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February 2019

Data Gap Investigation Technical Memorandum – Phase I Groundwater Quality Assessment

NERT Remedial Investigation – Downgradient Study Area
Nevada Environmental Response Trust Site
Henderson, Nevada

Final

Data Gap Investigation Technical Memorandum – Phase I Groundwater Quality Assessment, Revision 0

Nevada Environmental Response Trust
Remedial Investigation – Downgradient Study Area, Henderson, Nevada

Responsible Certified Environmental Manager (CEM) for this project

I hereby certify that I am responsible for the services described in this document and for the preparation of this document. The services described in this document have been provided in a manner consistent with the current standards of the profession and, to the best of my knowledge, comply with all applicable federal, state and local statutes, regulations and ordinances.

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List of Abbreviations

%	percent
BCL	Basic Comparison Level
bgs	below ground surface
cfs	cubic feet per second
CSM	Conceptual Site Model
DGI	Data Gap Investigation
DGIP	Data Gap Investigation Plan
Downgradient Study Area	NERT RI Downgradient Study Area
EA	Environmental Assessment
EPA	U.S. Environmental Protection Agency
Endeavour	Endeavour LLC
lb/day	pounds per day
LVW	Las Vegas Wash
mg/L	milligram(s) per liter
NDEP	Nevada Division of Environmental Protection
NERT	Nevada Environmental Response Trust
NERT Site	on-site portion of the NERT RI
Reclamation	U.S. Bureau of Reclamation
RI	Remedial Investigation
SNWA	Southern Nevada Water Authority
TDS	total dissolved solids
µg/L	microgram(s) per liter
USCS	Unified Soil Classification System
UMCf	Upper Muddy Creek formation
xMCf	Transitional Muddy Creek formation

1.0 Introduction

This Data Gap Investigation (DGI) Technical Memorandum describes the installation of the initial (Phase I) groundwater wells and the results of subsequent groundwater sampling along the Las Vegas Wash (LVW) in support of the Nevada Environmental Response Trust (NERT) Remedial Investigation (RI) Downgradient Study Area in Henderson, Nevada (herein referred to as the Downgradient Study Area) (**Figure 1**). This DGI was developed at the direction of the Nevada Division of Environmental Protection (NDEP) and describes the rationale, procedures and methods for the installation, development and sampling of the groundwater wells as well as the observations and results of the investigation. In general, the work was performed consistent with the *Data Gap Investigation Plan (DGIP) – Phase I Groundwater Monitoring Well Installation* as modified by the May 31, 2018 Technical Memorandum (AECOM 2017a and 2018a). Consistent with NDEP protocols, this DGI Technical Memorandum was provided to stakeholders for review; however, no stakeholder comments were received (**Appendix A)**.

The overall objective of the investigation of the Downgradient Study Area is to identify subsurface pathways through which perchlorate-impacted groundwater is entering the LVW. The Phase I DGI was conducted to aid in meeting that objective. The Phase I DGIP identified 10 new wells; however, one well was not installed due to near surface bedrock which the drill rig was unable to penetrate. The DGI, therefore, consisted of the installation of nine new wells, sampling of groundwater from the nine new and 17 existing wells, and installation of transducers in the nine new wells to characterize groundwater conditions in areas where data gaps were identified.

Perchlorate concentrations in the Downgradient Study Area are generally defined but additional data are required to address specific data gaps identified based on historic data and groundwater monitoring data collected in April 2016 (AECOM 2016a), transducer data (AECOM 2018b), and LVW surface water data collected in May 2016 (AECOM 2016b), February 2017 (AECOM 2017d), and in February, March, and May 2018 (AECOM 2018c). The term perchlorate flux and perchlorate load are used to describe perchlorate inflow and transportation within LVW. Perchlorate flux into LVW is the measurement of the amount of perchlorate discharging into LVW per unit of time, for example pounds per day (lb/day). Total perchlorate load in LVW is the estimated amount of perchlorate that is carried by the surface water in LVW at a specific location, for example 29 lb/day at Lower Narrows Weir. As stated in the DGIP, the data gaps addressed in part by this Phase I DGI include:

1. Where are the high concentration (1,000 micrograms per liter [µg/L] or higher) perchlorate-impacted groundwater plumes along the north and south sides of the LVW?
2. Why are there noticeable differences in perchlorate concentrations in groundwater over relatively short distances?
3. Do the high-concentration perchlorate plumes follow distinct water-bearing zones within the alluvium or bedrock formations?
4. Along the LVW, does groundwater flow generally in the same direction as the surface water?
5. Where does perchlorate-impacted groundwater discharge to the LVW?
6. Where is the groundwater/surface water interface and how far is it from the LVW?
7. Is there an area of known or suspected perchlorate flux of sufficient magnitude where an interim remedial action would be appropriate?
8. Is perchlorate-impacted groundwater bypassing the seep well field on its eastern side in the vicinity of monitoring well COH2B1?
9. Do concentrations of perchlorate in groundwater fluctuate over time, seasonally, or after a rain event?

Remaining data gaps will be the focus of the more extensive Phase II investigation that will build on the Phase I results (presented in this document) and the surface water studies performed by AECOM in the winter and spring of 2018. The well installation, sampling, and analytical results of the samples collected during this investigation are summarized in this DGI Technical Memorandum. The data collected during this field effort have been used to address the data gaps and update the Conceptual Site Model (CSM), previously presented in the DGIP. As an interim deliverable, this document presents the sampling and analytical results of the samples collected per the DGIP. All data presented in this document, in addition to complimentary data from adjacent areas within Operable Unit-3 (NERT RI Study Area north of Galleria Road), will be further evaluated by NERT during the preparation of the RI Report.

1.1 Rationale for Phase I Well Installation Locations

Perchlorate concentrations obtained from the April and May 2016 groundwater and surface water analysis were used to identify key locations along the LVW where data gaps exist that could be addressed by the installation of groundwater monitoring wells completed in the shallow (0 to 90 feet below ground surface [bgs]) water-bearing zone). In addition, historical data and recommendations presented in previous data gap technical memorandums were also evaluated (Broadbent 2015 and Environ 2015). **Table 1** presents the rationale for the installation of each well. **Figure 2** shows the nine groundwater monitoring well locations in relation to the perchlorate concentrations present in April and May 2016 in groundwater, surface water and seeps. **Figure 3** shows the geology, location of the Phase I wells and the perchlorate concentrations in groundwater from April 2016.

1.2 Site Background Information

1.2.1 Regional Geology

The Site is located within the Las Vegas Valley, which occupies a topographic and structural basin trending northwest-southeast and extending approximately 55 miles from near Indian Springs on the north to Railroad Pass on the south. The valley is bounded by the Las Vegas Range, Sheep Range, and Desert Range to the north; by Frenchman and Sunrise Mountains to the east; by the McCullough Range and River Mountains to the south and southeast; and the Spring Mountains to the west. The mountain ranges bounding the east, north, and west sides of the valley consist primarily of Paleozoic and Mesozoic sedimentary rocks (limestones, sandstones, siltstones, and fanglomerates), whereas the mountains on the south and southeast consist primarily of Tertiary volcanic rocks (basalts, rhyolites, andesites, and related rocks) that overlie Precambrian metamorphic and granitic rocks (ENSR 2007).

In the Las Vegas Valley, eroded Tertiary and Quaternary sedimentary and volcanic rocks comprise the unconsolidated basin deposits, which can be up to 13,000 feet thick (ENSR 2007). The valley floor consists of fluvial, paludal (swamp), playa, and lacustrine deposits surrounded by more steeply sloping alluvial fan aprons derived from erosion of the surrounding mountains. Generally, the deposits grade finer with increasing distance from their source and with decreasing elevation. The structure within the Quaternary and Tertiary-aged basin fill is characterized by a series of generally north-south trending fault scarps.

1.2.2 Local Geology

The local geology and hydrogeology are defined by data collected from soil borings and wells that have been installed in the LVW area. The following descriptions have been updated from the CSM report (ENSR 2005). The Downgradient Study Area is composed of Quaternary alluvial deposits, the Muddy Creek formation, the Thumb formation, and the Horse Springs formation (**Figure 4**). These deposits are described in more detail below.

Alluvium. The alluvium consists of a reddish-brown heterogeneous mixture of fine- to coarse-grained angular sand and gravel with lesser amounts of silt, clay, and caliche. Boulders and cobbles are common. Due to the mode of deposition, no distinct beds or units are continuous over the LVW area. North of LVW the alluvium is primarily from the Frenchman Mountains and the clasts are generally composed of limestone, sandstone, siltstone, quartzite, with locally high concentrations of granite and gneiss (Bell and Smith 1980). South of LVW the alluvium is derived from the River Mountains and McCullough Range. The clasts present in the alluvium and derived from these mountains are dominantly composed of dacite, with basalt, tuff, and sedimentary rocks also present. Gypsum is also present in all of the alluvial deposits (Bell and Smith 1980).

South of LVW a feature of the alluvial deposits is the stream-deposited sands and gravels that were laid down within paleochannels eroded into the surface of the Muddy Creek formation during infrequent flood runoff periods. These deposits vary in thickness and are narrow and generally linear. These are generally uniform sand and gravel deposits that exhibit higher permeability than the adjacent, well-graded deposits. Along LVW the paleochannels are less distinct and have likely been reworked as the main channel of LVW meandered and alternately cut downward and filled in with sediments through the course of seasonal storms, wastewater releases, and manmade channel alterations. The LVW has been and continues to be significantly modified through the installation and modification of erosion control features and improvements made to roads, bike paths, footpaths, and wildlife habitat within Clark County Wetlands Park.

The thickness of the alluvial deposits ranges from less than 1 foot to more than 90 feet in the Downgradient Study Area. Soil types identified in on-site soil borings include gravel, sandy gravel, silty gravel, clayey gravel, sand, silty sand, clayey sand, sandy clay, clay, sandy silt, and silt.

Transitional (or reworked) Muddy Creek formation. Where present, Transitional Muddy Creek formation (xMCf) is encountered at the base of the alluvium. The xMCf consists of reworked sediments derived from the Muddy Creek formation. The xMCf appears similar to the Muddy Creek formation, but it consists of reworked, less consolidated, and indurated sediments.

Muddy Creek formation. The Upper Muddy Creek formation (UMCf) of Pleistocene age occurs in the Las Vegas Valley as valley-fill deposits that are coarse grained near mountain fronts and become progressively finer grained toward the center of the valley. The Muddy Creek formation represents deposition in an alluvial apron environment from the Spring Mountains to the west, grading into fluvial, paludal (swamp), playa, and lacustrine environments further out into the valley center.

In Phase I borings, the contact between the Quaternary alluvium and the UMCf (fine-grained member) is typically marked by gray-green to yellow-green gypsiferous clays and silts. The Muddy Creek formation can also be yellow brown or red brown. The UMCf is up to 325 feet thick (Bell and Smith 1980).

Horse Springs formation. As described in the geotechnical investigations conducted for the weir construction, the Horse Springs formation is composed of siliceous limestone interbedded with white to yellow silts and shales (GES 2007a). By Lower Narrows Weir it consists mostly of carbonate beds and is intruded by andesite sills with low-grade metamorphic contact aureoles. An aureole is the zone of altered rock that surrounds an intrusion. It consists of interbedded limestone, dolomite, and calcareous sandstone and claystone. Colors range from buff-white to pinkish gray to red brown. It is distinguished mainly by the fissile siltstone and claystone beds, variability of color over 6 inches to several feet, and an abundance of carbonate beds.

Thumb formation. As described in the geotechnical investigations conducted for the weir construction, the Thumb formation consists of red limestone, calcareous sandstone and siltstone (GES 2007b). Some parts of this formation are well bedded. The formation also contains volcanic flows and dikes. It is characterized by three sequences:

1. An upper sequence consisting of Precambrian gneiss, schist and granite clasts strongly cemented in a silica matrix. The clasts are typically angular. It becomes weakly cemented by the Frenchman fault zone.
2. A middle sequence consisting of thinly laminated pink to reddish yellow claystone and siltstone. This sequence is 20 to 30 feet thick, weakly cemented and friable. It contains gypsum veins and cross bedding.

3. A lower sequence that is composed of interbedded medium-grained sandstone, siltstone and claystone. It is predominantly red to reddish brown in color, weakly to moderately cemented and has some greenish gray units. Individual beds are 0.5 to 8 inches thick. Generally the sandstone beds are more strongly cemented than the siltstone and claystone beds. The silt and clay beds have low permeability. This unit dips at 8 to 30 degrees and the Frenchman fault deforms it.

Extrusive Igneous Rocks. North of LVW, an andesitic and basaltic sequence follows the trend of the Frenchman fault. It consists of an upper greenish black flow of porphyritic basalt that has green olivine phenocrysts in a black groundmass. Below this flow is float composed of brownish black basaltic andesite. The trend of this sequence is North 32 degrees West and it exhibits dips up to 60 degrees to the southwest (GES 2007a and GES 2007b).

1.2.3 Local Groundwater Hydrology

The local groundwater hydrology is based on data collected from existing wells that have been installed in the LVW area. The depth to groundwater within the Downgradient Study Area along LVW varies from less than 3 feet bgs to over 40 feet bgs. Generally, when a well is physically near LVW shallow depth to water is observed; conversely, when a well is far away from LVW a deeper depth to water is observed, which is mainly due to topographic elevation differences. Actual groundwater elevations increase with distance from LVW. The groundwater flow direction is generally to the east at a gradient of 0.0079 feet per feet. The shallow flow zone has been defined as groundwater from 0 to 90 feet bgs, and this zone was the focus of the Phase I investigation.

The groundwater quality along LVW was evaluated by the Southern Nevada Water Authority (SNWA)(Zhou 2012). The data was based on samples collected from wells on a monthly or quarterly basis from 2001 to 2010. The pH values in groundwater were typically between 6.5 and 7.5. Dissolved oxygen was generally less than 5 milligrams per liter (mg/L). Total dissolved solids (TDS) ranged from 1,400 to 6,800 mg/L and groundwater exhibiting TDS concentrations lower than 3,000 mg/L were suspected of being mixed with surface water from LVW (Zhou 2012).

2.0 Well Installation and Data Collection

Well installation and sampling for this DGI were conducted consistent with the DGIP – Phase I Groundwater Monitoring Well Installation. Nine groundwater monitoring wells were installed, developed, and sampled as part of this DGI. The wells are located within the Downgradient Study Area along the north and south banks of the LVW. The nine new wells and 17 existing wells were sampled. These well locations are shown on **Figure 5**.

2.1 Pre-Field Activities

Work was conducted under the site-specific Health and Safety Plan (AECOM 2017b) and Quality Assurance Project Plan (AECOM 2017c) was developed for the Downgradient Study Area and the planned field work. The existing NERT RI Quality Assurance Project Plan was adapted to include the proposed Downgradient Study Area investigations, specifically including the changes applied to the proposed well installations described below in Section 2.2.8.

Access to U.S. Bureau of Reclamation (Reclamation) and Clark County properties to install the new groundwater wells was obtained by NDEP and NERT, respectively. An Environmental Assessment (EA) was prepared for wells located on Reclamation land. Wells located on Clark County were assessed at the same level as the well locations on Reclamation property and were included in the EA. Reclamation issued a Right-of-Use Entry Permit (Contract No. 16-07-30-L0850E) for the NDEP Downgradient Study Area activities, including this Phase I DGI. Per the EA requirements, an Archaeological Inadvertent Discovery Plan was prepared and approved by Reclamation. In addition, on-site biological monitors were approved by Reclamation before being assigned to the field work. Clark County issued a Revocable Permit for Occupancy on May 15, 2018, authoring access to their property.

NERT, in conjunction with the drilling subcontractor, obtained the standard well drilling approvals from the Nevada Division of Water Resources. Notification was made to Nevada's Underground Service Alert to have utilities in the vicinity of the proposed wells located and marked. A utility geophysical clearance survey was conducted at each boring location. Notice of Intent and Underground Service Alert tickets are provided in **Appendix B**.

2.2 Field Activities

To maintain consistency in the methods applied in the field for this assessment, field activities adhered to the procedures described in relevant Field Guidance Documents in the Field Sampling Plan for the NERT RI/Feasibility Study (ENVIRON 2014). Groundwater sampling was conducted using low-flow sampling methods.

2.2.1 Well Installation and Development

Well installation activities were conducted June 13 through June 28, 2018. Soil borings were advanced using the rotary sonic drilling method. Equipment that came in contact with impacted soil or water was decontaminated prior to drilling and decontaminated between boreholes. Each well borehole was drilled to depths up to 90 feet bgs, until the UMCf or bedrock such as the Horse Spring formation or the Thumb formation was encountered, or until refusal was encountered, whichever came first (**Table 2**). The lithology at each soil boring was logged by the field geologist using the Unified Soil Classification System (USCS). Soil boring logs are provided in **Appendix C**.

The new groundwater monitoring wells were identified as NERT (owner) followed by the approximate river mile to the nearest hundredth of a mile, followed by the N or S for the north or south side of the LVW, followed by 1,2,3, etc. for the number of wells within that hundredth of a river mile. For example the westernmost Phase I monitoring well was identified as NERT5.91S1.

The total depth of each boring was determined in the field based on if and where the UMCf or other bedrock such as the Horse Spring or Thumb formation was encountered. The boreholes were 8 inches in diameter. Well completion depths were between 40.4 and 55.4 feet bgs, with the exception of one well (NERT3.80S1) that was completed at 20 feet bgs (**Table 2**).

Each borehole was backfilled to the desired total depth of the well by pouring in bentonite chips. Wells were constructed of 4-inch diameter schedule 40 PVC with a screened interval of 10 feet. The well depth and screened interval were selected to match the surrounding wells and to intercept the same flow zone of interest. Monterey #3 sand was used as the filter pack and extended at least 2 feet above the well screen. The screen slot size was 0.020 inches. A minimum 2-foot hydrated bentonite seal was placed above the filter pack and the annular space was backfilled with bentonite chips to the surface. Well completions were flush mounted traffic-rated well boxes with a vault and lockable well cap. Soil boring logs and well construction diagrams are provided in **Appendix C**.

Well development activities were conducted July 9 through July 17, 2018, exceeding the minimum required 72-hours waiting period after well completion. The wells were developed by bailing and surging to remove fine particles that may have gotten into the well or filter pack. Well development continued until the water was clear and field parameters stabilized. Stabilization of field parameters was over three readings as follows: pH ± 0.1, temperature ± 1 degree Celsius, and within ±10 percent (%) for specific conductivity, dissolved oxygen, oxygen reduction potential and turbidity. Well development records are provided in **Appendix D**.

2.2.2 Soil Property Testing

Soil property samples were collected from the nine boring locations during the drilling activities. One soil sample was collected from the unsaturated zone and up to five samples were collected from the saturated zone. The samples locations were selected by the field geologist and the task lead based on field observations. In general, samples were collected where a lithologic change was observed. The soil property testing included:

- grain-size distribution (ASTM-D422),
- moisture content (ASTM-D2216),
- Atterberg limits (ASTM D4318), and
- USCS description (ASTM-D2487).

Samples were shipped under chain-of-custody protocols to PTS Laboratories in Santa Fe Springs, California. Results of the soil property testing are provided on **Tables 3 through 5** and laboratory reports are provided in **Appendix E**.

2.2.3 Groundwater Sampling

Groundwater sampling activities were conducted July 9 through July 17, 2018. Groundwater sampling was conducted using the low-flow method (in which low volumes of water were purged with little or no drawdown) while allowing water quality field parameters to stabilize as specified in the field guidance document, if achievable between three successive measurements. If field parameters did not stabilize by the time six volumes had been purged, then final water quality parameters were recorded and a sample of groundwater was collected. The pump intake was positioned at the approximate midpoint of the well screen.

A water quality meter (equipped with a flow-through cell) was used during purging to track water quality field parameters and assess when stabilization of parameters had occurred. Samplers conducted in-field measurements for depth to water, pH, electrical conductivity, dissolved oxygen, oxidation-reduction potential, turbidity and temperature of groundwater samples. Stabilization of field parameters was determined over three readings as follows: pH ± 0.1, Temperature ± 1 degree Celsius, Specific Conductivity, Dissolved Oxygen, Oxygen Reduction Potential and Turbidity within ± 10 %. A water quality meter, calibrated as recommended by the manufacturer, was used to measure these parameters.

The identification system for the groundwater samples consisted of the well ID followed by the sample date in YYYYMMDD format. For example, a groundwater sample collected from monitoring well NERT5.91S1 on June 28, 2018, was identified as NERT5.91S1-20180628.

Groundwater samples from the new wells were analyzed for the following constituents:

- Perchlorate (U.S. Environmental Protection Agency [EPA] Method 314.0);
- Chlorate (EPA Method 300.1);
- Chromium, Dissolved (EPA Method 200.8 [ICP-MS]);
- Chloride (EPA Method 300.0);
- Bromide (EPA Method 300.0); and
- TDS (Method SM 2540C).

Groundwater samples obtained from the nine new wells for analyses of total dissolved chromium (i.e., combined trivalent and hexavalent chromium) and hexavalent chromium were filtered in the field using a 0.45-micron filter. Groundwater samples designated only for hexavalent chromium analysis were to be analyzed within 24 hours of sample collection or the sample would be preserved by pH adjustment upon arrival at the laboratory (i.e., within 24 hours after sample collection) to allow for a longer holding time. Due to an equipment malfunction at the laboratory, these samples were not analyzed within the holding time; therefore, hexavalent chromium data is not available for the new wells. Correspondence regarding hexavalent chromium testing with the laboratory and NDEP is included in **Appendix F**. The Phase I wells will be analyzed for hexavalent chromium in the Phase II investigation.

To obtain a more complete picture of the perchlorate and chlorate concentrations in groundwater along the LVW, 17 existing wells were sampled simultaneously with the nine new wells. The 26 wells sampled are shown on **Figure 5**. The existing wells were only analyzed for perchlorate and chlorate. Groundwater sampling records are presented in **Appendix G**.

2.2.4 Water Level Measurements

During well installation activities and the groundwater sampling event, groundwater monitoring wells were sounded for depth to water. An electronic sounder, accurate to the nearest ± 0.01 feet, was used to measure depth to water in each well. The electronic sounder was lowered down the casing to the top of the water column, and the graduated markings on the probe wire or tape were used to measure the depth to water from the surveyed point on the rim of the well casing or to the ground surface prior to the installation of the well casing.

2.2.5 Induction Logging of Bore Holes

Induction logging was conducted July 19 and 20, 2018, at each of the nine new wells. Formation conductivity and natural gamma data were collected using a Robertson Geologging, Ltd. dual induction probe. These data were acquired from the 4-inch PVC casing used for construction of the new wells. Details of the induction logging procedures are provided in the NERT Remedial Investigation Borehole Geophysics (GEOVision 2018) report in **Appendix H**.

2.2.6 Transducer Installation

After Ramboll completed nuclear magnetic resonance logging and AECOM sampled the wells, AECOM installed transducers in each well. The transducers were set to automatically record groundwater level data every 15 minutes (96 times per day). Prior to the installation of each transducer and following installation of the transducer, a manual groundwater level measurement was collected using a water-level sounder. Static groundwater level readings were measured and recorded to the nearest 0.01 foot from the surveyed reference mark on the top north edge of the inner well casing.

The installation of each dedicated transducer typically consisted of placing the transducer at approximately 20 feet below the top of the water table and securing the transducer with a cable within the well head. As shown on **Table 6,** some wells have less than 20 feet of water column so for these wells the transducer was placed approximately 2 feet above the bottom of the well. Data from these transducers will be downloaded on a bimonthly (every two months) basis starting November 2018 concurrently with existing transducers in the Downgradient Study Area (AECOM 2018b). Automated readings from the transducers will need to be corrected for barometric pressure fluctuations. Barometric data is available from the barometer in well WMW4.9S.

2.2.7 Surveying of New Groundwater Well Locations

New groundwater well locations and elevations (ground surface and top of casing) were surveyed by a licensed land surveyor. Locations were referenced to the State Plane Coordinate System and elevations were referenced to the North American Datum 83 Nevada East Zone (2701) with vertical datum based on NAVD 88 referenced to the City of Henderson Benchmark network. The survey report is presented in **Appendix I**.

2.2.8 Deviations from DGIP – Phase I Groundwater Monitoring Well Installation

The procedures for well installation and sampling were detailed in the DGIP – Phase I Groundwater Monitoring Well Installation. Modifications to the investigation plan were developed based on discussions with Ramboll regarding the procedures used for the installation of other monitoring wells in the NERT RI. These modifications were presented in a technical memorandum, dated May 31, 2018 (AECOM 2018a). These modifications were made, in part, so drilling procedures would be consistent with the other RI well installations, and included:

- Drilling 8-inch diameter boreholes instead of 12-inch diameter boreholes;
- Removing seven to ten borehole volumes of water during development if the well has sufficient recharge to provide that volume of water over a 4-hour period instead of developing the well until the water was clear and field parameters had stabilized. Development was stipulated to not exceed 4 hours in both the original work plan and the May 31, 2018, technical memorandum modification.
- Backfilling of the borehole to the desired well depth by pouring bentonite chips into the well bore instead of using a tremmie pipe to place bentonite slurry.
- Increasing the total depth of each borehole to 90 feet bgs instead of 70 feet bgs.
- Relocating three wells (NERT5.91S1, NERT5.11S1, and NERT3.80S1) due to field conditions, including avoidance of biologically sensitive resources and restoration areas, and to prevent the blocking of a public bike path.

In addition to the modification to the initial investigation plan, the following deviations occurred due to field conditions and laboratory issues.

- One well (NERT3.65S1) was not installed due to refusal in the conglomerate unit of the Thumb formation at 3 feet bgs.
- The borings for four wells (NERT4.93S1, NERT4.51S1, NERT4.38N1, and NERT3.80S1) were not drilled to a total depth of 90 feet due to refusal at shallower depths.
- Hexavalent chromium results were not obtained because the samples could not be analyzed within the holding time due to a malfunction of laboratory equipment (**Appendix F**).

2.3 Data Validation

Data validation was conducted to assess the validity and usability of laboratory analytical data from the July 2018 Groundwater Sampling conducted in the Downgradient Study Area. Data generated from sampling activities were validated to Stage 2A per the Data Validation Guidance issued by NDEP on July 13, 2018 (NDEP 2018). With the exception of hexavalent chromium, all samples were analyzed as requested and all holding times were met. Due to matrix interference, the results for perchlorate for four samples were qualified as estimated (“J+”). In addition, due to low-level blank contamination, the results for chromium for three samples were qualified as estimated (“J+”). No other data were qualified. Based upon the Stage 2A data validation all other results are considered valid and usable for all purposes.

Overall, the data as qualified are useable for meeting Project objectives. All results are considered to be valid; the analytical completeness defined as the ratio of the number of valid analytical results (valid analytical results include values qualified as estimated) to the total number of analytical results requested on samples submitted for analysis, for the Project is 100 %. Additionally, because all samples in each data set were collected and analyzed under similar prescribed conditions, the data are considered to be comparable. Details of the data validation are presented in the Data Validation Summary Report in **Appendix J**.

3.0 Well Installation and Groundwater Sampling Results

3.1 Lithology

Sediments encountered in the boreholes drilled along the LVW include interbedded layers of poorly graded gravel, sandy gravel, poorly graded sand, gravelly sand, gravelly silty sand, silty sand, clayey sand, sandy silt, silt, sandy clay, and clay. These sediments were encountered at thicknesses of 22.5 feet to 90 feet and are typical of the fluvial depositional environment encountered in the Downgradient Study Area near the LVW.

Alluvium varied from unconsolidated to very well-cemented. Within the alluvium, discontinuous beds of gravel, sand, silt and clay were observed. Caliche was encountered in several boreholes.

Bedrock formations were encountered in six of the boreholes between 22.5 feet and 75 feet bgs (NERT3.80S1, NERT4.21N1, NERT4.38N1, NERT5.11S1, NERT5.49S1, and NERT5.91S1). North of the LVW between Lower Narrows Weir and Homestead Weir, the Thumb formation was encountered in two boreholes (NERT4.38N1 and NERT4.21N1) at 57.5 and 56 feet bgs, respectively. In the eastern-most borehole (NERT3.80S1) located south of the LVW, both the UMCf and the Thumb formation were observed at depths of 22.5 feet and 30 feet bgs, respectively. In the Phase I borings, the Thumb formation is dark gray to dark reddish brown, densely cemented silt. A summary of depth to bedrock is provided in **Table 7**.

The top of the UMCf was encountered in the three western-most boreholes south of the LVW at 50 to 66 feet bgs. In the Phase I boreholes, the contact between the Quaternary alluvium and the UMCf is typically marked by gray-green to yellow-green gypsiferous clays and silts. These boreholes (NERT5.91S1, NERT5.49S1, and NERT5.11S1) are located in the central portion of the Downgradient Study Area, between Pabco Road Weir and Bostick Weir.

Eastward, three boreholes (NERT4.93S1, NERT4.71S1, and NERT4.51S1) south of the LVW between Bostick Weir and Lower Narrows Weir did not encounter bedrock formations. Two of these boreholes (NERT4.93S1 and NERT4.51S1) hit refusal at depths of 65 feet and 57.5 feet bgs (within the alluvium) and one (NERT4.71S1) was drilled to its target depth of 90 feet bgs.

3.2 Soil Property Testing

Soil property testing was conducted on 43 samples (**Tables 3 through 5**). Testing included grain size distribution, moisture content, Atterberg limits, and USCS description. The USCS description from these analyses is shown on the boring logs at the depth that the sample was obtained. Moisture content ranged from 3.3 to 75.3 percent of dry weight. In general, the grain size distribution and USCS description exhibited a smaller overall grain size than the field observations. This is not uncommon in sandy, gravelly, alluvial settings where samples collected for soil property testing are from a discrete layer within the alluvial sediments which may not be representative of the deposit being described. Typically, the larger gravel clasts are not included in the sample bag, thus biasing the analysis toward finer grained classification. In addition the USCS description from the lab is based on the material that is smaller than the 40 screen sieve. In general, the Atterberg limits exhibited higher plasticity that the field observations. Field testing for plasticity of fine grained fraction is difficult when fine sand is present as it is in most of the samples.

3.3 Water Levels and Field Parameters

Groundwater was encountered between 2.89 and 43.31 feet bgs (**Table 8**). Groundwater elevations ranged from approximately 1,440 to 1,530 feet above mean sea level (**Table 8**). In general, groundwater elevations were highest at the western side of the Downgradient Study Area and lowest in the east side (**Figure 6**). In addition, when a well is physically near LVW shallow depth to water is observed; conversely, when a well is far away from

LVW a deeper depth to water is observed, which is mainly due to topographic elevation differences. Actual groundwater elevations increase with distance from LVW. The July 2018 groundwater elevations are shown in cross section with the weirs' profiles and surface water elevations on **Figure 7**.

Water quality field parameters were collected when each well was sampled. Field measurements for pH, electrical conductivity, dissolved oxygen, oxidation-reduction potential, turbidity and temperature were obtained and evaluated for stability (**Table 9**).

3.4 Induction Logging

Induction logging was performed on the nine Phase I wells. Data from borings demonstrated similar patterns. The upper 10 to 35 feet exhibited low conductivity which corresponds to gravelly sand to silty sand observed during drilling activities. Elevated conductivity corresponding to finer-grained silts and sands, as well as the groundwater table, were detected below the coarser-grained shallower sediments. Silty sands and sandy silts were detected between 5 feet and 35 feet bgs in three borings (NERT4.71S1, NERT4.51S1, and NERT4.38N1). These borings are located between Calico Ridge Weir and Lower Narrows Weir.

A comparison of the two coil spacings (long and short) showed that, overall, differences within each soil boring were fairly small suggesting lateral homogeneity in sediment conductivity. The natural gamma results correlate weakly with the sediment type and grain size noted by the soil boring logs. Since the induction logging was conducted after the wells were completed, the logs did not record data down to the UMCf or other bedrock formations.

The results of the NMR logging performed by Ramboll provided useful information regarding water content and potential mobility of the water. The resulting data were used to estimate hydraulic conductivity.

3.5 Groundwater Sampling Results

Groundwater samples were collected from 26 wells, nine new Phase I wells and 17 existing wells that were previously sampled in April 2016 (AECOM 2016a). Phase I wells were sampled for the six constituents listed in Section 2.2.3. The 17 existing wells were only sampled for perchlorate and chlorate. Analytical laboratory results are provided in **Appendix K**. Of interest and relevance to the groundwater quality assessment is the initiation of the LVW Bioremediation Pilot Study. The work plan for this study is included in **Appendix L**. The LVW Bioremediation Pilot Study includes the installation of injection and monitoring wells along two transects: Transect 1A is east and south of the seep well field and Transect 1B is south of LVW in the vicinity of Bostic Weir and Calico Ridge Weir (**Appendix L**). Injection of carbon donors was started in January 2018.

3.5.1 Perchlorate

Concentrations of perchlorate detected in the new Phase I wells ranged from 5.1 to 6,000 µg/L, and in the 17 existing wells from 3.9 J to 3,900 µg/L (**Table 10**). **Figure 8** presents the April 2016 and July 2018 concentrations of perchlorate in wells. **Figure 9** presents the July 2018 perchlorate concentrations and perchlorate contours. Perchlorate concentrations in groundwater exceeded the Nevada Interim Action Screening Level of 18 µg/L in 23 of the 26 wells sampled in July 2018 (**Table 10**). Concentrations are highest between Historic Lateral Weir Expansion and Lower Narrows Weir, with the highest concentrations detected in the new Phase I wells. Downgradient of the Lower Narrows Weir, concentrations decrease.

Between Pabco Road Weir and Historic Lateral Weir Expansion, two wells (WMW5.7N and NERT5.49S1), showed significantly lower concentrations (3.9 J and 5.1 µg/L) than other wells in the general vicinity. Lower concentrations (680 and 930 µg/L) were also detected in two wells (WMW4.9N and WMW4.9S) between Bostick and Calico Ridge Weirs. Additionally, significantly lower concentrations (4.3 J and 48 µg/L) than surrounding wells were detected in two wells (MW-20 and MW-25) located on the northern boundary of the Henderson Landfill site.

A comparison of concentrations of the existing wells between April 2016 and August 2018 showed that concentrations were lower in 11 wells and higher in six wells in 2018. In general, concentrations in 2018 remained relatively stable to those reported in 2016, with the exception of four locations. Groundwater from well WMW4.9S1showed a significantly higher concentration in 2018 exhibiting a 71% increase, from the 2016 concentration. Caution should be used when making comparisons with well WMW4.9S1 since it is downgradient of the LVW Bioremediation Pilot Study Transect 1B and perchlorate concentrations are likely affected. Groundwater from three wells,COH2B1, MW-02, and MW-20, had concentrations that were lower in 2018 exhibiting 70% to 89% decreases from the 2016 concentrations.

3.5.2 Chlorate

Concentrations of chlorate detected in the new Phase I wells ranged from 300 to 25,000 µg/L, and in the 17 existing wells from 13 J to 14,000 µg/L (**Figure 10** and **Table 10**). Chlorate concentrations in groundwater equaled or exceeded the BCL of 1,000 µg/L in 18 of the 26 wells sampled in July 2018 (**Table 10**)(NDEP 2017). Chlorate concentrations show the same distribution of concentrations as perchlorate concentrations, with a generally increasing trend between Historical Lateral Weir and Lower Narrows Weir (5,900 to 25,000 µg/L). The highest concentrations were detected in the new Phase I wells. Concentrations decrease downgradient of the Lower Narrows Weir.

Between Pabco Road Weir and Historic Lateral Weir Expansion, four wells (COH2B1, NERT5.91S1, WMW5.58S and NERT5.49S1) showed significantly lower concentrations (13J to 8,900 µg/L) than other upgradient wells. Lower concentrations (13 J and 2,700 µg/L) were also detected in two wells (WMW4.9N and WMW4.9S) between Bostick and Calico Ridge Weirs. Additionally, significantly lower concentrations (78 J and 57 µg/L) were detected in two wells (MW-20 and MW-25) located on the northern boundary of the Henderson Landfill site.

A comparison of concentrations of the existing wells between April 2016 and August 2018 showed that concentrations were lower in six wells and higher in 10 wells in 2018. In about half of the wells, concentrations in 2018 remained relatively stable to those reported in 2016. At seven wells concentrations were significantly different. Four wells (WMW5.5S, MW-3, WMW4.9S, and LNDMW2) showed significantly higher concentrations of 1.3 to 4.7 times in 2018 than those reported in 2016. At two of the locations (COH2B1 and AA-30), concentrations were lower by 1.5 to 8.9 times in 2018 than those reported in 2016 (**Figure 10**).

The 2018 data shows a general correlation between perchlorate and chlorate concentrations. High chlorate concentrations were typically detected in wells with high perchlorate concentrations, and vice versa, low chlorate concentrations were detected in wells with low perchlorate concentrations (**Table 10**).

3.5.3 Chloride/Bromide Ratio

Chloride concentrations in the new Phase I wells ranged from 250 to 910 mg/L (**Figure 11** and **Table 10**). Chloride concentrations in groundwater exceeded the BCL of 250 mg/L in all 9 of the wells sampled in July 2018 (**Table 10**)(NDEP 2017). Bromide concentrations in the new Phase I wells were non-detect with the exception of one sample with a detection of 0.27 J. None of the bromide concentrations exceeded the BCL of 11.3 mg/L (**Table 10**)(NDEP 2017). The chloride/bromide ratios ranged from >0.52 to >926. The highest chloride/bromide ratio was at >926 at NERT5.49S1 located west of Historical Lateral Expansion. Ratios decrease significantly to the west and east from NERT5.49S1. The lowest ratio was >166 at NERT4.71S1 located just west of Calico Ridge Weir.

3.5.4 Chromium

Dissolved chromium concentrations in the new Phase I wells ranged from 1.3 J to 26 µg/L (**Figure 12 and Table 10**). None of the dissolved chromium concentrations exceeded the maximum contaminant level for drinking water of 100 µg/L (**Table 10**). Concentrations are highest between Historic Lateral Weir Expansion and Lower Narrows Weir. The highest concentration of dissolved chromium was detected at 26 µg/L in NERT4.71S1 located south of the LVW just west of Calico Ridge Weir. Chromium concentrations decrease to the west and east from

NERT4.71S1. The lowest concentrations were detected on the west and east end of the Downgradient Study Area.

3.5.5 Total Dissolved Solids

TDS concentrations in the new Phase I wells ranged from 1,400 to 5,200 mg/L (**Figure 13 and Table 10**). There is not a BCL established for TDS. The TDS concentrations exceeded the secondary maximum contaminant level for drinking water of 500 mg/L in all nine wells tested. Concentrations are highest between Historic Lateral Weir Expansion and Homestead Weir. The highest concentration of TDS was detected at 5,200 mg/L in NERT4.71S1 located south of the LVW just west of Calico Ridge Weir. Concentrations decrease to the west and east from NERT4.71S1. The lowest concentration was detected in at 1,400 mg/L at NERT5.49S1 located west of Historic Lateral Weir Expansion.

3.6 Investigative Waste Disposal

Soil and rock waste was transported to a secure staging area on the NERT site. NERT managed the waste profiling and disposal of the waste along with other investigative-derived waste generated for the RI investigation. The liquid investigative-derived waste was placed into polyethylene tanks and transported to the groundwater extraction and treatment system at the NERT Site. The liquid waste was discharged into the GW-11 pond, which receives groundwater pumped from extraction wells. The liquid waste was treated and discharged through the on-site treatment systems. The remaining investigative-derived waste was double-bagged in plastic trash bags and was disposed as municipal trash.

4.0 Conceptual Site Model

A CSM of the LVW and potential inputs of perchlorate was developed for the DGIP – Phase I Groundwater Monitoring Well Installation (AECOM 2017a). This section updates the CSM based on the surface water and groundwater data collected in 2017 and 2018. A diagram of the updated CSM is provided in **Figure 14**. That figure depicts estimated perchlorate load (in lb/day) along the LVW from surface water sampling data collected during April and May of 2018. During that sampling event, construction of the Sunrise Mountain Weir and the Historic Lateral Weir Expansion was ongoing. A large volume of groundwater was being pumped from those construction areas to a temporary treatment facility where perchlorate was removed prior to discharge back to the LVW upstream of the Pabco Road Weir. As a result of that dewatering and treatment program, perchlorate concentrations in the LVW were lower than would otherwise be expected, particularly within the reach between Upper Narrows and Calico Ridge Weirs.

4.1 Anthropogenic Sources of Discharge to the LVW

Discharges from the four major wastewater treatment plants in the valley represent the vast majority of flow in the LVW (Clark County Water Reclamation District, City of Las Vegas Water Pollution and Control Facility, City of Henderson Water Reclamation Facilities, and City of North Las Vegas Water Reclamation Facility). Outfalls from groundwater treatment plants (NERT, American Pacific Corporation /Endeavour LLC [Endeavour], and TIMET) join the channel conveying treated wastewater from the City of Henderson, entering LVW above Pabco Road Weir (**Figure 14**). The remaining flow in the LVW comes from Duck Creek and the C-1 Channel, as well as non-point sources including urban and stormwater runoff and shallow groundwater discharge. Comparison of surface water and groundwater elevations show that portions of LVW are below the groundwater table and, therefore, receive groundwater discharge (AECOM 2018b). Other parts of LVW are above the groundwater, which cause infiltration (loss) of the surface water. This condition is dynamic and changes depending on a wide variety of variables including, but not limited to, increases in flow rates from the wastewater treatment plants due to increased land development, diurnal fluctuations in wastewater flows, and seasonal fluctuations of the groundwater table.

The treatment plants contribute a relatively steady daily supply of water to the LVW throughout the year. The outfalls discharge continuously but at a predictably cyclic rate. That cycling causes a diurnal flow pattern similar to a tidal pattern, with daily high and daily low flows. Unless disrupted by rain storm events, daily high flows are on the order of 100 % higher than the daily low. However, the constant daily discharge represents the vast majority of flow in LVW, and the natural, seasonal variability in streamflow has largely been eliminated. On average, streamflow tends to be somewhat higher from October through March (290 to 340 cubic feet per second [cfs]) and lower from April through September (260 to 310 cfs) (USGS 2017).

Along with the general increase in flow in LVW through the years, there has also been an increase in the magnitude of stormwater runoff draining into the LVW. Fifty years ago, the annual peak flow at Pabco Road was on the order of 300 cfs (median value of 280 cfs from 1957 to 1967), or similar to the current average annual flow (298 cfs). More recently, annual peak flows are on the order of 4,500 cfs (median value of 4,350 cfs from 2005 to 2015) (USGS 2017).

In an effort to protect the channel from the erosive forces of higher flows, a series of erosion control structures (weirs) have been constructed to slow the water velocities in the LVW. Where erosional forces have been allowed to run their course, the stream channel within the Downgradient Study Area is generally 40 feet or less in width. Near some of the weirs, the width increases to 300 feet or more.

The channel materials consist of loose, unconsolidated sediments that have been shifted and sorted by the energy of the flowing water. Most of the underlying material is alluvium that consists of both fine-grained materials (silts and clays) and courser materials (sands and gravels). As the water carries those deposits downstream, sand and gravel are deposited in areas with higher velocity, providing a more solid streambed. Where streamflow slows down in natural pools and behind some of the weir structures, silts and clays are deposited, creating a soft bottom. The Horse Springs formation is present in the southern streambank east of Calico Ridge Weir, and the Thumb formation is present on the northern and southern streambanks between the Lower Narrows and Three Kids Weirs.

4.2 Known Sources of Perchlorate

The former Kerr McGee/Tronox site (NERT On-Site Study Area) (**Figure 1**) has been the location of industrial operations since 1942 when it was developed by the U.S. government as a magnesium plant to support World War II operations. Following the war, this area continued to be used for industrial activities, including production of perchlorate, boron, and manganese compounds. Former industrial and waste management activities conducted at the NERT On-Site Study Area, as well as those conducted at adjacent properties, resulted in contamination of environmental media, including soil, groundwater, and surface water. The Endeavour site has also released perchlorate to groundwater and operates a treatment system to the west of the NERT site. Data indicate that between 16 to 19 lb/day perchlorate enter the Athens Drainage Channel downgradient of the Endeavour plume (Endeavour 2018).

Since 1979, the NERT On-Site Study Area has been the subject of numerous investigations and removal actions. Soil removal actions were conducted in 2010 and 2011 from the NERT On-Site Study Area to minimize potential health risks from impacted soil. Additional soil removal was performed in 2013 when the eastern end of the Beta Ditch was excavated. The soil removal activities and post-removal conditions are described in detail in the Revised Interim Soil Removal Action Completion Report (ENVIRON 2012). On-site and off-site groundwater removal actions include the installation of the groundwater extraction and treatment system, designed to capture and treat perchlorate and hexavalent chromium in shallow groundwater.

In Spring 1999, SNWA hydrologists discovered a seep ("the original seep") discharging to the LVW at approximately 400 gallons per minute. Perchlorate concentrations in the seep exceeded 100,000 µg/L in 1999. The results of the seep samples indicated that a significant mass flux of perchlorate was entering the LVW. Kerr McGee subsequently implemented a capture system (consisting of a dam and sump structure) at the seep in November 1999 to reduce the migration of perchlorate to the LVW (ENSR 2005). The operation of the Seep Capture System and Seep Well Field has contained and treated a substantial mass of perchlorate that otherwise would have entered the LVW. To support the Downgradient Study Area investigation, surface water samples were collected from several locations in and near the LVW in May 2016. As part of that sampling program, a sample was collected from the sump immediately downgradient of the seep discovered by SNWA in 1999. The capture system that was subsequently implemented has significantly reduced both the perchlorate concentration and volume of groundwater discharging at the location. The 2016 sample had a perchlorate concentration of 85 µg/L, three orders of magnitude lower than samples collected in 1999. The seep was reported to be active only seasonally, with the small volume of flow terminating a short distance downstream in a topographic low where it seeps back into the ground and/or is evaporated into the air upgradient of its historic confluence with LVW. The seep was active during the May 2016 sampling, with discharge through the sump visible (AECOM 2016b). In the fall of 2017 there was no longer visible evidence of the seep as it was completely filled in during activities associated with the construction of Sunrise Mountain Weir.

4.3 Perchlorate Patterns and Suspected Discharges

During the May 2016 sampling program (AECOM 2016b) an attempt was made to locate the seeps that were sampled by Kerr McGee in 2000. Seeps that were successfully located, accessible, and flowing were subsequently sampled. It is surmised that weir construction, onshore riparian zone restoration, flooding and vegetative growth during intervening years, and the ongoing regional drought conditions may have affected the occurrence and, if present, the flow from the previously identified seeps. Because the installation of the weirs likely altered the seeps, attempts were made to relocate the seeps and, if possible, sample them. Of the 18 historic seep locations, only three (KM-45, KM-67 and KM-71) could be located in May 2016. All other historic seeps may have been buried by weir and bank construction, submerged by the expanded stream channel and associated sediments, temporarily dried up under the drought conditions of the time, or obscured by dense vegetation.

Two seeps (KM-67 and KM-71) were sampled in May 2016. The concentrations of perchlorate in the seeps were lower in 2016 than in 2000. At KM-71, the concentration in 2016 (1.4 J µg/L) was substantially lower than in 2000 (3,400 µg/L). In 2000, KM-71 was located downgradient of the current location of the Sunrise Mountain Weir. The seep was located in 2016 immediately upstream of the KM-71 location in a backwater channel. The seep that was sampled in May 2016 could be a different seep than the seep sampled in 2000. At KM-67, located near the Three Kids Weir, the concentration (1,500 µg/L) in 2016 was slightly lower than in 2000 (2,100 µg/L). Construction of Three Kids Weir was completed in July 2015. A riprap weir referred to as "Demonstration Weir" was constructed near this location in 1999. The Demonstration Weir was relocated and rebuilt in 2007 and was eventually dismantled in 2013 and replaced by the Three Kids Weir (Las Vegas Wash Coordination Committee 2016). Although a weir was in place in this location during both the 2000 and 2016 sampling events, it is not clear to what extent, if any, each weir affected the stream flow and sample results during the 2000 and 2016 sampling events.

During the January and February 2017 surface water sampling events, sampling locations and methodology were designed to further refine the understanding of where perchlorate enters the LVW, and what impact the varying flow regime has on perchlorate concentrations in surface water samples. Known and suspected regions of perchlorate discharge were selected to help pinpoint loci of discharge and where, along transects, that discharge may be occurring. By characterizing the flow regime during sample collection, estimates of actual perchlorate flux were calculated to represent flow-weighted sampling results.

Following intensive water-temperature studies in the LVW in early 2018, a number of new and previously sampled surface water locations were selected for sampling in May 2018 (**Figures 15** and **16**). Locations were selected to target new potential locations of groundwater inputs identified as temperature anomalies during thermal infrared and fiber optic distributed temperature sensing surveys, to refine the understanding of perchlorate contributions in areas where perchlorate flux into the LVW were suspected, and to resample previous locations to evaluate changes over time. The Phase I groundwater monitoring wells were installed in July 2018 to provide additional groundwater data along LVW.

The results of the surface water and seep sampling conducted by Kerr McGee in 2000 and by AECOM in May 2016, December 2016, January and February 2017, and May 2018 indicate that there is evidence of perchlorate discharge to the LVW, particularly in the areas between the Upper Narrows Weir and Sunrise Mountain Weir (under construction during the 2018 sampling event), between the Historic Lateral Weir Expansion (under construction in 2018) and the Calico Ridge Weir, downstream of the Calico Ridge Weir, between the Lower Narrows and Homestead Weirs, and downstream of the Three Kids Weir (**Figures 15** and **16**).

Surface water sampling results indicate the potential for small, cumulative gains of perchlorate along the southern bank of the LVW from the region near the Historic Lateral Weir Expansion down to the Three Kids Weir, where perchlorate was generally found to be approximately twice as high as samples collected from mid-channel locations. Along much of that bank, the slow, relatively minor seepage of groundwater may be contributing to a slow general increase in perchlorate load. Larger gains observed in sample results are more likely to be attributed to more focused discharge of groundwater with higher concentrations of perchlorate. These higher concentration discharges were detected near the toe of the Upper Narrows Weir, near the toe of the Calico Ridge Weir, and near the toe of the Three Kids Weir.

During the May 2018 sampling event, samples were collected from sampling points across 13 transects (**Figure 15**) in the LVW. In addition, 14 grab samples were collected (**Figure 16**). The surface water sample locations in LVW ranged from upstream of Duck Creek Confluence Weir to downstream of the Lake Las Vegas area, located outside of the Downgradient Study Area. During the 2018 sampling event, most samples were collected during low-flow periods in an effort to normalize conditions at the time of sampling. Details regarding the supplemental surface water sampling event will be provided in the Supplemental Surface Water Investigation Technical Memorandum (AECOM 2018c, currently in preparation).

Surface water data were collected outside of the Downgradient Study Area between Rainbow Gardens Weir and the Lake Las Vegas Outlet (**Figure 16**). These surface water data indicate that no significant additional sources of perchlorate were identified along this section of the LVW (AECOM 2018c, currently in preparation).

In July 2018, nine new groundwater monitoring wells were installed along LVW and a total of 26 wells (the nine new wells and 17 existing wells) along LVW were sampled. These wells were sampled to provide additional data on groundwater impacts in the Downgradient Study Area. Surface water elevations were compared to groundwater elevations to evaluate where groundwater was likely entering LVW. As shown on **Figure 7**, groundwater elevations appear to be higher than surface water elevations below Calico Ridge Weir, Homestead Weir, and Three Kids Weir indicating groundwater discharge to the LVW in these areas. Projected groundwater elevations appear to be below the surface water elevations at all other locations between Pabco Road Weir and Three Kids Weir.

Perchlorate flux into LVW is the measurement of the amount of perchlorate discharging into LVW per unit of time, for example 5 lb/day. Total perchlorate load in LVW is the amount of perchlorate estimated that is carried by the surface water in LVW at a specific location, for example 29 lb/day at Lower Narrows Weir. Perchlorate load and flux at various reaches along the LVW are discussed in detail below and presented on **Figure 14**. NERT also collects surface water samples on a monthly basis as part of its ongoing RI surface water sampling program. Perchlorate load is reported from these sampling events in the Semi-Annual Remedial Performance Memorandum and Annual Remedial Performance Report. Given the variances in sample collection dates and sample locations, variances in reported perchlorate load in the LVW are to be expected. How the groundwater data contribute to the understanding of the total perchlorate loading in LVW is also discussed below.

Upper Narrows to Pabco Road Weir: Based on 2018 surface water samples, the perchlorate load above Pabco Road Weir was between 1 and 2 lb/day. Along this reach, groundwater data obtained from well COH2B1 in July 2018 showed a perchlorate concentration of 1600 µg/L (**Figures 9** and **14**). As shown on **Figure 8** this concentration was much lower than the 2016 perchlorate concentration of 5,600 µg/L, a decrease of 4,000 µg/L .Caution should be used when making comparisons with this well because it is downgradient of the LVW Bioremediation Pilot Study Transect 1A and perchlorate concentrations are likely affected. The groundwater elevation is slightly below the surface water elevation at Pabco Weir indicating, at the time of measurement, groundwater was not entering LVW at this location (**Figures 6** and **7**).

Pabco Road Weir to Bostic Weir: Based on 2018 surface water samples, the estimated perchlorate load in LVW begins to increase slowly near the Historic Lateral Weir Expansion. Between Pabco Road Weir and Bostic Weir the 2018 groundwater data was obtained from nine wells. Perchlorate concentrations ranged from 3.9 to 6,000 µg/L (**Figures 9** and **14**). Along this reach, the groundwater elevations were lower than the surface water elevations indicating that at the time of measurement, groundwater was not entering LVW (**Figures 6** and **7**). Of interest is the grab sample from the C-1 channel that exhibited a perchlorate concentration of 1,800 µg/L. This sample was collected from the C-1 Channel about 2.5 days after a rain event. It is possible that evaporation from the pool of standing water concentrated perchlorate to some degree. This sample result from the C-1 Channel, which only conveys flow to the LVW during storm events, is much higher than expected.

Bostic Weir to Calico Ridge Weir: Based on 2018 surface water samples, the estimated perchlorate load in LVW increased to 5.3 lb/day below the Bostick Weir, and 7.0 lb/day as the water entered the Calico Ridge Weir. Along this reach, groundwater data was obtained from six wells in July 2018. Perchlorate concentrations ranged from 680 to 3,800 µg/L (**Figures 9** and **14**). Groundwater elevations along this reach were equal to or higher than the surface water elevations indicating, at the time of measurement, groundwater was likely infiltrating into LVW (**Figures 6** and **7**).

Calico Ridge Weir to Lower Narrows Weir: Based on 2018 surface water samples, the estimated perchlorate load in LVW increased to 29 lb/day by the time it reaches Lower Narrows Weir. Most of the 22 lb/day perchlorate flux is suspected to come from groundwater discharge near the toe of the Calico Ridge Weir. Along this reach, groundwater data was obtained from three wells in July 2018. Perchlorate concentrations ranged from 4.3 J to 3,100 µg/L (**Figures 9** and **14**). Downgradient of Calico Ridge Weir, groundwater elevations are higher than surface water elevations and upgradient of Lower Narrows Weir groundwater elevations were lower than surface water elevations. At the time of measurement, groundwater was likely infiltrating into LVW downgradient of Calico Ridge Weir; however, it was not entering the LVW upgradient of Lower Narrows Weir (**Figures 6** and **7**).

Lower Narrows Weir to Homestead Weir: Based on 2018 surface water samples, the estimated perchlorate load in LVW increased slightly. Along this reach, groundwater data was obtained from three wells in July 2018. Perchlorate concentrations ranged from 48 to 2,200 µg/L (**Figures 9** and **14**). Groundwater elevations were lower than surface water elevations indicating that at the time of measurement, groundwater was not entering LVW along this reach (**Figures 6** and **7**).

Homestead Weir to Three Kids Weirs: Based on 2018 surface water samples, the estimated perchlorate load in LVW was 32 to 33 lb/day. This represents a gain of 3 lb/day from the Lower Narrows Weir to the Three Kids Weir. Along this reach, groundwater data was obtained from two wells in July 2018. Perchlorate concentrations ranged from 320 to 1,100 µg/L (**Figures 9** and **14**). Downgradient of Homestead Weir, groundwater elevations were higher than surface water elevations and upgradient of Three Kids Weir groundwater elevations were lower than surface water elevations. At the time of measurement, groundwater was likely infiltrating into LVW downgradient of Homestead Weir; however, it was not entering LVW upgradient of Three Kids Weir (**Figures 6** and **7**).

Three Kids Weir to Rainbow Gardens Weir: Based on 2018 surface water samples, the estimated perchlorate load in LVW was 40 to 56 lb/day. Downstream of the Three Kids Weir, discharge from the KM-67 seep enters on the south bank and begins to mix in with the waters of the LVW. Along this reach, groundwater data was obtained from one well in July 2018. The perchlorate concentration in this well was 1,500 µg/L (**Figures 9** and **14**). Downgradient of Three Kids Weir, groundwater elevations were higher than surface water elevations indicating that at the time of measurement, groundwater was likely infiltrating into LVW (**Figures 6** and **7**).

5.0 Conclusions and Recommendations

5.1 Conclusions

The following summarizes the conclusions of this Phase I DGI organized by the data gaps identified in Section 1.0.

1. *Where are the high concentration (1,000 µg/L or higher) perchlorate-impacted groundwater plumes along the north and south sides of the LVW?*

   Based on groundwater samples collected in July 2018, perchlorate concentrations of 1,000 µg/L or higher are present along the south bank of LVW except at monitoring wells NERT5.49S1 (5.1 µg/L) east of Historic Lateral Weir Expansion Weir, WMW4.9S (930 µg/L) between Bostic Weir and Calico Ridge Weir, and MW-20 (48 µg/L) and MW-25 (4.3 µg/L) at the Henderson Landfill site (**Figure 9**). The highest concentration of 6,000 µg/L was detected at NERT5.11S1 south of LVW between Historic Lateral Weir Expansion and Bostic Weir.

   There is limited data for the north bank of LVW; however, based on the six locations sampled, perchlorate concentrations of 1,000 µg/L or higher are present in three wells between Lower Narrows Weir and Homestead Weir.

   Additional monitoring wells are needed to further define the extent of high concentration (1,000 µg/L or higher) perchlorate plumes. Investigation of perchlorate concentrations along areas of LVW should be located in areas where the groundwater elevation is higher than the surface water elevation in LVW, as these conditions allow perchlorate-impacted groundwater to enter LVW (**Figure 7**).

2. *Why are there noticeable differences in perchlorate concentrations in groundwater over relatively short distances?*

   The data indicate that the perchlorate concentrations in groundwater are spatially highly variable. Since perchlorate is highly soluble, it is indicative that there are discrete flow zones within the alluvial sediments that are not in close communication. The lower perchlorate concentration of 930 µg/L at WMW4.9S is surrounded by nearby wells MW-13, NERT4.71S1, and NERT4.93S1 with concentrations from 3,700 µg/L, 3,800 µg/L, and 3,900 µg/L, respectively (**Figure 9**). Well WMW4.9S is screened over 30 feet while the surrounding wells are screened over 10-foot intervals. All of these wells are screened in gravelly sand to sand strata. The reason for the lower concentration may be related to the longer screened interval of well WMW4.9S.

   Groundwater from wells WMW5.7N and NERT5.49S1 exhibit lower perchlorate concentrations than surrounding wells. Perchlorate concentrations in WMW5.7N and NERT5.49S1 are 3.9 J µg/L and 5.1 µg/L respectively. Perchlorate concentrations in surrounding wells WMW5.58S, NERT5.91S1, and WMW5.5S are 2,500 µg/L, 2,900 µg/L, and 3,100 µg/L, respectively (**Figure 9**). Groundwater in well NERT5.49S1 exhibited the lowest TDS concentration (1,400 mg/L) of all the wells sampled for TDS (**Figure 13**). The low TDS concentration indicates that it is likely that surface water is mixing with groundwater at this location. The surface water would also dilute the perchlorate concentrations.

   Sampling of existing wells, installation of additional monitoring wells, and pump or tracer tests are needed to further investigate why perchlorate concentrations change over relatively short distances.

3. *Do the high-concentration perchlorate plumes follow distinct water-bearing zones within the alluvium or bedrock formations?*

   Distinct water-bearing zones were identified in the Phase I individual boring logs; however, distinct water-bearing zones were not identified as being continuous between nearby boreholes that had boring logs available for comparison. Cluster wells recently installed (Spring to Summer 2018) for the LVW Bioremediation Pilot Study have discrete screened intervals within the alluvial deposits and preliminary data support the presence of discrete water bearing zones. The cluster wells exhibit different water levels and different constituent concentrations indicating that the groundwater monitored in adjacent wells at depths of less than 90 feet bgs is from distinct and separate water bearing zones. Pump and tracer tests are needed to further investigate distinct water bearing zones within the alluvium and bedrock.

4. *Along the LVW, does groundwater flow generally in the same direction as the surface water?*

   The groundwater flow direction adjacent to LVW appears to flow generally to the east, similar to the surface water flow direction. Sampling of existing wells, installation of additional monitoring wells, and pump or tracer tests will further refine the understanding of groundwater flow along LVW.

5. *Where does perchlorate-impacted groundwater discharge to the LVW?*

   As shown on **Figure 7** there are three locations along the LVW downstream of Pabco Road Weir (Calico Ridge Weir, Homestead Weir, and Three Kids Weir) where the groundwater elevation is higher than the elevation of the surface water in the LVW. These conditions allow for potential discharge of groundwater into the LVW because of the higher potentiometric surface of groundwater. Based on this and surface water sampling to date, perchlorate-impacted groundwater is discharging to the LVW downgradient of Calico Ridge Weir and Three Kids Weir. Although elevations and perchlorate concentrations in groundwater near Homestead Weir are also higher than those for surface water, the surface water perchlorate data collected to date do not support a significant discharge of perchlorate-impacted groundwater to the LVW near Homestead Weir.

   Sampling of existing wells, installation of additional monitoring wells, and pump or tracer tests are needed to further investigate where impacted groundwater is discharging to LVW.

6. *Where is the groundwater/surface water interface and how far is it from the LVW?*

   The groundwater/surface water interface is dynamic. As indicated by TDS concentrations, the groundwater/surface water interface is immediately adjacent to LVW in some areas and up to 470 feet away at well NERT5.49S1. Low TDS concentrations (less than 1,800 parts per million) have been detected in groundwater from wells NERT5.49S1, WMW4.95S, WMW5.58S, and WMW5.7N in 2016 and 2018.

   Sampling of existing wells and installation of additional monitoring wells are needed to further investigate the groundwater/surface water interface.

7. *Is there an area of known or suspected perchlorate flux of sufficient magnitude where an interim remedial action would be appropriate?*

   Given that perchlorate concentrations in Lake Mead are well below NDEP's interim action level and that NERT is completing a pilot study between Bostic and Homestead Weirs (an area with elevated perchlorate mass flux from groundwater to surface water), AECOM does not recommend implementation of interim remedial actions at this time.

8. *Is perchlorate-impacted groundwater bypassing the seep well field on its eastern side in the vicinity of monitoring well COH2B1?*

   Concentrations of perchlorate in groundwater from well COH2B1 were 5,600 µg/L in April 2016 and 1,600 µg/L in July 2018. This indicates that perchlorate-impacted groundwater is present in this area and that the concentration fluctuates as much as 4,000 µg/L. *The source of the perchlorate in this well may be from the Endeavour plume (Ramboll 2018 and Endeavour 2018).*

   Sampling of existing wells, installation of additional monitoring wells, and pump or tracer tests are needed to further investigate the source of perchlorate in this area.

9. *Do concentrations of perchlorate in groundwater fluctuate over time, seasonally, or after a rain event?*

   Comparisons of perchlorate concentrations in groundwater from 17 wells sampled in April 2016 and July 2018 indicate that nine wells had concentrations that were within 10% of each other, five wells had concentrations that were 21 to 80% of each other, and three wells had concentrations that decreased over 200% (**Figure 8**). Additional data are needed to evaluate changes in groundwater perchlorate concentrations seasonally and/or after rain events because at present there are only two data points over two years.

   Sampling of existing wells, installation of additional monitoring wells, and pump or tracer tests are needed to further investigate perchlorate fluctuations over time.

5.2 Recommendations for Phase II Data Gap Investigation

The Phase I investigation was focused on the stretch of LVW between Pabco Road Weir and just below Three Kids Weir. Based on the results of the 2016, 2017, and 2018 surface water investigations, the 2016 groundwater sampling, the 2017 to 2018 transducer data, and the Phase I groundwater investigation, the following specific areas along LVW have been identified where surface water and groundwater data indicate that perchlorate-impacted groundwater is entering LVW and contributing to the perchlorate flux in the surface water: It is understood that the measurements of flux may not be fully representative of normal conditions because weir construction and dewatering was occurring at the time of the investigation.

1. Between Bostic and Calico Ridge Weir approximately 2 lb/day of perchlorate are entering LVW.
2. Downgradient of Calico Ridge Weir on both the north and south banks of LVW approximately 22 lb/day of perchlorate are entering LVW.
3. Downgradient of Homestead Weir approximately 3 lb/day of perchlorate are entering LVW.
4. Downgradient of Three Kids Weir, near the area of KM-67 seep, approximately 23 lb/day of perchlorate are entering LVW.

The Phase II investigation should be focused on the specific areas identified as contributing the largest flux to LVW. These are downgradient of Calico Ridge Weir (22 lb/day of perchlorate) and downgradient of Three Kids Weir (23 lb/day of perchlorate). All work should be closely coordinated with the LVW Bioremediation Pilot Study. Evaluating the area between Bostic and Calico Ridge Weir is not recommended because there is only 5 lb/day of flux and the surface water data did not indicate that groundwater is entering LVW. Evaluating the area downgradient of Homestead Weir is less promising because the perchlorate flux is only increasing 3 lb/day and the surface water data did not indicate that groundwater was entering LVW in that area; however it is an area of interest to NDEP due to the groundwater elevations near Homestead Weir being higher than surface water elevations, potentially indicating gaining conditions.

Additional monitoring wells should be installed on the north and south sides of LVW at and both east and west of the Calico Ridge Weir, and east and west of Three Kids Weir to investigate perchlorate concentrations in groundwater. Tracer tests should be conducted from groundwater to surface water in areas where perchlorate concentrations in groundwater are the highest and adjacent to LVW where surface water data indicate that perchlorate impacted-groundwater is entering LVW. Pump tests should be conducted to determine yield, permeability and conductivity of the shallow flow zone in these areas.

Additional monitoring wells could also be installed downgradient of Homestead Weir on the south side of LVW to investigate groundwater concentrations and to further evaluate if groundwater is entering LVW in this area.

To evaluate changes in perchlorate concentrations over short distances, well clusters should be installed with discrete screened intervals to determine if the perchlorate is following discrete layers within the flow zone. Tracer tests between wells could be used to determine connectivity. To evaluate changes in perchlorate concentrations after rain events and seasonally, a subset of wells could be selected for monthly monitoring over an entire year. This study would likely require other consultants due to the length of AECOM's contract.

6.0 References

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Tables

Table 1
Rationale for Phase I Groundwater Monitoring Wells
NERT RI - Downgradient Study Area
Henderson, Nevada

New Well	Proposed Pilot Boring Depth in feet bgs[1]	Proposed Well Depth in feet bgs (2)	Well Diameter [3]	Proposed Well Screen in feet bgs [4]	Proposed Sand Pack Interval in feet bgs [5]	Rationale Based on Perchlorate Concentrations Detected in Groundwater and Surface Water Samples Obtained April and May 2016	Geology and Approximate Distance from Pertinent Features
NERT5.91S1	90	50	4"	40 - 50	38 - 50	Determine perchlorate concentrations between COH2B1 (total well depth of 67 feet bgs and 5,600 µg/L) and WMW5.5S (total well depth of 38.3 feet bgs and 3,200 µg/L) to further characterize this area of perchlorate impact east of the seep well field. Surface water concentrations are 15 to 17 µg/L.	This well is in alluvium overlying the Muddy Creek formation 1,000 feet east northeast from well COH2B1 and 1,900 feet west southwest of well WMW5.5S. It is 450 feet west of a paleochannel identified by Ed Krish (2015).
NERT5.49S1	90	40	4"	30 - 40	28 - 40	Determine concentrations between WMW5.58S1 (total well depth of 40.95 feet bgs and 510 µg/L) and WMW5.5S (total well depth of 38.3 feet bgs and 3,200 µg/L) There is a significant drop off of concentration. This is an area identified as a paleochannel and there is a layer of coarse grained sediment, wash gravels, present. Placing a well in this area will help evaluate the significance of the wash gravels and further characterize perchlorate impacts. Surface water concentrations are 19 to 23 µg/L.	This well is in alluvium overlying the Muddy Creek formation 570 feet southeast from well WMW5.58S1 and 350 feet west northwest of well WMW5.5S. It is on a paleochannel identified by BRC (2007) and 250 feet northwest of a paleochannel identified by Ed Krish (2015).
NERT5.11S1	90	45	4"	35 - 45	33 - 45	Determine concentrations between proposed wells NERT5.49S1 and NERT4.93S1. Surface water concentrations are 19 to 23 µg/L.	This well is in alluvium overlying the Muddy Creek formation 1,700 feet northeast from proposed well NERT5.49S1 and 800 feet west southwest of proposed well NERT4.93S1. It is 380 feet west of a paleochannel identified by Ed Krish (2015).
NERT4.93S1	90	50	4"	40 - 50	38 - 50	Determine concentrations between MW-13 (total well depth of 49.4 feet bgs at 3,800 µg/L and WMW4.9S (total well depth of 46.75 feet bgs at 270 µg/L) to obtain additional data on the paleochannel and perchlorate impacts in the area. Surface water concentrations are 15 to 23 µg/L.	This well is in alluvium overlying the Muddy Creek formation 470 feet northwest from well MW-13 and 500 feet southwest of well WMW4.9S. It is 400 feet east of a paleochannel identified by Ed Krish (2015).
NERT4.71S1	90	50	4"	40 - 50	38 - 50	Determine concentrations between WMW4.9S (total well depth of 46.75 feet bgs at 270 µg/L) and proposed well NERT4.9-51S1 to obtain additional data on the paleochannel and perchlorate impacts in the area. Surface water concentrations are 15 to 44 µg/L.	This well is in alluvium overlying the Muddy Creek formation 65 feet northeast from well WMW4.9S and 1100 feet west southwest of proposed well NERT4.51S1. It is on a paleochannel identified by Northgate (2010), 150 feet northeast of a paleochannel identified by Ed Krish (2015), and 500 feet southwest of a paleochannel identified by BRC (2007).
NERT4.51S1	90	50	4"	40 - 50	38 - 50	Determine concentrations between proposed well NERT4.71S1 and LNDMW1 (total well depth of 61 feet bgs at 1,900 µg/L) to obtain additional data on the paleochannel and perchlorate impacts in the area. Surface water concentrations increase from 15 to 44 µg/L in this area.	This well is in alluvium overlying the Muddy Creek formation 1,150 feet east northeast of proposed well NERT4.71S1 and 1,000 feet west southwest of well LNDMW1. It is 600 feet northeast of a paleochannel identified by BRC (2007).
NERT4.38N1	90	55	4"	45 - 55	43 - 55	Determine concentrations west of LNDMW2 (total well depth of 55.05 feet bgs at 1,500 µg/L) to further characterize perchlorate concentrations on the north side of LVW. Surface water concentrations increase from 15 to 44 µg/L in this area.	This well is in alluvium overlying the Thumb formation. It is 450 feet west from well LNDMW2 and 1,900 feet east northeast of well WMW4.9N.
NERT4.21N1	90	55	4"	45 - 55	43 - 55	Determine concentrations southeast of LNDMW2 (total well depth of 55.05 feet bgs at 1,500 µg/L) to further characterize perchlorate impacts on the north side of LVW. Surface water concentrations increase from 15 to 44 µg/L in this area.	This well is in alluvium overlying the Thumb formation 450 feet southeast from well LNDMW2 and 100 feet southeast of proposed well NERT4.38N1. This well is 1,400 feet southwest of a mapped fault within the Frenchman Fault zone.
NERT3.80S1	90	60	4"	50 - 60	48 - 60	Determine concentrations between LNDMW1 (total well depth of 61 feet bgs at 1,900 µg/L) and WMW3.5S (total well depth of 59.8 feet bgs at 1,400 µg/L) on the south side of LVW to further characterize perchlorate impacts in the area. This well may also provide additional data regarding faulting in the area. Surface water concentrations are 35 to 50 µg/L.	This well is in alluvium overlying the Thumb formation. It is 2,550 feet east northeast from well LNDMW1 and 70 feet southwest of proposed well NERT3.65S1. It is between the projected traces of two mapped faults within the Frenchman Fault zone.
NERT3.65S1 (Not installed due to refusal of sonic drill at 3 feet bgs)	90	60	4"	50 - 60	48 - 60	Determine concentrations southwest of WMW3.5S (total well depth of 59.8 feet bgs at 1,400 µg/L) near Three Kids Weir to further characterize perchlorate impacts in the area. This well may also provide additional data regarding faulting in the area. Surface water concentrations in LVW are 26 to 35 µg/L and there is a seep in this area (KM67) with a concentration of 1,400 µg/L.	This well is in alluvium over the Thumb formation. It is 500 feet south of the KM67 seep and is 25 feet southwest of well WMW3.5S. It is within Frenchman Fault zone as documented in the Demonstration Weir (Three Kids Weir) geotechnical report (GES, 2003).

Notes:
(1) Proposed Borehole depth is similar to other NERT off site RI wells to provide stratigraphic information at comparable depths.
(2) The Proposed Well Depths are as proposed in the Data Gap Investigation Plan (DGIP) - Phase I Groundwater Monitoring Well Installation (AECOM, May 2017a).
(3) The borehole is 8 inches in diameter and sealed with bentonite from the total depth to the planned well screen.
(4) Well casing is 4 inch schedule 40 PVC and well screen slot size is 0.02 inches
(5) Sand Pack size is No. 3.
µg/L: micrograms per liter
bgs: below ground surface

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Table 2
Phase I Groundwater Monitoring Well Installation Details
NERT RI - Downgradient Study Area
Henderson, Nevada

Well ID	Drilling Start Date	Drilling Completion Date	Well Installation					Well Development		
			Pilot Boring Depth [1.] (feet bgs)	Depth to Groundwater (feet bgs)	Well Completion Depth (feet bgs)	Well Screen [2.] (feet bgs)	Sand Pack Interval [3.] (feet bgs)	Date Developed	Depth to Groundwater (feet bgs)	Well Depth after Development (feet bgs)
NERT5.91S1	6/17/2018	6/18/2018	90	35	50.4	40 - 50	38 - 50	6/28/2018	13.35	50.00
NERT5.49S1	6/18/2018	6/19/2018	90	26	40.4	30 - 40	28 - 40	6/27/2018	26.79	40.10
NERT5.11S1	6/16/2018	6/17/2018	90	25	45.4	35 - 45	33 - 45	6/27/2018	20.77	45.05
NERT4.93S1	6/15/2018	6/16/2018	65 [4.]	26	55	45 - 55	43 - 55	6/26/2018	27.77	54.55
NERT4.71S1	6/26/2018	6/27/2018	90	26	50	40 - 50	38 - 50	7/5/2018	28.75	47.30
NERT4.51S1	6/13/2018	6/14/2018	57.5 [4.]	27	54	40 - 50	37.5 - 51	6/26/2018	26.60	53.32
NERT4.38N1	6/20/2018	6/21/2018	60 [4.]	33	40.9	30 - 40	28 - 40	6/25/2018	33.2	39.8
NERT4.21N1	6/19/2018	6/20/2018	90	42	55.4	45 - 55	43 - 55	6/25/2018	35.88	54.9
NERT3.80S1	6/27/2018	6/28/2018	55 [4.]	12	20	10 - 20	8 - 20	7/5/2018	10.67	19.67
NERT3.65S1	6/28/2018	6/28/2018	3 [4.]	NA	NA	NA	NA	NA	NA	NA

Notes:
1. The borehole was 8 inches in diameter and sealed with bentonite from the total depth to the bottom of the well screen.
2. Well casing is 4-inch schedule 40 PVC and well screen slot size is 0.02 inches.
3. Sand pack is Monterey No. 3 sand.
4. Encountered refusal at specified depth. Final depth is a deviation from the Data Gap Investigation Phase I Work Plan.
bgs - below ground surface
NA - Not applicable

Table 3
Summary of Grain Size Analysis
NERT Downgradient Study Area, Henderson, Nevada

Soil Boring Name	Sample Identification	Collection Date	Depth (feet)	Mean Grain Size Description USCS/ASTM (1)	Median Grain Size (mm)	Particle Size Distribution (weight percent) (2)				
							Sand Size			
						Gravel	Coarse	Medium	Fine	Silt/Clay
NERT5.91S1	NERT5.91S1 17'	6/17/2018	17	Fine sand	0.105	8.23	5.67	13.57	37.23	35.30
	NERT5.91S1 40'	6/17/2018	40	Medium sand	0.602	6.3	17.25	31.96	27.34	17.15
	NERT5.91S1 47'	6/17/2018	47	Medium sand	1.12	13.92	18.31	34.38	18.28	15.12
	NERT5.91S1 50'	6/17/2018	50	Medium sand	1.709	24.65	20.82	35.73	14.29	4.51
	NERT5.91S1 60'	6/17/2018	60	Medium sand	1.05	1.11	25.38	40.61	23.76	9.15
	NERT5.91S1 87'	6/17/2018	87	Coarse sand	1.787	5.51	39.88	36.35	14.29	3.97
NERT5.49S1	NERT5.49S1 20'	6/18/2018	20	Coarse sand	1.367	12.07	26.91	25.22	26.69	9.10
	NERT5.49S1 32'	6/18/2018	32	Gravel	2.224	31.77	20.62	23.5	17.66	6.44
	NERT5.49S1 72'	6/18/2018	72	Medium sand	0.603	0	11.02	48.28	30.3	10.4
	NERT5.49S1 89'	6/18/2018	89	Gravel	4.54	48.17	28.42	17.02	5.79	0.59
NERT5.11S1	NERT5.11S1 17'	6/16/2018	17	Gravel	4.028	42.84	32.3	15.8	5.02	4.04
	NERT5.11S1 37'	6/16/2018	37	Fine sand	1.343	22.35	18.97	23.97	24.43	10.28
	NERT5.11S1 40'	6/16/2018	40	Fine sand	0.356	5.47	5.18	32.40	51.9	5.06
	NERT5.11S1 67'	6/16/2018	67	Fine sand	0.255	0.00	2.22	33.79	35.85	28.14
	NERT5.11S1 72'	6/16/2018	72	Medium sand	0.472	0.3	9.42	43.27	31.85	15.16
NERT4.93S1	NERT4.93S1 15'	6/15/2018	15	Fine sand	0.239	6.22	9.38	23.38	39.75	21.27
	NERT4.93S1 41'	6/15/2018	41	Silt/clay	0.083	0	0.92	11.23	42.45	45.4
	NERT4.93S1 47'	6/15/2018	47	Gravel	7.356	60.98	16.79	12.86	6.71	2.66
	NERT4.93S1 48'	6/15/2018	48	Medium sand	1.178	16.59	19.25	32.28	23.38	8.5
	NERT4.93S1 60'	6/15/2018	60	Medium sand	0.333	10.14	13.93	23.11	30.85	21.97
NERT4.51S1	NERT4.51S1 15'	6/14/2018	15	Silt/clay	0.072	0.96	7.2	16.32	24.21	51.31
	NERT4.51S1 42'	6/14/2018	42	Gravel	4.931	51.43	21.53	14.14	8.96	3.95
	NERT4.51S1 48'	6/14/2018	48	Gravel	6.907	59.91	19.64	12.11	6.34	2
	NERT4.51S1 52'	6/14/2018	52	Gravel	9.216	74.01	13.99	8.35	2.9	0.76
NERT4.38N1	NERT4.38N1 12'	6/20/2018	12	Gravel	16.141	87.48	4.19	3.18	3.13	2.02
	NERT4.38N1 35'	6/20/2018	35	Medium sand	0.392	0	0.26	47.47	39.38	12.89
	NERT4.38N1 45'	6/20/2018	45	Medium sand	0.795	0.91	11.12	55.5	25.43	7.03
	NERT4.38N1 55'	6/20/2018	55	Fine sand	0.202	0	0.21	27.36	42.64	29.8
	NERT4.38N1 60'	6/20/2018	60	Fine sand	0.236	0	1.77	29.08	46.25	22.9
NERT4.21N1	NERT4.21N1 22'	6/19/2018	22	Medium sand	0.805	1.48	20.09	41.73	22.44	14.26
	NERT4.21N1 45'	6/19/2018	45	Gravel	3.462	44.21	16.09	25.19	12.75	1.75
	NERT4.21N1 48'	6/19/2018	48	Gravel	4.59	49.03	21.37	20.51	8.3	0.79

Table 3
Summary of Grain Size Analysis
NERT Downgradient Study Area, Henderson, Nevada

Soil Boring Name	Sample Identification	Collection Date	Depth (feet)	Mean Grain Size Description USCS/ASTM (1)	Median Grain Size (mm)	Particle Size Distribution (weight percent) (2)				
							Sand Size			
						Gravel	Coarse	Medium	Fine	Silt/Clay
	NERT4.21N1 62'	6/19/2018	62	Medium sand	1.262	2.91	29	42.7	18.28	7.11
	NERT4.21N1 87'	6/19/2018	87	Coarse sand	1.597	10.42	32.44	27.66	20.04	9.44
NERT4.71S1	NERT4.71S1 23'	6/26/2018	23	Coarse sand	2.171	30.72	20.09	21.04	13.10	1.90
	NERT4.71S1 37'	6/26/2018	37	Fine sand	0.091	0.00	16.09	1.12	53.36	37.93
	NERT4.71S1 47'	6/26/2018	47	Coarse sand	2.550	28.03	21.37	29.17	11.01	3.07
	NERT4.71S1 87'	6/27/2018	87	Coarse sand	3.068	31.18	29	38.67	2.07	0.85
	NERT4.71S1 89.5'	6/27/2018	89.5	Gravel	3.968	45.03	32.44	18.94	11.10	5.43
NERT3.80S1	NERT3.80S1 10'	6/27/2018	10	Medium sand	0.670	15.64	20.09	14.50	31.60	10.38
	NERT3.80S1 12'	6/27/2018	12	Medium sand	0.397	19.16	16.09	7.96	38.89	12.65
	NERT3.80S1 15'	6/27/2018	15	Coarse sand	2.978	38.72	21.37	19.56	12.52	0.63
	NERT3.80S1 35'	6/27/2018	35	Medium sand	0.361	16.10	29	7.28	35.96	16.42

Notes:
(1) Based on Mean from Trask; USCS: Unified Soil Classification System
(2) Grain Size Analysis via Method D422M, sieve method
ASTM: ASTM Method D422M, sieve method
N/A: Mean grain size could not be calculated using Trask method because there was no 25 weight percent fraction of material in the sample.
mm: millimeters

Table 4
Summary of Moisture Content Analysis
NERT Downgradient Study Area, Henderson, Nevada

Soil Boring Name	Sample Identification	Collection Date	Depth (feet)	Moisture Content (1)
NERT5.91S1	NERT5.91S1 17'	6/17/2018	17	23.3
	NERT5.91S1 40'	6/17/2018	40	33.1
	NERT5.91S1 47'	6/17/2018	47	24.2
	NERT5.91S1 50'	6/17/2018	50	17.9
	NERT5.91S1 60'	6/17/2018	60	33.1
	NERT5.91S1 87'	6/17/2018	87	75.3
NERT5.49S1	NERT5.49S1 20'	6/18/2018	20	7.0
	NERT5.49S1 32'	6/18/2018	32	14.1
	NERT5.49S1 72'	6/18/2018	72	70.8
	NERT5.49S1 89'	6/18/2018	89	41.7
NERT5.11S1	NERT5.11S1 17'	6/16/2018	17	6.8
	NERT5.11S1 37'	6/16/2018	37	4.3
	NERT5.11S1 40'	6/16/2018	40	13.6
	NERT5.11S1 67'	6/16/2018	67	62.7
	NERT5.11S1 72'	6/16/2018	72	37.3
NERT4.93S1	NERT4.93S1 15'	6/15/2018	15	10.2
	NERT4.93S1 41'	6/15/2018	41	23.8
	NERT4.93S1 47'	6/15/2018	47	8.7
	NERT4.93S1 48'	6/15/2018	48	13.4
	NERT4.93S1 60'	6/15/2018	60	25.0
NERT4.51S1	NERT4.51S1 15'	6/14/2018	15	7.2
	NERT4.51S1 42'	6/14/2018	42	4.6
	NERT4.51S1 48'	6/14/2018	48	3.3
	NERT4.51S1 52'	6/14/2018	52	6.3
NERT4.38N1	NERT4.38N1 12'	6/20/2018	12	3.7
	NERT4.38N1 35'	6/20/2018	35	15.3
	NERT4.38N1 45'	6/20/2018	45	9.5
	NERT4.38N1 55'	6/20/2018	55	10.9
	NERT4.38N1 60'	6/20/2018	60	19.6
NERT4.21N1	NERT4.21N1 22'	6/19/2018	22	19.1
	NERT4.21N1 45'	6/19/2018	45	13.8
	NERT4.21N1 48'	6/19/2018	48	7.7
	NERT4.21N1 62'	6/19/2018	62	13.2
	NERT4.21N1 87'	6/19/2018	87	13.6
NERT4.71S1	NERT4.71S1 23'	6/26/2018	23	4.7
	NERT4.71S1 37'	6/26/2018	37	26.3
	NERT4.71S1 47'	6/26/2018	47	10.7
	NERT4.71S1 87'	6/27/2018	87	9.3
	NERT4.71S1 89.5'	6/27/2018	89.5	9.0
NERT3.80S1	NERT3.80S1 10'	6/27/2018	10	10.1
	NERT3.80S1 12'	6/27/2018	12	20.6
	NERT3.80S1 15'	6/27/2018	15	6.3
	NERT3.80S1 35'	6/27/2018	35	4.7

Notes:
(1) ASTM Method D2216. Moisture Content is in percent of dry weight.

Table 5
Summary of Atterberg Limits Analysis
NERT Downgradient Study Area, Henderson, Nevada

Soil Boring Name	Sample Identification	Collection Date	Depth (feet)	Atterberg Limits [1] Liquid Limit	Plastic Limit	Plastic Index	USCS
NERT5.91S1	NERT5.91S1 17'	6/17/2018	17	31.2	17.1	14.1	CL - Sandy Lean Clay
	NERT5.91S1 40'	6/17/2018	40	42.0	18.0	24.0	CL - Sandy Lean Clay
	NERT5.91S1 47'	6/17/2018	47	31.9	11.8	20.1	CL - Lean Clay with Sand
	NERT5.91S1 50'	6/17/2018	50	32.1	11.8	20.3	CL - Sandy Lean Clay with Gravel
	NERT5.91S1 60'	6/17/2018	60	85.4	29.7	55.7	CH - Fat Clay with Sand
	NERT5.91S1 87'	6/17/2018	87	147.7	40.0	107.7	CH - Fat Clay with Sand
NERT5.49S1	NERT5.49S1 20'	6/18/2018	20	23.2	10.6	12.6	CL/SC - Clayey Sand
	NERT5.49S1 32'	6/18/2018	32	20.0	Non-Plastic		CL/ML - Silty Clay with Gravel
	NERT5.49S1 72'	6/18/2018	72	42.1	18.0	24.1	CL - Sandy Lean Clay
	NERT5.49S1 89'	6/18/2018	89	42.1	16.1	26.0	CL - Lean Clay with Gravel
NERT5.11S1	NERT5.11S1 17'	6/16/2018	17	33.9	16.8	17.1	SP - Poorly Graded Sand with Gravel
	NERT5.11S1 37'	6/16/2018	37	27.3	16.8	10.5	CL - Lean Clay with Sand
	NERT5.11S1 40'	6/16/2018	40	20.5	Non-Plastic		ML - Sandy Silt
	NERT5.11S1 67'	6/16/2018	67	85.5	29.7	55.8	CH - Sandy Fat Clay
	NERT5.11S1 72'	6/16/2018	72	107.2	30.6	76.6	CH - Sandy Fat Clay
NERT4.93S1	NERT4.93S1 15'	6/15/2018	15	21.6	19.2	2.4	ML - Sandy Silt
	NERT4.93S1 41'	6/15/2018	41	31.6	16.6	15.0	CL - Sandy Lean Clay
	NERT4.93S1 47'	6/15/2018	47	20.1	Non-Plastic		GP - Poorly graded Gravel with Sand
	NERT4.93S1 48'	6/15/2018	48	21.2	14.9	6.3	CL/ML - Sandy Silty Clay with Gravel
	NERT4.93S1 60'	6/15/2018	60	30.9	16.5	14.4	CL-Sandy Lean Clay
NERT4.51S1	NERT4.51S1 15'	6/14/2018	15	30.3	19.6	10.7	CL - Lean Clay with Sand
	NERT4.51S1 42'	6/14/2018	42	21.9	Non-Plastic		GP - Poorly Graded Gravel with Sand
	NERT4.51S1 48'	6/14/2018	48	21.0	Non-Plastic		GP - Poorly Graded Gravel with Sand
	NERT4.51S1 52'	6/14/2018	52	53.5	17.0	36.5	CH - Gravely Fat Clay with Sand
NERT4.38N1	NERT4.38N1 12'	6/20/2018	12	36.4	14.8	21.6	GP/CL Poorly Graded Gravel with Clay
	NERT4.38N1 35'	6/20/2018	35	24.0	Non-Plastic		ML - Sandy Silt
	NERT4.38N1 45'	6/20/2018	45	37.5	13.2	24.3	CL - Sandy Lean Clay
	NERT4.38N1 55'	6/20/2018	55	68.1	16.0	52.1	CH - Sandy Fat Clay
	NERT4.38N1 60'	6/20/2018	60	45.7	19.8	25.9	CL - Sandy Lean Clay

Table 5
Summary of Atterberg Limits Analysis
NERT Downgradient Study Area, Henderson, Nevada

Soil Boring Name	Sample Identification	Collection Date	Depth (feet)	Atterberg Limits (1) Liquid Limit	Atterberg Limits (1) Plastic Limit	Atterberg Limits (1) Plastic Index	USCS
NERT4.21N1	NERT4.21N1 22'	6/19/2018	22	31.2	16.8	14.4	CL - Lean Clay with Sand
	NERT4.21N1 45'	6/19/2018	45	21.6	Non-Plastic		CL/ML - Silty Clay with Gravel
	NERT4.21N1 48'	6/19/2018	48	17.8	Non-Plastic		CL/ML - Silty Clay with Gravel
	NERT4.21N1 62'	6/19/2018	62	44.3	16.1	28.2	CL - Lean Clay with Sand
	NERT4.21N1 87'	6/19/2018	87	44.4	14.7	29.7	CL - Lean Clay with Sand
NERT4.71S1	NERT4.71S1 23'	6/26/2018	23	19.0	Non-Plastic		SM - Silty Sand with Gravel
	NERT4.71S1 37'	6/26/2018	37	28.3	18.8	9.5	CL - Lean Clay with Sand
	NERT4.71S1 47'	6/26/2018	47	23.0	Non-Plastic		SM - Silty Sand with Gravel
	NERT4.71S1 87'	6/27/2018	87	19.3	11.6	7.7	CL/SP - Pooly Graded Sand with Gravel
	NERT4.71S1 89.5'	6/27/2018	89.5	19.6	13.1	6.5	CL/ML- Silty Lean Clay with Gravel
NERT3.80S1	NERT3.80S1 10'	6/27/2018	10	21.0	Non-Plastic		SM - Silty Sand with Gravel
	NERT3.80S1 12'	6/27/2018	12	17.6	12.2	5.4	CL/ML - Silty Lean Clay with Sand
	NERT3.80S1 15'	6/27/2018	15	17.9	Non-Plastic		SP - Poorly Graded Sand with Gravel
	NERT3.80S1 35'	6/27/2018	35	26.1	11.4	14.7	CL - Sandy Lean Clay with Gravel

Notes:

(1) ASTM Method D4318. Silt assumed as fine fraction for Non-Plastic samples.

USCS: Unified Soil Classification System

CH: Inorganic clays of high plasticity, fat clays

CL: Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays

GP: Poorly graded gravel

MH: Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts

ML: Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity

SC: Clayey sand

SP: Poorly graded sand

Table 6
Transducer Installation Details
NERT RI - Downgradient Study Area
Henderson Nevada

Well ID	Date & Time of Install	Pre-Installation Depth to Groundwater (feet btoc)	Total Well Total Depth (feet btoc)	Water Column (feet)	Transducer Future Start Time	Estimated Transducer Depth (1) (feet btoc)	Transducer Depth Below Pre-Installation Depth to Groundwater (2) (feet)	Post-Installation Depth to Groundwater (feet btoc)
NERT5.91S1	9/6/18 1415	12.87	49.7	36.83	1500	33	20.13	12.85
NERT5.49S1	9/6/18 1515	26.90	39.75	12.85	1600	37.75	10.85	26.9
NERT5.11S1	9/7/18 1215	20.8	44.75	23.95	1245	40	19.20	20.8
NERT4.93S1	9/7/2018 1150	27.57	54.05	26.48	12.15	47	19.43	27.57
NERT4.71S1	9/7/2018 1110	28.87	46.73	17.86	1145	44.75	15.88	28.86
NERT4.51S1	9/7/2018 1025	26.31	50	23.69	1100	46	19.69	26.31
NERT4.38N1	9/7/2018 0715	32.85	39.51	6.66	0800	37.5	4.65	32.87
NERT4.21N1	9/7/18 0810	35.54	54.61	19.07	0900	53	17.46	35.54
NERT3.80S1	9/7/18 0955	10.62	19.4	8.78	1015	17.5	6.88	10.62

Notes:
btoc: Below top of casing.
(1) Depth of the transducer is measured to the bottom of the transducer.
(2) Transducers were installed approximately 20 feet below the pre-installation groundwater surface, or approximately 2 feet above the measured total depth of the well if water column was less than 22 feet.

Table 7
Summary of Depth to Bedrock
NERT RI - Downgradient Study Area
Henderson, Nevada

Well ID	Depth to Bedrock (feet bgs)	Bedrock	Comments
NERT3.80S1	22.5	UMCf	Near an outcrop of Thumb (basal conglomerate).
	30	Thumb	Refusal at 55 feet bgs.
NERT4.21N1	56	Thumb	Altered Thumb formation. Drilled to 90 feet bgs. Soil is lithified below 60 feet bgs.
NERT4.38N1	57.5	Thumb	Drilled to 60 feet bgs.
NERT4.51S1	No bedrock encountered	NA	Refusal at 57.5 feet bgs due to large gravel.
NERT4.71S1	No bedrock encountered	NA	Drilled to 90 feet bgs.
NERT4.93S1	No bedrock encountered	NA	Refusal at 65 feet bgs due to volcanic breccia.
NERT5.11S1	66	UMCf	Drilled to 90 feet bgs.
NERT5.49S1	75	UMCf	Drilled to 90 feet bgs.
NERT5.91S1	50	UMCf	Drilled to 90 feet bgs.

Notes:
bgs: below ground surface
UMCf: Upper Muddy Creek formation
NA: Not applicable

Table 8

Depth to Groundwater and Groundwater Elevations July 2018

NERT Downgradient Study Area

Henderson, Nevada

Well ID	Easting (1)	Northing (1)	Elevation (1) (feet amsl, TOC)	Date Gaged	Depth to Water (feet, TOC)	Elevation (feet amsl)
AA-30	836125.80	26733691.92	1532.35	7/13/2018	18.55	1513.80
COH2B1	832598.59	26733593.69	1546.95	7/13/2018	16.21	1530.74
LNDMW1	841145.67	26736145.45	1511.19	7/11/2018	36.68	1474.51
LNDMW2	840864.28	26737125.16	1501.98	7/17/2018	34.22	1467.76
MW-3	836835.36	26733434.90	1523.29	7/12/2018	2.89	1520.40
MW-4	836666.49	26733446.64	1526.35	7/17/2018	6.04	1520.31
MW-02	838994.12	26734478.11	1533.13	7/12/2018	39.52	1493.61
MW-13	838306.91	26734740.22	1529.84	7/12/2018	34.92	1494.92
MW-20	840590.41	26735460.67	1512.54	7/12/2018	32.7	1479.84
MW-25	839862.75	26734834.10	1531.65	7/12/2018	39.34	1492.31
NERT5.91S1	833571.59	26733845.83	1536.76	7/16/2018	12.61	1524.15
NERT5.49S1	835451.85	26734325.76	1543.37	7/16/2018	26.32	1517.05
NERT5.11S1	837144.38	26734881.04	1522.88	7/10/2018	19.84	1503.04
NERT4.93S1	837979.18	26734990.31	1523.33	7/10/2018	26.91	1496.42
NERT4.71S1	838991.63	26735349.66	1519.29	7/9/2018	28.51	1490.78
NERT4.51S1	840138.03	26735857.15	1506.24	7/10/2018	25.91	1480.33
NERT4.38N1	840337.59	26737140.64	1505.04	7/16/2018	32.51	1472.53
NERT4.21N1	841309.13	26736954.70	1502.07	7/16/2018	35.32	1466.75
NERT3.80S1	843700.76	26736780.10	1460.54	7/9/2018	10.47	1450.07
WMW5.7N	834471.76	26734425.52	1528.50	7/17/2018	8.36	1520.14
WMW5.5S	835768.11	26733971.74	1528.22	7/13/2018	13.55	1514.67
WMW5.58S	835070.11	26734647.03	1526.08	7/13/2018	16.60	1509.48
WMW4.9S	838411.85	26735290.15	1518.84	7/13/2018	26.2	1492.64
WMW4.9N	838408.40	26736756.98	1523.37	7/17/2018	31.58	1491.79
WMW3.5S	844697.76	26737275.90	1483.54	7/16/2018	43.31	1440.23
WMW3.5N	843836.97	26737791.35	1482.54	7/17/2018	35.17	1447.37

Notes:

(1) Well coordinates and elevations surveyed by licensed surveyor (Stanley) April 4 through 8, 2016. Coordinate system: State Plane Coordinate System; Elevations are referenced to the North American Datum (NAD) 83 Nevada East Zone (2701) with vertical datum based on NAVD 88 referenced to the City of Henderson Benchmark network.

amsl = Above mean sea level

TOC = Top of casing

Table 9
Water Quality Parameters July 2018
NERT Downgradient Study Area
Henderson, Nevada

Well ID	Sample Date	Screen Interval (feet, bgs)	Water-Bearing Zone	Lithology	Purge Volume Removed (Liters)	Temp (°C)	pH	EC (µS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Purge Flow Rate (mL/min)	Depth to Water (feet)	Color / Odor
AA-30	7/13/2018	11.7 - 31.7	Shallow	Qal	6.0	25.15	7.72	8.08	1.46	168	7.9	200	18.55	Clear/None
COH2B1	7/13/2018	--	Shallow	--	12.5	26.14	7.26	3.66	0.55	169	37.6	200	16.21	Clear/None
LNDMW1	7/11/2018	--	Shallow	--	11.25	27.10	7.13	4.98	3.13	171	412	150	36.68	Cloudy/None
LNDMW2	7/17/2018	--	Shallow	--	8.0	32.47	7.22	3.42	0.56	179	582	200	34.22	Clear/None
MW-3	7/12/2018	--	Shallow	--	3.0	28.93	7.34	5.13	4.98	179	1.0	150	2.89	Clear/None
MW-4	7/17/2018	--	Shallow	--	2.75	34.43	7.2	4.26	2.92	127	0.0	150	6.04	Clear/None
MW-02	7/12/2018	? - 45	Shallow	--	7.5	25.67	7.17	4.05	6.34	146	2.2	200	39.52	Clear/None
MW-13	7/12/2018	? - 48	Shallow	Qal	4.5	27.45	7.21	5.52	4.34	142	22.6	250	34.92	Clear/None
MW-20	7/12/2018	--	Shallow	--	8.01	30.01	7.51	3.45	1.04	147	129	200	32.7	Clear/None
MW-25	7/12/2018	--	Shallow	--	6.5	27.65	7.30	4.41	6.84	143	11.7	200	39.34	Clear/None
NERT3.80S1	7/9/2018	10 - 20	Shallow	Qal	6.25	33.14	7.15	3.64	1.27	124	24.6	150	10.47	None
NERT4.21N1	7/16/2018	45 - 55	Shallow	Qal	7.0	33.81	7.25	4.00	2.39	1.54	0.4	200	35.32	Cloudy/None
NERT4.38N1	7/16/2018	30 - 40	Shallow	Qal	5.0	34.48	7.21	3.73	1.60	168	36.8	200	32.51	Clear/None
NERT4.51S1	7/10/2018	40 - 50	Shallow	Qal	3.75	29.13	7.23	4.89	4.64	162	0.0	200	25.91	None
NERT4.71S1	7/9/2018	40 - 50	Shallow	Qal	8.5	25.76	8.28	5.65	3.89	152	54	200	28.50	None
NERT4.93S1	7/10/2018	45 - 55	Shallow	Qal	5.5	28.73	7.10	4.58	2.7	151	5.5	200	26.91	None
NERT5.11S1	7/10/2018	35 - 45	Shallow	Qal	7.25	25.96	7.04	5.27	0.58	102	16.7	200	19.84	None
NERT5.49S1	7/16/2018	30 - 40	Shallow	Qal	7.0	33.25	7.94	1.53	0.49	139	45.1	200	26.32	Clear/None
NERT5.91S1	7/16/2018	40 - 50	Shallow	Qal	4.75	31.09	7.62	2.48	0.57	154	39.2	150	12.61	None
WMW3.5N	7/17/2018	--	Shallow	--	18.5	29.11	7.11	6.21	1.09	195	>1000	200	35.17	Red Brown/None
WMW3.5S	7/16/2018	--	Shallow	--	7.0	29.12	7.11	3.69	0.55	179	7.8	200	43.31	Clear/None
WMW4.9N	7/17/2018	--	Shallow	--	10.0	28.39	7.15	3.17	1.09	174	181	200	31.58	Clear/None
WMW4.9S	7/13/2018	--	Shallow	--	6.0	34.28	7.31	2.53	1.10	64	44.3	200	26.2	Clear/None
WMW5.5S	7/13/2018	--	Shallow	--	6.0	30.50	7.23	3.58	3.33	164	11.7	200	13.59	Clear/None
WMW5.58S	7/13/2018	--	Shallow	--	12.25	34.55	7.53	4.32	0.57	-79	498	150	17.31	Brown/None
WMW5.7N	7/17/2018	--	Shallow	--	4.0	37.71	7.14	2.32	0.48	174	0.0	200	8.36	Clear/None

Notes:
-- = No data available
bgs = below ground surface
°C = Degrees Celsius
DO = Dissolved Oxygen
EC = Electrical Conductivity
ORP - Oxidation reduction potential
mg/L = milligrams per liter
mL/min = milliliters per minute
mV = millivolts
NA = Not applicable
NTU = Nephelometric Turbidity Units
TBD = To be determined
TOC = Top of Casing
Qal = Alluvium
µS/cm = microSiemens per centimeter

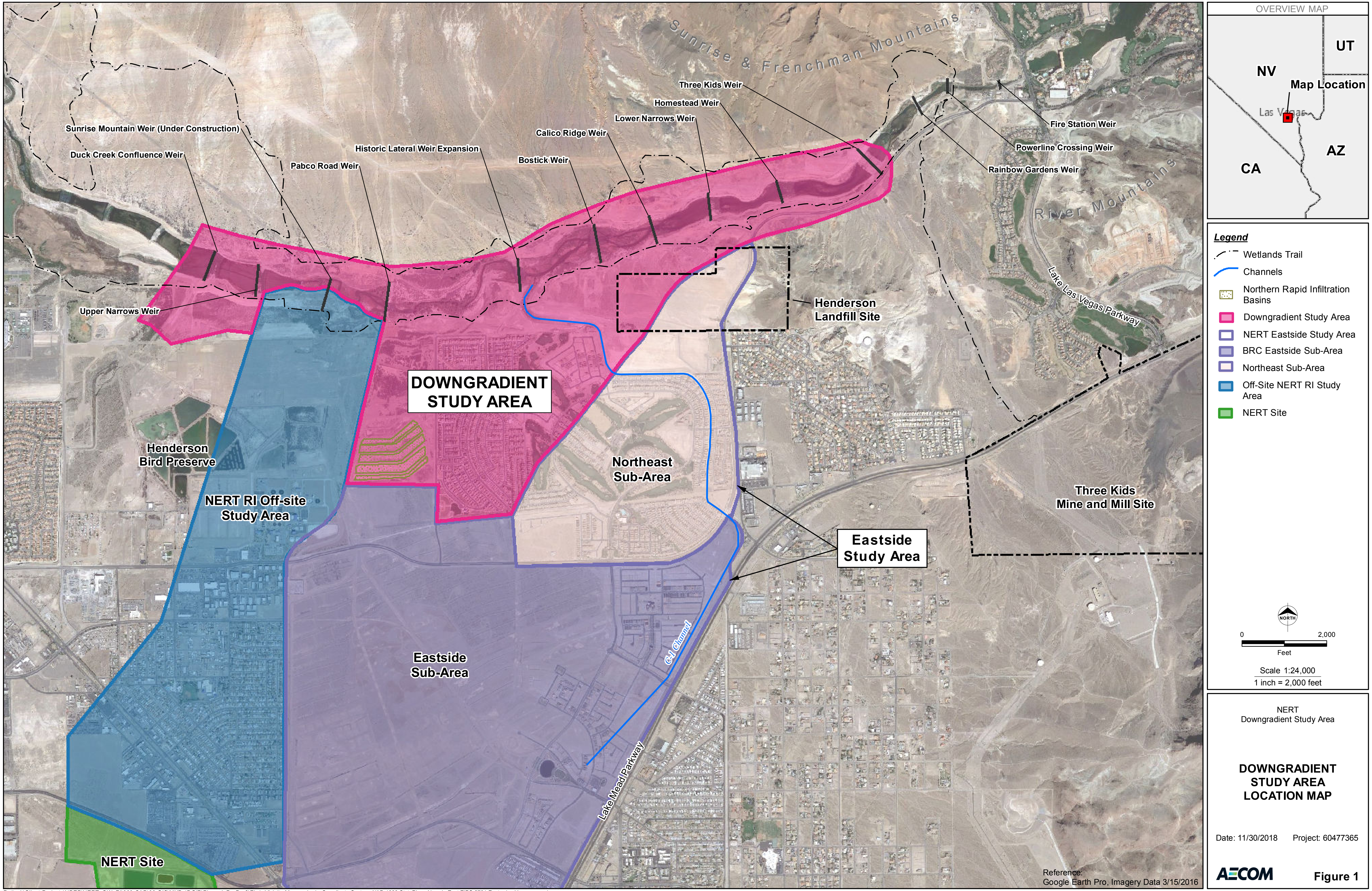
Table 10
Analytical Results of Groundwater Well Sampling July 2018
NERT Downgradient Study Area
Henderson, Nevada

Well ID	Sample Date	Sample ID	Perchlorate (µg/L)	Chlorate (µg/L)	Chloride (mg/L)	Bromide (mg/L)	Chloride / Bromide Ratio	Dissolved Chromium (µg/L)	Total Dissolved Solids (mg/L)
		Method	**314**	**300.1B**	**300.0**	**300.0**		**200.8**	**SM 2540C**
		Screening Level	**18 µg/L**	**1,000**	**250 mg/L**	**11.3**		**100 µg/L**	**500 mg/L**
		Source	**BCL**	**BCL**	**2nd MCL**	**BCL**		**MCL**	**2nd MCL**
NERT3.80S1	7/9/2018	NERT3.80S1-20180709	**1100**	**1700**	**480**	ND (<2.5)	>192	**1.8 J**	**3100**
NERT4.21N1	7/16/2018	NERT4.21N1-20180716	**2200**	**6800**	**570**	ND (<2.5)	>228	**15**	**4000**
NERT4.38N1	7/16/2018	NERT4.38N1-20180716	**1400**	**300**	**510**	ND (<2.5)	>204	**2.5 B**	**3600**
NERT4.51S1	7/10/2018	NERT4.51S1-20180710	**3100**	**10000**	**710**	ND (<2.5)	>284	**19**	**4900**
NERT4.71S1	7/10/2018	NERT4.71S1-20180710	**3800**	**14000**	**830**	ND (<5.0)	>166	**26**	**5200**
NERT4.93S1	7/10/2018	NERT4.93S1-20180710	**3900**	**19000**	**770**	ND (<2.5)	>308	**15**	**4300**
NERT4.93S1	7/10/2018	NERT4.93S1-20180710-EB	ND (<4.0)	ND (<20)	**0.26 J**	ND (<0.50)	>0.52	ND (<2.0)	ND (<10)
NERT4.93S1	7/10/2018	NERT4.93S1-20180710-FB	ND (<4.0)	ND (<20)	ND (<0.50)	ND (<0.50)	>1.00	ND (<2.0)	ND (<10)
NERT4.93S1	7/10/2018	NERT4.93S1-20180710-FD	**3900**	**18000**	**770**	ND (<2.5)	>308	**14**	**4300**
NERT5.11S1	7/10/2018	NERT5.11S1-20180710	**6000**	**25000**	**910**	ND (<2.5)	>364	**13**	**4700**
NERT5.49S1	7/16/2018	NERT5.49S1-20180716	**5.1**	ND (<100)	**250**	**0.27 J**	>926	**1.3 J B**	**1400**
NERT5.91S1	7/16/2018	NERT5.91S1-20180716	**2900**	**660**	**570**	ND (<2.5)	>228	**1.5 J B**	**3100**
AA-30	7/13/2018	AA-30-20180713	**3900**	**9400**	--	--	--	--	--
COH2B1	7/13/2018	COH2B1-20180713	**1600**	**1000**	--	--	--	--	--
LNDMW1	7/11/2018	LNDMW1-20180711	**1600**	**4700**	--	--	--	--	--
LNDMW2	7/17/2018	LNDMW2-20180717	**1700**	**6000**	--	--	--	--	--
MW-02	7/12/2018	MW-02-20180712	**1900**	**2600**	--	--	--	--	--
MW-02	7/12/2018	MW-02-20180712-EB	ND (<4.0)	ND (<20)	--	--	--	--	--
MW-02	7/12/2018	MW-02-20180712-FB	ND (<4.0)	ND (<20)	--	--	--	--	--
MW-02	7/12/2018	MW-02-20180712-FD	**1900**	**2600**	--	--	--	--	--
MW-13	7/12/2018	MW-13-20180712	**3700**	**14000**	--	--	--	--	--
MW-20	7/12/2018	MW-20-20180712	**48**	**78 J**	--	--	--	--	--
MW-25	7/12/2018	MW-25-20180712	**4.3 F1**	**57**	--	--	--	--	--
MW-3	7/12/2018	MW-3-20180712	**3300**	**6200**	--	--	--	--	--
MW-4	7/12/2018	MW-4-20180712	**3000**	**5900**	--	--	--	--	--
WMW3.5N	7/17/2018	WMW3.5N-20180717	**320**	**640**	--	--	--	--	--
WMW3.5S	7/16/2018	WMW3.5S-20180716	**1500**	**3900**	--	--	--	--	--
WMW4.9N	7/17/2018	WMW4.9N-20180717	**680**	**13 J**	--	--	--	--	--
WMW4.9S	7/13/2018	WMW4.9S-20180713	**930**	**2700**	--	--	--	--	--
WMW4.9S	7/13/2018	WMW4.9S-20180713-FD	**900**	**2700**	--	--	--	--	--
WMW5.58S	7/13/2018	WMW5.58S1-20180713	**2500**	**3200**	--	--	--	--	--
WMW5.5S	7/13/2018	WMW5.5S-20180713	**3100**	**11000**	--	--	--	--	--
WMW5.7N	7/17/2018	WMW5.7N-20180717	**3.9 J F1**	ND (<100)	--	--	--	--	--

BCL - Basic Comparison Level: Residential water basic comparison levels in NDEP July 2017 BCL spreadsheet (NDEP 2017). BCL for perchlorate is identified as 18 ug/L to be consistent with the Nevada Interim Action Level.

MCL - Maximum Contaminant Level: Primary United States Environmental Protections Agency Maximum Contaminant Level (USEPA 40 CFR Part 141).
2nd MCL - Secondary Maximum Contaminant Level: National Secondary Drinking Water Regulations (USEPA, 40 CFR Part 143).
Gray Shading - Value equals or exceeds screening level
-- Not analyzed
ND - Not Detected above associated method detection limit
B - Compound was found in the blank and sample.
J - Result is less than the Reporting Limit but greater than or equal to the Method Detection Limit and the concentration is an approximate value.
F1 - Matrix spike and/or matrix spike duplicate recovery is outside acceptable limits
µg/L - Micrograms per liter
mg/L - Milligrams per liter

Figures



NERT
Downgradient Study Area

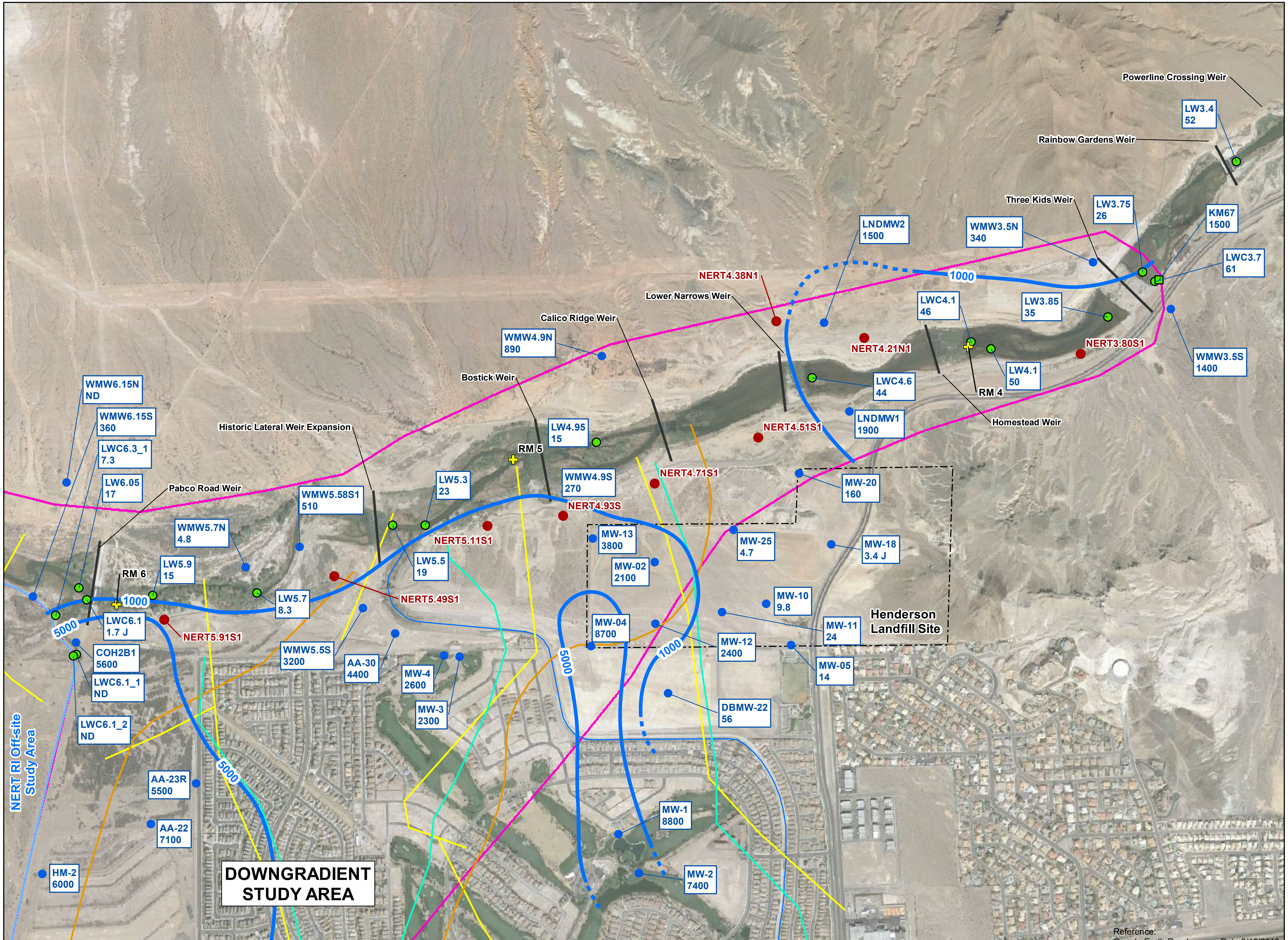
DOWNGRADIENT STUDY AREA LOCATION MAP

Date: 11/30/2018 Project: 60477365

AECOM

Figure 1

Path: J:\Client-Projects\NDEP\NERT_GW_RI\900-CAD\00-GIS\MXDs\DGIP\Phase I_PreDraft\Fig1_Vicinity Map.mxd | Coordinate System: NAD 1983 StatePlane Nevada East FIPS 2701 Feet | User: scopm1



Path: J:\Client-Projects\NDEP\NERT_GW_RI\900-CAD\00-GIS\MXDs\DGIP\Phase I_PreDraft\Fig2_GW_SW_Sampling_perc2.mxd | Coordinate System: NAD 1983 StatePlane Nevada East FIPS 2701 Feet | User: scopm1

OVERVIEW MAP

Legend

- Groundwater Monitoring Well in Shallow Water Bearing Zone
- Surface Water Sample Location - Seeps
- Surface Water Sample Location - LVW/Tributaries
- Phase I Data Gap Investigation Well in Shallow Water Bearing Zone
- River Mile
- Perchlorate Isoconcentration Contour (dashed where inferred)
- Paleochannels (BRC 2007)
- Paleochannels (Krish 2015)
- Paleochannels (Northgate 2010)
- C-1 Channel
- NERT RI Downgradient Study Area
- NERT RI Off-site Study Area

Perchlorate Concentration in µg/L

ND - Not detected above method detection limit
J - Associated conentration is estimated
µg/L - Micrograms per liter

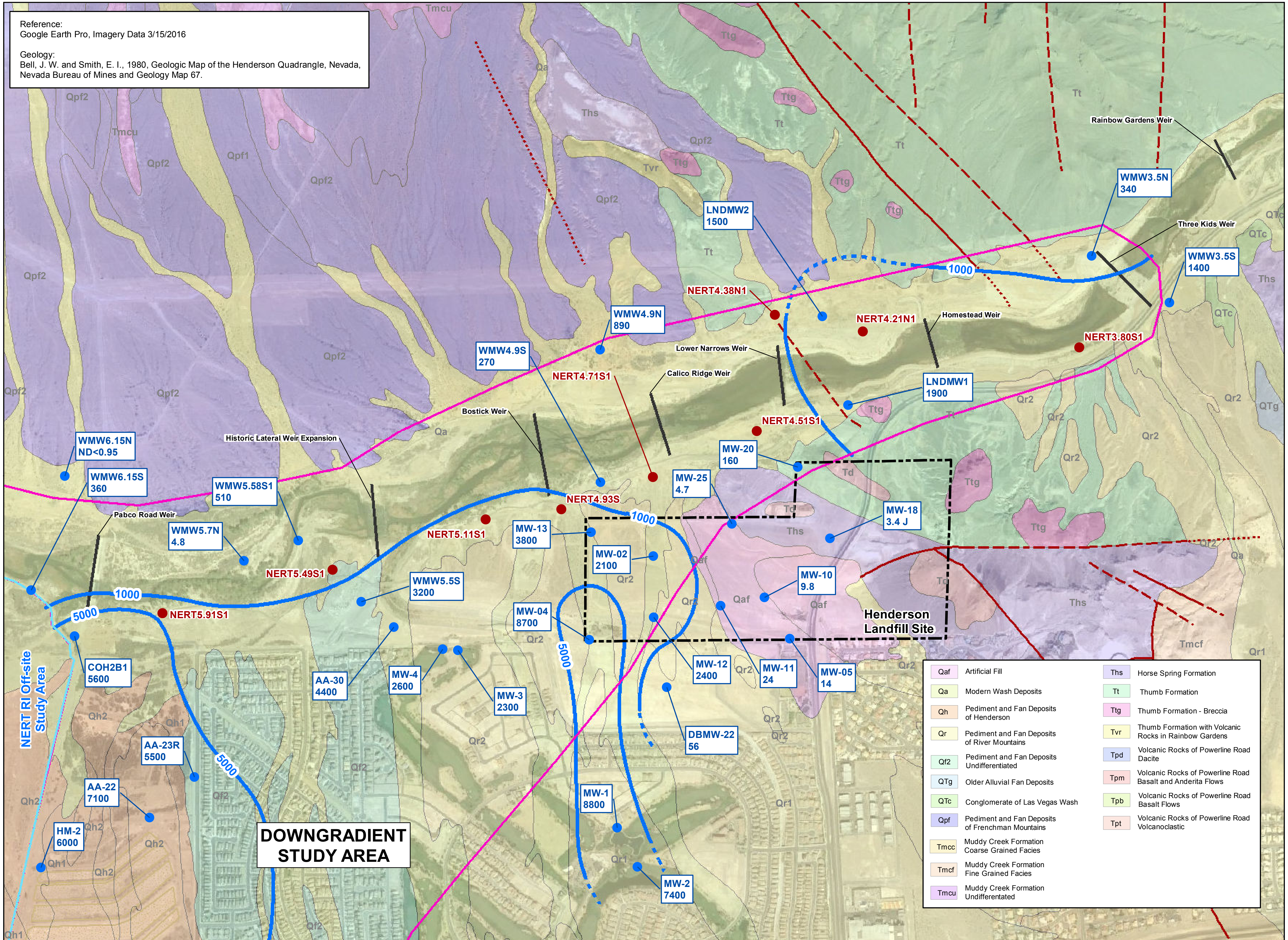
0 1,000
Feet
Scale 1:12,000
1 inch = 1,000 feet

NERT RI
Downgradient Study Area

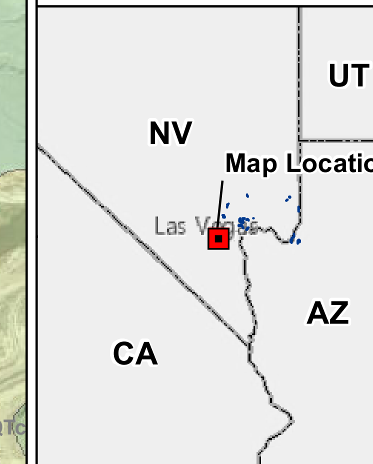
PHASE I MONITORING WELLS AND GROUNDWATER AND SURFACE WATER PERCHLORATE CONCENTRATIONS FROM APRIL 2016

Date: 11/30/2018 Project: 60477365

AECOM **Figure 2**



OVERVIEW MAP



Legend

- Northern Rapid Infiltration Basins
- NERT Downgradient Study Area
- NERT Off-site Study Area
- Phase I Data Gap Investigation Well in Shallow Water Bearing Zone
- Fault, dashed where inferred, dotted where concealed
- Groundwater Monitoring Well in Shallow Water Bearing Zone
- Perchlorate Isoconcentration Contour From April 2016 (dashed where inferred)

Perchlorate Concentration in μg/L

ND - Not detected above method detection limit
J - Associated concentration is estimated
μg/L - Micrograms per liter

NORTH
0 1,000
Feet

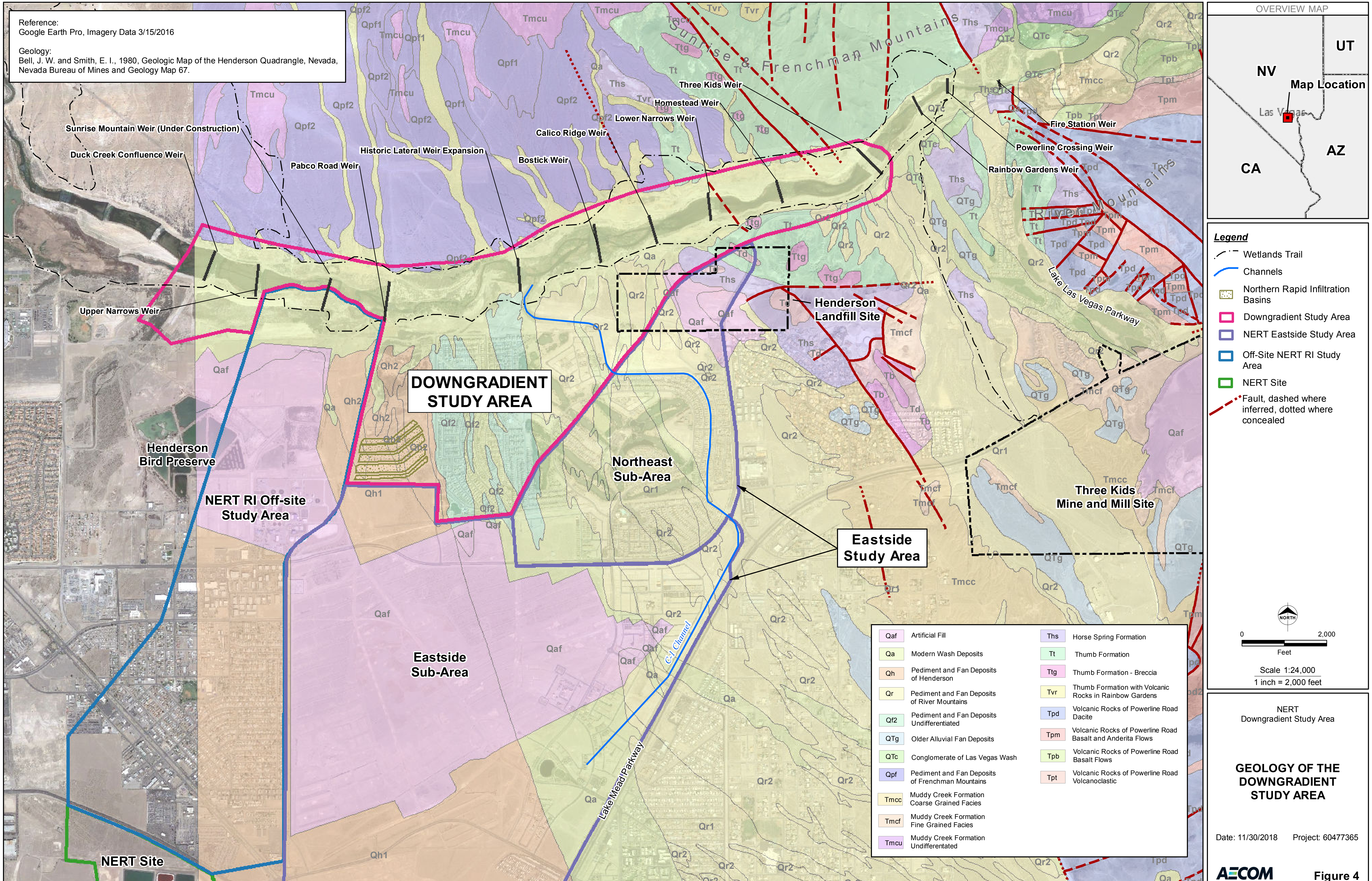
NERT RI
Downgradient Study Area

GEOLOGY, PHASE I MONITORING WELLS AND PERCHLORATE CONCENTRATIONS IN GROUNDWATER APRIL 2016

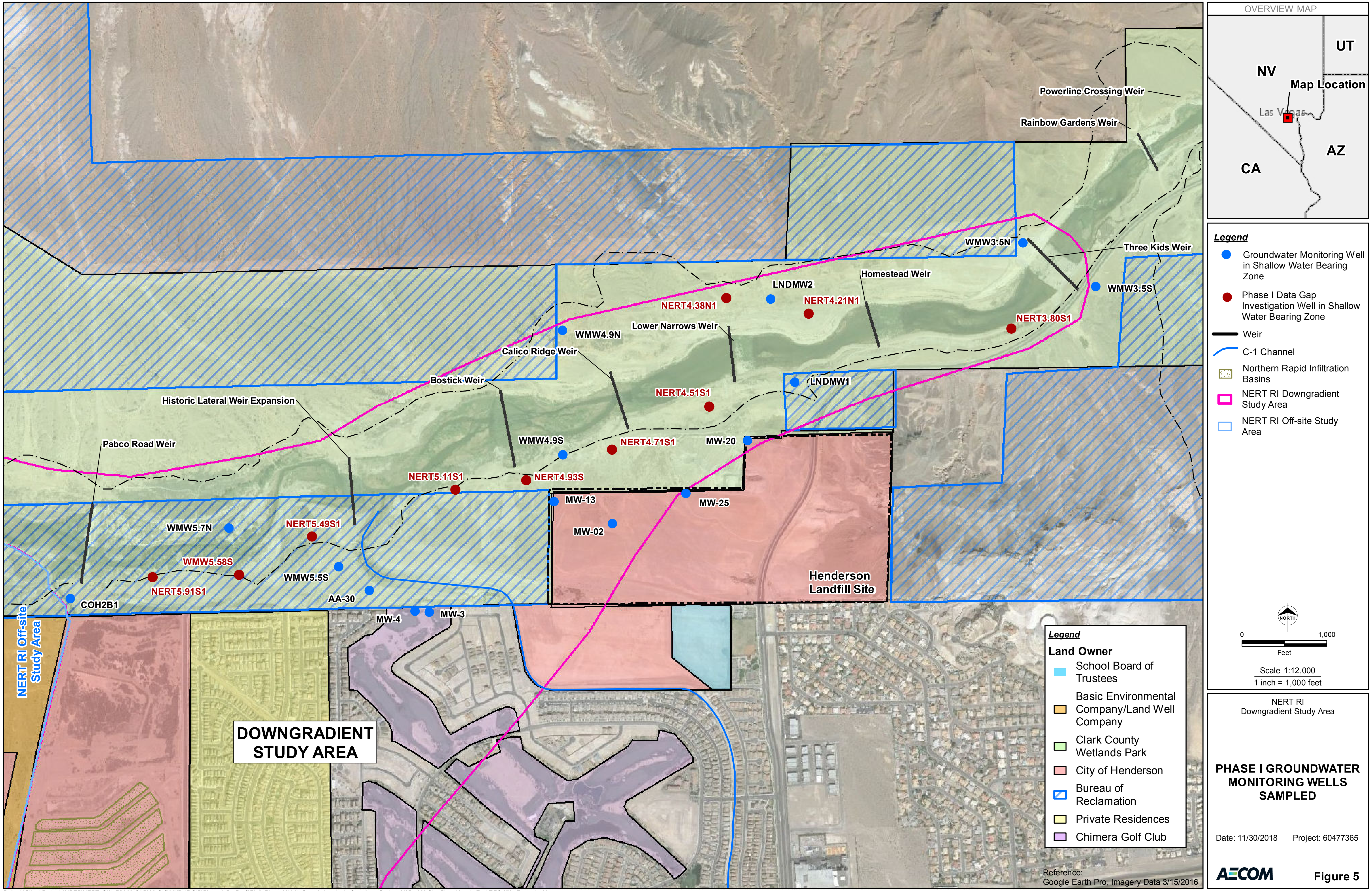
Date: 11/30/2018 Project: 60477365

AECOM **Figure 3**

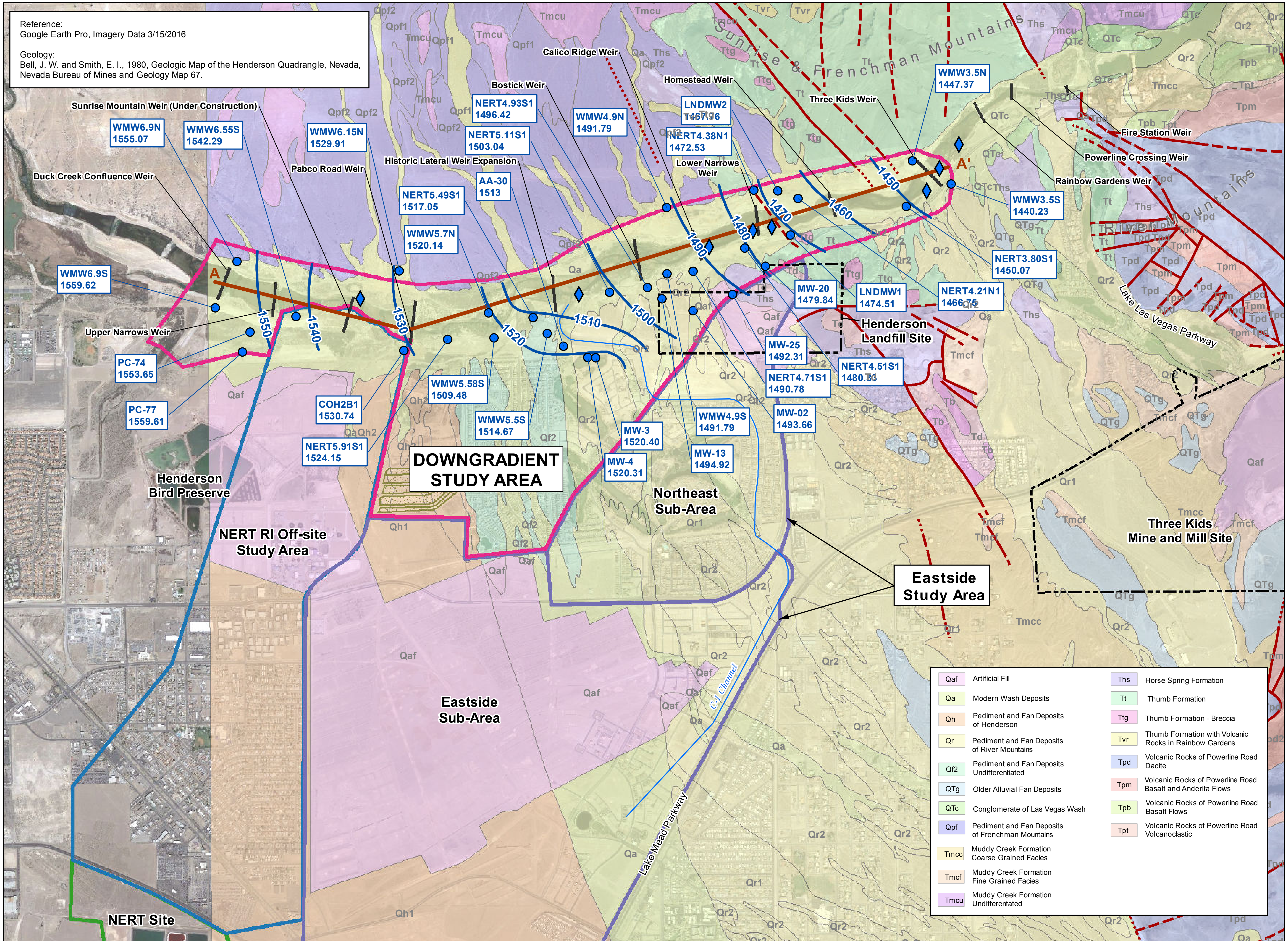
Path: J:\Client-Projects\NDEP\NERT_GW_RI\900-CAD\00-GIS\MXDs\DGIP\Phase I_PreDraft\Fig3_Geology-perc-12_2016.mxd | Coordinate System: NAD 1983 StatePlane Nevada East FIPS 2701 Feet | User: scopm1

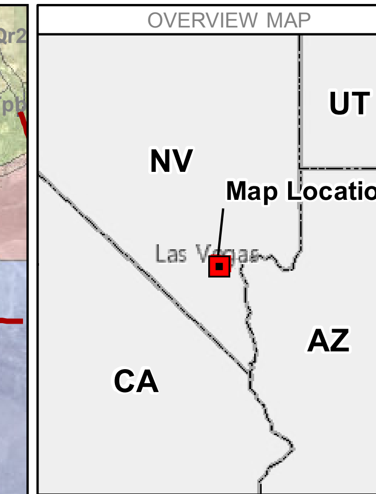


Path: J:\Client-Projects\NDEP\NERT_GW_RI\900-CAD\00-GIS\MXDs\DGIP\Phase I_PreDraft\Fig4_Geologic Study Area.mxd | Coordinate System: NAD 1983 StatePlane Nevada East FIPS 2701 Feet | User: scopm1



Path: J:\Client-Projects\NDEP\NERT_GW_RI\900-CAD\00-GIS\MXDs\DGIP\Phase I_PreDraft\Fig5_Phase1 Wells Sampled.mxd | Coordinate System: NAD 1983 StatePlane Nevada East FIPS 2701 Feet | User: scopm1





Legend

- Groundwater Monitoring Well Sampled in July 2018
- Approximate Location of Staff Gage Installation
- Weir
- C-1 Channel
- Northern Rapid Infiltration Basins
- Downgradient Study Area
- NERT Eastside Study Area
- Off-Site NERT RI Study Area
- NERT Site
- Fault, dashed where inferred, dotted where concealed
- 1450 Groundwater Elevation (feet above mean sea level)
- Groundwater Elevation Contour (feet above mean sea level)
- A–A' Schematic Cross Section Line (Figure 7)

NORTH

0 2,000
Feet
Scale 1:24,000
1 inch = 2,000 feet

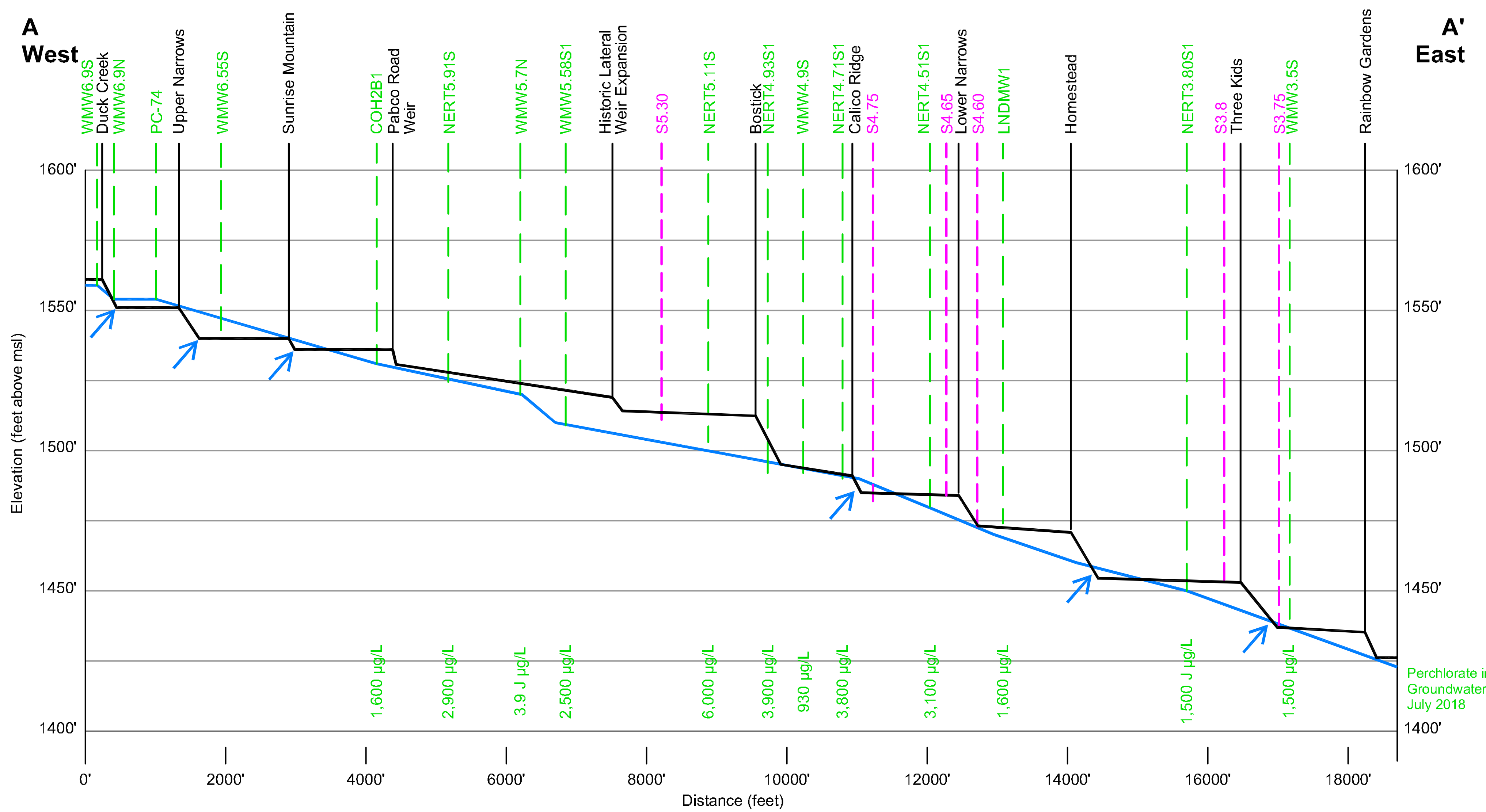
NERT
Downgradient Study Area

GROUNDWATER ELEVATIONS ALONG LAS VEGAS WASH JULY 2018

Date: 11/30/2018 Project: 60477365

AECOM **Figure 6**

Path: J:\Client-Projects\NDEP\NERT_GW_RI\900-CAD\00-GIS\MXDs\DGIP\Phase I_PreDraft\Fig6_GW_July samples_GWElev.mxd | Coordinate System: NAD 1983 StatePlane Nevada East FIPS 2701 Feet | User: scopm1



Legend

- Surface Water Elevation: Based on AECOM survey of Pabco Road Weir, Las Vegas Wash grade control structures, general elevation information updated 3/22/2018, survey information 6/29/2018, and elevations from Staff Gage Transducers (July 9 to 17, 2018)
- Groundwater Elevation: Based on depth to water measurements on (July 9 to 17, 2018).
- Location of Surface Water Gage
- Location of Transducers in Monitoring Wells
- Location of Weir
- Area Where Groundwater Elevation is Higher Than Surfacewater Elevation

NERT
Downgradient Study Area

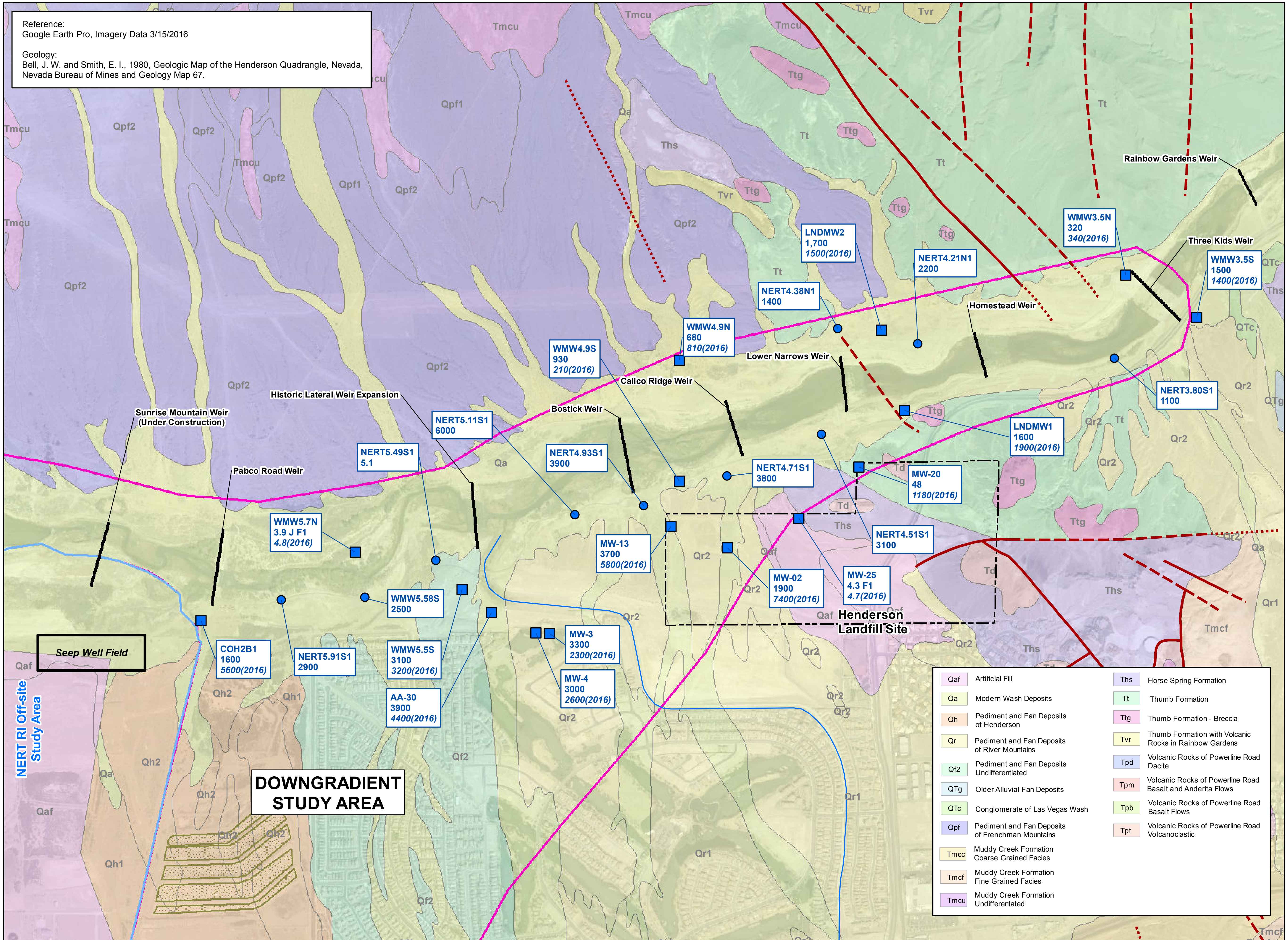
SCHEMATIC CROSS SECTION OF SURFACE WATER AND GROUNDWATER ELEVATIONS ALONG LAS VEGAS WASH 2018

Date: 11/30/2018 Project: 60477365

AECOM

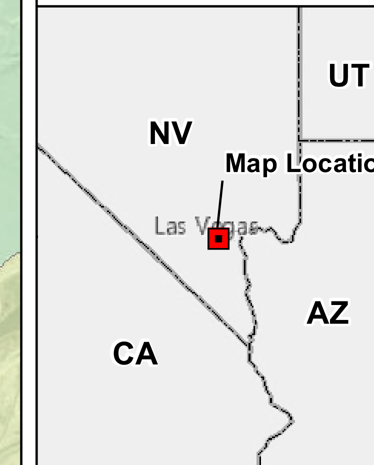
Figure 7

J:\Client-Projects\NDEP\NERT_GW_RI\900-CAD\00-GIS\MXDs\DGIP\Phase I_PreDraft\Fig7_LVW_CrossSection.dwg



Qaf	Artificial Fill	Ths	Horse Spring Formation
Qa	Modern Wash Deposits	Tt	Thumb Formation
Qh	Pediment and Fan Deposits of Henderson	Ttg	Thumb Formation - Breccia
Qr	Pediment and Fan Deposits of River Mountains	Tvr	Thumb Formation with Volcanic Rocks in Rainbow Gardens
Qf2	Pediment and Fan Deposits Undifferentiated	Tpd	Volcanic Rocks of Powerline Road Dacite
QTg	Older Alluvial Fan Deposits	Tpm	Volcanic Rocks of Powerline Road Basalt and Anderita Flows
QTc	Conglomerate of Las Vegas Wash	Tpb	Volcanic Rocks of Powerline Road Basalt Flows
Qpf	Pediment and Fan Deposits of Frenchman Mountains	Tpt	Volcanic Rocks of Powerline Road Volcanoclastic
Tmcc	Muddy Creek Formation Coarse Grained Facies		
Tmcf	Muddy Creek Formation Fine Grained Facies		
Tmcu	Muddy Creek Formation Undifferentated		

OVERVIEW MAP



Legend

- Groundwater Monitoring Well Sampled in July 2018
- Groundwater Monitoring Well Sampled in April 2016 and July 2018
- Weir
- C-1 Channel
- Northern Rapid Infiltration Basins
- NERT RI Downgradient Study Area
- NERT RI Off-site Study Area
- Fault, dashed where inferred, dotted where concealed
- Perchlorate Concentration Isocontour (dashed where inferred)

Perchlorate Concentration in μg/L

- ND - Not detected above method detection limit
- J - Result is less than the Reporting Limit but greater than or equal to the Method Detection Limit and the concentration is an approximate value
- F1 - Matrix spike and/or matrix duplicate recovery is outside acceptable limits
- μg/L - Micrograms per liter

NORTH

0 1,100
Feet
Scale 1:13,200
1 inch = 1,100 feet

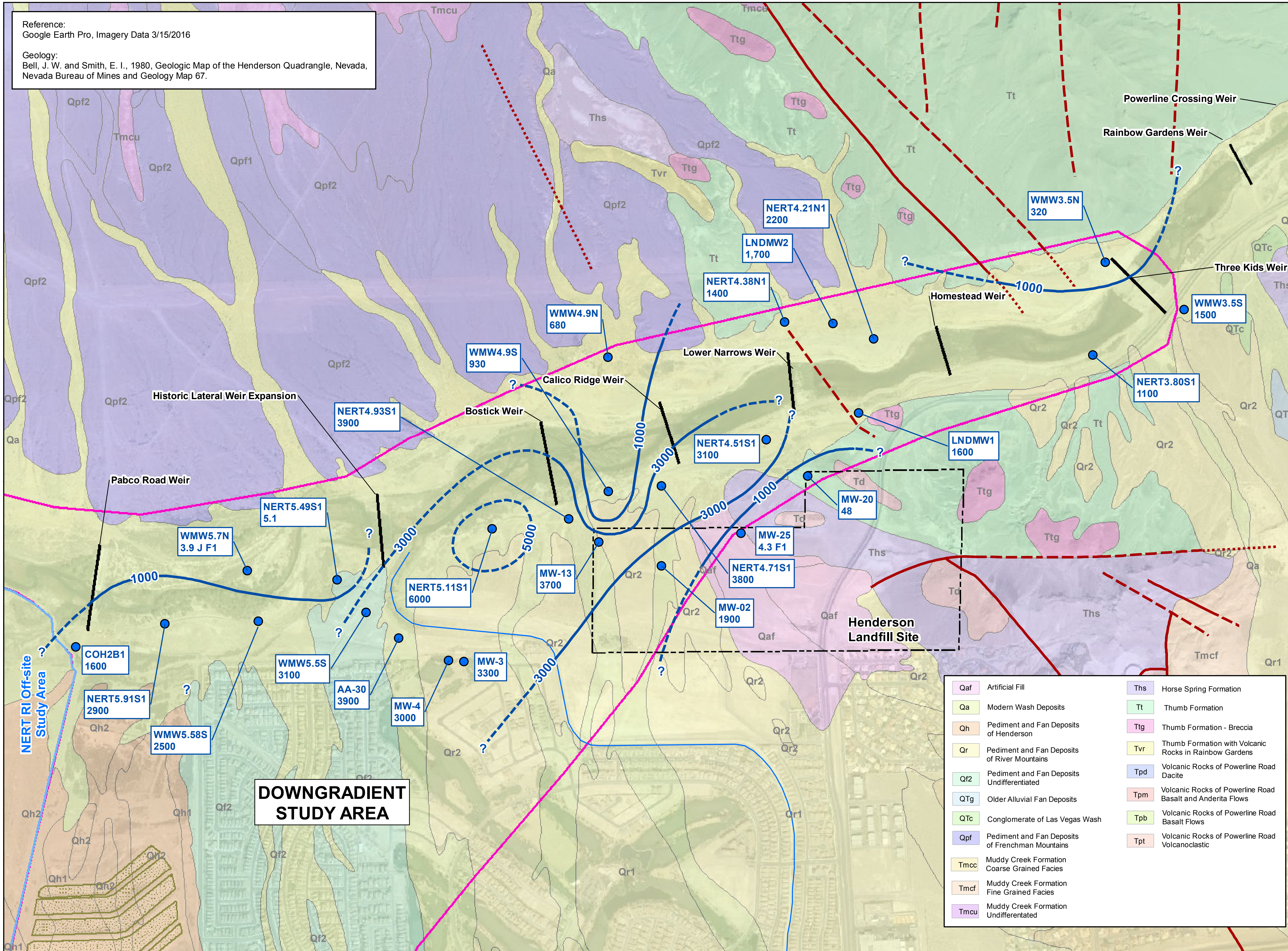
NERT RI
Downgradient Study Area

PERCHLORATE CONCENTRATIONS IN GROUNDWATER APRIL 2016 AND JULY 2018

Date: 11/30/2018 Project: 60477365

AECOM

Figure 8



Legend

- Groundwater Monitoring Well Sampled in July 2018
- Weir
- C-1 Channel
- Northern Rapid Infiltration Basins
- NERT RI Downgradient Study Area
- NERT RI Off-site Study Area
- Fault, dashed where inferred, dotted where concealed
- Perchlorate Concentration Isocontour (dashed where inferred)

