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Surface Water and Seep Grab Sampling Technical Memorandum

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

Final

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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.

Sally Bilodeau — 11/1/16

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Contents

List of Appendices

List of Figures

List of Tables

List of Abbreviations

cfs	cubic feet per second
EB	equipment blank
EPA	United States Environmental Protection Agency
FB	field blank
FD	field duplicate
KM	seep sample stations sampled by Kerr McGee
LVW	Las Vegas Wash
LW	Designation for mid-channel surface water sampling locations
LWC	Designation for sampling locations from side inflows, ditches, tributaries
mg/L	milligrams per liter
MS	Matrix Spike
MSD	Matrix Spike Duplicate
NDEP	Nevada Division of Environmental Protection
NERT	Nevada Environmental Response Trust
NTU	Nephelometric Turbidity Units
QAPP	Quality Assurance Project Plan
RI	Remedial Investigation
RM	River Mile
RPD	Relative Percent Difference
SWIP	Surface Water Investigation Plan
SWSP	Surface Water Sampling Plan
t/ss	tributary/side stream
µg/L	micrograms per liter
µS/cm	micro-siemens per centimeter
USGS	United States Geological Survey

Definition of Key Terms

Groundwater discharge: approximate location where groundwater is entering the surface, either on land or under water. The groundwater may or may not contain perchlorate.

Groundwater flux: measurement of the amount of groundwater discharging per unit of time (for example gallons per minute or cubic feet per second).

Perchlorate discharge: approximate location where groundwater containing perchlorate is discharging to the surface, either on land or under water.

Perchlorate flux: measurement of the amount of perchlorate discharging per unit of time (e.g. pounds per day).

Potential discharge: a location where discharge may be occurring, but where there is still uncertainty.

Seep: an area of slow discharge of groundwater on land or into a body of water.

Spring: a discrete place where groundwater actively discharges on land or into a body of water. Springs often create small rivulets on the ground surface, and may be visible underwater as sand boils or areas of reduced cloudiness.

Sump: a manmade collection structure used to manage surface runoff.

1.0 Introduction

This technical memorandum (memo) describes the sampling locations and results of the surface water and seep sampling conducted for the Nevada Environmental Response Trust (NERT) Remedial Investigation (RI) - Downgradient Study Area in Henderson, Nevada (**Figure 1**). This memo has been prepared as in interim deliverable in advance of the forthcoming NERT RI Report. Except as noted in this memo, the work was conducted per the procedures and methods described in the Surface Water Sampling Plan (SWSP) approved by Nevada Division of Environmental Protection (NDEP) on April 27, 2016.

The overall objective of the Downgradient Study Area investigation is to identify subsurface pathways within the Downgradient Study Area through which perchlorate-impacted groundwater is entering Las Vegas Wash (LVW). The surface water sampling program is being conducted to aid in meeting that objective. The surface water investigation will consist of several tiers of sampling to characterize surface water concentrations of key constituents under a variety of flow conditions. The concentration data combined with estimated flow rates from simultaneously measured water level measurements will be used to identify reaches along the LVW where a significant and quantifiable perchlorate mass flux is entering the LVW. While quarterly sampling has been conducted at a limited number of locations in the past few years, the majority of the locations previously sampled have not been sampled since 2011 or earlier. As part of the planning phase for future surface water investigation activities in the Downgradient Study Area, the first tier of the surface water sampling program, which is the subject of this technical memorandum, consists of a comprehensive grab sampling of these historical surface water sample locations. The data quality objectives, sampling methods and procedures, and sampling plan for this comprehensive grab sampling are described in the SWSP[1], which was designed to answer the following study questions:

- What are the current nature and concentration distributions of the target contaminants (i.e., perchlorate, chlorate, chromium, and hexavalent chromium) in the LVW?
- Which of the target contaminants are currently present in significant concentrations to be included in future LVW investigations?
- Are contaminant concentrations different in 2016 than in previous years for which data are available?
- Are patterns of target contaminants in the LVW consistent over time?
- Can ratios of bromide and chloride and concentrations of total dissolved solids be used to help identify the loci of potential groundwater inputs to the LVW?
- Can bromide be considered a possible candidate for future tracer tests?

The sampling and analytical results of these grab samples are summarized in this technical memorandum. As an interim deliverable, this document presents the sampling and analytical results of the grab samples collected per the SWSP. These data will serve as the basis for the forthcoming Surface Water Investigation Plan (SWIP). All surface water data will be further evaluated by NERT during the preparation of the RI report. Based on the results of this first tier, a second tier of surface water investigation (presented in the SWIP) is planned that will include a detailed sampling program and flow gaging across several cross-sections of the LVW.

[1] AECOM, 2016. Surface Water Sampling Plan. NERT Remedial Investigation – Downgradient Study Area, Nevada Environmental Response Trust Site, Henderson, Nevada. Final. April.

2.0 Sampling Procedures

Surface water and seep sampling was conducted consistent with the SWSP in May 2016. Daily field reports are provided in **Appendix A**. Daily Health and Safety sheets are provided in **Appendix B.** Details recorded when the samples were obtained are contained in the Log Book provided in **Appendix C.** This appendix also contains the calibration logs for the field equipment used and Field Data Sheets for recording water quality readings.

AECOM's field team consisted of two environmental scientists who performed the field work in the Downgradient Study Area to collect surface water samples from a series of mid-channel locations (identified as LW stations on **Figure 2**) and locations collected from historic side inflows or ditches[2] (tributary/side stream [t/ss]"); identified as LWC stations on **Figure 2**). The location names are consistent with historic sampling conducted on the LVW and tributaries. Some of the "LWC" t/ss samples were located in tributaries or side streams under current post-weir construction conditions. Others were in the LVW proper, although usually along a bank indicating the coordinates could have historically been in the side stream. The target locations for these surface water samples are provided in **Table 1**. The digits following "LW" indicate the river mile (RM) measured from the high pool elevation of Lake Mead.[3] Samples collected near each other are designated with "_1", "_2", etc. to distinguish them from main stations. In addition, part of the May 2016 investigation involved attempting to re-establish the locations of all seep sampling stations that were sampled by Kerr McGee in 2000 (identified as KM samples) (**Table 2**; **Figure 2**). Historically documented seeps include the "GCS5 seep", sampled by SNWA as location LWC3.7. This sampling location is located very near the seep KM-67, and it is likely this is the same groundwater discharge. 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. Actual seep locations compared to historically documented seep locations are provided in **Figure 3**.

2.1 Pre-Sampling Meeting

On May 9, 2016, the field team arrived at the Downgradient Study Area and met with Dr. Weiquan Dong of NDEP. Dr. Dong and the field team performed a pre-sampling site reconnaissance of the LVW access points and weirs. During this site reconnaissance, the locations of LW6.05 and LWC6.1 were shifted from the coordinate locations to locations in the LVW and t/ss that are the actual target. Additionally, the sampling of the "Kerr McGee Seep" was discussed and the location was shown to the AECOM field staff. Note that the sampling location for the "Kerr McGee Seep" is an open pit/sump that collects and contains the seep water. The location is referred to as "Kerr McGee Seep", but is actually the water contained in the sump. The water in this sump could be impacted by surface water and the concentrations of perchlorate in the sample may not necessarily be representative of the groundwater/seep concentrations.

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[2] Shanahan, S.A. and X. Zhou, Ph.D. 2013. "Appendix M: Lake Mead and Las Vegas Wash Water Quality Sampling Nomenclature" to "Las Vegas Wash Surface Water Quality Monitoring and Assessment Plan" Southern Nevada Water Authority. Prepared for Las Vegas Wash Coordination Committee, Research and Environmental Monitoring Study Team. September.

[3] Shanahan, S.A. and X. Zhou, Ph.D. 2013. "Appendix M: Lake Mead and Las Vegas Wash Water Quality Sampling Nomenclature" to "Las Vegas Wash Surface Water Quality Monitoring and Assessment Plan" Southern Nevada Water Authority. Prepared for Las Vegas Wash Coordination Committee, Research and Environmental Monitoring Study Team. September.

2.2 Sampling Procedures

Sampling was conducted on weekdays between May 10 and May 18, 2016. Samples were collected using a peristaltic pump with dedicated tubing. Samples requiring field filtration were passed through dedicated in-line 0.45 micron filter cartridges. Samples in the LVW were collected as much as practicable during the daily low-flow period. Timing of collection of the samples compared to daily flow records from the United States Geological Survey (USGS) stream gages on the LVW are provided in for each sampling day in **Figure 4** through **Figure 10**. Flows from the stream gage near Pabco Road (USGS 09419700; approximately RM 6) and at Three Kids Wash (USGS 09419753; approximately RM 3.8) were used. After collection, samples were immediately stored on ice, and transported that day to Silver State Analytical (dissolved hexavalent chromium) and the local Test America facility for shipment to their Irvine, California, laboratory for analyses of perchlorate, chlorate, dissolved chromium (i.e., total concentration of hexavalent and trivalent chromium), total dissolved solids, chloride, and bromide.

The sampling team began at the station furthest downstream (LW3.1, located approximately 3,000 feet east of the Downgradient Study Area boundary) and proceeded westward towards the most upstream station (LW7.2 near the western edge of the Downgradient Study Area). Stations in the LVW were accessed with a canoe. Water depth was often too low for paddling so the field team walked the LVW and the canoe was used to provide a stable base for equipment during sampling.

Along the east-to-west traverse, the locations of historic seeps were searched for using both reported coordinates and field mapping. Where those locations were found to be currently submerged by the LVW or buried by weir structures, stations were searched for by walking in a grid pattern and looking for visual clues (upwelling or changes in water clarity) and monitoring for water quality changes using a YSI multi-parameter sonde, which measures temperature, specific conductivity, turbidity, dissolved oxygen, and pH (**Table 3**). Where those seeps were presumed based on coordinates to be currently located on land, stations were searched for by walking in a grid and looking for active groundwater discharge, moist soil, and precipitate from evaporated discharge. Historic soil pit locations were searched for by looking for physical signs of past digging. The observations made at each seep location are provided in **Table 3**.

2.3 Deviations from Sampling Plan

Sample LW5.7 was collected at 1345 on May 13, 2016, when flow on the Pabco Road gage was 339 cubic feet per second (cfs); the median flow at Pabco Road was 324 cfs, occurring at 1330. The flow at Pabco Road gage at 1345 was only approximately 5 percent above the observed median when sample LW5.7 was obtained. Considering that the sampling location was approximately one-third of a mile downstream of the gage, the sample would be representative of lower flow conditions than observed at 1345 at Pabco Road. This is further supported by the median flow measurement of 342 cfs at 1500 at Three Kids Wash gage, which is 2 miles downstream of sample location LW5.7. Therefore, while sampling may have occurred just past the median flow at Pabco Road gage, it did not impact the overall SWSP, and the sampling was not out of compliance with the objectives. This is therefore not a deviation from the SWSP, but the additional flow in the LVW may have “diluted” the concentrations of perchlorate and other constituents in sample LW5.7 as discussed in Section 5.

Two locations (LW6.05 and LWC6.1) were adjusted per on-site discussions with Dr. Dong, NDEP (Section 2.1). In addition, a sample located in the sump that collects the water from the “Kerr McGee Seep” (KM-S) was added to the sampling plan, also as requested by Dr. Dong.

Of the 18 historic seep locations, only three (KM-45, KM-67 and KM-71) could be located in the field. All other stations may have been buried by weir and bank construction, submerged by the expanded stream channel and associated sediments, temporarily dried up under the ongoing drought conditions, or obscured by dense vegetation. The observations made at each seep location are provided in **Table 2**. Of those three located stations, two (KM-67 and KM-71) were sampled. Seep KM-67 was found to be submerged on the south side of the LVW. Seep KM-71 was located in a backwater channel on the north side of the LVW. KM-45 was identified as a pit located near the Pabco Road Weir. The pit was dry and therefore not sampled.

