located along the historic shoreline forming a discontinuous narrow band that separates the playa from the upland alluvial fan complexes. The locations of natural springs on Owens Lake appears to be controlled by geologic features such as faults and fractures allowing upward vertical

flow from deep confined regional aquifers and also by topographic and sedimentological changes along the historic shoreline area.

Surface water flows within the wetlands range from distinct identifiable point sources to broad diffuse seep zones. Many of the spring and seep zones on Owens Lake display well-defined seasonal cycles with respect to observed flow rates, temperature, and shallow groundwater levels. The sites that show strong variations in measured parameters corresponding to seasonal timing or to large precipitation events may have a relatively shallow source that is more sensitive to short-term changes within the hydrologic system. Sites with relatively stable measurements are thought to have a deeper source that is less variable over time and less sensitive to climatic cycles and conditions.

This report describes the overall hydrologic character of monitored springs and classifies them based on observed flow characteristics and on location. The natural springs at Owens Lake can be classified as perennial, seasonal, or ephemeral. None of the springs monitored as part of the Spring Monitoring Program are ephemeral, although they exist at Owens Lake. An additional classification group was made for the uncontrolled flowing artesian wells. Based on a review of the electrical conductivity measurements Owens Lake spring sites can be divided into three main geographical groups: (1) eastern, (2) southeastern, and (3) south and western.

Based on data from co-located 4-foot and 10-foot piezometers, most of the lake bed is characterized by having an overall upward vertical discharge gradient driven by the high evaporative demands of the system. However, in some portions of the lake bed, a vertical downward gradient in water levels and salinity is observed. Areas where this occurs are on the Owens River delta and also in and adjacent to many wetland areas where surface water flows provide recharge to the groundwater system. The shallow groundwater and spring system is composed of multiple hydrologic units that range in texture from coarse sands and fine gravels to fine clay-dominated soils. Many of the clay-dominated units are fractured, containing extensive networks of interconnected cracks that create high secondary porosity and increase the overall hydraulic conductivity.

Recharge to the shallow hydrologic system is dominated by upward vertical movement of water from the deep confined regional aquifer system directly to the shallow hydrologic units. Fault zones cut through portions of the lake basin and create pathways that allow for increased vertical recharge to the shallow system from the deep confined regional aquifers. Along much of the shoreline areas, the shallow system also gets recharged from lateral flow of groundwater through the surrounding alluvial fans toward the lake bed.

In this report, Owens Lake is divided into eight hydrologic areas based on the overall character of the shallow hydrology as well as the soils present. Interpreted hydrologic cross-sections through most of the hydrologic areas are presented showing the overall groundwater flow patterns. Along the southeastern portion of the lake bed, in what is termed the Desiccated Clay Zone, the groundwater system is thought to receive lateral recharge from both the upland areas along the historic shoreline as well as from the brine pool.

Evaporation and evapotranspiration exceeds average precipitation in all areas of Owens Lake. However, the shallow hydrologic system responds to precipitation events in both water levels and spring flows across most of the lake bed. The sensitivity of the system, in terms of the minimum amount of precipitation needed to cause an observable response, varies across the lake from as little as 0.1 of an inch to greater than 0.5 inches. The extent of response, correlation of the response timing, and the character of the response both with depth and location vary across the lake bed, providing further evidence that the shallow hydrologic system is complex.

For many years, the dried bed of Owens Lake was the largest source of windblown dust in the United States. As a result, the City of Los Angeles Department of Water and Power has worked to control emissions from the lake bed surface. Dust controls have been implemented on the lake bed through a series of phased projects starting in 2001. The first measures were approximately 12 square miles in areal extent. By 2006, approximately 30 square miles of controls were under operation. Currently, the main control method implemented is Shallow Flooding and is present both as ponds and as sheet flooding. Additional measures include Managed Vegetation and Gravel.

Further dust control construction is planned, such that by 2010 approximately 43 square miles of controls will be in place and operating. The data and results presented in this report discuss the character of the shallow hydrologic system before dust control implementation. There are clear changes evident at some of the monitoring sites due to the operation of the dust control measures. These changes are not discussed specifically in this report; however, they are apparent in some of the data presented both in the appendices as well as in some of the figures."

4.0 PIEZOMETER INSTALLATION

The project consisted of the installation of nine sets of piezometers located around the perimeter of Owens Lake shown in Figure 2. More precise locations are indicated in the location maps provided in Appendix A. As shown in Figure 3, each piezometer set consists of a deep piezometer that is approximately 31 to 34 feet in depth, a medium depth piezometer approximately 12 feet in depth, and a shallow piezometer approximately 6 feet in depth. Screen lengths of 2, 1.5, and 1 foot, respectively, were used in the piezometers installed by HAI. Generally the deepest of the piezometers was also the northern most of the set. The piezometers were typically placed to form a triangle with sides of approximately 10 feet.

The two shallow piezometers at P5, P6, and P7 were installed by others prior to this phase of the hydrological work at the site. The previously existing piezometers were installed by Great Basin Unified Air Pollution Control District (GBUAPCD). However, where accessible, measurements were obtained of the total depth inside the casing and of screen lengths (see Table 1 for a summary of piezometer construction details). Supporting information is included and compiled in Appendices A and B.

4.1 Piezometer Design and Well Construction Specifications

Figure 3 depicts the general details provided by the LADWP for installation of the piezometers. The shallow and medium depths piezometers were installed per these details. The deep piezometers were installed in general accordance with the detail provided, however the total depth and backfill materials were often slightly altered to accommodate specific site conditions encountered. In addition LADWP requested that the screened interval of the deeper piezometers be placed in a sandy zone if possible. Therefore, several of the borings were excavated slightly deeper than anticipated. Additional details of the installation of each piezometer are described below, and indicated on Table 1, and presented on the borings logs for the deep piezometers (Appendix A).

In general the boreholes excavated for each piezometer were 8 inches in diameter. The casing for the piezometers consisted of pre-threaded 2-inch diameter schedule 40 PVC pipe. The screen sections of the pipe were machine-generated slots with a width of 0.020 inches. A screw-on cap was placed at the bottom of each piezometer. A push-on cap was initially placed on the top of each piezometer, followed by later installation of a screw-on cap.

4.2 Drilling and Piezometer Installation Methodology

Hollow stem drilling methods were used by HAI's subcontractor (Gregg) to install the piezometers. In general each borehole was drilled using an 8-inch diameter auger to the desired depth using a track-mounted Marl M5T drill rig. A track-mounted rig was necessary to access some of the swampy drilling locations.

The 2-inch schedule 40 PVC casing (a lower 2-ft slotted section, then solid pipe) was assembled and then inserted through the auger stem to the desired depths. Filter pack material consisting of #3 size Monterey sand was placed through the auger stem at the desired interval to surround the screened section of the pipe. After the filter pack was constructed, bentonite pellets, consisting of coated balls of bentonite, were then placed in the annulus as the auger was raised to seal the boring above the screened interval. The bentonite pellets (Pel-Plug 3/8" TR30) are coated such that their expansion is delayed thus minimizing the potential for bridging. The coated pellets were installed to a minimum of two feet above the filter pack, followed by placement of standard bentonite (Enviroplug Medium) chips to the ground surface. Material depths of filter pack and sealing materials were carefully measured throughout the process to ensure the desired depths. The details of pipe placement and backfill materials are indicated on the boring logs in Appendix A1.

Flowing sands caused by the inflow of groundwater into the hollow stem auger during drilling were encountered during the installation of the deeper piezometers at P-1, P-2, P-3, and P-4. To control the inflow of sand a wooden plug was placed inside the auger casing and then punched out after placement of the piezometer casing. Once the plug was removed, the hole immediately filled in with native sands to a depth of approximately 23 to 25 feet below the ground surface. These conditions precluded the placement of filter pack sand; however, because these native deposits were granular, the native sands created a natural filter pack. The auger was then raised to the depth of the design filter pack and the bentonite plug pellets were able to be placed as described previously. The boring logs provide the details of the backfill materials for the deep piezometers installation.

Soil samples were collected for visual description and geotechnical analysis from the deep piezometers during the drilling process. The soil samples were generally collected at 5-foot intervals using a 2-inch diameter split-spoon sampler that was driven with a pneumatic driver (no blow counts were provided). The samples were placed in labeled plastic bags. Soil samples could not be collected from borings located along the western perimeter of the Lake using the pneumatic samplers due to their loose, granular nature. Instead soil samples were collected directly from soil trapped within the hollow stem auger flights as it was raised from the hole.

Pictures of the well installation process are provided in Appendix A.

4.3 Piezometer Construction, Soils Testing, and Boring Logs

Boring logs were generated for the deep piezometers based on the description of samples collected at depth intervals of approximately every 5 feet during the drilling. These logs are presented in Appendix A1 and provide a description of the materials encountered, the results of geotechnical soil testing, and the details of installation of each of the deep piezometers. Multiple soil samples were submitted for geotechnical analysis from each boring as indicated in Table 1. Tests included Visual Classification (ASTM D 2488) and Sieve Analysis (ASTM D422). The lab reports are included in Appendix B.

After the piezometers were constructed the top of the casing was cut approximately 18 inches above the natural ground surface. A 2-ft x 2-ft concrete base approximately 6-inches thick was then formed in place

to help protect the piezometer from disturbance. It is understood that outer protective steel boxes or piping will be installed at a later time by others to house the piezometers.

5.0 WELL DEVELOPMENT

Well development was performed from April 22 to 29, 2015. The purpose of well development is to cleanse the well bore and filter pack of material that could interrupt or hinder communication between the groundwater in the formation, and the groundwater collecting in the well casing. The filtration capacity of the filter pack (i.e. the sand surrounding the well screen) is typically improved by the development process. If properly designed and developed, the well screen and filter pack will work together to restrict the movement of surrounding sedimentary materials into the borehole during sampling or pumping.

5.1 Methodology

The method employed for development of the piezometers was a surge / bail / pump method. A general description of the process follows. A summary of the well development is included in Table 2. As noted in the table there were some deviations from the proposed development process required due to field conditions.

Step 1 – Surging:
Surging involves the use of a specialized down-well tool known as a surge block. It is effectively a piston placed on a solid rod and constructed to fit tightly within a well. The movement of the tool within the screened section of the well forces water to move through the well screen and into the sand filter pack. Surge blocks can be made of steel, poly-plastic, or a combination of these two materials. The best surge blocks incorporate one-way valves installed through the block. This allows the surge block to fall downward with nominal surging, and rise with significant surge. By rising with significant surge, smeared materials and fine particles stuck within the well screen and filter pack are pulled from the bore wall and drawn into the well for removal with a bailer.

Surging was conducted for a minimum of 20 minutes and involved the entire screened interval. An overlapping method was used to ensure complete surging of the well screen interval. A longer surging period can benefit wells known to have a high volume of fines, or wells that are in need of rehabilitation.

Step 2 – Bailing:
Bailing a well removes sand and large particles from the well. Typically, wells are bailed after surging to remove the larger particles drawn into the well during surging. The best tool to use for bailing a well of debris is a bottom-loading bailer made of Teflon, schedule-40 pvc, or steel. The bailer should have enough weight to travel to the bottom of a well and push downward into the residual sand, silt, and clay that has accumulated.

During the bailing procedure, bailer discharge is monitored for sand, silt, and other potential debris in the well (roots, debris). Once the bailer discharge shows no sand and minimal fines, the bailing procedure ends. One to two bore volumes is typically the amount of water removed before the discharge is clear enough for the next phase, depending on the formation and bailer discharge quality.

Step 3 – Pumping:
Pumping is the final step of well development in the three-step development procedure. When pumping the well, a bottom-loading submersible pump designed to handle fine silt and clay particles is used. The pump is typically equipped with a check valve so that no back-flushing or back-surging occurs.

Relatively constant flow rates are maintained when pumping a well after surging and bailing. Flow rates should be established that allow a constant flow with constant drawdown. This creates a beneficial flow condition that allows the filter pack of the well to filter the fines within the filter pack's structure and allow for the flow of clear water into the well casing. Constant drawdown is monitored during the pumping phase of development. These data can also help in the preparation for subsequent well testing (sampling, aquifer testing, etc.).

During the pumping phase water quality data may be obtained to observe potential changes in water quality. Typical measurements include temperature, pH, Electrical Conductance, Dissolved Oxygen, and Turbidity. Turbidity is the primary indicator of well development. When the turbidity reaches 50 Nephelometric Turbidity Units (NTU) or lower, a monitoring well may be considered properly developed depending on well construction, aquifer materials, and sampling requirements. Monitoring wells and piezometers typically have filter packs on the order of 2-inches in thickness and may not be fully effective, resulting in more turbid water on the order of 100 NTUs. Low flow purge rates can help to reduce sample turbidity when sampling. The measured field logs are attached in Appendix C.

Well development activities become limited when slow recharging wells quickly dewater during bailing. Due to the construction considerations of most well screen and end cap materials, well development is delayed and potentially ceases when the water column in the well becomes less than one foot in thickness.

5.2 Summary of Well Development and Observations

Table 2 summarizes the piezometer development. In general three conditions were encountered at the 25 piezometers that were available to develop:

1. Fast recharging piezometers with relatively rapid inflow of water. Fifteen of the 25 piezometers were considered fast recharging.
2. Slow recharging piezometers that rapidly dewatered when pumped. These proved more difficult to develop and are characteristic of low-permeability aquifer materials (i.e. silts and clays). In most cases the wells completely dewatered and did not produce sufficient volumes of water to conduct pumping or test produced water quality. Six of the 25 piezometers were slow recharging (dewatered).
3. Artesian wells. These wells were left uncapped following well installation to allow the natural flow of water to continue to clear the filter pack and well. They were subsequently capped following hydraulic testing. Four piezometers had measureable flow (P4A, P5A, P6A, and P6B), and two others that are classified as fast recharging had very low artesian flow rates described as a ‘trickle’. It is likely that the two low flow piezometers would not flow if installed with taller surface casings.

6.0 HYDRAULIC TESTING

Hydraulic (pump) tests were performed about two weeks after completion of Well development from May 11 to 14, 2015. Sixteen of the 25 accessible piezometers were hydraulically tested to support hydraulic conductivity calculations based on short-term constant discharge testing with target duration of approximately 30 minutes at a steady pumping rate of approximately 3 gpm. The testing program is summarized in Table 3.

The hydraulic testing focused on the lowermost and intermediate depth piezometers (the -A and -B piezometers). Five of the 16 piezometers that were tested would not sustain flow and quickly dewatered because they were completed in low permeability materials. In these instances the water level recovery data were the primary hydraulic test data used for the analysis.

Each of the piezometer sets consisted of three piezometers. Continuously-recording water level (pressure) transducers were placed in each of the wells. Submersible Solinst Leveloggers were used for the testing. Barometric pressure data were simultaneously collected during testing to allow the conversion of the pressure measurements to water levels.

Data collection was typically conducted for a 24 hour period following the short-term constant discharge test. The data loggers were set up to record data at 20 to 30 second intervals to facilitate short- and longer-term data collection. The purpose of the longer-term measurements was to assess for potential background water level variations that may have affected the test data. In some cases (e.g. Piezometers 5-B, 5A-A, and 8-A) water levels did not fully recover after 24 hours but sufficient data were collected to support test interpretation.

6.1 Testing Methodology

The constant discharge tests were conducted using a small-diameter submersible Grundfos pump attached to a ¾-in diameter discharge hose. Water was discharged to the ground surface approximately 100 feet from the test location via a hose. An electronic pump controller was used to support flow rates ranging from approximately 1 to 3.5 gpm. Instantaneous flow measurements were observed using a float-type gauge and all cumulative flows were recorded at a precision of 0.1 gallons using a totalizer. Flow durations were recorded by hand and verified using the water level responses observed by the down-hole pressure transducers.

The pump controller was adjusted to compensate for pump efficiency as water levels changed in order to maintain a constant discharge rate. In two cases the pumping duration was extended beyond 30 minutes to attain steadier drawdown conditions because the pumping rate was observed to vary during the initial 30 minutes of testing.

Manual water level measurements were also recorded during testing. Copies of the field notes are included in Appendix C.

Three transducers were used for each test and were typically installed within the hour preceding the constant discharge testing of the A (deep) and B (intermediate depth) piezometers. Water level (pressure) data were then obtained prior to, during, and typically for a 24 hour period following testing. Following testing, each of the Solinst Leveloggers were stopped and the data downloaded to a laptop computer to verify that the data had been recorded. Binary files as used by the Solinst software were saved and the Solinst software was used to export an Excel-compatible file. Barometric compensations were then run to convert the pressure data to water levels.

Free-flowing artesian conditions were observed at some of the piezometer locations following well installation. These wells were allowed to freely discharge for the approximately 2 to 3 week period between installation and testing with the intent to allow the flow rates to attain equilibrium prior to testing. PVC fittings and pipe were used to temporarily divert water from the piezometers. Flow rates were not monitored with the exception of limited field observations made using a bucket and stopwatch to measure discharge. All wells were securely capped following testing.

6.2 Data Interpretation

The single piezometer (well) tests were conducted under constant discharge conditions with a target duration of 30 minutes. Due to the multi-level placement of the piezometer screens, the pumped interval could not directly be monitored by an observation well. The single-well tests were analyzed as a function

of drawdown and recovery versus the logarithm of pumping time. Here the constant rate discharge test analyses were done using the Cooper-Jacob solution to determine the aquifer transmissivity. The method is a numerical approximation of the Theis non-equilibrium solution for flow to a well. It assumes horizontal flow to a well completed within a non-leaky confined aquifers. Relevant technical references include Kruseman, G.P. and N.A. de Ridder (1994) and Fetter (2001). English units (feet, gallons) will be used consistent with the US Geological Survey methodology (e.g. Lohman, S.W., 1972).

Analysis involves plotting of the drawdown data as a function of the logarithm time since the start of pumping. A straight line was fitted to the data as shown in Figures 5A to 5I.

The Cooper-Jacob solution for drawdown as a function of distance (r) and time (t) follows from

$$s(r,t) = Q / 4\pi T \ W(u) \quad (1)$$

$$u = r^2 S / 4Tt \quad (2)$$

where

Q, is pumping rate [L^3/t]
r, is radial distance from pumping well to an observation well [L]
s, is drawdown [L]
S, is storativity [dimensionless]
t, is elapsed time since start of pumping [T]
T, is the aquifer transmissivity [L^2/T]
W(u), is the Theis well function for unsteady radial flow to a well. It can be approximated using a truncated infinite series expression:

$$W(u)= 0.5772 - \ln(u) \quad (3)$$

and applies or small values of u (i.e. u<0.05). A smaller value for u leads to a more accurate approximation of the Theis well function.

The Cooper-Jacob solution is based on the log-linear approximation of W(u) where:

$$S(r,t) = Q/4\pi T \ (-0.5772 - \ln(r^2 S/4Tt)) \quad (4)$$

which is an equation for a line. Drawdown (s) is plotted as a function of $\log_{10}(t)$. The slope of the line is then used to calculate T:

$$T = 2.303 \ Q/4\pi\Delta s \ = Kb \quad (5)$$

where

Δs, is the slope of the fitted line drawdown during one log cycle
Q, is the pumping rate
K, is the hydraulic conductivity [L/T]
b, is the aquifer thickness (piezometer screen length assuming horizontal flow in the aquifer)

S can be calculated from observation data given a value of r, but here there are no observation wells to determine aquifer storability.

Well recovery data are analyzed in a similar manner where time is expressed as t' = (time since pumping started/time since pumping stopped). The supporting derivation is not presented here but can be found in the previous references.

Three artesian wells were also tested. The wells had been open to flow for approximately two weeks and flow rates were observed to be fairly constant during the period of time required for the short-term constant discharge tests. Constant head tests were considered where the height of the casing was varied and the change in flow rate measured as a function of head. However, given that the test pump was capable of flow rates that exceeded the observed artesian rates, constant discharge testing was conducted with the assumption that the baseline flow rate would be relatively constant during the 30 minute test period. Under this assumption the test data were then analyzed using the incremental increase in flow rate attained by the pump. For example the pumping of a piezometer flowing at 2 gpm with a pump discharging at 3.5 gpm corresponds to a 1.5 gpm incremental increase. Thus, the test would be equivalent to a 1.5 gpm constant discharge test and analyzed accordingly.

Lastly, low flow conditions were observed during seven of the tests where pumping could not be sustained for 30 minutes. In these cases the test analyses were primarily based on the recovery data. The log of the drawdown data versus log time were also plotted to examine the potential for borehole storage effects where water is primarily derived from the well casing and not the surrounding aquifer. Thus, the drawdown data do not provide meaningful data for test interpretation. A 45 degree slope is diagnostic of borehole storage.

6.3 Observations and Test Results

The purpose of the single-piezometer hydraulic testing was to obtain estimates of the hydraulic conductivity of the aquifer materials. The testing program is summarized in Table 3. A pumping rate of approximately 3.5 gpm with duration of 30 minutes was initially targeted absent site-specific data. Test pumping rates were reduced for lower yield piezometers and ranged from 0.3 to 3.6 gpm with durations ranging from 1 to 64.5 minutes.

A wide range of aquifer and hydrologic conditions were encountered as evidenced by the pumping test data summarized in Table 4. Estimated hydraulic conductivities ranged from as high as 4,000 ft/day in highly permeable granular materials to as low as 0.02 ft/day in lower permeability silts and clays.

The testing results are depicted in Figure 6. Shown in the figure are the piezometer screen depths and representative values of hydraulic conductivity, K (in ft/day), reported to 2 significant digits. Review of the data shows the following:

- The highest K values occur along the western side at P1, P2, and P3. The coarse grained sands are likely associated with alluvial fans that have formed along the eastern slope of the Sierra Nevada Mountains located to the west of Owens Lake. Springs occur within these areas which are near recent fault scarps formed by the 1872 Owens Valley Earthquake (Babb, 1991; Lee, 1906; and Pakiser, 1964).
- The lowest K values, corresponding to silts and clay, occur in the shallower sediments at P5, P5A, and P6. These appear to form a shallow confining layer and support artesian flow in lower piezometers as P5 and P6. The artesian aquifer is of relatively low hydraulic conductivity, on the order of 2 to 10 ft/day.
- Conditions at P4 are similar to P5 and P5A with artesian conditions. Lithology likely varies due to differences in sediment source areas.
- Conditions at P8 may represent a transition from those observed at P6 and P7 due to changes in sediment lithology related to differing sediment source areas.

7.0 CONCLUDING REMARKS

The piezometer boring and hydraulic test data obtained by HAI provide a limited perspective of the overall hydrogeology. There are clearly differences in aquifer conditions across the Site related to the overall sedimentology and depth of basement rock. An integrated approach is necessary to fully interpret the data and is beyond the scope of this limited data collection effort.

8.0 REFERENCES

Babb, D.E., 1991. History of Early Water Diversions and their impact on Owens Lake. In Water Usage: Sociology/Economics, WMRS Symposium Volume 4, City of Los Angeles Department of Water and Power.

Danskin Wesley R., 1998. Evaluation of the Hydrologic System and selected Watermanagement Alternatives in the Qwens Valley, USGS Water Supply Paper 2370.

Fetter, C.W., 2001. Applied Hydrogeology (4th ed.), Prentice-Hall, Upper Saddle River, New Jersey, 598p.

Hollet, K.J., Danskin W. R., McCaffrey, W. F., Walti, C.L., 1991. Geology and Water Resources of Owens Valley, California., USGS Water-Supply Paper 2370-B.

Kruseman, G.P. and N.A. de Ridder, 1994. Analysis and Evaluation of Pumping Test Data (2nd ed.), Publication 47, Intern. Inst. for Land Reclamation and Improvement, Wageningen, The Netherlands, 370p.

Lee, J., Spencer, J., Owen, L., 2001. Holocene Slip rates along the Owens Valley Fault, California: Geological Society of America, V.29 No. 9, p. 819-822

Lee. W.T., 1906. Geology and Water resources of Owens Valley, California, USGS Water Supply and Irrigation Paper No. 181

Lohman, S.W., 1972. Ground-water hydraulics, U.S. Geological Survey Prof. Paper 708, 70p.

Pakiser, L.C., Kane, M.F., and Jackson, W.H., 1964. Structural geology and volcanism of Owens Valley region, California; a geophysical study, USGS, Professional Paper 438.

Wilkerson, G., Milliken, Saint-Amand, P., Saint-Amand, D., 2007. Roadside Geology and Mining History Owens Valley and Mono Basin, U.S. Bureau of Land Management.

TABLES

Table 1. Summary of Piezometer Installation and Construction

Piezometer ID		Installation Date	Elevation: ft MSL at toc	Boring TD, ft bgs	Casing TD, ft btc	Top of screen (ft. btc)	Bottom of screen (ft. btc)	Screen Length, feet	Soil Classification at Screen Interval (ASTM D2488)	Sieve Analysis (ASTM D422)	Geotechnical Samples: ID & (depth, ft bgs): Visual Classification (ASTM D2488) and Sieve (ASTM D422) provided in Appendix B
P1	A	04/28/15	3573.94	32.0	33.0	29.5	31.5	2	Sand	SP-SM	S-1 (6), S-2 (11), S-3 (31)
	B	04/28/15	3573.99	12.0	13.9	10.5	12	1.5	Sand*	SP	not sampled
	C	04/28/15	3574.08	6.0	9.2	5	6	1	Sand*	SW	not sampled
P2	A	04/27/15	3568.37	32.0	33.1	29.5	31.5	2	Sand	SP-SM	S-1 (6), S-2 (11), S-3 (17), S-4 (27)
	B	04/27/15	3568.08	12.0	13.3	10.5	12	1.5	Sand*	SP	not sampled
	C	04/27/15	3568.35	6.0	8.32	5	6	1	Sand*	SP	not sampled
P3	A	04/27/15	3568.38	33.0	34.4	30	32	2	Sand	SW-SM	S-1 (6), S-2 (11), S-3 (16), S-4 (31)
	B	04/27/15	3568.34	12.0	13	10.5	12	1.5	Silty Clay*	SM	not sampled
	C	04/27/15	3568.36	6.0	7.95	5	6	1	Silty Clay/Sand*	ML	not sampled
P4	A	04/23/15	3617.85	32.5	34.0	30.5	32.5	2	Sand	SW-SM	S-1 (6), S-2 (11), S-3 (16), S-4 (21), S-5 (26), S-6 (31)
	B	04/23/15	3617.88	12.0	13.2	10.5	12	1.5	Sand*	SM	not sampled
	C	04/23/15	3617.72	6.0	8.05	5	6	1	Sand*	SM	not sampled
P5	A	04/24/15	3579.68	34.0	35.5	31.5	33.5	2	Clay/Sand	CL	S-1 (6), S-2 (11), S-3 (16), S-4 (21), S-5 (26), S-6 (31), S-7 (32)
	B**	04/24/15	3578.61	10.0	10.4	8.4	10.4	2	Silty Clay*	CL-ML	not sampled
	C**	04/24/15	3578.74	5.0	4.4	3.4	4.4	1	Silty Clay*	ML	not sampled
P5A	A	04/23/15	3584.85	33.5	36.0	31.5	33.5	2	Clay	CL	S-1 (6), S-2 (11), S-3 (16), S-4 (21), S-5 (26), S-6 (31), S-7 (34)
	B	04/23/15	3584.54	12.0	13.6	10.5	12	1.5	Sand*	SC	not sampled
	C	04/23/15	3584.74	6.0	8.2	5	6	1	Sand/Silty Clay*	SM	not sampled
P6	A	04/22/15	3590.76	32.5	34.0	30	32	2	Silty Clay	ML	S-1 (6), S-2 (11), S-3 (16), S-4 (21), S-5 (26), S-6 (31)
	B**	04/22/15	3589.83	10.0	10.3	2.3	10.3	8	Silty Sand*	ML	not sampled
	C**	04/22/15	3589.78	5.0	4.9	3.9	4.9	1	Sand / Sandy Silt*	SM	not sampled
P7	A	04/29/15	3583.47	32.5	34.1	30.5	32.5	2	Clay	ML	S-1 (6), S-2 (11), S-3 (16), S-4 (21), S-5 (26), S-6 (31)
	B**	no access	3583.26								existing piezometer constructed by others
	C**	no access	3583.05								existing piezometer constructed by others
P8	A	04/24/15	3593.79	34.5	32.1	30.5	32.5	2	Clayey Silt	CL-ML	S-1 (6), S-2 (11), S-3 (16), S-4 (21), S-5 (26), S-6 (31), S-7 (34)
	B	04/24/15	3593.19	12.0	13.3	10.5	12	1.5	Clayey Silt*	ML	not sampled
	C	04/24/15	3592.98	6.0	7.26	5	6	1	Clay/Sand*	SC-SM	not sampled

Notes:
1. All Piezometers are constructed of 2-in schedule 40 PVC. Screened section is 0.020-inch slot size.
2. * Lithologies based on sampling and observations from the Piezometer A boring
3. ** Wells installed by others prior to April 2015.

TD: total depth; toc: top of casing; btc: below top of casing

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Table 2. Summary of Piezometer Development

Piezometer ID		Development Date	DTW, ft btc	WL measurement time (post-development)	Surged?	Development Purge Volume	Response (fast or slow recharge)	Notes, flow if artesian, etc.	Final NTUs
P1	A	4/29/2015	2.55	7:05 AM	yes	24 Gal	Fast	Pumped @ 1.0 gpm	90.61
	B	4/29/2015	2.95	7:40 AM	yes	12 Gal	Fast	Pumped @ 0.5 gpm	95.03
	C	4/29/2015	3.26	7:55 AM	yes	5 Gal	Fast	Pumped @ .05 gpm	52.17
P2	A	4/28/2015	2.48	12:10 PM	yes	22 Gal	Fast	Pumped @ 1.0 gpm	28.02
	B	4/28/2015	3.63	12:28 PM	yes	6.5 Gal	Fast	Pumped @ 0.5 gpm	9.40
	C	4/28/2015	3.87	12:40 PM	yes	4.8 Gal	Fast	Pumped @ 0.5 gpm	24.25
P3	A	4/27-4/28/15	2.69	2:35 PM	yes	32 Gal	Fast	Pumped @ 0.5 gpm	108.50
	B	4/27-4/28/15	3.15	2:56 PM	yes	13 Gal	Fast	Pumped @ 0.25 gpm	14.46
	C	4/27-4/28/15	3.05	3:10 PM	yes	7 Gal	Fast	Pumped @ 0.4 gpm	18.69
P4	A	4/27/2015	0	7:20 AM	no	Ongoing	Artesian	Artesian flow @ 2.5 GPM	NM
	B	4/27/2015	3.62	9:20 AM	yes	8 Gal	Fast	Pumped @ 0.25-0.5 gpm	5.36
	C*	4/27/2015	3.85	9:40 AM	yes	2.2 Gal	Slow	Pumped to bottom @ 0.25gpm	NM
P5	A	4/24/2015	0	11:50 AM	no	Ongoing	Artesian	Artesian flow @ 5.25 GPM	1.21
	B**	4/24/2015	1.00	1:45 PM	yes	2.8 Gal	Slow	Pumped to bottom @ 0.25gpm	18.78
	C**	4/24/2015	1.33	1:56 PM	yes	2.0 Gal	Slow	Pumped to bottom @ 0.25gpm	101.60
P5A	A*	4/24/2015	14.36	7:40 AM	yes	10.5 Gal	Slow	Pumped to bottom @ 0.75gpm	177.00
	B	4/24/2015	3.03	8:00 AM	yes	8.5 Gal	Fast	Pumped @ 500 ML/Min	36.00
	C	4/24/2015	2.94	8:16 AM	yes	5.8 Gal	Fast	Pumped @ 400 ML/Min	25.78
P6	A	4/23/2015	0.0	7:04 AM	no	684 Gal/ Ongoing	Artesian	Pumped: 2.4 gpm /Flow=2.2gpm	NM
	B**	4/23/2015	0.0	8:40 AM	yes	Ongoing	Artesian	Flow measured 190 ML/Min	NM
	C**	4/23/2015	0.96	8:05 AM	yes	1.0 Gal	Slow	Hand bailed dry - no pumping	NM
P7	A	4/30/2015	1.48	6:55 AM	yes	7 Gal	Fast	Hand-Bailed. Pump failed	Pump failed
	B**	no access.							
	C**	no access.							
P8	A	4/22/2015	3.01	8:00 AM	yes	5.0 Gal	Slow	Pumped @ 0.5 gpm/Dewatered	NM
	B	4/22/2015	2.2	8:32 AM	yes	13.5 Gal	Fast	Pumped @ 1.0 gpm	5.19
	C	4/22/2015	1.91	8:55 AM	yes	8.2	Fast	Pumped @ 0.25 gpm	90.70

Notes:
1. All Piezometers are 2-in schedule 40 PVC
2. ** Wells installed by others prior to May 2015
3. * Low flow wells where wells dewatered (pumped to bottom or hand-bailed dry)
4. P6A was pumped for an extended period to contain artesian flow and allow time for the concrete pad to cure.
5. Artesian wells with significant flow are noted as 'ongoing' development as they were left uncapped and flowing prior to hydraulic tests.
6. Not all wells were able to be surged due to artesian flow/pressure.
7. NM indicates turbidity was not measured

DTW: depth to water; btc: below top of casing; NTUs: Nephelometric Turbidity Units

Table 3. Summary of Hydraulic Tests

Piezometer ID		Test Date	Initial WL		Test Start	Totalizer Start	Totalizer Stop	Gallons Pumped	Duration (from datalogger)	Avg Rate,	Notes
			btc	time	Time	gal	gal	gal	mins	gpm	
P1	A	5/11/2015	2.51	8:22	8:25:00 AM	30,868.8	31,099.6	230.8	64.50	3.58	
	B	5/11/2015	3.05	10:17	10:30:00 AM	31,104.0	31,162.4	58.4	30.50	1.91	
P2	A	5/11/2015	2.52	12:17	12:35:00 PM	31,163.4	31,273.9	110.5	31.00	3.56	
	B	5/11/2015	2.66	12:17	1:40:00 PM	31,274.3	31,370.6	96.3	31.17	3.09	
P3	A	5/13/2015	2.73	7:49	7:57:00 AM	31,708.4	31,822.8	114.4	32.67	3.50	
	B	5/13/2015	3.26	9:05	9:08:00 AM	31,822.8	31,941.7	118.9	33.00	3.60	
P4	A	5/13/2015	0	11:51	11:54:00 AM	31,941.9	32,037.6	95.7	37.66	2.54	Low flow artesian. 0.5 gpm when tested
	B	5/13/2015	3.48	12:52	12:54:00 PM	32,037.6	32,038.8	1.2	1.00	1.60	Rapidly dewatered
P5	A	5/12/2015	0	9:21	9:30:00 AM	31,370.6	31,587.0	216.4	63.00	3.43	Low flow artesian. 3.1 gpm when tested
	B	5/12/2015	0.91	11:06	11:18:00 AM	31,587.0	31,588.1	1.1	1.50	0.73	Rapidly dewatered
P5A	A	5/12/2015	1.65	14:38	2:50:00 PM	31,703.9	31,708.4	4.5	4.33	1.04	Rapidly dewatered
	B	4/24/2015	1.82	10:06	10:06:00 AM	manual meas. (bucket)		6.0	32.00	0.19	Used development drawdown data. Not tested due to weather.
P6	A	5/12/2015	0	12:38	12:43:00 PM	31,588.1	31,702.2	114.1	32.67	3.49	Low flow artesian. 2.4 gpm when tested
	B	5/12/2015	0	13:23	1:26:35 PM	31,702.2	31,703.7	1.5	1.33	1.13	Casing full/ minimal artesian flow. Rapidly dewatered.
P7	A	5/14/2015	0	7:12	7:15:00 AM	2,041.4	2,045.4	4.0	3.00	1.33	Casing full/ minimal artesian flow
	B	no access/ not tested									
P8	A	5/13/2015	0	14:05	2:10:00 PM	32,038.8	32,040.7	1.9	6.00	0.32	Casing full/ minimal artesian flow
	B	5/13/2015	2.45	14:33	2:36:00 PM	32,040.7	32,041.7	1.0	1.00	1.00	

Notes: watered quickly

btc: below top of casing

Table 4. Summary of Hydraulic Testing Results

Piezo. ID		Test Date	Pumping Data			K, ft/day		Drawdown Notes	Recovery Notes	Notes
			Avg. Rate, gpm	Duration, in minutes	General Behavior	K_{est}, Drawdown	K_{est}, Recovery			
P1	A	5/11/2015	3.58	64.50	Typical	94	(11)	Ran test beyond 30 min due to initial variations in pumping rate. Very stable drawdown rate.	Quick recovery.	Drawdown data are judged more reliable
	B	5/11/2015	1.91	30.50	Typical	224	(35)	Stable drawdown rate.	Quick recovery.	Drawdown data are judged more reliable
P2	A	5/11/2015	3.56	31.00	Typical	1435	2004	Stable drawdown rate attained quickly.	Quick recovery with noisy residual drawdown (potential barometric effects)	Recovery results appear reasonable despite low magnitude (<0.1 ft). Drawdown data are judged more reliable.
	B	5/11/2015	3.10	31.00	Typical	1515	3167	Stable drawdown rate attained quickly. Appears noisy due to low drawdown (0.15 feet max.).	Quick recovery.	Recovery results appear reasonable despite low magnitude (<0.1 ft). Drawdown data are judged more reliable.
P3	A	5/13/2015	3.50	32.67	Typical	4390	525	Stable drawdown rate attained in less than 10 minutes.	Quick recovery with noisy residual drawdown (potential barometric effects)	Good drawdown data. Fast recovery with few data points. Drawdown data are judged more reliable.
	B	5/13/2015	3.60	33.00	Typical	31	--	Stable drawdown rate.	Fast recovery not interpreted- only 2 points collected	Manual data used with few recovery data due to recovery rate.
P4	A	5/13/2015	2.54	37.66	0.5 gpm artesian	23	0.5	Net pumping rate of 2.04 gpm with ~14 ft of drawdown after 30 minutes.	Very rapid water level recovery.	Artesian well had been discharging since installation. Flow rate over time not recorded. Well was capped after testing.
	B	5/13/2015	1.60	0.75	Dewatered	--	4.4	Rapidly dewatered, drawdown data not interpreted.	Good recovery data.	Drawdown not interpretable. Meaningful recovery data.
P5	A	5/12/2015	3.43	63.00	3.1 gpm artesian	11, 8	--	Net pumping rate of 0.33 gpm. Pump interuption at 18 min. Both curves interpreted.	Very quick recovery due to low net pumping rate. Residual drawdown data are of low magnitude and not meaningful.	Artesian well had been discharging since installation. Flow rate over time not recorded. Well was capped after testing.
	B	5/12/2015	0.73	1.50	Dewatered	--	0.05	Rapidly dewatered, possible borehole storage effects.	Long recovery period- well did not recover in 24 hours.	Very rapid drawdown/ not interpretable. Meaningful recovery data.
P5A	A	5/12/2015	1.04	4.33	Dewatered	BHS	1.6	Ran low flow rate (~1 gpm). Well yield dominated by borehole storage.	Long recovery period- well did not recover in 24 hours.	Drawdown data not interpretable. Meaningful recovery data.
	B	4/24/2015	0.19	32.00	Typical	0.017	--	Used low flow rate development pumping records.	Few data recorded during well development	Lower priority piezometer not tested due to late winter storm on last day of work. Data do appear subject to borehole storage and are interpretable.
P6	A	5/12/2015	3.49	32.67	2.4 gpm artesian	4.6	1.2	Net pumping rate of 1.09 gpm. Saw increase in drawdown at ~20 min.	Well recovered in 75 seconds. Fast recovery due to low net pumping rate.	Artesian well had been discharging since installation. Drawdown testing at late times (>20 min) may exhibit delayed yield or boundary effect.
	B	5/12/2015	1.13	1.33	Dewatered	BHS	0.23	Ran low flow rate (1.1 gpm). Well yield dominated by borehole storage.	Good recovery data.	Drawdown data dominated by borehole storage effects and not interpretable. Meaningful recovery data.
P7	A	5/14/2015	1.33	3.00	Minimal artesian	0.66	0.19	Ran low flow rate (1.33 gpm). Early time well yield dominated by borehole storage.	Good recovery data.	Good drawdown and recovery data. Artesian flow at time of testing was minimal (a 'trickle').
	B			no access						
P8	A	5/13/2015	0.32	6.00	Minimal artesian/ dewatered	(0.5)	7.5	Ran at very low flow rate (0.32 gpm) and realized over 18 ft of drawdown.	Long recovery period- well did not recover in 24 hours.	Early time drawdown data affected by borehole storage effects. Meaningful recovery data.
	B	5/13/2015	1.00	1.00	Dewatered	(0.02)	3.0	Fast drawdown not interpreted- only 2 points collected.	Good recovery data.	Rapid drawdown with few data points. Good recovery data.

Notes: 30 minutes of pumping not sustained

K_{est}: Estimated hydraulic conductivity

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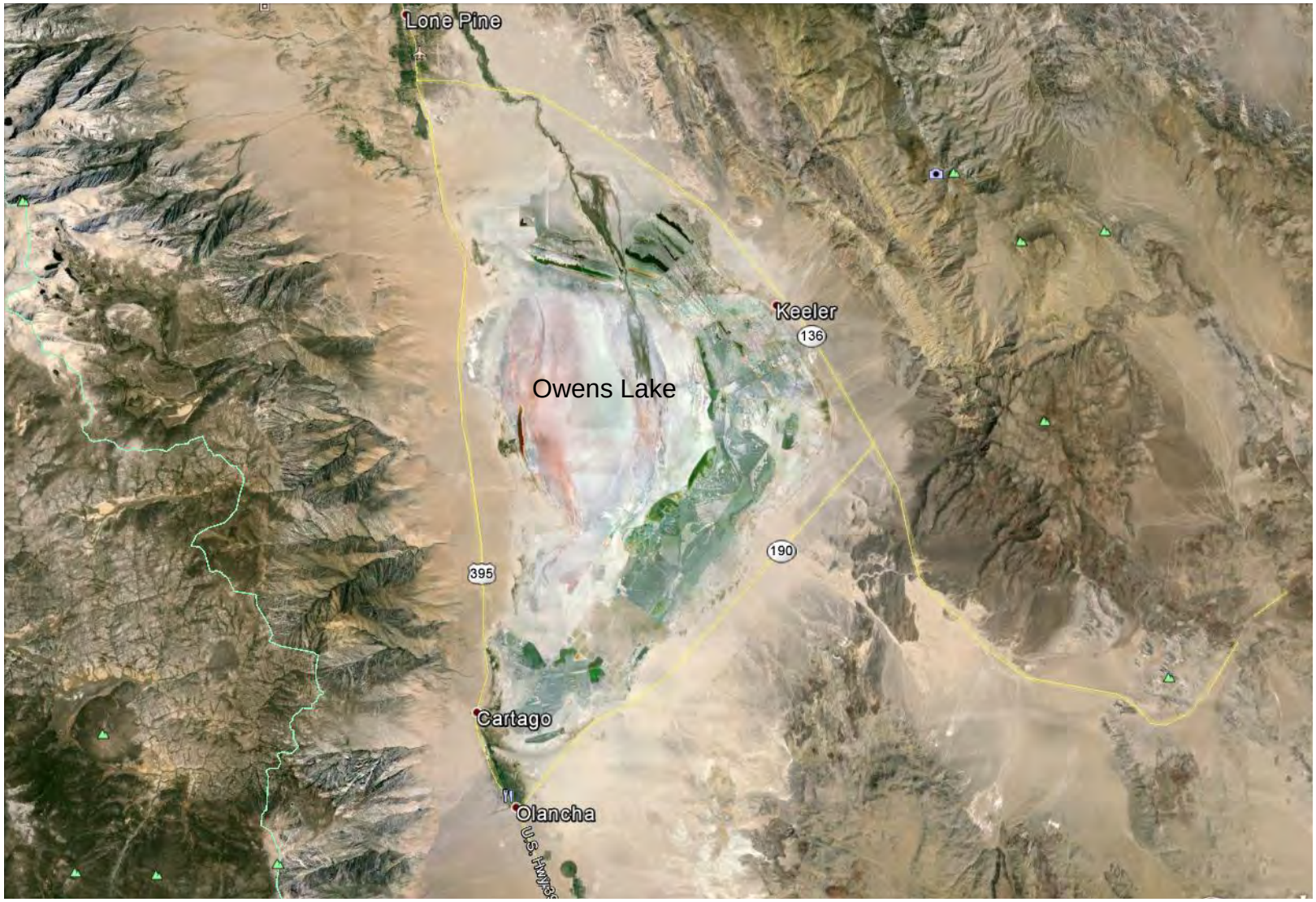
Table 5. Summary of Data in Figure 5

Piezometer ID		Depth, ft	Lithology	USCS	K, ft/day	Artesian
P1	A	29	Poorly graded Sand with Silt	SP-SM	90	
	B	10	Poorly graded Sand	SP	220	
	C	4	Well graded Sand	SW		
P2	A	29	Poorly graded Sand with Silt	SP-SM	1400	
	B	10	Poorly graded Sand	SP	1500	
	C	4	Poorly graded Sand	SP		
P3	A	30	Well graded Sand with Silt	SW-SM	4400	
	B	10	Silty Sand	SM	33	
	C	4	Sandy Silt	ML		
P4	A	30	Well graded Sand with Silt	SW-SM	20	0.5 gpm
	B	10	Silty Sand	SM	4	
	C	4	Silty Sand	SM		
P5	A	31	Sandy lean Clay	CL	10	3.1 gpm
	B	8	Silty Clay	CL-ML	0.05	
	C	2	Silt	ML		
P5A	A	31	Lean Clay	CL	2	
	B	10	Clayey Sand	SC	0.02	
	C	4	Silty Sand	SM		
P6	A	30	Silty with Sand	ML	5	2.4 gpm
	B	5	Sandy Silt	ML	0.2	trickle
	C	3	Silty Sand	SM		
P7	A	30	Sandy Silt	ML	0.2	trickle
	B	no access				
P8	A	30	Silty Clay with Sand	CL-ML	8	trickle
	B	10	Sandy Silt	ML	3	
	C	4	Clayey Sand	SC-SM		

Notes:
1. Depth is approximate mid-point of piezometer screen
2. Lithologies confirmed by lab testing
3. Hydraulic Conductivites selected from Table 4, show 2 signifiant digits

FIGURES



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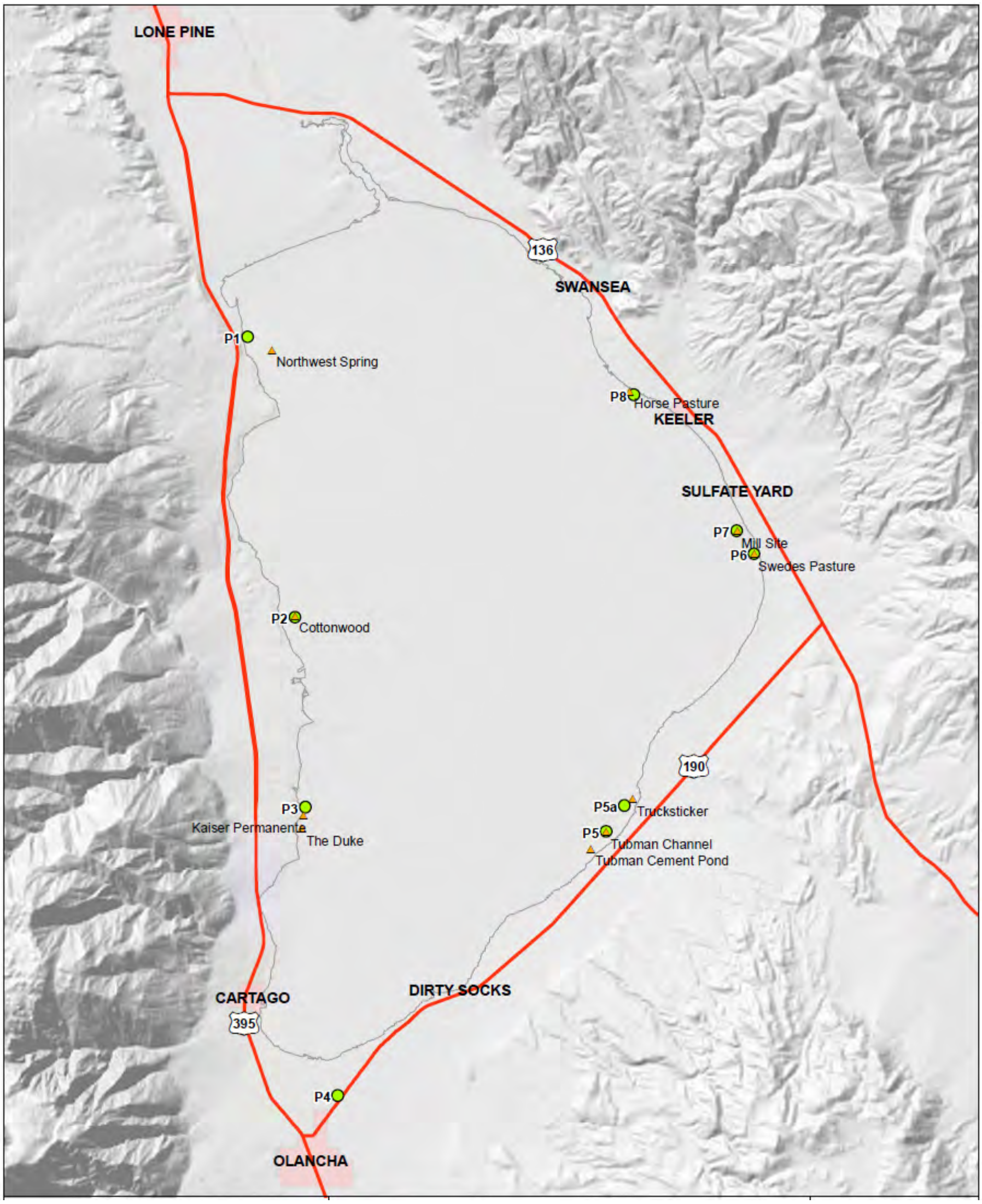
HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

Owens Lake Groundwater Development Program
Inyo County, California

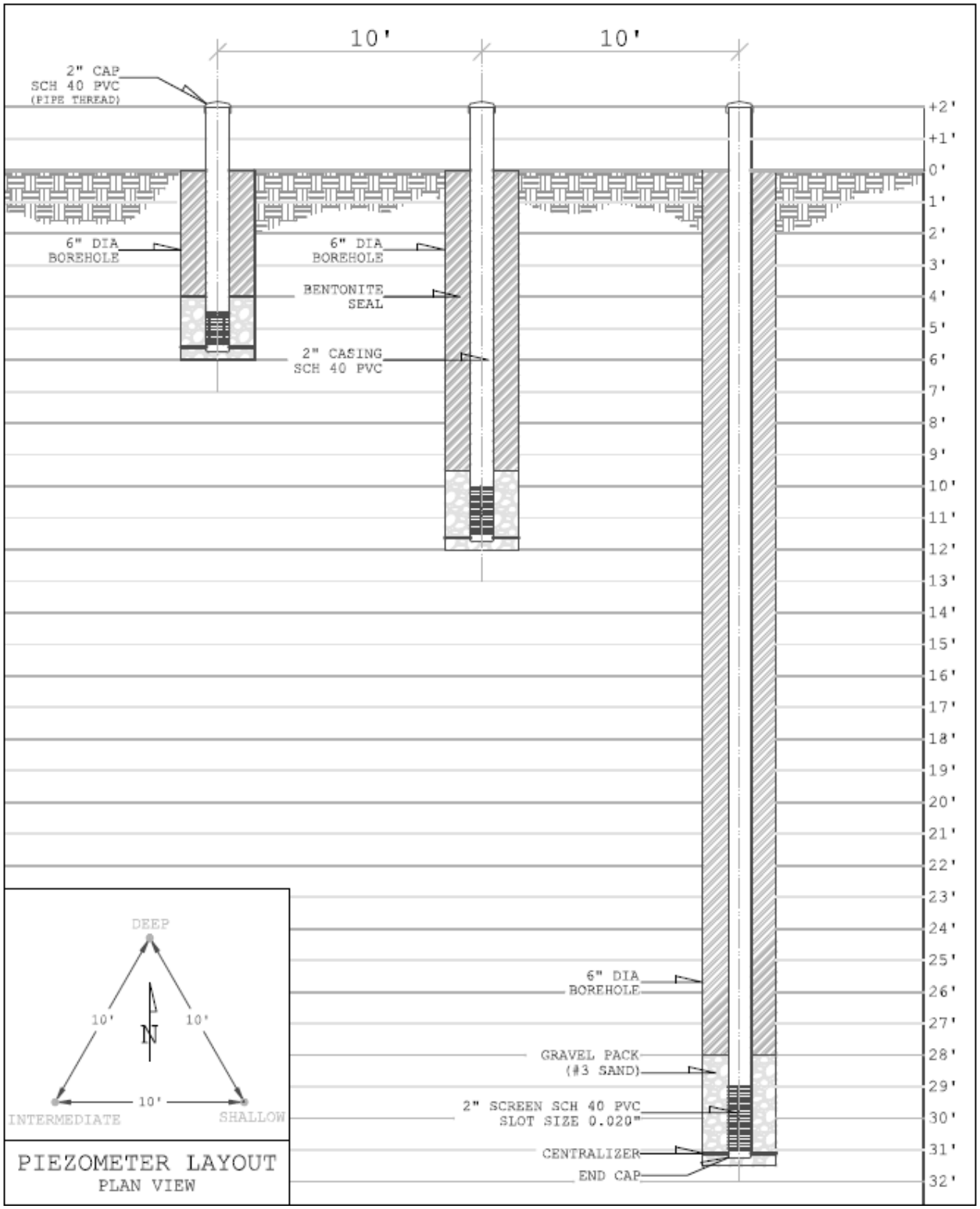
Project No. LADWP-15-001

SITE LOCATION MAP

Figure **1**



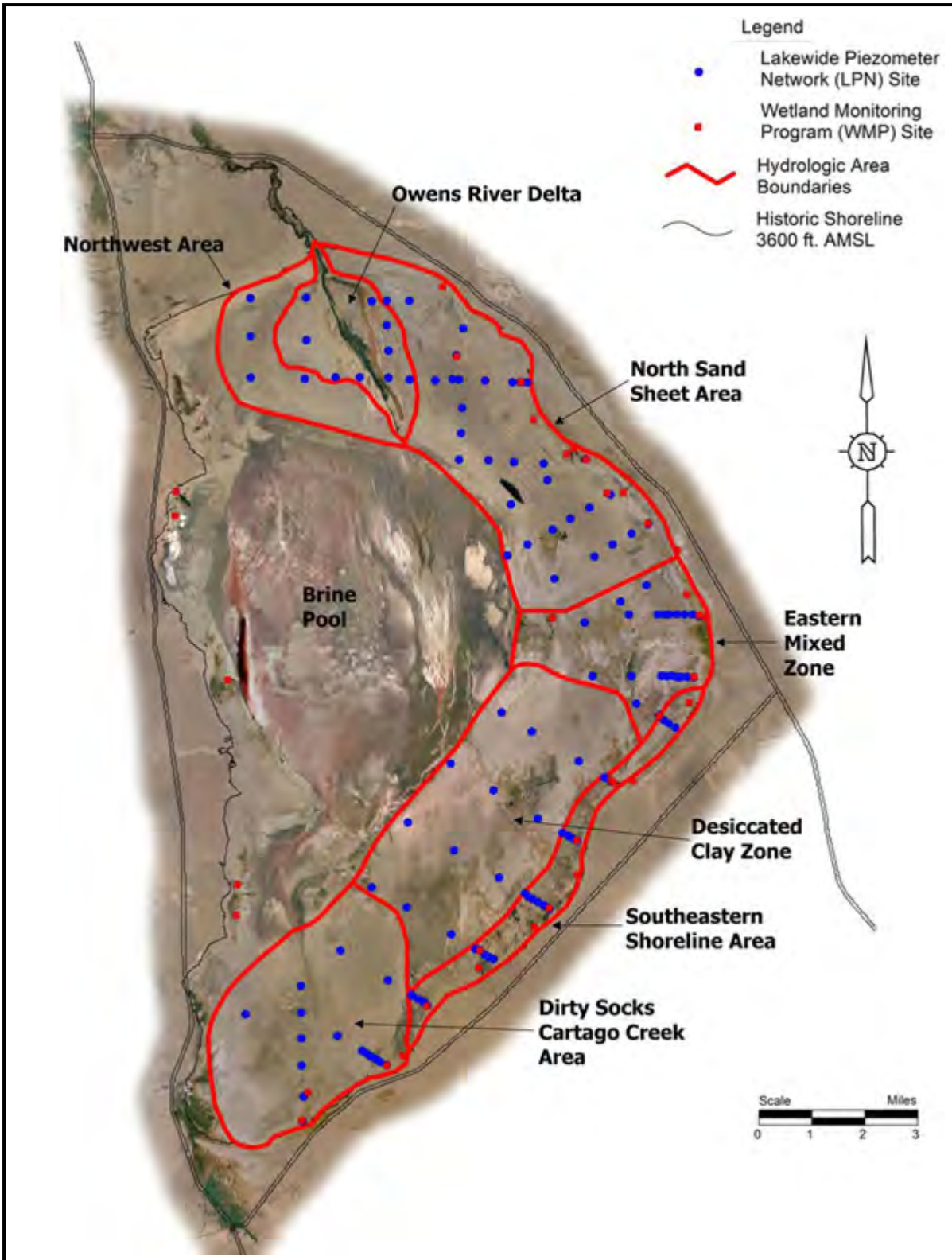
HUSHMAND ASSOCIATES, INC. Geotechnical and Earthquake Engineers	**Owens Lake Groundwater Development Program** Inyo County, California Project No. : LADWP-15-001	**PIEZOMETER LOCATIONS**	Figure **2**



Notes: The figure shown above is for illustration purpose and actual dimensions during installation may be different.