Perchlorate Concentration in µg/L

J - Result is less than the Reporting Limit but greater than or equal to the Method Detection Limit and the concentration is an approximate value
F1 - Matrix spike and/or matrix duplicate recovery is outside acceptable limits
µg/L - Micrograms per liter

NORTH

0 1,000
Feet

Scale 1:12,000
1 inch = 1,000 feet

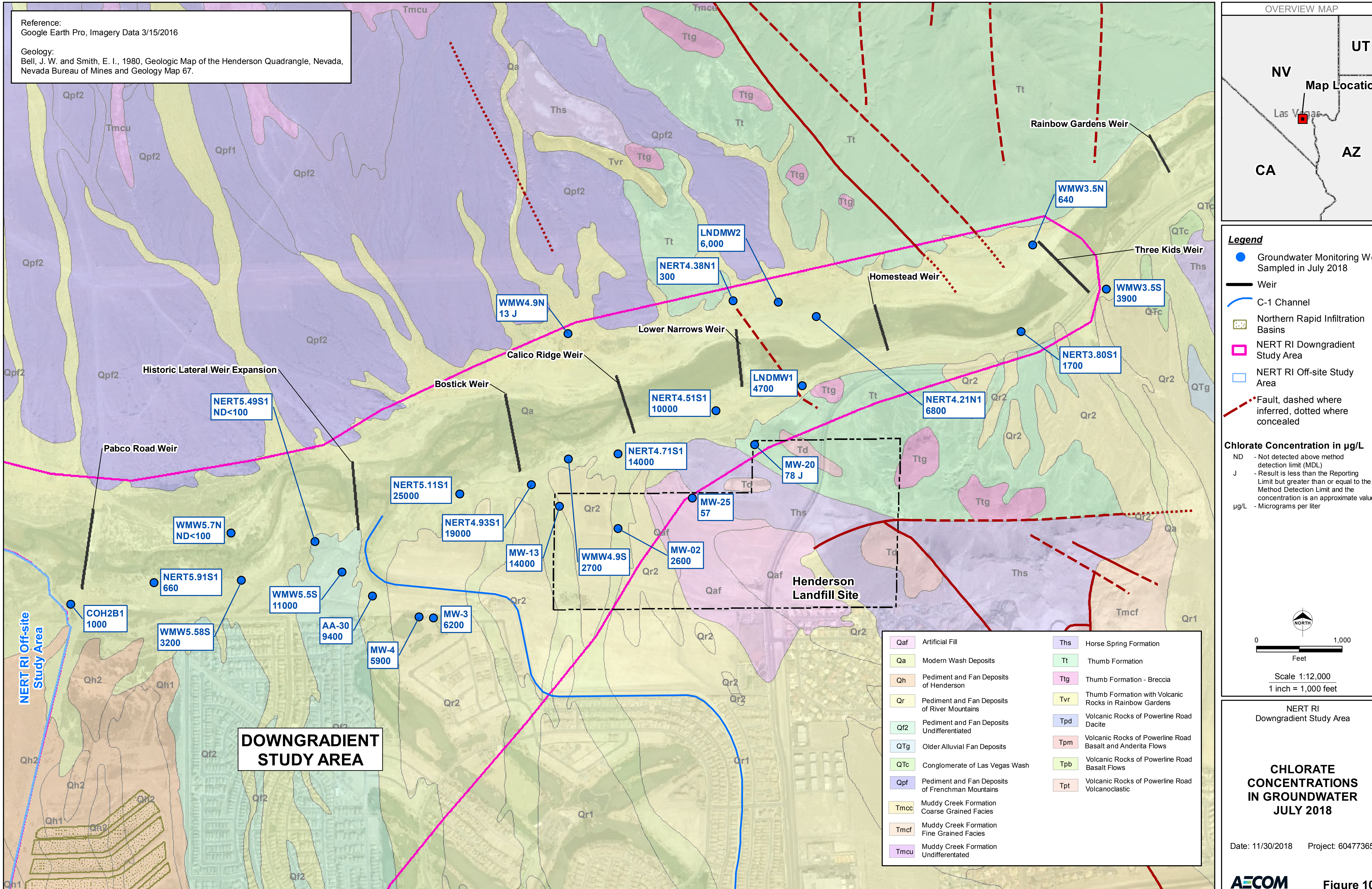
NERT RI
Downgradient Study Area

PERCHLORATE CONCENTRATIONS IN GROUNDWATER JULY 2018

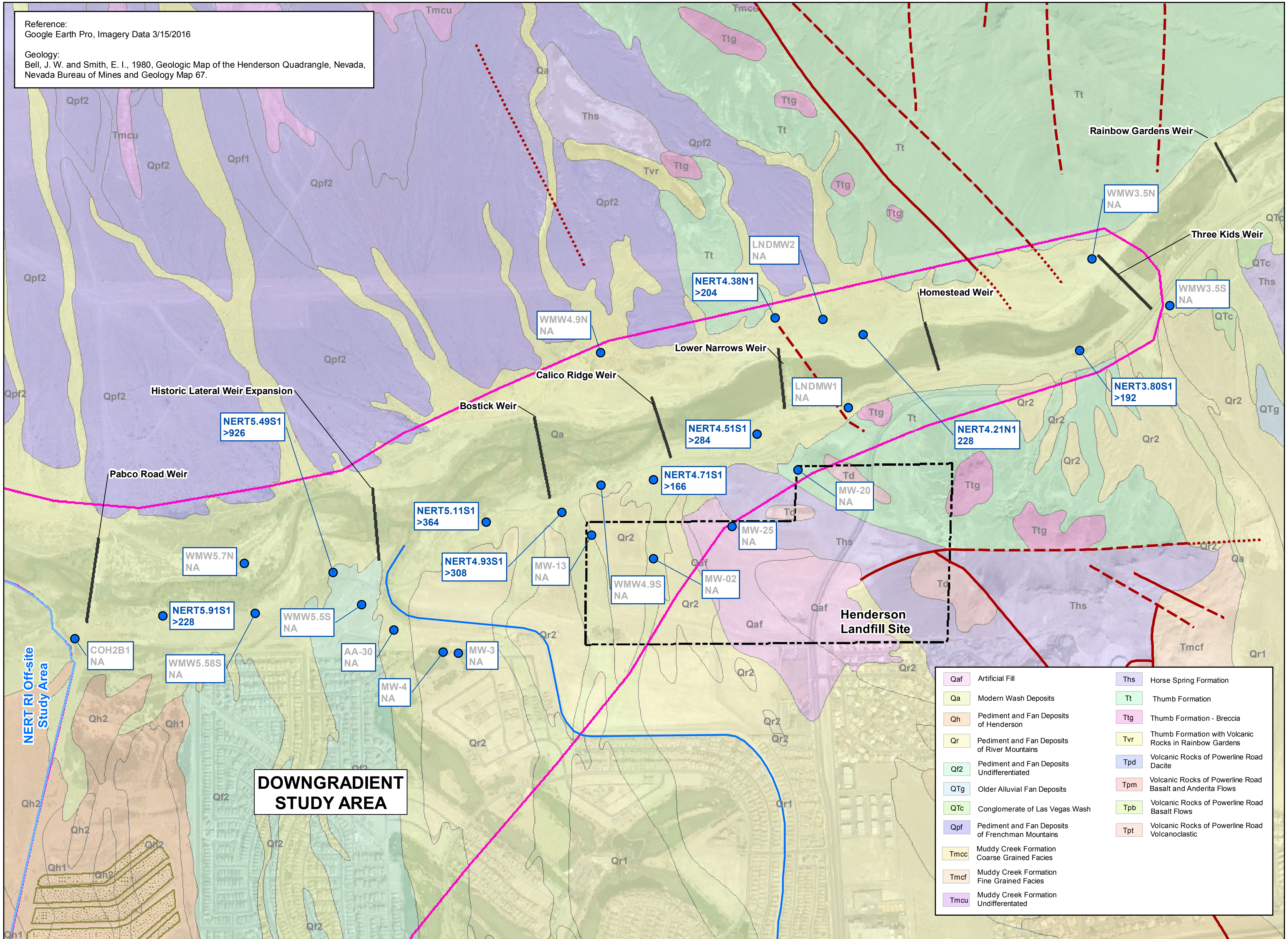
Date: 11/30/2018 Project: 60477365

AECOM **Figure 9**

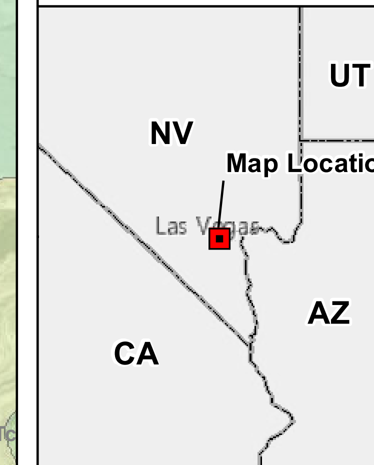
Path: J:\Client-Projects\NDEP\NERT_GW_RI\900-CAD\00-GIS\MXDs\DGIP\Phase I_PreDraft\Fig9_GW_July samples_Perc2018.mxd | Coordinate System: NAD 1983 StatePlane Nevada East FIPS 2701 Feet | User: scopm1



Path: J:\Client-Projects\NDEP\NERT_GW_RI\900-CAD\00-GIS\MXDs\DGIP\Phase I_PreDraft\Fig10_GW_July samples_Chlorate.mxd | Coordinate System: NAD 1983 StatePlane Nevada East FIPS 2701 Feet | User: scopm1



OVERVIEW MAP



Legend

- Groundwater Monitoring Well Sampled in July 2018
- Weir
- C-1 Channel
- Northern Rapid Infiltration Basins
- NERT RI Downgradient Study Area
- NERT RI Off-site Study Area
- Fault, dashed where inferred, dotted where concealed
- >192 Chloride/Bromide Ratio
- NA Sample taken but Not Analyzed

NORTH

0 1,000

Feet

Scale 1:12,000

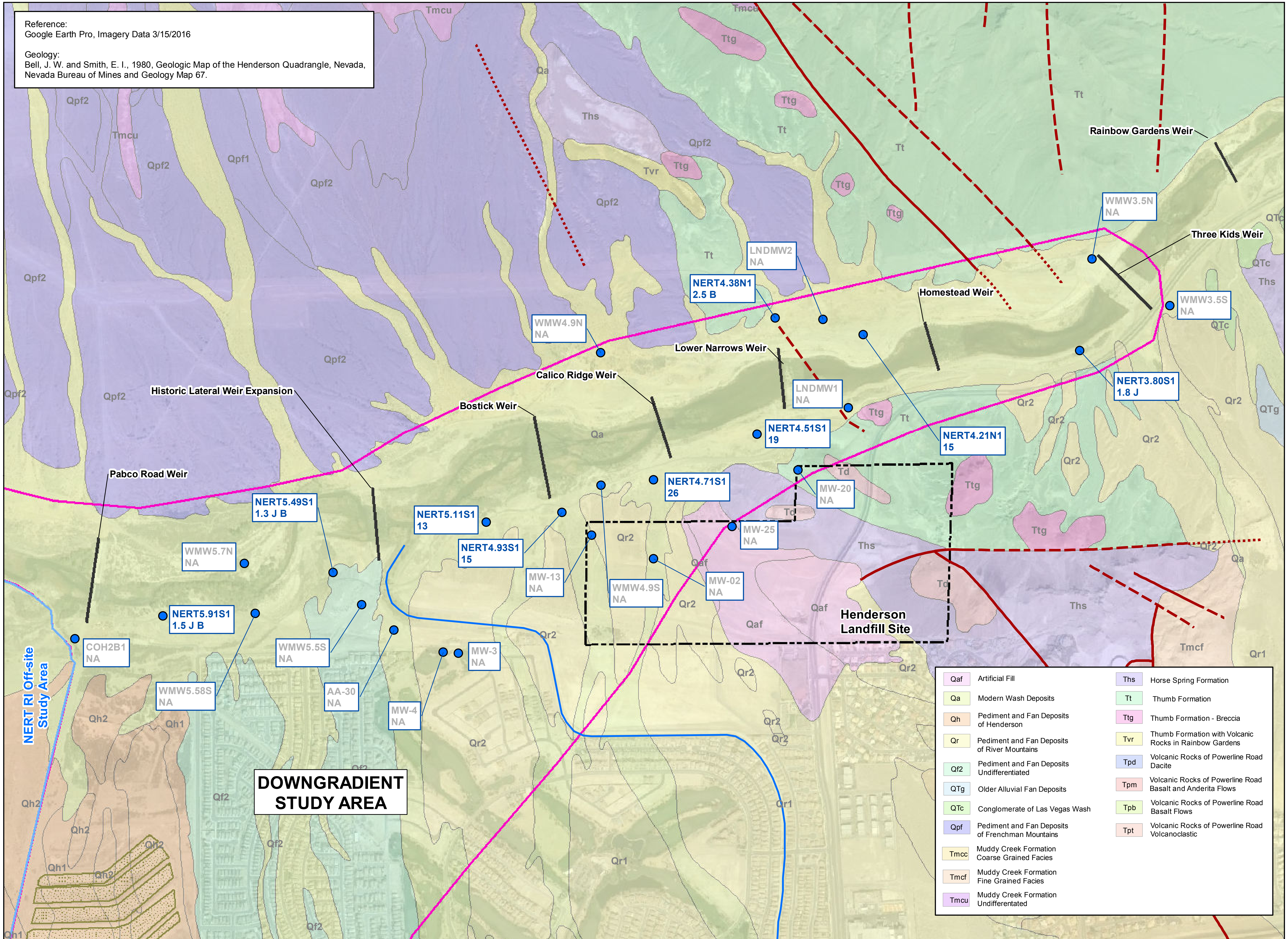
1 inch = 1,000 feet

NERT RI
Downgradient Study Area

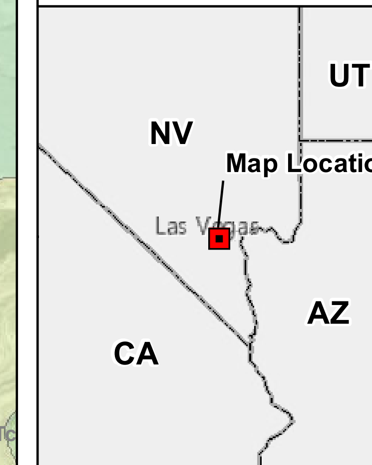
CHLORIDE/BROMIDE RATIO IN GROUNDWATER JULY 2018

Date: 11/30/2018 Project: 60477365

AECOM **Figure 11**



OVERVIEW MAP



Legend

- Groundwater Monitoring Well Sampled in July 2018
- Weir
- C-1 Channel
- Northern Rapid Infiltration Basins
- NERT RI Downgradient Study Area
- NERT RI Off-site Study Area
- Fault, dashed where inferred, dotted where concealed

Dissolved Chromium Concentration in μg/L

NA - Sample taken but Not Analyzed for Chromium
J - Result is less than the Reporting Limit but greater than or equal to the Method Detection Limit and the concentration is an approximate value
B - Compound was found in the blank and sample
μg/L - Micrograms per liter

NORTH

0 1,000
Feet

Scale 1:12,000
1 inch = 1,000 feet

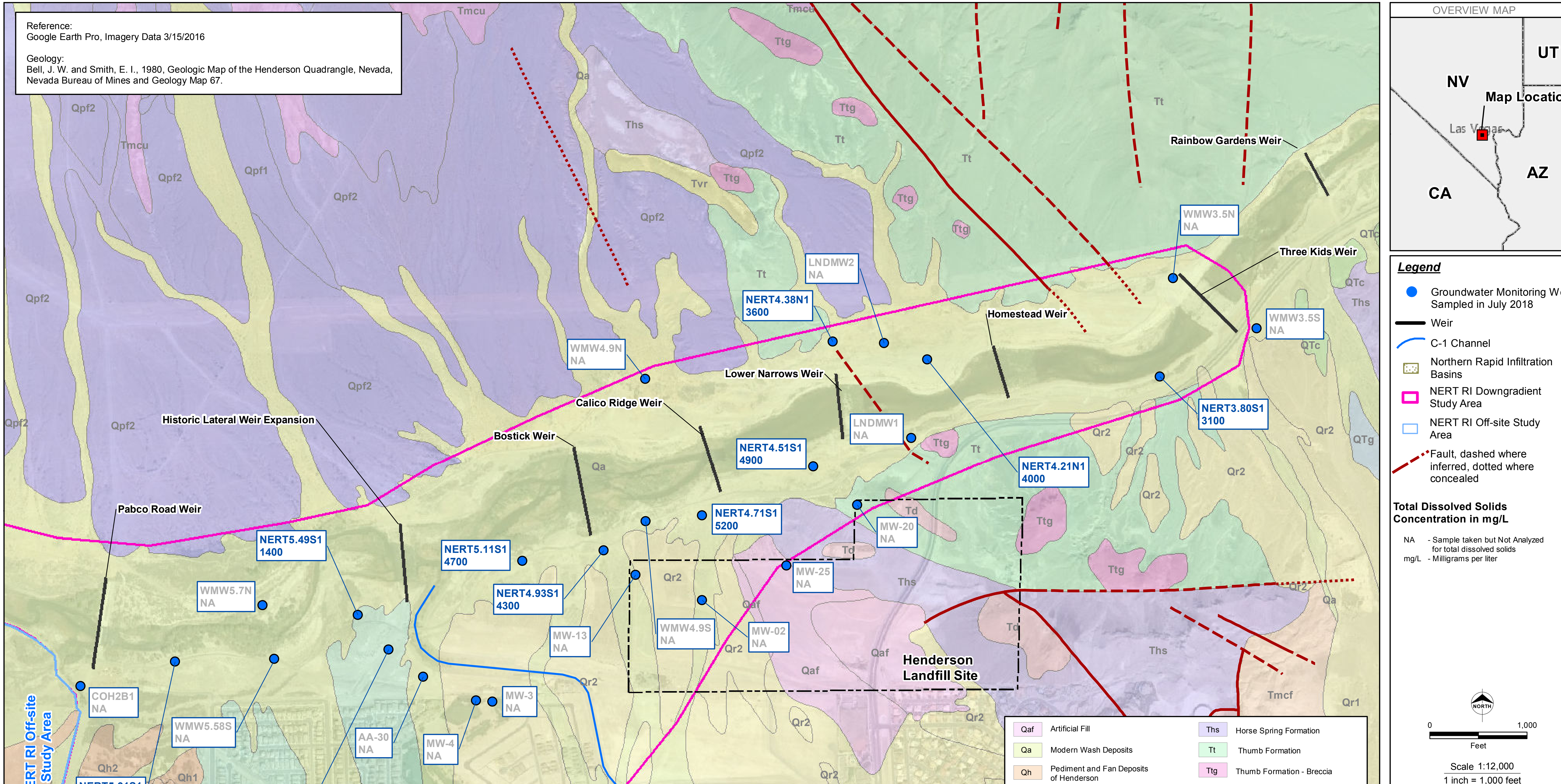
NERT RI
Downgradient Study Area

DISSOLVED CHROMIUM CONCENTRATIONS IN GROUNDWATER JULY 2018

Date: 11/30/2018 Project: 60477365

AECOM

Figure 12



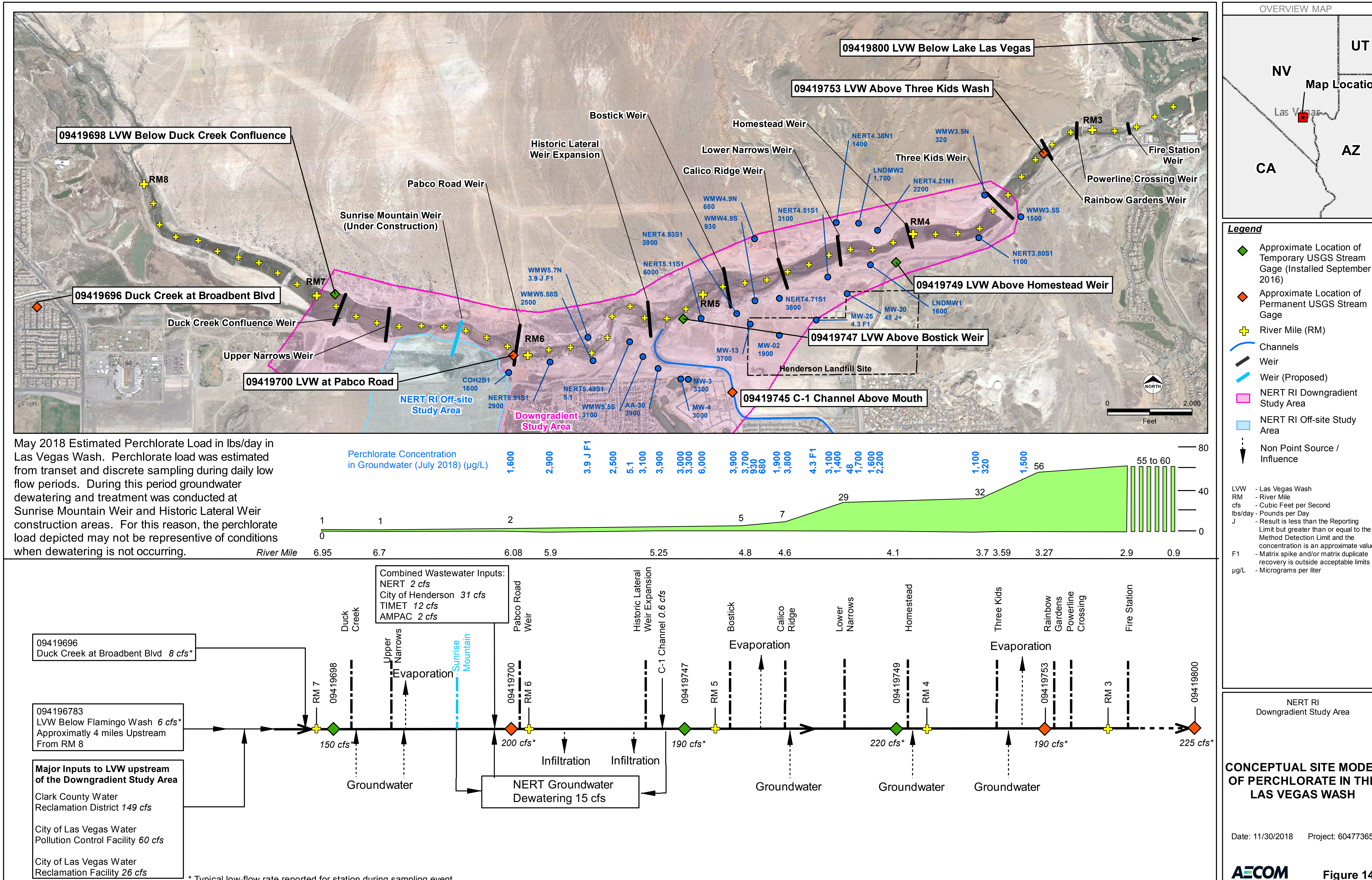
NERT RI
Downgradient Study Area

TOTAL DISSOLVED SOLIDS CONCENTRATIONS IN GROUNDWATER JULY 2018

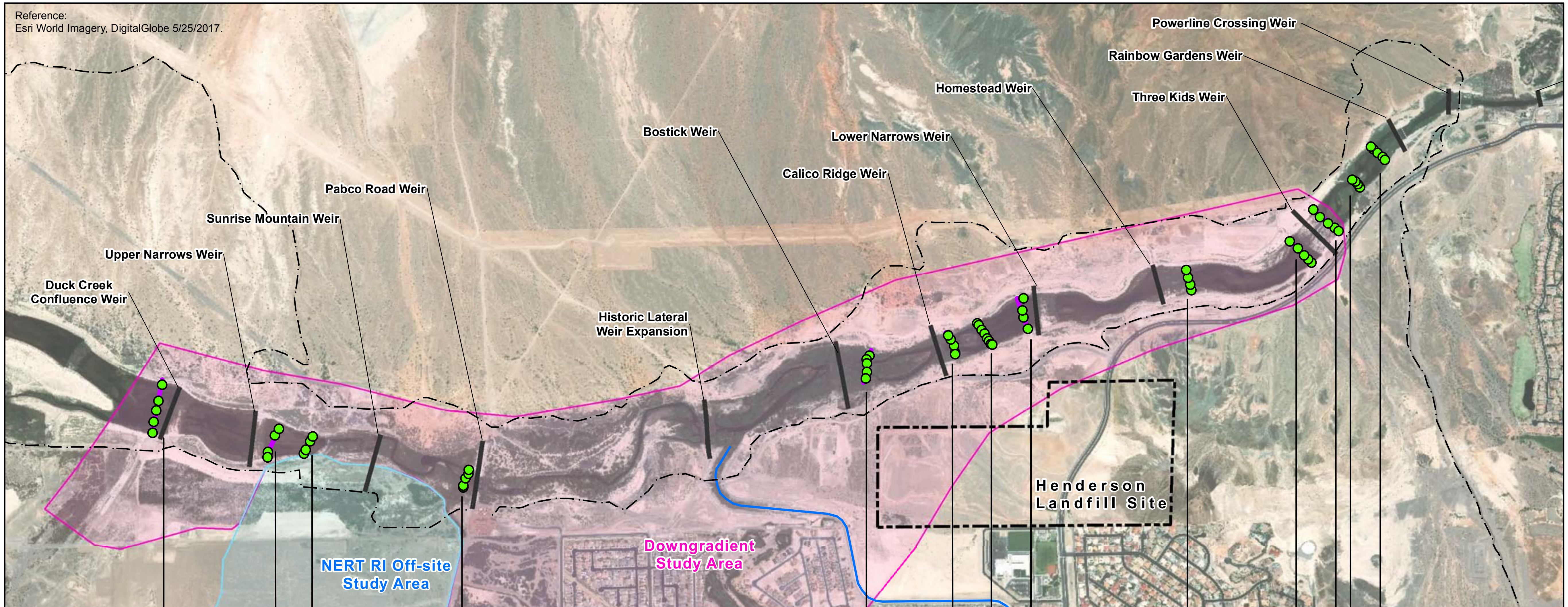
Date: 11/30/2018 Project: 60477365

AECOM **Figure 13**

Path: J:\Client-Projects\NDEP\NERT_GW_RI\900-CAD\00-GIS\MXDs\DGIP\Phase I_PreDraft\Fig13_GW_July samples_TDS.mxd | Coordinate System: NAD 1983 StatePlane Nevada East FIPS 2701 Feet | User: scopm1



Path: J:\Client-Projects\NDEP\NERT_GW_RI\900-CAD\00-GIS\MXDs\DGIP\Phase I_PreDraft\Fig14_GW-CSM-2018.mxd | Coordinate System: NAD 1983 StatePlane Nevada East FIPS 2701 Feet | User: scopm1



Transect ID	T6.8	T6.55	T6.5	T6	T4.85	T4.8	T4.7		T4.65	T3.9	T3.8	T3.75	T3.5		T3.3
North Bank	<0.95	<0.95	<0.95	2.7 J	4.7	31	15		14	23	41	200	37	38	33
	<0.95	<0.95	<0.95	3 J	5.3	5.4	10		11	29	19	19	33		72
	1.9 J	1.3 J	<0.95	1.2 J	5.1	5.8	12		35	39	25	26	85		81
	1.6 J	690	13	1.2 J	5	1800	12		35	44	36	40	91		89
South Bank	<0.95			1.4 J	7.3	3200	16				32	53	90		96
							23								
							21	22							
							23								

Color Scale Perchlorate (µg/L)
>90
80
70
60
50
40
30
20
10
0

Legend

- Surface Water Sample Location Along Transect
- Transects
- Weir
- Northern Rapid Infiltration Basins
- Wetlands Trail
- Channels
- NERT RI Downgradient Study Area
- NERT RI Off-site Study Area

Perchlorate Concentration in µg/L

J - Associated concentration is estimate
µg/L - Micrograms per liter

Note:
1. Field duplicates are not presented.
2. Two concentrations for one location indicates sampling conducted at two depths. Shallow depth on left and deep depth on right.

NORTH

0 1,500
Feet

Scale 1:18,000
1 inch = 1,500 feet

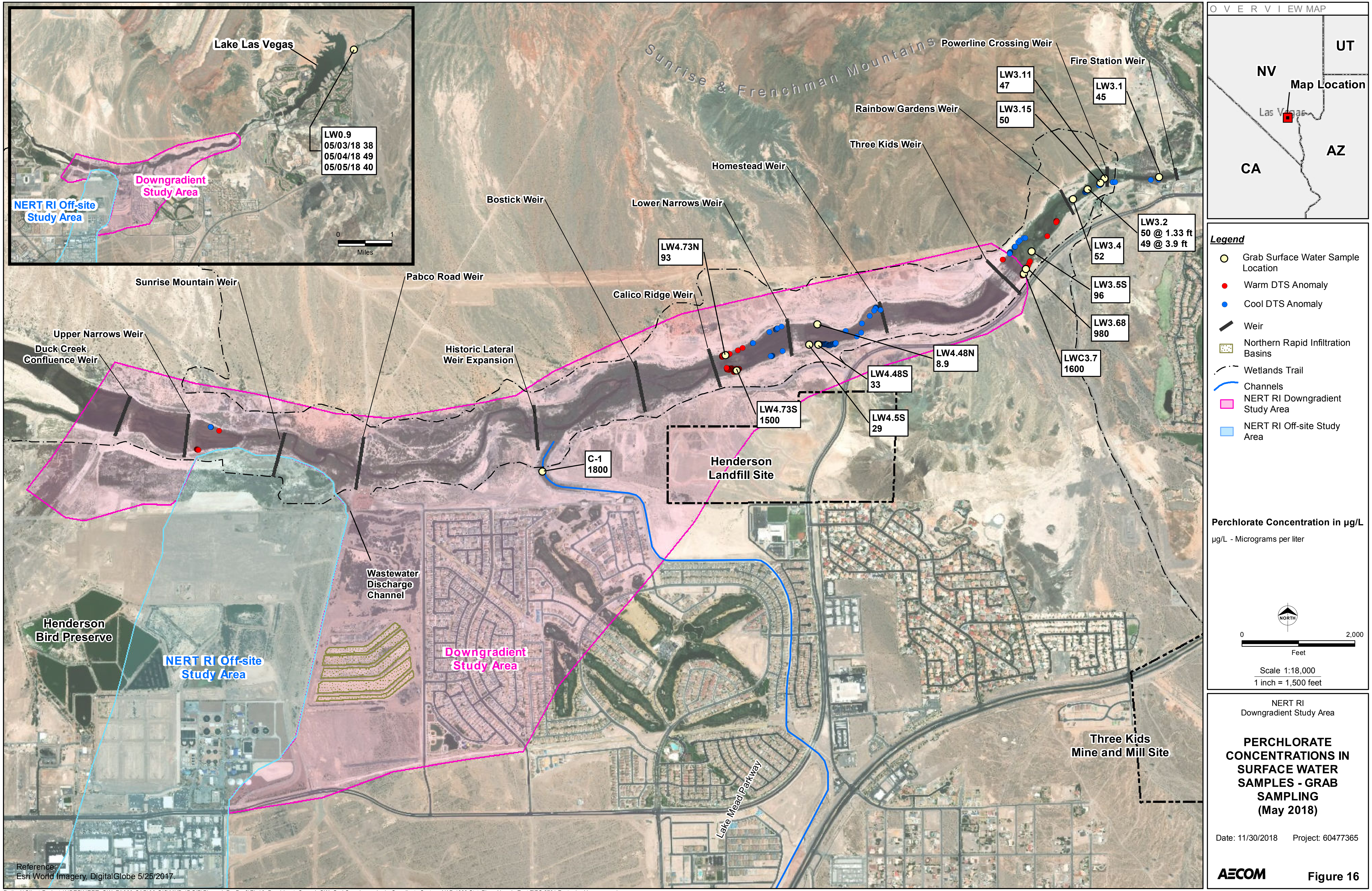
NERT RI
Downgradient Study Area

PERCHLORATE CONCENTRATIONS IN SURFACE WATER SAMPLES - TRANSECT SAMPLING (May 2018)

Date: 11/30/2018 Project: 60477365

AECOM

Figure 15



Lake Las Vegas
LW0.9
05/03/18 38
05/04/18 49
05/05/18 40
Downgradient Study Area
NERT RI Off-site Study Area
0 1 Miles
Sunrise & Frenchman Mountains
Powerline Crossing Weir
Fire Station Weir
LW3.11 47
LW3.1 45
Rainbow Gardens Weir
LW3.15 50
Three Kids Weir
Homestead Weir
Bostick Weir
Lower Narrows Weir
LW3.2 50 @ 1.33 ft 49 @ 3.9 ft
LW3.4 52
LW4.73N 93
LW3.5S 96
Sunrise Mountain Weir
Pabco Road Weir
Calico Ridge Weir
LW3.68 980
Upper Narrows Weir
Duck Creek Confluence Weir
Historic Lateral Weir Expansion
LW4.48N 8.9
LWC3.7 1600
LW4.48S 33
LW4.73S 1500
LW4.5S 29
C-1 1800
Henderson Landfill Site
Wastewater Discharge Channel
Henderson Bird Preserve
NERT RI Off-site Study Area
Downgradient Study Area
Lake Mead Parkway
Three Kids Mine and Mill Site
Reference: Esri World Imagery, DigitalGlobe 5/25/2017
OVERVIEW MAP
UT
NV
Map Location
Las Vegas
CA
AZ
Legend
Grab Surface Water Sample Location
Warm DTS Anomaly
Cool DTS Anomaly
Weir
Northern Rapid Infiltration Basins
Wetlands Trail
Channels
NERT RI Downgradient Study Area
NERT RI Off-site Study Area
Perchlorate Concentration in µg/L
µg/L - Micrograms per liter
NORTH
0 2,000
Feet
Scale 1:18,000
1 inch = 1,500 feet
NERT RI
Downgradient Study Area
PERCHLORATE CONCENTRATIONS IN SURFACE WATER SAMPLES - GRAB SAMPLING (May 2018)
Date: 11/30/2018
Project: 60477365
AECOM
Figure 16

Appendix A

Response to Stakeholder Comments (No stakeholder comments received)

Appendix B

Notice of Intent and Underground Service Alert Tickets

3.6551

BRIAN SANDOVAL
GOVERNOR

STATE OF NEVADA

BRADLEY CROWELL
Director

JASON KING, P.E.
State Engineer

DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES
DIVISION OF WATER RESOURCES
400 Shadow Lane, Suite 201
Las Vegas, Nevada 89106
(702) 486-2770 · Fax (702) 486-2781
http://water.nv.gov

NOTICE OF INTENT CARD REVIEW FORM

To: Bob Nix   Date: June 12, 2018

Facsimile No.: ______   or E-mail Address: bnix@cascade-env.com

This document was: ☑ E-mailed ☐ Faxed

NOI Card Number: 39997   ☑ **Approved**   ☐ **Rejected** (See reasons below)

Work performed	missing	☐	invalid	☐
Proposed use of well	missing	☐	invalid	☐
Intended start date	missing	☐	invalid	☐
Waiver/Permit number if applicable	missing	☐	invalid	☐
Well location (legal description, GPS coordinates)	missing	☐	invalid	☐
Parcel number	missing	☐	invalid	☐
Address at well location	missing	☐	invalid	☐
Permit number	missing	☐	invalid	☐
Waiver number or NDEP Facility ID Number	missing	☐	invalid	☐
Address of Client	missing	☐	invalid	☐
Name of client/owner	missing	☐	invalid	☐
Contractor's license number	missing	☐	invalid	☐
Onsite well driller's license number	missing	☐	invalid	☐
Drilling company name/address	missing	☐	invalid	☐
Driller's signature	missing	☐	invalid	☐
Replacement well	Yes	☐	No	☑

If yes, existing well must be plugged at time the replacement well is drilled, pursuant to NAC 534.300 Replacement Well.

Instructions: Please note that you must provide a copy of the well driller's report for the installation of one (1) monitor well within 30 days of completion. If you have any questions, please do not hesitate to give our office a call.

JD

Person reviewing NOI Card: Christi Cooper, waiver issued by Tracy Geter

Date reviewed: June 11, 2018

BRIAN SANDOVAL
Governor

BRADLEY CROWELL
Director

STATE OF NEVADA

JASON KING, P.E.
State Engineer

JOHN GUILLORY, P.E.
Supervising Engineer

DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES

DIVISION OF WATER RESOURCES

SOUTHERN NEVADA BRANCH OFFICE

400 Shadow Lane, Suite 201
Las Vegas, Nevada 89106
(702) 486-2770 • Fax (702) 486-2781
http://water.nv.gov

June 12, 2018

MO-3500

Bob Nix
Operations Manager
Cascade Drilling, LP
4221 West Oquendo Road
Las Vegas, Nevada 89118

RE: Request for waiver to install one (1) temporary monitor well (NERT 3.65S1) to collect groundwater samples and analyze the samples as requested by Nevada Division of Environmental Protection (NDEP) Order Number 8-001721, located on vacant land, just south of 201 Via Antincendio, Clark County, Nevada, within the SW¼ of the NE¼ of Section 28, T.21S, R.63E (Lat: 36° 05' 44.720" N, Long: -114° 56' 44.650" W, NAD 83/ WGS 84), and within the Las Vegas Valley Basin (212).

Dear Mr. Nix:

As provided in Nevada Administrative Code (NAC) § 534.450 of the Regulation for Water Well and Related Drilling, permission is herewith **granted** to install one (1) temporary monitor well to assess water conditions as described in your request received June 5, 2018. Your statement ensuring Nevada Environmental Response Trust responsibility for abandonment of the well upon project completion was received in this office on June 5, 2018.

This office also waives the following regulations:

1) NAC § 534.4351 (1) (c). The purpose of this well is to collect groundwater samples and analyze the samples as requested by NDEP Order Number 8-001721, located on vacant land, just south of 201 Via Antincendio, Clark County, Nevada. The wellhead shall be protected from damage due to vandalism or sunlight. If polyvinyl chloride (PVC) casing is used, then the well must be completed with ASTM F-480 (Sch. 40 or heavier) well casing as provided in NAC § 534.362.

2) NAC 534.4357(1c) - "If water or vapors which are being monitored in a monitoring well are not encountered within 5 feet below the surface of the ground, the well driller shall place in the annual space of the well: From the seal placed pursuant to paragraph (b) to the surface, a seal, with a minimum thickness of 20 feet below the surface, consisting of cement grout, neat cement or concrete grout." Due to the shallow depth and large screen intervals of the proposed monitor well, you are allowed to install the sanitary seal as shown in your waiver request.

Glued casing joint connections will not be allowed. Full compliance with the remainder of the statute and regulation is required.

A plot map showing the actual location of the completed wells must be submitted upon completion of the drilling operations. Please include an accurate description of the location of the monitor well on the completion reports (GPS coordinates are required).

The well driller's reports shall bear this waiver number: MO-3500.

Authorization to drill under this waiver expires one (1) year from the date of this letter.

The well driller must have a copy of this waiver in possession at all times during drilling activities pertaining to this project. This well may only be pumped when necessary to obtain samples.

Please note that you must notify the Nevada Division of Environmental Protection (NDEP) for possible permitting requirements for groundwater or temporary surface discharge permits, which may include Underground Injection Control (UIC) or National Pollution Discharge Elimination System (NPDES) Permit Numbers. For more information regarding the permitting process with NDEP, please contact NDEP Water Pollution Control Department at (775) 687-4670.

The wells shall be plugged and abandoned, as provided by regulation, upon project completion. The current owner of Assessor's Parcel Number 160-28-601-001 is shown as County of Clark (Parks and Community Services) by the records of the Clark County Assessor's office. This waiver does not imply or grant any land use agreements between County of Clark (Parks and Community Services) and any land owners. It is expressly understood that this authorization does not relieve the operator of the requirements of any other state, federal or local agencies.

If you have any questions, please contact this office at 702-486-2770.

Sincerely,

Tracy Geter
Drilling Supervisor

cc: File
Carson City Office
Christi Cooper, SNBO Office
Jay A. Steinberg, President, Nevada Environmental Response Trust, Chicago, Illinois

NOI No. 39997
APN 160-28-601-001
NDEP Order No. 8-001721
For one, 4-inch Monitor Well

ORIGINAL
FILE WITH DIVISION OF
WATER RESOURCES

NOTICE OF INTENT

No. 39997

Today's Date: 6-4-18   Intended Start Date: 6-12-18   Well ID (if applicable): NERT 3.65S1

Type of Work to be Done: Drilling: ☑ Deepening: ☐ Reconditioning: ☐ Plugging: ☐

Is this a replacement well? Yes ☐ No ☑   If there is an existing well, what is the well log number? ______

Proposed use of well: Monitor   Diameter of well: 4 inches   Number of wells: 1

If this well is a domestic well, is it located within a water purveyor's service area? Yes ☐ No ☐   If yes, what is the DOM waiver: ______

If this is a monitor well required by another government agency, what is the facility ID number? 8-001721   Agency: NDEP

If this well is being completed under a waiver, please provide the corresponding waiver number: ______

If a water right is associated with this well, what is the permit number? ______

Location of the well by Public Land Survey: SW 1/4 NE 1/4 Sec. 28 T 21 N/S R 63 E

Latitude: 36° 05' 44.72" N   UTM E ______   ☐ NAD 27

Longitude: 114° 56' 44.65" W or   UTM N ______   ☑ NAD 83/WGS 84

Address at well location: ______

Assessor Parcel Number: 160-28-601-001

County: Clark   Subdivision Name: ______

Name of Client: Nevada Environmental Trust

Address of Client: 35 East Wacker Dr #690 Chicago IL 60601-2314

Contractor's License Number: 0073966   On-Site Driller's License Number: 2512

Company Name and Address: Cascade Drilling LP 4221 W. Oquendo Rd Las Vegas NV 89118

Need Log Forms ☐   **Need Intent Cards** ☐

702-220-5811

Driller's Signature: Bob N

(Rev. 1-14)

Ø

IN THE OFFICE OF THE STATE ENGINEER OF NEVADA

AFFIDAVIT OF INTENT
TO PLUG A MONITORING WELL

Notice of Intent # 39997

DCNR/DWR/SNBO RECEIVED JUN 05 2018

I, Nevada Environmental Response Trust (Trust) by and through Le Petomane XXVII Inc., — Name & Title

not individually but solely as Trustee of the Trust — Company

35 East Wacker Drive #690 Chicago, IL 60601-2314 — Address

312-505-2688 — Telephone Number

For well NERT3.65S1 - no additional wells included.

of the real property located at:

Street Address (if any) ______________________

County Assessor Parcel Number (APN) 160-28-601-001

Situated within the SW ¼ NE ¼ Section 28 T 21 S R 63 E, M.D.B. & M.

Latitude (N): 36° 05' 44.72" Longitude (W): 114° 56' 44.65" or UTM (m) E: ________ UTM (m) N: ________ Datum NAD83/WGS84

and whereupon one or more monitoring wells are located or to be located, fully understand that I shall be responsible for, and shall cause the wells to be plugged in accordance with the provisions contained in Nevada Administrative Code (NAC) 534.4365 and all other applicable rules and regulations for drilling/plugging wells in the State of Nevada, **not later than thirty days after the date when monitoring is no longer required.**

I shall further make any purchaser of this parcel aware of these conditions.

Responsible Party (Printed Name): Jay Steinberg, Pres. [illegible] (Signature): [signature] Not Individually, but solely as [illegible]

not individually, but solely in his representative capacity as President of the Nevada Environmental Response Trust Trustee

State of Tennessee

County of Williamson

Subscribed and sworn to before me on 5-31-18

by Todd W. Koller

[signature]

Signature of Notary Public Required

TODD W. KOLLER STATE OF TENNESSEE NOTARY PUBLIC COUNTY OF WILLIAMSON

Notary Seal

11-27-2021

Revised 12/14

IN THE OFFICE OF THE STATE ENGINEER OF THE STATE OF NEVADA
REQUEST FOR A WAIVER TO DRILL OBSERVATION OR MONITOR WELL(S)

The applicant and/or person or company responsible for drilling and plugging the temporary well(s):

Bob Nix	Operations Manager	Cascade Drilling LP
Name	Title	Company
4221 W. Oquendo Rd.	Las Vegas	NV 89118
Street Address or PO Box	City or Town	State and ZIP Code

Telephone number of responsible party: (702) 715-5811

Estimated project dates: Jun-12-2018 Start Date Jun-29-2018 Completion Date

Location of the well: **PLSS, GPS Coordinates and Map Datum are required.**
(If more than one well is to be installed for the same project, use the accompanying form to list each well.)

SW ¼ NE ¼ Section 28 T 21 S R 63 E, M.D.B. & M.

Latitude (N): 36° 05' 44.72"
Longitude (W): 114° 56' 44.65"
or
UTM (m) E: ____
UTM (m) N: ____
Datum NAD83/WGS8

County Assessor Parcel Number (APN): 160-28-601-001

Street Address (if any): ____

NDEP Order # (if any): 8-001721

DCNR/DWR/SNBO RECEIVED JUN 05 2018

Purpose and duration of well(s):

No Later the thirty days after the date when monitoring is no longer required

Also we need to waive NAC 534.4357 (1c) do to to potential impact of the installation on the surface completions and installation of the well that is to be installed we will be placing a 5' seal above the filter pack

If this waiver is an amendment or change to an original waiver, or if the property has other monitor wells installed, please give the original waiver number. M/O - ____

The following items must be submitted with the waiver request:

- **A schematic drawing of the typical monitor well construction**
- **Affidavit of Intent to Plug a Well (Listing all wells by well ID/Name) (Separate Affidavit for each ¼, ¼)**
- **Location Map (i.e., Large Scale, inch = miles)**
- **Site Detail Map (i.e., Small Scale, inch = feet)**

Signatory Contact Information:

(702) 715-5811
Telephone Number

4221 W Oquendo Rd.
Mailing Address

Las Vegas, NV 89118
City, State, ZIP Code

PAID

Bob Nix
Printed Name

Bob N
Signature

Jun-04-2018
Date

Rev 12/14 - waiver_mo *$120 PER QUARTER-QUARTER FILING FEE MUST ACCOMPANY THIS REQUEST*

4.21 N1

BRIAN SANDOVAL
GOVERNOR

STATE OF NEVADA

BRADLEY CROWELL
Director

JASON KING, P.E.
State Engineer

DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES
DIVISION OF WATER RESOURCES
400 Shadow Lane, Suite 201
Las Vegas, Nevada 89106
(702) 486-2770 · Fax (702) 486-2781
http://water.nv.gov

NOTICE OF INTENT CARD
REVIEW FORM

To: Bob Nix

Date: June 13, 2018

Facsimile No.: ______ or E-mail Address: bnix@cascade-env.com

This document was: ☑ E-mailed ☐ Faxed

NOI Card Number: 39999 ☑ **Approved** ☐ **Rejected** (See reasons below)

Work performed	missing	☐	invalid	☐
Proposed use of well	missing	☐	invalid	☐
Intended start date	missing	☐	invalid	☐
Waiver/Permit number if applicable	missing	☐	invalid	☐
Well location (legal description, GPS coordinates)	missing	☐	invalid	☐
Parcel number	missing	☐	invalid	☐
Address at well location	missing	☐	invalid	☐
Permit number	missing	☐	invalid	☐
Waiver number or NDEP Facility ID Number	missing	☐	invalid	☐
Address of Client	missing	☐	invalid	☐
Name of client/owner	missing	☐	invalid	☐
Contractor's license number	missing	☐	invalid	☐
Onsite well driller's license number	missing	☐	invalid	☐
Drilling company name/address	missing	☐	invalid	☐
Driller's signature	missing	☐	invalid	☐
Replacement well	Yes	☐	No	☑

If yes, existing well must be plugged at time the replacement well is drilled, pursuant to NAC 534.300 Replacement Well.

Instructions: Please note that you must provide a copy of the well driller's report for the installation of one (1) monitor well within 30 days of completion. If you have any questions, please do not hesitate to give our office a call.

Js

Person reviewing NOI Card: Christi Cooper, waiver issued by Tracy Geter

Date reviewed: June 11, 2018

BRIAN SANDOVAL
Governor

BRADLEY CROWELL
Director

STATE OF NEVADA

JASON KING, P.E.
State Engineer

JOHN GUILLORY, P.E.
Supervising Engineer

DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES
DIVISION OF WATER RESOURCES
SOUTHERN NEVADA BRANCH OFFICE
400 Shadow Lane, Suite 201
Las Vegas, Nevada 89106
(702) 486-2770 • Fax (702) 486-2781
http://water.nv.gov

June 13, 2018

MO-3503

Bob Nix
Operations Manager
Cascade Drilling, LP
4221 West Oquendo Road
Las Vegas, Nevada 89118

4.21N1

RE: Request for waiver to install one (1) temporary monitor well (NERT 4.38N1) to collect groundwater samples and analyze the samples as requested by Nevada Division of Environmental Protection (NDEP) Order Number 8-001721, located on vacant land, just north of 1720 East Galleria Drive, Clark County, Nevada, within the SW¼ of the NW¼ of Section 28, T.21S, R.63E (Lat: 36° 05' 43.479" N, Long: -114° 57' 23.950" W, NAD 83/ WGS 84), and within the Las Vegas Valley Basin (212).

Dear Mr. Nix:

As provided in Nevada Administrative Code (NAC) § 534.450 of the Regulation for Water Well and Related Drilling, permission is herewith **granted** to install one (1) temporary monitor well to assess water conditions as described in your request received June 5, 2018. Your statement ensuring Nevada Environmental Response Trust responsibility for abandonment of the well upon project completion was received in this office on June 5, 2018.

This office also waives the following regulations:

1) NAC § 534.4351 (1) (c). The purpose of this well is to collect groundwater samples and analyze the samples as requested by NDEP Order Number 8-001721, located on vacant land, just north of 1720 East Galleria Drive, Clark County, Nevada. The wellhead shall be protected from damage due to vandalism or sunlight. If polyvinyl chloride (PVC) casing is used, then the well must be completed with ASTM F-480 (Sch. 40 or heavier) well casing as provided in NAC § 534.362.

2) NAC 534.4357(1c) - "If water or vapors which are being monitored in a monitoring well are not encountered within 5 feet below the surface of the ground, the well driller shall place in the annual space of the well: From the seal placed pursuant to paragraph (b) to the surface, a seal, with a minimum thickness of 20 feet below the surface, consisting of cement grout, neat cement or concrete grout." Due to the shallow depth and large screen intervals of the proposed monitor well, you are allowed to install the sanitary seal as shown in your waiver request.

Glued casing joint connections will not be allowed. Full compliance with the remainder of the statute and regulation is required.

A plot map showing the actual location of the completed wells must be submitted upon completion of the drilling operations. Please include an accurate description of the location of the monitor well on the completion reports (GPS coordinates are required).

The well driller's reports shall bear this waiver number: MO-3503.

Authorization to drill under this waiver expires one (1) year from the date of this letter.

The well driller must have a copy of this waiver in possession at all times during drilling activities pertaining to this project. This well may only be pumped when necessary to obtain samples.

Please note that you must notify the Nevada Division of Environmental Protection (NDEP) for possible permitting requirements for groundwater or temporary surface discharge permits, which may include Underground Injection Control (UIC) or National Pollution Discharge Elimination System (NPDES) Permit Numbers. For more information regarding the permitting process with NDEP, please contact NDEP Water Pollution Control Department at (775) 687-4670.

The wells shall be plugged and abandoned, as provided by regulation, upon project completion. The current owner of Assessor's Parcel Number 160-28-201-001 is shown as County of Clark (Parks and Community Services) by the records of the Clark County Assessor's office. This waiver does not imply or grant any land use agreements between County of Clark (Parks and Community Services) and any land owners. It is expressly understood that this authorization does not relieve the operator of the requirements of any other state, federal or local agencies.

If you have any questions, please contact this office at 702-486-2770.

Sincerely,

Tracy Geter
Drilling Supervisor

cc: File
Carson City Office
Christi Cooper, SNBO Office
Jay A. Steinberg, President, Nevada Environmental Response Trust, Chicago, Illinois

NOI No. 39999
APN 160-28-201-001
NDEP Order No. 8-001721
For one, 4-inch Monitor Well

ORIGINAL
FILE WITH DIVISION OF
WATER RESOURCES

NOTICE OF INTENT

No. 39999

Today's Date: 6-4-18

Intended Start Date: 6-12-18

Well ID (if applicable): NERT 4.21N1

Type of Work to be Done: Drilling: ☑ Deepening: ☐ Reconditioning: ☐ Plugging: ☐

If there is an existing well, what is the well log number?

Is this a replacement well? Yes ☐ No ☑

Diameter of well: 4 inches

Number of wells: 1

Proposed use of well: Monitor

If this well is a domestic well, is it located within a water purveyor's service area? Yes ☐ No ☐ If yes, what is the DOM waiver:

If this is a monitor well required by another government agency, what is the facility ID number? 8-001721 Agency: NDEP

If this well is being completed under a waiver, please provide the corresponding waiver number:

If a water right is associated with this well, what is the permit number?

Location of the well by Public Land Survey: SW 1/4 NW 1/4 Sec. 28 T 21 NS R 63 E

Latitude: 36°05'43.479"N

Longitude: 114°57'23.950"W or

UTM E

UTM N

☐ NAD 27

☑ NAD 83/WGS 84

Address at well location:

Assessor Parcel Number: 160-28-201-001

Subdivision Name:

County: Clark

Name of Client: Nevada Environmental Response Trust

Address of Client: 35 East Wacker Dr. #690 Chicago IL 60601-2314

On-Site Driller's License Number: 2512

Contractor's License Number: 0073966

Company Name and Address: Cascade Drilling LP 4221 W. Oquendo Rd. Las Vegas NV 89118

Driller's Signature: Bob

Need Log Forms ☐

Need Intent Cards ☐

(Rev. 1-14)

IN THE OFFICE OF THE STATE ENGINEER OF NEVADA

AFFIDAVIT OF INTENT TO PLUG A MONITORING WELL

Notice of Intent # 39999

DCNR/DWR/SNBO RECEIVED JUN 05 2018

I, Nevada Environmental Response Trust (Trust) by and through Le Petomane XXVII Inc., — Name & Title

not individually but solely as Trustee of the Trust — Company

35 East Wacker Drive #690
Chicago, IL 60601-2314 — Address

For well NERT4.21N1 - no additional wells included.

312-505-2688 — Telephone Number

of the real property located at:

Street Address (if any) ______

County Assessor Parcel Number (APN) 160-28-201-001

Situated within the SW ¼ NW ¼ Section 28 T 21 S R 63 E, M.D.B. & M.

Latitude (N): 36°05'43.479"	or	UTM (m) E: ______	Datum
Longitude (W): 114°57'23.950"		UTM (m) N: ______	NAD83/WGS84

and whereupon one or more monitoring wells are located or to be located, fully understand that I shall be responsible for, and shall cause the wells to be plugged in accordance with the provisions contained in Nevada Administrative Code (NAC) 534.4365 and all other applicable rules and regulations for drilling/plugging wells in the State of Nevada, **not later than thirty days after the date when monitoring is no longer required.**

I shall further make any purchaser of this parcel aware of these conditions.

Responsible Party
(Printed Name): Jay Steinberg, President (Signature): Jay A Steinberg, not individually, but solely as President

not individually, but solely in his representative capacity as President of the Nevada Environmental Response Trust Trustee

State of Tennessee
County of Williamson

Subscribed and sworn to before me on 5-31-18
by Todd W. Koller

T W. Koller
Signature of Notary Public Required

TODD W. KOLLER STATE OF TENNESSEE NOTARY PUBLIC COUNTY OF WILLIAMSON
Notary Seal
11-27-2021

Revised 12/14

IN THE OFFICE OF THE STATE ENGINEER OF THE STATE OF NEVADA
REQUEST FOR A WAIVER TO DRILL OBSERVATION OR MONITOR WELL(S)

The applicant and/or person or company responsible for drilling and plugging the temporary well(s):

Bob Nix	Operations Manager	Cascade Drilling LP
Name	Title	Company
4221 W. Oquendo Rd.	Las Vegas	NV 89118
Street Address or PO Box	City or Town	State and ZIP Code

Telephone number of responsible party: (702) 715-5811

Estimated project dates: Jun-12-2018 Start Date Jun-29-2018 Completion Date

Location of the well: **PLSS, GPS Coordinates and Map Datum are required.**
(If more than one well is to be installed for the same project, use the accompanying form to list each well.)

SW ¼ NW ¼ Section 28 T 21 S R 63 E, M.D.B. & M.

Latitude (N): 36*05'43.479"
Longitude (W): 114*57'23.950"
or
UTM (m) E: ______
UTM (m) N: ______
Datum NAD83/WGS84

County Assessor Parcel Number (APN): 160-28-201-001

Street Address (if any): ______

NDEP Order # (if any): 8-001721

DCNR/DWR/SNBO
RECEIVED
JUN 05 2018

Purpose and duration of well(s):

No Later the thirty days after the date when monitoring is no longer required

Also we need to waive NAC 534.4357 (1c) do to to potential impact of the installation on the surface completions and installation of the well that is to be installed we will be placing a 5' seal above the filter pack

If this waiver is an amendment or change to an original waiver, or if the property has other monitor wells installed, please give the original waiver number. M/O - ______

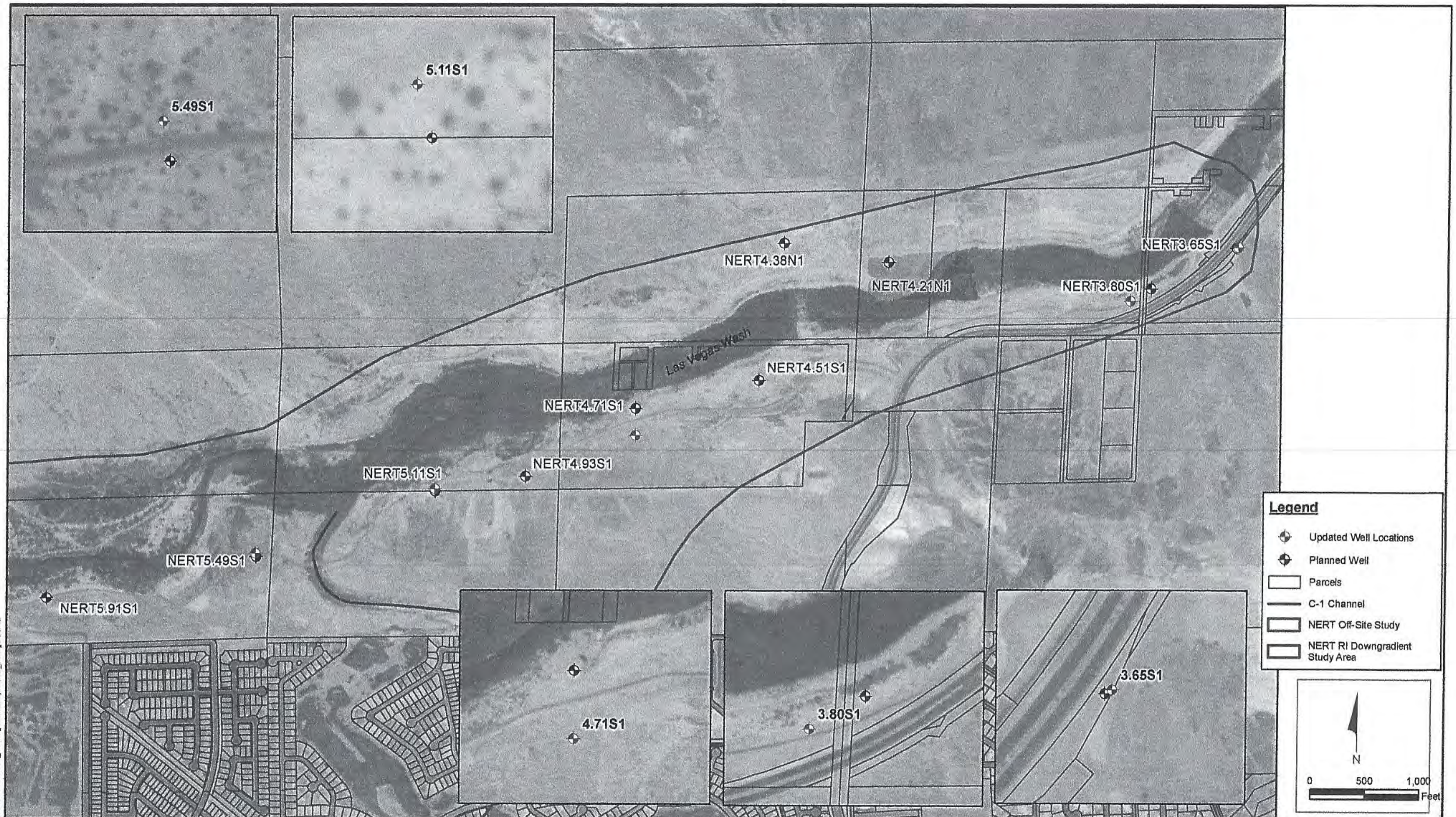
The following items must be submitted with the waiver request:

- **A schematic drawing of the typical monitor well construction**
- **Affidavit of Intent to Plug a Well (Listing all wells by well ID/Name) (Separate Affidavit for each ¼, ¼)**
- **Location Map (i.e., Large Scale, inch = miles)**
- **Site Detail Map (i.e., Small Scale, inch = feet)**

Signatory Contact Information:

(702) 715-5811	Bob Nix
Telephone Number	Printed Name
4221 W Oquendo Rd.	Bob N
Mailing Address	Signature
Las Vegas, NV 89118	Jun-04-2018
City, State, ZIP Code	Date

$120 PER QUARTER-QUARTER FILING FEE MUST ACCOMPANY THIS REQUEST



RAMBOLL

AECOM Phase I Investigation Updated Well Locations Wells

Phase 3 RI Work Plan Modification No. 2

Nevada Environmental Response Trust Site Henderson, Nevada

DRAFT

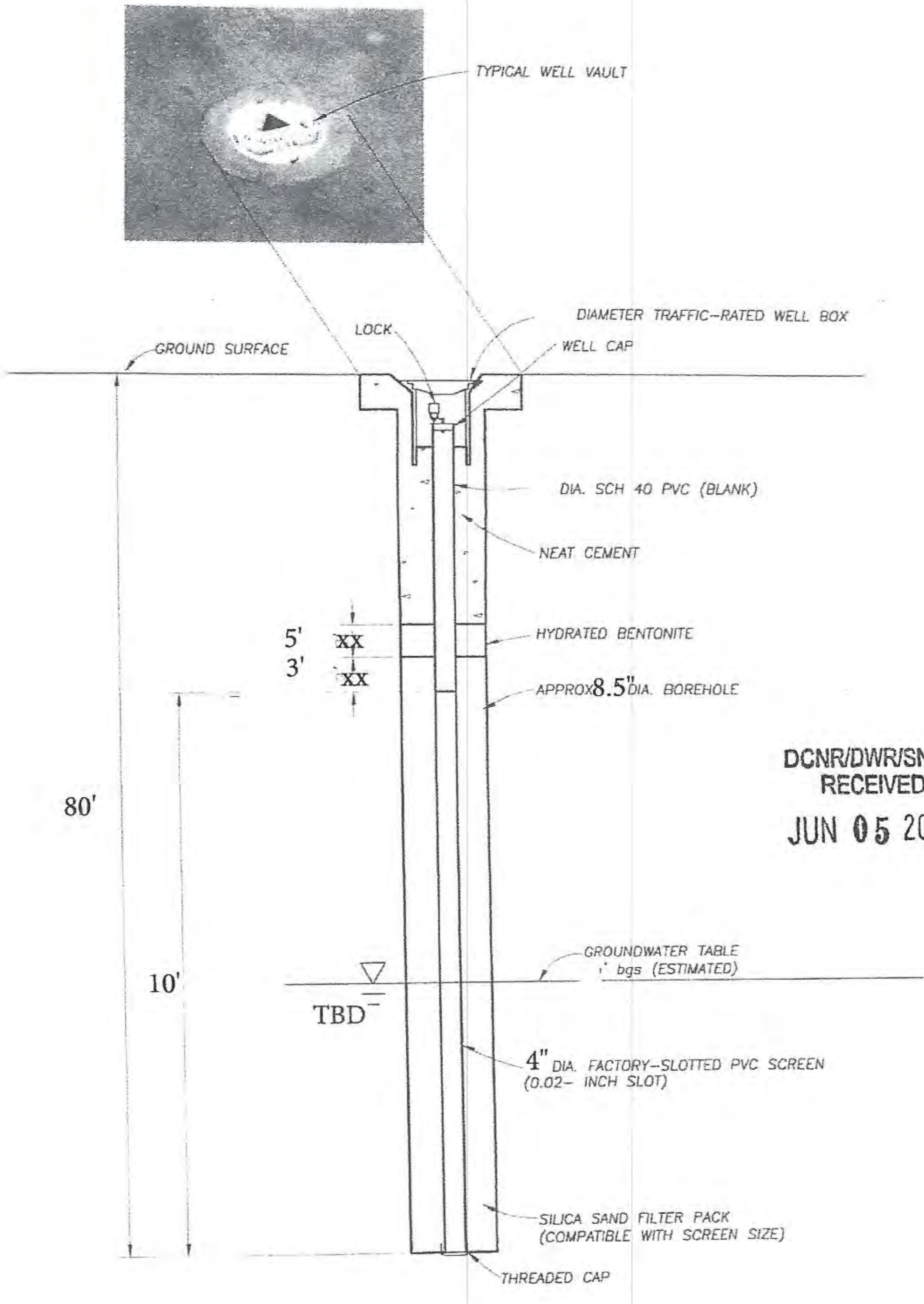
For Discussion Purposes Only

Figure

Drafter: RS	Date: 6/4/2018	Contract Number: 169 000 6943-036	Approved by:	Revised:

DCNR/DWR/SNBO
RECEIVED
JUN 05 2018


NERT 4.21N1
Legend
36 05 40.954 -114 56 54.439
Feature 1
Feature 2
Feature 3
Feature 4
DCNR/DWR/SNBO
RECEIVED
JUN 05 2018
36 05 43.479 -114 57 23.950
Google Earth
1000 ft
N



DCNR/DWR/SNBO
RECEIVED
JUN 05 2018

SCALE: NOT OT SCALE	REVISION
	A

4.38N1

BRIAN SANDOVAL
GOVERNOR

STATE OF NEVADA

BRADLEY CROWELL
Director

JASON KING, P.E.
State Engineer

DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES

DIVISION OF WATER RESOURCES

400 Shadow Lane, Suite 201
Las Vegas, Nevada 89106
(702) 486-2770 · Fax (702) 486-2781
http://water.nv.gov

NOTICE OF INTENT CARD
REVIEW FORM

To: Bob Nix

Date: June 12, 2018

Facsimile No.: ______ or E-mail Address: bnix@cascade-env.com

This document was: ☑ E-mailed ☐ Faxed

NOI Card Number: 40479 ☑ **Approved** ☐ **Rejected** (See reasons below)

Work performed	missing	☐	invalid	☐
Proposed use of well	missing	☐	invalid	☐
Intended start date	missing	☐	invalid	☐
Waiver/Permit number if applicable	missing	☐	invalid	☐
Well location (legal description, GPS coordinates)	missing	☐	invalid	☐
Parcel number	missing	☐	invalid	☐
Address at well location	missing	☐	invalid	☐
Permit number	missing	☐	invalid	☐
Waiver number or NDEP Facility ID Number	missing	☐	invalid	☐
Address of Client	missing	☐	invalid	☐
Name of client/owner	missing	☐	invalid	☐
Contractor's license number	missing	☐	invalid	☐
Onsite well driller's license number	missing	☐	invalid	☐
Drilling company name/address	missing	☐	invalid	☐
Driller's signature	missing	☐	invalid	☐
Replacement well	Yes	☐	No	☑

If yes, existing well must be plugged at time the replacement well is drilled, pursuant to NAC 534.300 Replacement Well.

Instructions: Please note that you must provide a copy of the well driller's report for the installation of one (1) monitor well within 30 days of completion. If you have any questions, please do not hesitate to give our office a call.

Person reviewing NOI Card: Christi Cooper, waiver issued by Tracy Geter

Date reviewed: June 11, 2018

BRIAN SANDOVAL
Governor

BRADLEY CROWELL
Director

STATE OF NEVADA

JASON KING, P.E.
State Engineer

JOHN GUILLORY, P.E.
Supervising Engineer

DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES
DIVISION OF WATER RESOURCES
SOUTHERN NEVADA BRANCH OFFICE

400 Shadow Lane, Suite 201
Las Vegas, Nevada 89106
(702) 486-2770 • Fax (702) 486-2781
http://water.nv.gov

June 12, 2018

MO-3502

Bob Nix
Operations Manager
Cascade Drilling, LP
4221 West Oquendo Road
Las Vegas, Nevada 89118

RE: Request for waiver to install one (1) temporary monitor well (NERT 4.38N1) to collect groundwater samples and analyze the samples as requested by Nevada Division of Environmental Protection (NDEP) Order Number 8-001721, located on vacant land, approximately one-half mile north of 1650 East Galleria Drive, Clark County, Nevada, within the SE¼ of the NE¼ of Section 29, T.21S, R.63E (Lat: 36° 05' 45.246" N, Long: -114° 57' 35.591" W, NAD 83/ WGS 84), and within the Las Vegas Valley Basin (212).

Dear Mr. Nix:

As provided in Nevada Administrative Code (NAC) § 534.450 of the Regulation for Water Well and Related Drilling, permission is herewith **granted** to install one (1) temporary monitor well to assess water conditions as described in your request received June 5, 2018. Your statement ensuring Nevada Environmental Response Trust responsibility for abandonment of the well upon project completion was received in this office on June 5, 2018.

This office also waives the following regulations:

1) NAC § 534.4351 (1) (c). The purpose of this well is to collect groundwater samples and analyze the samples as requested by NDEP Order Number 8-001721, located on vacant land, approximately one-half mile north of 1650 East Galleria Drive, Clark County, Nevada. The wellhead shall be protected from damage due to vandalism or sunlight. If polyvinyl chloride (PVC) casing is used, then the well must be completed with ASTM F-480 (Sch. 40 or heavier) well casing as provided in NAC § 534.362.

2) NAC 534.4357(1c) - "If water or vapors which are being monitored in a monitoring well are not encountered within 5 feet below the surface of the ground, the well driller shall place in the annual space of the well: From the seal placed pursuant to paragraph (b) to the surface, a seal, with a minimum thickness of 20 feet below the surface, consisting of cement grout, neat cement or concrete grout." Due to the shallow depth and large screen intervals of the proposed monitor well, you are allowed to install the sanitary seal as shown in your waiver request.

Glued casing joint connections will not be allowed. Full compliance with the remainder of the statute and regulation is required.

A plot map showing the actual location of the completed wells must be submitted upon completion of the drilling operations. Please include an accurate description of the location of the monitor well on the completion reports (GPS coordinates are required).

The well driller's reports shall bear this waiver number: MO-3502.

Authorization to drill under this waiver expires one (1) year from the date of this letter.

The well driller must have a copy of this waiver in possession at all times during drilling activities pertaining to this project. This well may only be pumped when necessary to obtain samples.

Please note that you must notify the Nevada Division of Environmental Protection (NDEP) for possible permitting requirements for groundwater or temporary surface discharge permits, which may include Underground Injection Control (UIC) or National Pollution Discharge Elimination System (NPDES) Permit Numbers. For more information regarding the permitting process with NDEP, please contact NDEP Water Pollution Control Department at (775) 687-4670.

The wells shall be plugged and abandoned, as provided by regulation, upon project completion. The current owner of Assessor's Parcel Number 160-29-601-001 is shown as County of Clark (Parks and Community Services) by the records of the Clark County Assessor's office. This waiver does not imply or grant any land use agreements between County of Clark (Parks and Community Services) and any land owners. It is expressly understood that this authorization does not relieve the operator of the requirements of any other state, federal or local agencies.

If you have any questions, please contact this office at 702-486-2770.

Sincerely,

Tracy Geter
Drilling Supervisor

cc: File
Carson City Office
Christi Cooper, SNBO Office
Jay A. Steinberg, President, Nevada Environmental Response Trust, Chicago, Illinois

NOI No. 40479
APN 160-29-601-001
NDEP Order No. 8-001721
For one, 4-inch Monitor Well

ORIGINAL
FILE WITH DIVISION OF
WATER RESOURCES

Today's Date: 6-4-18

NOTICE OF INTENT

No. 40479

Type of Work to be Done: Drilling: ☑ Deepening: ☐ Intended Start Date: 6-12-18 Reconditioning: ☐ Plugging: ☐

Is this a replacement well? Yes ☐ No ☑

Well ID (if applicable): NERT 4.38N1

Proposed use of well: Monitor

If there is an existing well, what is the well log number?

Diameter of well: 4 inches

Number of wells: 1

If this well is a domestic well, is it located within a water purveyor's service area? Yes ☐ No ☐

If this is a monitor well required by another government agency, what is the facility ID number? 8-001721 Agency: NDEP

If this well is being completed under a waiver, please provide the corresponding waiver number: If yes, what is the DOM waiver:

If a water right is associated with this well, what is the permit number?

Location of the well by Public Land Survey: SE 1/4 NE 1/4 Sec. 29 T 21 N/S R 63 E

Latitude: 36°05'45.246"N

Longitude: 114°57'35.591"W

or

UTM E

UTM N

☐ NAD 27

☑ NAD 83/WGS 84

Address at well location:

Assessor Parcel Number: 160-29-601-001

County: Clark

Name of Client: Nevada Environmental Response Trust

Subdivision Name:

Address of Client: 35 East Wacker Dr. #690 Chicago IL 60601-2314

Contractor's License Number: 0073966

Company Name and Address: Cascade Drilling LP 4221 W. Oquendo Rd. Las Vegas NV 89118

On-Site Driller's License Number: 2512

Need Log Forms ☐

Need Intent Cards ☐

(Rev. 1-14)

Driller's Signature: Bob [signature]

IN THE OFFICE OF THE STATE ENGINEER OF NEVADA

AFFIDAVIT OF INTENT TO PLUG A MONITORING WELL

Notice of Intent # 40479

DCNR/DWR/SNBO RECEIVED JUN 05 2018

I, Nevada Environmental Response Trust (Trust) ~~by and through Le Petomane XXVII Inc.,~~ Name & Title
not individually but solely as Trustee of the Trust Company
35 East Wacker Drive #690 Address
Chicago, IL 60601-2314

312-505-2688 Telephone Number

For well NERT4.38N1 - no additional wells included.

of the real property located at:

Street Address (if any) ______

County Assessor Parcel Number (APN) 160-29-601-001

Situated within the SE ¼ NE ¼ Section 29 T 21 S R 63 E, M.D.B. & M.

Latitude (N): 36°05'45.246" Longitude (W): 114°57'35.591" or UTM (m) E: ______ UTM (m) N: ______ Datum NAD83/WGS84

and whereupon one or more monitoring wells are located or to be located, fully understand that I shall be responsible for, and shall cause the wells to be plugged in accordance with the provisions contained in Nevada Administrative Code (NAC) 534.4365 and all other applicable rules and regulations for drilling/plugging wells in the State of Nevada, **not later than thirty days after the date when monitoring is no longer required.**

I shall further make any purchaser of this parcel aware of these conditions.

Responsible Party
(Printed Name): Jay Steinberg (President) (Signature): Not Individually, but Solely as
not individually, but solely in his representative capacity as President of the Nevada Environmental Response Trust Trustee

State of Tennessee
County of Williamson

Subscribed and sworn to before me on 5-31-18

by Todd W. Koller

T. W. Koller
Signature of Notary Public Required

TODD W. KOLLER STATE OF TENNESSEE NOTARY PUBLIC COUNTY OF WILLIAMSON
Notary Seal
11-27-2021

Revised 12/14

IN THE OFFICE OF THE STATE ENGINEER OF THE STATE OF NEVADA
REQUEST FOR A WAIVER TO DRILL OBSERVATION OR MONITOR WELL(S)

The applicant and/or person or company responsible for drilling and plugging the temporary well(s):

Bob Nix	Operations Manager	Cascade Drilling LP
Name	Title	Company
4221 W. Oquendo Rd.	Las Vegas	NV 89118
Street Address or PO Box	City or Town	State and ZIP Code

Telephone number of responsible party: (702) 715-5811

Estimated project dates: Jun-12-2018 Start Date Jun-29-2018 Completion Date

Location of the well: **PLSS, GPS Coordinates and Map Datum are required.**
(If more than one well is to be installed for the same project, use the accompanying form to list each well.)

SE ¼ NE ¼ Section 29 T 21 S R 63 E, M.D.B. & M.

Latitude (N): 36*05'45.246"
Longitude (W): 114* 57'35.591"
or
UTM (m) E: ____
UTM (m) N: ____
Datum NAD83/WGS8-

County Assessor Parcel Number (APN): 160-29-601-001

Street Address (if any): ____

NDEP Order # (if any): 8-001721

Purpose and duration of well(s):

No Later the thirty days after the date when monitoring is no longer required

DCNR/DWR/SNBO
RECEIVED
JUN 05 2018

Also we need to waive NAC 534.4357 (1c) do to to potential impact of the installation on the surface completions and installation of the well that is to be installed we will be placing a 5' seal above the filter pack

If this waiver is an amendment or change to an original waiver, or if the property has other monitor wells installed, please give the original waiver number. M/O - ____

The following items must be submitted with the waiver request:

- **A schematic drawing of the typical monitor well construction**
- **Affidavit of Intent to Plug a Well (Listing all wells by well ID/Name) (Separate Affidavit for each ¼, ¼)**
- **Location Map (i.e., Large Scale, inch = miles)**
- **Site Detail Map (i.e., Small Scale, inch = feet)**

Signatory Contact Information:

(702) 715-5811
Telephone Number

4221 W Oquendo Rd.
Mailing Address

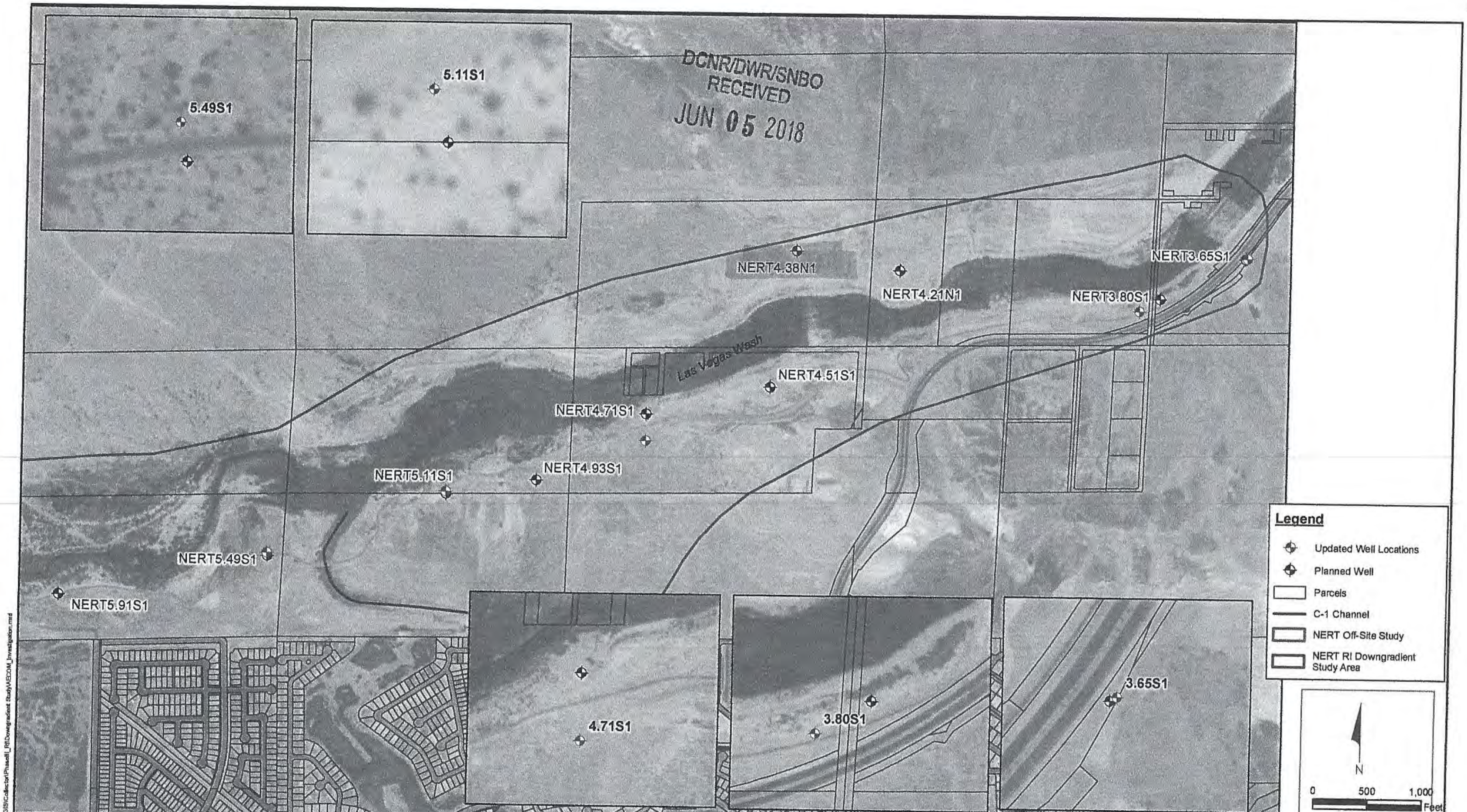
Las Vegas, NV 89118
City, State, ZIP Code

Bob Nix
Printed Name

Bob Nix
Signature

Jun-04-2018
Date

 $120 PER QUARTER-QUARTER FILING FEE MUST ACCOMPANY THIS REQUEST



DCNR/DWR/SNBO
RECEIVED
JUN 05 2018

RAMBOLL

AECOM Phase I Investigation Updated Well Locations Wells

Phase 3 RI Work Plan Modification No. 2

Nevada Environmental Response Trust Site Henderson, Nevada

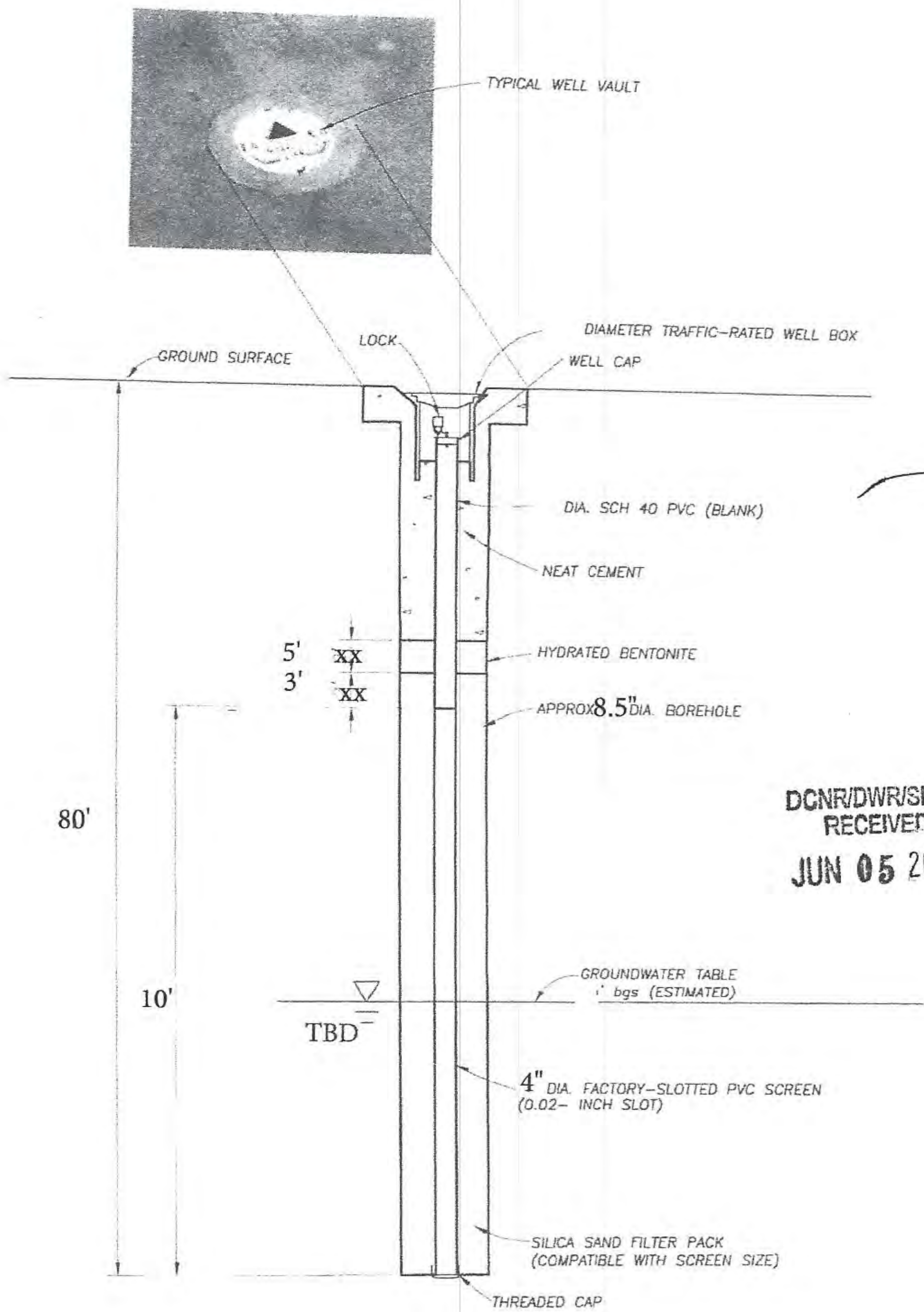
DRAFT

For Discussion Purposes Only

Figure

Drafter: RS | Date: 6/4/2018 | Contract Number: 169 000 6943-036 | Approved by: | Revised:


NERT 4.38N1
Legend
Feature 1
Feature 2
Feature 3
DCNR/DWR/SNBO
RECEIVED
JUN 05 2018
36 05 45.246 -114 57 35.591
Google Earth
1000 ft
N



SCALE: NOT OT SCALE

REVISION
A

4.51s1

BRIAN SANDOVAL
GOVERNOR

STATE OF NEVADA

BRADLEY CROWELL
Director

JASON KING, P.E.
State Engineer

DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES

DIVISION OF WATER RESOURCES

400 Shadow Lane, Suite 201
Las Vegas, Nevada 89106
(702) 486-2770 · Fax (702) 486-2781
http://water.nv.gov

NOTICE OF INTENT CARD
REVIEW FORM

To: Bob Nix

Date: June 18, 2018

Facsimile No.: ______ or E-mail Address: bnix@cascade-env.com

This document was: ☑ E-mailed ☐ Faxed

NOI Card Number: 40000 ☑ **Approved** ☐ **Rejected** (See reasons below)

Work performed	missing	☐	invalid	☐
Proposed use of well	missing	☐	invalid	☐
Intended start date	missing	☐	invalid	☐
Waiver/Permit number if applicable	missing	☐	invalid	☐
Well location (legal description, GPS coordinates)	missing	☐	invalid	☐
Parcel number	missing	☐	invalid	☐
Address at well location	missing	☐	invalid	☐
Permit number	missing	☐	invalid	☐
Waiver number or NDEP Facility ID Number	missing	☐	invalid	☐
Address of Client	missing	☐	invalid	☐
Name of client/owner	missing	☐	invalid	☐
Contractor's license number	missing	☐	invalid	☐
Onsite well driller's license number	missing	☐	invalid	☐
Drilling company name/address	missing	☐	invalid	☐
Driller's signature	missing	☐	invalid	☐
Replacement well	Yes	☐	No	☑

If yes, existing well must be plugged at time the replacement well is drilled, pursuant to NAC 534.300 Replacement Well.

Instructions: Please note that you must provide a copy of the well driller's report for the installation of one (1) monitor well within 30 days of completion. If you have any questions, please do not hesitate to give our office a call.

Jr

Person reviewing NOI Card: Christi Cooper, waiver issued by Tracy Geter

Date reviewed: June 15, 2018

BRIAN SANDOVAL
Governor

BRADLEY CROWELL
Director

STATE OF NEVADA

JASON KING, P.E.
State Engineer

JOHN GUILLORY, P.E.
Supervising Engineer

DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES

DIVISION OF WATER RESOURCES

SOUTHERN NEVADA BRANCH OFFICE

400 Shadow Lane, Suite 201
Las Vegas, Nevada 89106
(702) 486-2770 • Fax (702) 486-2781
http://water.nv.gov

June 18, 2018

MO-3509

Bob Nix
Operations Manager
Cascade Drilling, LP
4221 West Oquendo Road
Las Vegas, Nevada 89118

RE: Request for waiver to install one (1) temporary monitor well (NERT 4.51S1) to collect groundwater samples and analyze the samples as requested by Nevada Division of Environmental Protection (NDEP) Order Number 8-001721, located on vacant land, just north of 1650 East Galleria Drive, Clark County, Nevada, within the NE¼ of the SE¼ of Section 29, T.21S, R.63E (Lat: 36° 05' 32.770" N, Long: -114° 57' 38.384" W, NAD 83/ WGS 84), and within the Las Vegas Valley Basin (212).

Dear Mr. Nix:

As provided in Nevada Administrative Code (NAC) § 534.450 of the Regulation for Water Well and Related Drilling, permission is herewith **granted** to install one (1) temporary monitor well to assess water conditions as described in your request received June 7, 2018. Your statement ensuring Nevada Environmental Response Trust responsibility for abandonment of the well upon project completion was received in this office on June 7, 2018.

This office also waives the following regulations:

1) NAC § 534.4351 (1) (c). The purpose of this well is to collect groundwater samples and analyze the samples as requested by NDEP Order Number 8-001721, located on vacant land, just north of 1650 East Galleria Drive, Clark County, Nevada. The wellhead shall be protected from damage due to vandalism or sunlight. If polyvinyl chloride (PVC) casing is used, then the well must be completed with ASTM F-480 (Sch. 40 or heavier) well casing as provided in NAC § 534.362.

2) NAC 534.4357(1c) - "If water or vapors which are being monitored in a monitoring well are not encountered within 5 feet below the surface of the ground, the well driller shall place in the annual space of the well: From the seal placed pursuant to paragraph (b) to the surface, a seal, with a minimum thickness of 20 feet below the surface, consisting of cement grout, neat cement or concrete grout." Due to the shallow depth and large screen intervals of the proposed monitor well, you are allowed to install the sanitary seal as shown in your waiver request.

Glued casing joint connections will not be allowed. Full compliance with the remainder of the statute and regulation is required.

A plot map showing the actual location of the completed wells must be submitted upon completion of the drilling operations. Please include an accurate description of the location of the monitor well on the completion reports (GPS coordinates are required).

The well driller's reports shall bear this waiver number: MO-3509.

Authorization to drill under this waiver expires one (1) year from the date of this letter.

The well driller must have a copy of this waiver in possession at all times during drilling activities pertaining to this project. This well may only be pumped when necessary to obtain samples.

Please note that you must notify the Nevada Division of Environmental Protection (NDEP) for possible permitting requirements for groundwater or temporary surface discharge permits, which may include Underground Injection Control (UIC) or National Pollution Discharge Elimination System (NPDES) Permit Numbers. For more information regarding the permitting process with NDEP, please contact NDEP Water Pollution Control Department at (775) 687-4670.

The wells shall be plugged and abandoned, as provided by regulation, upon project completion. The current owner of Assessor's Parcel Number 160-29-701-002 is shown as County of Clark (Parks and Community Services) by the records of the Clark County Assessor's office. This waiver does not imply or grant any land use agreements between County of Clark (Parks and Community Services) and any land owners. It is expressly understood that this authorization does not relieve the operator of the requirements of any other state, federal or local agencies.

If you have any questions, please contact this office at 702-486-2770.

Sincerely,

Tracy Geter
Drilling Supervisor

cc: File
Carson City Office
Christi Cooper, SNBO Office
Jay A. Steinberg, President, Nevada Environmental Response Trust, Chicago, Illinois

NOI No. 40000
APN 160-29-701-002
NDEP Order No. 8-001721
For one, 4-inch Monitor Well

ORIGINAL
FILE WITH DIVISION OF
WATER RESOURCES

NOTICE OF INTENT

No. 40000

Today's Date: 6-4-18

Intended Start Date: 6-12-18

Type of Work to be Done: Drilling: ☑ Deepening: ☐ Reconditioning: ☐ Plugging: ☐ Well ID (if applicable): NERT 4.5151

Is this a replacement well? Yes ☐ No ☑

If there is an existing well, what is the well log number?

Proposed use of well: Monitor

Diameter of well: 4 inches

Number of wells: 1

If this well is a domestic well, is it located within a water purveyor's service area? Yes ☐ No ☐ If yes, what is the DOM waiver:

If this is a monitor well required by another government agency, what is the facility ID number? 8-001721 Agency: NDEP

If this well is being completed under a waiver, please provide the corresponding waiver number:

If a water right is associated with this well, what is the permit number?

Location of the well by Public Land Survey: NE 1/4 SE 1/4 Sec. 29 T 21 ~~N~~/S R 63 E

Latitude: 36°05'32.770"N

Longitude: 114°57'38.384"W or

UTM E

UTM N

☐ NAD 27

☑ NAD 83/WGS 84

Address at well location:

Assessor Parcel Number: 160-29-701-002

County: Clark

Subdivision Name:

Name of Client: Nevada Environmental Response Trust

Address of Client: 35 East Wacker Dr #690 Chicago IL 60601-2314

Contractor's License Number: 0073966

On-Site Driller's License Number: 2512

Company Name and Address: Cascade Drilling LP 4221 W. Oquendo Rd. Las Vegas NV 89118

702-220-8811

Need Log Forms ☐

Need Intent Cards ☐

(Rev. 1-14)

Driller's Signature: Bob V

BRIAN SANDOVAL
GOVERNOR

STATE OF NEVADA

BRADLEY CROWELL
Director

JASON KING, P.E.
State Engineer

DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES
DIVISION OF WATER RESOURCES
400 Shadow Lane, Suite 201
Las Vegas, Nevada 89106
(702) 486-2770 · Fax (702) 486-2781
http://water.nv.gov

NOTICE OF INTENT CARD
REVIEW FORM

To: Bob Nix   Date: June 12, 2018

Facsimile No.: ______ or E-mail Address: bnix@cascade-env.com

This document was: ☑ E-mailed ☐ Faxed

NOI Card Number: 40482 ☑ **Approved** ☐ **Rejected** (See reasons below)

Work performed	missing	☐	invalid	☐
Proposed use of well	missing	☐	invalid	☐
Intended start date	missing	☐	invalid	☐
Waiver/Permit number if applicable	missing	☐	invalid	☐
Well location (legal description, GPS coordinates)	missing	☐	invalid	☐
Parcel number	missing	☐	invalid	☐
Address at well location	missing	☐	invalid	☐
Permit number	missing	☐	invalid	☐
Waiver number or NDEP Facility ID Number	missing	☐	invalid	☐
Address of Client	missing	☐	invalid	☐
Name of client/owner	missing	☐	invalid	☐
Contractor's license number	missing	☐	invalid	☐
Onsite well driller's license number	missing	☐	invalid	☐
Drilling company name/address	missing	☐	invalid	☐
Driller's signature	missing	☐	invalid	☐
Replacement well	Yes	☐	No	☑

If yes, existing well must be plugged at time the replacement well is drilled, pursuant to NAC 534.300 Replacement Well.

Instructions: Please note that you must provide a copy of the well driller's report for the installation of one (1) monitor well within 30 days of completion. If you have any questions, please do not hesitate to give our office a call.

JP

Person reviewing NOI Card: Christi Cooper, waiver issued by Tracy Geter

Date reviewed: June 11, 2018

BRIAN SANDOVAL
Governor

BRADLEY CROWELL
Director

STATE OF NEVADA

JASON KING, P.E.
State Engineer

JOHN GUILLORY, P.E.
Supervising Engineer

DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES

DIVISION OF WATER RESOURCES

SOUTHERN NEVADA BRANCH OFFICE

400 Shadow Lane, Suite 201
Las Vegas, Nevada 89106
(702) 486-2770 • Fax (702) 486-2781
http://water.nv.gov

June 12, 2018

MO-3499

Bob Nix
Operations Manager
Cascade Drilling, LP
4221 West Oquendo Road
Las Vegas, Nevada 89118

RE: Request for waiver to install one (1) temporary monitor well (NERT-4-71S1) to collect groundwater samples and analyze the samples as requested by Nevada Division of Environmental Protection (NDEP) Order Number 8-001721, located on vacant land, just north of 1650 East Galleria Drive, Henderson, Nevada, within the NW¼ of the SE¼ of Section 29, T.21S, R.63E (Lat: 36° 05' 27.87" N, Long: -114° 57' 52.37" W, NAD 83/ WGS 84), and within the Las Vegas Valley Basin (212).

Dear Mr. Nix:

As provided in Nevada Administrative Code (NAC) § 534.450 of the Regulation for Water Well and Related Drilling, permission is herewith **granted** to install one (1) temporary monitor well to assess water conditions as described in your request received June 5, 2018. Your statement ensuring Nevada Environmental Response Trust responsibility for abandonment of the well upon project completion was received in this office on June 5, 2018.

This office also waives the following regulations:

1) NAC § 534.4351 (1) (c). The purpose of this well is to collect groundwater samples and analyze the samples as requested by NDEP Order Number 8-001721, located on vacant land, just north of 1650 East Galleria Drive, Henderson, Nevada. The wellhead shall be protected from damage due to vandalism or sunlight. If polyvinyl chloride (PVC) casing is used, then the well must be completed with ASTM F-480 (Sch. 40 or heavier) well casing as provided in NAC § 534.362.

2) NAC 534.4357(1c) - "If water or vapors which are being monitored in a monitoring well are not encountered within 5 feet below the surface of the ground, the well driller shall place in the annual space of the well: From the seal placed pursuant to paragraph (b) to the surface, a seal, with a minimum thickness of 20 feet below the surface, consisting of cement grout, neat cement or concrete grout." Due to the shallow depth and large screen intervals of the proposed monitor well, you are allowed to install the sanitary seal as shown in your waiver request.

Glued casing joint connections will not be allowed. Full compliance with the remainder of the statute and regulation is required.

A plot map showing the actual location of the completed wells must be submitted upon completion of the drilling operations. Please include an accurate description of the location of the monitor well on the completion reports (GPS coordinates are required).

The well driller's reports shall bear this waiver number: MO-3499.

Authorization to drill under this waiver expires one (1) year from the date of this letter.

The well driller must have a copy of this waiver in possession at all times during drilling activities pertaining to this project. This well may only be pumped when necessary to obtain samples.

Please note that you must notify the Nevada Division of Environmental Protection (NDEP) for possible permitting requirements for groundwater or temporary surface discharge permits, which may include Underground Injection Control (UIC) or National Pollution Discharge Elimination System (NPDES) Permit Numbers. For more information regarding the permitting process with NDEP, please contact NDEP Water Pollution Control Department at (775) 687-4670.

The wells shall be plugged and abandoned, as provided by regulation, upon project completion. The current owner of Assessor's Parcel Number 160-29-701-002 is shown as County of Clark (Parks and Community Services) by the records of the Clark County Assessor's office. This waiver does not imply or grant any land use agreements between County of Clark (Parks and Community Services) and any land owners. It is expressly understood that this authorization does not relieve the operator of the requirements of any other state, federal or local agencies.

If you have any questions, please contact this office at 702-486-2770.

Sincerely,

Tracy Geter
Drilling Supervisor

cc: File
Carson City Office
Christi Cooper, SNBO Office
Jay A. Steinberg, President, Nevada Environmental Response Trust, Chicago, Illinois

NOI No. 40482
APN 160-29-701-002
NDEP Order No. 8-001721
For one, 4-inch Monitor Well

ORIGINAL
FILE WITH DIVISION OF
WATER RESOURCES

NOTICE OF INTENT

No. 40482

Today's Date: 6-4-18 Intended Start Date: 6-12-18 Well ID (if applicable): NERT 4.71S1

Type of Work to be Done: Drilling: ☑ Deepening: ☐ Reconditioning: ☐ Plugging: ☐

Is this a replacement well? Yes ☐ No ☑ If there is an existing well, what is the well log number? ______

Proposed use of well: Monitor Diameter of well: 4 inches Number of wells: 1

If this well is a domestic well, is it located within a water purveyor's service area? Yes ☐ No ☐ If yes, what is the DOM waiver: ______

If this is a monitor well required by another government agency, what is the facility ID number? 8-001721 Agency: NDEP

If this well is being completed under a waiver, please provide the corresponding waiver number: ______

If a water right is associated with this well, what is the permit number? ______

Location of the well by Public Land Survey: NW 1/4 SE 1/4 Sec. 29 T 21 N/S R 63 E

Latitude: 36° 05' 27.87" N UTM E ______ ☐ NAD 27

Longitude: 114° 57' 52.37" W UTM N ______ ☑ NAD 83/WGS 84

Address at well location: ______

Assessor Parcel Number: 160-29-701-002

County: Clark Subdivision Name: ______

Name of Client: Nevada Environmental Trust

Address of Client: 35 East Wacker Drive #690 Chicago IL 60601-2314

Contractor's License Number: 0073966 On-Site Driller's License Number: 2512

Company Name and Address: Cascade Drilling LP 4221 W. Oquendo Rd. Las Vegas NV 89118

Need Log Forms ☐ Need Intent Cards ☐

Driller's Signature: ______

(Rev. 1-14)

O

IN THE OFFICE OF THE STATE ENGINEER OF NEVADA

AFFIDAVIT OF INTENT TO PLUG A MONITORING WELL

Notice of Intent # 40482

DCNR/DWR/SNBO RECEIVED JUN 05 2018

I, Nevada Environmental Response Trust (Trust) ~~by and through Le Petomane XXVII Inc.,~~ — Name & Title

not individually but solely as Trustee of the Trust — Company

35 East Wacker Drive #690 Chicago, IL 60601-2314 — Address

For well NERT4.71S1 - no additional wells included.

312-505-2688 — Telephone Number

of the real property located at:

Street Address (if any) ______

County Assessor Parcel Number (APN) 160-29-701-002

Situated within the NW ¼ SE ¼ Section 29 T 21 S R 63 E, M.D.B. & M.

Latitude (N): 36° 05' 27.87" / Longitude (W): 114° 57' 52.37" or UTM (m) E: ______ / UTM (m) N: ______ Datum NAD83/WGS84

and whereupon one or more monitoring wells are located or to be located, fully understand that I shall be responsible for, and shall cause the wells to be plugged in accordance with the provisions contained in Nevada Administrative Code (NAC) 534.4365 and all other applicable rules and regulations for drilling/plugging wells in the State of Nevada, **not later than thirty days after the date when monitoring is no longer required.**

I shall further make any purchaser of this parcel aware of these conditions.

Responsible Party (Printed Name): Jay Steinberg, Pres. AS (Signature): [signature], not individually, but solely as Pres AS

not individually, but solely in his representative capacity as President of the Nevada Environmental Response Trust Trustee

State of Tennessee

County of Williamson

Subscribed and sworn to before me on 5-31-18

by Todd W. Koller

TODD W. KOLLER STATE OF TENNESSEE NOTARY PUBLIC COUNTY OF WILLIAMSON

[signature]

Signature of Notary Public Required

Notary Seal

11-27-2021

Revised 12/14

IN THE OFFICE OF THE STATE ENGINEER OF THE STATE OF NEVADA
REQUEST FOR A WAIVER TO DRILL OBSERVATION OR MONITOR WELL(S)

The applicant and/or person or company responsible for drilling and plugging the temporary well(s):

Name	Title	Company
Bob Nix	Operations Manager	Cascade Drilling LP

Street Address or PO Box	City or Town	State and ZIP Code
4221 W. Oquendo Rd.	Las Vegas	NV 89118

Telephone number of responsible party: (702) 715-5811

Estimated project dates: Jun-12-2018 Start Date Jun-29-2018 Completion Date

Location of the well: **PLSS, GPS Coordinates and Map Datum are required.**
(If more than one well is to be installed for the same project, use the accompanying form to list each well.)

NW ¼ SE ¼ Section 29 T 21 S R 63 E, M.D.B. & M.

Latitude (N): 36°05'27.87"
Longitude (W): 114° 57' 52.37"
or
UTM (m) E: ____
UTM (m) N: ____
Datum NAD83/WGS8-

County Assessor Parcel Number (APN): 160-29-701-002
Street Address (if any): ____
NDEP Order # (if any): 8-001721

DCNR/DWR/SNBO RECEIVED JUN 05 2018

Purpose and duration of well(s):
No Later the thirty days after the date when monitoring is no longer required

Also we need to waive NAC 534.4357 (1c) do to to potential impact of the installation on the surface completions and installation of the well that is to be installed we will be placing a 5' seal above the filter pack

If this waiver is an amendment or change to an original waiver, or if the property has other monitor wells installed, please give the original waiver number. M/O - ____

The following items must be submitted with the waiver request:

- **A schematic drawing of the typical monitor well construction**
- **Affidavit of Intent to Plug a Well (Listing all wells by well ID/Name) (Separate Affidavit for each ¼, ¼)**
- **Location Map (i.e., Large Scale, inch = miles)**
- **Site Detail Map (i.e., Small Scale, inch = feet)**

Signatory Contact Information:

PAID

(702) 715-5811 Telephone Number	Bob Nix Printed Name
4221 W Oquendo Rd. Mailing Address	Bob Nix Signature
Las Vegas, NV 89118 City, State, ZIP Code	Jun-04-2018 Date

$120 PER QUARTER-QUARTER FILING FEE MUST ACCOMPANY THIS REQUEST

5.11s1
4.93S1

BRIAN SANDOVAL
GOVERNOR

STATE OF NEVADA

BRADLEY CROWELL
Director

JASON KING, P.E.
State Engineer

DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES

DIVISION OF WATER RESOURCES

400 Shadow Lane, Suite 201
Las Vegas, Nevada 89106
(702) 486-2770 · Fax (702) 486-2781
http://water.nv.gov

NOTICE OF INTENT CARD
REVIEW FORM

To: Bob Nix

Date: June 12, 2018

Facsimile No.: ____________ or E-mail Address: bnix@cascade-env.com

This document was: ☑ E-mailed ☐ Faxed

NOI Card Number: 40478 ☑ **Approved** ☐ **Rejected** (See reasons below)

Work performed	missing	☐	invalid	☐
Proposed use of well	missing	☐	invalid	☐
Intended start date	missing	☐	invalid	☐
Waiver/Permit number if applicable	missing	☐	invalid	☐
Well location (legal description, GPS coordinates)	missing	☐	invalid	☐
Parcel number	missing	☐	invalid	☐
Address at well location	missing	☐	invalid	☐
Permit number	missing	☐	invalid	☐
Waiver number or NDEP Facility ID Number	missing	☐	invalid	☐
Address of Client	missing	☐	invalid	☐
Name of client/owner	missing	☐	invalid	☐
Contractor's license number	missing	☐	invalid	☐
Onsite well driller's license number	missing	☐	invalid	☐
Drilling company name/address	missing	☐	invalid	☐
Driller's signature	missing	☐	invalid	☐
Replacement well	Yes	☐	No	☑

If yes, existing well must be plugged at time the replacement well is drilled, pursuant to NAC 534.300 Replacement Well.

Instructions: Please note that you must provide a copy of the well driller's report for the installation of two (2) monitor wells within 30 days of completion. If you have any questions, please do not hesitate to give our office a call.

JB

Person reviewing NOI Card: Christi Cooper, waiver issued by Tracy Geter

Date reviewed: June 11, 2018

5.11S1
4.93S1

BRIAN SANDOVAL
Governor

BRADLEY CROWELL
Director

STATE OF NEVADA

JASON KING, P.E.
State Engineer

JOHN GUILLORY, P.E.
Supervising Engineer

DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES
DIVISION OF WATER RESOURCES
SOUTHERN NEVADA BRANCH OFFICE
400 Shadow Lane, Suite 201
Las Vegas, Nevada 89106
(702) 486-2770 • Fax (702) 486-2781
http://water.nv.gov

June 12, 2018

MO-3501

Bob Nix
Operations Manager
County of Clark (Parks and Services)
P.O. Box 711
Dallas, Texas 75221-0711

RE: Request for waiver to install two (2) temporary monitor wells to collect groundwater samples and analyze the samples as requested by Nevada Division of Environmental Protection (NDEP) Order Number 8-001721, located on vacant land, just northwest of 1650 East Galleria Drive, Henderson, Nevada and within the Las Vegas Valley Basin (212).

Dear Mr. Nix:

As provided in Nevada Administrative Code (NAC) § 534.450 of the Regulation for Water Well and Related Drilling, permission is herewith **granted** to install two (2) temporary monitor wells to assess water conditions as described in your request received June 5, 2018. Your statement ensuring Nevada Environmental Response Trust responsibility for abandonment of the well upon project completion was received in this office on June 5, 2018.

The two (2) proposed monitor wells referenced in your letter are listed below:

Well Name	Legal Description	GPS Coordinates (NAD 83/ WGS 84)
NERT 5.11S1	NE¼, SW¼ Section 29, T.21S, R63E	36° 05' 23.07" N, -114° 58' 14.820" W
NERT 4.93S1	NE¼, SW¼ Section 29, T.21S, R63E	36° 05' 24.152" N, -114° 58' 04.605" W

This office also waives the following regulations:

1) NAC § 534.4351 (1) (c). The purpose of this well is to collect groundwater samples and analyze the samples as requested by NDEP Order Number 8-001721, located on vacant land, just northwest of 1650 East Galleria Drive, Henderson, Nevada. The wellhead shall be protected from damage due to vandalism or sunlight. If polyvinyl chloride (PVC) casing is used, then the well must be completed with ASTM F-480 (Sch. 40 or heavier) well casing as provided in NAC § 534.362.

2) NAC 534.4357(1c) - "If water or vapors which are being monitored in a monitoring well are not encountered within 5 feet below the surface of the ground, the well driller shall place in the annual space of the well: From the seal placed pursuant to paragraph (b) to the surface, a seal, with a minimum thickness of 20 feet below the surface, consisting of cement grout, neat cement or concrete grout." Due to the shallow depth and large screen intervals of the proposed monitor well, you are allowed to install the sanitary seal as shown in your waiver request.

Glued casing joint connections will not be allowed. Full compliance with the remainder of the statute and regulation is required.

A plot map showing the actual location of the completed wells must be submitted upon completion of the drilling operations. Please include an accurate description of the location of the monitor well on the completion reports (GPS coordinates are required).

The well driller's reports shall bear this waiver number: MO-3501.

Authorization to drill under this waiver expires one (1) year from the date of this letter.

The well driller must have a copy of this waiver in possession at all times during drilling activities pertaining to this project. This well may only be pumped when necessary to obtain samples.

Please note that you must notify the Nevada Division of Environmental Protection (NDEP) for possible permitting requirements for groundwater or temporary surface discharge permits, which may include Underground Injection Control (UIC) or National Pollution Discharge Elimination System (NPDES) Permit Numbers. For more information regarding the permitting process with NDEP, please contact NDEP Water Pollution Control Department at (775) 687-4670.

The wells shall be plugged and abandoned, as provided by regulation, upon project completion. The current owner of Assessor's Parcel Number 160-29-301-001 is shown as County of Clark (Parks and Services) by the records of the Clark County Assessor's office. This waiver does not imply or grant any land use agreements between County of Clark (Parks and Services) and any land owners. It is expressly understood that this authorization does not relieve the operator of the requirements of any other state, federal or local agencies.

If you have any questions, please contact this office at 702-486-2770.

Sincerely,

Tracy Geter
Drilling Supervisor

cc: File
Carson City Office
Christi Cooper, SNBO Office
Jay A. Steinberg, President, Nevada Environmental Response Trust, Chicago, Illinois

NOTICE OF INTENT

No. 40478

ORIGINAL FILE WITH DIVISION OF WATER RESOURCES

Today's Date: 6-4-18

Intended Start Date: 6-12-18

Well ID (if applicable): NERT 5.11S1

Type of Work to be Done: Drilling: ☑ Deepening: ☐ Reconditioning: ☐ Plugging: ☐

If there is an existing well, what is the well log number?

Is this a replacement well? Yes ☐ No ☑

Diameter of well: 4 inches

Number of wells: 2

Proposed use of well: Monitor

If this well is a domestic well, is it located within a water purveyor's service area? Yes ☐ No ☐ If yes, what is the DOM waiver:

If this is a monitor well required by another government agency, what is the facility ID number? 8-001721 Agency: NDEP

If this well is being completed under a waiver, please provide the corresponding waiver number:

If a water right is associated with this well, what is the permit number?

Location of the well by Public Land Survey: NE 1/4 SW 1/4 Sec. 29 T 21 N/S R 63 E

Latitude: 36° 05' 23.07" N

Longitude: 114° 58' 14.82" W or

UTM E

UTM N

☐ NAD 27

☑ NAD 83/WGS 84

Address at well location:

Assessor Parcel Number: 160-29-301-001

Subdivision Name:

County: Clark

Name of Client: Nevada Environmental Response Trust

Address of Client: 35 East Wacker Dr. Chicago IL 60601-2314

Contractor's License Number: 0073966

On-Site Driller's License Number: 2512

Company Name and Address: Cascade Drilling LP 4221 W. Oquendo Rd Las Vegas NV 89118

Driller's Signature: Bob M

Need Log Forms ☐

Need Intent Cards ☐

702-220-5811

(Rev. 1-14)

O

IN THE OFFICE OF THE STATE ENGINEER OF NEVADA

AFFIDAVIT OF INTENT TO PLUG A MONITORING WELL

Notice of Intent # 40478

DCNR/DWR/SNBO RECEIVED JUN 05 2018

I, Nevada Environmental Response Trust (Trust) by and through Le Petomane XXVII Inc., — Name & Title
not individually but solely as Trustee of the Trust — Company
35 East Wacker Drive #690 Chicago, IL 60601-2314 — Address
312-505-2688 — Telephone Number

For well NERT5.11S1 - additional wells included on "Additional Well Location" sheet

of the real property located at:

Street Address (if any) ______

County Assessor Parcel Number (APN) 160-29-301-001

Situated within the NE ¼ SW ¼ Section 29 T 21 S R 63 E, M.D.B. & M.

Latitude (N): 36°05'23.07" Longitude (W): 114°58'14.82" or UTM (m) E: ______ UTM (m) N: ______ Datum NAD83/WGS84

and whereupon one or more monitoring wells are located or to be located, fully understand that I shall be responsible for, and shall cause the wells to be plugged in accordance with the provisions contained in Nevada Administrative Code (NAC) 534.4365 and all other applicable rules and regulations for drilling/plugging wells in the State of Nevada, **not later than thirty days after the date when monitoring is no longer required.**

I shall further make any purchaser of this parcel aware of these conditions.

Responsible Party (Printed Name): Jay Steinberg, President (Signature): [signature] not individually, but solely in his representative capacity as President of the Nevada Environmental Response Trust Trustee — not individually, but solely as Pres.

State of Tennessee

County of Williamson

Subscribed and sworn to before me on 5-31-18

by Todd W. Koller

[signature]
Signature of Notary Public Required

TODD W. KOLLER STATE OF TENNESSEE NOTARY PUBLIC COUNTY OF WILLIAMSON
Notary Seal
11-27-2021

Revised 12/14

DCNR/DWR/SNBO
RECEIVED
JUN 05 2018

Additional Well Locations

Coordinate system Lat/Long

Datum NAD83/WGS84

Well ID/Name	Coordinates		1/4	1/4	Sec.	Twn	Rng	APN
NERT4.93S1	36° 05' 24.152" N	114° 58' 04.605" W	NE	SW	29	21S	63E	160-29-301-001

IN THE OFFICE OF THE STATE ENGINEER OF THE STATE OF NEVADA
REQUEST FOR A WAIVER TO DRILL OBSERVATION OR MONITOR WELL(S)

The applicant and/or person or company responsible for drilling and plugging the temporary well(s):

Bob Nix	Operations Manager	Cascade Drilling LP
Name	Title	Company
4221 W. Oquendo Rd.	Las Vegas	NV 89118
Street Address or PO Box	City or Town	State and ZIP Code

Telephone number of responsible party: (702) 715-5811

Estimated project dates: Jun-12-2018 Start Date Jun-29-2018 Completion Date

Location of the well: **PLSS, GPS Coordinates and Map Datum are required.**
(If more than one well is to be installed for the same project, use the accompanying form to list each well.)

NE ¼ SW ¼ Section 29 T 21 S R 63 E, M.D.B. & M.

Latitude (N): 36° 05' 23.07"
Longitude (W): 114° 58' 14.82"
or
UTM (m) E: ____________
UTM (m) N: ____________

Datum NAD83/WGS84

County Assessor Parcel Number (APN): 160-29-301-001

Street Address (if any): ____________

NDEP Order # (if any): 8-001721

Purpose and duration of well(s):
No Later the thirty days after the date when monitoring is no longer required

DCNR/DWR/SNBO
RECEIVED
JUN 05 2018

Also we need to waive NAC 534.4357 (1c) do to to potential impact of the installation on the surface completions and installation of the well that is to be installed
we will be placing a 5' seal above the filter pack

If this waiver is an amendment or change to an original waiver, or if the property has other monitor wells installed, please give the original waiver number. M/O - ________

The following items must be submitted with the waiver request:

- **A schematic drawing of the typical monitor well construction**
- **Affidavit of Intent to Plug a Well (Listing all wells by well ID/Name) (Separate Affidavit for each ¼, ¼)**
- **Location Map (i.e., Large Scale, inch = miles)**
- **Site Detail Map (i.e., Small Scale, inch = feet)**

Signatory Contact Information:

(702) 715-5811
Telephone Number

4221 W Oquendo Rd.
Mailing Address

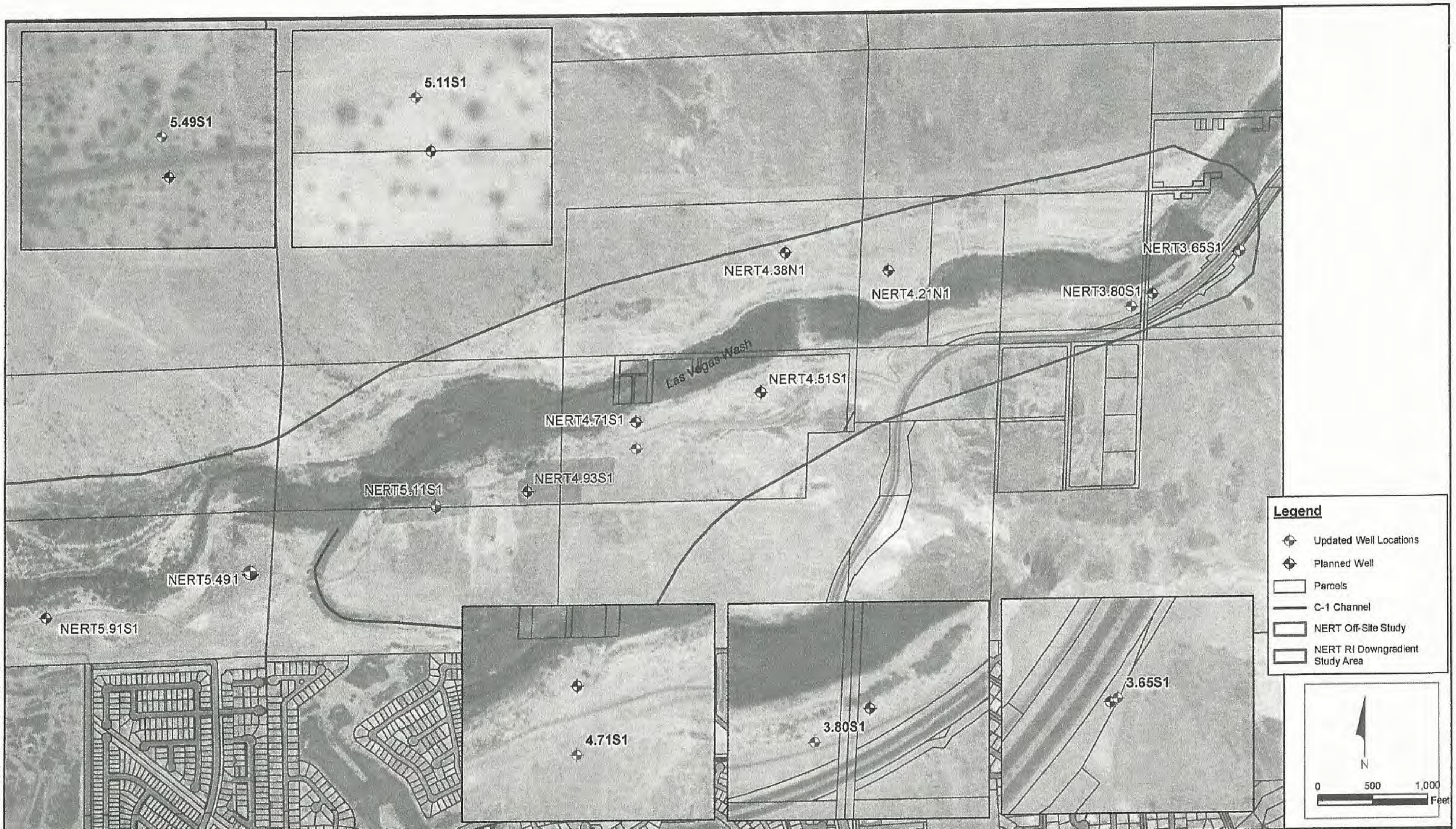
Las Vegas, NV 89118
City, State, ZIP Code

Bob Nix
Printed Name

Bob Nix
Signature

Jun-04-2018
Date

$120 PER QUARTER-QUARTER FILING FEE MUST ACCOMPANY THIS REQUEST



RAMBOLL

AECOM Phase I Investigation Updated Well Locations Wells

Phase 3 RI Work Plan Modification No. 2
Nevada Environmental Response Trust Site Henderson, Nevada

DRAFT
For Discussion Purposes Only

Figure

Drafter: RS	Date: 6/4/2018	Contract Number: 169 000 6943-036	Approved by:	Revised:

54951

BRIAN SANDOVAL
GOVERNOR

STATE OF NEVADA

BRADLEY CROWELL
Director

JASON KING, P.E.
State Engineer

DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES

DIVISION OF WATER RESOURCES

400 Shadow Lane, Suite 201
Las Vegas, Nevada 89106
(702) 486-2770 · Fax (702) 486-2781
http://water.nv.gov

NOTICE OF INTENT CARD
REVIEW FORM

To: Bob Nix

Date: June 13, 2018

Facsimile No.: ______ or E-mail Address: bnix@cascade-env.com

This document was: ☑ E-mailed ☐ Faxed

NOI Card Number: 40480 ☑ **Approved** ☐ **Rejected** (See reasons below)

Work performed	missing	☐	invalid	☐
Proposed use of well	missing	☐	invalid	☐
Intended start date	missing	☐	invalid	☐
Waiver/Permit number if applicable	missing	☐	invalid	☐
Well location (legal description, GPS coordinates)	missing	☐	invalid	☐
Parcel number	missing	☐	invalid	☐
Address at well location	missing	☐	invalid	☐
Permit number	missing	☐	invalid	☐
Waiver number or NDEP Facility ID Number	missing	☐	invalid	☐
Address of Client	missing	☐	invalid	☐
Name of client/owner	missing	☐	invalid	☐
Contractor's license number	missing	☐	invalid	☐
Onsite well driller's license number	missing	☐	invalid	☐
Drilling company name/address	missing	☐	invalid	☐
Driller's signature	missing	☐	invalid	☐
Replacement well	Yes	☐	No	☑

If yes, existing well must be plugged at time the replacement well is drilled, pursuant to NAC 534.300 Replacement Well.

Instructions: Please note that you must provide a copy of the well driller's report for the installation of one (1) monitor well within 30 days of completion. If you have any questions, please do not hesitate to give our office a call.

JS

Person reviewing NOI Card: Christi Cooper, waiver issued by Tracy Geter

Date reviewed: June 11, 2018

BRIAN SANDOVAL
Governor

BRADLEY CROWELL
Director

STATE OF NEVADA

JASON KING, P.E.
State Engineer

JOHN GUILLORY, P.E.
Supervising Engineer

DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES
DIVISION OF WATER RESOURCES
SOUTHERN NEVADA BRANCH OFFICE
400 Shadow Lane, Suite 201
Las Vegas, Nevada 89106
(702) 486-2770 • Fax (702) 486-2781
http://water.nv.gov

June 13, 2018

MO-3504

Bob Nix
Operations Manager
Cascade Drilling, LP
4221 West Oquendo Road
Las Vegas, Nevada 89118

RE: Request for waiver to install one (1) temporary monitor well (NERT 5.49S1) to collect groundwater samples and analyze the samples as requested by Nevada Division of Environmental Protection (NDEP) Order Number 8-001721, located at 8850 East Russell Road, Clark County, Nevada, within the SE¼ of the SE¼ of Section 30, T.21S, R.63E (Lat: 36° 05' 17.370" N, Long: -114° 58' 34.930" W, NAD 83/ WGS 84), and within the Las Vegas Valley Basin (212).

Dear Mr. Nix:

As provided in Nevada Administrative Code (NAC) § 534.450 of the Regulation for Water Well and Related Drilling, permission is herewith **granted** to install one (1) temporary monitor well to assess water conditions as described in your request received June 5, 2018. Your statement ensuring Nevada Environmental Response Trust responsibility for abandonment of the well upon project completion was received in this office on June 5, 2018.

This office also waives the following regulations:

1) NAC § 534.4351 (1) (c). The purpose of this well is to collect groundwater samples and analyze the samples as requested by NDEP Order Number 8-001721, located at 8850 East Russell Road, Clark County, Nevada. The wellhead shall be protected from damage due to vandalism or sunlight. If polyvinyl chloride (PVC) casing is used, then the well must be completed with ASTM F-480 (Sch. 40 or heavier) well casing as provided in NAC § 534.362.

2) NAC 534.4357(1c) - "If water or vapors which are being monitored in a monitoring well are not encountered within 5 feet below the surface of the ground, the well driller shall place in the annual space of the well: From the seal placed pursuant to paragraph (b) to the surface, a seal, with a minimum thickness of 20 feet below the surface, consisting of cement grout, neat cement or concrete grout." Due to the shallow depth and large screen intervals of the proposed monitor well, you are allowed to install the sanitary seal as shown in your waiver request.

Glued casing joint connections will not be allowed. Full compliance with the remainder of the statute and regulation is required.

A plot map showing the actual location of the completed wells must be submitted upon completion of the drilling operations. Please include an accurate description of the location of the monitor well on the completion reports (GPS coordinates are required).

The well driller's reports shall bear this waiver number: MO-3504.

Authorization to drill under this waiver expires one (1) year from the date of this letter.

The well driller must have a copy of this waiver in possession at all times during drilling activities pertaining to this project. This well may only be pumped when necessary to obtain samples.

Please note that you must notify the Nevada Division of Environmental Protection (NDEP) for possible permitting requirements for groundwater or temporary surface discharge permits, which may include Underground Injection Control (UIC) or National Pollution Discharge Elimination System (NPDES) Permit Numbers. For more information regarding the permitting process with NDEP, please contact NDEP Water Pollution Control Department at (775) 687-4670.

The wells shall be plugged and abandoned, as provided by regulation, upon project completion. The current owner of Assessor's Parcel Number 160-30-000-003 is shown as United States of America (USA) by the records of the Clark County Assessor's office. This waiver does not imply or grant any land use agreements between USA and any land owners. It is expressly understood that this authorization does not relieve the operator of the requirements of any other state, federal or local agencies.

If you have any questions, please contact this office at 702-486-2770.

Sincerely,

Tracy Geter
Drilling Supervisor

cc: File
Carson City Office
Christi Cooper, SNBO Office
Jay A. Steinberg, President, Nevada Environmental Response Trust, Chicago, Illinois

NOI No. 39999
APN 160-30-000-003
NDEP Order No. 8-001721
For one, 4-inch Monitor Well

ORIGINAL
FILE WITH DIVISION OF
WATER RESOURCES

NOTICE OF INTENT

No. 40480

Today's Date: 6-4-18

Intended Start Date: 6-12-18

Type of Work to be Done: Drilling: ☑ Deepening: ☐ Reconditioning: ☐ Plugging: ☐

Well ID (if applicable): NERT 5.4951

Is this a replacement well? Yes ☐ No ☑

If there is an existing well, what is the well log number? ______

Proposed use of well: Monitor

Diameter of well: 4 inches

Number of wells: 1

If this well is a domestic well, is it located within a water purveyor's service area? Yes ☐ No ☐ If yes, what is the DOM waiver:

If this is a monitor well required by another government agency, what is the facility ID number? 8-001721 Agency: NDEP

If this well is being completed under a waiver, please provide the corresponding waiver number: ______

If a water right is associated with this well, what is the permit number? ______

Location of the well by Public Land Survey: SE 1/4 SE 1/4 Sec. 30 T 21 N/S R 63 E

Latitude: 36°05'17.37" N

Longitude: 114°58'34.93" W

UTM E ______

UTM N ______

☐ NAD 27

☑ NAD 83/WGS 84

Address at well location:

Assessor Parcel Number: 160-30-000-003

County: Clark

Subdivision Name: ______

Name of Client: Nevada Environmental Response Trust

Address of Client: 35 East Wacker Dr. #690 Chicago IL 60601-2314

Contractor's License Number: 0073966

On-Site Driller's License Number: 2512

Company Name and Address: Cascade Drilling LP 4221 W. Oquendo Rd Las Vegas NV 89118

Need Log Forms ☐ Need Intent Cards ☐

(Rev. 1-14)

702-220-5811

Driller's Signature: Bob N

O

IN THE OFFICE OF THE STATE ENGINEER OF NEVADA

AFFIDAVIT OF INTENT
TO PLUG A MONITORING WELL

Notice of Intent # 40480

DCNR/DWR/SNBO
RECEIVED
JUN 05 2018

I, Nevada Environmental Response Trust (Trust) ~~by and through Le Petomane XXVII Inc.,~~ Name & Title

not individually but solely as Trustee of the ~~Trust~~ Company

35 East Wacker Drive #690
~~Chicago, IL 60601-2314~~ Address

For well NERT5.49S1 - no additional wells included.

312-505-2688 Telephone Number

of the real property located at:

Street Address (if any) ____________________

County Assessor Parcel Number (APN) 160-30-000-003

Situated within the SE ¼ SE ¼ Section 30 T 21 S R 63 E, M.D.B. & M.

Latitude (N):	36°05'17.37"	or	UTM (m) E:		Datum
Longitude (W):	114°58'34.93"		UTM (m) N:		NAD83/WGS84

and whereupon one or more monitoring wells are located or to be located, fully understand that I shall be responsible for, and shall cause the wells to be plugged in accordance with the provisions contained in Nevada Administrative Code (NAC) 534.4365 and all other applicable rules and regulations for drilling/plugging wells in the State of Nevada, **not later than thirty days after the date when monitoring is no longer required.**

I shall further make any purchaser of this parcel aware of these conditions.

Responsible Party
(Printed Name): Jay Steinberg, President (Signature): Jay A Steinberg, not individually, but solely as

not individually, but solely in his representative capacity as President of the Nevada Environmental Response Trust Trustee

State of Tennessee
County of Williamson

Subscribed and sworn to before me on 5·31·18

by Todd W. Koller

T. W. Koller
Signature of Notary Public Required

TODD W. KOLLER
STATE OF TENNESSEE NOTARY PUBLIC
COUNTY OF WILLIAMSON
Notary Seal
11·27·2021

Revised 12/14

IN THE OFFICE OF THE STATE ENGINEER OF THE STATE OF NEVADA
REQUEST FOR A WAIVER TO DRILL OBSERVATION OR MONITOR WELL(S)

The applicant and/or person or company responsible for drilling and plugging the temporary well(s):

Bob Nix	Operations Manager	Cascade Drilling LP
Name	Title	Company
4221 W. Oquendo Rd.	Las Vegas	NV 89118
Street Address or PO Box	City or Town	State and ZIP Code

Telephone number of responsible party: (702) 715-5811

Estimated project dates: Jun-12-2018 Start Date Jun-29-2018 Completion Date

Location of the well: **PLSS, GPS Coordinates and Map Datum are required.**
(If more than one well is to be installed for the same project, use the accompanying form to list each well.)

SE ¼ SE ¼ Section 30 T 21 S R 63 E, M.D.B. & M.

Latitude (N): 36*05'17.37"
Longitude (W): 114* 58'34.93"
or
UTM (m) E:
UTM (m) N:
Datum NAD83/WGS84

County Assessor Parcel Number (APN): 160-30-000-003

Street Address (if any):

NDEP Order # (if any): 8-001721

Purpose and duration of well(s):

No Later the thirty days after the date when monitoring is no longer required

DCNR/DWR/SNBO
RECEIVED
JUN 05 2018

Also we need to waive NAC 534.4357 (1c) do to to potential impact of the installation on the surface completions and installation of the well that is to be installed
we will be placing a 5' seal above the filter pack

If this waiver is an amendment or change to an original waiver, or if the property has other monitor wells installed, please give the original waiver number. M/O - ________

The following items must be submitted with the waiver request:

- **A schematic drawing of the typical monitor well construction**
- **Affidavit of Intent to Plug a Well (Listing all wells by well ID/Name) (Separate Affidavit for each ¼, ¼)**
- **Location Map (i.e., Large Scale, inch = miles)**
- **Site Detail Map (i.e., Small Scale, inch = feet)**

Signatory Contact Information:

(702) 715-5811
Telephone Number

4221 W Oquendo Rd.
Mailing Address

Las Vegas, NV 89118
City, State, ZIP Code

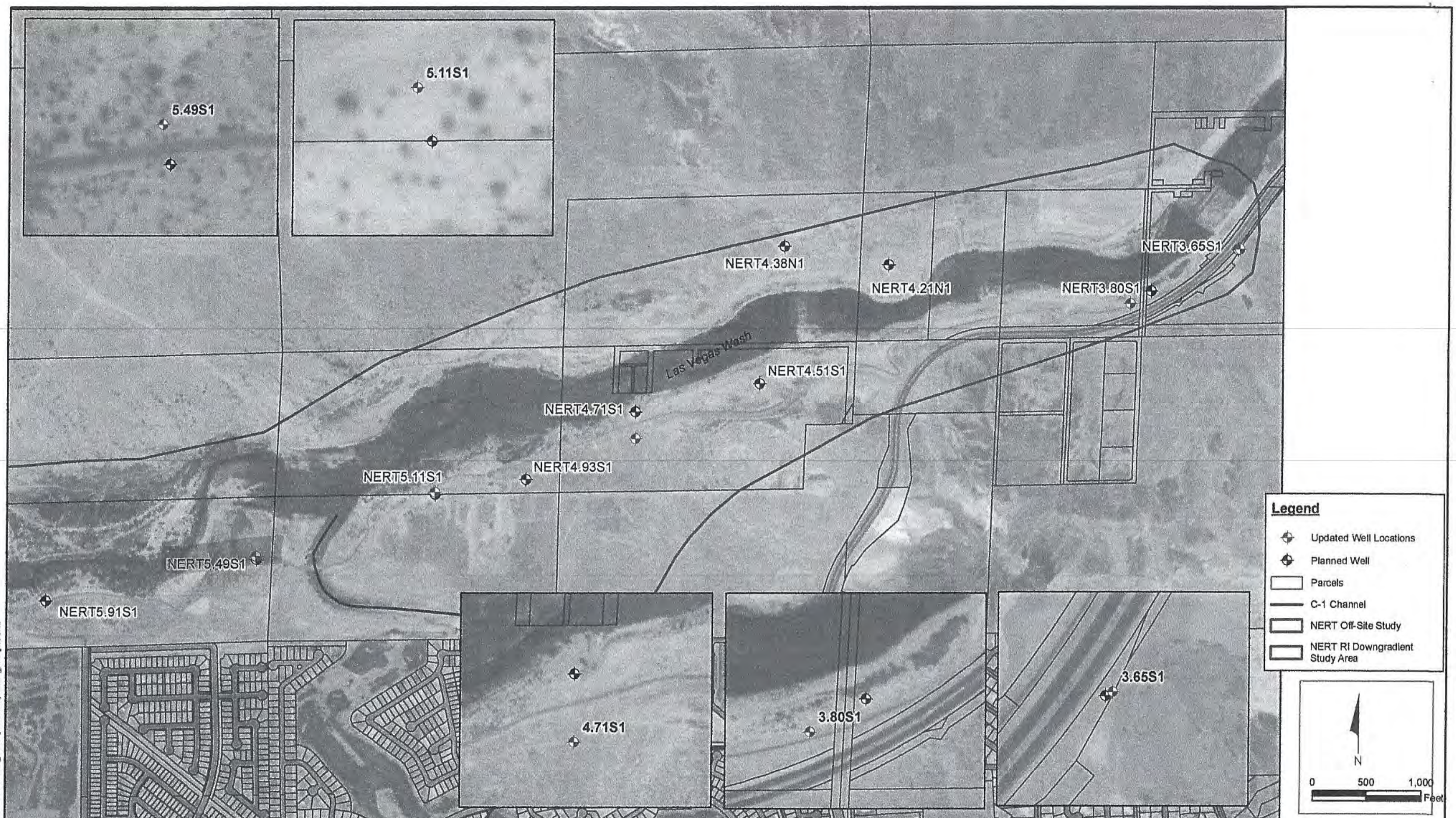
PAID

Bob Nix
Printed Name

Bob Nix
Signature

Jun-04-2018
Date

$120 PER QUARTER-QUARTER FILING FEE MUST ACCOMPANY THIS REQUEST



RAMBOLL

AECOM Phase I Investigation Updated Well Locations Wells

Phase 3 RI Work Plan Modification No. 2

Nevada Environmental Response Trust Site Henderson, Nevada

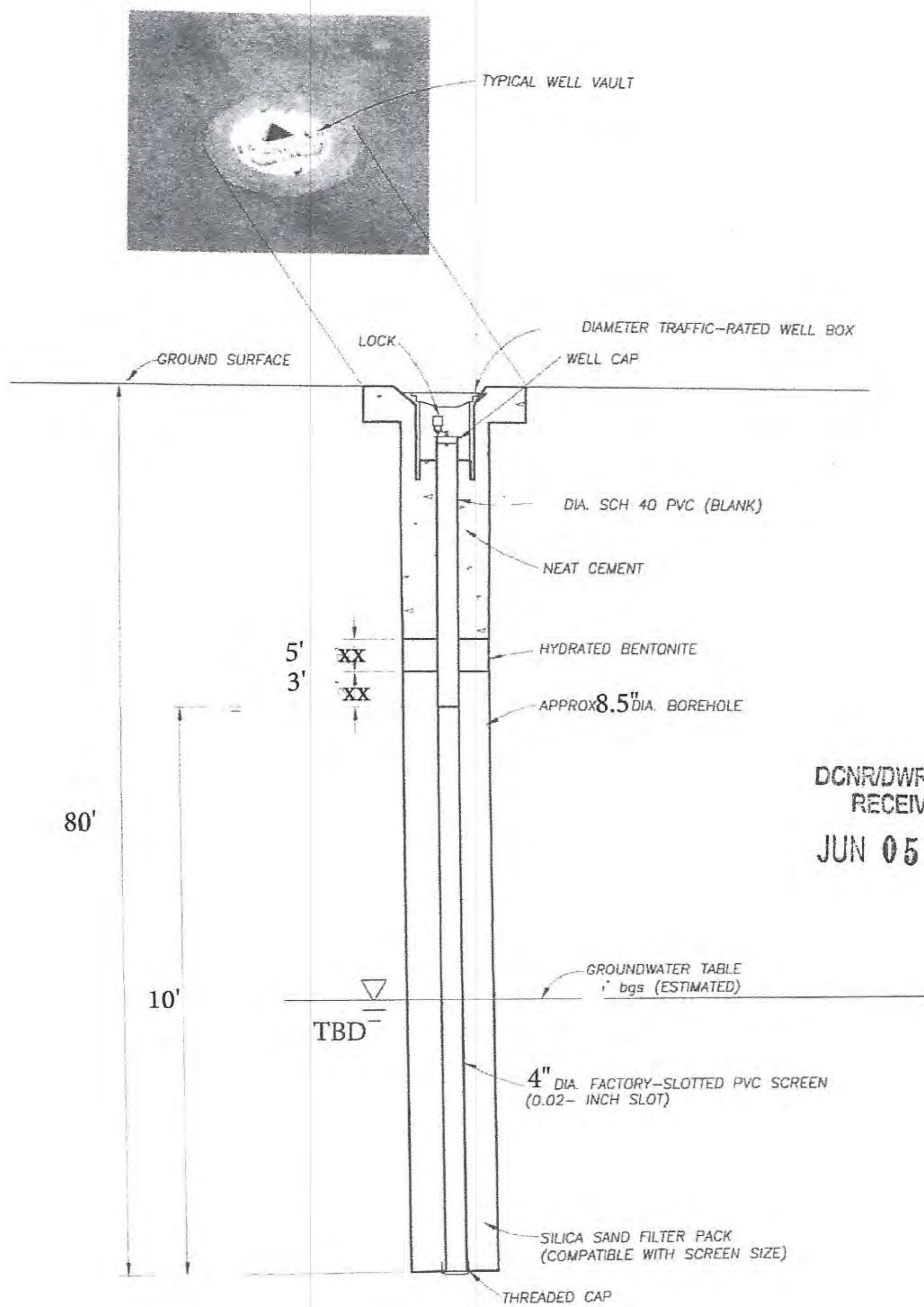
DRAFT

For Discussion Purposes Only

Figure

Drafter: RS | Date: 6/4/2018 | Contract Number: 169 000 6943-036 | Approved by: | Revised:


NERT 5.49S1
Write a description for your map.
Legend
36 05 27.87 -114 57 52.37
Feature 1
Feature 2
Feature 3
Feature 4
NV
36 05 17.37 -114 58 34.93
RECEIVED
JUN 05 2018
Google Earth
1000 ft
N



SCALE: NOT OT SCALE	REVISION
	A

Bob Nix DIG-ALERT # W815900626 JULY 6/2018 549S1

From: notification@usan.org
Sent: Thursday, June 7, 2018 7:20 AM
To: Gabe Miclette
Subject: USA North 811 Confirmation for Ticket X815800161-00X

EMLCFM 00317 USANX 06/07/18 07:20:00 X815800161-00X NORM NEW POLY LREQ

Message Number: X815800161 Rev: 00X Received by USAN at 07:14 on 06/07/18

Work Begins: 06/11/18 at 17:00 Notice: 020 hrs Priority: 2
Night Work: Weekend Work:

Expires: 07/05/18 at 23:59 Update By: 07/02/18 at 00:00

Caller: GABRIEL MICLETTE
Company: RAMBOLL
Address: 510 S. 4TH STREET
City: HENDERSON State: NV Zip: 89015
Business Tel: 510-655-7400 Fax:
Email Address: gmiclette@ramboll.com

Nature of Work: VERTICAL BORING FOR SOIL SAMPLES
Done for: NERT Explosives:
Foreman: GREG
Cell Tel: 510-655-7400
Area Premarked: Y Premark Method: WHITE PAINT
Permit Type: NO
Excavation Enters Into Street Or Sidewalk Area: N

Location:
Street Address: W BURKHOLDER BLVD
Cross Street: E RUSSELL RD

AT A POINT 1530 FEET WEST AND 900 NORTH OF THE INTERSECTION OF W BURKHOLDER BLVD AND E RUSSELL RD
COORDINATES: 3605'17.019" N, 11458'34.845" W

Place: HENDERSON County: CLARK State: NV

Long/Lat Long: -114.975616 Lat: 36.087654 Long: -114.976971 Lat: 36.088753

Comments:
5.49S1

Sent to:
BAWACO = BASIC WATER COMPANY
CTYHEN = CITY HENDERSON
SNVWTR = SO NEV WTR AUTHORITY
CENTE2 = CENTURYLINK
NENGSO = NV ENERGY
SWGLVE = SWGAS LAS VEGAS

5.9151

BRIAN SANDOVAL
GOVERNOR

STATE OF NEVADA

BRADLEY CROWELL
Director

JASON KING, P.E.
State Engineer

DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES
DIVISION OF WATER RESOURCES
400 Shadow Lane, Suite 201
Las Vegas, Nevada 89106
(702) 486-2770 · Fax (702) 486-2781
http://water.nv.gov

NOTICE OF INTENT CARD
REVIEW FORM

To: Bob Nix

Date: June 13, 2018

Facsimile No.: ______ or E-mail Address: bnix@cascade-env.com

This document was: ☑ E-mailed ☐ Faxed

NOI Card Number: 40481 ☑ **Approved** ☐ **Rejected** (See reasons below)

Work performed	missing	☐	invalid	☐
Proposed use of well	missing	☐	invalid	☐
Intended start date	missing	☐	invalid	☐
Waiver/Permit number if applicable	missing	☐	invalid	☐
Well location (legal description, GPS coordinates)	missing	☐	invalid	☐
Parcel number	missing	☐	invalid	☐
Address at well location	missing	☐	invalid	☐
Permit number	missing	☐	invalid	☐
Waiver number or NDEP Facility ID Number	missing	☐	invalid	☐
Address of Client	missing	☐	invalid	☐
Name of client/owner	missing	☐	invalid	☐
Contractor's license number	missing	☐	invalid	☐
Onsite well driller's license number	missing	☐	invalid	☐
Drilling company name/address	missing	☐	invalid	☐
Driller's signature	missing	☐	invalid	☐
Replacement well	Yes	☐	No	☑

If yes, existing well must be plugged at time the replacement well is drilled, pursuant to NAC 534.300 Replacement Well.

Instructions: Please note that you must provide a copy of the well driller's report for the installation of one (1) monitor well within 30 days of completion. If you have any questions, please do not hesitate to give our office a call.

Js

Person reviewing NOI Card: Christi Cooper, waiver issued by Tracy Geter

Date reviewed: June 11, 2018

BRIAN SANDOVAL
Governor

BRADLEY CROWELL
Director

STATE OF NEVADA

JASON KING, P.E.
State Engineer

JOHN GUILLORY, P.E.
Supervising Engineer

DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES
DIVISION OF WATER RESOURCES
SOUTHERN NEVADA BRANCH OFFICE

400 Shadow Lane, Suite 201
Las Vegas, Nevada 89106
(702) 486-2770 • Fax (702) 486-2781
http://water.nv.gov

June 13, 2018

MO-3505

Bob Nix
Operations Manager
Cascade Drilling, LP
4221 West Oquendo Road
Las Vegas, Nevada 89118

RE: Request for waiver to install one (1) temporary monitor well (NERT 5.91S1) to collect groundwater samples and analyze the samples as requested by Nevada Division of Environmental Protection (NDEP) Order Number 8-001721, located at 8850 East Russell Road, Clark County, Nevada, within the SW¼ of the SE¼ of Section 30, T.21S, R.63E (Lat: 36° 05' 13.397" N, Long: -114° 58' 58.424" W, NAD 83/ WGS 84), and within the Las Vegas Valley Basin (212).

Dear Mr. Nix:

As provided in Nevada Administrative Code (NAC) § 534.450 of the Regulation for Water Well and Related Drilling, permission is herewith **granted** to install one (1) temporary monitor well to assess water conditions as described in your request received June 5, 2018. Your statement ensuring Nevada Environmental Response Trust responsibility for abandonment of the well upon project completion was received in this office on June 5, 2018.

This office also waives the following regulations:

1) NAC § 534.4351 (1) (c). The purpose of this well is to collect groundwater samples and analyze the samples as requested by NDEP Order Number 8-001721, located at 8850 East Russell Road, Clark County, Nevada. The wellhead shall be protected from damage due to vandalism or sunlight. If polyvinyl chloride (PVC) casing is used, then the well must be completed with ASTM F-480 (Sch. 40 or heavier) well casing as provided in NAC § 534.362.

2) NAC 534.4357(1c) - "If water or vapors which are being monitored in a monitoring well are not encountered within 5 feet below the surface of the ground, the well driller shall place in the annual space of the well: From the seal placed pursuant to paragraph (b) to the surface, a seal, with a minimum thickness of 20 feet below the surface, consisting of cement grout, neat cement or concrete grout." Due to the shallow depth and large screen intervals of the proposed monitor well, you are allowed to install the sanitary seal as shown in your waiver request.

Glued casing joint connections will not be allowed. Full compliance with the remainder of the statute and regulation is required.

A plot map showing the actual location of the completed wells must be submitted upon completion of the drilling operations. Please include an accurate description of the location of the monitor well on the completion reports (GPS coordinates are required).

<u>The well driller's reports shall bear this waiver number: MO-3505</u>.

Authorization to drill under this waiver expires one (1) year from the date of this letter.

The well driller must have a copy of this waiver in possession at all times during drilling activities pertaining to this project. This well may only be pumped when necessary to obtain samples.

Please note that you must notify the Nevada Division of Environmental Protection (NDEP) for possible permitting requirements for groundwater or temporary surface discharge permits, which may include Underground Injection Control (UIC) or National Pollution Discharge Elimination System (NPDES) Permit Numbers. For more information regarding the permitting process with NDEP, please contact NDEP Water Pollution Control Department at (775) 687-4670.

The wells shall be plugged and abandoned, as provided by regulation, upon project completion. The current owner of Assessor's Parcel Number 160-30-000-003 is shown as United States of America (USA) by the records of the Clark County Assessor's office. This waiver does not imply or grant any land use agreements between USA and any land owners. It is expressly understood that this authorization does not relieve the operator of the requirements of any other state, federal or local agencies.