3.0 Analytical Program

The analytical program was focused on Downgradient Study Area groundwater constituents that may affect water quality in the LVW (**Table 4**). Bromide was added because it may be used as a tracer in future investigations. Surface water and seep samples were analyzed for the following constituents:

- Perchlorate (United States Environmental Protection Agency [EPA] Method 314.0);
- Chlorate (EPA Method 300.1);
- Chromium, Dissolved (EPA Method 200.8 [ICP-MS]);
- Hexavalent Chromium, Dissolved (EPA Method 218.7);
- Chloride (EPA Method 300.0);
- Bromide (EPA Method 300.0); and
- Total Dissolved Solids (Standard Method 2540C).

As directed by NDEP, field-filtering of water samples for perchlorate analysis was not required. Filtering for dissolved chromium and hexavalent chromium analysis was conducted in the field using a 0.45-micron filter. Copies of the analytical results and chain-of-custody records are provided in **Appendix D**.

4.0 Data Validation

Consistent with the NDEP requirements, all data were validated to at least Stage 2B and a minimum of 10 percent of the data were validated according to Stage 4 data validation procedures. Because validation data were provided by the laboratories on a data package basis, 5 out of 24 samples (21 percent) were validated using these Stage 4 procedures. Due to the relatively small number of samples as well as the need to conduct Stage 4 validation for all methods and inclusion of both seep and surface water samples, the actual numbers subjected to Stage 4 validation was approximately twice the minimum requirement. The overall project requirements and completeness levels were met. As presented in **Table 5,** there were 24 primary samples and 7 quality control samples. Each sample contained 7 analyses for a total of 217 results. A total of 23 results, or 11 percent of the total, were qualified. No results were rejected. Based upon the Stage 2B and Stage 4 data validation all other results are considered valid and usable for all purposes. The Data Validation Summary Report is attached as **Appendix E** and provides detailed information about the data reviewed and results qualified.

5.0 Summary of Surface Water and Seep Data

Surface water samples were collected from 14 locations in the LVW channel (LW3.1, LW3.4, LW3.75, LW3.85, LW4.1, LW4.95, LW5.3, LW5.5, LW5.7, LW5.9, LW6.05, LW6.7, LW6.85, and LW7.2) and 7 locations in t/ss (LWC3.7, LWC4.1, LWC4.6, LWC6.1, LWC6.1_1, LWC6.1_2, and LWC6.3_1) (**Figure 2**). Samples were collected from three seeps (KM-678, KM-71, and KM-S). **Table 6** presents the analytical results of surface water and seep sampling.

5.1 Field Water Quality Parameters

At each location, a meter was used to measure pH, specific conductivity, dissolved oxygen, turbidity and temperature in the field (**Table 3**). Temperature ranged from 19.47 to 28.95 degrees Celsius. The water in the sump at the Kerr McGee Seep (KM-S) had the lowest temperature. Samples in the LVW collected later in the day tended to be warmer. Specific conductivity ranged from 1,068 to 8,152 micro-siemens per centimeter (µS/cm). The highest conductivity of 8,152 µS/cm was measured at LWC6.3_1 (the NERT outfall). Most readings in the LVW were 2,000 – 3,000 µS/cm and the seeps were generally higher (3,171 µS/cm at KM-S and 4,167 µS/cm at KM-67). The pH measurements were generally near neutral to slightly alkaline, ranging from 6.33 (LWC6.3_1) to 8.54 (LW4.95). Dissolved oxygen in the surface water ranged from 5.89 to 13.24 milligrams per liter (mg/L), and most locations exceeded 100 percent saturation (saturation was corrected for temperature and atmospheric pressure). In the seeps, dissolved oxygen was low in KM-71 (0.52 mg/L; 6.4 percent saturation) and KM-67 (0.63 mg/L; 7.4 percent saturation), but moderate at KM-S (4.07 mg/L; 51.4 percent saturation). Turbidity ranged from 0.0 to 35.1 Nephelometric Turbidity Units (NTUs). The seeps were generally clear (0.0 to 0.4 NTU).

5.2 Laboratory Analyses Results

In May 2016, the concentrations of target contaminants in the LVW and t/ss were generally lower in most locations sampled than in previous sampling events. Plots of historic concentrations (since 2002) and May 2016 concentrations of perchlorate, dissolved chromium, hexavalent chromium and total dissolved solids for each sampling location (with data) are provided in **Appendix F**. The results of the 2016 sampling are presented in **Figure 11** through **Figure 23**, and discussed below.

5.2.1 Perchlorate

Perchlorate concentrations in the LVW have generally decreased over time (**Appendix F**).

Upper Reach (LW7.2 to Proposed Location of Sunrise Mountain Weir)

Concentrations of perchlorate in surface water are low in the upper portions of the LVW [<0.95 at LW7.2, 1.0 J micrograms per liter (µg/L) at LW6.85, and <0.95 µg/L at LW6.7] (**Figure 11** and **Figure 12**). Groundwater emanating from the Kerr-McGee Seep that was collected in and sampled from the sump (KM-S) has dropped by several orders of magnitude due to the groundwater capture system; however perchlorate levels (85 µg/L) in the sump are higher than concentrations of perchlorate measured in samples from the LVW collected upstream of the Kerr McGee Seep location.

Pabco Road Reach (Proposed Location of Sunrise Mountain Weir to LW5.9)

By the time water in the LVW reaches the Pabco Road Weir, perchlorate concentrations increase to 17 µg/L and 15 µg/L (LW6.05 and LW5.9, respectively). It is not known how much this increase is attributable to the addition of perchlorate that may be transported via groundwater discharge from sump area which is collecting the Kerr-

McGee Seep water and how much may be attributable to other, more diffuse groundwater inputs from uncharted paleochannels, underground sources, or other discharges (e.g., the wastewater outfall sampled as LWC6.1_1). The sample collected from the wastewater outfall labeled LWC6.1_1 had a perchlorate concentration of 7.3 µg/L. This sample may be from the TIMET outfall or City of Henderson wastewater treatment plant discharge. Review of coordinates of the outfalls indicated this may be associated with the City of Henderson discharge, but this will be confirmed during the implementation of the upcoming SWIP.

Main Reach (LW5.9 to Homestead Weir)

While the sample collected at LW5.7 (8.3 µg/L) may leave the impression that perchlorate concentrations may dilute below the Pabco Road Weir, there is uncertainty associated with the increased flow rates at the time of sampling. This uncertainty cannot be quantified using the existing data. The influence of flow on the concentrations of perchlorate is included as an objective in the upcoming SWIP. . As discussed in Section 2.2, the sample at LW5.7 was collected during a higher flow period of the daily cycle, with estimated flows approximately 90 percent higher than during the sampling of LW5.9. Those higher flows are the result of daily fluctuations in wastewater discharges from outfalls, some of which are located upstream of the Downgradient Study Area and would likely have water quality characteristics similar to samples collected at LW7.2 and LW6.7, where no perchlorate was detected above laboratory reporting limits.

In the region of the Historic Lateral Weir and the Proposed Historic Lateral Weir Expansion, sampling results from LW5.5 and LW5.3 indicate a small rise in perchlorate concentration, increasing from 15 and 17 µg/L at stations near the Pabco Road Weir to 19 and 23 µg/L near the Historic Lateral Weir at stations LW5.5 and LW5.3, respectively.

Near the eastern edge of the Henderson Landfill Site (LW4.95), perchlorate results indicate some dilution (15 µg/L), however similar to the results from LW5.7 much of that can be explained by the higher flows at the time of sampling (approximately 40 percent higher than at the time of collection for LW5.5 and LW5.3). Perchlorate concentrations increased from 19 to 23 µg/L near the Historic Lateral Weir to approximately 50 µg/L near the Homestead Weir. Near the western edge of the landfill, samples collected in the LVW (LW4.1, LWC4.6 and LWC4.1) indicate groundwater discharge in that area has a higher concentration of perchlorate. The concentrations of perchlorate at LW4.1, LWC4.1, and LWC4.6 are indistinguishable within the variability of the data, but an overall increase in perchlorate can be seen between Historic Lateral Weir and Homestead Weir.

Three Kids Reach (Homestead Weir to Rainbow Gardens Weir)

Sampling results indicate some dilution of perchlorate downstream of the Homestead Weir, dropping from 50 µg/L above the Homestead Weir (LW4.1) to 35 µg/L upstream of the Three Kids Weir (LW3.85). A sample collected below the Three Kids Weir (LW3.75) had a lower perchlorate result; however this may in part be attributable to the 25 percent higher flows at the time of sampling. Due to the uncertainty associated with distance between samples and the potential variability of flows through the LVW from various sources, no quantitative conclusions can be drawn regarding the measured differences in perchlorate concentrations. Note that additional sampling to be performed in this reach under the planned SWIP may provide confirmation of these observations.

Below the Three Kids Weir, a spring was located discharging directly into the LVW from rip rap placed along the southern bank. Discharge from that spring was visibly clearer than water in the LVW and had a significantly different field water-quality signal (temperature, specific conductivity, pH, dissolved oxygen, and turbidity). The concentration of perchlorate from the spring at KM-67 (1,500 µg/L) was two or more orders of magnitude higher than any other samples collected during this program. Due to the physical configuration of that discharge, the rate of flow could not be readily quantified. A sample was also collected from the LVW approximately 50 feet up upstream of the KM-67 spring. That sample (LWC3.7) was located near the southern toe of the Three Kids Weir and had a perchlorate concentration of 61 µg/L. LWC3.7 is the location of the GCS5 seep and may be targeting the same seep as the sample collected at KM-67.

Downstream Reach (Rainbow Gardens Weir to LW3.1)

Samples collected during the May 2016 sampling event did not provide an estimate of perchlorate concentration immediately after the mixing of KM-67. The next sample downstream is at RM 3.4, below Rainbow Gardens Weir. Some additional contaminated groundwater may be entering the Wash from the south in the vicinity of KM-67, however the nearby topography and geology suggests a groundwater divide a short distance downstream. In this portion of the LVW, the valley floor crosses the volcanic rocks of the Horse Spring Formation (Rainbow Garden and Frenchman Mountain). Those rocks represent a topographic high to the north. A short cliff consisting of lithified alluvial deposits is located approximately 100 feet downstream of KM-67, representing a topographic high extending to the south. With the water table typically reflecting topography, these features suggest the presence of groundwater divides in the vicinity of the Three Kids Weir. Faulting is also present in this area. The groundwater flow in this area is complex and not well characterized. There may be groundwater upwelling and or a groundwater divide in the vicinity of the Three Kids Weir.

Samples collected in the LVW downstream of the Three Kids Weir had perchlorate levels ranging from 52 µg/L (LW3.4 below the Rainbow Gardens Weir) to 51 µg/L (LW3.1 above the Fire Station Weir). While those samples were collected closer to the southern bank of the Wash, it is likely that they were representative of fully mixed samples of the Wash. The channel in those areas is relatively narrow with higher flow velocity.

5.2.2 Chlorate

Chlorate was detected above the detection limit (20 µg/L) in all samples from the LVW channel, two of three seeps, and in all t/ss except one location in the wasteway (LWC6.1_2) and the NERT Outfall (LWC6.3_1). Chlorate concentrations ranged from 14 J to 4,400 µg/L, with the lowest detected concentration in the KM-71 seep and the highest concentration in the KM-67 seep. Chlorate was not detected in the sump water collecting the “Kerr McGee Seep” (KM-S). Other surface water samples ranged from 86 to 260 µg/L. There was no discernible pattern in chlorate concentrations (**Figure 13 and Figure 14**).

In the Upper Reach (KM7.2 to proposed location of Sunrise Mountain Weir), chlorate concentrations above Duck Creek Confluence Weir were 180 to 240 µg/L, indicating reclaimed water (i.e., non-NERT outfalls and discharges to the LVW located upstream of the Downgradient Study Area) may be a significant source of chlorate to the LVW.

5.2.3 Dissolved Chromium and Hexavalent Chromium

Dissolved chromium concentrations in the LVW have generally remained consistent over time (**Appendix F**). Hexavalent chromium concentrations have decreased.