NOT TO SCALE

HUSHMAND ASSOCIATES, INC. Geotechnical and Earthquake Engineers	**Owens Lake Groundwater Development Program** Inyo County, California Project No. LADWP-15-001	**TYPICAL CLUSTER PIEZOMETER DESIGN**	Figure **3**

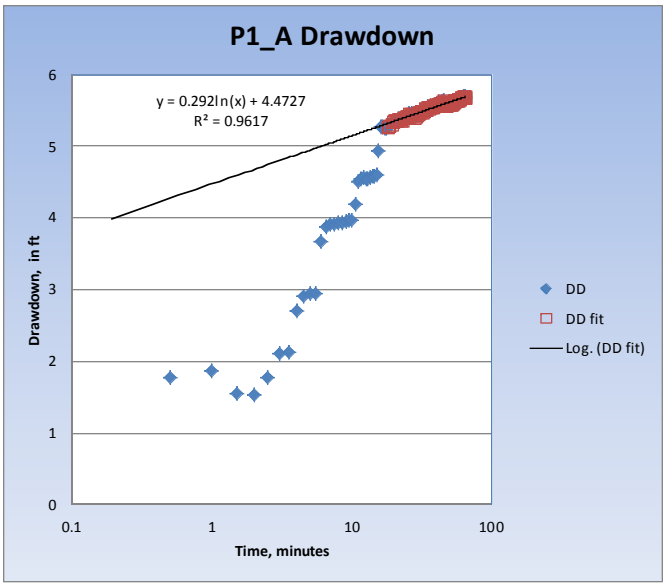


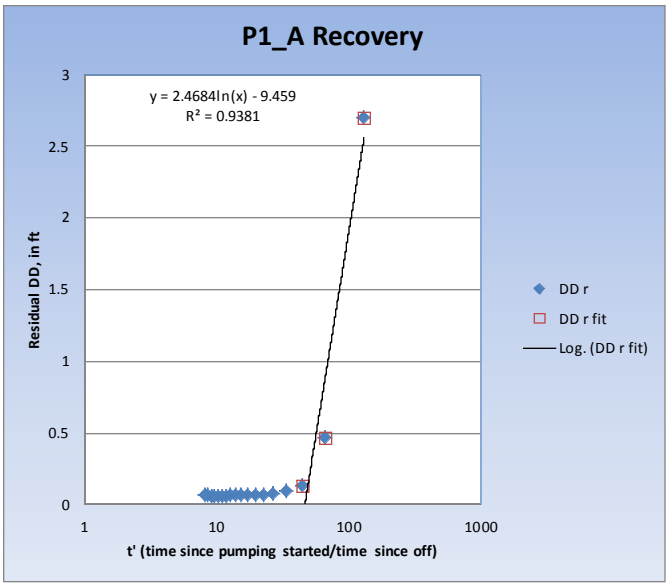
Source: Orthophoto base map by AirPhotoUSA(tm), September 2000

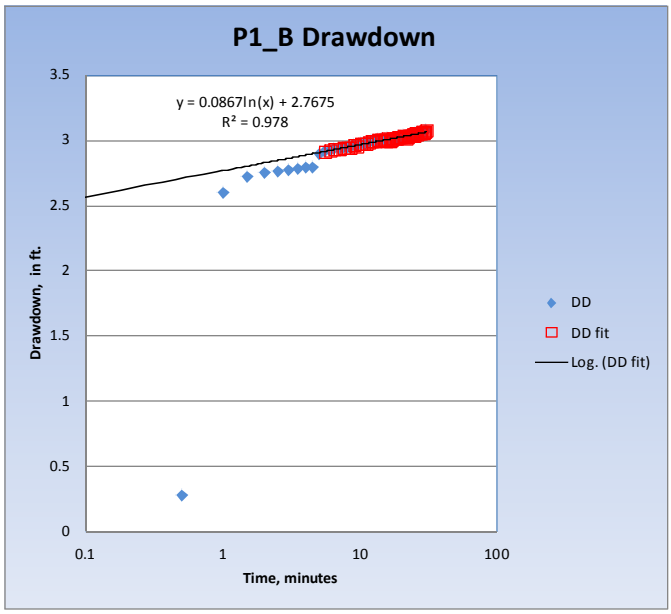
HUSHMAND ASSOCIATES, INC. Geotechnical and Earthquake Engineers	**Owens Lake Groundwater Development Program** Inyo County, California	**MAP OF OWENS LAKE SHALLOW HYDROLOGIC SYSTEM**	Figure **4**
	Project No. LADWP-15-001		

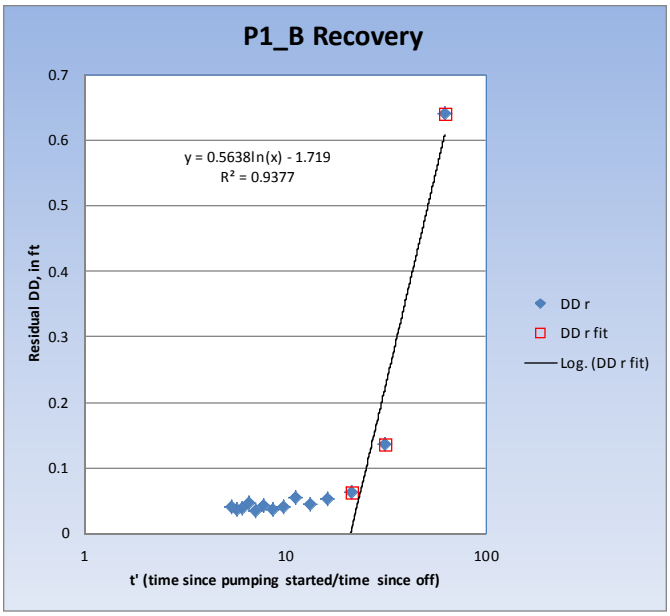
Hydraulic Conductivity, in ft/day

	DD	Recovery	Q, gpm	Duration (min)
P1_A	94	(11)	3.58	64.50
P1_B	224	(35)	1.91	30.50





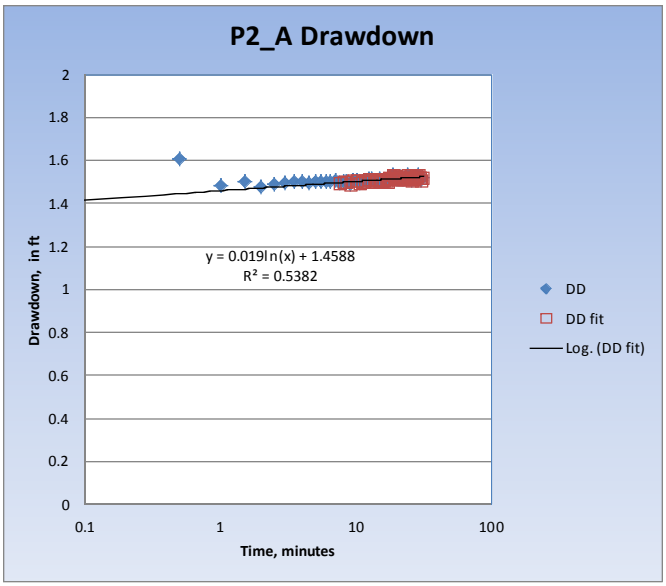


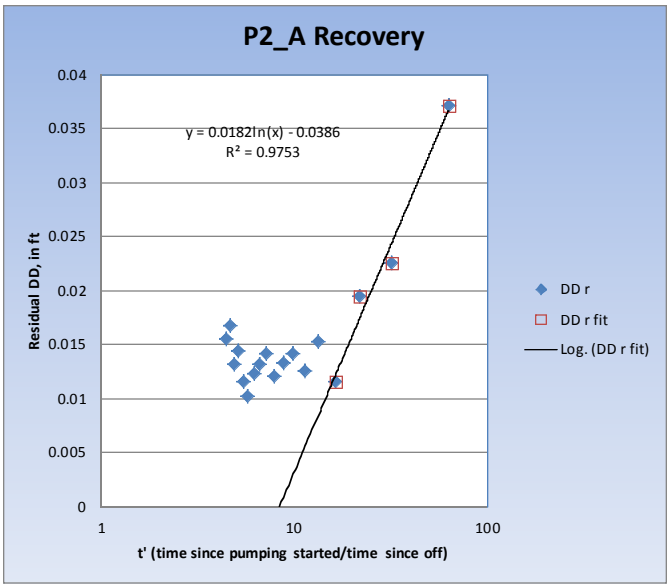


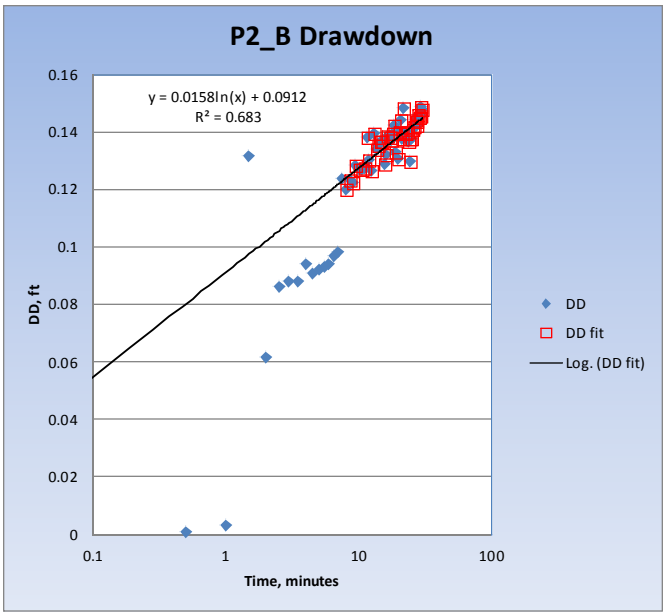
HUSHMAND ASSOCIATES, INC. Geotechnical and Earthquake Engineers	**Owens Lake Groundwater Development Program** Inyo County, California Project No. LADWP-15-001	**HYDRAULIC TEST RESULTS: P1_A AND P1_B**	**Figure** **5A**

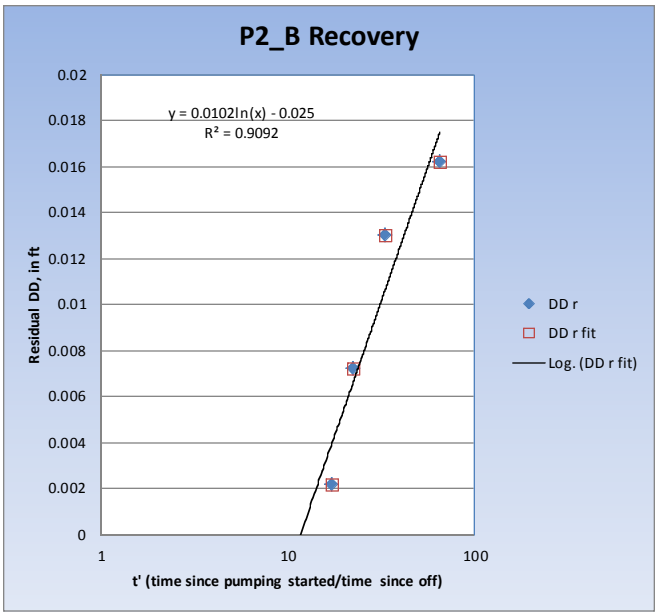
Hydraulic Conductivity, in ft/day

	DD	Recovery	Q, gpm	duration (min)
P2_A	1435	2004	3.56	31.0
P2_B	1515	3167	3.56	31.0





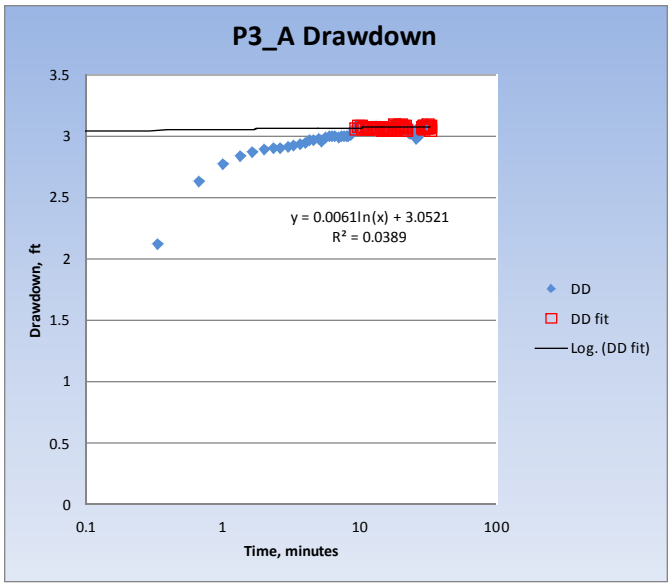


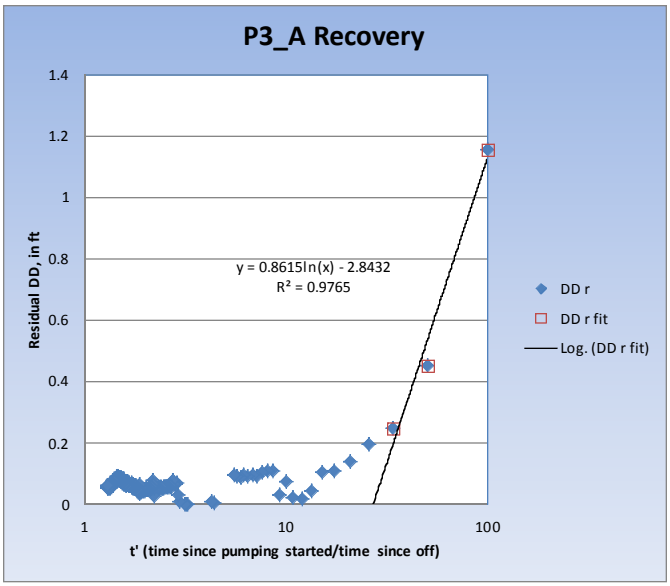


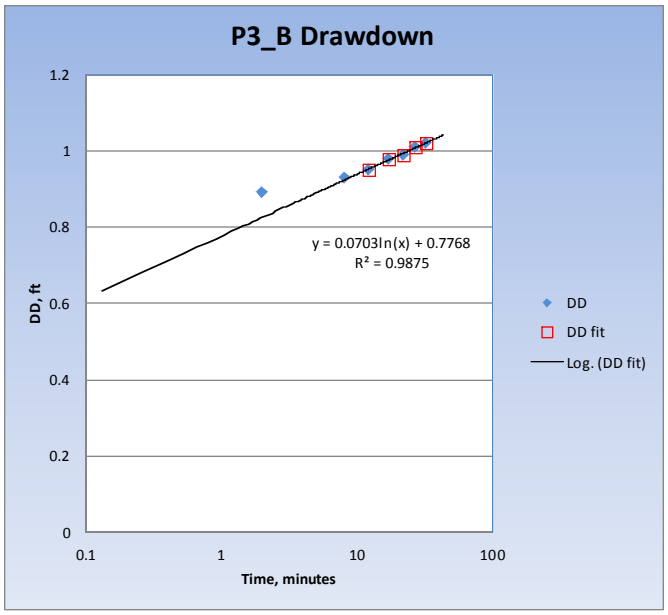
HUSHMAND ASSOCIATES, INC. Geotechnical and Earthquake Engineers	**Owens Lake Groundwater Development Program** Inyo County, California Project No. LADWP-15-001	**HYDRAULIC TEST RESULTS: P2_A AND P2_B**	**Figure** **5B**

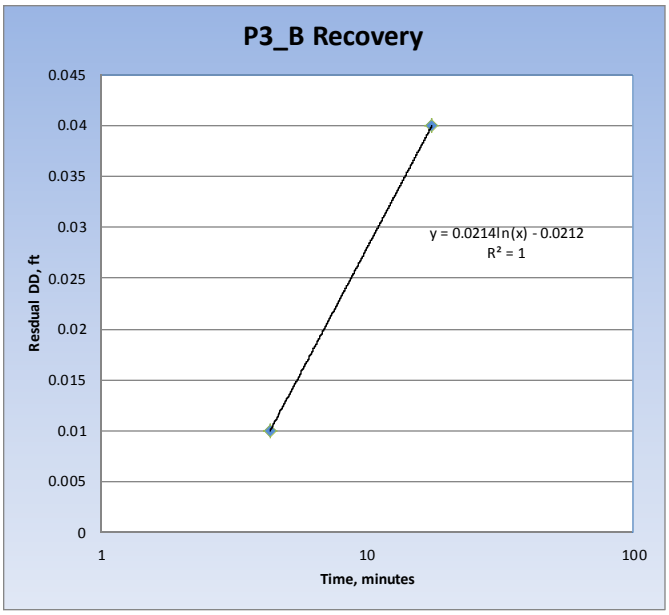
Hydraulic Conductivity, in ft/day

	DD	Recovery	Q, gpm	duration (min)
P3_A	4390	525	3.50	32.7
P3_B	31	--	3.60	33.0







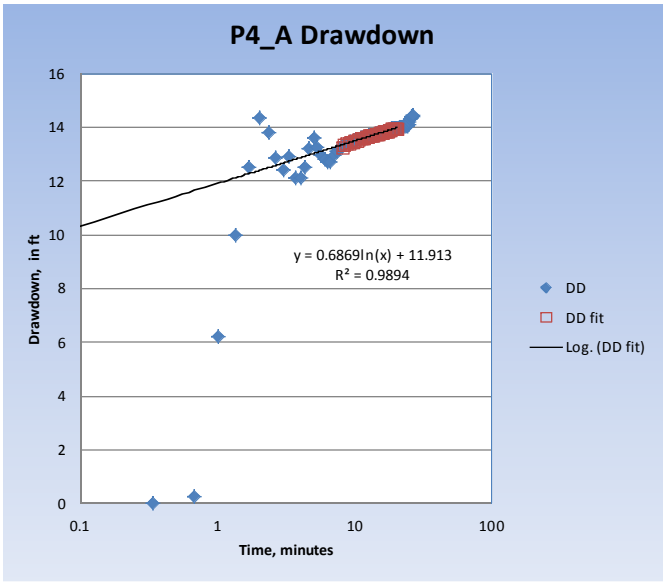


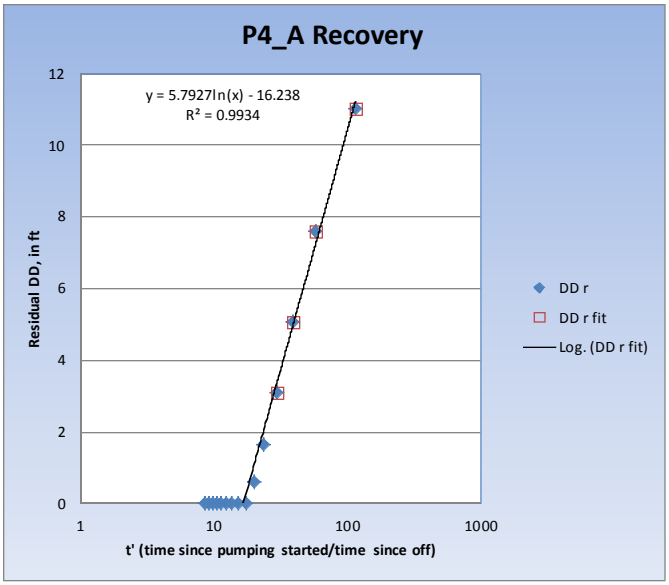
HUSHMAND ASSOCIATES, INC. Geotechnical and Earthquake Engineers	**Owens Lake Groundwater Development Program** Inyo County, California Project No. LADWP-15-001	**HYDRAULIC TEST RESULTS: P3_A AND P3_B**	**Figure** **5C**

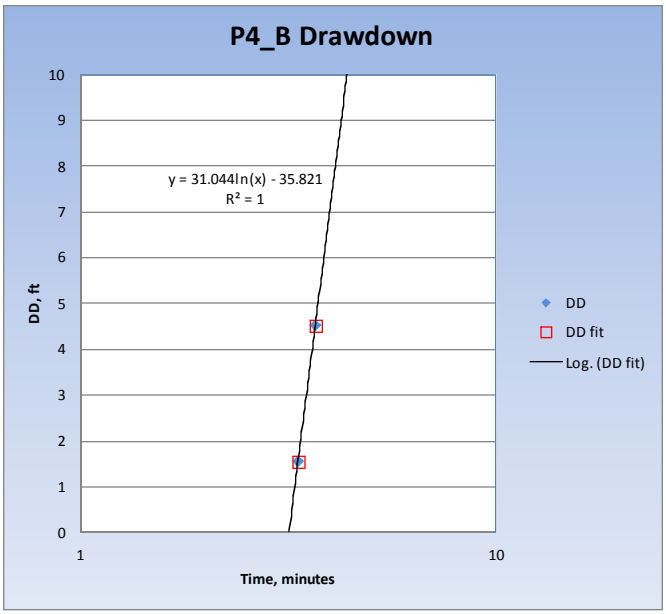
Hydraulic Conductivity, in ft/day

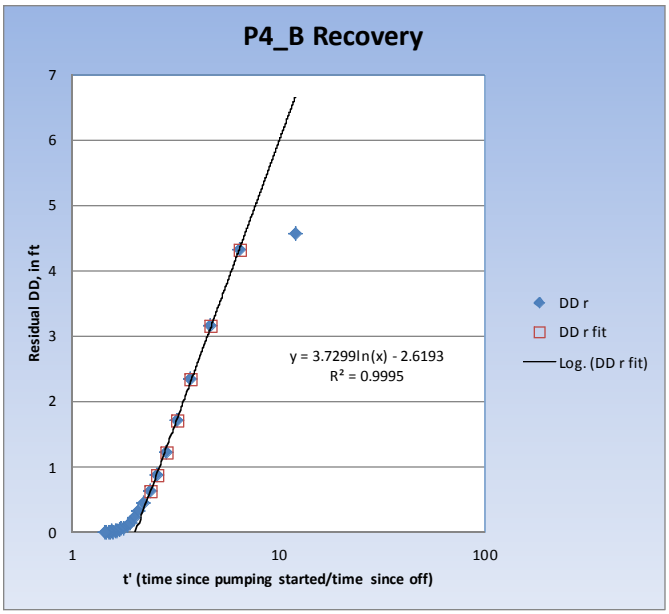
	DD	Recovery	Q, gpm	duration (min)
P4_A	23	0.5	2.54	37.66
P4_B	--	4.4	1.60	0.75

P4_A artesian flow rate = 0.5 gpm at time of test (2.04 gpm net)







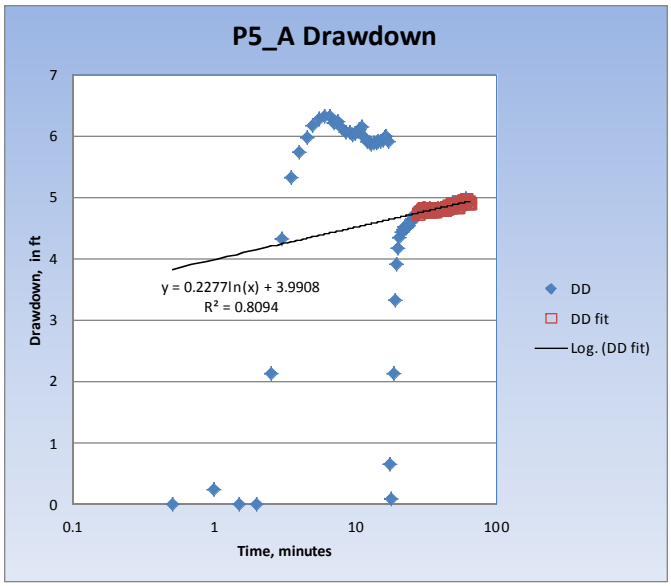


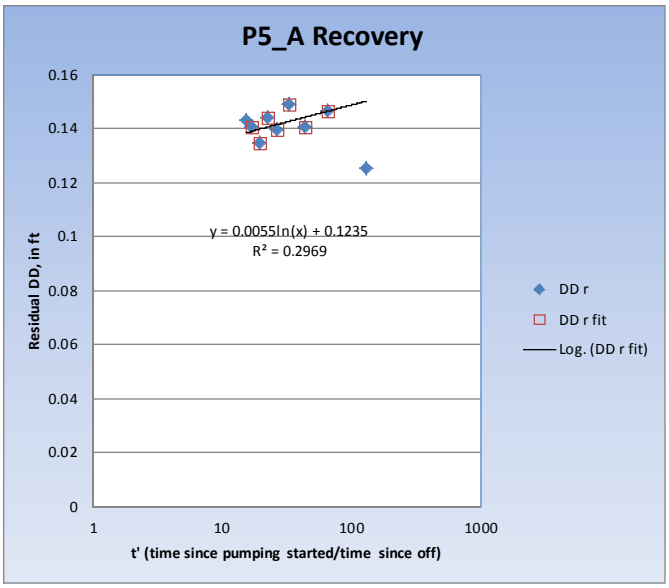
HUSHMAND ASSOCIATES, INC. Geotechnical and Earthquake Engineers	**Owens Lake Groundwater Development Program** Inyo County, California Project No. LADWP-15-001	**HYDRAULIC TEST RESULTS: P4_A AND P4_B**	**Figure** **5D**

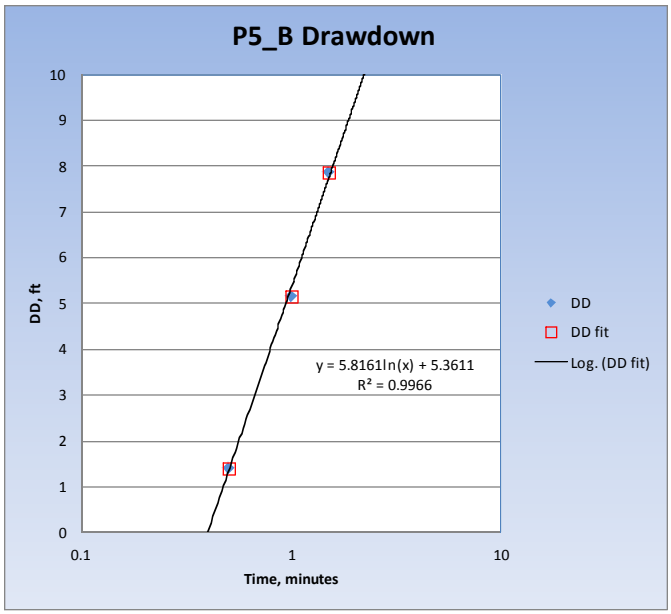
Hydraulic Conductivity, in ft/day

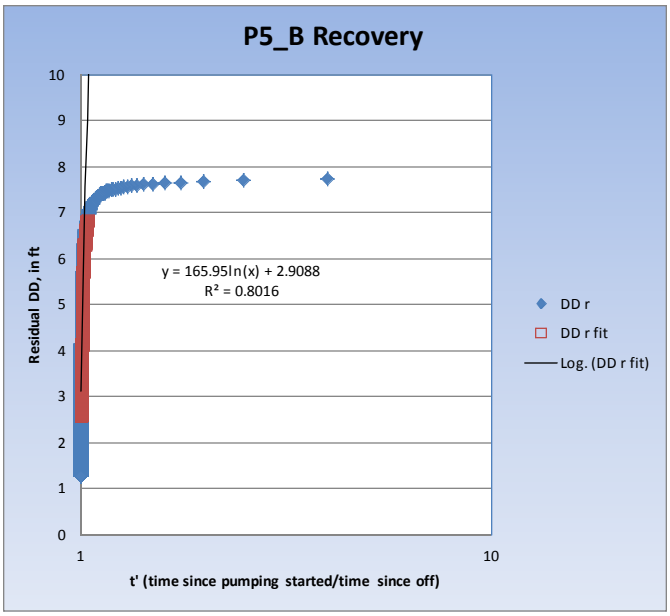
	DD	Recovery	Q, gpm	duration (min)
P5_A	11, 8	--	3.43	63.00
P5_B	--	0.05	0.73	1.50

P5_A artesian flow rate = 3.1 gpm at time of test (0.33 gpm net)





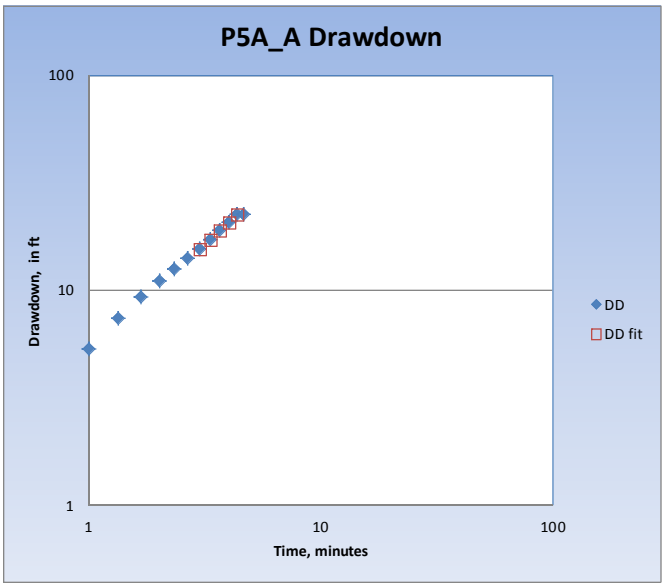


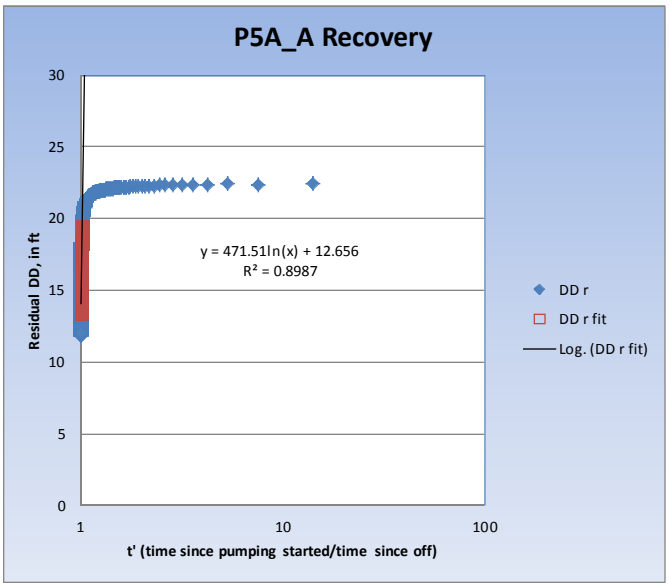


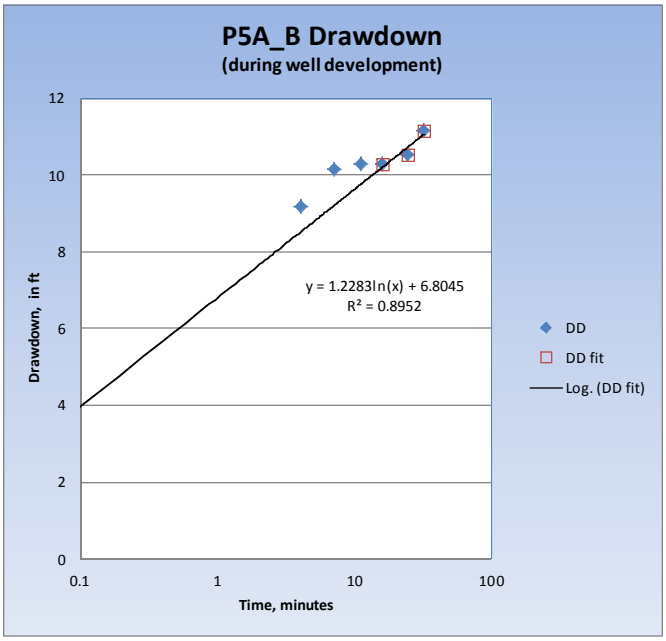
HUSHMAND ASSOCIATES, INC. Geotechnical and Earthquake Engineers	**Owens Lake Groundwater Development Program** Inyo County, California Project No. LADWP-15-001	**HYDRAULIC TEST RESULTS: P5_A AND P5_B**	**Figure** **5E**

Hydraulic Conductivity, in ft/day

	DD	Recovery	Q, gpm	duration (min)
P5A_A	BHS	1.56	1.04	4.33
P5A_B	0.017	--	0.19	32.00







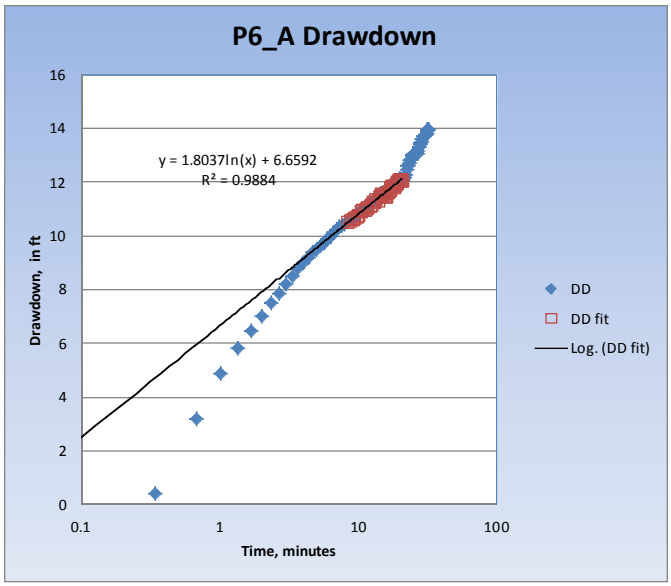
NO RECOVERY DATA
(well development)

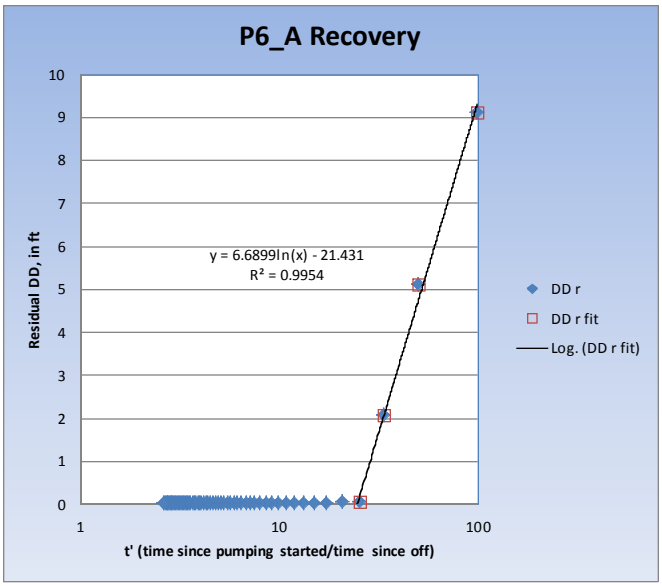
HUSHMAND ASSOCIATES, INC. Geotechnical and Earthquake Engineers	**Owens Lake Groundwater Development Program** Inyo County, California Project No. LADWP-15-001	**HYDRAULIC TEST RESULTS: P5A_A AND P5A_B**	**Figure** **5F**

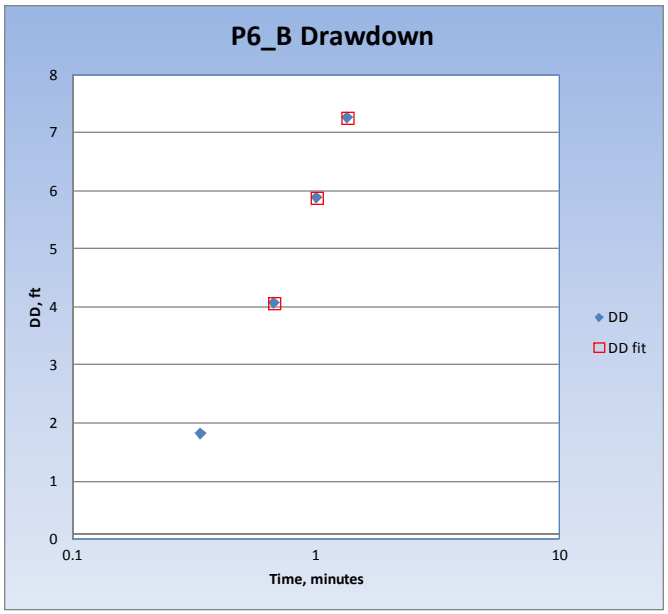
Hydraulic Conductivity, in ft/day

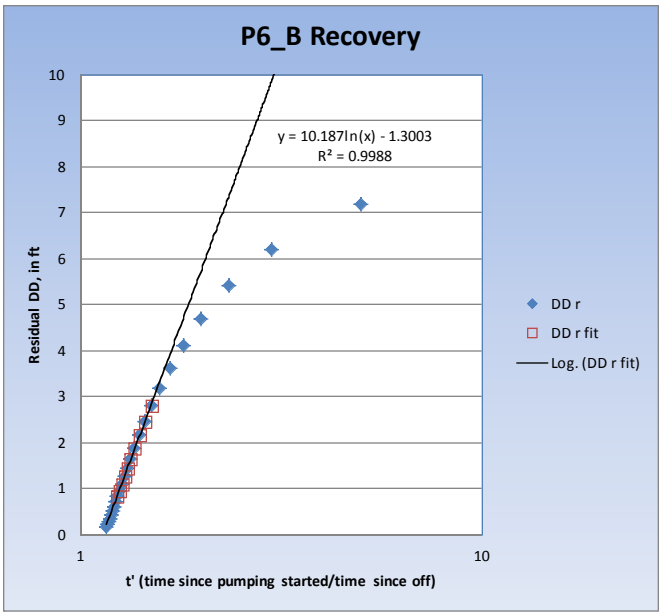
	DD	Recovery	Q, gpm	duration (min)
P6_A	4.6	1.2	3.49	32.67
P6_B	BHS	0.23	1.13	1.33

P6_A artesian flow rate = 2.4 gpm at time of test (1.09 gpm net)
P6_B casing full of water/ very low artesian flow ("trickle")







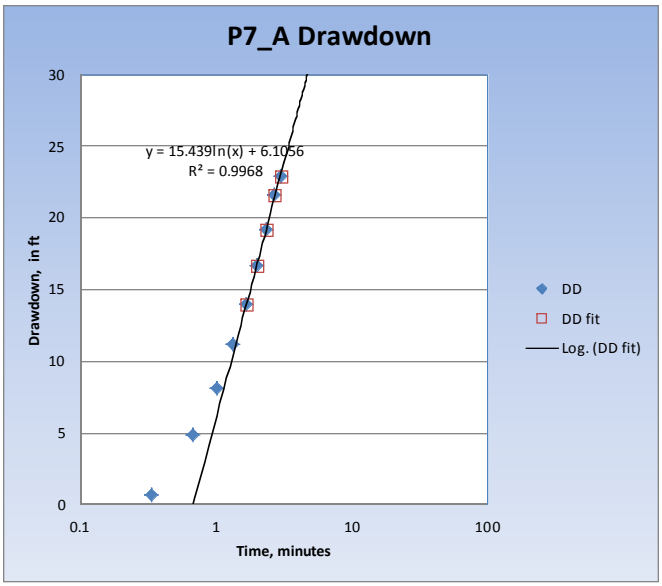


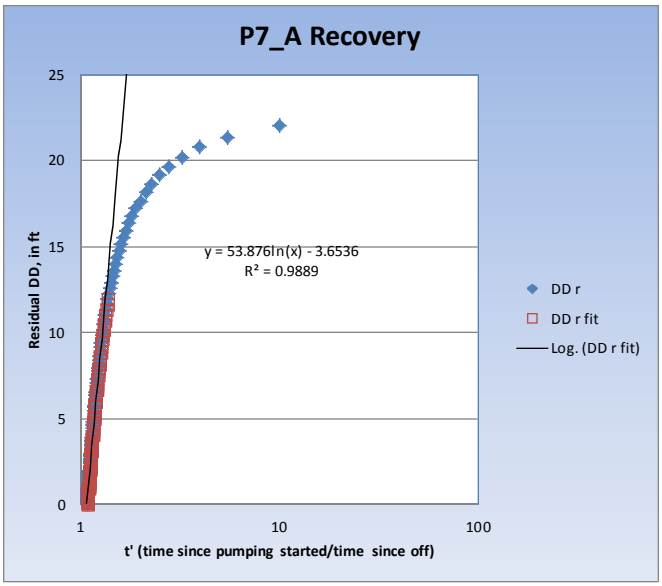
HUSHMAND ASSOCIATES, INC. Geotechnical and Earthquake Engineers	**Owens Lake Groundwater Development Program** Inyo County, California Project No. LADWP-15-001	**HYDRAULIC TEST RESULTS: P6_A AND P6_B**	**Figure** **5G**

Hydraulic Conductivity, in ft/day

	DD	Recovery	Q, gpm	duration (min)
P7_A	0.66	0.19	1.33	3.00
P7_B	No Access			

P7_A casing full of water/ very low artesian flow ("trickle")





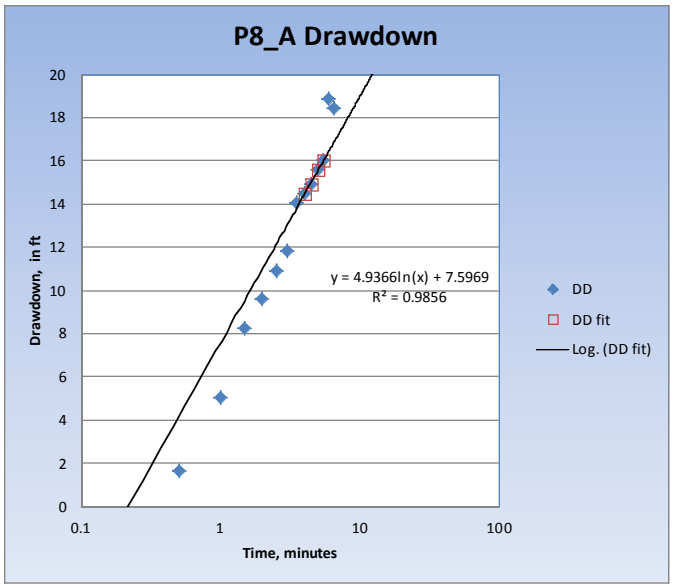
NO ACCESS TO P7_B

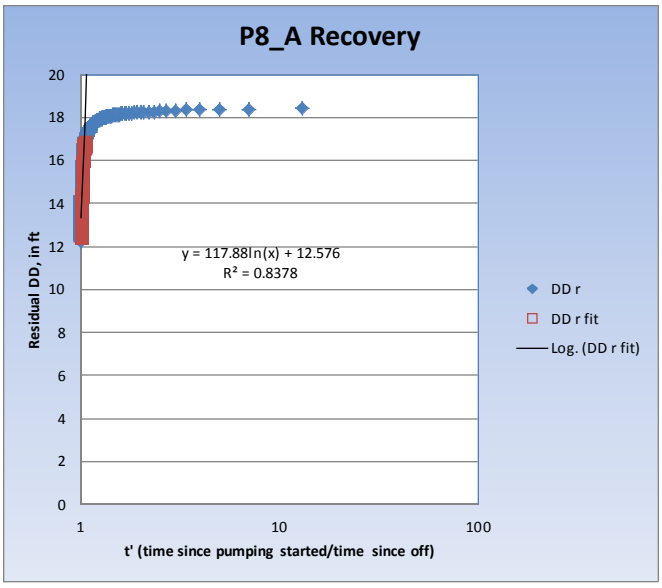
HUSHMAND ASSOCIATES, INC. Geotechnical and Earthquake Engineers	**Owens Lake Groundwater Development Program** Inyo County, California Project No. LADWP-15-001	**HYDRAULIC TEST RESULTS: P7_A AND P7_B**	**Figure** **5H**

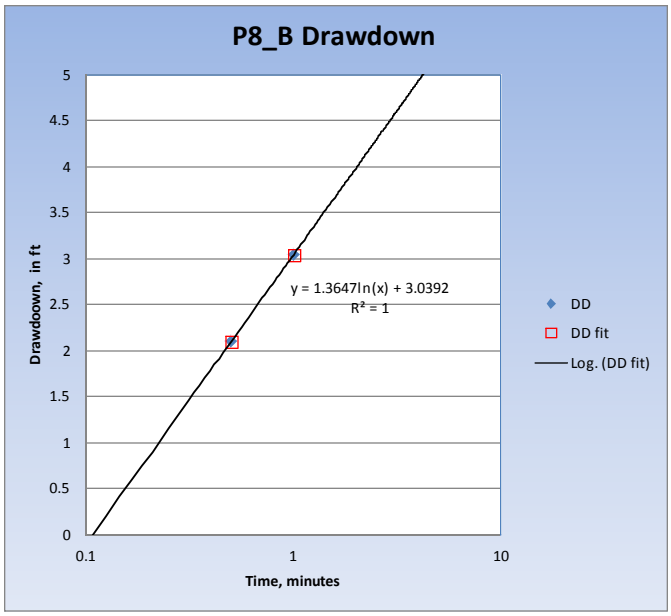
Hydraulic Conductivity, in ft/day

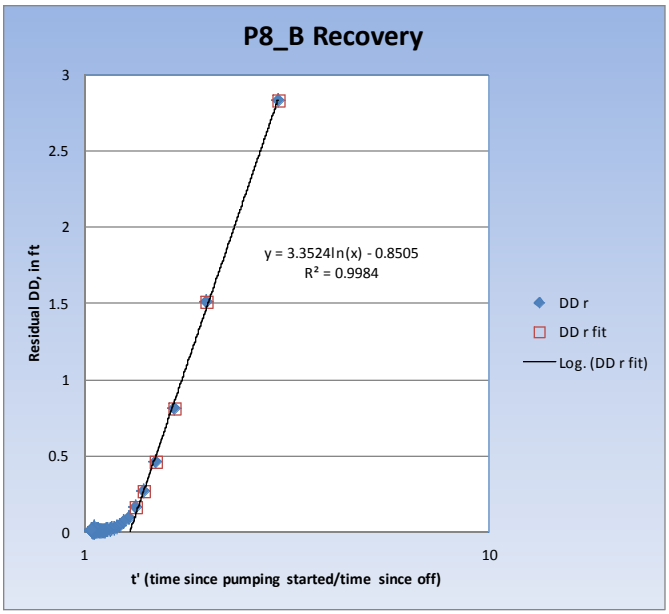
	DD	Recovery	Q, gpm	duration (min)
P8_A	(0.5)	7.5	0.32	6.00
P8_B	(0.02)	3	1.00	1.00

P8_A casing full of water/ very low artesian flow ("trickle")

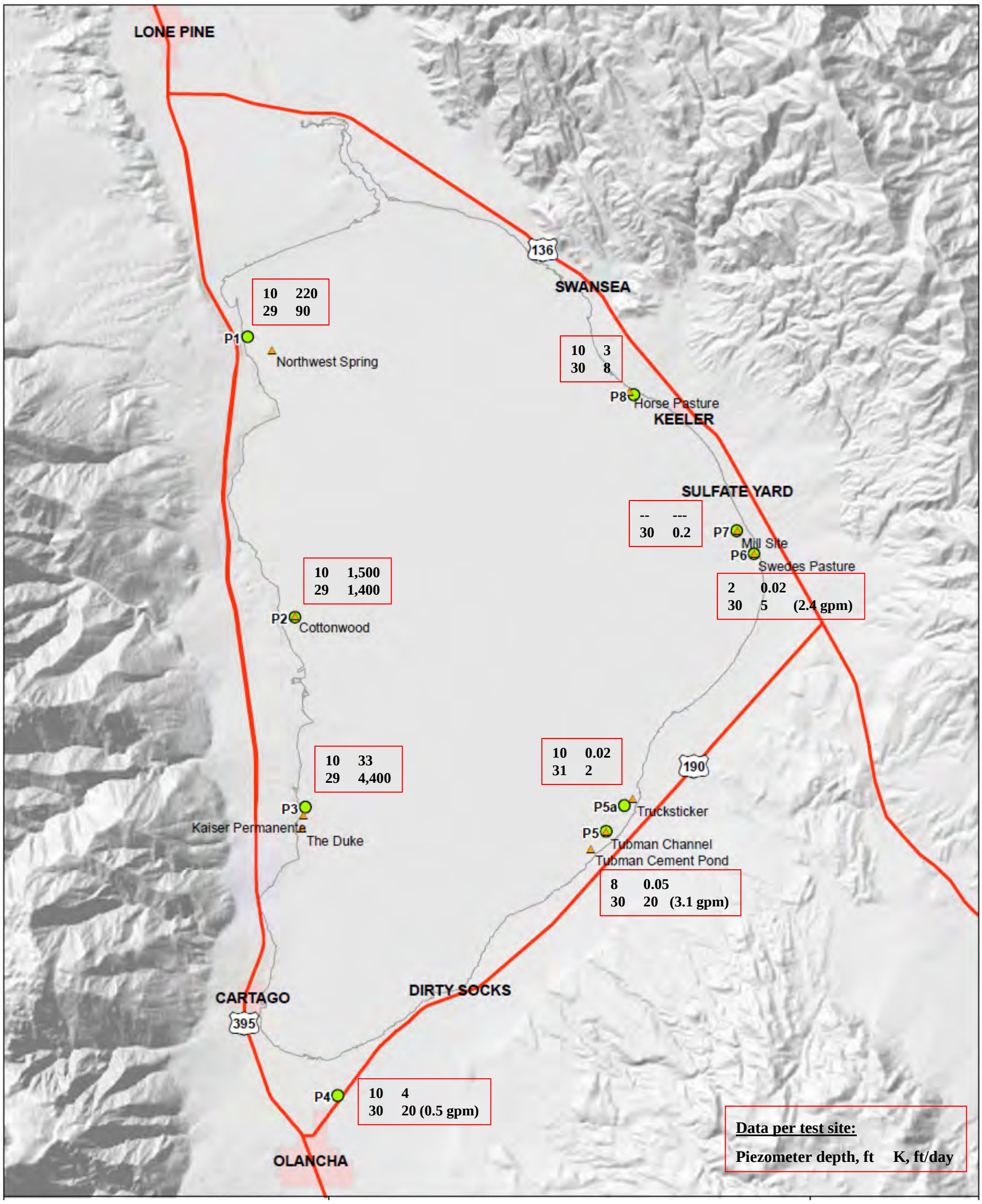








HUSHMAND ASSOCIATES, INC. Geotechnical and Earthquake Engineers	**Owens Lake Groundwater Development Program** Inyo County, California Project No. LADWP-15-001	**HYDRAULIC TEST RESULTS: P8_A AND P8_B**	**Figure** **5I**



HUSHMAND ASSOCIATES, INC. Geotechnical and Earthquake Engineers	**Owens Lake Groundwater Development Program** Inyo County, California Project No. : LADWP-15-001	**SUMMARY OF HYDRAULIC TESTING RESULTS**
		Figure **6**

APPENDIX A

PIEZOMETER LOGS AND LOCATIONS

APPENDIX A1

COMPLETION AND BORING LOGS

GEOTECHNICAL BORING LOG

Date: 4/28/15 Piezometer No.: **P1-A** Logged by: DAT Sheet: 1 of 1

Project Name Owens Lake Project Number: 15-0330

Driller: Gregg Drilling Rig Type: M5T Hole Dia: 8 inches

Drive Weight: Pnuematic Survey Lat/Lon. 2070058.618 / 6847271.7490 Hole Elev: 3573.938'

Depth (ft.)	Sample No.		Sieve % Gravel/Sand /Fine	Well Details	Soils Log	Backfill Details	Soil Class (USCS)	Geologic Descriptions
5'	S-1	X	12.9/82.2/4.9	Well Pad; 2.0" Dia. Solid PVC Pipe (28.5' to Top); 2.0" Dia. slotted PVC (29.5 to 31.5')		32.0 to 25.0' native sand fill hole - Bent. Pellets 19.5 to 25.0 - Enviroplug to Top	SW	**Alluvium:** @5' - SAND, med. to coarse, black, (Gley 1 2.5), sat., loose.
10'	S-2	X	1.4/96.6/2.0				SP	@10' - same as above, less coarse material.
15'							SP-SM	@15' - Sampling not possible, native sand filled auger due to loose sand and natural water pressure. samples below this depth collected directly from auger
20'							SP-SM	Below 15' soils on auger was SAND as above, med. to coarse, black (Gley 1 - 2.5).
25'								
30'	S-3	X	0.8/91.8/7.4				SP-SM	
35'								Total Depth 32.0' Piezometer Total Depth Inside - 33.0' (below TOC, approx. 1.0' AGS) Groundwater measured: @ 2.55' (TOC) - 4/29/15, 7:30am
40'								

HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

GEOTECHNICAL BORING LOG

Date: 4/27/15 Piezometer No.: **P2-A** Logged by: DAT Sheet: 1 of 1

Project Name: Owens Lake Project Number: 15-0330

Driller: Gregg Drilling Rig Type: M5T Hole Dia: 8 inches

Drive Weight: Pnuematic Survey Lat. / Lon.: 2041225.93 / 6852709.4240 Hole Elev: 3568.372'

Depth (ft.)	Sample No.		Sieve: Gravel / Sand / Fine	Well Details	Soils Log	Backfill Details	Soil Class (USCS)	Geologic Descriptions
				Well Pad			SP	**Alluvium:**
5'	S-1	X	2.7/ 95.8 /1.5				SP	@5' - SAND, med. to coarse, black, (Gley 1 - 2.5), sat., loose.
10'	S-2	X	0.3/ 98.6 /1.1	2.0" Dia. Solid PVC Pipe (28.5' to Top)			SP	@10' - same as above, less coarse material.
15'	S-3	X	0.3/ 81.8 /17.9			32.0 to 25.0' native sand - Bent. Pellets 19.5 to 25.0 - Enviroplug to Top	SM	@15' - Sampling not possible, native sand filled auger due to loose sand and natural water pressure. Samples below this depth collected directly from auger.
20'							SP	Below 15' soils on auger was SAND as above, med. to coarse, black.
25'	S-4	X	2.3/ 91.8 /5.9	2.0" Dia. slotted PVC (29.5 to 31.5')			SP-SM	Same as above
30'								
35'								Total Depth 32.0' Piezometer Total Depth Inside - 33.1' (TOC - approx. 1' AGS) Groundwater measured @ 2.48' (TOC) - 4/28/15, 12:15pm
40'								

HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

GEOTECHNICAL BORING LOG

Date: 4/27/15 Piezometer No.: **P3-A** Logged by: DAT Sheet: 1 of 1

Project Name: Owens Lake Project Number: 15-0330

Driller: Gregg Drilling Rig Type: M5T Hole Dia: 8 inches

Drive Weight: Pnuematic Survey Lat. / Lon.: 2021500.7200 / 6854218.811 Hole Elev: 3568.377'

Depth (ft.)	Sample No.		Sieve: Gravel/Sand/ Fine	Well Details	Soils Log	Backfill Details	Soil Class (USCS)	Geologic Descriptions
				Well Pad			SP	**Alluvium:** Surface is coarse SAND, very dark gray, black Gley 1 - 4/1 to 2.5), sat., loose.
5'	S-1	X	0/ 34.3 /65.7				ML	@5' - Variable materials, bedding to laminations, SAND, med. to coarse, black, (Gley 1 - 2.5), sat., loose. to silty CLAY and Clayey SAND, greenish gray (Gley 1 - 5/1), sat. sl. stiff.
10'	S-2	X	0.5/ 56.7 /42.8				SM	@10' - Alternating fi. sandy to silty CLAY, very dark gray (Gley 1 4/1), sat. soft, and med. SAND, (black (Gley 1 - 2.5), sat, loose.
15'	S-3	X	0.3/ 96.2 /3.5	2.0" Dia. Solid PVC Pipe (30.0' to Top)		33.0 to 23.0' native sand - Bent. Pellets 19.0 to 23.0 - Enviroplug to Top	SP	@15' -SAND, med. to coarse, black (Gley 1 -2.5), sat., loose.
20'							SP	Below 20' - Sampling not possible, native sand filled auger due to loose sand and natural water pressure. Samples below this depth collected directly from auger.
25'								
30'	S-4	X	5.0/ 88.4/ 6.7	2.0" Dia. slotted PVC (30.0 ' to 32.0')			SW-SM	@30 to 32' - Soils on auger was SAND as above, med. to coarse, black (Gley 1 - 2.5). @33' auger tip had silty CLAY, dark greenish gray (Gley 1 - 4/1).
35'								Total Depth 33.0' Piezometer Total Depth Inside - 34.4' (TOC - approx 1.5' AGS) Groundwater measured
40'								

HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

GEOTECHNICAL BORING LOG

Date: 4/23/15 Piezometer No.: **P4-A** Logged by: DAT Sheet: 1 of 1

Project Name: Owens Lake Project Number: 15-0330

Driller: Gregg Drilling Rig Type: M5T Hole Dia: 8 inches

Drive Weight: Pnuematic Survey Lat. / Lon.: 1991629.758 / 6858179.6440 Hole Elev: 3617.8

Depth (ft.)	Sample No.		Sieve: Gravel/Sand/ Fine	Well Details	Soils Log	Backfill Details	Soil Class (USCS)	Geologic Descriptions
				Well Pad				**Alluvium:**
5'	S-1	X	1.8/ 81.8 /16.4				SM	@5' - SAND, med., greenish grey, (Gley 1 - 5/1), sat., loose to sl. dense. Occ. sm. shell fragments.
10'	S-2	X	1.6/ 77.3 /21.1				SM	@10' - silty fine SAND, dark greenish gray (Gley 1 4/1), sat. sl. dense.
15'	S-3	X	0/ 62.2 /37.4	2.0" Dia. Solid PVC Pipe (30.0' to Top)			SM	@15' - Same as above, dark greenish gray (Gley 1 - 4/1), sat., sl. dense.
20'	S-4	X	0.7/ 65.5 /33.8			33.0 to 23.0' native sand - Bent. Pellets 21.0 to 23.0 - Enviroplug to Top	SC-SM	@20' - SAND, fine to coarse, greenish grey, (Gley 1 - 5/1), sat., loose to sl. dense. Occ. sm. shell fragments. 2" layer of CLAY, greenish gray (Gley 1, 5/1), sat., soft.
25'	S-5	X	3.3/ 84.3 /12.4				SM	@25' - SAND, med. to coarse, black, (Gley 1 - 2.5), sat., loose to sl. dense. abundant shell and snail fragments.
30'	S-6	X	1.2/ 91.2 /7.7	2.0" Dia. slotted PVC (30.5 ' to 32.5')			SW-SM	@30' same as above, less shell and snail fragments.
35'								Total Depth 32.5' Piezometer Total Depth Inside - 34.0' (TOC - approx 1.5' AGS) Groundwater measured:
40'								

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GEOTECHNICAL BORING LOG

Date: 4/24/15 Piezometer No.: **P5-A** Logged by: DAT Sheet: 1 of 1

Project Name Owens Lake Project Number: 15-0330

Driller: Gregg Drilling Rig Type: M5T Hole Dia: 8 inches

Drive Weight: Pnuematic Survey Lat. / Lon.: 2019619.6160 / 6885481.4900 Hole Elev: 3579.681'

Depth (ft.)	Sample No.		Sieve	Well Details	Soils Log	Backfill Details	Soil Class (USCS)	Geologic Descriptions
				Well Pad			SP	**Alluvium:** near surface - SAND, med., olive brown,
5'	S-1	X	0/ 8.6 /91.4				ML	@5' - silty CLAY, dark greenish grey, (Gley 1 - 4/1), sat., soft.
10'	S-2	X	0/ 11.3 /88.7	2.0" Dia. Solid PVC Pipe (31.5' to Top)			CL-ML	@10' - same as above
15'	S-3	X	0/ 6.9 /93.1			34.0 to 29.5' #3 sand - Bent. Pellets 27.4' to 29.5' - Enviroplug to Top	CL-ML	@15' - Same as above
20'	S-4	X	0/ 45.7 /54.3				CL	@20' - 1' layer of silty CLAY, greenish gray (Gley 1, 5/1), sat., soft. 6" layer of SAND, med., greenish grey, (Gley 1 - 6/1), sat., loose.
25'	S-5	X	0.2/ 26.9 /72.8				CL SP	@25' - silty CLAY, greenish gray (Gley 1, 5/1), sat., soft. @26' - SAND, coarse, lt. gray (5y - 7/1), sat., loose. 2-3" thick.
30'	S-6	X	0/ 43.5 /56.5	2.0" Dia. slotted PVC (31.5 ' to 33.5)			CL	@30' silty CLAY, greenish gray (Gley 1, 5/1), sat., soft.
	S-7	X	0.6/ 46.2 /53.2				CL	@32' sandy CLAY, greenish gray (Gley 1, 5/1), sl. sat., mod. soft.
								@32.5' - SAND, coarse, lt. gray (Gley 1, 6/1), sat., loose.
35'								Total Depth 34.0' Piezometer Total Depth Inside - 35.5' (TOC - approx 1.5' AGS)
								Groundwater measured: Artesian- 4/24/15. Flow initially 5.25 gal./min. Artisian condition noticed while drilling for sample S-7 @ 32.5'.
40'								