If you have any questions, please contact this office at 702-486-2770.

Sincerely,

Tracy Geter
Drilling Supervisor

cc: File
Carson City Office
Christi Cooper, SNBO Office
Jay A. Steinberg, President, Nevada Environmental Response Trust, Chicago, Illinois

NOI No. 40481
APN 160-30-000-003
NDEP Order No. 8-001721
For one, 4-inch Monitor Well

ORIGINAL
FILE WITH DIVISION OF
WATER RESOURCES

NOTICE OF INTENT

No. 40481

Today's Date: 6-4-18

Intended Start Date: 6-12-18

Well ID (if applicable): NERT 5.91S1

Type of Work to be Done: Drilling: ☑ Deepening: ☐ Reconditioning: ☐ Plugging: ☐

Is this a replacement well? Yes ☐ No ☐

If there is an existing well, what is the well log number?

Proposed use of well: Monitor

Diameter of well: 4 inches

Number of wells: 1

If this well is a domestic well, is it located within a water purveyor's service area? Yes ☐ No ☐ If yes, what is the DOM waiver:

If this is a monitor well required by another government agency, what is the facility ID number? 8-001721 Agency: NDEP

If this well is being completed under a waiver, please provide the corresponding waiver number:

If a water right is associated with this well, what is the permit number?

Location of the well by Public Land Survey: SW 1/4 SE 1/4 Sec. 30 T 21 N/S R 63 E

Latitude: 36°05'13.397"N

Longitude: 114°58'58.424"W

or

UTM E

UTM N

☐ NAD 27

☑ NAD 83/WGS 84

Address at well location:

Assessor Parcel Number: 160-30-000-003

County: Clark

Subdivision Name:

Name of Client: Nevada Environmental Response Trust

Address of Client: 35 East Wacker Dr #690 Chicago IL 60601-2314

Contractor's License Number: 0073966

On-Site Driller's License Number: 2512

Company Name and Address: Cascade Drilling LP 422 W. Oquendo Rd. Las Vegas NV 89118

Need Log Forms ☐

Need Intent Cards ☐

702-220-5811

Driller's Signature: Bob [signature]

(Rev. 1-14)

IN THE OFFICE OF THE STATE ENGINEER OF NEVADA

AFFIDAVIT OF INTENT
TO PLUG A MONITORING WELL

Notice of Intent # 40481

DCNR/DWR/SNBO
RECEIVED
JUN 05 2018

I, Nevada Environmental Response Trust (Trust) by and through Le Petomane XXVII Inc., — Name & Title

not individually but solely as Trustee of the Trust — Company

35 East Wacker Drive #690 — Address

Chicago, IL 60601-2314

312-505-2688 — Telephone Number

For well NERT5.91S1 - no additional wells included.

of the real property located at:

Street Address (if any) ______

County Assessor Parcel Number (APN) 160-30-000-003

Situated within the SW ¼ SE ¼ Section 30 T 21 S R 63 E, M.D.B. & M.

Latitude (N): 36°05'13.397" Longitude (W): 114°58'58.424" or UTM (m) E: ______ UTM (m) N: ______ Datum NAD83/WGS84

and whereupon one or more monitoring wells are located or to be located, fully understand that I shall be responsible for, and shall cause the wells to be plugged in accordance with the provisions contained in Nevada Administrative Code (NAC) 534.4365 and all other applicable rules and regulations for drilling/plugging wells in the State of Nevada, **not later than thirty days after the date when monitoring is no longer required.**

I shall further make any purchaser of this parcel aware of these conditions.

Responsible Party
(Printed Name): Jay Steinberg, President (Signature): Jay A Steinberg, not individually, but solely in his representative capacity as President of the Nevada Environmental Response Trust Trustee

WJ [illegible] but solely as Pres.

State of Tennessee

County of Williamson

Subscribed and sworn to before me on 5.31.18

by TODD W. Koller

T W. Kll
Signature of Notary Public Required

TODD W. KOLLER
STATE OF TENNESSEE NOTARY PUBLIC
COUNTY OF WILLIAMSON
Notary Seal

11-27-2021

Revised 12/14

IN THE OFFICE OF THE STATE ENGINEER OF THE STATE OF NEVADA
REQUEST FOR A WAIVER TO DRILL OBSERVATION OR MONITOR WELL(S)

The applicant and/or person or company responsible for drilling and plugging the temporary well(s):

Bob Nix	Operations Manager	Cascade Drilling LP
Name	Title	Company
4221 W. Oquendo Rd.	Las Vegas	NV 89118
Street Address or PO Box	City or Town	State and ZIP Code

Telephone number of responsible party: (702) 715-5811

Estimated project dates: Jun-12-2018 Start Date Jun-29-2018 Completion Date

Location of the well: **PLSS, GPS Coordinates and Map Datum are required.**
(If more than one well is to be installed for the same project, use the accompanying form to list each well.)

SW ¼ SE ¼ Section 30 T 21 S R 63 E, M.D.B. & M.

Latitude (N): 36*05'13.397"
Longitude (W): 114* 58'58.424
or
UTM (m) E:
UTM (m) N:

Datum NAD83/WGS84

County Assessor Parcel Number (APN): 160-30-000-003

Street Address (if any):

NDEP Order # (if any): 8-001721

Purpose and duration of well(s):

No Later the thirty days after the date when monitoring is no longer required

DCNR/DWR/SNBO
RECEIVED
JUN 05 2018

Also we need to waive NAC 534.4357 (1c) do to to potential impact of the installation on the surface completions and installation of the well that is to be installed we will be placing a 5' seal above the filter pack

If this waiver is an amendment or change to an original waiver, or if the property has other monitor wells installed, please give the original waiver number. M/O -

The following items must be submitted with the waiver request:

- **A schematic drawing of the typical monitor well construction**
- **Affidavit of Intent to Plug a Well (Listing all wells by well ID/Name) (Separate Affidavit for each ¼, ¼)**
- **Location Map (i.e., Large Scale, inch = miles)**
- **Site Detail Map (i.e., Small Scale, inch = feet)**

Signatory Contact Information:

(702) 715-5811
Telephone Number

4221 W Oquendo Rd.
Mailing Address

Las Vegas, NV 89118
City, State, ZIP Code

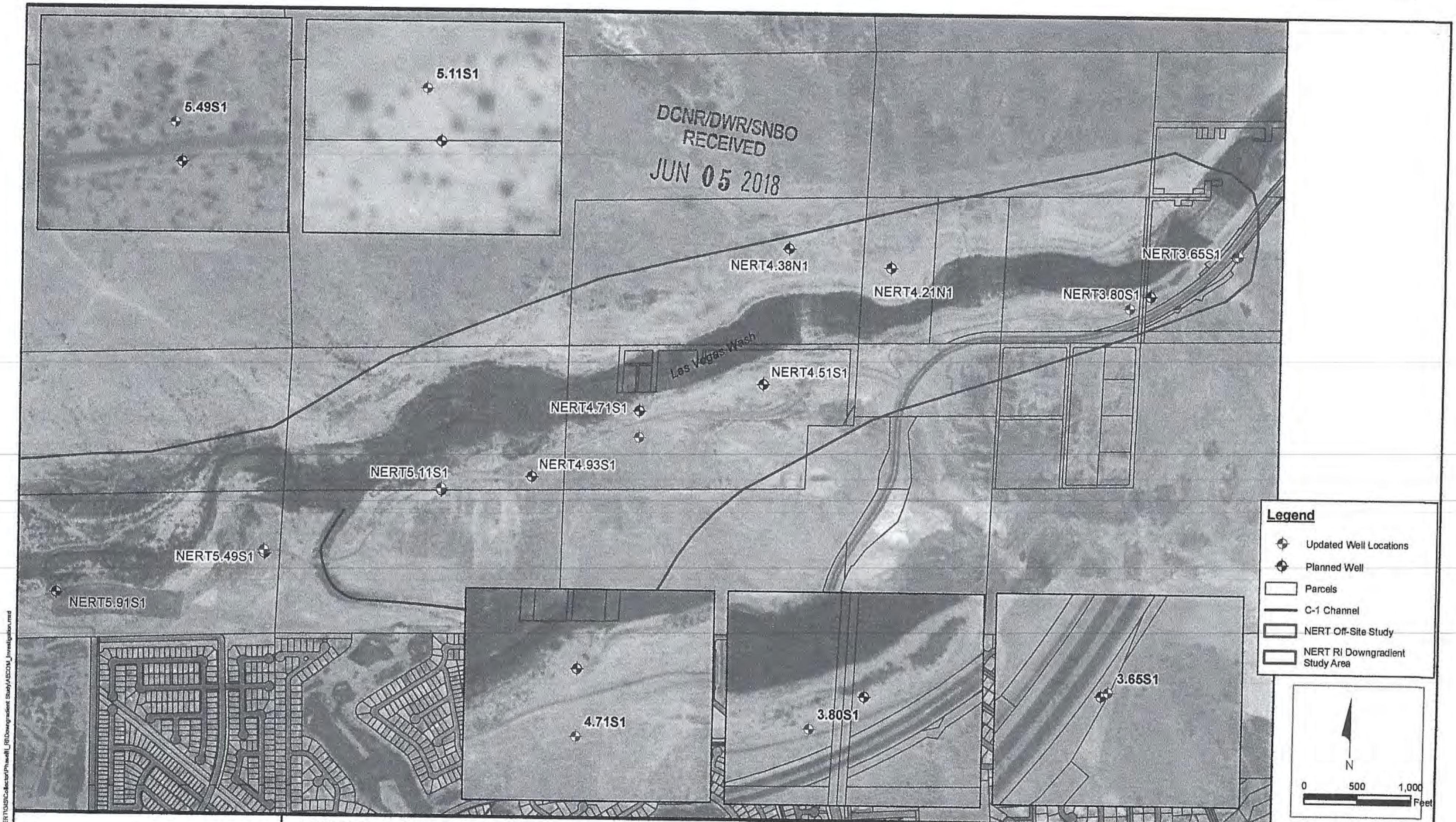
PAID

Bob Nix
Printed Name

Bob N
Signature

Jun-04-2018
Date

Rev 12/14 - waiver_mo *$120 PER QUARTER-QUARTER FILING FEE MUST ACCOMPANY THIS REQUEST*



RAMBOLL

AECOM Phase I Investigation Updated Well Locations Wells

Phase 3 RI Work Plan Modification No. 2
Nevada Environmental Response Trust Site Henderson, Nevada

DRAFT
For Discussion Purposes Only

Figure

Drafter: RS | Date: 6/4/2018 | Contract Number: 169 000 6943-036 | Approved by: | Revised:

From:	Gabe Miclette
To:	Bilodeau, Sally; Bob Nix
Cc:	Caceres-Schnell, Carmen; Piper, Sara; Ross E Russell; Neil A. Hale
Subject:	RE: 811 dig tickets for 5 of 10 Phase I wells
Date:	Thursday, May 31, 2018 12:53:28 PM
Attachments:	image004.jpg image005.png image001.png

Bob and Sally,

Below are the dig ticket and and corresponding well ids. Let me know if you need anything else!

Well ID #	Dig ticket number
NERT 4.93s1	**X815002979-00X**
NERT 5.11s1	**X815002989-00X**
NERT 3.80s1	**X815003007-00X**
NERT 4.51s1	**X815003009-00X**
NERT 4.71s1	**X815003012-00X**

Cheers,

Gabriel Miclette

D +1 510 420 2535
gmiclette@ramboll.com

Ramboll
2200 Powell Street
Suite 700
Emeryville, CA 94608
USA
www.ramboll.com

From: Bilodeau, Sally [mailto:Sally.Bilodeau@aecom.com]
Sent: Thursday, May 31, 2018 12:39 PM
To: Bob Nix <bnix@cascade-env.com>
Cc: Caceres-Schnell, Carmen <Carmen.Caceres-Schnell@aecom.com>; Piper, Sara <Sara.Piper@aecom.com>; Ross E Russell <rrussell@ramboll.com>; Gabe Miclette <GMiclette@ramboll.com>; Neil A. Hale <nhale@cascade-env.com>
Subject: RE: 811 dig tickets for 5 of 10 Phase I wells

Gabe,
Please give Bob the reference numbers thanks.

Sally Bilodeau, PG, CEM
AECOM Camarillo CA
D +1-805-764-4006
M +1-805-551-0649

Built to deliver a better world

From: Bob Nix [mailto:bnix@cascade-env.com]
Sent: Thursday, May 31, 2018 12:30 PM
To: Bilodeau, Sally
Cc: Caceres-Schnell, Carmen; Piper, Sara; Ross E Russell; Gabe Miclette; Neil A. Hale
Subject: RE: 811 dig tickets for 5 of 10 Phase I wells

Would you happen to have a reference Well ID # associated with these 5 Tickets?

BOB NIX OPERATIONS MANAGER
4221 West Oquendo Road
Las Vegas, NV 89118
P 702-220-8811 C 702-715-5811 | BNIX@CASCADE-ENV.COM
EXCELLENCE ON EVERY LEVEL™ WWW.CASCADE-ENV.COM
Please consider the environment before printing this e-mail
Cascade Drilling | Technical Services

From: Bilodeau, Sally [mailto:Sally.Bilodeau@aecom.com]
Sent: Thursday, May 31, 2018 9:51 AM
To: Bob Nix <bnix@cascade-env.com>
Cc: Caceres-Schnell, Carmen <Carmen.Caceres-Schnell@aecom.com>; Piper, Sara <Sara.Piper@aecom.com>; Ross E Russell <rrussell@ramboll.com>; Gabe Miclette <GMiclette@ramboll.com>
Subject: FW: 811 dig tickets for 5 of 10 Phase I wells

Bob,
I apologize if you already got these from Ramboll but attached are 5 of the 10 Dig Alert tickets for the upcoming drilling project by Las Vegas Wash in Henderson.
I am also including the current table for drilling and well completion details.
I'd like to discuss the need for a portable toilet on site when you have time, please email or call my cell.

Sally Bilodeau, PG, CEM
AECOM Camarillo CA

D +1-805-764-4006
M +1-805-551-0649

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From: Gabe Miclette [mailto:GMiclette@ramboll.com]
Sent: Wednesday, May 30, 2018 7:45 PM
To: Ross E Russell; Bilodeau, Sally
Subject: 811 dig tickets to start

Hi Ross and Sally,

Attached are 5 of the dig tickets for the downgradient locations NERT: 3.80s1, 4.51s1, 4.71s1, 4.93s1, and 5.11s1. Once the remaining locations are marked out and accessible, Ramboll will submit the remaining dig tickets. As you can see in the attachments, the tickets expire 6/27/18. Have a great rest of the evening.

Cheers,

Gabriel Miclette

D +1 510 420 2535
gmiclette@ramboll.com

Ramboll
2200 Powell Street
Suite 700
Emeryville, CA 94608
USA
www.ramboll.com

From: Gabe Miclette
To: Bilodeau, Sally
Cc: Caceres-Schnell, Carmen; Piper, Sara; Ross E Russell; Neil A. Hale; Bob Nix
Subject: RE: 811 dig tickets for the remaining 5 of 10 Phase I wells
Date: Thursday, June 07, 2018 7:57:55 AM
Attachments: image002.png
image003.png
image004.jpg
image005.png

Well ID #		Dig ticket number	
NERT	5.91s1	**X815800149-00X**	7/5/2018
NERT	5.49s1	**X815800161-00X**	7/5/2018
NERT	3.65s1	**X815800174-00X**	7/5/2018
NERT	4.38s1	**X815800203-00X**	7/5/2018
NERT	4.21s1	**X815800221-00X**	7/5/2018

Cheers,

Gabriel Miclette

D +1 510 420 2535
gmiclette@ramboll.com

Ramboll
2200 Powell Street
Suite 700
Emeryville, CA 94608
USA
www.ramboll.com

From: Gabe Miclette
Sent: Thursday, June 07, 2018 7:56 AM
To: 'Bilodeau, Sally' <Sally.Bilodeau@aecom.com>
Cc: 'Caceres-Schnell, Carmen' <Carmen.Caceres-Schnell@aecom.com>; 'Piper, Sara' <Sara.Piper@aecom.com>; Ross E Russell <rrussell@ramboll.com>; 'Neil A. Hale' <nhale@cascade-env.com>; Bob Nix <bnix@cascade-env.com>
Subject: 811 dig tickets for the remaining 5 of 10 Phase I wells

Hi all,

Attached is the remaining dig tickets for the Downgradient Phase 1 wells. Let me know if you have any questions.

Cheers,

Gabriel Miclette

D +1 510 420 2535
gmiclette@ramboll.com

Ramboll
2200 Powell Street
Suite 700
Emeryville, CA 94608
USA
www.ramboll.com

From: Gabe Miclette
Sent: Thursday, May 31, 2018 12:53 PM
To: 'Bilodeau, Sally' <Sally.Bilodeau@aecom.com>; Bob Nix <bnix@cascade-env.com>
Cc: Caceres-Schnell, Carmen <Carmen.Caceres-Schnell@aecom.com>; Piper, Sara <Sara.Piper@aecom.com>; Ross E Russell <rrussell@ramboll.com>; Neil A. Hale <nhale@cascade-env.com>
Subject: RE: 811 dig tickets for 5 of 10 Phase I wells

Bob and Sally,

Below are the dig ticket and and corresponding well ids. Let me know if you need anything else!

Well ID #		Dig ticket number
NERT	4.93s1	**X815002979-00X**
NERT	5.11s1	**X815002989-00X**
NERT	3.80s1	**X815003007-00X**
NERT	4.51s1	**X815003009-00X**
NERT	4.71s1	**X815003012-00X**

Cheers,

Gabriel Miclette

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Cc: Caceres-Schnell, Carmen <Carmen.Caceres-Schnell@aecom.com>; Piper, Sara <Sara.Piper@aecom.com>; Ross E Russell <rrussell@ramboll.com>; Gabe Miclette <GMiclette@ramboll.com>; Neil A. Hale <nhale@cascade-env.com>
Subject: RE: 811 dig tickets for 5 of 10 Phase I wells

Gabe,
Please give Bob the reference numbers thanks.

Sally Bilodeau, PG, CEM
AECOM Camarillo CA
D +1-805-764-4006
M +1-805-551-0649

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From: Bob Nix [mailto:bnix@cascade-env.com]
Sent: Thursday, May 31, 2018 12:30 PM
To: Bilodeau, Sally
Cc: Caceres-Schnell, Carmen; Piper, Sara; Ross E Russell; Gabe Miclette; Neil A. Hale
Subject: RE: 811 dig tickets for 5 of 10 Phase I wells

Would you happen to have a reference Well ID # associated with these 5 Tickets?

BOB NIX OPERATIONS MANAGER
4221 West Oquendo Road
Las Vegas, NV 89118
P 702-220-8811 C 702-715-5811 | BNIX@CASCADE-ENV.COM
EXCELLENCE ON EVERY LEVEL™ WWW.CASCADE-ENV.COM

Please consider the environment before printing this e-mail

Cascade Drilling | Technical Services

From: Bilodeau, Sally [mailto:Sally.Bilodeau@aecom.com]
Sent: Thursday, May 31, 2018 9:51 AM
To: Bob Nix <bnix@cascade-env.com>
Cc: Caceres-Schnell, Carmen <Carmen.Caceres-Schnell@aecom.com>; Piper, Sara <Sara.Piper@aecom.com>; Ross E Russell <rrussell@ramboll.com>; Gabe Miclette <GMiclette@ramboll.com>
Subject: FW: 811 dig tickets for 5 of 10 Phase I wells

Bob,
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I am also including the current table for drilling and well completion details.
I'd like to discuss the need for a portable toilet on site when you have time, please email or call my cell.

Sally Bilodeau, PG, CEM
AECOM Camarillo CA
D +1-805-764-4006
M +1-805-551-0649

Built to deliver a better world

From: Gabe Miclette [mailto:GMiclette@ramboll.com]
Sent: Wednesday, May 30, 2018 7:45 PM
To: Ross E Russell; Bilodeau, Sally
Subject: 811 dig tickets to start

Hi Ross and Sally,

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Cheers,

Gabriel Miclette

D +1 510 420 2535
gmiclette@ramboll.com

Ramboll
2200 Powell Street

Suite 700
Emeryville, CA 94608
USA
www.ramboll.com

From: notification@usan.org
To: Gabe Miclette
Subject: USA North 811 Confirmation for Ticket X815002979-00X
Date: Wednesday, May 30, 2018 6:59:17 PM

```
EMLCFM 04170 USANX 05/30/18 18:59:14 X815002979-00X NORM NEW POLY LREQ

Message Number: X815002979 Rev: 00X Received by USAN at 18:57 on 05/30/18

Work Begins:    06/04/18 at 17:00   Notice: 030 hrs      Priority: 2
Night Work:     Weekend Work:

Expires: 06/27/18 at 23:59   Update By:    06/25/18 at 00:00

Caller:         GABRIEL MICLETTE
Company:        RAMBOLL
Address:        510 S. 4TH STREET
City:           HENDERSON                     State: NV Zip: 89015
Business Tel:   510-655-7400                  Fax:
Email Address:  gmiclette@ramboll.com

Nature of Work: VERTICAL BORING FOR SOIL SAMPLES
Done for:       NERT                          Explosives:
Foreman:        GREG
Cell Tel:       602-734-7711
Area Premarked: Y   Premark Method: WHITE PAINT
Permit Type:    NO
Excavation Enters Into Street Or Sidewalk Area: N

Location:
Street Address: E RUSSELL RD
  Cross Street: MCCORMICK RD

AT A POINT 2720 FEET EAST AND 1520 NORTH OF THE INTERSECTION OF E RUSSELL RD
AND
MCCORMICK RD
COORDINATES: 36 05' 24.152" N, 114 58' 04.605" W

Place: HENDERSON                    County: CLARK                State: NV

Long/Lat Long: -114.966859 Lat:  36.089603 Long: -114.968248 Lat:  36.090829

Comments:
FOR 4.93S1

Sent to:
BAWACO = BASIC WATER COMPANY          CENTE2 = CENTURYLINK
CTYHEN = CITY HENDERSON               NENGSO = NV ENERGY
SWGLVE = SWGAS LAS VEGAS
```

From: notification@usan.org
To: Gabe Miclette
Subject: USA North 811 Confirmation for Ticket X815002989-00X
Date: Wednesday, May 30, 2018 7:04:09 PM

```
EMLCFM 04180 USANX 05/30/18 19:04:06 X815002989-00X NORM NEW POLY LREQ

Message Number: X815002989 Rev: 00X Received by USAN at 19:00 on 05/30/18

Work Begins:    06/04/18 at 17:00   Notice: 030 hrs      Priority: 2
Night Work:     Weekend Work:

Expires: 06/27/18 at 23:59   Update By:    06/25/18 at 00:00

Caller:         GABRIEL MICLETTE
Company:        RAMBOLL
Address:        510 S. 4TH STREET
City:           HENDERSON                     State: NV Zip: 89015
Business Tel:   510-655-7400                  Fax:
Email Address:  gmiclette@ramboll.com

Nature of Work: VERTICAL BORING FOR SOIL SAMPLES
Done for:       NERT                          Explosives:
Foreman:        GREG
Cell Tel:       602-734-7711
Area Premarked: Y   Premark Method: WHITE PAINT
Permit Type:    NO
Excavation Enters Into Street Or Sidewalk Area: N

Location:
Street Address: E RUSSELL RD
  Cross Street: MCCORMICK RD

AT A POINT 2045 FEET EAST AND 1500 NORTH OF THE INTERSECTION OF E RUSSELL RD
AND
MCCORMICK RD
COORDINATES: 3605'23.000" N, 11458'14.821" W

Place: HENDERSON                    County: CLARK                State: NV

Long/Lat Long: -114.969712 Lat:  36.089026 Long: -114.971066 Lat:  36.090125

Comments:
FOR 5.11S1

Sent to:
BAWACO = BASIC WATER COMPANY          CENTE2 = CENTURYLINK
CTYHEN = CITY HENDERSON               NENGSO = NV ENERGY
SWGLVE = SWGAS LAS VEGAS
```

From: notification@usan.org
To: Gabe Miclette
Subject: USA North 811 Confirmation for Ticket X815003007-00X
Date: Wednesday, May 30, 2018 7:14:36 PM

```
EMLCFM 04193 USANX 05/30/18 19:14:31 X815003007-00X NORM NEW POLY LREQ

Message Number: X815003007 Rev: 00X Received by USAN at 19:04 on 05/30/18

Work Begins:    06/04/18 at 17:00   Notice: 030 hrs      Priority: 2
Night Work:     Weekend Work:

Expires: 06/27/18 at 23:59   Update By:    06/25/18 at 00:00

Caller:         GABRIEL MICLETTE
Company:        RAMBOLL
Address:        510 S. 4TH STREET
City:           HENDERSON                     State: NV Zip: 89015
Business Tel:   510-655-7400                  Fax:
Email Address:  gmiclette@ramboll.com

Nature of Work: VERTICAL BORING FOR SOIL SAMPLES
Done for:       NERT                          Explosives:
Foreman:        GREG
Cell Tel:       602-734-7711
Area Premarked: Y   Premark Method: WHITE PAINT
Permit Type:    NO
Excavation Enters Into Street Or Sidewalk Area: N

Location:
Street Address: OLSEN ST
  Cross Street: CALICO RIDGE DR

AT A POINT 3050 FEET EAST AND 3555 NORTH OF THE INTERSECTION OF CALICO RIDGE
DR
AND OLSEN ST
COORDINATES: 3605'40.954" N, 11456'54.439" W

Place: HENDERSON                    County: CLARK                State: NV

Long/Lat Long: -114.947533 Lat:  36.094157 Long: -114.948888 Lat:  36.095256

Comments:
FOR 3.80S1

Sent to:
BAWACO = BASIC WATER COMPANY          CENTE2 = CENTURYLINK
CTYHEN = CITY HENDERSON               NENGSO = NV ENERGY
SWGLVE = SWGAS LAS VEGAS
```

From: notification@usan.org
To: Gabe Miclette
Subject: USA North 811 Confirmation for Ticket X815003009-00X
Date: Wednesday, May 30, 2018 7:19:35 PM

```
EMLCFM 04197 USANX 05/30/18 19:19:30 X815003009-00X NORM NEW POLY LREQ

Message Number: X815003009 Rev: 00X Received by USAN at 19:15 on 05/30/18

Work Begins:    06/04/18 at 17:00   Notice: 030 hrs      Priority: 2
Night Work:     Weekend Work:

Expires: 06/27/18 at 23:59   Update By:    06/25/18 at 00:00

Caller:         GABRIEL MICLETTE
Company:        RAMBOLL
Address:        510 S. 4TH STREET
City:           HENDERSON                    State: NV Zip: 89015
Business Tel:   510-655-7400                 Fax:
Email Address:  gmiclette@ramboll.com

Nature of Work: VERTICAL BORING FOR SOIL SAMPLES
Done for:       NERT                         Explosives:
Foreman:        GREG
Cell Tel:       602-734-7711
Area Premarked: Y   Premark Method: WHITE PAINT
Permit Type:    NO
Excavation Enters Into Street Or Sidewalk Area: N

Location:
Street Address: OLSEN ST
  Cross Street: CALICO RIDGE DR

AT A POINT 737 FEET WEST AND 2770 NORTH OF THE INTERSECTION OF CALICO RIDGE
DR
AND OLSEN ST
COORDINATES: 3605'32.770" N, 11457'38.384" W

Place: HENDERSON                   County: CLARK                State: NV

Long/Lat Long: -114.959927 Lat:  36.091919 Long: -114.961281 Lat:  36.093018

Comments:
FOR 4.51S1

Sent to:
BAWACO = BASIC WATER COMPANY          CENTE2 = CENTURYLINK
NENGSO = NV ENERGY                    SWGLVE = SWGAS LAS VEGAS
```

From: notification@usan.org
To: Gabe Miclette
Subject: USA North 811 Confirmation for Ticket X815003012-00X
Date: Wednesday, May 30, 2018 7:24:15 PM

```
EMLCFM 04201 USANX 05/30/18 19:24:11 X815003012-00X NORM NEW POLY LREQ

Message Number: X815003012 Rev: 00X Received by USAN at 19:20 on 05/30/18

Work Begins:    06/04/18 at 17:00   Notice: 030 hrs      Priority: 2
Night Work:     Weekend Work:

Expires: 06/27/18 at 23:59   Update By:    06/25/18 at 00:00

Caller:         GABRIEL MICLETTE
Company:        RAMBOLL
Address:        510 S. 4TH STREET
City:           HENDERSON                     State: NV Zip: 89015
Business Tel:   510-655-7400                  Fax:
Email Address:  gmiclette@ramboll.com

Nature of Work: VERTICAL BORING FOR SOIL SAMPLES
Done for:       NERT                          Explosives:
Foreman:        GREG
Cell Tel:       602-734-7711
Area Premarked: Y   Premark Method: WHITE PAINT
Permit Type:    NO
Excavation Enters Into Street Or Sidewalk Area: N

Location:
Street Address: OLSEN ST
  Cross Street: CALICO RIDGE DR

AT A POINT 1850 FEET WEST AND 2500 NORTH OF THE INTERSECTION OF CALICO RIDGE
DR
AND OLSEN ST
COORDINATES: 3605'30.267" N, 11457'52.354" W

Place: HENDERSON                    County: CLARK                State: NV

Long/Lat Long: -114.963900 Lat:  36.091236 Long: -114.965254 Lat:  36.092336

Comments:
FOR 4.71S1

Sent to:
BAWACO = BASIC WATER COMPANY          CENTE2 = CENTURYLINK
CTYHEN = CITY HENDERSON               NENGSO = NV ENERGY
SWGLVE = SWGAS LAS VEGAS
```

From: notification@usan.org
To: Gabe Miclette
Subject: USA North 811 Confirmation for Ticket X815800149-00X
Date: Thursday, June 07, 2018 7:14:17 AM

```
EMLCFM 00284 USANX 06/07/18 07:14:10 X815800149-00X NORM NEW POLY LREQ

Message Number: X815800149 Rev: 00X Received by USAN at 07:02 on 06/07/18

Work Begins:    06/11/18 at 17:00   Notice: 020 hrs      Priority: 2
Night Work:     Weekend Work:

Expires: 07/05/18 at 23:59   Update By:    07/02/18 at 00:00

Caller:         GABRIEL MICLETTE
Company:        RAMBOLL
Address:        510 S. 4TH STREET
City:           HENDERSON                     State: NV Zip: 89015
Business Tel:   510-655-7400                  Fax:
Email Address:  gmiclette@ramboll.com

Nature of Work: VERTICAL BORING FOR SOIL SAMPLES
Done for:       NERT                          Explosives:
Foreman:        GREG
Cell Tel:       510-655-7400
Area Premarked: Y   Premark Method: WHITE PAINT
Permit Type:    NO
Excavation Enters Into Street Or Sidewalk Area: N

Location:
Street Address: W BURKHOLDER BLVD
  Cross Street: E RUSSELL RD

AT A POINT 370 FEET WEST AND 480 NORTH OF THE INTERSECTION OF W BURKHOLDER
BLVD
AND E RUSSELL RD
COORDINATES:3605'13.397 N  11458'58.424 W

Place: HENDERSON                    County: CLARK                State: NV

Long/Lat Long: -114.981977 Lat:  36.086679 Long: -114.983331 Lat:  36.087778

Comments:
FOR 5.91S1

Sent to:
BAWACO = BASIC WATER COMPANY          CENTE2 = CENTURYLINK
COXLVE = COX COMM LAS VEGAS           CTYHEN = CITY HENDERSON
NENGSO = NV ENERGY                    SWGLVE = SWGAS LAS VEGAS
```

From: notification@usan.org
To: Gabe Miclette
Subject: USA North 811 Confirmation for Ticket X815800161-00X
Date: Thursday, June 07, 2018 7:20:07 AM

```
EMLCFM 00317 USANX 06/07/18 07:20:00 X815800161-00X NORM NEW POLY LREQ

Message Number: X815800161 Rev: 00X Received by USAN at 07:14 on 06/07/18

Work Begins:    06/11/18 at 17:00   Notice: 020 hrs      Priority: 2
Night Work:     Weekend Work:

Expires: 07/05/18 at 23:59   Update By:    07/02/18 at 00:00

Caller:         GABRIEL MICLETTE
Company:        RAMBOLL
Address:        510 S. 4TH STREET
City:           HENDERSON                    State: NV Zip: 89015
Business Tel:   510-655-7400                 Fax:
Email Address:  gmiclette@ramboll.com

Nature of Work: VERTICAL BORING FOR SOIL SAMPLES
Done for:       NERT                         Explosives:
Foreman:        GREG
Cell Tel:       510-655-7400
Area Premarked: Y   Premark Method: WHITE PAINT
Permit Type:    NO
Excavation Enters Into Street Or Sidewalk Area: N

Location:
Street Address: W BURKHOLDER BLVD
  Cross Street: E RUSSELL RD

AT A POINT 1530 FEET WEST AND 900 NORTH OF THE INTERSECTION OF W BURKHOLDER
BLVD
AND E RUSSELL RD
COORDINATES: 3605'17.019" N, 11458'34.845" W

Place: HENDERSON                    County: CLARK                State: NV

Long/Lat Long: -114.975616 Lat:  36.087654 Long: -114.976971 Lat:  36.088753

Comments:
5.49S1

Sent to:
BAWACO = BASIC WATER COMPANY          CENTE2 = CENTURYLINK
CTYHEN = CITY HENDERSON               NENGSO = NV ENERGY
SNVWTR = SO NEV WTR AUTHORITY         SWGLVE = SWGAS LAS VEGAS
```

From: notification@usan.org
To: Gabe Miclette
Subject: USA North 811 Confirmation for Ticket X815800174-00X
Date: Thursday, June 07, 2018 7:29:58 AM

```
EMLCFM 00345 USANX 06/07/18 07:29:52 X815800174-00X NORM NEW POLY LREQ

Message Number: X815800174 Rev: 00X Received by USAN at 07:20 on 06/07/18

Work Begins:    06/11/18 at 17:00   Notice: 020 hrs      Priority: 2
Night Work:     Weekend Work:

Expires: 07/05/18 at 23:59   Update By:    07/02/18 at 00:00

Caller:         GABRIEL MICLETTE
Company:        RAMBOLL
Address:        510 S. 4TH STREET
City:           HENDERSON                     State: NV Zip: 89015
Business Tel:   510-655-7400                  Fax:
Email Address:  gmiclette@ramboll.com

Nature of Work: VERTICAL BORING FOR SOIL SAMPLES
Done for:       NERT                          Explosives:
Foreman:        GREG
Cell Tel:       510-655-7400
Area Premarked: Y   Premark Method: WHITE PAINT
Permit Type:    NO
Excavation Enters Into Street Or Sidewalk Area: N

Location:
Street Address: OLSEN ST
  Cross Street: CALICO RIDGE DR

AT A POINT 3610 FEET EAST AND 4050 FEET NORTH OF THE INTERSECTION OF CALICO
RIDGE DR AND OLSEN ST
COORDINATES: 3605'44.659" N, 11456'44.600" W

Place: HENDERSON                    County: CLARK                State: NV

Long/Lat Long: -114.945174 Lat:  36.094732 Long: -114.946528 Lat:  36.095832

Comments:
FOR 3.65S1

Sent to:
BAWACO = BASIC WATER COMPANY          CENTE2 = CENTURYLINK
CTYHEN = CITY HENDERSON               NENGSO = NV ENERGY
SWGLVE = SWGAS LAS VEGAS
```

From: notification@usan.org
To: Gabe Miclette
Subject: USA North 811 Confirmation for Ticket X815800203-00X
Date: Thursday, June 07, 2018 7:43:28 AM

```
EMLCFM 00408 USANX 06/07/18 07:43:22 X815800203-00X NORM NEW POLY LREQ

Message Number: X815800203 Rev: 00X Received by USAN at 07:29 on 06/07/18

Work Begins:    06/11/18 at 17:00   Notice: 020 hrs      Priority: 2
Night Work:     Weekend Work:

Expires: 07/05/18 at 23:59   Update By:    07/02/18 at 00:00

Caller:         GABRIEL MICLETTE
Company:        RAMBOLL
Address:        510 S. 4TH STREET
City:           HENDERSON                     State: NV Zip: 89015
Business Tel:   510-655-7400                  Fax:
Email Address:  gmiclette@ramboll.com

Nature of Work: VERTICAL BORING FOR SOIL SAMPLES
Done for:       NERT                          Explosives:
Foreman:        GREG
Cell Tel:       510-655-7400
Area Premarked: Y   Premark Method: WHITE PAINT
Permit Type:    NO
Excavation Enters Into Street Or Sidewalk Area: N

Location:
Street Address: OLSEN ST
  Cross Street: CALICO RIDGE DR

AT A POINT 395 FEET WEST AND 4000 NORTH OF THE INTERSECTION OF CALICO RIDGE
DR
AND OLSEN ST
COORDINATES: 3605'45.246" N, 11457'35.591" W

Place: HENDERSON                    County: CLARK                State: NV

Long/Lat Long: -114.959130 Lat:  36.095587 Long: -114.960485 Lat:  36.096686

Comments:
FOR 4.38S1

Sent to:
BAWACO = BASIC WATER COMPANY          CENTE2 = CENTURYLINK
NENGSO = NV ENERGY                    SNVWTR = SO NEV WTR AUTHORITY
SWGLVE = SWGAS LAS VEGAS
```

From:	notification@usan.org
To:	Gabe Miclette
Subject:	USA North 811 Confirmation for Ticket X815800221-00X
Date:	Thursday, June 07, 2018 7:48:24 AM

```
EMLCFM 00444 USANX 06/07/18 07:48:18 X815800221-00X NORM NEW POLY LREQ

Message Number: X815800221 Rev: 00X Received by USAN at 07:43 on 06/07/18

Work Begins:    06/11/18 at 17:00   Notice: 020 hrs      Priority: 2
Night Work:     Weekend Work:

Expires: 07/05/18 at 23:59   Update By:    07/02/18 at 00:00

Caller:         GABRIEL MICLETTE
Company:        RAMBOLL
Address:        510 S. 4TH STREET
City:           HENDERSON                     State: NV Zip: 89015
Business Tel:   510-655-7400                  Fax:
Email Address:  gmiclette@ramboll.com

Nature of Work: VERTICAL BORING FOR SOIL SAMPLES
Done for:       NERT                          Explosives:
Foreman:        GREG
Cell Tel:       510-655-7400
Area Premarked: Y   Premark Method: WHITE PAINT
Permit Type:    NO
Excavation Enters Into Street Or Sidewalk Area: N

Location:
Street Address: OLSEN ST
  Cross Street: CALICO RIDGE DR

AT A POINT 430 FEET EAST AND 3710 NORTH OF THE INTERSECTION OF CALICO RIDGE
DR
AND OLSEN ST
COORDINATES: 3605'43.479" N, 11457'23.950" W

Place: HENDERSON                    County: CLARK                State: NV

Long/Lat Long: -114.956156 Lat:  36.094766 Long: -114.957511 Lat:  36.095866

Comments:
FOR 4.21S1

Sent to:
BAWACO = BASIC WATER COMPANY           CENTE2 = CENTURYLINK
NENGSO = NV ENERGY                     SWGLVE = SWGAS LAS VEGAS
```

Appendix C

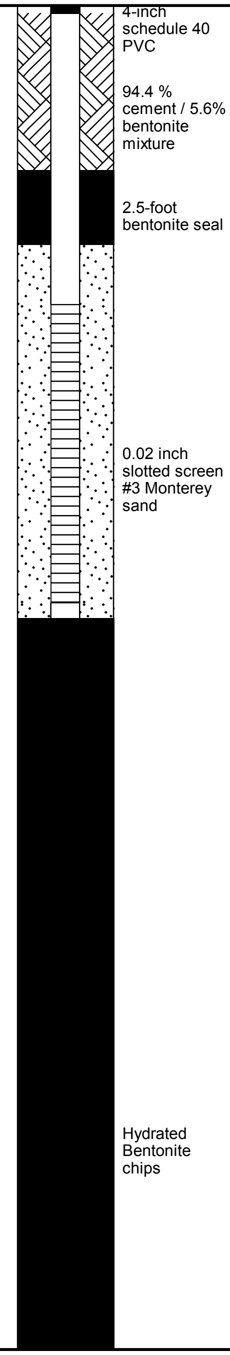
Boring Logs and Well Construction Diagrams

AECOM AECOM 1220 Avenida Acaso Camarillo, CA 93012 805-388-3775	*Client:* NDEP *Project Number:* 60477365 *Site Description/Location:* Las Vegas Wash, Henderson, NV, *Coordinates:* 26736780.1 N 843700.76 E *Elevation:* 1460.5 FT *Datum:* *Drilling Equipment/Method:* /Sonic *Weather:* Sunny, hot, dry *Sample Type(s):* From Cores *Boring Diameter:* 8 IN.	**Boring No. NERT 3.80S1** *Ambient PID Reading:* NA *Sheet:* 1 *of* 2 *Monitoring Well Installed:* Yes *Screened Interval:*

Approved By: S. Bilodeau	*Logged By:* S. Piper	*Date/Time Started:* 06-27-18	*Depth of Boring:* 55 FT BGS
Drilling Contractor: Cascade Drilling	*Backfill:*	*Date/Time Finished:* 06-28-18	*Water Level:* 10.67 FT BGS

DEPTH (ft)	Sample ID	Sample Depth (ft)	Blows per 6"/RQD	Recovery (ft)	Headspace (ppm)	USCS	Graphic Log	MATERIAL IDENTIFICATION, color, description of fine grained material (silt and clay) description of coarse grained material (sand and gravel), structural or mineralogical features, density or stiffness, moisture content, odors or staining.
0–5								, hand auguered to refusal, no recovery to 5'
5–10	NERT 3.80S1 10 20180627 1330			1		SP-SM		GRAVELLY SAND TO GRAVELLY SILTY SAND, light yellowish brown (10 YR 6/4), 5% non plastic fines, 60% fine grained, angular sand, 35% fine grained, angular gravel with cobbles up to 8 inches in diameter, soft, moist -@10' gravel decreases to 20%, color change to brown (10YR 4/3), difficult drilling -@10' PTS (SM) silty sand with gravel
10–15	NERT 3.80S1 12 20180627 1340			1		SP		GRAVELLY SAND, light reddish brown (5YR 6/3), fine sand and gravel, soft, wet -@12' PTS (CL-ML) silty lean clay with gravel
15–20	NERT 3.80S1 15 20180627 1345			1		SC-SM		SILTY SAND TO CLAYEY SAND, dusky red (2.5YR 4/4), 40% low to high plastic fines, 60% fine grained sand, contains cemented fragments, dense, moist -@15' PTS (SP) poorly graded sand with gravel
25						SC-SM		MUDDY CREEK FORMATION, light greenish grey (5GY 7/1), difficult drilling -@23.5' color returns to dusky red (2.5YR 4/4) -@26' sand content increases, fines are non-plastic and material is wet -@27.5' Silty sand to clayey sand (SM-SC), dark yellowish brown (10YR 3/4), fines are low to high plasticity, sand is fine grained, material is dense, moist
30–35	NERT 3.80S1 35 20180627 1500			1		SM		THUMB FORMATION, dark yellowish brown (10 YR 3/4, silty sandstone, some clay lenses present, material has very dense fragments (lithified siltstone) -@33.5' color change to dusky red (2.5 YR 4/4), 40% non-plastic fines, 60% fine sand, cobbles up to 4 inches in diameter -@35' some clay lenses present -@35' PTS (CL) sandy lean clay with gravel
40								
45								

Well Diagram



Notes:

AECOM AECOM 1220 Avenida Acaso Camarillo, CA 93012 805-388-3775	*Client:* NDEP		**Boring No. NERT 3.80S1**
	Project Number: 60477365		
	Site Description/Location: Las Vegas Wash, Henderson, NV,		*Ambient PID Reading:* NA
	Coordinates: 26736780.1 N 843700.76 E	*Elevation:* 1460.5 FT *Datum:*	*Sheet:* 2 *of* 2
	Drilling Equipment/Method: /Sonic	*Weather:* Sunny, hot, dry	*Monitoring Well Installed:* Yes
	Sample Type(s): From Cores	*Boring Diameter:* 8 IN.	*Screened Interval:*
Approved By: S. Bilodeau	*Logged By:* S. Piper	*Date/Time Started:* 06-27-18	*Depth of Boring:* 55 FT BGS
Drilling Contractor: Cascade Drilling	*Backfill:*	*Date/Time Finished:* 06-28-18	*Water Level:* 10.67 FT BGS

DEPTH (ft)	Sample ID	Sample Depth (ft)	Blows per 6"/RQD	Recovery (ft)	Headspace (ppm)	USCS	Graphic Log	MATERIAL IDENTIFICATION, color, description of fine grained material (silt and clay) description of coarse grained material (sand and gravel), structural or mineralogical features, density or stiffness, moisture content, odors or staining.	Well Diagram
						SM		THUMB FORMATION, dark yellowish brown (10 YR 3/4, silty sandstone, some clay lenses present, material has very dense fragments (lithified siltstone) *(continued)*	
								-@47.5' silty sandstone, 20% silt, 80% fine grained sand	
50								-@50' very hard drilling, open hole, no casing -@50' to 55' 10% to 20% gravel up to 1 inch in diameter	
55									

-@55' backfilled boring with bentonite chips to 20 feet. Monitoring well installed.
Refusal at 55 feet.
Boring Terminated

Notes:

AECOM 1220 Avenida Acaso Camarillo, CA 93012 805-388-3775		
	Client: NDEP	**Boring No. NERT 4.21N1**
	Project Number: 60477365	
	Site Description/Location: Las Vegas Wash, Henderson, NV,	*Ambient PID Reading:* NA
	Coordinates: 26736954.7 N 840337.59 E *Elevation:* 1502.07 FT *Datum:*	*Sheet:* 1 *of* 2
	Drilling Equipment/Method: /Sonic *Weather:* Sunny, hot, dry	*Monitoring Well Installed:* Yes
	Sample Type(s): From Cores *Boring Diameter:* 8 IN.	*Screened Interval:*
Approved By: S. Bilodeau	*Logged By:* S. Piper *Date/Time Started:* 06-19-18	*Depth of Boring:* 90 FT BGS
Drilling Contractor: Cascade Drilling	*Backfill:* *Date/Time Finished:* 06-19-18	*Water Level:* 42 FT BGS

DEPTH (ft)	Sample ID	Sample Depth (ft)	Blows per 6"/RQD	Recovery (ft)	Headspace (ppm)	USCS	Graphic Log	MATERIAL IDENTIFICATION, color, description of fine grained material (silt and clay) description of coarse grained material (sand and gravel), structural or mineralogical features, density or stiffness, moisture content, odors or staining.	Well Diagram
								-Hand augured	
5						SP-SM		GRAVELLY SAND TO SILTY SAND, light reddish brown (5YR 6/4), 5% non plastic fines, 85% fine to coarse grained, angular sand, 10% fine to coarse grained, angular gravel up to 1 inch in diameter, soft, dry	
10									92% cement / 8% bentonite mixture
15								-@15-17.5' No recovery	
								-@18' gravel increases to 20%, color change to dark grey (5YR 4/1)	
20								-@20' silt increases to 10%, color change to light reddish brown (5YR 6/3)	4-inch schedule 40 PVC
	NERT 4.21N1 22 2018061 1015			1				-@22' PTS (CL) lean clay with sand	
						SM		SILTY SAND, light reddish brown (5YR 6/3), 20% non plastic fines, 80% fine to coarse grained, angular sand, soft, dry	
25								-@25' silty sand with gravel, 25% low plastic fines, 65% fine- to coarse-grained, angular sand, 10% fine-grained gravel up to 1/2 inch in diameter, dark yellowish brown (10YR 4/4), moist, dense, difficult to drill	
								-@27.5-30' drill pipe was very hot	
30									
35								-@30-40' silt increases to 40%	
40						SP-SM		GRAVELLY SAND TO SILTY SAND, reddish brown (5YR 4/4), 5% non plastic fines, 75% fine to coarse grained, angular sand, 20% fine to coarse grained, angular gravel up to 1 inch in diameter, soft, wet	3-foot bentonite seal
						SP		GRAVELLY SAND, reddish brown (5YR 4/4), 80% fine to coarse grained, angular sand, 20% fine to coarse grained, angular gravel up to 1 inch in diameter, soft, wet	
45	NERT 4.21N1 45 20180619 1105			1				-@45' PTS (CL-ML) silty clay with gravel	

Notes:

AECOM

AECOM
1220 Avenida Acaso
Camarillo, CA 93012
805-388-3775

Client: NDEP		**Boring No. NERT 4.21N1**
Project Number: 60477365		
Site Description/Location: Las Vegas Wash, Henderson, NV,		*Ambient PID Reading:* NA
Coordinates: 26736954.7 N 840337.59 E	*Elevation:* 1502.07 FT *Datum:*	*Sheet:* 2 *of* 2
Drilling Equipment/Method: /Sonic	*Weather:* Sunny, hot, dry	*Monitoring Well Installed:* Yes
Sample Type(s): From Cores	*Boring Diameter:* 8 IN.	*Screened Interval:*
Approved By: S. Bilodeau	*Logged By:* S. Piper / *Date/Time Started:* 06-19-18	*Depth of Boring:* 90 FT BGS
Drilling Contractor: Cascade Drilling	*Backfill:* / *Date/Time Finished:* 06-19-18	*Water Level:* 42 FT BGS

DEPTH (ft)	Sample ID	Sample Depth (ft)	Blows per 6"/RQD	Recovery (ft)	Headspace (ppm)	USCS	Graphic Log	MATERIAL IDENTIFICATION, color, description of fine grained material (silt and clay) description of coarse grained material (sand and gravel), structural or mineralogical features, density or stiffness, moisture content, odors or staining.
						SP		-@48' 60% coarse grained sand, 40% fine to coarse grained angular gravel, wet
50	NERT 4.21N1 48 20180619 1120			1		SP-SM		-@ 48' PTS (CL-ML) silty clay with gravel GRAVELLY SAND TO SILTY SAND, reddish brown (5YR 3/2), 10% low plastic fines, 60% coarse grained, angular sand, 30% fine to coarse grained, angular gravel up to 1 inch in diameter, soft, wet
55						ML		THUMB FORMATION, dark reddish brown (5YR 3/4), 80% silt, 20% fine grained sand, cemented, small pieces are friable, very dense, moist
60								-@60' bottom of casing while drilling
	NERT 4.21N1 62 20180619 1155			1				-@62' PTS (CL) lean clay with sand -@62.5' very slow drilling
65								-@65' Material is very dense, very compacted
70								
75								-@75' very slow drilling, clay content increases
80								-@80-81.5' silty sand lens (SM), soft, non-cemented -@81.5-87.5' sandy siltstone with clay lenses (ML) 70% silt, 20% sand, 10% clay, moist, dense, almost lithified
85								
	NERT 4.21N1 87 20180619 1516			1				-@87' PTS (CL) lean clay with sand -@87.5-90' sandy siltstone (ML)
90								

Well Diagram

-Backfilled boring with bentonite chips to 55.4 feet. Monitoring well installed.
Total Depth = 90 feet.
Boring Terminated
Target depth achieved

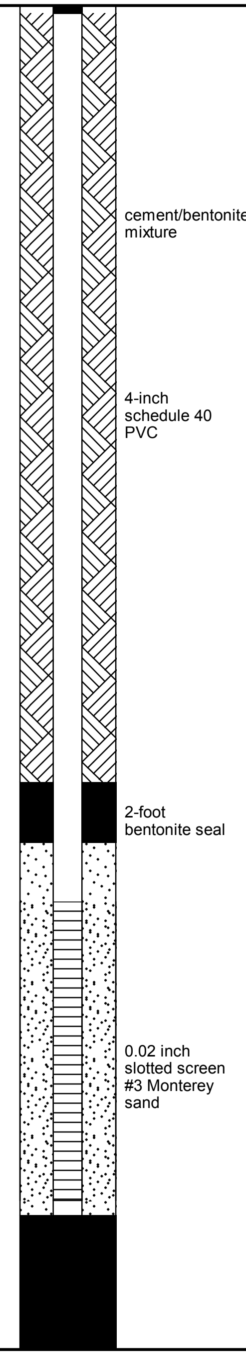
Notes:

AECOM AECOM 1220 Avenida Acaso Camarillo, CA 93012 805-388-3775	*Client:* NDEP *Project Number:* 60477365 *Site Description/Location:* Las Vegas Wash, Henderson, NV, *Coordinates:* 26737140.64 N 840337.59 E *Elevation:* 1505.04 FT *Datum:* *Drilling Equipment/Method:* /Sonic *Weather:* Sunny, hot, dry *Sample Type(s):* From Cores *Boring Diameter:* 8 IN.	**Boring No. NERT 4.38N1** *Ambient PID Reading:* NA *Sheet:* 1 *of* 2 *Monitoring Well Installed:* Yes *Screened Interval:*

Approved By: S. Bilodeau	*Logged By:* S. Piper	*Date/Time Started:* 06-20-18	*Depth of Boring:* 60 FT BGS
Drilling Contractor: Cascade Drilling	*Backfill:*	*Date/Time Finished:* 06-21-18	*Water Level:* 33 FT BGS

DEPTH (ft)	Sample ID	Sample Depth (ft)	Blows per 6"/RQD	Recovery (ft)	Headspace (ppm)	USCS	Graphic Log	MATERIAL IDENTIFICATION, color, description of fine grained material (silt and clay) description of coarse grained material (sand and gravel), structural or mineralogical features, density or stiffness, moisture content, odors or staining.
0								-@0-5' hand auger
5						ML		SANDY SILT, weak red (2.5Y 6/2), 70% non plastic fines, 30% fine grained sand, some fragments are very hard, may be decomposed bedrock (Thumb Formation), soft to dense, dry
12	NERT 4.38N1 121 2018 0620 1320			1				-@12' PTS (GP-CC) poorly graded gravel with clay -@12.5' Drill bit is very hot
15								-@15' stopped drilling to let rig cool off
18						SM		SILTY SAND, weak red (2.5Y 6/2), 40% low plastic fines, 60% fine to medium grained sand, some fragments are very hard and well cemented, may be decomposed bedrock (Thumb formation), dense, moist
22.5								-@22.5' Sand content increases
30								-@30' 25% non plastic fines, 75% fine to medium grained sand, soft
34	NERT 4.38N1 121 2018 0620 1445			1		SM		GRAVELY SILTY SAND, weak red (2.5Y 6/2), 20% non plastic fines, 70% fine to medium grained sand, 10% fine to coarse grained gravel up to 1 inch in diameter, soft, moist to wet -@35' PTS (ML) sandy silt -@36' increase in silt content, gradational contact to siltstone
38						ML		SILT, reddish borwn (5YR 5/2), 100% non plastic fines, dense, moist
40								-@40' color change to light brownish grey (10YR 6/2)
45	NERT 4.38N1							

Well Diagram



Notes:

AECOM AECOM 1220 Avenida Acaso Camarillo, CA 93012 805-388-3775	*Client:* NDEP *Project Number:* 60477365 *Site Description/Location:* Las Vegas Wash, Henderson, NV, *Coordinates:* 26737140.64 N 840337.59 E *Elevation:* 1505.04 FT *Datum:* *Drilling Equipment/Method:* /Sonic *Weather:* Sunny, hot, dry *Sample Type(s):* From Cores *Boring Diameter:* 8 IN.		**Boring No. NERT 4.38N1** *Ambient PID Reading:* NA *Sheet:* 2 *of* 2 *Monitoring Well Installed:* Yes *Screened Interval:*
Approved By: S. Bilodeau	*Logged By:* S. Piper	*Date/Time Started:* 06-20-18	*Depth of Boring:* 60 FT BGS
Drilling Contractor: Cascade Drilling	*Backfill:*	*Date/Time Finished:* 06-21-18	*Water Level:* 33 FT BGS

DEPTH (ft)	Sample ID	Sample Depth (ft)	Blows per 6"/RQD	Recovery (ft)	Headspace (ppm)	USCS	Graphic Log	MATERIAL IDENTIFICATION, color, description of fine grained material (silt and clay) description of coarse grained material (sand and gravel), structural or mineralogical features, density or stiffness, moisture content, odors or staining.	Well Diagram
	121 2018 0620 1545			1		ML		SILT, reddish borwn (5YR 5/2), 100% non plastic fines, dense, moist *(continued)* -@45' material is dry, PTS (CL) sandy lean clay	
50									HydratedBentonite chips and natural backfill
								-@52.5' material is damp	
55	NERT 4.38N1 121 2018 0620 0850			1				-@55' PTS (CH) sandy fat clay	
						ML		THUMB FORMATION, dark grey (10YR 4/1), 100% silt, amorphous gypsum (white) occurs between thin, platy, siltstone beds, dense and cemented, dry	
60	NERT 4.38N1 121 2018 0620 0910			1				-@60' PTS (CL) sandy lean clay, backfilled boring with bentonite chips to 40 feet and a monitoring well was installed. Refusal at 60 feet. Boring Terminated	

Notes:

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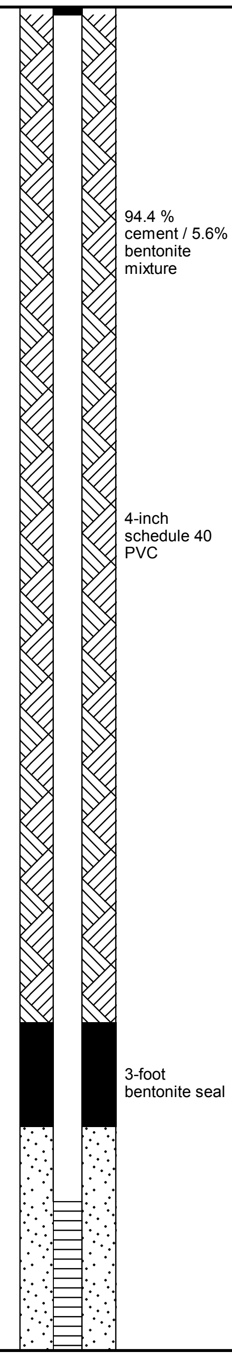
1220 Avenida Acaso
Camarillo, CA 93012
805-388-3775

Client: NDEP			**Boring No. NERT 4.51S1**
Project Number: 60477365			
Site Description/Location: Las Vegas Wash, Henderson, NV,			*Ambient PID Reading:* NA
Coordinates: 26735857.15 N 840138.034 E	*Elevation:* 1506.24 FT	*Datum:*	*Sheet:* 1 *of* 2
Drilling Equipment/Method: /Sonic	*Weather:* Sunny, hot, dry		*Monitoring Well Installed:* Yes
Sample Type(s): From Cores	*Boring Diameter:* 8 IN.		*Screened Interval:*
Approved By: S. Bilodeau	*Logged By:* S. Piper	*Date/Time Started:* 06-13-18	*Depth of Boring:* 57.5 FT BGS
Drilling Contractor: Cascade Drilling	*Backfill:*	*Date/Time Finished:* 06-14-18	*Water Level:* 27 FT BGS

DEPTH (ft)	Sample ID	Sample Depth (ft)	Blows per 6"/RQD	Recovery (ft)	Headspace (ppm)	USCS	Graphic Log	MATERIAL IDENTIFICATION, color, description of fine grained material (silt and clay) description of coarse grained material (sand and gravel), structural or mineralogical features, density or stiffness, moisture content, odors or staining.
0–5								-@0-5' Hand auguered
5						SM		SILTY SAND, light yellowish brown (10YR 6/4), 30% non-plastic fines, 70% fine to medium grained, angular sand, occasional gravel up to 1 inch in diameter, dry, soft -@7.5' trace of clay -@10' increase in silt to 35%
15	NERT 4.51S1 15 20180614 0850			1		SP-SM		GRAVELLY SAND TO SILTY SAND, yellowish brown (10YR 5/4), 5% non-plastic fines, 90% fine grained sand, 5% fine to coarse grained gravel, cobbles up to 3 inches in diameter, dry, soft -@15' PTS (CL) lean clay with sand -@17.5' color change to brown (10YR 5/3) and gravel content increases to 15%, gravel is fine to medium grained -@20' 5% non-plastic fines, 80% fine to medium grained sand, 15% medium to very coarse grained gravel up to 2 inches in diameter -@22.5-24' gravelly lens, dark red (2YR 4/6) 10% non-plastic fines, 50% coarse grained sand, 40% medium to coarse grained gravel -@24' gravelly sand to silty sand (SP-SM), brown (10YR 5/3), 5% non-plastic fines, 55% medium to coarse grained sand, 40% coarse grained gravel, cobbles up to 4 inches in diameter -@27-35' no recovery, difficult drilling in gravelly material
35						SP		GRAVELLY SAND, brown (10YR 4/3), 70% fine to coarse grained, angular sand, 30% fine grained, angular gravel, cobbles up to 3 inches in diameter, soft to medium, wet
40	NERT 4.51S1 42 20180614 0841			1		SP-SM		GRAVELLY SAND TO SILTY SAND, yellowish brown (10YR 5/4), 10% low plastic fines, 60% fine to medium grained sand, 30% medium to coarse grained, angular gravel, cobbles up to 9 inches in diameter, soft to medium, moist -@42' PTS (GP) poorly graded gravel with sand -@42.5' color change to very dark greyish brown (10YR 3/2), increase in sand and gravel, material is wet
45								

Well Diagram



Notes:

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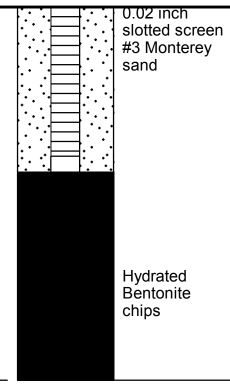
1220 Avenida Acaso
Camarillo, CA 93012
805-388-3775

Boring No. NERT 4.51S1

Client: NDEP			
Project Number: 60477365			
Site Description/Location: Las Vegas Wash, Henderson, NV,			*Ambient PID Reading:* NA
Coordinates: 26735857.15 N 840138.034 E	*Elevation:* 1506.24 FT	*Datum:*	*Sheet:* 2 *of* 2
Drilling Equipment/Method: /Sonic		*Weather:* Sunny, hot, dry	*Monitoring Well Installed:* Yes
Sample Type(s): From Cores		*Boring Diameter:* 8 IN.	*Screened Interval:*
Approved By: S. Bilodeau	*Logged By:* S. Piper	*Date/Time Started:* 06-13-18	*Depth of Boring:* 57.5 FT BGS
Drilling Contractor: Cascade Drilling	*Backfill:*	*Date/Time Finished:* 06-14-18	*Water Level:* 27 FT BGS

DEPTH (ft)	Sample ID	Sample Depth (ft)	Blows per 6"/RQD	Recovery (ft)	Headspace (ppm)	USCS	Graphic Log	MATERIAL IDENTIFICATION, color, description of fine grained material (silt and clay) description of coarse grained material (sand and gravel), structural or mineralogical features, density or stiffness, moisture content, odors or staining.
	NERT 4.51S1 48 20180614 0856			1		SP-SM		GRAVELLY SAND TO SILTY SAND, yellowish brown (10YR 5/4), 10% low plastic fines, 60% fine to medium grained sand, 30% medium to coarse grained, angular gravel, cobbles up to 9 inches in diameter, soft to medium, moist *(continued)* -@48' PTS (GP) poorly graded gravel with sand
50								
	NERT 4.51S1 52 20180614 1600			1		ML		CEMENTED ALLUVUIM, grey to greenish grey (10YR 5/1 to 5G 5/1), breccia with chlorite alteration (sandy silt), 90% low plastic fines, 10% fine to medium grained sand, dense, moist, very difficult drilling -@52' PTS (CL) gravelly fat clay with sand
55								

Well Diagram



, Backfilled boring with bentonite chips to 45 feet and a monitoring well was installed.
Refusal at 57.5 feet.
Boring Terminated

Notes:

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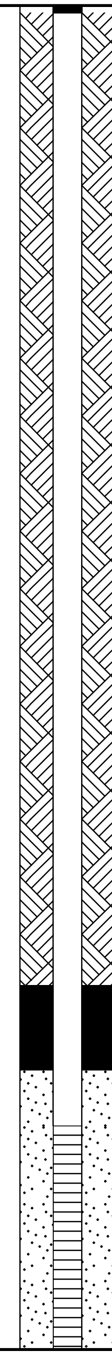
805-388-3775

Client: NDEP		**Boring No. NERT 4.71S1**
Project Number: 60477365		
Site Description/Location: Las Vegas Wash, Henderson, NV,		*Ambient PID Reading:* NA
Coordinates: 26735349.66 N 838991.63 E	*Elevation:* 1519.29 FT *Datum:*	*Sheet:* 1 *of* 2
Drilling Equipment/Method: /Sonic	*Weather:* Sunny, hot, dry	*Monitoring Well Installed:* Yes
Sample Type(s): From Cores	*Boring Diameter:* 8 IN.	*Screened Interval:*
Approved By: S. Bilodeau	*Logged By:* S. Piper	*Date/Time Started:* 06-26-18
Drilling Contractor: Cascade Drilling	*Backfill:*	*Date/Time Finished:* 06-27-18

Depth of Boring: 90 FT BGS
Water Level: 28.75 FT BGS

DEPTH (ft)	Sample ID	Sample Depth (ft)	Blows per 6"/RQD	Recovery (ft)	Headspace (ppm)	USCS	Graphic Log	MATERIAL IDENTIFICATION, color, description of fine grained material (silt and clay) description of coarse grained material (sand and gravel), structural or mineralogical features, density or stiffness, moisture content, odors or staining.
0–5								, hand augered
5						SM		SILTY SAND, light yellowish brown (10YR 6/4), 30% non-plastic fines, 65% fine to medium grained, angular sand, 5% angular gravel up to 1 inch in diameter, soft, dry
12.5								-@ 12.5' silt increases to 40% and gravel is <5%, there are fine gypsum crystals present, material is moist
19								-@19-20' Sand lens (SP)
22.5								-@ 22.5-24' Sand and Gravel lens (SP) gravel is up to 2 " diameter
23	NERT 4.71S1 23 20180627 1050			1				-@23' PTS (SM) Silty Sand with Gravel
24								-@24-25' Sand and Gravel lens (SP) gravel is up to 2 inches in diameter
25						ML		SANDY SILT WITH CLAY, light yellowish brown (10YR 6/4), sandy silt with plastic clay lenses, plasticity of silt is low, plasticity of clay is high, dense, moist
27.5						SM		SILTY SAND WITH GRAVEL, light yellowish brown (10YR 6/4), low plastic fines, medium to coarse grained sand, fine to med grained gravel up to ½ inch diameter, dense, moist
30						CL-ML		SANDY SILT WITH CLAY, yellowish brown (10YR 5/4), sandy silt with plastic clay lenses, plasticity of silt is low, plasticity of clay is high, dense, moist to wet
35						SP		GRAVELLY SAND, dark yellowish brown (10YR 3/4), 60% med to coarse angular sand, 40% fine to coarse grained gravel up to 1 inch diameter, some interbedded silt, dense, wet
37	NERT 4.71S1 37 20180626 1130			1				-@37' PTS (CL) Lean Clay with Sand
37.5						SM		SILTY SAND, dark yellowish brown (10YR 3/4), 40% low plastic fines, 60% fine grained sand, some high plastic clay and fine gravel also present, dense, wet
45						SP		GRAVELLY SAND, yellowish brown (10YR 5/4), 60% angular to sub angular coarse sand, 40% fine to coarse basaltic gravel up to 1 inch diameter, soft, wet
47	NERT 4.71S1 47 20180626			1				-@47' PTS (SM) Silty Sand with Gravel

Well Diagram



Notes:

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AECOM
1220 Avenida Acaso
Camarillo, CA 93012
805-388-3775

Boring No. NERT 4.71S1

Client: NDEP			
Project Number: 60477365			
Site Description/Location: Las Vegas Wash, Henderson, NV,			*Ambient PID Reading:* NA
Coordinates: 26735349.66 N 838991.63 E	*Elevation:* 1519.29 FT	*Datum:*	*Sheet:* 2 *of* 2
Drilling Equipment/Method: /Sonic	*Weather:* Sunny, hot, dry		*Monitoring Well Installed:* Yes
Sample Type(s): From Cores	*Boring Diameter:* 8 IN.		*Screened Interval:*
Approved By: S. Bilodeau	*Logged By:* S. Piper	*Date/Time Started:* 06-26-18	*Depth of Boring:* 90 FT BGS
Drilling Contractor: Cascade Drilling	*Backfill:*	*Date/Time Finished:* 06-27-18	*Water Level:* 28.75 FT BGS

DEPTH (ft)	Sample ID	Sample Depth (ft)	Blows per 6"/RQD	Recovery (ft)	Headspace (ppm)	USCS	Graphic Log	MATERIAL IDENTIFICATION, color, description of fine grained material (silt and clay) description of coarse grained material (sand and gravel), structural or mineralogical features, density or stiffness, moisture content, odors or staining.	Well Diagram
50	1140					SP		-@47.5' color change to dark yellowish brown (10YR3/4) GRAVELLY SAND, yellowish brown (10YR 5/4), 60% angular to sub angular coarse sand, 40% fine to coarse basaltic gravel up to 1 inch diameter, soft, wet *(continued)* -@52.5' color change to very dark greyish brown (10YR 3/2) sand is medium to coarse grained with cobbles up to 3 inches diameter	
55									
60						SM		GRAVELLY SILTY SAND, brown (10YR4/3), 20% non plastic fines, 60% fine sand, 20% fine to coarse, angular to subangular gravel with cobbles up to <3 inches diameter, dense, wet	
65									
70						SP		GRAVELLY SAND, yellowish brown (10YR5/4), 60% coarse grained sand, 40% fine to coarse grained angular to subangular gravel with cobbles up to 4 inches diameter, soft, wet -@71' gravel lens stained red (2.5YR 5/6) -@72.5' fine sand lens, looks like beach sand -@75' color change to greyish brown (10YR 5/2) cobbles are up to 6 inches in diameter	Hydrated Bentonite chips
75									
80						SM		SILTY SAND, greyish brown (10YR 5/2), 20% non plastic fines, 60% fine to med sand, 20% fine to very coarse grained gravel up to 2 inches in diameter, soft, wet -@82.5' 20% non plastic fines, 60% fine to coarse grained sand, 20% fine to coarse grained gravel	
85								-@85' some cobbles are 6 inches in diameter	
	NERT 4.71S1 87 20180627 0720			1				-@87' PTS (SP) Poorly Graded Sand with Gravel -@87.5' increase in silt and sand content	
90	NERT 4.71S1 89.5 20180627 0725			1				-@89.5 PTS (CL-ML) Silty Lean Clay with Gravel	

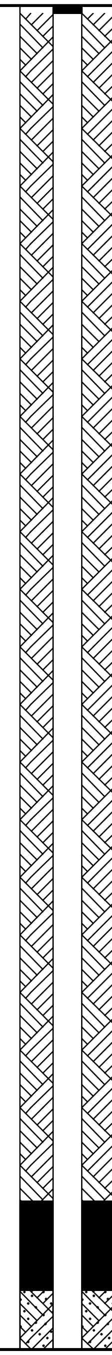
-@90' boring backfilled with bentonite chips to 45 feet and a monitoring well was installed
Total Depth = 90 feet.
Boring Terminated
Target depth achieved

Notes:

AECOM AECOM 1220 Avenida Acaso Camarillo, CA 93012 805-388-3775	*Client:* NDEP *Project Number:* 60477365 *Site Description/Location:* Las Vegas Wash, Henderson, NV, *Coordinates:* 26734990.31 N 837979.18 E *Elevation:* 1523.33 FT *Datum:* *Drilling Equipment/Method:* /Sonic *Weather:* Sunny, hot, dry *Sample Type(s):* From Cores *Boring Diameter:* 8 IN.		**Boring No. NERT 4.93S1** *Ambient PID Reading:* NA *Sheet:* 1 *of* 2 *Monitoring Well Installed:* Yes *Screened Interval:*
Approved By: S. Bilodeau	*Logged By:* S. Piper	*Date/Time Started:* 06-14-18	*Depth of Boring:* 65 FT BGS
Drilling Contractor: Cascade Drilling	*Backfill:*	*Date/Time Finished:* 06-15-18	*Water Level:* 27.8 FT BGS

DEPTH (ft)	Sample ID	Sample Depth (ft)	Blows per 6"/RQD	Recovery (ft)	Headspace (ppm)	USCS	Graphic Log	MATERIAL IDENTIFICATION, color, description of fine grained material (silt and clay) description of coarse grained material (sand and gravel), structural or mineralogical features, density or stiffness, moisture content, odors or staining.
0								, 0-5' hand augured
5						SP		GRAVELLY SAND, yellowish brown (10YR 5/4), 80% fine to coarse grained sand, 20% fine to coarse grained gravel with cobbles 3 inches max, angular, soft, dry
8						SP-SM		GRAVELLY SAND TO SILTY SAND, grayish brown (10YR 5/2), 5% non-plastic fines, 80% fine grained sand, 15% fine to coarse grained gravel (>1 inch max), soft, dry
15	NERT 4.93S1 15 20180615 0958			1				-@15' PTS (ML) sandy silt
18								-@18' color change to yellowish brown (10YR 5/4) 5% non-plastic fines, 75% fine grained sand, 20% fine to coarse grained gravel, with cobbles 4 inches max
22.5								-@ 22.5-27' color change to grey (5YR 5/1), gravel is volcanic rhyolite(?) with some feldspar and quartz present, small gas vesicles are also present.
27								-@27-32' no recovery, gravelly sand
32.5						SP		GRAVELLY SAND, yellowish brown (10YR 5/4), 80% fine to coarse grained, angular sand, 20% fine to coarse grained angular gravel, soft, wet
35						CL		CLAY, brown (7.5YR 5/3), 100% low plastic fines, stiff, moist
37								-@37' 3" silty sand lens 20% non plastic fines, 80% fine grained sand, soft, moist
40								-@40 color change to dark grey brown (7.5YR4/20)
41	NERT 4.93S1 41 20180615 0828			1				-@41' PTS (CL) sandy lean clay
45								

Well Diagram



4-inch schedule 40 PVC

94.4 % cement / 5.6% bentonite mixture

3-foot bentonite seal

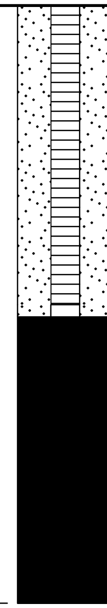
Notes:

AECOM 1220 Avenida Acaso Camarillo, CA 93012 805-388-3775	*Client:* NDEP *Project Number:* 60477365 *Site Description/Location:* Las Vegas Wash, Henderson, NV, *Coordinates:* 26734990.31 N 837979.18 E *Elevation:* 1523.33 FT *Datum:* *Drilling Equipment/Method:* /Sonic *Weather:* Sunny, hot, dry *Sample Type(s):* From Cores *Boring Diameter:* 8 IN.	**Boring No. NERT 4.93S1** *Ambient PID Reading:* NA *Sheet:* 2 *of* 2 *Monitoring Well Installed:* Yes *Screened Interval:*

Approved By: S. Bilodeau	*Logged By:* S. Piper	*Date/Time Started:* 06-14-18	*Depth of Boring:* 65 FT BGS
Drilling Contractor: Cascade Drilling	*Backfill:*	*Date/Time Finished:* 06-15-18	*Water Level:* 27.8 FT BGS

DEPTH (ft)	Sample ID	Sample Depth (ft)	Blows per 6"/RQD	Recovery (ft)	Headspace (ppm)	USCS	Graphic Log	MATERIAL IDENTIFICATION, color, description of fine grained material (silt and clay) description of coarse grained material (sand and gravel), structural or mineralogical features, density or stiffness, moisture content, odors or staining.
	NERT 4.93S1 47 20180615 0802			1		SP		GRAVELLY SAND TO SANDY GRAVEL, yellowish brown (10YR 5/4), fine to medium grained sand, fine to very coarse grained gravel up to 2 inches in size *(continued)* -@47 PTS (GP) poorly graded gravel with sand
50	NERT 4.93S1 48 20180615 0824			1		SM		SILTY SAND, light reddish brown (5YR6/4), mottled, non to low plastic fines, medium grained sand, soft, wet -@50' PTS (CL-ML) sandy silty clay with gravel
55						SP-SM		GRAVELLY SAND TO SILTY SAND, dark reddish grey (5YR 4/2), 10% non plastic fines, 50% fine to coarse grained angular sand, 40% medium to coarse grained angular gravel with cobbles up to 4 inches in diameter, soft, wet, Clasts are composed of breccia, black with chlorite. Difficult to drill.
60	NERT 4.93S1 60 20180615 0953			1		SM		GRAVELLY SILTY SAND TO SANDY SILT, red brown (5YR 5/3), 50% medium plastic fines, 20% fine to coarse grained angular sand, 30% fine to coarse grained angular gravel with cobbles up to 4 inches in size, dense, moist -@60 PTS (CL) sandy lean clay
65								

Well Diagram



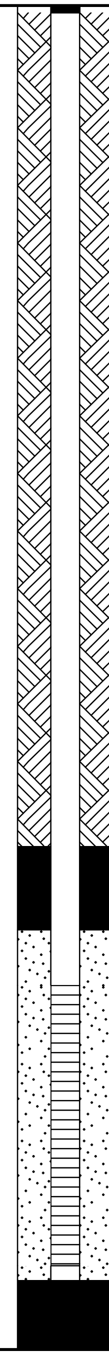
-backfilled boring with bentonite chips to 55 feet. Monitoring well was installed.
Refusal at 65 feet.
Boring Terminated

Notes:

AECOM 1220 Avenida Acaso Camarillo, CA 93012 805-388-3775			
Client: NDEP			**Boring No. NERT 5.11S1**
Project Number: 60477365			
Site Description/Location: Las Vegas Wash, Henderson, NV,			*Ambient PID Reading:* NA
Coordinates: 26734881.04 N 837144.38 E	*Elevation:* 1522.88 FT	*Datum:*	*Sheet:* 1 *of* 2
Drilling Equipment/Method: /Sonic	*Weather:* Sunny, hot, dry		*Monitoring Well Installed:* Yes
Sample Type(s): From Cores	*Boring Diameter:* 8 IN.		*Screened Interval:*
Approved By: S. Bilodeau	*Logged By:* S. Piper	*Date/Time Started:* 06-15-18	*Depth of Boring:* 90 FT BGS
Drilling Contractor: Cascade Drilling	*Backfill:*	*Date/Time Finished:* 06-16-18	*Water Level:* 20.8 FT BGS

DEPTH (ft)	Sample ID	Sample Depth (ft)	Blows per 6"/RQD	Recovery (ft)	Headspace (ppm)	USCS	Graphic Log	MATERIAL IDENTIFICATION, color, description of fine grained material (silt and clay) description of coarse grained material (sand and gravel), structural or mineralogical features, density or stiffness, moisture content, odors or staining.
0–5								, hand auguered
5–10						SP-SM		GRAVELLY SAND TO SILTY SAND, grayish brown (10YR 5/2), 10% non plastic fines, 80% fine to medium grained sand, 10% fine to coarse grained gravel with cobbles >4 inches max, angular, soft, dry -@8' color change to light brownish gray (10YR 6/2) and gravel content increases
10–12.5						SP		GRAVELLY SAND, light brownish gray (10YR 6/2), 70% fine to medium grained sand, 30% fine to coarse grained gravel with cobbles >4 inches max, angular, soft, dry
12.5–20	NERT 5.11S1 17 20180615 1457			1		SP-SM		GRAVELLY SAND TO SILTY SAND, brownish gray (10YR 6/2), 25% non plastic fines, 60% fine to medium grained sand, 15% fine to coarse grained gravel with cobbles >4 inches max, angular, soft, moist -@17' PTS (SP) poorly graded sand with gravel
20–32.5						SM		SILTY SAND, 40% non plastic fines, 55% fine to med. grained sand, 5% fine grained gravel up to 1/4" in size -@25' color change to light yellowish brown (10YR 5/4) and gravel is up to 2" in size -@31 40% non plastic fines, 35% fine grained sand,15% fine grained gravel up to ¼" in size
32.5–37.5	NERT 5.11S1 37 20180615			1		SM		SILTY SAND TO SANDY SILT, light yellowish brown (10YR5/4), 50% low plastic fines, 35% fine to med. grained sand, 15% fine grained gravel up to 1/4" in size -@37' PTS (CL) lean clay with sand
37.5–40						SP		GRAVELLY SAND, grayish brown (10YR 5/2), 30% low plastic fines, 55% fine grained sand, 15% fine to medium grained gravel with cobbles up to 4 inches in size, soft, wet
40–48	NERT 5.11S1 40 20180615 1520			1		SM		SILTY SAND, light yellowish brown (10YR 5/4), 30% low plastic fines, 55% fine grained sand, 15% fine to medium grained gravel up to 4" in size, dense, moist -@40' PTS (ML) sandy silt -@45' difficult drilling

Well Diagram



Notes:

AECOM 1220 Avenida Acaso Camarillo, CA 93012 805-388-3775	Client: NDEP	Boring No. NERT 5.11S1
	Project Number: 60477365	
	Site Description/Location: Las Vegas Wash, Henderson, NV,	Ambient PID Reading: NA
	Coordinates: 26734881.04 N 837144.38 E Elevation: 1522.88 FT Datum:	Sheet: 2 of 2
	Drilling Equipment/Method: /Sonic Weather: Sunny, hot, dry	Monitoring Well Installed: Yes
	Sample Type(s): From Cores Boring Diameter: 8 IN.	Screened Interval:
Approved By: S. Bilodeau	Logged By: S. Piper Date/Time Started: 06-15-18	Depth of Boring: 90 FT BGS
Drilling Contractor: Cascade Drilling	Backfill: Date/Time Finished: 06-16-18	Water Level: 20.8 FT BGS

DEPTH (ft)	Sample ID	Sample Depth (ft)	Blows per 6"/RQD	Recovery (ft)	Headspace (ppm)	USCS	Graphic Log	MATERIAL IDENTIFICATION, color, description of fine grained material (silt and clay) description of coarse grained material (sand and gravel), structural or mineralogical features, density or stiffness, moisture content, odors or staining.	Well Diagram
50						SM		SILTY SAND, light yellowish brown (10YR 5/4), 30% low plastic fines, 55% fine grained sand, 15% fine to medium grained gravel up to 4" in size, dense, moist *(continued)*	
55						CL-ML		SANDY SILT TO SANDY CLAY, light reddish brown (5YR 6/4), 55% medium plastic fines with some highly plastic clay lenses, 40% fine to med. grained sand, 5% fine grained gravel up to 1/4" in size, stiff, moist	
60									
65									
	NERT 5.11S1 67 20180618 0750			1		CL		MUDDY CREEK FORMATION, brown and green, 55% medium plastic fines with some highly plastic clay lenses, 40% fine to med. grained sand, 5% fine grained gravel up to 1/4" in size, stiff, moist -@ 67' PTS (CH) sandy fat clay	Hydrated Bentonite chips
70									
	NERT 5.11S1 72 20180618 0810			1				-@ 72' PTS (CH) sandy fat clay -@72.5' gypsum crystals	
75									
80								-@80' color change to gray 60% low plastic fines, 25% fine grained sand, 5% fine grained gravel	
85								-@85' gypsum crystals	
90									

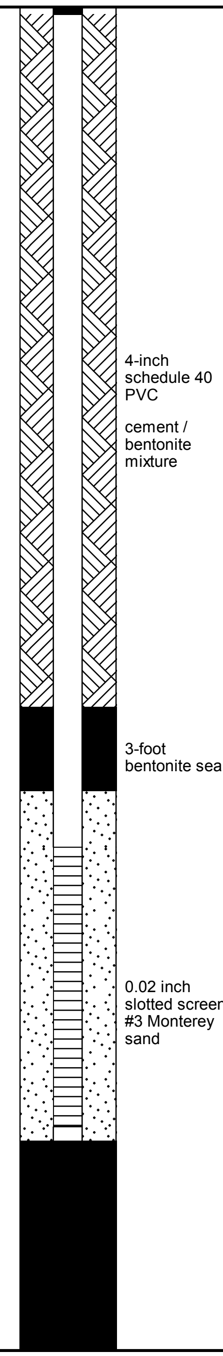
, target depth achieved, backfilled boring with bentonite chips to 45 feet. Monitoring wells installed.
Total Depth = 90 feet.
Boring Terminated
Target depth achieved

Notes:

AECOM 1220 Avenida Acaso Camarillo, CA 93012 805-388-3775	*Client:* NDEP		**Boring No. NERT 5.49S1**
	Project Number: 60477365		
	Site Description/Location: Las Vegas Wash, Henderson, NV,		*Ambient PID Reading:* NA
	Coordinates: 26734326.34 N 835452.17 E	*Elevation:* 1543.37 FT *Datum:*	*Sheet:* 1 *of* 2
	Drilling Equipment/Method: /Sonic	*Weather:* Sunny, hot, dry	*Monitoring Well Installed:* Yes
	Sample Type(s): From Cores	*Boring Diameter:* 8 IN.	*Screened Interval:*
Approved By: S. Bilodeau	*Logged By:* S. Piper	*Date/Time Started:* 06-18-18	*Depth of Boring:* 90 FT BGS
Drilling Contractor: Cascade Drilling	*Backfill:*	*Date/Time Finished:* 06-19-18	*Water Level:* 26.8 FT BGS

DEPTH (ft)	Sample ID	Sample Depth (ft)	Blows per 6"/RQD	Recovery (ft)	Headspace (ppm)	USCS	Graphic Log	MATERIAL IDENTIFICATION, color, description of fine grained material (silt and clay) description of coarse grained material (sand and gravel), structural or mineralogical features, density or stiffness, moisture content, odors or staining.
0–5								, hand auguered
5–15						SP		GRAVELLY SAND, grayish brown (10YR 5/2), 80% fine to coarse grained sand, 20% fine to coarse grained gravel (>1 inches max), angular, soft, dry -@12.5' gravel content increases to 30%
15–22.5	NERT 5.49S1 20 20180618 0820	20		1		SP-SM		GRAVELLY SAND TO SILTY SAND, yellowish brown (10YR 5/4), 5% non plastic fines, 75% fine grained sand, 30% fine to coarse grained angular gravel with cobbles up to 3 inches in size, soft, dry -@20' PTS (CL-SC) clayey sand
22.5–47.5	NERT 5.49S1 32 20180618 0910	32		1		SP		GRAVELLY SAND, very dark gray (10YR 3/1), 75% fine to med. grained sand, 25% fine to very coarse grained angular gravel (2 inches max), angular, soft, dry -@25' material is wet, cobble size increases to 6 inches -@27.5' color change to reddish brown (5YR 4/4) -@30' color change to very dark gray (5YR 3/1) -@32' PTS (CL-ML) Silty clay with gravel -@ 32.5' 60% sand 40% gravel -@33-34.5' Gravel lens (GP) 100% fine to coarse grained angular gravel (with cobbles up to 6 inches max size) difficult drilling. -@ 34.5' 60% sand, 40% gravel -@35' color is dark yellowish brown (10YR 4/4)

Well Diagram



Notes:

AECOM 1220 Avenida Acaso Camarillo, CA 93012 805-388-3775	Client: NDEP	Boring No. NERT 5.49S1
	Project Number: 60477365	
	Site Description/Location: Las Vegas Wash, Henderson, NV,	Ambient PID Reading: NA
	Coordinates: 26734326.34 N 835452.17 E Elevation: 1543.37 FT Datum:	Sheet: 2 of 2
	Drilling Equipment/Method: /Sonic Weather: Sunny, hot, dry	Monitoring Well Installed: Yes
	Sample Type(s): From Cores Boring Diameter: 8 IN.	Screened Interval:
Approved By: S. Bilodeau	Logged By: S. Piper Date/Time Started: 06-18-18	Depth of Boring: 90 FT BGS
Drilling Contractor: Cascade Drilling	Backfill: Date/Time Finished: 06-19-18	Water Level: 26.8 FT BGS

DEPTH (ft)	Sample ID	Sample Depth (ft)	Blows per 6"/RQD	Recovery (ft)	Headspace (ppm)	USCS	Graphic Log	MATERIAL IDENTIFICATION, color, description of fine grained material (silt and clay) description of coarse grained material (sand and gravel), structural or mineralogical features, density or stiffness, moisture content, odors or staining.	Well Diagram
50						SP		GRAVELLY SAND, very dark gray (10YR 3/1), 75% fine to med. grained sand, 25% fine to very coarse grained angular gravel (2 inches max), angular, soft, dry *(continued)*	
								-@52.2' cobbles are subangular volcanic conglomerate.	
55									
60						SP-SM		MUDDY CREEK FORMATION, dark yellowish brown (10YR 4/4), 10% non plastic fines, 20% fine to coarse grained sand, 70% fine to coarse grained angular gravel, cobbles >6" present, angular, soft, wet	
65						SM		MUDDY CREEK FORMATION, dark yellowish brown (10YR 4/4)	Hydrated Bentonite chips
70									
	NERT 5.49S1 72 20180618 1115			1				-@72' PTS (CL) Sandy lean clay	
75						ML		MUDDY CREEK FORMATION, siltstone/claystone with gypsum crystals present, decomposition odor present	
80									
85									
	NERT 5.49S1 89 20180618 1130			1				-@89' PTS (CL) Lean clay with gravel	
90									

-@90' backfilled boring with bentonite chips to 45'. Monitoring well installed.
Total Depth = 90 feet.
Boring Terminated
Target depth achieved

Notes:

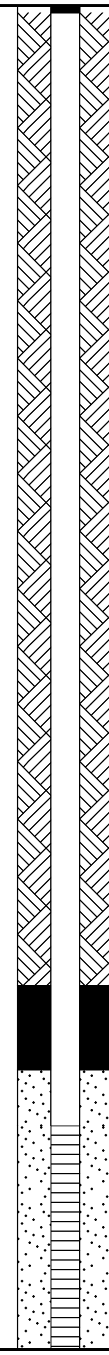
AECOM

AECOM
1220 Avenida Acaso
Camarillo, CA 93012
805-388-3775

Client: NDEP		**Boring No. NERT 5.91S1**
Project Number: 60477365		
Site Description/Location: Las Vegas Wash, Henderson, NV,		*Ambient PID Reading:* NA
Coordinates: 26738845.83 N 833571.59 E	*Elevation:* 1536.76 FT *Datum:*	*Sheet:* 1 *of* 2
Drilling Equipment/Method: /Sonic	*Weather:* Sunny, hot, dry	*Monitoring Well Installed:* Yes
Sample Type(s): From Cores	*Boring Diameter:* 8 IN.	*Screened Interval:*
Approved By: S. Bilodeau	*Logged By:* S. Piper	*Date/Time Started:* 06-17-18
		Depth of Boring: 90 FT BGS
Drilling Contractor: Cascade Drilling	*Backfill:*	*Date/Time Finished:* 06-18-18
		Water Level: 13.35 FT BGS

DEPTH (ft)	Sample ID	Sample Depth (ft)	Blows per 6"/RQD	Recovery (ft)	Headspace (ppm)	USCS	Graphic Log	MATERIAL IDENTIFICATION, color, description of fine grained material (silt and clay) description of coarse grained material (sand and gravel), structural or mineralogical features, density or stiffness, moisture content, odors or staining.
								, hand auguered
5						SP-SM		GRAVELLY SAND TO SILTY SAND, yellowish brown (10YR 5/4), 10% non plastic fines, 60% medium to coarse grained sand, 30% fine to coarse grained angular gravel with cobbles up to 3 inches in size, soft, dry
10								-@10 - 11' Sandy silt lens 70% low plastic fines, 30% fine grained sand
								-@13' color is mottled: brown (2.5YR 5/3) and yellowish brown (10YR 5/4)
15						CL-ML		SANDY SILT TO SANDY CLAY, brown (2.5YR 5/3), 60% silt, 10% clay, med. plastic fines, 30% fine grained sand, composed of sand with silt and clay lenses, dense, moist
	NERT 5.91S1 17 20180617 0815			1				-@17' PTS (CL) Sandy lean clay
20						CL-ML		GRAVELLY SILT TO SANDY CLAY, brown (2.5YR 5/3), 65% med plastic fines, 30% fine grained sand, 10% fine to med. grained angular gravel (1/2 inch max), angular, dense, moist
25								-@25' color is mottled: brown (2.5YR 5/3) and yellowish brown (10YR 5/4)
								-@27.5' color change to yellowish brown (10YR 5/4)
30						SM		SILTY SAND WITH CLAY LENSES, weak red (2.5YR 5/3), 25% silt, 10% clay, med. plastic fines, 60% fine grained sand, 5% fine grained gravel up to ½' in size, dense, moist
								-@32.5 material is wet
35								-@37' color change to yellowish brown (10YR 5/4) 40% non plastic fines, 50% fine grained sand, 10% fine grained gravel
40	NERT 5.91S1 40 20180617 0930			1				-@40' PTS (CL) Sandy lean clay
						SM		GRAVELLY SILTY SAND, yellowish brown (10YR 5/4), 20% non plastic fines, 60% fine to med. grained sand, 20% fine to coarse grained, volcanic gravel with cobbles up to 6 inches in size, dense, wet
45	NERT 5.91S1 47 20180617			1				-@47' PTS (CL) Lean clay with sand

Well Diagram



Notes:

AECOM 1220 Avenida Acaso Camarillo, CA 93012 805-388-3775	*Client:* NDEP	**Boring No. NERT 5.91S1**
	Project Number: 60477365	
	Site Description/Location: Las Vegas Wash, Henderson, NV,	*Ambient PID Reading:* NA
	Coordinates: 26738845.83 N 833571.59 E *Elevation:* 1536.76 FT *Datum:*	*Sheet:* 2 *of* 2
	Drilling Equipment/Method: /Sonic *Weather:* Sunny, hot, dry	*Monitoring Well Installed:* Yes
	Sample Type(s): From Cores *Boring Diameter:* 8 IN.	*Screened Interval:*

Approved By: S. Bilodeau	*Logged By:* S. Piper	*Date/Time Started:* 06-17-18	*Depth of Boring:* 90 FT BGS
Drilling Contractor: Cascade Drilling	*Backfill:*	*Date/Time Finished:* 06-18-18	*Water Level:* 13.35 FT BGS

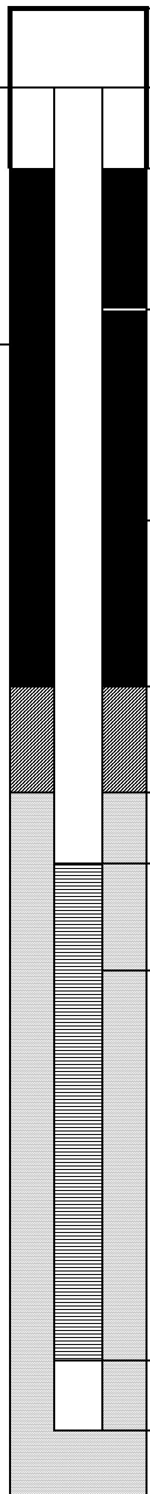
DEPTH (ft)	Sample ID	Sample Depth (ft)	Blows per 6"/RQD	Recovery (ft)	Headspace (ppm)	USCS	Graphic Log	MATERIAL IDENTIFICATION, color, description of fine grained material (silt and clay) description of coarse grained material (sand and gravel), structural or mineralogical features, density or stiffness, moisture content, odors or staining.	Well Diagram
	0930					SM			
50	NERT 5.91S1 50 20180617 0930			1				-@50 PTS (CL) Sandy lean clay with gravel	
						ML		MUDDY CREEK FORMATION, light greenish grey, 80% siltstone/claystone with 20% fine grained sand, dense, moist	
55									
60	NERT 5.91S1 60 20180617 0950			1				-@60' color changes to dark greenish grey -@60' PTS (CH) fat clay with sand	
65									
70									Hydrated Bentonite chips
75									
80									
85								-@85' Material is wet, some gravel present	
	NERT 5.91S1 87 20180617 1020			1				-@87' PTS (CH) fat clay with sand	
90									

, backfilled boring with bentonite chips to 50 feet. Monitoring well installed.
Total Depth = 90 feet.
Boring Terminated
Target depth achieved

Notes:

AECOM		
	Client: NDEP	***WELL ID: NERT3.80S1***
	Project Number: 60477365 - 2016-170	
	Site Location: Las Vegas Wash, Henderson, Nevada	*Date Installed: 6/28/2018*
	Well Location: Coords:	*Inspector: Sara Piper*
	Method: Sonic	*Contractor: Cascade*

MONITORING WELL CONSTRUCTION DETAIL



Measuring Point for Surveying & Water Levels

Cement, Bentonite, Bentonite Slurry Grout, or Native Materials

___ % Cement

___ % Bentonite

___ % Native Materials

	Depth from G.S. (feet)	Elevation(feet) Datum NAVD88
Traffic rated well box		
Top of Riser Pipe		1460.54
Ground Surface (G.S.)	0.0	1461.06
Bottom of Steel Guard Pipe		
Top of Bentonite	5.5	1455.6
Top of Sand	8	1453.1
Top of Screen	10	1451.1
▼ Stabilized Water Level	10.67	1450.4
Bottom of Screen	20	1441.1
Bottom of Tail Pipe:	20	1441.1
Bottom of Borehole	drilled to 55 feet and backfilled with bentonite chips	1406.1

Riser Pipe:
- Length: 10
- Inside Diameter (ID): 4 inches
- Type of Material: PVC

Bentonite Seal Thickness: 2.5 feet

Screen:
- Length: 10 feet
- Inside Diameter (ID): 4 inches
- Slot Size: 0.020 inches
- Type of Material: Schedule 40 PVC

Type/Size of Sand: #3

Sand Pack Thickness: 2 inches

Borehole Diameter: 8 inches

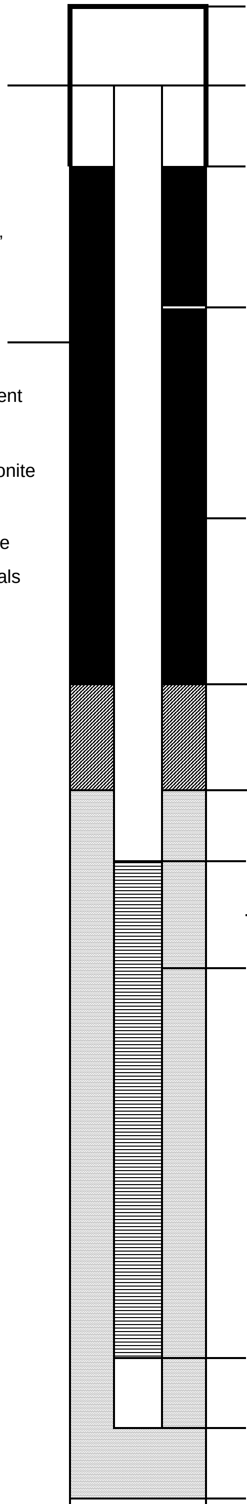
Approved: Sally W. Bilodeau

Describe Measuring Point:
North side at top of casing.

9/13/2018
Date

AECOM		
Client: NDEP		*WELL ID: NERT4.21N1*
Project Number: 60477365 - 2016-170		
Site Location: Las Vegas Wash, Henderson, Nevada		*Date Installed:* 6/19/2018
Well Location:	*Coords:*	*Inspector:* Sara Piper
Method: Sonic		*Contractor:* Cascade

MONITORING WELL CONSTRUCTION DETAIL



Measuring Point for Surveying & Water Levels

Cement, Bentonite, Bentonite Slurry Grout, or Native Materials

92 % Cement

8 % Bentonite

% Native Materials

Item	Depth from G.S. (feet)	Elevation(feet) Datum NAVD88
Traffic rated well box		
Top of Riser Pipe		1502.07
Ground Surface (G.S.)	0.0	1502.29
Bottom of Steel Guard Pipe		
Top of Bentonite	40	1462.29
Top of Sand	43	1459.29
Top of Screen	45	1457.29
▼ Stabilized Water Level	35.88	1466.41
Bottom of Screen	55	1447.3
Bottom of Tail Pipe:	55.4	1446.9
Bottom of Borehole	drilled to 90 feet and backfilled with bentonite	1412.3

Riser Pipe:
- Length: 45 feet
- Inside Diameter (ID): 4 inches
- Type of Material: Schedule 40 PVC

Bentonite Seal Thickness: 3 feet

Screen:
- Length: 10 feet
- Inside Diameter (ID): 4 inches
- Slot Size: 0.020 inches
- Type of Material: PVC

Type/Size of Sand: #3

Sand Pack Thickness: 2 inches

Borehole Diameter: 8 inches

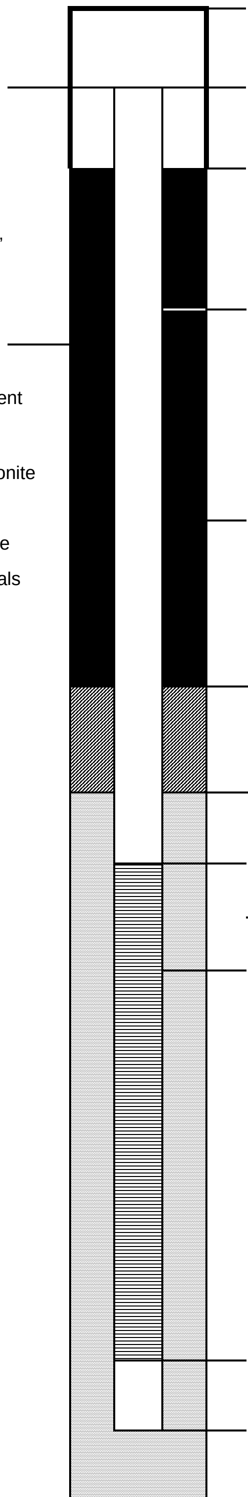
Approved: Sally W. Bilodeau

Date: 9/13/2018

Describe Measuring Point:
North side at top of casing.

AECOM	*Client:* NDEP	***WELL ID: NERT4.38N1***
	Project Number: 60477365 - 2016-170	
	Site Location: Las Vegas Wash, Henderson, Nevada	*Date Installed:* 6/21/2018
	Well Location: *Coords:*	*Inspector:* Sara Piper
	Method: Sonic	*Contractor:* Cascade

MONITORING WELL CONSTRUCTION DETAIL



Measuring Point for Surveying & Water Levels

Cement, Bentonite, Bentonite Slurry Grout, or Native Materials

% Cement

% Bentonite

% Native Materials

	Depth from G.S. (feet)	Elevation(feet) Datum NAVD88
Traffic rated well box	Flush	
Top of Riser Pipe		1505.04
Ground Surface (G.S.)	0.0	1505.27
Bottom of Steel Guard Pipe		
Top of Bentonite	26	1479.3
Top of Sand	28	1477.3
Top of Screen	30	1475.3
▼ Stabilized Water Level	33.2	1472.1
Bottom of Screen	40	1465.3
Bottom of Tail Pipe:	40	1465.3
Bottom of Borehole	drilled to 60 feet and backfilled with bentonite	1445.3

Riser Pipe:
- Length: 30 feet
- Inside Diameter (ID): 4 inches
- Type of Material: Schedule 40 PVC

Bentonite Seal Thickness: 2 feet

Screen:
- Length: 10 feet
- Inside Diameter (ID): 4 inches
- Slot Size: 0.020 inches
- Type of Material: Schedule 40 PVC

Type/Size of Sand: #3

Sand Pack Thickness: 2 inches

Borehole Diameter: 8 inches

Approved:

Sally W. Bilodeau

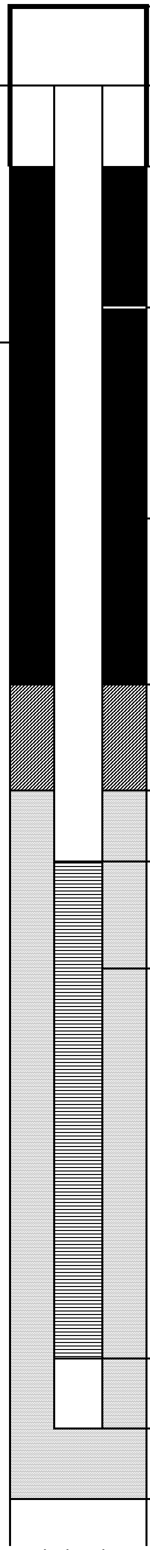
9/13/2018

Date

Describe Measuring Point:
North side at top of casing.

AECOM	Client: NDEP	WELL ID: NERT4.51S1
	Project Number: 60477365 - 2016-170	
	Site Location: Las Vegas Wash, Henderson, Nevada	Date Installed: 6/14/2018
	Well Location: Coords:	Inspector: Sara Piper
	Method: Sonic	Contractor: Cascade

MONITORING WELL CONSTRUCTION DETAIL



	Depth from G.S. (feet)	Elevation(feet) Datum NAVD88
Traffic rated well box	Flush	
Top of Riser Pipe		1506.24
Ground Surface (G.S.)	0.0	1506.79
Bottom of Steel Guard Pipe		
Top of Bentonite	34 feet	1472.8
Top of Sand	37 feet	1469.8
Top of Screen	40 feet	1466.8
Stabilized Water Level	26.6 feet	1480.2
Bottom of Screen	50 feet	1456.8
Bottom of Tail Pipe:	50.4 feet	1456.4
Bottom of Borehole	drilled to 57.5 feet and backfilled with bentonite	1449.3

Measuring Point for Surveying & Water Levels

Cement, Bentonite, Bentonite Slurry Grout, or Native Materials

% Cement

% Bentonite

% Native Materials

Riser Pipe:
- Length: 40 feet
- Inside Diameter (ID): 4 inches
- Type of Material: Schedule 40 PVC

Bentonite Seal Thickness: 3 feet

Screen:
- Length: 10 feet
- Inside Diameter (ID): 4 inches
- Slot Size: 0.020 inches
- Type of Material: Schedule 40 PVC

Type/Size of Sand: #3

Sand Pack Thickness: 2 inches

Borehole Diameter: 8 inches

Approved: Sally W. Bilodeau

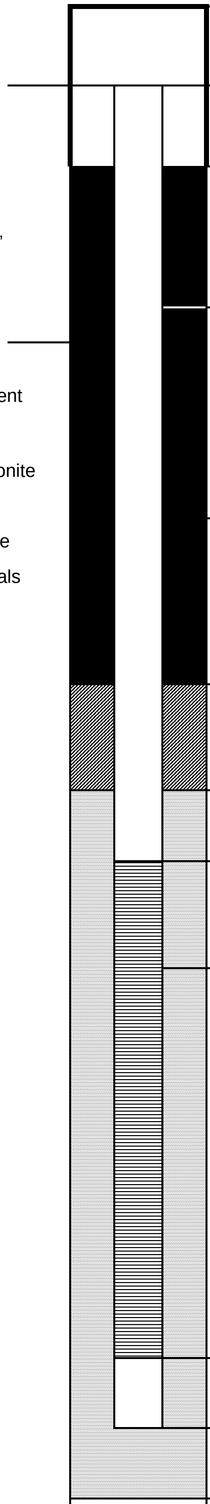
9/13/2018
Date

Describe Measuring Point:
North side at top of casing.

AECOM

Client: NDEP	**WELL ID: NERT4.71S1**
Project Number: 60477365 - 2016-170	
Site Location: Las Vegas Wash, Henderson, Nevada	Date Installed: 6/27/2018
Well Location: Coords:	Inspector: Sara Piper
Method: Sonic	Contractor: Cascade

MONITORING WELL CONSTRUCTION DETAIL



Measuring Point for Surveying & Water Levels

Cement, Bentonite, Bentonite Slurry Grout, or Native Materials

___ % Cement

___ % Bentonite

___ % Native Materials

	Depth from G.S. (feet)	Elevation(feet) Datum NAVD88
Traffic rated well box		
Top of Riser Pipe		1519.29
Ground Surface (G.S.)	0.0	1519.64
Bottom of Steel Guard Pipe		
Top of Bentonite	35	1484.6
Top of Sand	38	1481.6
Top of Screen	40	1479.6
▼ Stabilized Water Level	28.75	1490.9
Bottom of Screen	50	1469.6
Bottom of Tail Pipe:	50.4	1469.2
Bottom of Borehole	drilled to 90 feet and backfilled with bentonite chips	1429.6

Riser Pipe:
- Length: 30
- Inside Diameter (ID): 4 inches
- Type of Material: Schedule 40 PVC

Bentonite Seal Thickness: 3 feet

Screen:
- Length: 10 feet
- Inside Diameter (ID): 4 inches
- Slot Size: 0.020 inches
- Type of Material: Schedule 40 PVC

Type/Size of Sand: #3

Sand Pack Thickness: 2 inches

Borehole Diameter: 8 inches

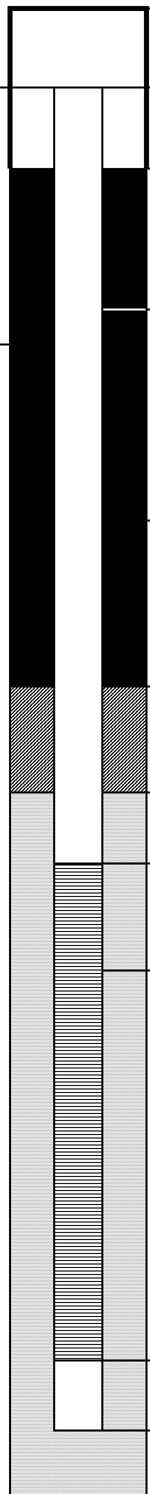
Approved: Sally W. Bilodeau

Date: 9/13/2018

Describe Measuring Point:
North side at top of casing.

Client: NDEP	WELL ID: NERT4.93S1
Project Number: 60477365 - 2016-170	
Site Location: Las Vegas Wash, Henderson, Nevada	Date Installed: 6/15/2018
Well Location: Coords:	Inspector: Sara Piper
Method: Sonic	Contractor: Cascade

MONITORING WELL CONSTRUCTION DETAIL



	Depth from G.S. (feet)	Elevation(feet) Datum NAVD88
Traffic rated well box	Flush	
Top of Riser Pipe		1523.33
Ground Surface (G.S.)	0.0	1523.83
Bottom of Steel Guard Pipe		
Top of Bentonite	40 feet	1483.8
Top of Sand	43 feet	1480.8
Top of Screen	45 feet	1478.8
▼ Stabilized Water Level	27.77 feet	1496.1
Bottom of Screen	55 feet	1468.8
Bottom of Tail Pipe:	55.4 feet	1468.4
Bottom of Borehole	drilled to 65 feet and backfilled with bentonite	1458.8

Measuring Point for Surveying & Water Levels

Cement, Bentonite, Bentonite Slurry Grout, or Native Materials

___ % Cement

___ % Bentonite

___ % Native Materials

Riser Pipe:
- Length: 45 feet
- Inside Diameter (ID): 4 inches
- Type of Material: Schedule 40 PVC

Bentonite Seal Thickness: 3 feet

Screen:
- Length: 10 feet
- Inside Diameter (ID): 4 inches
- Slot Size: 0.020 inches
- Type of Material: Schedule 40 PVC

Type/Size of Sand: #3

Sand Pack Thickness: 2 inches

Borehole Diameter: 8 inches

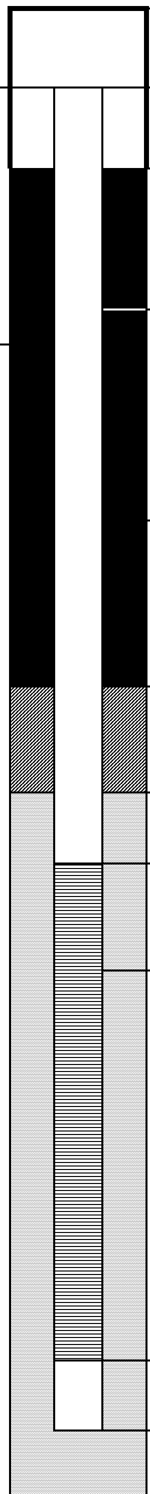
Approved: Sally W. Bilodeau

9/13/2018
Date

Describe Measuring Point:
North side at top of casing.

AECOM	*Client: NDEP*	***WELL ID: NERT5.11S1***
	Project Number: 60477365 - 2016-170	
	Site Location: Las Vegas Wash, Henderson, Nevada	*Date Installed: 6/16/2018*
	Well Location: Coords:	*Inspector: Sara Piper*
	Method: Sonic	*Contractor: Cascade*

MONITORING WELL CONSTRUCTION DETAIL



	Depth from G.S. (feet)	Elevation(feet) Datum NAVD88
Traffic rated well box		
Top of Riser Pipe		1522.88
Ground Surface (G.S.)	0.0	1523.18
Bottom of Steel Guard Pipe		
Top of Bentonite	30	1493.2
Top of Sand	33	1490.2
Top of Screen	35	1488.2
▼ Stabilized Water Level	20.77	1502.4
Bottom of Screen	45	1478.2
Bottom of Tail Pipe:	45.4	1477.8
Bottom of Borehole	drilled to 90 feet and backfilled with bentonite chips	1433.2

Measuring Point for Surveying & Water Levels

Cement, Bentonite, Bentonite Slurry Grout, or Native Materials

___ % Cement

___ % Bentonite

___ % Native Materials

Riser Pipe:
- Length: 35
- Inside Diameter (ID): 4 inches
- Type of Material: Schedule 40 PVC

Bentonite Seal Thickness: 3 fwwt

Screen:
- Length: 10 feet
- Inside Diameter (ID): 4 inches
- Slot Size: 0.020 inches
- Type of Material: Schedule 40 PVC

Type/Size of Sand: #3

Sand Pack Thickness: 2 inches

Borehole Diameter: 8 inches

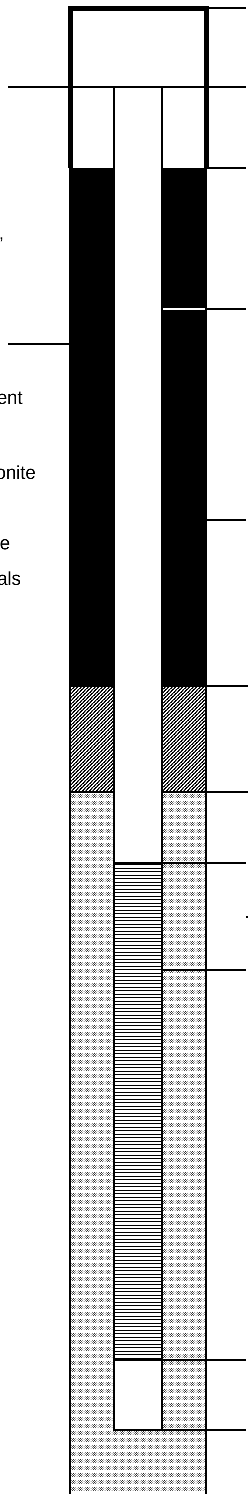
Approved: Sally W. Bilodeau

9/13/2018
Date

Describe Measuring Point:
North side at top of casing.

AECOM	Client: NDEP	WELL ID: NERT5.49S1
	Project Number: 60477365 - 2016-170	
	Site Location: Las Vegas Wash, Henderson, Nevada	Date Installed: 6/18/2018
	Well Location: Coords:	Inspector: Sara Piper
	Method: Sonic	Contractor: Cascade

MONITORING WELL CONSTRUCTION DETAIL



	Depth from G.S. (feet)	Elevation(feet) Datum NAVD88
Traffic rated well box		
Top of Riser Pipe		1543.37
Ground Surface (G.S.)	0.0	1543.73
Bottom of Steel Guard Pipe		
Top of Bentonite	25	1518.73
Top of Sand	28	1515.73
Top of Screen	30	1513.7
Stabilized Water Level	26.79	1516.94
Bottom of Screen	40	1503.73
Bottom of Tail Pipe:	40.4	1503.33
Bottom of Borehole	drilled to 90 feet and backfilled with bentonite chips	1453.73

Measuring Point for Surveying & Water Levels

Cement, Bentonite, Bentonite Slurry Grout, or Native Materials

____ % Cement

____ % Bentonite

____ % Native Materials

Riser Pipe:
- Length: 30
- Inside Diameter (ID): 4 inches
- Type of Material: Schedule 40 PVC

Bentonite Seal Thickness: 3 feet

Screen:
- Length: 10 feet
- Inside Diameter (ID): 4 inches
- Slot Size: 0.020 inches
- Type of Material: Schedule 40 PVC

Type/Size of Sand: #3

Sand Pack Thickness: 2 inches

Borehole Diameter: 8 inches

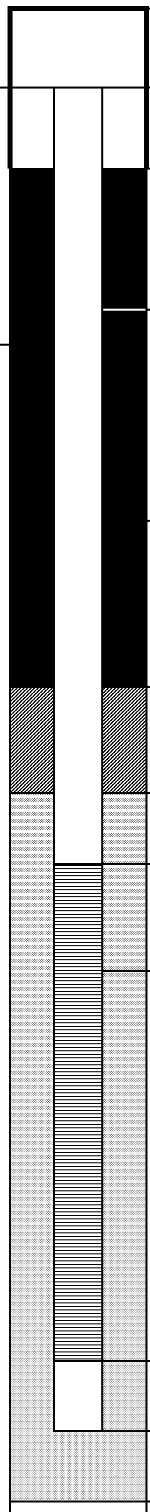
Approved: Sally W. Bilodeau

9/13/2018
Date

Describe Measuring Point:
North side at top of casing.

AECOM	*Client:* *NDEP*	***WELL ID: NERT5.91S1***
	Project Number: *60477365 - 2016-170*	
	Site Location: *Las Vegas Wash, Henderson, Nevada*	*Date Installed: 6/17/2018*
	Well Location: *Coords:*	*Inspector: Sara Piper*
	Method: *Sonic*	*Contractor:* *Cascade*

MONITORING WELL CONSTRUCTION DETAIL



Item	Depth from G.S. (feet)	Elevation(feet) Datum NAVD88
Traffic rated well box		
Top of Riser Pipe		1536.76
Ground Surface (G.S.)	0.0	1537.10
Bottom of Steel Guard Pipe		
Top of Bentonite	35	1502.1
Top of Sand	38	1499.1
Top of Screen	40	1497.1
▼ Stabilized Water Level	13.35	1523.8
Bottom of Screen	50	1487.1
Bottom of Tail Pipe:	50.4	1486.7
Bottom of Borehole	drilled to 90 feet and backfilled with bentonite chips	1446.8

Measuring Point for Surveying & Water Levels

Cement, Bentonite, Bentonite Slurry Grout, or Native Materials

___ % Cement

___ % Bentonite

___ % Native Materials

Riser Pipe:
- Length: 30
- Inside Diameter (ID): 4 inches
- Type of Material: Schedule 40 PVC

Bentonite Seal Thickness: 3 feet

Screen:
- Length: 10 feet
- Inside Diameter (ID): 4 inches
- Slot Size: 0.020 inches
- Type of Material: Schedule 40 PVC

Type/Size of Sand: #3

Sand Pack Thickness: 2 inches

Borehole Diameter: 8 inches

Approved: Sally W. Bilodeau

Date: 9/13/2018

Describe Measuring Point:
North side at top of casing.

Appendix D

Well Development Records

Well/Piez. ID: NERT38051

AECOM

Development Record

Client: NDEP Site Location: NERT38051-LVW

Project No: 60477365-2016-170 Date: 7/5/18 Developer: J CARTER AECOM / F Vadukzcd Cascade

WELL/PIEZOMETER DATA

Well ☒ Piezometer ☐ Diameter 4" PVC / 8" BH Material ______

Measuring Point Description: North TOC Geology at Screen Interval (if known) ______

Depth to Top of Screen (ft.): 9.67

Depth to Bottom of Screen (ft.): 19.67 Time of Water Level Measurement: 700

Total Well Depth (ft.): 19.67 Calculate Purge Volume (gal.): ~~112.5 = 375~~ 170-240

Depth to Static Water Level (ft.): 10.67 Disposal Method: Poly tank to NERT site

Wellhead PID/FID ______

Original Well Development ☒ Redevelopment ☐ Date of Original Development ______

DEVELOPMENT METHOD Surge block/Bailer, Pump **PURGE METHOD** ______

Field Testing Equipment Used:

Make	Model	Serial Number
HORIBA	U52-2	7415

Field Testing Calibration Documentation Found in Field Notebook # ______ Page # ______ – Daily

Time	Volume Removed (gal)	T° (C/F)	pH	Spec. Cond (umhos)	Turbidity (NTUs)	DO	Color	Odor	Other
750	25	26.25	7.43	3.81	30.1	2.60	Clear	None	–
810	75	25.62	7.17	3.71	2.7	1.30	Clear	None	–
820	100	25.24	7.16	3.70	0.0	1.28	Clear	None	–
830	125	24.68	7.10	3.71	0.0	1.24	Clear	None	–
840	150	24.12	7.11	3.73	0.0	1.27	Clear	None	–
850	175	24.01	7.10	3.74	0.0	1.27	Clear	None	–
0900	200	24.02	7.11	3.74	0.0	1.25	Clear	None	–
Development complete									
					7/5/18				

ACCEPTANCE CRITERIA (from workplan) ~~112.5~~

Min. Purge Volume (7-10 borehole volumes) ~~375~~ gallons 170-240

Maximum Turbidity Allowed ______ NTUs

Stabilization of parameters 10%

pH +-0.1

temp 1 degree C

all others 10%

	Yes	No	N/A
Has required volume been removed	☐	☐	☐
Has required turbidity been reached	☐	☐	☐
Have parameters stabilized	☐	☐	☐

If no or N/A explain below:

if there is sufficient recharge but not over 4 hrs

Signature ______ Date: 7/5/18

Surge/Bail @ 705 ~ 3 gal removed

Pump on @ 740 - purge @ 2.5 gal/min

NERT
4.21N1

AECOM

Well/Piez. ID:

Well/Piezometer Development Record

Client: NDEP Site Location: North side of wash

Project No: 60477365-2016-170 Date: ______ Developer: Jr. Tilivala-Cascade.

WELL/PIEZOMETER DATA

Well ☑ Piezometer ☐ Diameter 4" Material Sch 40 PVC

Measuring Point Description: N side TOC

Geology at Screen Interval (if known): Gravels, sand + silt

Depth to Top of Screen (ft.): 45'

Depth to Bottom of Screen (ft.): 54.9

Time of Water Level Measurement: 0802

Total Well Depth (ft.): 54.9

Calculate Purge Volume (gal.): 3 casing volumes = 36 gal.

Depth to Static Water Level (ft.): 35.88

Disposal Method: Poly tank on trailer

Wellhead PID/FID: —

Original Well Development ☑ Redevelopment ☐ Date of Original Development: 6/25/18

DEVELOPMENT METHOD Bail, Surge + pump **PURGE METHOD** ______

Field Testing Equipment Used: Make / Model / Serial Number

Horiba 59613, WL indicator

Bailer, surge block and pump (monsoon = max 3 gpm)

Field Testing Calibration Documentation Found in Field Notebook # ______ Page # ______

Time	Volume Removed (gal)	T° (C/F)	pH	Spec. Cond (umhos)	Turbidity (NTUs)	DO	Color	Odor	Other	DTW	ORP
0952	start	24.90	7.73	5.54	>1,000	3.25	Brn	—		36	129
1002	2.5	24.04	7.62	5.54	>1,000	2.29	Brn	—		36	120
1012	12.5	23.82	7.62	5.50	850	2.21	slt cloudy	—		36	119
1017	22.5	23.74	7.55	5.60	350	2.19	clear			36	110
1022	35	23.72	7.57	5.61	280	2.20	clear	—		36	100
1027	47.5	23.73	7.58	5.62	130	2.20	clear	—		36	100

2 gpm

2.5 gpm

ACCEPTANCE CRITERIA (from workplan)

Min. Purge Volume (7-10 borehole volumes) ______ gallons

Maximum Turbidity Allowed ______ NTUs

Stabilization of parameters 10%

pH +-0.1

temp 1 degree C

all others 10%

	Yes	No	N/A
Has required volume been removed	☑	☐	☐
Has required turbidity been reached	☐	☑	☐
Have parameters stabilized	☑	☐	☐

if there is sufficient recharge but not over 4 hrs

If no or N/A explain below:

Signature ______ Date: 6/25/18

Baited 7 gallons

Pump 47.5 gallons.

AECOM

Well/Piez. ID: NERT 4.38N1

Well/Piezometer Development Record

Client: NDEP Site Location: LV Wash North

Project No: 60477365-2016-170 Date: ____ Developer: Junior Tiliucla / cascade

WELL/PIEZOMETER DATA

Well ☑ Piezometer ☐ Diameter 4" Material Sch 40 PVC

Measuring Point Description: N TOC Geology at Screen Interval (if known): Silt, Sand & gravel

Depth to Top of Screen (ft.): 30.

Depth to Bottom of Screen (ft.): 39.8 Time of Water Level Measurement: 1210

Total Well Depth (ft.): 39.8 Calculate Purge Volume (gal.): 3 casing volume R.9 gallons.

Depth to Static Water Level (ft.): 33.2 Disposal Method: Polytank on truck

Wellhead PID/FID: ____

Original Well Development ☑ Redevelopment ☐ Date of Original Development: 6/25/18

DEVELOPMENT METHOD: bail, surge, pump. PURGE METHOD: ____

Field Testing Equipment Used: Make / Model / Serial Number

Horiba, WL indicator

~~Pum monsoon~~ – 3 gpm

Field Testing Calibration Documentation Found in Field Notebook # ____ Page # ____

Time	Volume Removed (gal)	T° (C/F)	pH	Spec. Cond (umhos)	Turbidity (NTUs)	DO	Color	Odor	Other	DTW	ORP
1322	start	24.61	7.30	5.17	0.0 7100	1.94	Brown	–		33.22	87
1327	10	23.60	7.55	5.14	71,000 ↓	1.87	cloudy	–		33.2	76
1332	22.5	23.45	7.51	5.05	372	1.86	clear	–		33.2	52
1337	34	23.58	7.47	5.02	147	1.86	clear	–		33.2	47
1342	46.5	23.41	7.47	5.02	72	1.86	clear	–		33.51	43
			Stop.								

2gpm

ACCEPTANCE CRITERIA (from workplan)

Min. Purge Volume (7-10 borehole volumes) ____ gallons
Maximum Turbidity Allowed ____ NTUs
Stabilization of parameters 10%
pH +-0.1
temp 1 degree C
all others 10%

	Yes	No	N/A
Has required volume been removed	☑	☐	☐
Has required turbidity been reached	☑	☐	☐
Have parameters stabilized	☑	☐	☐

if there is sufficient recharge but not over 4 hrs

If no or N/A explain below:

Signature: [signature] Date: 6/25/18

Bailed 7 gallon

Pump 46.5 gallons -

AECOM

Well/Piez. ID: NERT4.57S1

Well/Piezometer Development Record

Client: NDEP Site Location: LV Wash

Project No: 60477365-2016-170 Date: 6-26-18 Developer: Cascade

WELL/PIEZOMETER DATA

Well ☒ Piezometer ☐ Diameter 4" Material ______

Measuring Point Description: TOC

Geology at Screen Interval (if known): ______

Depth to Top of Screen (ft.): 40

Depth to Bottom of Screen (ft.): 50

Time of Water Level Measurement: 7:15

Total Well Depth (ft.): 53.30

Calculate Purge Volume (gal.): 24.4=1 vol 170 gal

Depth to Static Water Level (ft.): 26.60

Disposal Method: ______

17.35 well gall
7.05 sand pack gall

Wellhead PID/FID: - -

Original Well Development ☒ Redevelopment ☐ Date of Original Development: 6-26-18

DEVELOPMENT METHOD: Pump

PURGE METHOD: Bail/Surge/Pump 1.5"@ 2.5 gpm

Field Testing Equipment Used:

Make	Model	Serial Number
Horiba	U-50	59613

Field Testing Calibration Documentation Found in Field Notebook # ______ Page # ______

Time	Volume Removed (gal)	T° (C/F)	pH	Spec. Cond (umhos)	Turbidity (NTUs)	DO %	Color	Odor	Other	ORP mV
9:31	27.5	25.56	7.49	5.74	137	109.3	Clear	None	2.5 gpm	-29
9:52	80	23.58	7.50	5.75	139	88.4	Clear	None	2.5	153
10:00	100	23.57	7.50	5.74	119	79.5	Clear	None	26.66 DTW	143
10:05	112.5	23.57	7.54	5.74	131	71.7	Clear	None		133
10:10	125.0	23.56	7.55	5.79	135	67.0	Clear	None	26.66 DTW	129
10:15	137.5	23.60	7.56	5.75	116	60.4	Clear	None		
10:20	150	23.61	7.56	5.74	120	60.1	Clear	None		123
10:25	162.5	23.63	7.56	5.75	130	54.7	Clear	None		118
10:30	175	23.61	7.56	5.75	125	52.0	Clear	None		116
10:35	187.5	23.63	7.56	5.75	120	50.3	Clear	None	26.66 DTW	115
									26.62 - Final DTW	

ACCEPTANCE CRITERIA (from workplan)
Min. Purge Volume (7-10 borehole volumes) ____gallons
Maximum Turbidity Allowed ____ NTUs
Stabilization of parameters 10%
pH +-0.1
temp 1 degree C
all others 10%

	Yes	No	N/A
Has required volume been removed	☒	☐	☐
Has required turbidity been reached	☐	☐	☒
Have parameters stabilized	☒	☐	☐

If no or N/A explain below:

if there is sufficient recharge but not over 4 hrs

Signature: [signature] Date: 6-26-18

9850

LV Wash 6-26-18

6:00 arrive onsite
6:30 mobe to meet drillers
H+S Meeting
7:00 mobe to well NERT 4.5151
Area checked By Biologist prior to well Development.
~~De~~ 7:15 Set up Development truck on well (Cascade Drilling)
7:30 Take well DTW + TD
7:45 Remove sediment from Bottom of well with Bailer 2"
Some sand fine grained removed from Bottom of well
8:07 12.5 gallons removed with Bailer. Very small amount of
Sand removed with last few Bails. 53.3 TD/Some
26.64 DTW
8:10 Start surging 15 min every 5' screen
8:40 Finish surging 53.32 TD. 2675 DTW
8:45 Bail sediment from Bottom of well. - 15 gallons removed 9:00
Sand cleans up
26.70 DTW
9:05 Set pump in well 49.3 ft
9:30 Start pump
10:00 NDEP arrives on site obeserves well Development
10:35 Well peramaters have stablized 187.5 gallons have been
purged.
10:50 53.33 TD Final 26.62 DTW Final
DTW measured on west side of casing

AECOM

Development Record

Well/Piez. ID: NERT4.7151

Client: NDEP

Site Location: NERT LVW

Project No: 60477365-2016-170

Date: 7/5/18

Developer: J CARDOZO AECOM
F Verduzco Cascade

WELL/PIEZOMETER DATA

Well ☒ Piezometer ☐

Diameter 4" PVC
8" BH

Material ________

Measuring Point Description: North TOC

Geology at Screen Interval (if known) ________

Depth to Top of Screen (ft.) ~~34.80~~ 37.30

Depth to Bottom of Screen (ft.) ~~44.80~~ 47.30

Time of Water Level Measurement: 0935

Total Well Depth (ft.) ~~44.80~~ 47.30

Calculate Purge Volume (gal.) ~~294-420~~ 340-485

Depth to Static Water Level (ft.) 28.75

Disposal Method: Poly tank to NERT site

Wellhead PID/FID ________

Original Well Development ☒

Redevelopment ☐

Date of Original Development ________

DEVELOPMENT METHOD: Surge/Bail, Pump

PURGE METHOD ________

Field Testing Equipment Used:

Make	Model	Serial Number
Horiba	U52-2	7415

Field Testing Calibration Documentation Found in Field Notebook # ________ Page # ________ - Daily

Time	Volume Removed (gal)	T° (C/F)	pH	Spec. Cond (umhos)	Turbidity (NTUs)	DO	Color	Odor	Other
1145	30	33.39	10.15	5.47	>1000	2.25	Brown	None	✓
1215	105	30.26	9.84	5.36	>1000	2.15	Cloudy	None	✓
1235	155	28.44	8.20	5.48	265	5.07	cloudy	None	✓
1255	205	27.06	7.94	5.56	128	2.29	cloudy	None	✓
1315	255	27.19	7.86	5.57	11.8	2.04	Clear	None	✓
1325	280	26.74	7.79	5.62	7.6	2.87	Clear	None	✓
1335	305	26.66	7.76	5.63	6.4	2.64	Clear	None	✓
1345	330	26.50	7.69	5.72	5.9	2.59	Clear	None	✓
1355	375	26.59	7.64	5.70	5.5	2.63	Clear	None	✓
1400	development complete				7/5/18				

ACCEPTANCE CRITERIA (from workplan) ~~294-420~~

Min. Purge Volume (7-10 borehole volumes) ____ gallons 340-485

Maximum Turbidity Allowed ____ NTUs

Stabilization of parameters 10%

pH +-0.1

temp 1 degree C

all others 10%

Has required volume been removed ☐ Yes ☐ No ☐ N/A

Has required turbidity been reached ☐ Yes ☐ No ☐ N/A

Have parameters stabilized ☐ Yes ☐ No ☐ N/A

If no or N/A explain below:

if there is sufficient recharge but not over 4 hrs

Signature ________

Date: 7/5/18

Surge / Bail @ 0945 - Several ft of bentonite like material @ bottom of well. ~27 gal removed

1110 - Remeasure Bottom @ 47.30

1145 ~ Begin Pump @ 2.5 gal/min

AECOM

Well/Piez. ID: NERT 4.93S1

Well/Piezometer Development Record

Client: NDEP Site Location: LV Wash

Project No: 60477365-2016-170 Date: 6-26-18 Developer: Cascade

WELL/PIEZOMETER DATA

Well ☒ Piezometer ☐ Diameter 4" Material ______

Measuring Point Description: TOC West side

Depth to Top of Screen (ft.): 45

Depth to Bottom of Screen (ft.): 55

Total Well Depth (ft.): 53.90

Depth to Static Water Level (ft.): 27.77

18.99 = well gall
7.05 = Bore Hole

Geology at Screen Interval (if known): ______

Time of Water Level Measurement: 12:10

Calculate Purge Volume (gal.): 26 = 1 volume
182

Disposal Method: ______

Wellhead PID/FID: ______

Original Well Development ☒ Redevelopment ☐ Date of Original Development: 6-26-18

DEVELOPMENT METHOD ______ **PURGE METHOD** Bail / Surge / Pump

Field Testing Equipment Used:

Make	Model	Serial Number
Horiba	u-50	59613

Field Testing Calibration Documentation Found in Field Notebook # ______ Page # ______

Time	Volume Removed (gal)	T° (C/F)	pH	Spec. Cond (umhos)	Turbidity (NTUs)	DO mg/L	Color	Odor	SPM Other	ORP	DTW
14:45	50	23.52	7.73	5.83	987	6.21	Tan	None	2.5 gpm	145	27.91
15:00	87.5	23.47	7.45	5.80	713	2.88	Very light Brn	None	2.5	149	
15:10	112.5	23.43	7.41	5.83	275	1.49	Clear	None	2.5	127	27.90
		Pump	burn	out-	Had to re	place.					
15:45	120	23.50	7.42	5.77	625	6.41	Tan	None	2.5	136	
15:50	132.5	23.42	7.46	5.80	425	1.51	Very lt Brn	None	2.5	131	
15:55	145	23.38	7.48	5.81	318	1.38	light Tan	None	2.5	127	27.85
16:00	157.5	23.37	7.49	5.81	338	1.35	light Tan	None	2.5	121	
16:05	170	23.36	7.50	5.82	346	1.32	" "	None	2.5	119	
16:10	182.5	23.37	7.50	5.83	298	1.33	" "	None	2.5	118	
16:15	190	23.36	7.51	5.83	279	1.32	" "	None	2.5	117	27.85

Stop pump

ACCEPTANCE CRITERIA (from workplan)

Min. Purge Volume (7-10 borehole volumes) 182 gallons
Maximum Turbidity Allowed ______ NTUs
Stabilization of parameters 10%
pH +-0.1
temp 1 degree C
all others 10%
if there is sufficient recharge but not over 4 hrs

	Yes	No	N/A
Has required volume been removed	☒	☐	☐
Has required turbidity been reached	☐	☐	☐
Have parameters stabilized	☒	☐	☐

If no or N/A explain below:

Signature: [signature] Date: 6-26-18

182 gall = 7 volumes 65 refusal 45-55

Scanned by CamScanner

NERT 4.93 S1

6-26-18

11:00 Set up on well

11:20 Lunch

12:10 DTW = 27.77 TD 53-90 - soft Bottom

12:20 Use Bailer on well - Bottom of well has much mud - fine grained some fine grained sand also

13:08 - 25 gallons removed with bailer. Still a little bit of sand still coming from bottom of well

13:10 Start to surge well 30 min

13:45 Finish surge 28.25 DTW 54.55 TD

13:50 Bail more water post-surge 25 gallons

14:30 Set pump in well

14:45 Start pump

15:12 Pump stops working is replaced.

15:45 re-start pumping

15:85 over 7 volumes of well & boreHole are removed 190 gall. total pumping is stopped - Clean up site.

16:20 DTW = 27.76 TD = 54.55 Final

AECOM

Well/Piez. ID: NERT5.11S1

Well/Piezometer Development Record

Client: NDEP

Site Location: LV Wash

Project No: 60477365-2016-170 Date: 6-27-18

Developer: Cascade

WELL/PIEZOMETER DATA

Well ☒ Piezometer ☐ Diameter 4" Material ______

Measuring Point Description: TOC west side

Geology at Screen Interval (if known): ______

Depth to Top of Screen (ft.): 35

Depth to Bottom of Screen (ft.): 45

Time of Water Level Measurement: 7:10

Total Well Depth (ft.): 44.80

Calculate Purge Volume (gal.): 159 gall.

Depth to Static Water Level (ft.): 20.77

Disposal Method: ______

Wellhead PID/FID: --

Original Well Development ☒ Redevelopment ☐

Date of Original Development: 6-27-18

DEVELOPMENT METHOD: Pump

PURGE METHOD: Bail / Pump 1.5"

Field Testing Equipment Used: Make: Horiba Model: U-50 Serial Number: 59613

Field Testing Calibration Documentation Found in Field Notebook # ______ Page # ______

Time	Volume Removed (gal)	T° (C/F)	pH	Spec. Cond (umhos)	Turbidity (NTUs)	DO mg/l	Color	Odor	Other gpm	ORP	DTW
		22.48	7.41	5.83	463	0.90	Tan	None	2.5	-4	20.91
9:20	12.5	22.47	7.47	5.82	458	0.63	Clear	None	2.5	-13	
9:30	37.5	22.46	7.48	5.81	338	0.45	Clear	None	2.5	-13	
9:40	62.5	22.45	7.48	5.80	333	0.32	Clear	None	2.5	-10	20.88
9:50	87.5	22.44	7.48	5.82	224	0.30	Clear	None	2.1	-5	
10:00	112.5	22.45	7.49	5.80	215	0.29	Clear	None	2.5	-2	
10:10	137.5	22.45	7.49	5.81	203	0.28	Clear	None	2.5	-1	20.88
10:20	162.5										

ACCEPTANCE CRITERIA (from workplan)

Min. Purge Volume (7-10 borehole volumes) 7 gallons

Maximum Turbidity Allowed ______ NTUs

Stabilization of parameters 10%

pH +-0.1

temp 1 degree C

all others 10%

if there is sufficient recharge but not over 4 hrs

	Yes	No	N/A
Has required volume been removed	☒	☐	☐
Has required turbidity been reached	☐	☐	☐
Have parameters stabilized	☒	☐	☐

If no or N/A explain below:

Signature: Tom Mn Date: 6-27-18

Scanned by CamScanner

NERT 5.11 S1 Well Development 6-27-18

6:00 Arrive onsite

6:15 H&S Meeting

6:30 Set up on well 511S1

7:00 Initial DTW = 20.77 TD = 44.80

7:20 Start to bail water & sediment from bottom of well.

Small amount of fine sand from bottom of well

10 gallons removed from well with Bailer.

7:35 Start to surge well 30 min.

8:10 Bail sediment from bottom of well 20 gallons removed.

8:45 Set pump in well 10" from BTM.

9:15 start pump @ 2.5 gpm

10:20 stop pump

10:35 Final DTW = 20.80 TD = 45.05

Well/Piez. ID: NERT 5.4951

AECOM

Well/Piezometer Development Record

Client: NDEP   Site Location: LV Wash

Project No: 60477365-2016-170   Date: 6-27-18   Developer: Cascade

WELL/PIEZOMETER DATA

Well ☒   Piezometer ☐   Diameter 4   Material ______

Measuring Point Description: TOC South side

Geology at Screen Interval (if known): ______

Depth to Top of Screen (ft.): 30

Depth to Bottom of Screen (ft.): 40

Time of Water Level Measurement: 12:00

Total Well Depth (ft.): 39.99

Calculate Purge Volume (gal.): 110

Depth to Static Water Level (ft.): 26.79

Disposal Method: ______

Wellhead PID/FID: ______

Original Well Development ☒   Redevelopment ☐   Date of Original Development: 6-27-18

DEVELOPMENT METHOD: Bail/Surge/Pump   **PURGE METHOD**: Pump

Field Testing Equipment Used:

Make	Model	Serial Number
Horiba	U-50	59613

Field Testing Calibration Documentation Found in Field Notebook # ______ Page # ______

13:35

Time	Volume Removed (gal)	T° (C/F)	pH	Spec. Cond (umhos)	Turbidity (NTUs)	DO	Color	Odor	SpCm Other	ORP	DTW
13:40	12.5	22.64	7.61	2.36	421	1.45	Clear	None	2.5	81	
13:50	37.5	22.41	7.64	2.37	92.3	0.10	Clear	None	2.5	64	26.80
14:00	62.5	22.35	7.65	2.37	31.7	0.00	Clear	None	2.5	58	
14:05	75	22.30	7.67	2.37	15.6	0.00	Clear	None	2.5	56	26.80
14:10	87.5	22.30	7.67	2.37	7.3	0.00	Clear	None	2.5		
14:15	100	22.31	7.68	2.37	3.2	0.00	Clear	None	2.5		26.80
14:20	112.5	22.30	7.68	2.37	1.4	0.00	Clear	None	2.5		

ACCEPTANCE CRITERIA (from workplan)

Min. Purge Volume (7-10 borehole volumes) 110 gallons

Maximum Turbidity Allowed ______ NTUs

Stabilization of parameters 10%

pH +-0.1

temp 1 degree C

all others 10%

	Yes	No	N/A
Has required volume been removed	☒	☐	☐
Has required turbidity been reached	☐	☐	☐
Have parameters stabilized	☒	☐	☐

If no or N/A explain below:

if there is sufficient recharge but not over 4 hrs

Signature: Jon M   Date: 6-27-18

6-27-18 LV Wash NERT 5.4951

11:45 Set up on well 5.4951

12:00 DTW = 26.79 TD = 39.99

12:03 Bail sediment from bottom of well

10 gallons removed B1

12:30 TD = 40.10

12:35 Surge well 30 minutes 40.05 TD

13:05 Bail sediment from bottom of well

10 gallons removed 40.10 TD

13:25 Set pump in well 1' from BTM Start @ 13:35

14:20 Pump stopped

14:40 Final DTW = 26.75 TD 40.10

AECOM

Well/Piez. ID: NERT 5.91S1

Well/Piezometer Development Record

Client: NDEP Site Location: LV Wash

Project No: 60477365-2016-170 Date: 6-28-18 Developer: Cascade

WELL/PIEZOMETER DATA

Well ☒ Piezometer ☐ Diameter 4" Material ______

Measuring Point Description: TOC - East side

Depth to Top of Screen (ft.): 40

Depth to Bottom of Screen (ft.): 50

Total Well Depth (ft.): 46.25 Initial

Depth to Static Water Level (ft.): 13.35 Initial

23.8 well vol.
7.05 Bore Hole vol

Geology at Screen Interval (if known): ______

Time of Water Level Measurement: 6:40

Calculate Purge Volume (gal.): 216

Disposal Method: ______

Wellhead PID/FID: --

Original Well Development ☒ Redevelopment ☐ Date of Original Development: 6-28-18

DEVELOPMENT METHOD Bail/Surge/Pump **PURGE METHOD** Pump 1.5"

Field Testing Equipment Used:

Make	Model	Serial Number
Horiba	U-50	59613

Field Testing Calibration Documentation Found in Field Notebook # ______ Page # ______

8:12

Time	Volume Removed (gal)	T° (C/F)	pH	Spec. Cond (umhos)	Turbidity (NTUs)	DO mg/L	Color	Odor	Other 3 gpm	ORP	DTW
8:15	9	22.93	7.65	5.08	MAX	0.53	Tan	None	3	75	
8:21	27	22.95	7.63	5.02	MAX	0.12	Tan	None	3	-25	31.40
8:28	48	22.86	7.67	4.86	MAX	0.00	Light Tan	None	3	-42	35.70
8:35	69	22.76	7.66	4.74	MAX	0.00	Very light Tan	None	3	-40	36.94
8:43	93	22.76	7.66	4.73	109	0.00	Clear	None	3	-53	37.55
8:50	114	22.74	7.67	4.68	36.8	0.00	Clear	None	3	-55	37.65
8:58	138	22.73	7.66	4.67	17.0	0.00	Clear	None	3	-55	37.75
9:06	162	22.74	7.66	4.66	6.8	0.00	Clear	None	3	-55	37.94
9:15	189	22.74	7.67	4.66	3.7	0.00	Clear	None	3	-54	37.97
9:24	216	22.73	7.66	4.67	3.6	0.00	Clear	None	3	-53	38.10

MAX => 1000

ACCEPTANCE CRITERIA (from workplan)

Min. Purge Volume (7-10 borehole volumes) 216 gallons

Maximum Turbidity Allowed ______ NTUs

Stabilization of parameters 10%

pH +-0.1

temp 1 degree C

all others 10%

if there is sufficient recharge but not over 4 hrs

	Yes	No	N/A
Has required volume been removed	☒	☐	☐
Has required turbidity been reached	☒	☐	☐
Have parameters stabilized	☒	☐	☐

If no or N/A explain below:

Signature [signature] Date: 6-28-18

6-28-18 LV Wash NERT 5.9151

6:00 Arrive onsite & mobe to well

6:20 H & S Meeting

6:40 Set up on well DTW = 13.35 TD 46.25

6:45 Start to bail sediment from bottom of well

Mostly silt removed from bottom of well. 11 gallons removed

50 ft TD tagged

7:00 Start to surge well.

7:38 Bail sediment from bottom of well. 20 gal removed post ~~Ba~~ Surge

8:00 Set pump in well

8:12 Start pump @ 3 gpm

9:24 Stop pump 216 gal. removed. 7 vol. well parameters stablized.

9:45 Final 15.25 DTW 50.0 TD

Appendix E

Laboratory Reports of Soil Property Testing

5730 Centralcrest St. • Houston, TX 77092
Telephone (713) 316-1800 • Fax (877) 225-9953

July 11, 2018

Carmen Caceres-Schnell.
Project Manager,
AECOM,
1220 Avenida Acaso,
Camarillo, CA 93012.

Re: PTS File No: 48147
Project Name: NDEP Downgradient Study Area
Project Number: 60477365 Task 2016-170

Dear Carmen Caceres-Schnell,

Please find enclosed report for Physical Properties analyses conducted upon samples received from your **NDEP Downgradient Study Area** project. All analyses were performed by applicable ASTM, EPA, or API methodologies. The samples are currently in storage and will be retained for thirty days past the completion of testing at no charge. Please note that the samples will be disposed of at that time. You may contact me regarding storage, disposal, or return of the samples

PTS Laboratories appreciates the opportunity to be of service. If you have any questions or require additional information, please contact myself or Emeka Anazodo at (713) 316-1800.

Sincerely,
PTS Laboratories, Inc.

C.A.Umeh

Chidi Umeh
Flow Laboratory Supervisor

Encl.

PTS Laboratories

Project Name:	**NDEP Downgradient Study Area**	**PTS File No:**	**48147**
Project Number:	**60477365 Task 2016-170**	**Client:**	**AECOM**

TEST PROGRAM - 20180628

CORE ID	Depth ft.	Core Recovery ft.	Grain Size Analysis ASTM D422	Atterberg Limits ASTM D4318	USCS Soil Classification ASTM D2487	Moisture Content D2216	Comments
		Bags	Grab	Grab	Calc.	Grab	
Date Received: 20180627							
NERT4.51S1 15' 20180614	15	N/A	X	X	X	X	In ZipLock Bag
NERT4.51S1 42' 20180614	42	N/A	X	X	X	X	In ZipLock Bag
NERT4.51S1 48' 20180614	48	N/A	X	X	X	X	In ZipLock Bag
NERT4.51S1 52' 20180614	52	N/A	X	X	X	X	In ZipLock Bag
NERT4.93S1 15' 20180615	15	N/A	X	X	X	X	In ZipLock Bag
NERT4.93S1 41' 20180615	41	N/A	X	X	X	X	In ZipLock Bag
NERT4.93S1 47' 20180615	47	N/A	X	X	X	X	In ZipLock Bag
NERT4.93S1 48' 20180615	48	N/A	X	X	X	X	In ZipLock Bag
NERT4.93S1 60' 20180615	60	N/A	X	X	X	X	In ZipLock Bag
NERT5.11S1 17' 20180615	17	N/A	X	X	X	X	In ZipLock Bag
NERT5.11S1 37' 20180615	37	N/A	X	X	X	X	In ZipLock Bag
NERT5.11S1 40' 20180615	40	N/A	X	X	X	X	In ZipLock Bag
NERT5.11S1 67' 20180616	67	N/A	X	X	X	X	In ZipLock Bag
NERT5.11S1 72' 20180616	72	N/A	X	X	X	X	In ZipLock Bag
NERT5.91S1 17' 20180617	17	N/A	X	X	X	X	In ZipLock Bag
NERT5.91S1 40' 20180617	40	N/A	X	X	X	X	In ZipLock Bag
NERT5.91S1 47' 20180617	47	N/A	X	X	X	X	In ZipLock Bag
NERT5.91S1 50' 20180617	50	N/A	X	X	X	X	In ZipLock Bag
NERT5.91S1 60' 20180617	60	N/A	X	X	X	X	In ZipLock Bag
NERT5.91S1 87' 20180617	87	N/A	X	X	X	X	In ZipLock Bag
NERT5.49S1 20' 20180618	20	N/A	X	X	X	X	In ZipLock Bag
NERT5.49S1 32' 20180618	32	N/A	X	X	X	X	In ZipLock Bag
NERT5.49S1 72' 20180618	72	N/A	X	X	X	X	In ZipLock Bag
NERT5.49S1 89' 20180618	89	N/A	X	X	X	X	In ZipLock Bag
NERT4.21N1 22' 20180619	22	N/A	X	X	X	X	In ZipLock Bag
NERT4.21N1 45' 20180619	45	N/A	X	X	X	X	In ZipLock Bag
NERT4.21N1 48' 20180619	48	N/A	X	X	X	X	In ZipLock Bag
NERT4.21N1 62' 20180619	62	N/A	X	X	X	X	In ZipLock Bag
NERT4.21N1 87' 20180619	87	N/A	X	X	X	X	In ZipLock Bag
NERT4.38N1 12' 20180620	12	N/A	X	X	X	X	In ZipLock Bag
NERT4.38N1 35' 20180620	35	N/A	X	X	X	X	In ZipLock Bag
NERT4.38N1 45' 20180620	45	N/A	X	X	X	X	In ZipLock Bag
NERT4.38N1 55' 20180621	55	N/A	X	X	X	X	In ZipLock Bag
NERT4.38N1 60' 20180621	60	N/A	X	X	X	X	In ZipLock Bag
TOTALS:			**34**	**34**	**34**	**34**	**34**

Laboratory Test Program Notes

Standard TAT for basic analysis is 10-15 business days.