Dissolved chromium was detected above the detection limit (0.5 µg/L) in surface water at one location in LVW, in four t/ss to the LVW, and in one of the three seeps. Dissolved chromium concentrations ranged from 0.51 J to 2.2 µg/L (LWC6.3_1) in the LVW and t/ss. Concentrations ranged from <0.5 to 6.3 µg/L (KM-67) in the seeps (**Figure 15** and **Figure 16**). In general, dissolved chromium concentrations were low and the input from KM-67 did not appear to increase concentrations of chromium outside of the presumed mixing zone of KM-67 and also was not reflected in downstream samples (i.e., concentrations downstream of KM-67 were similar to those upstream of KM-67).

Hexavalent chromium was detected above the detection limit (0.090 µg/L) in one sample location (seep KM-67; at 10 µg/L). Hexavalent chromium was not detected in surface water from the other sample locations (**Figure 16**).

5.2.4 Total Dissolved Solids

Total dissolved solids concentrations in the LVW have generally remained consistent over time (**Appendix F**).

Total dissolved solids were detected above the method detection limit (5.0 to 100 mg/L) in all samples. Total dissolved solids concentrations ranged from 620 to 5,100 mg/L, with the lowest concentration in the wastewater channel (LWC6.1_2) and the highest concentration at the NERT outfall (LWC6.3_1). Other surface water samples ranged from 1,300 to 1,800 mg/L. In two of the seeps, total dissolved solids were within or slightly higher than the range of the LVW samples (1,400 mg/L at KM-71 and 2,000 mg/L at KM-S). Total dissolved solids at the seep near Three Kids Weir (KM-67) were approximately two times the upper end of the LVW samples (3,500 mg/L). As with other constituents (except perchlorate; **Figure 12**), the slightly higher concentration of total dissolved solids in KM-67 did not appear to impact concentrations outside of the presumed mixing zone of KM-67 (**Figure 18** and **Figure 19**).

5.2.5 Chloride and Bromide

Chloride was detected above the detection limit (5 to 130 mg/L) in all surface water and seep locations. Chloride concentrations followed the pattern of total dissolved solids, with highest concentrations near the NERT outfall (1,600 to 1,700 mg/L at LWC6.3_1 and its field duplicate) and were lowest at LWC6.1_2 (91 mg/L) (**Figure 20**). The other surface water concentrations, excluding seeps, ranged from 230 to 460 mg/L. In the Kerr-McGee Seep sump sample and one of the two sampled seeps, chloride concentrations were slightly higher than the upper end of the range of the LVW samples (460 mg/L at KM-S and 580 mg/L at KM-67). The chloride concentration in the other seep (KM-71) was within the range of the t/ss and LVW samples (230 mg/L).

Bromide was detected above the detection limit (0.25 – 2.5 mg/L) at 15 surface water locations and in two of the three seeps. Concentrations were highest at LW6.1 (3.5 mg/L) and lowest at LWC4.1 (0.36 J mg/L). The bromide concentrations in the seeps were within the range encountered in surface water (0.63 mg/L in KM-S, 1.3 – 1.6 mg/L in KM-71 and the field duplicate and undetected in KM-67) (**Figure 21**).

The ratio of chloride to bromide was calculated (**Table 7**). Where bromide was undetected, the detection limit was used as an estimate. The ratios were generally similar, with higher ratios noted upstream of Sunrise Mountain Weir (LW6.7), the seep water collected in the sump at KM-S, and in the NERT outfall (LWC6.3_1). Downstream of the Henderson Landfill Site (LW4.1 and LWC4.1), ratios were also higher. The ratio of chloride to bromide is provided in **Figure 22** and **Figure 23**.

5.2.6 Quality Control Samples

Quality control samples collected included field duplicates (FD), field blanks (FB), and equipment blanks (EB). As required, the laboratory ran required quality control procedures including matrix spike and matrix spike duplicate (MS/MSD) analysis. A detailed discussion of quality control and data validation is contained in **Appendix E**.

Three FD samples were collected (samples KM71-20160516-FD, LWC3.4-20160510-FD, and LWC6.3.1-20160517-FD) (**Table 5**). Acceptable relative percent difference (RPD) between the primary and duplicate sample was specified as 30 percent in the Quality Assurance Project Plan (QAPP). Acceptable field and analytical precision was demonstrated for all field duplicate pairs with the exception of bromide concentration in LWC3.4-20160510 and its FD which had a RPD of 36 percent. Bromide results in these two samples were qualified as estimates with a “J” flag.

Two EB samples were collected and analyzed (samples LWC6.1-20160516-EB and LW6.7-20160517-EB). No contaminants were detected.

Two FB samples were collected and analyzed (samples LW3.1-20160516-FB and LW6.7-20160517-FB). No contaminants were detected.

Sample concentrations were compared to concentrations detected in the EB and FB as required by the QAPP. No sample data were qualified based on the EB or FB results because no analytes were detected in those samples.

MS/MSD samples were run as required by the laboratory. No data were qualified due to MS/MSD recoveries that were outside of control criteria.

6.0 Conclusions

The results of the SWSP answered the following six study questions:

Study Question1. *What are the current nature and concentration distribution of the target contaminants in the LVW?*

Perchlorate concentrations in the LVW are generally slightly higher downstream than in the upstream areas. Upstream of the Pabco Road/original seep area, perchlorate concentrations are non-detect (at 0.95 µg/L) to low detection (1 µg/L). Perchlorate in the sample from the sump that collects groundwater from the Kerr McGee Seep (KM-S) is 85 µg/L. Since this sample is collected from an open sump, the concentrations of perchlorate likely represent the collected seep water and other potential sources. The water in the sump may discharge via groundwater transport to the LVW, which may contribute to the increase in concentrations in the LVW downstream of the seep. With distance from Pabco Road Weir to the Calico Ridge Weir, concentrations range from 8 – 20 µg/L. Downstream of the Calico Ridge Weir, concentrations in the LVW increase (26 – 52 µg/L), with concentrations 44-61 µg/L in the t/ss samples. KM-67, a seep located in the Three Kids Weir area, has the highest concentration of perchlorate (1,500 µg/L).

Chlorate concentrations upstream of the seeps area are similar to those downstream, indicating the major source of chlorate to the LVW is located upstream of the Downgradient Study Area.

Dissolved chromium is detected at low concentrations in the LVW and t/ss. The highest concentration, excluding seeps, is 2.2 µg/L found at LWC6.3_1 (the NERT outfall). Hexavalent chromium is undetected in the LVW and t/ss. Both dissolved and hexavalent chromium, however, were detected in the seep KM-67 (6.3 µg/L dissolved chromium and 10 µg/L hexavalent chromium were reported).

Study Question 2. *Which of the target contaminants are currently present in significant concentrations to be included in future LVW investigations?*

Given the general pattern of concentrations, dissolved and hexavalent chromium analyses do not need to be retained in future sampling events. Total dissolved solids, chloride and bromide should be retained for mapping physical characteristics. Some signature peaks of total dissolved solids appear in the seep KM-67.

Study Question 3. *Are contaminant concentrations different in 2016 than in previous years for which data are available?*

For perchlorate, concentrations are generally decreasing in the LVW with the exceptions of LW3.4 and LWC6.1_1, where concentrations measured in May 2016 are similar to historic concentrations. In the seeps, concentrations in KM-67 are similar to historic concentrations, whereas the concentrations in KM-71 have decreased from 4,630 µg/L in January 2002 to 13 µg/L in December 2002. Since that sample, May 2016 (1.55 µg/L) is the only sampling event.

Dissolved chromium and hexavalent chromium concentrations are lower or similar (when concentrations were low in historic data). Similarly, total dissolved solids concentrations have remained similar in the LVW since 2002. No historic data were available for total dissolved solids in the seeps.

Study Question 4. *Are patterns of target contaminants in the LVW consistent over time?*

As indicated in Study Question 3, above, concentrations of contaminants in 2016 are generally lower than the previous years for which data are available.

Study Question 5. *Can ratios of bromide and chloride and concentrations of total dissolved solids be used to help identify the loci of potential groundwater inputs to the LVW?*

Patterns of bromide, and the chloride:bromide ratios were inconclusive. It is not clear why the ratio would be higher downstream of the landfill. Higher chloride is expected in the NERT outfall, where the discharge consists of treated water where perchlorate and chlorate have been degraded to chloride. The ratios were not notably different in samples with high perchlorate (e.g., KM-67) than in the LVW surface water. However, given the few seeps sampled and the number of undetected bromide data, these conclusions have some uncertainty. Chloride and bromide data will be collected during the implementation of the SWIP.

Study Question 6. *Can bromide be considered a possible candidate for future tracer tests?*

As indicated in Study Question 3, above, concentrations of contaminants in 2016 are generally lower than the previous years for which data are available. Since bromide is present in surface water and seep locations, it is less desirable as a tracer than a chemical that is not present.

7.0 Recommendations

Based on the May 2016 sampling effort, it is apparent that additional sampling with flow differences removed from the uncertainty would be helpful to determining the patterns of contaminants in the LVW. Flows increase almost 100 percent between absolute low and absolute high on a daily basis. During the May 2016 event, on the days sampled (**Figure 4** through **Figure 10**) the average low flows were 183 cfs (Three Kids Wash) and 157 cfs (Pabco Road) whereas the maximum daily flows were 368 cfs (Three Kids Wash) and 362 cfs (Pabco Road). The maximum daily flows are 201 percent and 230 percent of the maximum daily flows at Three Kids Wash and Pabco Road, respectively. The increased flow could easily dilute concentrations. To minimize the impacts of flows on the concentrations of perchlorate in surface water (LVW main channel and t/ss locations), synoptic sampling of locations during both low and high flows should be conducted. This sampling will occur during the lowest and highest flows, not just lower or upper 50th percentile of flows. In addition, at a subset of locations, a third sample will be collected each day at "mid-flow". These samples will be collected near the USGS gages to provide the highest quality flow data on the LVW. Samples will be collected during all flow periods quasi-simultaneously be several sampling teams, and will occur daily for four days. Multiple rounds of sampling will help reduce the potential impact of flows or other uncertainties.

To help reduce uncertainty in the impact flows have on the concentration data, additional surface water level gages/transducers should be installed. This effort should be coordinated with the USGS to maximize its effectiveness and reduce redundancies between the USGW program and the Downgradient Study Area investigation.

At several locations in the LVW, previously identified seeps with high perchlorate concentrations could not be located. The locations of these historic/former seeps should be revisited and transect sampling conducted across the LVW to determine if the seeps are still active and if inputs of perchlorate can be determined. Transects should include upstream and downstream of the historic seeps, in case the point of discharge has moved due to weir construction or storm events.

In addition, perchlorate contour maps created from the groundwater sampling conducted in 2016[4] indicate the potential for perchlorate discharge near the Upper Narrows Weir, between the Historic Lateral Weir and the Bostick Weir, and near the Pabco Road Weir. These locations should be among those targeted with transect sampling.

To help identify perchlorate discharge/flux to the LVW, one of the sampling efforts should focus near the Three Kids Weir (KM-67 and LWC3.7 [GCS5 seep]), between Homestead Weir and Lower Narrows Weir, and between RM 6.5 and RM 6. Concentrations of perchlorate may be increasing (flow-dependent) around these locations. KM-67 is a seep with high concentrations of perchlorate (1,500 µg/L) and should be further investigated. Seep KM-67 could be a major contributor of perchlorate to the LVW. The flow of water from the seep KM-67 should be quantified. Measuring flow from an underwater seep is difficult but could be estimated using the flow differentials and differences between the perchlorate concentrations upstream and downstream of this seep. Any estimation of flow using these indirect techniques would not separately account for other potential contributions of flow/perchlorate in the area (i.e., additional smaller, unaccounted for seeps). The August 2016 preliminary draft version of the SWIP for the implementation of a comprehensive surface water investigation will be revised to reflect the recommendations of this Surface Water and Seep Grab Sampling Technical Memorandum.

[4] AECOM, 2016. Groundwater Sampling Technical Memorandum. NERT Remedial Investigation – Downgradient Study Area. Nevada Environmental Response Trust Site, Henderson, Nevada. October.