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GEOTECHNICAL BORING LOG

Date: 4/23/15 Piezometer No.: **P5A-A** Logged by: DAT Sheet: 1 of 1

Project Name: Owens Lake Project Number: 15-0330

Driller: Gregg Drilling Rig Type: M5T Hole Dia: 8 inches

Drive Weight: Pnuematic Survey Lat. / Lon.: 2022368.5370 / 6887350.4580 Hole Elev: 3584.852'

Depth (ft.)	Sample No.		Sieve: Gravel/Sand/ Fine	Well Details	Soils Log	Backfill Details	Soil Class (USCS)	Geologic Descriptions
				Well Pad			SP	**Alluvium:** near surface -SAND, fi. to medium, lt. Olive brown (2.5Y 5/4), sat., loose .
5'	S-1	X	3.9/ 83.2 /12.9				SM	@5' - SAND, fi. to medium, lt. Olive brown (2.5Y 5/4), sat., loose
10'	S-2	X	1.9/ 68.0 /30.1	2.0" Dia. Solid PVC Pipe (31.5' to Top)		34.0 to 28.5' #3 sand - Bent. Pellets 23.0' to 28.5' - Enviroplug to Top	SC	@10' to 11' - same as above. @11' Clayey Silt to silty CLAY, olive (5Y 4/4)
15'	S-3	X	3.3/ 59.2 /37.5				SC	@15' - Sand, greenish Gray (GLey 1 5/1), sat. Loose
20'	S-4	X	1.3/ 58.8 /39.9				SC	@20' - layering of 75% SAND, med., greenish grey, (Gley 1 - 6/1) sat., loose. and 25% silty CLAY, greenish gray (Gley 1, 5/1), sat., soft. bedding 1/4" to 6" thick.
25'	S-5	X	2.2/ 26.0 /71.8	2.0" Dia. slotted PVC (31.5 ' to 33.5)			CL	@25' -primarily silty CLAY, greenish gray (Gley 1, 5/1), sat., soft. Sand bed from 25.0 to 25.3'.
30'	S-6	X	0/ 3.2 /96.8				CL	@30' silty CLAY, greenish gray (Gley 1, 5/1), sat., soft.
	S-7	X	0.2/ 19.8 /79.9				CL	@32' silty CLAY, greenish gray (Gley 1, 5/1), sl. sat., mod. soft. 2 - 1/2" thick layers of med. SAND.
35'								Total Depth 33.5' Piezometer Total Depth Inside - 36.0' (TOC - approx 1.5' AGS) Groundwater measured: 14.36' (TOC) 4/24/15.
40'								

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GEOTECHNICAL BORING LOG

Date: 4/22/15 Piezometer No.: **P6-A** Logged by: DAT Sheet: 1 of 1

Project Name: Owens Lake Project Number: 15-0330

Driller: Gregg Drilling Rig Type: M5T Hole Dia: 8 inches

Drive Weight: Pnuematic Survey Lat. / Lon.: 2048762.225 / 6900272.3700 Hole Elev: 3590.759'

Depth (ft.)	Sample No.		Sieve: Gravel/Sand/ Fine	Well Details	Soils Log	Backfill Details	Soil Class (USCS)	Geologic Descriptions
5'	S-1	X	0.5/ 57.0/ 42.5	Well Pad; 2.0" Dia. Solid PVC Pipe (30.0' to Top)		32.5 to 28.9' #3 sand - Bent. Pellets 27.3' to 28.9' - Enviroplug to Top	SM	**Alluvium:** @5' - Layered - 1/2 is SAND, fi. to medium, black (Gley 1 2.5), sat., loose, abundant shell fragments. 1/2 sample is v. fi. sandy SILT, greenish gray (Gley 1 - 5/1), sat., sl. soft.
10'	S-2	X	0.2/ 38.1 /61.7				ML	@10' silty SAND, olive (5Y 4/4) & sandy SILT w/clay, greenish Gray (GLey 1 - 5/1) , alternating layers each a few inches thick. sat, sl. soft.
15'	S-3	X	0/ 31.4 /68.6				ML	@15' - alternating Clayey SAND, fi. SAND, & sandy clayey SILT, greenish Gray (GLey 1 5/1) to olive (5Y 4/4) , sat. Loose. Bedding a few inches thick.
20'	S-4	X	0.1/ 69.9 /30.0				SM	@20' - SAND to clayey SAND, med., black to dark greenish grey, (Gley 1 - 2.5 to 4/1), sat., loose.
25'	S-5	X	0.1/ 27.9 / 72.0	2.0" Dia. slotted PVC (30.0 ' to 32.0)			ML	@25' -silty to sandy CLAY, greenish gray (Gley 1, 5/1), sat., sl. soft.
30'	S-6	X	0/ 25.1 /74.9				ML	@30' silty CLAY to clayey SILT, greenish gray (Gley 1, 5/1), sat., soft.
35'								Total Depth 32.5' Piezometer Total Depth Inside - 34.0' (TOC - approx 1.5' AGS) Groundwater measured:
40'								

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GEOTECHNICAL BORING LOG

Date: 4/29/15 Piezometer No.: **P7-A** Logged by: DAT Sheet: 1 of 1

Project Name: Owens Lake Project Number: 15-0330

Driller: Gregg Drilling Rig Type: M5T Hole Dia: 8 inches

Drive Weight: Pnuematic Survey Lon. / Lat.: 2051164.6740 / 6898413.0990 Hole Elev: 3583.467'

Depth (ft.)	Sample No.		Sieve: Gravel/Sand/ Fine	Well Details	Soils Log	Backfill Details	Soil Class (USCS)	Geologic Descriptions
				Well Pad				**Alluvium:**
5'	S-1	X	0/ 15.0 /85.0				ML	@5' - silty CLAY to CLAY, greenish gray (Gley 1 - 5/1), sat., sl. soft.
10'	S-2	X	0.1/ 12.1 /87.8	2.0" Dia. Solid PVC Pipe (30.5' to Top)			CL-ML	@10' same as above. @ 11' SAND, fi. to med. lt. olive brown (5Y 5/4)), sat., loose.
15'	S-3	X	0/ 40.9 /59.1			32.5 to 28.5' #3 sand - Bent. Pellets 25.9' to 28.5' - Enviroplug to Top	ML	@15' - silty CLAY, & v.fi. sandy SILT, greenish gray (Gley 1 - 5/1) to pale olive (5Y - 6/4), sat. soft.
20'	S-4	X	0/ 18.3 /81.7				ML	@20' - CLAY to silty CLAY, dark greenish grey, (Gley 1 - 4/1), sat., soft.
25'	S-5	X	0/ 43.0 /57.0				ML	@25' -silty CLAY to fi. sandy silty CLAY, dark greenish gray (Gley 1, 4/1) to olive (5Y - 5/4), sat., soft.
30'	S-6	X	0/ 37.2 /62.8	2.0" Dia. slotted PVC (30.5 ' to 32.5)			ML	@30' sl. sandy CLAY, dark greenish gray (Gley 1, 4/1) to olive (5Y - 5/4), sat., soft.
35'								Total Depth 32.5' Piezometer Total Depth Inside - 34.1' (TOC - approx 1.5' AGS) Groundwater measured: 1.48 (TOC): 4/30/15.
40'								

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GEOTECHNICAL BORING LOG

Date: 4/21/15 Piezometer No.: **P8-A** Logged by: DAT Sheet: 1 of 1

Project Name: Owens Lake Project Number: 15-0330

Driller: Gregg Drilling Rig Type: M5T Hole Dia: 8 inches

Drive Weight: Pnuematic Survey Lon. / Lat.: 2065073.3180 / 6887407.9840 Hole Elev: 3593.791'

Depth (ft.)	Sample No.		Sieve: Gravel/Sand/ Fine	Well Details	Soils Log	Backfill Details	Soil Class (USCS)	Geologic Descriptions
				Well Pad				**Alluvium:** 0-5' clayey silty SAND to sandy SILT, greenish gray (Gley - 5/1), sat. sl. soft.
5'	S-1	X					ML	@5' - clayey SILT, greenish gray (Gley 1 - 5/1), sat., sl. soft.
								@6-7' Clayey SILT to silty CLAY, black (Gley 1 - 2.5) sat., sl. soft.
10'	S-2	X					CL SP	@10' layers of silty CLAY to SAND, med. greenish gray (Gley 1 5/1), sat. soft to loose. Beds ae several inches thick.
15'	S-3	X	0/ 31.5 /68.5	2.0" Dia. Solid PVC Pipe (30.0' to Top)		34.5 to 28.8' #3 sand - Bent. Pellets 25.9' to 28.8' - Enviroplug to Top	ML	@15' - clayey SILT, greenish gray (Gley 1 - 5/1), sat. soft.
20'	S-4	X	0/ 17.1 /82.9				ML	@20' - clayey SILTto silty CLAY, dark greenish grey, (Gley 1 - 4/1), to lt. yellowish brown (2.5Y - 6/4), sat. soft.
25'	S-5	X		2.0" Dia. slotted PVC (30.5' to 32.5')			ML	@25' - clayey SILT to silty CLAY, greenish gray (Gley 1, 5/1), sat., soft.
30'	S-6	X					ML	@30' same as above.
	S-7	X					CL	@33' CLAY, greenish black (Gley 1 - 2.5/1), sat. soft.
35'								Total Depth 34.5'
								Piezometer Total Depth Inside - 32.1' (TOC - approx 1.0' AGS)
								Groundwater measured: 2.01' (TOC): 4/22/15.
40'								

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APPENDIX A2

LOCATION SITE PICTURES

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Owens Lake Groundwater Development Program
Inyo County, California

Project No.
LADWP-15-001

P1: INSTALLATION AND COMPLETION

Figure
A2-1

HUSHMAND ASSOCIATES, INC. Geotechnical and Earthquake Engineers	**Owens Lake Groundwater Development Program** Inyo County, California Project No. LADWP-15-001	**P2: COARSE SAND SAMPLE WITH OSTRACODS AND PIEZOMETER COMPLETION**	Figure **A2-2**

HUSHMAND ASSOCIATES, INC. Geotechnical and Earthquake Engineers	**Owens Lake Groundwater Development Program** Inyo County, California Project No. LADWP-15-001	**P-3: COMPLETION OF PIEZOMETER SET PRIOR CUTTING CASING**	Figure **A2-3**

HUSHMAND ASSOCIATES, INC. Geotechnical and Earthquake Engineers	**Owens Lake Groundwater Development Program** Inyo County, California Project No. LADWP-15-001	**P-4: COMPLETED SET OF PIEZOMETERS**	Figure **A2-4**

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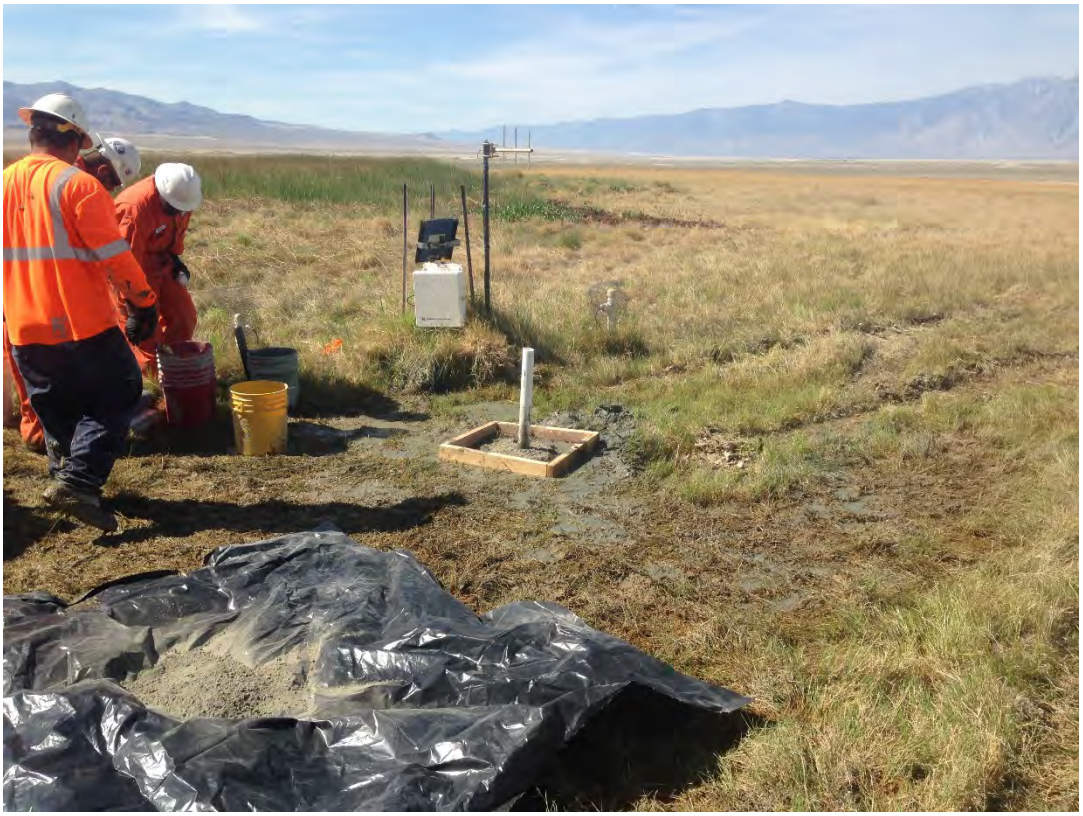
Owens Lake Groundwater Development Program
Inyo County, California

Project No.
LADWP-15-001

P5: CLAY AND SAND MIX SAMPLE AND ARTESIAN FLOW FROM P-5-A

Figure
A2-5

HUSHMAND ASSOCIATES, INC. Geotechnical and Earthquake Engineers	**Owens Lake Groundwater Development Program** Inyo County, California Project No. LADWP-15-001	**P6: DRILLING OF DEEP PIEZOMETER AND ARTESIAN FLOW FROM TOP**	Figure **A2-6**



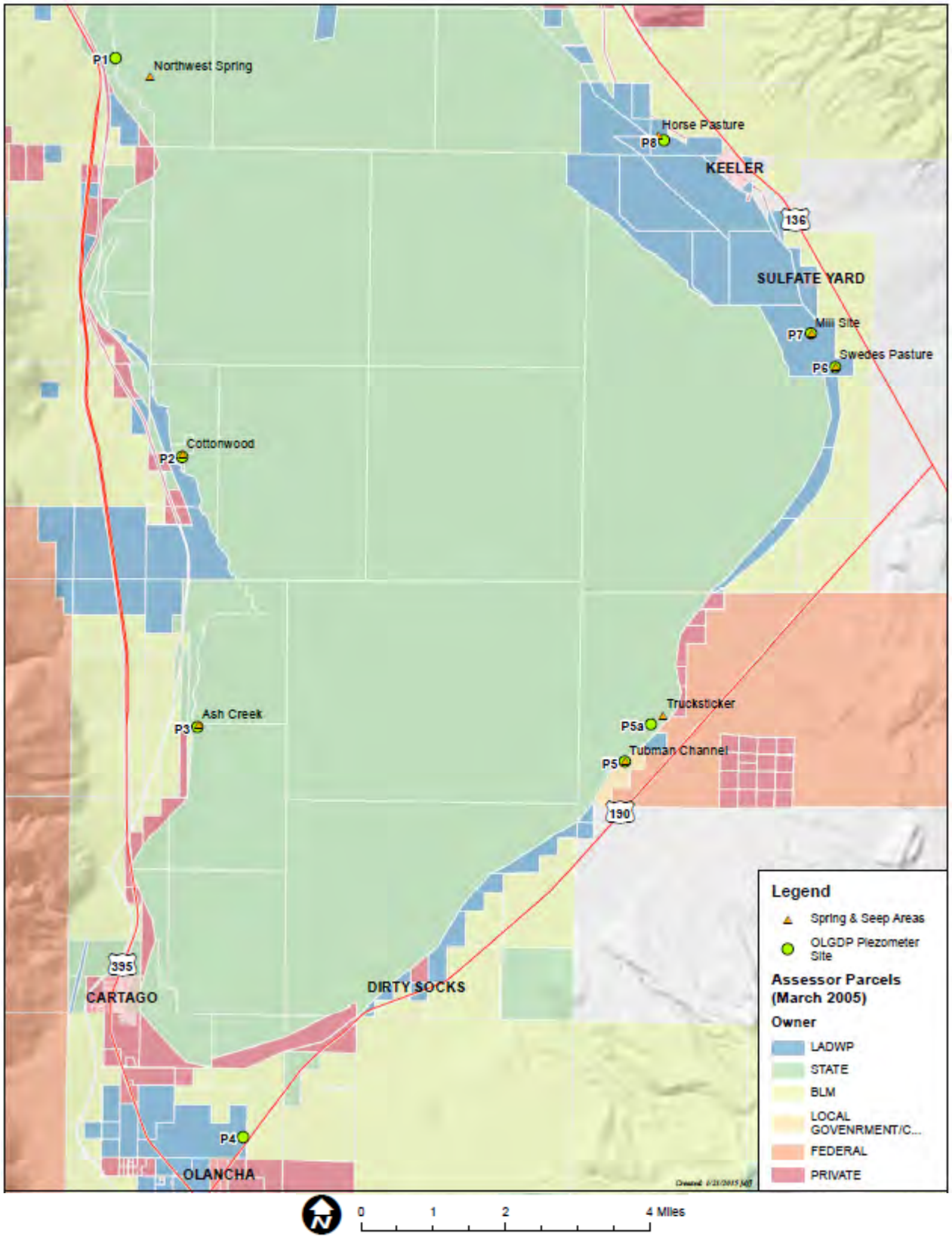
HUSHMAND ASSOCIATES, INC. Geotechnical and Earthquake Engineers	**Owens Lake Groundwater Development Program** Inyo County, California Project No. LADWP-15-001	**P7: EXISTING PIEZOMETERS AND COMPLETED DEEP PIEZOMETER**	Figure **A2-7**

HUSHMAND ASSOCIATES, INC. Geotechnical and Earthquake Engineers	**Owens Lake Groundwater Development Program** Inyo County, California Project No. LADWP-15-001	**P8: DRILLING DEEP PIEZOMETER AND SAMPLE WITH CLAY RICH DEPOSITS**	Figure **A2-8**

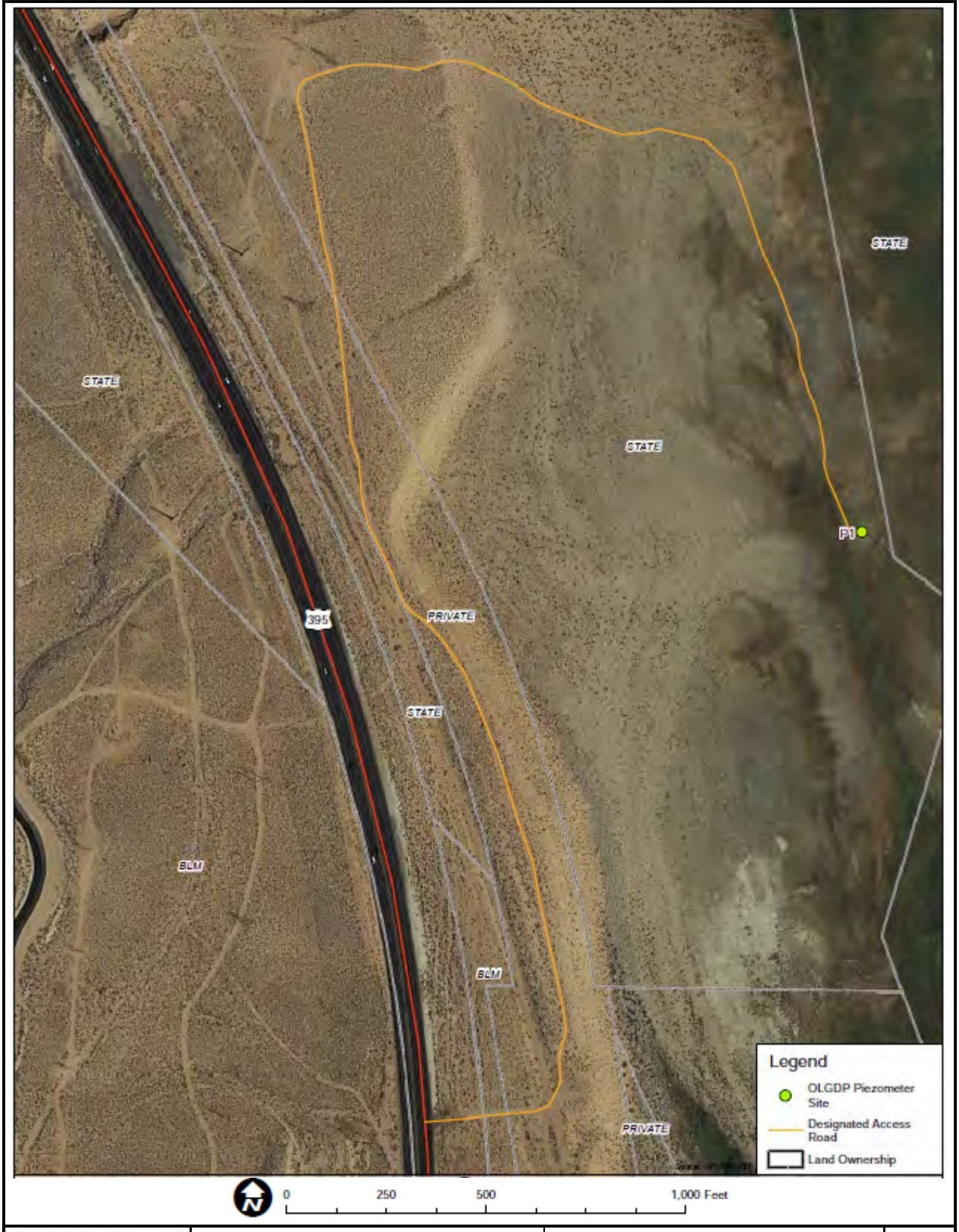
HUSHMAND ASSOCIATES, INC. Geotechnical and Earthquake Engineers	**Owens Lake Groundwater Development Program** Inyo County, California Project No. LADWP-15-001	**P8: PIEZOMETER COMPLETION & BENTONITE PELLETS USED TO PLUG DEEP PORTION OF HOLE**	Figure **A2-9**

APPENDIX A3

LOCATION AERIAL PHOTOS AND MAPS



HUSHMAND ASSOCIATES, INC. Geotechnical and Earthquake Engineers	**Owens Lake Groundwater Development Program** Inyo County, California	**PIEZOMETER LOCATIONS**	Figure **A3-1**
	Project No. LADWP-15-001		



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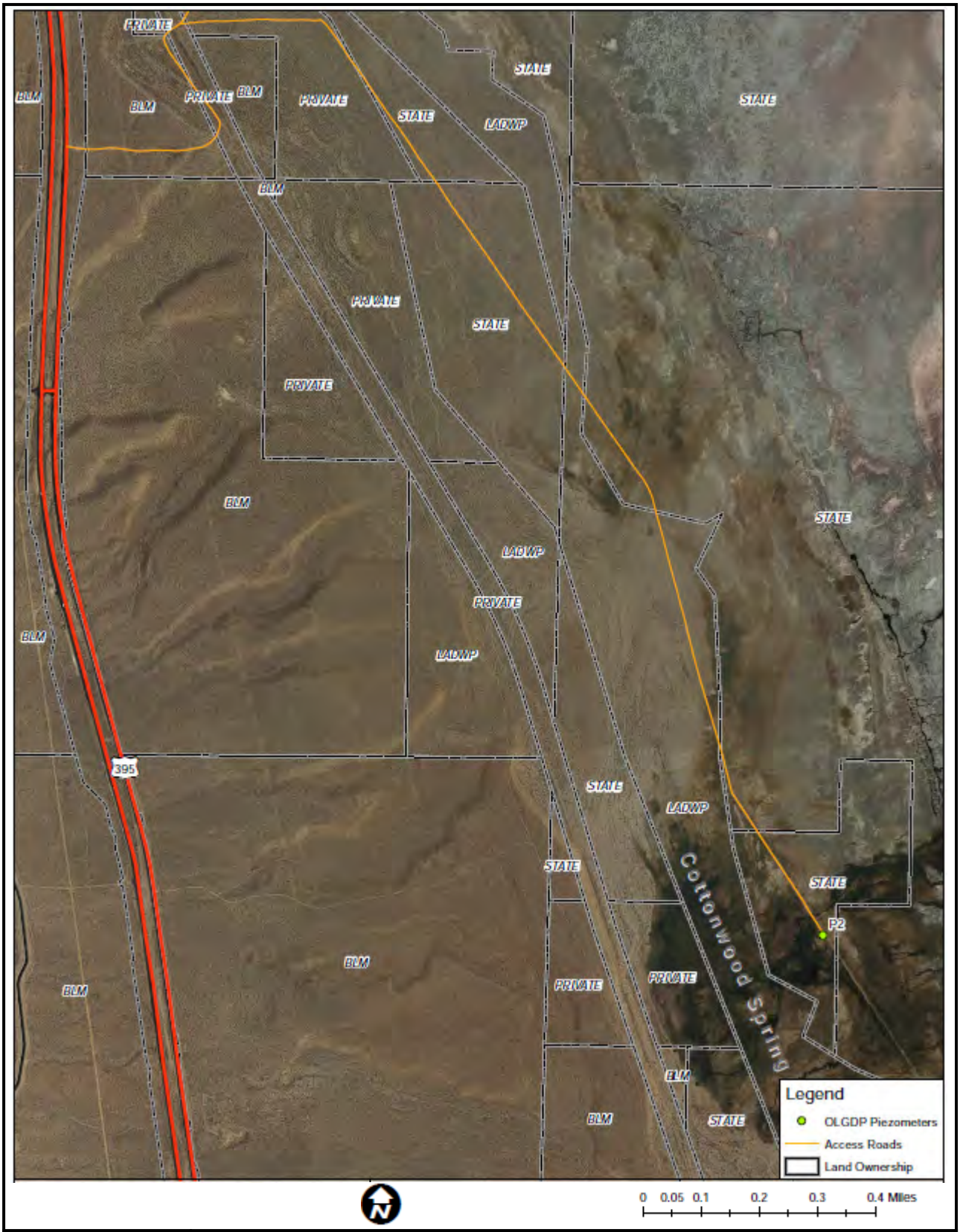
Owens Lake Groundwater Development Program
Inyo County, California

Project No.
LADWP-15-001

PIEZOMETER 1 (P1)
LOCATION MAP

Figure
A3-2



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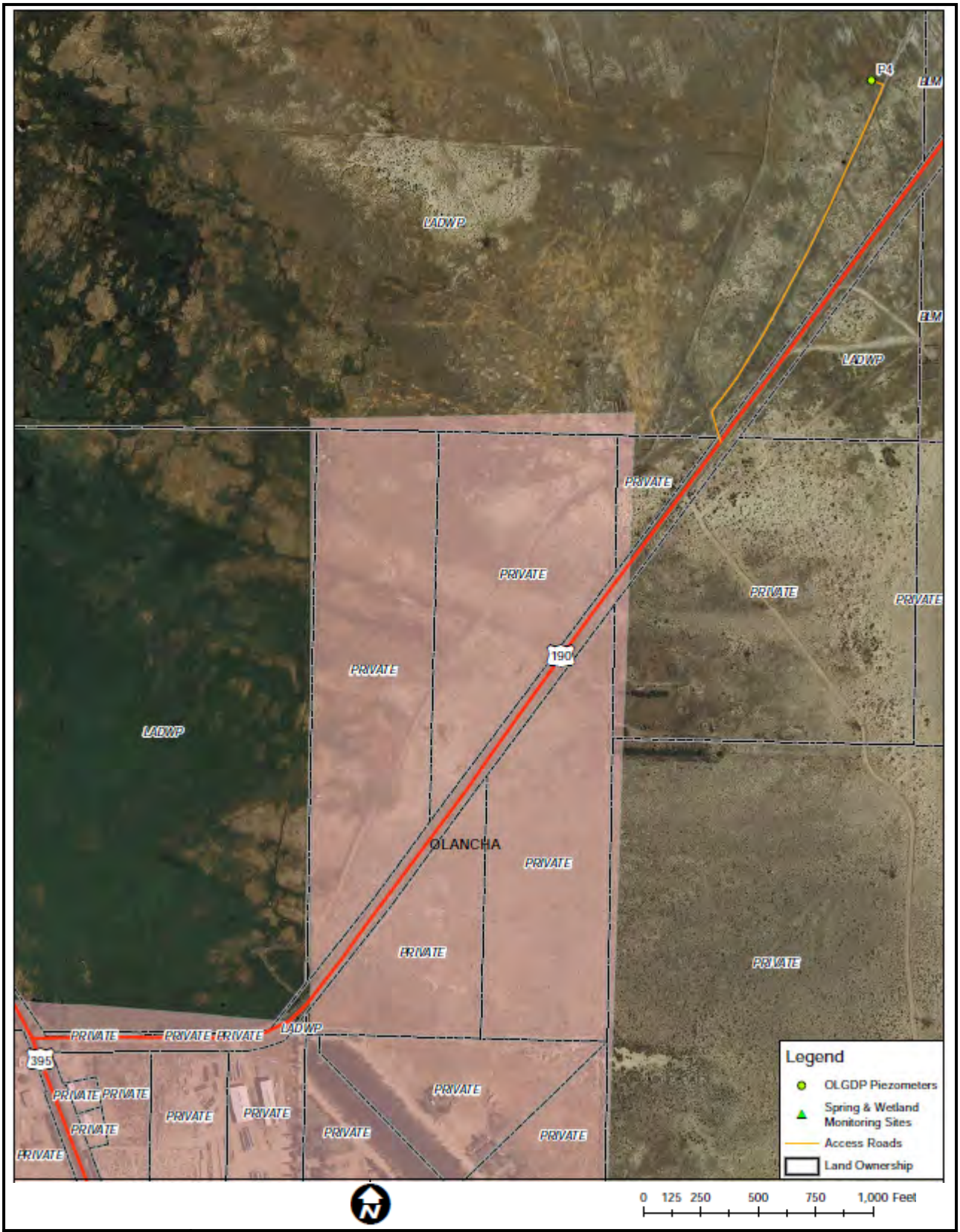
Owens Lake Groundwater Development Program
Inyo County, California

Project No.
LADWP-15-001

PIEZOMETER 2 (P2) LOCATION MAP

Figure **A3-3**

HUSHMAND ASSOCIATES, INC. Geotechnical and Earthquake Engineers	**Owens Lake Groundwater Development Program** Inyo County, California Project No. LADWP-15-001	**PIEZOMETER 3 (P3) LOCATION MAP**	Figure **A3-4**



HUSHMAND ASSOCIATES, INC. Geotechnical and Earthquake Engineers	**Owens Lake Groundwater Development Program** Inyo County, California	**PIEZOMETER 4 (P4) LOCATION MAP**	Figure **A3-5**
	Project No. LADWP-15-001		

HUSHMAND ASSOCIATES, INC. Geotechnical and Earthquake Engineers	**Owens Lake Groundwater Development Program** Inyo County, California Project No. LADWP-15-001	**PIEZOMETER 5 (P5) LOCATION MAP**	Figure **A3-6**

HUSHMAND ASSOCIATES, INC. Geotechnical and Earthquake Engineers	**Owens Lake Groundwater Development Program** Inyo County, California Project No. LADWP-15-001	**PIEZOMETER 5 ALTERNATIVE (P5a) LOCATION MAP**	Figure **A3-7**

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Owens Lake Groundwater Development Program
Inyo County, California

Project No.
LADWP-15-001

PIEZOMETER 6 (P6)
LOCATION MAP

Figure
A3-8

HUSHMAND ASSOCIATES, INC. Geotechnical and Earthquake Engineers	**Owens Lake Groundwater Development Program** Inyo County, California Project No. LADWP-15-001	**PIEZOMETER 7 (P7) LOCATION MAP**	Figure **A3-9**

HUSHMAND ASSOCIATES, INC. Geotechnical and Earthquake Engineers	**Owens Lake Groundwater Development Program** Inyo County, California Project No. LADWP-15-001	**PIEZOMETER 8 (P8) LOCATION MAP**	Figure **A3-10**

APPENDIX A4

PIEZOMETER ELEVATION AND LOCATION SURVEY

Table A4-1. Piezometer Elevation and Location Survey

OBJECT ID	NAME	CCS, Zone IV, NAD83, Feet, Northing_Y	CCS, Zone IV, NAD83, Feet, Easting_X	UTM, NAD83,Meter,X	UTM, NAD83,Meter,Y	Elevation, NAVD 88
1	CH X N COR CONC SLAB P1_A	2070059.6650	6847272.0500	407934.359	4040959.427	3572.208
2	CHS CUT N SIDE 2IN PVC P1-A	2070058.6180	6847271.7490	407934.261	4040959.110	3573.938
3	CHS CUT N SIDE 2IN PVC P1-C	2070050.7870	6847277.6190	407936.000	4040956.687	3574.084
4	CHS CUT N SIDE 2IN PVC P1-B	2070049.6560	6847267.8570	407933.019	4040956.404	3573.989
5	GROUND P1	2070052.7480	6847272.4030	407934.423	4040957.317	3571.8
6	CHS X N COR CONC SLAB P2-A	2041226.8650	6852709.6180	409408.354	4032140.754	3566.596
7	CHS CUT N SIDE 2IN PVC P2-A	2041225.9300	6852709.4240	409408.289	4032140.470	3568.372
8	CHS CUT N SIDE 2IN PVC P2-B	2041217.4940	6852703.6730	409406.483	4032137.937	3568.083
9	CHS CUT N SIDE 2IN PVC P2-C	2041216.6100	6852714.0130	409409.628	4032137.602	3568.354
10	GROUND P2	2041219.0800	6852708.8840	409408.081	4032138.387	3566.014
11	CHS X NW COR CONC SLAB P3-A	2021501.0970	6854218.0670	409743.075	4026121.566	3566.878
12	CHS CUT N SIDE 2IN PVC P3-A	2021500.7200	6854218.8110	409743.300	4026121.447	3568.377
13	CHS CUT N SIDE 2IN PVC P3-C	2021493.0600	6854224.7510	409745.061	4026119.075	3568.358
14	CHS CUT N SIDE 2IN PVC P3-B	2021492.3110	6854215.0480	409742.100	4026118.909	3568.344
15	GRUND P3	2021495.6940	6854220.2320	409743.701	4026119.907	3566.435
16	CHS X SE COR CONC SLAB P4-C	1991619.1320	6858181.9700	410761.739	4016992.737	3616.326
17	CHS CUT N SID 2IN PVC P4-A	1991629.7580	6858179.6440	410761.097	4016995.989	3617.848
18	CHS CUT N SID 2IN PVC P4-C	1991619.9090	6858181.3150	410761.544	4016992.977	3617.72
19	CHS CUT N SID 2IN PVC P4-B	1991622.5750	6858171.8730	410758.685	4016993.849	3617.875
20	GROUND P4	1991623.7540	6858178.1210	410760.596	4016994.169	3615.71
21	CHS X NW COR CONC SLAB P5A-A	2022368.1510	6887349.5130	419842.238	4026176.069	3583.146
22	CHS CUT N SIDE 2IN PVC P5A-A	2022368.5370	6887350.4580	419842.528	4026176.181	3584.852
23	CHS CUT N SIDE 2IN PVC P5A-B	2022360.0260	6887346.2920	419841.205	4026173.614	3584.543
24	CHS CUT N SIDE 2IN PVC P5A-C	2022359.4090	6887355.6380	419844.049	4026173.367	3584.739
25	GROUND P5A	2022362.8350	6887350.1620	419842.402	4026174.445	3582.604
26	CHS X S COR CONC SLAB P5-C	2019608.4570	6885484.2780	419256.525	4025347.126	3578.269
27	CHS CUT N SIDE 2IN PVC P5-C	2019609.5220	6885484.0850	419256.473	4025347.451	3578.741
28	CHS CUT N SIDE 2IN PVC P5-B	2019612.5000	6885474.2480	419253.495	4025348.421	3578.605
29	CHS CUT N SIDE 2IN PVC P5-A	2019619.6160	6885481.4900	419255.746	4025350.543	3579.681
30	GROUND P5	2019612.8410	6885479.3140	419255.040	4025348.493	3577.869
31	CHS X N COR CONC SLAB P6-A	2048763.0740	6900273.0390	423946.534	4034135.503	3589.56
32	CHS CT N SIDE 2IN PVC P6-A	2048762.2250	6900272.3700	423946.324	4034135.249	3590.759
33	CHS CT N SIDE 2IN PVC P6-B	2048755.5490	6900265.8280	423944.289	4034133.256	3589.83
34	CHS CT N SIDE 2IN PVC P6-C	2048764.9890	6900263.1500	423943.533	4034136.149	3589.777
35	GROUND P6	2048760.5750	6900265.9990	423944.373	4034134.786	3588.683
36	CHS X N COR CONC SLAB P7-A	2051165.3350	6898413.2200	423395.154	4034879.136	3581.877
37	CHS CUT N SIDE 2IN PVC P7-A	2051164.6740	6898413.0990	423395.113	4034878.935	3583.467
38	GROUND P7	2051161.7170	6898414.9700	423395.664	4034878.023	3581.261
39	TOP CAP 2IN PVS P7 EAST	2051157.5260	6898417.4920	423396.406	4034876.730	3583.051
40	TOP CAP 2IN PVS P7 SOUTH	2051157.1590	6898408.3030	423393.604	4034876.676	3583.258
41	CHS X N COR CONC SLAB P8-A	2065074.2770	6887408.3930	420130.624	4039186.256	3592.391
42	CHS CUT N SIDE 2IN PVC P8-A	2065073.3180	6887407.9840	420130.493	4039185.967	3593.791
43	CHS CUT N SIDE 2IN PVC P8-B	2065063.4600	6887404.4280	420129.348	4039182.986	3593.194
44	CHS CUT N SIDE 2IN PVC P8-C	2065065.7370	6887414.0980	420132.308	4039183.618	3592.979
45	GROUND P8	2065067.4750	6887408.8010	420130.705	4039184.181	3591.824

APPENDIX B

LABORATORY TEST RESULTS

HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

PARTICLE-SIZE ANALYSIS OF SOILS

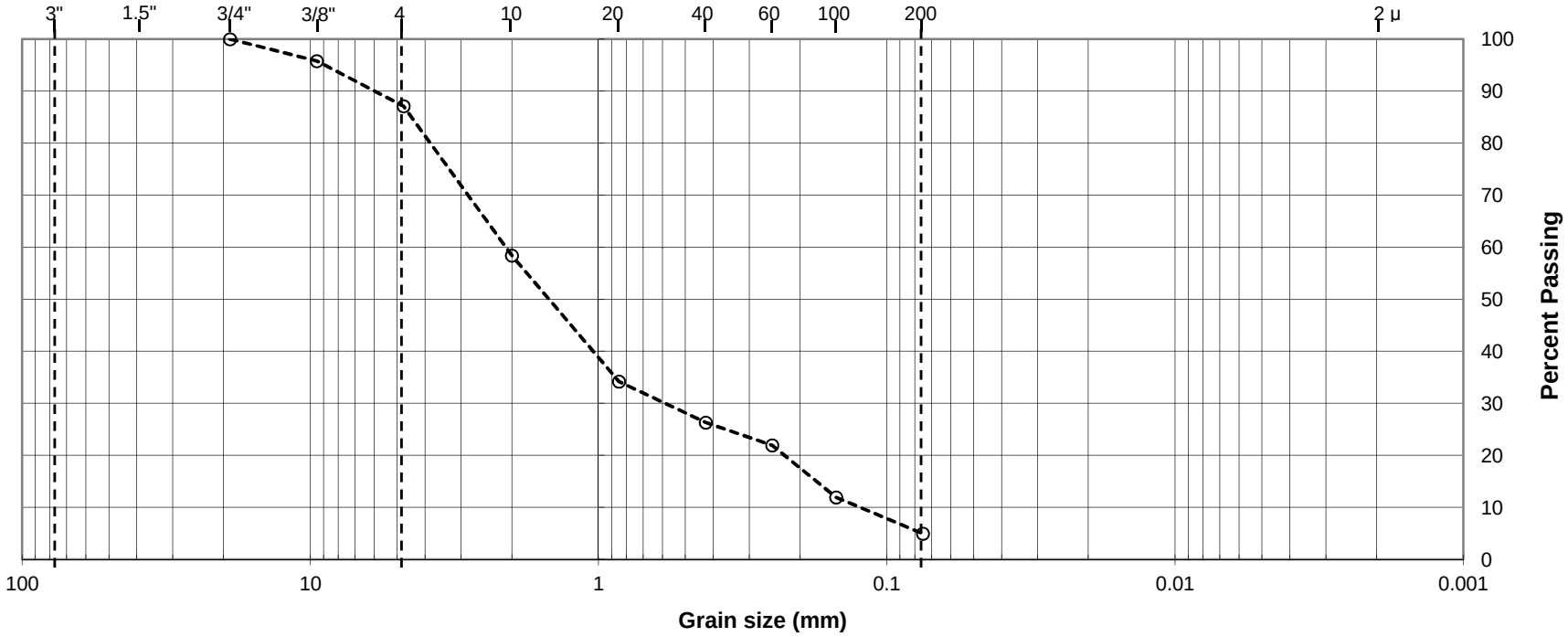
(ASTM D422)

Client: LADWP
Project Name: Owens Lake
Project No.: ---

HAI Project No.: LADWP-15-001
Tested by: SE
Checked by: MZ
Date: 5/11/2015

COBBLES	GRAVEL		SAND			SILT AND CLAY
	Coarse	Fine	Coarse	Medium	Fine	

U.S. STANDARD SIEVE SIZES



Boring No.	Sample No.	Symbol	USCS	% Gravel	% Sand	% Fines
P-1	S-1@ 5'	○	Dark Olive Gray, Well Graded Sand (SW)	12.9	82.2	4.9

HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

PARTICLE-SIZE ANALYSIS OF SOILS

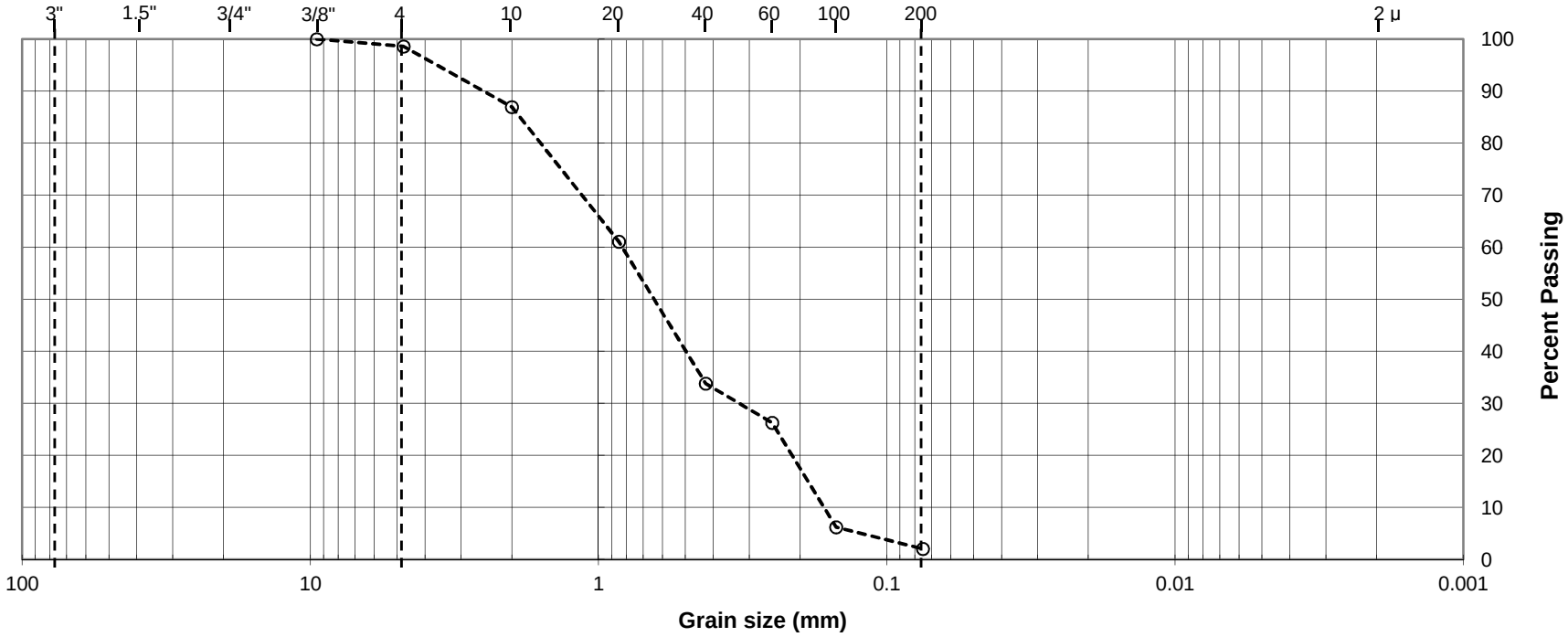
(ASTM D422)

Client: LADWP
Project Name: Owens Lake
Project No.: ---

HAI Project No.: LADWP-15-001
Tested by: SE
Checked by: MZ
Date: 5/11/2015

COBBLES	GRAVEL		SAND			SILT AND CLAY
	Coarse	Fine	Coarse	Medium	Fine	

U.S. STANDARD SIEVE SIZES



Boring No.	Sample No.	Symbol	USCS	% Gravel	% Sand	% Fines
P-1	S-2 @ 10'	○	Olive Gray, Poorly Graded Sand (SP)	1.4	96.6	2.0

HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

PARTICLE-SIZE ANALYSIS OF SOILS

(ASTM D422)

Client: LADWP
Project Name: Owens Lake
Project No.: ---

HAI Project No.: LADWP-15-001
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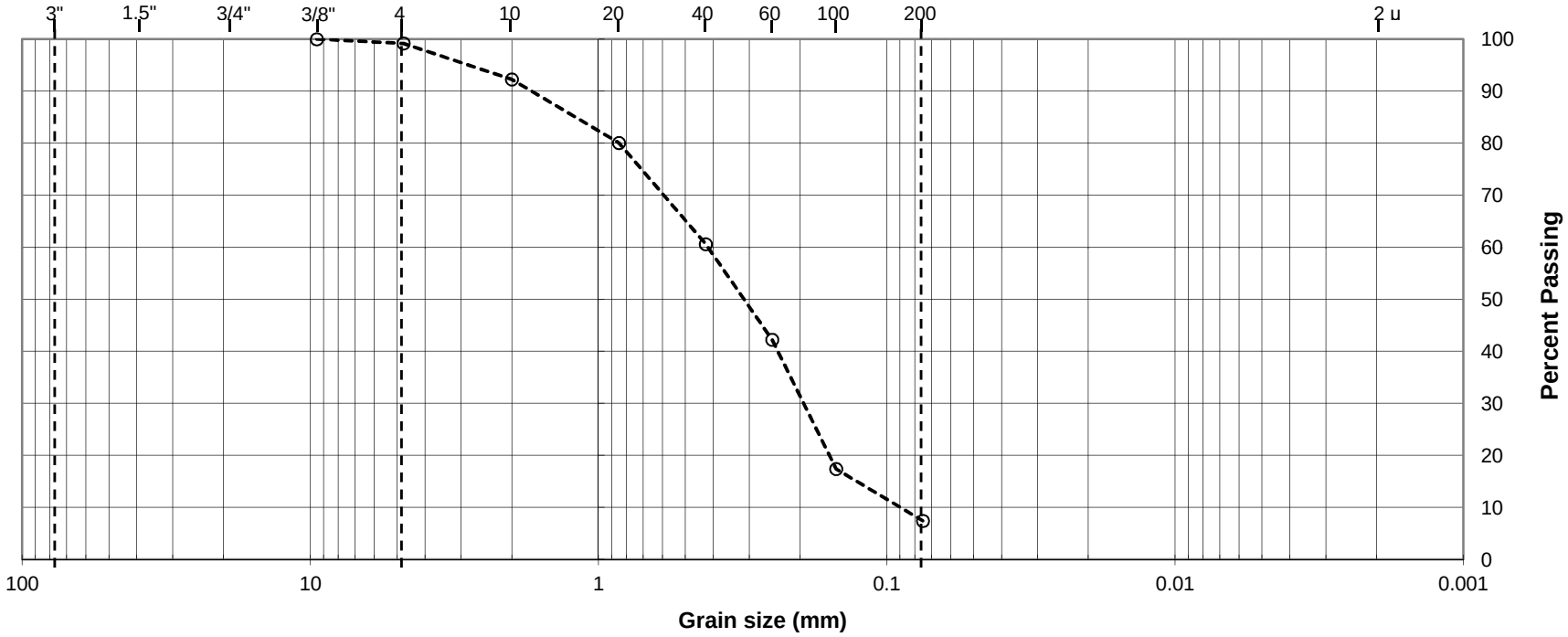
Checked by: MZ
Date: 5/11/2015

COBBLES	GRAVEL		SAND			SILT AND CLAY
	Coarse	Fine	Coarse	Medium	Fine	

U.S. STANDARD SIEVE SIZES



Boring No.	Sample No.	Symbol	USCS	% Gravel	% Sand	% Fines
P-1	S-3 @ 15'	○	Olive Gray, Poorly Graded Sand with Silt (SP-SM)	0.8	91.8	7.4

HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

PARTICLE-SIZE ANALYSIS OF SOILS

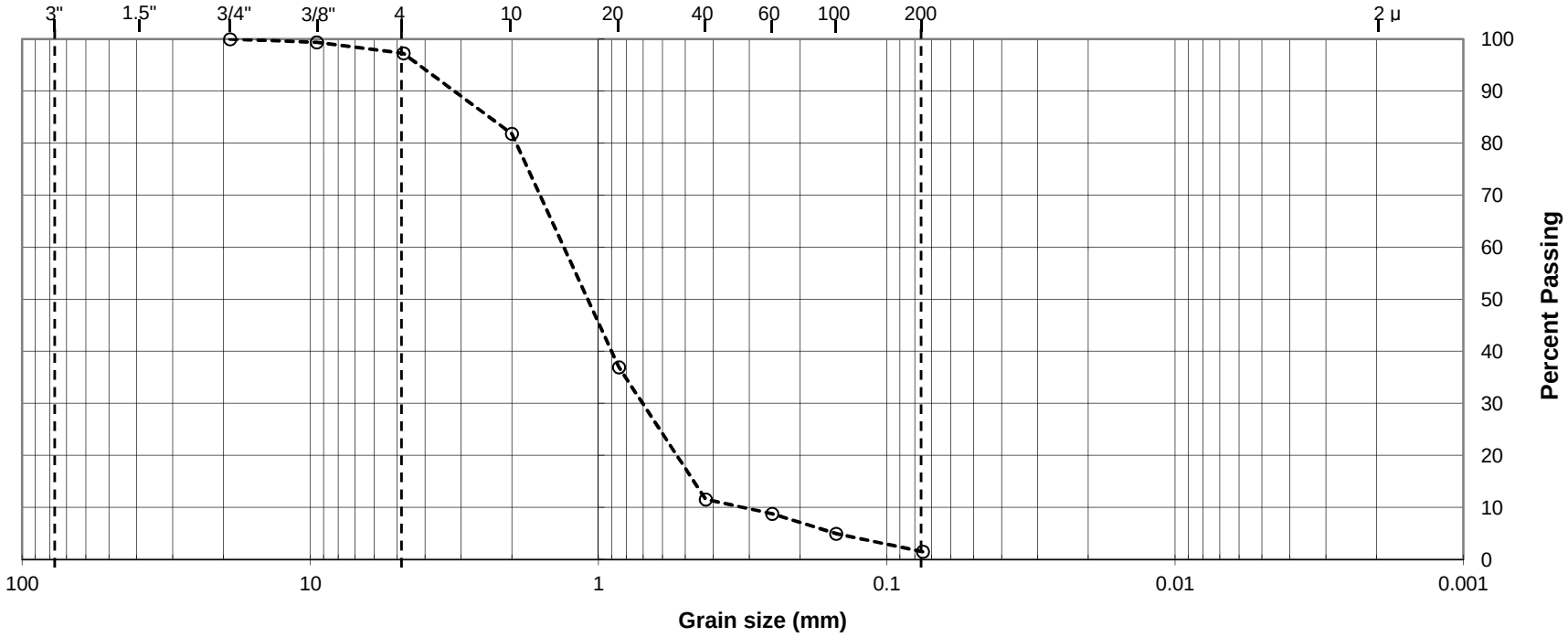
(ASTM D422)

Client: LADWP
Project Name: Owens Lake
Project No.: ---

HAI Project No.: LADWP-15-001
Tested by: SE
Checked by: MZ
Date: 5/11/2015

COBBLES	GRAVEL		SAND			SILT AND CLAY
	Coarse	Fine	Coarse	Medium	Fine	

U.S. STANDARD SIEVE SIZES



Boring No.	Sample No.	Symbol	USCS	% Gravel	% Sand	% Fines
P-2	S-1 @ 5'	○	Olive Gray, Poorly Graded Sand (SP)	2.7	95.8	1.5

HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

PARTICLE-SIZE ANALYSIS OF SOILS

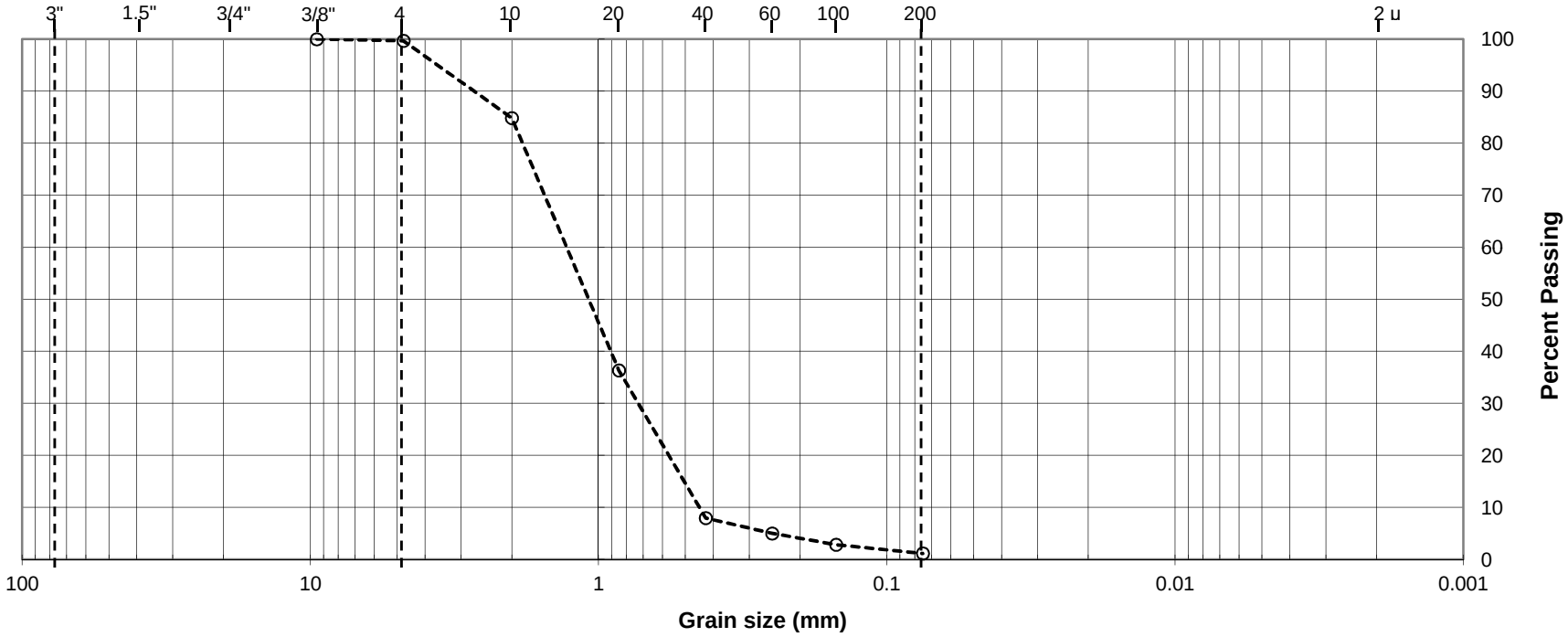
(ASTM D422)

Client: LADWP
Project Name: Owens Lake
Project No.: ---

HAI Project No.: LADWP-15-001
Tested by: SE
Checked by: MZ
Date: 5/11/2015

COBBLES	GRAVEL		SAND			SILT AND CLAY
	Coarse	Fine	Coarse	Medium	Fine	

U.S. STANDARD SIEVE SIZES



Boring No.	Sample No.	Symbol	USCS	% Gravel	% Sand	% Fines
P-2	S-2 @ 10'	○	Light Olive Gray, Poorly Graded Sand (SP)	0.3	98.6	1.1

HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

PARTICLE-SIZE ANALYSIS OF SOILS

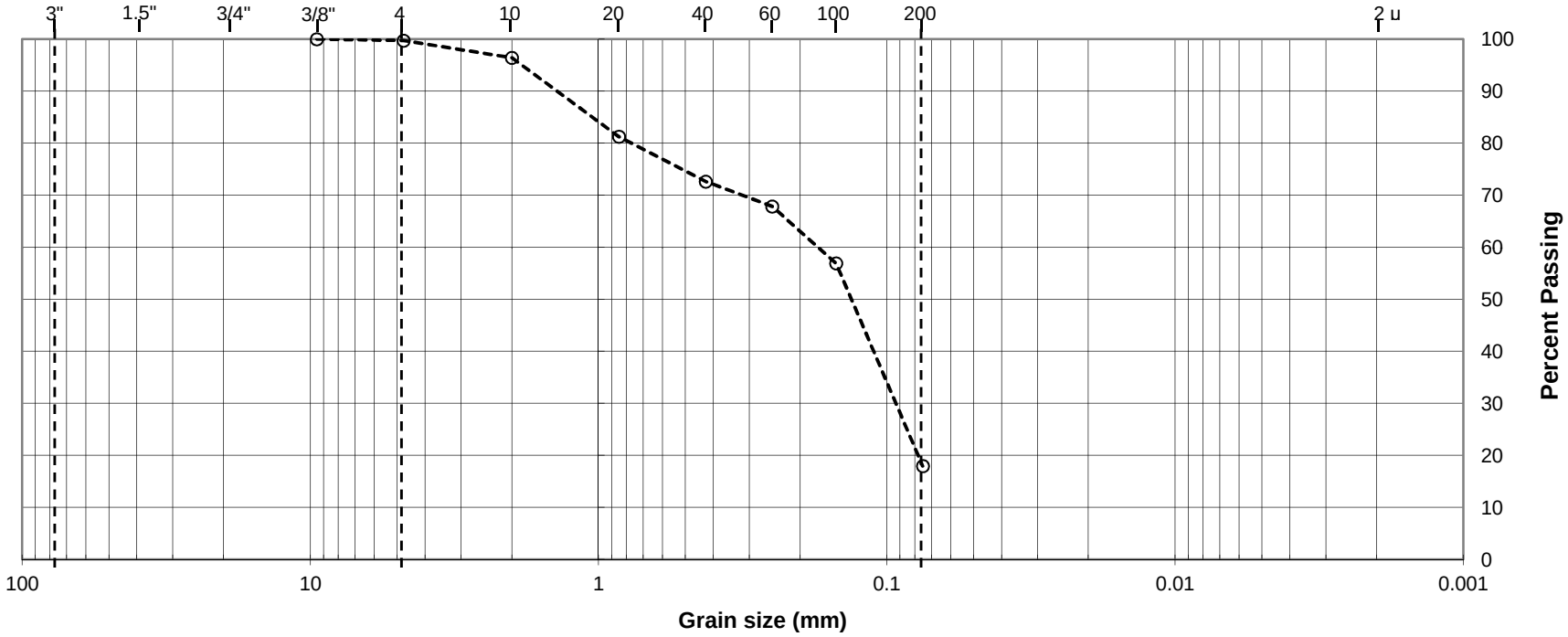
(ASTM D422)