Grain Size Analysis: Dry Sieve method; includes tabular data, graphics and statistical sorting in Excel format.

USCS Soil Classification by ASTM D2487 requires Atterberg Limits and Grain Size Analysis (included as part of Test Program).

PTS File No: 48147
Client: AECOM
Report Date: 07/07/18

PTS Laboratories

WATER (MOISTURE) CONTENT OF SOIL OR ROCK BY MASS

(Methodology: ASTM D 2216)

Project Name: NDEP Downgradient Study Area
Project No: 60477365 Task 2016-170

SAMPLE ID.	DEPTH, ft.	PTS ID NO	ANALYSIS DATE	ANALYSIS TIME	MATRIX	TARE WEIGHT, grams	WET SAMPLE + TARE WT., grams	DRY SAMPLE + TARE WT., grams	MOISTURE CONTENT, % dry weight
NERT4.51S1 15' 20180614	15.0	1	20180702	11:00	soil	15.45	57.44	54.63	7.2
NERT4.51S1 42' 20180614	42.0	2	20180702	11:00	soil	15.50	59.91	57.94	4.6
NERT4.51S1 48' 20180614	48.0	3	20180702	11:00	soil	15.37	75.29	73.35	3.3
NERT4.51S1 52' 20180614	52.0	4	20180702	11:00	soil	15.53	58.20	55.69	6.3
NERT4.93S1 15' 20180615	15.0	5	20180702	11:00	soil	15.36	64.60	60.03	10.2
NERT4.93S1 41' 20180615	41.0	6	20180702	11:00	soil	15.43	78.36	66.28	23.8
NERT4.93S1 47' 20180615	47.0	7	20180702	11:00	soil	15.43	76.52	71.61	8.7
NERT4.93S1 48' 20180615	48.0	8	20180702	11:00	soil	15.56	71.19	64.63	13.4
NERT4.93S1 60' 20180615	60.0	9	20180702	11:00	soil	15.28	72.83	61.33	25.0
NERT5.11S1 17' 20180615	17.0	10	20180702	11:00	soil	15.60	60.86	57.98	6.8
NERT5.11S1 37' 20180615	37.0	11	20180702	11:00	soil	15.42	65.21	63.14	4.3
NERT5.11S1 40' 20180615	40.0	12	20180702	11:00	soil	15.49	60.68	55.28	13.6
NERT5.11S1 67' 20180616	67.0	13	20180702	11:00	soil	15.45	60.99	43.44	62.7
NERT5.11S1 72' 20180616	72.0	14	20180702	11:00	soil	15.36	61.48	48.96	37.3
NERT5.91S1 17' 20180617	17.0	15	20180702	11:00	soil	15.39	61.64	52.91	23.3
NERT5.91S1 40' 20180617	40.0	16	20180702	11:00	soil	15.42	64.68	52.43	33.1
NERT5.91S1 47' 20180617	47.0	17	20180702	11:00	soil	15.47	61.29	52.36	24.2
NERT5.91S1 50' 20180617	50.0	18	20180702	11:00	soil	15.49	69.24	61.09	17.9

PTS Laboratories

PTS File No: 48147
Client: AECOM
Report Date: 07/07/18

WATER (MOISTURE) CONTENT OF SOIL OR ROCK BY MASS

(Methodology: ASTM D 2216)

Project Name: NDEP Downgradient Study Area
Project No: 60477365 Task 2016-170

SAMPLE ID.	DEPTH, ft.	PTS ID NO	ANALYSIS DATE	ANALYSIS TIME	MATRIX	TARE WEIGHT, grams	WET SAMPLE + TARE WT., grams	DRY SAMPLE + TARE WT., grams	MOISTURE CONTENT, % dry weight
NERT5.91S1 60' 20180617	60.0	19	20180702	11:00	soil	15.37	62.30	50.64	33.1
NERT5.91S1 87' 20180617	87.0	20	20180702	11:00	soil	15.49	59.23	40.44	75.3
NERT5.49S1 20' 20180618	20.0	21	20180702	11:00	soil	15.63	73.76	69.95	7.0
NERT5.49S1 32' 20180618	32.0	22	20180702	11:00	soil	15.44	68.84	62.26	14.1
NERT5.49S1 72' 20180618	72.0	23	20180702	11:00	soil	15.53	74.91	50.30	70.8
NERT5.49S1 89' 20180618	89.0	24	20180702	11:00	soil	15.46	64.38	49.98	41.7
NERT4.21N1 22' 20180619	22.0	25	20180702	11:00	soil	15.49	72.29	63.18	19.1
NERT4.21N1 45' 20180619	45.0	26	20180702	11:00	soil	15.53	76.42	69.04	13.8
NERT4.21N1 48' 20180619	48.0	27	20180702	11:00	soil	15.49	72.44	68.39	7.7
NERT4.21N1 62' 20180619	62.0	28	20180702	11:00	soil	15.55	58.96	53.91	13.2
NERT4.21N1 87' 20180619	87.0	29	20180702	11:00	soil	15.58	87.20	78.65	13.6
NERT4.38N1 12' 20180620	12.0	30	20180702	11:00	soil	60.49	153.92	150.59	3.7
NERT4.38N1 35' 20180620	35.0	31	20180702	11:00	soil	60.45	137.66	127.41	15.3
NERT4.38N1 45' 20180620	45.0	32	20180702	11:00	soil	60.09	145.97	138.49	9.5
NERT4.38N1 55' 20180621	55.0	33	20180702	11:00	soil	60.61	159.67	149.92	10.9
NERT4.38N1 60' 20180621	60.0	34	20180702	11:00	soil	60.86	123.50	113.25	19.6

PTS Laboratories

PTS File No: 48147
Client: AECOM
Report Date: 07/11/18

ATTERBERG LIMITS DATA - FINE FRACTION < No. 40 SIEVE

Project Name: NDEP Downgradient Study Area
Project No: 60477365 Task 2016-170

			METHODS:	ASTM D4318			ASTM D4318	ASTM D2487	USDA
				ATTERBERG LIMITS (1)			USCS / PLASTICITY	USCS	USDA
SAMPLE ID.	DEPTH, ft.	PTS ID NO	ANALYSIS DATE	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	CHART SYMBOL (Fines: <#40 Sieve)	CLASSIFICATION, Group Symbol - Name	SOIL TEXTURE SCHEME (2)
NERT4.51S1 15' 20180614	15	1	20180629	30.3	19.6	10.7	CL	CL - Lean Clay with sand	-
NERT4.51S1 42' 20180614	42	2	20180629	21.9	NON PLASTIC		NP	GP - Poorly Graded gravel with sand	-
NERT4.51S1 48' 20180614	48	3	20180629	21.0	NON PLASTIC		NP	GP - Poorly Graded gravel with sand	-
NERT4.51S1 52' 20180614	52	4	20180629	53.5	17.0	36.5	CH	CH - Gravely Fat Clay with Sand	-
NERT4.93S1 15' 20180615	15	5	20180629	21.6	19.2	2.4	ML	ML - Sandy silt	-
NERT4.93S1 41' 20180615	41	6	20180629	31.6	16.6	15.0	CL	CL - Sandy Lean Clay	-
NERT4.93S1 47' 20180615	47	7	20180629	20.1	NON PLASTIC		NP	GP - Poorly graded Gravel with sand	-
NERT4.93S1 48' 20180615	48	8	20180629	21.2	14.9	6.3	CL-ML	CL-ML - Sandy Silty Clay with Gravel	-
NERT4.93S1 60' 20180615	60	9	20180629	30.9	16.5	14.4	CL	CL-Sandy Lean Clay	-
NERT5.11S1 17' 20180615	17	10	20180629	33.9	16.8	17.1	SP	SP - Poorly graded sand with Gravel	-
NERT5.11S1 37' 20180615	37	11	20180629	27.3	16.8	10.5	CL	CL - Lean Clay with Sand	-
NERT5.11S1 40' 20180615	40	12	20180629	20.5	NON PLASTIC		NP	ML - Sandy Silt	-
NERT5.11S1 67' 20180616	67	13	20180629	85.5	29.7	55.8	CH	CH - Sandy Fat Clay	-
NERT5.11S1 72' 20180616	72	14	20180629	107.2	30.6	76.6	CH	CH - Sandy Fat Clay	-
NERT5.91S1 17' 20180617	17	15	20180629	31.2	17.1	14.1	CL	CL - Sandy Lean Clay	-
NERT5.91S1 40' 20180617	40	16	20180629	42.0	18.0	24.0	CL	CL - Sandy Lean Clay	-
NERT5.91S1 47' 20180617	47	17	20180702	31.9	11.8	20.1	CL	CL - Lean Clay with Sand	-

PTS File No: 48147
Client: AECOM
Report Date: 07/11/18

PTS Laboratories

ATTERBERG LIMITS DATA - FINE FRACTION < No. 40 SIEVE

Project Name: NDEP Downgradient Study Area
Project No: 60477365 Task 2016-170

SAMPLE ID.	DEPTH, ft.	PTS ID NO	METHODS: ANALYSIS DATE	ASTM D4318 ATTERBERG LIMITS (1) LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	ASTM D4318 USCS / PLASTICITY CHART SYMBOL (Fines: <#40 Sieve)	ASTM D2487 USCS CLASSIFICATION, Group Symbol - Name	USDA USDA SOIL TEXTURE SCHEME (2)
NERT5.91S1 50' 20180617	50	18	20180702	32.1	11.8	20.3	CL	CL - Sandy Lean Clay with Gravel	-
NERT5.91S1 60' 20180617	60	19	20180702	85.4	29.7	55.7	CH	CH - Fat Clay with Sand	-
NERT5.91S1 87' 20180617	87	20	20180702	147.7	40.0	107.7	CH	CH - Fat Clay with Sand	-
NERT5.49S1 20' 20180618	20	21	20180702	23.2	10.6	12.6	CL	CL-SC - Clayey Sand	-
NERT5.49S1 32' 20180618	32	22	20180702	20.0	NON PLASTIC		NP	CL-ML - Silty Clay with Gravel	-
NERT5.49S1 72' 20180618	72	23	20180702	42.1	18.0	24.1	CL	CL - Sandy Lean Clay	-
NERT5.49S1 89' 20180618	89	24	20180702	42.1	16.1	26.0	CL	CL - Lean Clay with Gravel	-
NERT4.21N1 22' 20180619	22	25	20180702	31.2	16.8	14.4	CL	CL - Lean Clay with Sand	-
NERT4.21N1 45' 20180619	45	26	20180703	21.6	NON PLASTIC		NP	CL-ML - Silty Clay with Gravel	-
NERT4.21N1 48' 20180619	48	27	20180703	17.8	NON PLASTIC		NP	CL-ML - Silty Clay with Gravel	-
NERT4.21N1 62' 20180619	62	28	20180703	44.3	16.1	28.2	CL	CL - Lean Clay with Sand	-
NERT4.21N1 87' 20180619	87	29	20180703	44.4	14.7	29.7	CL	CL - Lean Clay with Sand	-
NERT4.38N1 12' 20180620	12	30	20180703	36.4	14.8	21.6	CL	GP-CL Poorly graded gravel with Clay	-
NERT4.38N1 35' 20180620	35	31	20180703	24.0	NON PLASTIC		NP	ML - Sandy Silt	-
NERT4.38N1 45' 20180620	45	32	20180703	37.5	13.2	24.3	CL	CL - Sandy Lean Clay	-
NERT4.38N1 55' 20180621	55	33	20180703	68.1	16.0	52.1	CH	CH - Sandy Fat Clay	-
NERT4.38N1 60' 20180621	60	34	20180703	45.7	19.8	25.9	CL	CL - Sandy Lean Clay	-

PTS Laboratories, Inc.

PTS File No: 48147
AECOM

PARTICLE SIZE SUMMARY

(METHODOLOGY: ASTM D422)

PROJECT NAME: NDEP Downgradient Study Area
PROJECT NO: 60477365 Task 2016-170

Sample ID	Depth, ft.	PTS ID No	Mean Grain Size Description USCS/ASTM (1)	Median Grain Size, mm	Particle Size Distribution, wt. percent: Gravel	Sand Size: Coarse	Sand Size: Medium	Sand Size: Fine	Silt/Clay
NERT4.51S1 15' 20180614	15.0	1	Silt/clay	0.072	0.96	7.20	16.32	24.21	51.31
NERT4.51S1 42' 20180614	42.0	2	Gravel	4.931	51.43	21.53	14.14	8.96	3.95
NERT4.51S1 48' 20180614	48.0	3	Gravel	6.907	59.91	19.64	12.11	6.34	2.00
NERT4.51S1 52' 20180614	52.0	4	Gravel	9.216	74.01	13.99	8.35	2.90	0.76
NERT4.93S1 15' 20180615	15.0	5	Fine sand	0.239	6.22	9.38	23.38	39.75	21.27
NERT4.93S1 41' 20180615	41.0	6	Silt/clay	0.083	0.00	0.92	11.23	42.45	45.40
NERT4.93S1 47' 20180615	47.0	7	Gravel	7.356	60.98	16.79	12.86	6.71	2.66
NERT4.93S1 48' 20180615	48.0	8	Medium sand	1.178	16.59	19.25	32.28	23.38	8.50
NERT4.93S1 60' 20180615	60.0	9	Medium sand	0.333	10.14	13.93	23.11	30.85	21.97
NERT5.11S1 17' 20180615	17.0	10	Gravel	4.028	42.84	32.30	15.80	5.02	4.04
NERT5.11S1 37' 20180615	37.0	11	Fine sand	1.343	22.35	18.97	23.97	24.43	10.28
NERT5.11S1 40' 20180615	40.0	12	Fine sand	0.356	5.47	5.18	32.40	51.90	5.06
NERT5.11S1 67' 20180616	67.0	13	Fine sand	0.255	0.00	2.22	33.79	35.85	28.14
NERT5.11S1 72' 20180616	72.0	14	Medium sand	0.472	0.30	9.42	43.27	31.85	15.16
NERT5.91S1 17' 20180617	17.0	15	Fine sand	0.105	8.23	5.67	13.57	37.23	35.30
NERT5.91S1 40' 20180617	40.0	16	Medium sand	0.602	6.30	17.25	31.96	27.34	17.15
NERT5.91S1 47' 20180617	47.0	17	Medium sand	1.120	13.92	18.31	34.38	18.28	15.12

(1) Based on Mean from Trask

PTS Laboratories, Inc.

PTS File No: 48147
AECOM

PARTICLE SIZE SUMMARY

(METHODOLOGY: ASTM D422)

PROJECT NAME: NDEP Downgradient Study Area
PROJECT NO: 60477365 Task 2016-170

Sample ID	Depth, ft.	PTS ID No	Mean Grain Size Description USCS/ASTM (1)	Median Grain Size, mm	Particle Size Distribution, wt. percent				
					Gravel	Sand Size			Silt/Clay
						Coarse	Medium	Fine	
NERT5.91S1 50' 20180617	50.0	18	Medium sand	1.709	24.65	20.82	35.73	14.29	4.51
NERT5.91S1 60' 20180617	60.0	19	Medium sand	1.050	1.11	25.38	40.61	23.76	9.15
NERT5.91S1 87' 20180617	87.0	20	Coarse sand	1.787	5.51	39.88	36.35	14.29	3.97
NERT5.49S1 20' 20180618	20.0	21	Coarse sand	1.367	12.07	26.91	25.22	26.69	9.10
NERT5.49S1 32' 20180618	32.0	22	Gravel	2.224	31.77	20.62	23.50	17.66	6.44
NERT5.49S1 72' 20180618	72.0	23	Medium sand	0.603	0.00	11.02	48.28	30.30	10.40
NERT5.49S1 89' 20180618	89.0	24	Gravel	4.540	48.17	28.42	17.02	5.79	0.59
NERT4.21N1 22' 20180619	22.0	25	Medium sand	0.805	1.48	20.09	41.73	22.44	14.26
NERT4.21N1 45' 20180619	45.0	26	Gravel	3.462	44.21	16.09	25.19	12.75	1.75
NERT4.21N1 48' 20180619	48.0	27	Gravel	4.590	49.03	21.37	20.51	8.30	0.79
NERT4.21N1 62' 20180619	62.0	28	Medium sand	1.262	2.91	29.00	42.70	18.28	7.11
NERT4.21N1 87' 20180619	87.0	29	Coarse sand	1.597	10.42	32.44	27.66	20.04	9.44
NERT4.38N1 12' 20180620	12.0	30	Gravel	16.141	87.48	4.19	3.18	3.13	2.02
NERT4.38N1 35' 20180620	35.0	31	Medium sand	0.392	0.00	0.26	47.47	39.38	12.89
NERT4.38N1 45' 20180620	45.0	32	Medium sand	0.795	0.91	11.12	55.50	25.43	7.03
NERT4.38N1 55' 20180621	55.0	33	Fine sand	0.202	0.00	0.21	27.36	42.64	29.80
NERT4.38N1 60' 20180621	60.0	34	Fine sand	0.236	0.00	1.77	29.08	46.25	22.90

(1) Based on Mean from Trask

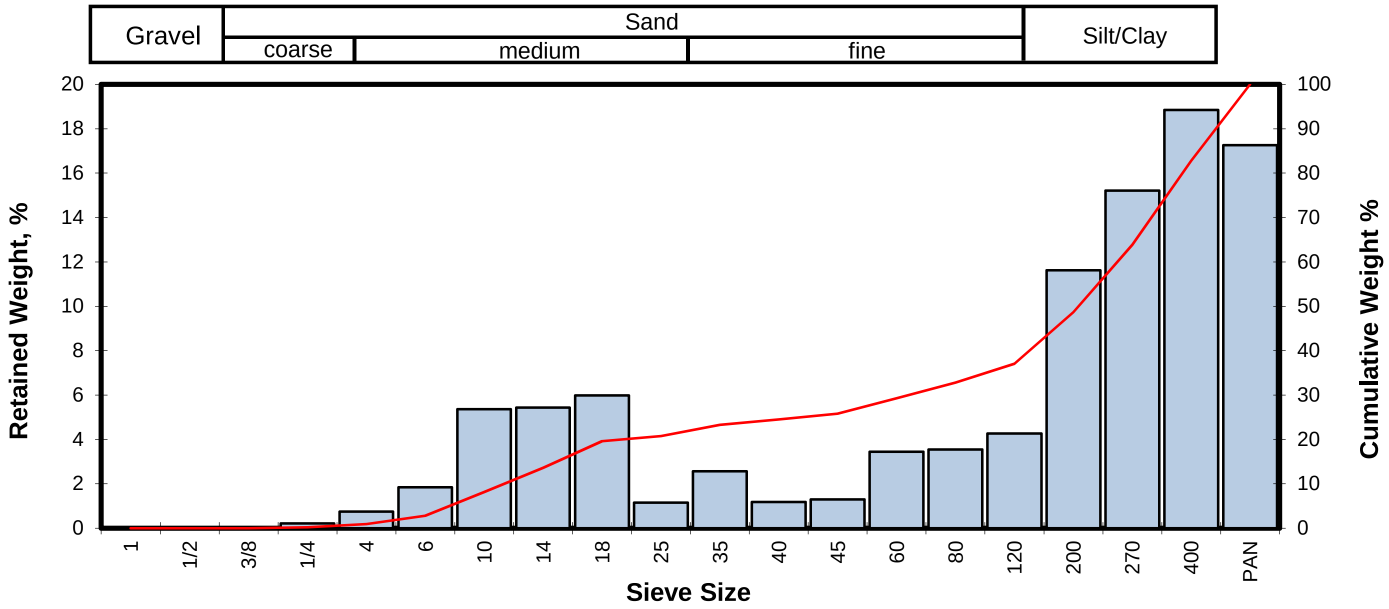
PTS Laboratories, Inc.

PTS ID NO:- 1

Sieve Analysis Results - ASTM D422

Client: AECOM
Project: NDEP Downgradient Study Area
Project No: 60477365 Task 2016-170

PTS File No: 48147
Sample ID: NERT4.51S1 15' 20180614
Depth, ft: 15



Opening Inches	Opening Millimeters	Phi of Screen	U.S. Sieve No.	Sample Weight grams	Incremental Weight, percent	Cumulative Weight, percent
0.9844	25.002	-4.64	1	0.00	0.00	0.00
0.4922	12.501	-3.64	1/2	0.00	0.00	0.00
0.3740	9.500	-3.25	3/8	0.00	0.00	0.00
0.2500	6.351	-2.67	1/4	0.31	0.21	0.21
0.1873	4.757	-2.25	4	1.09	0.75	0.96
0.1324	3.364	-1.75	6	2.68	1.84	2.80
0.0787	2.000	-1.00	10	7.81	5.36	8.16
0.0557	1.414	-0.50	14	7.92	5.44	13.60
0.0394	1.000	0.00	18	8.71	5.98	19.58
0.0278	0.707	0.50	25	1.69	1.16	20.74
0.0197	0.500	1.00	35	3.73	2.56	23.30
0.0166	0.420	1.25	40	1.72	1.18	24.48
0.0139	0.354	1.50	45	1.90	1.30	25.78
0.0098	0.250	2.00	60	5.03	3.45	29.24
0.0070	0.177	2.50	80	5.17	3.55	32.79
0.0049	0.125	3.00	120	6.22	4.27	37.06
0.0029	0.074	3.75	200	16.94	11.63	48.69
0.0021	0.053	4.25	270	22.16	15.21	63.90
0.0015	0.037	4.75	400	27.45	18.84	82.74
			PAN	25.14	17.26	100.00
TOTALS				145.67	100.00	100.00

Cumulative Weight Percent greater than

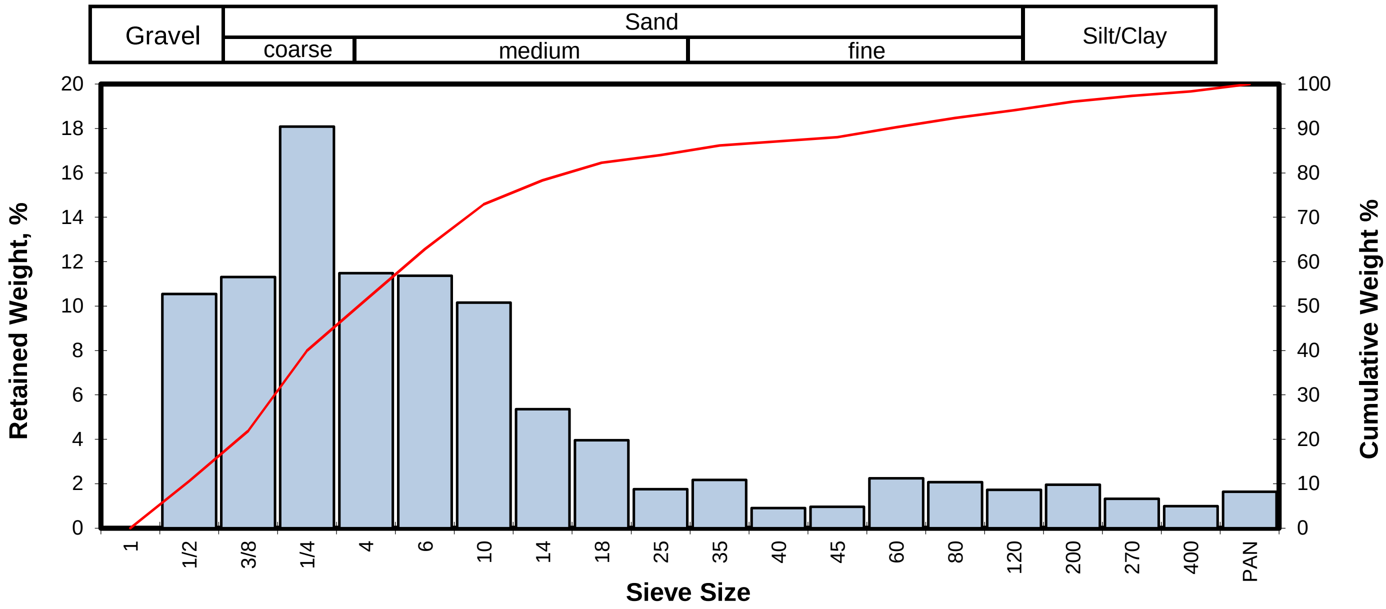
Weight percent	Phi Value	Particle Size Inches	Particle Size Millimeters
5	-1.44	0.1070	2.718
10	-0.83	0.0700	1.779
16	-0.30	0.0484	1.230
25	1.35	0.0154	0.392
40	3.19	0.0043	0.110
50	3.79	0.0028	0.072
60	4.12	0.0023	0.057
75	4.54	0.0017	0.043
84	4.40	0.0019	0.047
90	2.75	0.0058	0.148
95	1.38	0.0152	0.385

Measure	Trask	Inman	Folk-Ward
Median, phi	3.79	3.79	3.79
Median, in.	0.0028	0.0028	0.0028
Median, mm	0.072	0.072	0.072
Mean, phi	2.20	2.05	2.63
Mean, in.	0.0086	0.0095	0.0063
Mean, mm	0.218	0.241	0.161
Sorting	3.026	2.351	1.603
Skewness	1.798	-0.740	-1.728
Kurtosis	0.107	-0.401	0.362
Grain Size Description (ASTM-USCS Scale)	Silt/Clay (based on Mean from Trask)		

Description	Retained on Sieve #	Weight Percent
Gravel	4	0.96
Coarse Sand	10	7.20
Medium Sand	40	16.32
Fine Sand	200	24.21
Silt/Clay	<200	51.31
	Total	100

PTS Laboratories, Inc. PTS ID NO:- 2 **Sieve Analysis Results - ASTM D422**

Client:	AECOM	**PTS File No:**	48147
Project:	NDEP Downgradient Study Area	**Sample ID:**	NERT4.51S1 42' 20180614
Project No:	60477365 Task 2016-170	**Depth, ft:**	42



Opening Inches	Opening Millimeters	Phi of Screen	U.S. Sieve No.	Sample Weight grams	Incremental Weight, percent	Cumulative Weight, percent
0.9844	25.002	-4.64	1	0.00	0.00	0.00
0.4922	12.501	-3.64	1/2	20.21	10.55	10.55
0.3740	9.500	-3.25	3/8	21.69	11.32	21.87
0.2500	6.351	-2.67	1/4	34.65	18.08	39.95
0.1873	4.757	-2.25	4	22.00	11.48	51.43
0.1324	3.364	-1.75	6	21.79	11.37	62.80
0.0787	2.000	-1.00	10	19.46	10.15	72.95
0.0557	1.414	-0.50	14	10.27	5.36	78.31
0.0394	1.000	0.00	18	7.59	3.96	82.27
0.0278	0.707	0.50	25	3.37	1.76	84.03
0.0197	0.500	1.00	35	4.15	2.17	86.20
0.0166	0.420	1.25	40	1.72	0.90	87.09
0.0139	0.354	1.50	45	1.84	0.96	88.06
0.0098	0.250	2.00	60	4.29	2.24	90.29
0.0070	0.177	2.50	80	3.97	2.07	92.37
0.0049	0.125	3.00	120	3.32	1.73	94.10
0.0029	0.074	3.75	200	3.75	1.96	96.05
0.0021	0.053	4.25	270	2.53	1.32	97.38
0.0015	0.037	4.75	400	1.89	0.99	98.36
			PAN	3.14	1.64	100.00
TOTALS				191.63	100.00	100.00

Cumulative Weight Percent greater than

Weight percent	Phi Value	Particle Size Inches	Particle Size Millimeters
5	-4.17	0.7087	18.000
10	-3.70	0.5102	12.958
16	-3.45	0.4312	10.953
25	-3.15	0.3488	8.860
40	-2.67	0.2497	6.343
50	-2.30	0.1941	4.931
60	-1.87	0.1442	3.663
75	-0.81	0.0690	1.752
84	0.49	0.0280	0.712
90	1.93	0.0103	0.262
95	3.35	0.0039	0.098

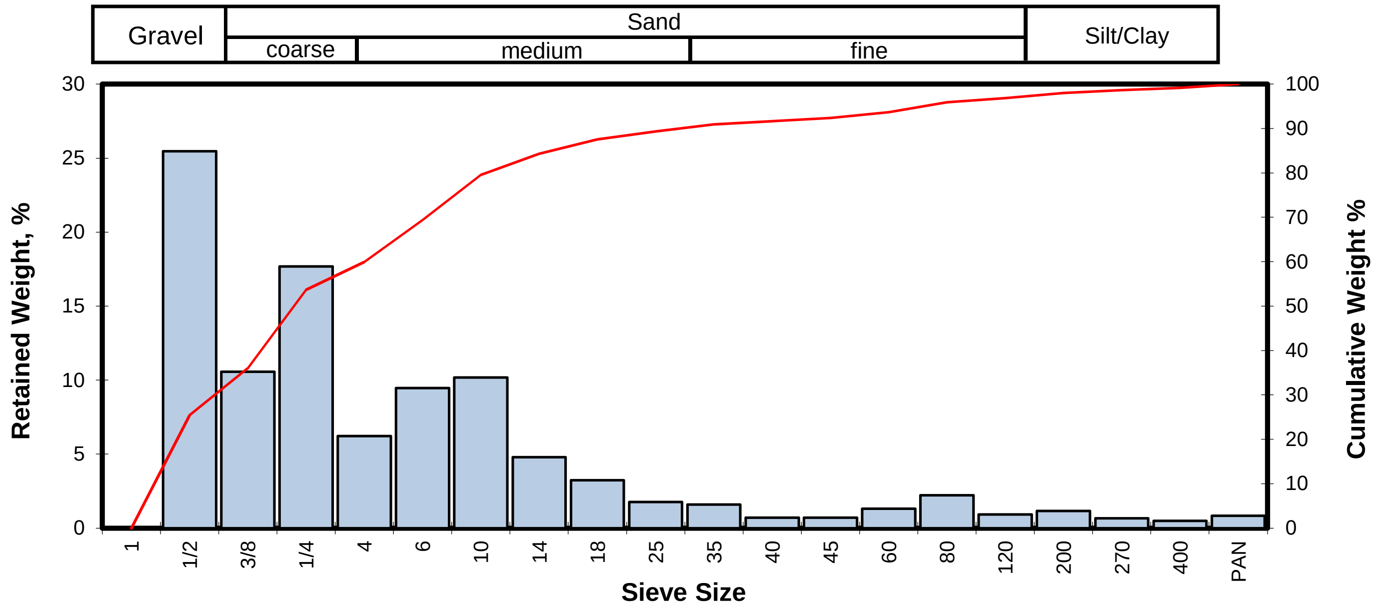
Measure	Trask	Inman	Folk-Ward
Median, phi	-2.30	-2.30	-2.30
Median, in.	0.1941	0.1941	0.1941
Median, mm	4.931	4.931	4.931
Mean, phi	-2.41	-1.48	-1.75
Mean, in.	0.2089	0.1099	0.1329
Mean, mm	5.306	2.792	3.375
Sorting	2.249	1.972	2.125
Skewness	0.799	0.416	0.460
Kurtosis	0.280	0.905	1.317
Grain Size Description (ASTM-USCS Scale)	Gravel (based on Mean from Trask)		

Description	Retained on Sieve #	Weight Percent
Gravel	4	51.43
Coarse Sand	10	21.53
Medium Sand	40	14.14
Fine Sand	200	8.96
Silt/Clay	<200	3.95
	Total	100

 Phone: (713) 316-1800

PTS Laboratories, Inc. PTS ID NO:- 3 **Sieve Analysis Results - ASTM D422**

Client:	AECOM	**PTS File No:**	48147
Project:	NDEP Downgradient Study Area	**Sample ID:**	NERT4.51S1 48' 20180614
Project No:	60477365 Task 2016-170	**Depth, ft:**	48



Opening Inches	Opening Millimeters	Phi of Screen	U.S. Sieve No.	Sample Weight grams	Incremental Weight, percent	Cumulative Weight, percent
0.9844	25.002	-4.64	1	0.00	0.00	0.00
0.4922	12.501	-3.64	1/2	45.38	25.45	25.45
0.3740	9.500	-3.25	3/8	18.82	10.56	36.01
0.2500	6.351	-2.67	1/4	31.51	17.67	53.69
0.1873	4.757	-2.25	4	11.10	6.23	59.91
0.1324	3.364	-1.75	6	16.88	9.47	69.38
0.0787	2.000	-1.00	10	18.13	10.17	79.55
0.0557	1.414	-0.50	14	8.53	4.78	84.33
0.0394	1.000	0.00	18	5.78	3.24	87.58
0.0278	0.707	0.50	25	3.15	1.77	89.34
0.0197	0.500	1.00	35	2.86	1.60	90.95
0.0166	0.420	1.25	40	1.27	0.71	91.66
0.0139	0.354	1.50	45	1.27	0.71	92.37
0.0098	0.250	2.00	60	2.34	1.31	93.68
0.0070	0.177	2.50	80	3.97	2.23	95.91
0.0049	0.125	3.00	120	1.66	0.93	96.84
0.0029	0.074	3.75	200	2.07	1.16	98.00
0.0021	0.053	4.25	270	1.19	0.67	98.67
0.0015	0.037	4.75	400	0.89	0.50	99.17
			PAN	1.48	0.83	100.00
TOTALS				178.28	100.00	100.00

Cumulative Weight Percent greater than

Weight percent	Phi Value	Particle Size Inches	Particle Size Millimeters
5	-4.45	0.8590	21.820
10	-4.25	0.7497	19.042
16	-4.02	0.6367	16.172
25	-3.66	0.4983	12.657
40	-3.12	0.3415	8.675
50	-2.79	0.2719	6.907
60	-2.25	0.1867	4.741
75	-1.34	0.0994	2.524
84	-0.53	0.0570	1.449
90	0.70	0.0242	0.613
95	2.30	0.0080	0.204

Measure	Trask	Inman	Folk-Ward
Median, phi	-2.79	-2.79	-2.79
Median, in.	0.2719	0.2719	0.2719
Median, mm	6.907	6.907	6.907
Mean, phi	-2.92	-2.28	-2.45
Mean, in.	0.2988	0.1906	0.2146
Mean, mm	7.590	4.840	5.450
Sorting	2.240	1.740	1.892
Skewness	0.818	0.295	0.401
Kurtosis	0.275	0.937	1.188
Grain Size Description (ASTM-USCS Scale)		Gravel (based on Mean from Trask)	

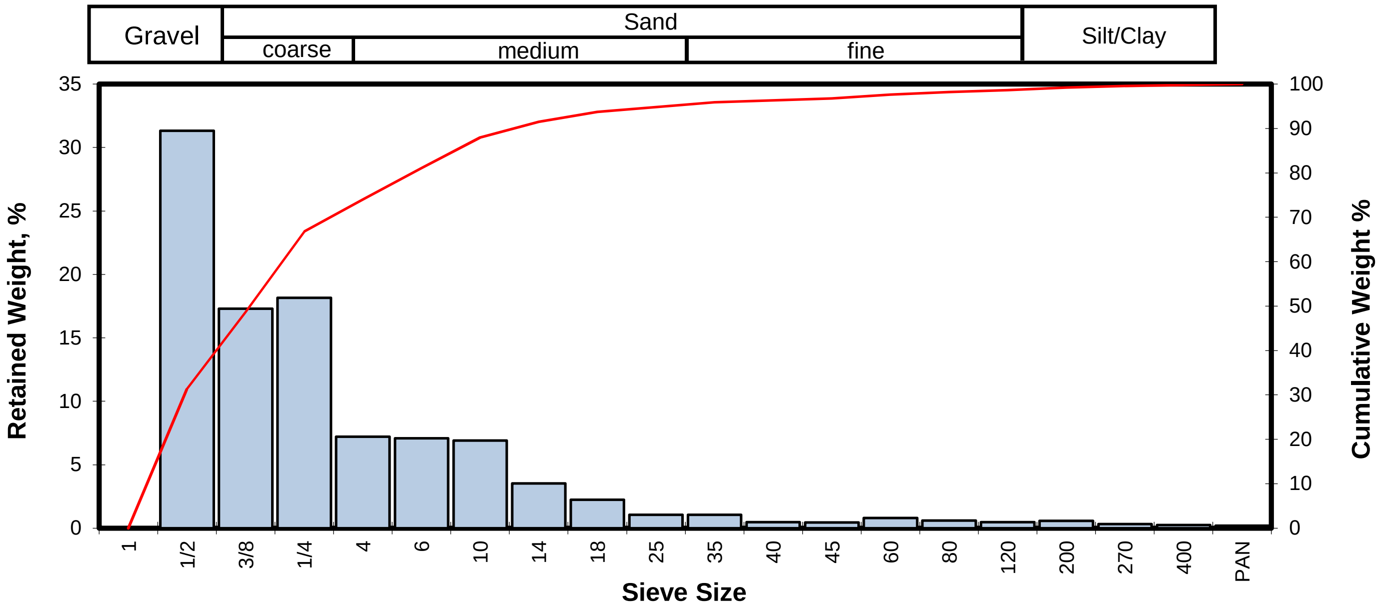
Description	Retained on Sieve #	Weight Percent
Gravel	4	59.91
Coarse Sand	10	19.64
Medium Sand	40	12.11
Fine Sand	200	6.34
Silt/Clay	<200	2.00
	Total	100

PTS Laboratories, Inc.

PTS ID NO:- 4

Sieve Analysis Results - ASTM D422

Client:	AECOM	**PTS File No:**	48147
Project:	NDEP Downgradient Study Area	**Sample ID:**	NERT4.51S1 52' 20180614
Project No:	60477365 Task 2016-170	**Depth, ft:**	52



Opening Inches	Opening Millimeters	Phi of Screen	U.S. Sieve No.	Sample Weight grams	Incremental Weight, percent	Cumulative Weight, percent
0.9844	25.002	-4.64	1	0.00	0.00	0.00
0.4922	12.501	-3.64	1/2	55.72	31.33	31.33
0.3740	9.500	-3.25	3/8	30.78	17.30	48.63
0.2500	6.351	-2.67	1/4	32.31	18.16	66.80
0.1873	4.757	-2.25	4	12.83	7.21	74.01
0.1324	3.364	-1.75	6	12.58	7.07	81.08
0.0787	2.000	-1.00	10	12.30	6.92	88.00
0.0557	1.414	-0.50	14	6.28	3.53	91.53
0.0394	1.000	0.00	18	3.99	2.24	93.77
0.0278	0.707	0.50	25	1.87	1.05	94.82
0.0197	0.500	1.00	35	1.89	1.06	95.88
0.0166	0.420	1.25	40	0.82	0.46	96.35
0.0139	0.354	1.50	45	0.80	0.45	96.80
0.0098	0.250	2.00	60	1.44	0.81	97.60
0.0070	0.177	2.50	80	1.08	0.61	98.21
0.0049	0.125	3.00	120	0.82	0.46	98.67
0.0029	0.074	3.75	200	1.01	0.57	99.24
0.0021	0.053	4.25	270	0.58	0.33	99.57
0.0015	0.037	4.75	400	0.42	0.24	99.80
			PAN	0.35	0.20	100.00
TOTALS				177.87	100.00	100.00

Cumulative Weight Percent greater than			
Weight percent	**Phi Value**	**Particle Size Inches**	**Particle Size Millimeters**
5	-4.48	0.8813	22.384
10	-4.32	0.7890	20.040
16	-4.13	0.6909	17.548
25	-3.85	0.5661	14.380
40	-3.45	0.4289	10.894
50	-3.20	0.3629	9.216
60	-2.88	0.2907	7.384
75	-2.18	0.1784	4.531
84	-1.43	0.1063	2.701
90	-0.72	0.0647	1.643
95	0.58	0.0263	0.667

Measure	Trask	Inman	Folk-Ward
Median, phi	-3.20	-3.20	-3.20
Median, in.	0.3629	0.3629	0.3629
Median, mm	9.216	9.216	9.216
Mean, phi	-3.24	-2.78	-2.92
Mean, in.	0.3723	0.2710	0.2987
Mean, mm	9.455	6.885	7.588
Sorting	1.781	1.350	1.443
Skewness	0.876	0.312	0.403
Kurtosis	0.268	0.877	1.247
Grain Size Description (ASTM-USCS Scale)	Gravel (based on Mean from Trask)		

Description	Retained on Sieve #	Weight Percent
Gravel	4	74.01
Coarse Sand	10	13.99
Medium Sand	40	8.35
Fine Sand	200	2.90
Silt/Clay	<200	0.76
	Total	100

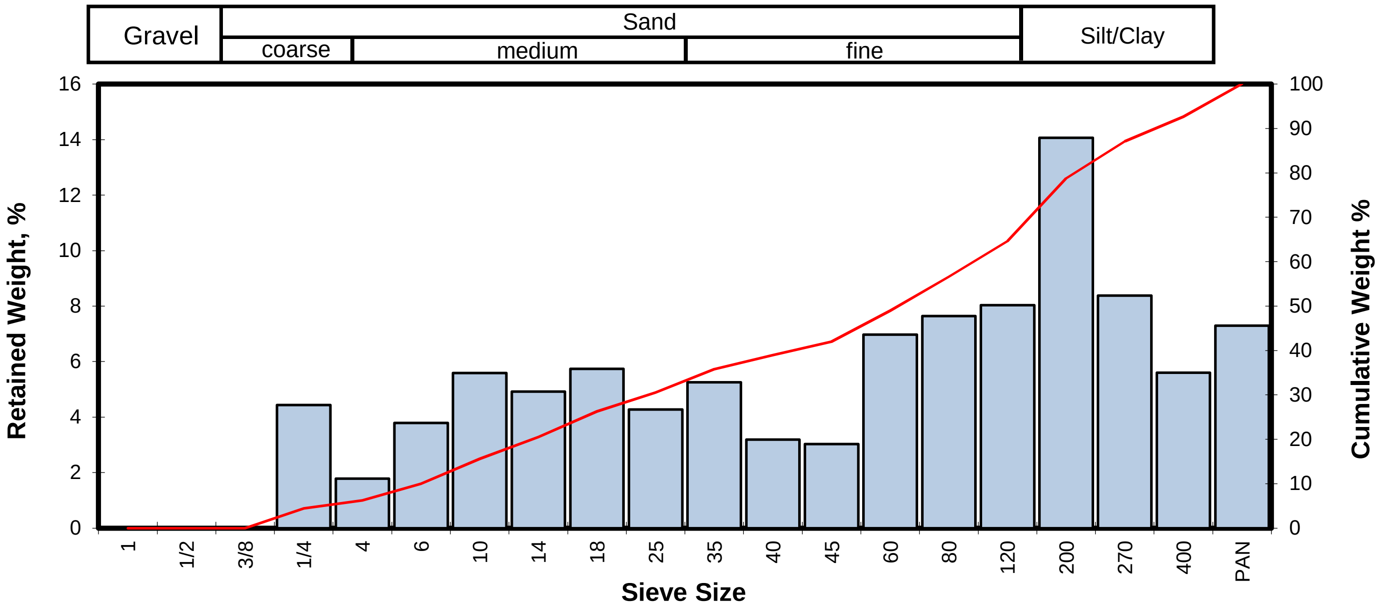
Phone: (713) 316-1800

PTS Laboratories, Inc.

PTS ID NO:- 5

Sieve Analysis Results - ASTM D422

Client:	AECOM	**PTS File No:**	48147
Project:	NDEP Downgradient Study Area	**Sample ID:**	NERT4.93S1 15' 20180615
Project No:	60477365 Task 2016-170	**Depth, ft:**	15



Opening Inches	Opening Millimeters	Phi of Screen	U.S. Sieve No.	Sample Weight grams	Incremental Weight, percent	Cumulative Weight, percent
0.9844	25.002	-4.64	1	0.00	0.00	0.00
0.4922	12.501	-3.64	1/2	0.00	0.00	0.00
0.3740	9.500	-3.25	3/8	0.00	0.00	0.00
0.2500	6.351	-2.67	1/4	6.36	4.44	4.44
0.1873	4.757	-2.25	4	2.55	1.78	6.22
0.1324	3.364	-1.75	6	5.44	3.80	10.01
0.0787	2.000	-1.00	10	8.01	5.59	15.60
0.0557	1.414	-0.50	14	7.05	4.92	20.52
0.0394	1.000	0.00	18	8.22	5.74	26.25
0.0278	0.707	0.50	25	6.13	4.28	30.53
0.0197	0.500	1.00	35	7.54	5.26	35.79
0.0166	0.420	1.25	40	4.57	3.19	38.98
0.0139	0.354	1.50	45	4.35	3.03	42.01
0.0098	0.250	2.00	60	10.00	6.98	48.99
0.0070	0.177	2.50	80	10.95	7.64	56.63
0.0049	0.125	3.00	120	11.51	8.03	64.66
0.0029	0.074	3.75	200	20.16	14.07	78.73
0.0021	0.053	4.25	270	12.01	8.38	87.11
0.0015	0.037	4.75	400	8.02	5.60	92.70
			PAN	10.46	7.30	100.00
TOTALS				143.33	100.00	100.00

Cumulative Weight Percent greater than			
Weight percent	**Phi Value**	**Particle Size Inches**	**Particle Size Millimeters**
5	-2.54	0.2282	5.796
10	-1.75	0.1326	3.367
16	-0.96	0.0766	1.944
25	-0.11	0.0425	1.079
40	1.33	0.0156	0.397
50	2.07	0.0094	0.239
60	2.71	0.0060	0.153
75	3.55	0.0034	0.085
84	4.06	0.0024	0.060
90	4.51	0.0017	0.044
95	3.25	0.0041	0.105

Measure	Trask	Inman	Folk-Ward
Median, phi	2.07	2.07	2.07
Median, in.	0.0094	0.0094	0.0094
Median, mm	0.239	0.239	0.239
Mean, phi	0.78	1.55	1.72
Mean, in.	0.0229	0.0134	0.0119
Mean, mm	0.582	0.341	0.303
Sorting	3.556	2.512	2.133
Skewness	1.270	-0.204	-0.397
Kurtosis	0.149	0.152	0.648
Grain Size Description (ASTM-USCS Scale)	Fine sand (based on Mean from Trask)		

Description	Retained on Sieve #	Weight Percent
Gravel	4	6.22
Coarse Sand	10	9.38
Medium Sand	40	23.38
Fine Sand	200	39.75
Silt/Clay	<200	21.27
	Total	100

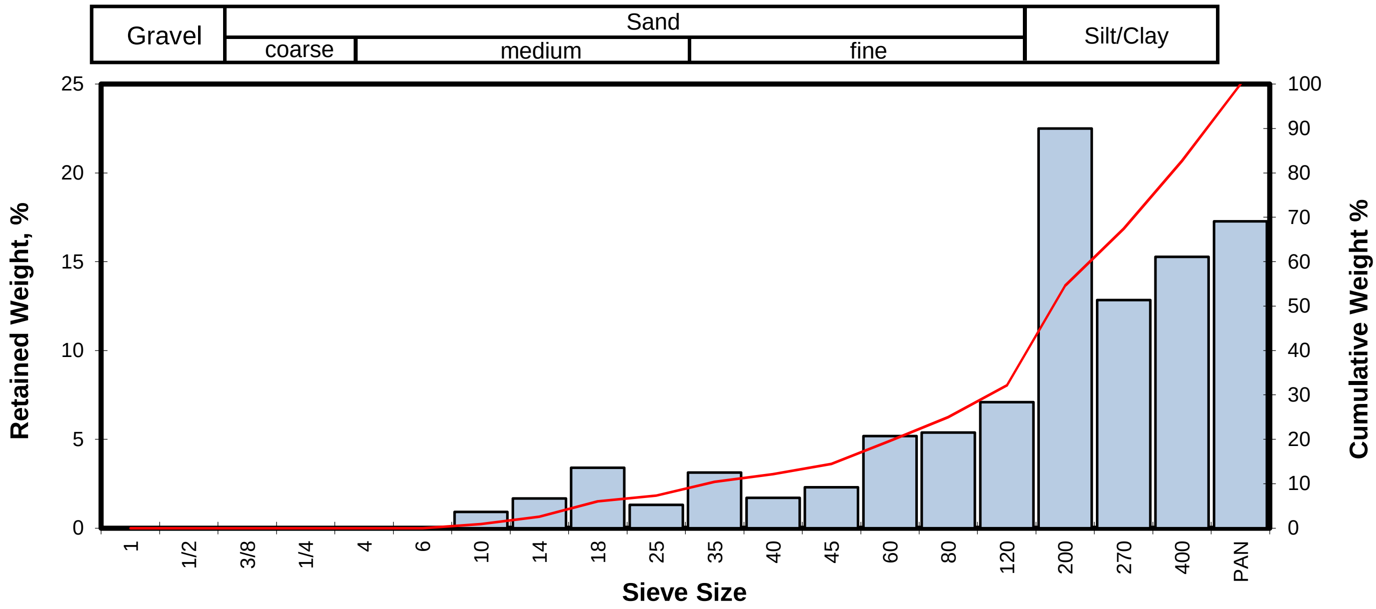
PTS Laboratories, Inc.

PTS ID NO:- 6

Sieve Analysis Results - ASTM D422

Client: AECOM
Project: NDEP Downgradient Study Area
Project No: 60477365 Task 2016-170

PTS File No: 48147
Sample ID: NERT4.93S1 41' 20180615
Depth, ft: 41



Opening Inches	Opening Millimeters	Phi of Screen	U.S. Sieve No.	Sample Weight grams	Incremental Weight, percent	Cumulative Weight, percent
0.9844	25.002	-4.64	1	0.00	0.00	0.00
0.4922	12.501	-3.64	1/2	0.00	0.00	0.00
0.3740	9.500	-3.25	3/8	0.00	0.00	0.00
0.2500	6.351	-2.67	1/4	0.00	0.00	0.00
0.1873	4.757	-2.25	4	0.00	0.00	0.00
0.1324	3.364	-1.75	6	0.00	0.00	0.00
0.0787	2.000	-1.00	10	1.29	0.92	0.92
0.0557	1.414	-0.50	14	2.36	1.68	2.60
0.0394	1.000	0.00	18	4.79	3.41	6.00
0.0278	0.707	0.50	25	1.83	1.30	7.30
0.0197	0.500	1.00	35	4.41	3.14	10.44
0.0166	0.420	1.25	40	2.40	1.71	12.15
0.0139	0.354	1.50	45	3.23	2.30	14.44
0.0098	0.250	2.00	60	7.29	5.18	19.63
0.0070	0.177	2.50	80	7.57	5.38	25.01
0.0049	0.125	3.00	120	9.98	7.10	32.11
0.0029	0.074	3.75	200	31.63	22.49	54.60
0.0021	0.053	4.25	270	18.07	12.85	67.45
0.0015	0.037	4.75	400	21.48	15.28	82.73
			PAN	24.29	17.27	100.00
TOTALS				140.62	100.00	100.00

Cumulative Weight Percent greater than

Weight percent	Phi Value	Particle Size Inches	Particle Size Millimeters
5	-0.15	0.0436	1.107
10	0.93	0.0207	0.525
16	1.65	0.0125	0.319
25	2.50	0.0070	0.177
40	3.26	0.0041	0.104
50	3.60	0.0033	0.083
60	3.96	0.0025	0.064
75	4.50	0.0017	0.044
84	4.40	0.0019	0.047
90	2.75	0.0059	0.149
95	1.37	0.0152	0.386

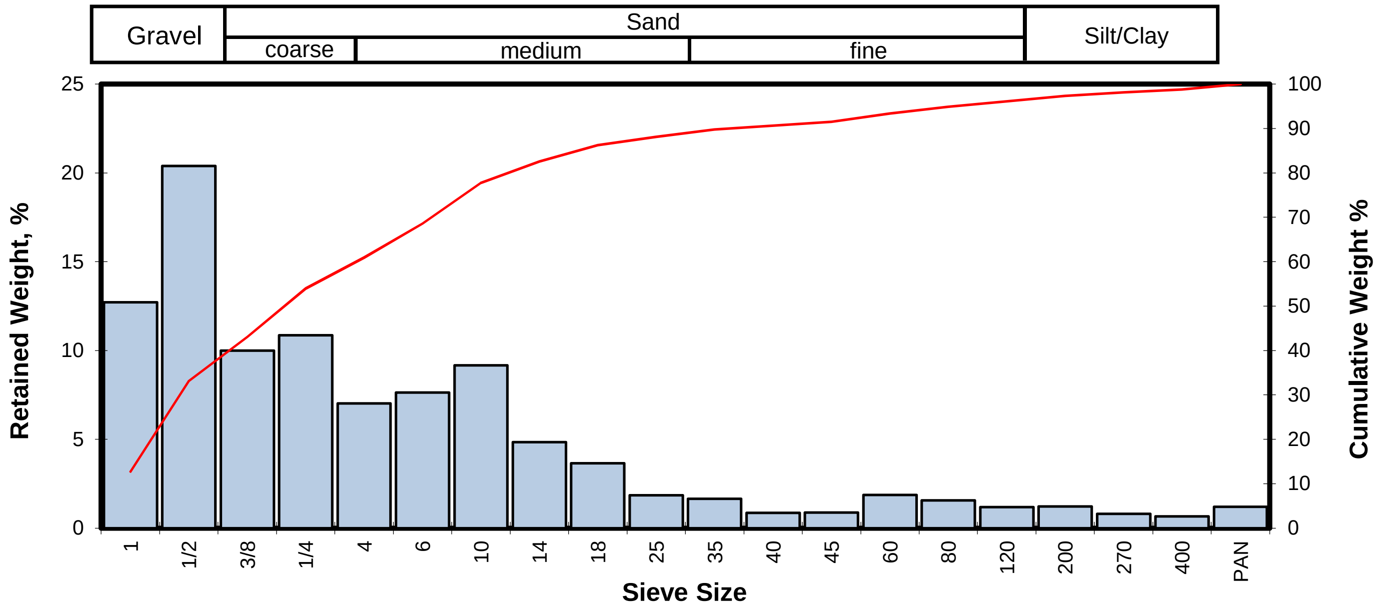
Measure	Trask	Inman	Folk-Ward
Median, phi	3.60	3.60	3.60
Median, in.	0.0033	0.0033	0.0033
Median, mm	0.083	0.083	0.083
Mean, phi	3.18	3.02	3.22
Mean, in.	0.0044	0.0048	0.0042
Mean, mm	0.111	0.123	0.108
Sorting	1.999	1.375	0.918
Skewness	1.071	-0.416	-2.168
Kurtosis	0.176	-0.446	0.312

Grain Size Description (ASTM-USCS Scale)	Silt/Clay (based on Mean from Trask)

Description	Retained on Sieve #	Weight Percent
Gravel	4	0.00
Coarse Sand	10	0.92
Medium Sand	40	11.23
Fine Sand	200	42.45
Silt/Clay	<200	45.40
	Total	100

PTS Laboratories, Inc. PTS ID NO:- 7 **Sieve Analysis Results - ASTM D422**

Client:	AECOM	**PTS File No:**	48147
Project:	NDEP Downgradient Study Area	**Sample ID:**	NERT4.93S1 47' 20180615
Project No:	60477365 Task 2016-170	**Depth, ft:**	47



Opening		Phi of	U.S. Sieve	Sample Weight	Incremental Weight,	Cumulative Weight,
Inches	Millimeters	Screen	No.	grams	percent	percent
0.9844	25.002	-4.64	1	25.21	12.72	12.72
0.4922	12.501	-3.64	1/2	40.42	20.39	33.10
0.3740	9.500	-3.25	3/8	19.81	9.99	43.10
0.2500	6.351	-2.67	1/4	21.54	10.87	53.96
0.1873	4.757	-2.25	4	13.91	7.02	60.98
0.1324	3.364	-1.75	6	15.12	7.63	68.61
0.0787	2.000	-1.00	10	18.17	9.17	77.77
0.0557	1.414	-0.50	14	9.59	4.84	82.61
0.0394	1.000	0.00	18	7.24	3.65	86.26
0.0278	0.707	0.50	25	3.68	1.86	88.12
0.0197	0.500	1.00	35	3.26	1.64	89.76
0.0166	0.420	1.25	40	1.72	0.87	90.63
0.0139	0.354	1.50	45	1.74	0.88	91.51
0.0098	0.250	2.00	60	3.72	1.88	93.38
0.0070	0.177	2.50	80	3.08	1.55	94.94
0.0049	0.125	3.00	120	2.34	1.18	96.12
0.0029	0.074	3.75	200	2.43	1.23	97.34
0.0021	0.053	4.25	270	1.58	0.80	98.14
0.0015	0.037	4.75	400	1.30	0.66	98.79
			PAN	2.39	1.21	100.00
TOTALS				198.25	100.00	100.00

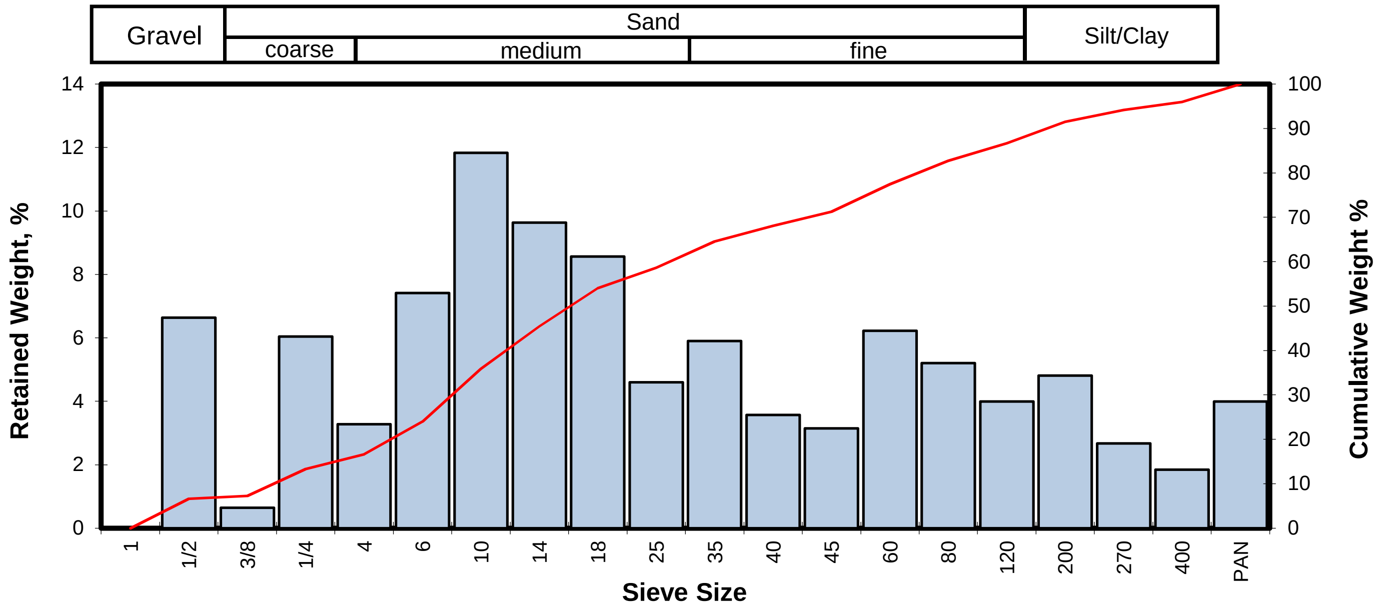
Cumulative Weight Percent greater than			
Weight percent	Phi Value	Particle Size Inches	Particle Size Millimeters
5			
10			
16	-4.48	0.8804	22.361
25	-4.04	0.6483	16.467
40	-3.37	0.4072	10.344
50	-2.88	0.2896	7.356
60	-2.31	0.1950	4.953
75	-1.23	0.0921	2.340
84	-0.31	0.0488	1.239
90	1.07	0.0188	0.477
95	2.53	0.0068	0.173

Measure	Trask	Inman	Folk-Ward
Median, phi	-2.88	-2.88	-2.88
Median, in.	0.2896	0.2896	0.2896
Median, mm	7.356	7.356	7.356
Mean, phi	-3.23	-2.40	-2.56
Mean, in.	0.3702	0.2072	0.2317
Mean, mm	9.404	5.264	5.885
Sorting	2.653	2.087	
Skewness	0.844	0.231	
Kurtosis			
Grain Size Description (ASTM-USCS Scale)	Gravel (based on Mean from Trask)		

Description	Retained on Sieve #	Weight Percent
Gravel	4	60.98
Coarse Sand	10	16.79
Medium Sand	40	12.86
Fine Sand	200	6.71
Silt/Clay	<200	2.66
	Total	100

PTS Laboratories, Inc. PTS ID NO:- 8 **Sieve Analysis Results - ASTM D422**

Client:	AECOM	**PTS File No:**	48147
Project:	NDEP Downgradient Study Area	**Sample ID:**	NERT4.93S1 48' 20180615
Project No:	60477365 Task 2016-170	**Depth, ft:**	48



Opening		Phi of	U.S.	Sample	Incremental	Cumulative
Inches	Millimeters	Screen	Sieve No.	Weight grams	Weight, percent	Weight, percent
0.9844	25.002	-4.64	1	0.00	0.00	0.00
0.4922	12.501	-3.64	1/2	9.33	6.64	6.64
0.3740	9.500	-3.25	3/8	0.90	0.64	7.28
0.2500	6.351	-2.67	1/4	8.49	6.04	13.31
0.1873	4.757	-2.25	4	4.61	3.28	16.59
0.1324	3.364	-1.75	6	10.43	7.42	24.01
0.0787	2.000	-1.00	10	16.64	11.83	35.85
0.0557	1.414	-0.50	14	13.55	9.64	45.48
0.0394	1.000	0.00	18	12.04	8.56	54.05
0.0278	0.707	0.50	25	6.47	4.60	58.65
0.0197	0.500	1.00	35	8.30	5.90	64.55
0.0166	0.420	1.25	40	5.02	3.57	68.12
0.0139	0.354	1.50	45	4.42	3.14	71.27
0.0098	0.250	2.00	60	8.75	6.22	77.49
0.0070	0.177	2.50	80	7.31	5.20	82.69
0.0049	0.125	3.00	120	5.62	4.00	86.69
0.0029	0.074	3.75	200	6.77	4.82	91.50
0.0021	0.053	4.25	270	3.75	2.67	94.17
0.0015	0.037	4.75	400	2.59	1.84	96.01
			PAN	5.61	3.99	100.00
TOTALS				140.60	100.00	100.00

Cumulative Weight Percent greater than			
Weight percent	Phi Value	Particle Size Inches	Particle Size Millimeters
5	-3.89	0.5839	14.831
10	-2.99	0.3119	7.922
16	-2.33	0.1973	5.012
25	-1.69	0.1268	3.221
40	-0.78	0.0678	1.722
50	-0.24	0.0464	1.178
60	0.61	0.0257	0.653
75	1.80	0.0113	0.287
84	2.66	0.0062	0.158
90	3.52	0.0034	0.087
95	4.48	0.0018	0.045

Measure	Trask	Inman	Folk-Ward
Median, phi	-0.24	-0.24	-0.24
Median, in.	0.0464	0.0464	0.0464
Median, mm	1.178	1.178	1.178
Mean, phi	-0.81	0.17	0.03
Mean, in.	0.0691	0.0350	0.0385
Mean, mm	1.754	0.889	0.977
Sorting	3.349	2.495	2.515
Skewness	0.816	0.163	0.145
Kurtosis	0.187	0.677	0.983
Grain Size Description (ASTM-USCS Scale)	Medium sand (based on Mean from Trask)		

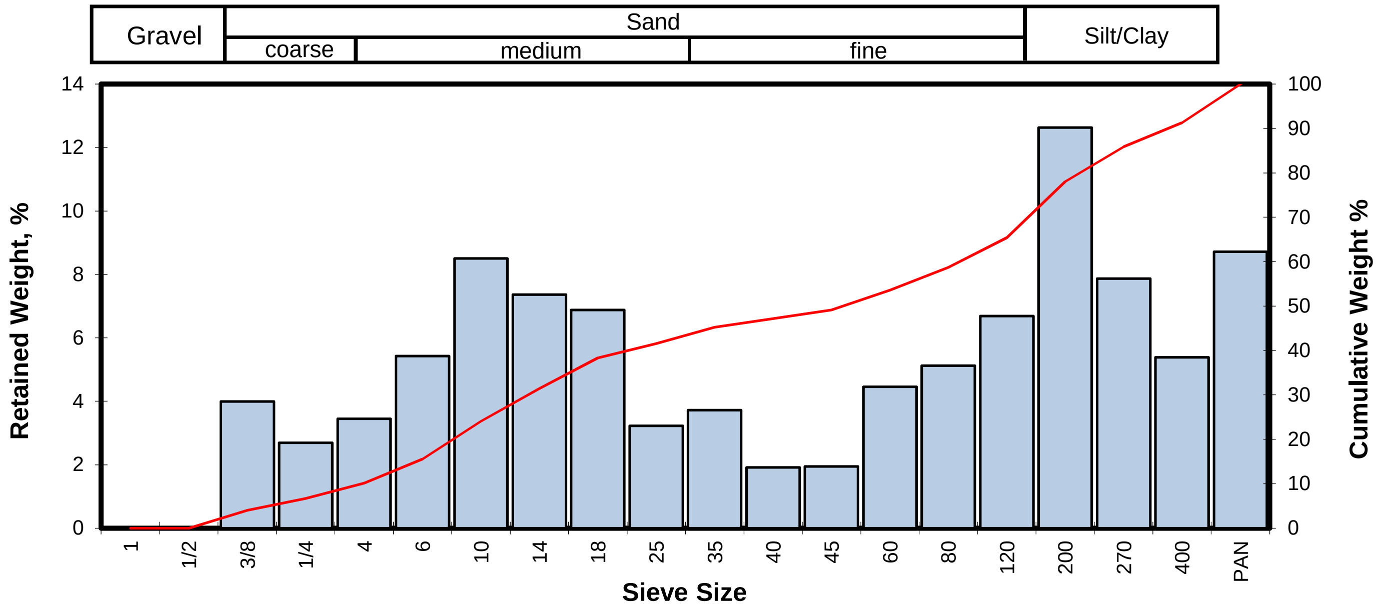
Description	Retained on Sieve #	Weight Percent
Gravel	4	16.59
Coarse Sand	10	19.25
Medium Sand	40	32.28
Fine Sand	200	23.38
Silt/Clay	<200	8.50
	Total	100

PTS Laboratories, Inc.

PTS ID NO:- 9

Sieve Analysis Results - ASTM D422

Client:	AECOM	**PTS File No:**	48147
Project:	NDEP Downgradient Study Area	**Sample ID:**	NERT4.93S1 60' 20180615
Project No:	60477365 Task 2016-170	**Depth, ft:**	60



Opening Inches	Opening Millimeters	Phi of Screen	U.S. Sieve No.	Sample Weight grams	Incremental Weight, percent	Cumulative Weight, percent
0.9844	25.002	-4.64	1	0.00	0.00	0.00
0.4922	12.501	-3.64	1/2	0.00	0.00	0.00
0.3740	9.500	-3.25	3/8	5.02	3.99	3.99
0.2500	6.351	-2.67	1/4	3.38	2.69	6.68
0.1873	4.757	-2.25	4	4.34	3.45	10.14
0.1324	3.364	-1.75	6	6.82	5.43	15.56
0.0787	2.000	-1.00	10	10.69	8.51	24.07
0.0557	1.414	-0.50	14	9.26	7.37	31.43
0.0394	1.000	0.00	18	8.65	6.88	38.32
0.0278	0.707	0.50	25	4.05	3.22	41.54
0.0197	0.500	1.00	35	4.68	3.72	45.26
0.0166	0.420	1.25	40	2.41	1.92	47.18
0.0139	0.354	1.50	45	2.45	1.95	49.13
0.0098	0.250	2.00	60	5.60	4.46	53.58
0.0070	0.177	2.50	80	6.44	5.12	58.71
0.0049	0.125	3.00	120	8.41	6.69	65.40
0.0029	0.074	3.75	200	15.87	12.63	78.03
0.0021	0.053	4.25	270	9.89	7.87	85.89
0.0015	0.037	4.75	400	6.77	5.39	91.28
			PAN	10.96	8.72	100.00
TOTALS				125.69	100.00	100.00

Cumulative Weight Percent greater than

Weight percent	Phi Value	Particle Size Inches	Particle Size Millimeters
5	-3.03	0.3217	8.172
10	-2.27	0.1894	4.811
16	-1.71	0.1289	3.275
25	-0.94	0.0754	1.914
40	0.26	0.0328	0.834
50	1.60	0.0130	0.330
60	2.60	0.0065	0.165
75	3.57	0.0033	0.084
84	4.13	0.0022	0.057
90	4.63	0.0016	0.040
95	2.72	0.0060	0.151

Measure	Trask	Inman	Folk-Ward
Median, phi	1.60	1.60	1.60
Median, in.	0.0130	0.0130	0.0130
Median, mm	0.330	0.330	0.330
Mean, phi	0.00	1.21	1.34
Mean, in.	0.0393	0.0170	0.0156
Mean, mm	0.999	0.433	0.395
Sorting	4.768	2.921	2.332
Skewness	1.215	-0.133	-0.371
Kurtosis	0.192	-0.015	0.523
Grain Size Description (ASTM-USCS Scale)	Medium sand (based on Mean from Trask)		

Description	Retained on Sieve #	Weight Percent
Gravel	4	10.14
Coarse Sand	10	13.93
Medium Sand	40	23.11
Fine Sand	200	30.85
Silt/Clay	<200	21.97
	Total	100

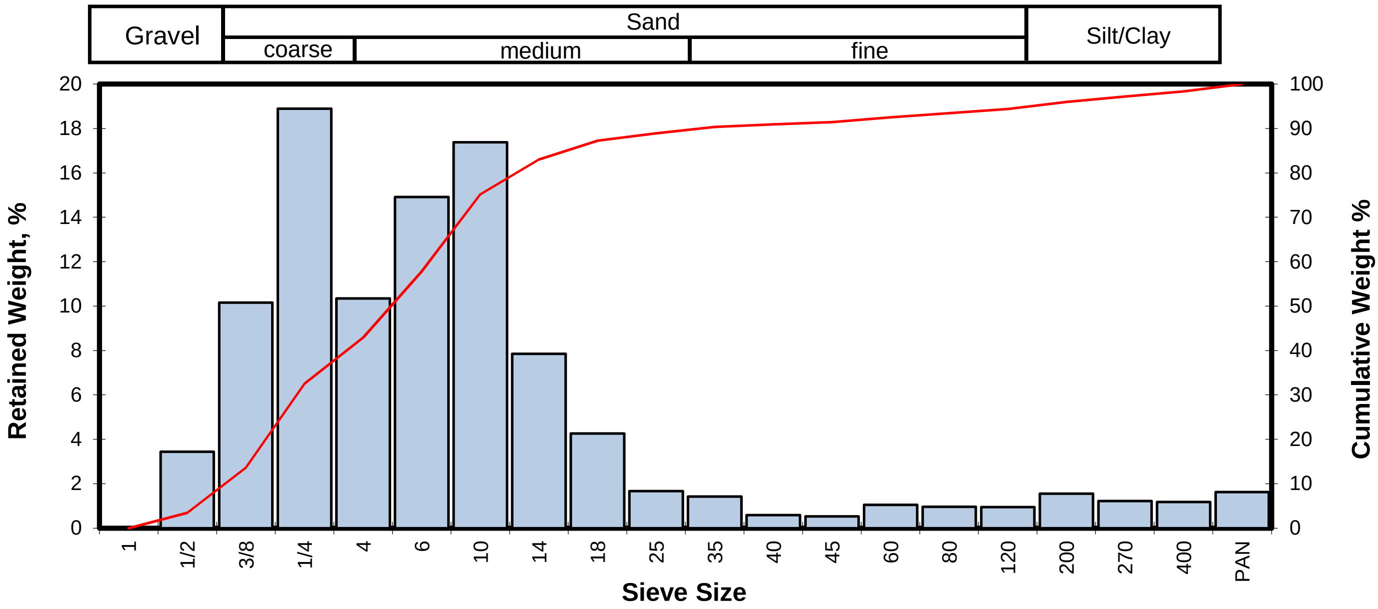
PTS Laboratories, Inc.

PTS ID NO:- 10

Sieve Analysis Results - ASTM D422

Client: AECOM
Project: NDEP Downgradient Study Area
Project No: 60477365 Task 2016-170

PTS File No: 48147
Sample ID: NERT5.11S1 17' 20180615
Depth, ft: 17



Opening Inches	Opening Millimeters	Phi of Screen	U.S. Sieve No.	Sample Weight grams	Incremental Weight, percent	Cumulative Weight, percent
0.9844	25.002	-4.64	1	0.00	0.00	0.00
0.4922	12.501	-3.64	1/2	5.33	3.44	3.44
0.3740	9.500	-3.25	3/8	15.73	10.16	13.60
0.2500	6.351	-2.67	1/4	29.26	18.89	32.49
0.1873	4.757	-2.25	4	16.02	10.34	42.84
0.1324	3.364	-1.75	6	23.11	14.92	57.76
0.0787	2.000	-1.00	10	26.92	17.38	75.14
0.0557	1.414	-0.50	14	12.16	7.85	82.99
0.0394	1.000	0.00	18	6.60	4.26	87.25
0.0278	0.707	0.50	25	2.59	1.67	88.93
0.0197	0.500	1.00	35	2.21	1.43	90.35
0.0166	0.420	1.25	40	0.91	0.59	90.94
0.0139	0.354	1.50	45	0.82	0.53	91.47
0.0098	0.250	2.00	60	1.62	1.05	92.52
0.0070	0.177	2.50	80	1.48	0.96	93.47
0.0049	0.125	3.00	120	1.46	0.94	94.41
0.0029	0.074	3.75	200	2.40	1.55	95.96
0.0021	0.053	4.25	270	1.90	1.23	97.19
0.0015	0.037	4.75	400	1.83	1.18	98.37
			PAN	2.52	1.63	100.00
TOTALS				154.87	100.00	100.00

Cumulative Weight Percent greater than

Weight percent	Phi Value	Particle Size Inches	Particle Size Millimeters
5	-3.58	0.4719	11.986
10	-3.39	0.4122	10.471
16	-3.17	0.3554	9.026
25	-2.90	0.2933	7.451
40	-2.36	0.2027	5.149
50	-2.01	0.1586	4.028
60	-1.65	0.1238	3.145
75	-1.01	0.0791	2.008
84	-0.38	0.0513	1.303
90	0.88	0.0214	0.545
95	3.28	0.0040	0.103

Measure	Trask	Inman	Folk-Ward
Median, phi	-2.01	-2.01	-2.01
Median, in.	0.1586	0.1586	0.1586
Median, mm	4.028	4.028	4.028
Mean, phi	-2.24	-1.78	-1.86
Mean, in.	0.1862	0.1350	0.1425
Mean, mm	4.730	3.429	3.618
Sorting	1.926	1.396	1.738
Skewness	0.960	0.166	0.354
Kurtosis	0.274	1.459	1.488
Grain Size Description (ASTM-USCS Scale)	Gravel (based on Mean from Trask)		

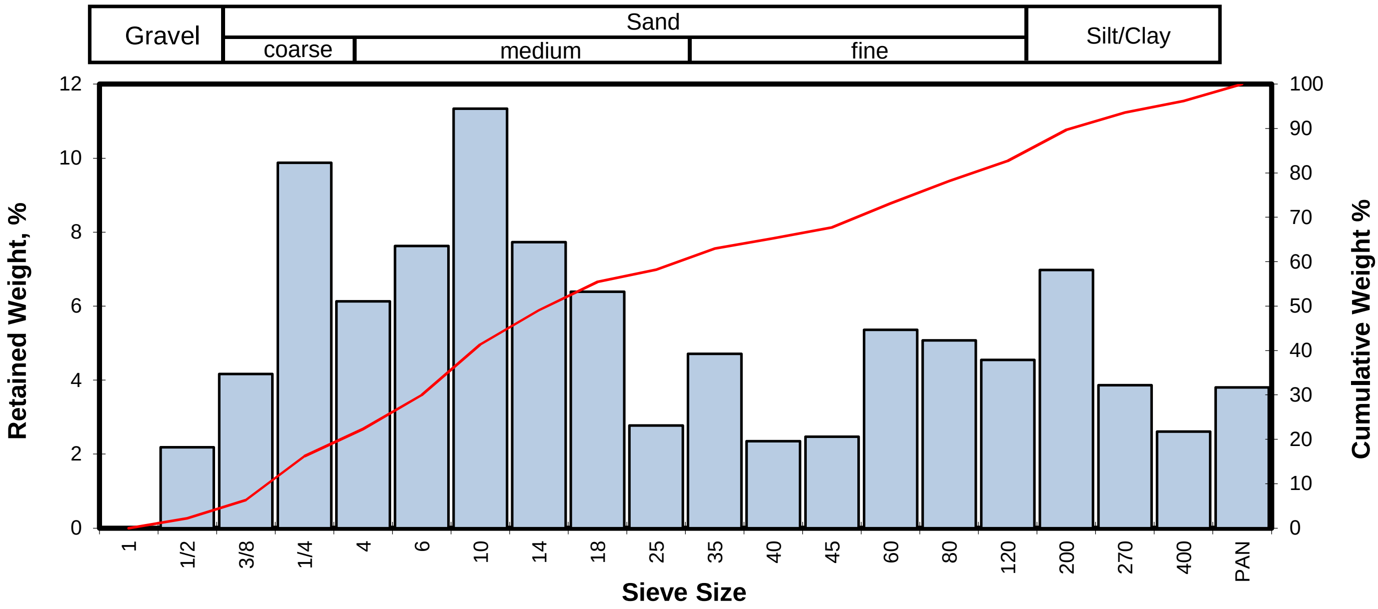
Description	Retained on Sieve #	Weight Percent
Gravel	4	42.84
Coarse Sand	10	32.30
Medium Sand	40	15.80
Fine Sand	200	5.02
Silt/Clay	<200	4.04
	Total	100

PTS Laboratories, Inc.

PTS ID NO:- 11

Sieve Analysis Results - ASTM D422

Client:	AECOM	**PTS File No:**	48147
Project:	NDEP Downgradient Study Area	**Sample ID:**	NERT5.11S1 37' 20180615
Project No:	60477365 Task 2016-170	**Depth, ft:**	37



Opening Inches	Opening Millimeters	Phi of Screen	U.S. Sieve No.	Sample Weight grams	Incremental Weight, percent	Cumulative Weight, percent
0.9844	25.002	-4.64	1	0.00	0.00	0.00
0.4922	12.501	-3.64	1/2	5.45	2.18	2.18
0.3740	9.500	-3.25	3/8	10.41	4.17	6.35
0.2500	6.351	-2.67	1/4	24.67	9.87	16.22
0.1873	4.757	-2.25	4	15.32	6.13	22.35
0.1324	3.364	-1.75	6	19.06	7.63	29.98
0.0787	2.000	-1.00	10	28.33	11.34	41.32
0.0557	1.414	-0.50	14	19.31	7.73	49.05
0.0394	1.000	0.00	18	15.97	6.39	55.44
0.0278	0.707	0.50	25	6.94	2.78	58.22
0.0197	0.500	1.00	35	11.78	4.72	62.94
0.0166	0.420	1.25	40	5.88	2.35	65.29
0.0139	0.354	1.50	45	6.17	2.47	67.76
0.0098	0.250	2.00	60	13.39	5.36	73.12
0.0070	0.177	2.50	80	12.68	5.08	78.19
0.0049	0.125	3.00	120	11.36	4.55	82.74
0.0029	0.074	3.75	200	17.44	6.98	89.72
0.0021	0.053	4.25	270	9.65	3.86	93.58
0.0015	0.037	4.75	400	6.53	2.61	96.20
			PAN	9.50	3.80	100.00
TOTALS				249.84	100.00	100.00

Cumulative Weight Percent greater than

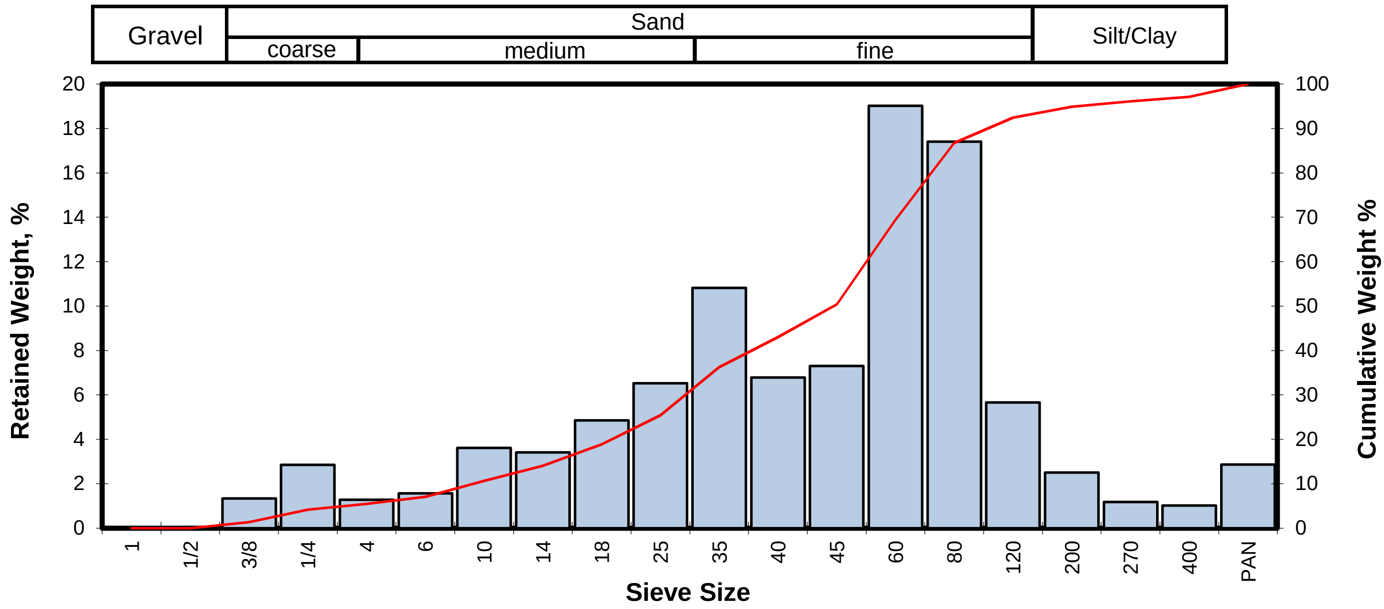
Weight percent	Phi Value	Particle Size Inches	Particle Size Millimeters
5	-3.38	0.4088	10.383
10	-3.03	0.3223	8.186
16	-2.68	0.2523	6.409
25	-2.08	0.1661	4.218
40	-1.09	0.0837	2.125
50	-0.43	0.0529	1.343
60	0.69	0.0244	0.620
75	2.19	0.0087	0.220
84	3.14	0.0045	0.114
90	3.79	0.0029	0.072
95	4.52	0.0017	0.044

Measure	Trask	Inman	Folk-Ward
Median, phi	-0.43	-0.43	-0.43
Median, in.	0.0529	0.0529	0.0529
Median, mm	1.343	1.343	1.343
Mean, phi	-1.15	0.23	0.01
Mean, in.	0.0874	0.0336	0.0391
Mean, mm	2.219	0.854	0.993
Sorting	4.380	2.908	2.650
Skewness	0.717	0.225	0.239
Kurtosis	0.246	0.358	0.759
Grain Size Description (ASTM-USCS Scale)	Fine sand (based on Mean from Trask)		

Description	Retained on Sieve #	Weight Percent
Gravel	4	22.35
Coarse Sand	10	18.97
Medium Sand	40	23.97
Fine Sand	200	24.43
Silt/Clay	<200	10.28
	Total	100

PTS Laboratories, Inc. PTS ID NO:- 12 **Sieve Analysis Results - ASTM D422**

Client: AECOM **PTS File No:** 48147
Project: NDEP Downgradient Study Area **Sample ID:** NERT5.11S1 40' 20180615
Project No: 60477365 Task 2016-170 **Depth, ft:** 40



Opening Inches	Opening Millimeters	Phi of Screen	U.S. Sieve No.	Sample Weight grams	Incremental Weight, percent	Cumulative Weight, percent
0.9844	25.002	-4.64	1	0.00	0.00	0.00
0.4922	12.501	-3.64	1/2	0.00	0.00	0.00
0.3740	9.500	-3.25	3/8	1.80	1.34	1.34
0.2500	6.351	-2.67	1/4	3.83	2.85	4.19
0.1873	4.757	-2.25	4	1.72	1.28	5.47
0.1324	3.364	-1.75	6	2.10	1.56	7.03
0.0787	2.000	-1.00	10	4.86	3.61	10.64
0.0557	1.414	-0.50	14	4.58	3.41	14.05
0.0394	1.000	0.00	18	6.52	4.85	18.90
0.0278	0.707	0.50	25	8.77	6.52	25.42
0.0197	0.500	1.00	35	14.56	10.83	36.25
0.0166	0.420	1.25	40	9.13	6.79	43.04
0.0139	0.354	1.50	45	9.82	7.30	50.34
0.0098	0.250	2.00	60	25.57	19.02	69.36
0.0070	0.177	2.50	80	23.40	17.40	86.76
0.0049	0.125	3.00	120	7.62	5.67	92.43
0.0029	0.074	3.75	200	3.37	2.51	94.94
0.0021	0.053	4.25	270	1.59	1.18	96.12
0.0015	0.037	4.75	400	1.37	1.02	97.14
			PAN	3.85	2.86	100.00
TOTALS				134.46	100.00	100.00

Cumulative Weight Percent greater than

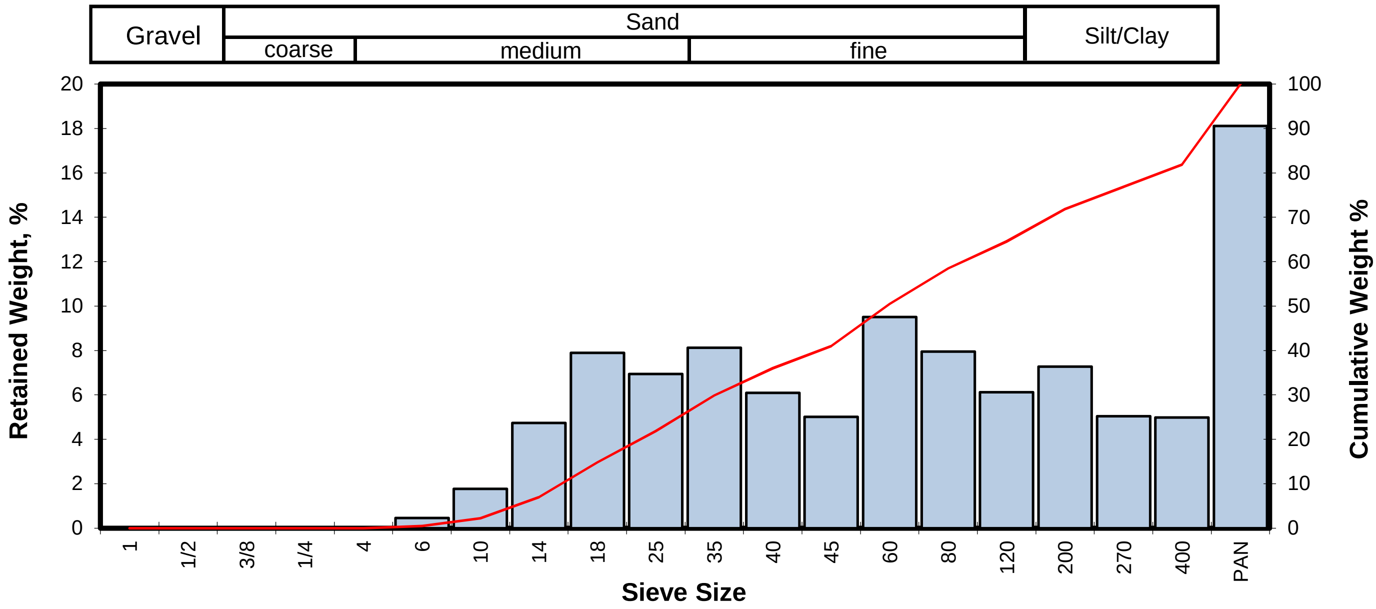
Weight percent	Phi Value	Particle Size Inches	Particle Size Millimeters
5	-2.40	0.2081	5.285
10	-1.13	0.0864	2.194
16	-0.30	0.0484	1.230
25	0.47	0.0285	0.723
40	1.14	0.0179	0.454
50	1.49	0.0140	0.356
60	1.75	0.0117	0.296
75	2.16	0.0088	0.223
84	2.42	0.0074	0.187
90	2.79	0.0057	0.145
95	3.78	0.0029	0.073

Measure	Trask	Inman	Folk-Ward
Median, phi	1.49	1.49	1.49
Median, in.	0.0140	0.0140	0.0140
Median, mm	0.356	0.356	0.356
Mean, phi	1.08	1.06	1.20
Mean, in.	0.0186	0.0189	0.0171
Mean, mm	0.473	0.479	0.434
Sorting	1.799	1.360	1.616
Skewness	1.128	-0.314	-0.287
Kurtosis	0.122	1.272	1.495
Grain Size Description (ASTM-USCS Scale)	Fine sand (based on Mean from Trask)		

Description	Retained on Sieve #	Weight Percent
Gravel	4	5.47
Coarse Sand	10	5.18
Medium Sand	40	32.40
Fine Sand	200	51.90
Silt/Clay	<200	5.06
	Total	100

PTS Laboratories, Inc. PTS ID NO:- 13 **Sieve Analysis Results - ASTM D422**

Client:	AECOM	**PTS File No:**	48147
Project:	NDEP Downgradient Study Area	**Sample ID:**	NERT5.11S1 67' 20180616
Project No:	60477365 Task 2016-170	**Depth, ft:**	67



Opening Inches	Opening Millimeters	Phi of Screen	U.S. Sieve No.	Sample Weight grams	Incremental Weight, percent	Cumulative Weight, percent
0.9844	25.002	-4.64	1	0.00	0.00	0.00
0.4922	12.501	-3.64	1/2	0.00	0.00	0.00
0.3740	9.500	-3.25	3/8	0.00	0.00	0.00
0.2500	6.351	-2.67	1/4	0.00	0.00	0.00
0.1873	4.757	-2.25	4	0.00	0.00	0.00
0.1324	3.364	-1.75	6	0.48	0.46	0.46
0.0787	2.000	-1.00	10	1.86	1.76	2.22
0.0557	1.414	-0.50	14	4.99	4.73	6.95
0.0394	1.000	0.00	18	8.33	7.90	14.85
0.0278	0.707	0.50	25	7.32	6.94	21.79
0.0197	0.500	1.00	35	8.57	8.13	29.92
0.0166	0.420	1.25	40	6.42	6.09	36.01
0.0139	0.354	1.50	45	5.28	5.01	41.02
0.0098	0.250	2.00	60	10.02	9.50	50.52
0.0070	0.177	2.50	80	8.38	7.95	58.47
0.0049	0.125	3.00	120	6.45	6.12	64.59
0.0029	0.074	3.75	200	7.67	7.27	71.86
0.0021	0.053	4.25	270	5.32	5.05	76.91
0.0015	0.037	4.75	400	5.25	4.98	81.89
			PAN	19.10	18.11	100.00
TOTALS				105.44	100.00	100.00

Cumulative Weight Percent greater than

Weight percent	Phi Value	Particle Size Inches	Particle Size Millimeters
5	-0.71	0.0642	1.632
10	-0.31	0.0487	1.237
16	0.08	0.0372	0.944
25	0.70	0.0243	0.617
40	1.45	0.0144	0.366
50	1.97	0.0100	0.255
60	2.63	0.0064	0.162
75	4.06	0.0024	0.060
84	4.20	0.0021	0.055
90	2.62	0.0064	0.162
95	1.31	0.0159	0.403

Measure	Trask	Inman	Folk-Ward
Median, phi	1.97	1.97	1.97
Median, in.	0.0100	0.0100	0.0100
Median, mm	0.255	0.255	0.255
Mean, phi	1.56	2.14	2.08
Mean, in.	0.0133	0.0089	0.0093
Mean, mm	0.338	0.227	0.236
Sorting	3.209	2.056	1.334
Skewness	0.754	0.081	-0.787
Kurtosis	0.259	-0.510	0.246
Grain Size Description (ASTM-USCS Scale)		Fine sand (based on Mean from Trask)	

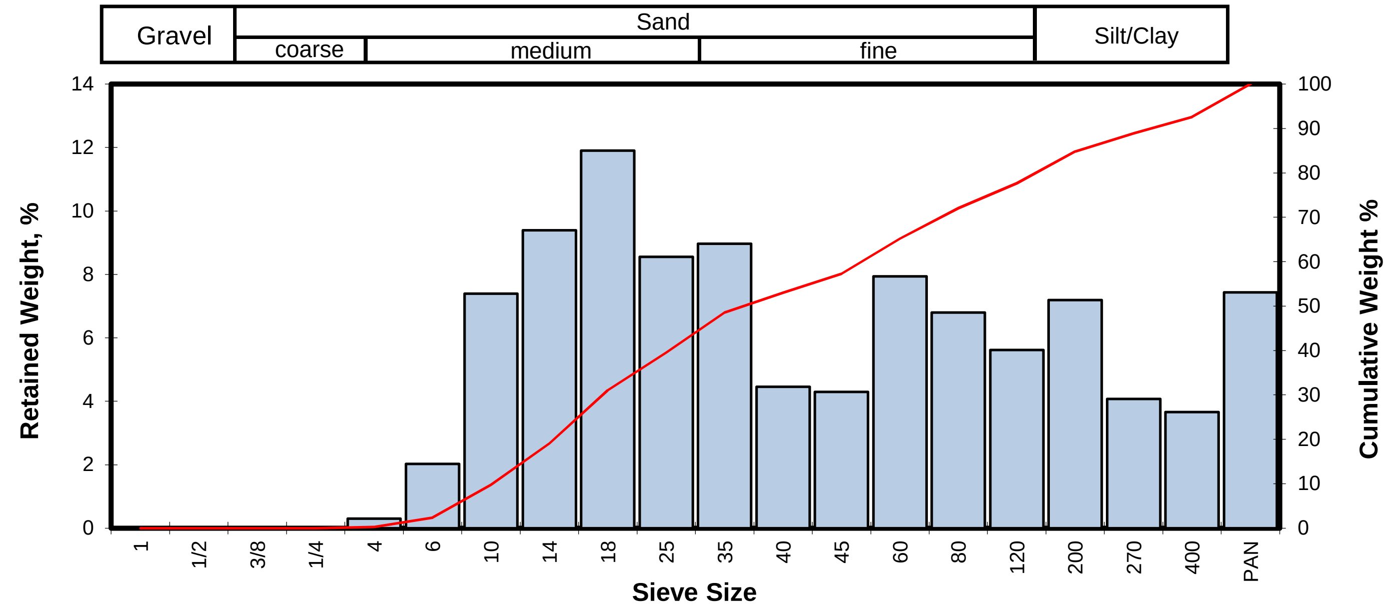
Description	Retained on Sieve #	Weight Percent
Gravel	4	0.00
Coarse Sand	10	2.22
Medium Sand	40	33.79
Fine Sand	200	35.85
Silt/Clay	<200	28.14
	Total	100

PTS Laboratories, Inc.

PTS ID NO:- 14

Sieve Analysis Results - ASTM D422

Client:	AECOM	**PTS File No:**	48147
Project:	NDEP Downgradient Study Area	**Sample ID:**	NERT5.11S1 72' 20180616
Project No:	60477365 Task 2016-170	**Depth, ft:**	72



Opening		Phi of	U.S. Sieve	Sample Weight	Incremental Weight,	Cumulative Weight,
Inches	**Millimeters**	**Screen**	**No.**	**grams**	**percent**	**percent**
0.9844	25.002	-4.64	1	0.00	0.00	0.00
0.4922	12.501	-3.64	1/2	0.00	0.00	0.00
0.3740	9.500	-3.25	3/8	0.00	0.00	0.00
0.2500	6.351	-2.67	1/4	0.00	0.00	0.00
0.1873	4.757	-2.25	4	0.39	0.30	0.30
0.1324	3.364	-1.75	6	2.66	2.03	2.32
0.0787	2.000	-1.00	10	9.70	7.39	9.72
0.0557	1.414	-0.50	14	12.32	9.39	19.11
0.0394	1.000	0.00	18	15.62	11.91	31.02
0.0278	0.707	0.50	25	11.22	8.55	39.57
0.0197	0.500	1.00	35	11.76	8.96	48.53
0.0166	0.420	1.25	40	5.85	4.46	52.99
0.0139	0.354	1.50	45	5.64	4.30	57.29
0.0098	0.250	2.00	60	10.42	7.94	65.23
0.0070	0.177	2.50	80	8.92	6.80	72.03
0.0049	0.125	3.00	120	7.37	5.62	77.65
0.0029	0.074	3.75	200	9.43	7.19	84.84
0.0021	0.053	4.25	270	5.34	4.07	88.91
0.0015	0.037	4.75	400	4.80	3.66	92.57
			PAN	9.75	7.43	100.00
TOTALS				131.19	100.00	100.00

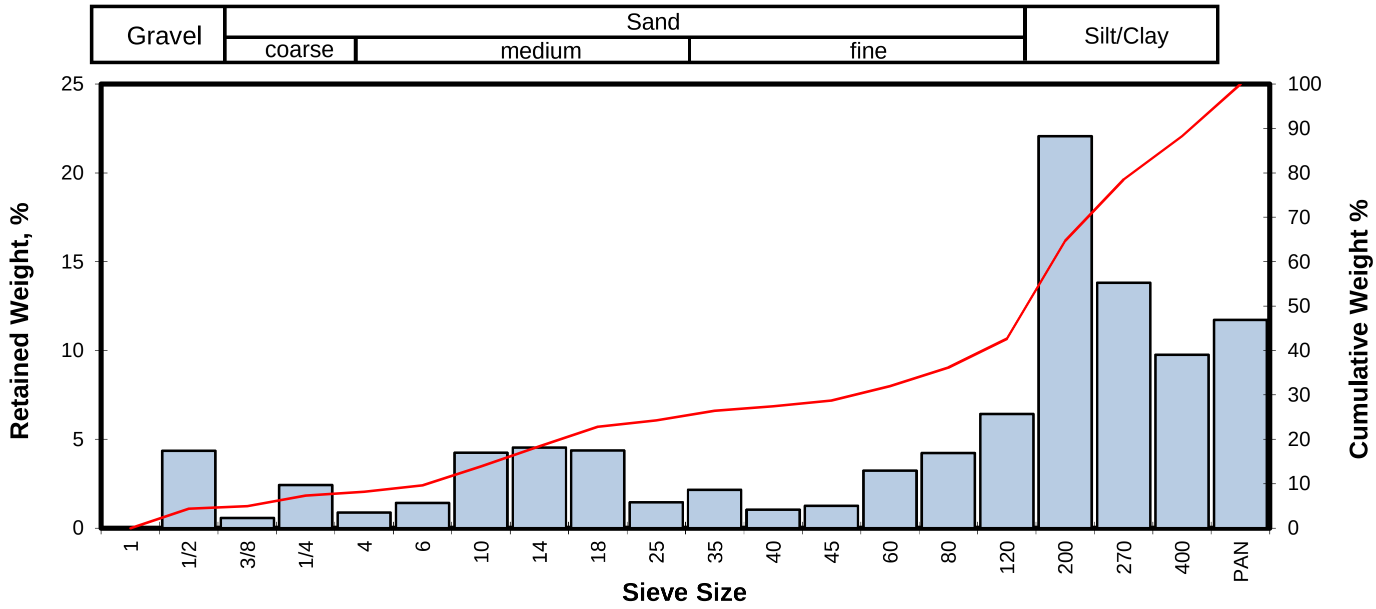
Cumulative Weight Percent greater than			
Weight percent	**Phi Value**	**Particle Size Inches**	**Particle Size Millimeters**
5	-1.48	0.1097	2.787
10	-0.99	0.0779	1.979
16	-0.67	0.0624	1.586
25	-0.25	0.0469	1.191
40	0.52	0.0274	0.695
50	1.08	0.0186	0.472
60	1.67	0.0124	0.314
75	2.76	0.0058	0.147
84	3.66	0.0031	0.079
90	4.40	0.0019	0.047
95	3.20	0.0043	0.109

Measure	Trask	Inman	Folk-Ward
Median, phi	1.08	1.08	1.08
Median, in.	0.0186	0.0186	0.0186
Median, mm	0.472	0.472	0.472
Mean, phi	0.58	1.50	1.36
Mean, in.	0.0264	0.0139	0.0153
Mean, mm	0.669	0.354	0.390
Sorting	2.845	2.164	1.790
Skewness	0.887	0.192	0.048
Kurtosis	0.270	0.080	0.635
Grain Size Description (ASTM-USCS Scale)	Medium sand (based on Mean from Trask)		

Description	Retained on Sieve #	Weight Percent
Gravel	4	0.30
Coarse Sand	10	9.42
Medium Sand	40	43.27
Fine Sand	200	31.85
Silt/Clay	<200	15.16
	Total	100

PTS Laboratories, Inc. PTS ID NO:- 15 **Sieve Analysis Results - ASTM D422**

Client:	AECOM	**PTS File No:**	48147
Project:	NDEP Downgradient Study Area	**Sample ID:**	NERT5.91S1 17' 20180617
Project No:	60477365 Task 2016-170	**Depth, ft:**	17



Opening Inches	Opening Millimeters	Phi of Screen	U.S. Sieve No.	Sample Weight grams	Incremental Weight, percent	Cumulative Weight, percent
0.9844	25.002	-4.64	1	0.00	0.00	0.00
0.4922	12.501	-3.64	1/2	9.21	4.36	4.36
0.3740	9.500	-3.25	3/8	1.22	0.58	4.94
0.2500	6.351	-2.67	1/4	5.11	2.42	7.36
0.1873	4.757	-2.25	4	1.84	0.87	8.23
0.1324	3.364	-1.75	6	2.99	1.42	9.64
0.0787	2.000	-1.00	10	8.99	4.26	13.90
0.0557	1.414	-0.50	14	9.59	4.54	18.44
0.0394	1.000	0.00	18	9.24	4.37	22.81
0.0278	0.707	0.50	25	3.09	1.46	24.27
0.0197	0.500	1.00	35	4.56	2.16	26.43
0.0166	0.420	1.25	40	2.19	1.04	27.47
0.0139	0.354	1.50	45	2.67	1.26	28.73
0.0098	0.250	2.00	60	6.84	3.24	31.97
0.0070	0.177	2.50	80	8.93	4.23	36.20
0.0049	0.125	3.00	120	13.58	6.43	42.62
0.0029	0.074	3.75	200	46.64	22.08	64.70
0.0021	0.053	4.25	270	29.18	13.81	78.51
0.0015	0.037	4.75	400	20.64	9.77	88.28
			PAN	24.76	11.72	100.00
TOTALS				211.27	100.00	100.00

Cumulative Weight Percent greater than

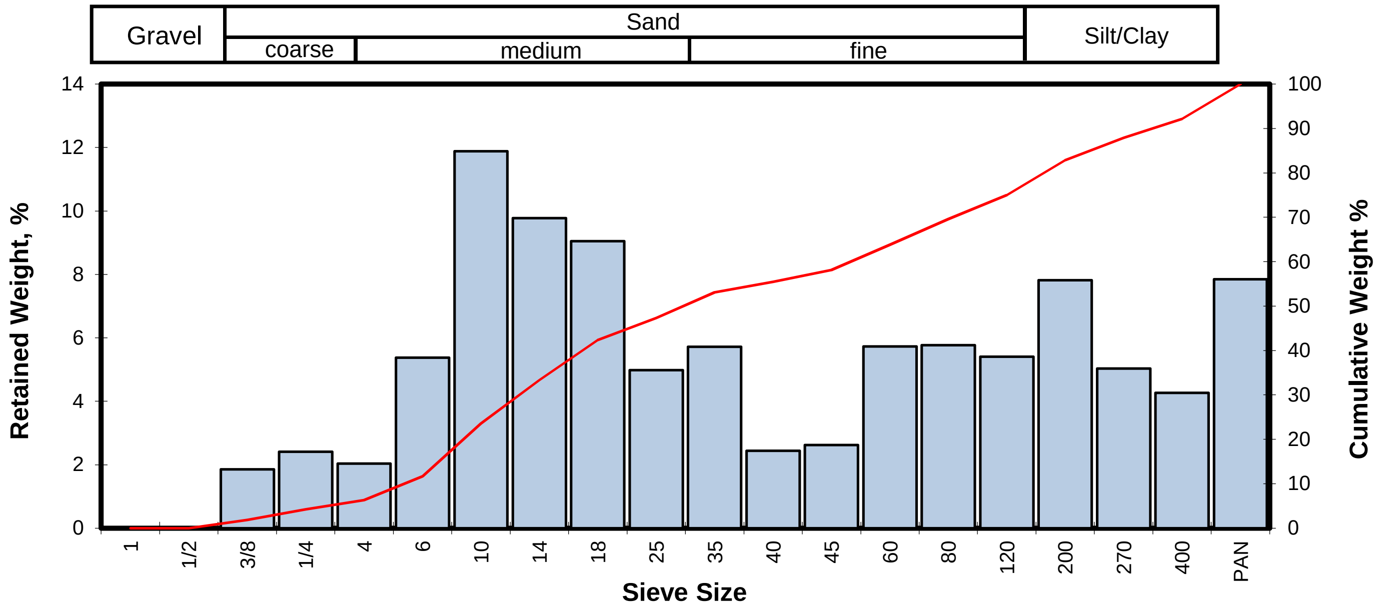
Weight percent	Phi Value	Particle Size Inches	Particle Size Millimeters
5	-3.23	0.3701	9.401
10	-1.69	0.1268	3.220
16	-0.77	0.0671	1.703
25	0.67	0.0248	0.629
40	2.80	0.0057	0.144
50	3.25	0.0041	0.105
60	3.59	0.0033	0.083
75	4.12	0.0023	0.057
84	4.53	0.0017	0.043
90	4.05	0.0024	0.060
95	2.03	0.0097	0.245

Measure	Trask	Inman	Folk-Ward
Median, phi	3.25	3.25	3.25
Median, in.	0.0041	0.0041	0.0041
Median, mm	0.105	0.105	0.105
Mean, phi	1.54	1.88	2.34
Mean, in.	0.0135	0.0107	0.0078
Mean, mm	0.343	0.271	0.198
Sorting	3.311	2.650	2.122
Skewness	1.809	-0.517	-0.991
Kurtosis	0.090	-0.008	0.624
Grain Size Description (ASTM-USCS Scale)		Fine sand (based on Mean from Trask)	

Description	Retained on Sieve #	Weight Percent
Gravel	4	8.23
Coarse Sand	10	5.67
Medium Sand	40	13.57
Fine Sand	200	37.23
Silt/Clay	<200	35.30
	Total	100

PTS Laboratories, Inc. PTS ID NO:- 16 **Sieve Analysis Results - ASTM D422**

Client:	AECOM	**PTS File No:**	48147
Project:	NDEP Downgradient Study Area	**Sample ID:**	NERT5.91S1 40' 20180617
Project No:	60477365 Task 2016-170	**Depth, ft:**	40



Opening Inches	Opening Millimeters	Phi of Screen	U.S. Sieve No.	Sample Weight grams	Incremental Weight, percent	Cumulative Weight, percent
0.9844	25.002	-4.64	1	0.00	0.00	0.00
0.4922	12.501	-3.64	1/2	0.00	0.00	0.00
0.3740	9.500	-3.25	3/8	3.54	1.85	1.85
0.2500	6.351	-2.67	1/4	4.60	2.41	4.26
0.1873	4.757	-2.25	4	3.90	2.04	6.30
0.1324	3.364	-1.75	6	10.27	5.37	11.67
0.0787	2.000	-1.00	10	22.72	11.88	23.55
0.0557	1.414	-0.50	14	18.69	9.77	33.32
0.0394	1.000	0.00	18	17.30	9.05	42.37
0.0278	0.707	0.50	25	9.53	4.98	47.36
0.0197	0.500	1.00	35	10.93	5.72	53.07
0.0166	0.420	1.25	40	4.66	2.44	55.51
0.0139	0.354	1.50	45	5.01	2.62	58.13
0.0098	0.250	2.00	60	10.95	5.73	63.86
0.0070	0.177	2.50	80	11.04	5.77	69.63
0.0049	0.125	3.00	120	10.33	5.40	75.03
0.0029	0.074	3.75	200	14.95	7.82	82.85
0.0021	0.053	4.25	270	9.62	5.03	87.88
0.0015	0.037	4.75	400	8.16	4.27	92.15
			PAN	15.01	7.85	100.00
TOTALS				191.21	100.00	100.00

Cumulative Weight Percent greater than

Weight percent	Phi Value	Particle Size Inches	Particle Size Millimeters
5	-2.52	0.2251	5.716
10	-1.91	0.1475	3.746
16	-1.48	0.1096	2.783
25	-0.93	0.0748	1.900
40	-0.13	0.0431	1.095
50	0.73	0.0237	0.602
60	1.66	0.0124	0.316
75	3.00	0.0049	0.125
84	3.86	0.0027	0.069
90	4.50	0.0017	0.044
95	3.03	0.0048	0.123

Measure	Trask	Inman	Folk-Ward
Median, phi	0.73	0.73	0.73
Median, in.	0.0237	0.0237	0.0237
Median, mm	0.602	0.602	0.602
Mean, phi	-0.02	1.19	1.04
Mean, in.	0.0399	0.0172	0.0192
Mean, mm	1.013	0.437	0.486
Sorting	3.894	2.670	2.175
Skewness	0.810	0.173	0.001
Kurtosis	0.240	0.037	0.579
Grain Size Description (ASTM-USCS Scale)	Medium sand (based on Mean from Trask)		

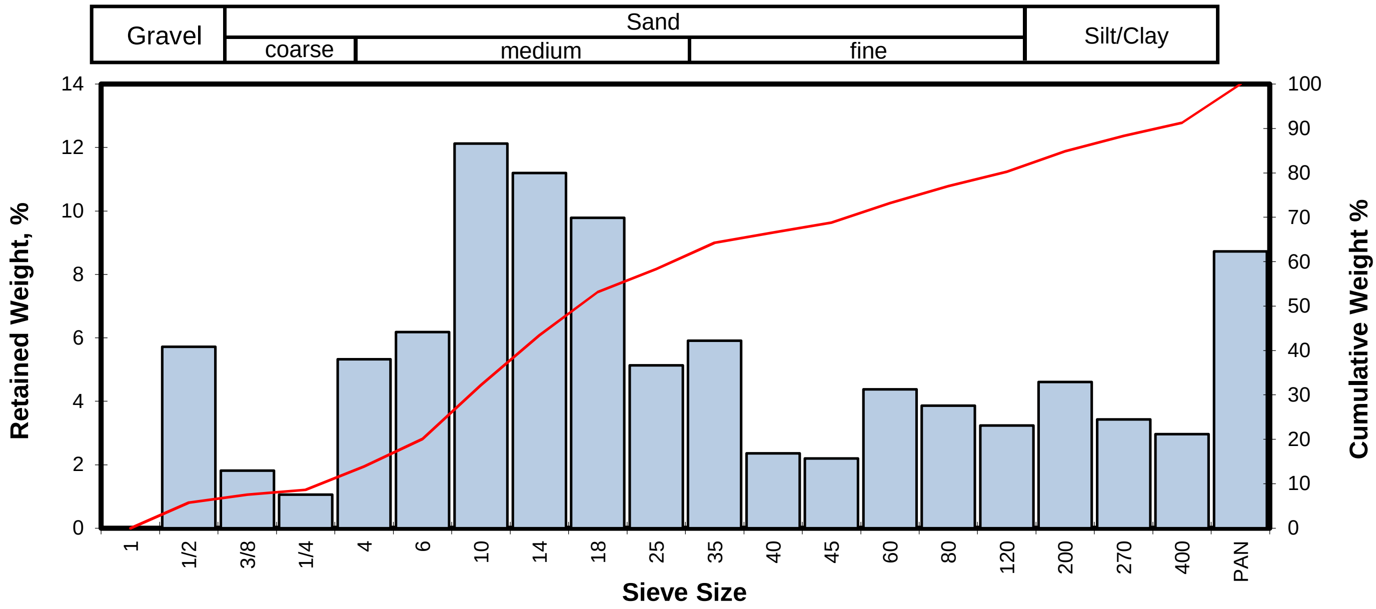
Description	Retained on Sieve #	Weight Percent
Gravel	4	6.30
Coarse Sand	10	17.25
Medium Sand	40	31.96
Fine Sand	200	27.34
Silt/Clay	<200	17.15
	Total	100

PTS Laboratories, Inc.

PTS ID NO:- 17

Sieve Analysis Results - ASTM D422

Client:	AECOM	**PTS File No:**	48147
Project:	NDEP Downgradient Study Area	**Sample ID:**	NERT5.91S1 47' 20180617
Project No:	60477365 Task 2016-170	**Depth, ft:**	47



Opening		Phi of	U.S. Sieve	Sample Weight	Incremental Weight,	Cumulative Weight,
Inches	Millimeters	Screen	No.	grams	percent	percent
0.9844	25.002	-4.64	1	0.00	0.00	0.00
0.4922	12.501	-3.64	1/2	10.57	5.72	5.72
0.3740	9.500	-3.25	3/8	3.35	1.81	7.54
0.2500	6.351	-2.67	1/4	1.96	1.06	8.60
0.1873	4.757	-2.25	4	9.83	5.32	13.92
0.1324	3.364	-1.75	6	11.42	6.18	20.10
0.0787	2.000	-1.00	10	22.40	12.13	32.23
0.0557	1.414	-0.50	14	20.68	11.19	43.42
0.0394	1.000	0.00	18	18.07	9.78	53.20
0.0278	0.707	0.50	25	9.49	5.14	58.34
0.0197	0.500	1.00	35	10.91	5.91	64.25
0.0166	0.420	1.25	40	4.36	2.36	66.61
0.0139	0.354	1.50	45	4.05	2.19	68.80
0.0098	0.250	2.00	60	8.09	4.38	73.18
0.0070	0.177	2.50	80	7.14	3.87	77.04
0.0049	0.125	3.00	120	5.97	3.23	80.27
0.0029	0.074	3.75	200	8.51	4.61	84.88
0.0021	0.053	4.25	270	6.34	3.43	88.31
0.0015	0.037	4.75	400	5.47	2.96	91.27
			PAN	16.12	8.73	100.00
TOTALS				184.73	100.00	100.00

Cumulative Weight Percent greater than			
Weight	Phi	Particle Size	
percent	Value	Inches	Millimeters
5	-3.77	0.5372	13.644
10	-2.56	0.2317	5.885
16	-2.08	0.1666	4.233
25	-1.45	0.1073	2.726
40	-0.65	0.0619	1.572
50	-0.16	0.0441	1.120
60	0.64	0.0253	0.641
75	2.24	0.0084	0.212
84	3.61	0.0032	0.082
90	4.53	0.0017	0.043
95	2.72	0.0060	0.152

Measure	Trask	Inman	Folk-Ward
Median, phi	-0.16	-0.16	-0.16
Median, in.	0.0441	0.0441	0.0441
Median, mm	1.120	1.120	1.120
Mean, phi	-0.56	0.76	0.45
Mean, in.	0.0578	0.0232	0.0287
Mean, mm	1.469	0.589	0.730
Sorting	3.583	2.844	2.406
Skewness	0.679	0.326	0.107
Kurtosis	0.215	0.141	0.722
Grain Size Description (ASTM-USCS Scale)	Medium sand (based on Mean from Trask)		

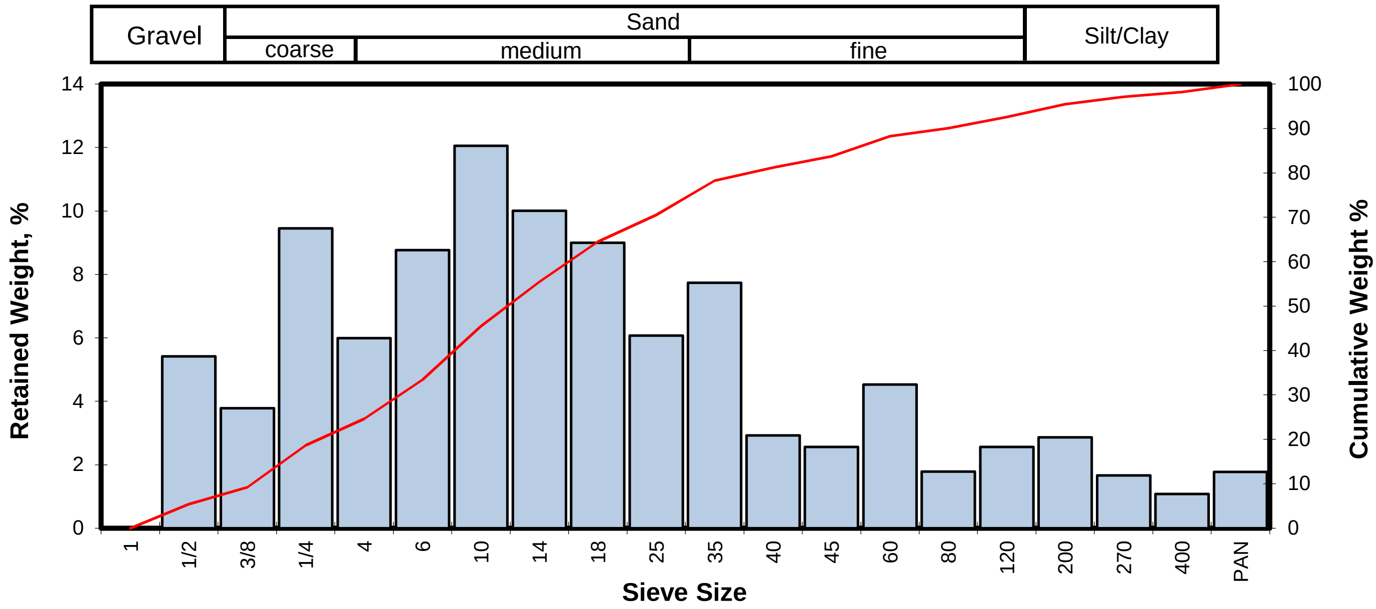
Description	Retained on Sieve #	Weight Percent
Gravel	4	13.92
Coarse Sand	10	18.31
Medium Sand	40	34.38
Fine Sand	200	18.28
Silt/Clay	<200	15.12
	Total	100

PTS Laboratories, Inc.

PTS ID NO:- 18

Sieve Analysis Results - ASTM D422

Client:	AECOM	**PTS File No:**	48147
Project:	NDEP Downgradient Study Area	**Sample ID:**	NERT5.91S1 50' 20180617
Project No:	60477365 Task 2016-170	**Depth, ft:**	50



Opening Inches	Opening Millimeters	Phi of Screen	U.S. Sieve No.	Sample Weight grams	Incremental Weight, percent	Cumulative Weight, percent
0.9844	25.002	-4.64	1	0.00	0.00	0.00
0.4922	12.501	-3.64	1/2	12.07	5.42	5.42
0.3740	9.500	-3.25	3/8	8.43	3.79	9.20
0.2500	6.351	-2.67	1/4	21.05	9.45	18.66
0.1873	4.757	-2.25	4	13.35	5.99	24.65
0.1324	3.364	-1.75	6	19.52	8.76	33.41
0.0787	2.000	-1.00	10	26.84	12.05	45.47
0.0557	1.414	-0.50	14	22.29	10.01	55.47
0.0394	1.000	0.00	18	20.05	9.00	64.48
0.0278	0.707	0.50	25	13.52	6.07	70.55
0.0197	0.500	1.00	35	17.22	7.73	78.28
0.0166	0.420	1.25	40	6.50	2.92	81.20
0.0139	0.354	1.50	45	5.70	2.56	83.76
0.0098	0.250	2.00	60	10.09	4.53	88.29
0.0070	0.177	2.50	80	3.97	1.78	90.07
0.0049	0.125	3.00	120	5.70	2.56	92.63
0.0029	0.074	3.75	200	6.37	2.86	95.49
0.0021	0.053	4.25	270	3.71	1.67	97.15
0.0015	0.037	4.75	400	2.39	1.07	98.23
			PAN	3.95	1.77	100.00
TOTALS				222.72	100.00	100.00

Cumulative Weight Percent greater than

Weight percent	Phi Value	Particle Size Inches	Particle Size Millimeters
5	-3.72	0.5193	13.190
10	-3.20	0.3616	9.184
16	-2.83	0.2800	7.112
25	-2.23	0.1847	4.691
40	-1.34	0.0997	2.532
50	-0.77	0.0673	1.709
60	-0.25	0.0468	1.188
75	0.79	0.0228	0.579
84	1.53	0.0137	0.347
90	2.48	0.0071	0.179
95	3.62	0.0032	0.081

Measure	Trask	Inman	Folk-Ward
Median, phi	-0.77	-0.77	-0.77
Median, in.	0.0673	0.0673	0.0673
Median, mm	1.709	1.709	1.709
Mean, phi	-1.40	-0.65	-0.69
Mean, in.	0.1038	0.0618	0.0636
Mean, mm	2.635	1.571	1.616
Sorting	2.846	2.179	2.202
Skewness	0.964	0.056	0.127
Kurtosis	0.228	0.685	0.997
Grain Size Description (ASTM-USCS Scale)	Medium Sand (based on Mean from Trask)		

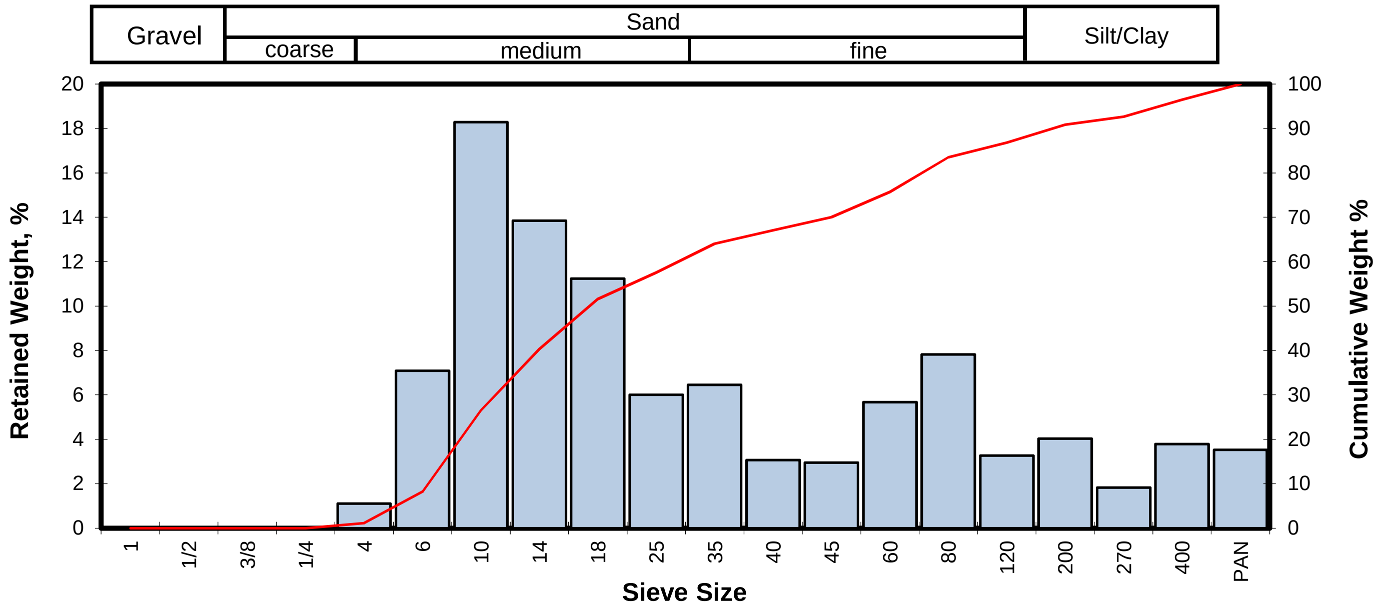
Description	Retained on Sieve #	Weight Percent
Gravel	4	24.65
Coarse Sand	10	20.82
Medium Sand	40	35.73
Fine Sand	200	14.29
Silt/Clay	<200	4.51
	Total	100

PTS Laboratories, Inc.

PTS ID NO:- 19

Sieve Analysis Results - ASTM D422

Client:	AECOM	**PTS File No:**	48147
Project:	NDEP Downgradient Study Area	**Sample ID:**	NERT5.91S1 60' 20180617
Project No:	60477365 Task 2016-170	**Depth, ft:**	60



Opening Inches	Opening Millimeters	Phi of Screen	U.S. Sieve No.	Sample Weight grams	Incremental Weight, percent	Cumulative Weight, percent
0.9844	25.002	-4.64	1	0.00	0.00	0.00
0.4922	12.501	-3.64	1/2	0.00	0.00	0.00
0.3740	9.500	-3.25	3/8	0.00	0.00	0.00
0.2500	6.351	-2.67	1/4	0.00	0.00	0.00
0.1873	4.757	-2.25	4	1.54	1.11	1.11
0.1324	3.364	-1.75	6	9.86	7.09	8.20
0.0787	2.000	-1.00	10	25.41	18.28	26.49
0.0557	1.414	-0.50	14	19.24	13.84	40.33
0.0394	1.000	0.00	18	15.62	11.24	51.57
0.0278	0.707	0.50	25	8.34	6.00	57.57
0.0197	0.500	1.00	35	8.97	6.45	64.02
0.0166	0.420	1.25	40	4.27	3.07	67.10
0.0139	0.354	1.50	45	4.11	2.96	70.05
0.0098	0.250	2.00	60	7.88	5.67	75.72
0.0070	0.177	2.50	80	10.87	7.82	83.54
0.0049	0.125	3.00	120	4.55	3.27	86.82
0.0029	0.074	3.75	200	5.61	4.04	90.85
0.0021	0.053	4.25	270	2.54	1.83	92.68
0.0015	0.037	4.75	400	5.26	3.78	96.47
			PAN	4.91	3.53	100.00
TOTALS				138.98	100.00	100.00

Cumulative Weight Percent greater than

Weight percent	Phi Value	Particle Size Inches	Particle Size Millimeters
5	-1.98	0.1549	3.933
10	-1.68	0.1258	3.196
16	-1.43	0.1061	2.695
25	-1.06	0.0821	2.086
40	-0.51	0.0561	1.426
50	-0.07	0.0413	1.050
60	0.69	0.0244	0.621
75	1.94	0.0103	0.261
84	2.57	0.0066	0.168
90	3.59	0.0033	0.083
95	4.56	0.0017	0.043

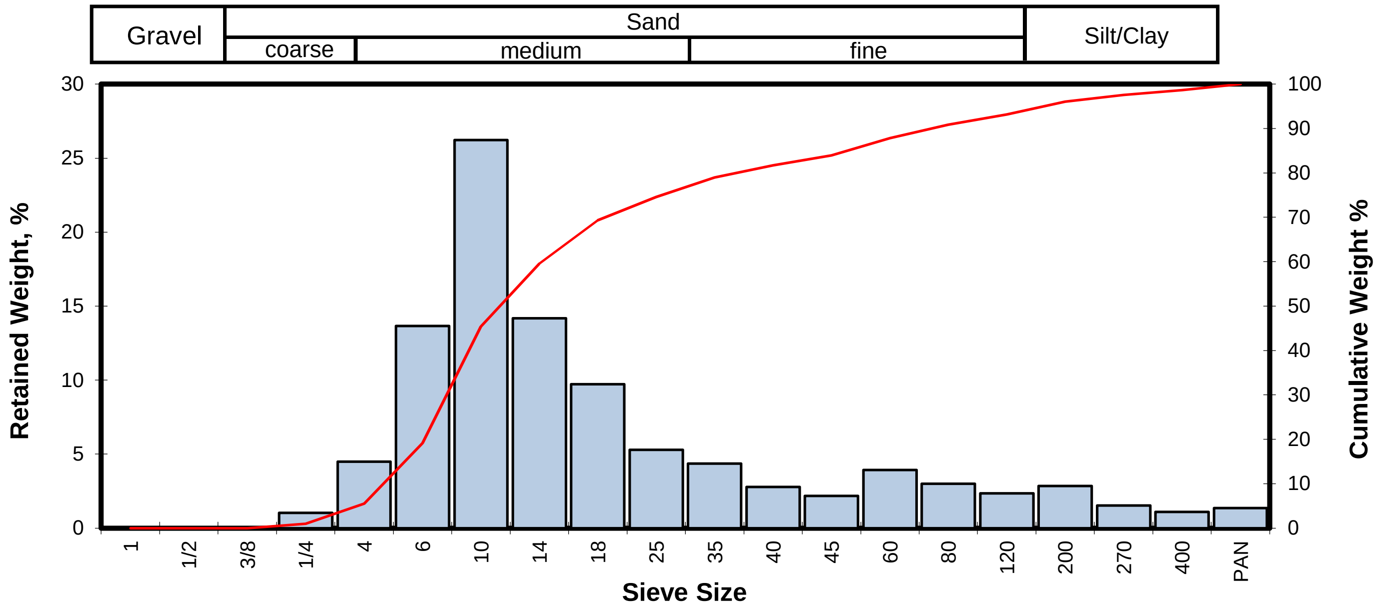
Measure	Trask	Inman	Folk-Ward
Median, phi	-0.07	-0.07	-0.07
Median, in.	0.0413	0.0413	0.0413
Median, mm	1.050	1.050	1.050
Mean, phi	-0.23	0.57	0.36
Mean, in.	0.0462	0.0265	0.0307
Mean, mm	1.174	0.674	0.781
Sorting	2.826	2.000	1.990
Skewness	0.703	0.320	0.368
Kurtosis	0.293	0.633	0.893

Grain Size Description (ASTM-USCS Scale)	Medium sand (based on Mean from Trask)

Description	Retained on Sieve #	Weight Percent
Gravel	4	1.11
Coarse Sand	10	25.38
Medium Sand	40	40.61
Fine Sand	200	23.76
Silt/Clay	<200	9.15
	Total	100

PTS Laboratories, Inc. PTS ID NO:- 20 **Sieve Analysis Results - ASTM D422**

Client:	AECOM	**PTS File No:**	48147
Project:	NDEP Downgradient Study Area	**Sample ID:**	NERT5.91S1 87' 20180617
Project No:	60477365 Task 2016-170	**Depth, ft:**	87



Opening		Phi of	U.S. Sieve	Sample Weight	Incremental Weight,	Cumulative Weight,
Inches	Millimeters	Screen	No.	grams	percent	percent
0.9844	25.002	-4.64	1	0.00	0.00	0.00
0.4922	12.501	-3.64	1/2	0.00	0.00	0.00
0.3740	9.500	-3.25	3/8	0.00	0.00	0.00
0.2500	6.351	-2.67	1/4	0.99	1.02	1.02
0.1873	4.757	-2.25	4	4.34	4.49	5.51
0.1324	3.364	-1.75	6	13.21	13.66	19.17
0.0787	2.000	-1.00	10	25.36	26.22	45.39
0.0557	1.414	-0.50	14	13.72	14.19	59.57
0.0394	1.000	0.00	18	9.41	9.73	69.30
0.0278	0.707	0.50	25	5.11	5.28	74.59
0.0197	0.500	1.00	35	4.22	4.36	78.95
0.0166	0.420	1.25	40	2.70	2.79	81.74
0.0139	0.354	1.50	45	2.10	2.17	83.91
0.0098	0.250	2.00	60	3.79	3.92	87.83
0.0070	0.177	2.50	80	2.90	3.00	90.83
0.0049	0.125	3.00	120	2.28	2.36	93.19
0.0029	0.074	3.75	200	2.75	2.84	96.03
0.0021	0.053	4.25	270	1.47	1.52	97.55
0.0015	0.037	4.75	400	1.05	1.09	98.64
			PAN	1.32	1.36	100.00
TOTALS				96.72	100.00	100.00

Cumulative Weight Percent greater than			
Weight percent	Phi Value	Particle Size Inches	Particle Size Millimeters
5	-2.30	0.1935	4.916
10	-2.09	0.1671	4.245
16	-1.87	0.1435	3.645
25	-1.58	0.1180	2.996
40	-1.15	0.0876	2.226
50	-0.84	0.0704	1.787
60	-0.48	0.0548	1.393
75	0.55	0.0269	0.684
84	1.51	0.0138	0.351
90	2.36	0.0077	0.195
95	3.48	0.0035	0.090

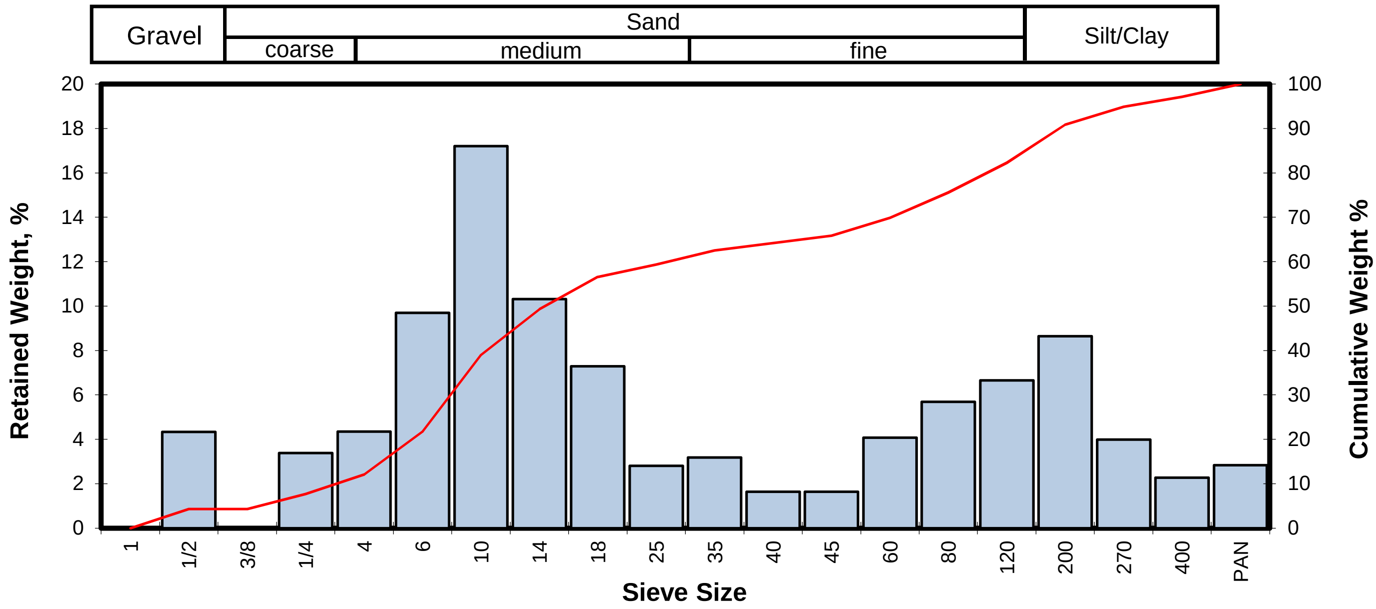
Measure	Trask	Inman	Folk-Ward
Median, phi	-0.84	-0.84	-0.84
Median, in.	0.0704	0.0704	0.0704
Median, mm	1.787	1.787	1.787
Mean, phi	-0.88	-0.18	-0.40
Mean, in.	0.0725	0.0445	0.0519
Mean, mm	1.840	1.131	1.317
Sorting	2.093	1.689	1.719
Skewness	0.801	0.391	0.443
Kurtosis	0.285	0.710	1.111
Grain Size Description (ASTM-USCS Scale)	Coarse Sand (based on Mean from Trask)		

Description	Retained on Sieve #	Weight Percent
Gravel	4	5.51
Coarse Sand	10	39.88
Medium Sand	40	36.35
Fine Sand	200	14.29
Silt/Clay	<200	3.97
	Total	100

 Phone: (713) 316-1800

PTS Laboratories, Inc. PTS ID NO:- 21 **Sieve Analysis Results - ASTM D422**

Client:	AECOM	**PTS File No:**	48147
Project:	NDEP Downgradient Study Area	**Sample ID:**	NERT5.49S1 20' 20180618
Project No:	60477365 Task 2016-170	**Depth, ft:**	20



Opening Inches	Opening Millimeters	Phi of Screen	U.S. Sieve No.	Sample Weight grams	Incremental Weight, percent	Cumulative Weight, percent
0.9844	25.002	-4.64	1	0.00	0.00	0.00
0.4922	12.501	-3.64	1/2	5.60	4.33	4.33
0.3740	9.500	-3.25	3/8	0.00	0.00	4.33
0.2500	6.351	-2.67	1/4	4.37	3.38	7.71
0.1873	4.757	-2.25	4	5.63	4.35	12.07
0.1324	3.364	-1.75	6	12.54	9.70	21.77
0.0787	2.000	-1.00	10	22.25	17.21	38.98
0.0557	1.414	-0.50	14	13.33	10.31	49.29
0.0394	1.000	0.00	18	9.42	7.29	56.57
0.0278	0.707	0.50	25	3.63	2.81	59.38
0.0197	0.500	1.00	35	4.11	3.18	62.56
0.0166	0.420	1.25	40	2.12	1.64	64.20
0.0139	0.354	1.50	45	2.11	1.63	65.83
0.0098	0.250	2.00	60	5.27	4.08	69.91
0.0070	0.177	2.50	80	7.36	5.69	75.60
0.0049	0.125	3.00	120	8.60	6.65	82.26
0.0029	0.074	3.75	200	11.17	8.64	90.90
0.0021	0.053	4.25	270	5.16	3.99	94.89
0.0015	0.037	4.75	400	2.94	2.27	97.16
			PAN	3.67	2.84	100.00
TOTALS				129.28	100.00	100.00

Cumulative Weight Percent greater than

Weight percent	Phi Value	Particle Size Inches	Particle Size Millimeters
5	-3.13	0.3454	8.773
10	-2.45	0.2148	5.456
16	-2.05	0.1627	4.133
25	-1.61	0.1201	3.051
40	-0.95	0.0761	1.932
50	-0.45	0.0538	1.367
60	0.60	0.0260	0.661
75	2.45	0.0072	0.183
84	3.15	0.0044	0.113
90	3.67	0.0031	0.078
95	4.27	0.0020	0.052

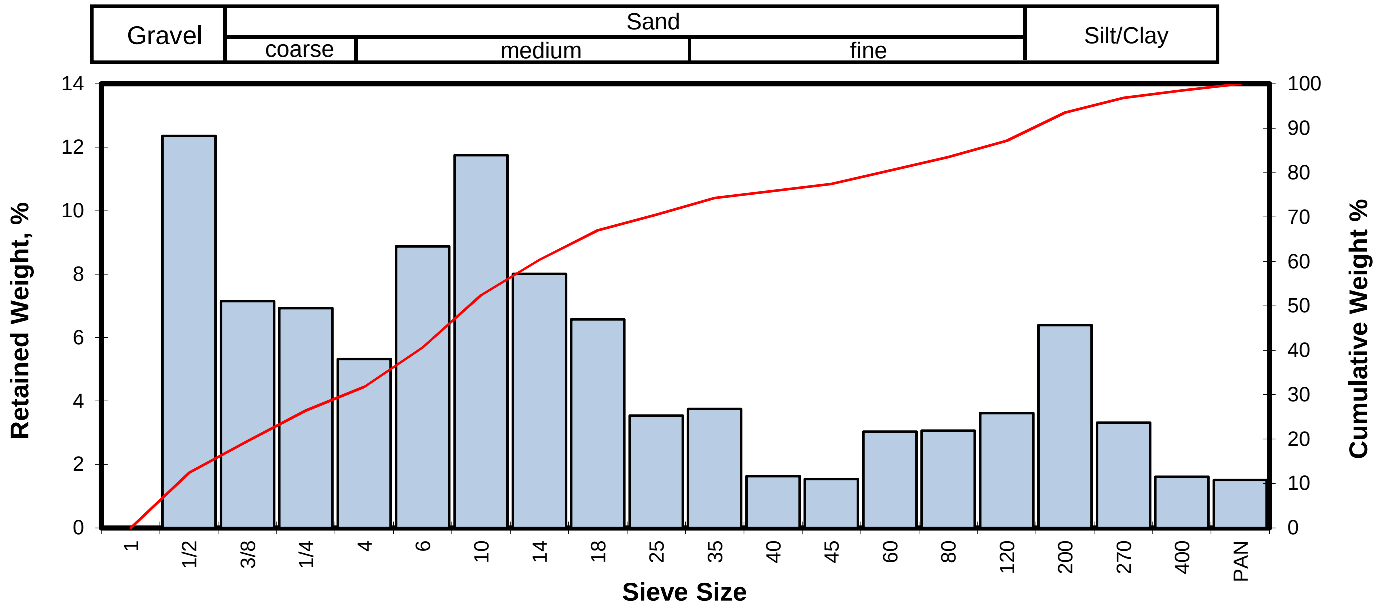
Measure	Trask	Inman	Folk-Ward
Median, phi	-0.45	-0.45	-0.45
Median, in.	0.0538	0.0538	0.0538
Median, mm	1.367	1.367	1.367
Mean, phi	-0.69	0.55	0.22
Mean, in.	0.0637	0.0269	0.0339
Mean, mm	1.617	0.682	0.860
Sorting	4.079	2.599	2.422
Skewness	0.547	0.386	0.331
Kurtosis	0.267	0.425	0.749
Grain Size Description (ASTM-USCS Scale)	Coarse Sand (based on Mean from Trask)		

Description	Retained on Sieve #	Weight Percent
Gravel	4	12.07
Coarse Sand	10	26.91
Medium Sand	40	25.22
Fine Sand	200	26.69
Silt/Clay	<200	9.10
	Total	100

 Phone: (713) 316-1800

PTS Laboratories, Inc. PTS ID NO:- 22 **Sieve Analysis Results - ASTM D422**

Client:	AECOM	**PTS File No:**	48147
Project:	NDEP Downgradient Study Area	**Sample ID:**	NERT5.49S1 32' 20180618
Project No:	60477365 Task 2016-170	**Depth, ft:**	32



Opening Inches	Opening Millimeters	Phi of Screen	U.S. Sieve No.	Sample Weight grams	Incremental Weight, percent	Cumulative Weight, percent
0.9844	25.002	-4.64	1	0.00	0.00	0.00
0.4922	12.501	-3.64	1/2	17.46	12.36	12.36
0.3740	9.500	-3.25	3/8	10.11	7.16	19.51
0.2500	6.351	-2.67	1/4	9.79	6.93	26.44
0.1873	4.757	-2.25	4	7.53	5.33	31.77
0.1324	3.364	-1.75	6	12.54	8.88	40.65
0.0787	2.000	-1.00	10	16.60	11.75	52.40
0.0557	1.414	-0.50	14	11.32	8.01	60.41
0.0394	1.000	0.00	18	9.29	6.58	66.98
0.0278	0.707	0.50	25	5.00	3.54	70.52
0.0197	0.500	1.00	35	5.30	3.75	74.27
0.0166	0.420	1.25	40	2.30	1.63	75.90
0.0139	0.354	1.50	45	2.18	1.54	77.44
0.0098	0.250	2.00	60	4.28	3.03	80.47
0.0070	0.177	2.50	80	4.33	3.06	83.54
0.0049	0.125	3.00	120	5.12	3.62	87.16
0.0029	0.074	3.75	200	9.04	6.40	93.56
0.0021	0.053	4.25	270	4.69	3.32	96.88
0.0015	0.037	4.75	400	2.28	1.61	98.49
			PAN	2.13	1.51	100.00
TOTALS				141.29	100.00	100.00

Cumulative Weight Percent greater than

Weight percent	Phi Value	Particle Size Inches	Particle Size Millimeters
5	-4.24	0.7436	18.888
10	-3.83	0.5618	14.269
16	-3.44	0.4280	10.871
25	-2.79	0.2719	6.906
40	-1.79	0.1358	3.450
50	-1.15	0.0875	2.224
60	-0.53	0.0567	1.439
75	1.11	0.0182	0.463
84	2.56	0.0067	0.169
90	3.33	0.0039	0.099
95	3.97	0.0025	0.064

Measure	Trask	Inman	Folk-Ward
Median, phi	-1.15	-1.15	-1.15
Median, in.	0.0875	0.0875	0.0875
Median, mm	2.224	2.224	2.224
Mean, phi	-1.88	-0.44	-0.68
Mean, in.	0.1451	0.0534	0.0630
Mean, mm	3.685	1.356	1.599
Sorting	3.863	3.003	2.745
Skewness	0.804	0.238	0.243
Kurtosis	0.227	0.366	0.862
Grain Size Description (ASTM-USCS Scale)	Gravel (based on Mean from Trask)		

Description	Retained on Sieve #	Weight Percent
Gravel	4	31.77
Coarse Sand	10	20.62
Medium Sand	40	23.50
Fine Sand	200	17.66
Silt/Clay	<200	6.44
	Total	100

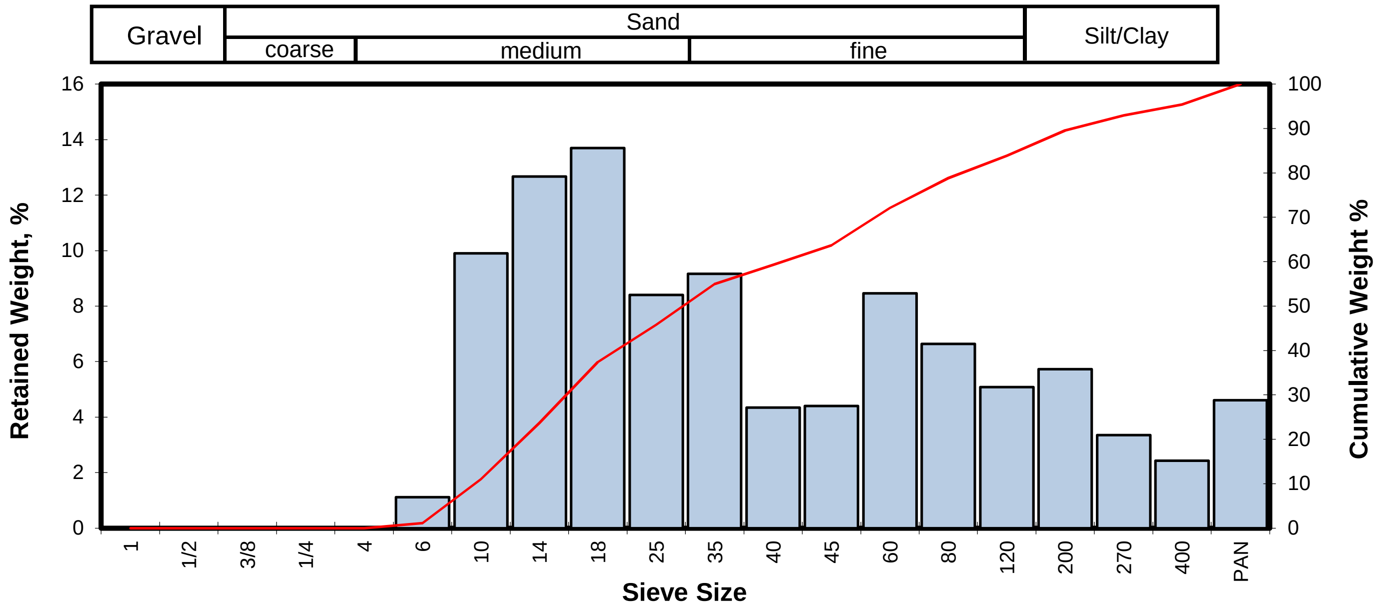
 Phone: (713) 316-1800

PTS Laboratories, Inc.