USGS is working on a seepage study that will measure temperature, specific conductivity, and flow at several locations in the LVW while incoming discharges from the wastewater outfalls upstream of the Downgradient Study Area are held constant. These data will also be used to help determine groundwater discharge areas to the LVW.

Figures

RM 8
Sunrise Mountain Weir (Proposed)
Duck Creek Confluence Weir
Historic Lateral Weir Expansion (Proposed)
Pabco Road ECS
Historic Lateral Weir
Calico Ridge Weir
Bostick Weir
Lower Narrows Weir
Homestead Weir
Three Kids Weir
RM 3
Fire Station Weir
Powerline Crossing Weir
Rainbow Gardens Weir
RM 4
RM 5
RM 6
RM 7
Upper Narrows Weir
Sunrise & Frenchman Mountains
River Mountains
Lake Las Vegas Parkway
Henderson Landfill Site
NERT RI Off-site Study Area
Henderson Bird Preserve
DOWNGRADIENT STUDY AREA
Three Kids Mine and Mill Site
C-1 Channel
Lake Mead Parkway
NERT RI On-site Study Area
Reference:
Google Earth Pro, Imagery Data 3/15/2016

OVERVIEW MAP

Legend

- Wetlands Trail
- Channels
- Northern Rapid Infiltration Basins
- River Mile (RM)
- NERT RI Downgradient Study Area
- NERT RI Off-site Study Area
- NERT RI On-site Study Area

NORTH

0 2,000
Feet

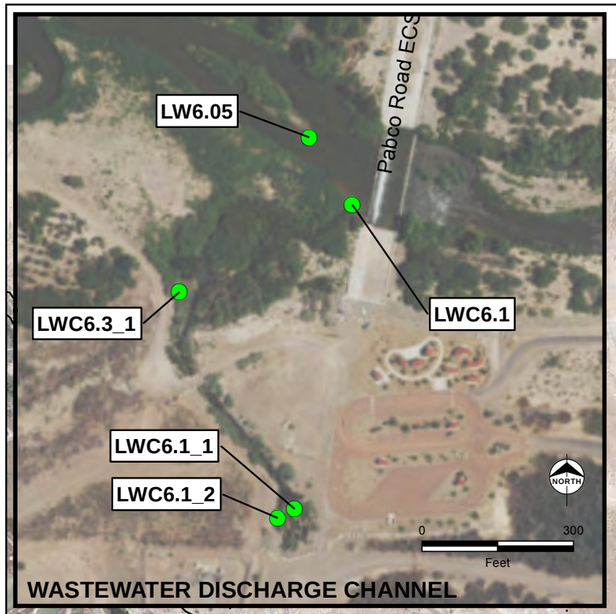
Scale 1:24,000
1 inch = 2,000 feet

NERT RI
Downgradient Study Area

DOWNGRADIENT STUDY AREA LOCATION MAP

Date: 10/24/2016 Project: 60477365

AECOM **Figure 1**



Legend

- Surface Water Sample Location - Seeps
- Surface Water Sample Location - LVW/Tributaries
- Weir
- Northern Rapid Infiltration Basins
- Wetlands Trail
- Channels
- NERT RI Downgradient Study Area
- NERT RI Off-site Study Area

NORTH

0 2,000

Feet

Scale 1:24,000

1 inch = 2,000 feet

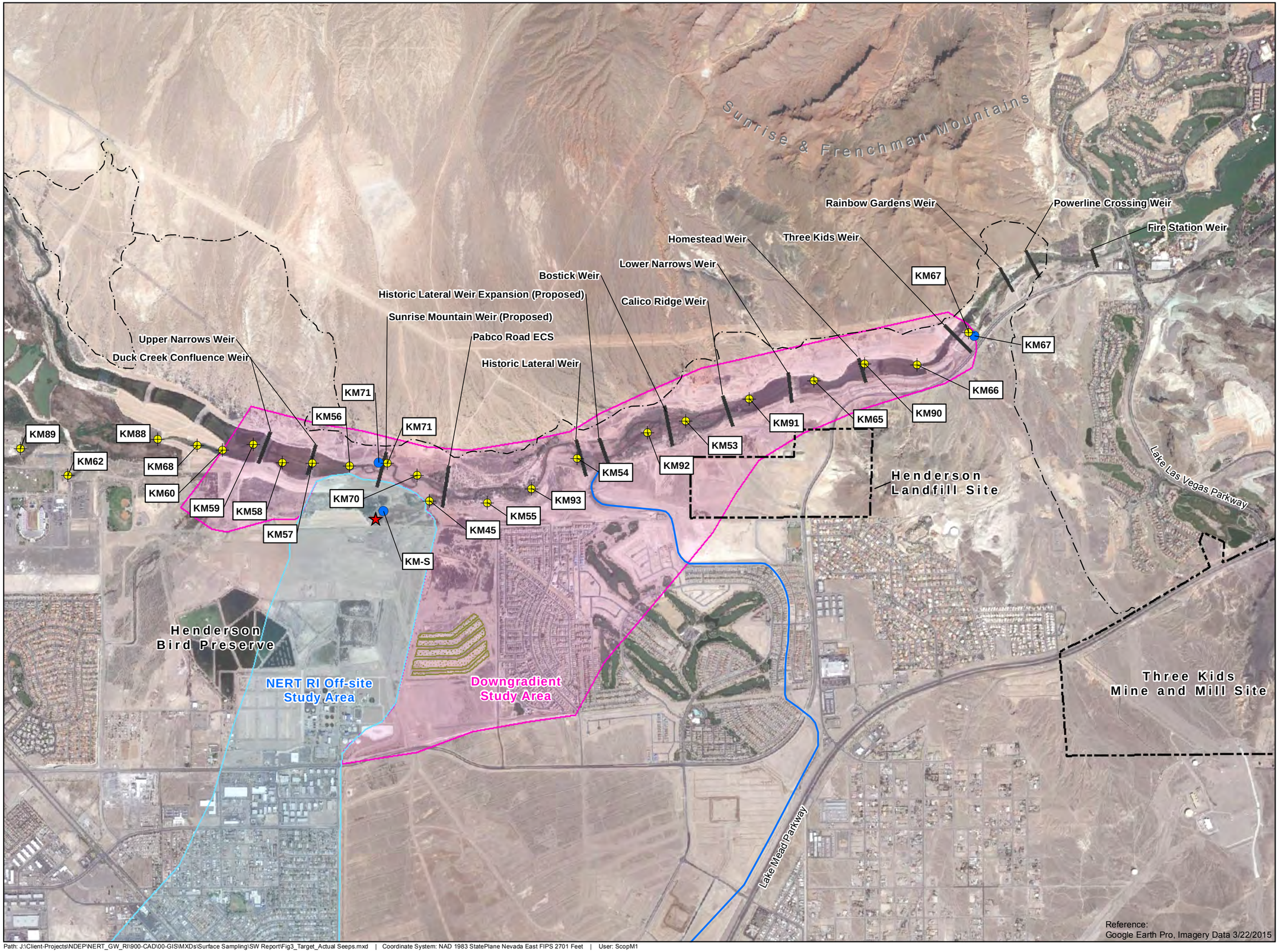
NERT RI
Downgradient Study Area

LOCATIONS OF SURFACE WATER AND SEEP SAMPLES MAY 2016

Date: 10/24/2016 Project: 60477365

AECOM

Figure 2



Legend

- 2000 Seep/Pit/Spring Locations
- Original Seep Location, KM-S was collected from the original seep location
- Surface Water Sample Location-Seeps
- Weir
- Northern Rapid Infiltration Basins
- Wetlands Trail
- Channels
- NERT RI Downgradient Study Area
- NERT RI Off-site Study Area

NORTH

0 2,000

Feet

Scale 1:24,000

1 inch = 2,000 feet

NERT RI
Downgradient Study Area

TARGET vs. ACTUAL SEEP LOCATIONS

Date: 10/24/2016 Project: 60477365

AECOM

Figure 3

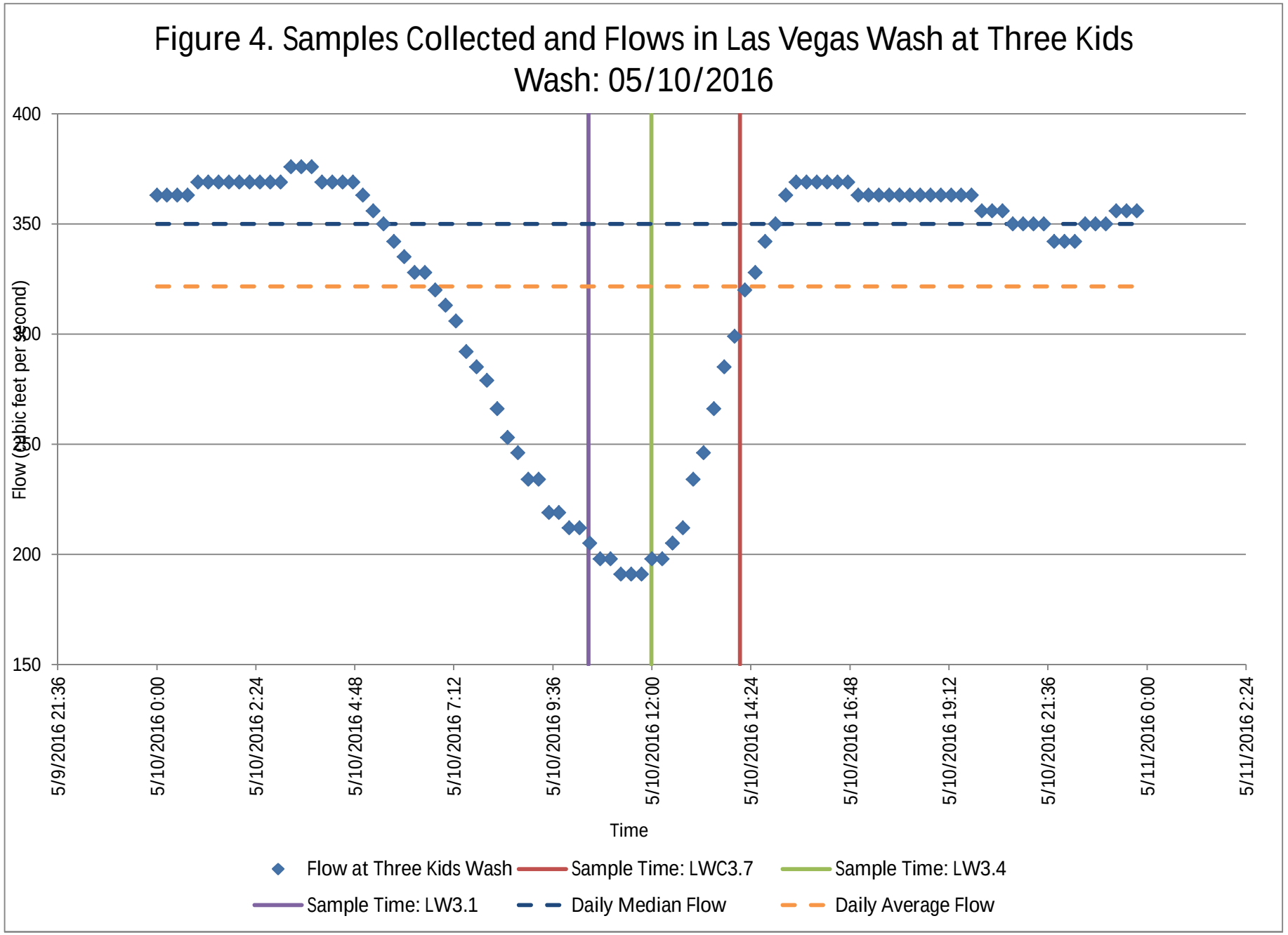


Figure 4. Samples Collected and Flows in Las Vegas Wash at Three Kids Wash: 05/10/2016
400
350
300
250
200
150
Flow (cubic feet per second)
5/9/2016 21:36
5/10/2016 0:00
5/10/2016 2:24
5/10/2016 4:48
5/10/2016 7:12
5/10/2016 9:36
5/10/2016 12:00
5/10/2016 14:24
5/10/2016 16:48
5/10/2016 19:12
5/10/2016 21:36
5/11/2016 0:00
5/11/2016 2:24
Time
Flow at Three Kids Wash
Sample Time: LWC3.7
Sample Time: LW3.4
Sample Time: LW3.1
Daily Median Flow
Daily Average Flow