Client: LADWP
Project Name: Owens Lake
Project No.: ---

HAI Project No.: LADWP-15-001
Tested by: SE
Checked by: MZ
Date: 5/11/2015

COBBLES	GRAVEL		SAND			SILT AND CLAY
	Coarse	Fine	Coarse	Medium	Fine	

U.S. STANDARD SIEVE SIZES



Boring No.	Sample No.	Symbol	USCS	% Gravel	% Sand	% Fines
P-2	S-3 @ 15-20'	○	Dark Olive Gray, Silty Sand (SM)	0.3	81.8	17.9

HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

PARTICLE-SIZE ANALYSIS OF SOILS

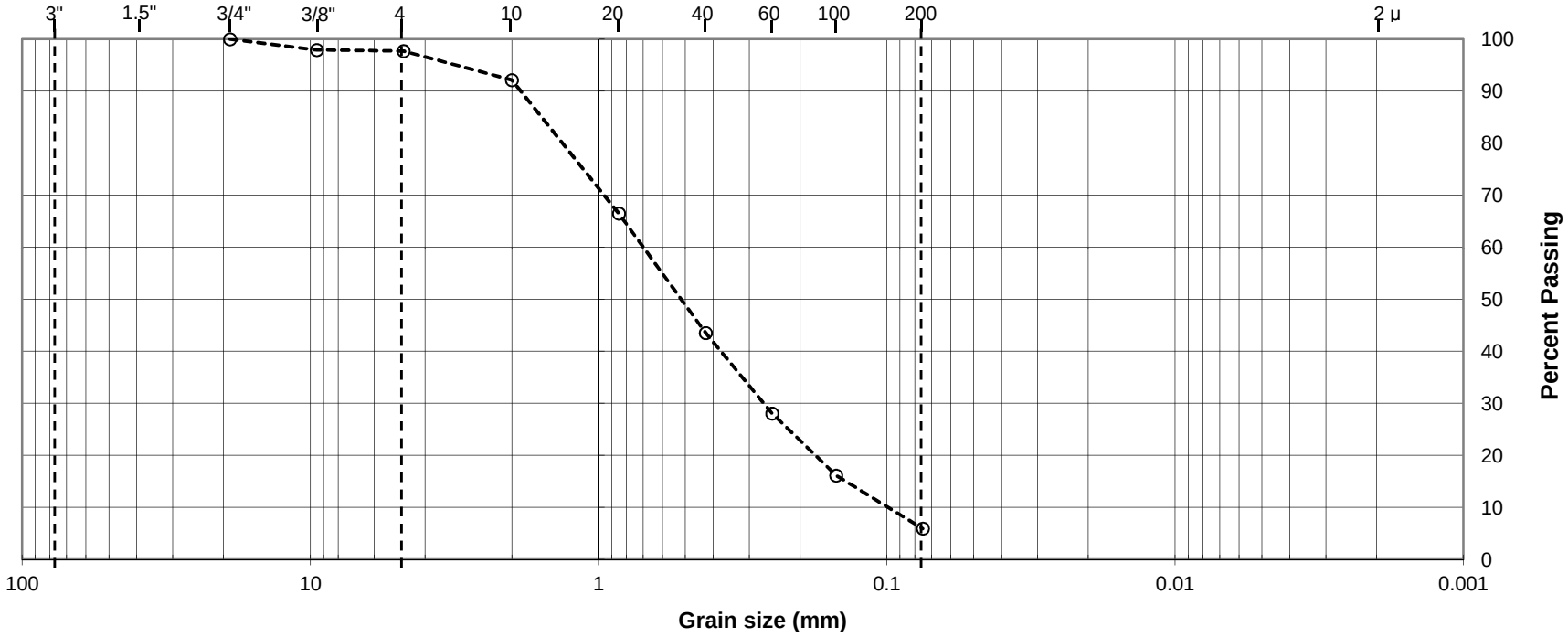
(ASTM D422)

Client: LADWP
Project Name: Owens Lake
Project No.: ---

HAI Project No.: LADWP-15-001
Tested by: SE
Checked by: MZ
Date: 5/11/2015

COBBLES	GRAVEL		SAND			SILT AND CLAY
	Coarse	Fine	Coarse	Medium	Fine	

U.S. STANDARD SIEVE SIZES



Boring No.	Sample No.	Symbol	USCS	% Gravel	% Sand	% Fines
P-2	S-4 @ 25-30'	○	Olive Gray, Poorly Graded Sand with Silt (SP-SM)	2.3	91.8	5.9

HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

PARTICLE-SIZE ANALYSIS OF SOILS

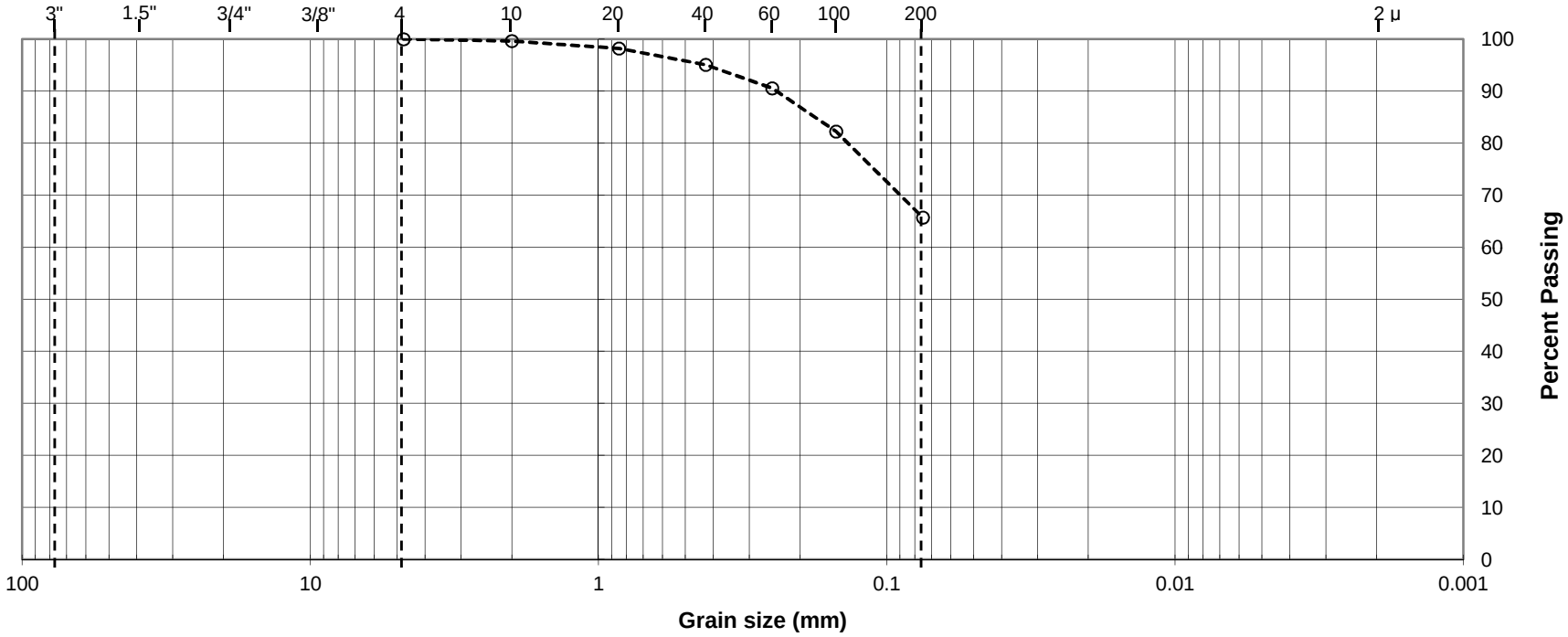
(ASTM D422)

Client: LADWP
Project Name: Owens Lake
Project No.: ---

HAI Project No.: LADWP-15-001
Tested by: SE
Checked by: MZ
Date: 5/11/2015

COBBLES	GRAVEL		SAND			SILT AND CLAY
	Coarse	Fine	Coarse	Medium	Fine	

U.S. STANDARD SIEVE SIZES



Boring No.	Sample No.	Symbol	USCS	% Gravel	% Sand	% Fines
P-3	S-1 @ 5'	○	Dark Olive, Sandy Silt (ML)	0.0	34.3	65.7

HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

PARTICLE-SIZE ANALYSIS OF SOILS

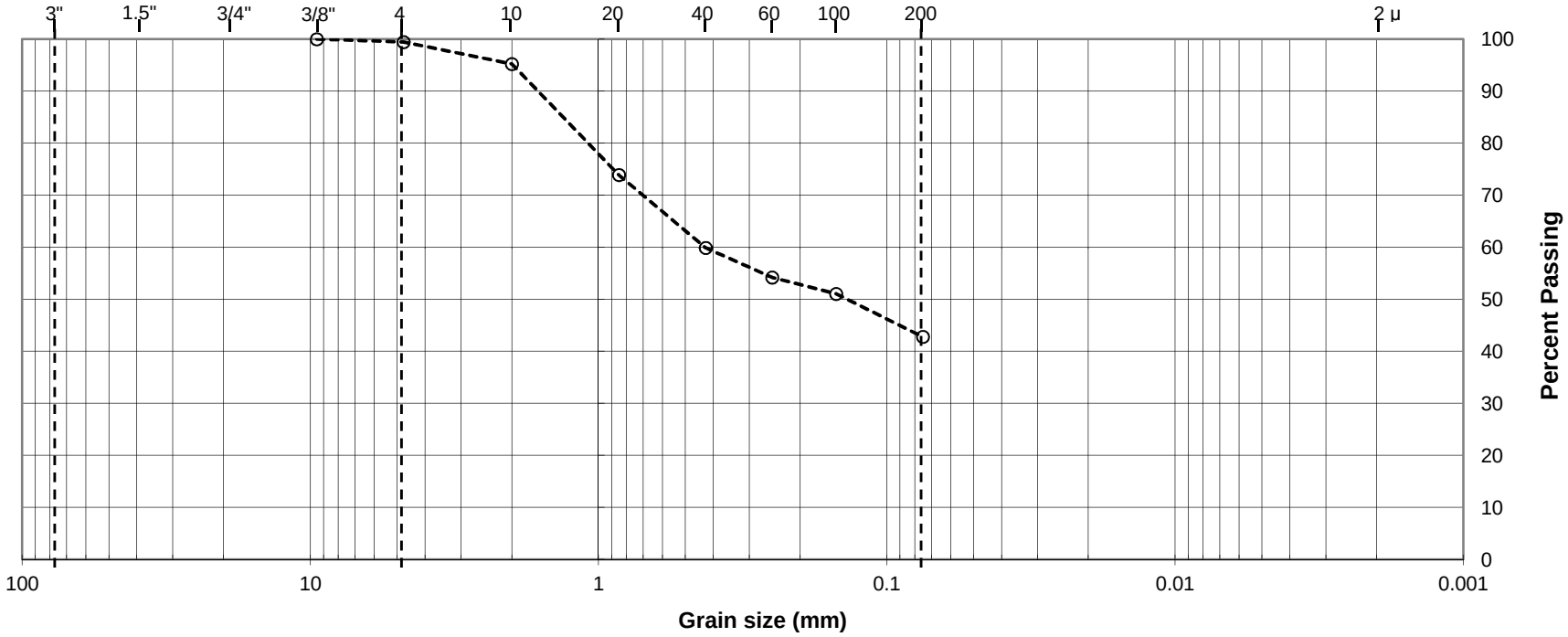
(ASTM D422)

Client: LADWP
Project Name: Owens Lake
Project No.: ---

HAI Project No.: LADWP-15-001
Tested by: SE
Checked by: MZ
Date: 5/11/2015

COBBLES	GRAVEL		SAND			SILT AND CLAY
	Coarse	Fine	Coarse	Medium	Fine	

U.S. STANDARD SIEVE SIZES



Boring No.	Sample No.	Symbol	USCS	% Gravel	% Sand	% Fines
P-3	S-2 @ 10'	○	Dark Olive Gray, Silty Sand (SM)	0.5	56.7	42.8

HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

PARTICLE-SIZE ANALYSIS OF SOILS

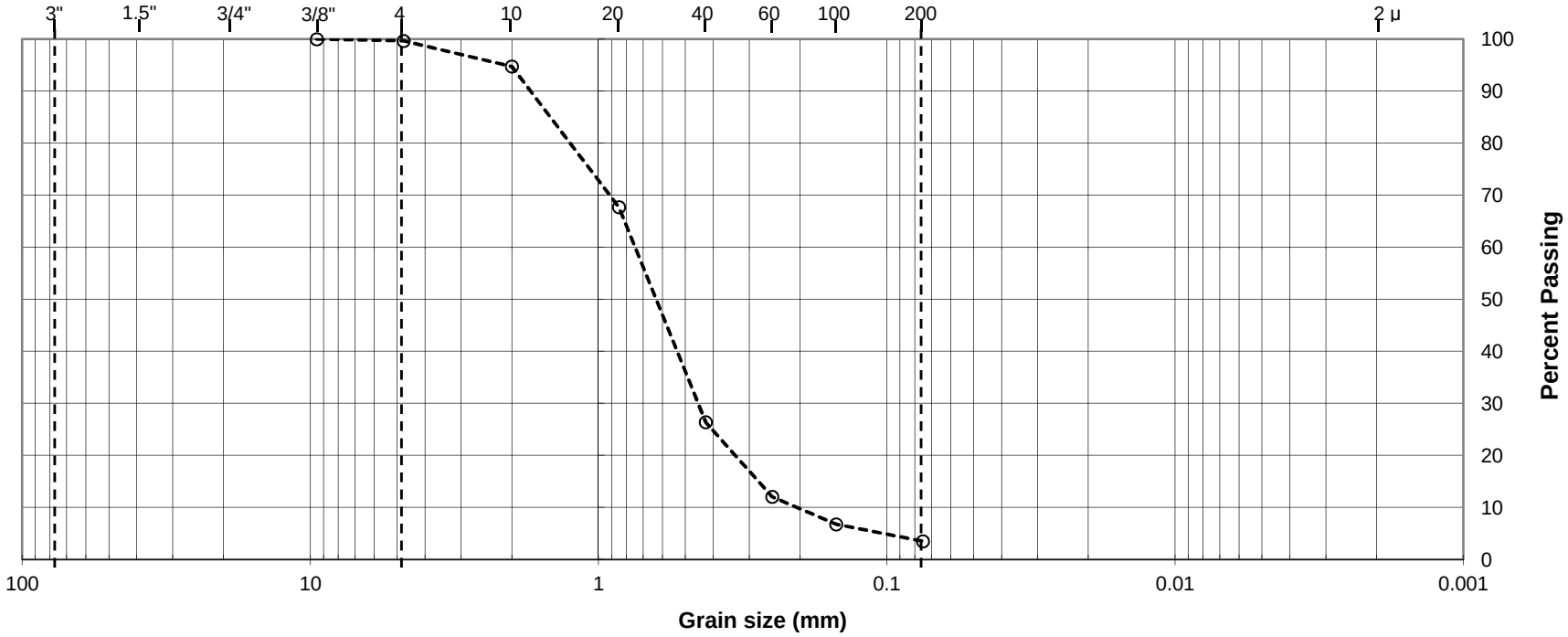
(ASTM D422)

Client: LADWP
Project Name: Owens Lake
Project No.: ---

HAI Project No.: LADWP-15-001
Tested by: SE
Checked by: MZ
Date: 5/11/2015

COBBLES	GRAVEL		SAND			SILT AND CLAY
	Coarse	Fine	Coarse	Medium	Fine	

U.S. STANDARD SIEVE SIZES



Boring No.	Sample No.	Symbol	USCS	% Gravel	% Sand	% Fines
P-3	S-3 @ 15'	○	Dark Olive Gray, Poorly Graded Sand (SP)	0.3	96.2	3.5

HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

PARTICLE-SIZE ANALYSIS OF SOILS

(ASTM D422)

Client: LADWP
Project Name: Owens Lake
Project No.: ---

HAI Project No.: LADWP-15-001
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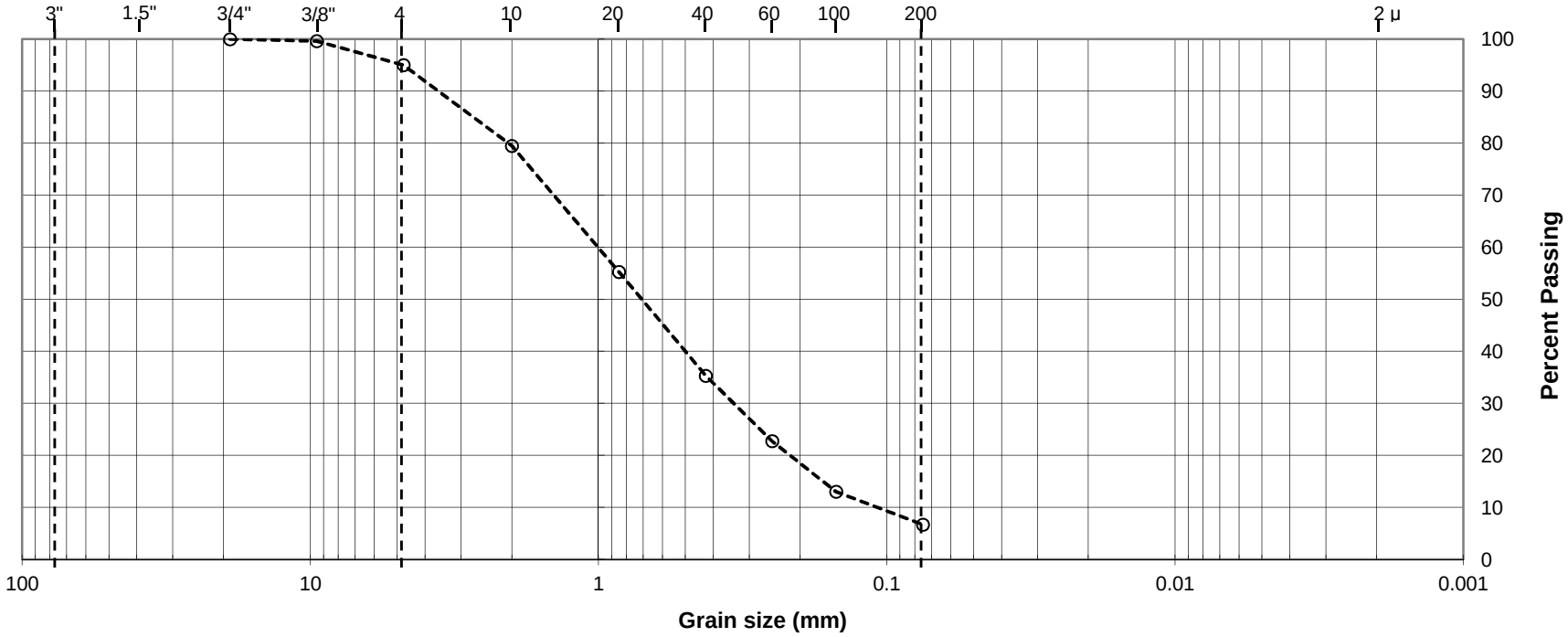
Checked by: MZ
Date: 5/11/2015

COBBLES	GRAVEL		SAND			SILT AND CLAY
	Coarse	Fine	Coarse	Medium	Fine	

U.S. STANDARD SIEVE SIZES



Boring No.	Sample No.	Symbol	USCS	% Gravel	% Sand	% Fines
P-3	S-4 @ 30'	○	Dark Gray, Well Graded Sand with Silt (SW-SM)	5.0	88.4	6.7

HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

PARTICLE-SIZE ANALYSIS OF SOILS

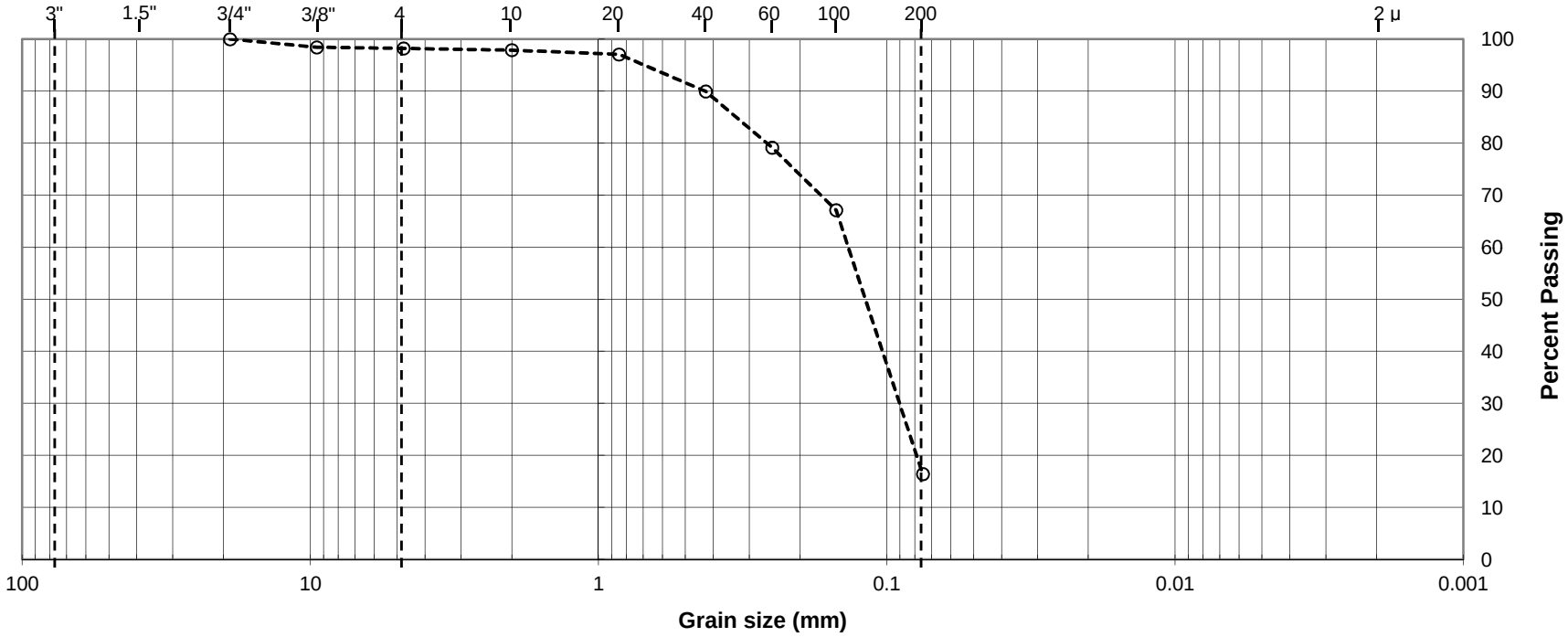
(ASTM D422)

Client: LADWP
Project Name: Owens Lake
Project No.: ---

HAI Project No.: LADWP-15-001
Tested by: SE
Checked by: MZ
Date: 5/11/2015

COBBLES	GRAVEL		SAND			SILT AND CLAY
	Coarse	Fine	Coarse	Medium	Fine	

U.S. STANDARD SIEVE SIZES



Boring No.	Sample No.	Symbol	USCS	% Gravel	% Sand	% Fines
P-4	S-1 @ 5'	○	Olive Gray, Silty Sand (SM)	1.8	81.8	16.4

HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

PARTICLE-SIZE ANALYSIS OF SOILS

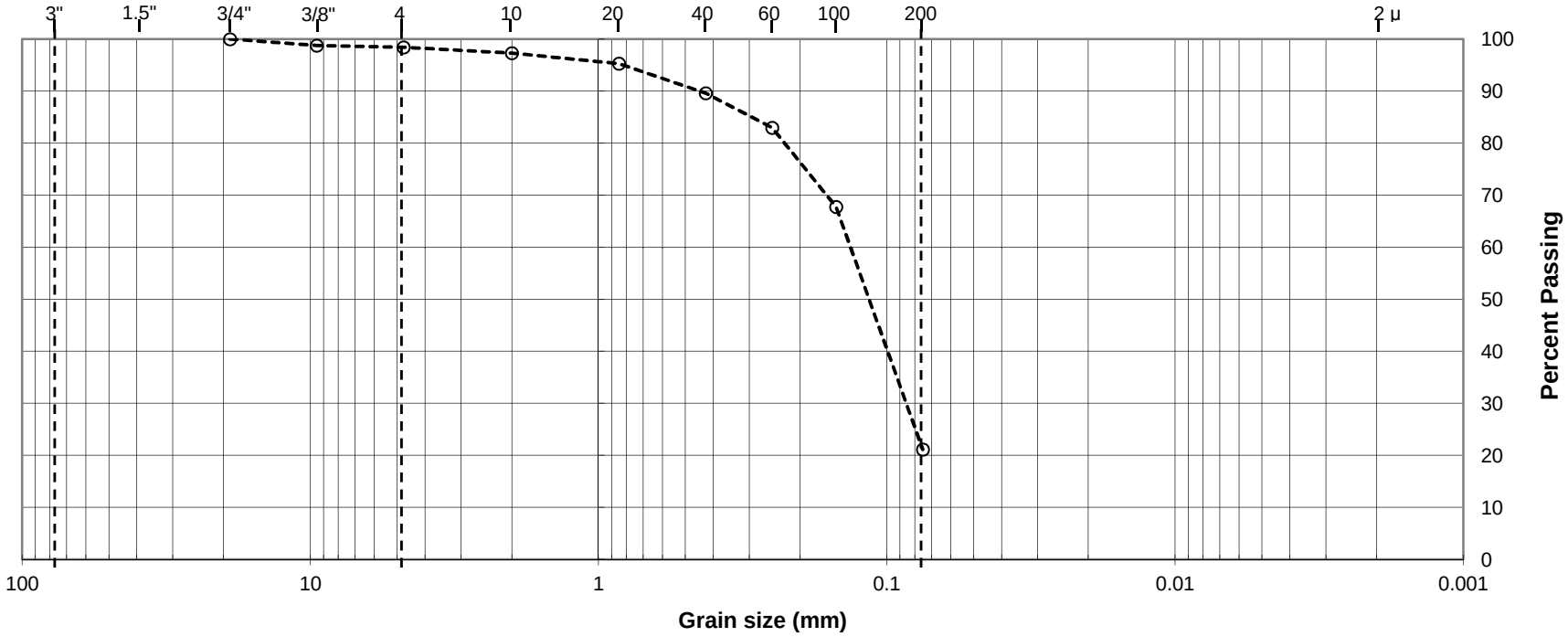
(ASTM D422)

Client: LADWP
Project Name: Owens Lake
Project No.: ---

HAI Project No.: LADWP-15-001
Tested by: SE
Checked by: MZ
Date: 5/11/2015

COBBLES	GRAVEL		SAND			SILT AND CLAY
	Coarse	Fine	Coarse	Medium	Fine	

U.S. STANDARD SIEVE SIZES



Boring No.	Sample No.	Symbol	USCS	% Gravel	% Sand	% Fines
P-4	S-2 @ 10'	○	Dark Olive Gray, Silty Sand (SM)	1.6	77.3	21.1

HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

PARTICLE-SIZE ANALYSIS OF SOILS

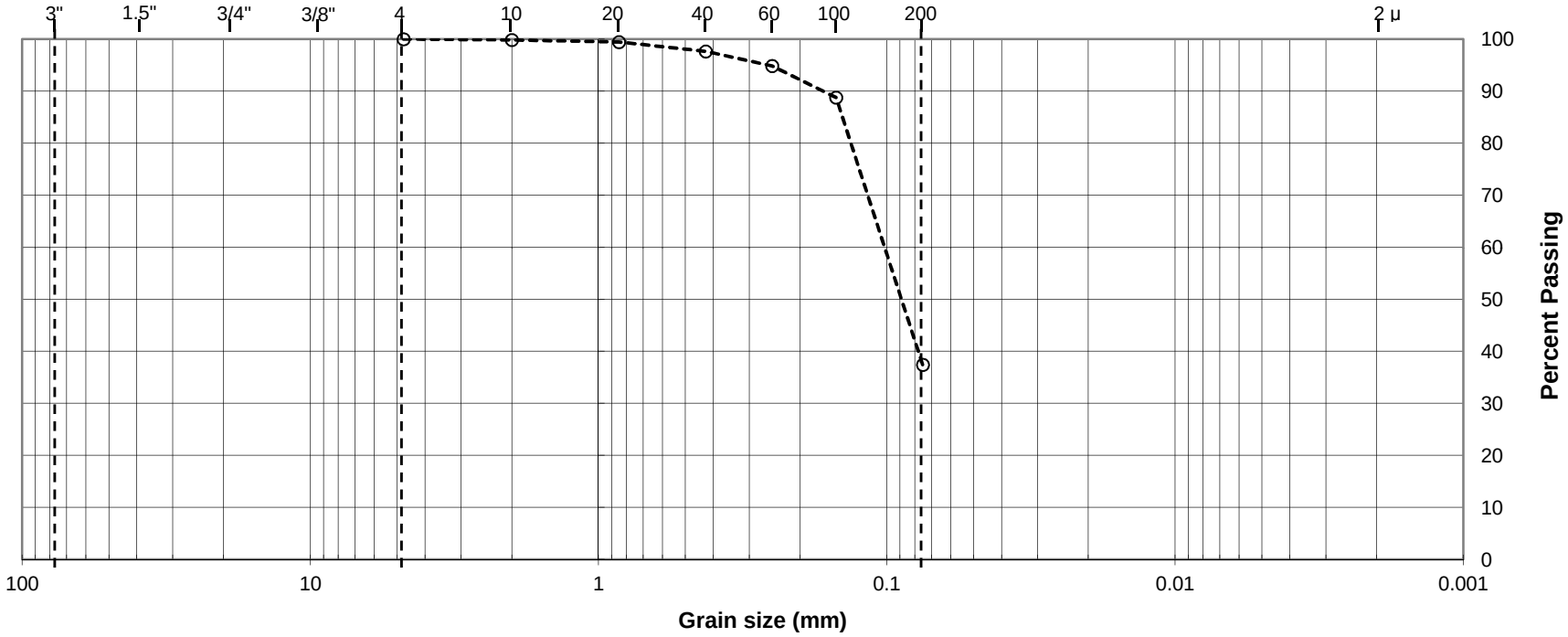
(ASTM D422)

Client: LADWP
Project Name: Owens Lake
Project No.: ---

HAI Project No.: LADWP-15-001
Tested by: SE
Checked by: MZ
Date: 5/11/2015

COBBLES	GRAVEL		SAND			SILT AND CLAY
	Coarse	Fine	Coarse	Medium	Fine	

U.S. STANDARD SIEVE SIZES



Boring No.	Sample No.	Symbol	USCS	% Gravel	% Sand	% Fines
P-4	S-3 @ 15'	○	Dark Olive Gray, Silty Sand (SM)	0.0	62.6	37.4

PARTICLE-SIZE ANALYSIS OF SOILS

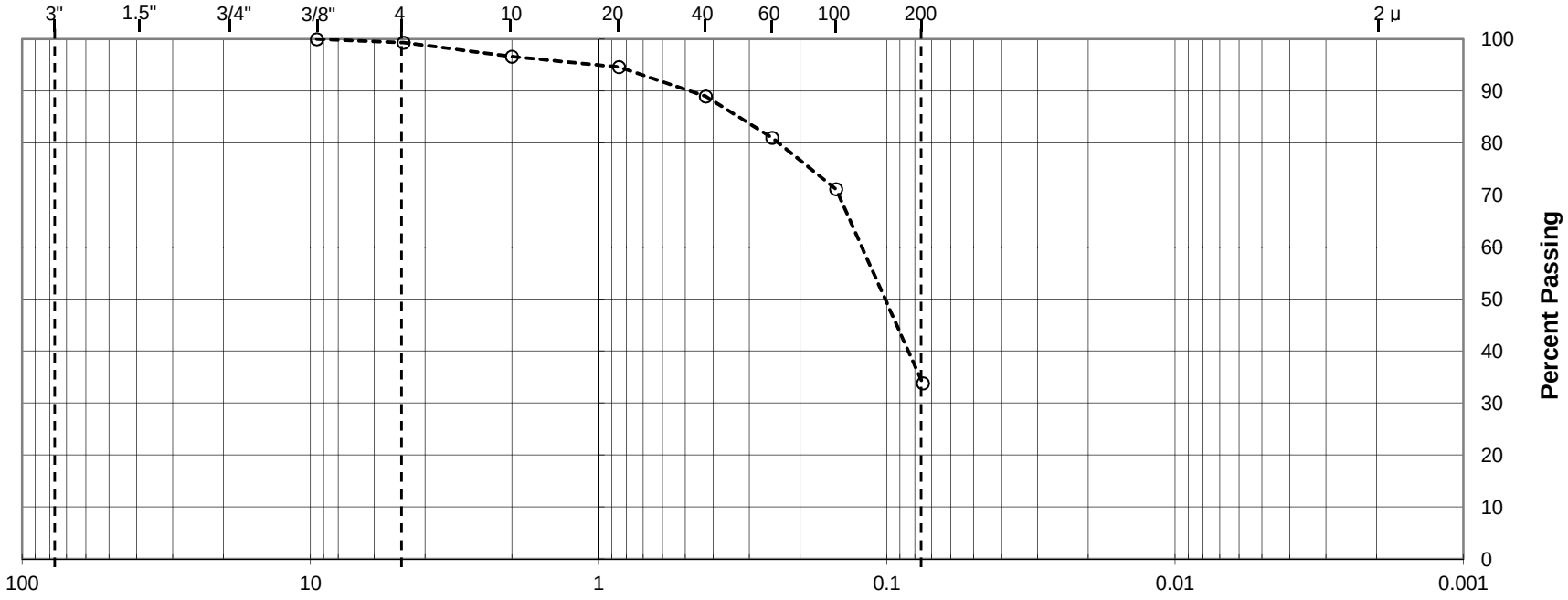
(ASTM D422)

HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

Client:	LADWP	***HAI Project No.:***	LADWP-15-001
Project Name:	Owens Lake	***Tested by:***	SE
Project No.:	---	***Checked by:***	MZ
		Date:	5/11/2015

COBBLES	***GRAVEL***		***SAND***			***SILT AND CLAY***
	Coarse	***Fine***	***Coarse***	***Medium***	***Fine***	

U.S. STANDARD SIEVE SIZES



Boring No.	Sample No.	Symbol	USCS	% Gravel	% Sand	% Fines
P-4	S-4 @ 20'	○	Dark Olive Gray, Silty, Clayey Sand (SC-SM)	0.7	65.5	33.8

HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

PARTICLE-SIZE ANALYSIS OF SOILS

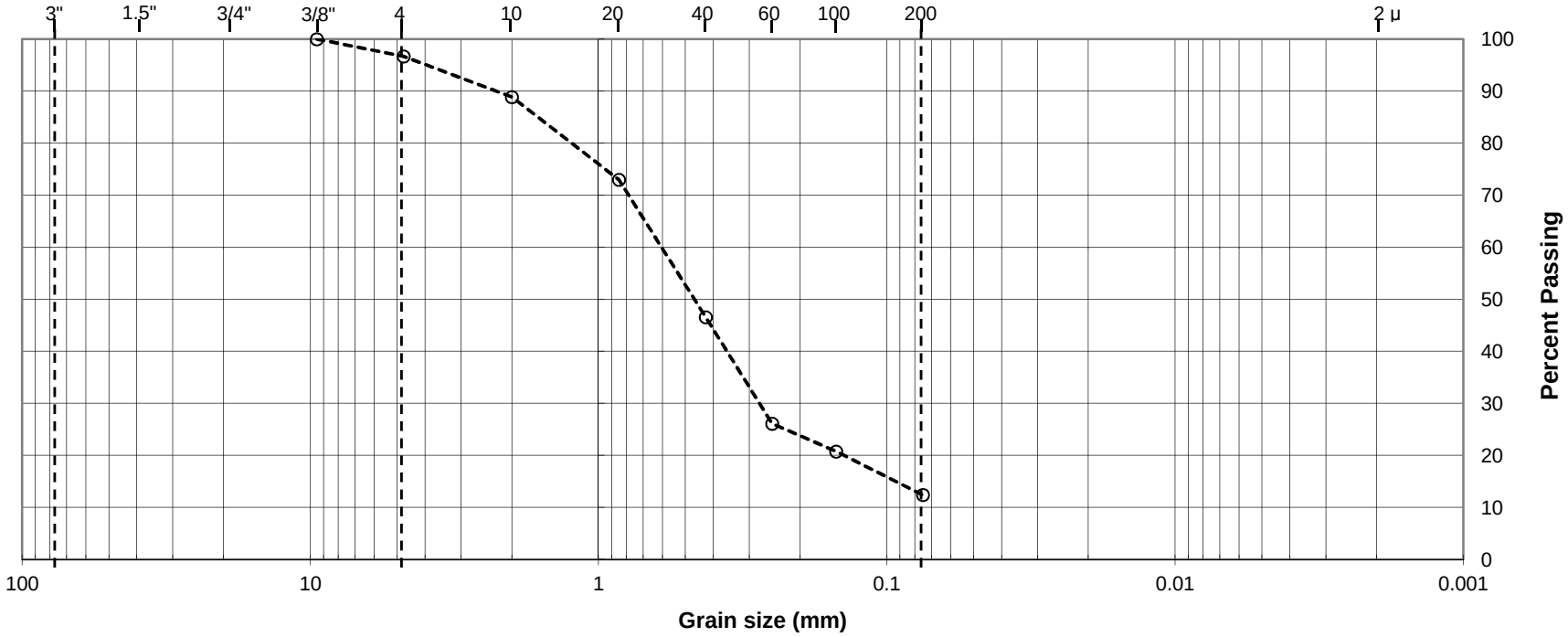
(ASTM D422)

Client: LADWP
Project Name: Owens Lake
Project No.: ---

HAI Project No.: LADWP-15-001
Tested by: SE
Checked by: MZ
Date: 5/11/2015

COBBLES	GRAVEL		SAND			SILT AND CLAY
	Coarse	Fine	Coarse	Medium	Fine	

U.S. STANDARD SIEVE SIZES



Boring No.	Sample No.	Symbol	USCS	% Gravel	% Sand	% Fines
P-4	S-5 @ 25'	○	Dark Olive Gray, Silty Sand (SM) *w/ Marine Fragments	3.3	84.3	12.4

PARTICLE-SIZE ANALYSIS OF SOILS

(ASTM D422)

HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

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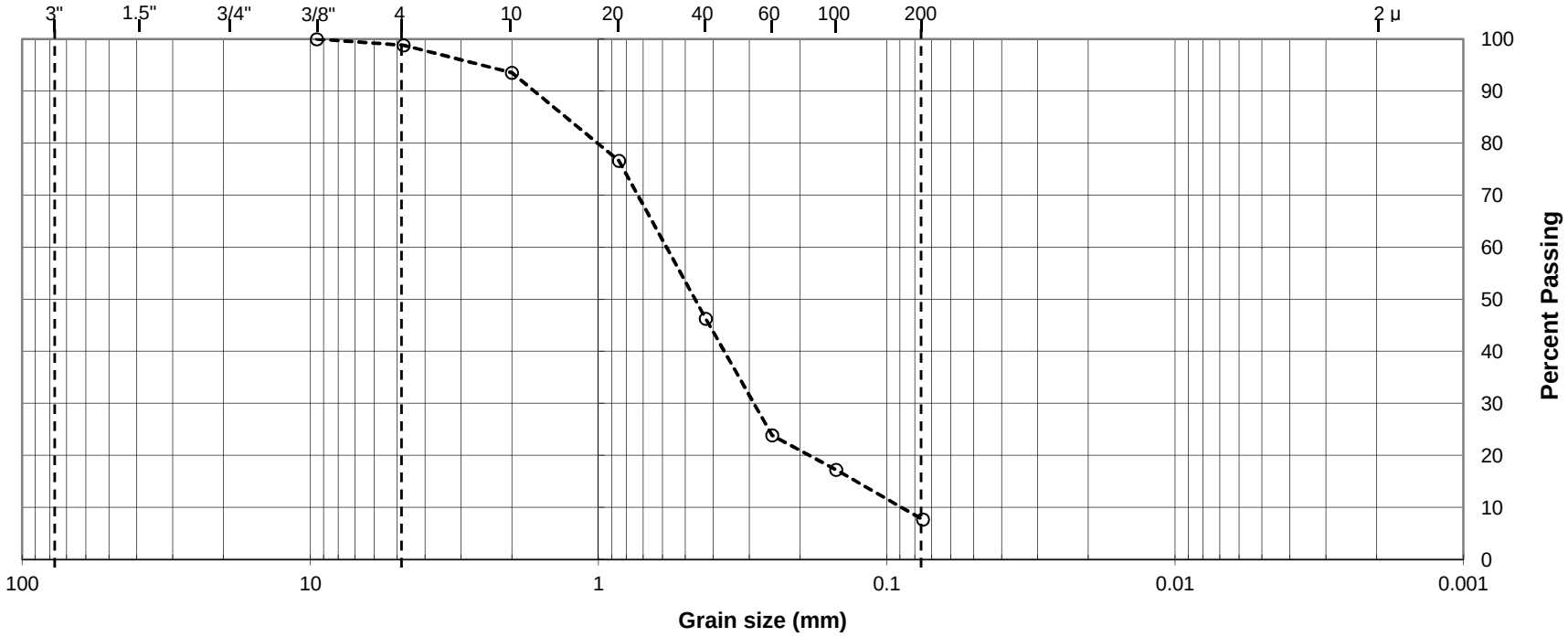
Date: 5/11/2015

COBBLES	GRAVEL		SAND			SILT AND CLAY
	Coarse	Fine	Coarse	Medium	Fine	

U.S. STANDARD SIEVE SIZES



Boring No.	Sample No.	Symbol	USCS	% Gravel	% Sand	% Fines
P-4	S-6 @ 30'	○	Dark Olive Gray, Well Graded Sand with Silt (SW-SM) *w/ Marine Fragments	1.2	91.2	7.7

HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

PARTICLE-SIZE ANALYSIS OF SOILS

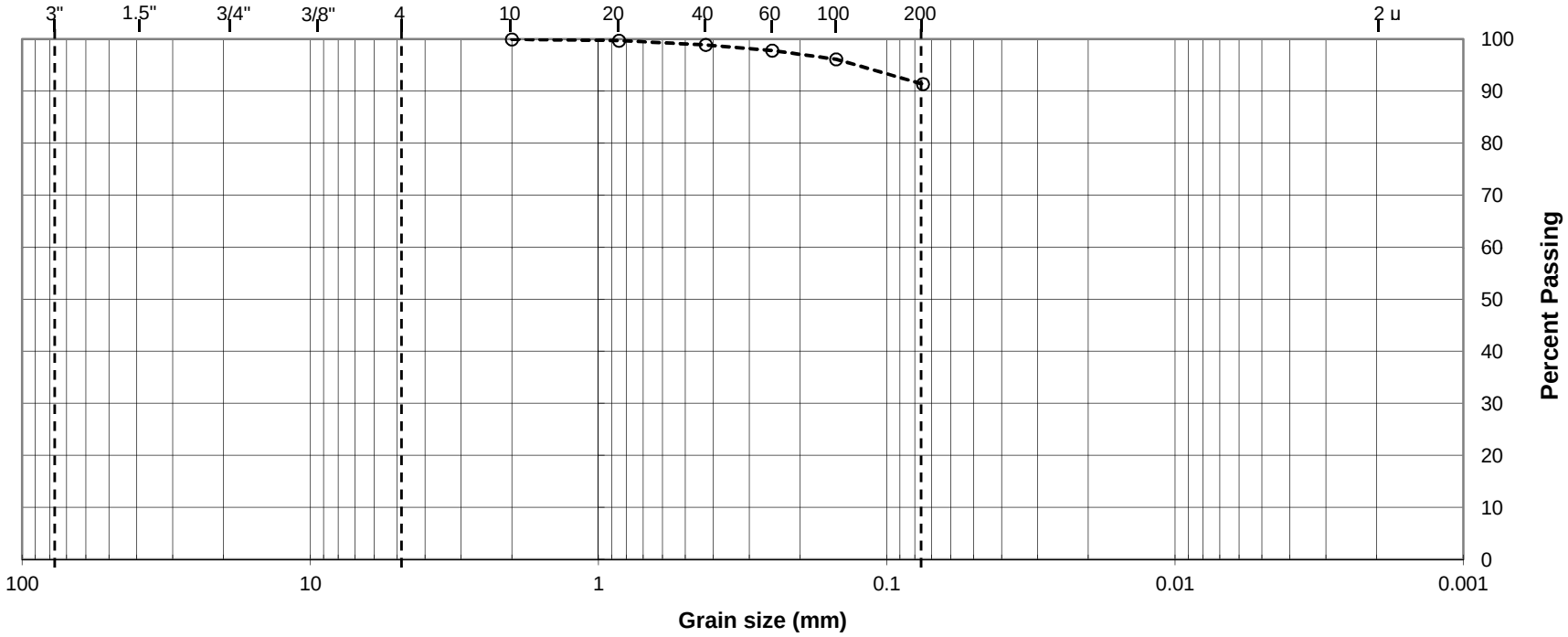
(ASTM D422)

Client: LADWP
Project Name: Owens Lake
Project No.: ---

HAI Project No.: LADWP-15-001
Tested by: KL/SE
Checked by: MZ
Date: 5/11/2015

COBBLES	GRAVEL		SAND			SILT AND CLAY
	Coarse	Fine	Coarse	Medium	Fine	

U.S. STANDARD SIEVE SIZES



Boring No.	Sample No.	Symbol	USCS	% Gravel	% Sand	% Fines
P-5	S-1 @ 5'	○	Olive Gray, Silt (ML)	0.0	8.6	91.4

HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

PARTICLE-SIZE ANALYSIS OF SOILS

(ASTM D422)

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Project No.: ---

HAI Project No.: LADWP-15-001
Tested by: KL/SE
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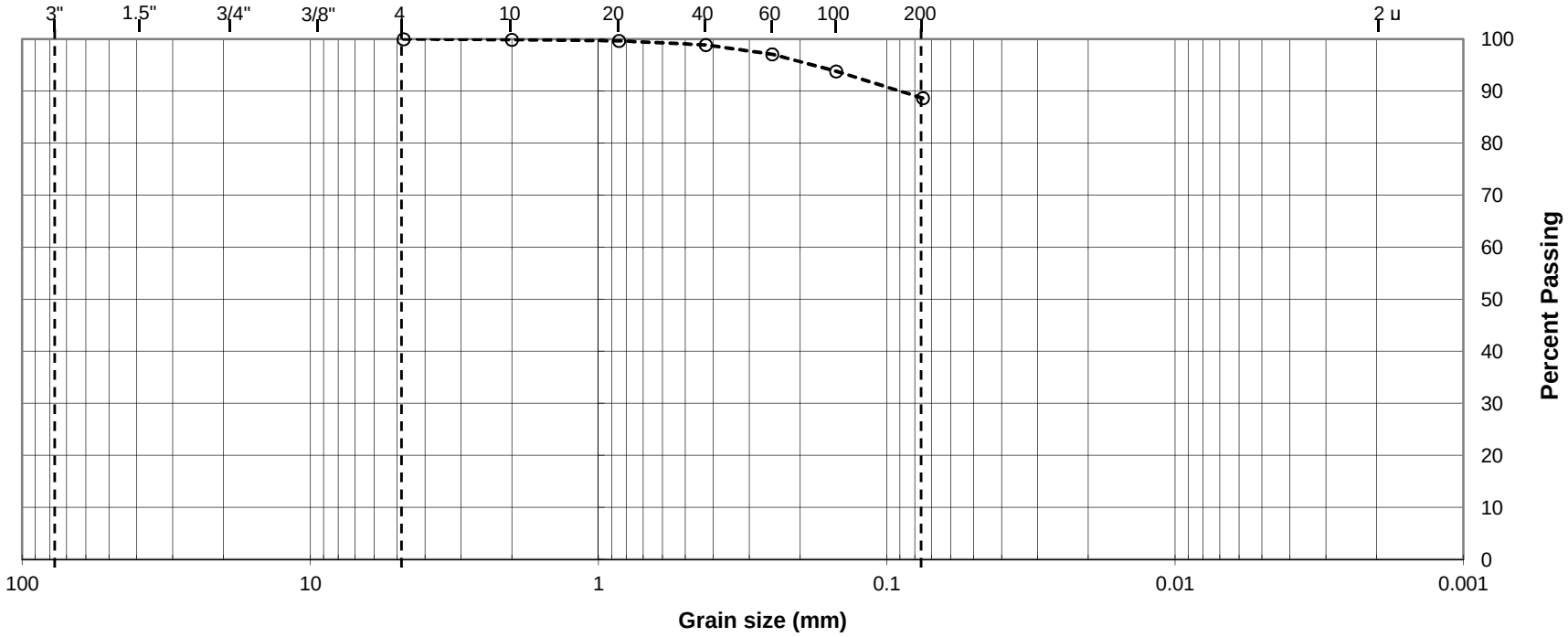
Date: 5/11/2015

COBBLES	GRAVEL		SAND			SILT AND CLAY
	Coarse	Fine	Coarse	Medium	Fine	

U.S. STANDARD SIEVE SIZES



Boring No.	Sample No.	Symbol	USCS	% Gravel	% Sand	% Fines
P-5	S-2 @ 10'	○	Olive Gray, Silty Clay (CL-ML)	0.0	11.3	88.7

HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

PARTICLE-SIZE ANALYSIS OF SOILS

(ASTM D422)

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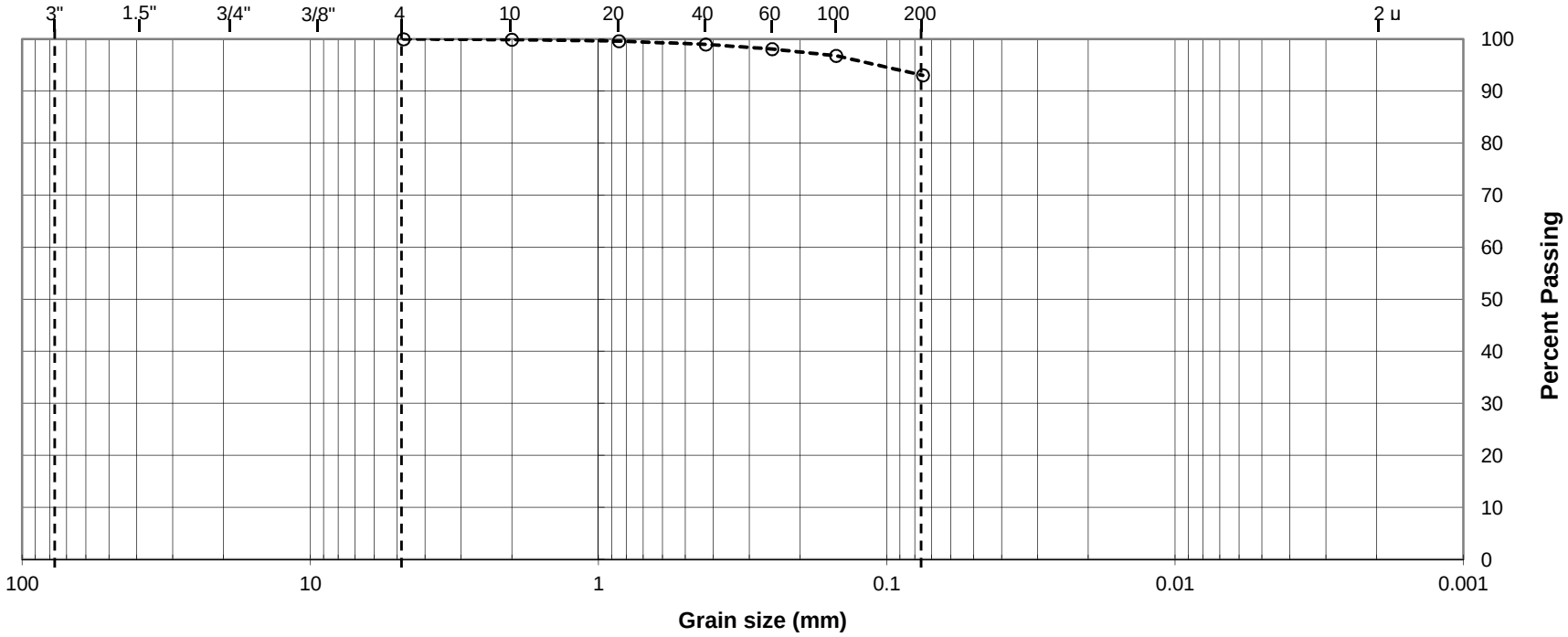
COBBLES	GRAVEL		SAND			SILT AND CLAY
	Coarse	Fine	Coarse	Medium	Fine	

U.S. STANDARD SIEVE SIZES



Boring No.	Sample No.	Symbol	USCS	% Gravel	% Sand	% Fines
P-5	S-3 @ 15'	○	Olive Gray, Silty Clay (CL-ML)	0.0	6.9	93.1

HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

PARTICLE-SIZE ANALYSIS OF SOILS

(ASTM D422)

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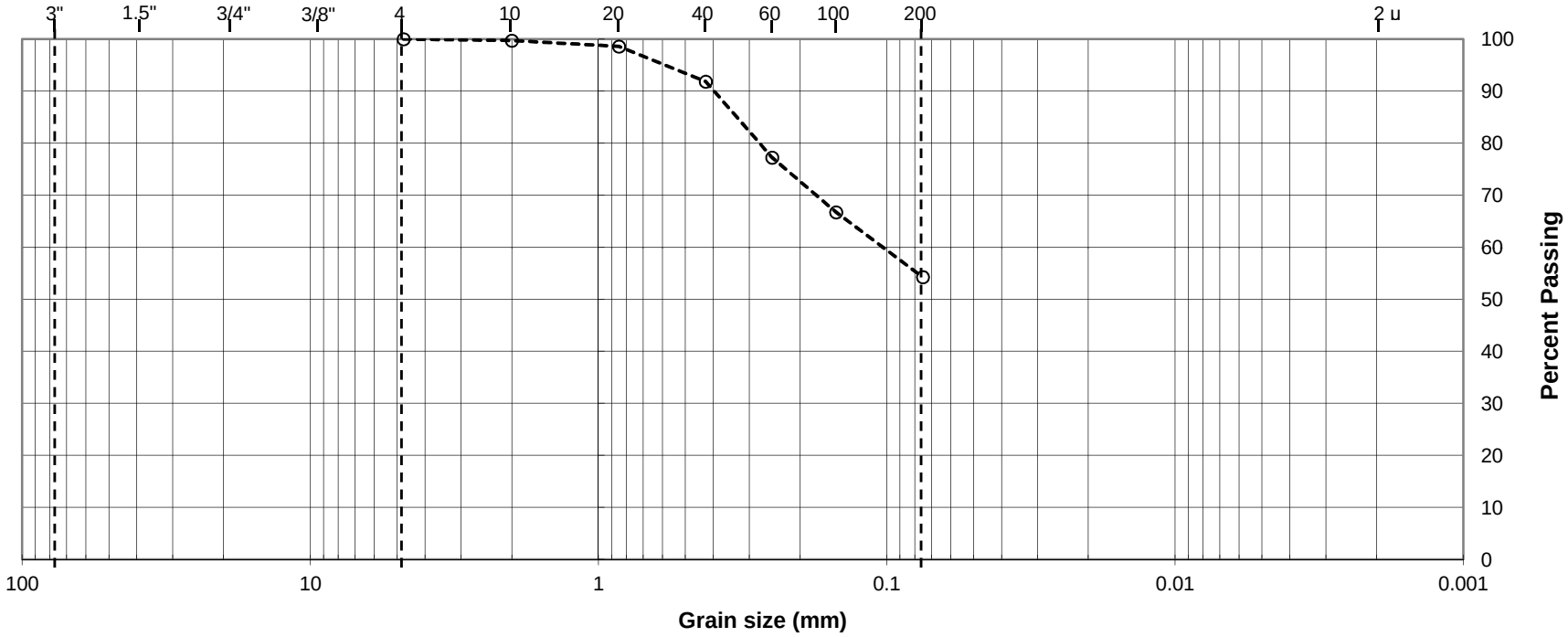
Project No.: ---

HAI Project No.: LADWP-15-001
Tested by: KL/SE
Checked by: MZ
Date: 5/11/2015

COBBLES	GRAVEL		SAND			SILT AND CLAY
	Coarse	Fine	Coarse	Medium	Fine	

U.S. STANDARD SIEVE SIZES



Boring No.	Sample No.	Symbol	USCS	% Gravel	% Sand	% Fines
P-5	S-4 @ 20'	○	Olive Gray, Sandy Lean Clay (CL)	0.0	45.7	54.3

HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

PARTICLE-SIZE ANALYSIS OF SOILS

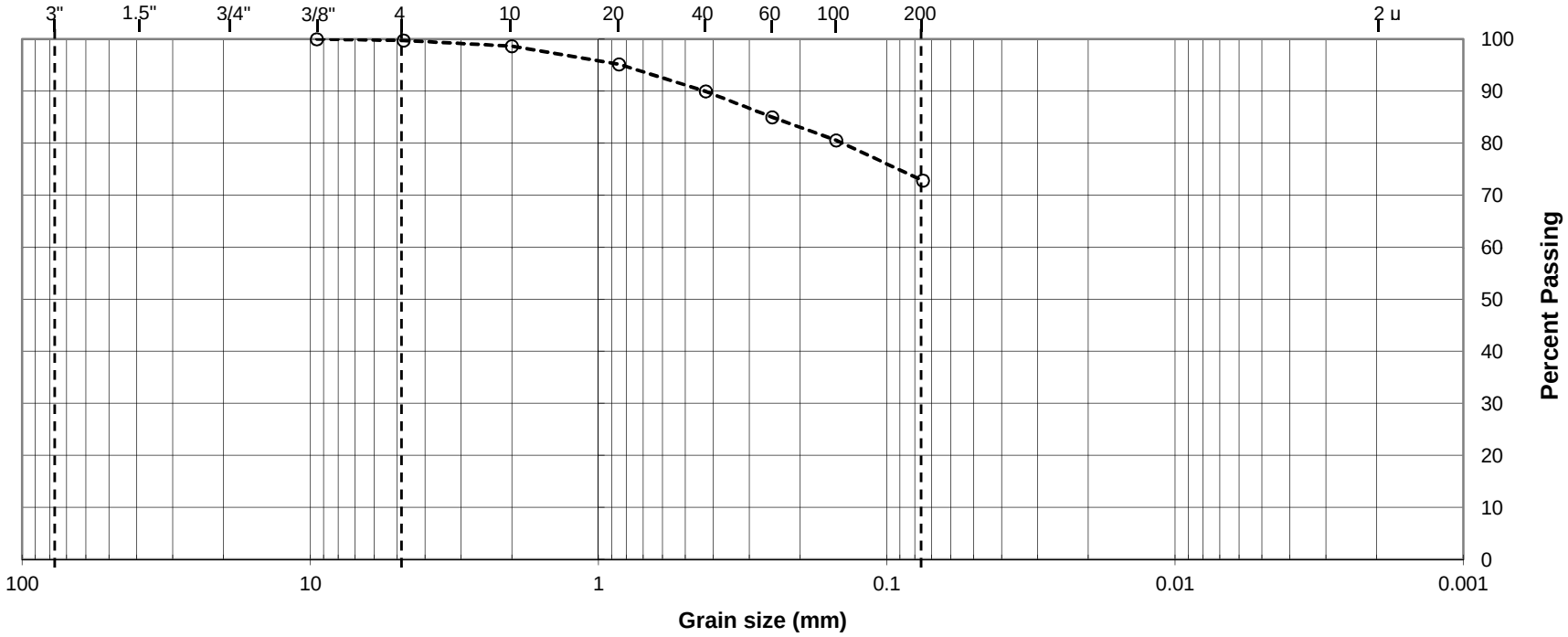
(ASTM D422)