PTS ID NO:- 23

Sieve Analysis Results - ASTM D422

Client:	AECOM	**PTS File No:**	48147
Project:	NDEP Downgradient Study Area	**Sample ID:**	NERT5.49S1 72' 20180618
Project No:	60477365 Task 2016-170	**Depth, ft:**	72



Opening Inches	Opening Millimeters	Phi of Screen	U.S. Sieve No.	Sample Weight grams	Incremental Weight, percent	Cumulative Weight, percent
0.9844	25.002	-4.64	1	0.00	0.00	0.00
0.4922	12.501	-3.64	1/2	0.00	0.00	0.00
0.3740	9.500	-3.25	3/8	0.00	0.00	0.00
0.2500	6.351	-2.67	1/4	0.00	0.00	0.00
0.1873	4.757	-2.25	4	0.00	0.00	0.00
0.1324	3.364	-1.75	6	0.77	1.11	1.11
0.0787	2.000	-1.00	10	6.85	9.91	11.02
0.0557	1.414	-0.50	14	8.76	12.67	23.69
0.0394	1.000	0.00	18	9.47	13.70	37.39
0.0278	0.707	0.50	25	5.81	8.40	45.79
0.0197	0.500	1.00	35	6.34	9.17	54.96
0.0166	0.420	1.25	40	3.00	4.34	59.30
0.0139	0.354	1.50	45	3.04	4.40	63.70
0.0098	0.250	2.00	60	5.85	8.46	72.16
0.0070	0.177	2.50	80	4.59	6.64	78.80
0.0049	0.125	3.00	120	3.51	5.08	83.87
0.0029	0.074	3.75	200	3.96	5.73	89.60
0.0021	0.053	4.25	270	2.32	3.36	92.96
0.0015	0.037	4.75	400	1.68	2.43	95.39
			PAN	3.19	4.61	100.00
TOTALS				69.14	100.00	100.00

Cumulative Weight Percent greater than

Weight percent	Phi Value	Particle Size Inches	Particle Size Millimeters
5	-1.46	0.1080	2.743
10	-1.08	0.0831	2.110
16	-0.80	0.0687	1.745
25	-0.45	0.0539	1.368
40	0.16	0.0353	0.898
50	0.73	0.0237	0.603
60	1.29	0.0161	0.409
75	2.21	0.0085	0.216
84	3.02	0.0049	0.124
90	3.81	0.0028	0.071
95	4.67	0.0015	0.039

Measure	Trask	Inman	Folk-Ward
Median, phi	0.73	0.73	0.73
Median, in.	0.0237	0.0237	0.0237
Median, mm	0.603	0.603	0.603
Mean, phi	0.34	1.11	0.98
Mean, in.	0.0312	0.0183	0.0199
Mean, mm	0.792	0.464	0.507
Sorting	2.519	1.910	1.883
Skewness	0.900	0.197	0.242
Kurtosis	0.283	0.604	0.942

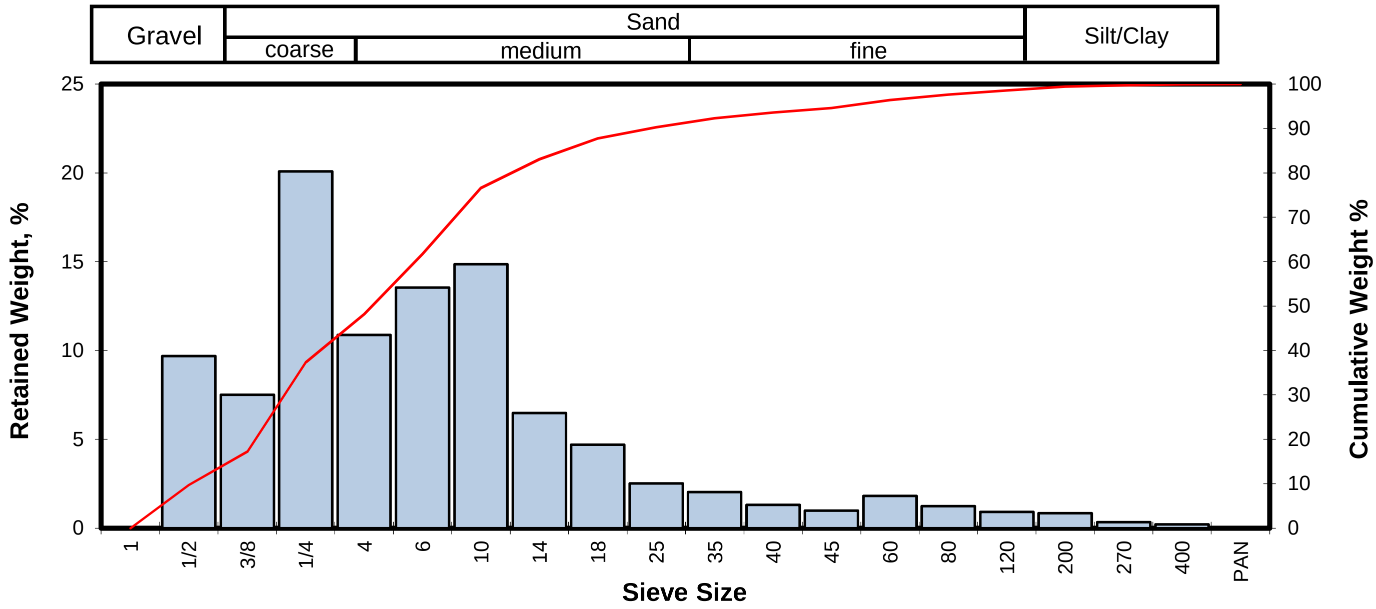
Grain Size Description (ASTM-USCS Scale)	Medium sand (based on Mean from Trask)

Description	Retained on Sieve #	Weight Percent
Gravel	4	0.00
Coarse Sand	10	11.02
Medium Sand	40	48.28
Fine Sand	200	30.30
Silt/Clay	<200	10.40
	Total	100

Phone: (713) 316-1800

PTS Laboratories, Inc. PTS ID NO:- 24 **Sieve Analysis Results - ASTM D422**

Client:	AECOM	**PTS File No:**	48147
Project:	NDEP Downgradient Study Area	**Sample ID:**	NERT5.49S1 89' 20180618
Project No:	60477365 Task 2016-170	**Depth, ft:**	89



Opening Inches	Opening Millimeters	Phi of Screen	U.S. Sieve No.	Sample Weight grams	Incremental Weight, percent	Cumulative Weight, percent
0.9844	25.002	-4.64	1	0.00	0.00	0.00
0.4922	12.501	-3.64	1/2	8.49	9.69	9.69
0.3740	9.500	-3.25	3/8	6.58	7.51	17.21
0.2500	6.351	-2.67	1/4	17.59	20.08	37.29
0.1873	4.757	-2.25	4	9.53	10.88	48.17
0.1324	3.364	-1.75	6	11.87	13.55	61.73
0.0787	2.000	-1.00	10	13.02	14.87	76.59
0.0557	1.414	-0.50	14	5.67	6.47	83.07
0.0394	1.000	0.00	18	4.12	4.70	87.77
0.0278	0.707	0.50	25	2.20	2.51	90.28
0.0197	0.500	1.00	35	1.78	2.03	92.32
0.0166	0.420	1.25	40	1.14	1.30	93.62
0.0139	0.354	1.50	45	0.87	0.99	94.61
0.0098	0.250	2.00	60	1.59	1.82	96.43
0.0070	0.177	2.50	80	1.08	1.23	97.66
0.0049	0.125	3.00	120	0.80	0.91	98.57
0.0029	0.074	3.75	200	0.73	0.83	99.41
0.0021	0.053	4.25	270	0.29	0.33	99.74
0.0015	0.037	4.75	400	0.18	0.21	99.94
			PAN	0.05	0.06	100.00
TOTALS				87.58	100.00	100.00

Cumulative Weight Percent greater than

Weight percent	Phi Value	Particle Size Inches	Particle Size Millimeters
5	-4.13	0.6885	17.487
10	-3.63	0.4867	12.362
16	-3.31	0.3909	9.929
25	-3.02	0.3199	8.126
40	-2.56	0.2327	5.910
50	-2.18	0.1787	4.540
60	-1.81	0.1384	3.515
75	-1.08	0.0833	2.115
84	-0.40	0.0520	1.320
90	0.44	0.0289	0.735
95	1.61	0.0129	0.328

Measure	Trask	Inman	Folk-Ward
Median, phi	-2.18	-2.18	-2.18
Median, in.	0.1787	0.1787	0.1787
Median, mm	4.540	4.540	4.540
Mean, phi	-2.36	-1.86	-1.97
Mean, in.	0.2016	0.1425	0.1537
Mean, mm	5.120	3.621	3.904
Sorting	1.960	1.455	1.597
Skewness	0.913	0.224	0.273
Kurtosis	0.259	0.970	1.210
Grain Size Description (ASTM-USCS Scale)	Gravel (based on Mean from Trask)		

Description	Retained on Sieve #	Weight Percent
Gravel	4	48.17
Coarse Sand	10	28.42
Medium Sand	40	17.02
Fine Sand	200	5.79
Silt/Clay	<200	0.59
	Total	100

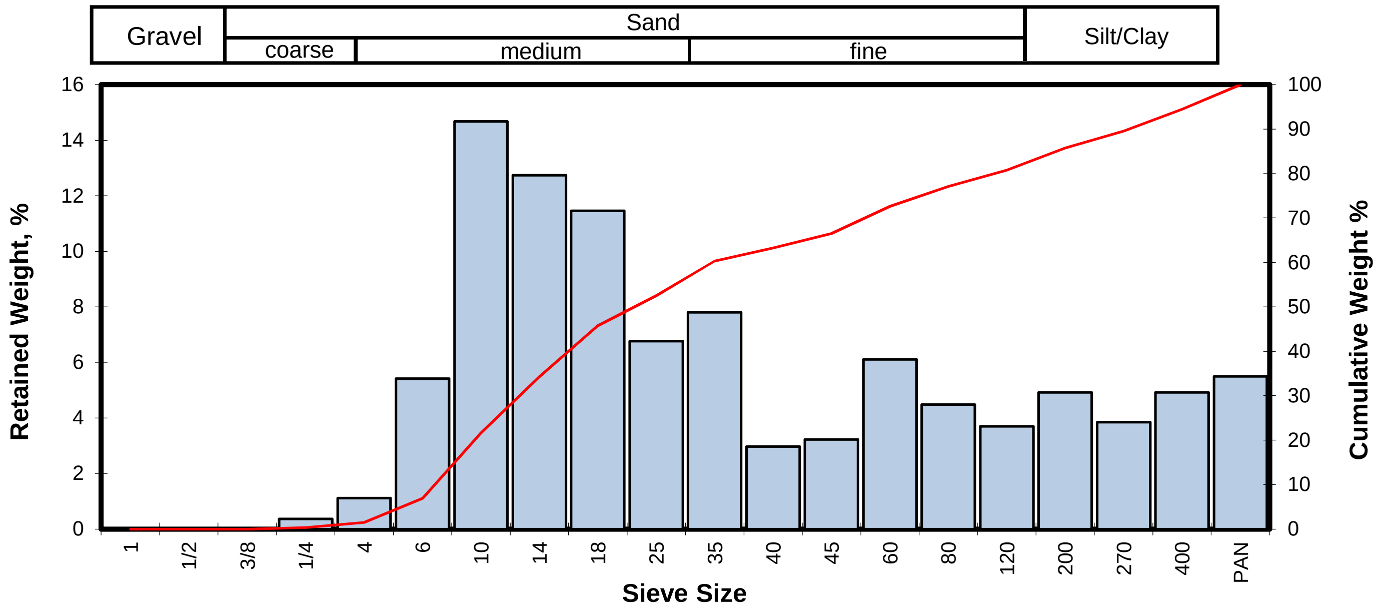
 Phone: (713) 316-1800

PTS Laboratories, Inc.

PTS ID NO:- 25

Sieve Analysis Results - ASTM D422

Client:	AECOM	**PTS File No:**	48147
Project:	NDEP Downgradient Study Area	**Sample ID:**	NERT4.21N1 22' 20180619
Project No:	60477365 Task 2016-170	**Depth, ft:**	22



Opening Inches	Opening Millimeters	Phi of Screen	U.S. Sieve No.	Sample Weight grams	Incremental Weight, percent	Cumulative Weight, percent
0.9844	25.002	-4.64	1	0.00	0.00	0.00
0.4922	12.501	-3.64	1/2	0.00	0.00	0.00
0.3740	9.500	-3.25	3/8	0.00	0.00	0.00
0.2500	6.351	-2.67	1/4	0.39	0.37	0.37
0.1873	4.757	-2.25	4	1.19	1.11	1.48
0.1324	3.364	-1.75	6	5.78	5.41	6.89
0.0787	2.000	-1.00	10	15.67	14.68	21.57
0.0557	1.414	-0.50	14	13.60	12.74	34.31
0.0394	1.000	0.00	18	12.23	11.45	45.76
0.0278	0.707	0.50	25	7.22	6.76	52.52
0.0197	0.500	1.00	35	8.33	7.80	60.33
0.0166	0.420	1.25	40	3.17	2.97	63.29
0.0139	0.354	1.50	45	3.45	3.23	66.53
0.0098	0.250	2.00	60	6.52	6.11	72.63
0.0070	0.177	2.50	80	4.78	4.48	77.11
0.0049	0.125	3.00	120	3.95	3.70	80.81
0.0029	0.074	3.75	200	5.26	4.93	85.74
0.0021	0.053	4.25	270	4.11	3.85	89.59
0.0015	0.037	4.75	400	5.25	4.92	94.50
			PAN	5.87	5.50	100.00
TOTALS				106.77	100.00	100.00

Cumulative Weight Percent greater than

Weight percent	Phi Value	Particle Size Inches	Particle Size Millimeters
5	-1.92	0.1495	3.797
10	-1.59	0.1186	3.013
16	-1.28	0.0959	2.436
25	-0.87	0.0717	1.822
40	-0.25	0.0469	1.190
50	0.31	0.0317	0.805
60	0.98	0.0200	0.507
75	2.26	0.0082	0.208
84	3.49	0.0035	0.089
90	4.29	0.0020	0.051
95	4.32	0.0020	0.050

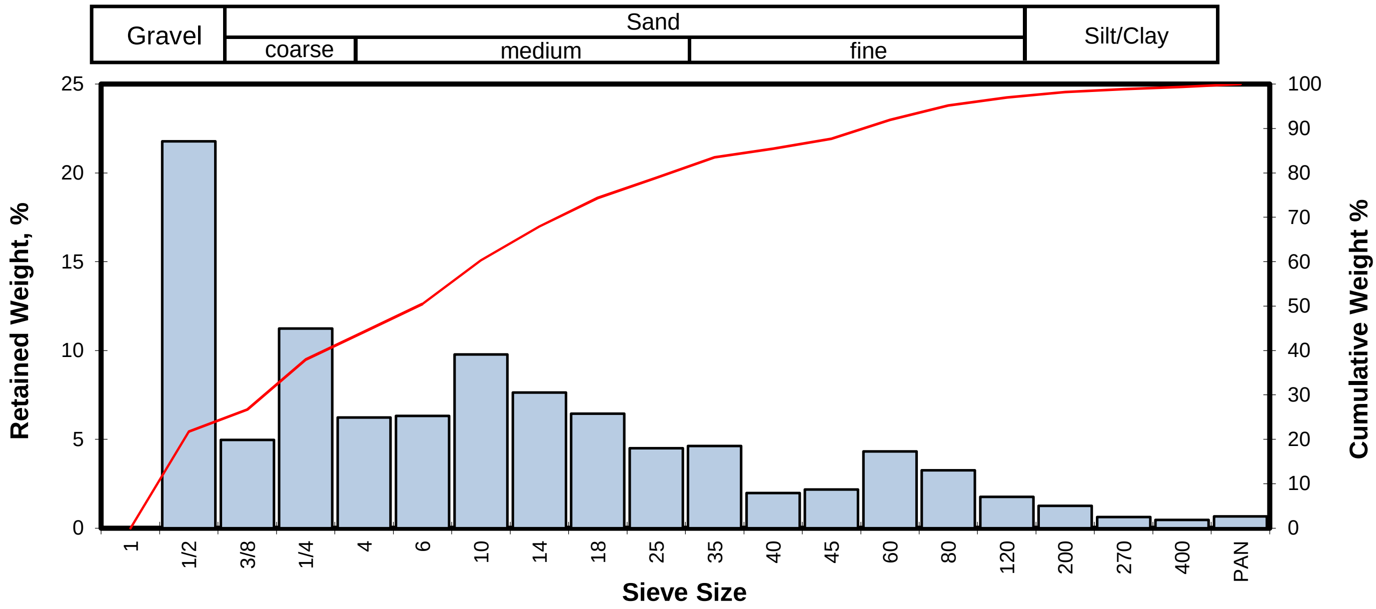
Measure	Trask	Inman	Folk-Ward
Median, phi	0.31	0.31	0.31
Median, in.	0.0317	0.0317	0.0317
Median, mm	0.805	0.805	0.805
Mean, phi	-0.02	1.10	0.84
Mean, in.	0.0400	0.0184	0.0220
Mean, mm	1.015	0.466	0.559
Sorting	2.959	2.385	2.139
Skewness	0.765	0.330	0.307
Kurtosis	0.272	0.309	0.818
Grain Size Description (ASTM-USCS Scale)	Medium sand (based on Mean from Trask)		

Description	Retained on Sieve #	Weight Percent
Gravel	4	1.48
Coarse Sand	10	20.09
Medium Sand	40	41.73
Fine Sand	200	22.44
Silt/Clay	<200	14.26
	Total	100

Phone: (713) 316-1800

PTS Laboratories, Inc. PTS ID NO:- 26 **Sieve Analysis Results - ASTM D422**

Client:	AECOM	**PTS File No:**	48147
Project:	NDEP Downgradient Study Area	**Sample ID:**	NERT4.21N1 45' 20180619
Project No:	60477365 Task 2016-170	**Depth, ft:**	45



Opening Inches	Opening Millimeters	Phi of Screen	U.S. Sieve No.	Sample Weight grams	Incremental Weight, percent	Cumulative Weight, percent
0.9844	25.002	-4.64	1	0.00	0.00	0.00
0.4922	12.501	-3.64	1/2	35.00	21.77	21.77
0.3740	9.500	-3.25	3/8	7.98	4.96	26.74
0.2500	6.351	-2.67	1/4	18.07	11.24	37.98
0.1873	4.757	-2.25	4	10.02	6.23	44.21
0.1324	3.364	-1.75	6	10.15	6.31	50.53
0.0787	2.000	-1.00	10	15.72	9.78	60.30
0.0557	1.414	-0.50	14	12.27	7.63	67.94
0.0394	1.000	0.00	18	10.36	6.44	74.38
0.0278	0.707	0.50	25	7.24	4.50	78.89
0.0197	0.500	1.00	35	7.43	4.62	83.51
0.0166	0.420	1.25	40	3.19	1.98	85.49
0.0139	0.354	1.50	45	3.49	2.17	87.66
0.0098	0.250	2.00	60	6.93	4.31	91.98
0.0070	0.177	2.50	80	5.22	3.25	95.22
0.0049	0.125	3.00	120	2.83	1.76	96.98
0.0029	0.074	3.75	200	2.03	1.26	98.25
0.0021	0.053	4.25	270	1.01	0.63	98.87
0.0015	0.037	4.75	400	0.74	0.46	99.33
			PAN	1.07	0.67	100.00
TOTALS				160.75	100.00	100.00

Cumulative Weight Percent greater than

Weight percent	Phi Value	Particle Size Inches	Particle Size Millimeters
5	-4.41	0.8395	21.323
10	-4.18	0.7160	18.185
16	-3.91	0.5915	15.023
25	-3.39	0.4117	10.458
40	-2.53	0.2277	5.783
50	-1.79	0.1363	3.462
60	-1.02	0.0800	2.033
75	0.07	0.0375	0.954
84	1.06	0.0189	0.479
90	1.77	0.0115	0.293
95	2.47	0.0071	0.181

Measure	Trask	Inman	Folk-Ward
Median, phi	-1.79	-1.79	-1.79
Median, in.	0.1363	0.1363	0.1363
Median, mm	3.462	3.462	3.462
Mean, phi	-2.51	-1.42	-1.55
Mean, in.	0.2246	0.1056	0.1150
Mean, mm	5.706	2.683	2.921
Sorting	3.312	2.486	2.285
Skewness	0.912	0.148	0.193
Kurtosis	0.266	0.384	0.816
Grain Size Description (ASTM-USCS Scale)			Gravel (based on Mean from Trask)

Description	Retained on Sieve #	Weight Percent
Gravel	4	44.21
Coarse Sand	10	16.09
Medium Sand	40	25.19
Fine Sand	200	12.75
Silt/Clay	<200	1.75
	Total	100

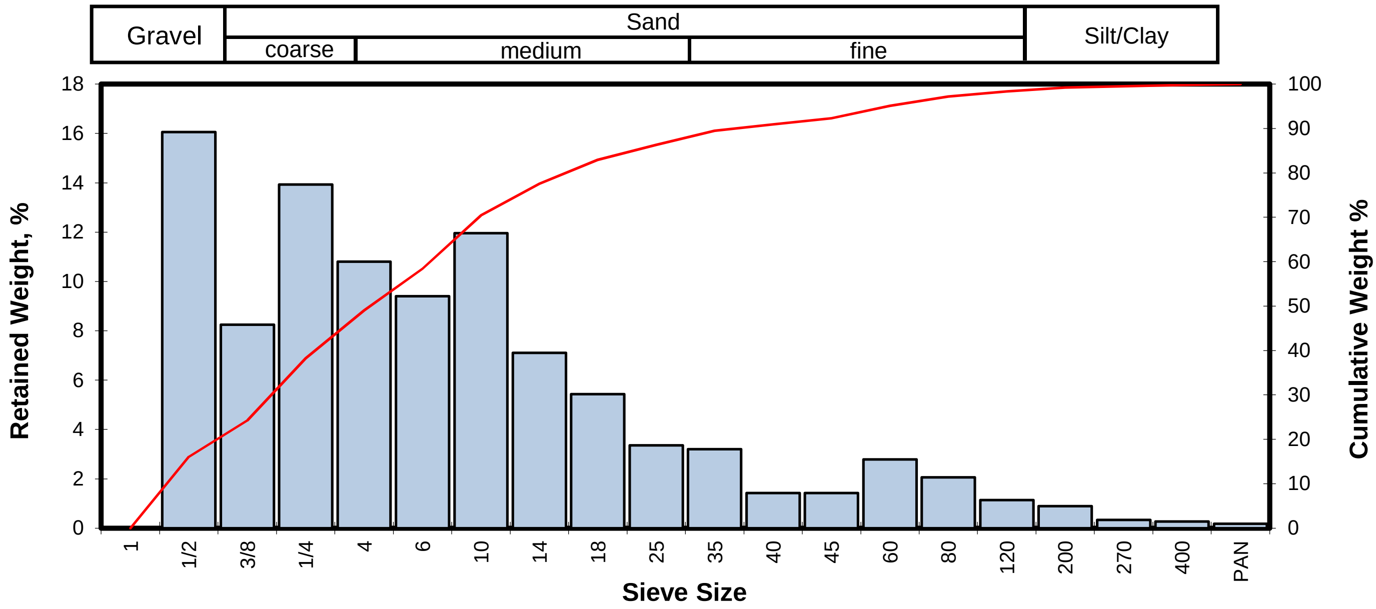
 Phone: (713) 316-1800

PTS Laboratories, Inc.

PTS ID NO:- 27

Sieve Analysis Results - ASTM D422

Client:	AECOM	**PTS File No:**	48147
Project:	NDEP Downgradient Study Area	**Sample ID:**	NERT4.21N1 48' 20180619
Project No:	60477365 Task 2016-170	**Depth, ft:**	48



Opening Inches	Opening Millimeters	Phi of Screen	U.S. Sieve No.	Sample Weight grams	Incremental Weight, percent	Cumulative Weight, percent
0.9844	25.002	-4.64	1	0.00	0.00	0.00
0.4922	12.501	-3.64	1/2	20.24	16.05	16.05
0.3740	9.500	-3.25	3/8	10.39	8.24	24.30
0.2500	6.351	-2.67	1/4	17.56	13.93	38.22
0.1873	4.757	-2.25	4	13.62	10.80	49.03
0.1324	3.364	-1.75	6	11.86	9.41	58.44
0.0787	2.000	-1.00	10	15.08	11.96	70.40
0.0557	1.414	-0.50	14	8.96	7.11	77.50
0.0394	1.000	0.00	18	6.85	5.43	82.94
0.0278	0.707	0.50	25	4.23	3.36	86.29
0.0197	0.500	1.00	35	4.03	3.20	89.49
0.0166	0.420	1.25	40	1.79	1.42	90.91
0.0139	0.354	1.50	45	1.80	1.43	92.34
0.0098	0.250	2.00	60	3.51	2.78	95.12
0.0070	0.177	2.50	80	2.60	2.06	97.18
0.0049	0.125	3.00	120	1.44	1.14	98.33
0.0029	0.074	3.75	200	1.12	0.89	99.21
0.0021	0.053	4.25	270	0.42	0.33	99.55
0.0015	0.037	4.75	400	0.34	0.27	99.82
			PAN	0.23	0.18	100.00
TOTALS				126.07	100.00	100.00

Cumulative Weight Percent greater than

Weight percent	Phi Value	Particle Size Inches	Particle Size Millimeters
5	-4.33	0.7932	20.148
10	-4.02	0.6392	16.236
16	-3.65	0.4933	12.531
25	-3.22	0.3665	9.309
40	-2.60	0.2384	6.056
50	-2.20	0.1807	4.590
60	-1.65	0.1237	3.143
75	-0.68	0.0629	1.598
84	0.16	0.0353	0.896
90	1.09	0.0185	0.470
95	1.98	0.0100	0.254

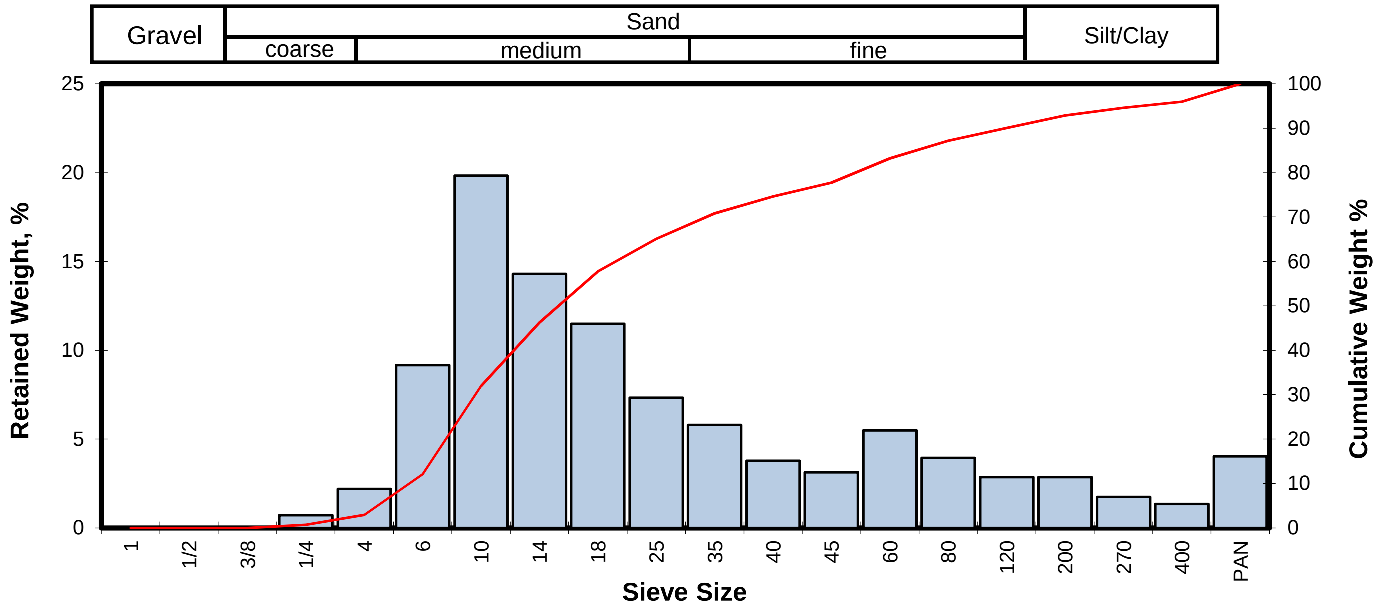
Measure	Trask	Inman	Folk-Ward
Median, phi	-2.20	-2.20	-2.20
Median, in.	0.1807	0.1807	0.1807
Median, mm	4.590	4.590	4.590
Mean, phi	-2.45	-1.74	-1.90
Mean, in.	0.2147	0.1319	0.1465
Mean, mm	5.453	3.351	3.721
Sorting	2.414	1.903	1.908
Skewness	0.840	0.238	0.281
Kurtosis	0.245	0.658	1.017
Grain Size Description (ASTM-USCS Scale)	Gravel (based on Mean from Trask)		

Description	Retained on Sieve #	Weight Percent
Gravel	4	49.03
Coarse Sand	10	21.37
Medium Sand	40	20.51
Fine Sand	200	8.30
Silt/Clay	<200	0.79
	Total	100

Phone: (713) 316-1800

PTS Laboratories, Inc. PTS ID NO:- 28 **Sieve Analysis Results - ASTM D422**

Client:	AECOM	**PTS File No:**	48147
Project:	NDEP Downgradient Study Area	**Sample ID:**	NERT4.21N1 62' 20180619
Project No:	60477365 Task 2016-170	**Depth, ft:**	62



Opening Inches	Opening Millimeters	Phi of Screen	U.S. Sieve No.	Sample Weight grams	Incremental Weight, percent	Cumulative Weight, percent
0.9844	25.002	-4.64	1	0.00	0.00	0.00
0.4922	12.501	-3.64	1/2	0.00	0.00	0.00
0.3740	9.500	-3.25	3/8	0.00	0.00	0.00
0.2500	6.351	-2.67	1/4	0.96	0.72	0.72
0.1873	4.757	-2.25	4	2.93	2.19	2.91
0.1324	3.364	-1.75	6	12.24	9.17	12.08
0.0787	2.000	-1.00	10	26.48	19.84	31.92
0.0557	1.414	-0.50	14	19.10	14.31	46.22
0.0394	1.000	0.00	18	15.33	11.48	57.71
0.0278	0.707	0.50	25	9.78	7.33	65.03
0.0197	0.500	1.00	35	7.74	5.80	70.83
0.0166	0.420	1.25	40	5.05	3.78	74.61
0.0139	0.354	1.50	45	4.17	3.12	77.74
0.0098	0.250	2.00	60	7.33	5.49	83.23
0.0070	0.177	2.50	80	5.27	3.95	87.18
0.0049	0.125	3.00	120	3.82	2.86	90.04
0.0029	0.074	3.75	200	3.81	2.85	92.89
0.0021	0.053	4.25	270	2.33	1.75	94.64
0.0015	0.037	4.75	400	1.79	1.34	95.98
			PAN	5.37	4.02	100.00
TOTALS				133.50	100.00	100.00

Cumulative Weight Percent greater than

Weight percent	Phi Value	Particle Size Inches	Particle Size Millimeters
5	-2.14	0.1731	4.396
10	-1.86	0.1433	3.639
16	-1.60	0.1195	3.035
25	-1.26	0.0944	2.398
40	-0.72	0.0647	1.644
50	-0.34	0.0497	1.262
60	0.16	0.0353	0.897
75	1.28	0.0162	0.412
84	2.10	0.0092	0.234
90	2.99	0.0049	0.126
95	4.39	0.0019	0.048

Measure	Trask	Inman	Folk-Ward
Median, phi	-0.34	-0.34	-0.34
Median, in.	0.0497	0.0497	0.0497
Median, mm	1.262	1.262	1.262
Mean, phi	-0.49	0.25	0.05
Mean, in.	0.0553	0.0332	0.0379
Mean, mm	1.405	0.842	0.964
Sorting	2.414	1.850	1.913
Skewness	0.787	0.315	0.382
Kurtosis	0.283	0.763	1.051

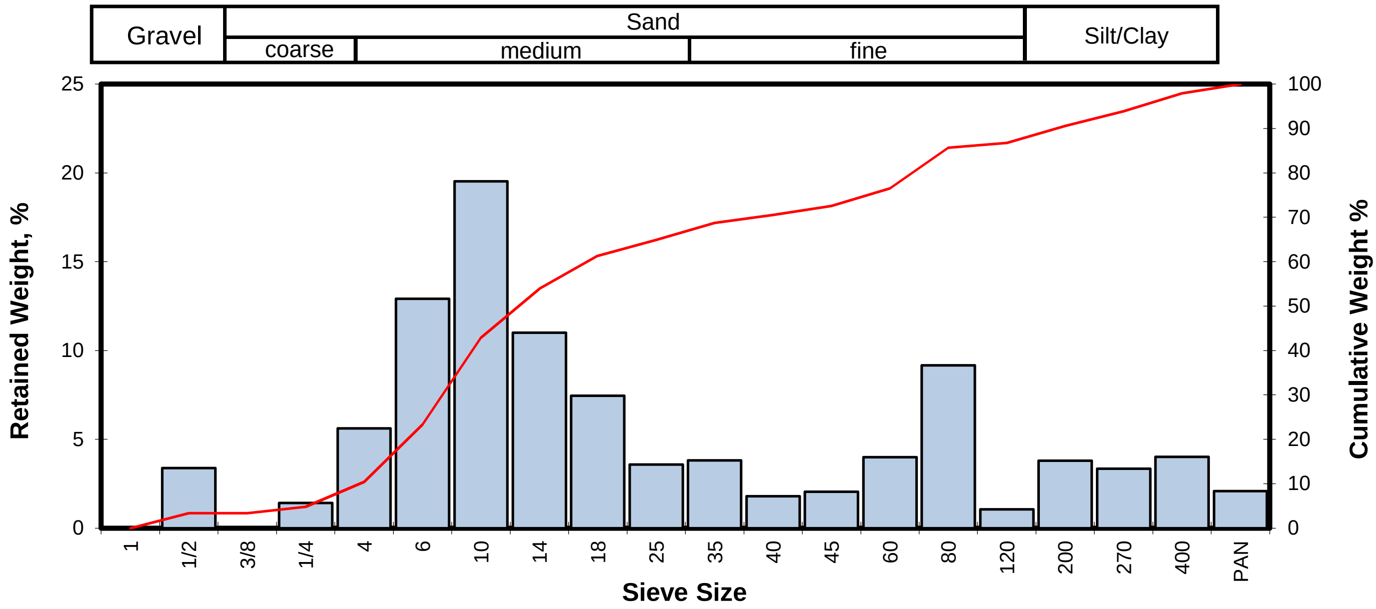
Grain Size Description (ASTM-USCS Scale)	Medium sand (based on Mean from Trask)

Description	Retained on Sieve #	Weight Percent
Gravel	4	2.91
Coarse Sand	10	29.00
Medium Sand	40	42.70
Fine Sand	200	18.28
Silt/Clay	<200	7.11
	Total	100

 Phone: (713) 316-1800

PTS Laboratories, Inc. PTS ID NO:- 29 **Sieve Analysis Results - ASTM D422**

Client:	AECOM	**PTS File No:**	48147
Project:	NDEP Downgradient Study Area	**Sample ID:**	NERT4.21N1 87' 20180619
Project No:	60477365 Task 2016-170	**Depth, ft:**	87



Opening Inches	Opening Millimeters	Phi of Screen	U.S. Sieve No.	Sample Weight grams	Incremental Weight, percent	Cumulative Weight, percent
0.9844	25.002	-4.64	1	0.00	0.00	0.00
0.4922	12.501	-3.64	1/2	4.76	3.38	3.38
0.3740	9.500	-3.25	3/8	0.00	0.00	3.38
0.2500	6.351	-2.67	1/4	2.00	1.42	4.80
0.1873	4.757	-2.25	4	7.90	5.61	10.42
0.1324	3.364	-1.75	6	18.17	12.91	23.33
0.0787	2.000	-1.00	10	27.48	19.53	42.86
0.0557	1.414	-0.50	14	15.48	11.00	53.86
0.0394	1.000	0.00	18	10.49	7.45	61.31
0.0278	0.707	0.50	25	5.05	3.59	64.90
0.0197	0.500	1.00	35	5.38	3.82	68.73
0.0166	0.420	1.25	40	2.52	1.79	70.52
0.0139	0.354	1.50	45	2.88	2.05	72.56
0.0098	0.250	2.00	60	5.61	3.99	76.55
0.0070	0.177	2.50	80	12.89	9.16	85.71
0.0049	0.125	3.00	120	1.49	1.06	86.77
0.0029	0.074	3.75	200	5.33	3.79	90.56
0.0021	0.053	4.25	270	4.70	3.34	93.90
0.0015	0.037	4.75	400	5.65	4.02	97.91
			PAN	2.94	2.09	100.00
TOTALS				140.72	100.00	100.00

Cumulative Weight Percent greater than			
Weight percent	**Phi Value**	**Particle Size Inches**	**Particle Size Millimeters**
5	-2.65	0.2475	6.287
10	-2.28	0.1913	4.860
16	-2.03	0.1612	4.095
25	-1.69	0.1267	3.217
40	-1.11	0.0850	2.158
50	-0.68	0.0629	1.597
60	-0.09	0.0418	1.063
75	1.81	0.0113	0.286
84	2.41	0.0074	0.189
90	3.64	0.0032	0.080
95	4.39	0.0019	0.048

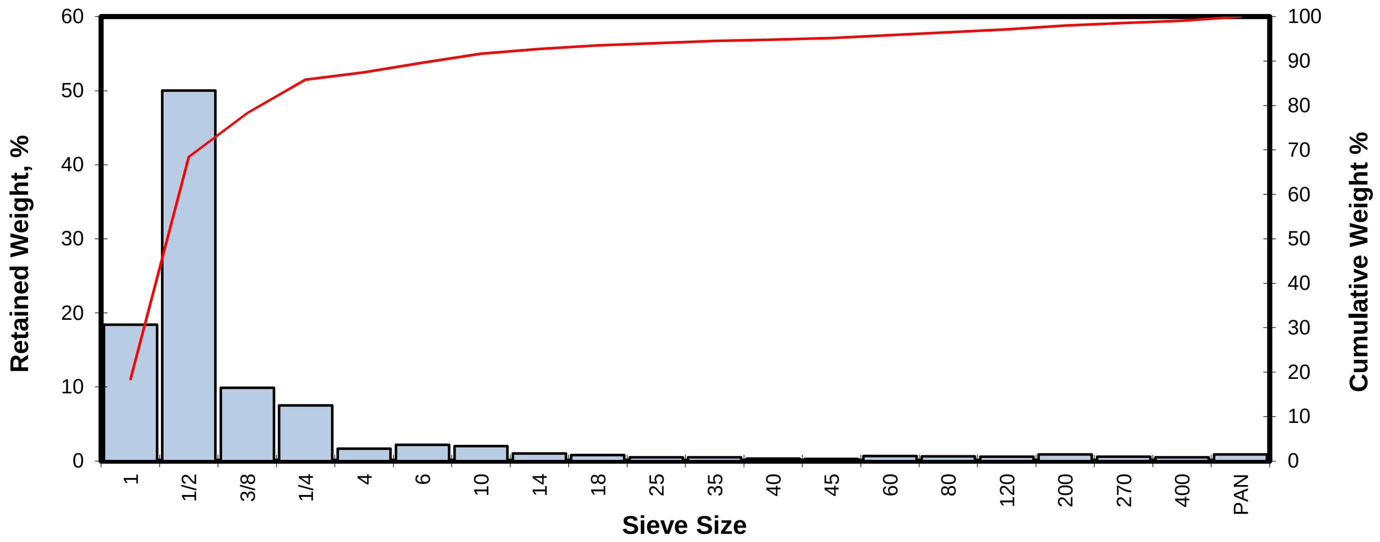
Measure	Trask	Inman	Folk-Ward
Median, phi	-0.68	-0.68	-0.68
Median, in.	0.0629	0.0629	0.0629
Median, mm	1.597	1.597	1.597
Mean, phi	-0.81	0.19	-0.10
Mean, in.	0.0690	0.0346	0.0422
Mean, mm	1.752	0.879	1.072
Sorting	3.354	2.220	2.177
Skewness	0.601	0.388	0.413
Kurtosis	0.307	0.585	0.826
Grain Size Description (ASTM-USCS Scale)	Coarse Sand (based on Mean from Trask)		

Description	Retained on Sieve #	Weight Percent
Gravel	4	10.42
Coarse Sand	10	32.44
Medium Sand	40	27.66
Fine Sand	200	20.04
Silt/Clay	<200	9.44
	Total	100

 Phone: (713) 316-1800

PTS Laboratories, Inc. PTS ID NO:- 30 **Sieve Analysis Results - ASTM D422**

Client:	AECOM	**PTS File No:**	48147
Project:	NDEP Downgradient Study Area	**Sample ID:**	NERT4.38N1 12' 20180620
Project No:	60477365 Task 2016-170	**Depth, ft:**	12



Opening Inches	Opening Millimeters	Phi of Screen	U.S. Sieve No.	Sample Weight grams	Incremental Weight, percent	Cumulative Weight, percent
0.9844	25.002	-4.64	1	50.14	18.42	18.42
0.4922	12.501	-3.64	1/2	136.11	50.01	68.44
0.3740	9.500	-3.25	3/8	26.88	9.88	78.31
0.2500	6.351	-2.67	1/4	20.44	7.51	85.82
0.1873	4.757	-2.25	4	4.51	1.66	87.48
0.1324	3.364	-1.75	6	5.91	2.17	89.65
0.0787	2.000	-1.00	10	5.50	2.02	91.67
0.0557	1.414	-0.50	14	2.84	1.04	92.72
0.0394	1.000	0.00	18	2.18	0.80	93.52
0.0278	0.707	0.50	25	1.43	0.53	94.04
0.0197	0.500	1.00	35	1.33	0.49	94.53
0.0166	0.420	1.25	40	0.87	0.32	94.85
0.0139	0.354	1.50	45	0.83	0.30	95.16
0.0098	0.250	2.00	60	1.86	0.68	95.84
0.0070	0.177	2.50	80	1.78	0.65	96.49
0.0049	0.125	3.00	120	1.66	0.61	97.10
0.0029	0.074	3.75	200	2.38	0.87	97.98
0.0021	0.053	4.25	270	1.64	0.60	98.58
0.0015	0.037	4.75	400	1.43	0.53	99.11
			PAN	2.43	0.89	100.00
TOTALS				272.15	100.00	100.00

Cumulative Weight Percent greater than

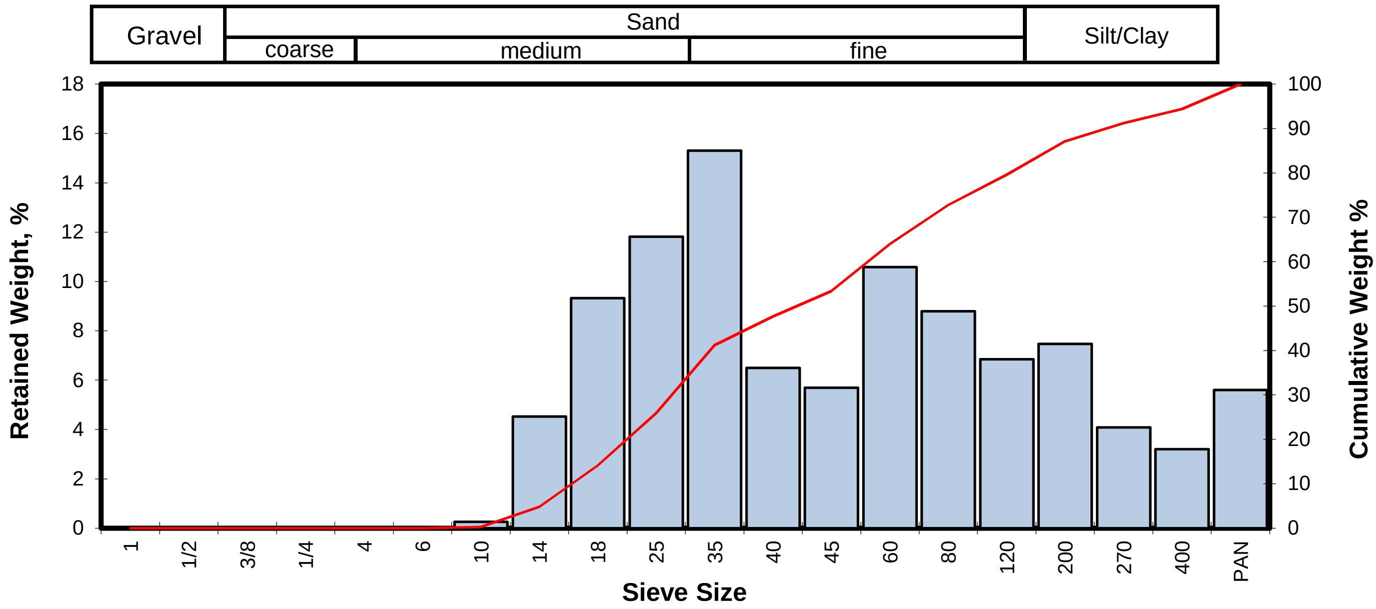
Weight percent	Phi Value	Particle Size Inches	Particle Size Millimeters
5			
10			
16			
25	-4.51	0.8986	22.824
40	-4.21	0.7299	18.540
50	-4.01	0.6355	16.141
60	-3.81	0.5532	14.052
75	-3.38	0.4101	10.417
84	-2.81	0.2757	7.004
90	-1.62	0.1211	3.076
95	1.37	0.0152	0.387

Measure	Trask	Inman	Folk-Ward
Median, phi	-4.01	-4.01	-4.01
Median, in.	0.6355	0.6355	0.6355
Median, mm	16.141	16.141	16.141
Mean, phi	-4.05		
Mean, in.	0.6544		
Mean, mm	16.621		
Sorting	1.480		
Skewness	0.955		
Kurtosis			
Grain Size Description (ASTM-USCS Scale)	Gravel (based on Mean from Trask)		

Description	Retained on Sieve #	Weight Percent
Gravel	4	87.48
Coarse Sand	10	4.19
Medium Sand	40	3.18
Fine Sand	200	3.13
Silt/Clay	<200	2.02
	Total	100

PTS Laboratories, Inc. PTS ID NO:- 31 **Sieve Analysis Results - ASTM D422**

Client:	AECOM	**PTS File No:**	48147
Project:	NDEP Downgradient Study Area	**Sample ID:**	NERT4.38N1 35' 20180620
Project No:	60477365 Task 2016-170	**Depth, ft:**	35



Opening		Phi of	U.S. Sieve	Sample Weight	Incremental Weight,	Cumulative Weight,
Inches	Millimeters	Screen	No.	grams	percent	percent
0.9844	25.002	-4.64	1	0.00	0.00	0.00
0.4922	12.501	-3.64	1/2	0.00	0.00	0.00
0.3740	9.500	-3.25	3/8	0.00	0.00	0.00
0.2500	6.351	-2.67	1/4	0.00	0.00	0.00
0.1873	4.757	-2.25	4	0.00	0.00	0.00
0.1324	3.364	-1.75	6	0.00	0.00	0.00
0.0787	2.000	-1.00	10	0.31	0.26	0.26
0.0557	1.414	-0.50	14	5.49	4.52	4.77
0.0394	1.000	0.00	18	11.33	9.33	14.10
0.0278	0.707	0.50	25	14.36	11.82	25.92
0.0197	0.500	1.00	35	18.60	15.31	41.23
0.0166	0.420	1.25	40	7.90	6.50	47.73
0.0139	0.354	1.50	45	6.91	5.69	53.42
0.0098	0.250	2.00	60	12.85	10.58	63.99
0.0070	0.177	2.50	80	10.69	8.80	72.79
0.0049	0.125	3.00	120	8.32	6.85	79.64
0.0029	0.074	3.75	200	9.08	7.47	87.11
0.0021	0.053	4.25	270	4.96	4.08	91.19
0.0015	0.037	4.75	400	3.89	3.20	94.40
			PAN	6.81	5.60	100.00
TOTALS				121.50	100.00	100.00

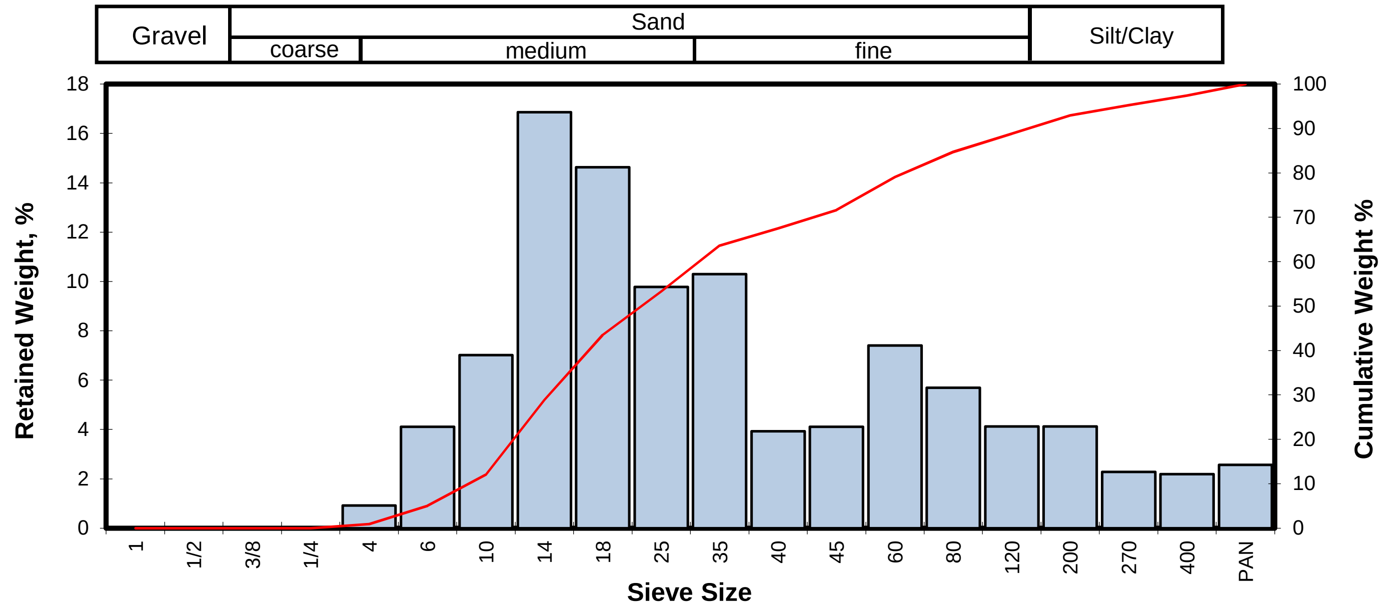
Cumulative Weight Percent greater than			
Weight	Phi	Particle Size	
percent	Value	Inches	Millimeters
5	-0.49	0.0552	1.402
10	-0.22	0.0458	1.165
16	0.08	0.0372	0.946
25	0.46	0.0286	0.726
40	0.96	0.0202	0.514
50	1.35	0.0154	0.392
60	1.81	0.0112	0.285
75	2.66	0.0062	0.158
84	3.44	0.0036	0.092
90	4.10	0.0023	0.058
95	4.24	0.0021	0.053

Measure	Trask	Inman	Folk-Ward
Median, phi	1.35	1.35	1.35
Median, in.	0.0154	0.0154	0.0154
Median, mm	0.392	0.392	0.392
Mean, phi	1.18	1.76	1.62
Mean, in.	0.0174	0.0116	0.0128
Mean, mm	0.442	0.295	0.325
Sorting	2.144	1.679	1.555
Skewness	0.864	0.244	0.233
Kurtosis	0.257	0.407	0.880
Grain Size Description (ASTM-USCS Scale)	Medium sand (based on Mean from Trask)		

Description	Retained on Sieve #	Weight Percent
Gravel	4	0.00
Coarse Sand	10	0.26
Medium Sand	40	47.47
Fine Sand	200	39.38
Silt/Clay	<200	12.89
	Total	100

PTS Laboratories, Inc. PTS ID NO:- 32 **Sieve Analysis Results - ASTM D422**

Client:	AECOM	**PTS File No:**	48147
Project:	NDEP Downgradient Study Area	**Sample ID:**	NERT4.38N1 45' 20180620
Project No:	60477365 Task 2016-170	**Depth, ft:**	45



Opening: Inches	Opening: Millimeters	Phi of Screen	U.S. Sieve No.	Sample Weight grams	Incremental Weight, percent	Cumulative Weight, percent
0.9844	25.002	-4.64	1	0.00	0.00	0.00
0.4922	12.501	-3.64	1/2	0.00	0.00	0.00
0.3740	9.500	-3.25	3/8	0.00	0.00	0.00
0.2500	6.351	-2.67	1/4	0.00	0.00	0.00
0.1873	4.757	-2.25	4	0.71	0.91	0.91
0.1324	3.364	-1.75	6	3.19	4.11	5.02
0.0787	2.000	-1.00	10	5.45	7.02	12.04
0.0557	1.414	-0.50	14	13.10	16.86	28.90
0.0394	1.000	0.00	18	11.37	14.64	43.53
0.0278	0.707	0.50	25	7.60	9.78	53.31
0.0197	0.500	1.00	35	8.00	10.30	63.61
0.0166	0.420	1.25	40	3.05	3.93	67.54
0.0139	0.354	1.50	45	3.19	4.11	71.64
0.0098	0.250	2.00	60	5.75	7.40	79.04
0.0070	0.177	2.50	80	4.42	5.69	84.73
0.0049	0.125	3.00	120	3.20	4.12	88.85
0.0029	0.074	3.75	200	3.20	4.12	92.97
0.0021	0.053	4.25	270	1.77	2.28	95.25
0.0015	0.037	4.75	400	1.70	2.19	97.44
			PAN	1.99	2.56	100.00
TOTALS				77.69	100.00	100.00

Cumulative Weight Percent greater than

Weight percent	Phi Value	Particle Size: Inches	Particle Size: Millimeters
5	-1.75	0.1326	3.369
10	-1.22	0.0916	2.326
16	-0.88	0.0726	1.843
25	-0.62	0.0603	1.532
40	-0.12	0.0428	1.087
50	0.33	0.0313	0.795
60	0.82	0.0222	0.565
75	1.73	0.0119	0.302
84	2.44	0.0073	0.185
90	3.21	0.0043	0.108
95	4.20	0.0021	0.055

Measure	Trask	Inman	Folk-Ward
Median, phi	0.33	0.33	0.33
Median, in.	0.0313	0.0313	0.0313
Median, mm	0.795	0.795	0.795
Mean, phi	0.12	0.78	0.63
Mean, in.	0.0361	0.0230	0.0255
Mean, mm	0.917	0.584	0.647
Sorting	2.252	1.659	1.731
Skewness	0.856	0.269	0.284
Kurtosis	0.277	0.793	1.041

Grain Size Description (ASTM-USCS Scale)	Medium sand (based on Mean from Trask)

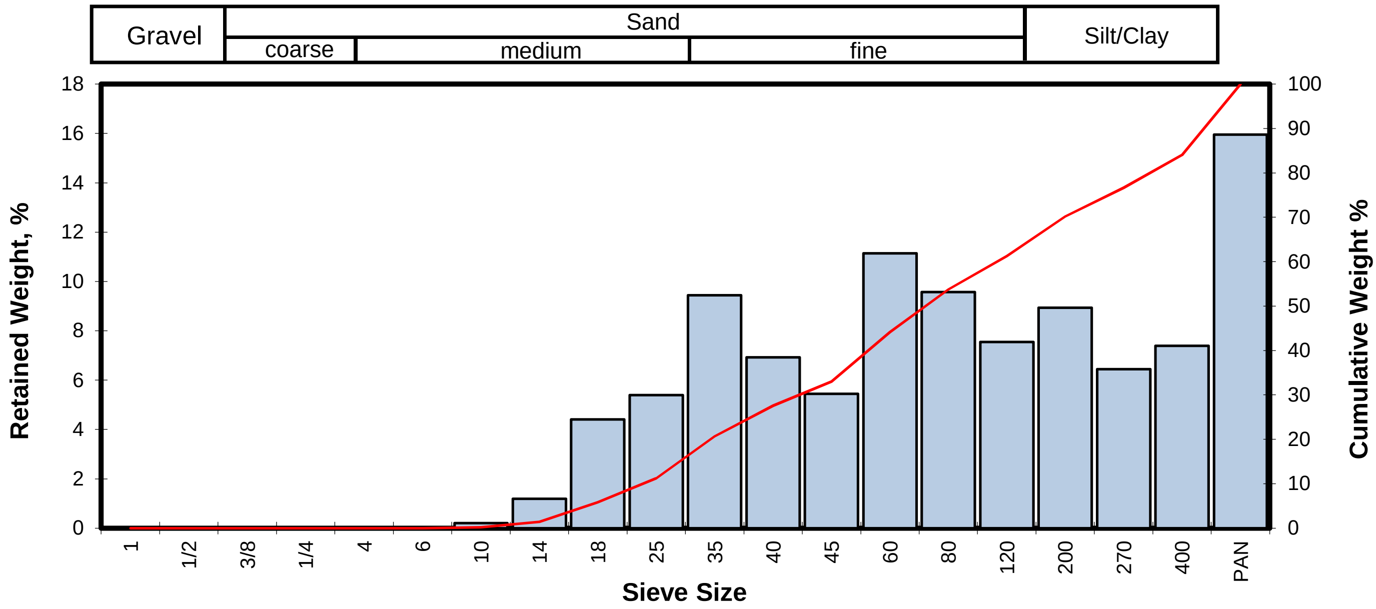
Description	Retained on Sieve #	Weight Percent
Gravel	4	0.91
Coarse Sand	10	11.12
Medium Sand	40	55.50
Fine Sand	200	25.43
Silt/Clay	<200	7.03
	Total	100

PTS Laboratories, Inc.

PTS ID NO:- 33

Sieve Analysis Results - ASTM D422

Client:	AECOM	**PTS File No:**	48147
Project:	NDEP Downgradient Study Area	**Sample ID:**	NERT4.38N1 55' 20180621
Project No:	60477365 Task 2016-170	**Depth, ft:**	55



Opening Inches	Opening Millimeters	Phi of Screen	U.S. Sieve No.	Sample Weight grams	Incremental Weight, percent	Cumulative Weight, percent
0.9844	25.002	-4.64	1	0.00	0.00	0.00
0.4922	12.501	-3.64	1/2	0.00	0.00	0.00
0.3740	9.500	-3.25	3/8	0.00	0.00	0.00
0.2500	6.351	-2.67	1/4	0.00	0.00	0.00
0.1873	4.757	-2.25	4	0.00	0.00	0.00
0.1324	3.364	-1.75	6	0.00	0.00	0.00
0.0787	2.000	-1.00	10	0.15	0.21	0.21
0.0557	1.414	-0.50	14	0.87	1.19	1.40
0.0394	1.000	0.00	18	3.21	4.40	5.80
0.0278	0.707	0.50	25	3.93	5.39	11.19
0.0197	0.500	1.00	35	6.88	9.44	20.63
0.0166	0.420	1.25	40	5.05	6.93	27.56
0.0139	0.354	1.50	45	3.97	5.45	33.01
0.0098	0.250	2.00	60	8.12	11.14	44.15
0.0070	0.177	2.50	80	6.98	9.58	53.72
0.0049	0.125	3.00	120	5.50	7.55	61.27
0.0029	0.074	3.75	200	6.51	8.93	70.20
0.0021	0.053	4.25	270	4.70	6.45	76.65
0.0015	0.037	4.75	400	5.39	7.39	84.04
			PAN	11.63	15.96	100.00
TOTALS				72.89	100.00	100.00

Cumulative Weight Percent greater than

Weight percent	Phi Value	Particle Size Inches	Particle Size Millimeters
5	-0.09	0.0419	1.065
10	0.39	0.0301	0.764
16	0.75	0.0233	0.593
25	1.16	0.0176	0.448
40	1.81	0.0112	0.284
50	2.31	0.0080	0.202
60	2.92	0.0052	0.133
75	4.12	0.0023	0.057
84	4.75	0.0015	0.037
90	2.98	0.0050	0.127
95	1.49	0.0140	0.356

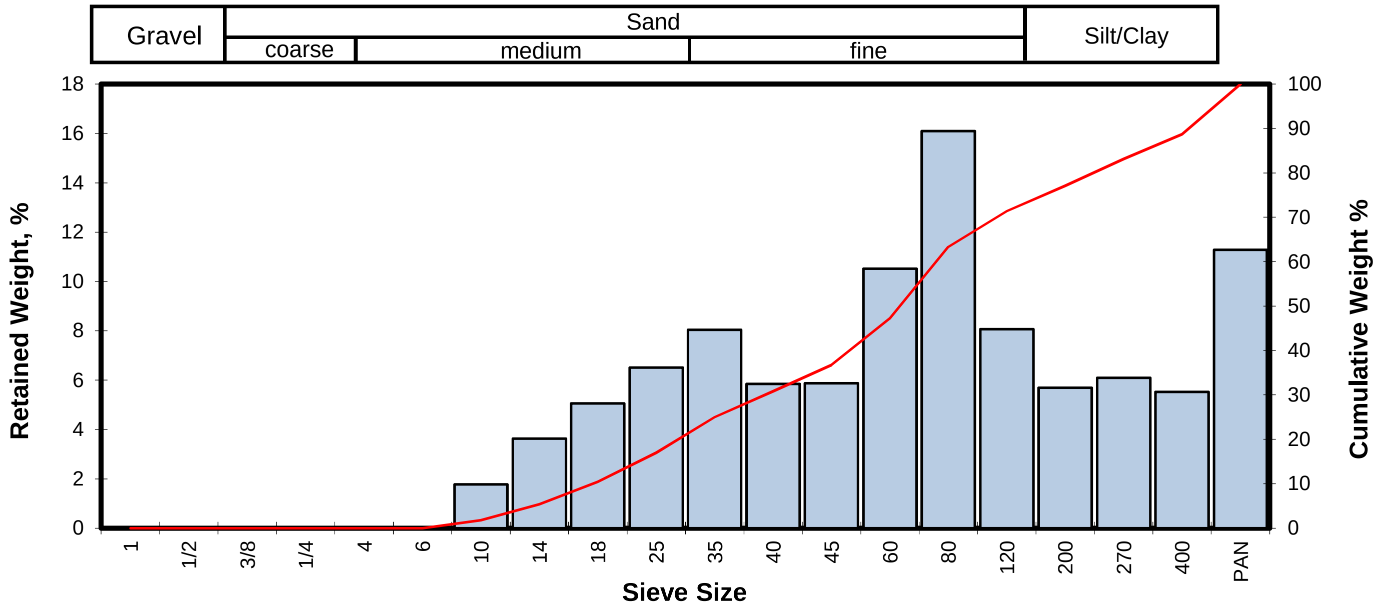
Measure	Trask	Inman	Folk-Ward
Median, phi	2.31	2.31	2.31
Median, in.	0.0080	0.0080	0.0080
Median, mm	0.202	0.202	0.202
Mean, phi	1.98	2.75	2.60
Mean, in.	0.0100	0.0058	0.0065
Mean, mm	0.253	0.149	0.165
Sorting	2.794	1.996	1.237
Skewness	0.793	0.223	-0.906
Kurtosis	0.307	-0.604	0.218
Grain Size Description (ASTM-USCS Scale)	Fine sand (based on Mean from Trask)		

Description	Retained on Sieve #	Weight Percent
Gravel	4	0.00
Coarse Sand	10	0.21
Medium Sand	40	27.36
Fine Sand	200	42.64
Silt/Clay	<200	29.80
	Total	100

Phone: (713) 316-1800

PTS Laboratories, Inc. PTS ID NO:- 34 **Sieve Analysis Results - ASTM D422**

Client:	AECOM	**PTS File No:**	48147
Project:	NDEP Downgradient Study Area	**Sample ID:**	NERT4.38N1 60' 20180621
Project No:	60477365 Task 2016-170	**Depth, ft:**	60



Opening Inches	Opening Millimeters	Phi of Screen	U.S. Sieve No.	Sample Weight grams	Incremental Weight, percent	Cumulative Weight, percent
0.9844	25.002	-4.64	1	0.00	0.00	0.00
0.4922	12.501	-3.64	1/2	0.00	0.00	0.00
0.3740	9.500	-3.25	3/8	0.00	0.00	0.00
0.2500	6.351	-2.67	1/4	0.00	0.00	0.00
0.1873	4.757	-2.25	4	0.00	0.00	0.00
0.1324	3.364	-1.75	6	0.00	0.00	0.00
0.0787	2.000	-1.00	10	1.64	1.77	1.77
0.0557	1.414	-0.50	14	3.35	3.62	5.40
0.0394	1.000	0.00	18	4.67	5.05	10.45
0.0278	0.707	0.50	25	6.02	6.51	16.96
0.0197	0.500	1.00	35	7.44	8.04	25.00
0.0166	0.420	1.25	40	5.41	5.85	30.85
0.0139	0.354	1.50	45	5.43	5.87	36.72
0.0098	0.250	2.00	60	9.73	10.52	47.24
0.0070	0.177	2.50	80	14.89	16.10	63.34
0.0049	0.125	3.00	120	7.46	8.07	71.41
0.0029	0.074	3.75	200	5.26	5.69	77.10
0.0021	0.053	4.25	270	5.63	6.09	83.19
0.0015	0.037	4.75	400	5.11	5.53	88.71
			PAN	10.44	11.29	100.00
TOTALS				92.48	100.00	100.00

Cumulative Weight Percent greater than

Weight percent	Phi Value	Particle Size Inches	Particle Size Millimeters
5	-0.55	0.0578	1.469
10	-0.04	0.0406	1.031
16	0.43	0.0293	0.744
25	1.00	0.0197	0.500
40	1.66	0.0125	0.317
50	2.09	0.0093	0.236
60	2.40	0.0075	0.190
75	3.47	0.0035	0.090
84	4.32	0.0020	0.050
90	4.21	0.0021	0.054
95	2.10	0.0092	0.233

Measure	Trask	Inman	Folk-Ward
Median, phi	2.09	2.09	2.09
Median, in.	0.0093	0.0093	0.0093
Median, mm	0.236	0.236	0.236
Mean, phi	1.76	2.38	2.28
Mean, in.	0.0116	0.0076	0.0081
Mean, mm	0.295	0.193	0.206
Sorting	2.357	1.949	1.377
Skewness	0.901	0.149	-0.419
Kurtosis	0.210	-0.318	0.441
Grain Size Description (ASTM-USCS Scale)	Fine sand (based on Mean from Trask)		

Description	Retained on Sieve #	Weight Percent
Gravel	4	0.00
Coarse Sand	10	1.77
Medium Sand	40	29.08
Fine Sand	200	46.25
Silt/Clay	<200	22.90
	Total	100

 Phone: (713) 316-1800

PTS Laboratories, Inc. Copy

CHAIN OF CUSTODY RECORD

PAGE 1 OF 2

COMPANY: AECOM

ADDRESS: 1220 Avenida Acaso | CITY: Camarillo | ZIP CODE: 93012

PROJECT MANAGER: Carmen Caceres-Schnell | email: carmen.caceres-schnell@aecom

PROJECT NAME: NDEP Downgradient Study Area | PHONE NUMBER: (805)764-4031

PROJECT NUMBER: 60477365 Task 2016-170 | FAX NUMBER:

SITE LOCATION: DGIP Phase I Wells

SAMPLER SIGNATURE:

PO# 86028

TURNAROUND TIME: 24 HOURS ☐ 5 DAYS ☐ 72 HOURS ☐ NORMAL ☑

OTHER:

SAMPLE INTEGRITY (CHECK): INTACT ____ TEMP(F) 73°F

PTS QUOTE NO.

PTS FILE: 48147

ANALYSIS REQUEST

SAMPLE ID	DATE	TIME	DEPTH, FT	NUMBER OF SAMPLES	SOIL PROPERTIES PACKAGE	HYDRAULIC CONDUCTIVITY PACKAGE	PORE FLUID SATURATIONS PACKAGE	TCEQ/TNRCC PROPERTIES PACKAGE	CAPILLARITY PACKAGE	FLUID PROPERTIES PACKAGE	PHOTOLOG: CORE PHOTOGRAPHY	VAPOR TRANSPORT PACKAGE	POROSITY: TOTAL, AIR FILLED, WATER FILLED	POROSITY: EFFECTIVE, ASTM D425M	SPECIFIC GRAVITY, ASTM D854	BULK DENSITY (DRY), API RP40 or ASTM D2937	AIR PERMEABILITY, API RP40	HYDRAULIC CONDUCTIVITY, EPA9100/API RP40 or D5084	GRAIN SIZE DISTRIBUTION, ASTM D422 or 4464M	TOC: WALKLEY-BLACK	ATTERBERG LIMITS, ASTM D4318	VAPOR INTRUSION PACKAGE	FREE PRODUCT MOBILITY PACKAGE	Moisture Content, ASTM D2216	COMMENTS
NERT4.51S1 20180614	6/14/18	0850	15																x		x			x	
4.51S142'20180614		0841	42																						
4.51S14820180614		0856	48																						
4.51S152 "		0916	52																						
NERT4.93S115'20180615	6/15/18	0958	15																						
4.93S114'20180615		0826	14																						
4.93S147'20180615		0955	47'																						
4.93S148'20180615		0824	48'																						
4.93S16020180615		0953	60'																						
NERT5.11S117'20180615	6/15/18	1457	17'																						
5.11S137' "		1520	37'																						

1. RELINQUISHED BY	2. RECEIVED BY	3. RELINQUISHED BY	4. RECEIVED BY
[signature]	[signature]		
COMPANY	COMPANY: PTS LABS. INC	COMPANY	COMPANY
DATE / TIME	DATE: 6/27/18 TIME: 1435	DATE / TIME	DATE / TIME

PTS Laboratories, Inc.

CHAIN OF CUSTODY RECORD

COMPANY	AECOM
ADDRESS	1220 Avenida Acaso
CITY	Camarillo
ZIP CODE	93012
PROJECT MANAGER	Carmen Caceres-Schnell
email	carmen.caceres-schnell@aecom
PROJECT NAME	NDEP Downgradient Study Area
PHONE NUMBER	(805)764-4031
PROJECT NUMBER	60477365 Task 2016-170
FAX NUMBER	
SITE LOCATION	DGIP Phase I Wells
SAMPLER SIGNATURE	

PO#	86028
TURNAROUND TIME	24 HOURS ☐ 5 DAYS ☐ 72 HOURS ☐ NORMAL ☑
OTHER:	
SAMPLE INTEGRITY (CHECK):	INTACT ____ TEMP(F) 73°F
PTS QUOTE NO.	
PTS FILE:	48147

ANALYSIS REQUEST

SAMPLE ID	DATE	TIME	DEPTH, FT	NUMBER OF SAMPLES	SOIL PROPERTIES PACKAGE	HYDRAULIC CONDUCTIVITY PACKAGE	PORE FLUID SATURATIONS PACKAGE	TCEQ/TNRCC PROPERTIES PACKAGE	CAPILLARITY PACKAGE	FLUID PROPERTIES PACKAGE	PHOTOLOG: CORE PHOTOGRAPHY	VAPOR TRANSPORT PACKAGE	POROSITY: TOTAL, AIR FILLED, WATER FILLED	POROSITY: EFFECTIVE, ASTM D425M	SPECIFIC GRAVITY, ASTM D854	BULK DENSITY (DRY), API RP40 or ASTM D2937	AIR PERMEABILITY, API RP40	HYDRAULIC CONDUCTIVITY, EPA9100/API RP40 or D5084	GRAIN SIZE DISTRIBUTION ASTM D422 or 4464M	TOC: WALKLEY-BLACK	ATTERBERG LIMITS, ASTM D4318	VAPOR INTRUSION PACKAGE	FREE PRODUCT MOBILITY PACKAGE	Moisture Content, ASTM D2216	COMMENTS
NERT S.1W1 40' 20180615	6/15/18	1520	40'																x		x			x	
S.1W1 67' 20180616	6/16/18	0750	67'																						
S.1W1 72 20180616	6/16/18	0810	72																						
NERT S.91S1 17' 20180617	6/17/18	0815	17'																						
S.91S1 40' 20180617	6/17/18	0930	40																						
S.91S1 47' 20180617		0930	47																						
S.91S1 50 20180617		0930	50																						
S.91S1 60 20180617		0950	60																						
S.91S1 67 20180617		1020	67																						
NERT S.49S1 20' 20180618	6/18/18	0820	20'																						
S.49S1 32 20180618	6/18/18	0910	32																						

1. RELINQUISHED BY	2. RECEIVED BY	3. RELINQUISHED BY	4. RECEIVED BY
[signature]	[signature]		
COMPANY	COMPANY PTS LABS INC	COMPANY	COMPANY
DATE TIME	DATE 6/27/18 TIME 1435	DATE TIME	DATE TIME

PTS Laboratories, Inc.

CHAIN OF COUNTY RECORD

COMPANY	AECOM
ADDRESS	1220 Avenida Acaso
CITY	Camarillo
ZIP CODE	93012
PROJECT MANAGER	Carmen Caceres-Schnell
email	carmen.caceres-schnell@aecom
PROJECT NAME	NDEP Downgradient Study Area
PHONE NUMBER	(805)764-4031
PROJECT NUMBER	60477365 Task 2016-170
FAX NUMBER	
SITE LOCATION	DGIP Phase I Wells
SAMPLER SIGNATURE	

PO# 86028

TURNAROUND TIME: 24 HOURS ☐ 72 HOURS ☐ 5 DAYS ☐ NORMAL ☑

OTHER:

SAMPLE INTEGRITY (CHECK): INTACT ____ TEMP(F) 73°F

PTS QUOTE NO.

PTS FILE: 48147

ANALYSIS REQUEST

SAMPLE ID	DATE	TIME	DEPTH, FT	NUMBER OF SAMPLES	SOIL PROPERTIES PACKAGE	HYDRAULIC CONDUCTIVITY PACKAGE	PORE FLUID SATURATIONS PACKAGE	TCEQ/TNRCC PROPERTIES PACKAGE	CAPILLARITY PACKAGE	FLUID PROPERTIES PACKAGE	PHOTOLOG: CORE PHOTOGRAPHY	VAPOR TRANSPORT PACKAGE	POROSITY: TOTAL, AIR FILLED, WATER FILLED	POROSITY: EFFECTIVE, ASTM D425M	SPECIFIC GRAVITY, ASTM D854	BULK DENSITY (DRY), API RP40 or ASTM D2937	AIR PERMEABILITY, API RP40	HYDRAULIC CONDUCTIVITY, EPA9100/API RP40 or D5084	GRAIN SIZE DISTRIBUTION ASTM D422 or 4464M	TOC: WALKLEY-BLACK	ATTERBERG LIMITS, ASTM D4318	VAPOR INTRUSION PACKAGE	FREE PRODUCT MOBILITY PACKAGE	Moisture Content, ASTM D2216		COMMENTS
VERT S.4931 72 20180618	6/18/18	1115	72																x		x			x		
5.4931 89 20180618	↓	1130	89																↓		↓			↓		
VERT 4.21W1 22 20180619	6/19/18	1015	22																							
4.21W1 45 20180619	6/19/18	1105	45																							
4.21W1 48 20180619	6/19/18	1120	48																							
4.21W1 62 20180619		1155	62																							
4.21W1 87 20180619	↓	1516	87																							
VERT 4.38W1 12 20180620	6/20/18	~~1015~~ 1320	~~22~~ 12																							
4.38W1 35 20180620	6/20/18	1445	35																							
4.38W1 45 20180620	"	1545	45																							
4.3W1 55 20180621	6/21/18	0850	55																↓		↓			↓		

1. RELINQUISHED BY	2. RECEIVED BY	3. RELINQUISHED BY	4. RECEIVED BY
[signature]	[signature]		
COMPANY	COMPANY PTS LABS INC	COMPANY	COMPANY
DATE TIME	DATE 6/27/18 TIME 1435	DATE TIME	DATE TIME

PTS Laboratories, Inc.

CHAIN OF COSTODY RECORD

PAGE 4 OF 4

COMPANY	AECOM
ADDRESS	1220 Avenida Acaso
CITY	Camarillo
ZIP CODE	93012
PROJECT MANAGER	Carmen Caceres-Schnell
email	carmen.caceres-schnell@aecom
PROJECT NAME	NDEP Downgradient Study Area
PHONE NUMBER	(805)764-4031
PROJECT NUMBER	60477365 Task 2016-170
FAX NUMBER	
SITE LOCATION	DGIP Phase I Wells
SAMPLER SIGNATURE	

PO# 86028

TURNAROUND TIME: 24 HOURS ☐ 72 HOURS ☐ 5 DAYS ☐ NORMAL ☑

OTHER: ____

SAMPLE INTEGRITY (CHECK): INTACT ____ TEMP(F) 73°F

PTS QUOTE NO.

PTS FILE: 48147

ANALYSIS REQUEST

SAMPLE ID	DATE	TIME	DEPTH, FT	NUMBER OF SAMPLES	SOIL PROPERTIES PACKAGE	HYDRAULIC CONDUCTIVITY PACKAGE	PORE FLUID SATURATIONS PACKAGE	TCEQ/TNRCC PROPERTIES PACKAGE	CAPILLARITY PACKAGE	FLUID PROPERTIES PACKAGE	PHOTOLOG: CORE PHOTOGRAPHY	VAPOR TRANSPORT PACKAGE	POROSITY: TOTAL, AIR FILLED, WATER FILLED	POROSITY: EFFECTIVE, ASTM D425M	SPECIFIC GRAVITY, ASTM D854	BULK DENSITY (DRY), API RP40 or ASTM D2937	AIR PERMEABILITY, API RP40	HYDRAULIC CONDUCTIVITY, EPA9100/API RP40 or D5084	GRAIN SIZE DISTRIBUTION, ASTM D422 or 4464M	TOC: WALKLEY-BLACK	ATTERBERG LIMITS, ASTM D4318	VAPOR INTRUSION PACKAGE	FREE PRODUCT MOBILITY PACKAGE	Moisture Content, ASTM D2216		COMMENTS
✓ NERTY38U1602480621	6/21/18	0940	60																x		x			x		

1. RELINQUISHED BY	2. RECEIVED BY	3. RELINQUISHED BY	4. RECEIVED BY
[signature]	[signature]		
COMPANY	COMPANY PTS LABS INC	COMPANY	COMPANY
DATE TIME	DATE 6/27/18 TIME 1435	DATE TIME	DATE TIME

PTS Laboratories, Inc.

5730 Centralcrest St. • Houston, TX 77092
Telephone (713) 316-1800 • Fax (877) 225-9953

July 12, 2018

Carmen Caceres-Schnell.
Project Manager,
AECOM,
1220 Avenida Acaso,
Camarillo, CA 93012.

Re: PTS File No: **48150**
Project Name: NDEP Downgradient Study Area
Project Number: 60477365 Task 2016-170

Dear Carmen Caceres-Schnell,

Please find enclosed report for Physical Properties analyses conducted upon samples received from your **NDEP Downgradient Study Area** project. All analyses were performed by applicable ASTM, EPA, or API methodologies. The samples are currently in storage and will be retained for thirty days past the completion of testing at no charge. Please note that the samples will be disposed of at that time. You may contact me regarding storage, disposal, or return of the samples

PTS Laboratories appreciates the opportunity to be of service. If you have any questions or require additional information, please contact myself or Emeka Anazodo at (713) 316-1800.

Sincerely,
PTS Laboratories, Inc.

C.A.Umeh

Chidi Umeh
Flow Laboratory Supervisor

Encl.

PTS Laboratories

Project Name: **NDEP Downgradient Study Area** **PTS File No: 48150**
Project Number: **60477365 Task 2016-170** **Client: AECOM**

TEST PROGRAM - 20180706

CORE ID	Depth ft.	Core Recovery ft.	Grain Size Analysis ASTM D422	Atterberg Limits ASTM D4318	USCS Soil Classification ASTM D2487	Moisture Content D2216	Comments
		Bags	Grab	Grab	Calc.	Grab	
Date Received: 20180705							
NERT4.71S1 23' 20180626	**23**	**N/A**	**X**	**X**	**X**	**X**	In ZipLock Bag
NERT4.71S1 37' 20180626	**37**	**N/A**	**X**	**X**	**X**	**X**	In ZipLock Bag
NERT4.71S1 47' 20180626	**47**	**N/A**	**X**	**X**	**X**	**X**	In ZipLock Bag
NERT4.71S1 87' 20180627	**87**	**N/A**	**X**	**X**	**X**	**X**	In ZipLock Bag
NERT4.71S1 89.5' 20180627	**89.5**	**N/A**	**X**	**X**	**X**	**X**	In ZipLock Bag
NERT3.80S1 10' 20180627	**10**	**N/A**	**X**	**X**	**X**	**X**	In ZipLock Bag
NERT3.80S1 12' 20180627	**12**	**N/A**	**X**	**X**	**X**	**X**	In ZipLock Bag
NERT3.80S1 15' 20180627	**15**	**N/A**	**X**	**X**	**X**	**X**	In ZipLock Bag
NERT3.80S1 35' 20180627	**35**	**N/A**	**X**	**X**	**X**	**X**	In ZipLock Bag
TOTALS:			**9**	**9**	**9**	**9**	**9**

Laboratory Test Program Notes
Standard TAT for basic analysis is 10-15 business days.
Grain Size Analysis: Dry Sieve method; includes tabular data, graphics and statistical sorting in Excel format.
USCS Soil Classification by ASTM D2487 requires Atterberg Limits and Grain Size Analysis (included as part of Test Program).

PTS File No: 48150
Client: AECOM
Report Date: 07/12/18

PTS Laboratories

WATER (MOISTURE) CONTENT OF SOIL OR ROCK BY MASS

(Methodology: ASTM D 2216)

Project Name: NDEP Downgradient Study Area
Project No: 60477365 Task 2016-170

SAMPLE ID.	DEPTH, ft.	PTS ID NO.	ANALYSIS DATE	ANALYSIS TIME	MATRIX	TARE WEIGHT, grams	WET SAMPLE + TARE WT., grams	DRY SAMPLE + TARE WT., grams	MOISTURE CONTENT, % dry weight
NERT4.71S1 23' 20180626	23.0	1	20180710	1610	soil	15.41	61.68	59.59	4.7
NERT4.71S1 37' 20180626	37.0	2	20180710	1610	soil	15.49	62.91	53.05	26.3
NERT4.71S1 47' 20180626	47.0	3	20180710	1610	soil	15.46	63.63	58.99	10.7
NERT4.71S1 87' 20180627	87.0	4	20180710	1610	soil	15.35	62.45	58.44	9.3
NERT4.71S1 89.5' 20180627	89.5	5	20180710	1610	soil	15.40	62.47	58.58	9.0
NERT3.80S1 10' 20180627	10.0	6	20180710	1610	soil	15.41	61.40	57.17	10.1
NERT3.80S1 12' 20180627	12.0	7	20180710	1610	soil	15.45	62.43	54.40	20.6
NERT3.80S1 15' 20180627	15.0	8	20180710	1610	soil	15.48	64.44	61.53	6.3
NERT3.80S1 35' 20180627	35.0	9	20180710	1610	soil	15.35	60.52	58.49	4.7

PTS File No: 48150
Client: AECOM
Report Date: 07/13/18

PTS Laboratories

ATTERBERG LIMITS DATA - FINE FRACTION < No. 40 SIEVE

Project Name: NDEP Downgradient Study Area
Project No: 60477365 Task 2016-170

			METHODS:	ASTM D4318			ASTM D4318	ASTM D2487	USDA
				ATTERBERG LIMITS (1)			USCS / PLASTICITY	USCS	USDA
SAMPLE ID.	DEPTH, ft.	PTS ID NO.	ANALYSIS DATE	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	CHART SYMBOL (Fines: <#40 Sieve)	CLASSIFICATION, Group Symbol: Name	SOIL TEXTURE SCHEME (2)
NERT4.71S1 23' 20180626	23.0	1	20180712	19.0	NON PLASTIC		NP	SM - Silty sand with gravel	-
NERT4.71S1 37' 20180626	37.0	2	20180712	28.3	18.8	9.5	CL	CL - Lean clay with sand	-
NERT4.71S1 47' 20180626	47.0	3	20180712	23.0	NON PLASTIC		NP	SM - Silty sand with gravel	-
NERT4.71S1 87' 20180627	87.0	4	20180712	19.3	11.6	7.7	CL	CL-SP - Poorly graded sand with gravel	-
NERT4.71S1 89.5' 20180627	89.5	5	20180712	19.6	13.1	6.5	CL-ML	CL-ML - Silty lean clay with gravel	-
NERT3.80S1 10' 20180627	10.0	6	20180712	21.0	NON PLASTIC		NP	SM - Silty sand with gravel	-
NERT3.80S1 12' 20180627	12.0	7	20180712	17.6	12.2	5.4	CL-ML	CL-ML - Silty lean clay with sand	-
NERT3.80S1 15' 20180627	15.0	8	20180712	17.9	NON PLASTIC		NP	SP - Poorly graded sand with gravel	-
NERT3.80S1 35' 20180627	35.0	9	20180712	26.1	11.4	14.7	CL	Sandy lean clay with gravel	-

(1) Silt assumed as fine fraction for NON-PLASTIC (NP) samples.

USCS: Unified Soil Classification System

PTS Laboratories, Inc.

AECOM

PTS File No: 48150
Report Date: 7/12/18

PARTICLE SIZE SUMMARY

(METHODOLOGY: ASTM D422)

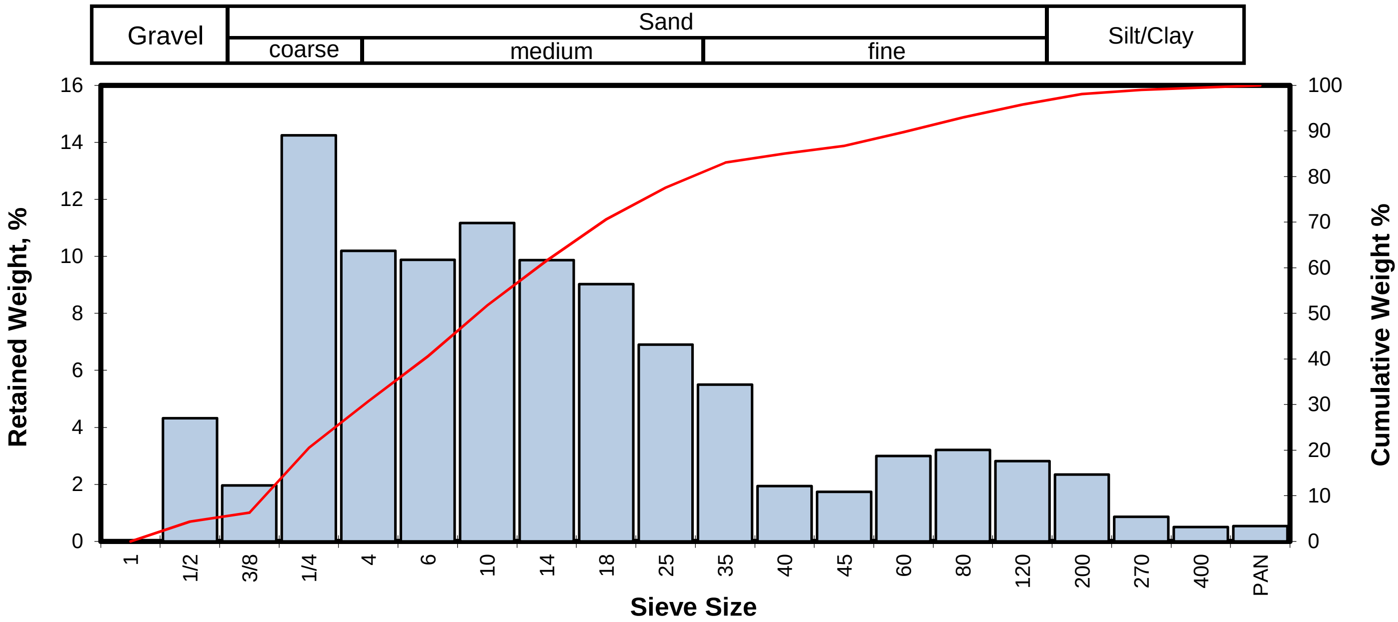
PROJECT NAME: NDEP Downgradient Study Area
PROJECT NO: 60477365 Task 2016-170

Sample ID	Depth, ft.	PTS ID No.	Mean Grain Size Description USCS/ASTM (1)	Median Grain Size, mm	Particle Size Distribution, wt. percent				
					Gravel	Sand Size			Silt/Clay
						Coarse	Medium	Fine	
NERT4.71S1 23' 20180626	23.0	1	Coarse sand	2.171	30.72	21.04	33.23	13.10	1.90
NERT4.71S1 37' 20180626	37.0	2	Fine sand	0.091	0.00	1.12	7.59	53.36	37.93
NERT4.71S1 47' 20180626	47.0	3	Coarse sand	2.550	28.03	29.17	28.73	11.01	3.07
NERT4.71S1 87' 20180627	87.0	4	Coarse sand	3.068	31.18	38.67	27.23	2.07	0.85
NERT4.71S1 89.5' 20180627	89.5	5	Gravel	3.968	45.03	18.94	19.51	11.10	5.43
NERT3.80S1 10' 20180627	10.0	6	Medium sand	0.670	15.64	14.50	27.88	31.60	10.38
NERT3.80S1 12' 20180627	12.0	7	Medium sand	0.379	19.16	7.96	21.33	38.89	12.65
NERT3.80S1 15' 20180627	15.0	8	Coarse sand	2.978	38.72	19.56	28.57	12.52	0.63
NERT3.80S1 35' 20180627	35.0	9	Medium sand	0.361	16.10	7.28	24.24	35.96	16.42

(1) Based on Mean from Trask

PTS Laboratories, Inc. PTS ID NO:- 1 **Sieve Analysis Results - ASTM D422**

Client:	AECOM	**PTS File No:**	48150
Project:	NDEP Downgradient Study Area	**Sample ID:**	NERT4.71S1 23' 20180626
Project No:	60477365 Task 2016-170	**Depth, ft:**	23.0



Opening Inches	Opening Millimeters	Phi of Screen	U.S. Sieve No.	Sample Weight grams	Incremental Weight, percent	Cumulative Weight, percent
0.9844	25.002	-4.64	1	0.00	0.00	0.00
0.4922	12.501	-3.64	1/2	5.45	4.32	4.32
0.3740	9.500	-3.25	3/8	2.48	1.97	6.29
0.2500	6.351	-2.67	1/4	17.95	14.24	20.53
0.1873	4.757	-2.25	4	12.84	10.19	30.72
0.1324	3.364	-1.75	6	12.45	9.88	40.60
0.0787	2.000	-1.00	10	14.07	11.16	51.77
0.0557	1.414	-0.50	14	12.43	9.86	61.63
0.0394	1.000	0.00	18	11.38	9.03	70.66
0.0278	0.707	0.50	25	8.70	6.90	77.56
0.0197	0.500	1.00	35	6.93	5.50	83.06
0.0166	0.420	1.25	40	2.44	1.94	85.00
0.0139	0.354	1.50	45	2.19	1.74	86.73
0.0098	0.250	2.00	60	3.78	3.00	89.73
0.0070	0.177	2.50	80	4.04	3.21	92.94
0.0049	0.125	3.00	120	3.55	2.82	95.75
0.0029	0.074	3.75	200	2.95	2.34	98.10
0.0021	0.053	4.25	270	1.09	0.86	98.96
0.0015	0.037	4.75	400	0.63	0.50	99.46
			PAN	0.68	0.54	100.00
TOTALS				126.03	100.00	100.00

Cumulative Weight Percent greater than

Weight percent	Phi Value	Particle Size Inches	Particle Size Millimeters
5	-3.51	0.4479	11.377
10	-3.10	0.3368	8.555
16	-2.85	0.2842	7.220
25	-2.48	0.2203	5.595
40	-1.78	0.1352	3.435
50	-1.12	0.0855	2.171
60	-0.58	0.0590	1.497
75	0.31	0.0317	0.804
84	1.12	0.0181	0.460
90	2.04	0.0096	0.243
95	2.87	0.0054	0.137

Measure	Trask	Inman	Folk-Ward
Median, phi	-1.12	-1.12	-1.12
Median, in.	0.0855	0.0855	0.0855
Median, mm	2.171	2.171	2.171
Mean, phi	-1.68	-0.87	-0.95
Mean, in.	0.1260	0.0717	0.0760
Mean, mm	3.200	1.822	1.931
Sorting	2.638	1.987	1.959
Skewness	0.977	0.128	0.189
Kurtosis	0.288	0.604	0.933
Grain Size Description (ASTM-USCS Scale)	Coarse sand (based on Mean from Trask)		

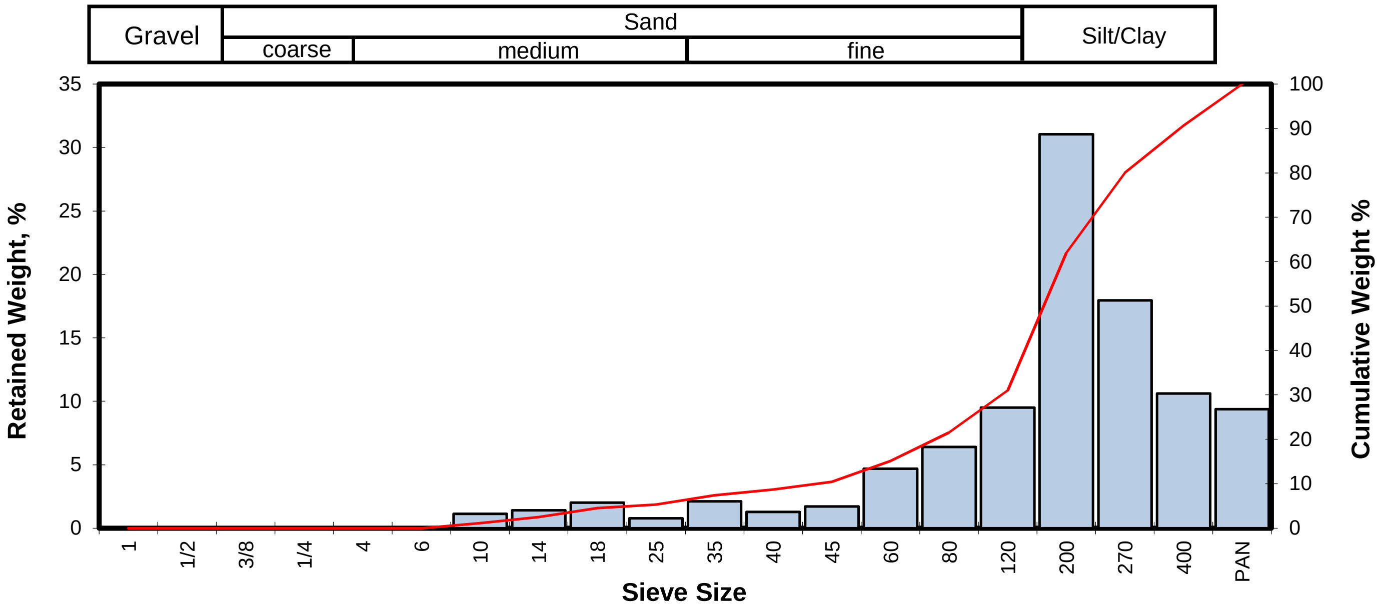
Description	Retained on Sieve #	Weight Percent
Gravel	4	30.72
Coarse Sand	10	21.04
Medium Sand	40	33.23
Fine Sand	200	13.10
Silt/Clay	<200	1.90
	Total	100

PTS Laboratories, Inc.

PTS ID NO:- 2

Sieve Analysis Results - ASTM D422

Client:	AECOM	**PTS File No:**	48150
Project:	NDEP Downgradient Study Area	**Sample ID:**	NERT4.71S1 37' 20180626
Project No:	60477365 Task 2016-170	**Depth, ft:**	37.0



Opening Inches	Opening Millimeters	Phi of Screen	U.S. Sieve No.	Sample Weight grams	Incremental Weight, percent	Cumulative Weight, percent
0.9844	25.002	-4.64	1	0.00	0.00	0.00
0.4922	12.501	-3.64	1/2	0.00	0.00	0.00
0.3740	9.500	-3.25	3/8	0.00	0.00	0.00
0.2500	6.351	-2.67	1/4	0.00	0.00	0.00
0.1873	4.757	-2.25	4	0.00	0.00	0.00
0.1324	3.364	-1.75	6	0.00	0.00	0.00
0.0787	2.000	-1.00	10	1.28	1.12	1.12
0.0557	1.414	-0.50	14	1.61	1.41	2.52
0.0394	1.000	0.00	18	2.30	2.01	4.53
0.0278	0.707	0.50	25	0.89	0.78	5.31
0.0197	0.500	1.00	35	2.43	2.12	7.43
0.0166	0.420	1.25	40	1.47	1.28	8.71
0.0139	0.354	1.50	45	1.97	1.72	10.43
0.0098	0.250	2.00	60	5.38	4.70	15.13
0.0070	0.177	2.50	80	7.32	6.39	21.52
0.0049	0.125	3.00	120	10.89	9.51	31.02
0.0029	0.074	3.75	200	35.57	31.05	62.07
0.0021	0.053	4.25	270	20.57	17.95	80.02
0.0015	0.037	4.75	400	12.16	10.61	90.63
			PAN	10.73	9.37	100.00
TOTALS				114.57	100.00	100.00

Cumulative Weight Percent greater than

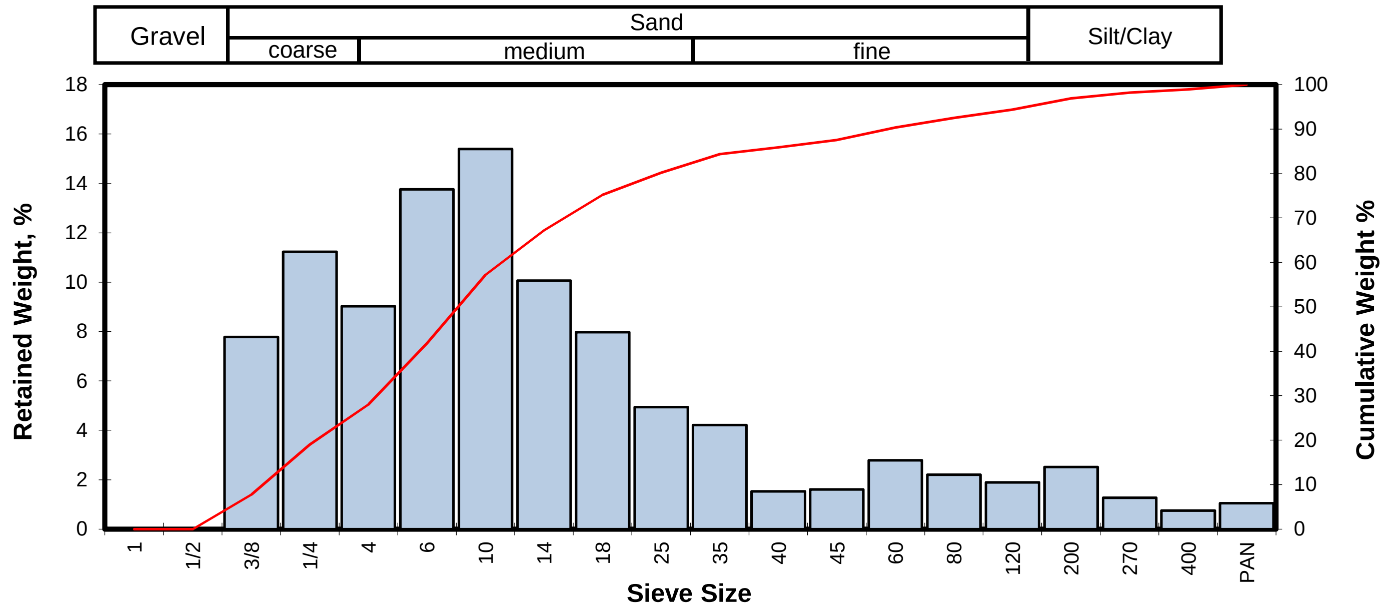
Weight percent	Phi Value	Particle Size Inches	Particle Size Millimeters
5	0.30	0.0319	0.811
10	1.44	0.0145	0.369
16	2.07	0.0094	0.238
25	2.68	0.0061	0.156
40	3.22	0.0042	0.108
50	3.46	0.0036	0.091
60	3.70	0.0030	0.077
75	4.11	0.0023	0.058
84	4.44	0.0018	0.046
90	4.72	0.0015	0.038
95	2.54	0.0068	0.172

Measure	Trask	Inman	Folk-Ward
Median, phi	3.46	3.46	3.46
Median, in.	0.0036	0.0036	0.0036
Median, mm	0.091	0.091	0.091
Mean, phi	3.23	3.25	3.32
Mean, in.	0.0042	0.0041	0.0039
Mean, mm	0.107	0.105	0.100
Sorting	1.640	1.185	0.931
Skewness	1.044	-0.174	-1.000
Kurtosis	0.148	-0.057	0.641
Grain Size Description (ASTM-USCS Scale)	Fine sand (based on Mean from Trask)		

Description	Retained on Sieve #	Weight Percent
Gravel	4	0.00
Coarse Sand	10	1.12
Medium Sand	40	7.59
Fine Sand	200	53.36
Silt/Clay	<200	37.93
	Total	100

PTS Laboratories, Inc. PTS ID NO:- 3 **Sieve Analysis Results - ASTM D422**

Client:	AECOM	**PTS File No:**	48150
Project:	NDEP Downgradient Study Area	**Sample ID:**	NERT4.71S1 47' 20180626
Project No:	60477365 Task 2016-170	**Depth, ft:**	47.0



Opening Inches	Opening Millimeters	Phi of Screen	U.S. Sieve No.	Sample Weight grams	Incremental Weight, percent	Cumulative Weight, percent
0.9844	25.002	-4.64	1	0.00	0.00	0.00
0.4922	12.501	-3.64	1/2	0.00	0.00	0.00
0.3740	9.500	-3.25	3/8	10.20	7.78	7.78
0.2500	6.351	-2.67	1/4	14.72	11.23	19.01
0.1873	4.757	-2.25	4	11.83	9.02	28.03
0.1324	3.364	-1.75	6	18.05	13.77	41.80
0.0787	2.000	-1.00	10	20.19	15.40	57.20
0.0557	1.414	-0.50	14	13.19	10.06	67.26
0.0394	1.000	0.00	18	10.46	7.98	75.23
0.0278	0.707	0.50	25	6.48	4.94	80.18
0.0197	0.500	1.00	35	5.53	4.22	84.39
0.0166	0.420	1.25	40	2.01	1.53	85.93
0.0139	0.354	1.50	45	2.11	1.61	87.54
0.0098	0.250	2.00	60	3.66	2.79	90.33
0.0070	0.177	2.50	80	2.89	2.20	92.53
0.0049	0.125	3.00	120	2.47	1.88	94.42
0.0029	0.074	3.75	200	3.30	2.52	96.93
0.0021	0.053	4.25	270	1.66	1.27	98.20
0.0015	0.037	4.75	400	0.99	0.76	98.96
			PAN	1.37	1.04	100.00
TOTALS				131.11	100.00	100.00

Cumulative Weight Percent greater than

Weight percent	Phi Value	Particle Size Inches	Particle Size Millimeters
5	-3.39	0.4126	10.479
10	-3.13	0.3454	8.773
16	-2.82	0.2785	7.074
25	-2.39	0.2064	5.242
40	-1.82	0.1386	3.519
50	-1.35	0.1004	2.550
60	-0.86	0.0715	1.816
75	-0.01	0.0398	1.010
84	0.95	0.0203	0.516
90	1.94	0.0103	0.260
95	3.17	0.0044	0.111

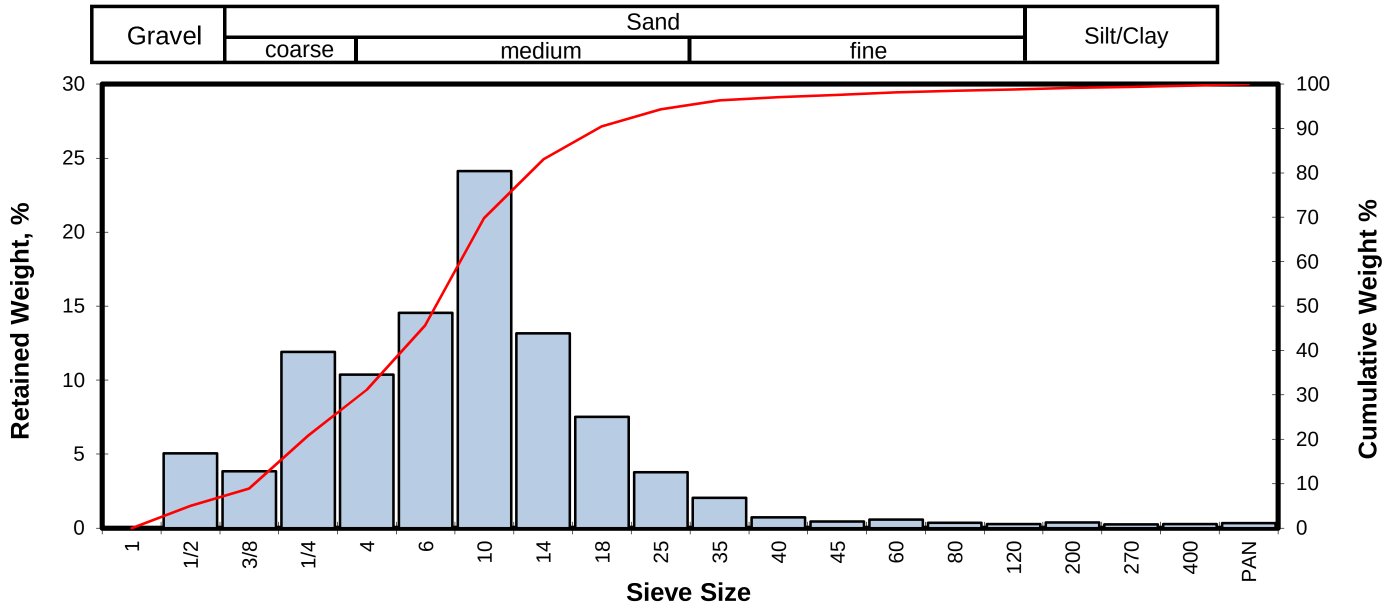
Measure	Trask	Inman	Folk-Ward
Median, phi	-1.35	-1.35	-1.35
Median, in.	0.1004	0.1004	0.1004
Median, mm	2.550	2.550	2.550
Mean, phi	-1.64	-0.93	-1.07
Mean, in.	0.1231	0.0753	0.0828
Mean, mm	3.126	1.911	2.104
Sorting	2.278	1.888	1.938
Skewness	0.902	0.220	0.299
Kurtosis	0.249	0.738	1.132
Grain Size Description (ASTM-USCS Scale)	Coarse sand (based on Mean from Trask)		

Description	Retained on Sieve #	Weight Percent
Gravel	4	28.03
Coarse Sand	10	29.17
Medium Sand	40	28.73
Fine Sand	200	11.01
Silt/Clay	<200	3.07
	Total	100

 Phone: (713) 316-1800

PTS Laboratories, Inc. PTS ID NO:- 4 **Sieve Analysis Results - ASTM D422**

Client:	AECOM	**PTS File No:**	48150
Project:	NDEP Downgradient Study Area	**Sample ID:**	NERT4.71S1 87' 20180627
Project No:	60477365 Task 2016-170	**Depth, ft:**	87.0



Opening		Phi of	U.S. Sieve	Sample Weight	Incremental Weight,	Cumulative Weight,
Inches	Millimeters	Screen	No.	grams	percent	percent
0.9844	25.002	-4.64	1	0.00	0.00	0.00
0.4922	12.501	-3.64	1/2	6.43	5.06	5.06
0.3740	9.500	-3.25	3/8	4.88	3.84	8.89
0.2500	6.351	-2.67	1/4	15.15	11.91	20.80
0.1873	4.757	-2.25	4	13.20	10.38	31.18
0.1324	3.364	-1.75	6	18.50	14.55	45.73
0.0787	2.000	-1.00	10	30.69	24.13	69.86
0.0557	1.414	-0.50	14	16.73	13.15	83.01
0.0394	1.000	0.00	18	9.55	7.51	90.52
0.0278	0.707	0.50	25	4.81	3.78	94.30
0.0197	0.500	1.00	35	2.61	2.05	96.35
0.0166	0.420	1.25	40	0.93	0.73	97.08
0.0139	0.354	1.50	45	0.58	0.46	97.54
0.0098	0.250	2.00	60	0.73	0.57	98.11
0.0070	0.177	2.50	80	0.47	0.37	98.48
0.0049	0.125	3.00	120	0.36	0.28	98.77
0.0029	0.074	3.75	200	0.49	0.39	99.15
0.0021	0.053	4.25	270	0.31	0.24	99.39
0.0015	0.037	4.75	400	0.34	0.27	99.66
			PAN	0.43	0.34	100.00
TOTALS				127.19	100.00	100.00

Cumulative Weight Percent greater than			
Weight percent	Phi Value	Particle Size Inches	Particle Size Millimeters
5	-3.65	0.4959	12.597
10	-3.19	0.3603	9.151
16	-2.90	0.2941	7.471
25	-2.50	0.2225	5.651
40	-1.95	0.1518	3.855
50	-1.62	0.1208	3.068
60	-1.31	0.0974	2.473
75	-0.80	0.0688	1.747
84	-0.43	0.0532	1.351
90	-0.03	0.0403	1.024
95	0.67	0.0247	0.628

Measure	Trask	Inman	Folk-Ward
Median, phi	-1.62	-1.62	-1.62
Median, in.	0.1208	0.1208	0.1208
Median, mm	3.068	3.068	3.068
Mean, phi	-1.89	-1.67	-1.65
Mean, in.	0.1456	0.1251	0.1236
Mean, mm	3.699	3.177	3.140
Sorting	1.799	1.234	1.272
Skewness	1.024	-0.041	0.008
Kurtosis	0.240	0.753	1.047
Grain Size Description (ASTM-USCS Scale)	Coarse sand (based on Mean from Trask)		

Description	Retained on Sieve #	Weight Percent
Gravel	4	31.18
Coarse Sand	10	38.67
Medium Sand	40	27.23
Fine Sand	200	2.07
Silt/Clay	<200	0.85
	Total	100

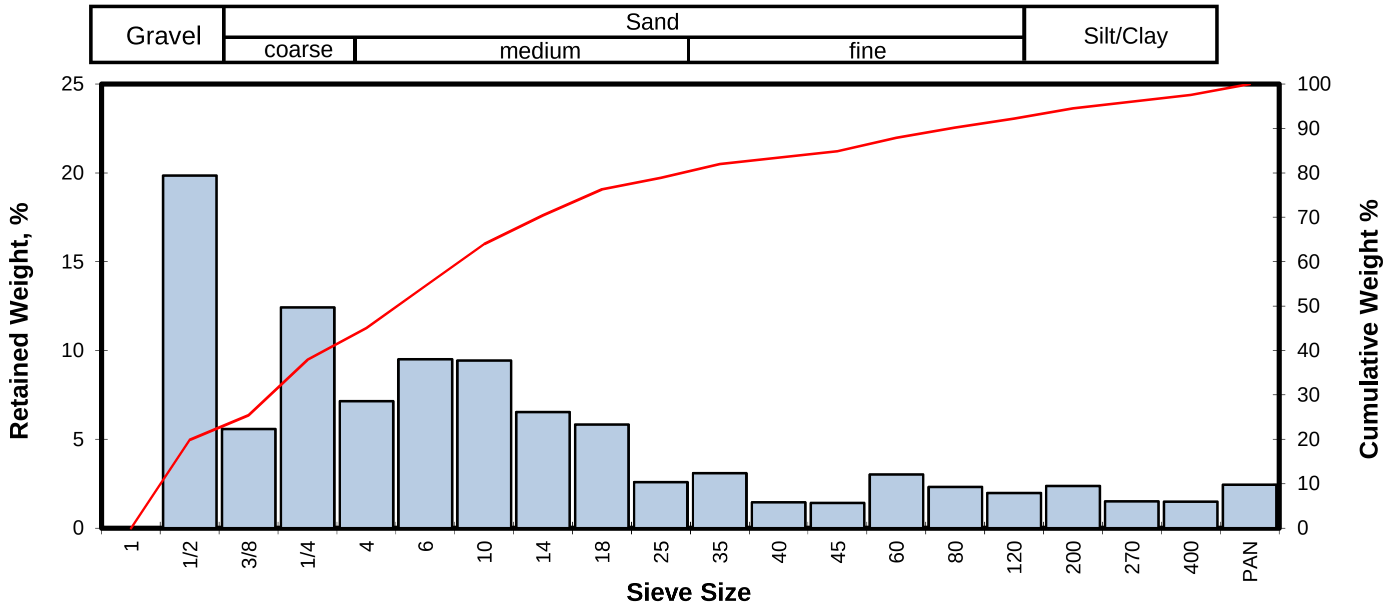
 Phone: (713) 316-1800

PTS Laboratories, Inc.

PTS ID NO:- 5

Sieve Analysis Results - ASTM D422

Client:	AECOM	**PTS File No:**	48150
Project:	NDEP Downgradient Study Area	**Sample ID:**	NERT4.71S1 89.5' 20180627
Project No:	60477365 Task 2016-170	**Depth, ft:**	89.5



Opening Inches	Opening Millimeters	Phi of Screen	U.S. Sieve No.	Sample Weight grams	Incremental Weight, percent	Cumulative Weight, percent
0.9844	25.002	-4.64	1	0.00	0.00	0.00
0.4922	12.501	-3.64	1/2	25.79	19.86	19.86
0.3740	9.500	-3.25	3/8	7.25	5.58	25.44
0.2500	6.351	-2.67	1/4	16.14	12.43	37.87
0.1873	4.757	-2.25	4	9.29	7.15	45.03
0.1324	3.364	-1.75	6	12.35	9.51	54.54
0.0787	2.000	-1.00	10	12.25	9.43	63.97
0.0557	1.414	-0.50	14	8.48	6.53	70.50
0.0394	1.000	0.00	18	7.57	5.83	76.33
0.0278	0.707	0.50	25	3.37	2.60	78.92
0.0197	0.500	1.00	35	4.01	3.09	82.01
0.0166	0.420	1.25	40	1.90	1.46	83.47
0.0139	0.354	1.50	45	1.84	1.42	84.89
0.0098	0.250	2.00	60	3.92	3.02	87.91
0.0070	0.177	2.50	80	3.01	2.32	90.23
0.0049	0.125	3.00	120	2.56	1.97	92.20
0.0029	0.074	3.75	200	3.08	2.37	94.57
0.0021	0.053	4.25	270	1.95	1.50	96.07
0.0015	0.037	4.75	400	1.93	1.49	97.56
			PAN	3.17	2.44	100.00
TOTALS				129.86	100.00	100.00

Cumulative Weight Percent greater than

Weight percent	Phi Value	Particle Size Inches	Particle Size Millimeters
5	-4.39	0.8267	20.999
10	-4.14	0.6943	17.636
16	-3.84	0.5632	14.304
25	-3.28	0.3823	9.710
40	-2.54	0.2294	5.828
50	-1.99	0.1562	3.968
60	-1.32	0.0980	2.489
75	-0.11	0.0426	1.082
84	1.34	0.0155	0.394
90	2.45	0.0072	0.183
95	3.89	0.0027	0.067

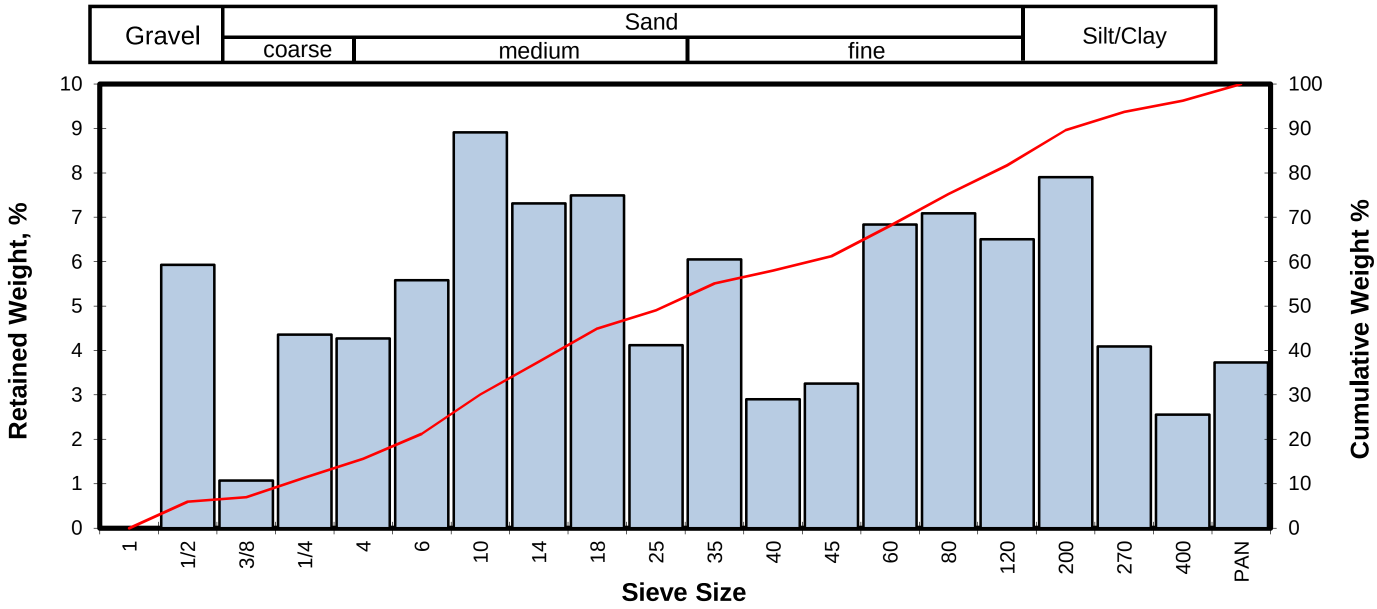
Measure	Trask	Inman	Folk-Ward
Median, phi	-1.99	-1.99	-1.99
Median, in.	0.1562	0.1562	0.1562
Median, mm	3.968	3.968	3.968
Mean, phi	-2.43	-1.25	-1.49
Mean, in.	0.2124	0.0935	0.1109
Mean, mm	5.396	2.375	2.818
Sorting	2.995	2.591	2.551
Skewness	0.817	0.286	0.353
Kurtosis	0.247	0.599	1.073
Grain Size Description (ASTM-USCS Scale)	Gravel (based on Mean from Trask)		

Description	Retained on Sieve #	Weight Percent
Gravel	4	45.03
Coarse Sand	10	18.94
Medium Sand	40	19.51
Fine Sand	200	11.10
Silt/Clay	<200	5.43
	Total	100

Phone: (713) 316-1800

PTS Laboratories, Inc. PTS ID NO:- 6 **Sieve Analysis Results - ASTM D422**

Client:	AECOM	**PTS File No:**	48150
Project:	NDEP Downgradient Study Area	**Sample ID:**	NERT3.80S1 10' 20180627
Project No:	60477365 Task 2016-170	**Depth, ft:**	10.0



Opening Inches	Opening Millimeters	Phi of Screen	U.S. Sieve No.	Sample Weight grams	Incremental Weight, percent	Cumulative Weight, percent
0.9844	25.002	-4.64	1	0.00	0.00	0.00
0.4922	12.501	-3.64	1/2	7.36	5.93	5.93
0.3740	9.500	-3.25	3/8	1.33	1.07	7.00
0.2500	6.351	-2.67	1/4	5.41	4.36	11.37
0.1873	4.757	-2.25	4	5.30	4.27	15.64
0.1324	3.364	-1.75	6	6.93	5.59	21.22
0.0787	2.000	-1.00	10	11.06	8.92	30.14
0.0557	1.414	-0.50	14	9.07	7.31	37.45
0.0394	1.000	0.00	18	9.30	7.50	44.95
0.0278	0.707	0.50	25	5.11	4.12	49.06
0.0197	0.500	1.00	35	7.51	6.05	55.12
0.0166	0.420	1.25	40	3.60	2.90	58.02
0.0139	0.354	1.50	45	4.04	3.26	61.28
0.0098	0.250	2.00	60	8.48	6.84	68.11
0.0070	0.177	2.50	80	8.80	7.09	75.21
0.0049	0.125	3.00	120	8.07	6.50	81.71
0.0029	0.074	3.75	200	9.81	7.91	89.62
0.0021	0.053	4.25	270	5.08	4.09	93.71
0.0015	0.037	4.75	400	3.17	2.56	96.27
			PAN	4.63	3.73	100.00
TOTALS				124.06	100.00	100.00

Cumulative Weight Percent greater than

Weight percent	Phi Value	Particle Size Inches	Particle Size Millimeters
5	-3.80	0.5488	13.940
10	-2.85	0.2836	7.205
16	-2.22	0.1831	4.651
25	-1.43	0.1063	2.699
40	-0.33	0.0495	1.257
50	0.58	0.0264	0.670
60	1.40	0.0149	0.378
75	2.49	0.0070	0.179
84	3.22	0.0042	0.108
90	3.80	0.0028	0.072
95	4.50	0.0017	0.044

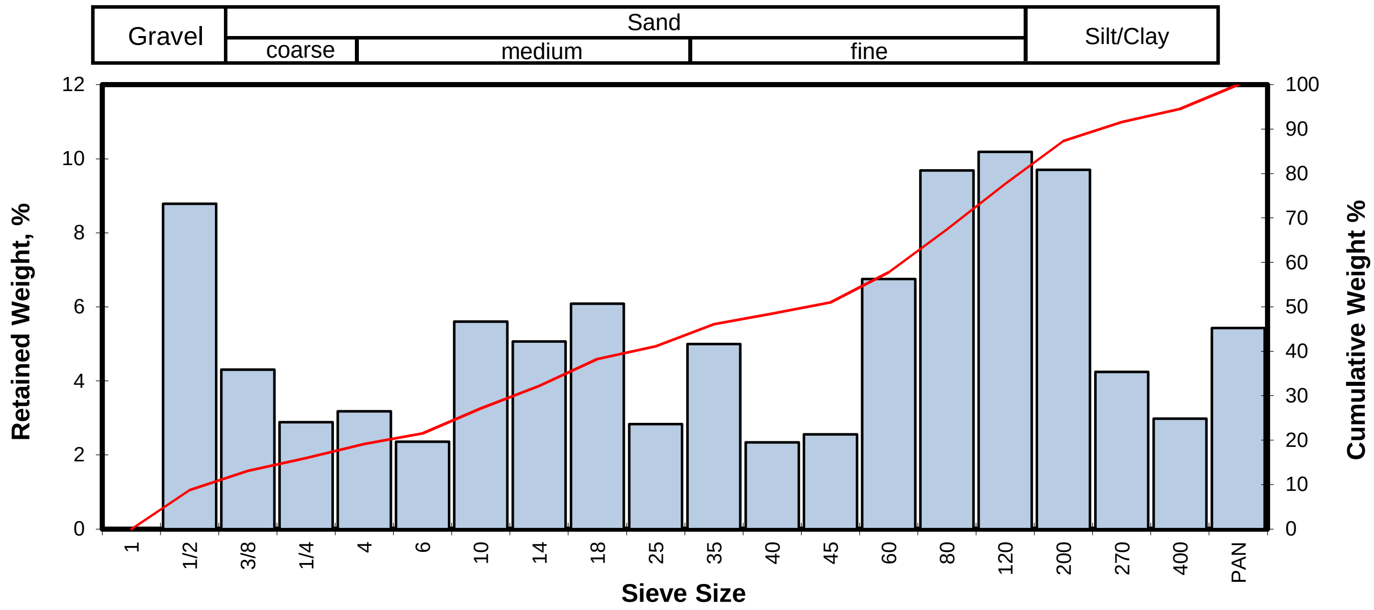
Measure	Trask	Inman	Folk-Ward
Median, phi	0.58	0.58	0.58
Median, in.	0.0264	0.0264	0.0264
Median, mm	0.670	0.670	0.670
Mean, phi	-0.52	0.50	0.53
Mean, in.	0.0566	0.0278	0.0273
Mean, mm	1.439	0.707	0.695
Sorting	3.888	2.717	2.617
Skewness	1.036	-0.028	-0.042
Kurtosis	0.177	0.528	0.869
Grain Size Description (ASTM-USCS Scale)	Medium sand (based on Mean from Trask)		

Description	Retained on Sieve #	Weight Percent
Gravel	4	15.64
Coarse Sand	10	14.50
Medium Sand	40	27.88
Fine Sand	200	31.60
Silt/Clay	<200	10.38
	Total	100

PTS Laboratories, Inc. PTS ID NO:- 7 **Sieve Analysis Results - ASTM D422**

Client: AECOM
Project: NDEP Downgradient Study Area
Project No: 60477365 Task 2016-170

PTS File No: 48150
Sample ID: NERT3.80S1 12' 20180627
Depth, ft: 12.0



Opening Inches	Opening Millimeters	Phi of Screen	U.S. Sieve No.	Sample Weight grams	Incremental Weight, percent	Cumulative Weight, percent
0.9844	25.002	-4.64	1	0.00	0.00	0.00
0.4922	12.501	-3.64	1/2	11.46	8.78	8.78
0.3740	9.500	-3.25	3/8	5.62	4.31	13.09
0.2500	6.351	-2.67	1/4	3.77	2.89	15.98
0.1873	4.757	-2.25	4	4.15	3.18	19.16
0.1324	3.364	-1.75	6	3.08	2.36	21.52
0.0787	2.000	-1.00	10	7.31	5.60	27.13
0.0557	1.414	-0.50	14	6.61	5.07	32.19
0.0394	1.000	0.00	18	7.94	6.09	38.28
0.0278	0.707	0.50	25	3.70	2.84	41.11
0.0197	0.500	1.00	35	6.52	5.00	46.11
0.0166	0.420	1.25	40	3.06	2.35	48.46
0.0139	0.354	1.50	45	3.34	2.56	51.02
0.0098	0.250	2.00	60	8.81	6.75	57.77
0.0070	0.177	2.50	80	12.64	9.69	67.46
0.0049	0.125	3.00	120	13.29	10.19	77.64
0.0029	0.074	3.75	200	12.66	9.70	87.35
0.0021	0.053	4.25	270	5.54	4.25	91.59
0.0015	0.037	4.75	400	3.89	2.98	94.57
			PAN	7.08	5.43	100.00
TOTALS				130.47	100.00	100.00

Cumulative Weight Percent greater than

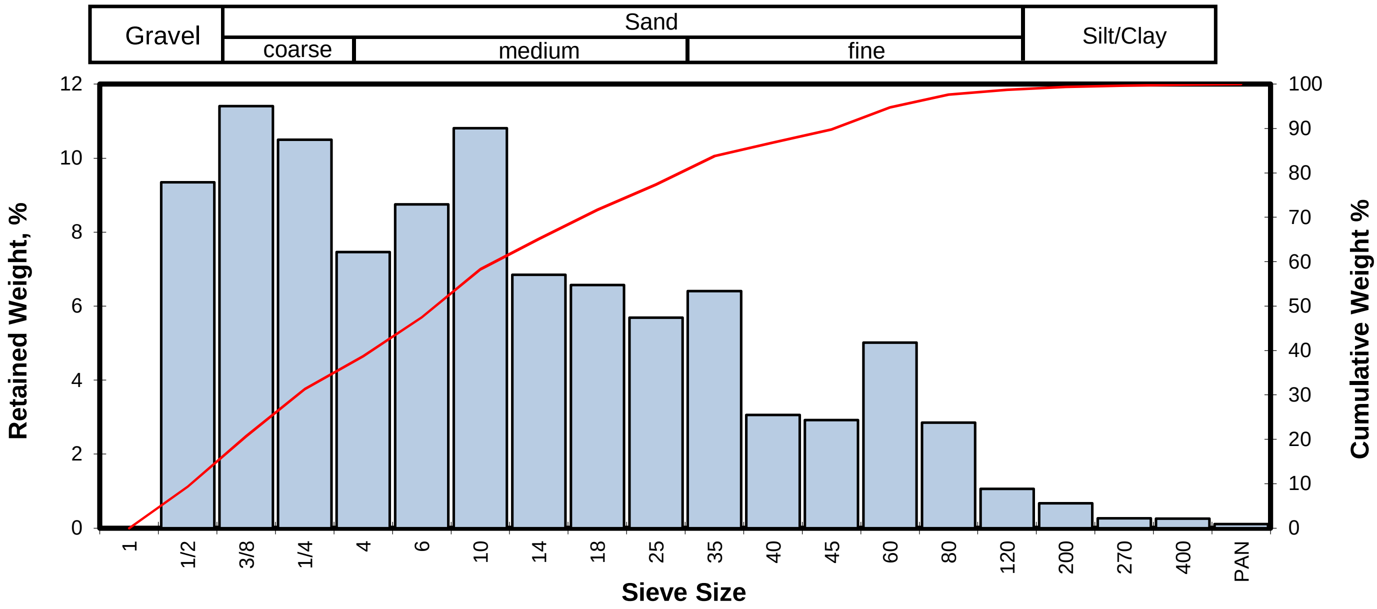
Weight percent	Phi Value	Particle Size Inches	Particle Size Millimeters
5	-4.07	0.6634	16.851
10	-3.53	0.4555	11.569
16	-2.66	0.2496	6.340
25	-1.28	0.0959	2.436
40	0.30	0.0319	0.810
50	1.40	0.0149	0.379
60	2.12	0.0091	0.231
75	2.87	0.0054	0.137
84	3.49	0.0035	0.089
90	4.06	0.0024	0.060
95	4.38	0.0019	0.048

Measure	Trask	Inman	Folk-Ward
Median, phi	1.40	1.40	1.40
Median, in.	0.0149	0.0149	0.0149
Median, mm	0.379	0.379	0.379
Mean, phi	-0.36	0.41	0.74
Mean, in.	0.0506	0.0296	0.0235
Mean, mm	1.286	0.751	0.598
Sorting	4.220	3.078	2.819
Skewness	1.524	-0.321	-0.308
Kurtosis	0.100	0.373	0.834
Grain Size Description (ASTM-USCS Scale)	Medium sand (based on Mean from Trask)		

Description	Retained on Sieve #	Weight Percent
Gravel	4	19.16
Coarse Sand	10	7.96
Medium Sand	40	21.33
Fine Sand	200	38.89
Silt/Clay	<200	12.65
	Total	100

PTS Laboratories, Inc. PTS ID NO:- 8 **Sieve Analysis Results - ASTM D422**

Client:	AECOM	**PTS File No:**	48150
Project:	NDEP Downgradient Study Area	**Sample ID:**	NERT3.80S1 15' 20180627
Project No:	60477365 Task 2016-170	**Depth, ft:**	15.0



Opening Inches	Opening Millimeters	Phi of Screen	U.S. Sieve No.	Sample Weight grams	Incremental Weight, percent	Cumulative Weight, percent
0.9844	25.002	-4.64	1	0.00	0.00	0.00
0.4922	12.501	-3.64	1/2	12.73	9.35	9.35
0.3740	9.500	-3.25	3/8	15.53	11.41	20.76
0.2500	6.351	-2.67	1/4	14.29	10.50	31.25
0.1873	4.757	-2.25	4	10.16	7.46	38.72
0.1324	3.364	-1.75	6	11.91	8.75	47.47
0.0787	2.000	-1.00	10	14.72	10.81	58.28
0.0557	1.414	-0.50	14	9.32	6.85	65.12
0.0394	1.000	0.00	18	8.95	6.57	71.70
0.0278	0.707	0.50	25	7.74	5.69	77.38
0.0197	0.500	1.00	35	8.72	6.41	83.79
0.0166	0.420	1.25	40	4.16	3.06	86.84
0.0139	0.354	1.50	45	3.98	2.92	89.77
0.0098	0.250	2.00	60	6.82	5.01	94.78
0.0070	0.177	2.50	80	3.88	2.85	97.63
0.0049	0.125	3.00	120	1.45	1.07	98.69
0.0029	0.074	3.75	200	0.92	0.68	99.37
0.0021	0.053	4.25	270	0.36	0.26	99.63
0.0015	0.037	4.75	400	0.35	0.26	99.89
			PAN	0.15	0.11	100.00
TOTALS				136.14	100.00	100.00

Cumulative Weight Percent greater than

Weight percent	Phi Value	Particle Size Inches	Particle Size Millimeters
5	-4.11	0.6795	17.259
10	-3.62	0.4845	12.307
16	-3.41	0.4194	10.653
25	-3.01	0.3179	8.074
40	-2.18	0.1780	4.521
50	-1.57	0.1172	2.978
60	-0.87	0.0722	1.833
75	0.29	0.0322	0.818
84	1.02	0.0195	0.494
90	1.52	0.0137	0.348
95	2.04	0.0096	0.243

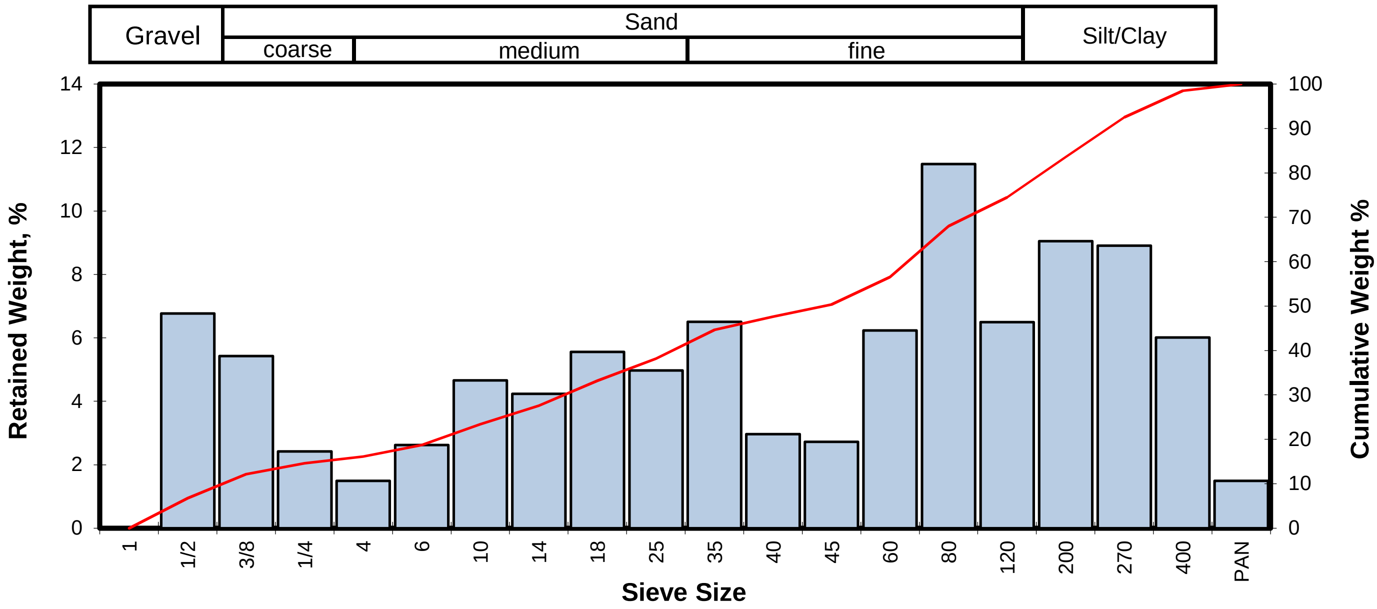
Measure	Trask	Inman	Folk-Ward
Median, phi	-1.57	-1.57	-1.57
Median, in.	0.1172	0.1172	0.1172
Median, mm	2.978	2.978	2.978
Mean, phi	-2.15	-1.20	-1.32
Mean, in.	0.1750	0.0903	0.0985
Mean, mm	4.446	2.294	2.502
Sorting	3.142	2.215	2.039
Skewness	0.863	0.170	0.173
Kurtosis	0.303	0.388	0.763
Grain Size Description (ASTM-USCS Scale)	Coarse sand (based on Mean from Trask)		

Description	Retained on Sieve #	Weight Percent
Gravel	4	38.72
Coarse Sand	10	19.56
Medium Sand	40	28.57
Fine Sand	200	12.52
Silt/Clay	<200	0.63
	Total	100

 Phone: (713) 316-1800

PTS Laboratories, Inc. PTS ID NO:- 9 **Sieve Analysis Results - ASTM D422**

Client:	AECOM	**PTS File No:**	48150
Project:	NDEP Downgradient Study Area	**Sample ID:**	NERT3.80S1 35' 20180627
Project No:	60477365 Task 2016-170	**Depth, ft:**	35.0



Opening Inches	Opening Millimeters	Phi of Screen	U.S. Sieve No.	Sample Weight grams	Incremental Weight, percent	Cumulative Weight, percent
0.9844	25.002	-4.64	1	0.00	0.00	0.00
0.4922	12.501	-3.64	1/2	12.08	6.77	6.77
0.3740	9.500	-3.25	3/8	9.69	5.43	12.19
0.2500	6.351	-2.67	1/4	4.32	2.42	14.61
0.1873	4.757	-2.25	4	2.66	1.49	16.10
0.1324	3.364	-1.75	6	4.67	2.62	18.72
0.0787	2.000	-1.00	10	8.32	4.66	23.38
0.0557	1.414	-0.50	14	7.56	4.23	27.61
0.0394	1.000	0.00	18	9.93	5.56	33.17
0.0278	0.707	0.50	25	8.87	4.97	38.14
0.0197	0.500	1.00	35	11.61	6.50	44.65
0.0166	0.420	1.25	40	5.30	2.97	47.61
0.0139	0.354	1.50	45	4.85	2.72	50.33
0.0098	0.250	2.00	60	11.13	6.23	56.56
0.0070	0.177	2.50	80	20.49	11.48	68.04
0.0049	0.125	3.00	120	11.59	6.49	74.53
0.0029	0.074	3.75	200	16.15	9.05	83.58
0.0021	0.053	4.25	270	15.91	8.91	92.49
0.0015	0.037	4.75	400	10.74	6.02	98.50
			PAN	2.67	1.50	100.00
TOTALS				178.54	100.00	100.00

Cumulative Weight Percent greater than

Weight percent	Phi Value	Particle Size Inches	Particle Size Millimeters
5	-3.91	0.5898	14.980
10	-3.41	0.4179	10.615
16	-2.28	0.1911	4.853
25	-0.81	0.0690	1.751
40	0.64	0.0252	0.640
50	1.47	0.0142	0.361
60	2.15	0.0089	0.225
75	3.04	0.0048	0.122
84	3.77	0.0029	0.073
90	4.11	0.0023	0.058
95	4.46	0.0018	0.045

Measure	Trask	Inman	Folk-Ward
Median, phi	1.47	1.47	1.47
Median, in.	0.0142	0.0142	0.0142
Median, mm	0.361	0.361	0.361
Mean, phi	0.09	0.75	0.99
Mean, in.	0.0369	0.0235	0.0198
Mean, mm	0.937	0.596	0.504
Sorting	3.794	3.026	2.780
Skewness	1.279	-0.239	-0.262
Kurtosis	0.077	0.382	0.891

Grain Size Description (ASTM-USCS Scale): Medium sand (based on Mean from Trask)

Description	Retained on Sieve #	Weight Percent
Gravel	4	16.10
Coarse Sand	10	7.28
Medium Sand	40	24.24
Fine Sand	200	35.96
Silt/Clay	<200	16.42
	Total	100

PTS Laboratories, Inc.

CHAIN OF CUSTODY RECORD

PAGE 1 OF 1

COMPANY	AECOM
ADDRESS	1220 Avenida Acaso
CITY	Camarillo
ZIP CODE	93012
PROJECT MANAGER	Carmen Caceres-Schnell
email	carmen.caceres-schnell@aecom
PROJECT NAME	NDEP Downgradient Study Area
PHONE NUMBER	(805)764-4031
PROJECT NUMBER	60477365 Task 2016-170
FAX NUMBER	
SITE LOCATION	DGIP Phase I Wells
SAMPLER SIGNATURE	[signature]

PO# 86028

TURNAROUND TIME
24 HOURS ☐ 5 DAYS ☐
72 HOURS ☐ NORMAL ☑

OTHER: ____

SAMPLE INTEGRITY (CHECK):
INTACT ____ TEMP(F) 77
9

PTS QUOTE NO.

PTS FILE: 48150

ANALYSIS REQUEST

SAMPLE ID	DATE	TIME	DEPTH, FT	NUMBER OF SAMPLES	SOIL PROPERTIES PACKAGE	HYDRAULIC CONDUCTIVITY PACKAGE	PORE FLUID SATURATIONS PACKAGE	TCEQ/TNRCC PROPERTIES PACKAGE	CAPILLARITY PACKAGE	FLUID PROPERTIES PACKAGE	PHOTOLOG: CORE PHOTOGRAPHY	VAPOR TRANSPORT PACKAGE	POROSITY: TOTAL, AIR FILLED, WATER FILLED	POROSITY: EFFECTIVE, ASTM D425M	SPECIFIC GRAVITY, ASTM D854	BULK DENSITY (DRY), API RP40 or ASTM D2937	AIR PERMEABILITY, API RP40	HYDRAULIC CONDUCTIVITY, EPA9100/API RP40 or D5084	GRAIN SIZE DISTRIBUTION, ASTM D422 or 4464M	TOC: WALKLEY-BLACK	ATTERBERG LIMITS, ASTM D4318	VAPOR INTRUSION PACKAGE	FREE PRODUCT MOBILITY PACKAGE	Moisture Content, ASTM D2216		COMMENTS
✓ NERT4.71S123 20180626	6/26/18	1010	23																x		x			x		
✓ " " 37 " "	6/26/18	1130	37																							
✓ " " 47 " "	6/26/18	1050	47																							
✓ " " 87 20180627	6/27/18	0720	87																							
✓ " " 89.5 " "	6/27/18	0725	89.5																							
✓ NERT3.80S1 10' 20180627	6/27/18	1330	10																							
✓ " " 12' "	6/27/18	1340	12																							
✓ " " 15' "	6/27/18	1345	15																							
✓ " " 35 "	6/27/18	1500	35																							

1. RELINQUISHED BY	2. RECEIVED BY	3. RELINQUISHED BY	4. RECEIVED BY
[signature]	[signature]		
COMPANY: AECOM	COMPANY: PTS LABS INC	COMPANY	COMPANY
DATE: 6/29/18 TIME: 0800	DATE: 7/5/18 TIME: 0915	DATE TIME	DATE TIME

Appendix F

Correspondence Regarding Hexavalent Chromium Analysis

From:	James Carlton Parker
To:	Van Den Berg, Harry; James Dotchin; "Steve Clough"
Cc:	Roper, Chad; Caceres-Schnell, Carmen; Bilodeau, Sally; Weiquan Dong; Alan Pineda
Subject:	RE: NERT RI - Phase I Groundwater Sample analysis for Hexavalent Chromium
Date:	Tuesday, July 31, 2018 2:49:21 PM
Attachments:	Table X Analytical Total Chrome Results.xlsx

Harry,
Based on the following information from your email and excel chart as well as the following information:
1) These samples are investigatory in nature and not performance samples,
2) Phase 2 well drilling is going to occur in the relatively near future,
3) Phase 1 wells were scheduled to be sampled again after Phase 2 drilling, but Phase 1 wells were originally scheduled only for perchlorate and chlorate at that time, and
4) Method 218.7 states samples must be analyzed within 14 days; it does not read samples should be analyzed.

NDEP finds we can discard the current out of time Phase 1 hex-chromium samples taken in July 2018 for now and when we return with Phase 2 drilling and it's subsequent Phase 1 and Phase 2 sampling we include hex-chromium on the Phase 1 wells (Phase 2 wells were scheduled to have hex-chromium). This is your option 4 below. If any questions please call me.

Carlton

Carlton Parker, P.G.
Supervisor
Bureau of Industrial Site Cleanup
Environmental Scientist IV
Nevada Division of Environmental Protection
2030 E. Flamingo Road, Suite 230
Las Vegas, NV 89119
p: 702.486.2850 Ext. 228 f: 702.486.2863
c: 702.659.3243
www.ndep.nv.gov

From: Van Den Berg, Harry <Harry.VanDenBerg@aecom.com>
Sent: Tuesday, July 31, 2018 1:58 PM
To: James Carlton Parker <jcarltonparker@ndep.nv.gov>; James Dotchin <jdotchin@ndep.nv.gov>
Cc: Roper, Chad <Chad.Roper@aecom.com>; Caceres-Schnell, Carmen <Carmen.Caceres-Schnell@aecom.com>; Bilodeau, Sally <Sally.Bilodeau@aecom.com>
Subject: NERT RI - Phase I Groundwater Sample analysis for Hexavalent Chromium

Carlton and JD,

Last week and again this week we followed up with TestAmerica and Silver State to check on the progress regarding the chromium results of the analytical tests for the Phase I wells, which were sampled on July 9, 10, and 16, 2018. TestAmerica has finished their analysis, however, Silver State missed their holding time for the Hex Cr analysis on all samples. Per method 218.7 hexavalent chromium analysis has a hold time of 14 days provided that samples are preserved upon receipt at the laboratory.

As you can see below when we contacted Silver State on Monday July 23, they indicated everything was progressing smoothly and that we should receive the first results in a few days. On Friday, July 27 they later told us that they had problems with their analytical equipment and requested to send the samples out to a sub (which we approved and pointed out that the samples would need to be run over the weekend of July 28 and 29 for any of them to be within holding time). This morning they notified us that the analyses will not be analyzed by the subcontract laboratory they selected until Wednesday, August 1.

Based on historical results in the area we were not expecting to find Hex Cr in the groundwater, but the analysis was added to be thorough and complete. Attached is a table that has dissolved total chromium results which range from 1.3 to 26 ug/L in groundwater collected from the Phase I wells.

At this point we have several options as follows.

1) Analyze the samples for Hex Cr and report the results with an "out of holding time" flag
2) Resample all wells where hex chrome was specified and have the Hex Cr samples analyzed within method criteria by another laboratory.
3) Combination of 1) and 2) and report both Hex Cr results (those out of holding time and the re-sampling within method criteria)
4) Resample the wells for Hex Cr when the Phase II wells are sampled. The Phase I wells are already scheduled for a sampling event at that time but were only being analyzed for Perchlorate and chlorate.

We believe option 4 may be the best course of action, since it would provide data that could be used without restriction and would not significantly add to the cost. Of course AECOM and Silver State would not charge for the re-analysis. Please let us know how you would like us to proceed or if you wish to discuss.

Thanks,

Harry Van Den Berg, PE, CEM
Associate Vice-President, Remediation
AECOM
1220 Avenida Acaso
Camarillo, CA 93012

D: (805) 764-4045
M: (805) 890-3098

From:	Roper, Chad
To:	Bilodeau, Sally; Caceres-Schnell, Carmen
Subject:	FW: Groundwater Samples for Hexavalent Chromium from NERT
Date:	Monday, July 23, 2018 5:49:15 PM

FYI

From: Melissa Vega [mailto:mvega@ssalabs.com]
Sent: Monday, July 23, 2018 5:49 PM
To: Roper, Chad
Subject: RE: Groundwater Samples for Hexavalent Chromium from NERT

Hi Chad,

Everything seems to have gone smoothly. No major questions on sample names once I figured out the handwriting.

The first report should come out in a few days or so.

Thanks much
Melissa

From: Roper, Chad <Chad.Roper@aecom.com>
Sent: Monday, July 23, 2018 3:48 PM
To: Melissa Vega <mvega@ssalabs.com>
Cc: 'John Sloan' <jsloan@ssalabs.com>; David Frohnen - ssa labs <dfrohnen@ssalabs.com>; Caceres-Schnell, Carmen <Carmen.Caceres-Schnell@aecom.com>; Bilodeau, Sally <Sally.Bilodeau@aecom.com>
Subject: Groundwater Samples for Hexavalent Chromium from NERT

Melissa,
I wanted to check on the status of the groundwater samples you received on July 11, and July 16… from AECOM and the NERT project…
Were there any sample name questions? Any login problems?
Thanks,

Chad Roper, Ph.D.
Project Manager, Remediation
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Appendix G

Groundwater Sampling Records

AECOM

Well ID: AA-30

Low-Flow Ground Water Sample Collection Record

Client: NERT Date: 7/13/18 Time: Start 0845 am/pm
Project No: 60477365 Finish 0930 am/pm
Site Location: LUW
Weather Conds: Cloudy, warm, Humid 86° Collector(s): GC / EW

1. WATER LEVEL DATA: (measured from Top of Casing)

a. Total Well Length 34.31 c. Length of Water Column 15.76 (a-b) Casing Diameter/Material 4" PVC

b. Water Table Depth 18.55 d. Calculated System Volume (see back) 10.29 x 1 / 30.87 x 3

2. WELL PURGE DATA

a. Purge Method: Low flow - bladder pump Purge 30'

b. Acceptance Criteria defined (see workplan)

- Temperature	± 2°C	-D.O.	0.3 mg/l
- pH	± 0.1 unit	Turbidity	10% if NTU reading is > 10 NTUs
- Sp. Cond.	± 3%	ORP	± 10 milivolts

c. Field Testing Equipment used:

Make	Model	Serial Number
Horiba	U52	60821

Time (24hr)	Volume Removed (Liters)	Temp. (°C)	pH	Spec. Cond. (µS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Drawdown (feet)	Color/Odor
0850	1.0	27.22	7.21	7.90	1.70	176	162.9	200	14.55	Cloudy / None
0900	3.0	27.06	7.21	7.89	1.46	176	31.2	200	18.55	Clear / None
0905	4.0	26.05	7.22	7.99	1.46	172	9.3	200	18.55	"
0910	5.0	25.63	7.22	8.07	1.47	169	8.4	200	18.55	"
0915	6.0	25.65	7.22	8.08	1.46	168	7.9	200	18.55	"
0920	– Sampled					GC 7/13/18				

d. Acceptance criteria pass/fail Yes No N/A (continued on back)

Have parameters stabilized ☑ Yes ☐ No ☐ N/A

If no or N/A - Explain below.

3. SAMPLE COLLECTION: Method: Low flow Bladder Pump

Sample ID	Container Type	No. of Containers	Preservation	Analysis Req.	Time
AA-30-20180713	250 mL Poly	1	None	Perchlorate	0920
	125 mL Poly	1	EDA	Chlorate	0920

Comments: well in good shape, lock in place - secure
Dedicated tubing present - ~35' in length - long enough

Signature [signature] Date 7/13/18

AECOM

Well ID: CO4Z81

Low-Flow Ground Water Sample Collection Record

Client: NERT Date: 7/13/18 Time: Start 700 am/pm
Project No: ~~Lum~~ 60477365 Finish 0810 am/pm
Site Location: Hh
Weather Conds: Mostly cloudy, calm, 82°, humid 50% Collector(s): AC / EW

1. WATER LEVEL DATA: (measured from Top of Casing)

a. Total Well Length 65.20 c. Length of Water Column 48.99 (a-b) Casing Diameter/Material 2" PVC

b. Water Table Depth 16.21 d. Calculated System Volume (see back) 7.99 x 1 24.0 x 3

2. WELL PURGE DATA

a. Purge Method: Low Flow Bladder Pump Pump @ 60'

b. Acceptance Criteria defined (see workplan)

- Temperature	± 2°C	-D.O.	0.3 mg/l
- pH	± 0.1 unit	Turbidity	10% if NTU reading is > 10 NTUs
- Sp. Cond.	± 3%	ORP	± 10 milivolts

c. Field Testing Equipment used:

Make	Model	Serial Number
Horiba	U-52	60821

Time (24hr)	Volume Removed (Liters)	Temp. (°C)	pH	Spec. Cond. (µS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Drawdown (feet)	Color/Odor
705	0.5	27.00	7.40	3.92	3.65	164	497	200	16.25	Milky Brown / Wooden
720	3.5	25.93	7.25	3.64	0.88	176	526	200	16.25	"
735	6.5	25.97	7.23	3.67	0.60	173	153	200	16.25	Cloudy / None
745	8.5	26.03	7.25	3.66	0.58	172	49.7	200	16.25	Clear / None
755	10.5	26.11	7.26	3.66	0.55	170	38.6	200	16.25	"
800	11.5	26.15	7.26	3.66	0.55	170	39.5	200	16.25	"
805	12.5	26.14	7.26	3.66	0.55	169	37.6	200	16.25	"
810	— Sampled — AC 7/13/18									

d. Acceptance criteria pass/fail Yes No N/A (continued on back)

Have parameters stabilized ☑ ☐ ☐

If no or N/A - Explain below.

Turb > 10 NTUs but stable

3. SAMPLE COLLECTION: Method: Low flow - bladder pump

Sample ID	Container Type	No. of Containers	Preservation	Analysis Req.	Time
CO4Z81-20180713	250 mL Poly	1	None	Perchlorate	0810
	125 mL Poly	1	EDA	Chlorate	0810

Comments ~~None~~ AC 7/13/18 well in good shape & secure. Dedicated tubing present

Signature [signature] Date 7/13/18

AECOM

Well ID: LNDMW-01

Low-Flow Ground Water Sample Collection Record

Client: NEDT　　Date: 7/11/18　　Time: Start 0950 am/pm

Project No: 60477365　　Finish 1130 am/pm

Site Location: LVW

Weather Conds: Breeze, Humid, ~95°　　Collector(s): JC/EW

1. WATER LEVEL DATA: (measured from Top of Casing)

a. Total Well Length 61.56　c. Length of Water Column 24.88 (a-b)　　Casing Diameter/Material 2" PVC

b. Water Table Depth 36.68　d. Calculated System Volume (see back) 4.1 x 1 / 12.2 x 3

2. WELL PURGE DATA

a. Purge Method: Low flow bladder pump　　Pump @ 57'

b. Acceptance Criteria defined (see workplan)

- Temperature	± 2°C	-D.O.	0.3 mg/l
- pH	± 0.1 unit	Turbidity	10% if NTU reading is > 10 NTUs
- Sp. Cond.	± 3%	ORP	± 10 milivolts

c. Field Testing Equipment used:

Make	Model	Serial Number
Horiba	U-52	60821

Time (24hr)	Volume Removed (Liters)	Temp. (°C)	pH	Spec. Cond. (µS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Drawdown (feet)	Color/Odor
1000	0.5	30.67	7.63	4.59	5.47	121	>1000	100	37.70	~~None~~ Brown
1015	2.3	28.50	7.13	4.87	3.61	155	>1000	150	37.69	~~None~~ Brown
1030	4.5	27.11	7.10	5.01	3.37	161	>1000	150	37.69	Brown
1045	6.75	27.13	7.09	5.03	3.18	168	947	150	37.69	Cloudy
1100	9.00	27.12	7.10	5.03	3.20	170	580	150	37.69	Cloudy
1105	9.75	27.52	7.12	5.01	3.25	169	417	150	37.69	Cloudy
1110	10.5	27.10	7.13	4.99	3.12	171	409	150	37.69	Cloudy
1115	11.25	27.10	7.13	4.98	3.13	171	412	150	37.69	Cloudy

d. Acceptance criteria pass/fail　　Yes　No　N/A　　(continued on back)

Have parameters stabilized　☒ Yes　☐ No　☐ N/A

If no or N/A - Explain below.