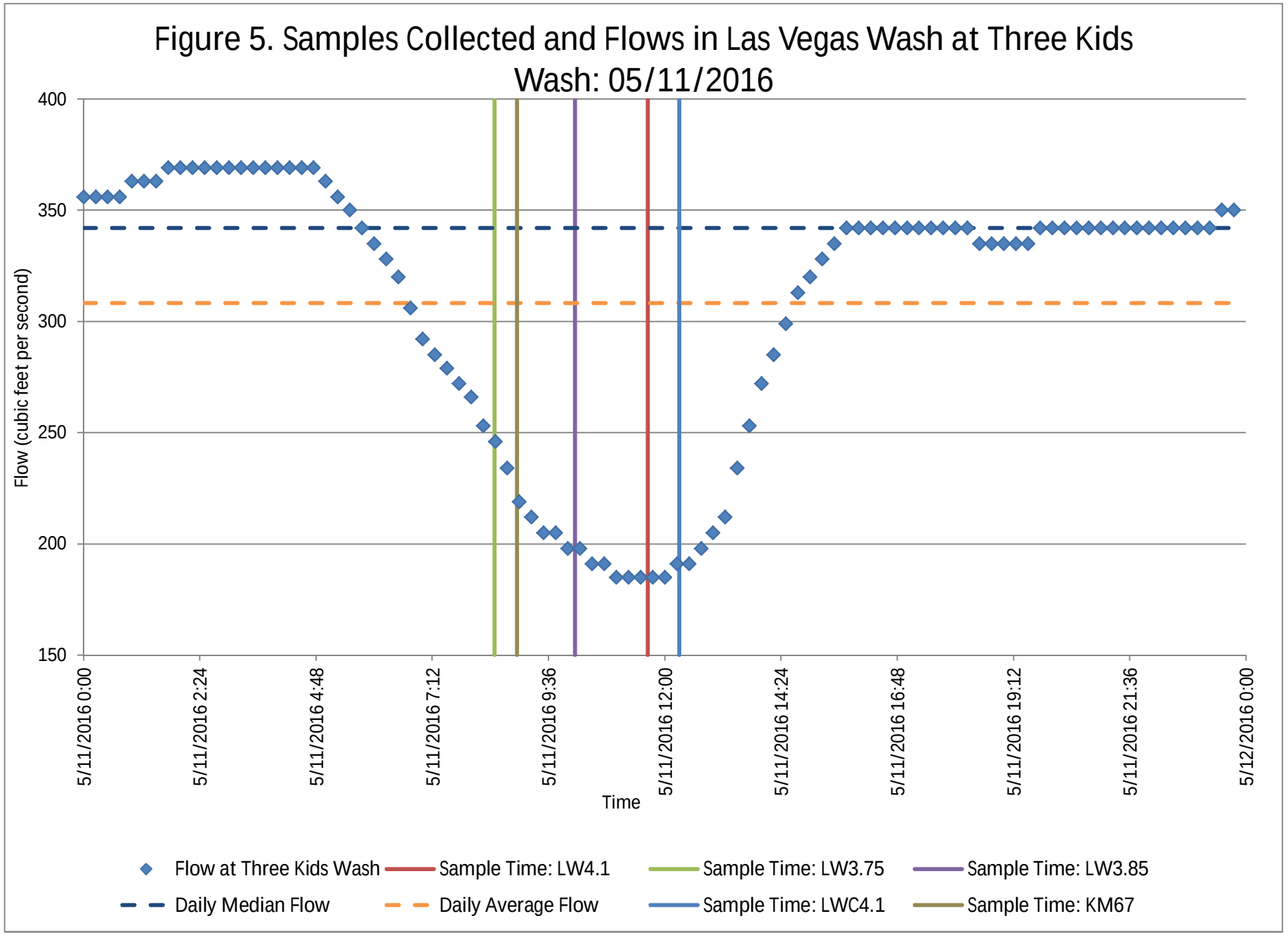


Figure 5. Samples Collected and Flows in Las Vegas Wash at Three Kids Wash: 05/11/2016
400
350
300
250
200
150
Flow (cubic feet per second)
5/11/2016 0:00
5/11/2016 2:24
5/11/2016 4:48
5/11/2016 7:12
5/11/2016 9:36
5/11/2016 12:00
5/11/2016 14:24
5/11/2016 16:48
5/11/2016 19:12
5/11/2016 21:36
5/12/2016 0:00
Time
Flow at Three Kids Wash
Sample Time: LW4.1
Sample Time: LW3.75
Sample Time: LW3.85
Daily Median Flow
Daily Average Flow
Sample Time: LWC4.1
Sample Time: KM67

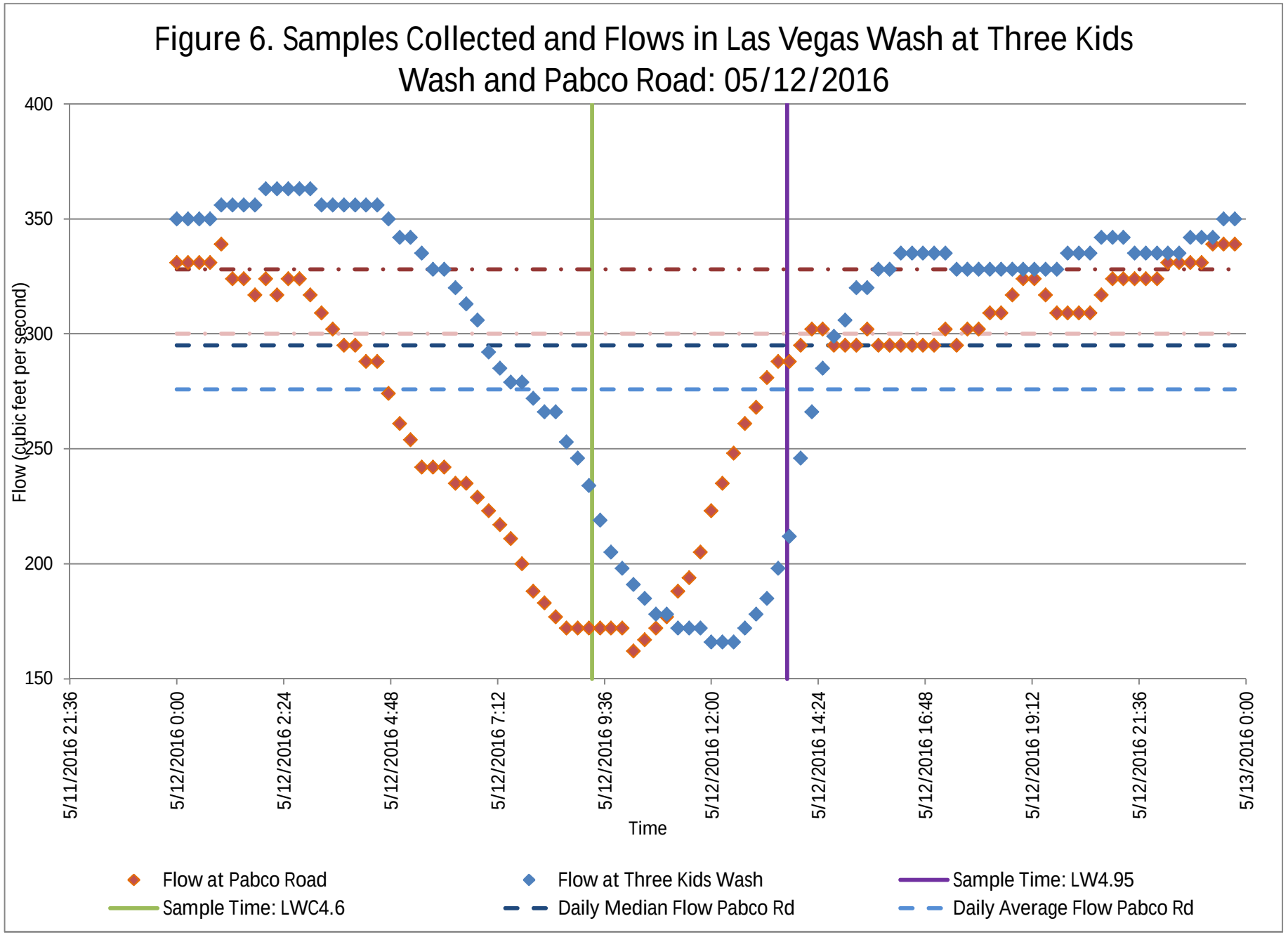


Figure 6. Samples Collected and Flows in Las Vegas Wash at Three Kids Wash and Pabco Road: 05/12/2016
400
350
300
250
200
150
Flow (cubic feet per second)
5/11/2016 21:36
5/12/2016 0:00
5/12/2016 2:24
5/12/2016 4:48
5/12/2016 7:12
5/12/2016 9:36
5/12/2016 12:00
5/12/2016 14:24
5/12/2016 16:48
5/12/2016 19:12
5/12/2016 21:36
5/13/2016 0:00
Time
Flow at Pabco Road
Flow at Three Kids Wash
Sample Time: LW4.95
Sample Time: LWC4.6
Daily Median Flow Pabco Rd
Daily Average Flow Pabco Rd