Client: LADWP
Project Name: Owens Lake
Project No.: ---

HAI Project No.: LADWP-15-001
Tested by: KL/SE
Checked by: MZ
Date: 5/11/2015

COBBLES	GRAVEL		SAND			SILT AND CLAY
	Coarse	Fine	Coarse	Medium	Fine	

U.S. STANDARD SIEVE SIZES



Boring No.	Sample No.	Symbol	USCS	% Gravel	% Sand	% Fines
P-5	S-5 @ 25'	○	Olive Gray, Lean Clay with Sand (CL)	0.2	26.9	72.8

HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

PARTICLE-SIZE ANALYSIS OF SOILS

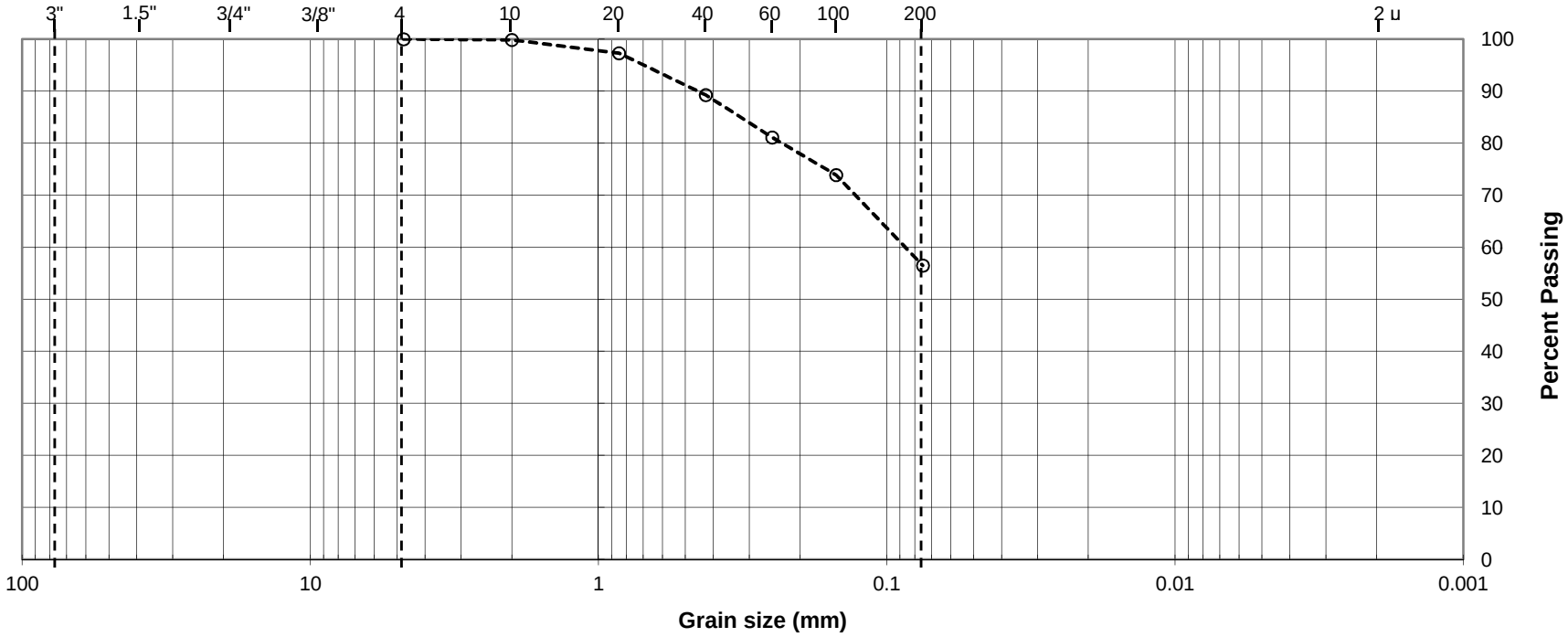
(ASTM D422)

Client: LADWP
Project Name: Owens Lake
Project No.: ---

HAI Project No.: LADWP-15-001
Tested by: KL/SE
Checked by: MZ
Date: 5/11/2015

COBBLES	GRAVEL		SAND			SILT AND CLAY
	Coarse	Fine	Coarse	Medium	Fine	

U.S. STANDARD SIEVE SIZES



Boring No.	Sample No.	Symbol	USCS	% Gravel	% Sand	% Fines
P-5	S-6 @ 30'	○	Olive Gray, Sandy Lean Clay (CL)	0.0	43.5	56.5

PARTICLE-SIZE ANALYSIS OF SOILS

(ASTM D422)

HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

Client: LADWP
Project Name: Owens Lake
Project No.: ---

HAI Project No.: LADWP-15-001
Tested by: KL/SE
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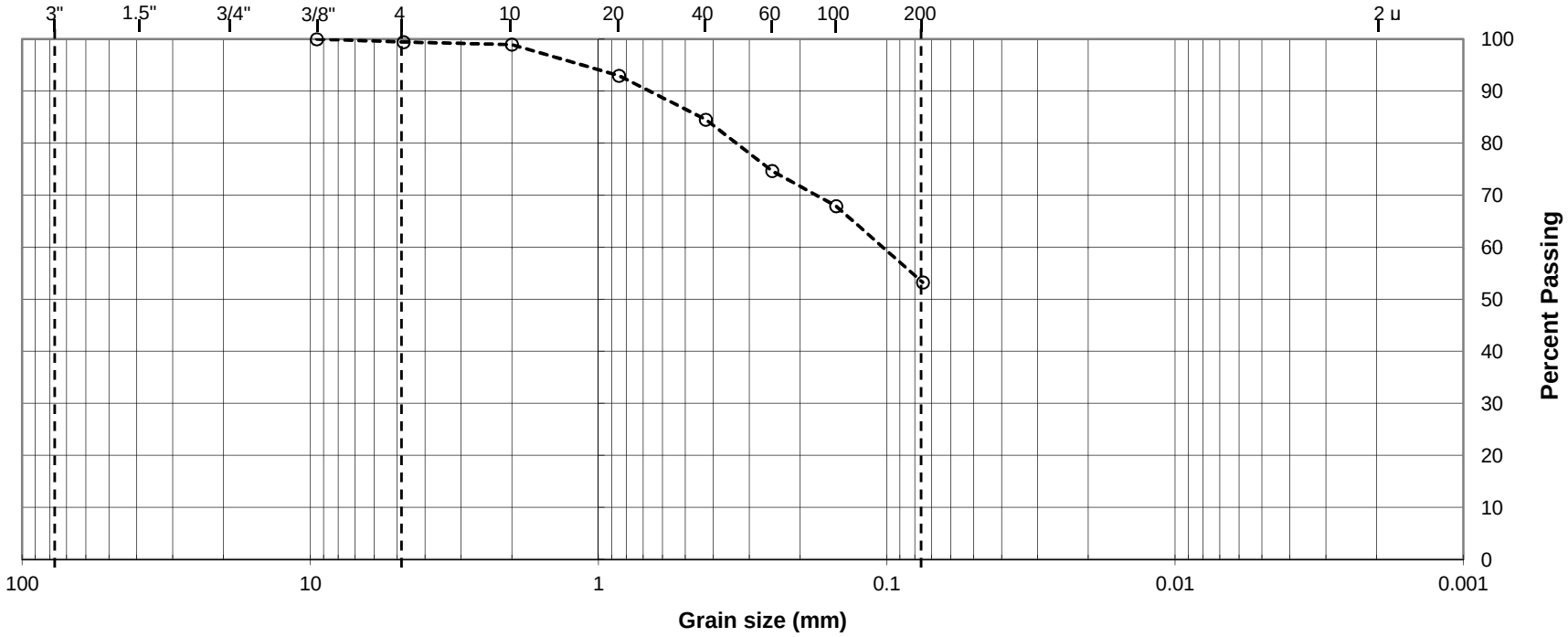
Date: 5/11/2015

COBBLES	GRAVEL		SAND			SILT AND CLAY
	Coarse	Fine	Coarse	Medium	Fine	

U.S. STANDARD SIEVE SIZES



Boring No.	Sample No.	Symbol	USCS	% Gravel	% Sand	% Fines
P-5	S-7 @ 35'	○	Olive Brown, Sandy Lean Clay (CL)	0.6	46.2	53.2

HUSHMAND ASSOCIATES, INC.
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PARTICLE-SIZE ANALYSIS OF SOILS

(ASTM D422)

Client: LADWP
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Project No.: ---

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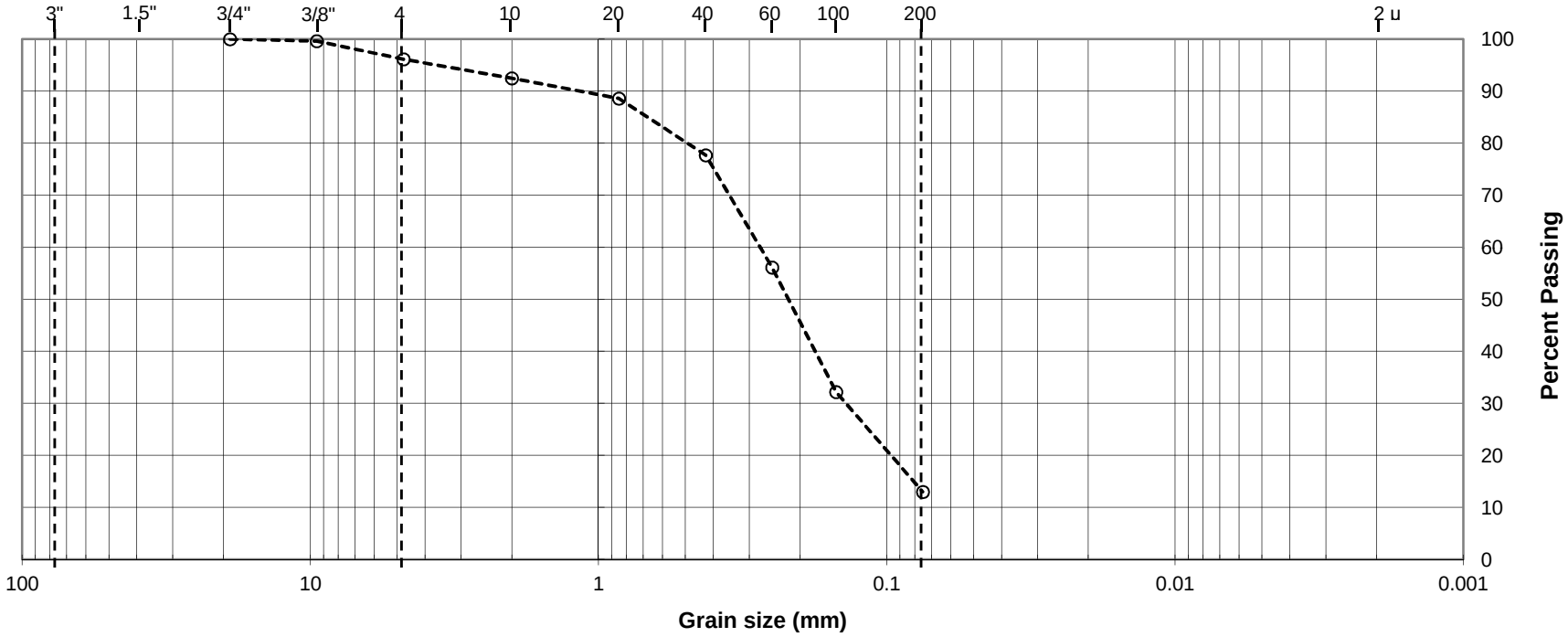
Date: 5/11/2015

COBBLES	GRAVEL		SAND			SILT AND CLAY
	Coarse	Fine	Coarse	Medium	Fine	

U.S. STANDARD SIEVE SIZES



Boring No.	Sample No.	Symbol	USCS	% Gravel	% Sand	% Fines
P-5a	S-1 @ 5'	○	Brown, Silty Sand (SM)	3.9	83.2	12.9

HUSHMAND ASSOCIATES, INC.
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PARTICLE-SIZE ANALYSIS OF SOILS

(ASTM D422)

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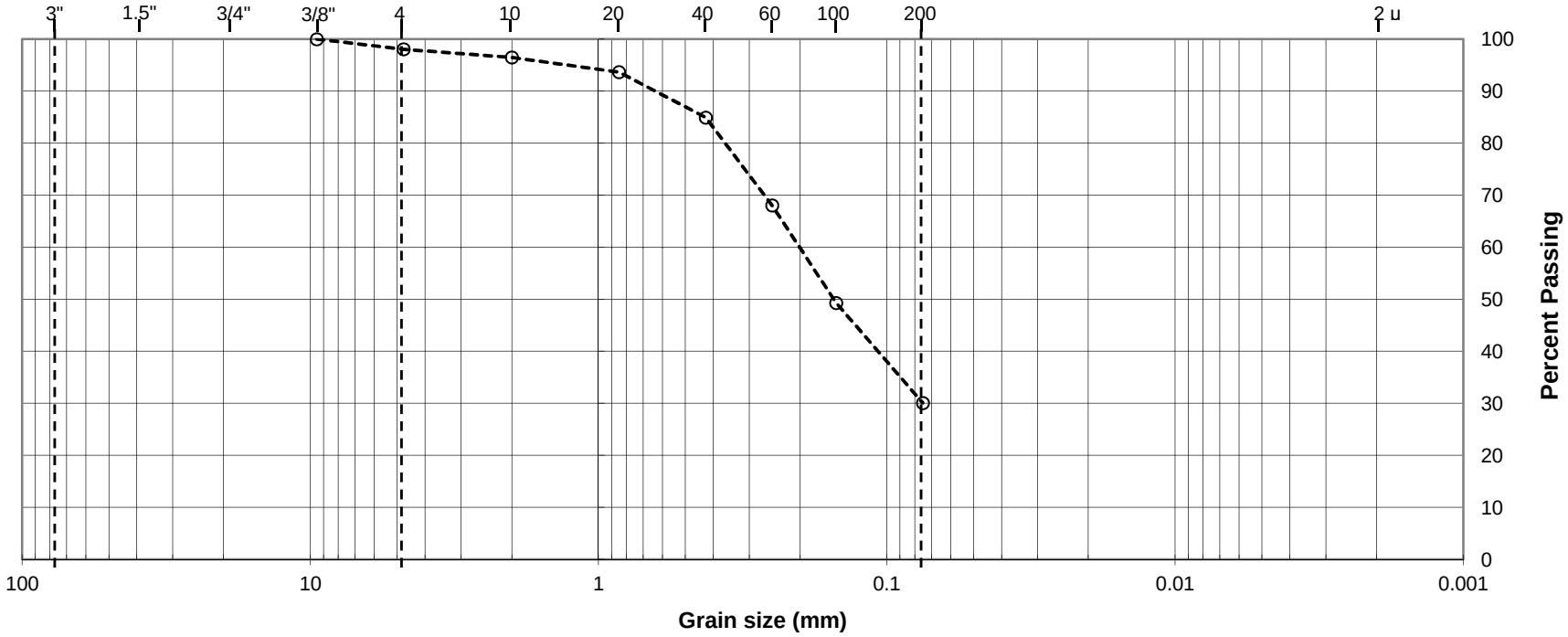
COBBLES	GRAVEL		SAND			SILT AND CLAY
	Coarse	Fine	Coarse	Medium	Fine	

U.S. STANDARD SIEVE SIZES



Boring No.	Sample No.	Symbol	USCS	% Gravel	% Sand	% Fines
P-5a	S-2 @ 10'	○	Olive, Clayey Sand (SC)	1.9	68.0	30.1

HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

PARTICLE-SIZE ANALYSIS OF SOILS

(ASTM D422)

Client: LADWP
Project Name: Owens Lake
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HAI Project No.: LADWP-15-001
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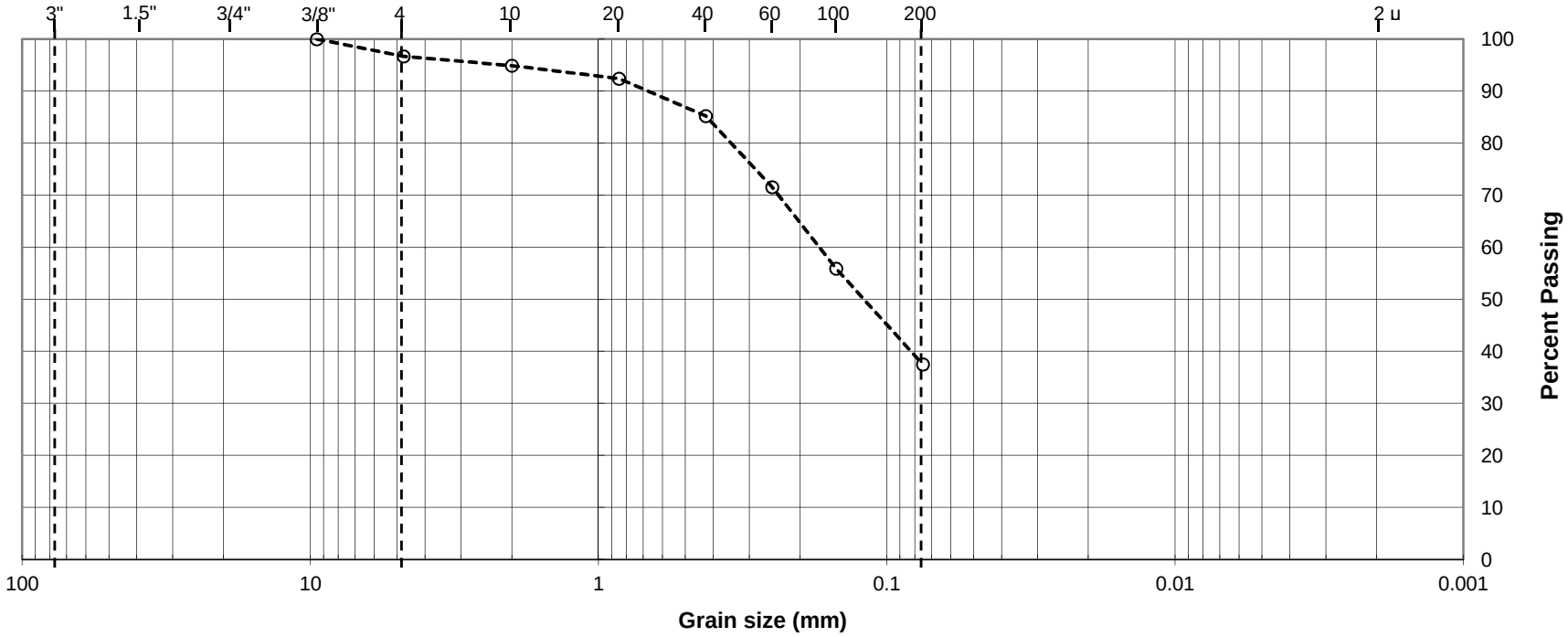
COBBLES	GRAVEL		SAND			SILT AND CLAY
	Coarse	Fine	Coarse	Medium	Fine	

U.S. STANDARD SIEVE SIZES



Boring No.	Sample No.	Symbol	USCS	% Gravel	% Sand	% Fines
P-5a	S-3 @ 15'	○	Olive, Clayey Sand (SC)	3.3	59.2	37.5

HUSHMAND ASSOCIATES, INC.
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PARTICLE-SIZE ANALYSIS OF SOILS

(ASTM D422)

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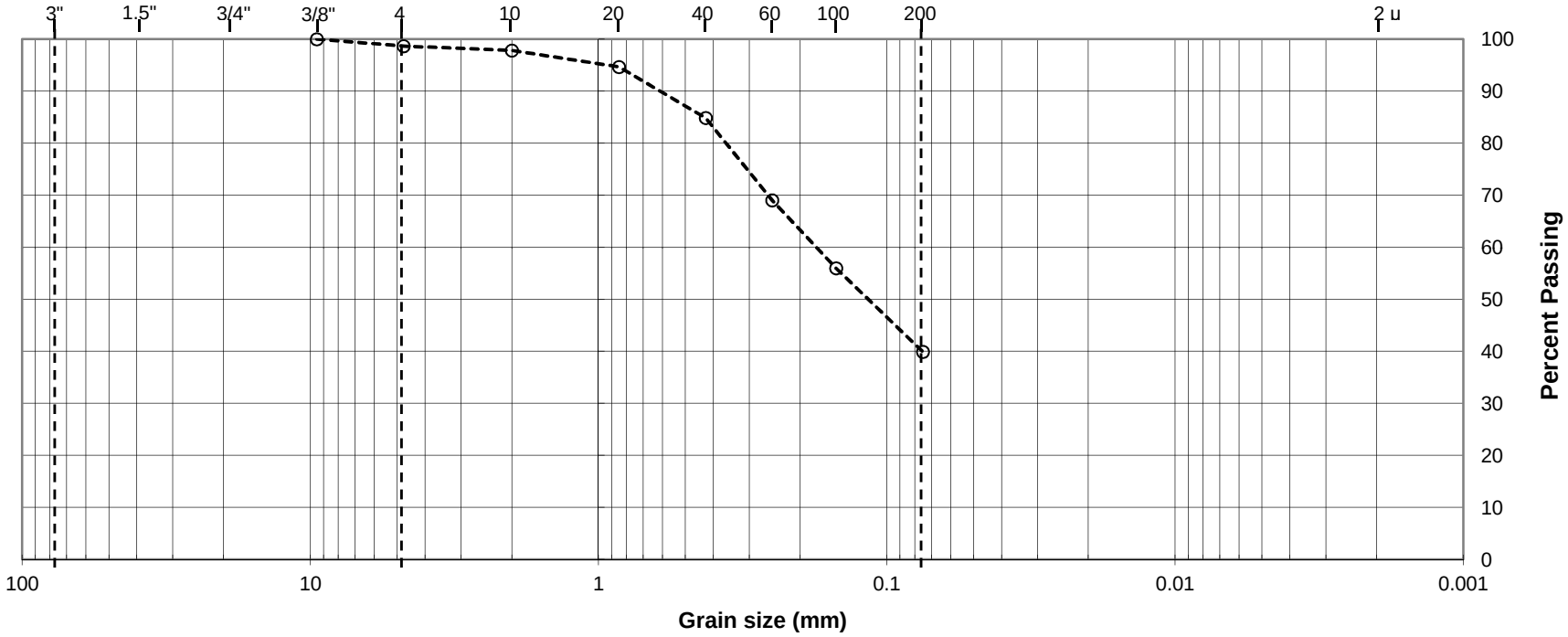
COBBLES	GRAVEL		SAND			SILT AND CLAY
	Coarse	Fine	Coarse	Medium	Fine	

U.S. STANDARD SIEVE SIZES



Boring No.	Sample No.	Symbol	USCS	% Gravel	% Sand	% Fines
P-5a	S-4 @ 20'	○	Light Olive Brown, Clayey Sand (SC)	1.3	58.8	39.9

HUSHMAND ASSOCIATES, INC.
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PARTICLE-SIZE ANALYSIS OF SOILS

(ASTM D422)

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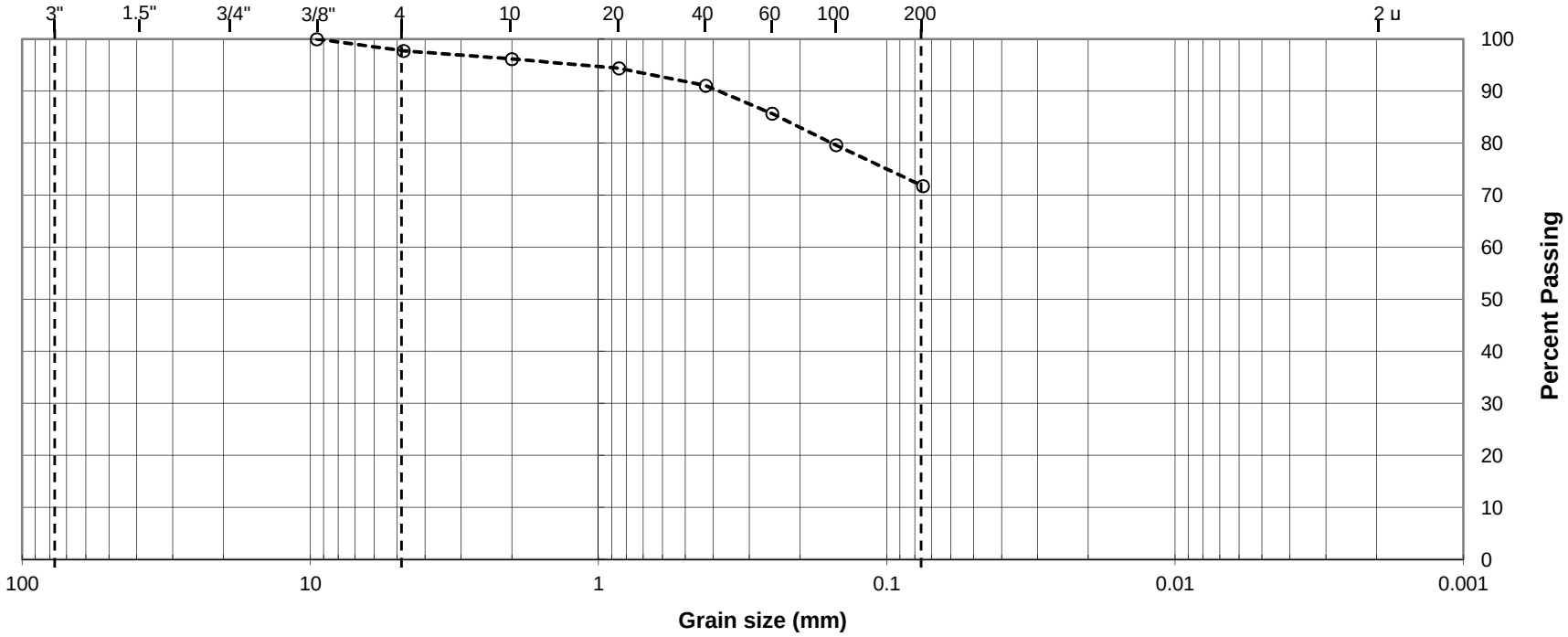
COBBLES	GRAVEL		SAND			SILT AND CLAY
	Coarse	Fine	Coarse	Medium	Fine	

U.S. STANDARD SIEVE SIZES



Boring No.	Sample No.	Symbol	USCS	% Gravel	% Sand	% Fines
P-5a	S-5 @ 25'	○	Olive Gray, Lean Clay with Sand (CL)	2.2	26.0	71.8

HUSHMAND ASSOCIATES, INC.
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PARTICLE-SIZE ANALYSIS OF SOILS

(ASTM D422)

Client: LADWP
Project Name: Owens Lake
Project No.: ---

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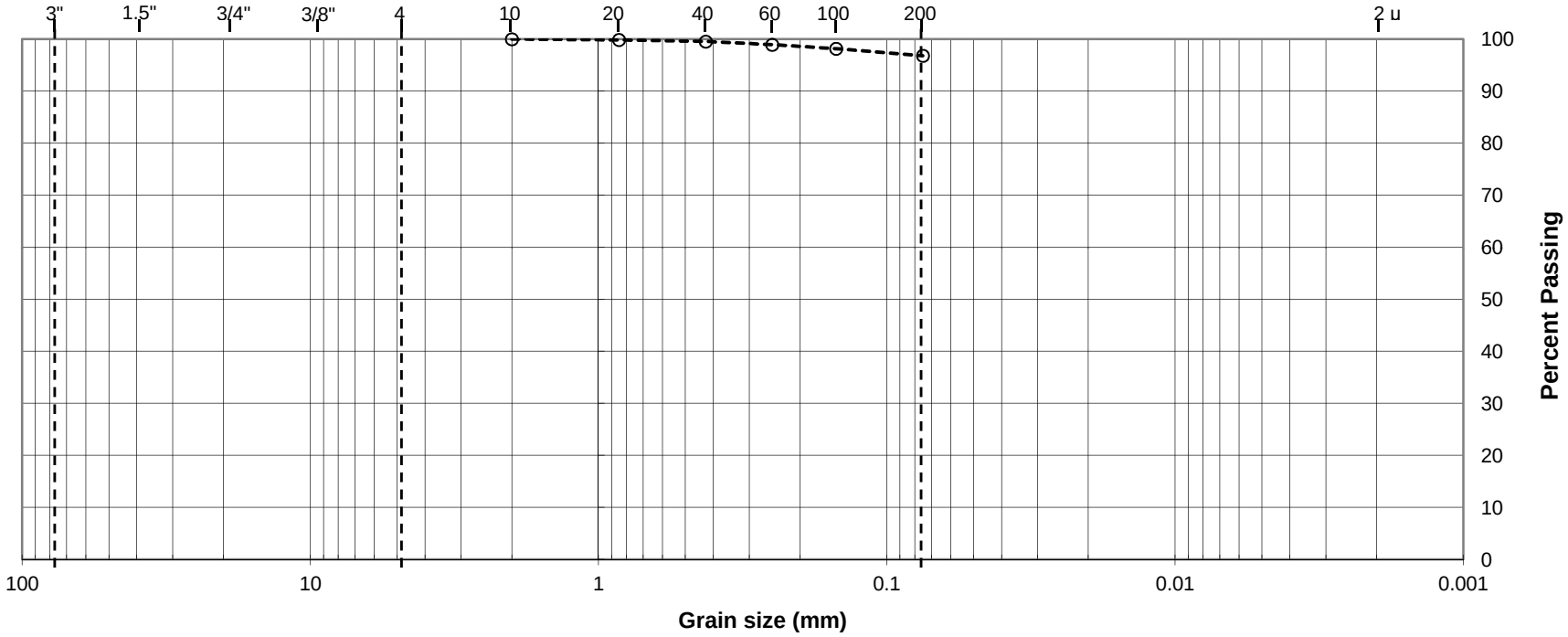
COBBLES	GRAVEL		SAND			SILT AND CLAY
	Coarse	Fine	Coarse	Medium	Fine	

U.S. STANDARD SIEVE SIZES



Boring No.	Sample No.	Symbol	USCS	% Gravel	% Sand	% Fines
P-5a	S-6 @ 30'	○	Olive Gray, Lean Clay (CL)	0.0	3.2	96.8

HUSHMAND ASSOCIATES, INC.
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PARTICLE-SIZE ANALYSIS OF SOILS

(ASTM D422)

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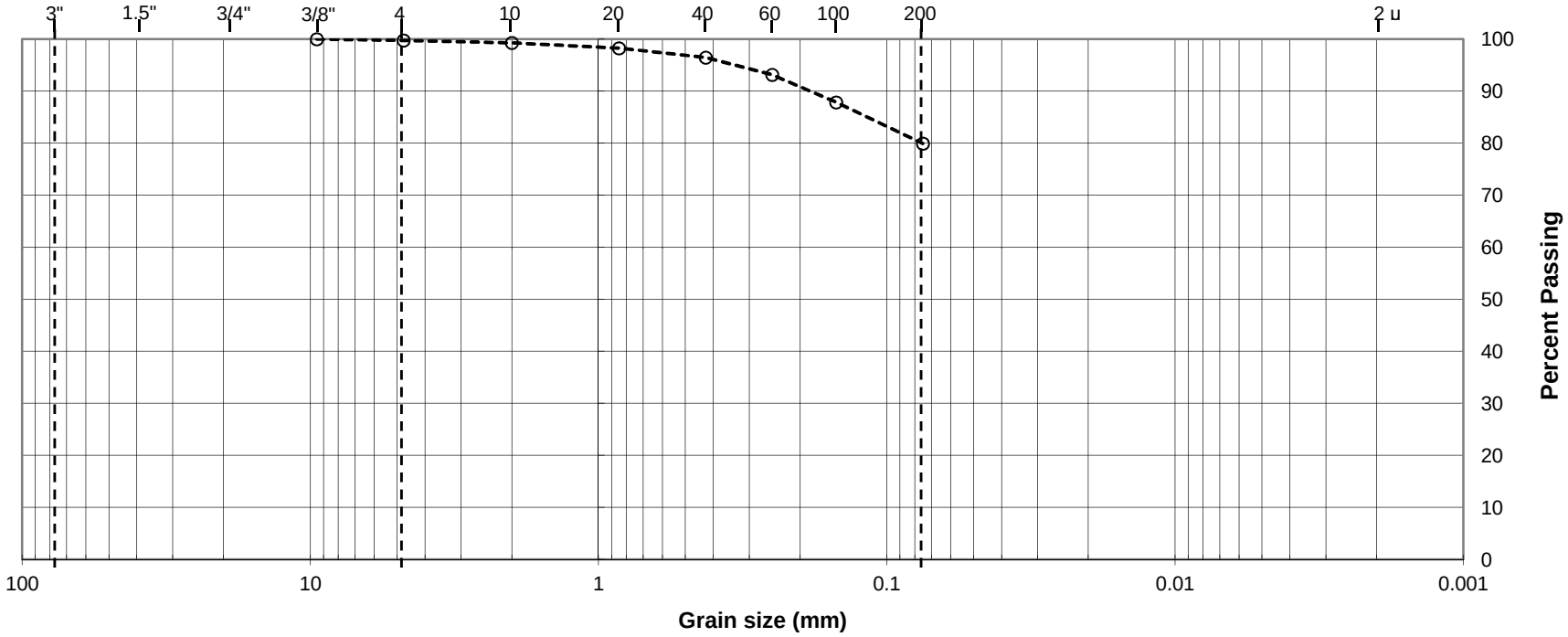
COBBLES	GRAVEL		SAND			SILT AND CLAY
	Coarse	Fine	Coarse	Medium	Fine	

U.S. STANDARD SIEVE SIZES



Boring No.	Sample No.	Symbol	USCS	% Gravel	% Sand	% Fines
P-5a	S-7 @ 32'	○	Olive Gray, Lean Clay with Sand (CL)	0.2	19.8	79.9

PARTICLE-SIZE ANALYSIS OF SOILS

(ASTM D422)

HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

Client: LADWP
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Project No.: ---

HAI Project No.: LADWP-15-001
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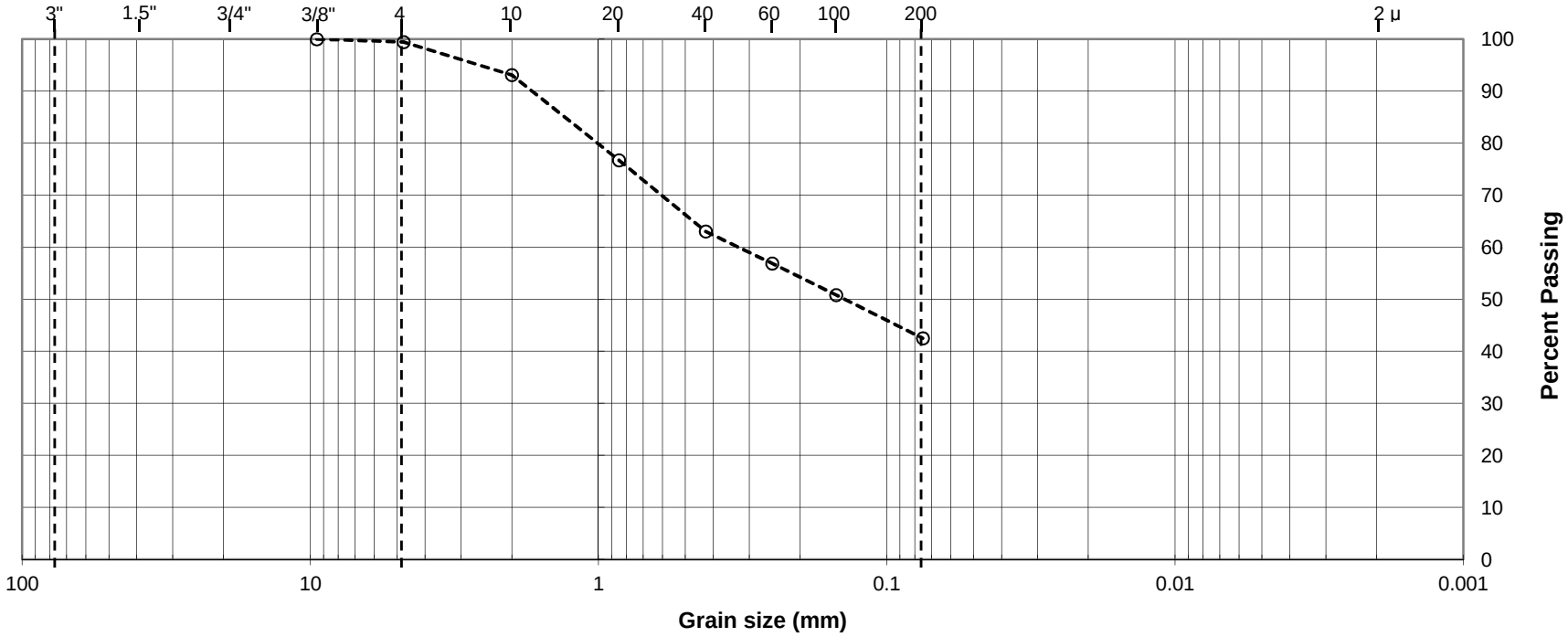
COBBLES	GRAVEL		SAND			SILT AND CLAY
	Coarse	Fine	Coarse	Medium	Fine	

U.S. STANDARD SIEVE SIZES



Boring No.	Sample No.	Symbol	USCS	% Gravel	% Sand	% Fines
P-6	S-1 @ 5'	○	Olive Gray, Silty Sand (SM)	0.5	57.0	42.5

HUSHMAND ASSOCIATES, INC.
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PARTICLE-SIZE ANALYSIS OF SOILS

(ASTM D422)

Client: LADWP
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Project No.: ---

HAI Project No.: LADWP-15-001
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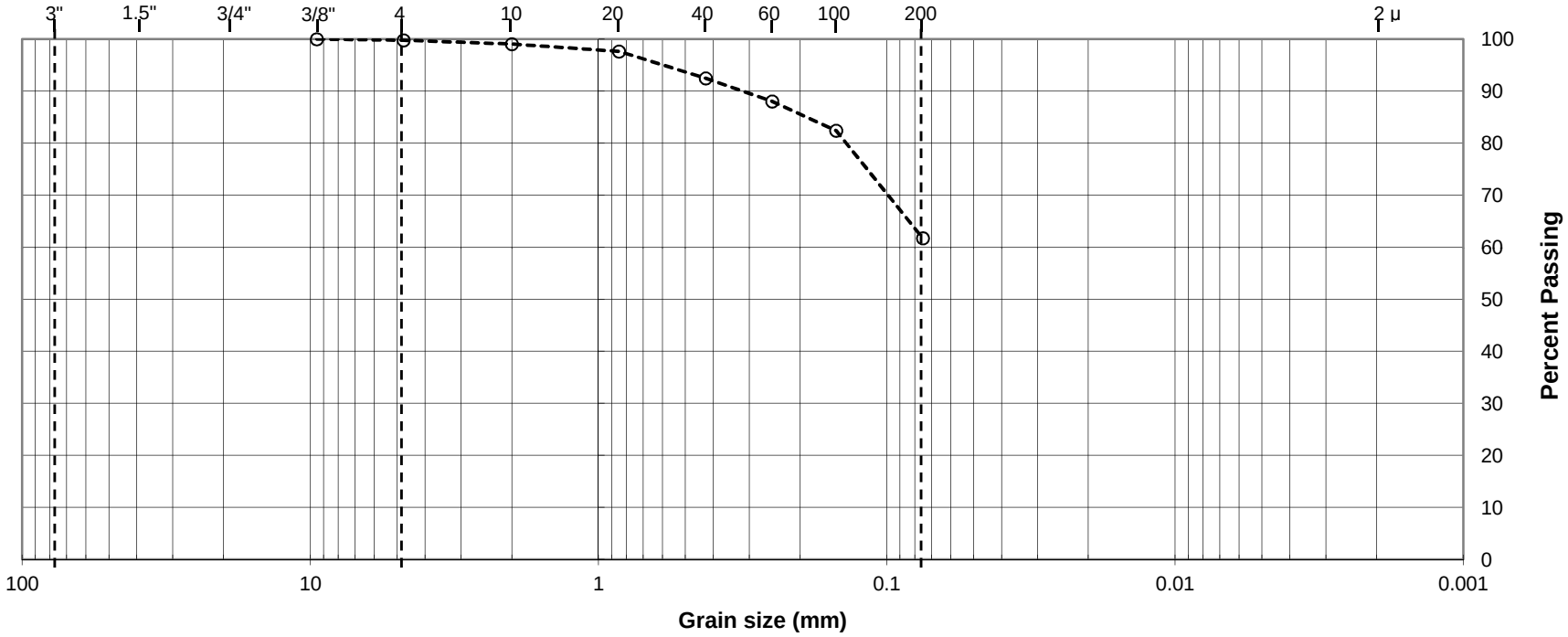
COBBLES	GRAVEL		SAND			SILT AND CLAY
	Coarse	Fine	Coarse	Medium	Fine	

U.S. STANDARD SIEVE SIZES



Boring No.	Sample No.	Symbol	USCS	% Gravel	% Sand	% Fines
P-6	S-2 @ 10'	○	Light Olive Gray, Sandy Silt (ML)	0.2	38.1	61.7

HUSHMAND ASSOCIATES, INC.
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PARTICLE-SIZE ANALYSIS OF SOILS

(ASTM D422)

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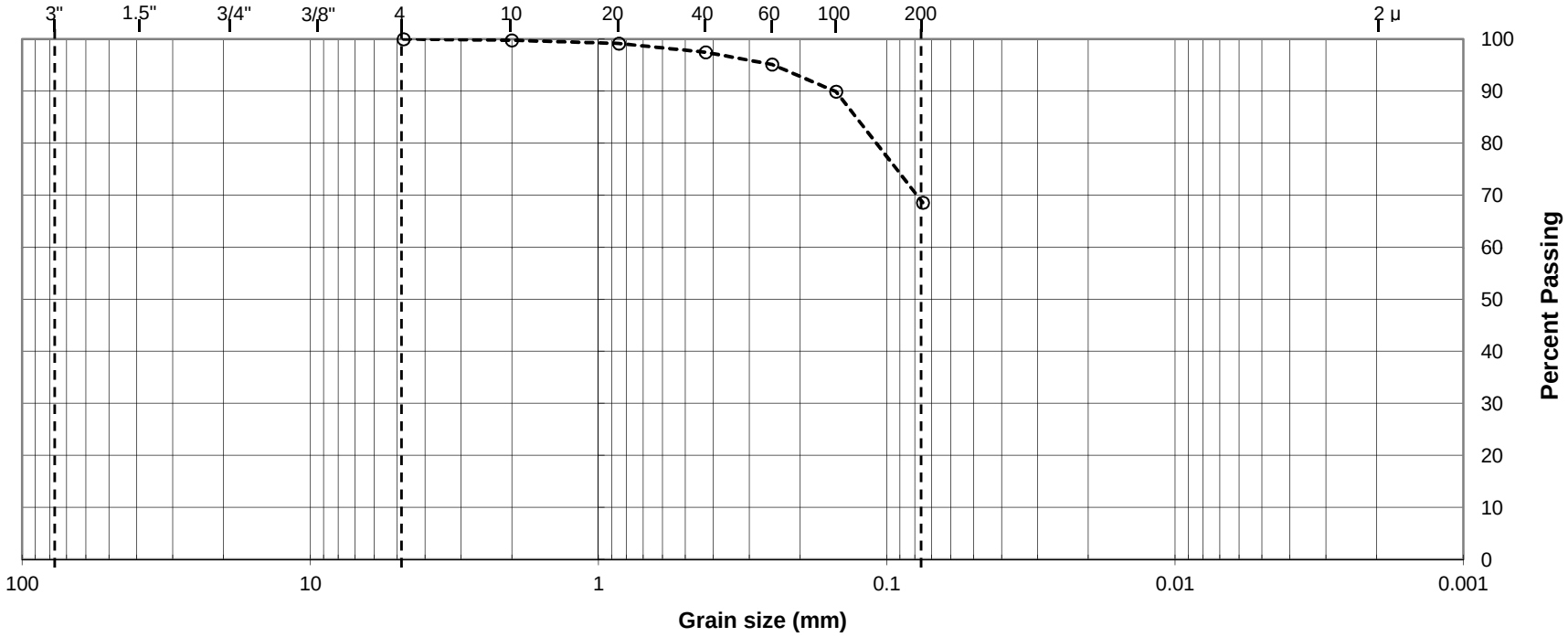
COBBLES	GRAVEL		SAND			SILT AND CLAY
	Coarse	Fine	Coarse	Medium	Fine	

U.S. STANDARD SIEVE SIZES



Boring No.	Sample No.	Symbol	USCS	% Gravel	% Sand	% Fines
P-6	S-3 @ 15'	○	Light Olive Gray, Sandy Silt (ML)	0.0	31.4	68.6

HUSHMAND ASSOCIATES, INC.
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PARTICLE-SIZE ANALYSIS OF SOILS

(ASTM D422)

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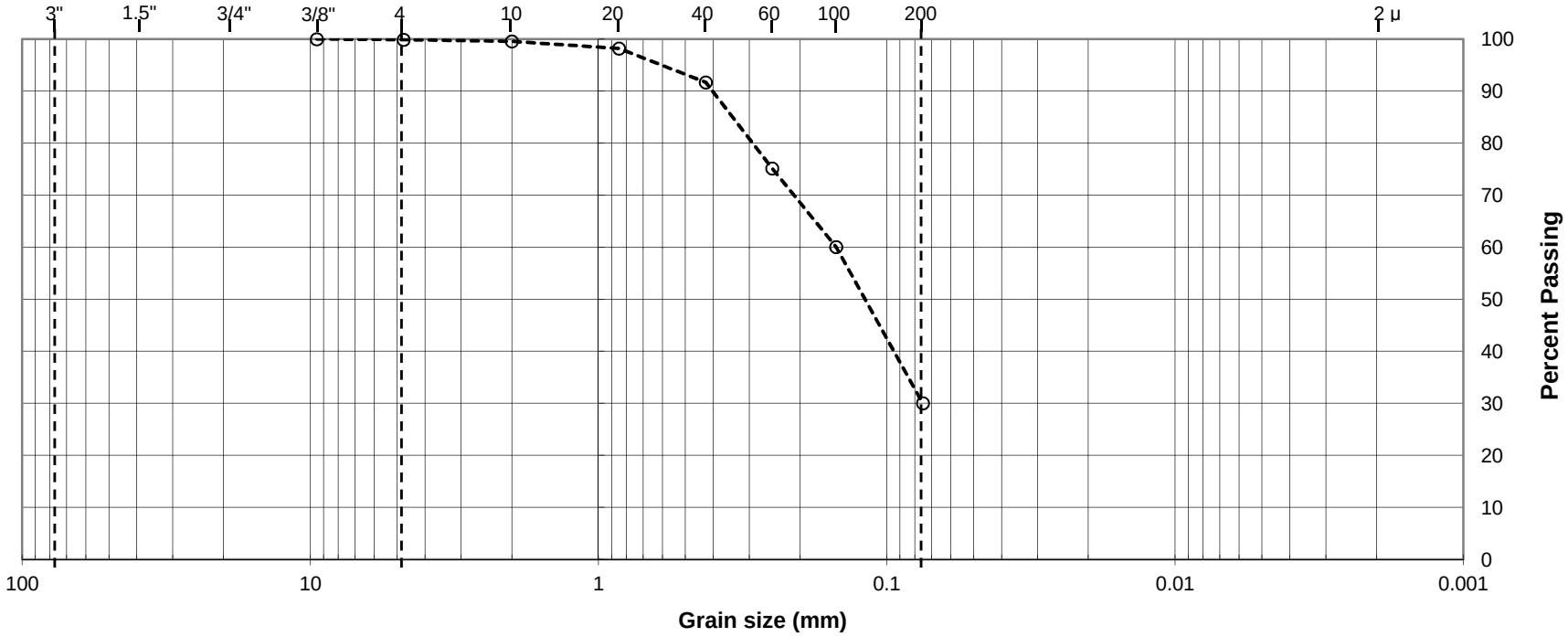
COBBLES	GRAVEL		SAND			SILT AND CLAY
	Coarse	Fine	Coarse	Medium	Fine	

U.S. STANDARD SIEVE SIZES



Boring No.	Sample No.	Symbol	USCS	% Gravel	% Sand	% Fines
P-6	S-4 @ 20'	○	Dark Olive Gray, Silty Sand (SM)	0.1	69.9	30.0

HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

PARTICLE-SIZE ANALYSIS OF SOILS

(ASTM D422)

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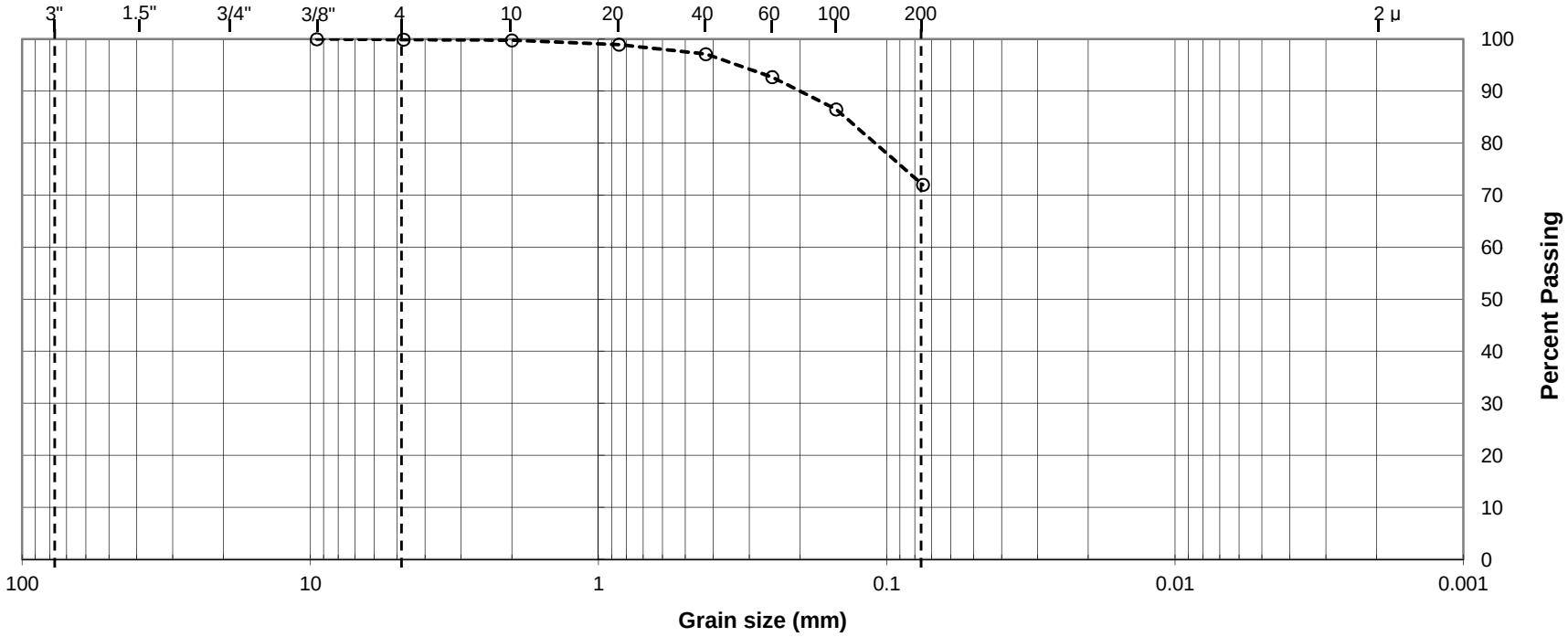
COBBLES	GRAVEL		SAND			SILT AND CLAY
	Coarse	Fine	Coarse	Medium	Fine	

U.S. STANDARD SIEVE SIZES



Boring No.	Sample No.	Symbol	USCS	% Gravel	% Sand	% Fines
P-6	S-5 @ 25'	○	Olive, Silt with Sand (ML)	0.1	27.9	72.0

PARTICLE-SIZE ANALYSIS OF SOILS

(ASTM D422)

HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

Client: LADWP
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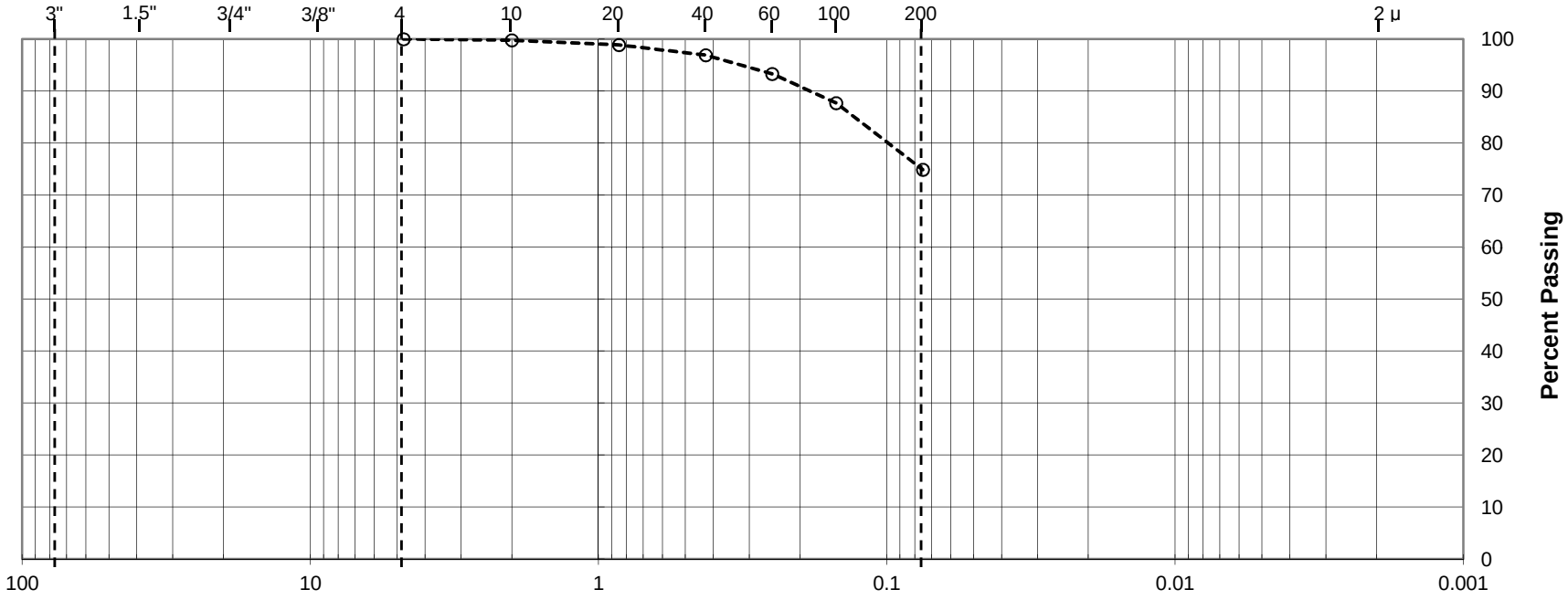
COBBLES	GRAVEL		SAND			SILT AND CLAY
	Coarse	Fine	Coarse	Medium	Fine	

U.S. STANDARD SIEVE SIZES



Boring No.	Sample No.	Symbol	USCS	% Gravel	% Sand	% Fines
P-6	S-6 @ 30'	○	Olive, Silt with Sand (ML)	0.0	25.1	74.9

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PARTICLE-SIZE ANALYSIS OF SOILS

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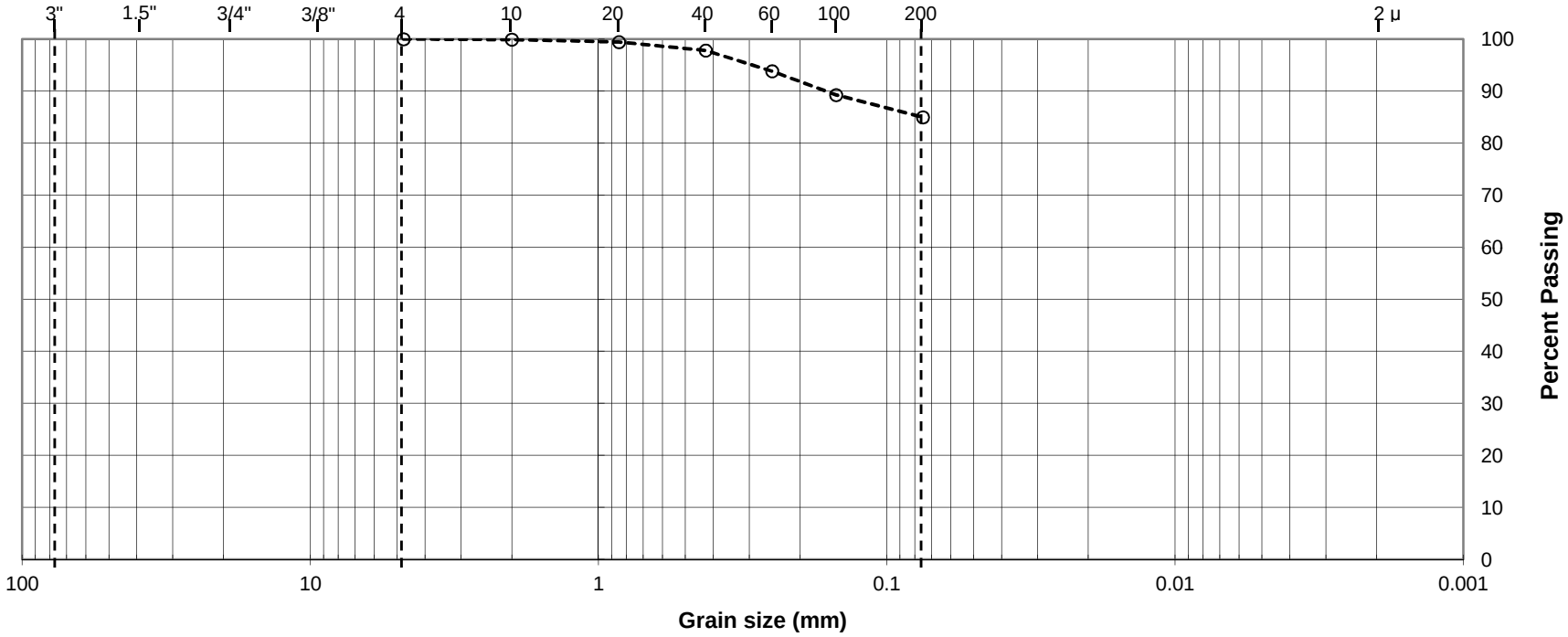
COBBLES	GRAVEL		SAND			SILT AND CLAY
	Coarse	Fine	Coarse	Medium	Fine	

U.S. STANDARD SIEVE SIZES



Boring No.	Sample No.	Symbol	USCS	% Gravel	% Sand	% Fines
P-7	S-1 @ 5'	○	Light Olive, Silt with Sand (ML)	0.0	15.0	85.0

HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

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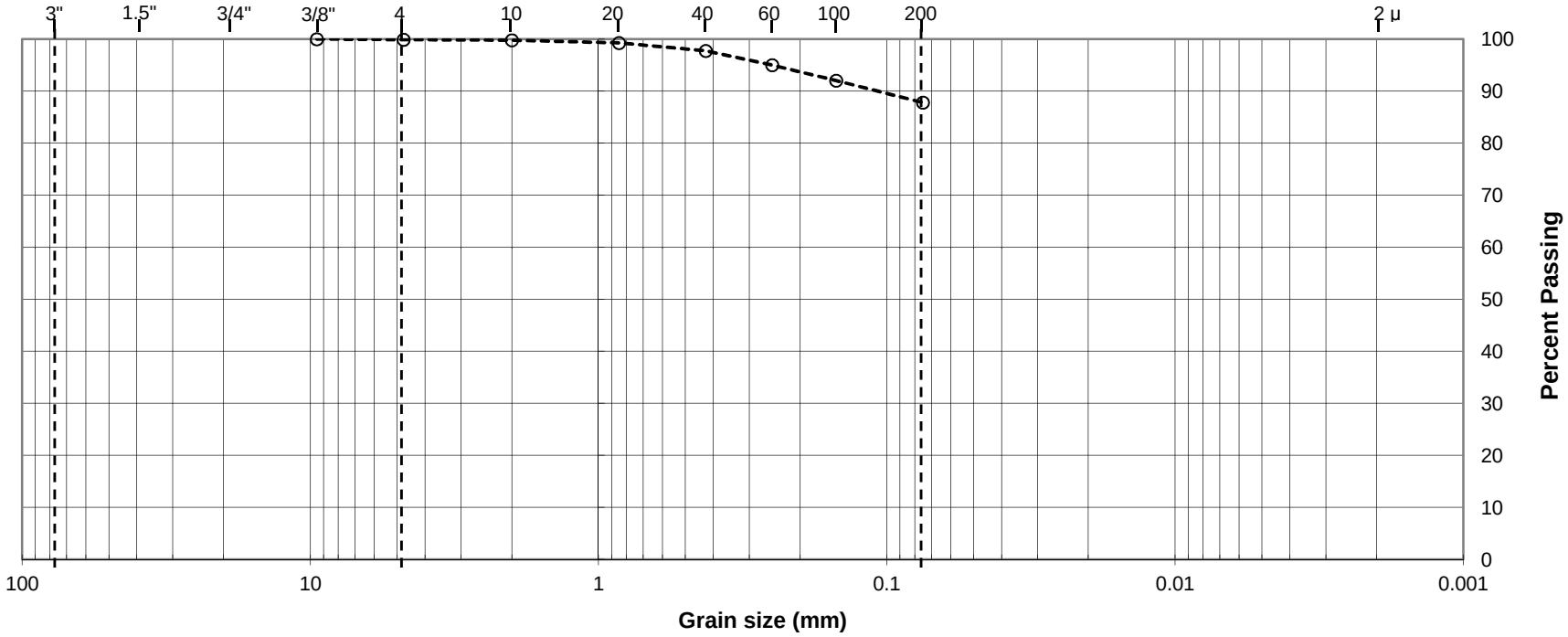
COBBLES	GRAVEL		SAND			SILT AND CLAY
	Coarse	Fine	Coarse	Medium	Fine	

U.S. STANDARD SIEVE SIZES



Boring No.	Sample No.	Symbol	USCS	% Gravel	% Sand	% Fines
P-7	S-2 @ 10'	○	Olive, Silty Clay (CL-ML)	0.1	12.1	87.8

HUSHMAND ASSOCIATES, INC.
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PARTICLE-SIZE ANALYSIS OF SOILS

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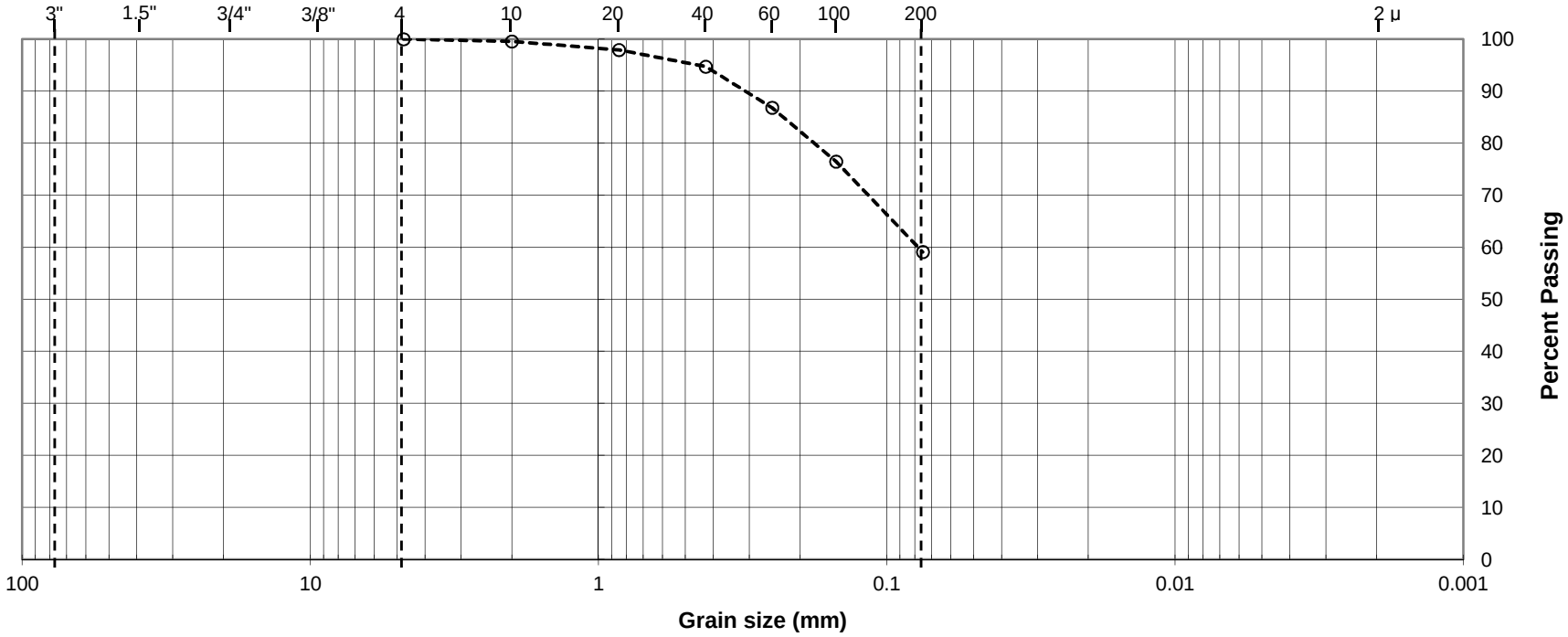
COBBLES	GRAVEL		SAND			SILT AND CLAY
	Coarse	Fine	Coarse	Medium	Fine	

U.S. STANDARD SIEVE SIZES



Boring No.	Sample No.	Symbol	USCS	% Gravel	% Sand	% Fines
P-7	S-3 @ 15'	○	Olive Brown, Sandy Silt (ML)	0.0	40.9	59.1

HUSHMAND ASSOCIATES, INC.
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PARTICLE-SIZE ANALYSIS OF SOILS

(ASTM D422)

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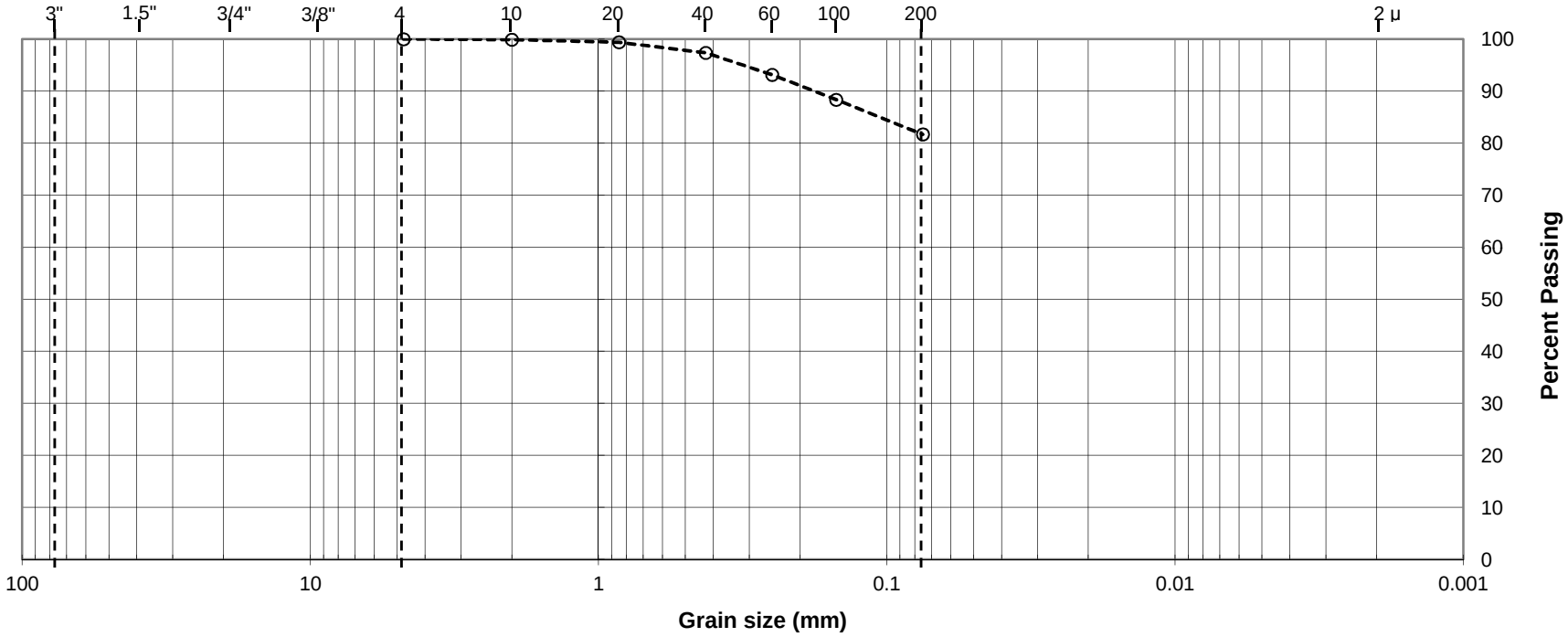
COBBLES	GRAVEL		SAND			SILT AND CLAY
	Coarse	Fine	Coarse	Medium	Fine	

U.S. STANDARD SIEVE SIZES



Boring No.	Sample No.	Symbol	USCS	% Gravel	% Sand	% Fines
P-7	S-4 @ 20'	○	Olive, Silt with Sand (ML)	0.0	18.3	81.7

HUSHMAND ASSOCIATES, INC.
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PARTICLE-SIZE ANALYSIS OF SOILS

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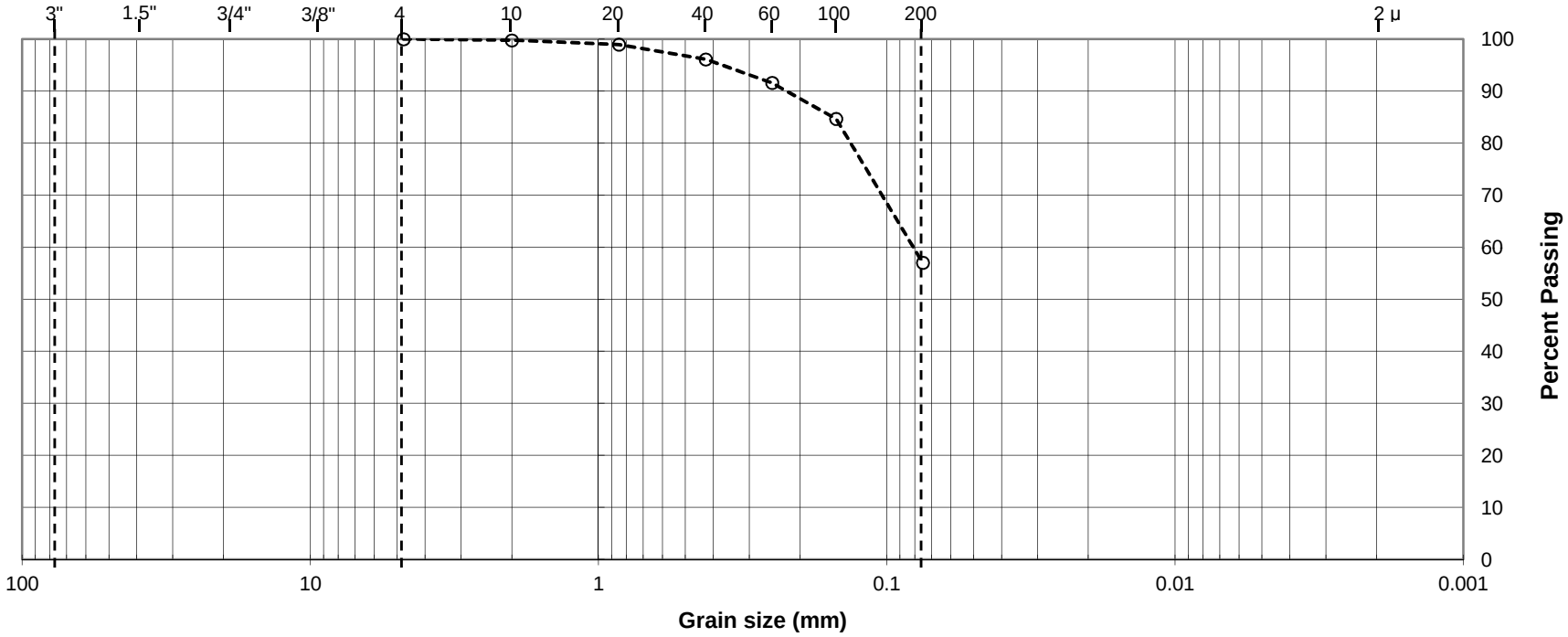
COBBLES	GRAVEL		SAND			SILT AND CLAY
	Coarse	Fine	Coarse	Medium	Fine	

U.S. STANDARD SIEVE SIZES



Boring No.	Sample No.	Symbol	USCS	% Gravel	% Sand	% Fines
P-7	S-5 @ 25'	○	Olive Gray, Sandy Silt (ML)	0.0	43.0	57.0

HUSHMAND ASSOCIATES, INC.
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PARTICLE-SIZE ANALYSIS OF SOILS

(ASTM D422)

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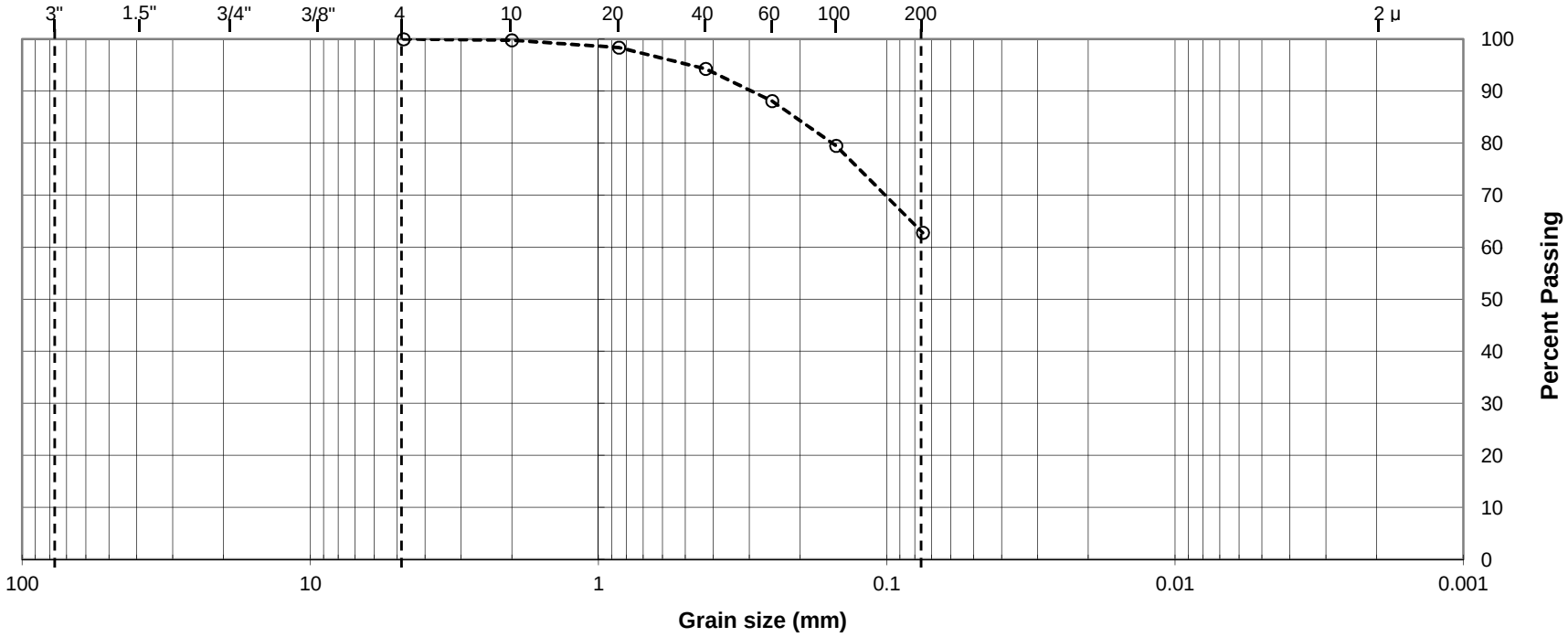
COBBLES	GRAVEL		SAND			SILT AND CLAY
	Coarse	Fine	Coarse	Medium	Fine	

U.S. STANDARD SIEVE SIZES



Boring No.	Sample No.	Symbol	USCS	% Gravel	% Sand	% Fines
P-7	S-6 @ 30'	○	Olive Brown, Sandy Silt (ML)	0.0	37.2	62.8

HUSHMAND ASSOCIATES, INC.
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PARTICLE-SIZE ANALYSIS OF SOILS

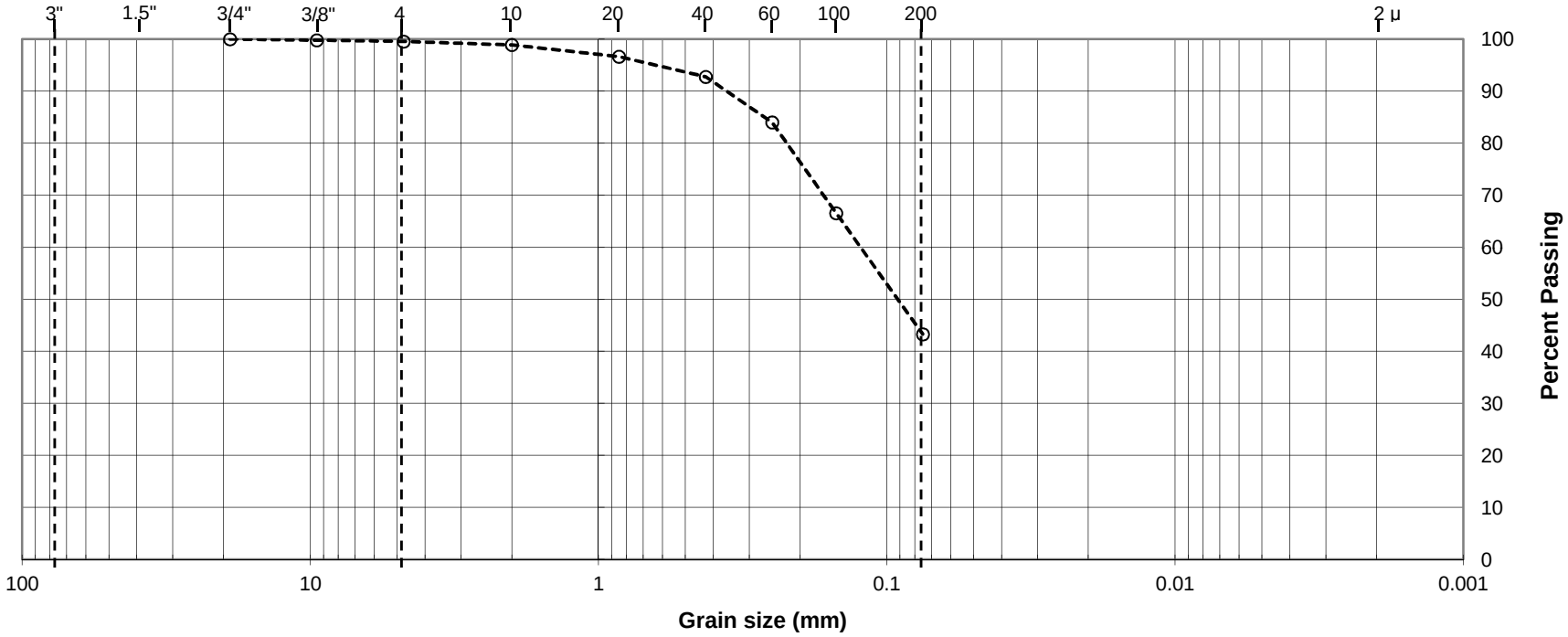
(ASTM D422)

Client: LADWP
Project Name: Owens Lake
Project No.: ---

HAI Project No.: LADWP-15-001
Tested by: SE
Checked by: MZ
Date: 6/23/2015

COBBLES	GRAVEL		SAND			SILT AND CLAY
	Coarse	Fine	Coarse	Medium	Fine	

U.S. STANDARD SIEVE SIZES



Boring No.	Sample No.	Symbol	USCS	% Gravel	% Sand	% Fines
P-8	S-1 @ 5'	○	Olive Gray, Silty, Clayey Sand (SC-SM)	0.5	56.3	43.3

PARTICLE-SIZE ANALYSIS OF SOILS

(ASTM D422)

HUSHMAND ASSOCIATES, INC.
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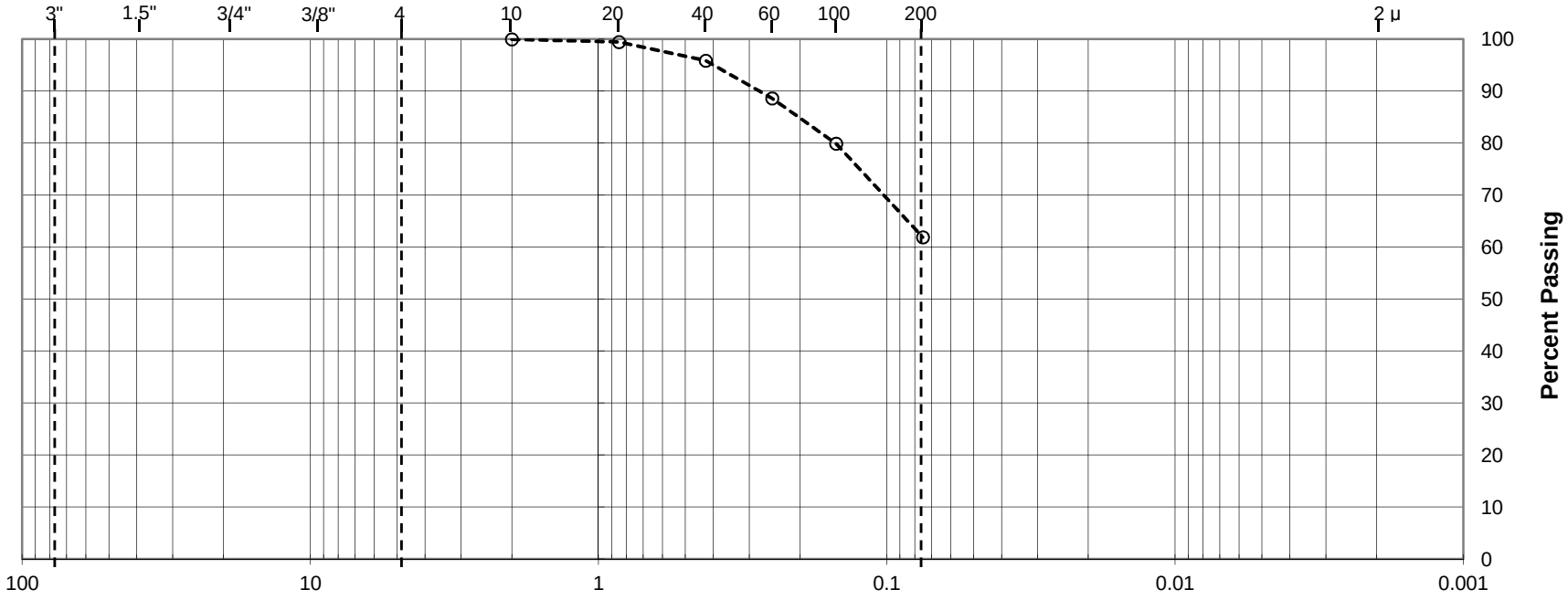
COBBLES	GRAVEL		SAND			SILT AND CLAY
	Coarse	Fine	Coarse	Medium	Fine	

U.S. STANDARD SIEVE SIZES



Boring No.	Sample No.	Symbol	USCS	% Gravel	% Sand	% Fines
P-8	S-2 @ 10'	○	Olive Gray, Sandy Silt (ML)	0.0	38.1	61.9

PARTICLE-SIZE ANALYSIS OF SOILS

(ASTM D422)

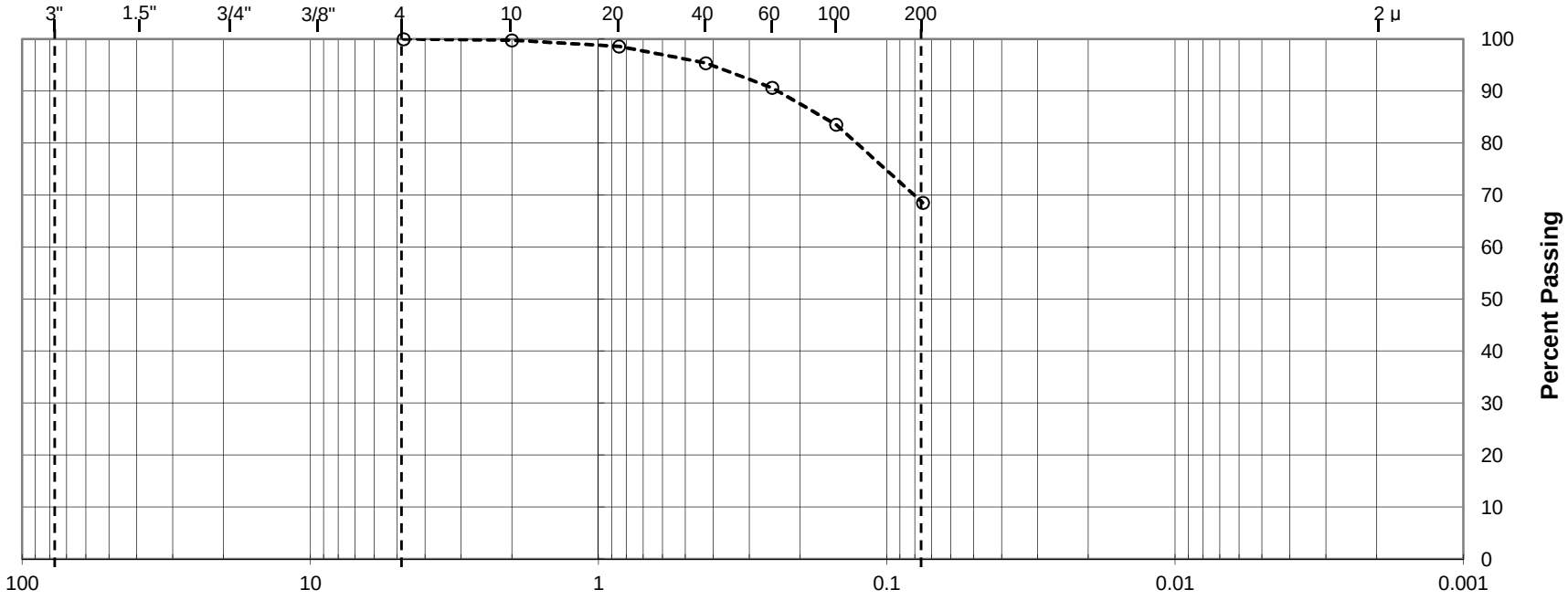
HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

Client: LADWP
Project Name: Owens Lake
Project No.: ---

HAI Project No.: LADWP-15-001
Tested by: SE
Checked by: MZ
Date: 5/11/2015

COBBLES	GRAVEL		SAND			SILT AND CLAY
	Coarse	Fine	Coarse	Medium	Fine	

U.S. STANDARD SIEVE SIZES



Boring No.	Sample No.	Symbol	USCS	% Gravel	% Sand	% Fines
P-8	S-3 @ 15'	○	Olive Gray, Sandy Silt (ML)	0.0	31.5	68.5

HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

PARTICLE-SIZE ANALYSIS OF SOILS

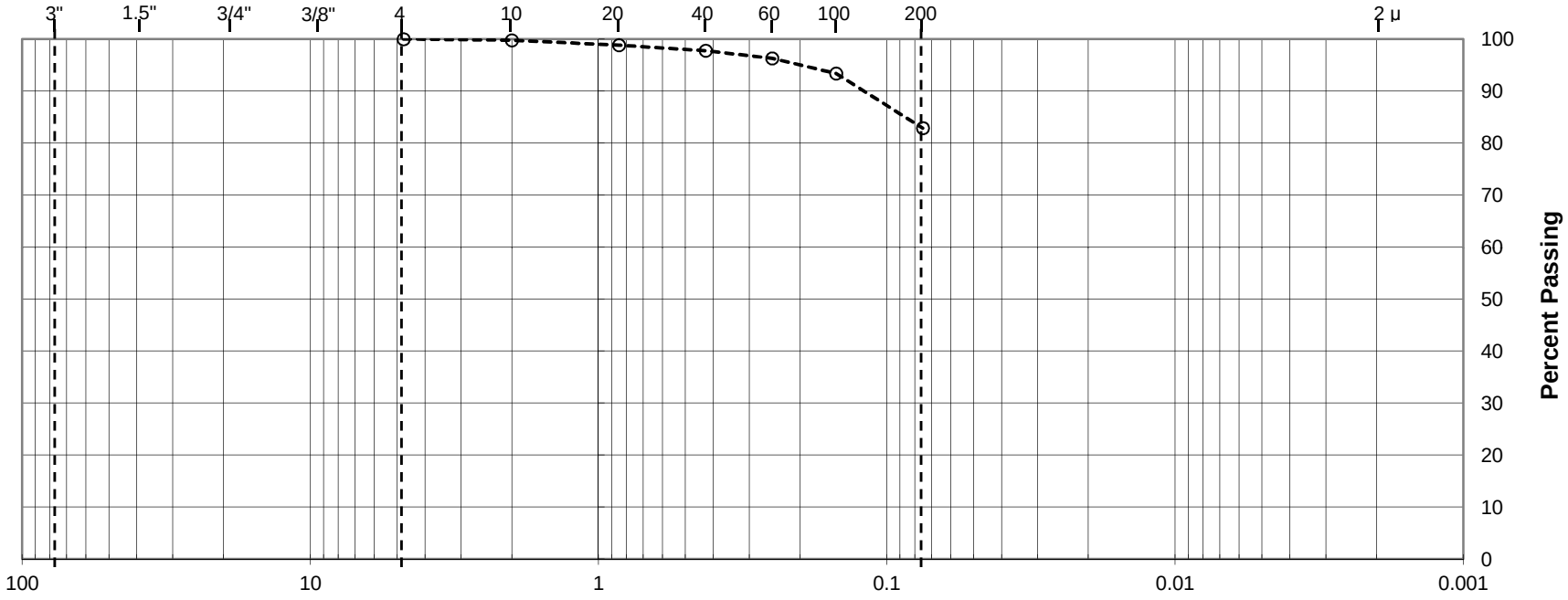
(ASTM D422)

Client: LADWP
Project Name: Owens Lake
Project No.: ---

HAI Project No.: LADWP-15-001
Tested by: SE
Checked by: MZ
Date: 5/11/2015

COBBLES	GRAVEL		SAND			SILT AND CLAY
	Coarse	Fine	Coarse	Medium	Fine	

U.S. STANDARD SIEVE SIZES



Boring No.	Sample No.	Symbol	USCS	% Gravel	% Sand	% Fines
P-8	S-4 @ 20'	○	Olive, Silt with Sand (ML)	0.0	17.1	82.9

PARTICLE-SIZE ANALYSIS OF SOILS

(ASTM D422)

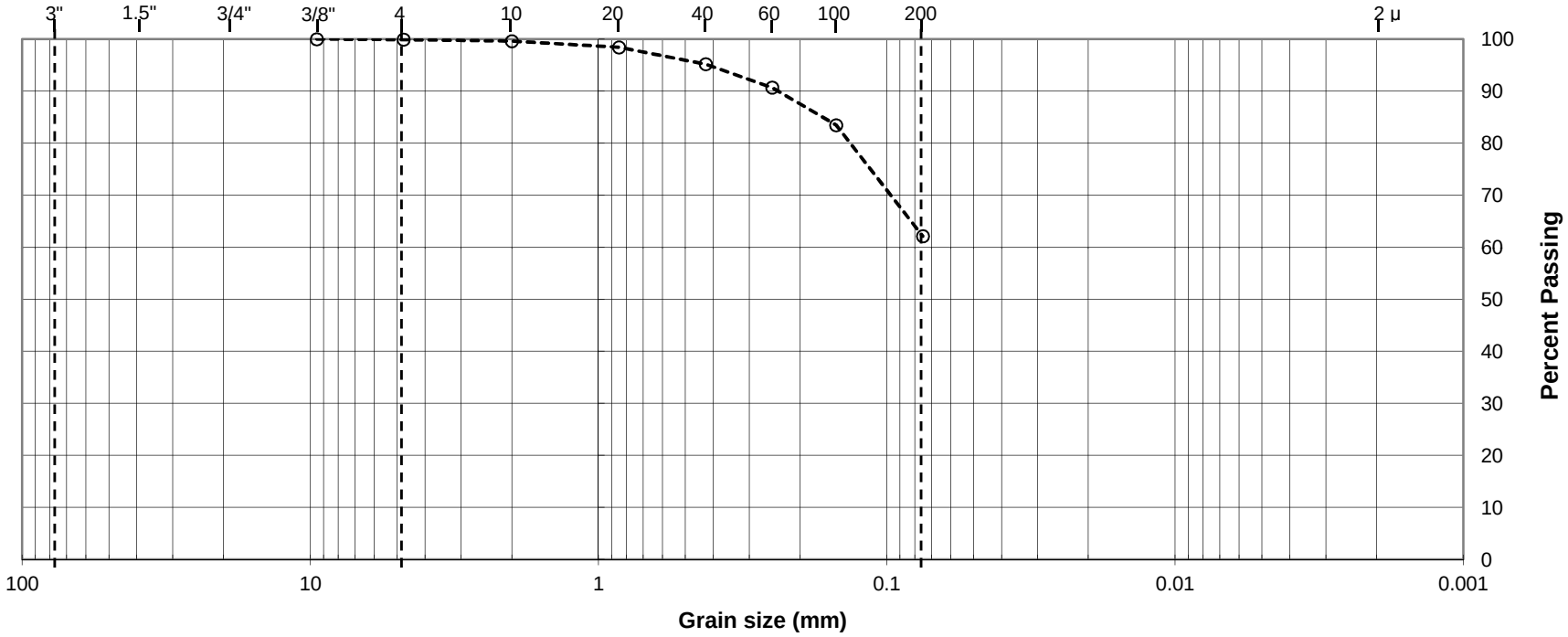
HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

Client: LADWP
Project Name: Owens Lake
Project No.: ---

HAI Project No.: LADWP-15-001
Tested by: SE
Checked by: MZ
Date: 6/23/2015

COBBLES	GRAVEL		SAND			SILT AND CLAY
	Coarse	Fine	Coarse	Medium	Fine	

U.S. STANDARD SIEVE SIZES



Boring No.	Sample No.	Symbol	USCS	% Gravel	% Sand	% Fines
P-8	S-5 @ 25'	○	Olive Gray, Sandy Silty Clay (CL-ML)	0.1	37.8	62.1

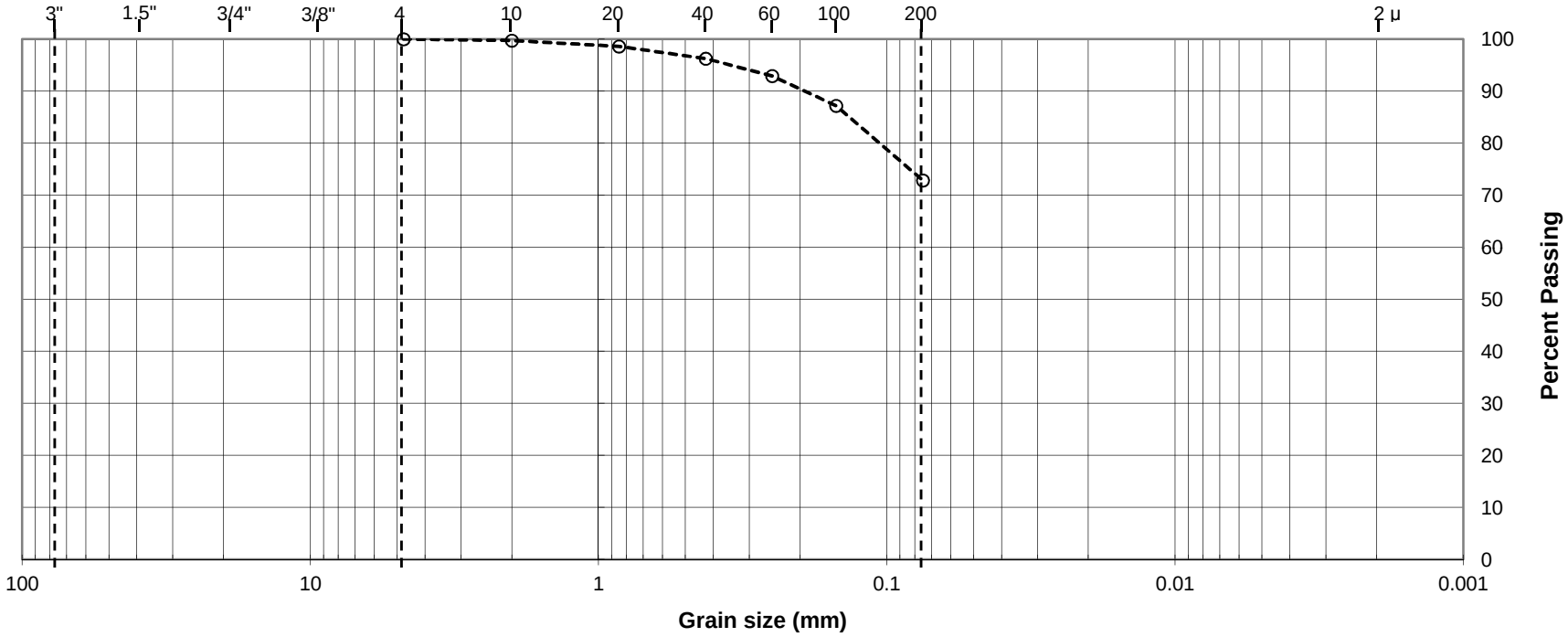
PARTICLE-SIZE ANALYSIS OF SOILS

(ASTM D422)

Client:	LADWP	***HAI Project No.:***	LADWP-15-001
Project Name:	Owens Lake	***Tested by:***	SE
Project No.:	---	***Checked by:***	MZ
		Date:	6/23/2015

COBBLES	GRAVEL		SAND			SILT AND CLAY
	Coarse	Fine	Coarse	Medium	Fine	

U.S. STANDARD SIEVE SIZES



Boring No.	Sample No.	Symbol	USCS	% Gravel	% Sand	% Fines
P-8	S-6 @ 30'	○	Olive Gray, Silty Clay with Sand (CL-ML)	0.0	27.2	72.8

HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

PARTICLE-SIZE ANALYSIS OF SOILS

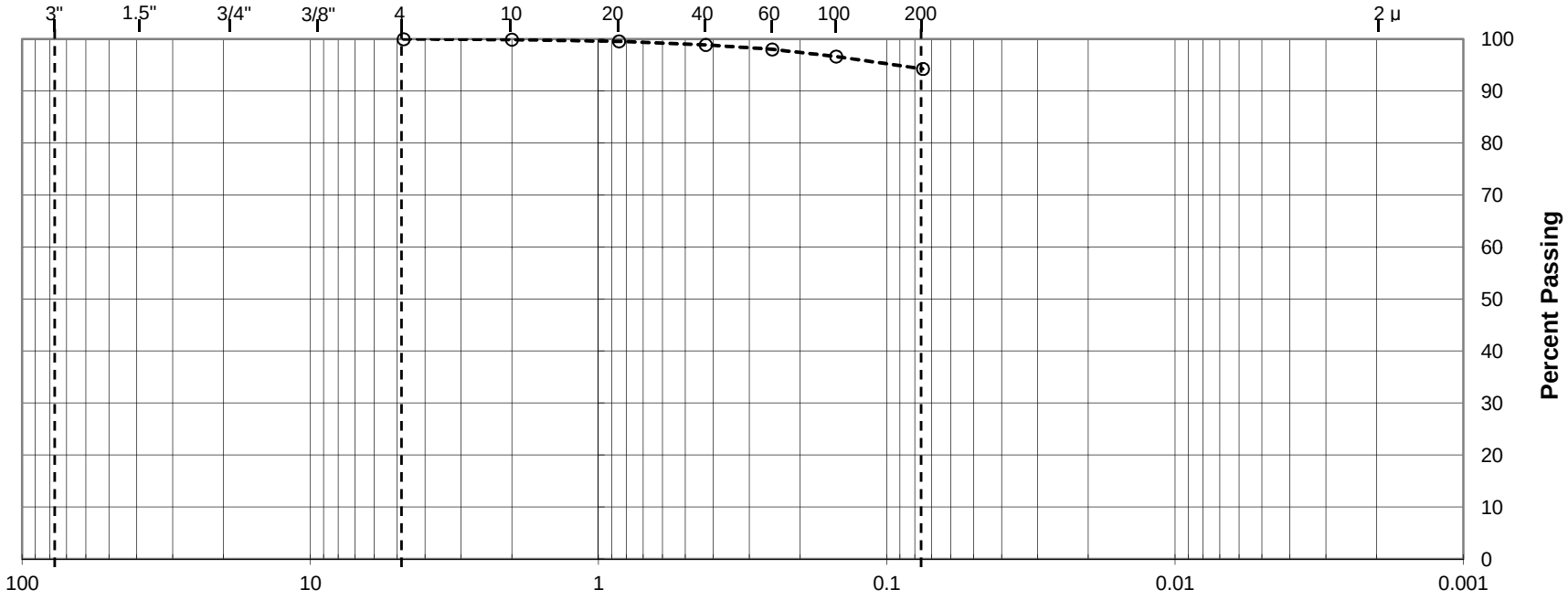
(ASTM D422)

Client: LADWP
Project Name: Owens Lake
Project No.: ---

HAI Project No.: LADWP-15-001
Tested by: SE
Checked by: MZ
Date: 6/23/2015

COBBLES	GRAVEL		SAND			SILT AND CLAY
	Coarse	Fine	Coarse	Medium	Fine	

U.S. STANDARD SIEVE SIZES



Boring No.	Sample No.	Symbol	USCS	% Gravel	% Sand	% Fines
P-8	S-7 @ 33'	○	Olive, Lean Clay (CL)	0.0	5.7	94.3

APPENDIX C

FIELD RECORDS

APPENDIX C1

PIEZOMETER DEVELOPMENT RECORDS

Well Development Data Sheet

Date: 4-22-15

Project: Owens Lake Piezometers

Tech: DWC

Well ID: P8-A

Procedure Data

Time	Temp.	E.C.	pH	Turbidity	DO	Gallons	Notes
Surge Start: 8:15	>>	>>	>>	>>	>>	>>	
Surge Stop: 8:35	>>	>>	>>	>>	>>	>>	
Bail Start 9:40	>>	>>	>>	>>	>>	>>	
~~Pump Start:~~ ~~Bail Stop~~ 9:55	>>	>>	>>	>>	>>	2.5	
Pump Start: 12:42	>>	>>	>>	>>	>>	0	
12:50						2.5	PUMPED TO BOTTOM OF WELL. DTW: 27.55 PUMP IN WELL
12:52							29.91 PUMP OUT OF WELL
13:16							
14:11							26.64 = DTW, NO PUMP.
Pump Stop:							
Q (Vol/Time)							

Total Gals. Purged 5.0

Total Vols. Purged < 1 BV

Final Temp.

Final EC

Final pH

Final Turbidity

Final DO

Well Data

Bore OD:	8"
Casing ID:	2"
Reported Well TD:	32'
Measured Well TD:	32.10'
Depth To Water:	3.01'
Ft./ Water:	29.09'
Factor:	.88/.17
Screen Int. Vol.:	1.76 (2')
Casing Volume:	4.60
1 Volume	6.3 g
Recharge:	F/S

Special Notes for This Well:

SLOW RECHARGING WELL.

4/29/15: OBSERVED ARTESIAN FLOW. INSTALLED PIPING.

Standard Bore Volume Factor Constants for 0.3 Filter Pack Porosity, Schedule 40 PVC:

Casing/Bore Diameter:	Bore Volume Factors:	Casing Volume Factors:
2"/8"	0.88	0.17 Gal/Ft.
4"/8"	1.19	0.66 Gal/Ft.
4"/10"	1.63	0.66 Gal/Ft.
6"/10"	2.16	1.5 Gal/Ft.
6"/12"	3.07	1.5 Gal/Ft.

Well Development Data Sheet

Date: 4-22-15

Project: Owens Lake Piezometers

Tech: DWC

Well ID: P8-B

Procedure Data

Time	Temp.	E.C.	pH	Turbidity	DO	Gallons	Notes
Surge Start: 8:38	>>	>>	>>	>>	>>	>>	
Surge Stop: 8:52	>>	>>	>>	>>	>>	>>	
Bail Start 10:00	>>	>>	>>	>>	>>	>>	
~~Pump Start: BAIL STOP~~ 13:07		>>	>>	>>	>>	1.5	
Pump Start: 13:00	>>	>>	>>	>>	>>	0	DTW 1.9'
13:02	18.4	3989	7.67	225.2	-	2.5	SILTY WATER
13:05	17.2	3591	8.07	63.10	-	5.0	
13:07	17.1	3554	8.07	31.16	-	7.5	
13:09	17.1	3495	8.10	11.36	-	10.0	
13:11	16.8	3523	8.10	5.19	-	12.5	(2.45 = ΔTW @ 13:14)
Pump Stop: 13:12							
Q (Vol/Time)	~1GPM						

Total Gals. Purged 13.5

Total Vols. Purged 5.2

Final Temp. 16.8

Final EC 3523

Final pH 8.10

Final Turbidity 5.19

Final DO —

Well Data

Bore OD:	8"
Casing ID:	2"
Reported Well TD:	12.0'
Measured Well TD:	13.3'
Depth To Water:	2.20'
Ft./ Water:	11.10'
Factor:	.88/.17
Screen Int. Vol.:	0.88 (1')
Casing Volume:	1.71
1 Volume	2.59
Recharge:	(F)/S

Special Notes for This Well:

FAST Recharging Well.

Standard Bore Volume Factor Constants for 0.3 Filter Pack Porosity, Schedule 40 PVC:

Casing/Bore Diameter:	Bore Volume Factors:	Casing Volume Factors:
2"/8"	0.88	0.17 Gal/Ft.
4"/8"	1.19	0.66 Gal/Ft.
4"/10"	1.63	0.66 Gal/Ft.
6"/10"	2.16	1.5 Gal/Ft.
6"/12"	3.07	1.5 Gal/Ft.

Well Development Data Sheet

Date: 4-22-15

Project: Owens Lake Piezometers

Tech: DWC

Well ID: P8-C

Procedure Data

Time	Temp.	E.C.	pH	Turbidity	DO	Gallons	Notes
Surge Start: 9:00	>>	>>	>>	>>	>>	>>	
Surge Stop: 9:10	>>	>>	>>	>>	>>	>>	
Bail Start 10:10	>>	>>	>>	>>	>>	>>	
~~Pump Start:~~ BAIL STOP 10:15	>>	>>	>>	>>	>>	1.2	DTW:
Pump Start: 13:23	>>	>>	>>	>>	>>	~~0~~	1.6
13:25						1.3	Pumped to Bottom (Pump off)
13:32						1.3	Pump on
13:33	17.2	4870	7.96	245.6	-	2.2	Pumped to Bottom. Pump off
13:41	18.9	4989	8.03	166.5	-	3.0	Pump on
13:45	20.0	4747	8.07	155.1	-	4.0	
13:48	20.8	4685	8.12	166.0	-	5.0	
Pump Stop: 13:54							
Q (Vol/Time)							

Total Gals. Purged 8.2

Total Vols. Purged 5.1

Final Temp. 20.8

Final EC 4685

Final pH 8.12

Final Turbidity 90.71

Final DO -

Well Data

Bore OD:	8"
Casing ID:	2"
Reported Well TD:	6'
Measured Well TD:	7.26'
Depth To Water:	1.91'
Ft./ Water:	5.35
Factor:	.88/.17
Screen Int. Vol.:	0.88
Casing Volume:	0.73
1 Volume	1.6
Recharge:	(F)/S

CONTINUED TURBIDITY CHECK

13:48	89.36	6.0
13:53	90.71	7.0

(1)

Special Notes for This Well:

Standard Bore Volume Factor Constants for 0.3 Filter Pack Porosity, Schedule 40 PVC:

Casing/Bore Diameter:	Bore Volume Factors:	Casing Volume Factors:
2"/8"	0.88 ✓	0.17 Gal/Ft. ✓
4"/8"	1.19	0.66 Gal/Ft.
4"/10"	1.63	0.66 Gal/Ft.
6"/10"	2.16	1.5 Gal/Ft.
6"/12"	3.07	1.5 Gal/Ft.

Well Development Data Sheet

Date: 4/23/15

Project: Owens Lake Piezometers

Tech: DuK

Well ID: P6-A

Procedure Data

Time	Temp.	E.C.	pH	Turbidity	DO	Gallons	Notes
Surge Start:	>>	>>	>>	>>	>>	>>	
Surge Stop:	>>	>>	>>	>>	>>	>>	
Bail Start	>>	>>	>>	>>	>>	>>	
Pump Start:	>>	>>	>>	>>	>>	0	
Pump Start: 7:45	>>	>>	>>	>>	>>		PUMPED WATER TO BUILD PAD. DEWATERED FOR CONSTRUCTION PURPOSES. RAN PUMP WHILE CONCRETE CURED.
12:00							INSTALLED BY-PASS PIPE FOR DIVERSION AROUND BASE OF WELL.
Pump Stop: 12:00							
Q (Vol/Time)	~2.4 AVERAGE GPM						

Total Gals. Purged 684

Total Vols. Purged 99

Final Temp. _____

Final EC _____

Final pH _____

Final Turbidity _____

Final DO _____

Well Data

Bore OD:	8"	
Casing ID:	2"	
Reported Well TD:	32	
Measured Well TD:		
Depth To Water:	0	ARTESIAN FLOW (EST. 2.0 - 2.5 gpm)
Ft./ Water:		
Factor:	0.88/0.17	
Screen Int. Vol.:	1.76	2'
Casing Volume:	5.1	
1 Volume	6.86	
Recharge:	(F)S	

Special Notes for This Well:

USED PUMP DURING PAD INSTALLATION TO KEEP GROUND SURFACE DRY. PUMPED WELL AT A SUSTAINED RATE OF 2.5 GPM.

Standard Bore Volume Factor Constants for 0.3 Filter Pack Porosity, Schedule 40 PVC:

Casing/Bore Diameter:	Bore Volume Factors:	Casing Volume Factors:
2"/8"	0.88	0.17 Gal/Ft.
4"/8"	1.19	0.66 Gal/Ft.
4"/10"	1.63	0.66 Gal/Ft.
6"/10"	2.16	1.5 Gal/Ft.
6"/12"	3.07	1.5 Gal/Ft.

Well Development Data Sheet

Date: 4/23/15

Project: Owens Lake Piezometers

Tech: DWC

Well ID: P6B

Procedure Data

Time	Temp.	E.C.	pH	Turbidity	DO	Gallons	Notes
Surge Start: 8:45	>>	>>	>>	>>	>>	>>	
Surge Stop: 8:55	>>	>>	>>	>>	>>	>>	
Bail Start 9:10	>>	>>	>>	>>	>>	>>	
~~Pump Start:~~ BAIL STOP 9:15	>>	>>	>>	>>	>>	2.5	
Pump Start:	>>	>>	>>	>>	>>	~~0~~	ARTESIAN FLOW CONDITIONS. DID NOT PUMP WELL. WELL FLOW MEASURED @ 190 ML/MINUTE
Pump Stop:							
Q (Vol/Time)	190 ML/MIN FLOW						

Total Gals. Purged _____

Total Vols. Purged _____

Final Temp. _____

Final EC _____

Final pH _____

Final Turbidity _____

Final DO _____

Well Data

Bore OD:	6 ?
Casing ID:	2"
Reported Well TD:	10
Measured Well TD:	10.3
Depth To Water:	~~0~~ ARTESIAN FLOW FROM WELL.
Ft./ Water:	6
Factor:	.88/.17
Screen Int. Vol.:	7.04 (8')
Casing Volume:	0.34
1 Volume	7.38
Recharge:	~~F~~/S

Special Notes for This Well:

8' of SCREEN INTERVAL

Standard Bore Volume Factor Constants for 0.3 Filter Pack Porosity, Schedule 40 PVC:

Casing/Bore Diameter:	Bore Volume Factors:	Casing Volume Factors:
2"/8"	0.88	0.17 Gal/Ft.
4"/8"	1.19	0.66 Gal/Ft.
4"/10"	1.63	0.66 Gal/Ft.
6"/10"	2.16	1.5 Gal/Ft.
6"/12"	3.07	1.5 Gal/Ft.

Well Development Data Sheet

Date: 4/23/15

Project: Owens Lake Piezometers

Tech: DwC

Well ID: P6-C

Procedure Data

Time	Temp.	E.C.	pH	Turbidity	DO	Gallons	Notes
Surge Start: 8:10	>>	>>	>>	>>	>>	>>	BAILED DRY
Surge Stop: 8:20	>>	>>	>>	>>	>>	>>	BAILING RECOVERY DATA
Bail Start 8:20	>>	>>	>>	>>	>>	>>	TIME DTW
~~Pump Start~~ BAIL STOP 8:23	>>	>>	>>	>>	>>	1.0	8:42 4.50
Pump Start:	>>	>>	>>	>>	>>		9:34 3.38
							10:36 2.55
							12:04 1.90
							WELL HAS SLOW RECOVERY. WELL NOT PUMPED DUE to SLOW RECOVERY.
Pump Stop:							
Q (Vol/Time)							

Total Gals. Purged _____

Total Vols. Purged _____

Final Temp. _____

Final EC _____

Final pH _____

Final Turbidity _____

Final DO _____

Well Data

Bore OD:	6"
Casing ID:	2"
Reported Well TD:	5
Measured Well TD:	4.9
Depth To Water:	0.96
Ft./ Water:	3.94
Factor:	0.88/0.17
Screen Int. Vol.:	0.88 (1')
Casing Volume:	0.49
1 Volume	1.37
Recharge:	F/S

Special Notes for This Well:

WATER LEVEL DRAWN DOWN DURING Bailing. Bailed DRY
DTW: 4.50 @ 8:42

Standard Bore Volume Factor Constants for 0.3 Filter Pack Porosity, Schedule 40 PVC:

Casing/Bore Diameter:	Bore Volume Factors:	Casing Volume Factors:
2"/8"	0.88	0.17 Gal/Ft.
4"/8"	1.19	0.66 Gal/Ft.
4"/10"	1.63	0.66 Gal/Ft.
6"/10"	2.16	1.5 Gal/Ft.
6"/12"	3.07	1.5 Gal/Ft.

Well Development Data Sheet

Date: 4/24/15

Project: Owens Lake Piezometers

Tech: DJC

Well ID: P5a-A

Procedure Data

Time	Temp.	µS E.C.	pH	Turbidity	DO	Gallons	Notes
Surge Start: 7:45	>>	>>	>>	>>	>>	>>	
Surge Stop: 8:00	>>	>>	>>	>>	>>	>>	
Bail Start 8:40	>>	>>	>>	>>	>>	>>	
BAIL STOP ~~Pump Start: 8:48~~	>>	>>	>>	>>	>>	3.0	Finite.
Pump Start: 9:38	>>	>>	>>	>>	>>	0	DTW: 15.15' START 65.2
9:50	20.8	8573	7.80	166.7	5.31	5.0	
9:54	19.3	8570	7.74	176.8	5.80	7.5	PURGE to Pump DTW: 33.45'
10:04							33.25 (RECOVERY Appears Slow)
10:37	<	RECOVERY DATA			>		32.95
11:08							32.48
Pump Stop:							
Q (Vol/Time)	~0.75 GPM						

Total Gals. Purged	10.5
Total Vols. Purged	2.1
Final Temp.	19.3
Final EC	8570
Final pH	7.74
Final Turbidity	176.8
Final DO	5.80

Well Data

Bore OD:	8"
Casing ID:	2"
Reported Well TD:	32'
Measured Well TD:	34.1
Depth To Water:	14.36'
Ft./ Water:	21.64
Factor:	0.88/0.17
Screen Int. Vol.:	1.76
Casing Volume:	3.3
1 Volume	5
Recharge:	F/S

TOC

2'

Special Notes for This Well:

Slow RECOVERY.

Standard Bore Volume Factor Constants for 0.3 Filter Pack Porosity, Schedule 40 PVC:

Casing/Bore Diameter:	Bore Volume Factors:	Casing Volume Factors:
2"/8"	0.88	0.17 Gal/Ft.
4"/8"	1.19	0.66 Gal/Ft.
4"/10"	1.63	0.66 Gal/Ft.
6"/10"	2.16	1.5 Gal/Ft.
6"/12"	3.07	1.5 Gal/Ft.

Well Development Data Sheet

Date: 4-24-15

Project: Owens Lake Piezometers

Tech: DWC

Well ID: P5a-B

Procedure Data

Time	Temp.	E.C. (mS)	pH	Turbidity	DO	Gallons	Notes
Surge Start: 8:05	>>	>>	>>	>>	>>	>>	
Surge Stop: 8:15	>>	>>	>>	>>	>>	>>	
Bail Start 8:50	>>	>>	>>	>>	>>	>>	
Bail Stop ~~Pump Start: 8:57~~	>>	>>	>>	>>	>>	2.5	DTW:
Pump Start: 10:06	>>	>>	>>	>>	>>	0	1.82'
10:10	19.1	15.79 mS	8.10	610.9	6.01	1.0	10.98
10:13	18.9	16.16	8.30	230.8	6.00	3.0	11.96
10:17	18.8	16.46	8.51	146.2	6.01	3.5	12.09
10:22	19.9	16.69	8.59	47.10	5.65	4.0	12.10
10:30	19.6	16.44	8.70	38.49	4.93	5.0	12.36
10:38	19.3	16.21	8.72	36.54	4.34	6.0	12.98
Pump Stop: 10:38							DTW: 8.98 @ 10:42
Q (Vol/Time)	500 mL/min.						