Turbidity high but stable

3. SAMPLE COLLECTION:　Method: Low flow bladder pump

Sample ID	Container Type	No. of Containers	Preservation	Analysis Req.	Time
LNDMW01_20180711	250 Poly	1	None	Perchlorate	1120
	~~250 Poly~~ JC 7/11/18				
	225 Poly Amber	1	CDA	Chlorate	1120
+ 3 Containers for TestAmerica					

Comments: No others

Signature [signature]　　Date 7/11/18

AECOM

Well ID: CNDMW2

Low-Flow Ground Water Sample Collection Record

Client: NERT
Date: 7/17/18
Time: Start 1025 am/pm
Finish 1120 am/pm
Project No: 60477365
Site Location: LVW
Weather Conds: Sunny, breeze, 100°
Collector(s): AC / EW

1. WATER LEVEL DATA: (measured from Top of Casing)

a. Total Well Length 55.35
c. Length of Water Column 21.13 (a-b)
Casing Diameter/Material 2" PVC

b. Water Table Depth 34.22
d. Calculated System Volume (see back) 3.45 x 1 / 10.35 x 3

2. WELL PURGE DATA

a. Purge Method: Low flow bladder Pump Pump @ 50'

b. Acceptance Criteria defined (see workplan)

- Temperature ± 2°C   -D.O. 0.3 mg/l
- pH ± 0.1 unit   Turbidity 10% if NTU reading is > 10 NTUs
- Sp. Cond. ± 3%   ORP ± 10 milivolts

c. Field Testing Equipment used:

Make	Model	Serial Number
Horiba	U-52	60821

Time (24hr)	Volume Removed (Liters)	Temp. (°C)	pH	Spec. Cond. (µS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Drawdown (feet)	Color/Odor
1030	1.0	34.18	7.32	3.26	1.18	165	>1000	200	34.24	Brown / None
1045	4.0	32.26	7.20	3.30	0.54	177	466	200	34.24	Cloudy / None
1055	6.0	31.97	7.22	3.34	0.52	178	587	200	34.24	Cloudy / None
1100	7.0	32.39	7.22	3.42	0.55	177	578	200	34.24	Cloudy / None
1105	8.0	32.47	7.22	3.42	0.56	179	582	200	34.24	cloudy/None
1110	—	Sampled								
						AC 7/17/18				

d. Acceptance criteria pass/fail   Yes   No   N/A

(continued on back)

Have parameters stabilized   ☑ Yes   ☐ No   ☐ N/A

If no or N/A - Explain below.
Turb > 10 but stable

3. SAMPLE COLLECTION: Method: low flow bladder pump

Sample ID	Container Type	No. of Containers	Preservation	Analysis Req.	Time
CNDMW2-20180717	250 mL Poly	1	None	Perchlorate	1110
	125 mL Poly Amber	1	EDA	chlorate	1110

Comments: well in good shape & secure

Signature: [signature]   Date: 7/17/18

AECOM

Well ID: MW-02

Low-Flow Ground Water Sample Collection Record

Client: WERT   Date: 7/12/18   Time: Start 1245 am/pm
Project No: 60477365   Finish 1335 am/pm
Site Location: LVW
Weather Conds: Cloudy, windy, ~90°   Collector(s): GE/EW

1. WATER LEVEL DATA: (measured from Top of Casing)

a. Total Well Length 45.05   c. Length of Water Column 5.53 (a-b)   Casing Diameter/Material 2" PVC

b. Water Table Depth 39.52   d. Calculated System Volume (see back) 0.90 x1
2.70 x3

2. WELL PURGE DATA

a. Purge Method: Low flow - bladder pump   pump @ 43'

b. Acceptance Criteria defined (see workplan)

- Temperature	± 2°C	-D.O.	0.3 mg/l
- pH	± 0.1 unit	Turbidity	10% if NTU reading is > 10 NTUs
- Sp. Cond.	± 3%	ORP	± 10 milivolts

c. Field Testing Equipment used:

Make	Model	Serial Number
Horiba	U-52	60821

Time (24hr)	Volume Removed (Liters)	Temp. (°C)	pH	Spec. Cond. (µS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Drawdown (feet)	Color/Odor
1250	0.5	29.67	7.44	4.01	7.26	133	110	250	39.51	clear/none
1300	2.5	26.55	7.15	4.03	[illegible].59	141	66.8	200	39.51	"
1305	3.5	25.86	7.17	4.05	6.50	143	31.9	200	39.51	"
1310	4.5	25.64	7.17	4.04	6.39	144	15.9	200	39.51	"
1315	5.5	25.79	7.18	4.04	6.42	145	6.9	200	39.51	"
1320	6.5	25.65	7.18	4.05	6.34	146	4.2	200	39.51	"
1325	7.5	25.67	7.17	4.05	6.38	146	2.2	200	39.51	
1330	—	Sampled								GE 7/12/18

d. Acceptance criteria pass/fail   Yes   No   N/A   (continued on back)

Have parameters stabilized   ☑ Yes   ☐ No   ☐ N/A

If no or N/A - Explain below.

3. SAMPLE COLLECTION: Method: Low flow - bladder pump

Sample ID	Container Type	No. of Containers	Preservation	Analysis Req.	Time
MW-02-20180712	250 mL Poly	1	None	Perchlorate	1330
	125 mL Poly Amber	1	EDA	Chlorite	

Collect Field duplicate MW-02-20180712-FD
+ FB MW-02-20180712-FB & Equipment rinsed blank MW-02-20180712-EB
+ 3 sample containers for Tetra Tech

Comments none

Signature [signature]   Date 7/12/18

AECOM

Well ID: MW-3

Low-Flow Ground Water Sample Collection Record

Client: NTC RT Date: 7/12/18 Time: Start 1000 am/pm
Project No: 60477365 Finish 1030 am/pm
Site Location: LVW
Weather Conds: Part Cloudy, Hot, Calm 95° Collector(s): AC / EW

1. WATER LEVEL DATA: (measured from Top of Casing)

a. Total Well Length 13.45 c. Length of Water Column 10.57 (a-b) Casing Diameter/Material 4" PVC

b. Water Table Depth 2.89 d. Calculated System Volume (see back) 6.9 x 1 / 13.5 x 3

2. WELL PURGE DATA

a. Purge Method: Low flow Bladder Pump Pump @ 10'

b. Acceptance Criteria defined (see workplan)

- Temperature	± 2°C	-D.O.	0.3 mg/l
- pH	± 0.1 unit	Turbidity	10% if NTU reading is > 10 NTUs
- Sp. Cond.	± 3%	ORP	± 10 milivolts

c. Field Testing Equipment used:

Make	Model	Serial Number
Horiba	U-52	60821

Time (24hr)	Volume Removed (Liters)	Temp. (°C)	pH	Spec. Cond. (µS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Drawdown (feet)	Color/Odor
1005	0.75	29.47	7.39	5.08	5.15	124	6.7	150	2.88	Clear / None
1010	1.5	28.75	7.35	5.24	5.22	127	4.6	150	2.88	"
1015	2.25	28.68	7.34	5.10	5.05	128	2.2	150	2.88	"
1020	3.0	28.93	7.34	5.13	4.98	129	1.0	150	2.88	"
1025	Sample									
					AC 7/12/18					

d. Acceptance criteria pass/fail Yes No N/A

(continued on back)

Have parameters stabilized ☒ ☐ ☐

If no or N/A - Explain below.

3. SAMPLE COLLECTION: Method: Low flow bladder Pump

Sample ID	Container Type	No. of Containers	Preservation	Analysis Req.	Time
MW-3-20180711	250 Poly	1	None	Perchlorate	1025
	125 Poly Amber	1	EDA	Chlorate	1025

Comments None

Signature [signature] Date 7/12/18

AECOM

Well ID: MW-4

Low-Flow Ground Water Sample Collection Record

Client: NERT Date: 7/12/18 Time: Start 1045 am/pm
Project No: 60413736 Finish 1115 am/pm
Site Location: LVW
Weather Conds: Cloudy, Hot, Humid, ~95° Collector(s): AC/EW

1. WATER LEVEL DATA: (measured from Top of Casing)

a. Total Well Length 7.65 c. Length of Water Column 1.61 (a-b) Casing Diameter/Material 4" PVC

b. Water Table Depth 6.04 d. Calculated System Volume (see back) 1.05 x1 / 3.15 x3

2. WELL PURGE DATA

a. Purge Method: Low flow Bladder Pump Purge @ 6.5'

b. Acceptance Criteria defined (see workplan)

- Temperature	±2°C	-D.O.	0.3 mg/l
- pH	±0.1 unit	Turbidity	10% if NTU reading is > 10 NTUs
- Sp. Cond.	±3%	ORP	± 10 milivolts

c. Field Testing Equipment used:

Make	Model	Serial Number
Horiba	U-52	60421

Time (24hr)	Volume Removed (Liters)	Temp. (°C)	pH	Spec. Cond. (µS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Drawdown (feet)	Color/Odor
1050	0.5	35.71	7.37	4.28	3.43	119	5.3	150	6.06	Clear/None
1055	1.25	35.47	7.24	4.28	2.91	124	1.8	150	6.06	Clear/None
1100	2.0	34.58	7.20	4.30	2.83	126	0.2	150	6.06	Clear/None
1105	2.75	34.43	7.20	4.26	2.92	127	0.0	150	6.06	Clear/None
1110	Sampled									

AC 7/12/18

d. Acceptance criteria pass/fail Yes ☑ No ☐ N/A ☐ (continued on back)

Have parameters stabilized

If no or N/A - Explain below.

3. SAMPLE COLLECTION: Method: Low flow Bladder Pump

Sample ID	Container Type	No. of Containers	Preservation	Analysis Req.	Time
MW-4-20180712	250 Poly	1	None	Perchlorate	1110
	125 Poly Amber	1	EDA	Chlorate	
	+3 Sample containers for Tetra Tech				

Comments None

Signature [signature] Date 7/12/18

AECOM

Well ID: MW-13

Low-Flow Ground Water Sample Collection Record

Client: NERT Date: 7/12/15 Time: Start 0810 am/pm
Project No: 60477365 Finish 0845 am/pm
Site Location: LVW
Weather Conds: Part cloudy, calm, ~90° Collector(s): AL/EW

1. WATER LEVEL DATA: (measured from Top of Casing)

a. Total Well Length 51.15 c. Length of Water Column 16.23 (a-b) Casing Diameter/Material 4"

b. Water Table Depth 34.92 d. Calculated System Volume (see back) 10.6 x 1 / 31.8 x 3

2. WELL PURGE DATA

a. Purge Method: Low flow - Bladder Pump Pump @ 46.5'

b. Acceptance Criteria defined (see workplan)

- Temperature	± 2°C	-D.O.	0.3 mg/l
- pH	± 0.1 unit	Turbidity	10% if NTU reading is > 10 NTUs
- Sp. Cond.	± 3%	ORP	± 10 milivolts

c. Field Testing Equipment used:

Make	Model	Serial Number
Horiba	U-52	60821

Time (24hr)	Volume Removed (Liters)	Temp. (°C)	pH	Spec. Cond. (μS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Drawdown (feet)	Color/Odor
0815	0.5	27.52	7.28	5.53	5.18	140	46.4	250	34.90	Clear/None
0819	1.5	27.47	7.22	5.49	4.40	143	21.3	250	34.90	"
0823	2.5	27.41	7.21	5.50	4.34	143	22.9	250	34.90	"
0827	3.5	27.43	7.21	5.51	4.35	142	22.4	250	34.90	"
0831	4.5	27.45	7.21	5.52	4.34	142	22.6	250	34.91	"
0835				Sampled						
				AL 7/12/15						

d. Acceptance criteria pass/fail Yes No N/A (continued on back)

Have parameters stabilized ☑ Yes ☐ No ☐ N/A

If no or N/A - Explain below.
Turb >10 but Stable

3. SAMPLE COLLECTION: Method: Low flow - bladder pump

Sample ID	Container Type	No. of Containers	Preservation	Analysis Req.	Time
MW-13-20150712	250 Poly	1	None	Perchlorate	
	125 Poly Amber	1	EDA	Chlorate	

+3 sample containers for Tetra Tech

Comments None

Signature [signature] Date 7/12/15

AECOM

Well ID: MW-20

Low-Flow Ground Water Sample Collection Record

Client: NERT Date: 7/12/18 Time: Start 1415 am/pm

Project No: 60477365 Finish 1510 am/pm

Site Location: LVW

Weather Conds: Cloudy, Breezy, ~90° Collector(s): JC/EW

1. WATER LEVEL DATA: (measured from Top of Casing)

a. Total Well Length 67.40 c. Length of Water Column 34.70 (a-b)

Casing Diameter/Material 2" PVC

b. Water Table Depth 32.70 d. Calculated System Volume (see back) 5.66 x 1 / 17.0 x 3

2. WELL PURGE DATA

a. Purge Method: Low Flow Bladder Pump Pump @ 62.5'

b. Acceptance Criteria defined (see workplan)

- Temperature	± 2°C	-D.O.	0.3 mg/l
- pH	± 0.1 unit	Turbidity	10% if NTU reading is > 10 NTUs
- Sp. Cond.	± 3%	ORP	± 10 milivolts

c. Field Testing Equipment used:

Make	Model	Serial Number
Horiba	U-52	60821

Time (24hr)	Volume Removed (Liters)	Temp. (°C)	pH	Spec. Cond. (µS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Drawdown (feet)	Color/Odor
1425	1.0	29.90	7.63	3.01	2.06	1.38	250	200	32.88	Cloudy/None
1435	3.0	29.84	7.52	2.92	1.25	145	176	200	32.88	"
1445	5.0	29.88	7.51	3.47	1.09	147	139	200	32.88	clear/None
1450	6.0	29.97	7.52	3.48	0.99	147	132	200	32.88	clear/None
1455	7.0	29.95	7.53	3.50	1.02	147	135	200	32.88	"
1500	8.0	30.01	7.51	3.45	1.04	147	129	200	32.88	"
1505	Sampled									

JC 7/12/18

d. Acceptance criteria pass/fail Yes ~~No~~ N/A (continued on back)

Have parameters stabilized ☑ ☐ ☐

If no or N/A - Explain below. Turb > 10 NTU's but stable

3. SAMPLE COLLECTION: Method: Low flow - bladder pump

Sample ID	Container Type	No. of Containers	Preservation	Analysis Req.	Time
MW-20-20180712	250 mL poly	1	None	Perchlorate	1505
	125 ml Poly	1	EDA	Chlorate	1505

+3 Sample containers for TetraTech

Comments None

Signature [signature] Date 7/12/18

AECOM

Well ID: MW-25

Low-Flow Ground Water Sample Collection Record

Client: NERT　Date: 7/11/18　Time: Start 1345 am/pm
Project No: 60477365　Finish ___ am/pm
Site Location: NERT LVW
Weather Conds: Partly Cloudy, Humid, Breezy 110°　Collector(s): DE/EW

1. WATER LEVEL DATA: (measured from Top of Casing)

a. Total Well Length 54.40　c. Length of Water Column 15.06 (a-b)　Casing Diameter/Material 4" PVC

b. Water Table Depth 39.34　d. Calculated System Volume (see back) 9.83 x 1 29.49 x 3

2. WELL PURGE DATA

a. Purge Method: Low flow Bladder Pump　pump @ 50'

b. Acceptance Criteria defined (see workplan)

- Temperature	± 2°C	-D.O.	0.3 mg/l
- pH	± 0.1 unit	Turbidity	10% if NTU reading is > 10 NTUs
- Sp. Cond.	± 3%	ORP	± 10 milivolts

c. Field Testing Equipment used:

Make	Model	Serial Number
Horiba	U-52	60821

Time (24hr)	Volume Removed (Liters)	Temp. (°C)	pH	Spec. Cond. (µS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Drawdown (feet)	Color/Odor
1345	0.25	31.67	7.54	3.65	5.83	177	324	200	39.21	Clear
1400	3.25	31.31	7.43	3.77	5.77	176	125	200	39.21	None
1410	5.25	31.32	7.43	3.61	5.90	178	71.7	200	39.21	None
Unable to Sample - Equipment malfunction & weather H&S										

d. Acceptance criteria pass/fail　Yes　No　N/A　(continued on back)

Have parameters stabilized ☐ ☐ ☐

If no or N/A - Explain below.

3. SAMPLE COLLECTION: Method: N/A

Sample ID	Container Type	No. of Containers	Preservation	Analysis Req.	Time
MW-25-20180711	250 Poly	1	None	Perchlorate	N/A
	125 Poly Amber	1	EDA	Chlorate	↓

Comments: Unable to sample Equipment malfunction & weather H&S

Signature ______　Date 7/11/18

AECOM

Well ID: MW-25

Low-Flow Ground Water Sample Collection Record

Client: NERT	Date: 7/12/18	Time: Start 700 am/pm	Finish 740 am/pm
Project No: 60477365			
Site Location: NERT LVW			
Weather Conds: Calm, Part cloudy ~90°	Collector(s): [illegible] / EW		

1. WATER LEVEL DATA: (measured from Top of Casing)

a. Total Well Length 54.40 c. Length of Water Column 15.06 (a-b) Casing Diameter/Material 4" PVC

b. Water Table Depth 39.34 d. Calculated System Volume (see back) 9.83 x1 / 29.49 x3

2. WELL PURGE DATA

a. Purge Method: Low flow Bladder Pump Pump @ 50'

b. Acceptance Criteria defined (see workplan)

- Temperature	± 2°C	-D.O.	0.3 mg/l
- pH	± 0.1 unit	Turbidity	10% if NTU reading is > 10 NTUs
- Sp. Cond.	± 3%	ORP	± 10 milivolts

c. Field Testing Equipment used:

Make	Model	Serial Number
Horiba	U-52	60821

Time (24hr)	Volume Removed (Liters)	Temp. (°C)	pH	Spec. Cond. (µS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Drawdown (feet)	Color/Odor
700	0.5	29.55	7.43	4.27	6.47	109	119	200	39.31	Clear/None
705	1.5	29.50	7.30	4.25	6.52	125	43.4	200	39.31	" "
710	2.5	29.08	7.29	4.29	6.52	130	33.1	200	39.31	"
715	3.5	28.02	7.29	4.37	6.94	136	20.1	200	39.31	"
720	4.5	27.75	7.29	4.39	6.94	139	15.1	200	39.31	"
725	5.5	27.61	7.30	4.41	6.92	141	10.3	200	39.31	"
730	6.5	27.65	7.30	4.41	6.84	143	11.7	200	39.31	"
Sampled — [illegible] 7/12/18										

d. Acceptance criteria pass/fail Yes No N/A (continued on back)

Have parameters stabilized ☑ Yes ☐ No ☐ N/A

If no or N/A - Explain below.

3. SAMPLE COLLECTION: Method: Low flow bladder Pump

Sample ID	Container Type	No. of Containers	Preservation	Analysis Req.	Time
MW-25-20180712	250 Poly	3	None	Perchlorate	~~0~~ 730
	125 Poly Amber	3	EDA	chlorate	
Extra volume for MS/MSD					
+ 3 Sample containers for Tetra Tech					

Comments

Signature [signature] Date 7/12/18

10.47

AECOM

Well ID: NERT3.90S1

Low-Flow Ground Water Sample Collection Record

Client: NERT Date: 7/9/18 Time: Start 0745 am/pm
Project No: 60477365 Finish 0840 am/pm
Site Location: NERT LVW
Weather Conds: Cloudy, light breeze, 95° Collector(s): JC

1. WATER LEVEL DATA: (measured from Top of Casing)

a. Total Well Length 19.41 c. Length of Water Column 8.94 (a-b) Casing Diameter/Material 4" PVC

b. Water Table Depth 10.47 d. Calculated System Volume (see back) 1x = 5.84 3x = 17.52

2. WELL PURGE DATA

a. Purge Method: Bladder Pump

b. Acceptance Criteria defined (see workplan)

- Temperature	± 2°C	-D.O.	0.3 mg/l
- pH	± 0.1 unit	Turbidity	10% if NTU reading is > 10 NTUs
- Sp. Cond.	± 3%	ORP	± 10 milivolts

c. Field Testing Equipment used:

Make	Model	Serial Number
Horiba	U-52	60821

Time (24hr)	Volume Removed (Liters)	Temp. (°C)	pH	Spec. Cond. (µS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Drawdown (feet)	Color/Odor
800	1.0	30.98	7.00	3.62	1.11	145	172	200	10.45	None
805	~~1.6~~ 1.75	29.71	7.04	3.64	1.16	167	80.1	150	10.46	None
810	~~2.2~~ 2.25	31.00	7.16	3.61	1.26	~~148~~	47.8	150	10.46	None
815	~~2.8~~ 3.25	31.13	7.16	3.59	1.33	146	46.1	150	10.46	None
820	~~3.4~~ 4.0	31.49	7.20	3.59	1.27	138	36.0	150	10.46	None
825	~~4.0~~ 4.75	31.96	7.21	3.62	1.25	132	30.3	150	10.46	None
0830	~~4.6~~ 5.5	32.74	7.19	3.65	1.24	128	20.3	150	10.46	None
0835	6.25	33.14	7.15	3.64	1.27	124	24.6	150	10.46	None

- Sun out effect temp

d. Acceptance criteria pass/fail Yes No N/A

(continued on back)

Have parameters stabilized Yes ☒ No ☒ N/A ☐

If no or N/A - Explain below.
Temp due to Sun heating up tubing & flow cell

3. SAMPLE COLLECTION: Method: Low flow bladder Pump

Sample ID	Container Type	No. of Containers	Preservation	Analysis Req.	Time
NERT3.90S1	250 mL Poly		Nitric	Dis Chrom	0840
	250 mL Poly		None	Perchlorate	↓
	~~125 mL Poly~~ AR 7/9/18		~~EDA~~	Br, Cl, TDS	
	125 mL Poly		EDA	Chlorate	↓

Comments Sun out ~820, increase temp on tubing & flow cell

Signature ______ Date 7/9/18

AECOM

Well ID: NERT4.21N1

Low-Flow Ground Water Sample Collection Record

Client: NERT Date: 7/16/14 Time: Start 1205 am/pm
Project No: 60477365 Finish 1250 am/pm
Site Location: LVW
Weather Conds: Sunny, Calm, humid, Hot - 100° Collector(s): JC / EW

1. WATER LEVEL DATA: (measured from Top of Casing)

a. Total Well Length 54.86 c. Length of Water Column 19.44 (a-b) Casing Diameter/Material 4" PVC

b. Water Table Depth 35.32 d. Calculated System Volume (see back) 12.72 x 1 / 38.16 x 3

2. WELL PURGE DATA

a. Purge Method: Low Flow bladder Pump Pump @ 50'

b. Acceptance Criteria defined (see workplan)

- Temperature	± 2°C	-D.O.	0.3 mg/l
- pH	± 0.1 unit	Turbidity	10% if NTU reading is > 10 NTUs
- Sp. Cond.	± 3%	ORP	± 10 milivolts

c. Field Testing Equipment used:

Make	Model	Serial Number
Horiba	U-52	6082

Time (24hr)	Volume Removed (Liters)	Temp. (°C)	pH	Spec. Cond. (µS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Drawdown (feet)	Color/Odor
1210	1.0	36.39	7.43	4.02	3.35	128	290	200	35.30	Cloudy/None
1215	2.0	35.59	7.29	3.94	2.59	148	209	200	35.30	" "
1225	4.0	34.46	7.25	3.97	2.39	149	29.9	200	35.30	Clear/None
1230	5.0	34.09	7.25	4.00	2.39	152	8.1	200	35.30	"
1235	6.0	33.80	7.25	4.01	2.39	151	0.5	200	35.30	"
1240	7.0	33.81	7.25	4.00	2.39	154	0.4	200	35.30	"
				Sampled JC 7/16/14						

d. Acceptance criteria pass/fail Yes No N/A (continued on back)

Have parameters stabilized ☑ Yes ☐ No ☐ N/A

If no or N/A - Explain below.

3. SAMPLE COLLECTION: Method: Low Flow bladder Pump

Sample ID	Container Type	No. of Containers	Preservation	Analysis Req.	Time
NERT4.21N1-20140716	250 ml poly	1	HNO3	Dis Cr	1240
	250 ml poly	1	None	Perchlorate, Br, Cl, TDS	1240
	125 ml poly	1	EDA	Chlorate	1240
	400 ml poly	1	Am Sulfate	Cr6	1240

Comments None

Signature [signature] Date 7/16/14

AECOM

Well ID: NERT4.35N1

Low-Flow Ground Water Sample Collection Record

Client: NERT　Date: 7/16/18　Time: Start 1335 am/pm
Project No: 60417365　Finish 1410 am/pm
Site Location: LVW
Weather Conds: Sunny, calm, humid ~100°　Collector(s): GC/EW

1. WATER LEVEL DATA: (measured from Top of Casing)

a. Total Well Length 39.75　c. Length of Water Column 7.24 (a-b)　Casing Diameter/Material 4" PVC

b. Water Table Depth 32.51　d. Calculated System Volume (see back) 4.73 x 1
14.19 x 3

2. WELL PURGE DATA

a. Purge Method: Low flow - bladder pump　pump @ 35'

b. Acceptance Criteria defined (see workplan)

- Temperature	± 2°C	-D.O.	0.3 mg/l
- pH	± 0.1 unit	Turbidity	10% if NTU reading is > 10 NTUs
- Sp. Cond.	± 3%	ORP	± 10 milivolts

c. Field Testing Equipment used:

Make	Model	Serial Number
Horiba	U-52	60821

Time (24hr)	Volume Removed (Liters)	Temp. (°C)	pH	Spec. Cond. (µS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Drawdown (feet)	Color/Odor
1340	1.0	36.03	7.20	3.69	1.82	170	52.3	200	32.50	Clear/None
1345	2.0	35.63	7.19	3.67	1.75	170	47.6	200	32.50	"
1350	3.0	34.90	7.21	3.71	1.64	169	32.4	200	32.50	"
1355	4.0	34.42	7.21	3.69	1.62	168	36.2	200	32.50	"
1400	5.0	34.48	7.21	3.73	1.60	168	36.8	200	32.50	"
—	Sampled									
		GC 7/16/18								

d. Acceptance criteria pass/fail　Yes　No　N/A　(continued on back)

Have parameters stabilized　☒ Yes　☐ No　☐ N/A

If no or N/A - Explain below.
Turb > 10 NTU, but stable

3. SAMPLE COLLECTION:　Method: Low flow bladder pump

Sample ID	Container Type	No. of Containers	Preservation	Analysis Req.	Time
NERT4.35N1-20180716	250 mL Poly	1	HNO3	Dis Cr	
	250 mL Poly	1	None	Perchlorate, Br, Cl, TDS	
	125 mL Poly	1	EDA	chlorate	
	400 mL Poly	1	Am Sulfate	Cr 6	

Comments None

Signature [signature]　Date 7/16/18

AECOM

Well ID: NERT4.51S1

Low-Flow Ground Water Sample Collection Record

Client: NERT   Date: 7/10/18   Time: Start 0930 am/pm   12 pm
Project No: 60477365   Finish 1220 am/pm
Site Location: LVW
Weather Conds: Calm, Hot, Humid 95°   Collector(s): AC / EW

1. WATER LEVEL DATA: (measured from Top of Casing)

a. Total Well Length 50.25   c. Length of Water Column 24.34 (a-b)   Casing Diameter/Material 4" PVC

b. Water Table Depth 25.91   d. Calculated System Volume (see back) 15.91 (3v = 47.73)

2. WELL PURGE DATA

a. Purge Method: Low Flow Bladder Pump   Pump @ 45.5'

b. Acceptance Criteria defined (see workplan)

- Temperature	± 2°C	-D.O.	0.3 mg/l
- pH	± 0.1 unit	Turbidity	10% if NTU reading is > 10 NTUs
- Sp. Cond.	± 3%	ORP	± 10 milivolts

c. Field Testing Equipment used:

Make	Model	Serial Number
Horiba	U-52	60921

Time (24hr)	Volume Removed (Liters)	Temp. (°C)	pH	Spec. Cond. (µS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Drawdown (feet)	Color/Odor
0940	0.5	29.44	7.41	4.94	5.09	146	30.9	150	25.81	None
~~0945~~ 945 Turn 1200	0.75	31.61	7.40	5.13	6.51	153	0.7	200	25.91	None
1205	1.75	30.70	7.28	4.87	4.74	159	0.1	200	25.91	None
1210	2.75	29.33	7.24	4.88	4.66	161	0.1	200	25.91	None
1215	3.75	29.13	7.23	4.89	4.64	162	0.0	200	25.81	None
Sampled		1220								
						AC 7/10/18				

d. Acceptance criteria pass/fail   Yes   No   N/A   (continued on back)

Have parameters stabilized   ☑   ☐   ☐

If no or N/A - Explain below.

3. SAMPLE COLLECTION: Method: Low flow bladder Pump

Sample ID	Container Type	No. of Containers	Preservation	Analysis Req.	Time
NERT4.51S1	250 Poly	3	HNO3	Dis Cr	1220
	250 Poly	3	None	Perchlorate, Cl, Br, TDS	
	125 Poly Amber	3	EDA	Chlorate	
	4250 Poly	3	Am Sulfate	Cr6	

Comments 945 - Air Compressor quit - went to get replacement
1200 Resume Pumping - Extra Vol for MS/MSD

Signature [signature]   Date 7/10/18

AECOM

Well ID: NERT4.7151

Low-Flow Ground Water Sample Collection Record

Client: NERT
Project No: 60417365
Site Location: NERT LVW
Weather Conds: Sunny, Calm, 100°
Date: 7/9/18
Time: Start 0945 am/pm
Finish ______ am/pm
Collector(s): AC / EW

1. WATER LEVEL DATA: (measured from Top of Casing)

a. Total Well Length 47.05
c. Length of Water Column 14.54 (a-b)
Casing Diameter/Material 4"

b. Water Table Depth 28.51
d. Calculated System Volume (see back) 1x = 2.40 51
3x 47.05

2. WELL PURGE DATA

a. Purge Method: Bladder Pump

b. Acceptance Criteria defined (see workplan)

- Temperature	± 2°C	-D.O.	0.3 mg/l
- pH	± 0.1 unit	Turbidity	10% if NTU reading is > 10 NTUs
- Sp. Cond.	± 3%	ORP	± 10 milivolts

c. Field Testing Equipment used:

Make	Model	Serial Number
Horiba	U-52	LAA7.1

Time (24hr)	Volume Removed (Liters)	Temp. (°C)	pH	Spec. Cond. (µS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Drawdown (feet)	Color/Odor
1000	—	40.61	7.67	4.98	3.51	89	50.3	200	29.40	None
1005	1.0	35.94	7.91	4.96	2.10	104	21.7	200	24.40	None
1010	2.0	35.24	7.95	4.89	1.97	107	22.6	200	29.40	None
1015	3.0	28.47	7.96	5.61	2.77	107	85.2	200	29.40	None
1020	4.0	31.84	8.04	5.17	2.27	105	76.0	200	29.40	None
1025	5.0	29.92	8.18	5.40	2.52	101	70.5	200	29.40	None
1030	6.0	30.52	8.26	5.28	2.93	95	62.7	200	29.40	None
1035	7.0	—	8.31	5.38	2.47	96	53.3	200	29.42	None

d. Acceptance criteria pass/fail — Yes ☐ No ☐ N/A ☐

(continued on back)

Have parameters stabilized

If no or N/A - Explain below.

3. SAMPLE COLLECTION: Method: Low flow bladder Pump

Sample ID	Container Type	No. of Containers	Preservation	Analysis Req.	Time
NERT4.7151	250 Poly		HNO3	Dis Cr	N/A
	250 Poly		None	Perchlorate, Cl⁻ Br⁻ TDS	
	125 Poly		EDA	Chlorate	
	500 Poly		Am Sulfate	Cr6	

Comments: unable to sample due to equipment issues

Signature ______ Date 7/9/18

NERT4.7151
7/9/18

Time	L	Temp	pH	Sp Cond	Do	ORP	Turb	flow	Draw Down	Comments
1040	8.0	30.25	8.34	5.28	2.41	94	44.0	200	24.90	None
1045	9.0	29.56	8.36	5.38	2.58	91	39.8	200	28.80	None
1050	100	30.12	8.35	5.36	2.10	90	36.6			

Unable to Sample
AC 7/9/18

AECOM

Well ID: NERT4.7151

Low-Flow Ground Water Sample Collection Record

Client: NERT	Date: 7/10/18 Time: Start 0805 am/pm
Project No: 60477365	Finish 0850 am/pm
Site Location: NERT LVW	
Weather Conds: Sunny, calm, ~80°	Collector(s): JC / EW

1. WATER LEVEL DATA: (measured from Top of Casing)

a. Total Well Length 47.05   c. Length of Water Column 18.55 (a-b)   Casing Diameter/Material 4"

b. Water Table Depth 28.50   d. Calculated System Volume (see back) 1x = 24.5 3x = 47.

2. WELL PURGE DATA

a. Purge Method: Low flow Bladder Pump - Pump @ ~42.75'

b. Acceptance Criteria defined (see workplan)

- Temperature	± 2°C	-D.O.	0.3 mg/l
- pH	± 0.1 unit	Turbidity	10% if NTU reading is > 10 NTUs
- Sp. Cond.	± 3%	ORP	± 10 milivolts

c. Field Testing Equipment used:

Make	Model	Serial Number
Horiba	U-52	60921

Time (24hr)	Volume Removed (Liters)	Temp. (°C)	pH	Spec. Cond. (μS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Drawdown (feet)	Color/Odor
0815	1.5	26.38	7.83	5.70	4.24	214	429	200	27.95	None
0820	2.5	26.15	8.12	5.65	4.02	198	376	200	27.95	None
0825	3.5	25.92	8.26	5.67	4.36	179	272	200	27.95	None
0830	4.5	25.79	8.29	5.65	3.96	170	220	200	27.95	None
0835	5.5	25.80	8.28	5.64	3.93	167	105	200	27.95	None
0840	6.5	25.78	8.28	5.64	3.92	162	59	200	27.95	None
0845	7.5	25.74	8.29	5.65	3.94	157	52	200	27.95	None
0850	8.5	25.76	8.28	5.65	3.89	152	54	200	27.95	None

d. Acceptance criteria pass/fail   Yes   No   N/A (continued on back)

Have parameters stabilized ☑ Yes ☐ No ☐ N/A

If no or N/A - Explain below.

3. SAMPLE COLLECTION: Method: Low flow Bladder Pump

Sample ID	Container Type	No. of Containers	Preservation	Analysis Req.	Time
NERT4.7151	250 Poly	1	HNO3	Dis Cr	0850
	250 Poly	1	None	Perchlorate, Cl, Br, TDS	0850
	125 Poly Amber	1	EPA	Chlorate	0850
	Amber 250 Poly	1	Am Sulfate	Cr 6	0850

Comments: None

Signature: [signature]   Date: 7/10/18

AECOM

Well ID: NERT4.7351

Low-Flow Ground Water Sample Collection Record

Client: NERT Date: 7/10/18 Time: Start 1315 am/pm
Project No: 60477365 Finish 1345 am/pm
Site Location: NERT LVW
Weather Conds: Clear, Sunny, Humid 95° Collector(s): GC/EW

1. WATER LEVEL DATA: (measured from Top of Casing)

a. Total Well Length 50.35 c. Length of Water Column 23.44 (a-b) Casing Diameter/Material 4" PVC

b. Water Table Depth 26.91 d. Calculated System Volume (see back) 26.91 1X 50.35 3X

2. WELL PURGE DATA

a. Purge Method: Low flow Bladder Pump Pump @ 45'

b. Acceptance Criteria defined (see workplan)

- Temperature	± 2°C	-D.O.	0.3 mg/l
- pH	± 0.1 unit	Turbidity	10% if NTU reading is > 10 NTUs
- Sp. Cond.	± 3%	ORP	± 10 milivolts

c. Field Testing Equipment used:

Make	Model	Serial Number
Horiba	U-52	60821

Time (24hr)	Volume Removed (Liters)	Temp. (°C)	pH	Spec. Cond. (μS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Drawdown (feet)	Color/Odor
1320	0.5	33.93	7.33	4.49	4.27	141	92.0	200	26.93	None
1325	1.5	30.94	7.11	4.50	3.01	152	42.5	200	26.93	None
1330	2.5	30.22	7.09	4.48	2.71	153	24.4	200	26.93	None
1335	3.5	29.71	7.10	4.50	2.62	154	12.6	200	26.93	None
1340	4.5	28.58	7.10	4.60	2.71	151	8.9	200	26.93	None
1345	5.5	28.73	7.10	4.58	2.70	151	5.5	200	26.93	None
				Sampled		1350				

d. Acceptance criteria pass/fail Yes No N/A (continued on back)

Have parameters stabilized ☐ ☐ ☐

If no or N/A - Explain below.

3. SAMPLE COLLECTION: Method: Low flow bladder Pump

Sample ID	Container Type	No. of Containers	Preservation	Analysis Req.	Time
NERT	250 Poly	1	HNO3	D. Cr	1350
4.7351	250 Poly	1	None	Perchlorate, Cl, Br, TDS	
	125 Poly Amber	1	EDA	Chlorate	
	4oz Poly	1	Am Sulfate	Cr6	

Comments Collect Field duplicate, Equipment Blank, & Field Blank

Signature [signature] Date 7/10/18

AECOM

Well ID: NERTS.1151

Low-Flow Ground Water Sample Collection Record

Client: NERT Date: 7/10/18 Time: Start 1505 am/pm
Project No: 60477365 Finish 1550 am/pm
Site Location: NERT LVW
Weather Conds: Clear, Humid, Hot ~100 Collector(s): AL/EW

1. WATER LEVEL DATA: (measured from Top of Casing)

a. Total Well Length 44.95 c. Length of Water Column 25.11 (a-b) Casing Diameter/Material 4" PVC

b. Water Table Depth 19.84 d. Calculated System Volume (see back) 16.39 L / 49.17 L 3

2. WELL PURGE DATA

a. Purge Method: Low Flow Bladder Pump Pump @ 40'

b. Acceptance Criteria defined (see workplan)

- Temperature	± 2°C	-D.O.	0.3 mg/l
- pH	± 0.1 unit	Turbidity	10% if NTU reading is > 10 NTUs
- Sp. Cond.	± 3%	ORP	± 10 milivolts

c. Field Testing Equipment used:

Make	Model	Serial Number
Horiba	U-52	60821

Time (24hr)	Volume Removed (Liters)	Temp. (°C)	pH	Spec. Cond. (µS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Drawdown (feet)	Color/Odor
1505	0.25	33.53	7.10	4.72	2.91	140	206	200	19.86	None
1510	1.25	29.50	6.97	5.03	0.91	138	117	200	19.86	None
1515	2.25	27.72	6.96	5.09	0.72	131	54.9	200	19.86	None
1520	3.25	26.76	7.00	5.16	0.63	122	42.1	200	19.86	None
1525	4.25	26.50	7.02	5.18	0.57	115	26.7	200	19.86	None
1530	5.25	26.37	7.02	5.19	0.56	112	21.4	200	19.86	None
1535	6.25	26.01	7.03	5.26	0.72	102	16.4	200	19.86	None
1540	7.25	25.96	7.04	5.27	0.58	102	16.7	200	19.86	None

d. Acceptance criteria pass/fail Yes No N/A (continued on back)

Have parameters stabilized ☒ Yes ☐ No ☐ N/A

If no or N/A - Explain below.

3. SAMPLE COLLECTION: Method: Low flow bladder pump

Sample ID	Container Type	No. of Containers	Preservation	Analysis Req.	Time
NERTS.1151	250 Poly	1	HNO3	Dis Cr	1545
	250 Poly	1	None	Perchlorate, Br, Cl, TDS	
	125 Poly Amber	1	EDA	Chlorate	
	4oz Poly	1	Am Sulfate	Cr 6	

Comments None

Signature [signature] Date 7/10/18

AECOM

Well ID: NERT5.4991

Low-Flow Ground Water Sample Collection Record

Client: NERT — Date: 7/16/18 — Time: Start 1030 am/pm

Project No: 60477365 — Finish 1120 am/pm

Site Location: LVW

Weather Conds: Few clouds, light breeze, Hot ~ 100° + 26% humidity — Collector(s): JC / EW

1. WATER LEVEL DATA: (measured from Top of Casing)

a. Total Well Length 39.95 — c. Length of Water Column 13.63 (a-b) — Casing Diameter/Material 4" PVC

b. Water Table Depth 26.32 — d. Calculated System Volume (see back) 8.90 x 1 / 26.70 x 3

2. WELL PURGE DATA

a. Purge Method: Low flow bladder Pump — Pump @ 35'

b. Acceptance Criteria defined (see workplan)

- Temperature	± 2°C	-D.O.	0.3 mg/l
- pH	± 0.1 unit	Turbidity	10% if NTU reading is > 10 NTUs
- Sp. Cond.	± 3%	ORP	± 10 milivolts

c. Field Testing Equipment used:

Make	Model	Serial Number
Horiba	U-52	60821

Time (24hr)	Volume Removed (Liters)	Temp. (°C)	pH	Spec. Cond. (µS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Drawdown (feet)	Color/Odor
1035	1.0	34.32	7.73	1.57	1.49	137	69.4	200	26.30	Clear/None
1040	2.0	33.93	7.89	1.53	0.69	137	62.5	200	26.30	"
1045	3.0	33.78	7.93	1.54	0.63	137	57.9	200	26.30	"
1050	4.0	33.62	7.96	1.53	0.59	137	58.4	200	26.30	"
1055	5.0	33.31	7.95	1.54	0.54	138	49.7	200	26.30	"
1100	6.0	33.23	7.94	1.55	0.53	138	44.5	200	26.30	"
1105	7.0	33.25	7.94	1.53	0.49	139	45.1	200	26.30	"
1110	Sampled				JC 7/16/18					

d. Acceptance criteria pass/fail — Yes / No / N/A

(continued on back)

Have parameters stabilized — Yes ☑ No ☐ N/A ☐

If no or N/A - Explain below.

Turb > 10 NTU but stable

3. SAMPLE COLLECTION: Method: Low flow bladder Pump

Sample ID	Container Type	No. of Containers	Preservation	Analysis Req.	Time
NERT5.4991-20180716	250 mL Poly	1	HNO3	Dis Cr	1110
	250 mL Poly	1	None	Perchlorate, Br, Cl, TDS	1110
	125 mL Poly Amber	1	EDA	Chlorate	1110
	400 mL Poly	1	Am Sulfate	Cr6	1110

Comments: None

Signature: [signature] — Date: 7/16/18

AECOM

Well ID: NERT5.91S1

Low-Flow Ground Water Sample Collection Record

Client: NERT Date: 7/16/18 Time: Start 0905 am/pm
Project No: ~~Han~~ 60477365 Finish 0950 am/pm
Site Location: LWW
Weather Conds: few clouds, light Breeze, ~95° Collector(s): JC / EW

1. WATER LEVEL DATA: (measured from Top of Casing)

a. Total Well Length 49.90 c. Length of Water Column 37.3 (a-b) Casing Diameter/Material 4" PVC

b. Water Table Depth 12.61 d. Calculated System Volume (see back) 24.34 x 1 / 73.02 x 3

2. WELL PURGE DATA

a. Purge Method: Low Flow Bladder Pump Pump @ 45'

b. Acceptance Criteria defined (see workplan)

- Temperature	± 2°C	-D.O.	0.3 mg/l
- pH	± 0.1 unit	Turbidity	10% if NTU reading is > 10 NTUs
- Sp. Cond.	± 3%	ORP	± 10 milivolts

c. Field Testing Equipment used:

Make	Model	Serial Number
Horiba	U52	60821

Time (24hr)	Volume Removed (Liters)	Temp. (°C)	pH	Spec. Cond. (µS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Drawdown (feet)	Color/Odor
0910	1.0	30.29	7.38	3.82	1.35	170	47.8	200	12.86	None / None
0915	1.75	29.79	7.44	2.63	1.29	168	34.8	150	12.90	"
0920	2.5	30.71	7.54	2.54	0.79	166	36.1	150	12.90	"
0925	3.25	30.98	7.58	2.49	0.71	163	38.4	150	12.90	"
0930	4.00	31.04	7.63	2.50	0.68	159	38.4	150	12.91	"
0935	4.75	31.09	7.62	2.48	0.57	154	39.2	150	12.91	"
0940	—	Sampled			JC 7/16/18					

Reduce flow Rate

d. Acceptance criteria pass/fail Yes ~~No~~ N/A (continued on back)

Have parameters stabilized ☑ ☐ ☐

If no or N/A - Explain below.
Turb > 10 NTU but stable

3. SAMPLE COLLECTION: Method: Low flow Bladder Pump

Sample ID	Container Type	No. of Containers	Preservation	Analysis Req.	Time
NERT5.91S1-20180716	250 mL Poly	1	HNO3	Dis Cr	0940
	250 mL Poly	1	None	Perchlorate, Cl, Br, TDS	0940
	125 mL Poly Amber	1	EDA	Chlorate	0940
	400 mL Poly	1	Am Sulfate	Cr 6	0940

Comments: None

Signature ________ Date 7/16/18

Well ID: WMW3.5N

AECOM

Low-Flow Ground Water Sample Collection Record

Client: NERT | Date: 7/17/18 | Time: Start 7:55 am/pm
Project No: 60477365 | Finish 0955 am/pm
Site Location: LVW
Weather Conds: Few cloud, Hot, Humid | Collector(s): AE / EW

1. WATER LEVEL DATA: (measured from Top of Casing)

a. Total Well Length 55.90 c. Length of Water Column 20.73 (a-b) Casing Diameter/Material 2" PVC

b. Water Table Depth 35.17 d. Calculated System Volume (see back) 3.39 L

16.141 x 3

2. WELL PURGE DATA

a. Purge Method: Low flow Bladder Pump   Pump @ 50'

b. Acceptance Criteria defined (see workplan)

- Temperature	± 2°C	-D.O.	0.3 mg/l
- pH	± 0.1 unit	Turbidity	10% if NTU reading is > 10 NTUs
- Sp. Cond.	± 3%	ORP	± 10 milivolts

c. Field Testing Equipment used:

Make	Model	Serial Number
Horiba	U-52	60821

Time (24hr)	Volume Removed (Liters)	Temp. (°C)	pH	Spec. Cond. (µS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Drawdown (feet)	Color/Odor
0805	1.5	30.81	7.35	6.52	2.27	214	>1000	150	35.15	Red/Brown/None
0820	4.5	27.71	7.14	6.78	0.82	216	>1000	200	35.15	Red Brown/None
0835	7.5	27.67	7.15	6.45	1.54	213	947	200	35.15	Red Brown/None
0850	10.5	27.25	7.12	6.55	1.12	217	563	200	35.15	Red Brown/None
0900	12.5	27.37	7.12	6.42	1.05	213	684	200	35.15	Red Brown/None
0915	15.5	28.17	7.14	6.24	1.13	197	>1000	200	35.15	Red Brown/None
0925	17.5	29.05	7.11	6.25	1.03	196	>1000	200	35.15	Red Brown/None
0930	18.5	29.11	7.11	6.21	1.04	195	>1000	200	35.15	Red Brown/None

increase flow rate

d. Acceptance criteria pass/fail Yes No N/A

(continued on back) Below

Have parameters stabilized ☐ Yes ☑ No ☐ N/A

If no or N/A - Explain below.

Turbidity would not clear up - rest of parameters stable ~2 casing volume purged

3. SAMPLE COLLECTION: Method: Low flow - bladder Pump

Sample ID	Container Type	No. of Containers	Preservation	Analysis Req.	Time
WMW3.5N-20180717	250 mL Poly	1	None	Perchlorate	0945
	250 mL Poly	1	EDA	Chlorate	0945

Comments: Well in good shape - lock present & secure

Signature [illegible] Date 7/17/18

0935	19.5	29.15	7.11	6.21	1.05	195	>1000	200	35.15	Red Brown/None
0940	20.5	29.13	7.11	6.23	1.01	196	>1000	200	35.15	Red Brown/None
0945	Sampled									

AE 7/17/18

AECOM

Well ID: WMW3.5S

Low-Flow Ground Water Sample Collection Record

Client: NERT
Date: 7/16/14
Time: Start 0745 am/pm
Project No: 60477368
Finish 0830 am/pm
Site Location: LVW
Weather Conds: Few clouds, light Breeze, ~90° 30% Humidity
Collector(s): JL / EW

1. WATER LEVEL DATA: (measured from Top of Casing)

a. Total Well Length 60.05
c. Length of Water Column 16.74 (a-b)
Casing Diameter/Material 2" PVC

b. Water Table Depth 43.31
d. Calculated System Volume (see back) 2.73 x 1 8.19 x 3

2. WELL PURGE DATA

a. Purge Method: Low flow Bladder Pump Pump @ 55'

b. Acceptance Criteria defined (see workplan)

- Temperature	± 2°C	-D.O.	0.3 mg/l
- pH	± 0.1 unit	Turbidity	10% if NTU reading is > 10 NTUs
- Sp. Cond.	± 3%	ORP	± 10 milivolts

c. Field Testing Equipment used:

Make	Model	Serial Number
Horiba	U-52	60821

Time (24hr)	Volume Removed (Liters)	Temp. (°C)	pH	Spec. Cond. (µS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Drawdown (feet)	Color/Odor
0750	1.0	29.22	6.90	3.83	1.41	209	77.1	200	43.32	None / None
0755	2.0	28.71	7.08	3.73	0.94	195	29.4	200	43.32	"
0800	3.0	29.27	7.09	3.69	0.65	183	15.9	200	43.33	"
0805	4.0	29.10	7.09	3.67	0.59	179	10.6	200	43.30	"
0810	5.0	29.17	7.10	3.71	0.59	177	9.2	200	43.30	"
0815	6.0	29.29	7.11	3.68	0.57	178	7.7	200	43.30	"
0820	7.0	29.12	7.11	3.69	0.55	179	7.4	200	43.32	"
Sampled										

d. Acceptance criteria pass/fail Yes No N/A

(continued on back)

Have parameters stabilized ☑ ☐ ☐

If no or N/A - Explain below.

3. SAMPLE COLLECTION: Method: Low flow - bladder pump

Sample ID	Container Type	No. of Containers	Preservation	Analysis Req.	Time
WMW3.5S-20140716	250 mL Poly	1	None	Perchlorate	0820
	125 mL Poly Amber	1	EDA	Chlorate	0820

Comments: well in good shape, 1 1/4" lock present & damaged

Signature [signature] Date 7/16/14

AECOM

Well ID: WMW4.9N

Low-Flow Ground Water Sample Collection Record

Client: NERT Date: 7/17/18 Time: Start 1145 am/pm
Project No: 60477365 Finish 1250 am/pm
Site Location: LVW
Weather Conds: Sunny, breezy, Hot ~105 Collector(s): GC/EW

1. WATER LEVEL DATA: (measured from Top of Casing)

a. Total Well Length 53.15 c. Length of Water Column 21.57 (a-b) Casing Diameter/Material 2" PVC

b. Water Table Depth 31.58 d. Calculated System Volume (see back) 3.52 L
10.56 x 3

2. WELL PURGE DATA

a. Purge Method: low flow bladder pump pump @ 48'

b. Acceptance Criteria defined (see workplan)

- Temperature	± 2°C	-D.O.	0.3 mg/l
- pH	± 0.1 unit	Turbidity	10% if NTU reading is > 10 NTUs
- Sp. Cond.	± 3%	ORP	± 10 milivolts

c. Field Testing Equipment used:

Make	Model	Serial Number
Horiba	U-52	60821

Time (24hr)	Volume Removed (Liters)	Temp. (°C)	pH	Spec. Cond. (µS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Drawdown (feet)	Color/Odor
1150	1.0	33.71	7.33	3.07	2.66	155	>1000	200	31.54	Red brown/None
1200	3.0	29.54	7.17	3.14	1.23	174	876	200	31.54	Red Brown/None
1210	5.0	28.84	7.13	3.16	1.19	174	474	200	31.54	" "
1220	7.0	28.70	7.14	3.16	1.12	174	277	200	31.54	cloudy/None
1225	8.0	28.32	7.15	3.17	1.10	173	179	200	31.54	clear/None
1230	9.0	28.25	7.16	3.17	1.09	173	173	200	31.54	clear/None
1235	10.0	28.39	7.15	3.17	1.09	174	181	200	31.54	" "
Sampled				GC 7/17/18						

d. Acceptance criteria pass/fail Yes No N/A (continued on back)

Have parameters stabilized ☑ Yes ☐ No ☐ N/A

If no or N/A - Explain below. Turb >10 NTUs but stable

3. SAMPLE COLLECTION: Method: low flow bladder pump

Sample ID	Container Type	No. of Containers	Preservation	Analysis Req.	Time
WMW4.9N-20180717	250 mL Poly	1	None	Perchlorate	1240
	125 mL Poly Amber	1	EDA	Chlorate	1240

Comments: well in good shape & secure w/ lock

Signature: [signature] Date: 7/17/18

AECOM

Well ID: ~~MWM-4.9S~~ WMW 4.9S

Low-Flow Ground Water Sample Collection Record

Client: NERT Date: 7/13/18 Time: Start 1245 am/pm
Project No: 60477365 Finish 1400 am/pm
Site Location: LVW
Weather Conds: Sunny, hot, humid - 95°   Collector(s): JQ /EW

1. WATER LEVEL DATA: (measured from Top of Casing)

a. Total Well Length 47.05   c. Length of Water Column 20.85 (a-b)   Casing Diameter/Material 4" PVC

b. Water Table Depth 26.20   d. Calculated System Volume (see back) 13.6 x 1 / 40.8 x 3

2. WELL PURGE DATA

a. Purge Method: Low flow bladder pump   Pump @ 42'

b. Acceptance Criteria defined (see workplan)

- Temperature	± 2°C	-D.O.	0.3 mg/l
- pH	± 0.1 unit	Turbidity	10% if NTU reading is > 10 NTUs
- Sp. Cond.	± 3%	ORP	± 10 milivolts

c. Field Testing Equipment used:

Make	Model	Serial Number
Horiba	U52	6A821

Time (24hr)	Volume Removed (Liters)	Temp. (°C)	pH	Spec. Cond. (µS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Drawdown (feet)	Color/Odor
1250	1.0	37.17	7.42	2.88	3.86	75	3.91	200	26.21	Clear / None
1300	3.0	35.96	7.27	2.56	1.26	53	124	200	26.21	clear / None
1305	4.0	34.45	7.30	2.53	1.15	62	49.4	200	26.21	"
1310	5.0	34.31	7.31	2.54	1.16	65	52.2	200	26.21	"
1350	6.0	34.28	7.31	2.53	1.10	64	44.3	200	26.21	"
1355	Sampled									
					JQ 7/13/18					

d. Acceptance criteria pass/fail   Yes   No   N/A   (continued on back)

Have parameters stabilized ☑ ☐ ☐

If no or N/A - Explain below.

Turb > 10 NTUs but stable

3. SAMPLE COLLECTION: Method: Low flow bladder pump

Sample ID	Container Type	No. of Containers	Preservation	Analysis Req.	Time
MWM4.95-20180713	250 mL Poly	1	None	Perchlorate	1355
	125 mL Poly	1	EDA	Chlorate	1355
	+ Field duplicate MWM4.9S-20180713-FD				1355

Comments well in good shape, ~~Ak~~ lock present & secure

Signature [signature]   Date 7/13/18

AECOM

Well ID: WMW-5.55S

Low-Flow Ground Water Sample Collection Record

Client: NERT Date: 7/13/18 Time: Start 0955 am/pm
Project No: 60477365 Finish 1035 am/pm
Site Location: LVW
Weather Conds: Cloudy, warm, humid, calm 82° Collector(s): JC / EW

1. WATER LEVEL DATA: (measured from Top of Casing)

a. Total Well Length 38.51 c. Length of Water Column 24.96 (a-b) Casing Diameter/Material 4" PVC

b. Water Table Depth 13.55 d. Calculated System Volume (see back) 16.29 x1 / 4887 x3

2. WELL PURGE DATA

a. Purge Method: Low flow - bladder Pump Pump @ 33.5'

b. Acceptance Criteria defined (see workplan)

- Temperature	± 2°C	-D.O.	0.3 mg/l
- pH	± 0.1 unit	Turbidity	10% if NTU reading is > 10 NTUs
- Sp. Cond.	± 3%	ORP	± 10 milivolts

c. Field Testing Equipment used: Make: Horiba Model: U-52 Serial Number: 60821

Time (24hr)	Volume Removed (Liters)	Temp. (°C)	pH	Spec. Cond. (µS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Drawdown (feet)	Color/Odor
1000	~~initial~~ 1.0	31.58	7.43	3.84	4.40	149	57.5	200	13.59	Clear / None
1010	3.0	31.19	7.27	3.57	3.46	160	13.9	200	13.59	Clear / None
1015	4.0	30.58	7.22	3.51	3.36	164	11.2	200	13.59	"
1020	5.0	30.49	7.19	3.59	3.28	166	11.5	200	13.59	"
1025	6.0	30.50	7.23	3.58	3.33	164	11.2	200	13.59	"
1030	—	Sampled								
					JC 7/13/18					

d. Acceptance criteria pass/fail Yes No N/A (continued on back)

Have parameters stabilized ☑ Yes ☐ No ☐ N/A

If no or N/A - Explain below. Turb >10 NTU but stable

3. SAMPLE COLLECTION: Method: Low flow bladder Pump

Sample ID	Container Type	No. of Containers	Preservation	Analysis Req.	Time
WMW-5.55S-20180713	250 mL Poly	1	None	Perchlorate	1030
	125 mL Poly	1	EDA	Chlorate	1030

Comments: Well in good shape - no lock present

Signature [signature] Date 7/13/18

AECOM

Well ID: WMW 5.58 S1

Low-Flow Ground Water Sample Collection Record

Client: NERT
Date: 7/13/18
Time: Start 1100 am/pm
Finish 1230 am/pm
Project No: 60477365
Site Location: LVW
Weather Conds: Calm, Sunny, Humid
Collector(s): AC / EW

1. WATER LEVEL DATA: (measured from Top of Casing)

a. Total Well Length 48.60
c. Length of Water Column 32.0 (a-b)
Casing Diameter/Material 2" PVC

b. Water Table Depth 16.60
d. Calculated System Volume (see back) 5.22 + 1 48.6 x 3

2. WELL PURGE DATA

a. Purge Method: Low flow - bladder pump   Pump @ 43.5'

b. Acceptance Criteria defined (see workplan)

- Temperature	±2°C	-D.O.	0.3 mg/l
- pH	±0.1 unit	Turbidity	10% if NTU reading is > 10 NTUs
- Sp. Cond.	±3%	ORP	± 10 milivolts

c. Field Testing Equipment used:

Make	Model	Serial Number
Horiba	U-52	60821

Time (24hr)	Volume Removed (Liters)	Temp. (°C)	pH	Spec. Cond. (µS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Drawdown (feet)	Color/Odor
1105	~~35.91~~	35.91	7.70	4.78	2.97	61	>1000	200	16.85	Brown / None
1120	4.0	33.88	7.46	4.28	0.62	-59	>1000	200	17.30	Brown / None
1130	5.5	33.54	7.52	4.49	0.77	-82	950	150	17.31	"
1145	7.75	33.26	7.45	4.48	0.73	-93	879	150	17.31	"
1200	10.0	34.26	7.53	4.36	0.59	-80	536	150	17.31	"
1205	10.75	34.53	7.53	4.39	0.54	-80	519	150	17.31	"
1210	11.50	34.53	7.53	4.32	0.57	-79	491	150	17.31	"
1215	12.25	34.55	7.52	4.33	0.54	-79	498	150	17.31	"

Reduce flow

d. Acceptance criteria pass/fail — Yes / No / N/A

(continued on back)

Have parameters stabilized — Yes ☑ No ☐ N/A ☐

If no or N/A - Explain below.
Turb >10 NTU but stable

3. SAMPLE COLLECTION: Method: Low flow - bladder pump

Sample ID	Container Type	No. of Containers	Preservation	Analysis Req.	Time
WMW5.58S1	250 mL Poly	1	None	Perchlorate	1220
	125 mL Poly Amber	1	EDA	chlorate	1220

Comments: well in good shape, secure w/ lock

Signature ____________ Date 7/13/18

AECOM

Well ID: WMW5.7N

Low-Flow Ground Water Sample Collection Record

Client: NERT	Date: 7/17/18	Time: Start 1325 am/pm
Project No: 60477365		Finish 1400 am/pm
Site Location: LVW		
Weather Conds: Hot, still, humid	Collector(s): JC / EW	

1. WATER LEVEL DATA: (measured from Top of Casing)

a. Total Well Length 21.20 c. Length of Water Column 12.84 (a-b) Casing Diameter/Material 4" PVC

b. Water Table Depth 8.36 d. Calculated System Volume (see back) 8.38 x 1 25.14 x 3

2. WELL PURGE DATA

a. Purge Method: Low flow bladder Pump pump e 16'

b. Acceptance Criteria defined (see workplan)

- Temperature	± 2°C	-D.O.	0.3 mg/l
- pH	± 0.1 unit	Turbidity	10% if NTU reading is > 10 NTUs
- Sp. Cond.	± 3%	ORP	± 10 milivolts

c. Field Testing Equipment used:

Make	Model	Serial Number
Horiba	U-52	60921

Time (24hr)	Volume Removed (Liters)	Temp. (°C)	pH	Spec. Cond. (µS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Drawdown (feet)	Color/Odor
1330	1.0	34.06	7.21	2.28	1.69	194	5.9	200	8.38	clear/None
1335	2.0	32.72	7.13	2.31	0.53	185	0.0	200	8.38	"
1340	3.0	32.60	7.14	2.32	0.47	178	0.0	200	8.38	"
1345	4.0	32.71	7.14	2.32	0.48	174	0.0	200	8.38	"
1350	— Sampled									

d. Acceptance criteria pass/fail Yes No N/A (continued on back)

Have parameters stabilized ☒ ☐ ☐

If no or N/A - Explain below.

3. SAMPLE COLLECTION: Method: Low flow bladder Pump

Sample ID	Container Type	No. of Containers	Preservation	Analysis Req.	Time
WMW5.7N-20180717	250 mL poly	1	None	Perchlorate	1350
	250 mL poly amber	1	EDA	Chlorate	1350

Comments well in good shape & secure

Signature [signature] Date 7/17/18

Appendix H

Geophysical Logging Report

NERT REMEDIAL INVESTIGATION
BOREHOLE GEOPHYSICS

LAS VEGAS WASH
HENDERSON, NEVADA

GEO*Vision* Project No. 18028

Prepared for

AECOM
1220 Avenida Acaso
Camarillo, CA 93012
(805) 764-4031

Prepared by

GEO*Vision* Geophysical Services
1124 Olympic Drive
Corona, CA 92881
(951) 549-1234

Report 18028-01 rev 1

August 14, 2018

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APPENDICES

APPENDIX A **DUAL INDUCTION AND NATURAL GAMMA QUALITY ASSURANCE LOGS**

INTRODUCTION

Geophysical measurements were taken in nine preexisting 4 inch monitoring wells in Las Vegas Wash near Henderson, Nevada as part of the Nevada Environmental Response Trust (NERT) Remedial Investigation Downgradient Study Area. Data acquisition was performed on July 19, 2018 and July 20, 2018. The work was performed for AECOM, Project Number: 60477365. Data analysis and report were reviewed by a **GEO***Vision* Professional Geophysicist or Engineer.

SCOPE OF WORK

This report presents the results of dual induction and natural gamma logs collected in nine cased boreholes, as detailed in Table 1. The purpose of these studies was to supplement stratigraphic information.

Table 1: Borehole logging dates and locations

BOREHOLE DESIGNATION	DATES LOGGED	COORDINATES – DEGREES [1]	
		LATITUDE	LONGITUDE
NERT3.80S1	7/20/2017	36.09491	-114.94855
NERT4.21N1	7/20/2017	36.09543	-114.95664
NERT4.38N1	7/20/2017	36.09596	-114.95992
NERT4.51S1	7/19/2017	36.09244	-114.96063
NERT4.71S1	7/19/2017	36.09106	-114.96452
NERT4.93S1	7/19/2017	36.09009	-114.96795
NERT5.11S1	7/19/2017	36.08981	-114.97078
NERT5.49S1	7/19/2017	36.08831	-114.97652
NERT5.91S1	7/19/2017	36.08702	-114.98289

[1] Coordinates provided by AECOM

INSTRUMENTATION

Induction / Natural Gamma Instrumentation

Formation conductivity and natural gamma data were collected using a dual induction (DUIN) probe manufactured by Robertson Geologging, Ltd (RG). The probe is 7.5 feet long, and 1.5 inches in diameter.

This probe is most often used to assist with

- Bed boundary identification
- Strata correlation between borings
- Strata geometry and type (shale indication)

The probe receives control signals from, and sends the digitized measurement values to, a RG Micrologger II (ML) on the surface via an armored multi-conductor cable. The cable is wound onto the drum of a winch and is used to support the probe. To provide probe depth data, cable travel is measured using a sheave of known circumference fitted with a digital rotary encoder. The probe and depth data are transmitted by USB link from the ML unit to a laptop computer where it is displayed and stored.

An electromagnetic (EM) induction probe consists of transmitter and receiver coils. An alternating current is applied to the transmitter coil, causing the coil to radiate a primary EM field. This primary EM field generates eddy currents in subsurface materials, which give rise to a secondary EM field. The secondary EM field is measured as an alternating current in the receiver coils, which is proportional to formation conductivity. The probe coil spacing is optimized to achieve high vertical resolution, minimal borehole influence and large radius of investigation. The RG dual induction probe has effective coil spacings of 1.6 and 2.6 feet, operates at a frequency of 39 kHz, has 1 millisiemens/meter resolution, and operates over a 5 to 3000 millisiemens/meter conductivity range.

Natural gamma measurements rely on small quantities of radioactive material contained in soil and rock to emit gamma radiation as they decay. Trace amounts of uranium and thorium are present in a few minerals; additionally potassium-bearing minerals such as feldspar, mica and clays will include traces of a radioactive isotope of potassium. This radiation is detected by scintillation, which is the production of a tiny flash of light when gamma rays strike a crystal of sodium iodide. The light is converted into an electrical pulse by a photomultiplier tube. Pulses above a threshold value of 60 KeV are counted by the probe's microprocessor. The measurement is useful because the radioactive elements are concentrated in certain soil and rock types, e.g. clay or shale, and depleted in others, e.g. sandstone or coal.

MEASUREMENT PROCEDURES

Geophysical data were acquired in nine preexisting 4 inch PVC monitoring wells. The monitoring wells were advanced at a nominal 8 inch diameter, prior to being completed. The DUIN probe can acquire data in uncased and PVC cased boreholes with or without fluid, thus ideal for this investigation.

Induction / Natural Gamma Measurement Procedures

Measurement procedures followed these ASTM standards:

- ASTM D5753-05 (Re-approved 2010), "Planning and Conducting Boring Geophysical Logging"
- ASTM D6274-10, "Conducting Boring Geophysical Logging – Gamma"
- ASTM D6726-01 (Re-approved 2007), "Conducting Boring Geophysical Logging – Electromagnetic Induction"

Prior to logging, measurement depths were referenced to ground surface. This was done by placing the top of the probe even with a stationary reference point, such as the top of monitoring well surface completion, and the electronic depth counter set to the probe length minus the height of the reference point. The calculations were recorded on field logs. Offset distances between probe tip and measurement points are corrected by the data acquisition software. Initially, the probe was lowered to the bottom of the boring, stopped, then returned to surface while acquiring data. Typically, probe ascent is approximately 15 feet/minute, collecting data continuously at 0.05-foot spacing. For this investigation, logs were run twice in each boring for quality assurance. All logging runs are summarized in Table 2.

This probe is not calibrated in the field, as it is used to provide qualitative measurements, not quantitative values, and is used only to assist in picking transitions between stratigraphic units, as described in ASTM D5753-05 (Reapproved 2010), "Planning and Conducting Borehole Geophysical Logging". However, functional tests were performed prior to logging the first borehole and after logging the last borehole to ascertain functionality throughout the project. This is accomplished by securing a coil with an effective conductivity around the probe and then comparing and recording the output of the system.

Natural gamma is not calibrated in the field, as it is a qualitative measurement, not a quantitative value, and is used only to assist in picking transitions between stratigraphic units, as described in ASTM D6274-10, “Conducting Borehole Geophysical Logging – Gamma”.

At the completion of each logging run, the probe zero depth indication at the depth reference point was verified prior to removal from the boring.

DATA ANALYSIS

Induction / Natural Gamma Analysis

No analysis is required for these data; however depths to identifiable boring log features, such as distinct natural gamma transitions, were compared to verify consistent depth readings on all logs. Using WellCAD™ software version 5.2, data are shifted and trimmed, as need, then plotted as adjacent line logs. The final logs are then exported as LAS 2.0 format and saved as PDF.

RESULTS

Induction / Natural Gamma Results

Induction and natural gamma data for the nine monitoring wells are presented in Figure 1 through Figure 9, respectively. The repeat, second, or QA logs, plotted coincidently with the initial logs are presented in Figures A1 through A9 in Appendix A. Generally, all logged borings exhibit an increase in conductivity with depth. There is some indication of formational and or stratigraphic variability in individual monitoring wells, evidenced by conductivity inflections between 20 to 35 feet in NERT421N1, Figure 8.

Depths on all figures and tables are referenced to ground surface. LAS 2.0 data (initial and QA) for each borehole as well as PDF files of initial and QA logs accompany this report.

SUMMARY

Discussion of Induction / Natural Gamma Results

Generally, conductivity and natural gamma data were of good quality. Long and short conductivity profiles provide a good indication of interbedding or interfaces, showing changes in conductivity that correspond with changes in natural gamma. Generally, all logged borings have an increase in conductivity with depth. There is some indication of formational and/or stratigraphic variability within individual boreholes. Repeat logs are near identical to the initial logs, with minor variability mostly in natural gamma, which is expected. Results support the validity and functionality of the method applied.

Quality Assurance

These geophysical measurements were performed using industry-standard or better methods for measurements and analyses. All work was performed under **GEO***Vision* quality assurance procedures, which include:

- Use of standard field data logs
- Use of equipment functional testing prior to logging to ascertain tools are working within manufacturer specifications.
- Independent review of results by a California professional geophysicist or engineer.

CERTIFICATION

All geophysical data, analysis, interpretations, conclusions, and recommendations in this document have been prepared under the supervision of and reviewed by a **GEO***Vision* California Professional Geophysicist.

Prepared by:

August 14, 2018

J. Jonathan Jordan Date
Staff Geophysicist
GEO*Vision* Geophysical Services

Approved by:

August 14, 2018

Victor Gonzalez Date
California Professional Geophysicist, PGp. 1074
GEO*Vision* Geophysical Services

∗ This geophysical investigation was conducted under the supervision of a California Professional Geophysicist using industry standard methods and equipment. A high degree of professionalism was maintained during all aspects of the project from the field investigation and data acquisition, through data processing, interpretation and reporting. All original field data files, field notes and observations, and other pertinent information are maintained in the project files and are available for the client to review for a period of at least one year.

A professional geophysicist's certification of interpreted geophysical conditions comprises a declaration of his/her professional judgment. It does not constitute a warranty or guarantee, expressed or implied, nor does it relieve any other party of its responsibility to abide by contract documents, applicable codes, standards, regulations or ordinances.

Table 2. Logging dates and depth ranges

BOREHOLE DESIGNATION	TOOL AND RUN NUMBER	DEPTH RANGE (FEET)	SAMPLE INTERVAL (FEET)	DATE LOGGED
NERT3.80S1	INDUCTION/NGAMMA 01	4.2 – 19.0	0.05	7/20/2018
NERT3.80S1	INDUCTION/NGAMMA 02	4.2 – 19.0	0.05	7/20/2018
NERT4.21N1	INDUCTION/NGAMMA 01	4.5 – 51.0	0.05	7/20/2018
NERT4.21N1	INDUCTION/NGAMMA 02	4.5 – 51.0	0.05	7/20/2018
NERT4.38N1	INDUCTION/NGAMMA 01	4.0 – 36.1	0.05	7/20/2018
NERT4.38N1	INDUCTION/NGAMMA 02	4.0 – 36.1	0.05	7/20/2018
NERT4.51S1	INDUCTION/NGAMMA 01	4.0 – 46.7	0.05	7/19/2018
NERT4.51S1	INDUCTION/NGAMMA 02	4.0 – 46.7	0.05	7/19/2018
NERT4.71S1	INDUCTION/NGAMMA 01	3.5 – 43.8	0.05	7/19/2018
NERT4.71S1	INDUCTION/NGAMMA 02	3.5 – 43.8	0.05	7/19/2018
NERT4.93S1	INDUCTION/NGAMMA 01	3.7 – 50.5	0.05	7/19/2018
NERT4.93S1	INDUCTION/NGAMMA 02	3.7 – 50.5	0.05	7/19/2018
NERT5.11S1	INDUCTION/NGAMMA 01	3.7 – 41.5	0.05	7/19/2018
NERT5.11S1	INDUCTION/NGAMMA 02	3.7 – 41.5	0.05	7/19/2018
NERT5.49S1	INDUCTION/NGAMMA 01	3.5 – 38.0	0.05	7/19/2018
NERT5.49S1	INDUCTION/NGAMMA 02	3.5 – 38.0	0.05	7/19/2018
NERT5.91S1	INDUCTION/NGAMMA 01	4.0 – 46.0	0.05	7/19/2018
NERT5.91S1	INDUCTION/NGAMMA 02	4.0 – 46.0	0.05	7/19/2018

GEOVision geophysical services	LOG TYPE	PROJECT	NERT Remedial Investigation
		WELL	NERT3.80S1
	Dual Induction Natural Gamma	LOCATION	Henderson, NV
		LOGGER	J Jordan
CLIENT AECOM		DATE	July 20, 2018

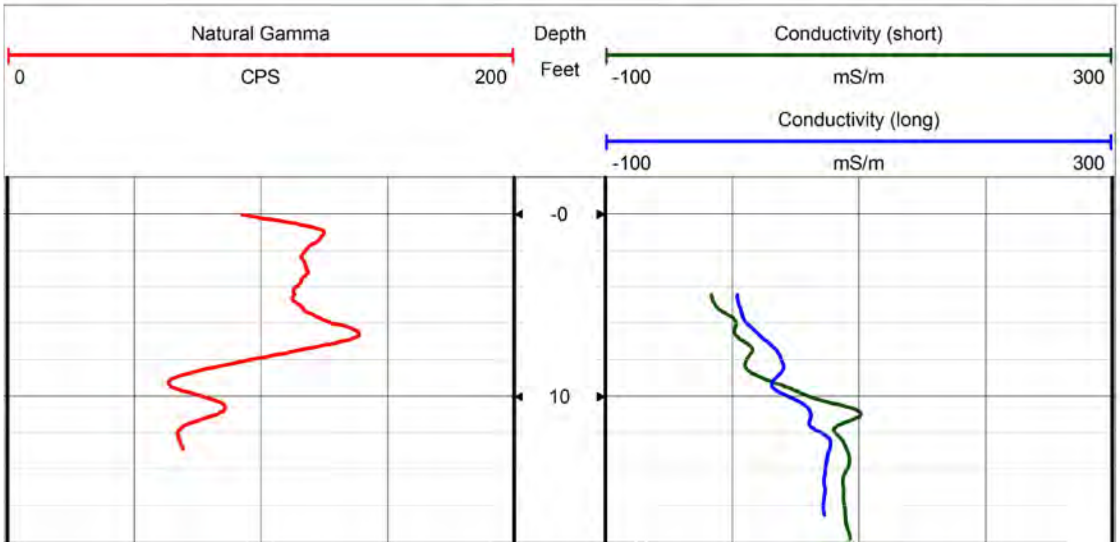

Figure 1: Borehole NERT3.80S1 Dual Induction and Natural Gamma Logs

GEOVision geophysical services

CLIENT AECOM

LOG TYPE

Dual Induction
Natural Gamma

PROJECT	NERT Remedial Investigation
WELL	NERT4.21N1
LOCATION	Henderson, NV
LOGGER	J Jordan
DATE	July 20, 2018

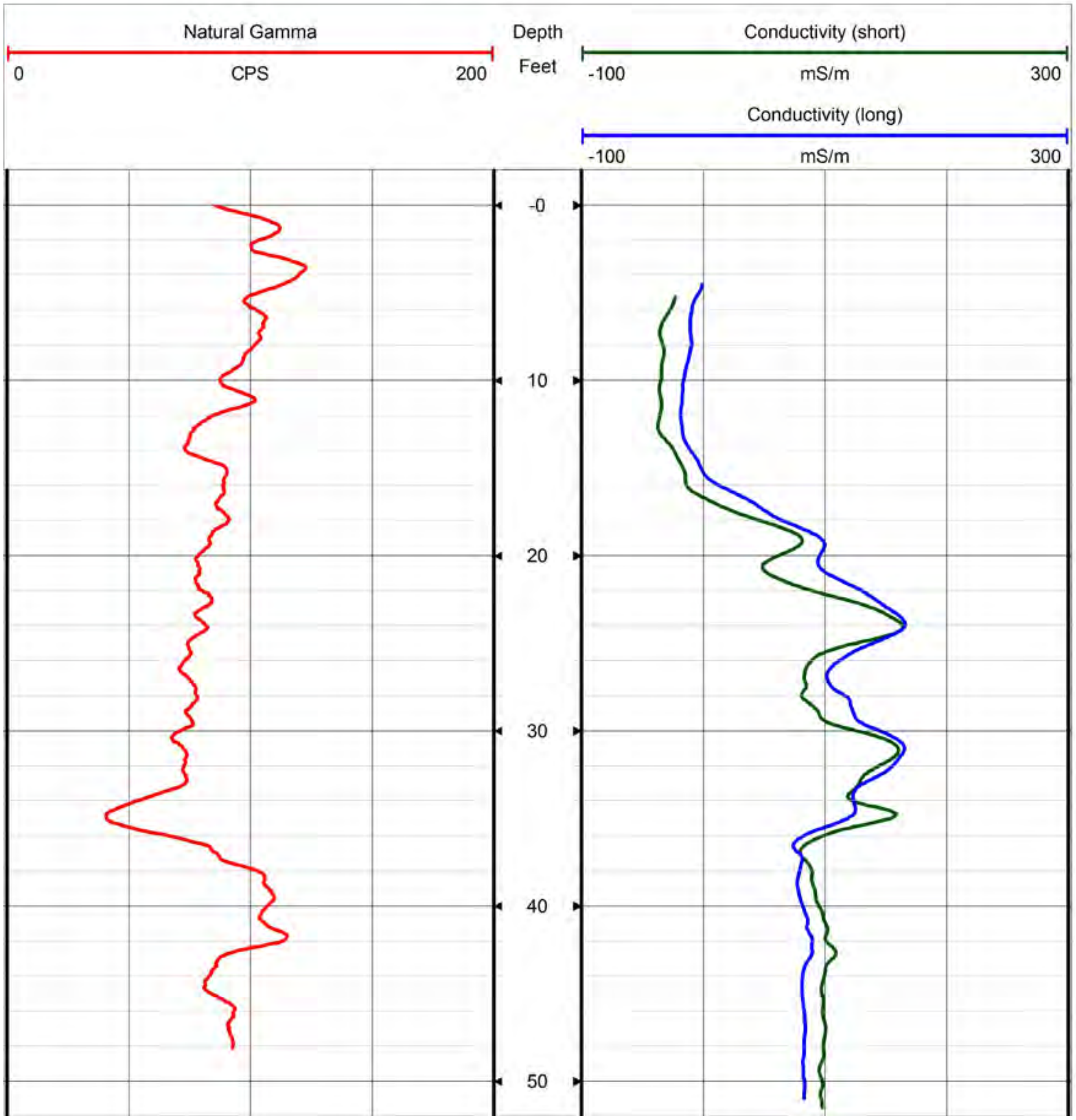

Figure 2: Borehole NERT4.21N1 Dual Induction and Natural Gamma Logs

GEOVision geophysical services

CLIENT AECOM

LOG TYPE

Dual Induction
Natural Gamma

PROJECT	NERT Remedial Investigation
WELL	NERT4.38N1
LOCATION	Henderson, NV
LOGGER	J Jordan
DATE	July 20, 2018

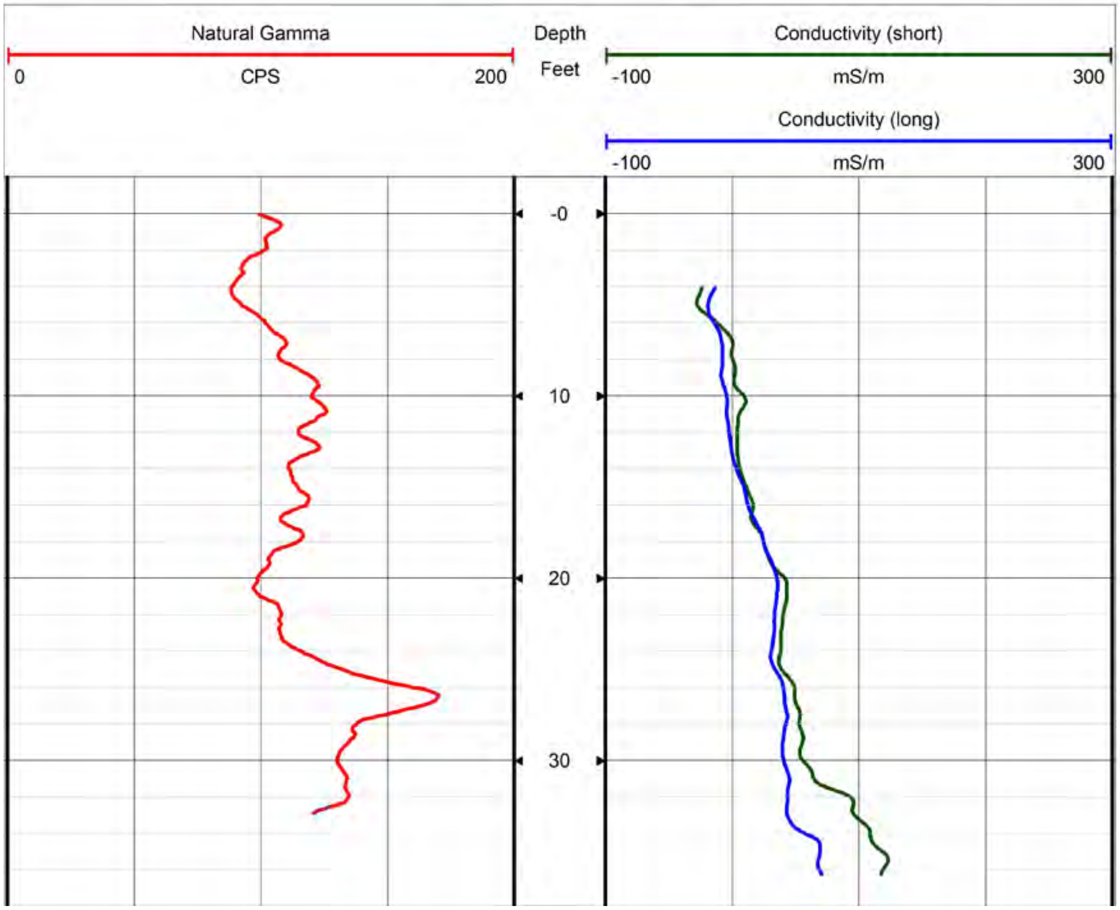

Figure 3: Borehole NERT4.38N1 Dual Induction and Natural Gamma Logs

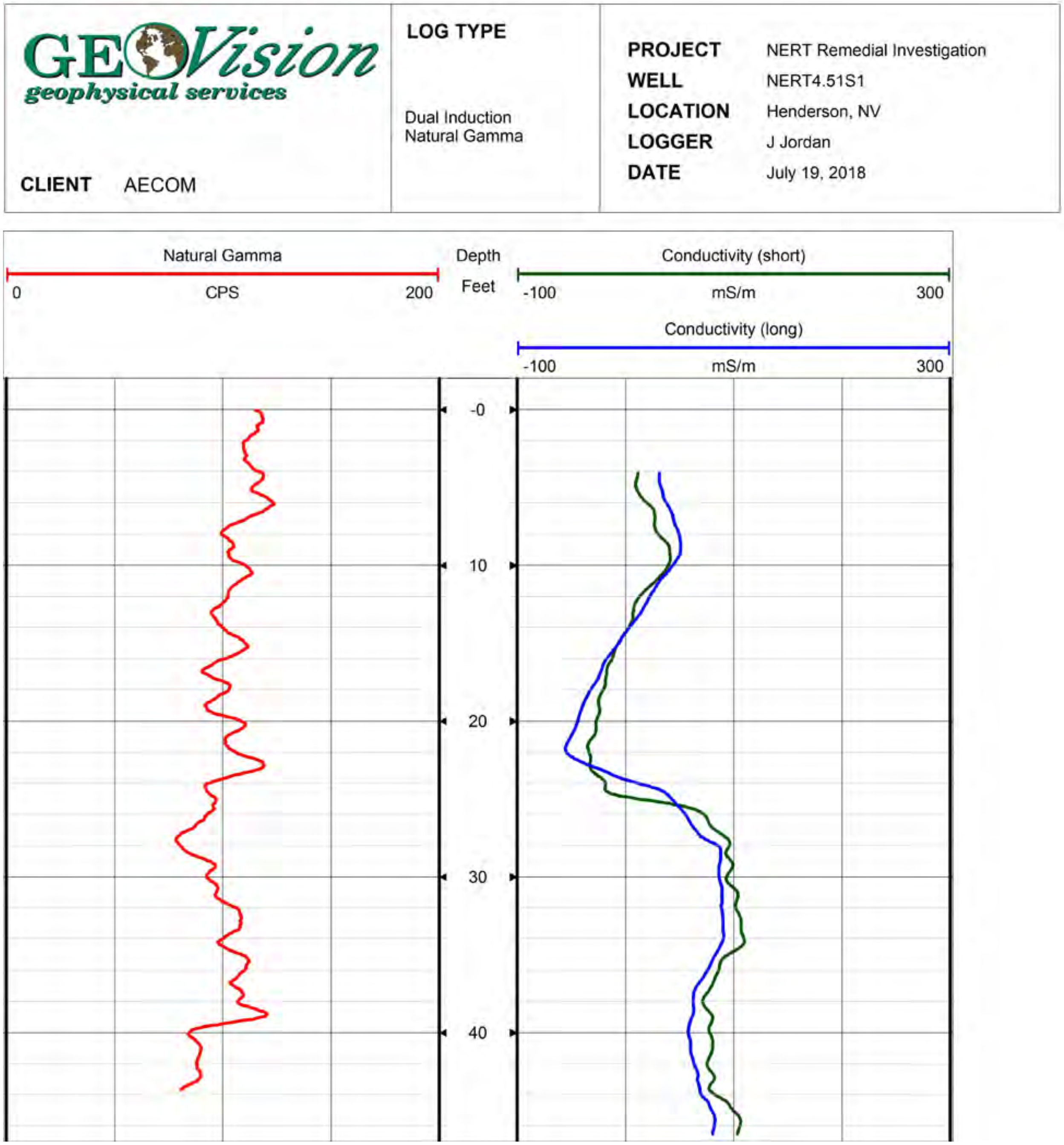

Figure 4: Borehole NERT4.51S1 Dual Induction and Natural Gamma Logs

GEOVision geophysical services	**LOG TYPE**	**PROJECT**	NERT Remedial Investigation
	Dual Induction	**WELL**	NERT4.71S1
	Natural Gamma	**LOCATION**	Henderson, NV
		LOGGER	J Jordan
CLIENT AECOM		**DATE**	July 19, 2018

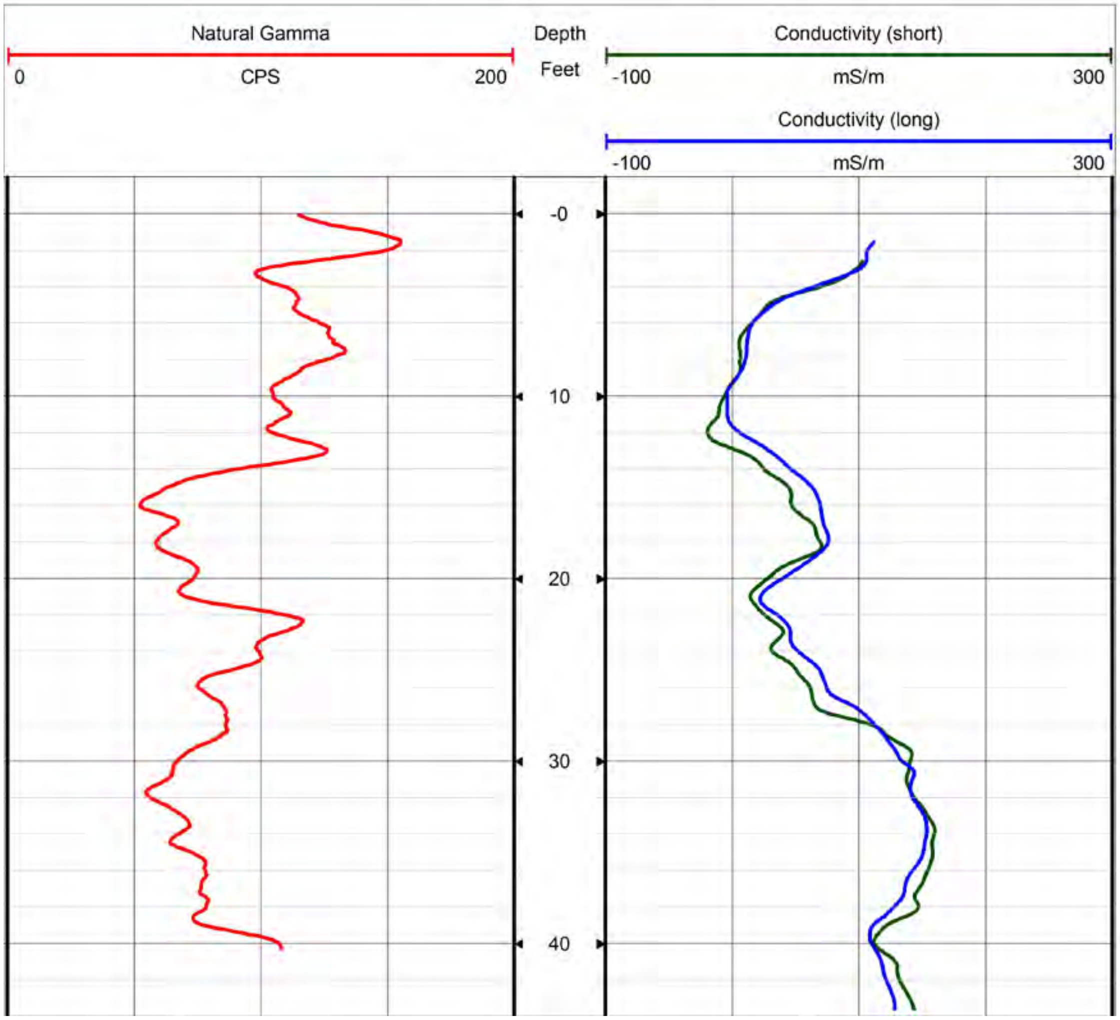

Figure 5: Borehole NERT4.71S1 Dual Induction and Natural Gamma Logs

GEOVision geophysical services	LOG TYPE		
	Dual Induction Natural Gamma	**PROJECT**	NERT Remedial Investigation
		WELL	NERT4.93S1
		LOCATION	Henderson, NV
		LOGGER	J Jordan
CLIENT AECOM		**DATE**	July 19, 2018

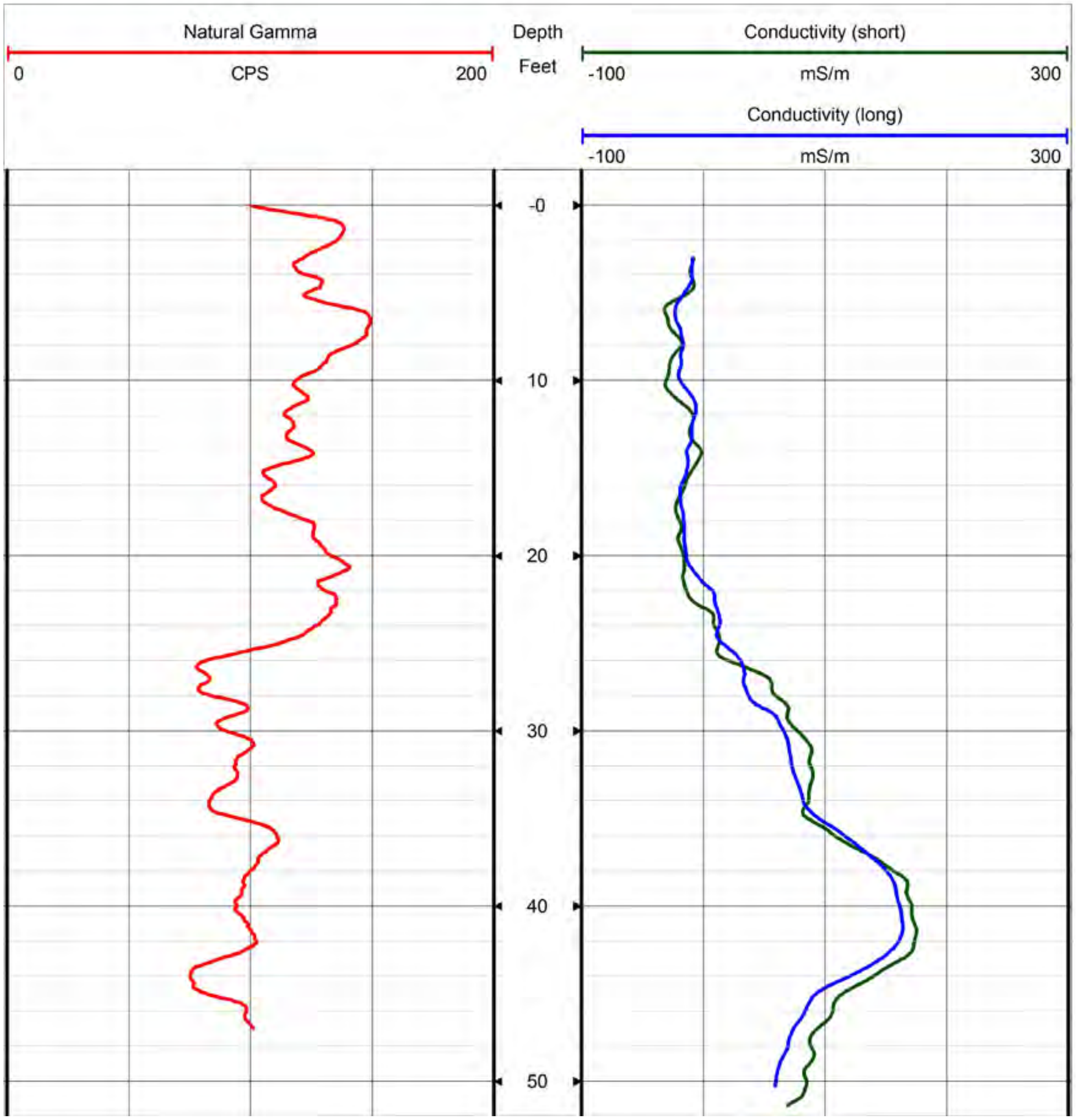

Figure 6: Borehole NERT4.93S1 Dual Induction and Natural Gamma Logs

GEOVision geophysical services	**LOG TYPE**	**PROJECT**	NERT Remedial Investigation
		WELL	NERT5.11S1
	Dual Induction Natural Gamma	**LOCATION**	Henderson, NV
		LOGGER	J Jordan
CLIENT AECOM		**DATE**	July 19, 2018

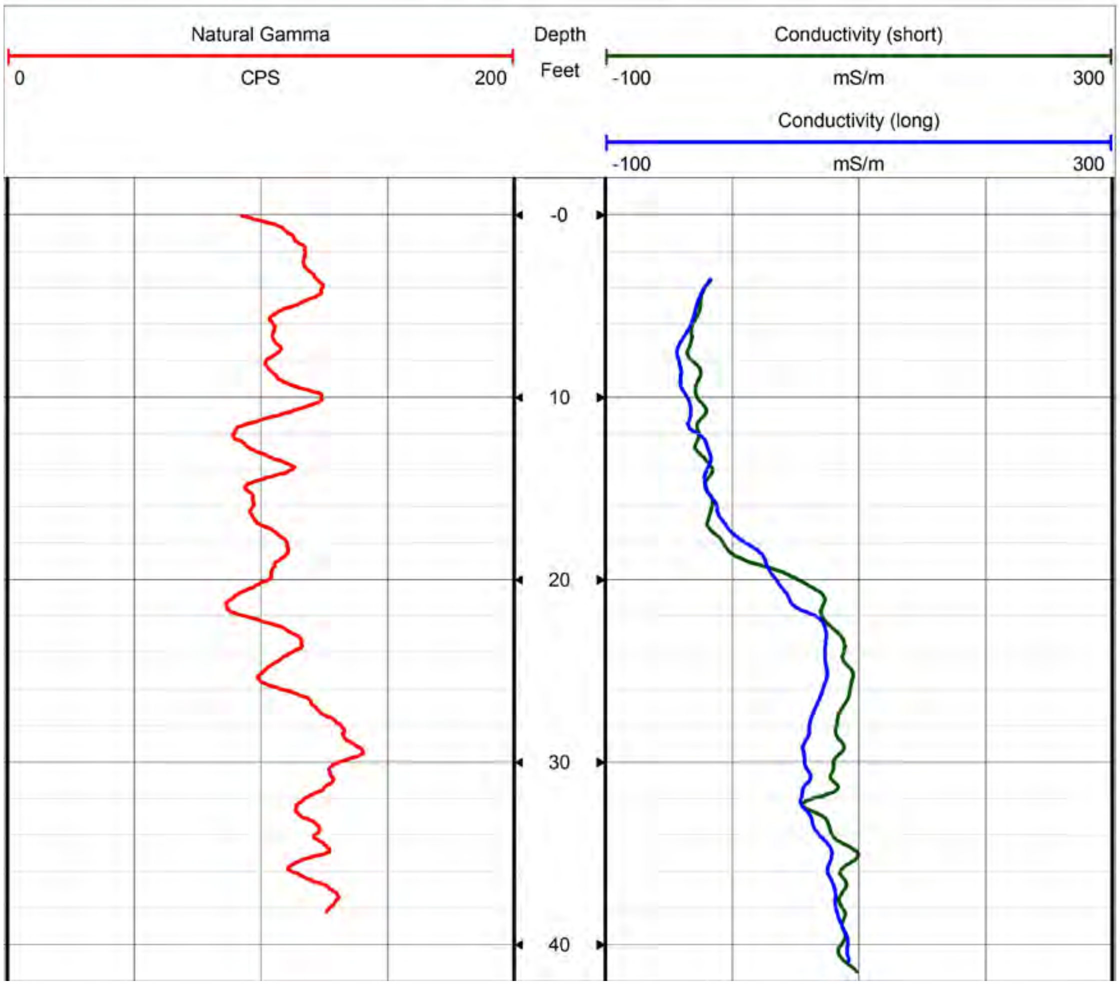

Figure 7: Borehole NERT5.11S1 Dual Induction and Natural Gamma Logs

GEOVision geophysical services **CLIENT** AECOM	**LOG TYPE** Dual Induction Natural Gamma	**PROJECT** NERT Remedial Investigation **WELL** NERT5.49S1 **LOCATION** Henderson, NV **LOGGER** J Jordan **DATE** July 19, 2018

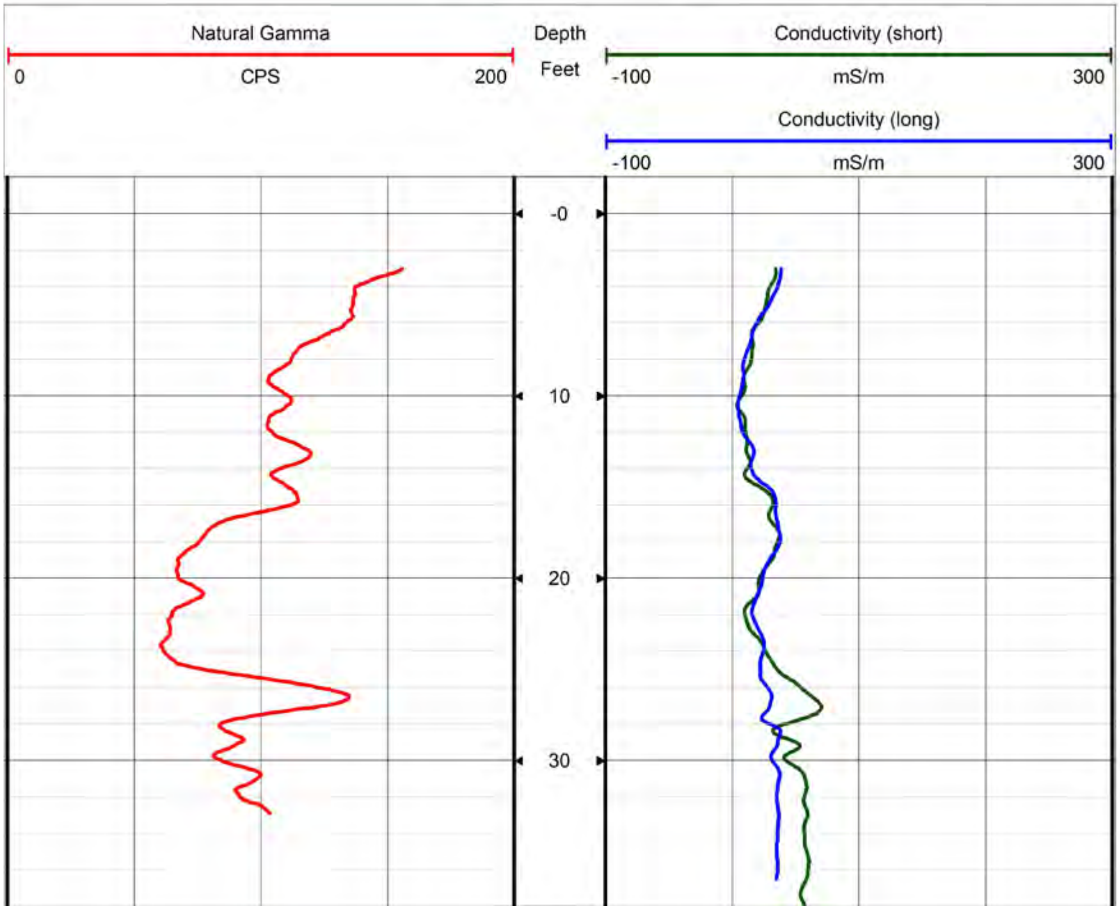

Figure 8: Borehole NERT5.49S1 Dual Induction and Natural Gamma Logs

GEOVision geophysical services

CLIENT AECOM

LOG TYPE

Dual Induction
Natural Gamma

PROJECT	NERT Remedial Investigation
WELL	NERT5.91S1
LOCATION	Henderson, NV
LOGGER	J Jordan
DATE	July 19, 2018

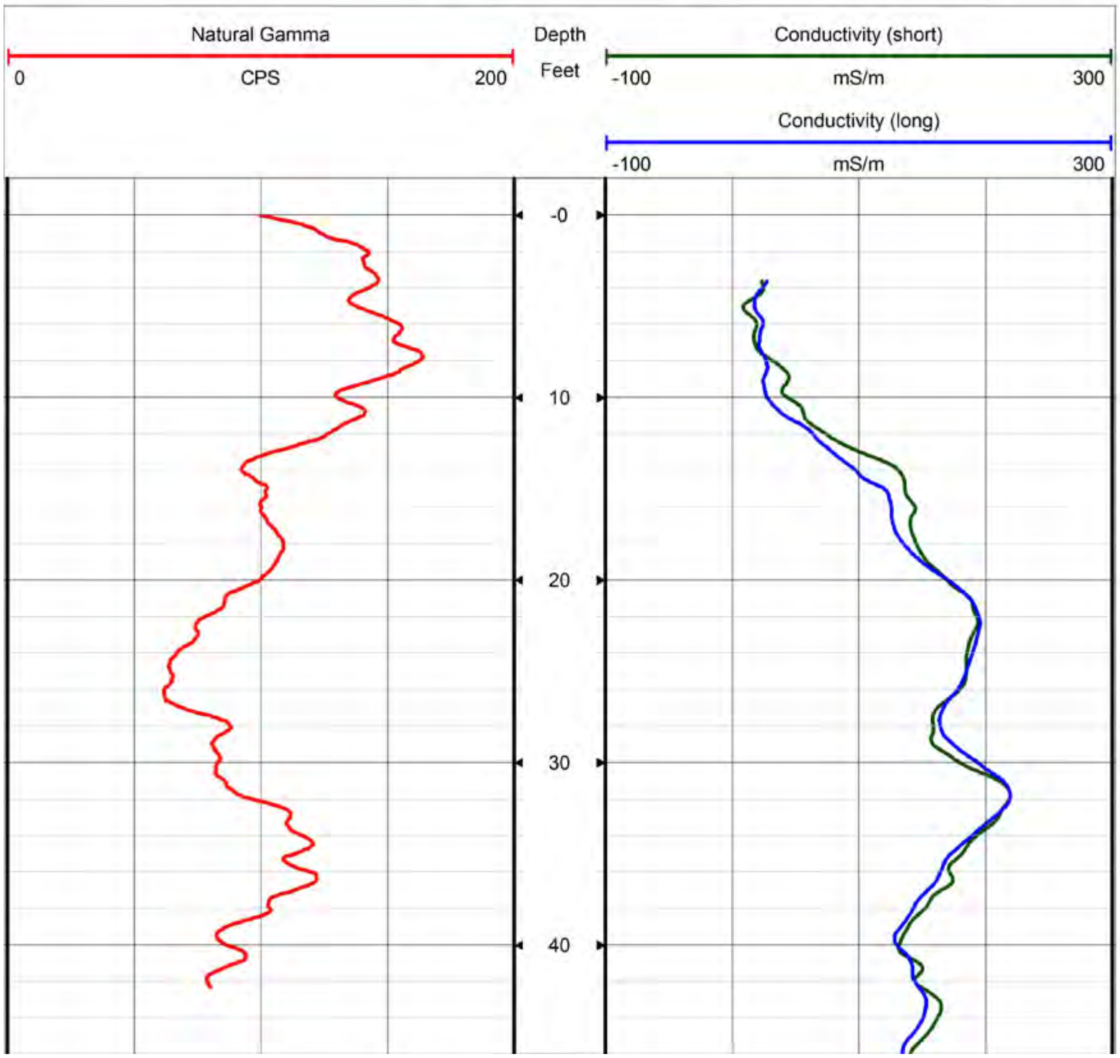

Figure 9: Borehole NERT5.91S1 Dual Induction and Natural Gamma Logs

APPENDIX A

DUAL INDUCTION AND NATURAL GAMMA QUALITY ASSURANCE LOGS

GEOVision geophysical services

CLIENT AECOM

LOG TYPE

Dual Induction
Natural Gamma

PROJECT	NERT Remedial Investigation
WELL	NERT3.80S1
LOCATION	Henderson, NV
LOGGER	J Jordan
DATE	July 20, 2018

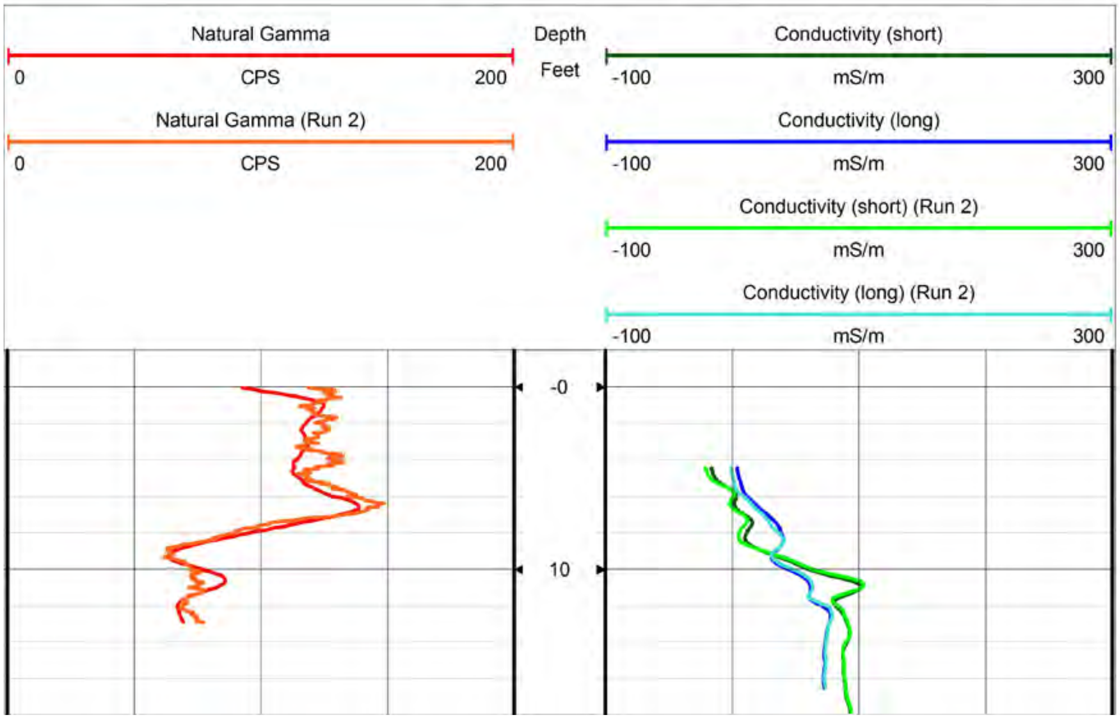

Figure A-1: Borehole NERT3.80S1 Dual Induction and Natural Gamma QA Logs

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CLIENT AECOM

LOG TYPE

Dual Induction
Natural Gamma

PROJECT	NERT Remedial Investigation
WELL	NERT4.21N1
LOCATION	Henderson, NV
LOGGER	J Jordan
DATE	July 20, 2018

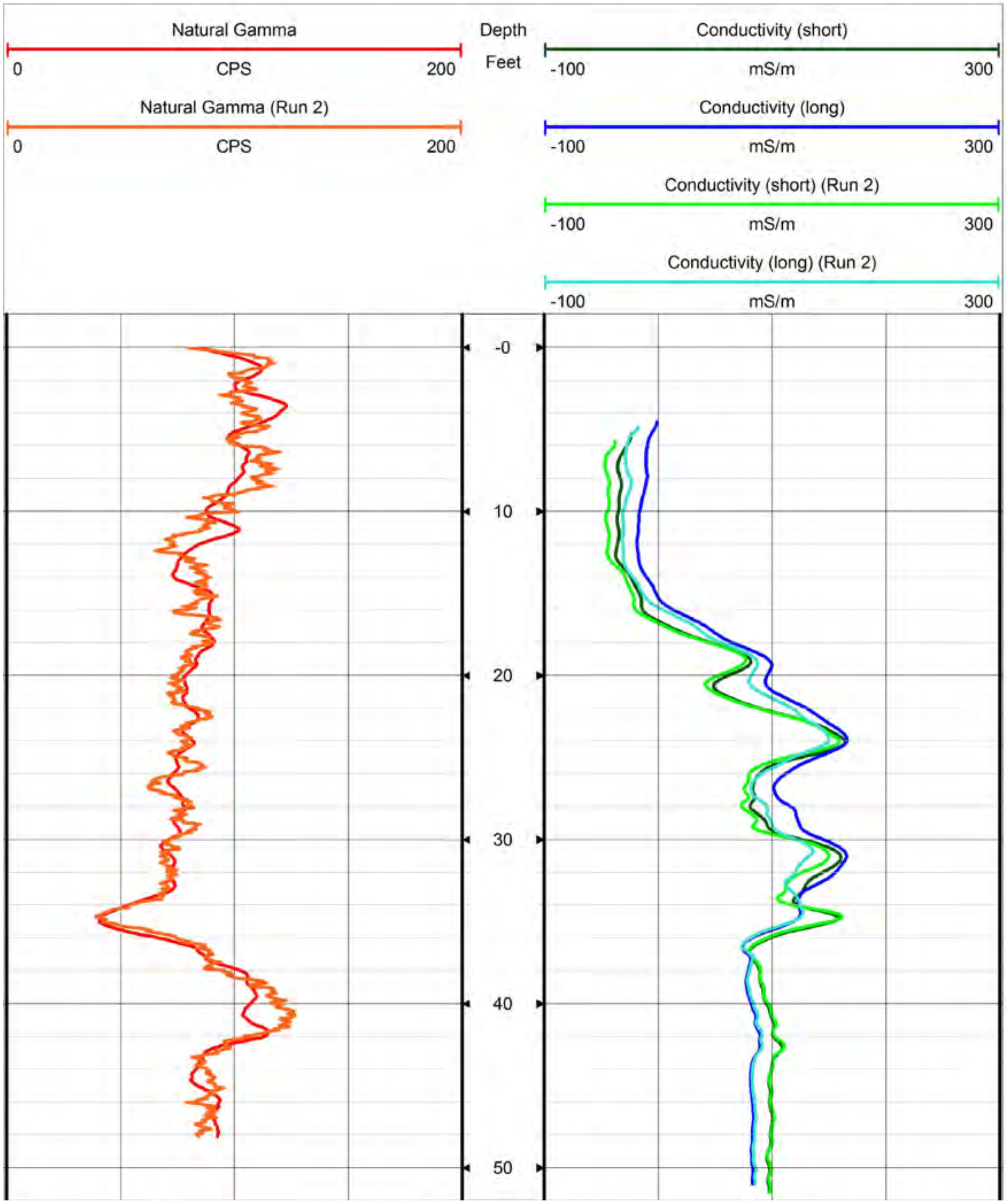

Figure A-2: Borehole NERT4.21N1 Dual Induction and Natural Gamma QA Logs

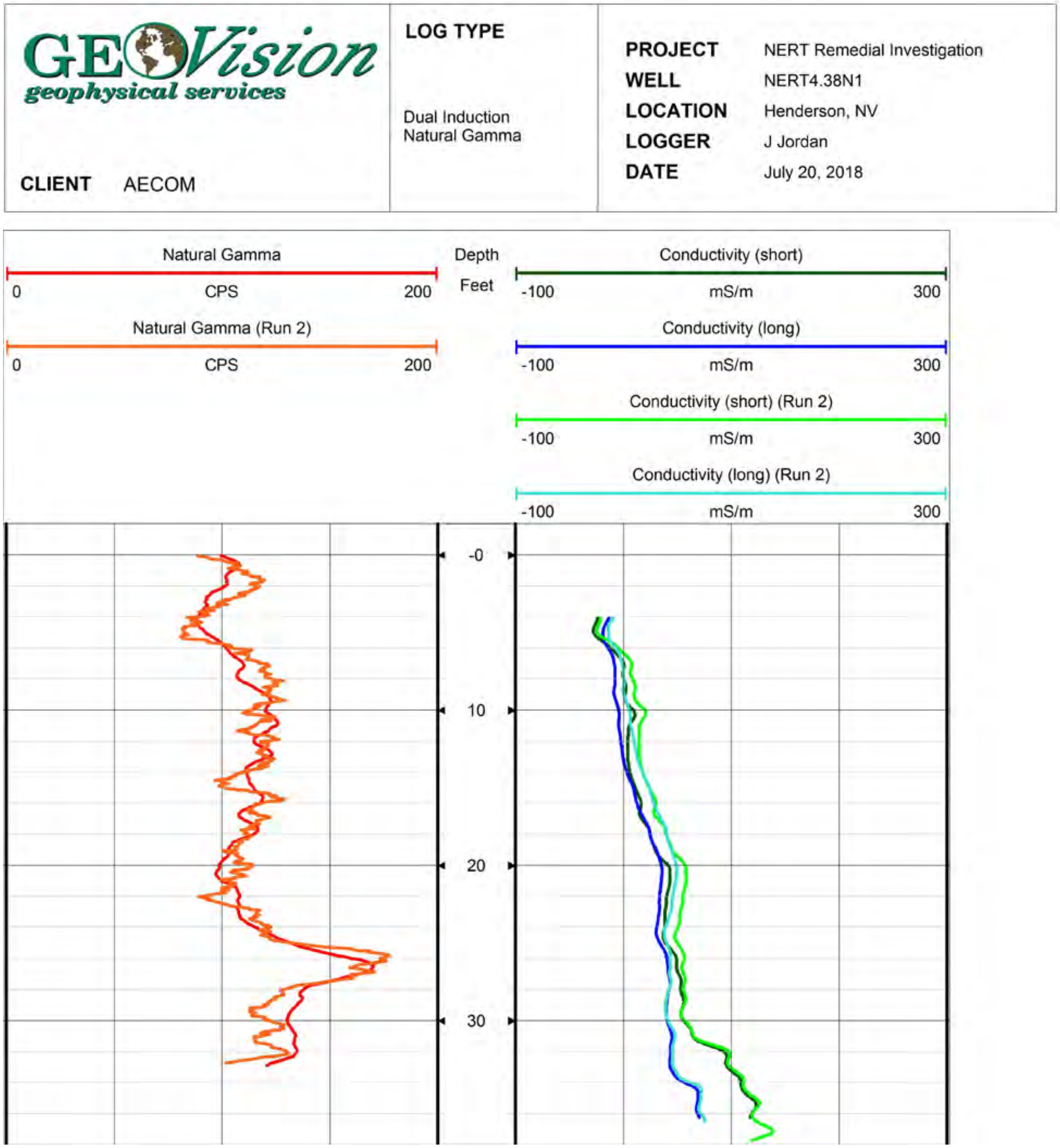

Figure A-3: Borehole NERT438.N1 Dual Induction and Natural Gamma QA Logs

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CLIENT AECOM

LOG TYPE

Dual Induction
Natural Gamma

PROJECT NERT Remedial Investigation
WELL NERT4.51S1
LOCATION Henderson, NV
LOGGER J Jordan
DATE July 19, 2018

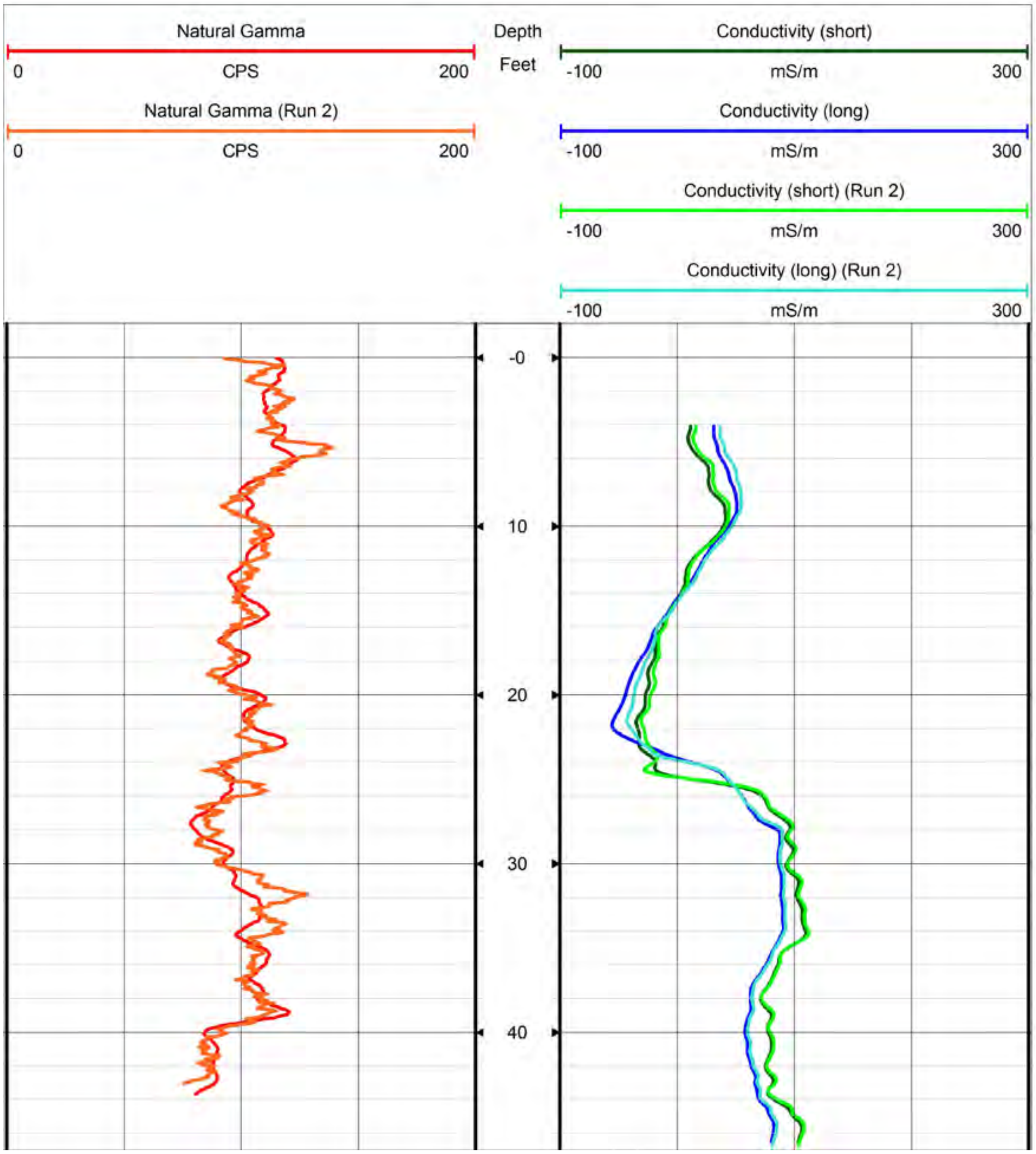

Figure A-4: Borehole NERT4.51S1 Dual Induction and Natural Gamma QA Logs

GEOVision geophysical services

CLIENT AECOM

LOG TYPE

Dual Induction
Natural Gamma

PROJECT	NERT Remedial Investigation
WELL	NERT4.71S1
LOCATION	Henderson, NV
LOGGER	J Jordan
DATE	July 19, 2018

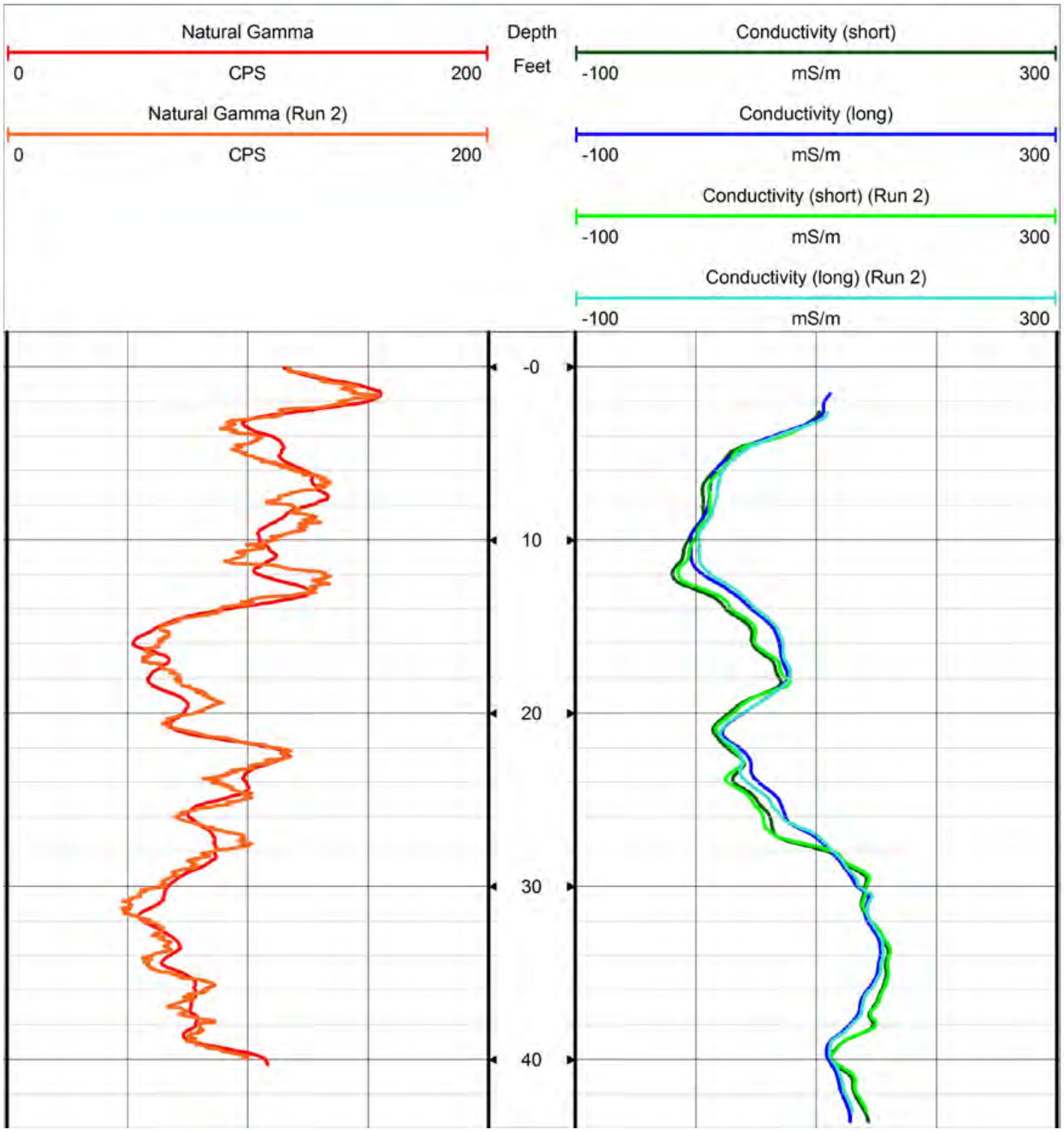

Figure A-5: Borehole NERT471S1 Dual Induction and Natural Gamma QA Logs

CLIENT AECOM	**LOG TYPE** Dual Induction Natural Gamma	**PROJECT** **WELL** **LOCATION** **LOGGER** **DATE**	NERT Remedial Investigation NERT4.93S1 Henderson, NV J Jordan July 19, 2018

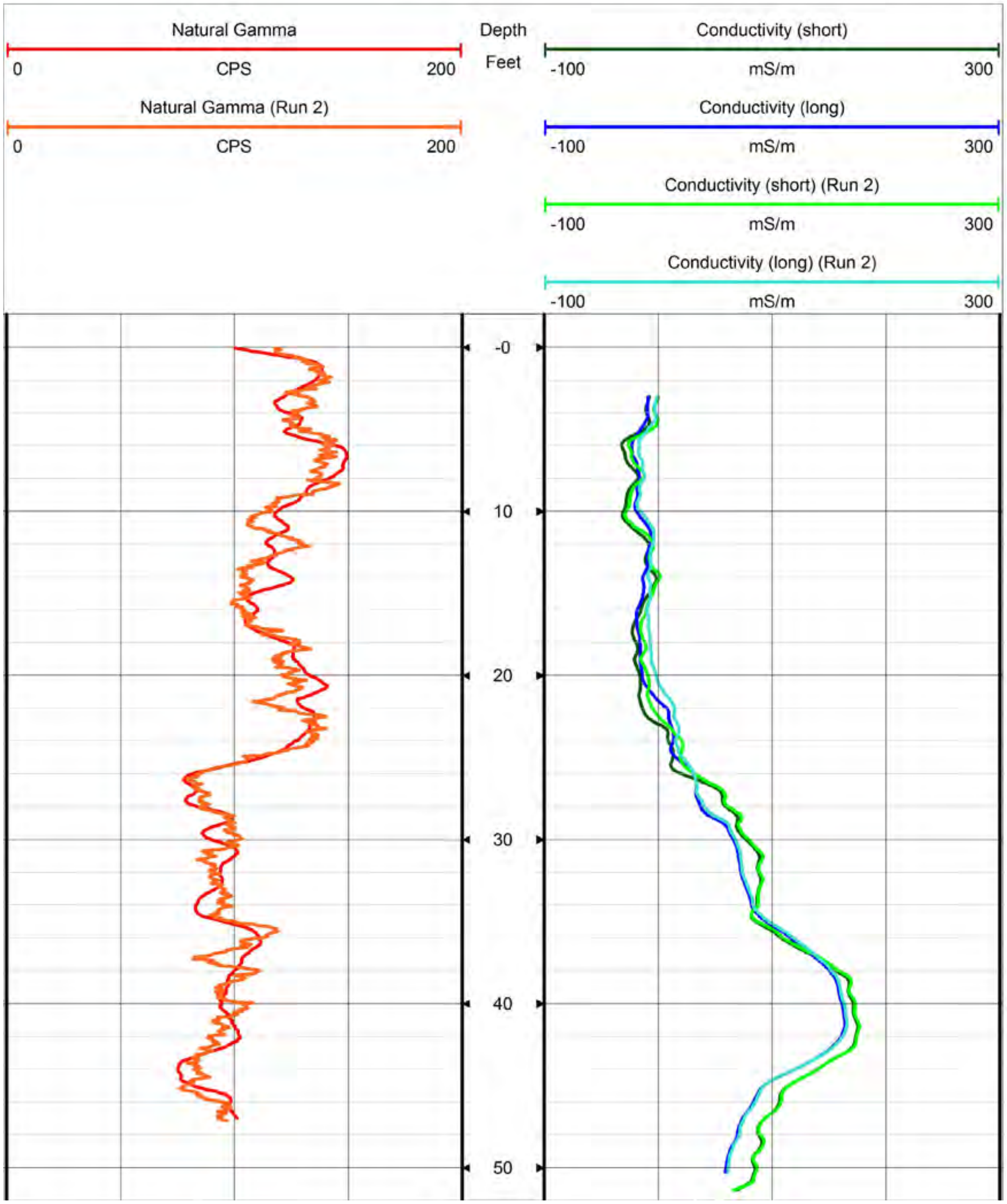

Figure A-6: Borehole NERT4.93S1 Dual Induction and Natural Gamma QA Logs

GEOVision geophysical services

CLIENT AECOM	**LOG TYPE** Dual Induction Natural Gamma	**PROJECT**	NERT Remedial Investigation
		WELL	NERT5.11S1
		LOCATION	Henderson, NV
		LOGGER	J Jordan
		DATE	July 19, 2018

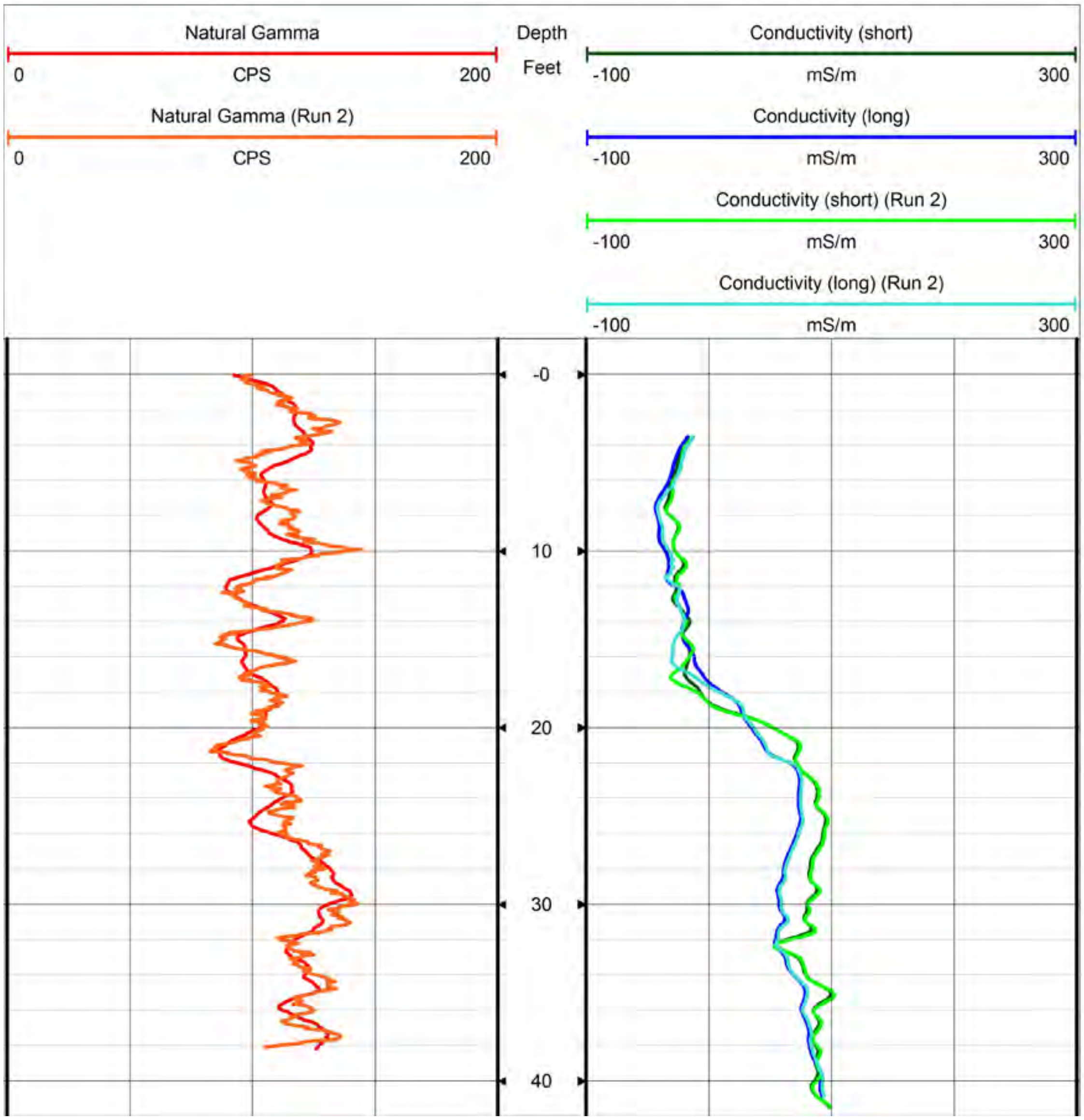

Figure A-7: Borehole NERT5.11S1 Dual Induction and Natural Gamma QA Logs

GEOVision geophysical services

CLIENT AECOM

LOG TYPE

Dual Induction
Natural Gamma

PROJECT	NERT Remedial Investigation
WELL	NERT5.49S1
LOCATION	Henderson, NV
LOGGER	J Jordan
DATE	July 19, 2018

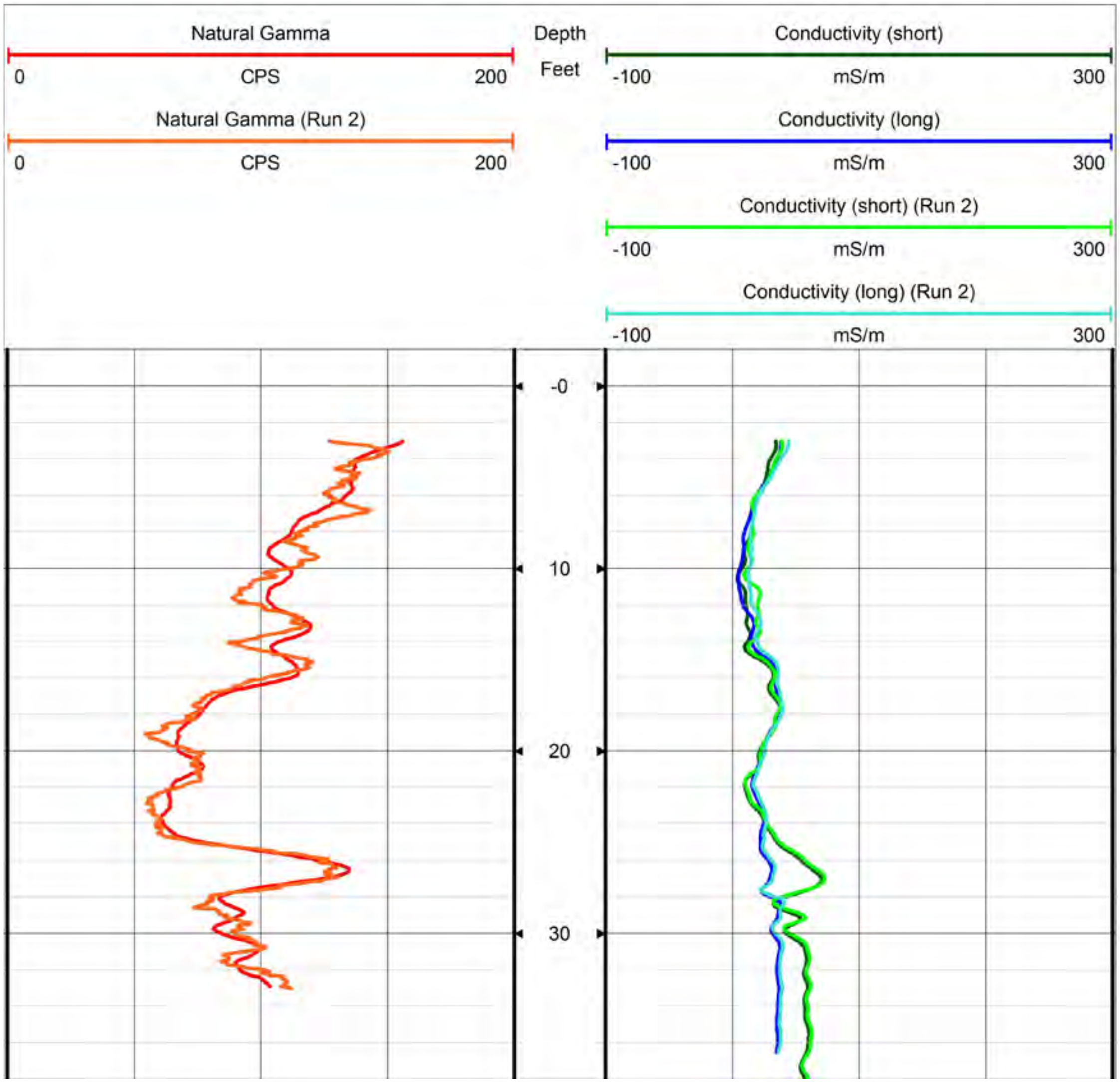

Figure A-8: Borehole NERT5.49S1 Dual Induction and Natural Gamma QA Logs

GEOVision geophysical services **CLIENT** AECOM	**LOG TYPE** Dual Induction Natural Gamma	**PROJECT** NERT Remedial Investigation **WELL** NERT5.91S1 **LOCATION** Henderson, NV **LOGGER** J Jordan **DATE** July 19, 2018

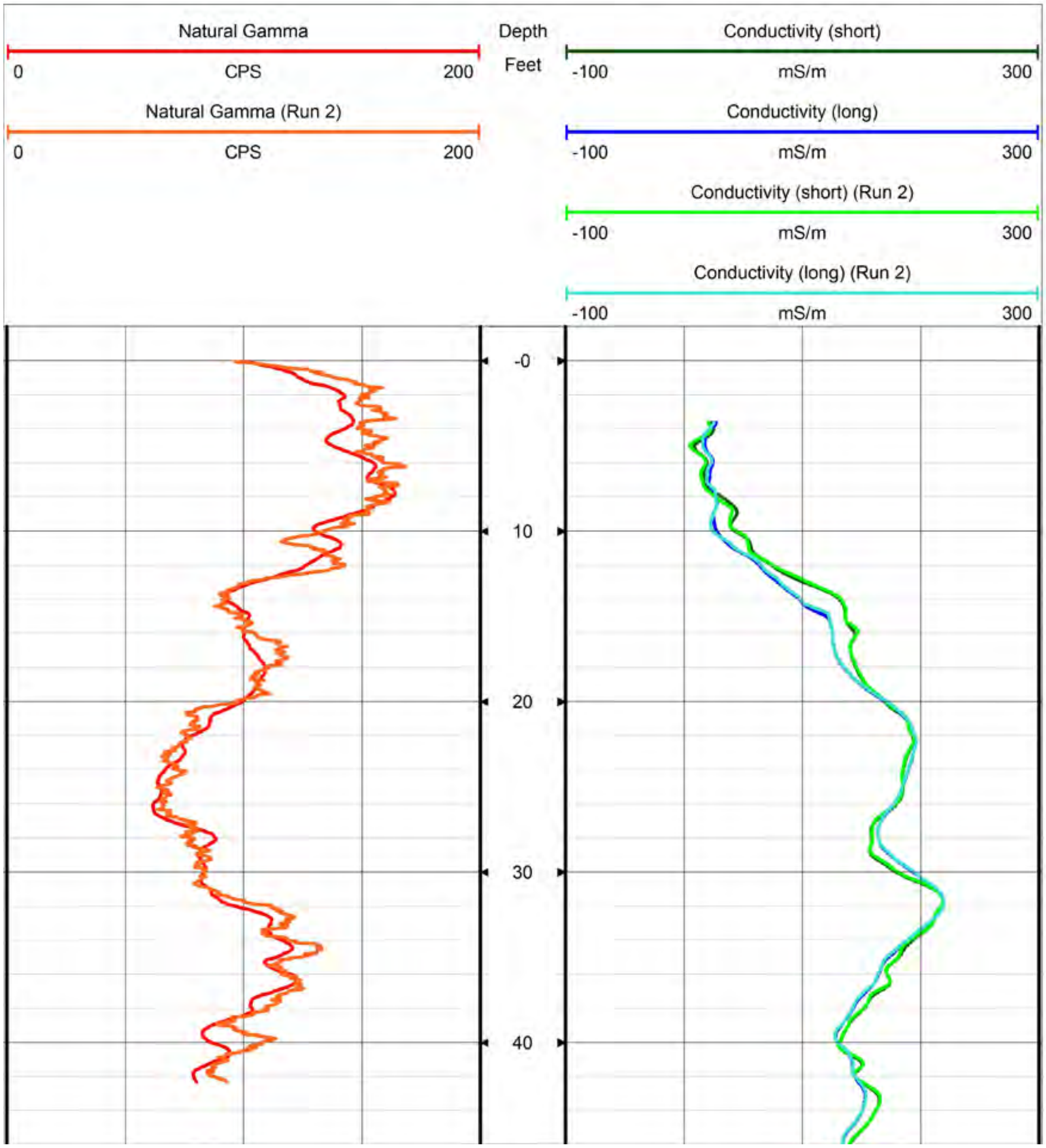

Figure A-9: Borehole NERT5.91S1 Dual Induction and Natural Gamma QA Logs

Appendix I

Survey Report

STANLEYCONSULTANTS, Inc

5820 South Eastern Avenue › Suite 200 › Las Vegas, NV 89119
702.369.9396 › stanleyconsultants.com

September 4, 2018

AECOM
1220 Avenida Acasco
Camarillo, CA. 93012

Reference: WELL LOCATION SURVEY / LAS VEGAS WASH STUDY / FINAL REPORT

Attention: Carmen Caceres-Schnell

An additional Well Location Survey for the Las Vegas Wash Project was completed on June 29th, 2018. The attached spreadsheet has the final horizontal and vertical measurements for the recovered wells. The measurements made were to the top of the inner well casing along with a ground surface measurement immediately adjacent to the well. The horizontal coordinates are derived from the Nevada State Plane Coordinate System East Zone, North American Datum of 1983 (NAD83). The vertical elevations are based off of the North American Vertical Datum of 1988 (NAVD88).

If you should have any questions, please feel free to call me at (702) 534-2150.

Sincerely,
STANLEY CONSULTANTS, INC.

By: Alan W Dill

Alan W. Dill, P.L.S.
Survey Manager

Survey ID	Northing	Easting	Elevation	Well ID and location	Location
30802	26736954.7	841309.125	1502.07	NERT4.21N1 TOP CASING	Top of Casing
30803	26736955.27	841309.423	1502.464	NERT4.21N1 TOP CONC	Top of Concrete
30804	26736955.36	841308.056	1502.293	NERT4.21N1 NG	Ground surface
30805	26737140.64	840337.588	1505.042	NERT4.38N1 TOP CASING	Top of Casing
30806	26737140.53	840336.841	1505.369	NERT4.38N1 TOP CONC	Top of Concrete
30807	26737140.41	840336.068	1505.271	NERT4.38N1 NG	Ground surface
30808	26734018.22	832750.228	1536.813	NAIL TAG CP	Nail Tag
30809	26734028.61	832752.186	1535.223	TOP WEIR PABCO	Top of Pabco Weir
30810	26734028.6	832752.174	1535.264	TOP WEIR PABCO	Top of Pabco Weir
30811	26733845.83	833571.59	1536.758	NERT5.91S1 TOP CASING	Top of Casing
30812	26733846.44	833571.393	1537.182	NERT5.91S1 TOP CONC	Top of Concrete
30813	26733846.77	833571.855	1537.102	NERT5.91S1 NG	Ground surface
30814	26734325.76	835451.847	1543.369	NERT5.49S1 TOP CASING	Top of Casing
30815	26734326.34	835452.173	1543.87	NERT5.49S1 TOP CONC	Top of Concrete
30816	26734326.39	835452.694	1543.728	NERT5.49S1 NG	Ground surface
30817	26734881.04	837144.377	1522.875	NERT5.11S1 TOP CASING	Top of Casing
30818	26734881.33	837143.661	1523.132	NERT5.11S1 TOP CONC	Top of Concrete
30819	26734881.75	837143.28	1523.183	NERT5.11S1 NG	Ground surface
30820	26734990.31	837979.182	1523.332	NERT4.93S1 TOP CASING	Top of Casing
30821	26734990.93	837979.305	1523.848	NERT4.93S1 TOP CONC	Top of Concrete
30822	26734991.23	837980.424	1523.83	NERT4.93S1 NG	Ground surface
30823	26735349.66	838991.633	1519.289	NERT4.71S1 TOP CASING	Top of Casing
30824	26735350.04	838991.232	1519.725	NERT4.71S1 TOP CONC	Top of Concrete
30825	26735349.65	838990.463	1519.644	NERT4.71S1 NG	Ground surface
30826	26735857.15	840138.034	1506.237	NERT4.51S1 TOP CASING	Top of Casing
30827	26735857.85	840137.717	1506.834	NERT4.51S1 TOP CONC	Top of Concrete
30828	26735858.27	840137.824	1506.792	NERT4.51S1 NG	Ground surface
30829	26738777.5	845358.726	1434.743	TOP WEIR	Top of Weir
30830	26739226.46	846034.185	1425.617	TOP ROCK	Top of Rock
30831	26736780.1	843700.756	1460.536	NERT3.80S1 TOP CASING	Top of Casing
30832	26736780.65	843700.59	1461.116	NERT3.80S1 TOP CONC	Top of Concrete
30833	26736781.33	843700.735	1461.061	NERT3.80S1 NG	Ground surface
30834	26736781.32	843700.735	1461.086	NERT3.80S1 NG	Ground surface

Survey ID	Latitude	Longatude	Elevation	Well ID and location	Location
30802	36d05'43.54651"	-114d57'23.90386"	1502.07	NERT4.21N1 TOP CASING	Top of Casing
30803	36d05'43.55212"	-114d57'23.90019"	1502.464	NERT4.21N1 TOP CONC	Top of Concrete
30804	36d05'43.55310"	-114d57'23.91683"	1502.293	NERT4.21N1 NG	Ground surface
30805	36d05'45.44708"	-114d57'35.72760"	1505.042	NERT4.38N1 TOP CASING	Top of Casing
30806	36d05'45.44604"	-114d57'35.73671"	1505.369	NERT4.38N1 TOP CONC	Top of Concrete
30807	36d05'45.44489"	-114d57'35.74614"	1505.271	NERT4.38N1 NG	Ground surface
30808	36d05'15.03940"	-114d59'08.41492"	1536.813	NAIL TAG CP	Nail Tag
30809	36d05'15.14204"	-114d59'08.39028"	1535.223	TOP WEIR PABCO	Top of Pabco Weir
30810	36d05'15.14188"	-114d59'08.39043"	1535.264	TOP WEIR PABCO	Top of Pabco Weir
30811	36d05'13.28448"	-114d58'58.42049"	1536.758	NERT5.91S1 TOP CASING	Top of Casing
30812	36d05'13.29060"	-114d58'58.42284"	1537.182	NERT5.91S1 TOP CONC	Top of Concrete
30813	36d05'13.29384"	-114d58'58.41719"	1537.102	NERT5.91S1 NG	Ground surface
30814	36d05'17.91535"	-114d58'35.47528"	1543.369	NERT5.49S1 TOP CASING	Top of Casing
30815	36d05'17.92101"	-114d58'35.47126"	1543.87	NERT5.49S1 TOP CONC	Top of Concrete
30816	36d05'17.92155"	-114d58'35.46492"	1543.728	NERT5.49S1 NG	Ground surface
30817	36d05'23.30182"	-114d58'14.81087"	1522.875	NERT5.11S1 TOP CASING	Top of Casing
30818	36d05'23.30472"	-114d58'14.81956"	1523.132	NERT5.11S1 TOP CONC	Top of Concrete
30819	36d05'23.30886"	-114d58'14.82417"	1523.183	NERT5.11S1 NG	Ground surface
30820	36d05'24.33025"	-114d58'04.63098"	1523.332	NERT4.93S1 TOP CASING	Top of Casing
30821	36d05'24.33645"	-114d58'04.62944"	1523.848	NERT4.93S1 TOP CONC	Top of Concrete
30822	36d05'24.33927"	-114d58'04.61578"	1523.83	NERT4.93S1 NG	Ground surface
30823	36d05'27.82049"	-114d57'52.26715"	1519.289	NERT4.71S1 TOP CASING	Top of Casing
30824	36d05'27.82426"	-114d57'52.27200"	1519.725	NERT4.71S1 TOP CONC	Top of Concrete
30825	36d05'27.82045"	-114d57'52.28140"	1519.644	NERT4.71S1 NG	Ground surface
30826	36d05'32.76687"	-114d57'38.25934"	1506.237	NERT4.51S1 TOP CASING	Top of Casing
30827	36d05'32.77376"	-114d57'38.26314"	1506.834	NERT4.51S1 TOP CONC	Top of Concrete
30828	36d05'32.77794"	-114d57'38.26180"	1506.792	NERT4.51S1 NG	Ground surface
30829	36d06'01.31180"	-114d56'34.41298"	1434.743	TOP WEIR	Top of Weir
30830	36d06'05.70759"	-114d56'26.14582"	1425.617	TOP ROCK	Top of Rock
30831	36d05'41.66646"	-114d56'54.77558"	1460.536	NERT3.80S1 TOP CASING	Top of Casing
30832	36d05'41.67188"	-114d56'54.77756"	1461.116	NERT3.80S1 TOP CONC	Top of Concrete
30833	36d05'41.67864"	-114d56'54.77574"	1461.061	NERT3.80S1 NG	Ground surface
30834	36d05'41.67845"	-114d56'54.77574"	1461.086	NERT3.80S1 NG	Ground surface

Appendix J

Data Validation Summary Report

Environment

Prepared for:
Nevada Division of Environmental Protection
Las Vegas, NV

Prepared by:
AECOM
Camarillo, CA
60477365
February 2019

Data Validation Summary Report
July 2018 Groundwater Sampling

NERT Remedial Investigation – Downgradient Study Area
Nevada Environmental Response Trust Site
Henderson, Nevada

Final

AECOM Environment

Prepared for:
Nevada Division of Environmental Protection
Las Vegas, NV

Prepared by:
AECOM
Camarillo, CA
60477365
February 2019

Data Validation Summary Report

July 2018 Groundwater Sampling

Lily Bayati

Prepared By Lily Bayati

Reviewed By Chad Roper, PhD, CEM

Contents

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List of Acronyms

DQO	data quality objectives
DUP	duplicate
DVSR	Data Validation Summary Report
EB	equipment blank
EPA	United States Environmental Protection Agency
FB	field blank
FD	field duplicate
LCS/LCSD	laboratory control sample / laboratory control sample duplicate
MS/MSD	matrix spike / matrix spike duplicate
NDEP	Nevada Division of Environmental Protection
NERT	Nevada Environmental Response Trust
PARCCS	precision, accuracy, representativeness, comparability, completeness, sensitivity
PQL	practical quantitation limit
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
RPD	relative percent difference
SDG	sample delivery group
SQL	sample quantitation limit
TDS	Total Dissolved Solids
%R	percent recovery

1.0 Introduction

This Data Validation Summary Report has been prepared by AECOM to assess the validity and usability of laboratory analytical data from the July 2018 groundwater sampling conducted in the Downgradient Study Area of the Nevada Environmental Response Trust (NERT) site in Henderson, Nevada. The assessment was performed by AECOM under their May 2017 Quality Assurance Project Plan (QAPP) and included the collection and analyses of 33 environmental and quality control (QC) samples. The analyses were performed by the following methods:

- Chlorate by United States Environmental Protection Agency (EPA) Method 300.1B
- Perchlorate by EPA Method 314.0
- Total Dissolved Solids (TDS) by Standard Method 2540C
- Bromide and Chloride by EPA Method 300.0
- Total Chromium by EPA Method 200.8

Laboratory analytical services were provided by TestAmerica, Inc. (Irvine, California). The samples were grouped into sample delivery groups (SDGs). The water samples are associated with quality assurance (QA)/QC samples designed to document the data quality of the entire SDG or a sub-group of samples within an SDG. **Table 1** is a cross-reference table listing each sample identification (ID), analysis, SDG, sample date, laboratory ample ID, matrix, and validation level. **Table 2** is a reference table that identifies the QC elements reviewed.