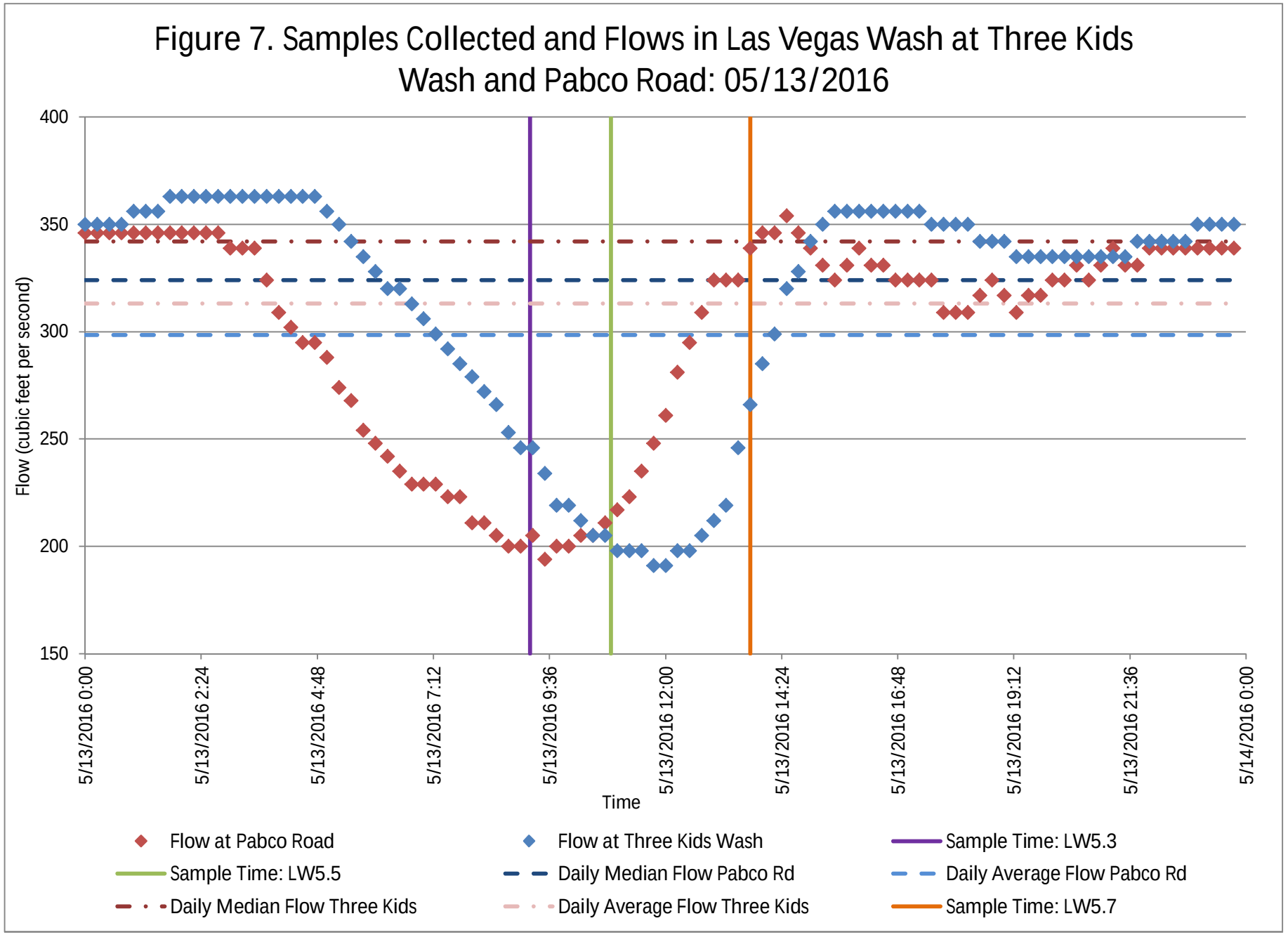


Figure 7. Samples Collected and Flows in Las Vegas Wash at Three Kids Wash and Pabco Road: 05/13/2016
Flow (cubic feet per second)
400
350
300
250
200
150
5/13/2016 0:00
5/13/2016 2:24
5/13/2016 4:48
5/13/2016 7:12
5/13/2016 9:36
5/13/2016 12:00
5/13/2016 14:24
5/13/2016 16:48
5/13/2016 19:12
5/13/2016 21:36
5/14/2016 0:00
Time
Flow at Pabco Road
Flow at Three Kids Wash
Sample Time: LW5.3
Sample Time: LW5.5
Daily Median Flow Pabco Rd
Daily Average Flow Pabco Rd
Daily Median Flow Three Kids
Daily Average Flow Three Kids
Sample Time: LW5.7

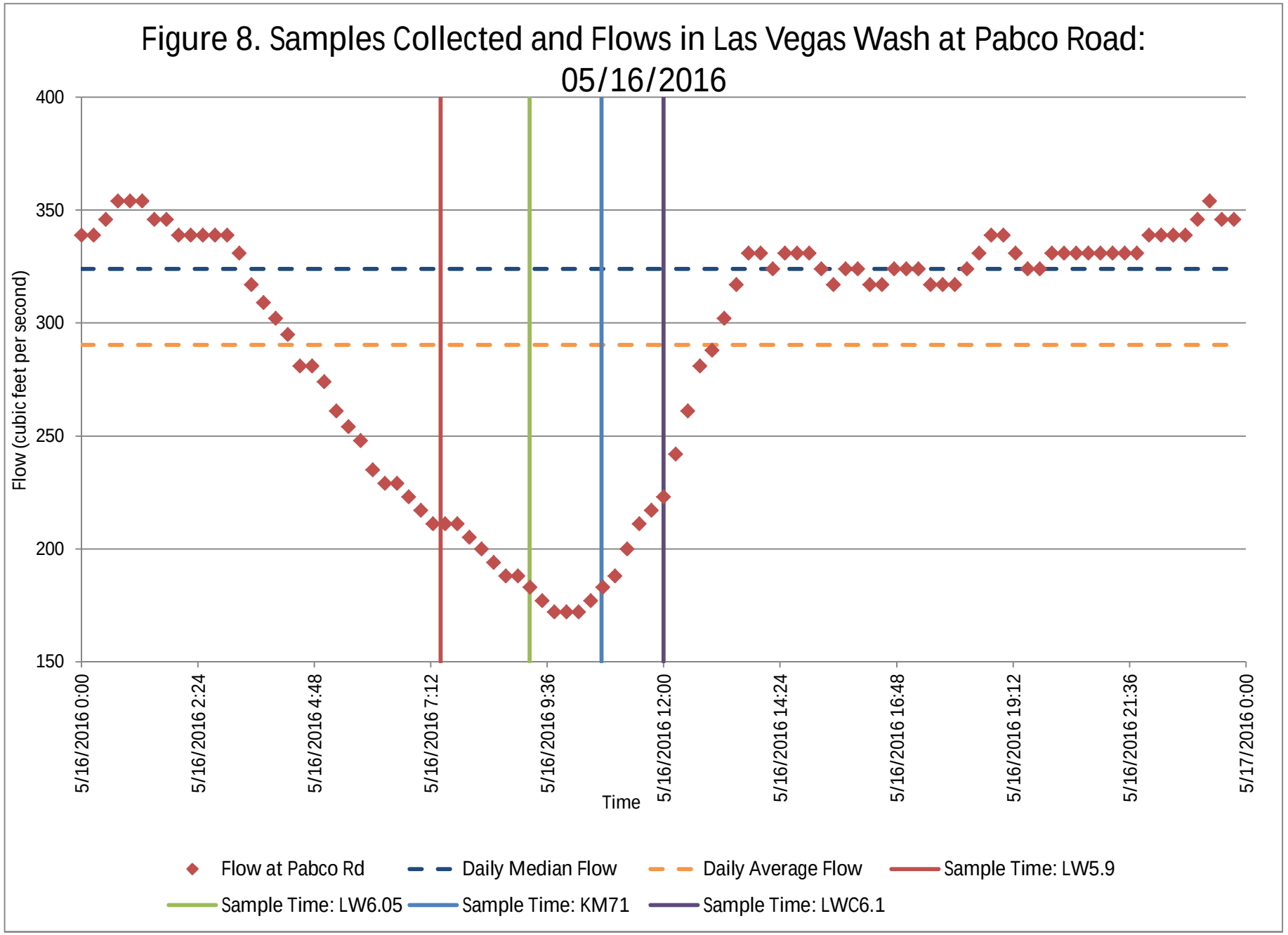
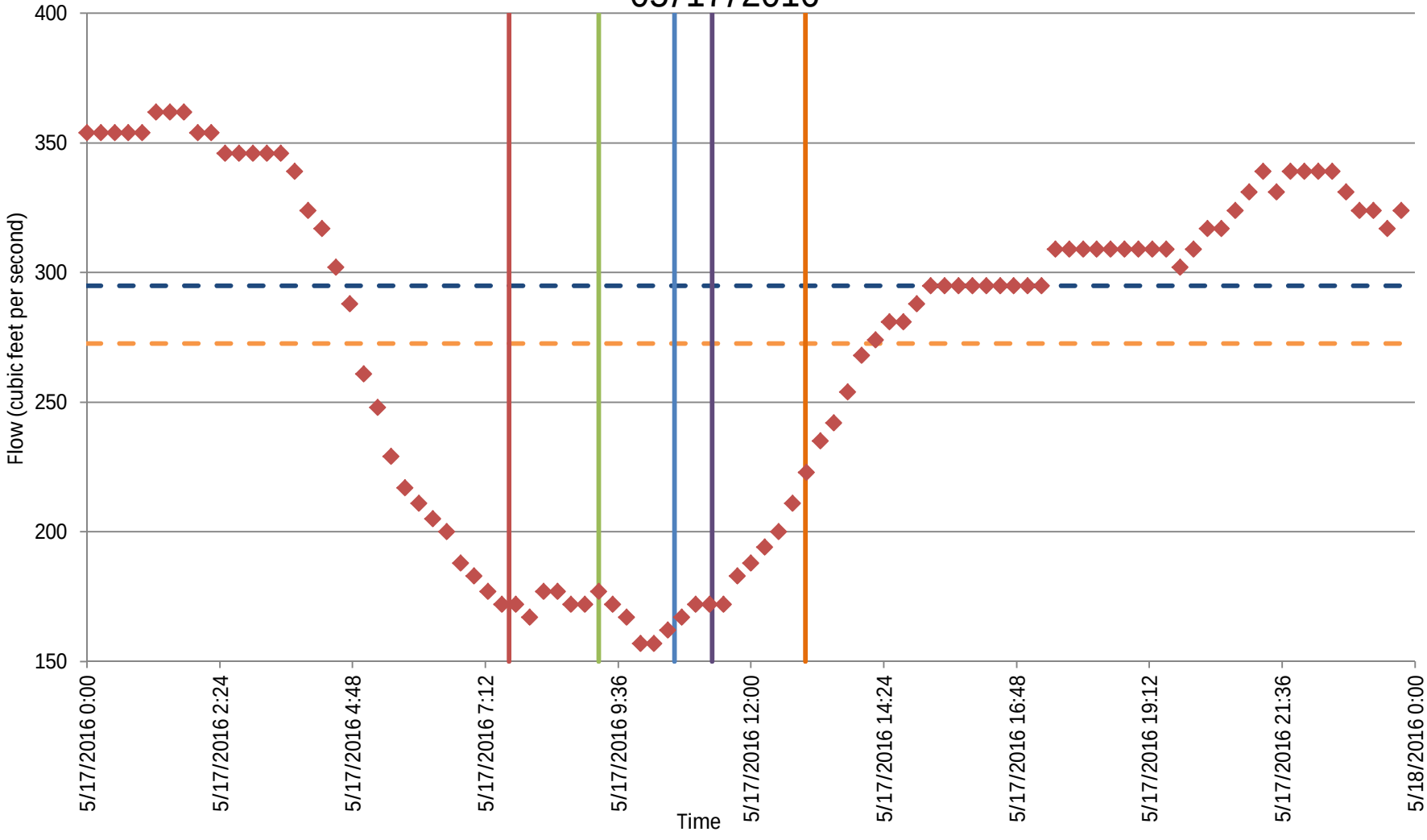


Figure 8. Samples Collected and Flows in Las Vegas Wash at Pabco Road: 05/16/2016
Flow (cubic feet per second)
400
350
300
250
200
150
5/16/2016 0:00
5/16/2016 2:24
5/16/2016 4:48
5/16/2016 7:12
5/16/2016 9:36
5/16/2016 12:00
5/16/2016 14:24
5/16/2016 16:48
5/16/2016 19:12
5/16/2016 21:36
5/17/2016 0:00
Time
Flow at Pabco Rd
Daily Median Flow
Daily Average Flow
Sample Time: LW5.9
Sample Time: LW6.05
Sample Time: KM71
Sample Time: LWC6.1

Figure 9. Samples Collected and Flows in Las Vegas Wash at Pabco Road: 05/17/2016