Total Gals. Purged	8.5
Total Vols. Purged	3.4
Final Temp.	19.3
Final EC	16.21
Final pH	8.72
Final Turbidity	36.54
Final DO	4.34

Well Data

Bore OD:	8"
Casing ID:	2"
Reported Well TD:	12'
Measured Well TD:	13.6'
Depth To Water:	3.03
Ft./ Water:	10.57
Factor:	0.88/0.17
Screen Int. Vol.:	0.88 1"
Casing Volume:	1.6
1 Volume	2.5
Recharge:	(F)S

Special Notes for This Well:

FAST RECOVERING Piezometer

Standard Bore Volume Factor Constants for 0.3 Filter Pack Porosity, Schedule 40 PVC:

Casing/Bore Diameter:	Bore Volume Factors:	Casing Volume Factors:
2"/8"	0.88	0.17 Gal/Ft.
4"/8"	1.19	0.66 Gal/Ft.
4"/10"	1.63	0.66 Gal/Ft.
6"/10"	2.16	1.5 Gal/Ft.
6"/12"	3.07	1.5 Gal/Ft.

Well Development Data Sheet

Date: 4/24/15

Project: Owens Lake Piezometers

Tech: DWC

Well ID: P5a-C

Procedure Data

Time	Temp.	E.C. (MS)	pH	Turbidity	DO	Gallons	Notes
Surge Start: 8:20	>>	>>	>>	>>	>>	>>	
Surge Stop: 8:30	>>	>>	>>	>>	>>	>>	
Bail Start 9:00	>>	>>	>>	>>	>>	>>	
~~Pump Start~~: 9:05	>>	>>	>>	>>	>>	2.0	DTW:
Bail stop Pump Start: 10:50	>>	>>	>>	>>	>>	0	2.59 @ Start
10:56	19.5	11.56	8.40	200.5	3.57	1	
11:03	18.4	9810 uS	8.29	23.66	2.93	2.5	DTW; Below Top of Pump (6.95')
11:09	18.4	9476	8.23	25.78	2.45	3.5	" " " " " "
Pump Stop: 11:12						3.8	
Q (Vol/Time)	~ 400 mL/min.						

Total Gals. Purged 5.8
Total Vols. Purged 3.8

Final Temp. 18.4
Final EC 9476 uS
Final pH 8.23
Final Turbidity 25.78
Final DO 2.45

Well Data

Bore OD:	8"
Casing ID:	2"
Reported Well TD:	6'
Measured Well TD:	8.15'
Depth To Water:	2.94
Ft./ Water:	5.21
Factor:	0.88/0.17
Screen Int. Vol.:	0.88 1'
Casing Volume:	0.71
1 Volume	1.5
Recharge:	(F)/S

Special Notes for This Well:

Fast Recovery

Standard Bore Volume Factor Constants for 0.3 Filter Pack Porosity, Schedule 40 PVC:

Casing/Bore Diameter:	Bore Volume Factors:	Casing Volume Factors:
2"/8"	0.88	0.17 Gal/Ft.
4"/8"	1.19	0.66 Gal/Ft.
4"/10"	1.63	0.66 Gal/Ft.
6"/10"	2.16	1.5 Gal/Ft.
6"/12"	3.07	1.5 Gal/Ft.

Well Development Data Sheet

Date: 4-24-15

Project: Owens Lake Piezometers

Tech: DwC

Well ID: P5-A

Procedure Data

Time	Temp.	E.C.	pH	NTU Turbidity	DO	Gallons	Notes
Surge Start:	>>	>>	>>	>>	>>	>>	WELL NOT DEVELOPED.
Surge Stop:	>>	>>	>>	>>	>>	>>	
Bail Start	>>	>>	>>	>>	>>	>>	
Pump Start:	>>	>>	>>	>>	>>		
Pump Start:	>>	>>	>>	>>	>>		
CONTINUOUS 12:10	20.5	6583	6.96	1.21	6.98		CONTINUOUS F/W @ 5.25 GPM
Pump Stop:							
Q (Vol/Time)	ARTESIAN FLOW: 5.25 GPM						

Total Gals. Purged ONGOING

Total Vols. Purged ONGOING

Final Temp. 20.5

Final EC 6583

Final pH 6.96

Final Turbidity 1.21

Final DO 6.98

Well Data

Bore OD:	8"
Casing ID:	2"
Reported Well TD:	32'
Measured Well TD:	N/M
Depth To Water:	0 ARTESIAN FLOW
Ft./ Water:	
Factor:	
Screen Int. Vol.:	
Casing Volume:	
1 Volume Recharge:	F/S

Special Notes for This Well:

ARTESIAN FLOW @ 5.25 GPM
MEASURED W/ BUCKET & STOPWATCH

Standard Bore Volume Factor Constants for 0.3 Filter Pack Porosity, Schedule 40 PVC:

Casing/Bore Diameter:	Bore Volume Factors:	Casing Volume Factors:
2"/8"	0.88	0.17 Gal/Ft.
4"/8"	1.19	0.66 Gal/Ft.
4"/10"	1.63	0.66 Gal/Ft.
6"/10"	2.16	1.5 Gal/Ft.
6"/12"	3.07	1.5 Gal/Ft.

Well Development Data Sheet

Date: 4/23-4/24/15

Project: Owens Lake Piezometers

Tech: DwC

Well ID: PS-B

Procedure Data

Time	Temp.	E.C. (MS)	pH	Turbidity	DO	Gallons	Notes
Surge Start: 13:50	>>	>>	>>	>>	>>	>>	
Surge Stop: 14:00	>>	>>	>>	>>	>>	>>	
Bail Start 14:10	>>	>>	>>	>>	>>	>>	DTW
~~Pump Start:~~ BAIL STOP 14:13	>>	>>	>>	>>	>>	1.8	Bailed to Bottom of well. 10.0'
4/24 Pump Start: 12:22	>>	>>	>>	>>	>>	0	DTW @ TOC. @ START
12:27	20.6	31.05	8.22	18.78	4.86	1	10.0 (Purged to Pump)
12:31	Recovery Data						7.65
12:46							7.33
Pump Stop: 12.27							
Q (Vol/Time)	~600 mL/min.						

Total Gals. Purged 2.8
Total Vols. Purged 1.27

Final Temp. 20.6
Final EC 31.05 MS
Final pH 8.22
Final Turbidity 18.78
Final DO 4.86

Well Data

Bore OD:	6"
Casing ID:	2"
Reported Well TD:	10'
Measured Well TD:	10.4
Depth To Water:	1.0'
Ft./ Water:	9.4
Factor:	0.04/0.13
Screen Int. Vol.:	1.36 (2' S.I.)
Casing Volume:	0.88
1 Volume	2.2
Recharge:	F/S

Special Notes for This Well:
PUMPED 4/24/15
SLOW RECHARGE

Standard Bore Volume Factor Constants for 0.3 Filter Pack Porosity, Schedule 40 PVC:

Casing/Bore Diameter:	Bore Volume Factors:	Casing Volume Factors:
2"/8"	0.88	0.17 Gal/Ft.
4"/8"	1.19	0.66 Gal/Ft.
4"/10"	1.63	0.66 Gal/Ft.
6"/10"	2.16	1.5 Gal/Ft.
6"/12"	3.07	1.5 Gal/Ft.

Well Development Data Sheet

Date: 4/27/15

Project: Owens Lake Piezometers

Tech: DWC

Well ID: P4-A

Procedure Data

Time	Temp.	E.C.	pH	Turbidity	DO	Gallons	Notes
Surge Start:	>>	>>	>>	>>	>>	>>	
Surge Stop:	>>	>>	>>	>>	>>	>>	
Bail Start	>>	>>	>>	>>	>>	>>	
Pump Start:	>>	>>	>>	>>	>>		
Pump Start:	>>	>>	>>	>>	>>		
Pump Stop:							
Q (Vol/Time)							

Total Gals. Purged _____

Total Vols. Purged _____

Final Temp. _____

Final EC _____

Final pH _____

Final Turbidity _____

Final DO _____

Well Data

Bore OD:	8"	
Casing ID:	2"	
Reported Well TD:	32'	
Measured Well TD:		
Depth To Water:	~~0~~	ARTESIAN
Ft./ Water:		
Factor:	0.68/0.17	
Screen Int. Vol.:		2'
Casing Volume:		
1 Volume		
Recharge:	(F)/S	

Special Notes for This Well:

ARTESIAN FLOW

Standard Bore Volume Factor Constants for 0.3 Filter Pack Porosity, Schedule 40 PVC:

Casing/Bore Diameter:	Bore Volume Factors:	Casing Volume Factors:
2"/8"	0.88	0.17 Gal/Ft.
4"/8"	1.19	0.66 Gal/Ft.
4"/10"	1.63	0.66 Gal/Ft.
6"/10"	2.16	1.5 Gal/Ft.
6"/12"	3.07	1.5 Gal/Ft.

Well Development Data Sheet

Date: 4/27/15

Project: Owens Lake Piezometers

Tech: DWC

Well ID: P4-B

Procedure Data

Time	Temp.	E.C.	pH	Turbidity	DO	Gallons	Notes
Surge Start: 9:25	>>	>>	>>	>>	>>	>>	
Surge Stop: 9:40	>>	>>	>>	>>	>>	>>	
Bail Start 10:01	>>	>>	>>	>>	>>	>>	SANDY
~~Pump Start: 10:10~~ (BIAL ~2700)	>>	>>	>>	>>	>>	3	
Pump Start: 10:42	>>	>>	>>	>>	>>	~~0~~	
10:46	17.5	6998	8.98	527.4	1.56	1	
10:48	17.4	2430	9.25	220.4	1.67	2	
10:53	16.1	1884	9.18	11.48	1.99	3	
10:57	16.7	1759	9.01	12.66	1.54	4	5.52 = DTW
11:02	16.2	1782	8.88	5.36	1.51	5	
Pump Stop: 11:02							
Q (Vol/Time)	~ 0.25 - 0.50 GPM						

Total Gals. Purged 8

Total Vols. Purged 3.07

Final Temp.	16.2
Final EC	1782
Final pH	8.88
Final Turbidity	5.36
Final DO	1.51

Well Data

Bore OD:	8"
Casing ID:	2"
Reported Well TD:	12'
Measured Well TD:	13.2'
Depth To Water:	3.62'
Ft./ Water:	9.58
Factor:	0.88/0.17
Screen Int. Vol.:	1.32 1.5'
Casing Volume:	1.37
1 Volume	2.6
Recharge:	(F)/S

Special Notes for This Well:

TDS: 1256 @ 5-gal.

Standard Bore Volume Factor Constants for 0.3 Filter Pack Porosity, Schedule 40 PVC:

Casing/Bore Diameter:	Bore Volume Factors:	Casing Volume Factors:
2"/8"	0.88	0.17 Gal/Ft.
4"/8"	1.19	0.66 Gal/Ft.
4"/10"	1.63	0.66 Gal/Ft.
6"/10"	2.16	1.5 Gal/Ft.
6"/12"	3.07	1.5 Gal/Ft.

Well Development Data Sheet

Date: 4-27-15

Project: Owens Lake Piezometers

Tech: AWC

Well ID: P4-C

Procedure Data

Time	Temp.	E.C.	pH	Turbidity	DO	Gallons	Notes
Surge Start: 9:45	>>	>>	>>	>>	>>	>>	
Surge Stop: 10:00	>>	>>	>>	>>	>>	>>	
Bail Start 10:30	>>	>>	>>	>>	>>	>>	SILTY
~~Pump Start:~~ Bail Stop 10:35	>>	>>	>>	>>	>>	1.2	Bailed DRY.
Pump Start: 11:10	>>	>>	>>	>>	>>	0	4.75 @ start = DTW
11:14						1	Pumped to Bottom.
Pump Stop: 11:14							
Q (Vol/Time)	0.25						

Total Gals. Purged 2.2

Total Vols. Purged 1.5

Final Temp. ____

Final EC ____

Final pH ____

Final Turbidity ____

Final DO 1

Well Data

Bore OD:	8"
Casing ID:	2"
Reported Well TD:	6'
Measured Well TD:	8.05'
Depth To Water:	3.85
Ft./ Water:	4.17
Factor:	0.88/0.17
Screen Int. Vol.:	0.88 1'
Casing Volume:	0.53
1 Volume	1.4
Recharge:	F/S

Special Notes for This Well:

Slower recharge.

Standard Bore Volume Factor Constants for 0.3 Filter Pack Porosity, Schedule 40 PVC:

Casing/Bore Diameter:	Bore Volume Factors:	Casing Volume Factors:
2"/8" ✓	0.88	0.17 Gal/Ft.
4"/8"	1.19	0.66 Gal/Ft.
4"/10"	1.63	0.66 Gal/Ft.
6"/10"	2.16	1.5 Gal/Ft.
6"/12"	3.07	1.5 Gal/Ft.

Well Development Data Sheet

Date: 4/27- 4/28/15

Project: Owens Lake Piezometers

Tech: DvC

Well ID: P3-A

Procedure Data

Time	Temp.	E.C.	pH	Turbidity	DO	Gallons	Notes
Surge Start: 14:40	>>	>>	>>	>>	>>	>>	
Surge Stop: 14:55	>>	>>	>>	>>	>>	>>	
4/28 – Bail Start 08:25	>>	>>	>>	>>	>>	>>	DTW: 2.61
~~Pump Start: 08:39~~ FAIL STOP	>>	>>	>>	>>	>>	7	DTW . 3.56
Pump Start: 9:08	>>	>>	>>	>>	>>	0	BLACK, SILTY WATER
9:12	21.9	4603	8.87	68.76	1.35	2	
9:22	20.4	4015	9.20	75.67	1.36	6	
9:34	20.1	4024	9.28	77.37	1.08	12	
9:44	20.0	4096	9.18	66.31	0.77	18	
9:55	20.8	4086	9.27	108.5	0.63	24	
							DTW: 2.65 @ 10:06 (Recovery)
Pump Stop: 9:58							
Q (Vol/Time)	0.4 - 0.5 GPM						

Total Gals. Purged	32
Total Vols. Purged	4.7
Final Temp.	20.8
Final EC	4086
Final pH	9.27
Final Turbidity	108.5
BEST TURB.	66.31
Final DO	0.63

Well Data

Bore OD:	8"
Casing ID:	2"
Reported Well TD:	32'
Measured Well TD:	34.4
Depth To Water:	2.69
Ft./ Water:	31.71
Factor:	0.88/0.17
Screen Int. Vol.:	1.76 g 2'
Casing Volume:	5.05 g
1 Volume	6.8 g
Recharge:	(F/S)

Special Notes for This Well:

FAST RECHARGE WELL

Standard Bore Volume Factor Constants for 0.3 Filter Pack Porosity, Schedule 40 PVC:

Casing/Bore Diameter:	Bore Volume Factors:	Casing Volume Factors:
2"/8"	0.88	0.17 Gal/Ft.
4"/8"	1.19	0.66 Gal/Ft.
4"/10"	1.63	0.66 Gal/Ft.
6"/10"	2.16	1.5 Gal/Ft.
6"/12"	3.07	1.5 Gal/Ft.

Well Development Data Sheet

Date: 4/27 - 4/28/15

Project: Owens Lake Piezometers

Tech: DWC

Well ID: P3-B

Procedure Data

Time	Temp.	E.C.	pH	Turbidity	DO	Gallons	Notes
Surge Start: 14:56	>>	>>	>>	>>	>>	>>	
Surge Stop: 15:11	>>	>>	>>	>>	>>	>>	
4/28 Bail Start 08:40	>>	>>	>>	>>	>>	>>	DTW: 3.11
~~Bail Stop~~ ~~Pump Start~~ 08:50	>>	>>	>>	>>	>>	3	DTW: 5.20
Pump Start: 10:08	>>	>>	>>	>>	>>	0	
10:11	19.5	3607	8.84	28.56	1.20	2.5	
10:16	20.0	3576	8.70	17.34	1.25	5.0	
10:21	19.7	3565	8.66	14.19	1.26	7.5	
10:26	20.0	3556	8.59	14.46	1.29	10.0	
10:30							DTW: 3.12 (RECOVERY)
Pump Stop: 10:26							
Q (Vol/Time)							

Total Gals. Purged 13

Total Vols. Purged 4.8

Final Temp. 20.0

Final EC 3556

Final pH 8.59

Final Turbidity 14.46

Final DO 1.29

Well Data

Bore OD:	8"	
Casing ID:	2"	
Reported Well TD:	12'	
Measured Well TD:	13'	
Depth To Water:	3.15	
Ft./ Water:	9.85	
Factor:	0.88/0.17	
Screen Int. Vol.:	1.52	1.5
Casing Volume:	1.41	
1 Volume	2.7	
Recharge:	(F)/S	

Special Notes for This Well:

FAST recharging well.

Standard Bore Volume Factor Constants for 0.3 Filter Pack Porosity, Schedule 40 PVC:

Casing/Bore Diameter:	Bore Volume Factors:	Casing Volume Factors:
2"/8"	0.88	0.17 Gal/Ft.
4"/8"	1.19	0.66 Gal/Ft.
4"/10"	1.63	0.66 Gal/Ft.
6"/10"	2.16	1.5 Gal/Ft.
6"/12"	3.07	1.5 Gal/Ft.

Well Development Data Sheet

Date: 4/27 - 4/28

Project: Owens Lake Piezometers

Tech: DJC

Well ID: P3-C

Procedure Data

Time	Temp.	E.C.	pH	Turbidity	DO	Gallons	Notes
Surge Start: 15:15	>>	>>	>>	>>	>>	>>	
Surge Stop: 15:30	>>	>>	>>	>>	>>	>>	
4/28 Bail Start 08:52	>>	>>	>>	>>	>>	>>	DTW: 3.04
~~Pump Start: 09:00~~ BAIL STOP	>>	>>	>>	>>	>>	2	DTW: 3.87
Pump Start: 10:30	>>	>>	>>	>>	>>	~~0~~	
10:34	19.0	3304	8.75	117.7	1.16	1.5	
10:38	18.9	3305	8.75	42.65	1.20	3	
10:42	19.0	3301	8.74	18.69	1.26	4.5	
Pump Stop: 10:43							
Q (Vol/Time)	~ 0.4 - 0.5						

Total Gals. Purged	7
Total Vols. Purged	4.6
Final Temp.	19.0
Final EC	3301
Final pH	8.74
Final Turbidity	18.69
Final DO	1.26

Well Data

Bore OD:	8"	
Casing ID:	2"	
Reported Well TD:	6'	
Measured Well TD:	7.95'	
Depth To Water:	3.05	
Ft./ Water:	4.90	
Factor:	0.88/0.17	
Screen Int. Vol.:	0.88	1'
Casing Volume:	0.66	
1 Volume	1.5	
Recharge:	(F)/S	

Special Notes for This Well:

FAST RECHARGING WELL.

Standard Bore Volume Factor Constants for 0.3 Filter Pack Porosity, Schedule 40 PVC:

Casing/Bore Diameter:	Bore Volume Factors:	Casing Volume Factors:
2"/8"	0.88	0.17 Gal/Ft.
4"/8"	1.19	0.66 Gal/Ft.
4"/10"	1.63	0.66 Gal/Ft.
6"/10"	2.16	1.5 Gal/Ft.
6"/12"	3.07	1.5 Gal/Ft.

Well Development Data Sheet

Date: 4/28/15

Project: Owens Lake Piezometers

Tech: DWC

Well ID: P2-A

Procedure Data

Time	Temp.	E.C.	pH	Turbidity	DO	Gallons	Notes
Surge Start: 12:15	>>	>>	>>	>>	>>	>>	
Surge Stop: 12:30	>>	>>	>>	>>	>>	>>	
Bail Start 12:56	>>	>>	>>	>>	>>	>>	
~~Pump Start:~~ BAIL STOP 13:10	>>	>>	>>	>>	>>	4	LITTLE FINES
Pump Start: 13:29	>>	>>	>>	>>	>>	0	
13:32	18.1	2612	8.54	63.58	4.29	3	
13:35	17.4	2604	8.38	63.35	5.62	6	
13:39	17.4	2594	8.28	38.16	5.74	9	
13:43	17.5	2597	8.17	41.28	5.06	12	
13:47	17.5	2593	8.11	34.97	4.18	15	
13:51	17.5	2596	8.05	28.02	3.96	18	
Pump Stop: 13:51							
Q (Vol/Time)	0.80 - 1.0 GPM						

Total Gals. Purged	22
Total Vols. Purged	3.33
Final Temp.	17.5
Final EC	2596
Final pH	8.05
Final Turbidity	28.02
Final DO	3.96

Well Data

Bore OD:	8"
Casing ID:	2"
Reported Well TD:	32'
Measured Well TD:	33.1'
Depth To Water:	2.48'
Ft./ Water:	30.62
Factor:	0.88/0.17
Screen Int. Vol.:	1.76 2'
Casing Volume:	4.8
1 Volume	6.6
Recharge:	(F)S

Special Notes for This Well:

Standard Bore Volume Factor Constants for 0.3 Filter Pack Porosity, Schedule 40 PVC:

Casing/Bore Diameter:	Bore Volume Factors:	Casing Volume Factors:
2"/8"	0.88	0.17 Gal/Ft.
4"/8"	1.19	0.66 Gal/Ft.
4"/10"	1.63	0.66 Gal/Ft.
6"/10"	2.16	1.5 Gal/Ft.
6"/12"	3.07	1.5 Gal/Ft.

Well Development Data Sheet

Date: 4/28/15

Project: Owens Lake Piezometers

Tech: DWC

Well ID: P2-B

Procedure Data

Time	Temp.	E.C.	pH	Turbidity	DO	Gallons	Notes
Surge Start: 12:33	>>	>>	>>	>>	>>	>>	
Surge Stop: 12:45	>>	>>	>>	>>	>>	>>	
Bail Start 13:12	>>	>>	>>	>>	>>	>>	
~~Pump Start:~~ BAIL STOP 13:16	>>	>>	>>	>>	>>	2.5	Little Fines.
Pump Start: 13:55	>>	>>	>>	>>	>>	0	
13:55	18.6	3391	7.96	80.85	3.01	1	
13:57	18.9	3540	7.99	13.44	3.37	2	
14:00	19.1	3550	7.94	9.40	3.31	3	
Pump Stop: 14:01							
Q (Vol/Time)							

Total Gals. Purged 6.5

Total Vols. Purged 2.1

Final Temp. 19.1

Final EC 3550

Final pH 7.94

Final Turbidity 9.40

Final DO 3.31

Well Data

Bore OD:	8"	
Casing ID:	2"	
Reported Well TD:	12'	
Measured Well TD:	13.31	
Depth To Water:	3.63	
Ft./ Water:	9.68	
Factor:	0.88/0.17	
Screen Int. Vol.:	1.58	1.5'
Casing Volume:	1.39	
1 Volume	3	
Recharge:	(F)S	

Special Notes for This Well:

Fast

Standard Bore Volume Factor Constants for 0.3 Filter Pack Porosity, Schedule 40 PVC:

Casing/Bore Diameter:	Bore Volume Factors:	Casing Volume Factors:
2"/8"	0.88	0.17 Gal/Ft.
4"/8"	1.19	0.66 Gal/Ft.
4"/10"	1.63	0.66 Gal/Ft.
6"/10"	2.16	1.5 Gal/Ft.
6"/12"	3.07	1.5 Gal/Ft.

Well Development Data Sheet

Date: 4/28/15

Project: Owens Lake Piezometers

Tech: DwC

Well ID: P2-C

Procedure Data

Time	Temp.	E.C.	pH	Turbidity	DO	Gallons	Notes
Surge Start: 12:44	>>	>>	>>	>>	>>	>>	
Surge Stop: 12:54	>>	>>	>>	>>	>>	>>	
Bail Start 13:18	>>	>>	>>	>>	>>	>>	
~~Bail Stop~~ ~~Pump Start:~~ 13:23	>>	>>	>>	>>	>>	1.8	
Pump Start: 14:03	>>	>>	>>	>>	>>	⊖	
14:04	20.1	3575	7.69	421.2	4.00	0.5	
14:05	21.2	2330	7.84	327.9	3.41	1.0	
14:06	20.2	2332	7.88	45.24	2.98	1.5	
14:07	20.0	2335	7.89	24.25	2.83	2.0	
Pump Stop: 14:08							
Q (Vol/Time)							

Total Gals. Purged 4.8

Total Vols. Purged 3.2

Final Temp. 20.0

Final EC 2335

Final pH 7.89

Final Turbidity 24.25

Final DO 2.83

Well Data

Bore OD:	8"
Casing ID:	2"
Reported Well TD:	6'
Measured Well TD:	8.32'
Depth To Water:	3.87
Ft./ Water:	4.45
Factor:	0.88/0.17
Screen Int. Vol.:	0.58
Casing Volume:	0.88
1 Volume	1.5
Recharge:	(F)/S

Special Notes for This Well:

Fast Recharge

Standard Bore Volume Factor Constants for 0.3 Filter Pack Porosity, Schedule 40 PVC:

Casing/Bore Diameter:	Bore Volume Factors:	Casing Volume Factors:
2"/8"	0.88	0.17 Gal/Ft.
4"/8"	1.19	0.66 Gal/Ft.
4"/10"	1.63	0.66 Gal/Ft.
6"/10"	2.16	1.5 Gal/Ft.
6"/12"	3.07	1.5 Gal/Ft.

Well Development Data Sheet

Date: 4/29/15

Project: Owens Lake Piezometers

Tech: DWC

Well ID: P1-A

Procedure Data

Time	Temp.	E.C.	pH	Turbidity	DO	Gallons	Notes
Surge Start: 7:30	>>	>>	>>	>>	>>	>>	
Surge Stop: 7:45	>>	>>	>>	>>	>>	>>	
Bail Start 8:13	>>	>>	>>	>>	>>	>>	
~~Pump Start:~~ Bail Stop 8:33	>>	>>	>>	>>	>>	6	
Pump Start: 9:20	>>	>>	>>	>>	>>	~~0~~	
9:23	18.3	1633	8.73	231.2	1.03	3	
9:25	18.2	1656	8.79	204.9	1.33	6	
9:28	18.2	1652	8.80	166.2	1.04	9	
9:32	18.2	1657	8.81	132.9	1.34	12	
9:35	18.3	1662	8.83	115.3	1.30	15	
9:38	18.4	1664	8.84	90.61	1.20	18	
Pump Stop: 9:38							
Q (Vol/Time)	~ 1.0 - 0.8 GPM						

Total Gals. Purged	24
Total Vols. Purged	3.7
Final Temp.	18.4
Final EC	1664
Final pH	8.84
Final Turbidity	90.61
Final DO	1.20

Special Notes for This Well:

Well Data

Bore OD:	8"
Casing ID:	2"
Reported Well TD:	32'
Measured Well TD:	33'
Depth To Water:	2.55'
Ft./ Water:	30.45
Factor:	0.88/0.17
Screen Int. Vol.:	1.76 2"
Casing Volume:	4.83
1 Volume	6.5
Recharge:	(F)S

Standard Bore Volume Factor Constants for 0.3 Filter Pack Porosity, Schedule 40 PVC:

Casing/Bore Diameter:	Bore Volume Factors:	Casing Volume Factors:
2"/8" ✓	0.88	0.17 Gal/Ft.
4"/8"	1.19	0.66 Gal/Ft.
4"/10"	1.63	0.66 Gal/Ft.
6"/10"	2.16	1.5 Gal/Ft.
6"/12"	3.07	1.5 Gal/Ft.

Well Development Data Sheet

Date: 4-29-15

Project: Owens Lake Piezometers

Tech: DWC

Well ID: P1-B

Procedure Data

Time	Temp.	E.C.	pH	Turbidity	DO	Gallons	Notes
Surge Start: 7:47	>>	>>	>>	>>	>>	>>	
Surge Stop: 7:57	>>	>>	>>	>>	>>	>>	
Bail Start 8:40	>>	>>	>>	>>	>>	>>	
~~Pump Start:~~ 8:54 BAIL STOP	>>	>>	>>	>>	>>	3	
Pump Start: 10:00	>>	>>	>>	>>	>>	0	
10:06	17.0	1426	8.87	301.0	1.31	3	
10:12	16.9	1381	8.87	139.7	1.04	6	
10:19	16.8	1373	8.86	95.03	0.98	9	
Pump Stop: 10:19							
Q (Vol/Time)	0.5 GPM						

Total Gals. Purged 12

Total Vols. Purged 4

Final Temp. 16.8

Final EC 1373

Final pH 8.86

Final Turbidity 95.03

Final DO 0.98

Well Data

Bore OD:	8"	
Casing ID:	2"	
Reported Well TD:	12'	
Measured Well TD:	13.9'	
Depth To Water:	2.95	
Ft./ Water:	10.95	
Factor:	0.88/0.17	
Screen Int. Vol.:	1.32	1.5
Casing Volume:	1.60	
1 Volume	3	
Recharge:	(F)/S	

Special Notes for This Well:

Standard Bore Volume Factor Constants for 0.3 Filter Pack Porosity, Schedule 40 PVC:

Casing/Bore Diameter:	Bore Volume Factors:	Casing Volume Factors:
2"/8" ✓	0.88	0.17 Gal/Ft.
4"/8"	1.19	0.66 Gal/Ft.
4"/10"	1.63	0.66 Gal/Ft.
6"/10"	2.16	1.5 Gal/Ft.
6"/12"	3.07	1.5 Gal/Ft.

Well Development Data Sheet

Date: 4/29/15

Project: Owens Lake Piezometers

Tech: DWC

Well ID: P1-C

Procedure Data

Time	Temp.	E.C.	pH	Turbidity	DO	Gallons	Notes
Surge Start: 8:00	>>	>>	>>	>>	>>	>>	
Surge Stop: 8:10	>>	>>	>>	>>	>>	>>	
Bail Start 8:56	>>	>>	>>	>>	>>	>>	
~~Pump Start:~~ BAIL STOP 9:02	>>	>>	>>	>>	>>	2	
Pump Start: 10:25	>>	>>	>>	>>	>>	~~0~~	
10:27	16.9	5279	8.74	74.27	2.25	1	
10:29	16.2	5265	8.86	74.16	1.03	2	
10:31	15.7	5194	8.90	52.17	0.90	3	
Pump Stop: 10:32							
Q (Vol/Time)							

Total Gals. Purged 5

Total Vols. Purged 3

Final Temp. 15.7

Final EC 5194

Final pH 8.90

Final Turbidity 52.17

Final DO 0.90

Well Data

Bore OD:	8"
Casing ID:	2"
Reported Well TD:	6'
Measured Well TD:	9.2'
Depth To Water:	3.26'
Ft./ Water:	5.94
Factor:	0.88/0.17
Screen Int. Vol.:	0.88 1'
Casing Volume:	0.83
1 Volume	1.7
Recharge:	(F)S

Special Notes for This Well:

Standard Bore Volume Factor Constants for 0.3 Filter Pack Porosity, Schedule 40 PVC:

Casing/Bore Diameter:	Bore Volume Factors:	Casing Volume Factors:
2"/8" ✓	0.88	0.17 Gal/Ft.
4"/8"	1.19	0.66 Gal/Ft.
4"/10"	1.63	0.66 Gal/Ft.
6"/10"	2.16	1.5 Gal/Ft.
6"/12"	3.07	1.5 Gal/Ft.

Well Development Data Sheet

Date: 4/30/15

Project: Owens Lake Piezometers

Tech: Dut

Well ID: P7-A

Procedure Data

Time	Temp.	E.C.	pH	Turbidity	DO	Gallons	Notes
Surge Start: 7:00	>>	>>	>>	>>	>>	>>	
Surge Stop: 7:15	>>	>>	>>	>>	>>	>>	
Bail Start 7:25	>>	>>	>>	>>	>>	>>	
~~Pump Start:~~ Bail Stop 7:41	>>	>>	>>	>>	>>	7	
Pump Start: 0	>>	>>	>>	>>	>>	0	Pump Failed
Pump Stop: —							
Q (Vol/Time)							

Total Gals. Purged 7

Total Vols. Purged

Final Temp.

Final EC

Final pH

Final Turbidity

Final DO

Well Data

Bore OD:	8"
Casing ID:	2"
Reported Well TD:	32'
Measured Well TD:	34.10'
Depth To Water:	1.48
Ft./ Water:	32.62
Factor:	0.88 / 0.17
Screen Int. Vol.:	1.76 2'
Casing Volume:	5.20
1 Volume Recharge:	7 F/S

Special Notes for This Well:

Standard Bore Volume Factor Constants for 0.3 Filter Pack Porosity, Schedule 40 PVC:

Casing/Bore Diameter:	Bore Volume Factors:	Casing Volume Factors:
2"/8" ✓	0.88	0.17 Gal/Ft.
4"/8"	1.19	0.66 Gal/Ft.
4"/10"	1.63	0.66 Gal/Ft.
6"/10"	2.16	1.5 Gal/Ft.
6"/12"	3.07	1.5 Gal/Ft.

Well Development Data Sheet

Date: 4/30/15

Project: Owens Lake Piezometers

Tech: DWK

Well ID: P7-A

Procedure Data

Time	Temp.	E.C.	pH	Turbidity	DO	Gallons	Notes
Surge Start: 7:00	>>	>>	>>	>>	>>	>>	
Surge Stop: 7:15	>>	>>	>>	>>	>>	>>	
Bail Start 7:25	>>	>>	>>	>>	>>	>>	
~~Pump Start:~~ BAIL STOP 7:41	>>	>>	>>	>>	>>	7	
Pump Start: 0	>>	>>	>>	>>	>>	0	Pump Failed
Pump Stop: ✓							
Q (Vol/Time)							

Total Gals. Purged 7

Total Vols. Purged

Final Temp.

Final EC

Final pH

Final Turbidity

Final DO

Well Data

Bore OD:	8"	
Casing ID:	2"	
Reported Well TD:	32'	
Measured Well TD:	34.10'	
Depth To Water:	1.48	
Ft./ Water:	32.62	
Factor:	0.88 /0.17	
Screen Int. Vol.:	1.76	2'
Casing Volume:	5.20	
1 Volume	7	
Recharge:	F/S	

Special Notes for This Well:

Standard Bore Volume Factor Constants for 0.3 Filter Pack Porosity, Schedule 40 PVC:

Casing/Bore Diameter:	Bore Volume Factors:	Casing Volume Factors:
2"/8" ✓	0.88	0.17 Gal/Ft.
4"/8"	1.19	0.66 Gal/Ft.
4"/10"	1.63	0.66 Gal/Ft.
6"/10"	2.16	1.5 Gal/Ft.
6"/12"	3.07	1.5 Gal/Ft.

APPENDIX C2

HYDRAULIC TESTING: FIELD RECORDS AND OBSERVATIONS

Aquifer Test

Project Name: OWENS LAKE GWP

Well ID: P1-A

Date: 5-11-15

Draw Down

TOTALIZER Static Water Level: 2.51

Time	DTW	Q	Temp	E. Cond.	~~pH~~	TDS	Comments:
8:22	SET PUMP						DUCOR # 3105457O
8:25	2.50	2.0	START		30,868.8		
8:30	5.41	2.0					P1-B # 1030690
8:33	6.38	3.0	INCREASED FLOW				P1-C # 1054569
8:36	7.10	3.5	INCREASED FLOW				
8:41	7.81	4.0	INCREASED FLOW				
8:45	7.88	4.0					
8:48	7.88	4.0					
8:55	8.01	4.0					
9:00	8.06	4.0					
9:05	8.11	4.0					
9:10	8.13	4.0					
9:15	8.12	4.0			31,044.0		
9:20	8.16	4.0			31,063.2		
9:25	8.20	4.0			31,082.8		
9:30	8.21	4.0			31,099.6		PUMP OFF
9:32	2.56	0			—		RECOVERY
9:483	2.51	0			—		

DTW = Depth to Water
Q = Pumping Rate (@ Gallons/Minutes)

Aquifer Test

Project Name: OWENS LAKE GWP

Well ID: P2 A/~~B~~/~~C~~

Date: 5-11-15

Draw Down

Static Water Level: 2.52

Time	DTW	Q	TOTALIZER Temp	E. Cond.	pH	TDS	Comments:
12:17	2.52	~~0~~	31,163.4	SET	PUMP		DOWN: 31040771 (A)
12:35	2.52	4	31,163.4	START			31045890 → (B)
12:40	4.11	4	31,180.7				
12:45	4.11	4	31,198.5				31053707 (C)
12:50	4.11	4	31,216.4				
12:55	4.13	4	31,232.3				
13:00		4	31,252.2				
13:05			31,273.9				

	P2			
TIME	A	B	C	NOTES
	2.52	2.66	3.91	PRETEST
	(1.61	1.59	1.69	"STICKUP")
12:40	4.11	3.68	3.93	
12:52	4.11	3.68	3.93	
13:00	4.13	3.68	3.93	
13:05	4.13	3.68	3.93	
13:08	2.58			
13:31	2.58	3.69	3.95	

DTW = Depth to Water
Q = Pumping Rate (@ Gallons/Minutes)

Aquifer Test

Project Name: OWENS LAKE GWP

Well ID: P3-A

Date: 05/13/15

Static Water Level: 2.73

Draw Down

Time	DTW	Q	Totalizer ~~Temp~~	E. Cond.	pH	TDS	Comments:
7:49	2.73	0	31,708.4	INSTALL PUMP			Ducon
7:57	2.73	3.5		PUMP ON			2041926 - A
8:00	5.65	3.5	715.4				1033658 - B
8:05	5.76	3.5	732.8				4204199 - C
8:10	5.85	3.5	750.2				
8:15	5.85	3.5	767.5				
8:20	5.87	3.5	784.9				
8:25	5.89	3.5	802.5				
8:30	5.90	3.5	819.7				
8:30:50		0	822.8 STOP PUMP				Recovery Data
8:32	2.95						
8:36	2.81						
8:49	2.76						

	TIME	DTW P3-A	P3-B	P3-C	
STATIC:	7:29	2.73	3.25	3.17	
	8:11	5.85	3.27	3.19	
	8:21	5.87	3.29	3.20	
8:30 Pump off	8:27	5.89	3.29	3.20	} Recovery Data
	8:37	2.81	3.27	3.18	
			3.26	3.18	

DTW = Depth to Water
Q = Pumping Rate (@ Gallons/Minutes)

Aquifer Test

Project Name: OWENS LAKE GWP

Well ID: P3-B

Date: 5-13-15

Draw Down

Static Water Level: 3.26

Time	DTW	Q	~~Temp~~ Totalizer	E. Cond.	pH	TDS	Comments:
9:05	3.26	~~0~~	31,822.8	PLACE PUMP			
9:08	3.26	3.5	31,822.8	START			
9:10	4.15	3.5	829.2				
9:16	4.19	3.5	850.0				
9:20	4.21	3.5	864.3				
9:25	4.24	3.5	882.0				
9:30	4.25	3.5	—				
9:35	4.27	3.5	918.0				
9:40	4.28	3.5	936.3				
9:41	-	3.5/0	941.7	STOP PUMP			
9:43	3.30	0	—	Recovery			Recovery Data
9:51	3.27						
					WL'S		
				TIME:	B	A	C
				STATIC	3.26	2.76	3.18
				9:21		2.76	3.31
				9:31		2.77	3.31
				9:53		2.75	3.19

DTW = Depth to Water
Q = Pumping Rate (@ Gallons/Minutes)

Aquifer Test

Project Name: OWENS LAKE GWP

Well ID: P4-A

Date: 5-13-15

Draw Down

Static Water Level: ARTESIAN @ 0.5 GPM

Time	DTW	Q	Totalizer ~~Temp~~	E. Cond.	pH	TDS	Comments:
11:51	0.5-FLOW	0	31,941.9	SET PUMP			DUCOM
11:54	"	"	"	START PUMP			A 31040771
11:56	14.51	2.5-3		ADJUSTED FLOW			B 31053707
11:57		3.0					C 31045890
11:58		2.5	955.4	ADJUSTED FLOW			
12:00	13.60	2.75	959.6	ADJUSTED FLOW			
12:05	14.05	2.5	971.2				
12:10	14.21	2.5	982.9				
12:16	14.45	2.5	998.1				
12:20	14.82	2.5	32,008.2				
12:25	14.97	2.5	21.0				
12:30	15.09	2.5	33.9				
12:31	15.10	2.5	37.6	PUMP OFF			
12:33	2.40	0	—	RECOVERY			
12:33:50	RESUME	FLOW.					

Time	DTW B	DTW C
STATIC	3.49	3.51
12:12	3.48	3.51
12:22	3.48	3.51
12:35	3.48	3.52

DTW = Depth to Water
Q = Pumping Rate (@ Gallons/Minutes)

Aquifer Test

Project Name: OWENS LAKE GWP

Well ID: P4-B

Date: 5-15-15

Draw Down

Static Water Level: 3.48

Totalizer

Time	DTW	Q	~~Temp~~	E. Cond.	pH	TDS	Comments:
12:52	3.48	0	37.6	INSTALL PUMP			
12:54		0	37.6	START PUMP			
12:55	9.01	2	38.8	Drawn to pump.			

DTW = Depth to Water

Q = Pumping Rate (@ Gallons/Minutes)

Aquifer Test

Project Name: OWENS LAKE GWP

Well ID: PS-A

Date: 5/12/15

Static Water Level: ARTESIAN @ 4 GPM

Time	DTW	Q	TOTALIZER ~~Temp~~	Draw Down E. Cond.	pH	TDS	Comments:
9:21	+3.1GPM	0	3137 0.6	PUMP INSTALLED			INDUCERS:
9:30	+3.1GPM	4.5	↓	START PUMP			A) 310 30730
9:35	6.51	4.5	385.1				B) 310 35144
9:40	6.30	4.5	403.8				C) 42042999
9:45	6.16	4.5	422.5	RE-START			
9:50	4.67	4.0	438.0				
9:55	4.87	4.0	455.0				
10:00	5.02	4.0	472.2				
10:05	4.98	4.0	489.0				
10:10	4.98	4.0	506.5	GPM CLOSER TO 3.5 GPM			9:46:45 FAILED / RE-START
10:15	5.02	4.0	523.6				~10 sec for WL recovery
10:20	5.07	4.0	541.0				
10:25	5.07	4.0	558.0				
10:30	5.11	4.0	575.6				
10:33	STOPPED		587.0				
10:38	3.1 GPM						
10:43	3.1 GPM						
							5.10 TOP OF "T"
							0.25 WL IN PIPE
							4.85 ft ABOVE T/CSG WL prior to test.
							3 GPM @ 4.85' STICK UP

TIME:	DTW ft	B	C
8:35	+3 GPM	0.98	1.40
9:41	6.30	0.91	1.35
(RE-STARTED) 10:06	4.98	0.90	1.33
10:26	5.07	0.91	1.33

DTW = Depth to Water
Q = Pumping Rate (@ Gallons/Minutes)

Aquifer Test

Project Name: OWENS LAKE GWP

Well ID: PS-B

Date: 5-12-15

Static Water Level: 0.91

Time	DTW	Q	TOTALIZER ~~Temp~~	Draw Down E. Cond.	pH	TDS	Comments:
11:06	0.91	0	31,587.0	INSTALL PUMP			DISPLACE WATER - OVERFLOWED
11:18		1		START 11:19		STOP.	PUMPED BOTTOM
11:20	7.85	RECOVERY					
11:22	7.80						
11:26	7.70						
11:30	7.60						

DTW = Depth to Water
Q = Pumping Rate (@ Gallons/Minutes)

Aquifer Test

Project Name: OWENS LAKE GWP

Well ID: P5a-A

Date: 5-12-15

Static Water Level: 1.65

Draw Down

Time	DTW	Q	Totalizer ~~Temp~~	E. Cond.	pH	TDS	Comments:
14:38	1.65	0	31703.9		pump in well		DXCER # 310545 69-A
					WATER upwelled,		310545 70-B
						↓	31030690 -C
14:48	0	1					
14:50	5224 20.00						
14:53	20.4		31708.4		STOP	PUMP	
14:55	22.35						
14:57	22.29						
15:05	22.08						
						Time	DTW 5a-B 5a-C
						14:15	2.98 2.96

DTW = Depth to Water
Q = Pumping Rate (@ Gallons/Minutes)

Aquifer Test

Project Name: OWENS LAKE GWP

Well ID: PG-B

Date: 5-12-15

Static Water Level: ARTESIAN

Time	DTW	Q	Totalizer ~~Temp~~	Draw Down E. Cond.	pH	TDS	Comments:
13:23	ARTESIAN	-	31,702.2	SET PUMP			
13:26:55	4.50	1.25					
13:27			31,703.7	STOP PUMP			0.17 gal./FT VOLUME
13:28:20	6.00	"					
13:28:35	5.50						
13:28:48	5.0						
13:29:04	4.5						
13:40	ARTESIAN FLOW RE-ESTABLISHED.						

DTW = Depth to Water
Q = Pumping Rate (@ Gallons/Minutes)

Aquifer Test

Project Name: OWENS LAKE GWP

Well ID: P8-A

Date: 5-13-15

Draw Down

Static Water Level: ARTESIAN - "TRICKLE"

Time	DTW	Q	~~Temp~~ Totalizer	E. Cond.	pH	TDS	Comments:
14:05	0	0	32,038.8	PUMP INSTALLED.			well: Ducea
14:10	0	1		START PUMP			A 310 30730
14:12	12.0	1	40.1				B 310 35144
14:14	18.26	1	40.7	FLUCTUATING FLOW			C 420 42999
14:16	24.00	0		purged to p-p / STOP PUMP			
14:18	18.69	0	RECOVERY				RECOVERY
14:22	18.59						
14:25	18.56						
14:30	18.46						
14:50	18.14						
14:55	18.08						

Time	WL		
~~START~~	A	B	C
STATIC	0	2.45	2.15
14:23	18.59	2.45	2.15
14:30	18.46	2.45	2.15

Recovery

DTW = Depth to Water

Q = Pumping Rate (@ Gallons/Minutes)

Aquifer Test

Project Name: OWENS LAKE GWP

Well ID: P2-13

Date: 5-11-15

Draw Down

Static Water Level: 3.69

Time	DTW	Q	Totalizer ~~Temp~~	E. Cond.	pH	TDS	Comments:
13:36	3.69		31,274.3	INSTALL PUMP			
13:40	3.69	2.5	START PUMP				
13:45	3.82	4.0	31,284.6	INCREASE PUMP RATE			
13:50	3.88	4.0	31,300.2				
13:55	3.89	4.0	31,319.0				
14:00	3.89	4.0	31,233.5				
14:05	3.89	4.0	31,350.4				
14:10	3.89	4.0	31,367.3				
14:11:10	3.89	4.0	31,370.55	PUMP OFF			
14:13:20	3.72	0	—	RECOVERY			
14:15:05	3.71	0					

		A	C	B
	TIME	DTW	DTW	
	13:53	2.58	3.98	
	13:55	2.58	3.98	3.89
	14:05	2.58	3.97	3.89
5/12/15	07:00	2.51	3.89	3.65

DTW = Depth to Water
Q = Pumping Rate (@ Gallons/Minutes)

Aquifer Test

Project Name: OWENS LAKE GWP

Well ID: P5a-A

Date: 5-12-15

Draw Down

Static Water Level: 1.65

Time	DTW	Q	~~Temp~~ Totalizer	E. Cond.	pH	TDS	Comments:
14:38	1.65	~~0~~	31703.9		pump in well		DWER # 310545690-A
					WATER upwelled,		310545670-B
							↓ 310530690-C
14:48	~~0~~	1					
14:50: 5224	20.00						
14:53	20.+		31708.4		STOP PUMP		
14:55	22.35						
14:57	22.29						
15:05	22.08						
						Time	DTW 5a-B 5a-C
						14:15	2.98 2.96

DTW = Depth to Water
Q = Pumping Rate (@ Gallons/Minutes)

Aquifer Test

Project Name: OWENS LAKE GWP

Well ID: P6 - A

Date: 5-12-15

Draw Down

Static Water Level: ARTESIAN @ 2.4 GPM

Time	DTW	Q	Totalizer ~~Temp~~	E. Cond.	pH	TDS	Comments:
12:38	—		31,588.1				
12:43	—	4	31,588.1		START	PUMP	
12:45	7.30	3.5	593.8				
12:45:41	8.00	3.6	~~0~~ N/A				STICKUP: 1.43
12:50	10.37	3.6	611.7				
12:55	11.53	3.6	629.9				
13:00	12.02	3.6	646.5				
13:05	12.50	3.6	664.5				
13:10	13.35	3.6	682.3				
13:15	14.25	3.6	699.6				
13:16	—	3.6	702.2		PUMP OFF		
13:17:15	ARTESIAN FLOW RETURNED.						

TRANSDUCERS:	WELL:
31040711	A
31053707	B
31004589	C

TIME	WELL ID: A	B	C
12:50		STATIC	1.15
13:00		STATIC	1.15
13:07		STATIC	1.15

DTW = Depth to Water
Q = Pumping Rate (@ Gallons/Minutes)

Aquifer Test

Project Name: OWENS LAKE GWP

Well ID: PB-B

Date: 5-13-15

Draw Down

Static Water Level: 2.45

Time	DTW	Q	~~Temp~~ Totalizer	E. Cond.	pH	TDS	Comments:
14:33	2.45	0	40.7	* INSTALL PUMP			
14:36	2.45	1	40.7	START PUMP			
14:37	5.81	1	41.7	pumped to bottom - STOP.			
14:39	3.25	0	Recovery				
14:40	2.65	—					
14:48	2.47	-					
					TIME	WL	
						A	C

DTW = Depth to Water
Q = Pumping Rate (@ Gallons/Minutes)

Aquifer Test

Project Name: OWENS LAKE GWP

Well ID: PB-B

Date: 5-13-15

Draw Down

Totalizer

Static Water Level: 2.45

Time	DTW	Q	~~Temp~~	E. Cond.	pH	TDS	Comments:
14:33	2.45	~~0~~	40.7	INSTALL PUMP			
14:36	2.45	1	40.7	START PUMP			
14:37	5.81	1	41.7	pumped to bottom - STOP			
14:39	3.25	~~0~~	Recovery				
14:40	2.65	—					
14:48	2.47	-					
					TIME	WL	
						A	C

DTW = Depth to Water

Q = Pumping Rate (@ Gallons/Minutes)

APPENDIX D

SOLINST LEVELOGGER TRANSDUCER RECORDS

APPENDIX E

HYDRAULIC TEST ANALYSES: DRAWDOWN AND RECOVERY TESTS

PIEZOMETER TEST SUMMARY 5/11/2015

Piezometer Set ID: P1

Test Data

	Piezo A		Piezo B	
Pumping Rate	3.58		1.91	gpm
	689		368	ft3/day
Pumping Duration	64.5		30.5	min
Screen Interval	2		1.5	ft

Drawdown (s= m ln(t) + b)

slope	0.292		0.087
intercept	4.47		2.77
DD at 10 min (fitted)	5.14		2.97
DD at 100 min (fitted)	5.81		3.17
del s (1 log cycle)	0.67		0.20
r2 fit	0.96		0.98

Recovery (s= m ln(t') + b; t' = (t since pumping began/time since pump was off)

slope	2.47		0.564
intercept	-9.46		-1.72
DD at 10 min (fitted)	-3.77		-0.42
DD at 100 min (fitted)	1.91		0.88
del s (1 log cycle)	5.69		1.30
r2 fit	0.92		0.94

Estimated T Values in ft2/day

DD	**188**		**336**	(= 2.303 Q/ 4 Pi del s; Q in ft3/day)
Recovery	22		52	

Estimated K values in ft/day

DD	**94**		**224**
Recovery	11		35

reference K values in ft/day

				cm/sec hi	lo
0.03	to	0.00003	clay	1.0E-05	1.0E-08
0.28	to	0.003	silt	1.0E-04	1.0E-06
2.84	to	0.03	fine sand	1.0E-03	1.0E-05
283.50	to	2.84	coarse sand	1.0E-01	1.0E-03
2835.00	to	28.35	gravel	1.0E+00	1.0E-02

1 cm/sec= 2835 ft/day
1 gpm= 192.51 ft3/day

HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

PIEZOMETER TEST SUMMARY 5/11/2015

Piezometer Set ID: P2

Test Data

	Piezo A		Piezo B	
Pumping Rate	3.56		3.1	gpm
	685		597	ft3/day
Pumping Duration	31		31	min
Screen Interval	2		1.5	ft

Drawdown (s= m ln(t) + b)

slope	0.019		0.0158
intercept	1.46		0.0912
DD at 10 min (fitted)	1.50		0.13
DD at 100 min (fitted)	1.55		0.16
del s (1 log cycle)	0.04		0.04
r2 fit	0.54		0.68

Recovery (s= m ln(t') + b; t' = (t since pumping began/time since pump was off)

slope	0.018		0.01
intercept	-0.038		-0.025
DD at 10 min (fitted)	0.003		0.00
DD at 100 min (fitted)	0.04		0.02
del s (1 log cycle)	0.04		0.02
r2 fit	0.92		0.97

Estimated T Values in ft2/day

DD	**2871**		**3006**	(= 2.303 Q/ 4 Pi del s)
Recovery	**3030**		**4750**	

Estimated K values in ft/day

DD	**1435**		**2004**
Recovery	**1515**		**3167**

reference K values, ft/day

				cm/sec hi	lo
0.03	to	0.00003	clay	1.0E-05	1.0E-08
0.28	to	0.003	silt	1.0E-04	1.0E-06
2.84	to	0.03	fine sand	1.0E-03	1.0E-05
283.50	to	2.84	coarse sand	1.0E-01	1.0E-03
2835.00	to	28.35	gravel	1.0E+00	1.0E-02

1 cm/sec= 2835 ft/day

HUSHMAND ASSOCIATES, INC. Geotechnical and Earthquake Engineers

PIEZOMETER TEST SUMMARY 5/13/2015

Piezometer Set ID: P3

Test Data

	Piezo A		Piezo B	
Pumping Rate	3.5		3.60	gpm
	674		693	ft3/day
Pumping Duration	32.67		33	min
Screen Interval	2		1.5	ft

Drawdown (s= m ln(t) + b)

slope	0.0061		0.07
intercept	3.052		0.777
DD at 10 min (fitted)	3.07		0.94
DD at 100 min (fitted)	3.08		1.10
del s (1 log cycle)	0.01		0.16
r2 fit	0.54		0.04

Recovery (s= m ln(t') + b; t' = (t since pumping began/time since pump was off)

slope	0.861		0.021
intercept	-2.84		-0.0212
DD at 10 min (fitted)	-0.86		0.03
DD at 100 min (fitted)	1.13		0.08
del s (1 log cycle)	1.98		0.05
r2 fit	0.97		0.98

Estimated T Values in ft2/day

DD	**8780**		**787**	(= 2.303 Q/ 4 Pi del s)
Recovery	**62**		--	
			(recovery too fast)	

Estimated K values in ft/day

DD	**4390**		**525**
Recovery	31		

reference K values, ft/day

				cm/sec	hi	lo
0.03	to	0.00003	clay		1.0E-05	1.0E-08
0.28	to	0.003	silt		1.0E-04	1.0E-06
2.84	to	0.03	fine sand		1.0E-03	1.0E-05
283.50	to	2.84	coarse sand		1.0E-01	1.0E-03
2835.00	to	28.35	gravel		1.0E+00	1.0E-02

1 cm/sec= 2835 ft/day

HAI HUSHMAND ASSOCIATES, INC. Geotechnical and Earthquake Engineers

PIEZOMETER TEST SUMMARY 5/13/2015

Piezometer Set ID: P4

Test Data

	Piezo A		Piezo B		
Pumping Rate	2.04		1.60	gpm	Piezo A is artesian, Q= 0.5 gpm
	393		308	ft3/day	Q pump= 2.54, test rate =2.04
Pumping Duration	37.66		0.75	min	
Screen Interval	2		1.5	ft	

Drawdown (s= m ln(t) + b)

slope	0.687		31.0
intercept	11.913		-35.8
DD at 10 min (fitted)	13.49		35.58
DD at 100 min (fitted)	15.08		106.96
del s (1 log cycle)	1.58		71.38
r2 fit	0.98		1

Recovery (s= m ln(t') + b; t' = (t since pumping began/time since pump was off)

slope	5.79		3.73
intercept	-16.24		-2.62
DD at 10 min (fitted)	-2.91		5.97
DD at 100 min (fitted)	10.42		14.56
del s (1 log cycle)	13.33		8.59
r2 fit	0.98		0.99

Estimated T Values in ft2/day

DD	**45**		**0.8**	(= 2.303 Q/ 4 Pi del s)
Recovery	**5.4**		**6.6**	

Estimated K values in ft/day

DD	**23**		**0.5**
Recovery	**2.7**		**4.4**

reference K values, ft/day

				cm/sec hi	lo
0.03	to	0.00003	clay	1.0E-05	1.0E-08
0.28	to	0.003	silt	1.0E-04	1.0E-06
2.84	to	0.03	fine sand	1.0E-03	1.0E-05
283.50	to	2.84	coarse sand	1.0E-01	1.0E-03
2835.00	to	28.35	gravel	1.0E+00	1.0E-02

1 cm/sec= 2835 ft/day

1 gpm= 192.51 ft3/day

HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

PIEZOMETER TEST SUMMARY 5/12/2015

Piezometer Set ID: P5

Note: Piezo A was flowing at 3.1 gpm.
Test run at 3.43 gpm, 0.33 net gpm increase

Test Data

	Piezo A		Piezo B		Piezo A	Piezo A 0 to 18 min
Pumping Rate	0.33		1.1	gpm	Q well= 3.1	0.33
	64		212	ft3/day	Q pump= 3.43	64
Pumping Duration	63		1.5	min		18
Screen Interval	2		2	ft		2

Drawdown (s= m ln(t) + b)

slope	0.227		5.82		0.31
intercept	3.99		5.36		5.08
DD at 10 min (fitted)	4.51		18.76		5.79
DD at 100 min (fitted)	5.04		32.16		6.51
del s (1 log cycle)	0.52		13.40		0.71
r2 fit	0.8		1		0.62

Recovery (s= m ln(t') + b; t' = (t since pumping began/time since pump was off)

slope	<1 min		165.9		<1 min
intercept	recovery		2.91		recovery
DD at 10 min (fitted)	not		384.91		not
DD at 100 min (fitted)	recorded		766.91		recorded
del s (1 log cycle)			382.00		
r2 fit			0.99		

Estimated T Values	in ft2/day				in ft2/day
DD	**22**		--	(= 2.303 Q/ 4 Pi del s)	**16**
Recovery	--		**0.10**		

Estimated K values	in ft/day			in ft/day
DD	**11**			**8**
Recovery			**0.05**	

reference K values, ft/day

				cm/se hi	lo
0.03	to	0.00003	clay	1.0E-05	1.0E-08
0.28	to	0.003	silt	1.0E-04	1.0E-06
2.84	to	0.03	fine sand	1.0E-03	1.0E-05
283.50	to	2.84	coarse sand	1.0E-01	1.0E-03
2835.00	to	28.35	gravel	1.0E+00	1.0E-02

1 cm/sec= 2835 ft/day

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PIEZOMETER TEST SUMMARY 5/13/2015

Piezometer Set ID: P5A

Test Data

	Piezo A		Piezo B	
Pumping Rate	1.04		0.188	gpm
	200		36	ft3/day
Pumping Duration	4.33		32	min
Screen Interval	2		1.5	ft

Drawdown (s= m ln(t) + b)

slope	not		1.228
intercept	calculated		6.8
DD at 10 min (fitted)	due to		9.63
DD at 100 min (fitted)	borehole		12.46
del s (1 log cycle)	storage		2.83
r2 fit			0.96