The laboratory analytical data were validated in accordance with procedures described in the Nevada Division of Environmental Protection (NDEP) Data Verification and Validation Requirements - Supplement established for the BMI Plant Sites and Common Areas Projects, Henderson, Nevada, dated April 13, 2009. In accordance with an NDEP data validation guidance letter dated July 13, 2018, 100 percent of the analytical data were validated according to Stage 2A data validation procedures.

The analytical data were evaluated for QA/QC based on the following documents: AECOM's QAPP Downgradient Study Area, Henderson, Nevada, Revision, dated May 2017; NDEP Data Validation Guidance dated July 13, 2018; EPA's Contract Laboratory Program National Functional Guidelines for Inorganic Data Review dated January 2017; and EPA's SW 846 Third Edition, Test Methods for Evaluating Solid Waste, update I, July 1992; update IIA, August 1993; update II, September 1994; update IIB, January 1995; update III, December 1996; update IV, February 2007.

This report summarizes the QA/QC evaluation of the data according to precision, accuracy, representativeness, completeness, comparability, and sensitivity (PARCCS) relative to the project data quality objectives (DQOs). This report provides a quantitative and qualitative assessment of the data and identifies potential sources of error, uncertainty, and bias that may affect the overall usability.

The PARCCS summary report evaluates and summarizes the results of QA/QC data validation for the entire sampling program. Section 2.0 interprets specific QC deviations and their effects on both individual data points and the analyses as a whole. Section 4.0 presents a summary of the PARCCS criteria by comparing quantitative parameters with acceptability criteria defined in the project DQOs. Qualitative PARCCS criteria are also summarized in this section.

1.1 Precision and Accuracy of Environmental Data

Environmental data quality depends on sample collection procedures, analytical methods and instrumentation, documentation, and sample matrix properties. Both sample collection procedures and laboratory analyses contain potential sources of uncertainty, error, and/or bias, which affect the overall quality of a measurement. Errors in sample data may result from incomplete equipment decontamination, inappropriate sampling techniques, sample heterogeneity, improper filtering, and improper preservation. The accuracy of analytical results is dependent on selecting appropriate analytical methods, maintaining equipment properly, and complying with QC requirements. The sample matrix (i.e.. groundwater) is also an important factor in the ability to obtain precise and accurate results within a given media.

Environmental and laboratory QA/QC samples assess the effects of sampling procedures and evaluate laboratory contamination, laboratory performance, and matrix effects. QA/QC samples include equipment blanks (EBs), field blanks (FBs), field duplicates (FDs), method blanks, laboratory control samples/laboratory control sample duplicates (LCS/LCSDs), and matrix spike/matrix spike duplicates (MS/MSDs).

Before conducting the PARCCS evaluation, the analytical data were validated according to the QAPP (AECOM 2017), Functional Guidelines (EPA 2017), EPA SW 846 Test Methods (EPA 1996) and NDEP July 13, 2018 Data Validation Guidance (NDEP 2018). Samples not meeting the acceptance criteria were qualified with a flag, an abbreviation indicating a deficiency with the data. The following are flags used in data validation:

J-	Estimated - The associated numerical value is an estimated quantity with a negative bias. The analyte was detected but the reported value may not be accurate or precise.
J+	Estimated - The associated numerical value is an estimated quantity with a positive bias. The analyte was detected but the reported value may not be accurate or precise.
J	Estimated - The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample. It is not possible to assess the direction of the potential bias. The analyte was detected but the reported value may not be accurate or precise.
R	Rejected - The data is unusable (the compound or analyte may or may not be present). Use of the "R" qualifier indicates a significant variance from functional guideline acceptance criteria. Either resampling or reanalysis is necessary to determine the presence or absence of the rejected analyte.
U	Nondetected - Analyses were performed for the compound or analyte, but it was not detected.
UJ	Estimated/Nondetected - The analyte was analyzed for, but not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.
DNR	Do Not Report - A more appropriate result is reported from another analysis or dilution.
A	Indicates the finding is based upon technical validation criteria.
P	Indicates the finding is related to a protocol/contractual deviation.

The hierarchy of flags is listed below:

R > J	The R flag will always take precedence over the J qualifier.
J+	The high bias (J+) flag is applied only to detected results.

J > J+ or J- A non-biased (J) flag will always supersede biased (J+ or J-) flags since it is not possible to assess the direction of the potential bias.

J = J+ plus J- Adding biased (J+, J-) flags with opposite signs will result in a nonbiased flag (J).

UJ = U plus J The UJ flag is used when a non-detected (U) flag is added to J flag.

Table 3 lists the reason codes used. Reason codes explain why flags have been applied and identify possible limitations of data use. Reason codes are cumulative except when one of the flags is R then only the reason code associated to the R flag will be used.

Table 4 presents the overall qualified results after all the flags or validation qualifiers and associated reason codes have been applied.

Once the data are reviewed and qualified according to the QAPP, functional guidelines, EPA Test Methods, and NDEP guidance the data set is then evaluated using PARCCS criteria. PARCCS criteria provide an evaluation of overall data usability. The following is a discussion of PARCCS criteria as related to the project DQOs.

Precision measures the reproducibility of repetitive measurements. It is defined as the degree of mutual agreement among independent measurements as the result of repeated application of the sample analytical process under similar conditions.

Components of precision include analytical precision and total precision. Analytical precision is a measurement of the variability associated with duplicate or replicate analyses of the same sample in the laboratory, and is determined by analysis of laboratory QC samples, such as duplicate control samples (LCSD, MSD, or sample duplicates). If the recoveries of analytes in the specified control samples are comparable within established control limits, then precision is within limits.

Total precision is a measurement of the variability associated with the entire sampling and analytical process. It is determined by analysis of duplicate or replicate field samples, and measures variability introduced by both the laboratory and field operations. FD samples are analyzed to assess field and analytical precision.

Duplicate results are assessed using the relative percent difference (RPD) between duplicate measurements. If the RPD for laboratory QC samples exceeds the laboratory's statistically determined acceptance ranges, data will be qualified as described in the applicable validation procedure. If the RPD between primary and duplicate field samples exceeds 50 percent for groundwater, data will be qualified as described in the applicable validation procedure.

The RPD will be calculated as follows:

$$\text{RPD} = \frac{|x_1 - x_2|}{\left(\frac{(x_1+x_2)}{2}\right)} * 100$$

where:

x_1 = analyte concentration in the primary sample, and

x_2 = analyte concentration in the duplicate sample

Possible causes of poor precision include improper sample collection or handling, inconsistent sample preparation, and poor instrument stability. In some duplicate pairs, results may be reported in either the primary or duplicate samples at levels below the practical quantitation limit (PQL) or non-detected. Since these values are considered to be estimates, RPD exceedances from these duplicate pairs do not suggest a significant impact on the data quality.

Accuracy is a measure of the agreement of an experimental determination and the true value of the parameter being measured. It is used to identify bias in a given measurement system. Recoveries outside acceptable QC limits may be caused by factors such as instrumentation, analyst error, or matrix interference. Accuracy is assessed through the analysis of MS, MSD, LCS, and LCSD. In some cases, samples from multiple SDGs were within one QC batch and therefore are associated with the same laboratory QC samples. Accuracy of inorganic analyses is determined using the percent recoveries of MS and LCS analyses.

Percent recovery (%R) is calculated using the following equation:

$$\%R = (A-B)/C \times 100$$

where:

A = measured concentration in the spiked sample
B = measured concentration of the spike compound in the unspiked sample
C = concentration of the spike

The %R of each analyte spiked in MS/MSD samples and LCS/LCSD is evaluated with the acceptance criteria specified by the previously noted documents. Spike recoveries outside the acceptable QC accuracy limits provide an indication of bias, where the reported data may overestimate or underestimate the actual concentration of compounds detected or quantitation limits reported for environmental samples.

Representativeness is a qualitative parameter that expresses the degree to which the sample data are characteristic of a population. It is evaluated by reviewing the QC results of blanks, samples and holding times. Positive detects of compounds in the blank samples identify compounds that may have been introduced into the samples during sample collection, transport, preparation, or analysis. The QA/QC blanks collected and analyzed are method blanks, calibration blanks, EBs, and FBs.

A method blank is a laboratory-grade water or solid matrix that contains the method reagents and has undergone the same preparation and analysis as the environmental samples. The method blank provides a measure of the combined contamination derived from the laboratory-source water, glassware, instruments, reagents, and sample preparation steps. Method blanks are prepared for each sample of a similar matrix extracted by the same method at a similar concentration level.

EBs consist of analyte-free water poured over or through the sample collection equipment. The water is collected in a sample container for laboratory analysis. These blanks are collected after the sampling equipment is decontaminated and measure efficiency of the decontamination procedure. EBs were collected and analyzed for all target analytes.

FBs consist of analyte-free source water stored at the sample collection site. Water is collected from each source water used during each sampling event. FBs were collected and analyzed for all target analytes.

For inorganic analyses, contaminants found in both the environmental sample and the blank sample are assumed to be laboratory artifacts if both values are less than the PQL or if a sample result and blank contaminant value are greater than the PQL and the sample result is less than 10 times the blank contaminant value. The blanks and associated samples are evaluated according to the NDEP July 13, 2018 Data Validation Guidance (NDEP 2018).

Holding times are evaluated to assure that the sample integrity is intact for accurate sample preparation and analysis. Holding times will be specific for each method and matrix analyzed. Holding time exceedance can cause loss of sample constituents due to biodegradation, precipitation, volatilization, and chemical degradation. In accordance with NDEP Guidance (NDEP 2018) sample results for analyses that were performed after the method holding time but less than two times the method holding time would be qualified as estimated (J- or UJ). For analyses that were performed after two times the method holding time, detected sample results would be qualified as estimated (J-) and nondetect sample results would be qualified as rejected (R).

Comparability is a qualitative expression of the confidence with which one data set may be compared to another. It provides an assessment of the equivalence of the analytical results to data obtained from other analyses. It is important that data sets be comparable if they are used in conjunction with other data sets. The factors affecting comparability include the following: sample collection and handling techniques, matrix type, and analytical method. If these aspects of sampling and analysis are carried out according to standard analytical procedures, the data are considered comparable. Comparability is also dependent upon other PARCCS criteria, because only when precision, accuracy, and representativeness are known can data sets be compared with confidence.

Completeness is defined as the percentage of acceptable sample results compared to the total number of sample results. Completeness is evaluated to determine if an acceptable amount of usable data were obtained so that a valid scientific site assessment can be completed. Completeness equals the total number of sample results for each fraction minus the total number of rejected sample results divided by the total number of sample results multiplied by 100. As specified in the project DQOs, the goal for completeness for target analytes in each analytical fraction is 90 percent.

Percent completeness is calculated using the following equation:

$$\%C = (T - R)/T \times 100$$

where:

%C = percent completeness
T = total number of sample results
R = total number of rejected sample results

Completeness is also determined by comparing the planned number of samples per method and matrix as specified in the QAPP, with the number determined above.

Sensitivity is the ability of an analytical method or instrument to discriminate between measurement responses representing different concentrations. This capability is established during the planning phase to meet the DQOs. It is important that calibration requirements, detection limits, and PQLs presented in the QAPP are achieved and that target analytes can be detected at concentrations necessary to support the DQOs. The method detection limits (MDLs) represent the minimum concentration of a substance that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero. Sample quantitation limits (SQLs) are adjusted MDL values that reflect sample-specific actions, such as dilutions or varying aliquot sizes. PQLs are the lowest level at which the entire analytical system gives a recognizable signal and acceptable calibration point for the analyte. The laboratory is required to report detected analytes down to the SQL for this project. The laboratory uses a format that reports estimated values down to the SQL. In addition, sample results are compared to method blank and FB results to identify potential effects of laboratory background and field procedures on sensitivity.

The following sections present a review of QC data chlorate, perchlorate, bromide, chloride, TDS and chromium analyses.

2.0 Analysis

A total of 26 primary water samples and 7 QC samples were collectively analyzed for total chromium by EPA Method 200.8, bromide and chloride by EPA Method 300.0; chlorate by EPA Method 300.1B; perchlorate by EPA Method 314.0; and TDS by Standard Method 2540C. All analytical data were assessed to be valid. This section discusses the QA/QC supporting documentation as defined by the PARCCS criteria and evaluated based on the DQOs.

2.1 Precision and Accuracy

2.1.1 Surrogate

Surrogate (dichloroacetic acid) recoveries were evaluated for chlorate analysis by EPA Method 300.1B. All surrogate %Rs met the acceptance criteria as stated in the QAPP.

2.1.2 MS/MSD Samples

Due to MS/MSD %Rs outside of acceptance criteria as stated in the QAPP, the following samples were qualified as estimated ("J+") for perchlorate: MW-25-20180712, MW-20-20180712, WMW3.5S-20180716 and WMW5.7N-20180717 The details regarding the qualification of results are presented in Attachment A, Section 5.

2.1.3 DUP Samples

Duplicate (DUP) samples were evaluated for TDS analysis by SM 2540C. All DUP RPDs met the acceptance criteria as stated in the QAPP.

2.1.4 LCS Samples

LCS samples were evaluated for all wet chemistry methods. All LCS %Rs met the acceptance criteria as stated in the QAPP.

2.1.5 FD Samples

The FD samples were evaluated for acceptable precision with RPDs. Acceptable field and analytical precision was demonstrated for all FD pairs.

2.1.6 Analyte Quantitation and Target Identification

All analytes reported and the detection limits obtained comply with project specifications. All dilutions were appropriate.

2.2 Representativeness

2.2.1 Sample Preservation and Holding Times

The evaluation of holding times to verify compliance with all analytical methods was conducted. All water samples met the 7-day analysis holding time criteria for TDS, the 28-day analysis holding time criteria for chlorate, perchlorate, bromide and chloride; and the 180-day holding analysis holding time for chromium.

The details regarding sample preservation and holding times are presented in Attachment A, Section I.

2.2.2 Blanks

Method blanks, EBs, and FBs were analyzed to evaluate representativeness.

2.2.2.1 Method Blanks

Due to low-level blank contamination, the results for chromium for samples NERT5.91S1-20180716, NERT5.49S1-20180716, and NERT4.38N1-20180716 were qualified as estimated ("J+"). The details regarding the qualification of these results are presented in Attachment A, Section 2.

2.2.2.2 EBs and FBs

Two EBs (NERT4.93S1-20180710-EB and MW-02-20180712-EB) and two FBs (NERT4.93S1-20180710-FB and MW-02-20180712-FB) were submitted for analyses. No contaminants were found in EBs and FBs that required data qualification. The details regarding these results are presented in Attachment A, Section 3.

2.3 Comparability

The laboratory used standard analytical methods for all of the analyses. In all cases, the sample quantitation limits attained were at or below the PQLs. Target compounds detected below the PQLs flagged (J) by the laboratory should be considered estimated. The comparability of the data is regarded as acceptable.

2.4 Completeness

The completeness level attained for wet chemistry field samples was 100 percent. This percentage was calculated as the total number of accepted sample results divided by the total number of sample results multiplied by 100.

2.5 Sensitivity

All laboratory PQLs met the specified requirements described in the QAPP.

3.0 Variances in Analytical Performance

The laboratory used standard analytical methods for all of the analyses throughout the project. No systematic variances in analytical performance were noted in the laboratory case narratives.

4.0 Summary of PARCCS Criteria

The validation reports present the PARCCS results for all SDGs. Each PARCCS criterion is discussed in detail in the following sections.

4.1 Precision and Accuracy

Precision and accuracy were evaluated using data quality indicators such as surrogates, MS/MSD, DUP, LCS/LCSD, and field duplicates. The precision and accuracy of the data set were considered acceptable after incorporation of validation-qualified results.

All blanks, surrogate, MS/MSD, RPDs, DUP, LCS, and FD %R met acceptance criteria with the exceptions noted in Section 2.1

4.2 Representativeness

All samples for each method and matrix were evaluated for holding time compliance. All samples were associated with a method blank in each individual SDG. The representativeness of the project data is considered acceptable after incorporation of validation-qualified results.

4.3 Comparability

Sampling frequency requirements were met in obtaining necessary EBs, FBs and FDs. The laboratory used standard analytical methods for the analyses. The analytical results were reported in correct standard units. Sample integrity criteria were met. Sample preservation and holding times were within QC criteria. The overall comparability is considered acceptable after incorporation of validation-qualified results.

4.4 Completeness

Of the 88 total analytes reported from primary samples, 0 sample results were rejected. The completeness for the SDGs is as follows:

Parameter	Total Analytes	No. of Rejects	% Completeness
Perchlorate	26	0	100
Chlorate	26	0	100
TDS	9	0	100
Chloride	9	0	100
Bromide	9	0	100
Chromium	9	0	100
Total	**88**	**0**	**100**

The completeness percentage based on rejected data met the 90-percent DQO goal.

4.5 Sensitivity

Sensitivity was achieved by the laboratory to support the DQOs. Calibration concentrations and PQLs met the project requirements and low-level contamination in the method blanks, calibration blanks, EBs, and FBs did not affect sensitivity.

5.0 Conclusions and Recommendations

The analytical data quality assessment for the water sample laboratory analytical results generated during the July 2018 groundwater sampling in the Downgradient Study Area of the NERT site in Henderson, Nevada, established that the overall project requirements and completeness levels were met. No results were rejected. Sample results that were found to be estimated ("J+") are usable for limited purposes only. Based upon the Stage 2A data validation, all other results are considered valid and usable for all purposes.

6.0 References

AECOM, 2017. Quality Assurance Project Plan, Downgradient Study Area, Henderson, Nevada (QAPP), May (Rev 1).

EPA, 2017. Contract Laboratory Program National Functional Guidelines for Inorganic Data Review. January 2017.

_________, 1996. EPA SW 846 Third Edition, Test Methods for Evaluating Solid Waste, update I, July 1992; update IIA, August 1993; update II, September 1994; update IIB, January 1995; update III, December 1996; update IV, February 2007.

_________,1983. EPA Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020, Cincinnati, Ohio. March.

NDEP, 2018. NDEP Data Validation and Verification Requirements for the BMI Complex and Common Areas. July 13.

Tables

Table 1
Sample Cross Reference
NERT Downgradient Study Area

Henderson, Nevada

SDG	Client Sample ID	Lab Sample ID	Matrix	Sample Date	QC Type	Validation Level	Bromide (E300)	Chlorate (E300.1B)	Chloride (E300)	Total Chromium (E200.8)	Perchlorate (E314.0)	Total Dissolved Solids (SM2540C)
4402156051	NERT3.80S1-20180709	440-215605-1	W	07/09/18		Stage 2A	X	X			X	X
4402156051	NERT4.51S1-20180710	440-215605-3	W	07/10/18		Stage 2A	X	X	X	X	X	X
4402156051	NERT4.71S1-20180710	440-215605-2	W	07/10/18		Stage 2A	X	X	X	X	X	X
4402156051	NERT4.93S1-20180710	440-215605-4	W	07/10/18		Stage 2A	X	X	X	X	X	X
4402156051	NERT4.93S1-20180710-EB	440-215605-7	W	07/10/18	EB	Stage 2A	X	X	X	X	X	X
4402156051	NERT4.93S1-20180710-FB	440-215605-6	W	07/10/18	FB	Stage 2A	X	X	X	X	X	X
4402156051	NERT4.93S1-20180710-FD	440-215605-5	W	07/10/18	DUP	Stage 2A	X	X	X	X	X	X
4402156051	NERT5.11S1-20180710	440-215605-8	W	07/10/18		Stage 2A	X	X	X	X	X	X
4402158041	AA-30-20180713	440-215804-12	W	07/13/18		Stage 2A		X			X	
4402158041	COH2B1-20180713	440-215804-11	W	07/13/18		Stage 2A		X			X	
4402158041	LNDMW1-20180711	440-215804-1	W	07/11/18		Stage 2A		X			X	
4402158041	MW-02-20180712	440-215804-6	W	07/12/18		Stage 2A		X			X	
4402158041	MW-02-20180712-EB	440-215804-9	W	07/12/18	EB	Stage 2A		X			X	
4402158041	MW-02-20180712-FB	440-215804-8	W	07/12/18	FB	Stage 2A		X			X	
4402158041	MW-02-20180712-FD	440-215804-7	W	07/12/18	DUP	Stage 2A		X			X	
4402158041	MW-13-20180712	440-215804-3	W	07/12/18		Stage 2A		X			X	
4402158041	MW-20-20180712	440-215804-10	W	07/12/18		Stage 2A		X			X	
4402158041	MW-25-20180712	440-215804-2	W	07/12/18		Stage 2A		X			X	
4402158041	MW-3-20180712	440-215804-4	W	07/12/18		Stage 2A		X			X	
4402158041	MW-4-20180712	440-215804-5	W	07/12/18		Stage 2A		X			X	
4402158041	WMW4.9S-20180713	440-215804-15	W	07/13/18		Stage 2A		X			X	
4402158041	WMW4.9S-20180713-FD	440-215804-16	W	07/13/18	DUP	Stage 2A		X			X	
4402158041	WMW5.58S-20180713	440-215804-14	W	07/13/18		Stage 2A		X			X	
4402158041	WMW5.5S-20180713	440-215804-13	W	07/13/18		Stage 2A		X			X	
4402162091	LNDMW2-20180717	440-216209-7	W	07/17/18		Stage 2A		X			X	
4402162091	NERT4.21N1-20180716	440-216209-4	W	07/16/18		Stage 2A	X	X	X	X	X	X
4402162091	NERT4.38N1-20180716	440-216209-5	W	07/16/18		Stage 2A	X	X	X	X	X	X
4402162091	NERT5.49S1-20180716	440-216209-3	W	07/16/18		Stage 2A	X	X	X	X	X	X
4402162091	NERT5.91S1-20180716	440-216209-2	W	07/16/18		Stage 2A	X	X	X	X	X	X
4402162091	WMW3.5N-20180717	440-216209-6	W	07/17/18		Stage 2A		X			X	
4402162091	WMW3.5S-20180716	440-216209-1	W	07/16/18		Stage 2A		X			X	
4402162091	WMW4.9N-20180717	440-216209-8	W	07/17/18		Stage 2A		X			X	
4402162091	WMW5.7N-20180717	440-216209-9	W	07/17/18		Stage 2A		X			X	

Notes:

SDG - Sample Designation Group

ID - Identifier

QC - Quality control

W - Water

EB - Equipment Blank

FB - Field Blank

DUP - Duplicate

Table 2
Validation Elements
NERT Downgradient Study Area
Henderson, Nevada

Stage 2A	All Analyses
Sample Receipt & Technical Holding Time	√
Laboratory Blanks	√
Field Blanks	√
Surrogate Spikes	√
Matrix Spike (MS), Matrix Spike Duplicate (MSD)	√
Laboratory Duplicate (DUP)	√
Laboratory Control Sample (LCS)/ Laboratory Control Sample Duplicate (LCSD)	√
Field Duplicate	√
Project Quantitation Limits (QL)	√
Multiple Results for One Sample	√
Overall Data Usability Assessment	√

Notes:
√ = Reviewed

Table 3
Qualification Codes and Definitions
NERT Downgradient Study Area
Henderson, Nevada

Reason Code	Explanation
a	qualified due to low abundance (radiochemical activity)
be	qualified due to equipment blank contamination
bf	qualified due to field blank contamination
bl	qualified due to laboratory blank contamination
bt	qualified due to trip blank contamination
bp	qualified due to pump blank contamination (wells w/o dedicated pumps, when contamination is detected in the Pump Blk)
br	qualified due to filter blank contamination (aqueous Hexavalent Chromium and Dissolved sample fractions)
c	qualified due to calibration problems
cp	qualified due to insufficient ingrowth (radiochemical only)
dc	dual column confirmation %D exceeded
e	concentration exceeded the calibration range
fd	qualified due to field duplicate imprecision
h	qualified due to holding time exceedance
i	qualified due to internal standard areas
k	qualified as Estimated Maximum Possible Concentrations (dioxins and PCB congeners)
l	qualified due to LCS recoveries
ld	qualified due to laboratory duplicate imprecision (matrix duplicate, MSD, LCSD)
m	qualified due to matrix spike recoveries
nb	qualified due to negative laboratory blank contamination (nondetect results only)
nd	qualified due to non-detected target analyte
o	other
p	qualified as a false positive due to contamination during shipping
pH	sample preservation not within acceptance range
q	qualified due to quantitation problem
s	qualified due to surrogate recoveries
sd	serial dilution did not meet control criteria
sp	detected value reported >SQL <PQL
st	sample receipt temperature exceeded
t	qualified due to elevated helium tracer concentrations
vh	volatile headspace detected in aqueous sample containers submitted for VOC analysis
x	qualified due to low % solids
z	qualified due to ICS results

Table 4

Qualified Results

NERT Downgradient Study Area

Henderson, Nevada

SDG	Client Sample ID	Sample Date	Method	Client Analyte ID	Analyte	Lab Result	Lab Qualifier	SQL	PQL	Units	Validator Qualifier	Reason Code	Reason Code Definition	Qualification Finding	
4402156051	NERT3.80S1-20180709	7/9/2018	E200.8	7440-47-3	Chromium	1.8	J	0.50	2.0	µg/l	J	sp	Detect <PQL		
4402156051	NERT3.80S1-20180709	7/9/2018	E300	16887-00-6	Chloride	480		1.3	100	mg/l					
4402156051	NERT3.80S1-20180709	7/9/2018	E300	24959-67-9	Bromide	1.3	U	1.3	2.5	mg/l					
4402156051	NERT3.80S1-20180709	7/9/2018	SM2540C	TDS	Total Dissolved Solids	3100		5.0	20	mg/l					
4402156052	NERT3.80S1-20180709	7/9/2018	E300.1	14866-68-3	Chlorate	1700		250	1000	µg/l					
4402156052	NERT3.80S1-20180709	7/9/2018	E314.0	14797-73-0	Perchlorate	1100		95	400	µg/l					
4402156051	NERT4.71S1-20180710	7/10/2018	E200.8	7440-47-3	Chromium	26		0.50	2.0	µg/l					
4402156051	NERT4.71S1-20180710	7/10/2018	E300	16887-00-6	Chloride	830		2.5	100	mg/l					
4402156051	NERT4.71S1-20180710	7/10/2018	E300	24959-67-9	Bromide	2.5	U	2.5	5.0	mg/l					
4402156051	NERT4.71S1-20180710	7/10/2018	E300.1	14866-68-3	Chlorate	14000		250	1000	µg/l					
4402156051	NERT4.71S1-20180710	7/10/2018	E314.0	14797-73-0	Perchlorate	3800		95	400	µg/l					
4402156051	NERT4.71S1-20180710	7/10/2018	SM2540C	TDS	Total Dissolved Solids	5200		5.0	100	mg/l					
4402156051	NERT4.51S1-20180710	7/10/2018	E200.8	7440-47-3	Chromium	19		0.50	2.0	µg/l					
4402156051	NERT4.51S1-20180710	7/10/2018	E300	16887-00-6	Chloride	710		1.3	100	mg/l					
4402156051	NERT4.51S1-20180710	7/10/2018	E300	24959-67-9	Bromide	1.3	U	1.3	2.5	mg/l					
4402156051	NERT4.51S1-20180710	7/10/2018	E300.1	14866-68-3	Chlorate	10000		250	1000	µg/l					
4402156051	NERT4.51S1-20180710	7/10/2018	E314.0	14797-73-0	Perchlorate	3100		95	400	µg/l					
4402156051	NERT4.51S1-20180710	7/10/2018	SM2540C	TDS	Total Dissolved Solids	4900		5.0	100	mg/l					
4402156051	NERT4.93S1-20180710	7/10/2018	E200.8	7440-47-3	Chromium	15		0.50	2.0	µg/l					
4402156051	NERT4.93S1-20180710	7/10/2018	E300	16887-00-6	Chloride	770		1.3	100	mg/l					
4402156051	NERT4.93S1-20180710	7/10/2018	E300	24959-67-9	Bromide	1.3	U	1.3	2.5	mg/l					
4402156051	NERT4.93S1-20180710	7/10/2018	E300.1	14866-68-3	Chlorate	19000		250	1000	µg/l					
4402156051	NERT4.93S1-20180710	7/10/2018	E314.0	14797-73-0	Perchlorate	3900		95	400	µg/l					
4402156051	NERT4.93S1-20180710	7/10/2018	SM2540C	TDS	Total Dissolved Solids	4300		5.0	50	mg/l					
4402156051	NERT4.93S1-20180710-FD	7/10/2018	E200.8	7440-47-3	Chromium	14		0.50	2.0	µg/l					
4402156051	NERT4.93S1-20180710-FD	7/10/2018	E300	16887-00-6	Chloride	770		1.3	100	mg/l					
4402156051	NERT4.93S1-20180710-FD	7/10/2018	E300	24959-67-9	Bromide	1.3	U	1.3	2.5	mg/l					
4402156051	NERT4.93S1-20180710-FD	7/10/2018	E300.1	14866-68-3	Chlorate	18000		250	1000	µg/l					
4402156051	NERT4.93S1-20180710-FD	7/10/2018	E314.0	14797-73-0	Perchlorate	3900		95	400	µg/l					
4402156051	NERT4.93S1-20180710-FD	7/10/2018	SM2540C	TDS	Total Dissolved Solids	4300		5.0	50	mg/l					
4402156051	NERT4.93S1-20180710-FB	7/10/2018	E200.8	7440-47-3	Chromium	0.50	U	0.50	2.0	µg/l					
4402156051	NERT4.93S1-20180710-FB	7/10/2018	E300	16887-00-6	Chloride	0.25	U	0.25	0.50	mg/l					
4402156051	NERT4.93S1-20180710-FB	7/10/2018	E300	24959-67-9	Bromide	0.25	U	0.25	0.50	mg/l					
4402156051	NERT4.93S1-20180710-FB	7/10/2018	E300.1	14866-68-3	Chlorate	5.0	U	5.0	20	µg/l					
4402156051	NERT4.93S1-20180710-FB	7/10/2018	E314.0	14797-73-0	Perchlorate	0.95	U	0.95	4.0	µg/l					
4402156051	NERT4.93S1-20180710-FB	7/10/2018	SM2540C	TDS	Total Dissolved Solids	5.0	U	5.0	10	mg/l					
4402156051	NERT4.93S1-20180710-EB	7/10/2018	E200.8	7440-47-3	Chromium	0.50	U	0.50	2.0	µg/l					
4402156051	NERT4.93S1-20180710-EB	7/10/2018	E300	16887-00-6	Chloride	0.26	J	0.25	0.50	mg/l	J	sp	Detect <PQL		

Table 4
Qualified Results
NERT Downgradient Study Area

Henderson, Nevada

SDG	Client Sample ID	Sample Date	Method	Client Analyte ID	Analyte	Lab Result	Lab Qualifier	SQL	PQL	Units	Validator Qualifier	Reason Code	Reason Code Definition	Qualification Finding	
4402156051	NERT4.93S1-20180710-EB	7/10/2018	E300	24959-67-9	Bromide	0.25	U	0.25	0.50	mg/l					
4402156051	NERT4.93S1-20180710-EB	7/10/2018	E300.1	14866-68-3	Chlorate	5.0	U	5.0	20	µg/l					
4402156051	NERT4.93S1-20180710-EB	7/10/2018	E314.0	14797-73-0	Perchlorate	0.95	U	0.95	4.0	µg/l					
4402156051	NERT4.93S1-20180710-EB	7/10/2018	SM2540C	TDS	Total Dissolved Solids	5.0	U	5.0	10	mg/l					
4402156051	NERT5.11S1-20180710	7/10/2018	E200.8	7440-47-3	Chromium	13		0.50	2.0	µg/l					
4402156051	NERT5.11S1-20180710	7/10/2018	E300	16887-00-6	Chloride	910		1.3	100	mg/l					
4402156051	NERT5.11S1-20180710	7/10/2018	E300	24959-67-9	Bromide	1.3	U	1.3	2.5	mg/l					
4402156051	NERT5.11S1-20180710	7/10/2018	E300.1	14866-68-3	Chlorate	25000		500	2000	µg/l					
4402156051	NERT5.11S1-20180710	7/10/2018	E314.0	14797-73-0	Perchlorate	6000		95	400	µg/l					
4402156051	NERT5.11S1-20180710	7/10/2018	SM2540C	TDS	Total Dissolved Solids	4700		5.0	100	mg/l					
4402158041	LNDMW1-20180711	7/11/2018	E300.1	14866-68-3	Chlorate	4700		100	1000	µg/l					
4402158041	LNDMW1-20180711	7/11/2018	E314.0	14797-73-0	Perchlorate	1600		95	400	µg/l					
4402158041	MW-20-20180712	7/12/2018	E300.1	14866-68-3	Chlorate	78	J	10	100	µg/l	J	sp	Detect <PQL		
4402158041	MW-20-20180712	7/12/2018	E314.0	14797-73-0	Perchlorate	48		0.95	4.0	µg/l	J+	m	matrix spike %R	126/ 132	%
4402158041	COH2B1-20180713	7/13/2018	E300.1	14866-68-3	Chlorate	1000		20	200	µg/l					
4402158041	COH2B1-20180713	7/13/2018	E314.0	14797-73-0	Perchlorate	1600		95	400	µg/l					
4402158041	AA-30-20180713	7/13/2018	E300.1	14866-68-3	Chlorate	9400		100	1000	µg/l					
4402158041	AA-30-20180713	7/13/2018	E314.0	14797-73-0	Perchlorate	3900		95	400	µg/l					
4402158041	WMW5.5S-20180713	7/13/2018	E300.1	14866-68-3	Chlorate	11000		100	1000	µg/l					
4402158041	WMW5.5S-20180713	7/13/2018	E314.0	14797-73-0	Perchlorate	3100		95	400	µg/l					
4402158041	WMW5.58S-20180713	7/13/2018	E300.1	14866-68-3	Chlorate	3200		100	1000	µg/l					
4402158041	WMW5.58S-20180713	7/13/2018	E314.0	14797-73-0	Perchlorate	2500		95	400	µg/l					
4402158041	WMW4.9S-20180713	7/13/2018	E300.1	14866-68-3	Chlorate	2700		100	1000	µg/l					
4402158041	WMW4.9S-20180713	7/13/2018	E314.0	14797-73-0	Perchlorate	930		48	200	µg/l					
4402158041	WMW4.9S-20180713-FD	7/13/2018	E300.1	14866-68-3	Chlorate	2700		100	1000	µg/l					
4402158041	WMW4.9S-20180713-FD	7/13/2018	E314.0	14797-73-0	Perchlorate	900		48	200	µg/l					
4402158041	MW-25-20180712	7/12/2018	E300.1	14866-68-3	Chlorate	57		2.0	20	µg/l					
4402158041	MW-25-20180712	7/12/2018	E314.0	14797-73-0	Perchlorate	4.3	F1	0.95	4.0	µg/l	J+	m	matrix spike %R	126/ 132	%
4402158041	MW-13-20180712	7/12/2018	E300.1	14866-68-3	Chlorate	14000		100	1000	µg/l					
4402158041	MW-13-20180712	7/12/2018	E314.0	14797-73-0	Perchlorate	3700		95	400	µg/l					
4402158041	MW-3-20180712	7/12/2018	E300.1	14866-68-3	Chlorate	6200		100	1000	µg/l					
4402158041	MW-3-20180712	7/12/2018	E314.0	14797-73-0	Perchlorate	3300		95	400	µg/l					
4402158041	MW-4-20180712	7/12/2018	E300.1	14866-68-3	Chlorate	5900		100	1000	µg/l					
4402158041	MW-4-20180712	7/12/2018	E314.0	14797-73-0	Perchlorate	3000		95	400	µg/l					
4402158041	MW-02-20180712	7/12/2018	E300.1	14866-68-3	Chlorate	2600		100	1000	µg/l					
4402158041	MW-02-20180712	7/12/2018	E314.0	14797-73-0	Perchlorate	1900		95	400	µg/l					
4402158041	MW-02-20180712-FD	7/12/2018	E300.1	14866-68-3	Chlorate	2600		100	1000	µg/l					
4402158041	MW-02-20180712-FD	7/12/2018	E314.0	14797-73-0	Perchlorate	1900		95	400	µg/l					

Table 4
Qualified Results
NERT Downgradient Study Area
Henderson, Nevada

SDG	Client Sample ID	Sample Date	Method	Client Analyte ID	Analyte	Lab Result	Lab Qualifier	SQL	PQL	Units	Validator Qualifier	Reason Code	Reason Code Definition	Qualification Finding	
4402158041	MW-02-20180712-FB	7/12/2018	E300.1	14866-68-3	Chlorate	2.0	U	2.0	20	µg/l					
4402158041	MW-02-20180712-FB	7/12/2018	E314.0	14797-73-0	Perchlorate	0.95	U	0.95	4.0	µg/l					
4402158041	MW-02-20180712-EB	7/12/2018	E300.1	14866-68-3	Chlorate	2.0	U	2.0	20	µg/l					
4402158041	MW-02-20180712-EB	7/12/2018	E314.0	14797-73-0	Perchlorate	0.95	U	0.95	4.0	µg/l					
4402162091	WMW3.5S-20180716	7/16/2018	E300.1	14866-68-3	Chlorate	3900		100	1000	µg/l					
4402162091	WMW3.5S-20180716	7/16/2018	E314.0	14797-73-0	Perchlorate	1500		95	400	µg/l	J+	m	matrix spike %R	154/ 157	%
4402162091	NERT5.91S1-20180716	7/16/2018	E200.8	7440-47-3	Chromium	1.5	JB	0.50	2.0	µg/l	J+	bl	Method Blank	1.26	ug/L
4402162091	NERT5.91S1-20180716	7/16/2018	E300	16887-00-6	Chloride	570		1.3	100	mg/l					
4402162091	NERT5.91S1-20180716	7/16/2018	E300	24959-67-9	Bromide	1.3	U	1.3	2.5	mg/l					
4402162091	NERT5.91S1-20180716	7/16/2018	E300.1	14866-68-3	Chlorate	660		20	200	µg/l					
4402162091	NERT5.91S1-20180716	7/16/2018	E314.0	14797-73-0	Perchlorate	2900		95	400	µg/l					
4402162091	NERT5.91S1-20180716	7/16/2018	SM2540C	TDS	Total Dissolved Solids	3100		5.0	50	mg/l					
4402162091	NERT5.49S1-20180716	7/16/2018	E200.8	7440-47-3	Chromium	1.3	JB	0.50	2.0	µg/l	J+	bl	Method Blank	1.26	ug/L
4402162091	NERT5.49S1-20180716	7/16/2018	E300	16887-00-6	Chloride	250		0.25	25	mg/l					
4402162091	NERT5.49S1-20180716	7/16/2018	E300	24959-67-9	Bromide	0.27	J	0.25	0.50	mg/l	J	sp	Detect <PQL		
4402162091	NERT5.49S1-20180716	7/16/2018	E300.1	14866-68-3	Chlorate	10	U	10	100	µg/l					
4402162091	NERT5.49S1-20180716	7/16/2018	E314.0	14797-73-0	Perchlorate	5.1		0.95	4.0	µg/l					
4402162091	NERT5.49S1-20180716	7/16/2018	SM2540C	TDS	Total Dissolved Solids	1400		5.0	20	mg/l					
4402162091	NERT4.21N1-20180716	7/16/2018	E200.8	7440-47-3	Chromium	15	B	0.50	2.0	µg/l			Method Blank	1.26	ug/L
4402162091	NERT4.21N1-20180716	7/16/2018	E300	16887-00-6	Chloride	570		1.3	100	mg/l					
4402162091	NERT4.21N1-20180716	7/16/2018	E300	24959-67-9	Bromide	1.3	U	1.3	2.5	mg/l					
4402162091	NERT4.21N1-20180716	7/16/2018	E300.1	14866-68-3	Chlorate	6800		100	1000	µg/l					
4402162091	NERT4.21N1-20180716	7/16/2018	E314.0	14797-73-0	Perchlorate	2200		95	400	µg/l					
4402162091	NERT4.21N1-20180716	7/16/2018	SM2540C	TDS	Total Dissolved Solids	4000		5.0	50	mg/l					
4402162091	NERT4.38N1-20180716	7/16/2018	E200.8	7440-47-3	Chromium	2.5	B	0.50	2.0	µg/l	J+	bl	Method Blank	1.26	ug/L
4402162091	NERT4.38N1-20180716	7/16/2018	E300	16887-00-6	Chloride	510		1.3	100	mg/l					
4402162091	NERT4.38N1-20180716	7/16/2018	E300	24959-67-9	Bromide	1.3	U	1.3	2.5	mg/l					
4402162091	NERT4.38N1-20180716	7/16/2018	E300.1	14866-68-3	Chlorate	300		4.0	40	µg/l					
4402162091	NERT4.38N1-20180716	7/16/2018	E314.0	14797-73-0	Perchlorate	1400		95	400	µg/l					
4402162091	NERT4.38N1-20180716	7/16/2018	SM2540C	TDS	Total Dissolved Solids	3600		5.0	50	mg/l					
4402162091	WMW3.5N-20180717	7/17/2018	E300.1	14866-68-3	Chlorate	640		20	200	µg/l					
4402162091	WMW3.5N-20180717	7/17/2018	E314.0	14797-73-0	Perchlorate	320		9.5	40	µg/l					
4402162091	LNDMW2-20180717	7/17/2018	E300.1	14866-68-3	Chlorate	6000		100	1000	µg/l					
4402162091	LNDMW2-20180717	7/17/2018	E314.0	14797-73-0	Perchlorate	1700		95	400	µg/l					
4402162091	WMW4.9N-20180717	7/17/2018	E300.1	14866-68-3	Chlorate	13	J	10	100	µg/l	J	sp	Detect <PQL		
4402162091	WMW4.9N-20180717	7/17/2018	E314.0	14797-73-0	Perchlorate	680		19	80	µg/l					
4402162091	WMW5.7N-20180717	7/17/2018	E300.1	14866-68-3	Chlorate	10	U	10	100	µg/l					
4402162091	WMW5.7N-20180717	7/17/2018	E314.0	14797-73-0	Perchlorate	3.9	JF1	0.95	4.0	µg/l	J+	m	matrix spike %R	154/ 157	%

Table 4

Qualified Results

NERT Downgradient Study Area

Henderson, Nevada

SDG	Client Sample ID	Sample Date	Method	Client Analyte ID	Analyte	Lab Result	Lab Qualifier	SQL	PQL	Units	Validator Qualifier	Reason Code	Reason Code Definition	Qualification Finding

Notes:

SDG Sample Designation Group

ID Identifier

J Estimated. The associated numerical value is the approximate concentration of the analyte in the sample.

It is not possible to assess the direction of the potential bias. The analyte was detected but the reported value may not be accurate or precise.

U Nondetected - Analyses were performed for the compound or analyte, but it was not detected.

UJ Estimated/Nondetected - The analyte was analyzed for, but not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.

SQL sample quantitation limits

PQL practical quantitation limit

µg/l micrograms per liter

mg/l milligrams per liter

FD RPD field duplicate relative percent difference

% percent

%R percent recovery

< less than

> greater than

Attachment A

Wet Chemistry Data Validation

Chlorate by EPA Method 300.1B
Perchlorate by EPA Method 314.0
Total Dissolved Solids by Standard Method 2540C
Bromide, Chloride by EPA Method 300.0
Chromium by EPA Method 200.8

1. Sample Receipt and Technical Holding Times

All samples were collected and preserved appropriately, and all analyses were performed within the method-specified holding times. All analyses were performed as requested on the chain of custodies. The laboratory reported all requested analyses and the deliverable data reports were complete.

2. Laboratory Blanks

Laboratory method blanks were analyzed at the proper frequency as required by each analytical method. No contaminants were found in the laboratory method blanks with the following exception.

Method	Blank	Analyte	Concentration	Qualified Samples	Qualifier
EPA 200.8	Mb 440-489062/1-A	Chromium	1.26 ug/L	**NERT5.91S1-20180716, NERT5.49S1-20180716 NERT4.38N1-20180716**	**J+**
Note: MB= Method Blank					

3. Field Blanks

Samples NERT4.93S1-20180710-EB and MW-02-20180712-EB were identified as equipment blanks. No contaminants were found in the equipment blanks or required data qualification.

Samples NERT4.93S1-20180710-FB and MW-02-20180712-FB were identified as field blanks. No contaminants were found in the field blanks.

4. Surrogate

Surrogate (dichloroacetic acid) recoveries were evaluated for chlorate analysis by EPA Method 300.1B. All surrogate percent recoveries met the acceptance criteria.

5. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on associated project samples. Percent recoveries (%R) and relative percent differences (RPD) were within QC limits with the following exceptions.

EPA Method	Sample	Analyte	MS Recovery	MSD Recovery	RPD	Qualified Samples	Qualifier
314.0	MW-25-20180712	Perchlorate	126%	132%	1	**MW-25-20180712 MW-20-20180712**	**J+**
	WMW5.7N-20180717	Perchlorate	154%	157%	1	**WMW3.5S-20180716 WMW5.7N-20180717**	
MS/MSD %Recovery Limits= 80-120%							

MS/MSD recovery limits do not apply when the sample concentration is ≥ 4x the spike added. In such an event, the data would be reported unflagged (*USEPA National Functional Guidelines)*. In addition, batch or non-project MS/MSD data were not evaluated.

6. Duplicate Sample Analysis

Duplicate (DUP) analyses were performed for Total Dissolved Solids by Standard Method 2540C. All duplicate analyses met criteria and therefore no samples were qualified based on duplicate analysis results.

7. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

8. Field Duplicates

Samples NERT4.93S1-20180710-FD, MW-02-20180712-FD, and WMW4.9S-20180713-FD were identified as field duplicates. Acceptable field and analytical precision was demonstrated for all field duplicate pairs. When the sample or field duplicate concentration is <RL, the RL is used for calculation purposes.

9. Sample Result Verification

Raw data were not reviewed for Stage 2A validation.

10. Overall Assessment of Data

All samples were analyzed as requested and all holding times were met. Due to matrix interference, the results for perchlorate for four samples were qualified as estimated (“J+”). In addition, due to low-level blank contamination, the results for chromium for three samples were qualified as estimated (“J+”). No other data were qualified. Overall, based on this data validation, the data as qualified are useable for meeting project objectives. All results are considered to be valid; the analytical completeness defined as the ratio of the number of valid analytical results (valid analytical results include values qualified as estimated) to the total number of analytical results requested on samples submitted for analysis, for the project is 100%. Additionally, because all samples in each data set were collected and analyzed under similar prescribed conditions, the data are considered to be comparable.

Appendix K

Analytical Laboratory Reports

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Irvine
17461 Derian Ave
Suite 100
Irvine, CA 92614-5817
Tel: (949)261-1022

TestAmerica Job ID: 440-215605-1
Client Project/Site: NERT Phase I GW Sample

For:
AECOM
1220 Avenida Acaso
Camarillo, California 93012

Attn: Ms. Sally Bilodeau

Authorized for release by:
7/23/2018 3:09:52 PM

Patty Mata, Senior Project Manager
(949)261-1022
patty.mata@testamericainc.com

The test results in this report meet all 2003 NELAC and 2009 TNI requirements for accredited parameters, exceptions are noted in this report. This report may not be reproduced except in full, and with written approval from the laboratory. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

Table of Contents

Sample Summary

Client: AECOM
Project/Site: NERT Phase I GW Sample

TestAmerica Job ID: 440-215605-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
440-215605-1	NERT3.80S1-20180709	Water	07/09/18 08:40	07/12/18 09:40
440-215605-2	NERT4.71S1-20180710	Water	07/10/18 08:50	07/12/18 09:40
440-215605-3	NERT4.51S1-20180710	Water	07/10/18 12:20	07/12/18 09:40
440-215605-4	NERT4.93S1-20180710	Water	07/10/18 13:50	07/12/18 09:40
440-215605-5	NERT4.93S1-20180710-FD	Water	07/10/18 13:50	07/12/18 09:40
440-215605-6	NERT4.93S1-20180710-FB	Water	07/10/18 14:00	07/12/18 09:40
440-215605-7	NERT4.93S1-20180710-EB	Water	07/10/18 14:15	07/12/18 09:40
440-215605-8	NERT5.11S1-20180710	Water	07/10/18 15:45	07/12/18 09:40

Job ID: 440-215605-1

Laboratory: TestAmerica Irvine

Narrative

Job Narrative
440-215605-1

Comments
Total Dissolved Chromium results are reported separately.

Receipt
The samples were received on 7/12/2018 9:40 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 2.0º C.

HPLC/IC
Method(s) 300.0: The following samples were diluted due to the nature of the sample matrix: NERT3.80S1-20180709 (440-215605-1), NERT4.71S1-20180710 (440-215605-2), NERT4.51S1-20180710 (440-215605-3), NERT4.93S1-20180710 (440-215605-4), NERT4.93S1-20180710-FD (440-215605-5) and NERT5.11S1-20180710 (440-215605-8). Elevated reporting limits (RLs) are provided.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

General Chemistry
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Client: AECOM
Project/Site: NERT Phase I GW Sample

TestAmerica Job ID: 440-215605-1

Client Sample ID: NERT3.80S1-20180709 — Lab Sample ID: 440-215605-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Chloride	480		100	50	mg/L	200		300.0	Total/NA
Chlorate	1700		1000	250	ug/L	50		300.1B	Total/NA
Perchlorate	1100		400	95	ug/L	100		314.0	Total/NA
Total Dissolved Solids	3100		20	10	mg/L	1		SM 2540C	Total/NA

Client Sample ID: NERT4.71S1-20180710 — Lab Sample ID: 440-215605-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Chloride	830		100	50	mg/L	200		300.0	Total/NA
Chlorate	14000		1000	250	ug/L	50		300.1B	Total/NA
Perchlorate	3800		400	95	ug/L	100		314.0	Total/NA
Total Dissolved Solids	5200		100	50	mg/L	1		SM 2540C	Total/NA

Client Sample ID: NERT4.51S1-20180710 — Lab Sample ID: 440-215605-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Chloride - DL	710		100	50	mg/L	200		300.0	Total/NA
Chlorate	10000		1000	250	ug/L	50		300.1B	Total/NA
Perchlorate	3100		400	95	ug/L	100		314.0	Total/NA
Total Dissolved Solids	4900		100	50	mg/L	1		SM 2540C	Total/NA

Client Sample ID: NERT4.93S1-20180710 — Lab Sample ID: 440-215605-4

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Chloride	770		100	50	mg/L	200		300.0	Total/NA
Chlorate	19000		1000	250	ug/L	50		300.1B	Total/NA
Perchlorate	3900		400	95	ug/L	100		314.0	Total/NA
Total Dissolved Solids	4300		50	25	mg/L	1		SM 2540C	Total/NA

Client Sample ID: NERT4.93S1-20180710-FD — Lab Sample ID: 440-215605-5

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Chloride	770		100	50	mg/L	200		300.0	Total/NA
Chlorate	18000		1000	250	ug/L	50		300.1B	Total/NA
Perchlorate	3900		400	95	ug/L	100		314.0	Total/NA
Total Dissolved Solids	4300		50	25	mg/L	1		SM 2540C	Total/NA

Client Sample ID: NERT4.93S1-20180710-FB — Lab Sample ID: 440-215605-6

No Detections.

Client Sample ID: NERT4.93S1-20180710-EB — Lab Sample ID: 440-215605-7

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Chloride	0.26	J	0.50	0.25	mg/L	1		300.0	Total/NA

Client Sample ID: NERT5.11S1-20180710 — Lab Sample ID: 440-215605-8

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Chloride	910		100	50	mg/L	200		300.0	Total/NA
Chlorate	25000		2000	500	ug/L	100		300.1B	Total/NA

This Detection Summary does not include radiochemical test results.

Client Sample ID: NERT5.11S1-20180710 (Continued) Lab Sample ID: 440-215605-8

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Perchlorate	6000		400	95	ug/L	100		314.0	Total/NA
Total Dissolved Solids	4700		100	50	mg/L	1		SM 2540C	Total/NA

This Detection Summary does not include radiochemical test results.

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

Client Sample ID: NERT3.80S1-20180709
Lab Sample ID: 440-215605-1

Date Collected: 07/09/18 08:40
Matrix: Water
Date Received: 07/12/18 09:40

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Bromide	ND		2.5	1.3	mg/L			07/13/18 22:06	5
Chloride	**480**		100	50	mg/L			07/13/18 22:22	200

Method: 300.1B - Disinfection By-Products, (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chlorate	**1700**		1000	250	ug/L			07/14/18 19:42	50

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Dichloroacetic acid(Surr)	*104*		*90 - 115*		*07/14/18 19:42*	*50*

Method: 314.0 - Perchlorate (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perchlorate	**1100**		400	95	ug/L			07/19/18 15:35	100

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	**3100**		20	10	mg/L			07/13/18 08:49	1

Client Sample ID: NERT4.71S1-20180710
Lab Sample ID: 440-215605-2

Date Collected: 07/10/18 08:50
Matrix: Water
Date Received: 07/12/18 09:40

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Bromide	ND		5.0	2.5	mg/L			07/13/18 22:37	10
Chloride	**830**		100	50	mg/L			07/13/18 22:53	200

Method: 300.1B - Disinfection By-Products, (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chlorate	**14000**		1000	250	ug/L			07/14/18 21:09	50

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Dichloroacetic acid(Surr)	*104*		*90 - 115*		*07/14/18 21:09*	*50*

Method: 314.0 - Perchlorate (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perchlorate	**3800**		400	95	ug/L			07/19/18 15:16	100

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	**5200**		100	50	mg/L			07/16/18 08:41	1

Client Sample ID: NERT4.51S1-20180710
Lab Sample ID: 440-215605-3

Date Collected: 07/10/18 12:20
Matrix: Water
Date Received: 07/12/18 09:40

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Bromide	ND		2.5	1.3	mg/L			07/14/18 01:21	5

Client Sample Results

Client: AECOM | TestAmerica Job ID: 440-215605-1
Project/Site: NERT Phase I GW Sample

Client Sample ID: NERT4.51S1-20180710 — Lab Sample ID: 440-215605-3

Date Collected: 07/10/18 12:20 — **Matrix: Water**
Date Received: 07/12/18 09:40

Method: 300.0 - Anions, Ion Chromatography - DL

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**710**		100	50	mg/L			07/14/18 01:37	200

Method: 300.1B - Disinfection By-Products, (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chlorate	**10000**		1000	250	ug/L			07/14/18 18:16	50

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Dichloroacetic acid(Surr)	*102*		*90 - 115*		*07/14/18 18:16*	*50*

Method: 314.0 - Perchlorate (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perchlorate	**3100**		400	95	ug/L			07/19/18 13:42	100

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	**4900**		100	50	mg/L			07/16/18 08:40	1

Client Sample ID: NERT4.93S1-20180710 — Lab Sample ID: 440-215605-4

Date Collected: 07/10/18 13:50 — **Matrix: Water**
Date Received: 07/12/18 09:40

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Bromide	ND		2.5	1.3	mg/L			07/13/18 23:08	5
Chloride	**770**		100	50	mg/L			07/14/18 00:34	200

Method: 300.1B - Disinfection By-Products, (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chlorate	**19000**		1000	250	ug/L			07/14/18 21:38	50

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Dichloroacetic acid(Surr)	*102*		*90 - 115*		*07/14/18 21:38*	*50*

Method: 314.0 - Perchlorate (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perchlorate	**3900**		400	95	ug/L			07/19/18 15:53	100

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	**4300**		50	25	mg/L			07/16/18 08:41	1

Client Sample ID: NERT4.93S1-20180710-FD — Lab Sample ID: 440-215605-5

Date Collected: 07/10/18 13:50 — **Matrix: Water**
Date Received: 07/12/18 09:40

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Bromide	ND		2.5	1.3	mg/L			07/14/18 00:50	5
Chloride	**770**		100	50	mg/L			07/14/18 01:05	200

Client Sample ID: NERT4.93S1-20180710-FD

Lab Sample ID: 440-215605-5
Matrix: Water

Date Collected: 07/10/18 13:50
Date Received: 07/12/18 09:40

Method: 300.1B - Disinfection By-Products, (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chlorate	18000		1000	250	ug/L			07/14/18 22:06	50

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Dichloroacetic acid(Surr)	*103*		*90 - 115*		*07/14/18 22:06*	*50*

Method: 314.0 - Perchlorate (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perchlorate	3900		400	95	ug/L			07/19/18 16:12	100

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	4300		50	25	mg/L			07/16/18 08:41	1

Client Sample ID: NERT4.93S1-20180710-FB

Lab Sample ID: 440-215605-6
Matrix: Water

Date Collected: 07/10/18 14:00
Date Received: 07/12/18 09:40

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Bromide	ND		0.50	0.25	mg/L			07/14/18 00:03	1
Chloride	ND		0.50	0.25	mg/L			07/14/18 00:03	1

Method: 300.1B - Disinfection By-Products, (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chlorate	ND		20	5.0	ug/L			07/14/18 07:53	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Dichloroacetic acid(Surr)	*109*		*90 - 115*		*07/14/18 07:53*	*1*

Method: 314.0 - Perchlorate (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perchlorate	ND		4.0	0.95	ug/L			07/19/18 11:32	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	ND		10	5.0	mg/L			07/16/18 08:41	1

Client Sample ID: NERT4.93S1-20180710-EB

Lab Sample ID: 440-215605-7
Matrix: Water

Date Collected: 07/10/18 14:15
Date Received: 07/12/18 09:40

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Bromide	ND		0.50	0.25	mg/L			07/14/18 00:19	1
Chloride	0.26	J	0.50	0.25	mg/L			07/14/18 00:19	1

Method: 300.1B - Disinfection By-Products, (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chlorate	ND		20	5.0	ug/L			07/14/18 08:29	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Dichloroacetic acid(Surr)	*110*		*90 - 115*		*08:29 07/14/18*	*1*

Client: AECOM
Project/Site: NERT Phase I GW Sample

TestAmerica Job ID: 440-215605-1

Client Sample ID: NERT4.93S1-20180710-EB
Lab Sample ID: 440-215605-7
Date Collected: 07/10/18 14:15
Matrix: Water
Date Received: 07/12/18 09:40

Method: 314.0 - Perchlorate (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perchlorate	ND		4.0	0.95	ug/L			07/19/18 14:59	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	ND		10	5.0	mg/L			07/16/18 08:41	1

Client Sample ID: NERT5.11S1-20180710
Lab Sample ID: 440-215605-8
Date Collected: 07/10/18 15:45
Matrix: Water
Date Received: 07/12/18 09:40

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Bromide	ND		2.5	1.3	mg/L			07/14/18 02:24	5
Chloride	**910**		100	50	mg/L			07/14/18 03:10	200

Method: 300.1B - Disinfection By-Products, (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chlorate	**25000**		2000	500	ug/L			07/15/18 18:47	100

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Dichloroacetic acid(Surr)	*106*		*90 - 115*		*07/15/18 18:47*	*100*

Method: 314.0 - Perchlorate (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perchlorate	**6000**		400	95	ug/L			07/19/18 16:30	100

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	**4700**		100	50	mg/L			07/16/18 08:41	1

Method: 300.1B - Disinfection By-Products, (IC)

Matrix: Water

Prep Type: Total/NA

Percent Surrogate Recovery (Acceptance Limits)

Lab Sample ID	Client Sample ID	DCAA (90-115)
440-215605-1	NERT3.80S1-20180709	104
440-215605-2	NERT4.71S1-20180710	104
440-215605-3	NERT4.51S1-20180710	102
440-215605-3 MS	NERT4.51S1-20180710	113
440-215605-3 MSD	NERT4.51S1-20180710	104
440-215605-4	NERT4.93S1-20180710	102
440-215605-5	NERT4.93S1-20180710-FD	103
440-215605-6	NERT4.93S1-20180710-FB	109
440-215605-7	NERT4.93S1-20180710-EB	110
440-215605-8	NERT5.11S1-20180710	106
440-215717-B-3 MS	Matrix Spike	109
440-215717-B-3 MSD	Matrix Spike Duplicate	107
440-215720-B-1 MS	Matrix Spike	109
440-215720-B-1 MSD	Matrix Spike Duplicate	109
LCS 440-487252/40	Lab Control Sample	109
LCS 440-487528/4	Lab Control Sample	108
LCS 440-487566/4	Lab Control Sample	106
MB 440-487252/41	Method Blank	109
MB 440-487528/5	Method Blank	109
MB 440-487566/5	Method Blank	103
MRL 440-487252/39	Lab Control Sample	108
MRL 440-487528/3	Lab Control Sample	102
MRL 440-487566/3	Lab Control Sample	107

Surrogate Legend

DCAA = Dichloroacetic acid(Surr)

Method Summary

Method	Method Description	Protocol	Laboratory
300.0	Anions, Ion Chromatography	MCAWW	TAL IRV
300.1B	Disinfection By-Products, (IC)	EPA	TAL IRV
314.0	Perchlorate (IC)	EPA	TAL IRV
SM 2540C	Solids, Total Dissolved (TDS)	SM	TAL IRV

Protocol References:

EPA = US Environmental Protection Agency

MCAWW = "Methods For Chemical Analysis Of Water And Wastes", EPA-600/4-79-020, March 1983 And Subsequent Revisions.

SM = "Standard Methods For The Examination Of Water And Wastewater"

Laboratory References:

TAL IRV = TestAmerica Irvine, 17461 Derian Ave, Suite 100, Irvine, CA 92614-5817, TEL (949)261-1022

Client Sample ID: NERT3.80S1-20180709 Lab Sample ID: 440-215605-1

Date Collected: 07/09/18 08:40 **Matrix: Water**
Date Received: 07/12/18 09:40

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.0		5	5 mL	1.0 mL	487320	07/13/18 22:06	NTN	TAL IRV
Total/NA	Analysis	300.0		200	5 mL	1.0 mL	487320	07/13/18 22:22	NTN	TAL IRV
Total/NA	Analysis	300.1B		50			487528	07/14/18 19:42	YZ	TAL IRV
Total/NA	Analysis	314.0		100			488407	07/19/18 15:35	PS	TAL IRV
Total/NA	Analysis	SM 2540C		1	50 mL	100 mL	487284	07/13/18 08:49	XL	TAL IRV

Client Sample ID: NERT4.71S1-20180710 Lab Sample ID: 440-215605-2

Date Collected: 07/10/18 08:50 **Matrix: Water**
Date Received: 07/12/18 09:40

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.0		10	5 mL	1.0 mL	487320	07/13/18 22:37	NTN	TAL IRV
Total/NA	Analysis	300.0		200	5 mL	1.0 mL	487320	07/13/18 22:53	NTN	TAL IRV
Total/NA	Analysis	300.1B		50			487528	07/14/18 21:09	YZ	TAL IRV
Total/NA	Analysis	314.0		100			488407	07/19/18 15:16	PS	TAL IRV
Total/NA	Analysis	SM 2540C		1	10 mL	100 mL	487658	07/16/18 08:41	XL	TAL IRV

Client Sample ID: NERT4.51S1-20180710 Lab Sample ID: 440-215605-3

Date Collected: 07/10/18 12:20 **Matrix: Water**
Date Received: 07/12/18 09:40

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.0		5	5 mL	1.0 mL	487320	07/14/18 01:21	NTN	TAL IRV
Total/NA	Analysis	300.0	DL	200			487320	07/14/18 01:37	NTN	TAL IRV
Total/NA	Analysis	300.1B		50			487528	07/14/18 18:16	YZ	TAL IRV
Total/NA	Analysis	314.0		100			488407	07/19/18 13:42	PS	TAL IRV
Total/NA	Analysis	SM 2540C		1	10 mL	100 mL	487658	07/16/18 08:40	XL	TAL IRV

Client Sample ID: NERT4.93S1-20180710 Lab Sample ID: 440-215605-4

Date Collected: 07/10/18 13:50 **Matrix: Water**
Date Received: 07/12/18 09:40

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.0		5	5 mL	1.0 mL	487320	07/13/18 23:08	NTN	TAL IRV
Total/NA	Analysis	300.0		200			487320	07/14/18 00:34	NTN	TAL IRV
Total/NA	Analysis	300.1B		50			487528	07/14/18 21:38	YZ	TAL IRV
Total/NA	Analysis	314.0		100			488407	07/19/18 15:53	PS	TAL IRV
Total/NA	Analysis	SM 2540C		1	20 mL	100 mL	487658	07/16/18 08:41	XL	TAL IRV

Client Sample ID: NERT4.93S1-20180710-FD

Lab Sample ID: 440-215605-5

Date Collected: 07/10/18 13:50

Matrix: Water

Date Received: 07/12/18 09:40

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.0		5	5 mL	1.0 mL	487320	07/14/18 00:50	NTN	TAL IRV
Total/NA	Analysis	300.0		200	5 mL	1.0 mL	487320	07/14/18 01:05	NTN	TAL IRV
Total/NA	Analysis	300.1B		50			487528	07/14/18 22:06	YZ	TAL IRV
Total/NA	Analysis	314.0		100			488407	07/19/18 16:12	PS	TAL IRV
Total/NA	Analysis	SM 2540C		1	20 mL	100 mL	487658	07/16/18 08:41	XL	TAL IRV

Client Sample ID: NERT4.93S1-20180710-FB

Lab Sample ID: 440-215605-6

Date Collected: 07/10/18 14:00

Matrix: Water

Date Received: 07/12/18 09:40

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.0		1			487320	07/14/18 00:03	NTN	TAL IRV
Total/NA	Analysis	300.1B		1			487252	07/14/18 07:53	YZ	TAL IRV
Total/NA	Analysis	314.0		1			488407	07/19/18 11:32	PS	TAL IRV
Total/NA	Analysis	SM 2540C		1	100 mL	100 mL	487658	07/16/18 08:41	XL	TAL IRV

Client Sample ID: NERT4.93S1-20180710-EB

Lab Sample ID: 440-215605-7

Date Collected: 07/10/18 14:15

Matrix: Water

Date Received: 07/12/18 09:40

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.0		1			487320	07/14/18 00:19	NTN	TAL IRV
Total/NA	Analysis	300.1B		1			487252	07/14/18 08:29	YZ	TAL IRV
Total/NA	Analysis	314.0		1			488407	07/19/18 14:59	PS	TAL IRV
Total/NA	Analysis	SM 2540C		1	100 mL	100 mL	487658	07/16/18 08:41	XL	TAL IRV

Client Sample ID: NERT5.11S1-20180710

Lab Sample ID: 440-215605-8

Date Collected: 07/10/18 15:45

Matrix: Water

Date Received: 07/12/18 09:40

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.0		5	5 mL	1.0 mL	487320	07/14/18 02:24	NTN	TAL IRV
Total/NA	Analysis	300.0		200	5 mL	1.0 mL	487320	07/14/18 03:10	NTN	TAL IRV
Total/NA	Analysis	300.1B		100			487566	07/15/18 18:47	YZ	TAL IRV
Total/NA	Analysis	314.0		100			488407	07/19/18 16:30	PS	TAL IRV
Total/NA	Analysis	SM 2540C		1	10 mL	100 mL	487658	07/16/18 08:41	XL	TAL IRV

Laboratory References:

TAL IRV = TestAmerica Irvine, 17461 Derian Ave, Suite 100, Irvine, CA 92614-5817, TEL (949)261-1022

Method: 300.0 - Anions, Ion Chromatography

Lab Sample ID: MB 440-487320/6
Matrix: Water
Analysis Batch: 487320
Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Bromide	ND		0.50	0.25	mg/L			07/13/18 13:26	1
Chloride	ND		0.50	0.25	mg/L			07/13/18 13:26	1

Lab Sample ID: LCS 440-487320/7
Matrix: Water
Analysis Batch: 487320
Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Bromide	5.00	5.33		mg/L		107	90 - 110
Chloride	5.00	5.09		mg/L		102	90 - 110

Method: 300.0 - Anions, Ion Chromatography - DL

Lab Sample ID: 440-215605-3 MS
Matrix: Water
Analysis Batch: 487320
Client Sample ID: NERT4.51S1-20180710
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Bromide - DL	ND		1000	970		mg/L		97	80 - 120
Chloride - DL	710		1000	1680		mg/L		96	80 - 120

Lab Sample ID: 440-215605-3 MSD
Matrix: Water
Analysis Batch: 487320
Client Sample ID: NERT4.51S1-20180710
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Bromide - DL	ND		1000	971		mg/L		97	80 - 120	0	20
Chloride - DL	710		1000	1680		mg/L		97	80 - 120	0	20

Method: 300.1B - Disinfection By-Products, (IC)

Lab Sample ID: MB 440-487252/41
Matrix: Water
Analysis Batch: 487252
Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chlorate	ND		20	5.0	ug/L			07/14/18 05:26	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Dichloroacetic acid(Surr)	*109*		*90 - 115*		*07/14/18 05:26*	*1*

Lab Sample ID: LCS 440-487252/40
Matrix: Water
Analysis Batch: 487252
Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Chlorate	100	100		ug/L		100	75 - 125

Method: 300.1B - Disinfection By-Products, (IC) (Continued)

Lab Sample ID: LCS 440-487252/40
Matrix: Water
Analysis Batch: 487252

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Surrogate	LCS %Recovery	LCS Qualifier	Limits
Dichloroacetic acid(Surr)	*109*		*90 - 115*

Lab Sample ID: MRL 440-487252/39
Matrix: Water
Analysis Batch: 487252

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte			Spike Added	MRL Result	MRL Qualifier	Unit	D	%Rec	%Rec. Limits		
Chlorate			20.0	21.4		ug/L		107	50 - 150		

Surrogate	MRL %Recovery	MRL Qualifier	Limits
Dichloroacetic acid(Surr)	*108*		*90 - 115*

Lab Sample ID: 440-215720-B-1 MS
Matrix: Water
Analysis Batch: 487252

Client Sample ID: Matrix Spike
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits		
Chlorate	160	F1	200	425	F1	ug/L		133	75 - 125		

Surrogate	MS %Recovery	MS Qualifier	Limits
Dichloroacetic acid(Surr)	*109*		*90 - 115*

Lab Sample ID: 440-215720-B-1 MSD
Matrix: Water
Analysis Batch: 487252

Client Sample ID: Matrix Spike Duplicate
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Chlorate	160	F1	200	385		ug/L		113	75 - 125	10	25

Surrogate	MSD %Recovery	MSD Qualifier	Limits
Dichloroacetic acid(Surr)	*109*		*90 - 115*

Lab Sample ID: MB 440-487528/5
Matrix: Water
Analysis Batch: 487528

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chlorate	ND		20	5.0	ug/L			07/14/18 11:02	1

Surrogate	MB %Recovery	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
Dichloroacetic acid(Surr)	*109*		*90 - 115*		*07/14/18 11:02*	*1*

Method: 300.1B - Disinfection By-Products, (IC) (Continued)

Lab Sample ID: LCS 440-487528/4
Matrix: Water
Analysis Batch: 487528

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Chlorate			100	104		ug/L		104	75 - 125

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
Dichloroacetic acid(Surr)	*108*		*90 - 115*

Lab Sample ID: MRL 440-487528/3
Matrix: Water
Analysis Batch: 487528

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte			Spike Added	MRL Result	MRL Qualifier	Unit	D	%Rec	%Rec. Limits
Chlorate			20.0	22.0		ug/L		110	50 - 150

Surrogate	*MRL %Recovery*	*MRL Qualifier*	*Limits*
Dichloroacetic acid(Surr)	*102*		*90 - 115*

Lab Sample ID: 440-215605-3 MS
Matrix: Water
Analysis Batch: 487528

Client Sample ID: NERT4.51S1-20180710
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Chlorate	10000		200	10900	4	ug/L		264	75 - 125

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
Dichloroacetic acid(Surr)	*113*		*90 - 115*

Lab Sample ID: 440-215605-3 MSD
Matrix: Water
Analysis Batch: 487528

Client Sample ID: NERT4.51S1-20180710
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Chlorate	10000		200	9920	4	ug/L		-244	75 - 125	10	25

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
Dichloroacetic acid(Surr)	*104*		*90 - 115*

Lab Sample ID: MB 440-487566/5
Matrix: Water
Analysis Batch: 487566

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chlorate	ND		20	5.0	ug/L			07/15/18 11:32	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Dichloroacetic acid(Surr)	*103*		*90 - 115*		*07/15/18 11:32*	*1*

Method: 300.1B - Disinfection By-Products, (IC) (Continued)

Lab Sample ID: LCS 440-487566/4
Client Sample ID: Lab Control Sample
Matrix: Water
Prep Type: Total/NA
Analysis Batch: 487566

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Chlorate			100	101		ug/L		101	75 - 125

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
Dichloroacetic acid(Surr)	*106*		*90 - 115*

Lab Sample ID: MRL 440-487566/3
Client Sample ID: Lab Control Sample
Matrix: Water
Prep Type: Total/NA
Analysis Batch: 487566

Analyte			Spike Added	MRL Result	MRL Qualifier	Unit	D	%Rec	%Rec. Limits
Chlorate			20.0	20.9		ug/L		104	50 - 150

Surrogate	*MRL %Recovery*	*MRL Qualifier*	*Limits*
Dichloroacetic acid(Surr)	*107*		*90 - 115*

Lab Sample ID: 440-215717-B-3 MS
Client Sample ID: Matrix Spike
Matrix: Water
Prep Type: Total/NA
Analysis Batch: 487566

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Chlorate	7900		200	7730	4	ug/L		-67	75 - 125

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
Dichloroacetic acid(Surr)	*109*		*90 - 115*

Lab Sample ID: 440-215717-B-3 MSD
Client Sample ID: Matrix Spike Duplicate
Matrix: Water
Prep Type: Total/NA
Analysis Batch: 487566

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Chlorate	7900		200	7580	4	ug/L		-143	75 - 125	2	25

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
Dichloroacetic acid(Surr)	*107*		*90 - 115*

Method: 314.0 - Perchlorate (IC)

Lab Sample ID: MB 440-488407/8
Client Sample ID: Method Blank
Matrix: Water
Prep Type: Total/NA
Analysis Batch: 488407

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perchlorate	ND		4.0	0.95	ug/L			07/19/18 10:01	1

Client: AECOM
Project/Site: NERT Phase I GW Sample

TestAmerica Job ID: 440-215605-1

Method: 314.0 - Perchlorate (IC) (Continued)

Lab Sample ID: LCS 440-488407/5
Matrix: Water
Analysis Batch: 488407

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Perchlorate			25.0	26.9		ug/L		107	85 - 115		

Lab Sample ID: MRL 440-488407/4
Matrix: Water
Analysis Batch: 488407

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte			Spike Added	MRL Result	MRL Qualifier	Unit	D	%Rec	%Rec. Limits		
Perchlorate			1.00	1.00	J	ug/L		100	75 - 125		

Lab Sample ID: 440-215605-3 MS
Matrix: Water
Analysis Batch: 488407

Client Sample ID: NERT4.51S1-20180710
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits		
Perchlorate	3100		2500	6110		ug/L		119	80 - 120		

Lab Sample ID: 440-215605-3 MSD
Matrix: Water
Analysis Batch: 488407

Client Sample ID: NERT4.51S1-20180710
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Perchlorate	3100		2500	6030		ug/L		116	80 - 120	1	20

Method: SM 2540C - Solids, Total Dissolved (TDS)

Lab Sample ID: MB 440-487284/1
Matrix: Water
Analysis Batch: 487284

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	ND		10	5.0	mg/L			07/13/18 08:49	1

Lab Sample ID: LCS 440-487284/2
Matrix: Water
Analysis Batch: 487284

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Total Dissolved Solids			1000	996		mg/L		100	90 - 110		

Lab Sample ID: 440-215666-H-6 DU
Matrix: Water
Analysis Batch: 487284

Client Sample ID: Duplicate
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Total Dissolved Solids	12000			11800		mg/L				0.6	5

Method: SM 2540C - Solids, Total Dissolved (TDS) (Continued)

Lab Sample ID: MB 440-487658/1
Matrix: Water
Analysis Batch: 487658

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	ND		10	5.0	mg/L			07/16/18 08:40	1

Lab Sample ID: LCS 440-487658/2
Matrix: Water
Analysis Batch: 487658

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Total Dissolved Solids	1000	974		mg/L		97	90 - 110

Lab Sample ID: 440-215605-3 DU
Matrix: Water
Analysis Batch: 487658

Client Sample ID: NERT4.51S1-20180710
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Total Dissolved Solids	4900		4780		mg/L		2	5

HPLC/IC

Analysis Batch: 487252

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-215605-6	NERT4.93S1-20180710-FB	Total/NA	Water	300.1B	
440-215605-7	NERT4.93S1-20180710-EB	Total/NA	Water	300.1B	
MB 440-487252/41	Method Blank	Total/NA	Water	300.1B	
LCS 440-487252/40	Lab Control Sample	Total/NA	Water	300.1B	
MRL 440-487252/39	Lab Control Sample	Total/NA	Water	300.1B	
440-215720-B-1 MS	Matrix Spike	Total/NA	Water	300.1B	
440-215720-B-1 MSD	Matrix Spike Duplicate	Total/NA	Water	300.1B	

Analysis Batch: 487320

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-215605-1	NERT3.80S1-20180709	Total/NA	Water	300.0	
440-215605-1	NERT3.80S1-20180709	Total/NA	Water	300.0	
440-215605-2	NERT4.71S1-20180710	Total/NA	Water	300.0	
440-215605-2	NERT4.71S1-20180710	Total/NA	Water	300.0	
440-215605-3	NERT4.51S1-20180710	Total/NA	Water	300.0	
440-215605-3 - DL	NERT4.51S1-20180710	Total/NA	Water	300.0	
440-215605-4	NERT4.93S1-20180710	Total/NA	Water	300.0	
440-215605-4	NERT4.93S1-20180710	Total/NA	Water	300.0	
440-215605-5	NERT4.93S1-20180710-FD	Total/NA	Water	300.0	
440-215605-5	NERT4.93S1-20180710-FD	Total/NA	Water	300.0	
440-215605-6	NERT4.93S1-20180710-FB	Total/NA	Water	300.0	
440-215605-7	NERT4.93S1-20180710-EB	Total/NA	Water	300.0	
440-215605-8	NERT5.11S1-20180710	Total/NA	Water	300.0	
440-215605-8	NERT5.11S1-20180710	Total/NA	Water	300.0	
MB 440-487320/6	Method Blank	Total/NA	Water	300.0	
LCS 440-487320/7	Lab Control Sample	Total/NA	Water	300.0	
440-215605-3 MS - DL	NERT4.51S1-20180710	Total/NA	Water	300.0	
440-215605-3 MSD - DL	NERT4.51S1-20180710	Total/NA	Water	300.0	

Analysis Batch: 487528

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-215605-1	NERT3.80S1-20180709	Total/NA	Water	300.1B	
440-215605-2	NERT4.71S1-20180710	Total/NA	Water	300.1B	
440-215605-3	NERT4.51S1-20180710	Total/NA	Water	300.1B	
440-215605-4	NERT4.93S1-20180710	Total/NA	Water	300.1B	
440-215605-5	NERT4.93S1-20180710-FD	Total/NA	Water	300.1B	
MB 440-487528/5	Method Blank	Total/NA	Water	300.1B	
LCS 440-487528/4	Lab Control Sample	Total/NA	Water	300.1B	
MRL 440-487528/3	Lab Control Sample	Total/NA	Water	300.1B	
440-215605-3 MS	NERT4.51S1-20180710	Total/NA	Water	300.1B	
440-215605-3 MSD	NERT4.51S1-20180710	Total/NA	Water	300.1B	

Analysis Batch: 487566

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-215605-8	NERT5.11S1-20180710	Total/NA	Water	300.1B	
MB 440-487566/5	Method Blank	Total/NA	Water	300.1B	
LCS 440-487566/4	Lab Control Sample	Total/NA	Water	300.1B	
MRL 440-487566/3	Lab Control Sample	Total/NA	Water	300.1B	
440-215717-B-3 MS	Matrix Spike	Total/NA	Water	300.1B	
440-215717-B-3 MSD	Matrix Spike Duplicate	Total/NA	Water	300.1B	

HPLC/IC (Continued)

Analysis Batch: 488407

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-215605-1	NERT3.80S1-20180709	Total/NA	Water	314.0	
440-215605-2	NERT4.71S1-20180710	Total/NA	Water	314.0	
440-215605-3	NERT4.51S1-20180710	Total/NA	Water	314.0	
440-215605-4	NERT4.93S1-20180710	Total/NA	Water	314.0	
440-215605-5	NERT4.93S1-20180710-FD	Total/NA	Water	314.0	
440-215605-6	NERT4.93S1-20180710-FB	Total/NA	Water	314.0	
440-215605-7	NERT4.93S1-20180710-EB	Total/NA	Water	314.0	
440-215605-8	NERT5.11S1-20180710	Total/NA	Water	314.0	
MB 440-488407/8	Method Blank	Total/NA	Water	314.0	
LCS 440-488407/5	Lab Control Sample	Total/NA	Water	314.0	
MRL 440-488407/4	Lab Control Sample	Total/NA	Water	314.0	
440-215605-3 MS	NERT4.51S1-20180710	Total/NA	Water	314.0	
440-215605-3 MSD	NERT4.51S1-20180710	Total/NA	Water	314.0	

General Chemistry

Analysis Batch: 487284

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-215605-1	NERT3.80S1-20180709	Total/NA	Water	SM 2540C	
MB 440-487284/1	Method Blank	Total/NA	Water	SM 2540C	
LCS 440-487284/2	Lab Control Sample	Total/NA	Water	SM 2540C	
440-215666-H-6 DU	Duplicate	Total/NA	Water	SM 2540C	

Analysis Batch: 487658

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-215605-2	NERT4.71S1-20180710	Total/NA	Water	SM 2540C	
440-215605-3	NERT4.51S1-20180710	Total/NA	Water	SM 2540C	
440-215605-4	NERT4.93S1-20180710	Total/NA	Water	SM 2540C	
440-215605-5	NERT4.93S1-20180710-FD	Total/NA	Water	SM 2540C	
440-215605-6	NERT4.93S1-20180710-FB	Total/NA	Water	SM 2540C	
440-215605-7	NERT4.93S1-20180710-EB	Total/NA	Water	SM 2540C	
440-215605-8	NERT5.11S1-20180710	Total/NA	Water	SM 2540C	
MB 440-487658/1	Method Blank	Total/NA	Water	SM 2540C	
LCS 440-487658/2	Lab Control Sample	Total/NA	Water	SM 2540C	
440-215605-3 DU	NERT4.51S1-20180710	Total/NA	Water	SM 2540C	

Definitions/Glossary

Qualifiers

HPLC/IC

Qualifier	Qualifier Description
4	MS, MSD: The analyte present in the original sample is greater than 4 times the matrix spike concentration; therefore, control limits are not applicable.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
F1	MS and/or MSD Recovery is outside acceptance limits.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Laboratory: TestAmerica Irvine

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	EPA Region	Identification Number	Expiration Date
Alaska	State Program	10	CA01531	06-30-19
Arizona	State Program	9	AZ0671	10-14-18
California	LA Cty Sanitation Districts	9	10256	06-30-18 *
California	State Program	9	CA ELAP 2706	06-30-19
Guam	State Program	9	Cert. No. 17-003R	01-23-19
Hawaii	State Program	9	N/A	01-29-19
Kansas	NELAP	7	E-10420	07-31-18 *
Nevada	State Program	9	CA015312018-1	07-31-18 *
New Mexico	State Program	6	N/A	01-29-19
Oregon	NELAP	10	4028	01-29-19
USDA	Federal		P330-15-00184	07-09-21
Washington	State Program	10	C900	09-03-18

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

TestAmerica Irvine
17461 Derian Ave
Suite 100
Irvine, CA 92614
Phone: 949.261.1022 Fax:

Chain of Custody Record 209428

TestAmerica
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TestAmerica Laboratories, Inc.
TAL-8210 (0713)

10 7/12

Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☐ Other:

Client Contact		Project Manager: Sally B. lodeau	Site Contact: J CAPETRIC	Date:	COC No
Company Name:	AECOM	Tel/Fax: 805 764 4006	Lab Contact: Faty Meta	Carrier:	1 of 1 COCs
Address:	1220 Avenida Acaso	Analysis Turnaround Time			Sampler: J CAPETRIC
City/State/Zip:	Camarillo CA	☐ CALENDAR DAYS ☐ WORKING DAYS			For Lab Use Only:
Phone	805 764 4006	TAT if different from Below Per WO			Walk-in Client
Fax		☐ 2 weeks			Lab Sampling:
Project Name:	NERT Phase I GW Sample	☐ 1 week			
Site:	Las Vegas Wash	☐ 2 days			Job / SDG No.:
P O #	60137365	☐ 1 day			

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y/N)	Perform MS / MSD (Y/N)	314.0 Perchlorate	300 Br, Cl	2540C TDS	200.8 Dis Cr	300.1 Chlorate	Sample Specific Notes:
NERT3.80S1-20180709	7/9/18	0840	G	GW	3	1		X	X	X	X	X	
NERT4.71S1-20180710	7/10/18	0850	G		3	1		X	X	X	X	X	
NERT4.51S1-20180710		1220	G		9	1	Y	X	X	X	X	X	Extra vol = MS/MSD
NERT4.93S1-20180710		1350	G		3	1		X	X	X	X	X	
NERT4.93S1-20180710-FD		1350	G		3	1		X	X	X	X	X	
NERT4.93S1-20180710-FB		1400	G		3	1		X	X	X	X	X	
NERT4.93S1-20180710-EB		1415	G		3	1		X	X	X	X	X	
NERT5.11S1-20180710		1545	G		3	1		X	X	X	X	X	

JC 7/11/18

440-215605 Chain of Custody

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample
☑ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
Per WO
☐ Return to Client ☐ Disposal by Lab ☐ Archive for ______ Months

Special Instructions/QC Requirements & Comments:

Custody Seals Intact ☐ Yes ☐ No	Custody Seal No.		Cooler Temp (°C): Obs'd 1.4 Corr'd 2.0		Therm ID No.: 12.67
Relinquished by: [signature]	Company: AECOM	Date/Time: 7/11/18 0850	Received by: [signature]	Company	Date/Time: 7/11/18 8:50am
Relinquished by: [signature]	Company: TAIW	Date/Time: 7/11/18	Received by: [signature]	Company:	Date/Time:
Relinquished by	Company	Date/Time:	Received in Laboratory by: [signature]	Company: 771-IRV	Date/Time: 7/12/18 9:40

(S) TRK. 4357 1174 5084

6.0 TAIW

Login Sample Receipt Checklist

Client: AECOM Job Number: 440-215605-1

Login Number: 215605 **List Source: TestAmerica Irvine**
List Number: 1
Creator: Garcia, Veronica G

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	Not Present
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Irvine
17461 Derian Ave
Suite 100
Irvine, CA 92614-5817
Tel: (949)261-1022

TestAmerica Job ID: 440-215605-2
Client Project/Site: NERT Phase I GW Sample

For:
AECOM
1220 Avenida Acaso
Camarillo, California 93012

Attn: Ms. Sally Bilodeau

Authorized for release by:
7/23/2018 3:15:15 PM

Patty Mata, Senior Project Manager
(949)261-1022
patty.mata@testamericainc.com

LINKS

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Visit us at: www.testamericainc.com

The test results in this report meet all 2003 NELAC and 2009 TNI requirements for accredited parameters, exceptions are noted in this report. This report may not be reproduced except in full, and with written approval from the laboratory. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

Table of Contents

Sample Summary

Client: AECOM
Project/Site: NERT Phase I GW Sample

TestAmerica Job ID: 440-215605-2

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
440-215605-1	NERT3.80S1-20180709	Water	07/09/18 08:40	07/12/18 09:40
440-215605-2	NERT4.71S1-20180710	Water	07/10/18 08:50	07/12/18 09:40
440-215605-3	NERT4.51S1-20180710	Water	07/10/18 12:20	07/12/18 09:40
440-215605-4	NERT4.93S1-20180710	Water	07/10/18 13:50	07/12/18 09:40
440-215605-5	NERT4.93S1-20180710-FD	Water	07/10/18 13:50	07/12/18 09:40
440-215605-6	NERT4.93S1-20180710-FB	Water	07/10/18 14:00	07/12/18 09:40
440-215605-7	NERT4.93S1-20180710-EB	Water	07/10/18 14:15	07/12/18 09:40
440-215605-8	NERT5.11S1-20180710	Water	07/10/18 15:45	07/12/18 09:40

Job ID: 440-215605-2

Laboratory: TestAmerica Irvine

Narrative

Job Narrative
440-215605-2

Comments
Only the Dissolved Chromium results are included in this report.

Receipt
The samples were received on 7/12/2018 9:40 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 2.0º C.

Metals
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

General Chemistry
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Client Sample ID: NERT3.80S1-20180709 — Lab Sample ID: 440-215605-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Chromium	1.8	J	2.0	0.50	ug/L	1		200.8	Dissolved

Client Sample ID: NERT4.71S1-20180710 — Lab Sample ID: 440-215605-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Chromium	26		2.0	0.50	ug/L	1		200.8	Dissolved

Client Sample ID: NERT4.51S1-20180710 — Lab Sample ID: 440-215605-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Chromium	19		2.0	0.50	ug/L	1		200.8	Dissolved

Client Sample ID: NERT4.93S1-20180710 — Lab Sample ID: 440-215605-4

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Chromium	15		2.0	0.50	ug/L	1		200.8	Dissolved

Client Sample ID: NERT4.93S1-20180710-FD — Lab Sample ID: 440-215605-5

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Chromium	14		2.0	0.50	ug/L	1		200.8	Dissolved

Client Sample ID: NERT4.93S1-20180710-FB — Lab Sample ID: 440-215605-6

No Detections.

Client Sample ID: NERT4.93S1-20180710-EB — Lab Sample ID: 440-215605-7

No Detections.

Client Sample ID: NERT5.11S1-20180710 — Lab Sample ID: 440-215605-8

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Chromium	13		2.0	0.50	ug/L	1		200.8	Dissolved

This Detection Summary does not include radiochemical test results.

Client Sample Results

Client: AECOM
Project/Site: NERT Phase I GW Sample

TestAmerica Job ID: 440-215605-2

Client Sample ID: NERT3.80S1-20180709

Lab Sample ID: 440-215605-1
Date Collected: 07/09/18 08:40
Date Received: 07/12/18 09:40
Matrix: Water

Method: 200.8 - Metals (ICP/MS) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium	1.8	J	2.0	0.50	ug/L		07/17/18 14:49	07/17/18 22:58	1

Client Sample ID: NERT4.71S1-20180710

Lab Sample ID: 440-215605-2
Date Collected: 07/10/18 08:50
Date Received: 07/12/18 09:40
Matrix: Water

Method: 200.8 - Metals (ICP/MS) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium	26		2.0	0.50	ug/L		07/17/18 14:49	07/17/18 23:00	1

Client Sample ID: NERT4.51S1-20180710

Lab Sample ID: 440-215605-3
Date Collected: 07/10/18 12:20
Date Received: 07/12/18 09:40
Matrix: Water

Method: 200.8 - Metals (ICP/MS) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium	19		2.0	0.50	ug/L		07/17/18 14:49	07/17/18 22:52	1

Client Sample ID: NERT4.93S1-20180710

Lab Sample ID: 440-215605-4
Date Collected: 07/10/18 13:50
Date Received: 07/12/18 09:40
Matrix: Water

Method: 200.8 - Metals (ICP/MS) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium	15		2.0	0.50	ug/L		07/17/18 14:49	07/17/18 23:02	1

Client Sample ID: NERT4.93S1-20180710-FD

Lab Sample ID: 440-215605-5
Date Collected: 07/10/18 13:50
Date Received: 07/12/18 09:40
Matrix: Water

Method: 200.8 - Metals (ICP/MS) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium	14		2.0	0.50	ug/L		07/17/18 14:49	07/17/18 23:04	1

Client Sample ID: NERT4.93S1-20180710-FB

Lab Sample ID: 440-215605-6
Date Collected: 07/10/18 14:00
Date Received: 07/12/18 09:40
Matrix: Water

Method: 200.8 - Metals (ICP/MS) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium	ND		2.0	0.50	ug/L		07/17/18 14:49	07/17/18 23:10	1

Client Sample ID: NERT4.93S1-20180710-EB

Lab Sample ID: 440-215605-7
Date Collected: 07/10/18 14:15
Date Received: 07/12/18 09:40
Matrix: Water

Method: 200.8 - Metals (ICP/MS) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium	ND		2.0	0.50	ug/L		07/17/18 14:49	07/17/18 23:12	1

Client Sample ID: NERT5.11S1-20180710
Date Collected: 07/10/18 15:45
Date Received: 07/12/18 09:40

Lab Sample ID: 440-215605-8
Matrix: Water

Method: 200.8 - Metals (ICP/MS) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium	13		2.0	0.50	ug/L		07/17/18 14:49	07/17/18 23:14	1

Method Summary

Method	Method Description	Protocol	Laboratory
200.8	Metals (ICP/MS)	EPA	TAL IRV
200.2	Preparation, Total Recoverable Metals	EPA	TAL IRV

Protocol References:

EPA = US Environmental Protection Agency

Laboratory References:

TAL IRV = TestAmerica Irvine, 17461 Derian Ave, Suite 100, Irvine, CA 92614-5817, TEL (949)261-1022

Lab Chronicle

Client: AECOM
Project/Site: NERT Phase I GW Sample

TestAmerica Job ID: 440-215605-2

Client Sample ID: NERT3.80S1-20180709

Lab Sample ID: 440-215605-1
Date Collected: 07/09/18 08:40
Matrix: Water
Date Received: 07/12/18 09:40

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Dissolved	Prep	200.2			25 mL	25 mL	487981	07/17/18 14:49	JL	TAL IRV
Dissolved	Analysis	200.8		1			488106	07/17/18 22:58	B1H	TAL IRV

Client Sample ID: NERT4.71S1-20180710

Lab Sample ID: 440-215605-2
Date Collected: 07/10/18 08:50
Matrix: Water
Date Received: 07/12/18 09:40

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Dissolved	Prep	200.2			25 mL	25 mL	487981	07/17/18 14:49	JL	TAL IRV
Dissolved	Analysis	200.8		1			488106	07/17/18 23:00	B1H	TAL IRV

Client Sample ID: NERT4.51S1-20180710

Lab Sample ID: 440-215605-3
Date Collected: 07/10/18 12:20
Matrix: Water
Date Received: 07/12/18 09:40

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Dissolved	Prep	200.2			25 mL	25 mL	487981	07/17/18 14:49	JL	TAL IRV
Dissolved	Analysis	200.8		1			488106	07/17/18 22:52	B1H	TAL IRV

Client Sample ID: NERT4.93S1-20180710

Lab Sample ID: 440-215605-4
Date Collected: 07/10/18 13:50
Matrix: Water
Date Received: 07/12/18 09:40

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Dissolved	Prep	200.2			25 mL	25 mL	487981	07/17/18 14:49	JL	TAL IRV
Dissolved	Analysis	200.8		1			488106	07/17/18 23:02	B1H	TAL IRV

Client Sample ID: NERT4.93S1-20180710-FD

Lab Sample ID: 440-215605-5
Date Collected: 07/10/18 13:50
Matrix: Water
Date Received: 07/12/18 09:40

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Dissolved	Prep	200.2			25 mL	25 mL	487981	07/17/18 14:49	JL	TAL IRV
Dissolved	Analysis	200.8		1			488106	07/17/18 23:04	B1H	TAL IRV

Client Sample ID: NERT4.93S1-20180710-FB

Lab Sample ID: 440-215605-6
Date Collected: 07/10/18 14:00
Matrix: Water
Date Received: 07/12/18 09:40

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Dissolved	Prep	200.2			25 mL	25 mL	487981	07/17/18 14:49	JL	TAL IRV
Dissolved	Analysis	200.8		1			488106	07/17/18 23:10	B1H	TAL IRV

Lab Chronicle

Client: AECOM
Project/Site: NERT Phase I GW Sample

TestAmerica Job ID: 440-215605-2

Client Sample ID: NERT4.93S1-20180710-EB

Lab Sample ID: 440-215605-7

Date Collected: 07/10/18 14:15
Date Received: 07/12/18 09:40

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Dissolved	Prep	200.2			25 mL	25 mL	487981	07/17/18 14:49	JL	TAL IRV
Dissolved	Analysis	200.8		1			488106	07/17/18 23:12	B1H	TAL IRV

Client Sample ID: NERT5.11S1-20180710

Lab Sample ID: 440-215605-8

Date Collected: 07/10/18 15:45
Date Received: 07/12/18 09:40

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Dissolved	Prep	200.2			25 mL	25 mL	487981	07/17/18 14:49	JL	TAL IRV
Dissolved	Analysis	200.8		1			488106	07/17/18 23:14	B1H	TAL IRV

Laboratory References:

TAL IRV = TestAmerica Irvine, 17461 Derian Ave, Suite 100, Irvine, CA 92614-5817, TEL (949)261-1022

Client: AECOM
Project/Site: NERT Phase I GW Sample

TestAmerica Job ID: 440-215605-2

Method: 200.8 - Metals (ICP/MS)

Lab Sample ID: MB 440-487981/1-A
Matrix: Water
Analysis Batch: 488106

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 487981

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium	ND		2.0	0.50	ug/L		07/17/18 14:49	07/17/18 22:49	1

Lab Sample ID: LCS 440-487981/2-A
Matrix: Water
Analysis Batch: 488106

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 487981

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Chromium	80.0	77.9		ug/L		97	85 - 115

Lab Sample ID: 440-215605-3 MS
Matrix: Water
Analysis Batch: 488106

Client Sample ID: NERT4.51S1-20180710
Prep Type: Dissolved
Prep Batch: 487981

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Chromium	19		80.0	90.0		ug/L		89	70 - 130

Lab Sample ID: 440-215605-3 MSD
Matrix: Water
Analysis Batch: 488106

Client Sample ID: NERT4.51S1-20180710
Prep Type: Dissolved
Prep Batch: 487981

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Chromium	19		80.0	90.4		ug/L		89	70 - 130	0	20

QC Association Summary

Client: AECOM
Project/Site: NERT Phase I GW Sample

TestAmerica Job ID: 440-215605-2

Metals

Prep Batch: 487981

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-215605-1	NERT3.80S1-20180709	Dissolved	Water	200.2	
440-215605-2	NERT4.71S1-20180710	Dissolved	Water	200.2	
440-215605-3	NERT4.51S1-20180710	Dissolved	Water	200.2	
440-215605-4	NERT4.93S1-20180710	Dissolved	Water	200.2	
440-215605-5	NERT4.93S1-20180710-FD	Dissolved	Water	200.2	
440-215605-6	NERT4.93S1-20180710-FB	Dissolved	Water	200.2	
440-215605-7	NERT4.93S1-20180710-EB	Dissolved	Water	200.2	
440-215605-8	NERT5.11S1-20180710	Dissolved	Water	200.2	
MB 440-487981/1-A	Method Blank	Total Recoverable	Water	200.2	
LCS 440-487981/2-A	Lab Control Sample	Total Recoverable	Water	200.2	
440-215605-3 MS	NERT4.51S1-20180710	Dissolved	Water	200.2	
440-215605-3 MSD	NERT4.51S1-20180710	Dissolved	Water	200.2	

Analysis Batch: 488106

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-215605-1	NERT3.80S1-20180709	Dissolved	Water	200.8	487981
440-215605-2	NERT4.71S1-20180710	Dissolved	Water	200.8	487981
440-215605-3	NERT4.51S1-20180710	Dissolved	Water	200.8	487981
440-215605-4	NERT4.93S1-20180710	Dissolved	Water	200.8	487981
440-215605-5	NERT4.93S1-20180710-FD	Dissolved	Water	200.8	487981
440-215605-6	NERT4.93S1-20180710-FB	Dissolved	Water	200.8	487981
440-215605-7	NERT4.93S1-20180710-EB	Dissolved	Water	200.8	487981
440-215605-8	NERT5.11S1-20180710	Dissolved	Water	200.8	487981
MB 440-487981/1-A	Method Blank	Total Recoverable	Water	200.8	487981
LCS 440-487981/2-A	Lab Control Sample	Total Recoverable	Water	200.8	487981
440-215605-3 MS	NERT4.51S1-20180710	Dissolved	Water	200.8	487981
440-215605-3 MSD	NERT4.51S1-20180710	Dissolved	Water	200.8	487981

Client: AECOM	TestAmerica Job ID: 440-215605-2
Project/Site: NERT Phase I GW Sample

Qualifiers

Metals

Qualifier	Qualifier Description
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Accreditation/Certification Summary

Client: AECOM
TestAmerica Job ID: 440-215605-2
Project/Site: NERT Phase I GW Sample

Laboratory: TestAmerica Irvine

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	EPA Region	Identification Number	Expiration Date
Alaska	State Program	10	CA01531	06-30-19
Arizona	State Program	9	AZ0671	10-14-18
California	LA Cty Sanitation Districts	9	10256	06-30-18 *
California	State Program	9	CA ELAP 2706	06-30-19
Guam	State Program	9	Cert. No. 17-003R	01-23-19
Hawaii	State Program	9	N/A	01-29-19
Kansas	NELAP	7	E-10420	07-31-18 *
Nevada	State Program	9	CA015312018-1	07-31-18 *
New Mexico	State Program	6	N/A	01-29-19
Oregon	NELAP	10	4028	01-29-19
USDA	Federal		P330-15-00184	07-09-21
Washington	State Program	10	C900	09-03-18

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

TestAmerica Irvine
17461 Derian Ave
Suite 100
Irvine, CA 92614
Phone: 949.261.1022 Fax:

Chain of Custody Record

209428

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TestAmerica Laboratories, Inc.
TAL-8210 (0713)

10/7/12

Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☐ Other:

Client Contact		Project Manager: Sally B.ledeau	Site Contact: J CAPETRIC	Date:	COC No
Company Name: AECOM		Tel/Fax: 805 764 4006	Lab Contact: Faty Meta	Carrier:	1 of 1 COCs
Address: 1220 Avenida Acaso		Analysis Turnaround Time			Sampler: J CAPETRIC
City/State/Zip: Camarillo CA		☐ CALENDAR DAYS ☐ WORKING DAYS			For Lab Use Only:
Phone: 805 764 4006		TAT if different from Below: Per WO			Walk-in Client
Fax		☐ 2 weeks			Lab Sampling
Project Name: NERT Phase I GW Sample		☐ 1 week			
Site: Las Vegas Wash		☐ 2 days			Job / SDG No.:
PO# 60137365		☐ 1 day			

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y/N)	Perform MS / MSD (Y/N)	314.0 Perchlorate	300 Br, Cl	2540C TDS	200.8 Dis Cr	300.1 Chlorate	Sample Specific Notes:
NERT3.80S1-20180709	7/9/18	0840	G	GW	3	1		X	X	X	X	X	
NERT4.71S1-20180710	7/10/18	0850	G		3	1		X	X	X	X	X	
NERT4.51S1-20180710		1220	G		9	1	Y	X	X	X	X	X	Extra vol = MS/MSD
NERT4.93S1-20180710		1350	G		3	1		X	X	X	X	X	
NERT4.93S1-20180710-FD		1350	G		3	1		X	X	X	X	X	
NERT4.93S1-20180710-FB		1400	G		3	1		X	X	X	X	X	
NERT4.93S1-20180710-EB		1415	G		3	1		X	X	X	X	X	
NERT5.11S1-20180710		1545	G		3	1		X	X	X	X	X	

JC 7/11/18

440-215605 Chain of Custody

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample

☑ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
Per WO
☐ Return to Client ☐ Disposal by Lab ☐ Archive for ____ Months

Special Instructions/QC Requirements & Comments:

Custody Seals Intact ☐ Yes ☐ No | Custody Seal No. | Cooler Temp (°C): Obs'd 1.4 Corr'd 2.0 | Therm ID No.: 12.67

Relinquished by:	Company: AECOM	Date/Time: 7/11/18 0850	Received by:	Company	Date/Time: 7/11/18 8:50am
Relinquished by:	Company: TAW	Date/Time: 7/11/18	Received by:	Company:	Date/Time:
Relinquished by	Company	Date/Time:	Received in Laboratory by:	Company: 771-IRV	Date/Time: 7/12/18 9:40

(S) TRK. 4357 1174 5084

6.0 TAW

Login Sample Receipt Checklist

Client: AECOM

Job Number: 440-215605-2

Login Number: 215605
List Number: 1
Creator: Garcia, Veronica G

List Source: TestAmerica Irvine

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	Not Present
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

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ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Irvine
17461 Derian Ave
Suite 100
Irvine, CA 92614-5817
Tel: (949)261-1022

TestAmerica Job ID: 440-215804-1
Client Project/Site: NERT Las Vegas Wash, 60477365

For:
AECOM
13 Newfields Rd
Exeter, New Hampshire 03833

Attn: Kristen Durocher

Authorized for release by:
7/25/2018 9:03:40 AM

Patty Mata, Senior Project Manager
(949)261-1022
patty.mata@testamericainc.com

The test results in this report meet all 2003 NELAC and 2009 TNI requirements for accredited parameters, exceptions are noted in this report. This report may not be reproduced except in full, and with written approval from the laboratory. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

1 2 3 4 5 6 7 8 9 10 11 12 13

Table of Contents

Sample Summary

Client: AECOM
Project/Site: NERT Las Vegas Wash, 60477365

TestAmerica Job ID: 440-215804-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
440-215804-1	LNDMW1-20180711	Water	07/11/18 11:20	07/14/18 10:15
440-215804-2	MW-25-20180712	Water	07/12/18 07:30	07/14/18 10:15
440-215804-3	MW-13-20180712	Water	07/12/18 08:35	07/14/18 10:15
440-215804-4	MW-3-20180712	Water	07/12/18 10:25	07/14/18 10:15
440-215804-5	MW-4-20180712	Water	07/12/18 11:10	07/14/18 10:15
440-215804-6	MW-02-20180712	Water	07/12/18 13:30	07/14/18 10:15
440-215804-7	MW-02-20180712-FD	Water	07/12/18 13:30	07/14/18 10:15
440-215804-8	MW-02-20180712-FB	Water	07/12/18 13:40	07/14/18 10:15
440-215804-9	MW-02-20180712-EB	Water	07/12/18 13:50	07/14/18 10:15
440-215804-10	MW-20-20180712	Water	07/12/18 15:05	07/14/18 10:15
440-215804-11	COH2B1-20180713	Water	07/13/18 08:10	07/14/18 10:15
440-215804-12	AA-30-20180713	Water	07/13/18 09:20	07/14/18 10:15
440-215804-13	WMW5.5S-20180713	Water	07/13/18 10:30	07/14/18 10:15
440-215804-14	WMW5.58S1-20180713	Water	07/13/18 12:20	07/14/18 10:15
440-215804-15	WMW4.9S-20180713	Water	07/13/18 13:55	07/14/18 10:15
440-215804-16	WMW4.9S-20180713-FD	Water	07/13/18 13:55	07/14/18 10:15

Job ID: 440-215804-1

Laboratory: TestAmerica Irvine

Narrative

Job Narrative
440-215804-1

Comments
No additional comments.

Receipt
The samples were received on 7/14/2018 10:15 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 1.3º C.

Receipt Exceptions
The container label for the following sample did not match the information listed on the Chain-of-Custody (COC): WMW5.5S-20180713 (440-215804-13). The container labels list WMW5.5S, while the COC lists WMW5.5S1. The client was contacted and the sample ID was changed to match the container label. Selected other sample IDs were also changed slightly from the IDs listed on the COC, based on client email request.

HPLC/IC
Method(s) 300.1B: The following sample was diluted for Chlorate due to the nature of the sample matrix: MW-20-20180712 (440-215804-10). Elevated reporting limits (RLs) are provided.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Client Sample ID: LNDMW1-20180711

Lab Sample ID: 440-215804-1

Date Collected: 07/11/18 11:20
Matrix: Water
Date Received: 07/14/18 10:15

Method: 300.1B - Disinfection By-Products, (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chlorate	4700		1000	100	ug/L			07/15/18 22:36	50

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Dichloroacetic acid(Surr)	108		90 - 115		07/15/18 22:36	50

Method: 314.0 - Perchlorate (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perchlorate	1600		400	95	ug/L			07/22/18 14:41	100

Client Sample ID: MW-25-20180712

Lab Sample ID: 440-215804-2

Date Collected: 07/12/18 07:30
Matrix: Water
Date Received: 07/14/18 10:15

Method: 300.1B - Disinfection By-Products, (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chlorate	57		20	2.0	ug/L			07/16/18 04:29	1

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Dichloroacetic acid(Surr)	95		90 - 115		07/16/18 04:29	1

Method: 314.0 - Perchlorate (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perchlorate	4.3	F1	4.0	0.95	ug/L			07/20/18 11:02	1

Client Sample ID: MW-13-20180712

Lab Sample ID: 440-215804-3

Date Collected: 07/12/18 08:35
Matrix: Water
Date Received: 07/14/18 10:15

Method: 300.1B - Disinfection By-Products, (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chlorate	14000		1000	100	ug/L			07/15/18 23:04	50

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Dichloroacetic acid(Surr)	110		90 - 115		07/15/18 23:04	50

Method: 314.0 - Perchlorate (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perchlorate	3700		400	95	ug/L			07/22/18 14:59	100

Client Sample ID: MW-3-20180712

Lab Sample ID: 440-215804-4

Date Collected: 07/12/18 10:25
Matrix: Water
Date Received: 07/14/18 10:15

Method: 300.1B - Disinfection By-Products, (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chlorate	6200		1000	100	ug/L			07/15/18 23:32	50

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Dichloroacetic acid(Surr)	111		90 - 115		07/15/18 23:32	50

Client Sample Results

Client: AECOM
Project/Site: NERT Las Vegas Wash, 60477365

TestAmerica Job ID: 440-215804-1

Client Sample ID: MW-3-20180712

Lab Sample ID: 440-215804-4
Date Collected: 07/12/18 10:25
Matrix: Water
Date Received: 07/14/18 10:15

Method: 314.0 - Perchlorate (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perchlorate	3300		400	95	ug/L			07/22/18 15:57	100

Client Sample ID: MW-4-20180712

Lab Sample ID: 440-215804-5
Date Collected: 07/12/18 11:10
Matrix: Water
Date Received: 07/14/18 10:15

Method: 300.1B - Disinfection By-Products, (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chlorate	5900		1000	100	ug/L			07/16/18 00:00	50

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Dichloroacetic acid(Surr)	*110*		*90 - 115*		*07/16/18 00:00*	*50*

Method: 314.0 - Perchlorate (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perchlorate	3000		400	95	ug/L			07/22/18 16:15	100

Client Sample ID: MW-02-20180712

Lab Sample ID: 440-215804-6
Date Collected: 07/12/18 13:30
Matrix: Water
Date Received: 07/14/18 10:15

Method: 300.1B - Disinfection By-Products, (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chlorate	2600		1000	100	ug/L			07/16/18 00:27	50

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Dichloroacetic acid(Surr)	*107*		*90 - 115*		*07/16/18 00:27*	*50*

Method: 314.0 - Perchlorate (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perchlorate	1900		400	95	ug/L			07/22/18 16:33	100

Client Sample ID: MW-02-20180712-FD

Lab Sample ID: 440-215804-7
Date Collected: 07/12/18 13:30
Matrix: Water
Date Received: 07/14/18 10:15

Method: 300.1B - Disinfection By-Products, (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chlorate	2600		1000	100	ug/L			07/16/18 00:55	50

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Dichloroacetic acid(Surr)	*109*		*90 - 115*		*07/16/18 00:55*	*50*

Method: 314.0 - Perchlorate (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perchlorate	1900		400	95	ug/L			07/22/18 16:51	100

Client Sample ID: MW-02-20180712-FB — Lab Sample ID: 440-215804-8

Date Collected: 07/12/18 13:40 — **Matrix: Water**
Date Received: 07/14/18 10:15

Method: 300.1B - Disinfection By-Products, (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chlorate	ND		20	2.0	ug/L			07/15/18 17:29	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Dichloroacetic acid(Surr)	*106*		*90 - 115*		*07/15/18 17:29*	*1*

Method: 314.0 - Perchlorate (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perchlorate	ND		4.0	0.95	ug/L			07/20/18 16:55	1

Client Sample ID: MW-02-20180712-EB — Lab Sample ID: 440-215804-9

Date Collected: 07/12/18 13:50 — **Matrix: Water**
Date Received: 07/14/18 10:15

Method: 300.1B - Disinfection By-Products, (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chlorate	ND		20	2.0	ug/L			07/15/18 12:23	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Dichloroacetic acid(Surr)	*107*		*90 - 115*		*07/15/18 12:23*	*1*

Method: 314.0 - Perchlorate (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perchlorate	ND		4.0	0.95	ug/L			07/20/18 17:15	1

Client Sample ID: MW-20-20180712 — Lab Sample ID: 440-215804-10

Date Collected: 07/12/18 15:05 — **Matrix: Water**
Date Received: 07/14/18 10:15

Method: 300.1B - Disinfection By-Products, (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chlorate	**78**	**J**	100	10	ug/L			07/16/18 22:25	5

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Dichloroacetic acid(Surr)	*97*		*90 - 115*		*07/16/18 22:25*	*5*

Method: 314.0 - Perchlorate (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perchlorate	**48**		4.0	0.95	ug/L			07/20/18 17:36	1

Client Sample ID: COH2B1-20180713 — Lab Sample ID: 440-215804-11

Date Collected: 07/13/18 08:10 — **Matrix: Water**
Date Received: 07/14/18 10:15

Method: 300.1B - Disinfection By-Products, (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chlorate	**1000**		200	20	ug/L			07/18/18 06:50	10

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Dichloroacetic acid(Surr)	*98*		*90 - 115*		*07/18/18 06:50*	*10*

1 2 3 4 5 6 7 8 9 10 11 12 13

Client Sample ID: COH2B1-20180713
Lab Sample ID: 440-215804-11
Date Collected: 07/13/18 08:10
Matrix: Water
Date Received: 07/14/18 10:15

Method: 314.0 - Perchlorate (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perchlorate	1600		400	95	ug/L			07/22/18 17:10	100

Client Sample ID: AA-30-20180713
Lab Sample ID: 440-215804-12
Date Collected: 07/13/18 09:20
Matrix: Water
Date Received: 07/14/18 10:15

Method: 300.1B - Disinfection By-Products, (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chlorate	9400		1000	100	ug/L			07/15/18 13:57	50

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Dichloroacetic acid(Surr)	*106*		*90 - 115*		*07/15/18 13:57*	*50*

Method: 314.0 - Perchlorate (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perchlorate	3900		400	95	ug/L			07/22/18 17:28	100

Client Sample ID: WMW5.5S-20180713
Lab Sample ID: 440-215804-13
Date Collected: 07/13/18 10:30
Matrix: Water
Date Received: 07/14/18 10:15

Method: 300.1B - Disinfection By-Products, (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chlorate	11000		1000	100	ug/L			07/16/18 19:38	50

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Dichloroacetic acid(Surr)	*99*		*90 - 115*		*07/16/18 19:38*	*50*

Method: 314.0 - Perchlorate (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perchlorate	3100		400	95	ug/L			07/22/18 17:47	100

Client Sample ID: WMW5.58S1-20180713
Lab Sample ID: 440-215804-14
Date Collected: 07/13/18 12:20
Matrix: Water
Date Received: 07/14/18 10:15

Method: 300.1B - Disinfection By-Products, (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chlorate	3200		1000	100	ug/L			07/16/18 20:06	50

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Dichloroacetic acid(Surr)	*100*		*90 - 115*		*07/16/18 20:06*	*50*

Method: 314.0 - Perchlorate (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perchlorate	2500		400	95	ug/L			07/22/18 18:05	100

Client Sample ID: WMW4.9S-20180713

Lab Sample ID: 440-215804-15

Date Collected: 07/13/18 13:55
Matrix: Water
Date Received: 07/14/18 10:15

Method: 300.1B - Disinfection By-Products, (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chlorate	2700		1000	100	ug/L			07/16/18 20:34	50

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Dichloroacetic acid(Surr)	*100*		*90 - 115*		*07/16/18 20:34*	*50*

Method: 314.0 - Perchlorate (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perchlorate	930		200	48	ug/L			07/22/18 18:23	50

Client Sample ID: WMW4.9S-20180713-FD

Lab Sample ID: 440-215804-16

Date Collected: 07/13/18 13:55
Matrix: Water
Date Received: 07/14/18 10:15

Method: 300.1B - Disinfection By-Products, (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chlorate	2700		1000	100	ug/L			07/16/18 21:02	50

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Dichloroacetic acid(Surr)	*99*		*90 - 115*		*07/16/18 21:02*	*50*

Method: 314.0 - Perchlorate (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perchlorate	900		200	48	ug/L			07/22/18 18:42	50

Method Summary

Method	Method Description	Protocol	Laboratory
300.1B	Disinfection By-Products, (IC)	EPA	TAL IRV
314.0	Perchlorate (IC)	EPA	TAL IRV

Protocol References:

EPA = US Environmental Protection Agency

Laboratory References:

TAL IRV = TestAmerica Irvine, 17461 Derian Ave, Suite 100, Irvine, CA 92614-5817, TEL (949)261-1022

Lab Chronicle

Client: AECOM
Project/Site: NERT Las Vegas Wash, 60477365

TestAmerica Job ID: 440-215804-1

Client Sample ID: LNDMW1-20180711
Date Collected: 07/11/18 11:20
Date Received: 07/14/18 10:15

Lab Sample ID: 440-215804-1
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.1B		50			487572	07/15/18 22:36	YZ	TAL IRV
Total/NA	Analysis	314.0		100			488893	07/22/18 14:41	PS	TAL IRV

Client Sample ID: MW-25-20180712
Date Collected: 07/12/18 07:30
Date Received: 07/14/18 10:15

Lab Sample ID: 440-215804-2
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.1B		1			487566	07/16/18 04:29	YZ	TAL IRV
Total/NA	Analysis	314.0		1			488651	07/20/18 11:02	MMH	TAL IRV

Client Sample ID: MW-13-20180712
Date Collected: 07/12/18 08:35
Date Received: 07/14/18 10:15

Lab Sample ID: 440-215804-3
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.1B		50			487572	07/15/18 23:04	YZ	TAL IRV
Total/NA	Analysis	314.0		100			488893	07/22/18 14:59	PS	TAL IRV

Client Sample ID: MW-3-20180712
Date Collected: 07/12/18 10:25
Date Received: 07/14/18 10:15

Lab Sample ID: 440-215804-4
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.1B		50			487572	07/15/18 23:32	YZ	TAL IRV
Total/NA	Analysis	314.0		100			488893	07/22/18 15:57	PS	TAL IRV

Client Sample ID: MW-4-20180712
Date Collected: 07/12/18 11:10
Date Received: 07/14/18 10:15

Lab Sample ID: 440-215804-5
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.1B		50			487572	07/16/18 00:00	YZ	TAL IRV
Total/NA	Analysis	314.0		100			488893	07/22/18 16:15	PS	TAL IRV

Client Sample ID: MW-02-20180712
Date Collected: 07/12/18 13:30
Date Received: 07/14/18 10:15

Lab Sample ID: 440-215804-6
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.1B		50			487572	07/16/18 00:27	YZ	TAL IRV

Client: AECOM
TestAmerica Job ID: 440-215804-1
Project/Site: NERT Las Vegas Wash, 60477365

Client Sample ID: MW-02-20180712
Lab Sample ID: 440-215804-6
Date Collected: 07/12/18 13:30
Matrix: Water
Date Received: 07/14/18 10:15

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	314.0		100			488893	07/22/18 16:33	PS	TAL IRV

Client Sample ID: MW-02-20180712-FD
Lab Sample ID: 440-215804-7
Date Collected: 07/12/18 13:30
Matrix: Water
Date Received: 07/14/18 10:15

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.1B		50			487572	07/16/18 00:55	YZ	TAL IRV
Total/NA	Analysis	314.0		100			488893	07/22/18 16:51	PS	TAL IRV

Client Sample ID: MW-02-20180712-FB
Lab Sample ID: 440-215804-8
Date Collected: 07/12/18 13:40
Matrix: Water
Date Received: 07/14/18 10:15

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.1B		1			487572	07/15/18 17:29	YZ	TAL IRV
Total/NA	Analysis	314.0		1			488651	07/20/18 16:55	MMH	TAL IRV

Client Sample ID: MW-02-20180712-EB
Lab Sample ID: 440-215804-9
Date Collected: 07/12/18 13:50
Matrix: Water
Date Received: 07/14/18 10:15

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.1B		1			487572	07/15/18 12:23	YZ	TAL IRV
Total/NA	Analysis	314.0		1			488651	07/20/18 17:15	MMH	TAL IRV

Client Sample ID: MW-20-20180712
Lab Sample ID: 440-215804-10
Date Collected: 07/12/18 15:05
Matrix: Water
Date Received: 07/14/18 10:15

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.1B		5			487614	07/16/18 22:25	YZ	TAL IRV
Total/NA	Analysis	314.0		1			488651	07/20/18 17:36	MMH	TAL IRV

Client Sample ID: COH2B1-20180713
Lab Sample ID: 440-215804-11
Date Collected: 07/13/18 08:10
Matrix: Water
Date Received: 07/14/18 10:15

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.1B		10			488081	07/18/18 06:50	YZ	TAL IRV
Total/NA	Analysis	314.0		100			488893	07/22/18 17:10	PS	TAL IRV

Lab Chronicle

Client: AECOM
Project/Site: NERT Las Vegas Wash, 60477365

TestAmerica Job ID: 440-215804-1

Client Sample ID: AA-30-20180713

Lab Sample ID: 440-215804-12
Date Collected: 07/13/18 09:20
Matrix: Water
Date Received: 07/14/18 10:15

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.1B		50			487566	07/15/18 13:57	YZ	TAL IRV
Total/NA	Analysis	314.0		100			488893	07/22/18 17:28	PS	TAL IRV

Client Sample ID: WMW5.5S-20180713

Lab Sample ID: 440-215804-13
Date Collected: 07/13/18 10:30
Matrix: Water
Date Received: 07/14/18 10:15

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.1B		50			487614	07/16/18 19:38	YZ	TAL IRV
Total/NA	Analysis	314.0		100			488893	07/22/18 17:47	PS	TAL IRV

Client Sample ID: WMW5.58S1-20180713

Lab Sample ID: 440-215804-14
Date Collected: 07/13/18 12:20
Matrix: Water
Date Received: 07/14/18 10:15

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.1B		50			487614	07/16/18 20:06	YZ	TAL IRV
Total/NA	Analysis	314.0		100			488893	07/22/18 18:05	PS	TAL IRV

Client Sample ID: WMW4.9S-20180713

Lab Sample ID: 440-215804-15
Date Collected: 07/13/18 13:55
Matrix: Water
Date Received: 07/14/18 10:15

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.1B		50			487614	07/16/18 20:34	YZ	TAL IRV
Total/NA	Analysis	314.0		50			488893	07/22/18 18:23	PS	TAL IRV

Client Sample ID: WMW4.9S-20180713-FD

Lab Sample ID: 440-215804-16
Date Collected: 07/13/18 13:55
Matrix: Water
Date Received: 07/14/18 10:15

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.1B		50			487614	07/16/18 21:02	YZ	TAL IRV
Total/NA	Analysis	314.0		50			488893	07/22/18 18:42	PS	TAL IRV

Laboratory References:

TAL IRV = TestAmerica Irvine, 17461 Derian Ave, Suite 100, Irvine, CA 92614-5817, TEL (949)261-1022

Method: 300.1B - Disinfection By-Products, (IC)

Lab Sample ID: MB 440-487566/5
Matrix: Water
Analysis Batch: 487566

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chlorate	ND		20	2.0	ug/L			07/15/18 11:32	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Dichloroacetic acid(Surr)	*103*		*90 - 115*		*07/15/18 11:32*	*1*

Lab Sample ID: LCS 440-487566/4
Matrix: Water
Analysis Batch: 487566

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Chlorate	100	101		ug/L		101	75 - 125

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
Dichloroacetic acid(Surr)	*106*		*90 - 115*

Lab Sample ID: MRL 440-487566/3
Matrix: Water
Analysis Batch: 487566

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	MRL Result	MRL Qualifier	Unit	D	%Rec	%Rec. Limits
Chlorate	20.0	20.9		ug/L		104	50 - 150

Surrogate	*MRL %Recovery*	*MRL Qualifier*	*Limits*
Dichloroacetic acid(Surr)	*107*		*90 - 115*

Lab Sample ID: 440-215804-2 MS
Matrix: Water
Analysis Batch: 487566

Client Sample ID: MW-25-20180712
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Chlorate	57		200	258		ug/L		100	75 - 125

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
Dichloroacetic acid(Surr)	*97*		*90 - 115*

Lab Sample ID: 440-215804-2 MSD
Matrix: Water
Analysis Batch: 487566

Client Sample ID: MW-25-20180712
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Chlorate	57		200	264		ug/L		104	75 - 125	2	25

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
Dichloroacetic acid(Surr)	*98*		*90 - 115*

Method: 300.1B - Disinfection By-Products, (IC) (Continued)

Lab Sample ID: MB 440-487572/6
Matrix: Water
Analysis Batch: 487572

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chlorate	ND		20	2.0	ug/L			07/15/18 11:55	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Dichloroacetic acid(Surr)	*109*		*90 - 115*		*07/15/18 11:55*	*1*

Lab Sample ID: LCS 440-487572/5
Matrix: Water
Analysis Batch: 487572

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Chlorate	100	103		ug/L		103	75 - 125

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
Dichloroacetic acid(Surr)	*108*		*90 - 115*

Lab Sample ID: MRL 440-487572/4
Matrix: Water
Analysis Batch: 487572

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	MRL Result	MRL Qualifier	Unit	D	%Rec	%Rec. Limits
Chlorate	20.0	20.9		ug/L		105	50 - 150

Surrogate	*MRL %Recovery*	*MRL Qualifier*	*Limits*
Dichloroacetic acid(Surr)	*109*		*90 - 115*

Lab Sample ID: 440-215618-AN-6 MS
Matrix: Water
Analysis Batch: 487572

Client Sample ID: Matrix Spike
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Chlorate	67	J	200	282		ug/L		108	75 - 125

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
Dichloroacetic acid(Surr)	*109*		*90 - 115*

Lab Sample ID: 440-215618-AN-6 MSD
Matrix: Water
Analysis Batch: 487572

Client Sample ID: Matrix Spike Duplicate
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Chlorate	67	J	200	302		ug/L		118	75 - 125	7	25

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
Dichloroacetic acid(Surr)	*109*		*90 - 115*

Method: 300.1B - Disinfection By-Products, (IC) (Continued)

Lab Sample ID: MB 440-487614/6
Client Sample ID: Method Blank
Matrix: Water
Prep Type: Total/NA
Analysis Batch: 487614

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chlorate	ND		20	2.0	ug/L			07/16/18 07:54	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Dichloroacetic acid(Surr)	*103*		*90 - 115*		*07/16/18 07:54*	*1*

Lab Sample ID: LCS 440-487614/5
Client Sample ID: Lab Control Sample
Matrix: Water
Prep Type: Total/NA
Analysis Batch: 487614

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Chlorate	100	102		ug/L		102	75 - 125

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
Dichloroacetic acid(Surr)	*100*		*90 - 115*

Lab Sample ID: MRL 440-487614/4
Client Sample ID: Lab Control Sample
Matrix: Water
Prep Type: Total/NA
Analysis Batch: 487614

Analyte	Spike Added	MRL Result	MRL Qualifier	Unit	D	%Rec	%Rec. Limits
Chlorate	20.0	20.6		ug/L		103	50 - 150

Surrogate	*MRL %Recovery*	*MRL Qualifier*	*Limits*
Dichloroacetic acid(Surr)	*99*		*90 - 115*

Lab Sample ID: 440-215804-10 MS
Client Sample ID: MW-20-20180712
Matrix: Water
Prep Type: Total/NA
Analysis Batch: 487614

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Chlorate	78	J	200	272		ug/L		97	75 - 125

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
Dichloroacetic acid(Surr)	*96*		*90 - 115*

Lab Sample ID: 440-215804-10 MSD
Client Sample ID: MW-20-20180712
Matrix: Water
Prep Type: Total/NA
Analysis Batch: 487614

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Chlorate	78	J	200	276		ug/L		99	75 - 125	1	25

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
Dichloroacetic acid(Surr)	*109*		*90 - 115*

Method: 300.1B - Disinfection By-Products, (IC) (Continued)

Lab Sample ID: MB 440-488081/6
Client Sample ID: Method Blank
Matrix: Water
Prep Type: Total/NA
Analysis Batch: 488081

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chlorate	ND		20	2.0	ug/L			07/18/18 05:55	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Dichloroacetic acid(Surr)	*101*		*90 - 115*		*07/18/18 05:55*	*1*

Lab Sample ID: LCS 440-488081/5
Client Sample ID: Lab Control Sample
Matrix: Water
Prep Type: Total/NA
Analysis Batch: 488081

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Chlorate	100	102		ug/L		102	75 - 125

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
Dichloroacetic acid(Surr)	*101*		*90 - 115*

Lab Sample ID: MRL 440-488081/4
Client Sample ID: Lab Control Sample
Matrix: Water
Prep Type: Total/NA
Analysis Batch: 488081

Analyte	Spike Added	MRL Result	MRL Qualifier	Unit	D	%Rec	%Rec. Limits
Chlorate	20.0	21.3		ug/L		107	50 - 150

Surrogate	*MRL %Recovery*	*MRL Qualifier*	*Limits*
Dichloroacetic acid(Surr)	*101*		*90 - 115*

Lab Sample ID: 440-215838-A-1 MS
Client Sample ID: Matrix Spike
Matrix: Water
Prep Type: Total/NA
Analysis Batch: 488081

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Chlorate	160		200	375		ug/L		109	75 - 125

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
Dichloroacetic acid(Surr)	*103*		*90 - 115*

Lab Sample ID: 440-215838-A-1 MSD
Client Sample ID: Matrix Spike Duplicate
Matrix: Water
Prep Type: Total/NA
Analysis Batch: 488081

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Chlorate	160		200	366		ug/L		105	75 - 125	2	25

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
Dichloroacetic acid(Surr)	*101*		*90 - 115*

Client: AECOM
Project/Site: NERT Las Vegas Wash, 60477365

TestAmerica Job ID: 440-215804-1

Method: 314.0 - Perchlorate (IC)

Lab Sample ID: MB 440-488651/6
Matrix: Water
Analysis Batch: 488651

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perchlorate	ND		4.0	0.95	ug/L			07/20/18 10:10	1

Lab Sample ID: LCS 440-488651/5
Matrix: Water
Analysis Batch: 488651

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Perchlorate	25.0	25.8		ug/L		103	85 - 115

Lab Sample ID: MRL 440-488651/4
Matrix: Water
Analysis Batch: 488651

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	MRL Result	MRL Qualifier	Unit	D	%Rec	%Rec. Limits
Perchlorate	1.00	ND		ug/L		94	75 - 125

Lab Sample ID: 440-215804-2 MS
Matrix: Water
Analysis Batch: 488651

Client Sample ID: MW-25-20180712
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Perchlorate	4.3	F1	25.0	35.9	F1	ug/L		126	80 - 120

Lab Sample ID: 440-215804-2 MSD
Matrix: Water
Analysis Batch: 488651

Client Sample ID: MW-25-20180712
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Perchlorate	4.3	F1	25.0	37.4	F1	ug/L		132	80 - 120	4	20

Lab Sample ID: MB 440-488893/6
Matrix: Water
Analysis Batch: 488893

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perchlorate	ND		4.0	0.95	ug/L			07/22/18 12:01	1

Lab Sample ID: LCS 440-488893/5
Matrix: Water
Analysis Batch: 488893

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Perchlorate	25.0	25.2		ug/L		101	85 - 115

Lab Sample ID: MRL 440-488893/8
Matrix: Water
Analysis Batch: 488893

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	MRL Result	MRL Qualifier	Unit	D	%Rec	%Rec. Limits
Perchlorate	1.00	1.09	J	ug/L		109	75 - 125

Lab Sample ID: 320-41250-A-2 MS
Matrix: Water
Analysis Batch: 488893

Client Sample ID: Matrix Spike
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits		
Perchlorate	2.0	J	25.0	22.1		ug/L		80	80 - 120		

Lab Sample ID: 320-41250-A-2 MSD
Matrix: Water
Analysis Batch: 488893

Client Sample ID: Matrix Spike Duplicate
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Perchlorate	2.0	J	25.0	22.6		ug/L		82	80 - 120	2	20

HPLC/IC

Analysis Batch: 487566

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-215804-2	MW-25-20180712	Total/NA	Water	300.1B	
440-215804-12	AA-30-20180713	Total/NA	Water	300.1B	
MB 440-487566/5	Method Blank	Total/NA	Water	300.1B	
LCS 440-487566/4	Lab Control Sample	Total/NA	Water	300.1B	
MRL 440-487566/3	Lab Control Sample	Total/NA	Water	300.1B	
440-215804-2 MS	MW-25-20180712	Total/NA	Water	300.1B	
440-215804-2 MSD	MW-25-20180712	Total/NA	Water	300.1B	

Analysis Batch: 487572

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-215804-1	LNDMW1-20180711	Total/NA	Water	300.1B	
440-215804-3	MW-13-20180712	Total/NA	Water	300.1B	
440-215804-4	MW-3-20180712	Total/NA	Water	300.1B	
440-215804-5	MW-4-20180712	Total/NA	Water	300.1B	
440-215804-6	MW-02-20180712	Total/NA	Water	300.1B	
440-215804-7	MW-02-20180712-FD	Total/NA	Water	300.1B	
440-215804-8	MW-02-20180712-FB	Total/NA	Water	300.1B	
440-215804-9	MW-02-20180712-EB	Total/NA	Water	300.1B	
MB 440-487572/6	Method Blank	Total/NA	Water	300.1B	
LCS 440-487572/5	Lab Control Sample	Total/NA	Water	300.1B	
MRL 440-487572/4	Lab Control Sample	Total/NA	Water	300.1B	
440-215618-AN-6 MS	Matrix Spike	Total/NA	Water	300.1B	
440-215618-AN-6 MSD	Matrix Spike Duplicate	Total/NA	Water	300.1B	

Analysis Batch: 487614

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-215804-10	MW-20-20180712	Total/NA	Water	300.1B	
440-215804-13	WMW5.5S-20180713	Total/NA	Water	300.1B	
440-215804-14	WMW5.58S1-20180713	Total/NA	Water	300.1B	
440-215804-15	WMW4.9S-20180713	Total/NA	Water	300.1B	
440-215804-16	WMW4.9S-20180713-FD	Total/NA	Water	300.1B	
MB 440-487614/6	Method Blank	Total/NA	Water	300.1B	
LCS 440-487614/5	Lab Control Sample	Total/NA	Water	300.1B	
MRL 440-487614/4	Lab Control Sample	Total/NA	Water	300.1B	
440-215804-10 MS	MW-20-20180712	Total/NA	Water	300.1B	
440-215804-10 MSD	MW-20-20180712	Total/NA	Water	300.1B	

Analysis Batch: 488081

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-215804-11	COH2B1-20180713	Total/NA	Water	300.1B	
MB 440-488081/6	Method Blank	Total/NA	Water	300.1B	
LCS 440-488081/5	Lab Control Sample	Total/NA	Water	300.1B	
MRL 440-488081/4	Lab Control Sample	Total/NA	Water	300.1B	
440-215838-A-1 MS	Matrix Spike	Total/NA	Water	300.1B	
440-215838-A-1 MSD	Matrix Spike Duplicate	Total/NA	Water	300.1B	

Analysis Batch: 488651

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-215804-2	MW-25-20180712	Total/NA	Water	314.0	
440-215804-8	MW-02-20180712-FB	Total/NA	Water	314.0	
440-215804-9	MW-02-20180712-EB	Total/NA	Water	314.0	

HPLC/IC (Continued)

Analysis Batch: 488651 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-215804-10	MW-20-20180712	Total/NA	Water	314.0	
MB 440-488651/6	Method Blank	Total/NA	Water	314.0	
LCS 440-488651/5	Lab Control Sample	Total/NA	Water	314.0	
MRL 440-488651/4	Lab Control Sample	Total/NA	Water	314.0	
440-215804-2 MS	MW-25-20180712	Total/NA	Water	314.0	
440-215804-2 MSD	MW-25-20180712	Total/NA	Water	314.0	

Analysis Batch: 488893

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-215804-1	LNDMW1-20180711	Total/NA	Water	314.0	
440-215804-3	MW-13-20180712	Total/NA	Water	314.0	
440-215804-4	MW-3-20180712	Total/NA	Water	314.0	
440-215804-5	MW-4-20180712	Total/NA	Water	314.0	
440-215804-6	MW-02-20180712	Total/NA	Water	314.0	
440-215804-7	MW-02-20180712-FD	Total/NA	Water	314.0	
440-215804-11	COH2B1-20180713	Total/NA	Water	314.0	
440-215804-12	AA-30-20180713	Total/NA	Water	314.0	
440-215804-13	WMW5.5S-20180713	Total/NA	Water	314.0	
440-215804-14	WMW5.58S1-20180713	Total/NA	Water	314.0	
440-215804-15	WMW4.9S-20180713	Total/NA	Water	314.0	
440-215804-16	WMW4.9S-20180713-FD	Total/NA	Water	314.0	
MB 440-488893/6	Method Blank	Total/NA	Water	314.0	
LCS 440-488893/5	Lab Control Sample	Total/NA	Water	314.0	
MRL 440-488893/8	Lab Control Sample	Total/NA	Water	314.0	
320-41250-A-2 MS	Matrix Spike	Total/NA	Water	314.0	
320-41250-A-2 MSD	Matrix Spike Duplicate	Total/NA	Water	314.0	

Definitions/Glossary

Qualifiers

HPLC/IC

Qualifier	Qualifier Description
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
F1	MS and/or MSD Recovery is outside acceptance limits.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

1 2 3 4 5 6 7 8 9 10 11 12 13

Accreditation/Certification Summary

Client: AECOM
Project/Site: NERT Las Vegas Wash, 60477365

TestAmerica Job ID: 440-215804-1

Laboratory: TestAmerica Irvine

The accreditations/certifications listed below are applicable to this report.

Authority	Program	EPA Region	Identification Number	Expiration Date
Nevada	State Program	9	CA015312018-1	07-31-18 *

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

TestAmerica Irvine
17461 Derian Ave
Suite 100
Irvine, CA 92614
Phone: 949.261.1022 Fax:

Chain of Custody Record

209427

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
TestAmerica Laboratories, Inc.
TAL-8210 (0713)

Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☐ Other:

Client Contact	
Company Name:	AECOM
Address:	1220 Avenida Acaso
City/State/Zip:	Camarillo CA
Phone:	805 764 4000
Fax:	
Project Name:	NERT Phase I GW Sample
Site:	Las Vegas Wash
P O #	60422365
Project Manager:	Sally Bilodeau
Tel/Fax:	805 764 4006
Site Contact:	
Lab Contact:	
Date:	
Carrier:	
COC No:	
	1 of 2 COCs
Sampler:	J Kirkpatrick

Analysis Turnaround Time: ☐ CALENDAR DAYS ☐ WORKING DAYS
TAT if different from Below: Per WO
☐ 2 weeks
☐ 1 week
☐ 2 days
☐ 1 day

For Lab Use Only:
Walk-in Client:
Lab Sampling:
Job / SDG No :

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y / N)	Perform MS / MSD (Y / N)	314.0 Perchlorate	300.1 Chlorate	Sample Specific Notes.
LNDMW01-20180711	7/11/18	1120	G	GW	2	N		X	X	
MW-25-20180712	7/12/18	0730	G	GW	6	N	Y	X	X	Extra vol = MS/MSD
MW-13-20180712		0835	G	GW	2	N		X	X	
MW-3-20180712		1025	G	GW	2	N		X	X	
MW-4-20180712		1110	G	GW	2	N		X	X	
MW-2-20180712		1330	G	GW	2	N		X	X	
MW-2-20180712-FD		1330	G	GW	2	N		X	X	
MW-2-20180712-FB		1340	G	GW	2	N		X	X	
MW-2-20180712-EB		1350	G	GW	2	N		X	X	
MW-20-20180712	7/12/18	1500	G	GW	2	N		X	X	

7/13/18
7/14/18

440-215804 Chain of Custody

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.
☒ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
Per WO
☐ Return to Client ☐ Disposal by Lab ☐ Archive for ____ Months

Special Instructions/QC Requirements & Comments:
CS 4357 1174 5420 1.1 1.3 IR89

Custody Seals Intact: ☐ Yes ☐ No
Custody Seal No.:
Cooler Temp. (°C): Obs'd ____ Corr'd: ____ Therm ID No.: ____

Relinquished by:	Company: AECOM	Date/Time: 7/13/18 1445	Received by:	Company: TALV	Date/Time: 7/13/18 1445
Relinquished by:	Company: TALV	Date/Time: 7/13/18	Received by:	Company	Date/Time
Relinquished by	Company:	Date/Time:	Received in Laboratory by:	Company: TAIRV	Date/Time: 7/14/18 1015

T 3 TALV

TestAmerica Irvine
17461 Derian Ave
Suite 100
Irvine, CA 92614
Phone: 949.261.1022 Fax:

Chain of Custody Record 209426

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
TestAmerica Laboratories, Inc.
TAL-8210 (0713)

Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☐ Other:

Client Contact			
Company Name: AECOM	Project Manager: Sally B. Jackson	Site Contact:	Date:
Address: 1220 Avenida Acaso	Tel/Fax: 805 764 4006	Lab Contact:	Carrier:
City/State/Zip: Camarillo, CA	Analysis Turnaround Time		
Phone: 805 764 4006	☐ CALENDAR DAYS ☐ WORKING DAYS		
Fax	TAT if different from Below: Per WO		
Project Name	☐ 2 weeks		
Site:	☐ 1 week / ☐ 2 days		
P O #	☐ 1 day		

COC No: 2 of 2 COCs
Sampler: J CAPATRI?
For Lab Use Only:
Walk-in Client:
Lab Sampling
Job / SDG No.:

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y/N)	Perform MS / MSD (Y/N)	314.0 Perchlorate	300.1 Chlorate	Sample Specific Notes:
COH2B1-20180713	7/13/18	0810	G	GW	2	N		✓	✓	
AA-30-20180713	7/13/18	0920	G	GW	2	N		✓	✓	
WMW5.5S1-20180713	7/13/18	1030	G	GW	2	N		✓	✓	
WMW5.58S1-20180713	7/13/18	1220	G	GW	2	N		✓	✓	
WMW4.9S-20180713	7/13/18	1355	G	GW	2	N		✓	✓	
WMW4.9S-20180713-FD	7/13/18	1355	G	GW	2	N		✓	✓	

7/13/18
7/14/18

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample

☒ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
Per WO
☐ Return to Client ☐ Disposal by Lab ☐ Archive for ____ Months

Special Instructions/QC Requirements & Comments:
1.1 1.3 IR-8?

Custody Seals Intact: ☐ Yes ☐ No	Custody Seal No.:	Cooler Temp. (°C): Obs'd: Corr'd: Therm ID No.:		
Relinquished by: [signature]	Company: AECOM	Date/Time: 7/13/18 1445	Received by: [signature]	Company: TALWR / Date/Time: 7/13/18 1445
Relinquished by: [signature]	Company: TALW	Date/Time: 7/13/18	Received by: [signature]	Company: / Date/Time:
Relinquished by:	Company:	Date/Time:	Received in Laboratory by: [signature]	Company: TAIRV / Date/Time: 7/14/18 0105

6.3 TAIRV

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Mata, Patty

From:	Bilodeau, Sally <Sally.Bilodeau@aecom.com>
Sent:	Monday, July 23, 2018 8:07 PM
To:	Mata, Patty
Cc:	Roper, Chad
Subject:	RE: Corrections to sample names from COCs from Henderson Nevda July 11 - 13, 2018 samples

-External Email-

Correction to the correction
The sample starting with WMW5.58S1 is OK do not change it.

Sally Bilodeau, PG, CEM
AECOM Camarillo CA
D +1-805-764-4006
M +1-805-551-0649

Built to deliver a better world

From: Bilodeau, Sally
Sent: Monday, July 23, 2018 7:56 PM
To: Mata, Patty
Cc: Roper, Chad
Subject: Corrections to sample names from COCs from Henderson Nevda July 11 - 13, 2018 samples

Patty,
Several sample names on the COCs are incorrect, the sample labels were correct on the bottles.
Samples starting with MW-2 should be MW-02 for all samples collected 7/12/18
The sample starting with LNDMW01 should start with LNDMW1
The sample starting with WMW5.5S1 should start with WMW5.5S
The sample starting with WMW5.58S1 should start with WMW5.58S

Sally Bilodeau, PG, CEG, CHG, CEM
Senior Program Manager, Remediation, West
D +1-805-764-4006
M +1-805-551-0649
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AECOM
1220 Avenida Acaso
Camarillo CA 93012-8750, USA
T +1-805-388-3775
aecom.com

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LinkedIn Twitter Facebook Instagram

Login Sample Receipt Checklist

Client: AECOM   Job Number: 440-215804-1

Login Number: 215804   **List Source: TestAmerica Irvine**
List Number: 1
Creator: Bonta, Lucia F

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	Not Present
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Irvine
17461 Derian Ave
Suite 100
Irvine, CA 92614-5817
Tel: (949)261-1022

TestAmerica Job ID: 440-216209-1
Client Project/Site: NERT Las Vegas Wash, 60477365

For:
AECOM
1220 Avenida Acaso
Camarillo, California 93012

Attn: Ms. Sally Bilodeau

Authorized for release by:
7/28/2018 3:59:18 PM

Patty Mata, Senior Project Manager
(949)261-1022
patty.mata@testamericainc.com

The test results in this report meet all 2003 NELAC and 2009 TNI requirements for accredited parameters, exceptions are noted in this report. This report may not be reproduced except in full, and with written approval from the laboratory. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

Table of Contents

Sample Summary

Client: AECOM
Project/Site: NERT Las Vegas Wash, 60477365

TestAmerica Job ID: 440-216209-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
440-216209-1	WMW3.5S-20180716	Water	07/16/18 08:20	07/19/18 09:30
440-216209-2	NERT5.91S1-20180716	Water	07/16/18 09:40	07/19/18 09:30
440-216209-3	NERT5.49S1-20180716	Water	07/16/18 11:10	07/19/18 09:30
440-216209-4	NERT4.21N1-20180716	Water	07/16/18 12:40	07/19/18 09:30
440-216209-5	NERT4.38N1-20180716	Water	07/16/18 14:00	07/19/18 09:30
440-216209-6	WMW3.5N-20180717	Water	07/17/18 09:45	07/19/18 09:30
440-216209-7	LNDMW2-20180717	Water	07/17/18 11:10	07/19/18 09:30
440-216209-8	WMW4.9N-20180717	Water	07/17/18 12:40	07/19/18 09:30
440-216209-9	WMW5.7N-20180717	Water	07/17/18 13:50	07/19/18 09:30

Job ID: 440-216209-1

Laboratory: TestAmerica Irvine

Narrative

Job Narrative
440-216209-1

Comments
Total Dissolved Chromium results are reported separately.

Receipt
The samples were received on 7/19/2018 9:30 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 0.8º C.

Receipt Exceptions
The container label for the following sample did not match the information listed on the Chain-of-Custody (COC): WMW5.7N-20180717 (440-216209-9). The container labels list WMW5.7N-20180717, while the COC lists WMW5.7N-20180718. The client was contacted and they provided a revised COC with ID that matched the container labels. The EPA 300.1 analysis was confirmed to be for Chlorate.

HPLC/IC
Method(s) 300.0: The following samples were diluted due to the nature of the sample matrix: NERT5.91S1-20180716 (440-216209-2), NERT4.21N1-20180716 (440-216209-4) and NERT4.38N1-20180716 (440-216209-5). Elevated reporting limits (RLs) are provided.