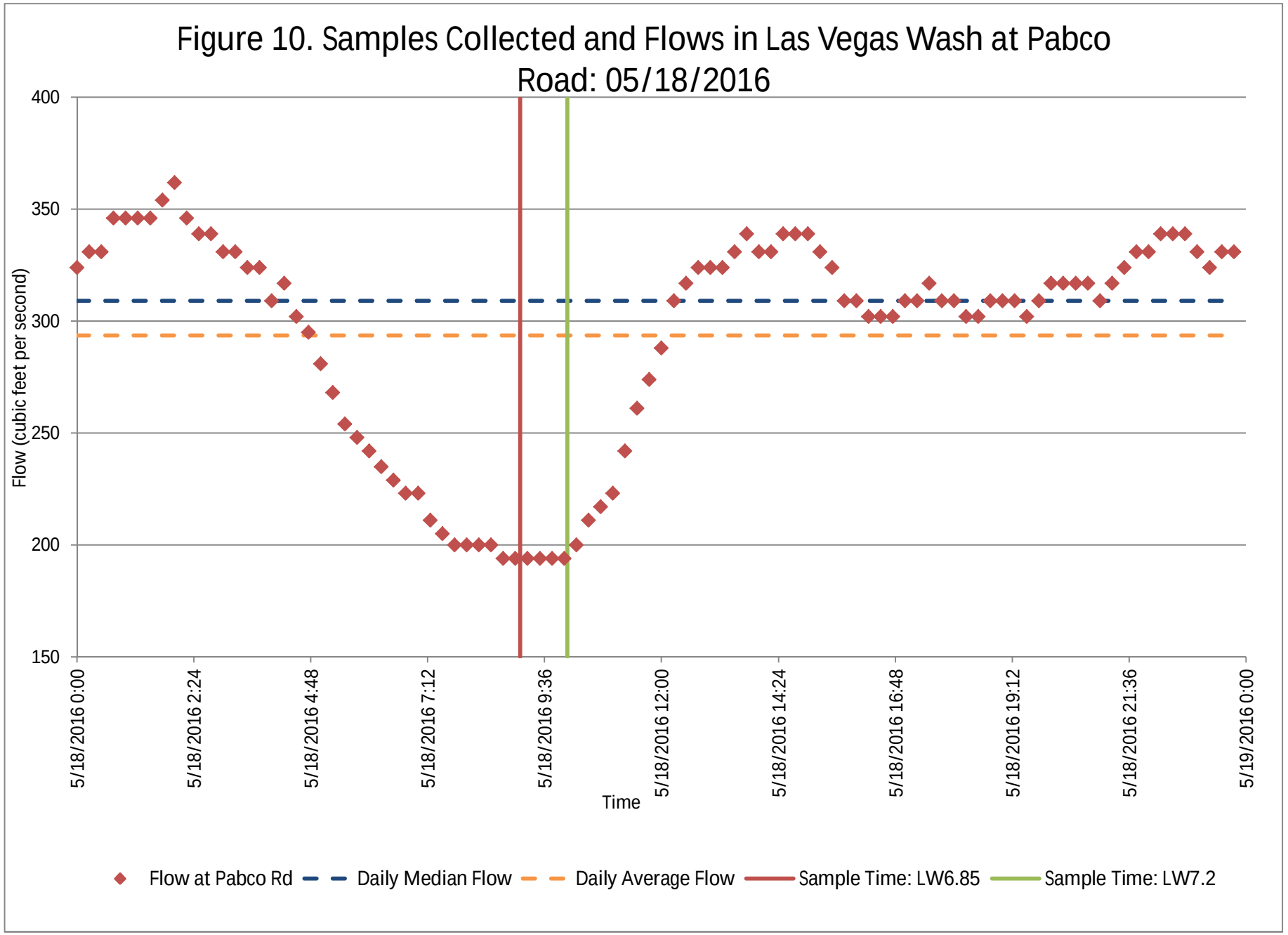
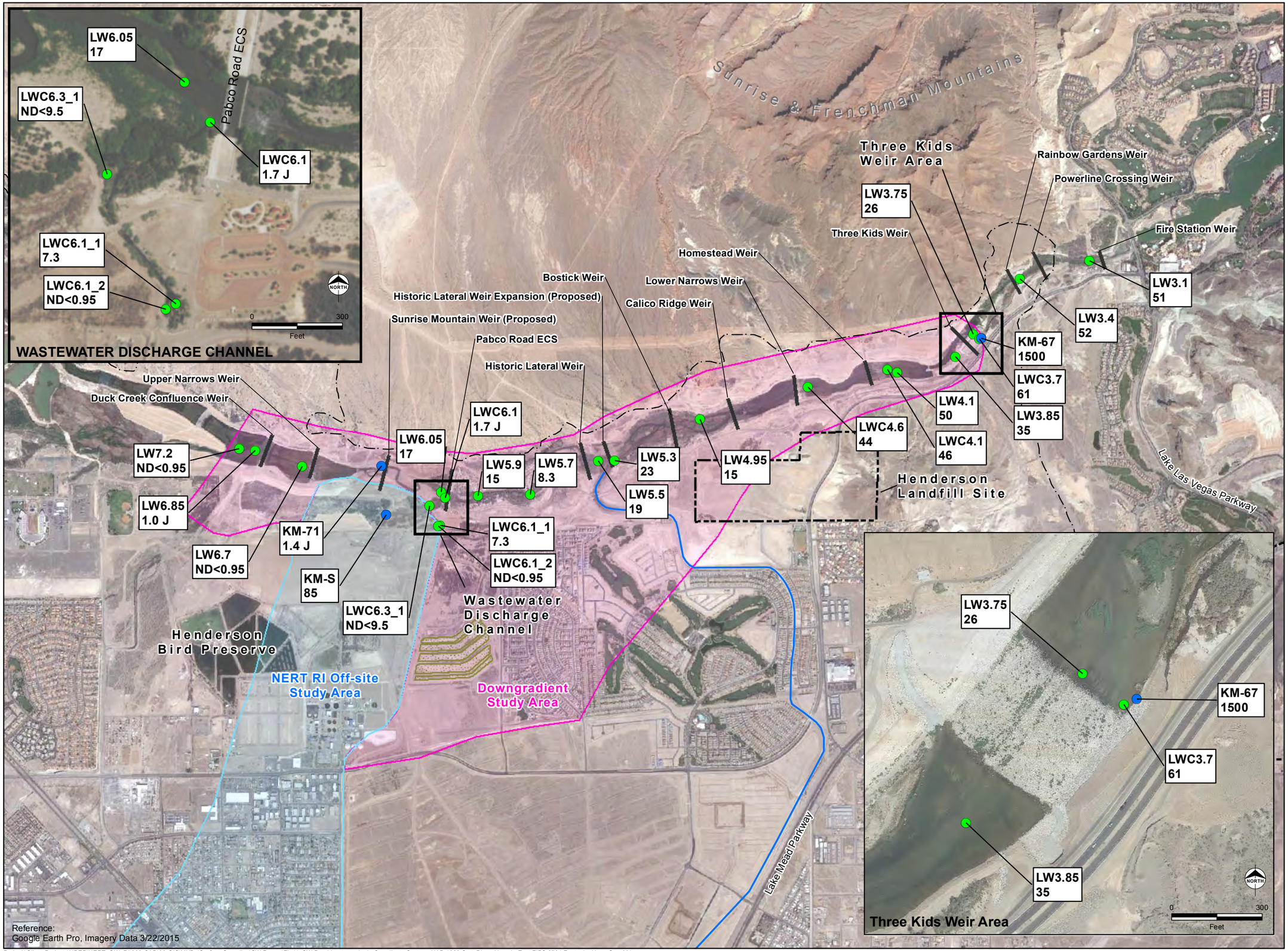


Figure 10. Samples Collected and Flows in Las Vegas Wash at Pabco Road: 05/18/2016
Flow (cubic feet per second)
400
350
300
250
200
150
5/18/2016 0:00
5/18/2016 2:24
5/18/2016 4:48
5/18/2016 7:12
5/18/2016 9:36
5/18/2016 12:00
5/18/2016 14:24
5/18/2016 16:48
5/18/2016 19:12
5/18/2016 21:36
5/19/2016 0:00
Time
Flow at Pabco Rd
Daily Median Flow
Daily Average Flow
Sample Time: LW6.85
Sample Time: LW7.2



NERT RI
Downgradient Study Area

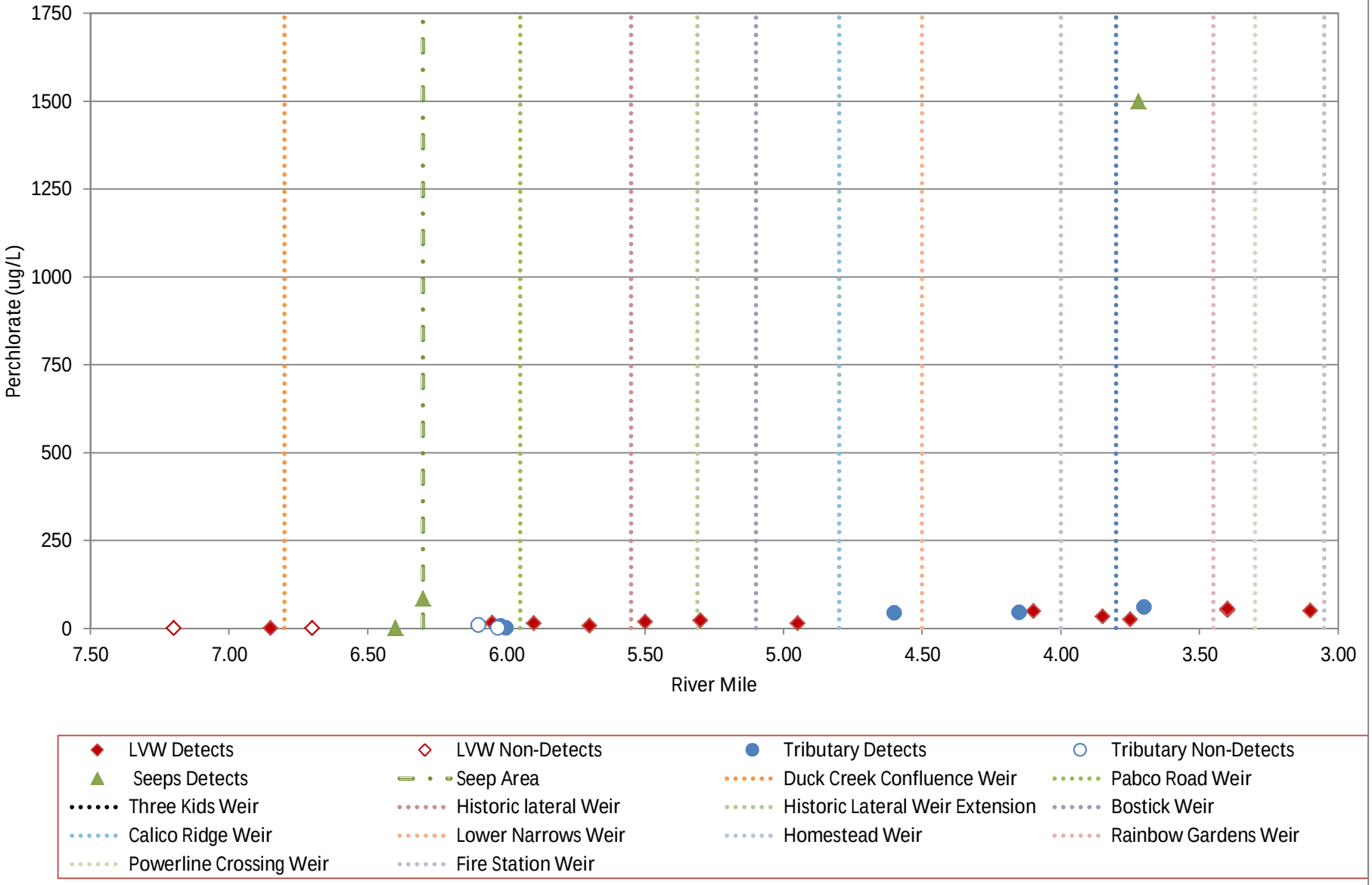
PERCHLORATE CONCENTRATIONS IN SURFACE WATER AND SEEPS