Recovery (s= m ln(t') + b; t' = (t since pumping began/time since pump was off)

slope	471.51		no data
intercept	12.66		(development)
DD at 10 min (fitted)	1098.35		
DD at 100 min (fitted)	2184.04		
del s (1 log cycle)	1085.69		
r2 fit	0.90		

Estimated T Values in ft2/day

DD	**BHS**		**2.35**	(= 2.303 Q/ 4 Pi del s; for ft2/day = 35Q/del s)
Recovery	**3.38E-02**		**no data**	

Estimated K values in ft/day

DD			**1.56**
Recovery	**1.69E-02**		

reference K values, ft/day

				cm/sec hi	lo
0.03	to	0.00003	clay	1.0E-05	1.0E-08
0.28	to	0.003	silt	1.0E-04	1.0E-06
2.84	to	0.03	fine sand	1.0E-03	1.0E-05
283.50	to	2.84	coarse sand	1.0E-01	1.0E-03
2835.00	to	28.35	gravel	1.0E+00	1.0E-02

1 cm/sec= 2835 ft/day

HAI HUSHMAND ASSOCIATES, INC. Geotechnical and Earthquake Engineers

PIEZOMETER TEST SUMMARY 5/12/2015

Piezometer Set ID: P6

Test Data

	Piezo A		Piezo B		Piezo A
Pumping Rate	1.09		1.2	gpm	Q pump=3.49
	210		231	ft3/day	Q well= 2.4
Pumping Duration	37		1	min	net 1.09
Screen Interval	2		8	ft	

Drawdown (s= m ln(t) + b)

slope	1.804		borehole
intercept	6.66		storage
DD at 10 min (fitted)	10.81		
DD at 100 min (fitted)	14.97		
del s (1 log cycle)	4.15		
r2 fit	0.98		

Recovery (s= m ln(t') + b; t' = (t since pumping began/time since pump was off)

slope	6.689		10.18
intercept	-21.431		-1.3
DD at 10 min (fitted)	-6.03		22.14
DD at 100 min (fitted)	9.37		45.58
del s (1 log cycle)	15.40		23.44
r2 fit	0.98		0.99

Estimated T Values in ft2/day

DD	**9.3**		--	(= 2.303 Q/ 4 Pi del s)
Recovery	**2.5**		**1.8**	

Estimated K values in ft/day

DD	**4.6**		
Recovery	**1.2**		**0.23**

reference K values, ft/day

				cm/sec hi	lo
0.03	to	0.00003	clay	1.0E-05	1.0E-08
0.28	to	0.003	silt	1.0E-04	1.0E-06
2.84	to	0.03	fine sand	1.0E-03	1.0E-05
283.50	to	2.84	coarse sand	1.0E-01	1.0E-03
2835.00	to	28.35	gravel	1.0E+00	1.0E-02

1 cm/sec= 2835 ft/day

1 gpm= 192.51 ft3/day

HUSHMAND ASSOCIATES, INC. Geotechnical and Earthquake Engineers

PIEZOMETER TEST SUMMARY 5/14/2015

Piezometer Set ID: P7

Test Data

	Piezo A		No Access	
Pumping Rate	1.3			gpm
	256			ft3/day
Pumping Duration	3			min
Screen Interval	2			ft

Drawdown (s= m ln(t) + b)

slope	15.439			
intercept	6.106			
DD at 10 min (fitted)	41.66			
DD at 100 min (fitted)	77.21			
del s (1 log cycle)	35.55			
r2 fit	0.99			

Recovery (s= m ln(t') + b; t' = (t since pumping began/time since pump was off)

slope	53.88			
intercept	-3.654			
DD at 10 min (fitted)	120.41			
DD at 100 min (fitted)	244.47			
del s (1 log cycle)	124.06			
r2 fit	0.99			

Estimated T Values in ft2/day

DD	1.32			(= 2.303 Q/ 4 Pi del s)
Recovery	**0.38**			

Estimated K values in ft/day

DD	**0.66**			
Recovery	**0.19**			

reference K values, ft/day

				cm/sec hi	lo
0.03	to	0.00003	clay	1.0E-05	1.0E-08
0.28	to	0.003	silt	1.0E-04	1.0E-06
2.84	to	0.03	fine sand	1.0E-03	1.0E-05
283.50	to	2.84	coarse sand	1.0E-01	1.0E-03
2835.00	to	28.35	gravel	1.0E+00	1.0E-02

1 cm/sec= 2835 ft/day

1 gpm= 192.51 ft3/day

HUSHMAND ASSOCIATES, INC. Geotechnical and Earthquake Engineers

PIEZOMETER TEST SUMMARY 5/13/2015

Piezometer Set ID: P8

Test Data

	Piezo A		Piezo B	
Pumping Rate	0.32		1.0	gpm
	62		193	ft3/day
Pumping Duration	6		1	min
Screen Interval	2		1.5	ft

Drawdown (s= m ln(t) + b)

slope	4.94		1.36
intercept	7.597		3.04
DD at 10 min (fitted)	18.97		6.17
DD at 100 min (fitted)	30.35		9.30
del s (1 log cycle)	11.37		3.13
r2 fit	0.98		1

Recovery (s= m ln(t') + b; t' = (t since pumping began/time since pump was off)

slope	117.8		3.35
intercept	12.58		-0.85
DD at 10 min (fitted)	283.82		6.86
DD at 100 min (fitted)	555.07		14.58
del s (1 log cycle)	271.24		7.71
r2 fit	0.84		0.99

Estimated T Values in ft2/day

DD	**0.99**		11.27	(= 2.303 Q/ 4 Pi del s)
Recovery	**0.04**		**4.57**	

Estimated K values in ft/day

DD	**0.5**		**7.5**
Recovery	**0.02**		**3.0**

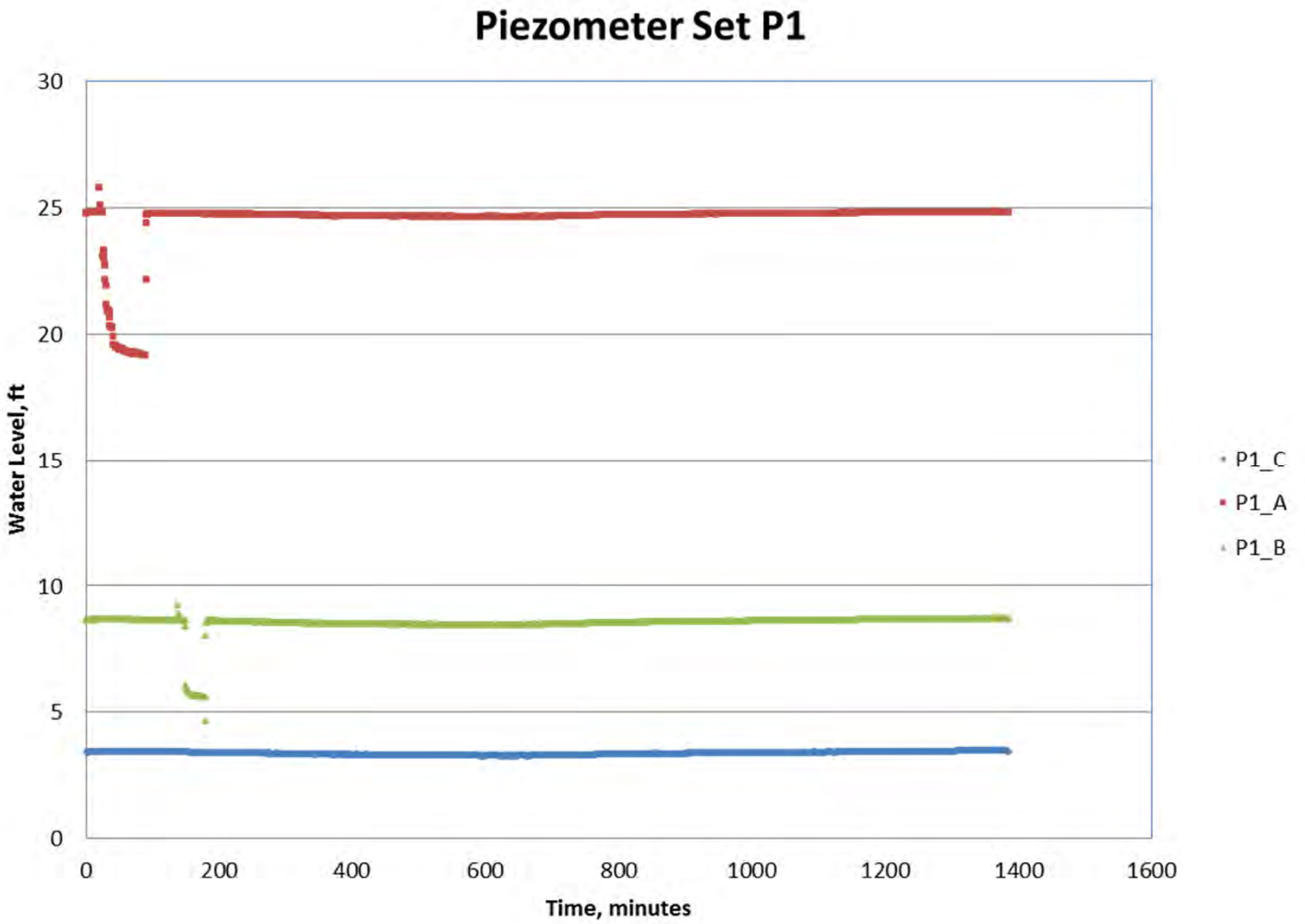
reference K values, ft/day

				cm/sec	hi	lo
0.03	to	0.00003	clay		1.0E-05	1.0E-08
0.28	to	0.003	silt		1.0E-04	1.0E-06
2.84	to	0.03	fine sand		1.0E-03	1.0E-05
283.50	to	2.84	coarse sand		1.0E-01	1.0E-03
2835.00	to	28.35	gravel		1.0E+00	1.0E-02

1 cm/sec= 2835 ft/day

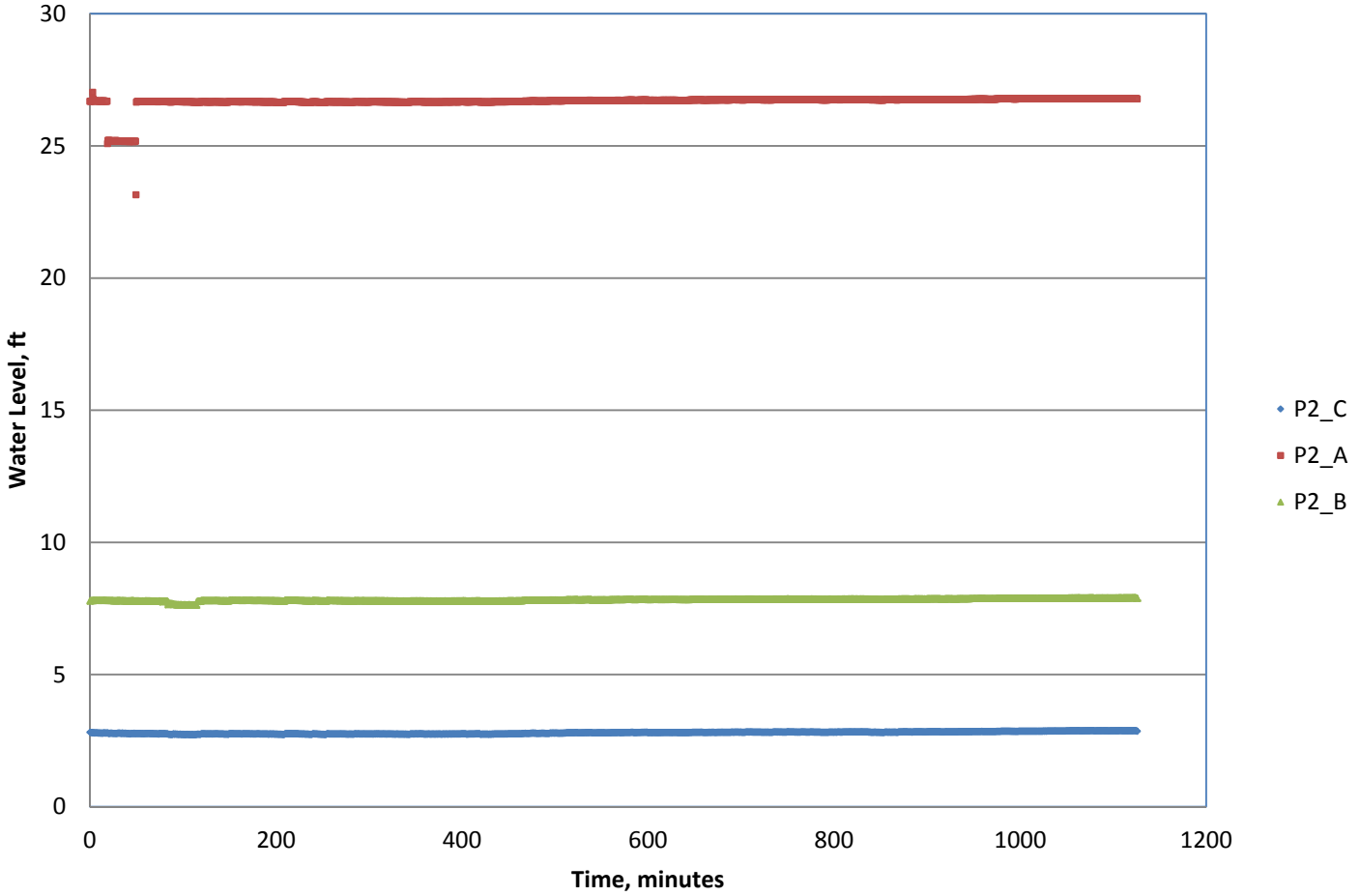
1 gpm= 192.51 ft3/day

HUSHMAND ASSOCIATES, INC. Geotechnical and Earthquake Engineers



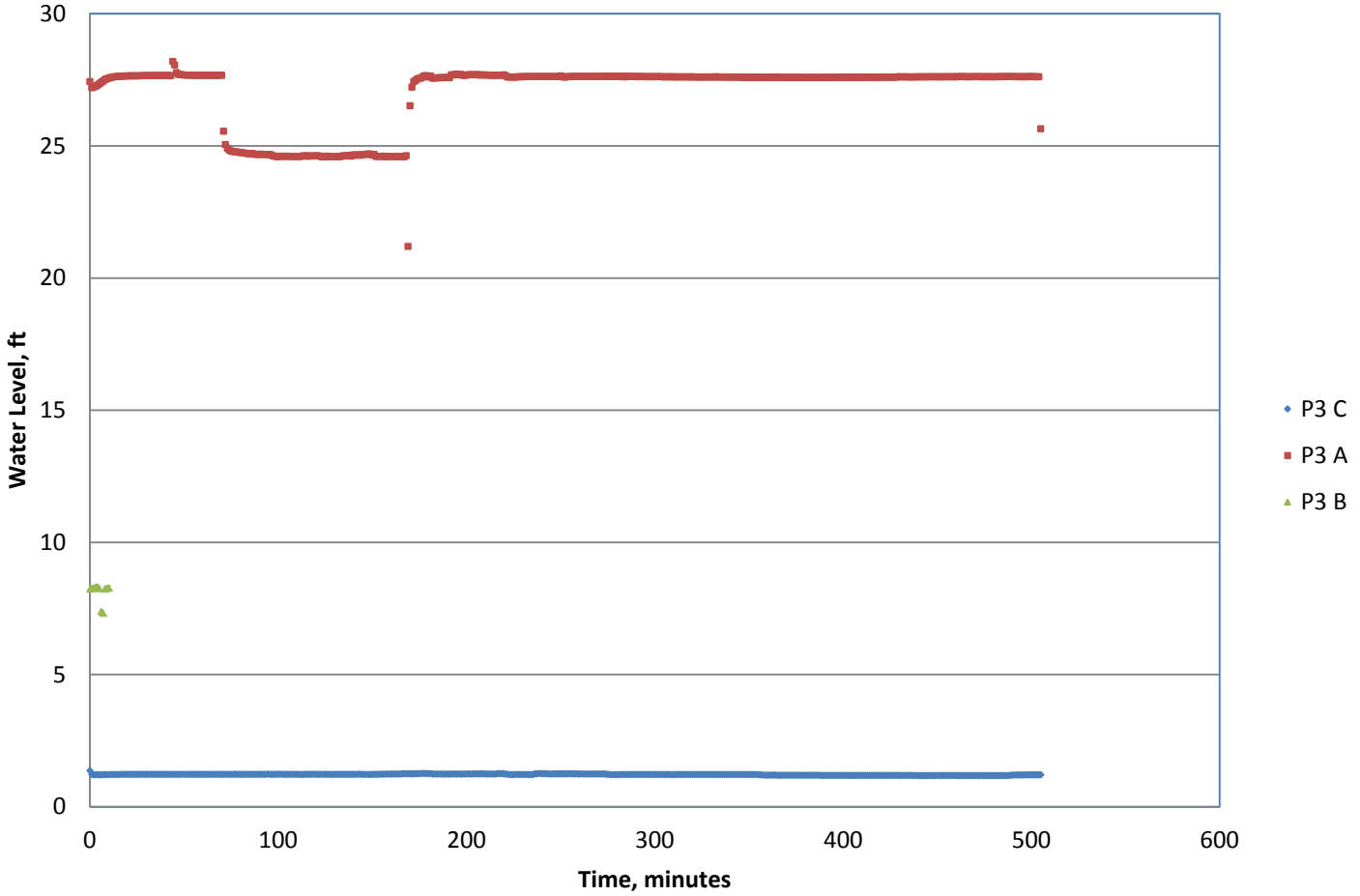
Notes: Water levels at each piezometer is relative to the transducer in that piezometer

HUSHMAND ASSOCIATES, INC. Geotechnical and Earthquake Engineers	**Owens Lake Groundwater Development Program** Inyo County, California Project No. LADWP-15-001	**TIME HISTORY DATA OF PIEZOMETER SET P1**	Figure **E-1**



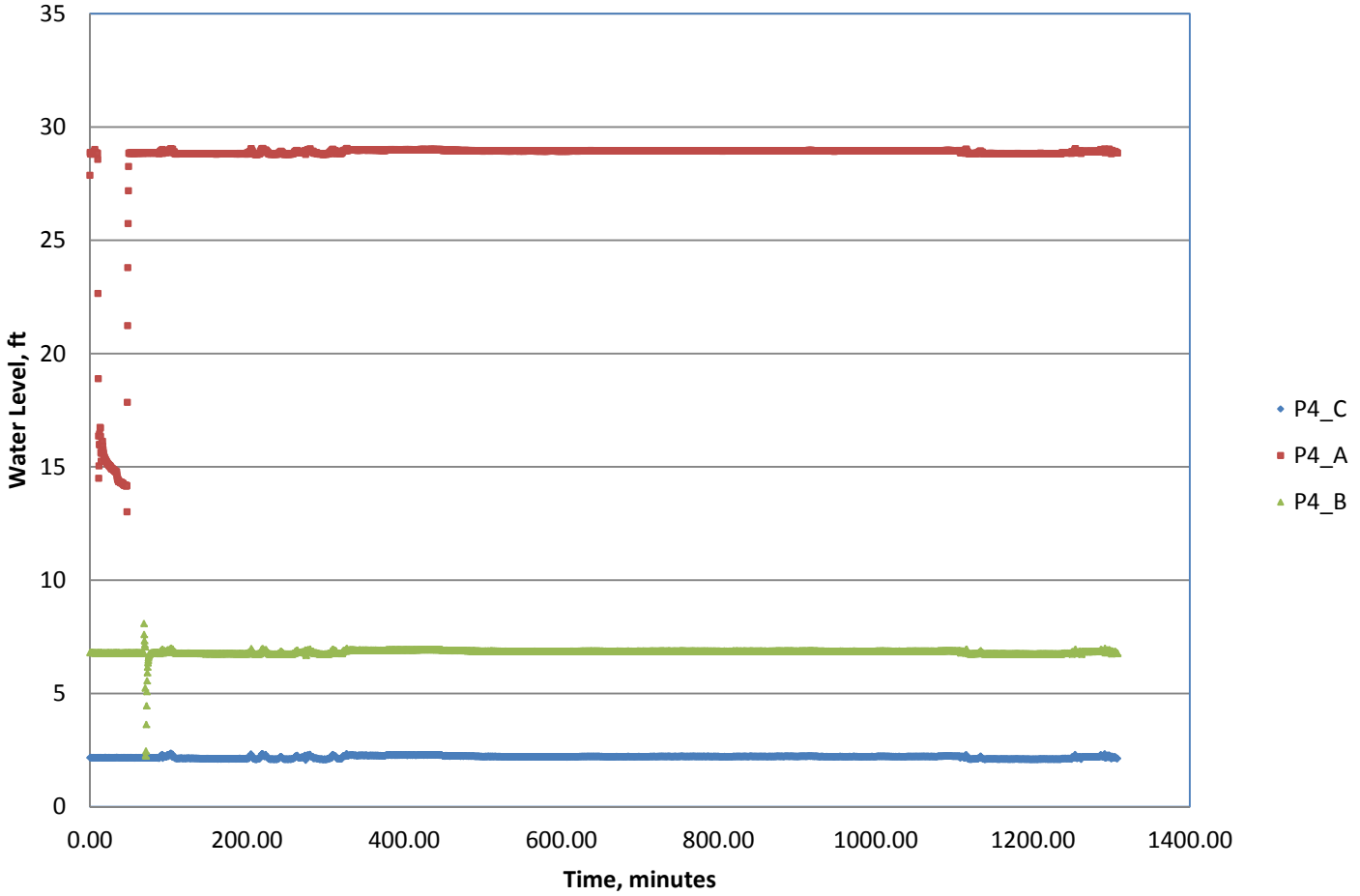
Notes: Water levels at each piezometer is relative to the transducer in that piezometer

HUSHMAND ASSOCIATES, INC. Geotechnical and Earthquake Engineers	**Owens Lake Groundwater Development Program** Inyo County, California Project No. LADWP-15-001	**TIME HISTORY DATA OF PIEZOMETER SET P2**	Figure **E-2**



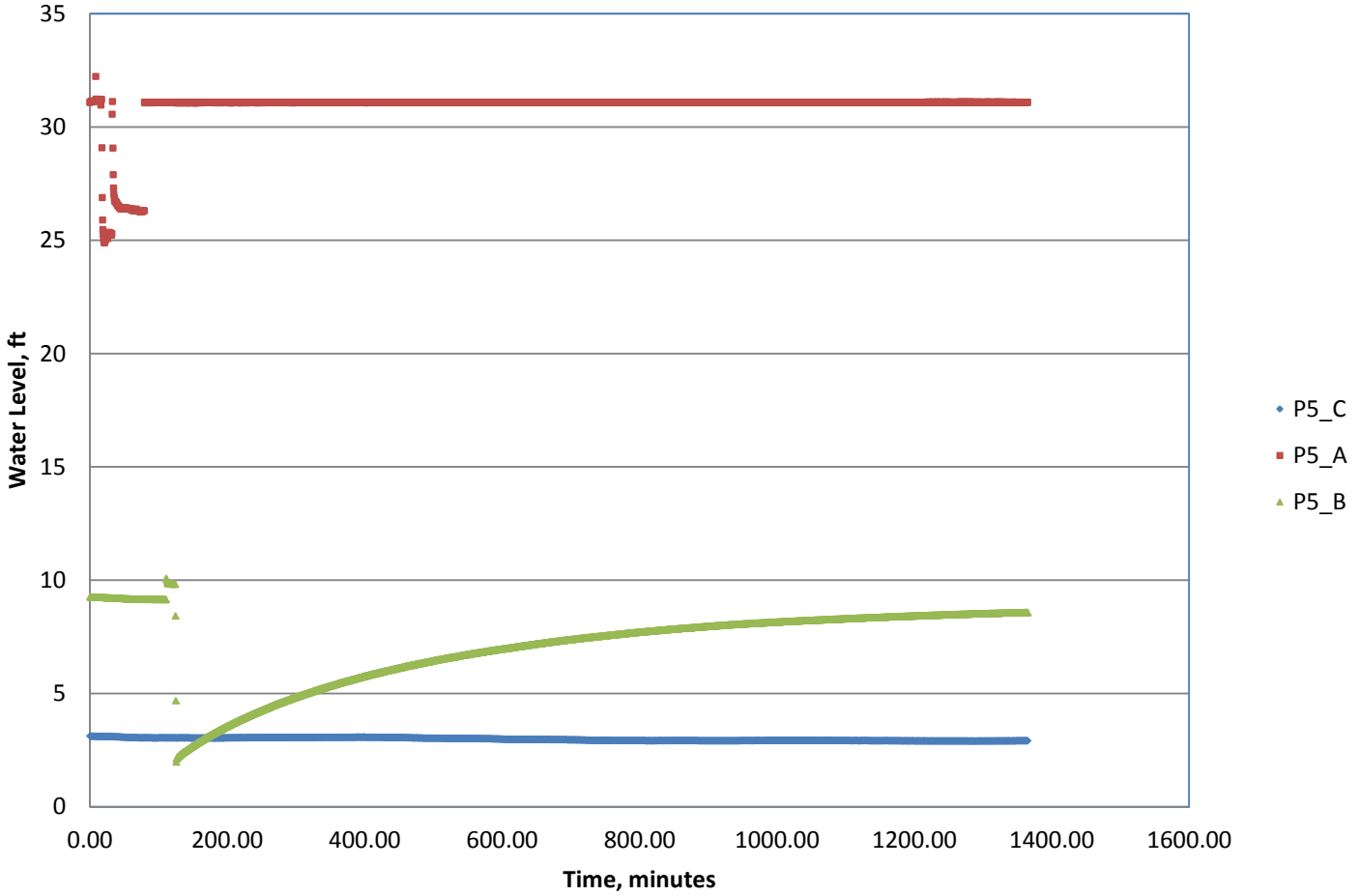
Notes: Water levels at each piezometer is relative to the transducer in that piezometer.
P3 B - Manual data used for test evaluation

HUSHMAND ASSOCIATES, INC. Geotechnical and Earthquake Engineers	**Owens Lake Groundwater Development Program** Inyo County, California Project No. LADWP-15-001	**TIME HISTORY DATA OF PIEZOMETER SET P3**	Figure **E-3**



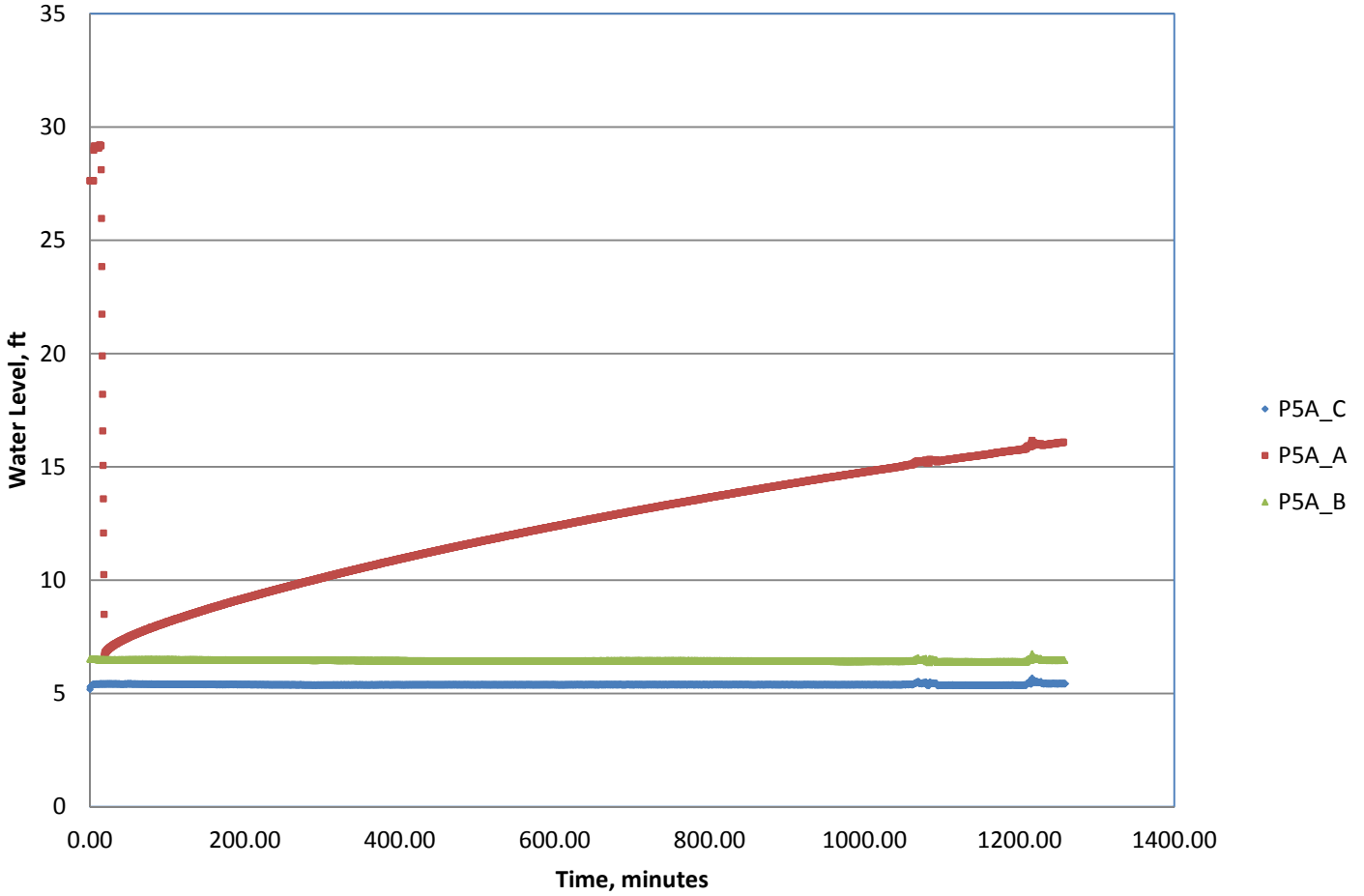
Notes: Water levels at each piezometer is relative to the transducer in that piezometer

HUSHMAND ASSOCIATES, INC. Geotechnical and Earthquake Engineers	**Owens Lake Groundwater Development Program** Inyo County, California Project No. LADWP-15-001	**TIME HISTORY DATA OF PIEZOMETER SET P4**	Figure **E-4**



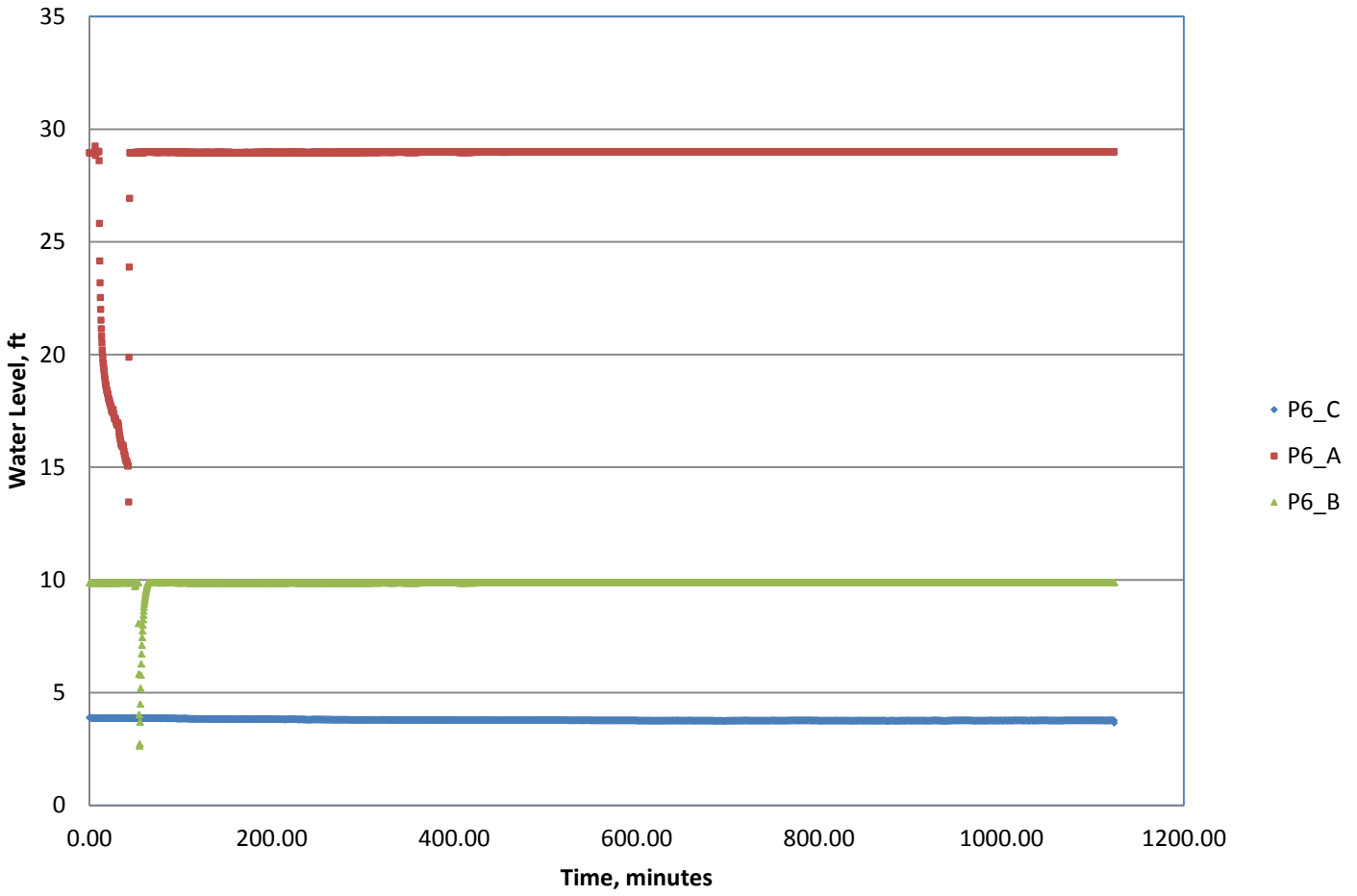
Notes: Water levels at each piezometer is relative to the transducer in that piezometer

HUSHMAND ASSOCIATES, INC. Geotechnical and Earthquake Engineers	**Owens Lake Groundwater Development Program** Inyo County, California Project No. LADWP-15-001	**TIME HISTORY DATA OF PIEZOMETER SET P5**	Figure **E-5**



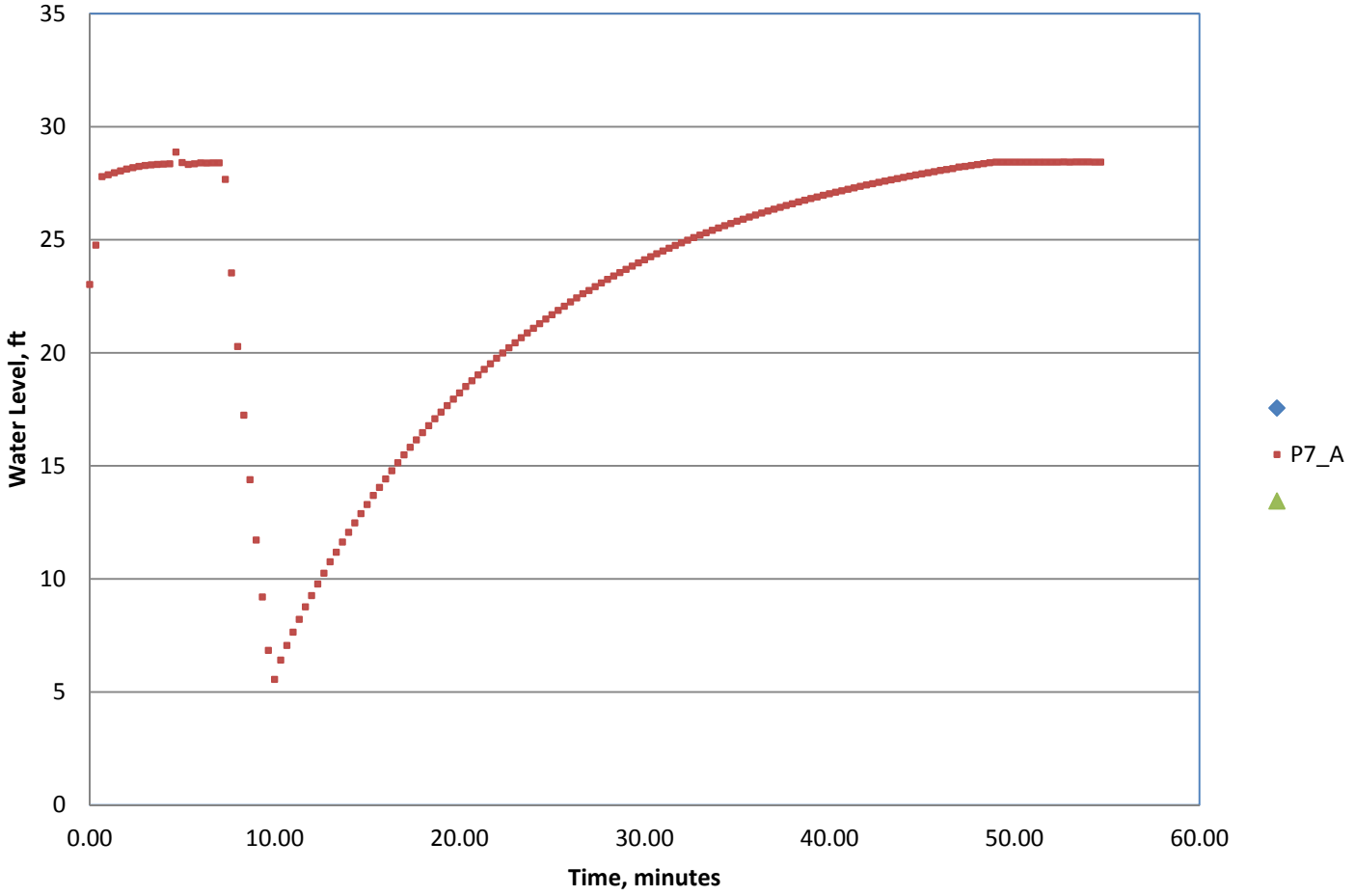
Notes: Water levels at each piezometer is relative to the transducer in that piezometer

HUSHMAND ASSOCIATES, INC. Geotechnical and Earthquake Engineers	**Owens Lake Groundwater Development Program** Inyo County, California Project No. LADWP-15-001	**TIME HISTORY DATA OF PIEZOMETER SET P5A**	Figure **E-6**



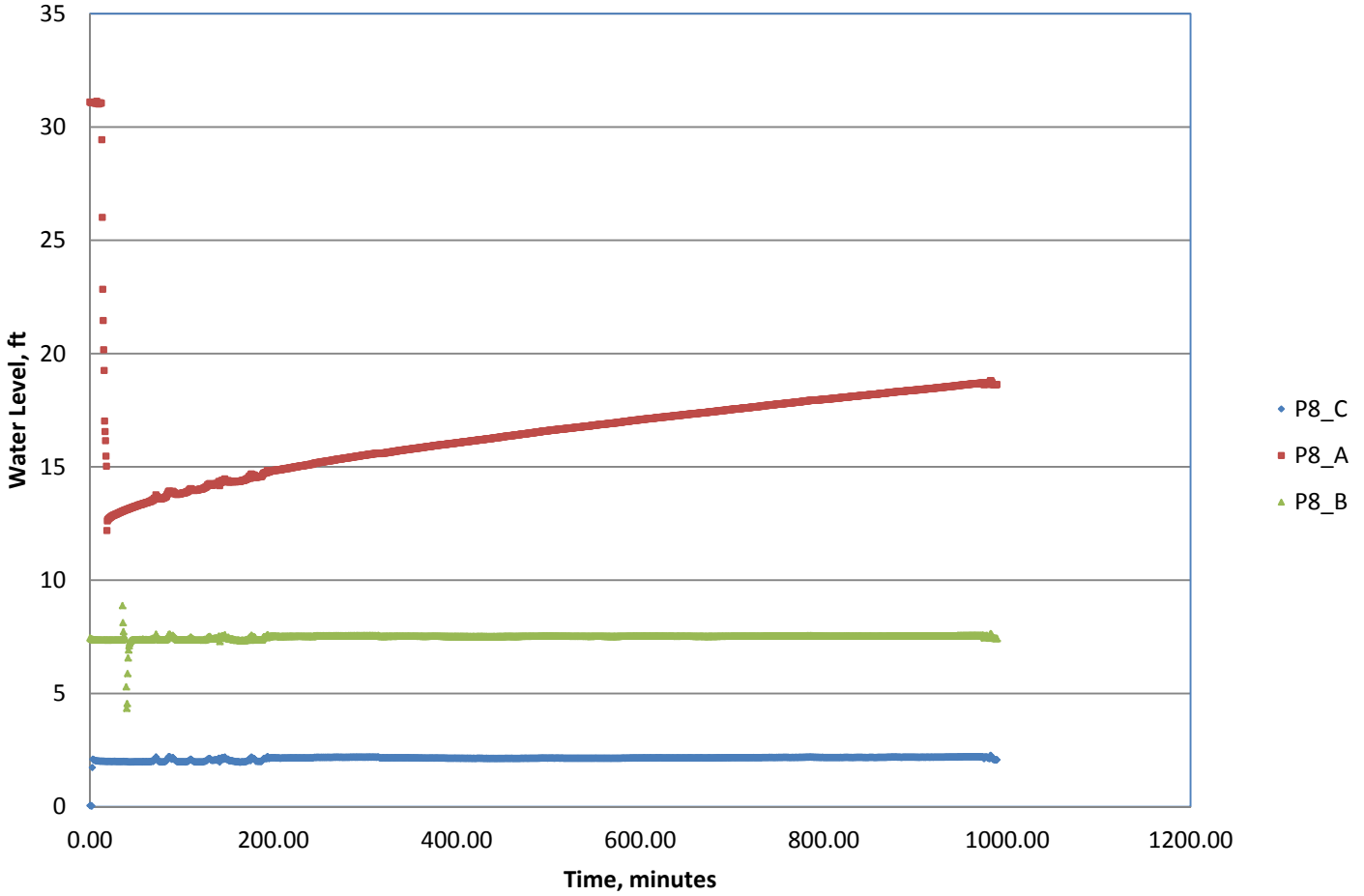
Notes: Water levels at each piezometer is relative to the transducer in that piezometer

HUSHMAND ASSOCIATES, INC. Geotechnical and Earthquake Engineers	**Owens Lake Groundwater Development Program** Inyo County, California Project No. LADWP-15-001	**TIME HISTORY DATA OF PIEZOMETER SET P6**	Figure **E-7**



Notes: Water levels at each piezometer is relative to the transducer in that piezometer

HUSHMAND ASSOCIATES, INC. Geotechnical and Earthquake Engineers	**Owens Lake Groundwater Development Program** Inyo County, California Project No. LADWP-15-001	**TIME HISTORY DATA OF PIEZOMETER SET P7**	Figure **E-8**



Notes: Water levels at each piezometer is relative to the transducer in that piezometer

HUSHMAND ASSOCIATES, INC. Geotechnical and Earthquake Engineers	**Owens Lake Groundwater Development Program** Inyo County, California Project No. LADWP-15-001	**TIME HISTORY DATA OF PIEZOMETER SET P8**	Figure **E-9**

APPENDIX F

RECENT MEASUREMENT DATA AT PIEZOMETER LOCATIONS

Table F-1. Summary of Piezometer Data

Location	RP Elevation	Slab Elev.	Offset	Total Head Elevation Measured in Feet above Mean Sea Level			
				6/12	7/20	8/11	9/2
P1 - A	3573.94			3570.98	3570.82	3570.60	3570.53
P1 -B	3573.99			3570.41	3570.25	3570.01	3569.95
P1 - C	3574.08			3570.09	3569.92	3569.73	3569.65
P2 - A	3568.37			3565.61	3565.92	3565.57	3565.60
P2 - B	3568.08			3564.25	3564.57	3564.26	3564.31
P2 - C	3568.35			3564.27	3564.55	3564.27	3564.31
P3 - A	3568.38			3565.27	3565.08	3564.81	3564.70
P3 - B	3568.34			3564.66	3564.44	3564.20	3564.11
P3 - C	3568.36			3564.75	3564.52	3564.31	3564.18
P4 - A*	3617.85	3616.33	2.50	3620.38	3620.21	3620.08	3622.53
P4 - B	3617.88			3613.88	3613.57	3613.23	3612.96
P4 - C	3617.72			3613.65	3613.82	3612.99	3612.72
P5 - A*	3579.68	3583.15	2.21	3599.50	3599.36	3599.38	3601.52
P5 - B	3578.61			3577.11	3576.65	3576.23	3575.99
P5 - C	3578.74			3576.78	3576.68	3575.94	3575.70
P5a - A	3584.85			3583.21	3583.09	3582.97	3582.82
P5a - B	3584.54			3581.07	3580.88	3580.54	3580.31
P5a - C	3584.74			3581.29	3581.09	3580.68	3580.47
P6 - A*	3590.76	3589.56	1.78	3602.48	3602.57	3602.55	3604.23
P6 - B	3589.83			3588.51	3588.34	3588.26	3588.13
P6 - C	3589.78			3588.01	3587.83	3587.51	3587.36
P7 - A*	3583.47	3581.88	2.14	3586.28	3586.07	3585.91	3587.91
P7 - B	3583.05			3580.99	3581.02	3580.77	3580.67
P7 - C	3583.26			3580.19	3579.95	3579.84	3579.74
P8 - A*	3593.79	3592.39	1.62	3592.66	3595.16	3594.89	3596.53
P8 - B	3593.19			3589.95	3589.63	3589.17	3589.08
P8 - C	3592.98			3590.04	3589.69	3589.25	3589.15

Notes:

Numbers in RED TEXT indicate approximate head for ***ARTESIAN FLOW,*** *calculated by PSI*2.306*

** Piezometers: P4-A, P5-A, P6-A, P7-A, and P8-A use RP Elevation from X notch on concrete slab*

Total artesian head calculated by : ***CONC SLAB ELEV + (psi*2.306) + Offset***

RP *= Reference Point located at the top of Piezometer casing*

Offset *= Distance from Concrete Slab to Presuure Head Measurement Location*

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Table F-2. Piezometer Data Measured on 6-12-2015

Location	Date	Time	RP to WS	Register height	RP Elevation	Remarks
P1 - A	6/12/2015	8:30	2.96	1.71	3573.938	2.96 - 1.71 = 1.25
P1 -B	6/12/2015	8:30	3.58	1.68	3573.989	3.58 - 1.68 = 1.90
P1 - C	6/12/2015	8:31	3.99	1.77	3574.084	3.99 - 1.77 = 2.22
P2 - A	6/12/2015	10:06	2.76	1.73	3568.372	2.76 - 1.73 = 1.03
P2 - B	6/12/2015	10:06	3.83	1.70	3568.08	3.83 - 1.70 = 2.13
P2 - C	6/12/2015	10:06	4.08	1.79	3568.354	4.08 - 1.79 = 2.29
P3 - A	6/12/2015	11:19	3.11	1.54	3568.377	3.11 - 1.54 = 1.57
P3 - B	6/12/2015	11:19	3.68	1.45	3568.344	3.68 - 1.45 = 2.23
P3 - C	6/12/2015	11:20	3.61	1.53	3568.358	3.61 - 1.53 = 2.08
P4 - A	6/18/2015	9:33	Artesian	n/a	3617.848	0.67 * 2.306 = 1.55
P4 - B	6/12/2015	11:56	4.00	1.46	3617.875	4.00 - 1.46 = 2.54
P4 - C	6/12/2015	11:58	4.07	1.35	3617.72	4.07 - 1.35 = 2.72
P5 - A	6/15/2015	9:02	Artesian	n/a	3579.681	6.13 * 2.306 = 14.14
P5 - B	6/15/2015	9:02	1.50	0.42	3578.605	1.50 - 0.42 = 1.08 (also known as N7 10ft)
P5 - C	6/15/2015	9:02	1.96	0.55	3578.741	1.96 - 0.55 = 1.41 (also known as N7 4ft)
P5a - A	6/15/2015	9:27	1.64	1.69	3584.852	1.64 - 1.69 = -0.05
P5a - B	6/15/2015	9:27	3.47	1.63	3584.543	3.47 - 1.63 = 1.84
P5a - C	6/15/2015	9:28	3.45	1.63	3584.739	3.45 - 1.63 = 1.82
P6 - A	6/18/2015	13:37	Artesian	n/a	3590.759	4.83 * 2.306 = 11.14
P6 - B	6/18/2015	14:29	1.32	2.47	3589.83	1.32 - 2.47 = -1.15
P6 - C	6/15/2015	10:49	1.77	0.86	3589.777	1.77 - 0.86 = 0.91
P7 - A	6/18/2015	15:40	Artesian	n/a	3583.467	0.98 * 2.306 = 2.26
P7 - B	6/23/2015	12:20	2.06	1.05		2.06 - 1.05 = 1.01
P7 - C	6/23/2015	12:20	3.07	0.78		3.07 - 0.78 = 2.29
P8 - A	6/18/2015	14:29	1.13	1.8	3593.791	1.13 - 1.80 = -0.67
P8 - B	6/15/2015	13:02	3.24	0.89	3593.194	3.24 - 0.89 = 2.35
P8 - C	6/15/2015	13:02	2.94	0.68	3592.979	2.94 - 0.68 = 2.26

Note: RP to WS (reference point to water surface), top of concrete slab to the top of the pvc pipe was used as the register height.

Table F-3. Piezometer Data Measured on 07-20-2015

Location	Date	Time	RP to WS	Register height	Remarks
P1 - A	7/20/2015	14:53	3.12	1.71	3.12 - 1.71 = 1.41
P1 -B	7/20/2015	14:55	3.74	1.68	3.74 - 1.68 = 2.06
P1 - C	7/20/2015	14:56	4.16	1.77	4.16 - 1.77 = 2.39
P2 - A	7/20/2015	14:32	2.45	1.73	2.45 - 1.73 = 0.72
P2 - B	7/20/2015	14:33	3.51	1.70	3.51 - 1.70 = 1.81
P2 - C	7/20/2015	14:35	3.80	1.79	3.80 - 1.79 = 2.01
P3 - A	7/20/2015	14:05	3.30	1.54	3.30 - 1.54 = 1.76
P3 - B	7/20/2015	14:07	3.90	1.45	3.90 - 1.45 = 2.45
P3 - C	7/20/2015	14:08	3.84	1.53	3.84 - 1.53 = 2.31
P4 - A	7/20/2015	13:41	Artesian	n/a	0.60 psi * 2.306 = 1.38
P4 - B	7/20/2015	13:42	4.31	1.46	4.31 - 1.46 = 2.85
P4 - C	7/20/2015	13:43	3.90	1.35	3.90 - 1.35 = 2.55
P5 - A	7/20/2015	13:21	Artesian	n/a	6.07 psi * 2.306 = 14.00
P5 - B	7/20/2015	13:22	1.96	0.42	1.96 - 0.42 = 1.54
P5 - C	7/20/2015	13:23	2.06	0.55	2.06 - 0.55 = 1.51
P5a - A	7/20/2015	13:03	1.76	1.69	1.76 - 1.69 = 0.07
P5a - B	7/20/2015	13:04	3.66	1.63	3.66 - 1.63 = 2.03
P5a - C	7/20/2015	13:05	3.65	1.63	3.65 - 1.63 = 2.02
P6 - A	7/20/2015	11:04	Artesian	n/a	4.87 psi * 2.306 = 11.23
P6 - B	7/20/2015	11:05	1.49	2.47	1.49 - 2.47 = -0.98
P6 - C	7/20/2015	11:07	1.95	0.86	1.95 - 0.86 = 1.09
P7 - A	7/20/2015	10:43	Artesian	n/a	0.89 psi * 2.306 = 2.05
P7 - B	7/20/2015	10:44	2.03	1.05	2.03 - 1.05 = 0.98
P7 - C	7/20/2015	10:45	3.31	0.78	3.31 - 0.78 = 2.53
P8 - A	7/20/2015	9:27	Artesian	n/a	0.50 psi * 2.306 = 1.15
P8 - B	7/20/2015	9:28	3.56	0.89	3.56 - 0.89 = 2.67
P8 - C	7/20/2015	9:28	3.29	0.68	3.29 - 0.68 = 2.61

Note: RP to WS (reference point to water surface), top of concrete slab to the top of the pvc pipe was used as the register height.

Table F-4. Piezometer Data Measured on 08-11-2015

Location	Date	Time	RP to WS	Register height	Remarks
P1 - A	8/11/2015	8:36	3.34	1.71	3.34 - 1.71 = 1.63
P1 -B	8/11/2015	8:36	3.98	1.68	3.98 - 1.68 = 2.30
P1 - C	8/11/2015	8:37	4.35	1.77	4.35 - 1.77 = 2.58
P2 - A	8/11/2015	9:24	2.8	1.73	2.80 - 1.73 = 1.07
P2 - B	8/11/2015	9:25	3.82	1.70	3.82 - 1.70 = 2.12
P2 - C	8/11/2015	9:26	4.08	1.79	4.08 - 1.79 = 2.29
P3 - A	8/11/2015	10:12	3.57	1.54	3.57 - 1.54 = 2.03
P3 - B	8/11/2015	10:13	4.14	1.45	4.14 - 1.45 = 2.69
P3 - C	8/11/2015	10:14	4.05	1.53	4.05 - 1.53 = 2.52
P4 - A	8/11/2015	11:03	Artesian	n/a	0.54 psi *2.306 = 1.25
P4 - B	8/11/2015	11:03	4.65	1.46	4.65 - 1.46 = 3.19
P4 - C	8/11/2015	11:04	4.73	1.35	4.73 - 1.35 = 3.38
P5 - A	8/11/2015	12:20	Artesian	n/a	6.08 psi *2.306 = 14.02
P5 - B	8/11/2015	12:21	2.38	0.42	2.38 - 0.42 = 1.96
P5 - C	8/11/2015	12:23	2.8	0.55	2.80 - 0.55 = 2.25
P5a - A	8/11/2015	12:38	1.88	1.69	1.88 - 1.69 = 0.19
P5a - B	8/11/2015	12:39	4	1.63	4.00 - 1.63 = 2.37
P5a - C	8/11/2015	12:40	4.06	1.63	4.06 - 1.63 = 2.43
P6 - A	8/11/2015	13:31	Artesian	n/a	4.86 psi *2.306 = 11.21
P6 - B	8/11/2015	13:32	1.57	2.47	1.57 - 2.47 = -0.90
P6 - C	8/11/2015	13:32	2.27	0.86	2.27 - 0.86 = 1.41
P7 - A	8/11/2015	13:56	Artesian	n/a	0.82 psi *2.306 = 1.89
P7 - B	8/11/2015	13:57	2.28	1.05	2.28 - 1.05 = 1.23
P7 - C	8/11/2015	13:58	3.42	0.78	3.42 - 0.78 = 2.64
P8 - A	8/11/2015	14:20	Artesian	n/a	0.38 psi *2.306 = 0.88
P8 - B	8/11/2015	14:20	4.02	0.89	4.02 - 0.89 = 3.13
P8 - C	8/11/2015	14:21	3.73	0.68	3.73 - 0.68 = 3.05

Note: RP to WS (reference point to water surface), top of concrete slab to the top of the pvc pipe was used as the register height.

P1 = Northwest Spring, P2 = Cottonwood, P3 = Kaiser Permanente, P4 = Olancha, P5 = Tubman Channel, P5a = Truck Sticker, P6 = Swedes Pasture, P7 = Millsite, P8 = Horse Pasture.

A = 31.5 ft deep piezometer, B = 12 ft deep piezometer, C = 6 ft deep piezometer.

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Table F-5. Piezometer Data Measured on 09-01-2015

Location	Date	Time	RP to WS	Register height	Remarks	head	offset
P1 - A	9/1/2015	9:56	3.41	1.71	3.41 - 1.71 = 1.70		
P1 -B	9/1/2015	9:56	4.04	1.68	4.04 - 1.68 = 2.36		
P1 - C	9/1/2015	9:57	4.43	1.77	4.43 - 1.77 = 2.66		
P2 - A	9/1/2015	10:21	2.77	1.73	2.77 - 1.73 = 1.04		
P2 - B	9/1/2015	10:21	3.77	1.70	3.77 - 1.70 = 2.07		
P2 - C	9/1/2015	10:21	4.04	1.79	4.04 - 1.79 = 2.25		
P3 - A	9/1/2015	10:54	3.68	1.54	3.68 - 1.54 = 2.14		
P3 - B	9/1/2015	10:54	4.23	1.45	4.23 - 1.45 = 2.78		
P3 - C	9/1/2015	10:55	4.18	1.53	4.18 - 1.53 = 2.65		
P4 - A	9/1/2015	11:21	Artesian	n/a	0.52 psi *2.306 + 2.50 = 3.699	3.699	2.50
P4 - B	9/1/2015	11:22	4.92	1.46	4.92 - 1.46 = 3.46		
P4 - C	9/1/2015	11:23	5.00	1.35	5.00 - 1.35 = 3.65		
P5 - A	9/1/2015	14:56	Artesian	n/a	6.05 psi *2.306 + 2.21 = 16.161	16.161	2.21
P5 - B	9/1/2015	14:56	2.62	0.42	2.62 - 0.42 = 2.20		
P5 - C	9/1/2015	14:57	3.04	0.55	3.04 - 0.55 = 2.49		
P5a - A	9/1/2015	15:09	2.03	1.69	2.03 - 1.69 = 0.34		
P5a - B	9/1/2015	15:09	4.23	1.63	4.23 - 1.63 = 2.60		
P5a - C	9/1/2015	15:09	4.27	1.63	4.27 - 1.63 = 2.64		
P6 - A	9/1/2015	14:27	Artesian	n/a	4.82 psi *2.306 + 1.78 = 12.894	12.894	1.78
P6 - B	9/1/2015	14:28	1.7	2.47	1.70 - 2.47 = -0.77		
P6 - C	9/1/2015	14:29	2.42	0.86	2.42 - 0.86 = 1.56		
P7 - A	9/1/2015	14:07	Artesian	n/a	0.76 psi *2.306 + 2.14 = 3.892	3.892	2.14
P7 - B	9/1/2015	14:08	2.38	1.05	2.38 - 1.05 = 1.33		
P7 - C	9/1/2015	14:08	3.52	0.78	3.52 - 0.78 = 2.74		
P8 - A	9/1/2015	12:01	Artesian	n/a	0.39 psi *2.306 + 1.62 = 2.519	2.519	1.62
P8 - B	9/1/2015	12:02	4.11	0.89	4.11 - 0.89 = 3.22		
P8 - C	9/1/2015	12:03	3.83	0.68	3.83 - 0.68 = 3.15		

Note: RP to WS (reference point to water surface), top of concrete slab to the top of the pvc pipe was used as the register height.

P1 = Northwest Spring, P2 = Cottonwood, P3 = Kaiser Permanente, P4 = Olancha, P5 = Tubman Channel,

P5a = Truck Sticker, P6 = Swedes Pasture, P7 = Millsite, P8 = Horse Pasture

A = 31.5 ft deep piezometer, B = 12 ft deep piezometer, C = 6 ft deep piezometer.

P4 - A = +2.50 offset, P5 - A = +2.21 offset, P6 - A = +1.78 offset, P7 - A = +2.14 offset, P8 - A = +1.62 offset.