Method(s) 300.1B: The following samples were diluted for Chlorate due to the nature of the sample matrix: NERT5.49S1-20180716 (440-216209-3), WMW4.9N-20180717 (440-216209-8) and WMW5.7N-20180717 (440-216209-9). Elevated reporting limits (RLs) are provided.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

General Chemistry
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Client: AECOM
Project/Site: NERT Las Vegas Wash, 60477365

TestAmerica Job ID: 440-216209-1

Client Sample ID: WMW3.5S-20180716
Lab Sample ID: 440-216209-1
Date Collected: 07/16/18 08:20
Matrix: Water
Date Received: 07/19/18 09:30

Method: 300.1B - Disinfection By-Products, (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chlorate	3900		1000	100	ug/L			07/22/18 18:26	50

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Dichloroacetic acid(Surr)	*97*		*90 - 115*		*07/22/18 18:26*	*50*

Method: 314.0 - Perchlorate (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perchlorate	1500		400	95	ug/L			07/27/18 12:28	100

Client Sample ID: NERT5.91S1-20180716
Lab Sample ID: 440-216209-2
Date Collected: 07/16/18 09:40
Matrix: Water
Date Received: 07/19/18 09:30

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Bromide	ND		2.5	1.3	mg/L			07/19/18 20:27	5
Chloride	570		100	50	mg/L			07/19/18 20:43	200

Method: 300.1B - Disinfection By-Products, (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chlorate	660		200	20	ug/L			07/23/18 15:54	10

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Dichloroacetic acid(Surr)	*99*		*90 - 115*		*07/23/18 15:54*	*10*

Method: 314.0 - Perchlorate (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perchlorate	2900		400	95	ug/L			07/25/18 19:21	100

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	3100		50	25	mg/L			07/21/18 08:51	1

Client Sample ID: NERT5.49S1-20180716
Lab Sample ID: 440-216209-3
Date Collected: 07/16/18 11:10
Matrix: Water
Date Received: 07/19/18 09:30

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	250		25	13	mg/L			07/19/18 22:46	50

Method: 300.0 - Anions, Ion Chromatography - DL

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Bromide	0.27	J	0.50	0.25	mg/L			07/19/18 22:00	1

Method: 300.1B - Disinfection By-Products, (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chlorate	ND		100	10	ug/L			07/24/18 08:58	5

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Dichloroacetic acid(Surr)	*97*		*90 - 115*		*07/24/18 08:58*	*5*

Client Sample ID: NERT5.49S1-20180716

Lab Sample ID: 440-216209-3

Date Collected: 07/16/18 11:10
Date Received: 07/19/18 09:30

Matrix: Water

Method: 314.0 - Perchlorate (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perchlorate	5.1		4.0	0.95	ug/L			07/25/18 18:26	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	1400		20	10	mg/L			07/21/18 08:51	1

Client Sample ID: NERT4.21N1-20180716

Lab Sample ID: 440-216209-4

Date Collected: 07/16/18 12:40
Date Received: 07/19/18 09:30

Matrix: Water

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Bromide	ND		2.5	1.3	mg/L			07/19/18 20:58	5
Chloride	570		100	50	mg/L			07/19/18 21:14	200

Method: 300.1B - Disinfection By-Products, (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chlorate	6800		1000	100	ug/L			07/22/18 20:45	50

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Dichloroacetic acid(Surr)	*99*		*90 - 115*		*07/22/18 20:45*	*50*

Method: 314.0 - Perchlorate (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perchlorate	2200		400	95	ug/L			07/25/18 19:40	100

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	4000		50	25	mg/L			07/21/18 08:51	1

Client Sample ID: NERT4.38N1-20180716

Lab Sample ID: 440-216209-5

Date Collected: 07/16/18 14:00
Date Received: 07/19/18 09:30

Matrix: Water

Method: 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Bromide	ND		2.5	1.3	mg/L			07/19/18 21:29	5
Chloride	510		100	50	mg/L			07/19/18 21:44	200

Method: 300.1B - Disinfection By-Products, (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chlorate	300		40	4.0	ug/L			07/23/18 17:45	2

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Dichloroacetic acid(Surr)	*97*		*90 - 115*		*07/23/18 17:45*	*2*

Method: 314.0 - Perchlorate (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perchlorate	1400		400	95	ug/L			07/25/18 19:58	100

Client Sample ID: NERT4.38N1-20180716 Lab Sample ID: 440-216209-5

Date Collected: 07/16/18 14:00 **Matrix: Water**
Date Received: 07/19/18 09:30

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	3600		50	25	mg/L			07/21/18 08:51	1

Client Sample ID: WMW3.5N-20180717 Lab Sample ID: 440-216209-6

Date Collected: 07/17/18 09:45 **Matrix: Water**
Date Received: 07/19/18 09:30

Method: 300.1B - Disinfection By-Products, (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chlorate	640		200	20	ug/L			07/23/18 18:13	10

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Dichloroacetic acid(Surr)	*101*		*90 - 115*		*07/23/18 18:13*	*10*

Method: 314.0 - Perchlorate (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perchlorate	320		40	9.5	ug/L			07/25/18 18:45	10

Client Sample ID: LNDMW2-20180717 Lab Sample ID: 440-216209-7

Date Collected: 07/17/18 11:10 **Matrix: Water**
Date Received: 07/19/18 09:30

Method: 300.1B - Disinfection By-Products, (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chlorate	6000		1000	100	ug/L			07/22/18 22:09	50

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Dichloroacetic acid(Surr)	*102*		*90 - 115*		*07/22/18 22:09*	*50*

Method: 314.0 - Perchlorate (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perchlorate	1700		400	95	ug/L			07/25/18 20:16	100

Client Sample ID: WMW4.9N-20180717 Lab Sample ID: 440-216209-8

Date Collected: 07/17/18 12:40 **Matrix: Water**
Date Received: 07/19/18 09:30

Method: 300.1B - Disinfection By-Products, (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chlorate	13	J	100	10	ug/L			07/24/18 09:26	5

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Dichloroacetic acid(Surr)	*101*		*90 - 115*		*07/24/18 09:26*	*5*

Method: 314.0 - Perchlorate (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perchlorate	680		80	19	ug/L			07/25/18 19:03	20

Client Sample Results

Client: AECOM
Project/Site: NERT Las Vegas Wash, 60477365

TestAmerica Job ID: 440-216209-1

Client Sample ID: WMW5.7N-20180717

Date Collected: 07/17/18 13:50
Date Received: 07/19/18 09:30

Lab Sample ID: 440-216209-9
Matrix: Water

Method: 300.1B - Disinfection By-Products, (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chlorate	ND		100	10	ug/L			07/24/18 09:54	5

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Dichloroacetic acid(Surr)	*98*		*90 - 115*		*07/24/18 09:54*	*5*

Method: 314.0 - Perchlorate (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perchlorate	**3.9**	**J F1**	4.0	0.95	ug/L			07/27/18 11:03	1

Method Summary

Method	Method Description	Protocol	Laboratory
300.0	Anions, Ion Chromatography	MCAWW	TAL IRV
300.1B	Disinfection By-Products, (IC)	EPA	TAL IRV
314.0	Perchlorate (IC)	EPA	TAL IRV
SM 2540C	Solids, Total Dissolved (TDS)	SM	TAL IRV

Protocol References:

EPA = US Environmental Protection Agency

MCAWW = "Methods For Chemical Analysis Of Water And Wastes", EPA-600/4-79-020, March 1983 And Subsequent Revisions.

SM = "Standard Methods For The Examination Of Water And Wastewater"

Laboratory References:

TAL IRV = TestAmerica Irvine, 17461 Derian Ave, Suite 100, Irvine, CA 92614-5817, TEL (949)261-1022

Lab Chronicle

Client: AECOM
Project/Site: NERT Las Vegas Wash, 60477365

TestAmerica Job ID: 440-216209-1

Client Sample ID: WMW3.5S-20180716
Lab Sample ID: 440-216209-1
Date Collected: 07/16/18 08:20
Matrix: Water
Date Received: 07/19/18 09:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.1B		50			488870	07/22/18 18:26	YZ	TAL IRV
Total/NA	Analysis	314.0		100			489968	07/27/18 12:28	CTH	TAL IRV

Client Sample ID: NERT5.91S1-20180716
Lab Sample ID: 440-216209-2
Date Collected: 07/16/18 09:40
Matrix: Water
Date Received: 07/19/18 09:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.0		5	5 mL	1.0 mL	488425	07/19/18 20:27	NTN	TAL IRV
Total/NA	Analysis	300.0		200			488425	07/19/18 20:43	NTN	TAL IRV
Total/NA	Analysis	300.1B		10			488938	07/23/18 15:54	YZ	TAL IRV
Total/NA	Analysis	314.0		100			489425	07/25/18 19:21	CTH	TAL IRV
Total/NA	Analysis	SM 2540C		1	20 mL	100 mL	488830	07/21/18 08:51	XL	TAL IRV

Client Sample ID: NERT5.49S1-20180716
Lab Sample ID: 440-216209-3
Date Collected: 07/16/18 11:10
Matrix: Water
Date Received: 07/19/18 09:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.0	DL	1	5 mL	1.0 mL	488425	07/19/18 22:00	NTN	TAL IRV
Total/NA	Analysis	300.0		50			488425	07/19/18 22:46	NTN	TAL IRV
Total/NA	Analysis	300.1B		5			489145	07/24/18 08:58	YZ	TAL IRV
Total/NA	Analysis	314.0		1			489425	07/25/18 18:26	CTH	TAL IRV
Total/NA	Analysis	SM 2540C		1	50 mL	100 mL	488830	07/21/18 08:51	XL	TAL IRV

Client Sample ID: NERT4.21N1-20180716
Lab Sample ID: 440-216209-4
Date Collected: 07/16/18 12:40
Matrix: Water
Date Received: 07/19/18 09:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.0		5	5 mL	1.0 mL	488425	07/19/18 20:58	NTN	TAL IRV
Total/NA	Analysis	300.0		200			488425	07/19/18 21:14	NTN	TAL IRV
Total/NA	Analysis	300.1B		50			488870	07/22/18 20:45	YZ	TAL IRV
Total/NA	Analysis	314.0		100			489425	07/25/18 19:40	CTH	TAL IRV
Total/NA	Analysis	SM 2540C		1	20 mL	100 mL	488830	07/21/18 08:51	XL	TAL IRV

Client Sample ID: NERT4.38N1-20180716

Lab Sample ID: 440-216209-5

Date Collected: 07/16/18 14:00
Matrix: Water
Date Received: 07/19/18 09:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.0		5	5 mL	1.0 mL	488425	07/19/18 21:29	NTN	TAL IRV
Total/NA	Analysis	300.0		200			488425	07/19/18 21:44	NTN	TAL IRV
Total/NA	Analysis	300.1B		2			488938	07/23/18 17:45	YZ	TAL IRV
Total/NA	Analysis	314.0		100			489425	07/25/18 19:58	CTH	TAL IRV
Total/NA	Analysis	SM 2540C		1	20 mL	100 mL	488830	07/21/18 08:51	XL	TAL IRV

Client Sample ID: WMW3.5N-20180717

Lab Sample ID: 440-216209-6

Date Collected: 07/17/18 09:45
Matrix: Water
Date Received: 07/19/18 09:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.1B		10			488938	07/23/18 18:13	YZ	TAL IRV
Total/NA	Analysis	314.0		10			489425	07/25/18 18:45	CTH	TAL IRV

Client Sample ID: LNDMW2-20180717

Lab Sample ID: 440-216209-7

Date Collected: 07/17/18 11:10
Matrix: Water
Date Received: 07/19/18 09:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.1B		50			488870	07/22/18 22:09	YZ	TAL IRV
Total/NA	Analysis	314.0		100			489425	07/25/18 20:16	CTH	TAL IRV

Client Sample ID: WMW4.9N-20180717

Lab Sample ID: 440-216209-8

Date Collected: 07/17/18 12:40
Matrix: Water
Date Received: 07/19/18 09:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.1B		5			489145	07/24/18 09:26	YZ	TAL IRV
Total/NA	Analysis	314.0		20			489425	07/25/18 19:03	CTH	TAL IRV

Client Sample ID: WMW5.7N-20180717

Lab Sample ID: 440-216209-9

Date Collected: 07/17/18 13:50
Matrix: Water
Date Received: 07/19/18 09:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.1B		5			489145	07/24/18 09:54	YZ	TAL IRV
Total/NA	Analysis	314.0		1			489968	07/27/18 11:03	CTH	TAL IRV

Laboratory References:

TAL IRV = TestAmerica Irvine, 17461 Derian Ave, Suite 100, Irvine, CA 92614-5817, TEL (949)261-1022

Method: 300.0 - Anions, Ion Chromatography

Lab Sample ID: MB 440-488425/6
Client Sample ID: Method Blank
Matrix: Water
Prep Type: Total/NA
Analysis Batch: 488425

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Bromide	ND		0.50	0.25	mg/L			07/19/18 11:01	1
Chloride	ND		0.50	0.25	mg/L			07/19/18 11:01	1

Lab Sample ID: LCS 440-488425/5
Client Sample ID: Lab Control Sample
Matrix: Water
Prep Type: Total/NA
Analysis Batch: 488425

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Bromide	5.00	5.09		mg/L		102	90 - 110
Chloride	5.00	4.93		mg/L		99	90 - 110

Method: 300.0 - Anions, Ion Chromatography - DL

Lab Sample ID: 440-216209-3 MS
Client Sample ID: NERT5.49S1-20180716
Matrix: Water
Prep Type: Total/NA
Analysis Batch: 488425

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Bromide - DL	0.27	J	5.00	5.38		mg/L		102	80 - 120
Chloride - DL	350	E	5.00	353	E 4	mg/L		112	80 - 120

Lab Sample ID: 440-216209-3 MSD
Client Sample ID: NERT5.49S1-20180716
Matrix: Water
Prep Type: Total/NA
Analysis Batch: 488425

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Bromide - DL	0.27	J	5.00	5.46		mg/L		104	80 - 120	2	20
Chloride - DL	350	E	5.00	350	E 4	mg/L		56	80 - 120	1	20

Method: 300.1B - Disinfection By-Products, (IC)

Lab Sample ID: MB 440-488870/6
Client Sample ID: Method Blank
Matrix: Water
Prep Type: Total/NA
Analysis Batch: 488870

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chlorate	ND		20	2.0	ug/L			07/22/18 10:32	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Dichloroacetic acid(Surr)	*100*		*90 - 115*		*07/22/18 10:32*	*1*

Lab Sample ID: LCS 440-488870/5
Client Sample ID: Lab Control Sample
Matrix: Water
Prep Type: Total/NA
Analysis Batch: 488870

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Chlorate	100	103		ug/L		103	75 - 125

Method: 300.1B - Disinfection By-Products, (IC) (Continued)

Lab Sample ID: LCS 440-488870/5
Matrix: Water
Analysis Batch: 488870

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Surrogate	LCS %Recovery	LCS Qualifier	Limits
Dichloroacetic acid(Surr)	*101*		*90 - 115*

Lab Sample ID: MRL 440-488870/4
Matrix: Water
Analysis Batch: 488870

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte			Spike Added	MRL Result	MRL Qualifier	Unit	D	%Rec	%Rec. Limits		
Chlorate			20.0	21.3		ug/L		106	50 - 150		

Surrogate	MRL %Recovery	MRL Qualifier	Limits
Dichloroacetic acid(Surr)	*100*		*90 - 115*

Lab Sample ID: 440-216286-A-1 MS
Matrix: Water
Analysis Batch: 488870

Client Sample ID: Matrix Spike
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits		
Chlorate	160		200	374		ug/L		108	75 - 125		

Surrogate	MS %Recovery	MS Qualifier	Limits
Dichloroacetic acid(Surr)	*99*		*90 - 115*

Lab Sample ID: 440-216286-A-1 MSD
Matrix: Water
Analysis Batch: 488870

Client Sample ID: Matrix Spike Duplicate
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Chlorate	160		200	377		ug/L		109	75 - 125	1	25

Surrogate	MSD %Recovery	MSD Qualifier	Limits
Dichloroacetic acid(Surr)	*100*		*90 - 115*

Lab Sample ID: MB 440-488938/6
Matrix: Water
Analysis Batch: 488938

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chlorate	ND		20	2.0	ug/L			07/23/18 07:32	1

Surrogate	MB %Recovery	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
Dichloroacetic acid(Surr)	*101*		*90 - 115*		*07/23/18 07:32*	*1*

Method: 300.1B - Disinfection By-Products, (IC) (Continued)

Lab Sample ID: LCS 440-488938/5
Matrix: Water
Analysis Batch: 488938

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Chlorate			100	105		ug/L		105	75 - 125		

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
Dichloroacetic acid(Surr)	*105*		*90 - 115*

Lab Sample ID: MRL 440-488938/4
Matrix: Water
Analysis Batch: 488938

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte			Spike Added	MRL Result	MRL Qualifier	Unit	D	%Rec	%Rec. Limits		
Chlorate			20.0	22.1		ug/L		111	50 - 150		

Surrogate	*MRL %Recovery*	*MRL Qualifier*	*Limits*
Dichloroacetic acid(Surr)	*100*		*90 - 115*

Lab Sample ID: 440-216322-A-1 MS
Matrix: Water
Analysis Batch: 488938

Client Sample ID: Matrix Spike
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits		
Chlorate	69		200	282		ug/L		107	75 - 125		

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
Dichloroacetic acid(Surr)	*100*		*90 - 115*

Lab Sample ID: 440-216322-A-1 MSD
Matrix: Water
Analysis Batch: 488938

Client Sample ID: Matrix Spike Duplicate
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Chlorate	69		200	279		ug/L		105	75 - 125	1	25

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
Dichloroacetic acid(Surr)	*99*		*90 - 115*

Lab Sample ID: MB 440-489145/6
Matrix: Water
Analysis Batch: 489145

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chlorate	ND		20	2.0	ug/L			07/24/18 08:03	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Dichloroacetic acid(Surr)	*102*		*90 - 115*		*07/24/18 08:03*	*1*

Method: 300.1B - Disinfection By-Products, (IC) (Continued)

Lab Sample ID: LCS 440-489145/5
Matrix: Water
Analysis Batch: 489145

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Chlorate			100	104		ug/L		104	75 - 125		

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
Dichloroacetic acid(Surr)	*102*		*90 - 115*

Lab Sample ID: MRL 440-489145/4
Matrix: Water
Analysis Batch: 489145

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte			Spike Added	MRL Result	MRL Qualifier	Unit	D	%Rec	%Rec. Limits		
Chlorate			20.0	21.1		ug/L		106	50 - 150		

Surrogate	*MRL %Recovery*	*MRL Qualifier*	*Limits*
Dichloroacetic acid(Surr)	*101*		*90 - 115*

Lab Sample ID: 440-216394-A-1 MS
Matrix: Water
Analysis Batch: 489145

Client Sample ID: Matrix Spike
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits		
Chlorate	160		200	362		ug/L		103	75 - 125		

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
Dichloroacetic acid(Surr)	*102*		*90 - 115*

Lab Sample ID: 440-216394-A-1 MSD
Matrix: Water
Analysis Batch: 489145

Client Sample ID: Matrix Spike Duplicate
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Chlorate	160		200	369		ug/L		106	75 - 125	2	25

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
Dichloroacetic acid(Surr)	*102*		*90 - 115*

Method: 314.0 - Perchlorate (IC)

Lab Sample ID: MB 440-489425/6
Matrix: Water
Analysis Batch: 489425

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perchlorate	ND		4.0	0.95	ug/L			07/25/18 09:10	1

Method: 314.0 - Perchlorate (IC) (Continued)

Lab Sample ID: LCS 440-489425/5
Matrix: Water
Analysis Batch: 489425

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Perchlorate	25.0	25.4		ug/L		102	85 - 115

Lab Sample ID: MRL 440-489425/4
Matrix: Water
Analysis Batch: 489425

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	MRL Result	MRL Qualifier	Unit	D	%Rec	%Rec. Limits
Perchlorate	1.00	ND		ug/L		93	75 - 125

Lab Sample ID: 440-215316-A-2 MS
Matrix: Water
Analysis Batch: 489425

Client Sample ID: Matrix Spike
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Perchlorate	1.3	J	25.0	21.3		ug/L		80	80 - 120

Lab Sample ID: 440-215316-A-2 MSD
Matrix: Water
Analysis Batch: 489425

Client Sample ID: Matrix Spike Duplicate
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Perchlorate	1.3	J	25.0	23.0		ug/L		87	80 - 120	7	20

Lab Sample ID: MB 440-489968/6
Matrix: Water
Analysis Batch: 489968

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perchlorate	ND		4.0	0.95	ug/L			07/27/18 09:42	1

Lab Sample ID: LCS 440-489968/5
Matrix: Water
Analysis Batch: 489968

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Perchlorate	10.0	10.7		ug/L		107	85 - 115

Lab Sample ID: MRL 440-489968/4
Matrix: Water
Analysis Batch: 489968

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	MRL Result	MRL Qualifier	Unit	D	%Rec	%Rec. Limits
Perchlorate	1.00	ND		ug/L		77	75 - 125

Lab Sample ID: MRL 440-489968/8
Matrix: Water
Analysis Batch: 489968

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	MRL Result	MRL Qualifier	Unit	D	%Rec	%Rec. Limits
Perchlorate	4.00	4.11		ug/L		103	75 - 125

Lab Sample ID: 440-216209-9 MS
Matrix: Water
Analysis Batch: 489968

Client Sample ID: WMW5.7N-20180717
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Perchlorate	3.9	J F1	10.0	19.3	F1	ug/L		154	80 - 120

Lab Sample ID: 440-216209-9 MSD
Matrix: Water
Analysis Batch: 489968

Client Sample ID: WMW5.7N-20180717
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Perchlorate	3.9	J F1	10.0	19.6	F1	ug/L		157	80 - 120	1	20

Method: SM 2540C - Solids, Total Dissolved (TDS)

Lab Sample ID: MB 440-488830/1
Matrix: Water
Analysis Batch: 488830

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	ND		10	5.0	mg/L			07/21/18 08:41	1

Lab Sample ID: LCS 440-488830/2
Matrix: Water
Analysis Batch: 488830

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Total Dissolved Solids	1000	994		mg/L		99	90 - 110

Lab Sample ID: 440-216049-C-11 DU
Matrix: Water
Analysis Batch: 488830

Client Sample ID: Duplicate
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Total Dissolved Solids	6500		6410		mg/L		1	5

HPLC/IC

Analysis Batch: 488425

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-216209-2	NERT5.91S1-20180716	Total/NA	Water	300.0	
440-216209-2	NERT5.91S1-20180716	Total/NA	Water	300.0	
440-216209-3 - DL	NERT5.49S1-20180716	Total/NA	Water	300.0	
440-216209-3	NERT5.49S1-20180716	Total/NA	Water	300.0	
440-216209-4	NERT4.21N1-20180716	Total/NA	Water	300.0	
440-216209-4	NERT4.21N1-20180716	Total/NA	Water	300.0	
440-216209-5	NERT4.38N1-20180716	Total/NA	Water	300.0	
440-216209-5	NERT4.38N1-20180716	Total/NA	Water	300.0	
MB 440-488425/6	Method Blank	Total/NA	Water	300.0	
LCS 440-488425/5	Lab Control Sample	Total/NA	Water	300.0	
440-216209-3 MS - DL	NERT5.49S1-20180716	Total/NA	Water	300.0	
440-216209-3 MSD - DL	NERT5.49S1-20180716	Total/NA	Water	300.0	

Analysis Batch: 488870

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-216209-1	WMW3.5S-20180716	Total/NA	Water	300.1B	
440-216209-4	NERT4.21N1-20180716	Total/NA	Water	300.1B	
440-216209-7	LNDMW2-20180717	Total/NA	Water	300.1B	
MB 440-488870/6	Method Blank	Total/NA	Water	300.1B	
LCS 440-488870/5	Lab Control Sample	Total/NA	Water	300.1B	
MRL 440-488870/4	Lab Control Sample	Total/NA	Water	300.1B	
440-216286-A-1 MS	Matrix Spike	Total/NA	Water	300.1B	
440-216286-A-1 MSD	Matrix Spike Duplicate	Total/NA	Water	300.1B	

Analysis Batch: 488938

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-216209-2	NERT5.91S1-20180716	Total/NA	Water	300.1B	
440-216209-5	NERT4.38N1-20180716	Total/NA	Water	300.1B	
440-216209-6	WMW3.5N-20180717	Total/NA	Water	300.1B	
MB 440-488938/6	Method Blank	Total/NA	Water	300.1B	
LCS 440-488938/5	Lab Control Sample	Total/NA	Water	300.1B	
MRL 440-488938/4	Lab Control Sample	Total/NA	Water	300.1B	
440-216322-A-1 MS	Matrix Spike	Total/NA	Water	300.1B	
440-216322-A-1 MSD	Matrix Spike Duplicate	Total/NA	Water	300.1B	

Analysis Batch: 489145

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-216209-3	NERT5.49S1-20180716	Total/NA	Water	300.1B	
440-216209-8	WMW4.9N-20180717	Total/NA	Water	300.1B	
440-216209-9	WMW5.7N-20180717	Total/NA	Water	300.1B	
MB 440-489145/6	Method Blank	Total/NA	Water	300.1B	
LCS 440-489145/5	Lab Control Sample	Total/NA	Water	300.1B	
MRL 440-489145/4	Lab Control Sample	Total/NA	Water	300.1B	
440-216394-A-1 MS	Matrix Spike	Total/NA	Water	300.1B	
440-216394-A-1 MSD	Matrix Spike Duplicate	Total/NA	Water	300.1B	

Analysis Batch: 489425

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-216209-2	NERT5.91S1-20180716	Total/NA	Water	314.0	
440-216209-3	NERT5.49S1-20180716	Total/NA	Water	314.0	
440-216209-4	NERT4.21N1-20180716	Total/NA	Water	314.0	

HPLC/IC (Continued)

Analysis Batch: 489425 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-216209-5	NERT4.38N1-20180716	Total/NA	Water	314.0	
440-216209-6	WMW3.5N-20180717	Total/NA	Water	314.0	
440-216209-7	LNDMW2-20180717	Total/NA	Water	314.0	
440-216209-8	WMW4.9N-20180717	Total/NA	Water	314.0	
MB 440-489425/6	Method Blank	Total/NA	Water	314.0	
LCS 440-489425/5	Lab Control Sample	Total/NA	Water	314.0	
MRL 440-489425/4	Lab Control Sample	Total/NA	Water	314.0	
440-215316-A-2 MS	Matrix Spike	Total/NA	Water	314.0	
440-215316-A-2 MSD	Matrix Spike Duplicate	Total/NA	Water	314.0	

Analysis Batch: 489968

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-216209-1	WMW3.5S-20180716	Total/NA	Water	314.0	
440-216209-9	WMW5.7N-20180717	Total/NA	Water	314.0	
MB 440-489968/6	Method Blank	Total/NA	Water	314.0	
LCS 440-489968/5	Lab Control Sample	Total/NA	Water	314.0	
MRL 440-489968/4	Lab Control Sample	Total/NA	Water	314.0	
MRL 440-489968/8	Lab Control Sample	Total/NA	Water	314.0	
440-216209-9 MS	WMW5.7N-20180717	Total/NA	Water	314.0	
440-216209-9 MSD	WMW5.7N-20180717	Total/NA	Water	314.0	

General Chemistry

Analysis Batch: 488830

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-216209-2	NERT5.91S1-20180716	Total/NA	Water	SM 2540C	
440-216209-3	NERT5.49S1-20180716	Total/NA	Water	SM 2540C	
440-216209-4	NERT4.21N1-20180716	Total/NA	Water	SM 2540C	
440-216209-5	NERT4.38N1-20180716	Total/NA	Water	SM 2540C	
MB 440-488830/1	Method Blank	Total/NA	Water	SM 2540C	
LCS 440-488830/2	Lab Control Sample	Total/NA	Water	SM 2540C	
440-216049-C-11 DU	Duplicate	Total/NA	Water	SM 2540C	

Definitions/Glossary

Client: AECOM
Project/Site: NERT Las Vegas Wash, 60477365

TestAmerica Job ID: 440-216209-1

Qualifiers

HPLC/IC

Qualifier	Qualifier Description
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
4	MS, MSD: The analyte present in the original sample is greater than 4 times the matrix spike concentration; therefore, control limits are not applicable.
E	Result exceeded calibration range.
F1	MS and/or MSD Recovery is outside acceptance limits.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Accreditation/Certification Summary

Client: AECOM
TestAmerica Job ID: 440-216209-1
Project/Site: NERT Las Vegas Wash, 60477365

Laboratory: TestAmerica Irvine

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	EPA Region	Identification Number	Expiration Date
Alaska	State Program	10	CA01531	06-30-19
Arizona	State Program	9	AZ0671	10-14-18
California	LA Cty Sanitation Districts	9	10256	06-30-18 *
California	State Program	9	CA ELAP 2706	06-30-19
Guam	State Program	9	Cert. No. 17-003R	01-23-19
Hawaii	State Program	9	N/A	01-29-19
Kansas	NELAP	7	E-10420	07-31-18 *
Nevada	State Program	9	CA015312018-1	07-31-18 *
New Mexico	State Program	6	N/A	01-29-19
Oregon	NELAP	10	4028	01-29-19
USDA	Federal		P330-15-00184	07-09-21
Washington	State Program	10	C900	09-03-18

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

TestAmerica Irvine
17461 Derian Ave
Suite 100
Irvine, CA 92614
Phone: 949.261.1022 Fax:

Chain of Custody Record

209425

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
TestAmerica Laboratories, Inc.
TAL-8210 (0713)

Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☐ Other:

Client Contact		Project Manager: Sally Bilodeau	Site Contact: J CARDTRIO	Date:	COC No:
Company Name:	AECOM	Tel/Fax: 805 764 4006	Lab Contact: Patty Mata	Carrier:	___ of ___ COCs
Address:	1220 Avenida Acaso	Analysis Turnaround Time			Sampler: J CARDTRIO
City/State/Zip:	Camarillo CA	☐ CALENDAR DAYS ☐ WORKING DAYS			For Lab Use Only:
Phone:	805 764 4006	TAT if different from Below: per WO			Walk-in Client
Fax		☐ 2 weeks			Lab Sampling:
Project Name:	NERT Phase I GW Sample	☐ 1 week			
Site	Las Vegas Wash	☐ 2 days			Job / SDG No.:
P O #	60477365	☐ 1 day			

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y / N)	Perform MS / MSD (Y / N)	314.0 Perchlorate	300 Br, Cl	2540C TDS	200.8 Dis Cr	300.1 Chlorate	Sample Specific Notes
WMW3.5S-20180716	7/16/18	0920	G	GW	2			X				X	
NERT5.91S-20180716	|	0940	|	|	3			X	X	X	X	X	
NERT5.49S1-20180716	|	1110	|	|	3			X	X	X	X	X	
NERT4.21N1-20180716	|	1240	|	|	3			X	X	X	X	X	
NERT4.38N1-20180716		1400	|	|	3			X	X	X	X	X	
WMW3.5N-20180717	7/17/18	0945	|	|	2			X				X	
2NDMW2-20180717	|	1110	|	|	2			X				X	
WMW4.9N-20180717	|	1240	|	|	2			X				X	
WMW5.7N-20180718		1350			2			X				X	

AU 7/18/18

LB 7/19/18

440-216209 Chain of Custody

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other ______

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample

☒ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
per WO
☐ Return to Client ☐ Disposal by Lab ☐ Archive for ______ Months

Special Instructions/QC Requirements & Comments:

Custody Seals Intact: ☐ Yes ☐ No	Custody Seal No.		Cooler Temp. (°C) Obs'd: 0.6 Corr'd: 0.8		Therm ID No.: IR89
Relinquished by: [signature]	Company: AECOM	Date/Time: 7/18/18 10:45	Received by: [signature]	Company:	Date/Time: 7/18/18 10:45
Relinquished by: [signature]	Company: TAIRV	Date/Time: 7/18/18	Received by: [signature]	Company	Date/Time
Relinquished by:	Company:	Date/Time:	Received in Laboratory by: [signature]	Company: TALV	Date/Time: 7/19/18 0930

C/S TRK 4357 1174 5599

5.0 TALV

TestAmerica Irvine
17461 Derian Ave
Suite 100
Irvine, CA 92614
Phone: 949.261.1022 Fax:

Chain of Custody Record

209425

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
TestAmerica Laboratories, Inc.
TAL-8210 (0713)

Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☐ Other:

Client Contact		Project Manager: Seth Bilodeau	Site Contact: J CARTRIO	Date:	COC No:
Company Name:	AECOM	Tel/Fax: 805 764 4066	Lab Contact: Patty Mata	Carrier:	of COCs
Address:	1220 Avenida Acaso	Analysis Turnaround Time			Sampler: J CARTRIO
City/State/Zip:	Camarillo CA	☐ CALENDAR DAYS ☐ WORKING DAYS			For Lab Use Only:
Phone:	805 764 4066	TAT if different from Below: per WO			Walk-in Client
Fax		☐ 2 weeks			Lab Sampling
Project Name:	NERT Phase I GW Sample	☐ 1 week			
Site	Las Vegas Wash	☐ 2 days			Job / SDG No.:
P O #	60177365	☐ 1 day			

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y/N)	Perform MS/MSD (Y/N)	314.0 Perchlorate	300 Br, Cl	2540C TDS	200.8 Dis Cr	300.1 Chlorate	Sample Specific Notes
WMW3.5S-20180716	7/16/18	0820	G	GW	2			X				X	
NERT5.91S-20180716		0940			3			X	X	X	X	X	
NERT5.49S1-20180716		1110			3			X	X	X	X	X	
NERT4.21N1-20180716		1240			3			X	X	X	X	X	
NERT4.38N1-20180716		1400			3			X	X	X	X	X	
WMW3.5N-20180717	7/17/18	0945			2			X				X	
LNDMW2-20180717		1110			2			X				X	
WMW4.9N-20180717		1240			2			X				X	
WMW5.7N-2018071~~8~~ 7 JCR 7/23/18		1350			2			X				X	

JL 7/18/18

LB 7/19/18

440-216209 Chain of Custody

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other ______

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample

☒ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
Per WO
☐ Return to Client ☐ Disposal by Lab ☐ Archive for ______ Months

Special Instructions/QC Requirements & Comments:

Custody Seals Intact ☐ Yes ☐ No | Custody Seal No. | Cooler Temp. (°C) Obs'd: 0.6 Corr'd: 0.8 Therm ID No.: IR 89

Relinquished by:	Company	Date/Time:	Received by:	Company:	Date/Time:
[illegible]	AECOM	7/18/18 10:45	CK		7/18/18 10:45
Relinquished by: [signature]	Company TAIRV	Date/Time: 7/18/18	Received by: [illegible]	Company	Date/Time
Relinquished by:	Company:	Date/Time:	Received in Laboratory by: [signature]	Company: TAIRV	Date/Time: 7/19/18 0930

C/S Trk 4357 1174 5599

5.6 TAIRV

COC Revised by Chad Roper 7/23/18
SMSTR/WO

Login Sample Receipt Checklist

Client: AECOM

Job Number: 440-216209-1

Login Number: 216209
List Number: 1
Creator: Bonta, Lucia F

List Source: TestAmerica Irvine

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	Not Present
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Irvine
17461 Derian Ave
Suite 100
Irvine, CA 92614-5817
Tel: (949)261-1022

TestAmerica Job ID: 440-216209-2
Client Project/Site: NERT Las Vegas Wash, 60477365

For:
AECOM
1220 Avenida Acaso
Camarillo, California 93012

Attn: Ms. Sally Bilodeau

Authorized for release by:
7/28/2018 4:00:32 PM

Patty Mata, Senior Project Manager
(949)261-1022
patty.mata@testamericainc.com

The test results in this report meet all 2003 NELAC and 2009 TNI requirements for accredited parameters, exceptions are noted in this report. This report may not be reproduced except in full, and with written approval from the laboratory. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

Table of Contents

Sample Summary

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
440-216209-2	NERT5.91S1-20180716	Water	07/16/18 09:40	07/19/18 09:30
440-216209-3	NERT5.49S1-20180716	Water	07/16/18 11:10	07/19/18 09:30
440-216209-4	NERT4.21N1-20180716	Water	07/16/18 12:40	07/19/18 09:30
440-216209-5	NERT4.38N1-20180716	Water	07/16/18 14:00	07/19/18 09:30

Job ID: 440-216209-2

Laboratory: TestAmerica Irvine

Narrative

Job Narrative
440-216209-2

Comments
Only the Dissolved Chromium results are included in this report.

Receipt
The samples were received on 7/19/2018 9:30 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 0.8º C.

Receipt Exceptions
The container label for the following sample did not match the information listed on the Chain-of-Custody (COC): WMW5.7N-20180717 (440-216209-9). The container labels list WMW5.7N-20180717, while the COC lists WMW5.7N-20180718. The client was contacted and they provided a revised COC with ID that matched the container labels.

Metals
Method(s) 200.8: The method blank for preparation batch 440-489062 and analytical batch 440-489315 contained Chromium above the method detection limit (MDL). This target analyte concentration was less than the reporting limit (RL); therefore, re-extraction and/or re-analysis of samples was not performed.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

General Chemistry
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Client Sample ID: NERT5.91S1-20180716 — Lab Sample ID: 440-216209-2

Date Collected: 07/16/18 09:40 — **Matrix: Water**
Date Received: 07/19/18 09:30

Method: 200.8 - Metals (ICP/MS) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium	1.5	J B	2.0	0.50	ug/L		07/23/18 14:23	07/24/18 13:56	1

Client Sample ID: NERT5.49S1-20180716 — Lab Sample ID: 440-216209-3

Date Collected: 07/16/18 11:10 — **Matrix: Water**
Date Received: 07/19/18 09:30

Method: 200.8 - Metals (ICP/MS) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium	1.3	J B	2.0	0.50	ug/L		07/23/18 14:23	07/24/18 14:00	1

Client Sample ID: NERT4.21N1-20180716 — Lab Sample ID: 440-216209-4

Date Collected: 07/16/18 12:40 — **Matrix: Water**
Date Received: 07/19/18 09:30

Method: 200.8 - Metals (ICP/MS) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium	15	B	2.0	0.50	ug/L		07/23/18 14:23	07/24/18 13:46	1

Client Sample ID: NERT4.38N1-20180716 — Lab Sample ID: 440-216209-5

Date Collected: 07/16/18 14:00 — **Matrix: Water**
Date Received: 07/19/18 09:30

Method: 200.8 - Metals (ICP/MS) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium	2.5	B	2.0	0.50	ug/L		07/23/18 14:23	07/24/18 14:03	1

Method Summary

Client: AECOM
Project/Site: NERT Las Vegas Wash, 60477365

TestAmerica Job ID: 440-216209-2

Method	Method Description	Protocol	Laboratory
200.8	Metals (ICP/MS)	EPA	TAL IRV
200.2	Preparation, Total Recoverable Metals	EPA	TAL IRV

Protocol References:

EPA = US Environmental Protection Agency

Laboratory References:

TAL IRV = TestAmerica Irvine, 17461 Derian Ave, Suite 100, Irvine, CA 92614-5817, TEL (949)261-1022

Lab Chronicle

Client: AECOM
Project/Site: NERT Las Vegas Wash, 60477365

TestAmerica Job ID: 440-216209-2

Client Sample ID: NERT5.91S1-20180716
Lab Sample ID: 440-216209-2
Date Collected: 07/16/18 09:40
Matrix: Water
Date Received: 07/19/18 09:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Dissolved	Prep	200.2			25 mL	25 mL	489062	07/23/18 14:23	JL	TAL IRV
Dissolved	Analysis	200.8		1			489315	07/24/18 13:56	B1H	TAL IRV

Client Sample ID: NERT5.49S1-20180716
Lab Sample ID: 440-216209-3
Date Collected: 07/16/18 11:10
Matrix: Water
Date Received: 07/19/18 09:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Dissolved	Prep	200.2			25 mL	25 mL	489062	07/23/18 14:23	JL	TAL IRV
Dissolved	Analysis	200.8		1			489315	07/24/18 14:00	B1H	TAL IRV

Client Sample ID: NERT4.21N1-20180716
Lab Sample ID: 440-216209-4
Date Collected: 07/16/18 12:40
Matrix: Water
Date Received: 07/19/18 09:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Dissolved	Prep	200.2			25 mL	25 mL	489062	07/23/18 14:23	JL	TAL IRV
Dissolved	Analysis	200.8		1			489315	07/24/18 13:46	B1H	TAL IRV

Client Sample ID: NERT4.38N1-20180716
Lab Sample ID: 440-216209-5
Date Collected: 07/16/18 14:00
Matrix: Water
Date Received: 07/19/18 09:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Dissolved	Prep	200.2			25 mL	25 mL	489062	07/23/18 14:23	JL	TAL IRV
Dissolved	Analysis	200.8		1			489315	07/24/18 14:03	B1H	TAL IRV

Laboratory References:

TAL IRV = TestAmerica Irvine, 17461 Derian Ave, Suite 100, Irvine, CA 92614-5817, TEL (949)261-1022

Method: 200.8 - Metals (ICP/MS)

Lab Sample ID: MB 440-489062/1-A
Matrix: Water
Analysis Batch: 489315

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 489062

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium	1.26	J	2.0	0.50	ug/L		07/23/18 14:23	07/24/18 13:40	1

Lab Sample ID: LCS 440-489062/2-A
Matrix: Water
Analysis Batch: 489315

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 489062

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Chromium	80.0	78.0		ug/L		97	85 - 115

Lab Sample ID: 440-216209-4 MS
Matrix: Water
Analysis Batch: 489315

Client Sample ID: NERT4.21N1-20180716
Prep Type: Dissolved
Prep Batch: 489062

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Chromium	15	B	80.0	86.5		ug/L		89	70 - 130

Lab Sample ID: 440-216209-4 MSD
Matrix: Water
Analysis Batch: 489315

Client Sample ID: NERT4.21N1-20180716
Prep Type: Dissolved
Prep Batch: 489062

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Chromium	15	B	80.0	87.1		ug/L		90	70 - 130	1	20

Metals

Prep Batch: 489062

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-216209-2	NERT5.91S1-20180716	Dissolved	Water	200.2	
440-216209-3	NERT5.49S1-20180716	Dissolved	Water	200.2	
440-216209-4	NERT4.21N1-20180716	Dissolved	Water	200.2	
440-216209-5	NERT4.38N1-20180716	Dissolved	Water	200.2	
MB 440-489062/1-A	Method Blank	Total Recoverable	Water	200.2	
LCS 440-489062/2-A	Lab Control Sample	Total Recoverable	Water	200.2	
440-216209-4 MS	NERT4.21N1-20180716	Dissolved	Water	200.2	
440-216209-4 MSD	NERT4.21N1-20180716	Dissolved	Water	200.2	

Analysis Batch: 489315

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-216209-2	NERT5.91S1-20180716	Dissolved	Water	200.8	489062
440-216209-3	NERT5.49S1-20180716	Dissolved	Water	200.8	489062
440-216209-4	NERT4.21N1-20180716	Dissolved	Water	200.8	489062
440-216209-5	NERT4.38N1-20180716	Dissolved	Water	200.8	489062
MB 440-489062/1-A	Method Blank	Total Recoverable	Water	200.8	489062
LCS 440-489062/2-A	Lab Control Sample	Total Recoverable	Water	200.8	489062
440-216209-4 MS	NERT4.21N1-20180716	Dissolved	Water	200.8	489062
440-216209-4 MSD	NERT4.21N1-20180716	Dissolved	Water	200.8	489062

Qualifiers

Metals

Qualifier	Qualifier Description
B	Compound was found in the blank and sample.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Accreditation/Certification Summary

Client: AECOM
TestAmerica Job ID: 440-216209-2
Project/Site: NERT Las Vegas Wash, 60477365

Laboratory: TestAmerica Irvine

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	EPA Region	Identification Number	Expiration Date
Alaska	State Program	10	CA01531	06-30-19
Arizona	State Program	9	AZ0671	10-14-18
California	LA Cty Sanitation Districts	9	10256	06-30-18 *
California	State Program	9	CA ELAP 2706	06-30-19
Guam	State Program	9	Cert. No. 17-003R	01-23-19
Hawaii	State Program	9	N/A	01-29-19
Kansas	NELAP	7	E-10420	07-31-18 *
Nevada	State Program	9	CA015312018-1	07-31-18 *
New Mexico	State Program	6	N/A	01-29-19
Oregon	NELAP	10	4028	01-29-19
USDA	Federal		P330-15-00184	07-09-21
Washington	State Program	10	C900	09-03-18

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

TestAmerica Irvine
17461 Derian Ave
Suite 100
Irvine, CA 92614
Phone: 949.261.1022 Fax:

Chain of Custody Record

209425

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
TestAmerica Laboratories, Inc.
TAL-8210 (0713)

Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☐ Other:

Client Contact	
Company Name:	AECOM
Address:	1220 Avenida Acaso
City/State/Zip:	Camarillo CA
Phone:	805 764 4006
Fax	
Project Name:	NERT Phase I GW Sample
Site	Las Vegas Wash
P O #	60477365

Project Manager: Sally Bilodeau
Tel/Fax: 805 764 4006
Site Contact: J Carotrio
Lab Contact: Patty Mata
Date:
Carrier:
COC No:
____ of ____ COCs
Sampler: J Carotrio

Analysis Turnaround Time
☐ CALENDAR DAYS ☐ WORKING DAYS
TAT if different from Below: per WO
☐ 2 weeks
☐ 1 week
☐ 2 days
☐ 1 day

For Lab Use Only:
Walk-in Client
Lab Sampling:
Job / SDG No.:

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y/N)	Perform MS / MSD (Y/N)	314.0 Perchlorate	300 Br, Cl	2540C TDS	200.8 Dis Cr	300.1 Chlorate	Sample Specific Notes
WMW3.5S-20180716	7/16/18	0820	G	GW	2			X				X	
NERT5.91S-20180716		0940			3			X	X	X	X	X	
NERT5.49S1-20180716		1110			3			X	X	X	X	X	
NERT4.21N1-20180716		1240			3			X	X	X	X	X	
NERT4.38N1-20180716		1400			3			X	X	X	X	X	
WMW3.5N-20180717	7/17/18	0945			2			X				X	
2NDMW2-20180717		1110			2			X				X	
WMW4.9N-20180717		1240			2			X				X	
WMW5.7N-20180718		1350			2			X				X	

7/18/18

LB 7/19/18

440-216209 Chain of Custody

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other ____

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample
☒ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
per WO
☐ Return to Client ☐ Disposal by Lab ☐ Archive for ____ Months

Special Instructions/QC Requirements & Comments:

Custody Seals Intact: ☐ Yes ☐ No
Custody Seal No.
Cooler Temp. (°C) Obs'd: 0.6 Corr'd: 0.8 Therm ID No.: IR 89

Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
[signature]	AECOM	7/18/18 10:45	[signature]		7/18/18 10:45
[signature]	TAIRV	7/18/18	[signature]		
			Received in Laboratory by: [signature]	TAIRV	7/19/18 0930

5.5 TAIRV

C/S TRK 4357 1174 5599

TestAmerica Irvine
17461 Derian Ave
Suite 100
Irvine, CA 92614
Phone: 949.261.1022 Fax:

Chain of Custody Record

209425

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
TestAmerica Laboratories, Inc.
TAL-8210 (0713)

Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☐ Other:

Client Contact	
Company Name:	AECOM
Address:	1220 Avenida Acaso
City/State/Zip:	Camarillo CA
Phone:	805 764 4006
Fax	
Project Name:	NERT Phase I GW Sample
Site	Las Vegas Wash
P O #	60177365

Project Manager: Elie Bitar
Tel/Fax: 805 764 4006
Site Contact: J CARRTRIO
Lab Contact: Patty Mata
Date:
Carrier:
COC No:
_____ of _____ COCs
Sampler: J CARRTRIO
For Lab Use Only:
Walk-in Client
Lab Sampling.
Job / SDG No.:

Analysis Turnaround Time
☐ CALENDAR DAYS ☐ WORKING DAYS
TAT if different from Below: per WO
☐ 2 weeks
☐ 1 week
☐ 2 days
☐ 1 day

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y/N)	Perform MS / MSD (Y/N)	314.0 Perchlorate	300 Br, Cl	2540C TDS	200.8 Dis Cr	300.1 Chlorate	Sample Specific Notes
WMW3.5S-20180716	7/16/18	0520	G	GW	2			X				X	
NERT5.91S-20180716		0940			3			X	X	X	X	X	
NERT5.49S1-20180716		1110			3			X	X	X	X	X	
NERT4.21N1-20180716		1240			3			X	X	X	X	X	
NERT4.38N1-20180716		1400			3			X	X	X	X	X	
WMW3.5N-20180717	7/17/18	0945			2			X				X	
2NDMW2-20180717		1110			2			X				X	
WMW4.9N-20180717		1240			2			X				X	
WMW5.7N-2018071~~8~~ 7		1350			2			X				X	

JCR 7/23/18
JC 7/18/18

LB 7/19/18

440-216209 Chain of Custody

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other ________

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample
☒ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
Per WO
☐ Return to Client ☐ Disposal by Lab ☐ Archive for ________ Months

Special Instructions/QC Requirements & Comments:

Custody Seals Intact ☐ Yes ☐ No
Custody Seal No.
Cooler Temp. (°C) Obs'd: 0.6 Corr'd 0.8 Therm ID No.: IR 89

Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
[signature]	AECOM	7/18/18 10:45	[signature]		7/18/18 10:45
[signature]	TAIRV	7/18/18	[signature]		
			Received in Laboratory by [signature]	TAIRV	7/19/18 0930

C/S Trk 4357 1174 5599

5.6
TAIRV

COC Revised by Chad Roper 7/23/18

Login Sample Receipt Checklist

Client: AECOM

Job Number: 440-216209-2

Login Number: 216209
List Number: 1
Creator: Bonta, Lucia F

List Source: TestAmerica Irvine

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	Not Present
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Appendix L

Las Vegas Wash Bioremediation Pilot Study Work Plan

Las Vegas Wash Bioremediation Pilot Study Work Plan
Nevada Environmental Response Trust Site
Henderson, Nevada

PREPARED FOR

Nevada Environmental Response Trust
35 E. Wacker Drive, Suite 1550
Chicago, IL 60601

PRESENTED BY

Tetra Tech, Inc.
150 S. 4th Street, Unit A
Henderson, NV 89015

September 22, 2017

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ACRONYMS/ABBREVIATIONS

Acronyms/Abbreviations	Definition
ASTM	American Society for Testing and Materials
AWF	Athens Road Well Field
bgs	below ground surface
BOD	biological oxygen demand
BOR	United States Bureau of Reclamation
CE	categorical exclusion
COH	City of Henderson
DO	dissolved oxygen
EA	environmental assessment
EC	electrical conductivity
EVO	emulsified vegetable oil
FS	Feasibility Study
IPaC	Information Planning and Conservation
ITRC	Interstate Technology & Regulatory Council
lbs/day	pounds per day
µg/L	micrograms per liter
mg/L	milligrams per liter
mV	milliVolts
NAC	Nevada Administrative Code
NDEP	Nevada Division of Environmental Protection
NDWR	Nevada Division of Water Resources
NEPA	National Environmental Policy Act
NERT or Trust	Nevada Environmental Response Trust
NFG	National Functional Guidelines
ORP	oxidation reduction potential
PLFA	phospholipid fatty acids
PVC	polyvinyl chloride
RAO	Remedial action objective
RI	Remedial Investigation
RIBs	Rapid Infiltration Basins
qPCR	quantitative polymerase chain reaction
Site	Nevada Environmental Response Trust site
SWF	Seep Well Field

Acronyms/Abbreviations	Definition
TDS	total dissolved solids
Tetra Tech	Tetra Tech, Inc.
TOC	total organic compound
UIC	Underground Injection Control
UMCf	Upper Muddy Creek formation
UNLV	University of Nevada at Las Vegas
U.S. EPA	United States Environmental Protection Agency
USGS	United States Geological Survey
VFAs	volatile fatty acids
ZOI	zone of influence

Las Vegas Wash Bioremediation Pilot Study Work Plan

Nevada Environmental Response Trust Site

(Former Tronox LLC Site)
Henderson, Nevada

Nevada Environmental Response Trust (NERT) Representative Certification

I certify that this document and all attachments submitted to the Division were prepared at the request of, or under the direction or supervision of NERT. Based on my own involvement and/or my inquiry of the person or persons who manage the system(s) or those directly responsible for gathering the information or preparing the document, or the immediate supervisor of such person(s), the information submitted and provided herein is, to the best of my knowledge and belief, true, accurate, and complete in all material respects.

Office of the Nevada Environmental Response Trust

Le Petomane XXVII, Inc., not individually, but solely in its representative capacity as the Nevada Environmental Response Trust Trustee

not individually, but solely as President

Signature: ____________________, not individually, but solely in his representative capacity as President of the Nevada Environmental Response Trust Trustee

Name: Jay A. Steinberg, not individually, but solely in his representative capacity as President of the Nevada Environmental Response Trust Trustee

Title: Solely as President and not individually

Company: Le Petomane XXVII, Inc., not individually, but solely in its representative capacity as the Nevada Environmental Response Trust Trustee

CERTIFICATION

I hereby certify that I am responsible for the services described in this document and for the preparation of this document. The services described in this document have been prepared in a manner consistent with the current standards of the profession, and to the best of my knowledge, comply with all applicable federal, state, and local statutes, regulations, and ordinances.

Description of Services Provided: Las Vegas Wash Bioremediation Pilot Study Work Plan, Nevada Environmental Response Trust Site, Henderson, Nevada

Kyle S. Hansen

09/22/2017

Kyle Hansen, CEM
Field Operations Manager/Geologist
Tetra Tech, Inc.

Date

Nevada CEM Certificate Number: 2167
Nevada CEM Expiration Date: September 18, 2018

1.0 INTRODUCTION

On behalf of the Nevada Environmental Response Trust (NERT or Trust), Tetra Tech, Inc. (Tetra Tech) has prepared this Las Vegas Wash Bioremediation Pilot Study Work Plan (Work Plan) for implementation of an in-situ bioremediation pilot study where perchlorate continues to migrate into the Las Vegas Wash, which is downgradient of the NERT site (Site), located in Clark County, Nevada (Figure 1). This Work Plan is being submitted to the Nevada Division of Environmental Protection (NDEP) under the Interim Consent Agreement effective February 14, 2011. The Work Plan presents a conceptual design for implementation of the in-situ bioremediation pilot study based on the currently available data and provides details on pre-design activities to be conducted prior to the final pilot study design.

1.1 PROJECT OBJECTIVES

The overall objective of this pilot study is to demonstrate and evaluate the effectiveness of implementing in-situ bioremediation to reduce the perchlorate mass flux that is migrating into the Las Vegas Wash. Based on data from July 2015 through June 2016, an estimated 38.5 pounds per day (lbs/day) of perchlorate discharges to the Las Vegas Wash between the Pabco Rd and Northshore Rd weirs (Ramboll Environ, 2016). Additionally, a primary remedial action objective (RAO) for the Site is to mitigate the discharge of chemicals of potential concern in groundwater to the Las Vegas Wash (ENVIRON, 2014a).

This pilot study will build on the results of the previous in-situ bioremediation treatability study performed downgradient of the Athens Road Well Field (AWF) near the City of Henderson (COH) Bird Viewing Ponds and on-going Seep Well Field (SWF) Area Bioremediation Treatability Study. Although the previous and on-going treatability studies focus on the alluvium, this pilot study will also include implementation of in-situ bioremediation in the Upper Muddy Creek formation (UMCf), which has not been evaluated to date. The pilot study will be executed on a larger scale than previous bioremediation treatability studies conducted for NERT and provide key information needed for the future Feasibility Study (FS) to evaluate design, optimization/scale-up, and cost effectiveness of this technology and its effectiveness on the RAO of mitigation of the perchlorate mass flux discharge to the Las Vegas Wash.

1.2 WORK PLAN ORGANIZATION

This Work Plan is organized as follows:

- **Introduction (Section 1.0):** Provides the primary objectives of the pilot study along with relevant background information, including site history, regional geology and hydrogeology, local geology and hydrogeology, and extent of contamination.
- **Technology Description (Section 2.0):** Provides an overview of bioremediation of perchlorate and provides a summary of previous and on-going in-situ bioremediation treatability studies.
- **Pre-Design Field and Laboratory Activities (Section 3.0):** Provides a description of the field and laboratory activities to be completed prior to implementation of the pilot study to optimize and finalize the pilot study design.
- **Pilot Study Conceptual Design (Section 4.0):** Describes the conceptual design of the pilot study including objectives, evaluation of study locations, conceptual layout(s), and preliminary substrate injection design.
- **Effectiveness Monitoring Plan (Section 5.0):** Presents the conceptual effectiveness monitoring program for the pilot study, including the field, analytical, and microbial groundwater monitoring and data validation requirements.

- **Access Agreement and Permitting (Section 6.0):** Summarizes access agreement and permitting requirements for pilot study implementation.
- **Ecological Review and Protection Measures (Section 7.0):** Presents a summary of federally listed species with the potential to occur within the pilot study area and a summary of protective measures, if required.
- **Reporting (Section 8.0):** Summarizes reporting related to design and execution of the pre-design field activities and pilot study.
- **Schedule (Section 9.0):** Summarizes the schedule for conducting the pre-design activities, pilot study, and associated reporting.
- **References (Section 10.0):** Lists the documents referenced in this Work Plan.

1.3 BACKGROUND

1.3.1 General

The Site has been used for industrial purposes since 1942, when it was initially developed by the United States government as a magnesium plant to support World War II operations. Since that time, the Site and the surrounding properties have been used for chemical manufacturing, including the production of various chlorate and perchlorate compounds. Entities that operated at the Site include Western Electrochemical Company, American Potash and Chemical Company, Kerr-McGee Chemical Corporation, and Tronox. On February 14, 2011, NERT took title to the Site as part of the settlement of the Tronox Chapter 11 bankruptcy proceedings. As part of a long-term lease, Tronox operates a manufacturing facility on 114 acres of the Site to produce manganese and boron products. Historical industrial production and related waste management activities conducted at the Site and on adjacent properties have resulted in the contamination of various environmental media, including soil, groundwater, and surface water. The most notable site-related contaminants of potential concern are chromium and perchlorate (ENVIRON, 2014a).

The pilot study location is northeast of the Site along the Las Vegas Wash, which is located 13 miles southeast of Las Vegas in an unincorporated section of Clark County, Nevada (Figure 1). It is surrounded by the incorporated area of the COH. Approximately 230 acres in the northeastern and central portions of the NERT RI Study Area are owned by United States Bureau of Reclamation. Other landowners along the Las Vegas Wash include Clark County and the COH.

1.3.2 Regional Geology

The Site is located near the southeast end of the Las Vegas Valley, a structural basin that also includes the metropolitan areas of North Las Vegas, Las Vegas, and Henderson. Las Vegas Valley is bounded on the west by the Spring Mountains, on the north by the southern ends of the Sheep and Las Vegas Ranges, on the east by Frenchman and Sunrise Mountains, and on the south by the River Mountains and McCullough Range. The northwest-southeast trending structural basin that underlies Las Vegas Valley is composed of Precambrian crystalline rocks; Precambrian and Paleozoic carbonate rocks; Permian, Triassic, and Jurassic clastic rocks; and Miocene igneous rocks. Gravity data indicate that the deeper parts of the basin are filled with 3,000-5,000 feet of clastic sedimentary deposits that range in age from Miocene through Holocene (Plume, 1989).

The clastic sedimentary valley-fill deposits of Las Vegas Valley are generally believed to consist of Muddy Creek Formation and younger deposits. The Muddy Creek Formation also includes thick beds of gypsum and salt and basalt flows, though these are not exposed in the Las Vegas Valley. The thickness of the valley fill deposits in the vicinity of the Site is approximately 4,000 feet. Extraction of groundwater from the valley fill since the early 1900s has resulted in significant subsidence centered on the areas with the heaviest groundwater pumping, such as downtown Las Vegas (Plume, 1989).

1.3.3 Local Geology and Hydrogeology

At and near the Site, as well as the area near the Las Vegas Wash, soil borings have encountered valley fill deposits including Quaternary alluvium, transitional Muddy Creek Formation, and the Pleistocene Upper Muddy Creek Formation (UMCf). The alluvium is generally described as reddish-brown discontinuous layers of sand and gravel with minor amounts of silt, clay, and caliche. The thickness of these alluvial deposits ranges from less than one foot to more than 50 feet beneath the Site (ENVIRON, 2014a). Thick deposits of alluvium that are structurally narrow and linear have been interpreted as stream-deposited sands and gravels that were deposited within paleochannels during flooding events. The paleochannel sand and gravel deposits often exhibit significantly greater permeability than the alluvium outside the paleochannels. At the base of the alluvium, the transitional Muddy Creek Formation is sometimes encountered below the Site. The transitional Muddy Creek Formation consists of reworked sediments derived from the Muddy Creek Formation. The UMCf underlies the transitional Muddy Creek Formation (if present) or alluvium, and consists of interbedded coarse-grained and fine-grained sediments that become progressively finer-grained to the north towards the central portion of the valley.

The UMCf subcrops beneath a thin veneer of Quaternary alluvium near the Site. In that area, the contact between the alluvium and the Muddy Creek Formation is typically marked by the appearance of a well-compacted, moderate brown silt-to-sandy silt or stiff clay-to-sandy clay (ENVIRON, 2014a). However, in the vicinity of the Las Vegas Wash and COH Bird Viewing Preserve, the contact is marked by light grey-green to yellow-green clays and silts. Recent information obtained from the on-going SWF Area Treatability Study area indicates that coarser-grained lenses also exist within the UMCf below the initial silty to clayey contact. Borehole log information in the areas east of Pabco Road indicates that the UMCf contact in that area similarly tends to be marked by silts and clays.

Locally, the ground surface slopes north toward the Las Vegas Wash. Thus, surface water north of the Site generally flows south to north toward the Las Vegas Wash (surface water on-Site does not leave the site). Surface water infiltrating into groundwater below the ponds of the COH Bird Preserve Viewing Preserve creates a groundwater high that diverts groundwater flowing north from the Site around the Bird Preserve. Subsurface paleochannels just south and east of the Bird Viewing Preserve also serve to direct impacted water from the Site toward the Las Vegas Wash.

The depth to water in wells near the proposed pilot study locations (i.e., wells AA-22, AA-23R, and WMW4.9S) tends to range between 26 and 30 feet based on recent measurements (AECOM, 2016). The horizontal groundwater gradient in the vicinity of the NERT Downgradient Study Area on unincorporated COH property is approximately 0.026 feet/foot based on recent groundwater level measurements in wells AA-22 and AA-23R (AECOM, 2016). Closer to the Las Vegas Wash, the horizontal groundwater gradient is distinctly lower, approximately 0.004 feet/foot, based on recent water level measurements in wells MW-13 and WMW4.9S (AECOM, 2016). The vertical gradient near the Las Vegas Wash is generally upward, with groundwater discharging into the Las Vegas Wash and underlying alluvium (ENVIRON, 2014a).

Unlike the areas west of Pabco Road, in the areas east of Pabco Road, the alluvial wells are not typically evaluated separately from the alluvial/UMCf transition and uppermost UMCf. Rather, the entire upper saturated interval down to 90 feet below ground surface (bgs) is contoured as the Shallow Zone [Daniel B. Stephens & Associates, Inc. (DBSA), 2010; AECOM, 2016]. This is in accordance with NDEP's definition of the water-bearing zones (NDEP, 2009). In the areas east of Pabco Road, the water table commonly occurs below the UMCf contact or just above it such that the layer of saturated alluvium is quite thin. Furthermore, hydraulic heads in the uppermost UMCf wells tend to be quite similar to those in nearby alluvial wells, as do perchlorate concentrations (AECOM, 2016). The underlying Middle Zone consists of thin, generally isolated sand lenses in the UMCf between 90 and 279 feet bgs, and the Deep Zone consists of UMCf between 270 and 400 feet bgs (DBSA, 2010).

1.3.4 Nature and Extent of Contamination

Recent alluvial groundwater sampling results, presented in data summaries from the Groundwater Sampling Technical Memorandum for the Downgradient Study Area (AECOM, 2016) activities, indicate that perchlorate concentrations in the area north of the Former COH Northern Rapid Infiltration Basins (RIBs) are higher than the concentrations near the Las Vegas Wash (Figure 2). Perchlorate concentrations ranged from 5,600 micrograms per liter (μg/L) (well AA-23R) to 7,100 μg/L (well AA-22) in the area to the north of the northern RIBs (Figure 2), while samples from wells closer to the Las Vegas Wash (Figure 3), exhibited lower concentrations ranging from 270 µg/L (well WMW4.9S) to 3,800 µg/L (well MW-13). In the same sampling event, hexavalent chromium concentrations north of the northern RIBs ranged from 30 µg/L (well AA-23R) to 99 µg/L (well AA-22). Samples from wells closer to the Las Vegas Wash exhibited generally lower concentrations ranging from 2.0 µg/L (well WMW4.9S) to 39 µg/L (well MW-13).

A number of shallow UMCf and alluvium/UMCf transition wells exist within the vicinity of the proposed pilot study location. These wells are typically contoured together with the alluvial wells as part of the Shallow Zone, and both sets of wells tend to have similar concentrations. Based on review of available data, perchlorate contamination is present in the shallow water-bearing zone, with elevated perchlorate concentrations potentially at depths of up to 90 feet bgs.

2.0 TECHNOLOGY DESCRIPTION

2.1 MICROBIOLOGY AND BIODEGRADATION OF PERCHLORATE

Perchlorate is the anionic component of ammonium perchlorate, a common ingredient in solid rocket fuel. Perchlorate salts are very soluble in water, (approximately 200,000 milligrams per liter [mg/L] for ammonium perchlorate and approximately 2,100,000 mg/L for sodium perchlorate) and do not adsorb very strongly to most soils.

Perchlorate also tends to be biologically stable under aerobic conditions or when there is a limited source of organic carbon. However, in the presence of a carbon substrate and after dissolved oxygen (DO) and nitrate have been depleted, perchlorate can act as an electron acceptor for anaerobic respiration. The first step in perchlorate biodegradation is carried out by the perchlorate reductase gene, wherein perchlorate is sequentially converted to chlorate and then to chlorite. A second gene, chlorite dismutase, further reduces the chlorite to chloride and oxygen (Interstate Technology & Regulatory Council [ITRC], 2008).

A variety of perchlorate-reducing bacteria have been isolated, with some of them being strict anaerobes, while others are facultative microbes. Generally, perchlorate-reducing microorganisms are known to be quite ubiquitous in the subsurface and are also quite versatile. As a result, successful groundwater treatment requires understanding the chemical, geochemical, physical, geological, and hydrogeological conditions at a site, and then developing an appropriate engineered approach. Physical, geological, and hydrogeological conditions are usually fixed, and therefore, a successful remedial strategy relies on the alteration and sustainment of the appropriate geochemical conditions to maintain perchlorate biodegradation. Favorable redox conditions that are appropriate for perchlorate biodegradation are less than 0 millivolts (mVs) and generally in the 0 to -100 mVs range. This range of redox is indicative of conditions wherein the aquifer is depleted of DO and nitrate is consumed, leaving perchlorate the next preferred electron acceptor as the respiratory source for native microorganisms (ITRC, 2008).

2.2 PREVIOUS BIOREMEDIATION APPLICATION

A groundwater bioremediation treatability study was performed between April 2015 and September 2016 within the vicinity of the COH Water Treatment Facility, which is immediately upgradient of the Bird Viewing Preserve and mid-way between the AWF and SWF. A treatability study results report, which summarized the laboratory bench-scale study, field carbon substrate injection design and details, and all the results and findings, was submitted in November 2016 and approved by NDEP on June 26, 2017 (Tetra Tech, 2016a). This section provides a brief summary of the findings of the treatability study.

The main elements of the treatability study included:

- (i) Single borehole dilution and slug tests to determine site hydrogeologic characteristics of hydraulic permeability and groundwater velocity;
- (ii) Bench batch microcosm and column testing at University of Nevada at Las Vegas (UNLV);
- (iii) Installation of field pilot study injection and monitoring wells;
- (iv) Two carbon substrate injection events; and
- (v) Periodic groundwater sampling, analyses, and evaluation of chemical, biochemical, and microbial parameters, which included a baseline sampling event followed by weekly, biweekly, and monthly groundwater sampling events.

2.2.1 Bioremediation Treatability Study Findings

As presented in the Groundwater Bioremediation Treatability Study Results Report (Tetra Tech, 2016a), groundwater in this area was amenable to enhanced biodegradation of perchlorate and other electron acceptors and co-contaminants, such as chlorate and nitrate. The addition of a carbon substrate in the form of a slow-release emulsified vegetable oil (EVO) product provided a sustained reducing environment, conducive to biodegrading perchlorate, in the subsurface within the targeted area downgradient of the injection. Bioremediation was shown to be a promising remedial process at this site and has strong potential to be a significant component of the overall remedy. The results, findings, and lessons learned from this study can be used to optimize the design and application of the technology in other areas to maximize effective perchlorate destruction. Several of the key findings that were used to develop this pilot study approach include:

- The relatively high groundwater velocity flow rates (32 feet/day) and short residence time were not an impediment to enhanced perchlorate biodegradation. The field study indicated that a sustained anaerobic condition was created and sustained in the subsurface during the study.
- The carbon substrate that was selected for laboratory and field testing, EVO, proved to be effective in creating and sustaining reducing conditions in groundwater.
- During the course of the study, perchlorate concentrations decreased by over 90 percent in some of the monitoring wells. Perchlorate concentrations of non-detectable concentrations were achieved at one location during the study.
- Maximum first-order perchlorate biodegradation rates in the field were determined to range from -0.25 day^{-1} to -0.51 day^{-1}. At these rates, perchlorate concentrations decreased very rapidly in groundwater. The estimate for mass removal ranged from 4.1 to 17.4 lbs/day destruction of perchlorate through the study area.
- The higher total dissolved solids (TDS) concentrations (> 5,000 mg/L) in the area did not have an impact on the development of a microbial consortium with the ability to biodegrade perchlorate, nor did it appear to have an impact on acclimation time for perchlorate biodegradation.
- In both the laboratory and field studies, denitrification (nitrate biodegradation) occurred very rapidly and preferentially compared to perchlorate biodegradation. Perchlorate biodegradation followed denitrification and, once initiated, the two reductive processes were observed to occur concurrently.
- Transient arsenic solubilization was observed but it did not appear to mobilize downgradient of the study area.
- An overall decrease in permeability with the bioremediation technology was observed from periodic slug tests performed during the study, which was more pronounced in the last two events towards the end of the study.
    - Plausible causes include biomass buildup, oil adsorption, increase in alkalinity, and the formation of gas bubbles from biological activity.
    - Well redevelopment performed on the wells in the treatability study area indicates that relatively simple techniques can be adopted for permeability recovery that would enable periodic carbon substrate injections to be performed.
- Improved definition of preferential flow pathways and paleochannel morphology may be implemented in future studies to better define the baseline perchlorate mass and mass removal rates during bioremediation.

2.3 ON-GOING SEEP WELL FIELD AREA TREATABILITY STUDY

A second treatability study is currently being undertaken in the vicinity of the SWF extraction system in accordance with the NDEP-approved Seep Well Field Area Bioremediation Treatability Study Work Plan (Tetra Tech, 2016b) (SWF Area Treatability Study). The overall objective of the SWF Area Treatability Study is to demonstrate the effectiveness of using in-situ bioremediation to reduce the flux of perchlorate mass that is migrating towards the Las Vegas Wash within the alluvium and is not currently being captured by the existing SWF. The subject study of this work plan, the Las Vegas Wash Bioremediation Pilot Study, builds on the results and findings of the previous COH treatability study summarized in Section 2.2 and also incorporates some of the findings and recommendations of the SWF Area Treatability Study, including the use of geophysical surveys, evaluation of a staggered injection well transect system, and construction of paired injection wells when the subsurface lithology suggests that this may improve injection coverage.

Pre-design activities and the first injection event for the SWF Area Treatability Study have been completed. As part of the pre-design, geophysical surveys, installation of soil borings and groundwater monitoring wells, groundwater sampling, aquifer testing, and basic bench-scale laboratory testing were completed between January and May 2017. Following the completion of the pre-design phase, twenty-five substrate injection wells (two transects, each of which are approximately 750 feet long) and an effectiveness monitoring network were installed in June 2017. Preliminary results from the on-going laboratory bench-scale studies currently being performed at UNLV have indicated that the addition of a slow-release carbon substrate, i.e., EVO, results in rapid bioremediation of nitrate and perchlorate in batch microcosms of site-specific media. One of the recommendations from the previous treatability study (described in Section 2.2), namely an evaluation of the sorption/desorption characteristics to site soils, is currently being performed at UNLV. The first field carbon substrate injection event was completed in September 2017.

To achieve cost efficiencies, final results from the UNLV bench-scale testing, pre-design field activities, and effectiveness monitoring associated with the SWF Treatability Study will be evaluated and applied to the design of the Las Vegas Wash bioremediation pilot study as appropriate. These include:

- Laboratory sorption/desorption test results from bench-scale studies;
- Application of geophysics;
- Zone of influence (ZOI) of the carbon substrate injection(s) and longevity of the carbon substrate;
- Conclusions on the advantages of a staggered configuration and paired injection well network, injection protocol and water distribution, downgradient influence of the injections, and any observed secondary geochemical impacts of the injections.

Additional data collected from the on-going NERT Remedial Investigation (RI) and the Downgradient RI will be reviewed and evaluated as data becomes available to incorporate any additional knowledge and significant findings into this pilot study.

3.0 PRE-DESIGN FIELD AND LABORATORY ACTIVITIES

This section describes the various preliminary activities to be completed prior to the field pilot study implementation of the Las Vegas Wash Bioremediation Pilot Study. The results will provide detailed information to optimize the final pilot study locations and design. Specifically, the objectives of the pre-design activities include:

- Characterization of the lithology in sufficient detail to refine conceptual injection well spacing.
- Identification of preferential flow pathways (such as paleochannels and transmissive zones) in order to better target injections.
- Assessment of localized vertical and horizontal distribution of perchlorate to target remediation zones.
- Accurate identification of groundwater flow directions and rates to design injection wells and perform injections to best address perchlorate migration into the Las Vegas Wash.

Various field activities will be conducted to gather the appropriate data to meet the objectives of the work, including soil boring and monitoring well installation, soil and groundwater sampling, single borehole dilution and slug tests, nuclear magnetic resonance (NMR) logging, surface water evaluations, transducer data collection, and laboratory bench tests. Each of these activities and their purpose are presented in this section.

3.1 FIELD ACTIVITIES

All field work described herein will be conducted in general accordance with the existing Field Sampling Plan, Revision 1 (ENVIRON, 2014b). Tetra Tech, on behalf of NERT, will prepare and submit required applications and obtain required permits prior to the installation of any soil borings, injection wells, and monitoring wells. Once approval is granted, an underground utility survey will be performed before drilling commences. All wells will be drilled in accordance with the Nevada Division of Water Resources (NDWR) requirements, following submittal of a Notice of Intent to Drill.

3.1.1 Access Agreement

Due to the off-Site location of the pre-design field activities and field pilot study (further described in Section 4.0), the Trust will acquire access agreements for all field activities (including injections and monitoring) from the COH and Clark County. Access requirements are further discussed in Section 6.0.

3.1.2 Utility Clearance

Tetra Tech will contact USA North Utility Locating Services, review available utility maps, and retain the services of a geophysical locator to check for underground utility lines prior to advancing the borings. Boring locations may be adjusted in the field based on the findings of the geophysical locator and utility locator service to avoid existing utilities, structures, or other site features. Prior to drilling, each location will also be cleared to a depth of 5 feet bgs either by hand augering or air knife operations.

3.1.3 Installation of Soil Borings and Monitoring Wells

Soil borings will be installed in strategic locations throughout the field study area to provide better characterization and allow for selection of the best locations for the bioremediation field pilot study. Twenty-five locations have been identified for installation of soil borings/monitoring wells (Figures 2 and 3). The purpose of the soil borings will be to obtain area-specific lithological information, physical parameters, and contaminant concentrations. Additionally, during boring installation, soil will be collected and transported to the UNLV for use in the laboratory bench tests (described in Section 3.2). Some of the borings at the eastern end of Transect 1b are anticipated to encounter bedrock. These borings will be advanced into the bedrock approximately 15 feet to evaluate its characteristics.

Tetra Tech will retain a licensed drilling contractor to advance the soil borings using rotosonic drilling methods with collection of continuous soil cores for accurate lithologic logging and sampling. Before the drill rig mobilizes to each selected soil boring location, down-hole drilling equipment will be cleaned with a high-pressure, high-temperature water spray to avoid potential cross-contamination. Soil borings will be advanced through the alluvium and UMCf to a depth of 120 feet to evaluate soil conditions and perchlorate concentrations within the alluvium and UMCf. The continuous soil cores will be logged by the field geologist from ground surface to total depth using the Unified Soil Classification System. To the extent borings encounter bedrock, cores will be obtained to evaluate its characteristics.

The drilling contractor will decontaminate soil collection equipment between samples. Soil samples for laboratory analysis will be collected in laboratory-supplied containers, labeled, placed in plastic bags, and stored in a cooler on ice for transport to the project analytical laboratory. Selected soil samples will be analyzed for soil grain size distribution. Upon reaching groundwater, undisturbed soil samples will be collected using a Shelby tube, or similar collection device, from a select number of boreholes, for analysis of physical parameters including moisture content, porosity, soil density, and specific gravity. Soil samples will also be analyzed for a variety of chemical and biochemical parameters (***Table 1***). Depth-discrete groundwater samples will be collected from select boreholes within the alluvium, just above the top of the UMCf, and within the UMCf to vertically profile the perchlorate extent.

Table 1 Example Soil Sampling Protocol

Parameter	Analytical Method	Purpose
Laboratory Parameters		
Perchlorate	E314.0	Estimate mass of perchlorate in saturated soil
TOC	SM5310B	Estimate available natural organic carbon
Soil pH	SW846 9045C	Assess geochemical conditions
Soluble Cations and Anions[1,2]	Notes 1 and 2	Assess salt loading
TDS[2]	SM2540C	Assess salt loading
Dissolved Metals[3]	SW 846 6010/6020	Assess potential secondary impacts of treatment
Hexavalent Chromium	SW 846 7199	Assess potential secondary impacts of treatment such as mobilization potential of chromium into the groundwater under reducing conditions
Total Kjeldahl Nitrogen	Modified EPA Method 351.2	Evaluate potential nutrient availability in soil
Total Phosphorus	EPA 6010B	Evaluate potential nutrient availability in soil
PLFA	Microbial Insights Method[4]	Examine native/natural microbial characteristics
Perchlorate Reductase Gene	Quantitative polymerase chain reaction (qPCR)	Examine native/natural microbial perchlorate degradation characteristics

Acronyms and Abbreviations:
PLFA: Phospholipid Fatty Acids
TDS: Total dissolved solids
TOC: Total organic carbon

Notes:
1. Cations include sodium, potassium, calcium, and magnesium (Method SW6010). Anions include chloride, sulfate, nitrate (Method E300.0), carbonate, and bicarbonate (Method SM2320B).
2. Analysis to be performed on water extract prepared per method SW9056.
3. Metals include arsenic, chromium, iron, and manganese.
4. White, D. C., H. C. Pinkart, and A. B. Ringelberg. (1995). Biomass measurements: Biochemical approaches, p. 91-101. In C. J. Hurst, G. R. Knudsen, M. J. McInerney, L. D. Stetzenbach, and M. V. Walter (ed.), Manual of Environmental Microbiology. ASM Press, Washington.

Monitoring wells will be installed to evaluate the extent of perchlorate in the pilot study area and monitor key parameters to help optimize the design and effectiveness of the field pilot study. All 25 soil boring locations will be converted to permanent monitoring wells, and up to 15 of those locations may be installed as paired or clustered wells with screened intervals in the alluvium and UMCf. In locations where bedrock is encountered near the eastern end of Transect 1b, up to two of the borings will be completed as monitoring wells screened in bedrock to evaluate its hydraulic characteristics. In cases where a well is screened in bedrock, a paired shallower well in the overlying material (i.e., alluvium or UMCf) will also be installed next to the bedrock well to evaluate vertical gradients. Decisions regarding which and how many locations will be installed as paired wells will be based on review of the soil cores and lithology encountered during the soil boring installation. If borehole log information indicates multiple highly permeable productive zones in the UMCf at significantly different depths, up to 5 additional wells may be installed and screened in the deeper zones. The purpose of the additional deeper wells would be to evaluate the perchlorate concentration and hydraulic gradient changes with depth.

Most wells will be constructed using 2-inch schedule 40 polyvinyl chloride (PVC) casing and screened with 2-inch diameter slotted PVC well screen. Up to six wells will be installed with 4-inch diameter schedule 40 PVC casing and screened with 4-inch diameter slotted PVC well screen; these wells will be used for borehole dilution testing in the alluvium and UMCf. A sand filter pack will be installed in the annular space around the well screens and extend up to two feet above the top of the screen intervals. The remainder of the annular space will be backfilled with two feet of hydrated bentonite, followed by neat cement grout. The total well depth, slot size, filter pack, and length of the well screens will be determined in the field based on the lithology and depth to groundwater. Wells will be completed with flush-mounted, tamper-resistant (locked), traffic-rated well boxes, at an elevation approximately one-half inch above grade.

Following the completion of well construction, but no sooner than 24 hours after well construction is complete, Tetra Tech will develop each of the newly installed wells. A surge block and bailer will be used to swab and surge the filter pack and remove sediment from the well. This process will be followed by pumping with a submersible pump to purge the well of fine-grained sediment. Well development will be considered complete when three to ten casing volumes of water have been removed from the well, and index parameters consisting of pH, specific conductivity, turbidity, and temperature are stable (pH within 0.1 and other parameters generally within 10 percent) over three consecutive measurements. All index parameter readings will be recorded by Tetra Tech on well development logs.

Following well development, groundwater will be sampled and analyzed for a variety of field and laboratory parameters, described in more detail in Section 5.1, to establish baseline conditions of the soil and groundwater to be used in the laboratory bench studies. Collected groundwater will be transported to UNLV and used in the bench studies described in Section 3.2.

Following installation of all groundwater monitoring wells, a land surveyor will survey the horizontal coordinates of each well relative to North American Datum 83 with an accuracy of 0.1 foot, and the elevation of the ground surface and top of well casing measuring point relative to North American Vertical Datum 88 with accuracies of 0.1 foot and 0.01 foot, respectively. If nearby existing wells have not been recently surveyed as part of the on-going Downgradient Study Area investigation, then they may be resurveyed to ensure that a consistent datum is in use.

3.1.4 Single-Borehole Dilution Test

A single-borehole dilution test will be performed in the six newly installed 4-inch diameter monitoring wells to evaluate volumetric flow in the alluvium and UMCf within the field pilot study area. Single-borehole dilution tests consist of mixing a tracer compound into the groundwater in a well, and then observing the decline in tracer concentration in the well as a function of time using downhole instruments (Pitrak et al., 2007). The decline in tracer concentration in the well is due to dilution by volumetric groundwater flow, and the results will be used to estimate groundwater velocity in the immediate vicinity of the well.

Tracers used in single-borehole dilution tests are typically chloride or bromide salts, or fluorescent dyes. During the prior bioremediation treatability studies' preliminary testing activities, distilled water was successfully used as the tracer in five monitoring wells. Based on the proximity of the pilot study area to the Las Vegas Wash, the use of fluorescent dye tracers is not recommended. Furthermore, recent water quality results indicate that groundwater near the proposed field pilot study location has a specific conductance of 3,000 to 7,000 microsiemens per centimeter (AECOM, 2016). The fairly high specific conductance would support the potential use of distilled water as a tracer. Water samples collected after well installation will therefore be analyzed for major cations and anions to confirm the suitability of distilled water as a tracer prior to use. If the specific conductance is low enough that distilled water would not serve as an appropriate tracer, other appropriate tracers will be evaluated.

Results of the single-borehole dilution tests will be used to determine appropriate flow rates for use in the field pilot study design. All results will be provided in a final report which is further described in Section 8.0.

3.1.5 Slug Tests

Slug tests will be performed in all newly installed wells to estimate location-specific aquifer hydraulic conductivity within the field pilot study area and to confirm the results of the borehole dilution tests described in Section 3.1.5. The slug tests will be performed in general accordance with American Society for Testing and Materials (ASTM) Standard D4044-96 (ASTM International, 2008). Prior to conducting each slug test, the water level in the well will be measured manually with an electronic water level probe to determine the static groundwater level. An electronic pressure transducer/data logger will then be suspended in the well, and water levels will be monitored manually until static conditions are reestablished. A falling-head test will then be conducted by smoothly lowering a length of weighted and sealed PVC pipe (slug) into the well, securing it in place above the transducer, and recording the rate of water level decline. Once static conditions are reestablished, a rising-head test will be conducted by removing the slug and allowing the water level to again recover to static conditions while recording the rate of recovery. Barometric pressure changes during testing will be monitored and recorded using a pressure transducer placed above the water table.

At the end of each test, the pressure transducer will be removed from the well, and the water level displacement data will be downloaded to a laptop computer and corrected for barometric pressure effects. The corrected data will be interpreted using AQTESOLV for Windows (Duffield, 2014), or similar aquifer test analysis software. If possible, both the falling-head and rising-head data will be analyzed to cross-check the interpretation results.

3.1.6 Nuclear Magnetic Resonance Logging

As discussed in Section 2.2, one of the lessons learned during the previous treatability study was that improved definition of preferential flow pathways and paleochannel morphology was needed to better define the baseline perchlorate mass and mass removal rates during bioremediation. As a result, down-hole geophysics using NMR logging will be performed on all newly installed monitoring wells and select existing monitoring wells. This method was used successfully at the SWF Area Treatability Study area to identify higher-transmissivity zones within each well. NMR will be used in newly installed and select existing monitoring wells to delineate localized preferential flow pathways. This technology can be used in open or PVC-cased wells to provide high-resolution downhole estimates of hydraulic conductivity, total water content, and relative pore-size distributions below the water table (Walsh et al, 2013). Above the water table, NMR provides volumetric water content measurements. The specific tool used will depend on the diameter of the well, because larger diameter wells require a larger tool that has a larger radius of investigation. All tools are expected to provide a measurement approximately every 1.5 to 2 feet of depth. The high-resolution estimates of hydraulic conductivity will be compared to the lithologic logs and aquifer testing results for each well to assess the possibility of preferential flow pathways.

3.1.7 Las Vegas Wash Surface Water Evaluation

Groundwater from the pilot study area footprint generally discharges into the Las Vegas Wash. The Las Vegas Wash greatly influences groundwater flow directions in its vicinity and the engineered weirs that have been/will be installed in the Las Vegas Wash result in complex groundwater flow patterns adjacent to the Las Vegas Wash. Theoretically, groundwater should discharge from within the footprint of this pilot study to the Las Vegas Wash downstream of weirs and be recharged by the Las Vegas Wash upstream of weirs. However, determining exactly where the areas transition from recharge to discharge (and vice versa) is problematic and would require a level of effort beyond the scope of this pilot study.

Hence, a simplified approach is proposed to identify the general groundwater flow direction in the vicinity of the Las Vegas Wash so that the injection transects and monitoring wells can be properly located. The surface water elevation will be measured from the following existing nearby gauges each time groundwater elevations are measured in the existing and new wells in the Las Vegas Wash study area:

- Las Vegas Wash at Pabco Rd Nr Henderson, NV [United States Geological Survey (USGS) #09419700]
- Las Vegas Wash 05 Middle Way (USGS #360517114585301)
- Las Vegas Wash Abv Bostick Weir Nr Henderson, NV (USSG #09419747)
- Las Vegas Wash 07 Lower Narrows Abv Lower Narrows Weir (USGS #360535114574001)
- Las Vegas Wash Abv Homestead Weir Nr Henderson, NV (USGS #09419749)

The gauges will be re-surveyed at the same time as the pre-design monitoring wells to ensure that all points are on a consistent datum and accurately located with measuring points surveyed to 0.01 foot vertically. The water levels will be compared to nearby groundwater elevations to help assess the groundwater flow directions.

Surface water samples are currently collected on a monthly basis to monitor the mass flux of perchlorate migrating into the Las Vegas Wash, pursuant to the RI Phase 2 Investigation Modification No. 3 (Ramboll Environ, 2017). These data will be used during the pre-design phase to refine the quantity of the mass flux of perchlorate migrating into the Las Vegas Wash. The current surface water sampling program includes sample collection from Pabco, Bostick, Homestead, Three Kids, Sunrise Mountain, and Duck Creek weirs and includes analysis for perchlorate, chlorate, and TDS. As part of the pre-design, surface water samples will also be collected from the Historic Lateral, Calico Ridge, and Lower Narrows weirs. In addition to perchlorate, chlorate, and TDS, surface water samples will also be analyzed for organic content in terms of TOC and/or biological oxygen demand (BOD), as well as dissolved metals.

3.1.8 Transducer Data Collection

Data will be obtained from transducers installed in nearby existing monitoring wells by AECOM as part of their Downgradient Study Area RI field work that is currently on-going. This data will be compared to available USGS gauging station data to assist in assessing localized groundwater/surface water interactions over time. In addition, transducers will be installed in up to 10 of the newly installed pre-design monitoring wells to assess vertical and horizontal gradients in the alluvium and UMCf.

3.1.9 Management of Investigation-Derived Wastes

Investigation-derived waste generated during pre-design field activities will be managed according to applicable state, federal, and local regulations and as described in Field Sampling Plan, Revision 1 (ENVIRON, 2014b).

The investigation-derived waste that will be generated during the environmental investigation includes soil cuttings, personal protective equipment, equipment decontamination water, and groundwater generated during depth-discrete groundwater sampling and well development. Investigation-derived soil waste will be accumulated in plastic-lined roll-off bins. Solids will be characterized by collecting representative samples, as necessary, to determine disposal options. Depending upon the size of the container and quantity of material, one sample may be sufficient for characterization, or several samples may be composited in the field. Generally, a minimum of one sample will be collected for each 10 cubic yards of solid waste or each roll-off bin. Waste sample analysis will be determined by the receiving waste facility's analysis requirements. Waste water generated during purging or decontamination activities will be temporarily stored in 55-gallon drums and/or 500-gallon totes and transferred into the GW-11 Pond. Drums, bins, and tanks will be labeled with "pending analysis" labels, the date accumulation began, contents, source, and contact information, and stored in a designated area. Management of investigation-derived waste will comply with the requirements of the access agreement.

3.1.10 Health and Safety

Fieldwork will be conducted in accordance with an Activity Hazard Analysis and other elements of Tetra Tech's internal Site-wide Health and Safety Plan (Tetra Tech, Inc., 2015), which addresses potential chemical and physical hazards associated with the field pilot study. It is anticipated that modified Level D personal protective equipment will be required for all field activities.

3.2 LABORATORY STUDIES

Bench-scale laboratory studies performed in connection with the previous bioremediation treatability study (Section 2.2) and on-going SWF Area Treatability Study (Section 2.3) have provided significant data on the biodegradation potential of perchlorate and other electron acceptors using EVO as the carbon substrate. The on-going EVO sorption/desorption laboratory testing for the SWF Area Treatability Study will provide additional information on the potential longevity of the carbon substrate for the alluvium. However, because the Las Vegas Wash Bioremediation Pilot Study will incorporate in-situ bioremediation not only in the alluvium but also the UMCf, additional bench-scale studies are warranted to gather information on site-specific soil and groundwater from the UMCf within the pilot study footprint. As a result, for purposes of this pilot study, limited and targeted laboratory studies will be performed as follows:

- **(i)** **Short-term batch microcosm perchlorate biodegradation tests** will be performed using soil and groundwater from the alluvium and UMCf collected during pre-design activities. Batch tests will confirm the applicability of EVO to the soil and groundwater that will be encountered in the vicinity of the Las Vegas Wash and provide an estimate of the acclimation time and perchlorate biodegradation rates. In addition to EVO, soluble substrate(s) (such as glycerin, acetate, and lactate) will also be evaluated in batch microcosms for specific application to the UMCf soil and groundwater because the chemical, lithological, and hydrogeological characteristics of this zone are different from the alluvium and, therefore, warrant testing using soluble as well as slow-release substrates.
- **(ii)** **Column studies** will be performed to simulate the upward migration of perchlorate from the UMCf into the alluvium and help establish the hydraulic, physical, and chemical relationship between these two lithological zones. These tests will be designed in order to understand the potential for upflux or transport of the perchlorate from the UMCf into the alluvium and better target these zones with carbon substrate during the pilot study and future remediation activities. While much is known about diffusion of ionic contaminants through low conductivity formations or clay liners, very little is known about back-diffusion of contaminants under the same conditions (Liu and Ball, 2002). It may be hypothesized that once the perchlorate in the alluvium groundwater is remediated, perchlorate in the UMCf may move via molecular diffusion into the alluvial portions of the formation. Such transport behavior is important and could be advantageous to addressing the perchlorate that could be residing in the upper portions of the UMCf, by focusing remediation activity and operations in the alluvium, which continually receives perchlorate via back diffusion.

  Laboratory experiments are proposed to determine back-diffusion coefficients between the alluvium and the UMCf formations for perchlorate and co-contaminants. This will be accomplished by using Thorough Diffusion Cells and assuming Fickian diffusion (Shackelford, 2013). Several levels of TDS will be used to simulate the various concentrations of TDS found in the UMCf and the alluvium. The set-up is likely to involve two chambers that will be filled with TDS-laden water and compacted cylinders of soils (i.e. alluvium and UMCF) placed between the cylinders. Once the soil column is placed among the two chambers, ions will start to diffuse through the soil column to the chambers and the TDS concentration and specific ion concentration in each will indicate the preferential path of the contaminants. The results will indicate whether back-diffusion is likely to occur to what extent it is expected to occur in the field in a given period of time.

(iii) EVO sorption/ desorption tests on soil and groundwater from the UMCf will be performed to understand the interactions of site-specific soil with the carbon substrate (which could include modifications and variations of EVO with additives), including substrate movement and how it desorbs over time, to support biodegradation. On-going laboratory sorption/desorption tests for the SWF Area Treatability Study are focusing on the alluvium; the proposed testing for this pilot study will examine the UMCf.

To achieve cost efficiencies and because the Galleria Road Bioremediation Treatability Study will be performed during a similar timeframe, only one set of laboratory studies will be performed for both the Las Vegas Wash Bioremediation Pilot Study and Galleria Road Bioremediation Treatability Study, presuming soil lithological and geochemical characteristics are similar for both areas.

4.0 PILOT STUDY CONCEPTUAL DESIGN

This section describes the conceptual design for the field pilot study, which includes specific objectives, pilot study location details, conceptual well layout, and preliminary substrate design. The field pilot study design, as well as the effectiveness monitoring program (described in Section 5.0), may be modified or refined based on the results of pre-design field and laboratory activities described in Section 3.0. The final design will be presented in a pilot study work plan addendum prior to implementation of the pilot study (described in Section 8.0).

4.1 OBJECTIVES

The objectives of the pilot study are to accomplish the following:

- Evaluate the feasibility and effectiveness of implementing in-situ bioremediation to reduce the flux of perchlorate mass migrating toward the Las Vegas Wash;
- Evaluate critical hydraulic (flow, migration, gradients) and chemical (perchlorate and other electron acceptors) relationships between the alluvium and UMCf that govern the flux to the Las Vegas Wash;
- Estimate the ZOI for substrate and biodegradation achievable in the alluvium and UMCf during the pilot study;
- Estimate or extrapolate the longevity of the carbon substrate and frequency of carbon substrate replenishment required to prevent perchlorate breakthrough immediately downgradient of the injection transect; and
- Examine the approach and feasibility for full-scale transect treatment including equipment, injection, and monitoring well layout, substrate addition and replenishment, and analytical sampling evaluation criteria to provide critical information applicable to the remedial alternatives evaluation in the forthcoming FS.

4.2 PILOT STUDY LOCATION

As shown in Figures 2 and 3, the proposed area for the pilot study is at two locations, noted as Transect 1a and Transect 1b. Transect 1a is located directly east of Pabco Road (also referred to as Aguila Road) on COH-owned property. This location was selected to intercept perchlorate contamination generally greater than 5,000 μg/L, which represents one of two higher perchlorate concentration locations within the Downgradient Study Area that are contributing to the total mass flux migrating into the Las Vegas Wash, and proposed work in this area will provide valuable information on the potential mass flux pathways, mechanisms, and rates, which will be critical for developing a remedy evaluation for the feasibility study. Transect 1b is located upgradient of the Las Vegas Wash on Clark County-owned property and was selected to treat contamination potentially migrating into the Las Vegas Wash from a second area that generally has perchlorate contamination at concentrations greater than 5,000 μg/L. Transect 1b is designed to connect with the bedrock outcrop at its eastern end. It is anticipated that the bedrock outcrop is an important feature influencing groundwater flow and perchlorate mass flux in this area.

4.3 CONCEPTUAL LAYOUT

This section describes the injection and monitoring wells that will be installed to evaluate the effectiveness of the in-situ bioremediation pilot study. Access agreements (discussed in Section 6.0) will be in-place prior to initiating field activities. Once access is granted, an underground utility survey will be performed before drilling commences. All wells will be drilled in accordance with the NDWR requirements. Drilling, well installation, and well development procedures are provided in the Field Sampling Plan, Revision 1 (ENVIRON, 2014b).

4.3.1 Injection Well Layout

Although the final number, location, spacing and orientation of the injection wells will be determined after completion of the pre-design field and laboratory activities described in Section 3.0, the injection wells within Transects 1a and 1b will be configured to best meet project objectives. Based on results from the previous and on-going treatability studies, there could be considerable heterogeneity in the lithology within relatively short distances. The soil grain type, thickness of sand/gravel lenses, and paleochannels vary in all three dimensions in the saturated subsurface. Therefore, flow pathways and transport of organic carbon during injections will likely be non-uniform. As a result, the injection transect could be installed in a single row or multiple staggered rows to address the impacts of heterogeneity and non-uniform flow, which could provide overlap and better distribution of the injected carbon substrate to curtail the potential for perchlorate breakthrough. The results of the on-going SWF Area Treatability Study will provide additional information and data that will assist in the final design of injection well transects and possible implementation of a staggered well network, if beneficial. Figures 4 and 5 depict the general injection well transect location. The final number of injection wells and configuration of the injection well transect line(s) will be determined in the pilot study work plan addendum.

The layout of the injection wells will also consider the orientation of the transects with respect to groundwater flow directions. It is anticipated that Transect 1a will be installed close to perpendicular to groundwater flow. Transect 1b will include portions that might be close to perpendicular to groundwater flow toward its eastern end while other portions near its center and western end might be more parallel to groundwater flow.

The injection well layout will potentially target both perchlorate-contaminated groundwater in the alluvium and UMCf in order to evaluate layouts that appropriately address the RAO of mitigation of perchlorate mass flux discharge to the Las Vegas Wash. Due to their difference in characteristics, the alluvium and UMCf will be addressed separately, as far as the injection well system is concerned. This includes the spacing, configuration, number of wells, and well design. Results of the pre-design activities, proposed UNLV bench-scale tests, and results of the on-going SWF Area Treatability Study will be used to finalize the injection system network.

Injection wells will be constructed of 2-inch schedule 40 PVC casing and screened with 2-inch diameter slotted PVC well screen, as discussed in Section 3.1.4. The total well depth, slot size, filter pack, and length of the well screens will be determined in the field based on the lithology and depth to groundwater. Paired wells may be used to separate screened intervals within the alluvium and UMCf to maximize subsurface distribution during substrate injections as needed. Wells will be completed with flush-mounted, tamper-resistant (locked), traffic-rated well boxes, at an elevation approximately one-half inch above grade. As discussed in Section 3.1.4, following the completion of well construction, but no sooner than 24 hours after well construction is complete, Tetra Tech will develop each of the newly installed wells.

4.3.2 Effectiveness Monitoring Wells

A monitoring well network, consisting of upgradient and downgradient monitoring wells, will be required to evaluate pilot study effectiveness. Upgradient monitoring wells will be used to determine the perchlorate concentrations in groundwater that are migrating into the injection well transect(s) and thereby, ultimately migrating into the Las Vegas Wash, if untreated. Downgradient monitoring wells will be installed at strategic locations downgradient of the injection well transects, directly in-line and offset from the injection wells, to monitor for treatment effectiveness. To the extent possible, monitoring wells that have been or will be installed by others in the vicinity of the pilot test will be incorporated in the monitoring well network. Periodic sampling of the Las Vegas Wash water will also be performed to provide additional information regarding bioremediation effectiveness on the RAO of mitigation of the perchlorate mass flux discharge to the Las Vegas Wash (Section 5.3).

Monitoring wells installed as part of the pre-design phase will be incorporated into the effectiveness monitoring program. Based on pre-design results and final pilot study layout, additional monitoring wells may be required. The exact number and location of monitoring wells will be finalized following the pre-design activities and presented in a pilot study work plan addendum (described in Section 8.0).

In general, new monitoring wells will be constructed of 2-inch schedule 40 PVC casing and screened with 2-inch diameter slotted PVC well screen and #3/16 filter pack, as discussed in Section 3.1.4. The slot size and filter pack may be adjusted based on the results of the soil physical parameter analyses. The depth of the well and length of well screen will be determined in the field based on lithology and depth to groundwater. Dual-nested or paired monitoring wells may be used to separate screened intervals, if conditions warrant. Wells will be completed with flush-mounted, tamper-resistant (locked), traffic-rated well boxes, at an elevation approximately one-half inch above grade. As discussed in Section 3.1.4, following the completion of well construction, but no sooner than 24 hours after well construction is complete, Tetra Tech will develop each of the newly installed wells.

4.4 PRELIMINARY INJECTION DESIGN

This section presents the preliminary injection design for injections of carbon substrate, water for chemical make-up, and distribution water. Results of the previous treatability studies have provided preliminary findings on the longevity of each carbon substrate injection event, lateral and downgradient coverage or influence of the injections, and impact of the distribution water. These findings have been incorporated in the conceptual injection design for both carbon substrate injections and follow-up distribution water. As the results from the on-going SWF Area Treatability Study are evaluated, the findings will be utilized for the final design of the pilot study and will be presented in a pilot study work plan addendum (described in Section 8.0).

4.4.1 Carbon Substrate Injections

Findings from the previous treatability study (described in Section 2.2) indicated that the effects of the first carbon injection lasted between two and three months in relatively high groundwater flow conditions (32 ft/day). That study incorporated a second injection event utilizing half of the quantity of carbon substrate used in the first event. The reason for adding only half the quantity was to examine the lower threshold of the substrate that would be required for bioremediation. In addition, the UNLV bench-scale column study indicated that temporary reductions in aquifer transmissivity could be an issue if excess carbon substrate was added. The second carbon substrate addition appeared to be sufficient for approximately two months, despite the observation that perchlorate continued to degrade and very little DO was present. The on-going SWF Area Treatability Study will provide additional data and information on the effectiveness and durability of the initial carbon substrate injection and frequency and need for subsequent injections.

In addition to the results from the previous and ongoing treatability studies, factors to be considered when determining the quantity of carbon substrate used for the Las Vegas Wash Bioremediation Pilot Study include the results and findings of the pre-design activities, known chemistry and geochemistry of the groundwater, and stoichiometric requirements for the carbon substrate based on the mass of perchlorate and other electron acceptors that will migrate through the transects. These estimates of carbon substrate quantities and projected frequency of the injections for the pilot study will be performed for the alluvium and UMCf, into which injections are expected to occur via two separate injection well network systems. The final substrate type and quantity for the injections into the UMCf (EVO, soluble substrate, or a combination of the two) will be evaluated and finalized in the pilot study work plan addendum based on the results and findings of the pre-design activities and UNLV bench-scale studies.

Prior to actual carbon substrate injections, slug tests will be performed on as many as half of the injection wells and monitoring wells to determine pre-injection hydraulic conditions. Step-rate injection tests will also be performed prior to carbon substrate injections to establish well injection rates and pressures in the injection wells. Slug tests will be performed periodically throughout the pilot study as they have been shown to provide valuable information on subsurface conductivity changes following carbon substrate injections as described in Section 2.2.

The carbon substrate will be pressure-injected into injection wells using a mobile injection system consisting of a tanker or trailer unit with a manifold piping system and hoses supplied with valves and regulators for controlling and monitoring rates of injection. The injection solution will be prepared by thoroughly mixing the carbon substrate, additional amendments such as micronutrients, and water in the trailer-mounted mixing tank. Prior to each injection, water will be used for dilution of the carbon substrate (generally diluted at a ratio of 1:4 parts of carbon substrate to water).

4.4.2 Distribution Water

Distribution water is an important component of the injection process to improve subsurface distribution of the amendments within the injection well transect. This feature of the bioremediation design is important because it improves the distribution of the carbon substrate to create a more complete treatment barrier. As a result, a designated quantity of water (determined based on results from the pre-design field and laboratory activities described in Section 3.0) will be injected into each well either with or following injections.

Based on results observed regarding the impact of distribution water during the two injection events in the previous treatability study (Section 2.2), it appears that fairly large amounts of distribution water will likely be required to enhance distribution of the carbon substrate in the vicinity of the injection wells. It appears that up to two-thirds of a single pore volume of distribution water could be required for each well. Preliminary findings also indicated that injecting distribution water into alternate wells within the transect provided better distribution of the carbon substrate that was injected. Results and lessons learned from the injections associated with the SWF Area Treatability Study will also be incorporated into the final distribution water protocol for the Las Vegas Wash Bioremediation Pilot Study, which will be presented in a pilot study work plan addendum following completion of the pre-design activities (described in Section 8.0).

Based on a review of the available water sources, there are three choices for distribution water. Specifically, these include COH water obtained from a nearby hydrant, extraction of groundwater from nearby monitoring wells, and water from the Las Vegas Wash itself. A detailed evaluation of each water source, their advantages and disadvantages, and final selection will be provided in a forthcoming pilot study work plan addendum that will present the final pilot study design. It should be noted that for the previous treatability study near the COH water treatment facility, hydrant water was used as the source for distribution water. However, the SWF Area Treatability Study used extracted groundwater from upgradient monitoring wells in the immediate vicinity of the treatability study. A series of injection and subsequent monitoring events will be performed for the SWF Area Treatability Study prior to submittal of the Las Vegas Wash Bioremediation Pilot Study technical memorandum (described in Section 8.0) and lessons learned from these injections will be incorporated in the evaluation of distribution water sources.

5.0 EFFECTIVENESS MONITORING PLAN

This section describes the conceptual groundwater and surface water monitoring programs to determine treatment effectiveness during the pilot study. This section also describes the methodology to evaluate the pilot study's impact on perchlorate mass flux. Based on the results of the pre-design investigation, the monitoring plan may be modified in the final pilot study design presented in the pilot study work plan addendum (described in Section 8.0).

5.1 GROUNDWATER SAMPLING PROCEDURES

General groundwater sampling activities will follow the guidance of the Field Sampling Plan, Revision 1 (ENVIRON, 2014b). Prior to groundwater sample collection, groundwater levels will be gauged in all wells for use in potentiometric contouring. Groundwater samples will be collected using low-flow purging and sampling techniques. During low-flow purging of the wells, a pump capable of purging between approximately 0.1 to 0.13 gallons per minute will be used to minimize drawdown and induce inflow of fresh groundwater. The pump discharge water will be passed through a flow-through cell field water analyzer for continuous monitoring of field parameters (temperature, pH, turbidity, electrical conductivity, DO, and oxidation reduction potential). Field parameters will be monitored and recorded on field sampling forms during purging. The wells will be sampled when purging is complete, which is when the field parameter readings and water levels have stabilized. Per NDEP letter dated June 27, 2016, field-filtering of water samples for perchlorate analysis will not be required. Filtering for dissolved metals and hexavalent chromium analyses will be conducted in the field using a 0.45-micron filter.

5.1.1 Effectiveness Monitoring

Groundwater samples will be collected from all injection and monitoring wells in the vicinity of the pilot study areas to establish baseline conditions prior to the injections. After injections have occurred, groundwater samples will be periodically collected from the upgradient and downgradient monitoring wells. A variety of field, laboratory, and microbial parameters that may be evaluated during the study are listed in ***Table 2***, which presents the parameters, associated methods, purpose, and frequency after injections. Effectiveness monitoring wells will include newly installed monitoring wells as well as select monitoring wells that are either existing or will be installed during the pre-design phase. The actual frequency of sampling, selected wells, and specific parameters to be sampled during each individual event will be presented as part of the final design and adjusted based on the results from pilot study effectiveness monitoring events. Specialized microbial analyses, namely, PLFA analyses and the presence of the perchlorate reductase gene, will be determined via the employment of Bio-Traps® in select wells during the study. In addition, slug tests will be repeated periodically during the field pilot study to examine any changes in hydraulic conductivity as a result of carbon injections and geochemical processes.

Table 2 Example Groundwater Effectiveness Monitoring Sampling Protocol

Parameter	Analytical Method	Purpose	Potential Frequency
Field Parameters			
EC	Field Meter	Assess geochemical conditions	Baseline, Weekly (Month 1), Biweekly (Month 2), Monthly thereafter
pH	Field Meter		
DO	Field Meter		
ORP	Field Meter		
Temperature	Field Meter		
Turbidity	Field Meter		

Parameter	Analytical Method	Purpose	Potential Frequency
Laboratory Parameters			
Perchlorate	E314	Assess treatment effectiveness	Baseline, Weekly (Month 1), Biweekly (Month 2), Monthly (Months 3 – 12), Quarterly thereafter
TOC	SM5310B	Assess carbon substrate distribution in the aquifer	
Nitrate	E300.0	Assessment of nitrate as the most likely competing electron acceptor and carbon substrate consumer	
Sulfate	E300.0	Assessment of sulfate as an electron acceptor and potential carbon substrate consumer	
Chlorate/Chlorite	E300.1	Assess treatment effectiveness and examination as intermediate by-product of perchlorate biodegradation	
TDS	SM2540C	Assess impact of salts on delayed or slower perchlorate biodegradation in the flow-through mode	Baseline, Monthly (Months 1 – 6), Quarterly thereafter
Alkalinity	SM2320B	Assess geochemical conditions	
Hexavalent Chromium	SW846 7199	Assess secondary impacts of treatment	
Sulfide	HACH Method 8131	Examine secondary geochemical impacts	
Total Nitrogen	E351.2	Examine the need for micronutrients	
Total Phosphorus	E365.3	Examine the need for micronutrients	
Ferrous Iron	HACH Field Kit	Assess effect of reducing conditions on iron	
Manganese	SW846 6010B	Assess potential for biologically driven dissolution of manganese	
Methane	EPA Method RSK175	Examine secondary geochemical impacts	
Dissolved Metals(1)	SW6010/6020	Assess secondary impacts of treatment (includes arsenic)	
VFAs	BF-MB-009, Rev 3	Surrogate carbon substrate assessment	
Chloride	E300.0	Potential estimation of conservative end-product of biodegradation	
PLFA	Microbial Insights Method[2]	Examine microbial response to carbon substrate addition, evaluate impact of carbon substrate on total live biomass over time	Baseline, Quarterly (through Month 6), Semi-annually
Perchlorate Reductase Gene	qPCR	Examine microbial response to carbon substrate addition	

Acronyms and Abbreviations:
BL: Baseline
EC: Electrical conductivity
DO: Dissolved Oxygen
ORP: Oxidation-reduction potential
PLFA: Phospholipid Fatty Acids
qPCR: quantitative polymerase chain reaction
TOC: Total organic carbon
TDS: Total dissolved solids
VFAs: Volatile Fatty Acids

Notes:
(1) Metals include arsenic, chromium, iron, and manganese.
(2) White, D. C., H. C. Pinkart, and D. B. Ringelberg. (1997). Biomass measurements: Biochemical approaches, p. 91-101. *In* C. J. Hurst, G. R. Knudsen, M. J. McInerney, L. D. Stetzenbach, and M. V. Walter (ed.), Manual of Environmental Microbiology. ASM Press, Washington.

5.2 MASS FLUX EVALUATION

In conjunction with groundwater monitoring, a groundwater model will be developed to assess the effectiveness of the pilot study. The objective of the groundwater modeling is to calculate the groundwater flux through the injection well transects before and after injection. The groundwater model results will be used to estimate the amount of perchlorate mass destroyed and amount of perchlorate mass that remains in the subsurface within the footprint of the pilot study after the study is completed. Specifically, the groundwater model for this Work Plan will be based on the Phase 6 Ramboll Environ groundwater flow and transport model (Phase 6 Model), which is scheduled to be completed by March 2018. The Phase 6 model will be modified by Tetra Tech to focus on the pilot study areas and Las Vegas Wash by using grid refinement and site-specific material properties measured by field techniques and laboratory analyses, such as NMR, slug tests, and physical properties. Once constructed, the modified groundwater model will be calibrated to the groundwater response to injections conducted during this study. Then, this model will be used to calculate groundwater flux through injection well transects to ultimately estimate perchlorate mass destroyed or left in place by the pilot study.

5.3 SURFACE WATER SAMPLING

Surface water samples are currently collected on a monthly basis to monitor the mass flux of perchlorate migrating into the Las Vegas Wash, pursuant to the RI Phase 2 Investigation Modification No. 3 at NERT (Ramboll Environ, 2017). This data will be used during the pre-design and pilot study phases to monitor for potential decreases in the mass flux of perchlorate migrating into the Las Vegas Wash resulting from this pilot study. The current surface water sampling program includes sample collection from six weir locations along the Las Vegas Wash, including Pabco, Bostick, Homestead, Three Kids, Sunrise Mountain, and Duck Creek weirs. Samples are analyzed for perchlorate, chlorate, and TDS. As part of the pilot study effectiveness monitoring program, surface water samples will also be periodically collected from three additional weir locations, including the Historic Lateral, Calico Ridge, and Lower Narrows weirs. In addition to surface water sampling, surface water elevations will also be periodically measured from nearby gauges and results will be compared to nearby groundwater elevations to help assess groundwater flow directions (locations presented in Section 3.1.8).

Surface water samples will be collected using similar techniques as used during collection of surface water samples required under RI Phase 2 Investigation Modification No. 3. Field parameters (temperature, pH, turbidity, electrical conductivity, DO, and ORP) will be monitored and recorded on field sampling forms prior to sample collection. In addition to the current monthly surface water sample analysis of perchlorate, chlorate, and TDS, organic content in terms of TOC and/or BOD as well as dissolved metals will be analyzed to obtain a baseline prior to in-situ bioremediation activities and to monitor for progress and secondary effects.

5.4 DATA VALIDATION

All pilot study field samples and field quality assurance/quality control (QA/QC) samples will be evaluated for quality and usability. Field QA/QC samples include equipment blanks, field blanks, field duplicates, and matrix spike/matrix spike duplicates. The QA/QC samples will provide information on the effects of sampling procedures and assess sampling contamination, laboratory performance, and matrix effects.

The current guidance described in the NDEP *Data Verification and Validation Requirements - Supplement April, 2009* states that “all data collected at the BMI Complex and Common Areas should be validated at least to Stage 2B…In addition, at least 10% of all data within a DVSR should be validated to Stage 4”. However, laboratory analytical data from pilot study activities will be verified and validated to Stage 2A in accordance with recommendations made to NERT concerning end-use of data. The intended use of data is to support technology selection in the forthcoming FS. Per the January 11, 2017 email from Weiquan Dong, NDEP accepts the recommendation and is currently in the process of revising the existing guidance.

The analytical data will be evaluated for QA/QC based on the following documents: *Quality Assurance Project Plan (QAPP),* Revision 1, July 18 2014; NDEP *Revised Guidance on Qualifying Data due to Blank Contamination for the BMI Complex and Common Areas*, January 5 2012; *National Functional Guidelines (NFG) for Inorganic Superfund Data Review, August 2014*; *National Functional Guidelines (NFG) for Superfund Organic Methods Data Review, August 2014;* and individual United States Environmental Protection Agency (US EPA) and laboratory methods, based on the logic contained in the NFG.

6.0 ACCESS AND PERMITTING REQUIREMENTS

Both access agreements and permits will be required prior to performing pre-design and/or injection activities associated with this pilot study. This section presents a summary of the access and permit requirements that will likely be required for the implementation of this pilot study.

6.1 ACCESS NEGOTATIONS

Due to the off-site location of the pilot study, the Trust will acquire land use authorizations for all field activities. As described in Section 4.2, the proposed areas for the pre-design and pilot study consist of two locations that are public parcels of land under the jurisdiction of COH and Clark County, respectively. As a result, Tetra Tech, on behalf of NERT, will prepare and submit all required applications for access to these parcels, in coordination with the Trust. Any adjustments made to the plot study resulting from this process will be presented in the pilot study work plan addendum (described in Section 8.0).

6.2 PERMITTING

There will be a series of permits required for the various activities that are being proposed as part of the pilot study. In addition to the permits described herein, a review of other potential permitting requirements was conducted and based on project design, several regulatory requirements likely will not apply. These include an entry permit issued by the BOR because no new wells are proposed to be installed on Federal land for the pre-design or pilot study activities. No new entry permit is anticipated as the only activity anticipated on Federal lands is limited to collecting data from existing wells, for which entry permits have already been established. Authorization under the construction stormwater general permit administered by NDEP is not anticipated because cumulative disturbances are not expected to exceed one acre. Lastly, there will be no wastewater discharges from well operation.

6.2.1 Land Use Authorization

As described above, land use authorization for well installation and operation will be required from COH and Clark County. The authorizations will consist of an application by Tetra Tech, on behalf of NERT, and demonstration that the land use meets applicable zoning requirements. This process may take several months and require Planning Commission review and approval, which could be expedited under an administrative review if the agencies consider the project a “governmental” facility or utility. Coordination also would be required with Clark County Parks & Recreation for facilities located in the Wetlands Park.

6.2.2 Well Installation Permitting

Both pre-design and field pilot study activities will require a Nevada Administrative Code (NAC) 534.441 Monitor Well Drilling Waiver and a NAC 534.320 Notice of Intent Card prior to installation of injection wells and monitoring wells. The Monitoring Well Drilling Waiver also requires a completed, signed, and notarized Affidavit of Intent to Abandon a Well as an attachment. As required, the injection and monitoring wells will be drilled by a licensed well driller pursuant to Nevada Revised Statutes 534.160 and will be constructed pursuant to NAC Chapter 534 – Underground Water and Wells. To the extent that any injection and monitoring wells associated with this pilot study are to be abandoned, they would be done so in accordance with the provisions contained in NAC 534.4365 and all other applicable rules and regulations for plugging wells in the State of Nevada. It is currently anticipated that most, if not all, of the injection and monitoring wells to be installed as part of this pilot study will remain in place at the end of the pilot study.

6.2.3 County Permitting

Per the Clark County Department of Air Quality, a dust control permit is required for activities that result in soil disturbance greater than 0.25 acres. A review of installation activities associated with pre-design and pilot study phases will be conducted to determine whether the soil disturbance will be greater than 0.25 acres. If required, Tetra Tech, on behalf of NERT, will prepare and submit the required dust control permitting application. No air permitting other than dust control is anticipated because there will be no air emissions associated with the wells or equipment needed for their installation and operation that would trigger minor source permitting.

6.2.4 NDEP – Underground Injection Control Program

The pilot study will require an underground injection control (UIC) permit for the injection of the carbon substrate and amendments into the saturated subsurface. Specifically, an application for a Class V General Permit for Long-Term Remediation UIC permit will be required. The UIC long-term general permit falls under NAC 445A. The permit application requires completion of UIC Form U200 – Permit Application and UIC Form U210 – Notice of Intent.

6.2.5 Water Appropriations Permit

Pursuant to Nevada Revised Statutes 533.335 and 533.437, an application for a Permit to Appropriate the Public Waters of the State of Nevada for Environmental Purposes (Water Appropriation Permit) may be required to support the extraction of groundwater from nearby injection or monitoring wells to be used as distribution water during injections. The need for the water appropriations permit will be determined following the detailed evaluation of the source for distribution water to be presented in the forthcoming pilot study work plan addendum that will present the final pilot study design.

7.0 ECOLOGICAL REVIEW AND PROTECTION MEASURES

As previously explained, the pilot study is located within the downgradient study area on private land that is owned by COH and on land that is under the jurisdiction of Clark County Wetlands Park. The most common vegetation community is desert shrubland, dominated by fourwing saltbush (*Atriplex canescens*), quailbush (*Atriplex lentiformis*), screw-bean mesquite (*Prosopis pubescens*), honey mesquite (*Prosopis glandulous* var. *torreyana*), salt cedar (*Tamarix chinensis*), and creosote (*Larrea tridentata*). Soils are loamy and gravelly. To the north of the pilot study areas is the riparian corridor of the Las Vegas Wash. Riparian vegetation communities are comprised of cottonwood (*Populus angustifolia*), willow (*Salix gooddingii*), and salt cedar, with inclusions of cattail (*Typha sp*.) wetlands.

Much of the pilot study area has been heavily disturbed for erosion control along the Las Vegas Wash, development of park infrastructure, and to support multiple wastewater outfalls for facilities discharging to the Las Vegas Wash. General disturbances near the Las Vegas Wash include roadways and a parking lot; picnic shelters and bathroom facilities; a paved bike path; unpaved trails; electric transmission structures; concrete weirs for treated wastewater outfalls to the wash; erosion control structures; and areas of active revegetation projects.

A desktop data review for federally listed species with the potential to occur was completed for the project area [Tetra Tech, 2017; United States Department of Interior – Bureau of Reclamation (USDOI – BOR), 2017]. Species for consideration were identified in a United States Fish and Wildlife Service (USFWS) Information Planning and Conservation (IPaC) report (USFWS, 2016). Surveys for federally protected species with the potential to occur were completed as recently as 2017 (Tetra Tech, 2017; USDOI-BOR, 2017). Documentation of past threatened and endangered species surveys in the Clark County Wetlands Park area is also provided in the Las Vegas Wash Wildlife Management Plan prepared by Southern Nevada Water Authority (SNWA) (SNWA, 2008) and the USFWS Biological Opinion prepared for other phases of SNWA weir construction (USFWS, 2009a). There is no federally-designated critical habitat for threatened or endangered species within 0.5 mile of the proposed pilot study locations, as documented in critical habitat rulemaking for individual species (USFWS, 2016; USFWS, 1994, 2013, 2014a). Findings of the desktop data review and surveys are summarized as follows:

- Southwest willow flycatcher (*Empidonax traillii extimus*) inhabits dense riparian tree and shrub habitat, especially where willows and/or tamarisk are present, as well as standing water or saturated soils. It is typically found below 8,500 feet in elevation. Breeding and nesting occurs from early May through July (USFWS, 2014b). Individuals have been recorded in the Las Vegas Wash during migration, but no nesting has been documented. It was not documented as a breeding species in the Las Vegas Wash during an extensive avian population survey conducted between 2005 and 2015 (Great Basin Bird Observatory, 2016). The 2017 surveys did not document individuals of this species (Tetra Tech, 2017; USDOI-BOR, 2017). Nesting is considered unlikely due to the lack of suitable habitat and of historic use records.
- Yuma clapper rail (*Rallus longirostris yumanensis*) is a marsh bird found in dense cattail or cattail-bulrush marshes along the lower Colorado River in Mexico north to the lower Muddy River and Virgin River in Utah – above those rivers' confluence with Lake Mead. In Nevada, this subspecies can be found along the Virgin River and lower Muddy River, along the Colorado River around Lake Mohave, and along the Las Vegas Wash (USFWS, 1983). Nesting is typically March through May (USFWS, 2010). Individuals were detected along the wash during multiple surveys conducted since 1998, but no nesting was documented (SNWA 2008). It was not documented as a breeding species in the Las Vegas Wash during an extensive avian population survey conducted between 2005 and 2015 (Great Basin Bird Observatory, 2016). The 2017 surveys did not document individuals of this species (Tetra Tech, 2017; USDOI-BOR, 2017).
- The yellow-billed cuckoo (*Coccyzus americanus*) is a riparian obligate that nests almost exclusively in large tracts of riparian woodlands, most commonly in cottonwood-willow-dominated woodlands

(Halterman, et al. 2015). Suitable breeding habitat is in multi-layered riparian woodlands (with a tree overstory and shrubby understory) and at least 12 acres in size. The species is typically found below 8,500 feet (USFWS, 2015). The nesting season for this species is considered June 1 through September 15. No migrant or resident yellow-billed cuckoo (*Coccyzus americanus*) were detected during systematic surveys along the wash during each year from 2000 to 2004 (SNWA, 2008). No individuals were found in the Las Vegas Wash during an extensive avian population survey conducted between 2005 and 2015 (Great Basin Bird Observatory, 2016). The 2017 surveys did not document individuals of this species (Tetra Tech, 2017; USDOI-BOR, 2017).

- Desert tortoise (*Gopherus agassizii*) were observed on the north side of Las Vegas Wash in 2003 (SNWA 2008). In 2005, tortoise burrows were found within portions of Clark County Wetlands Park, and additional burrows, a carcass, and scat evidence were found outside of the park (SNWA, 2008; USFWS, 2009a). Two separate desert tortoise survey events conducted according to USFWS protocol were completed in 2017. Surveys did not detect desert tortoises or tortoise signs. However, an incidental observation of a live desert tortoise in the Downgradient Study Area was reported by a SNWA subcontractor on March 28, 2017 (personal communication from Carlton Parker, NDEP).

Riparian habitat lies outside of the pre-design and pilot study areas. Federally listed avian species are not anticipated to nest in the portion of the Las Vegas Wash located near the pre-design and pilot study areas. Effects to avian species from the work proposed as part of the pre-design and pilot study are not anticipated. Therefore, additional protection measures are not required.

The majority of the project area is disturbed as the remaining suitable habitat is fragmented by urban development. However, it is possible for the desert tortoise to occur based on historic documentation. Effects to the desert tortoise may occur from the work proposed as part of the pre-design and pilot study. Direct effects may include mortality caused by crushing or impact from vehicle and equipment operation. Potential indirect effects considered include habitat degradation, fragmentation, and loss; and behavioral alterations caused by noise disturbance, creation of dust hazards from heavy equipment and vegetation removal, and human and vehicle presence.

Protection measures, which may be implemented, if warranted, include the following, which are identified in the 2009 USFWS Biological Opinion (USFWS, 2009a) and in the Desert Tortoise (Mojave Population) Field Manual (USFWS, 2009b):

- An authorized desert tortoise biologist would serve as a biological monitor during activities that required the use of heavy equipment or that resulted in ground disturbance. The monitor would have authority to cease activities if a desert tortoise appeared in the proposed pilot study areas.
- Desert tortoises will be treated in a manner to ensure that they do not overheat, exhibit signs of overheating (e.g., gaping, foaming at the mouth, etc.), or be placed in a situation where they cannot maintain surface and core temperatures necessary to their well-being. Unless the tortoise is in imminent danger, no desert tortoise shall be captured, moved, transported, released or purposefully caused to leave its burrow for whatever reason when the ambient air temperature is above 95 degrees, or if the ambient air temperature is anticipated to exceed 95 degrees before handling can be completed.
- Desert tortoise education would be presented to field personnel prior to initiating activities.
- A maximum speed of 15 miles per hour would be enforced.
- Litter would be controlled to avoid opportunistic predators, such as desert kit fox, coyotes, and common ravens.

8.0 REPORTING

Monthly status updates will be provided to the Trust and NDEP summarizing the progress and results of the pre-design field activities, laboratory, and pilot study.

Following completion of the pre-design phase described in Section 3.0, a pilot study work plan addendum will be prepared for NDEP and US EPA review. The pilot study work plan addendum will include the following:

- Summary of pre-design field activities, including presentation of soil boring logs, well construction diagrams, cross-sections, single borehole dilution tests, and slug tests;
- Analytical results summary of soil, groundwater, and surface water samples collected during the pre-design field activities;
- Preliminary summary and application of bench testing results;
- Final pilot study design, including injection and monitoring well layout, targeted treatment depths and intervals in the alluvium and UMCf, injection protocol for carbon donor and distribution water source, and finalized effectiveness monitoring program; and
- Schedule of pilot study activities, including implementation, anticipated injection intervals, monitoring, and reporting.

Following completion of the pilot study, a final Las Vegas Wash Bioremediation Pilot Study Report will be prepared and submitted for NDEP and US EPA review. This report will summarize the pilot study activities and will include:

- Results of soil borings, single borehole dilution tests, slug tests, and NMR logging conducted both during and following installation of the injection well network;
- Analytical results summary of soil and groundwater samples collected during injection and monitoring well installation as part of pilot study implementation;
- Summary of bench testing results;
- Evaluation of effectiveness in reducing perchlorate-contaminated groundwater that is migrating towards the Las Vegas Wash, including an estimate of the perchlorate mass reduction during the pilot study timeframe;
- Estimation of perchlorate degradation kinetics that were attainable in the field from trend graphs of individual monitoring wells; and
- Determination of the technology's feasibility and effectiveness for full-scale application and other relevant components required for proper evaluation in the FS, including:
    - Potential layout and plan for full-scale implementation;
    - Preliminary estimates of capital and operating costs for full-scale implementation;
    - Possible insights gathered from the predesign and pilot testing on where the mass flux is passing through the two transects and entering the Las Vegas Wash; and
    - Management of possible temporary reductions in aquifer transmissivity and any release of secondary constituents (e.g.: arsenic).

9.0 SCHEDULE

A general schedule for the primary deliverables and activities associated with implementing the pre-design and pilot study activities is presented in ***Table 3***. This schedule is contingent upon Trust, NDEP, and US EPA approval of this Work Plan, Trust approval of funding and notice to proceed, completion of access agreements, and obtaining all necessary permits.

Table 3 Preliminary Project Schedule

Task/Milestone	Estimated Start Date	Estimated Completion Date
Pre-Design Field Activities	January 2018	June 2018
Laboratory Bench-Scale Tests	February 2018	July 2018
Pilot Study Work Plan Addendum (presents pre-design results and final pilot study design)	July 2018	September 2018
Pilot Study Installation	October 2018	March 2019
Pilot Study Injections, Monitoring, and Reporting	April 2019	December 2020

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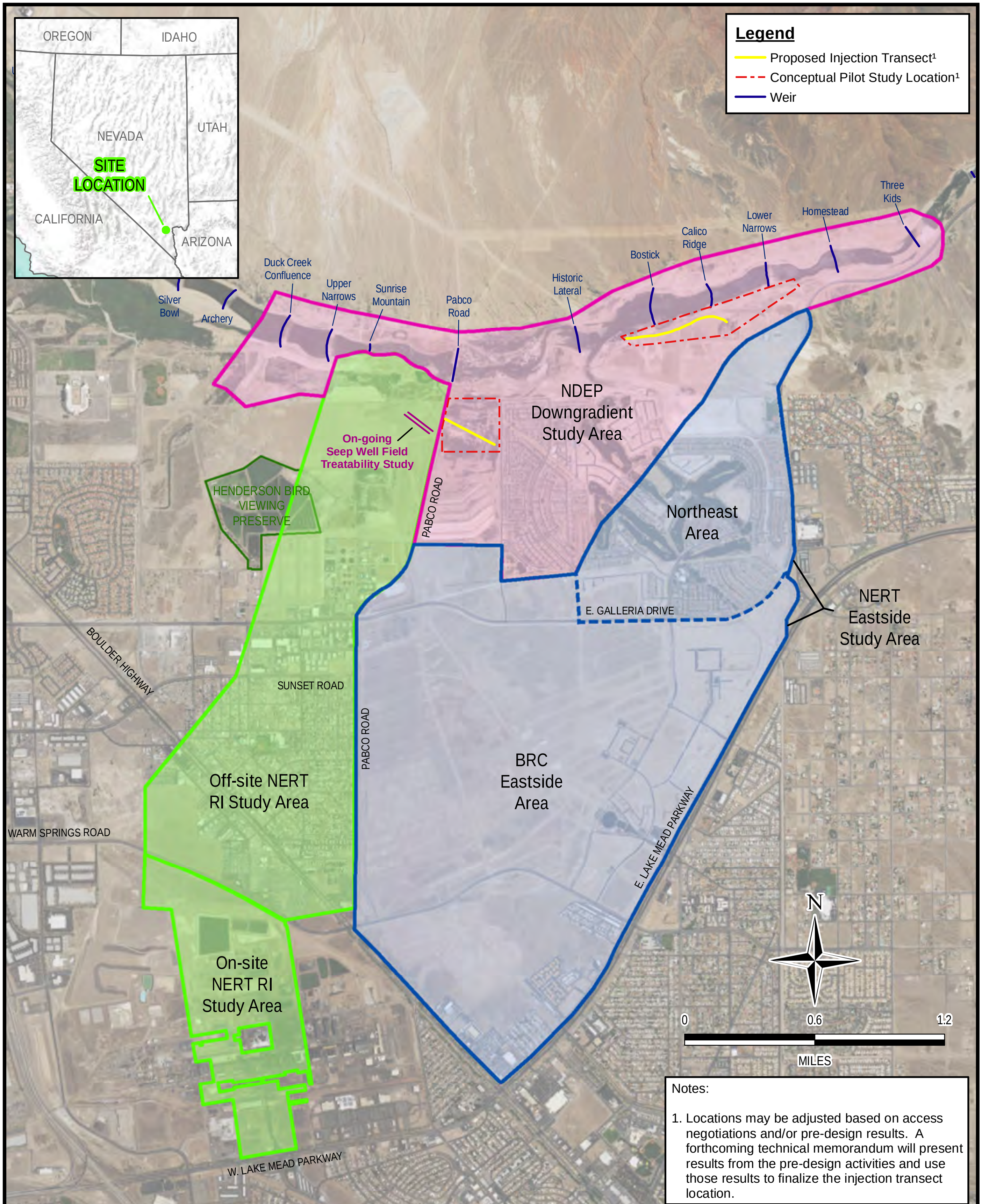
Figures



Notes:

1. Locations may be adjusted based on access negotiations and/or pre-design results. A forthcoming technical memorandum will present results from the pre-design activities and use those results to finalize the injection transect location.

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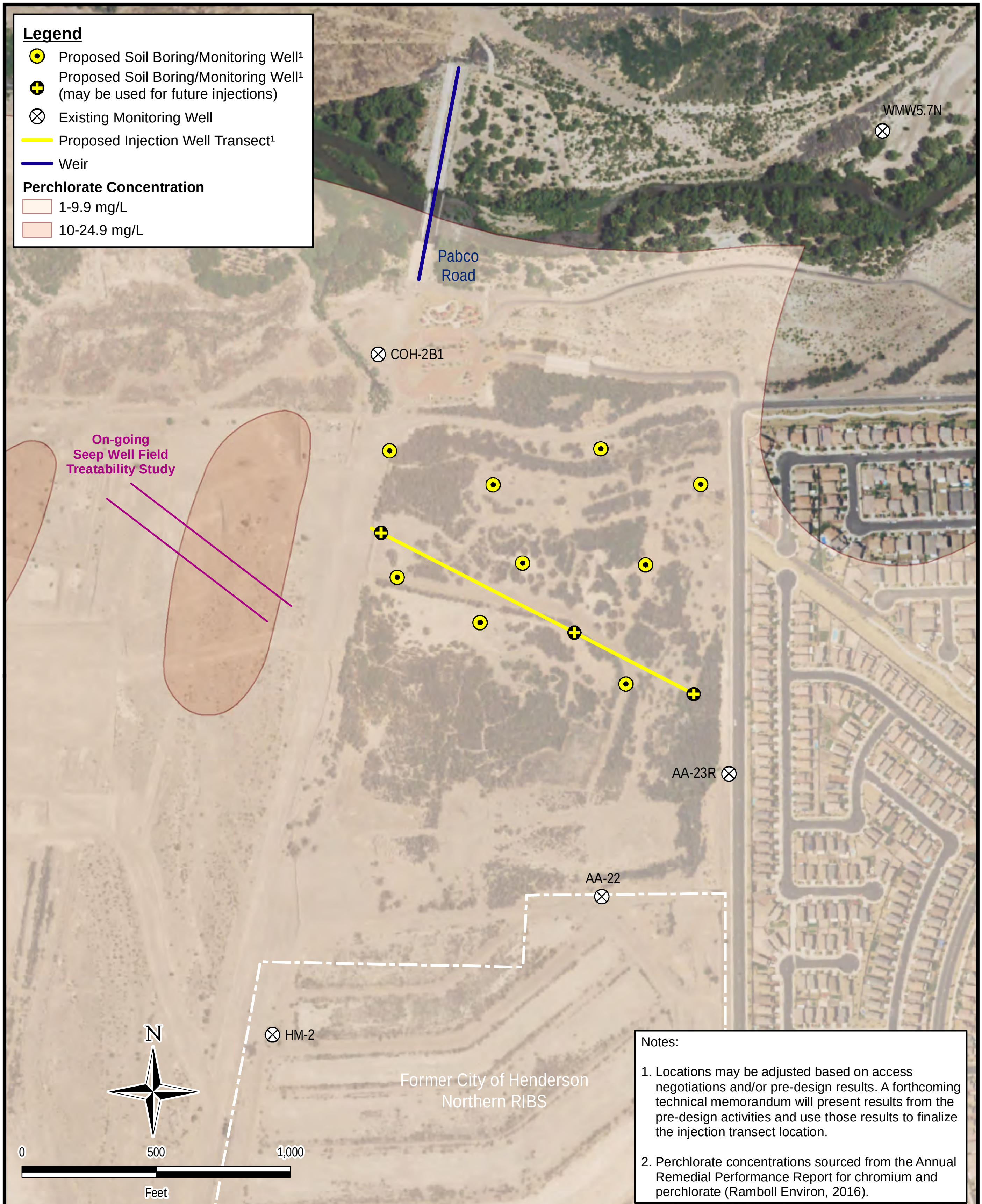
TETRA TECH www.tetratech.com 150 S. 4th Street, Unit A Henderson, Nevada 89015 Phone: (702) 854-2293	NEVADA ENVIRONMENTAL RESPONSE TRUST LAS VEGAS WASH PILOT STUDY WORK PLAN SITE LOCATION	Project No.: 114-520225 Date: AUGUST 17, 2017 Designed By: SRA Figure No. 1



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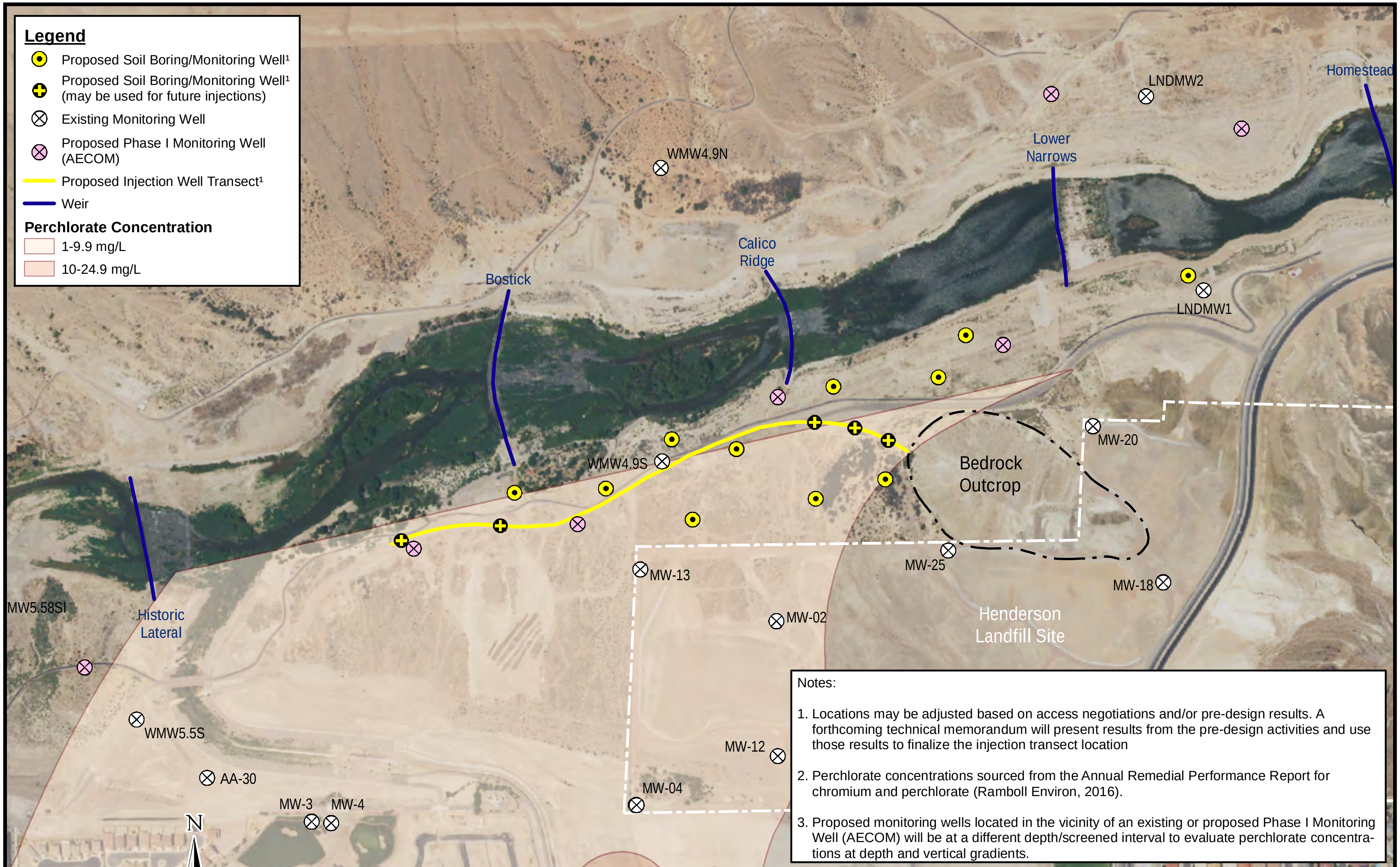
NEVADA ENVIRONMENTAL RESPONSE TRUST

LAS VEGAS WASH PILOT STUDY WORK PLAN

CONCEPTUAL PRE-DESIGN LAYOUT
IN THE VICINITY OF TRANSECT 1A

Project No.:	114-520225
Date:	AUGUST 17, 2017
Designed By:	SRA

Figure No.
2



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LAS VEGAS WASH PILOT STUDY WORK PLAN

CONCEPTUAL PRE-DESIGN LAYOUT
IN THE VICINITY OF TRANSECT 1B

Project No.:	114-520225
Date:	AUGUST 17, 2017
Designed By:	SRA
Figure No.	3

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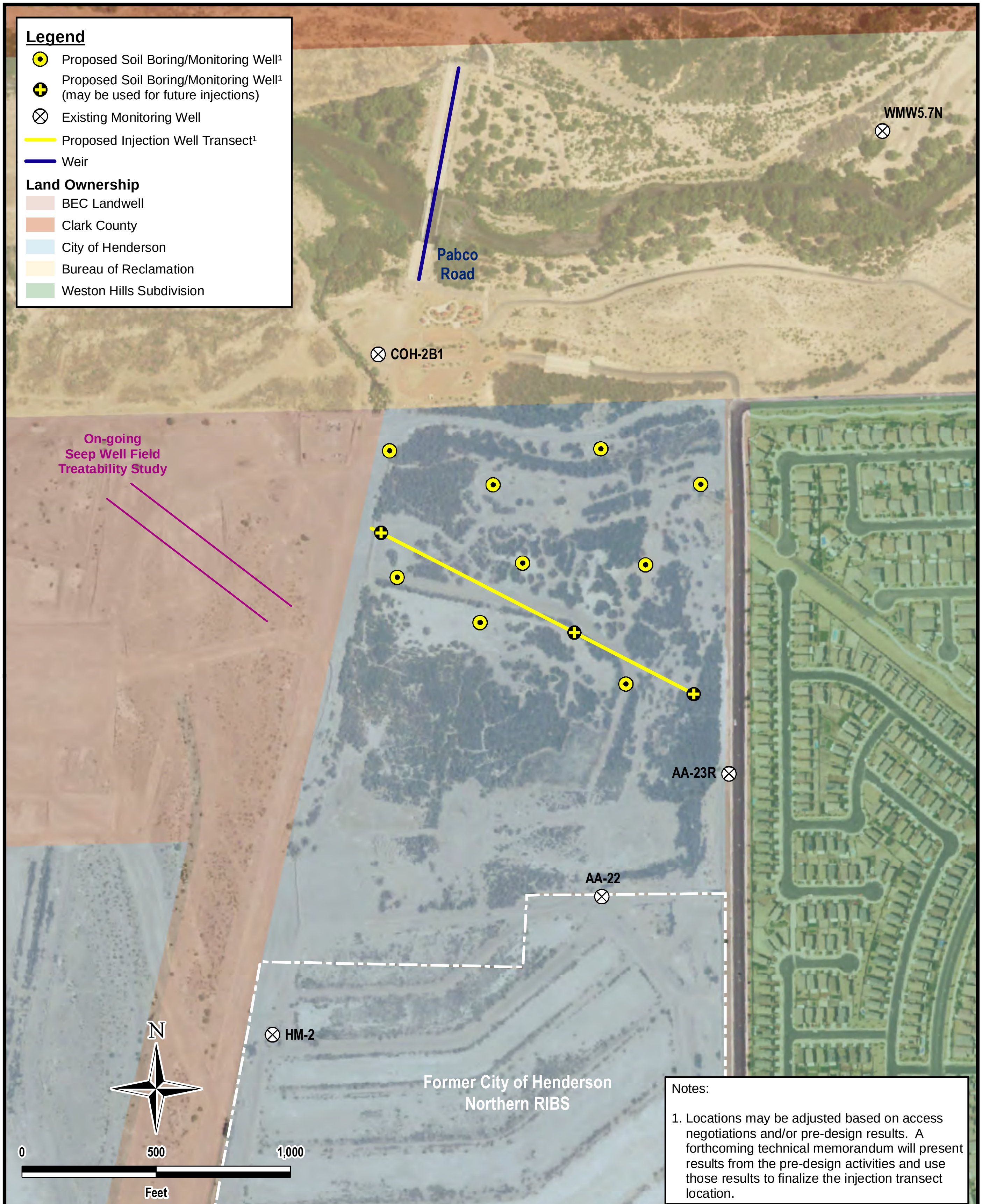

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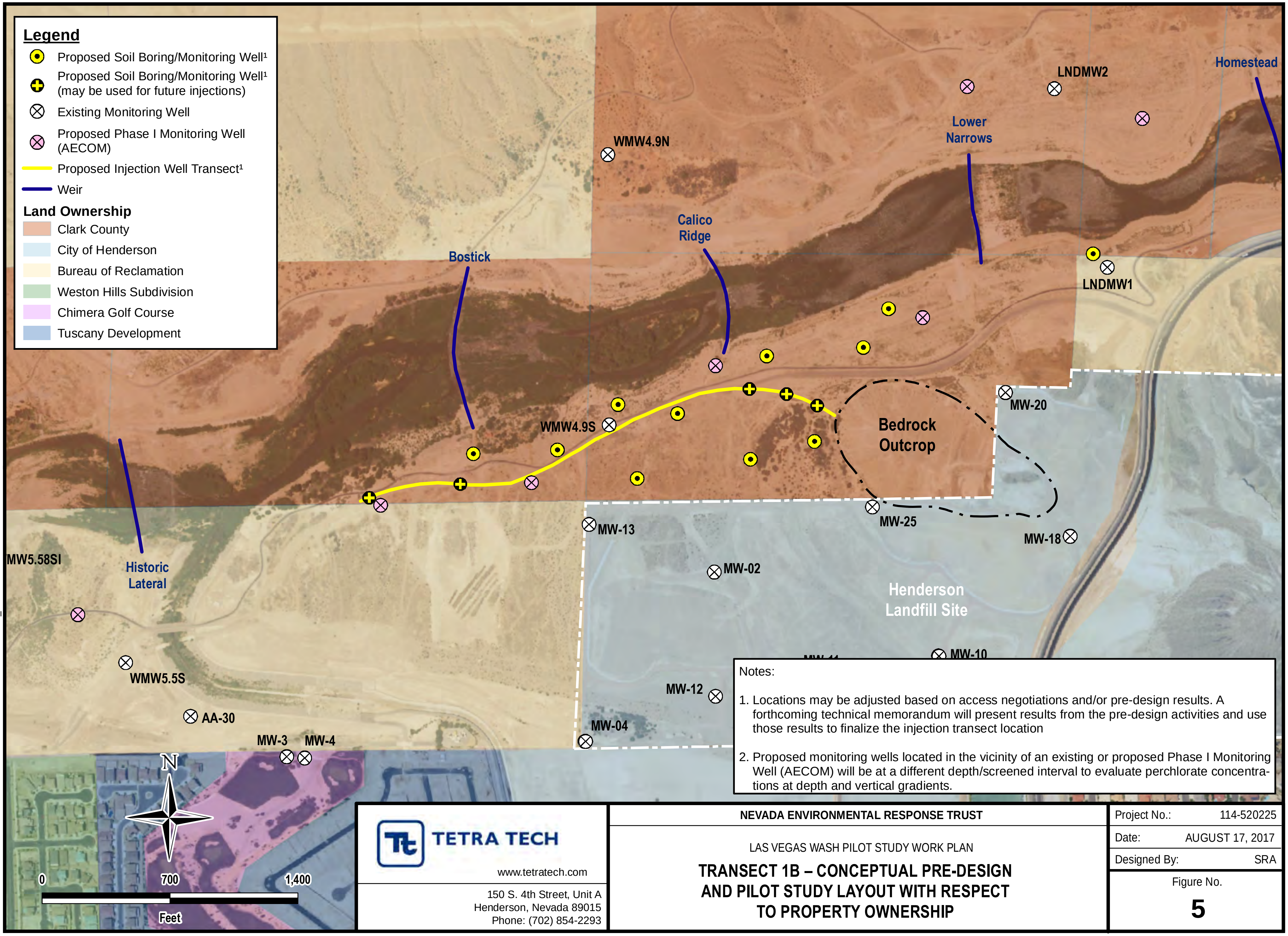
NEVADA ENVIRONMENTAL RESPONSE TRUST

LAS VEGAS WASH PILOT STUDY WORK PLAN

TRANSECT 1A – CONCEPTUAL PRE-DESIGN AND PILOT STUDY LAYOUT WITH RESPECT TO PROPERTY OWNERSHIP

Project No.:	114-520225
Date:	AUGUST 17, 2017
Designed By:	SRA
Figure No.	4



Notes:

1. Locations may be adjusted based on access negotiations and/or pre-design results. A forthcoming technical memorandum will present results from the pre-design activities and use those results to finalize the injection transect location

2. Proposed monitoring wells located in the vicinity of an existing or proposed Phase I Monitoring Well (AECOM) will be at a different depth/screened interval to evaluate perchlorate concentrations at depth and vertical gradients.

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TRANSECT 1B – CONCEPTUAL PRE-DESIGN AND PILOT STUDY LAYOUT WITH RESPECT TO PROPERTY OWNERSHIP

Project No.:	114-520225
Date:	AUGUST 17, 2017
Designed By:	SRA
Figure No.	5

\\TTS100FS1\PROJECTS\NERT\GIS FIGURE DATABASE\MXD\WORK PLAN\5_TRANSECT 1B - LOCATION WITH PROPERTY OWNERSHIP.MXD