Date: 10/24/2016 Project: 60477365

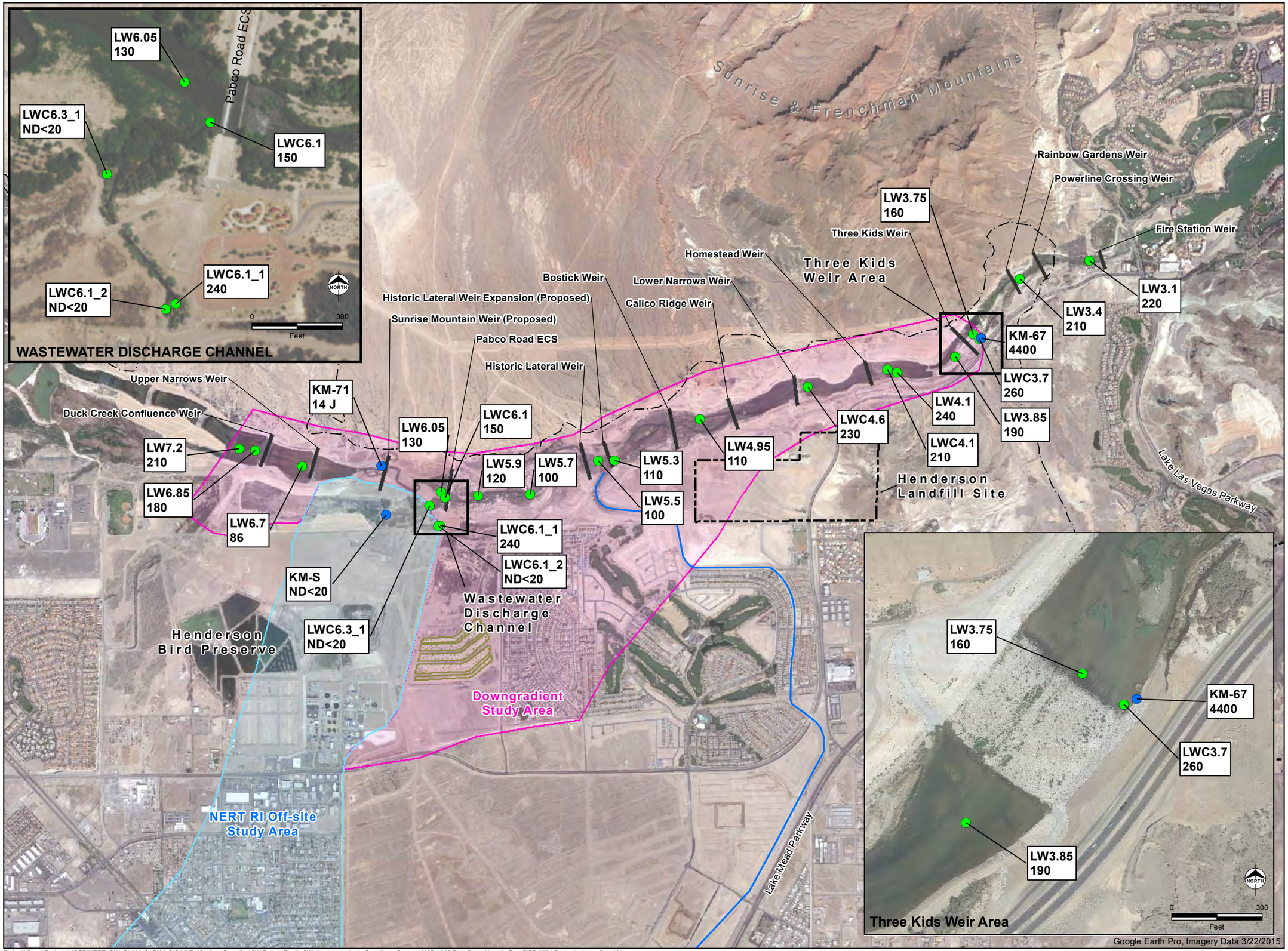
AECOM

Figure 11

Figure 12. Concentrations of Perchlorate by River Mile



Note: Non-detects shown at detection limit.



OVERVIEW MAP

Legend

- Surface Water Sample Location - Seeps
- Surface Water Sample Location - LVW/Tributaries
- Wetlands Trail
- Channels
- Northern Rapid Infiltration Basins
- Weir
- NERT Downgradient Study Area
- NERT Off-site Study Area

Chlorate Concentration in µg/L

ND - Not Detected above associated reporting limit
J - Associated concentration is estimate
µg/L - Micrograms per liter

0 2,000 Feet

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

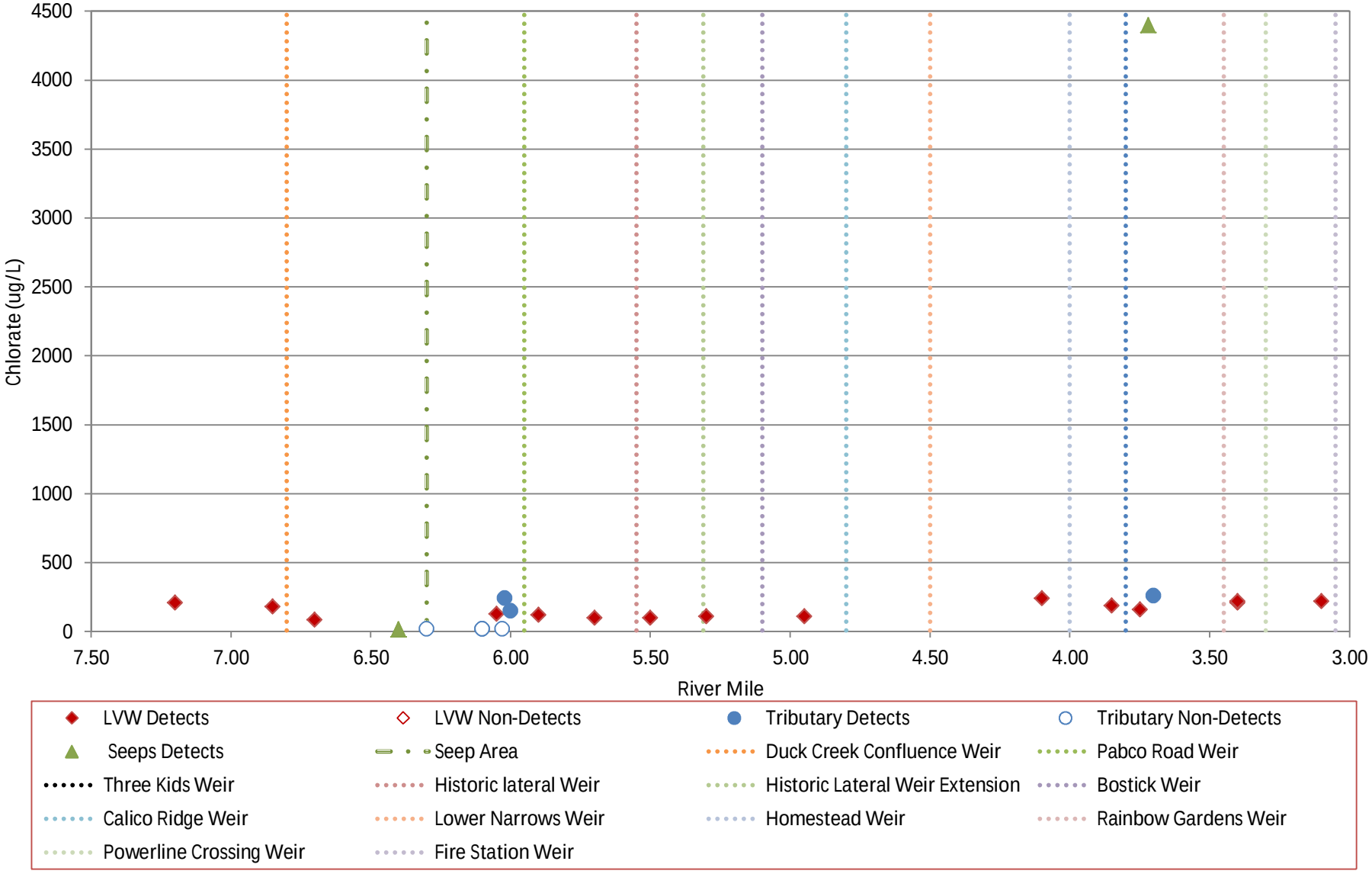
NERT RI
Downgradient Study Area

CHLORATE CONCENTRATIONS IN SURFACE WATER AND SEEPS

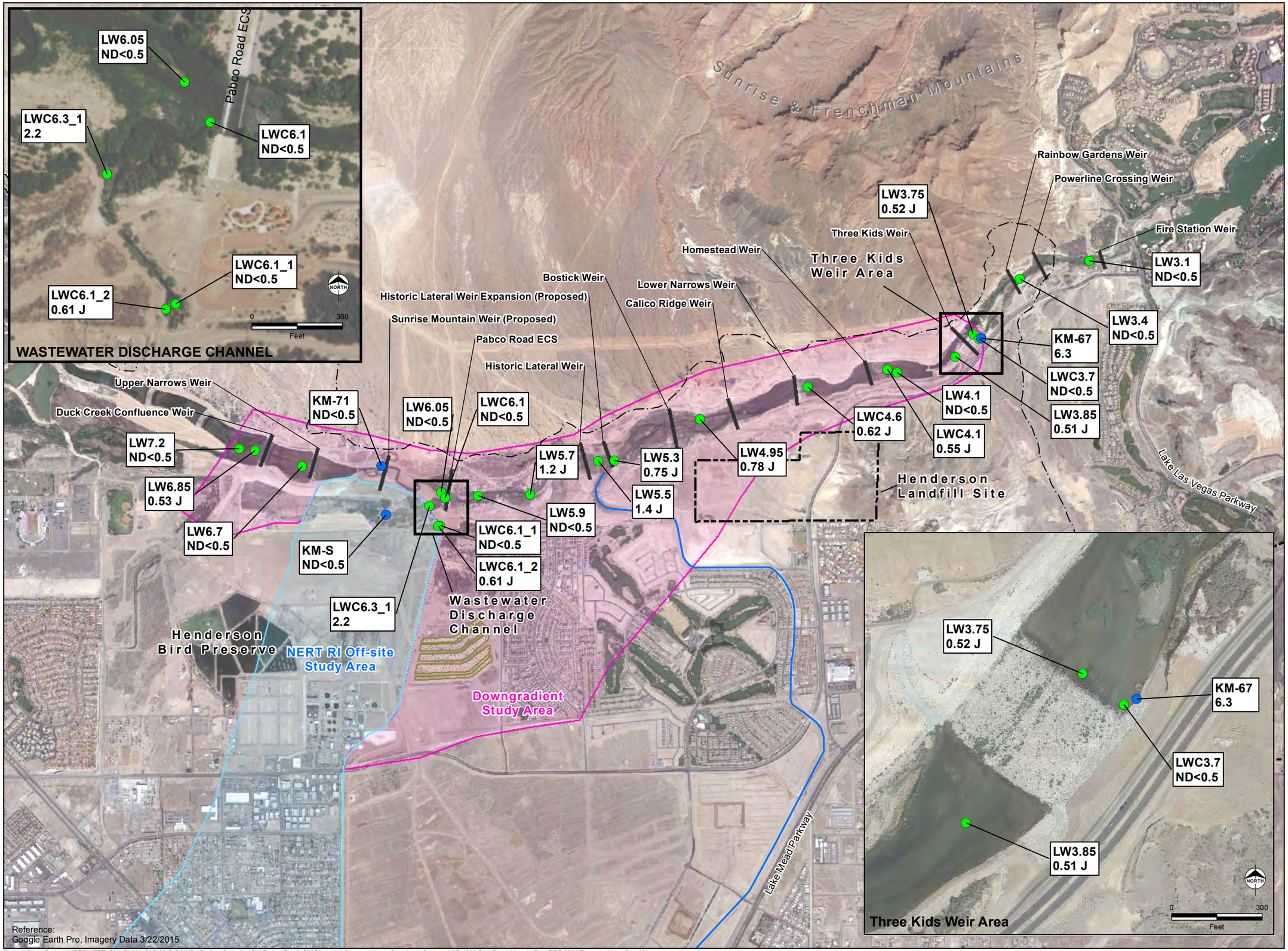
Date: 10/24/2016 Project: 60477365

AECOM **Figure 13**

Figure 14. Concentrations of Chlorate by River Mile



Note: Non-detects shown at detection limit.



Legend

- Surface Water Sample Location - Seeps
- Surface Water Sample Location - LVW/Tributaries
- Wetlands Trail
- Channels
- Northern Rapid Infiltration Basins
- Weir
- NERT RI Downgradient Study Area
- NERT RI Off-site Study Area

Dissolved Chromium Concentration in µg/L

ND - Not Detected above associated reporting limit
J - Associated concentration is estimate
µg/L - Micrograms per liter

NORTH
0
2,000
Feet

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

NERT RI
Downgradient Study Area

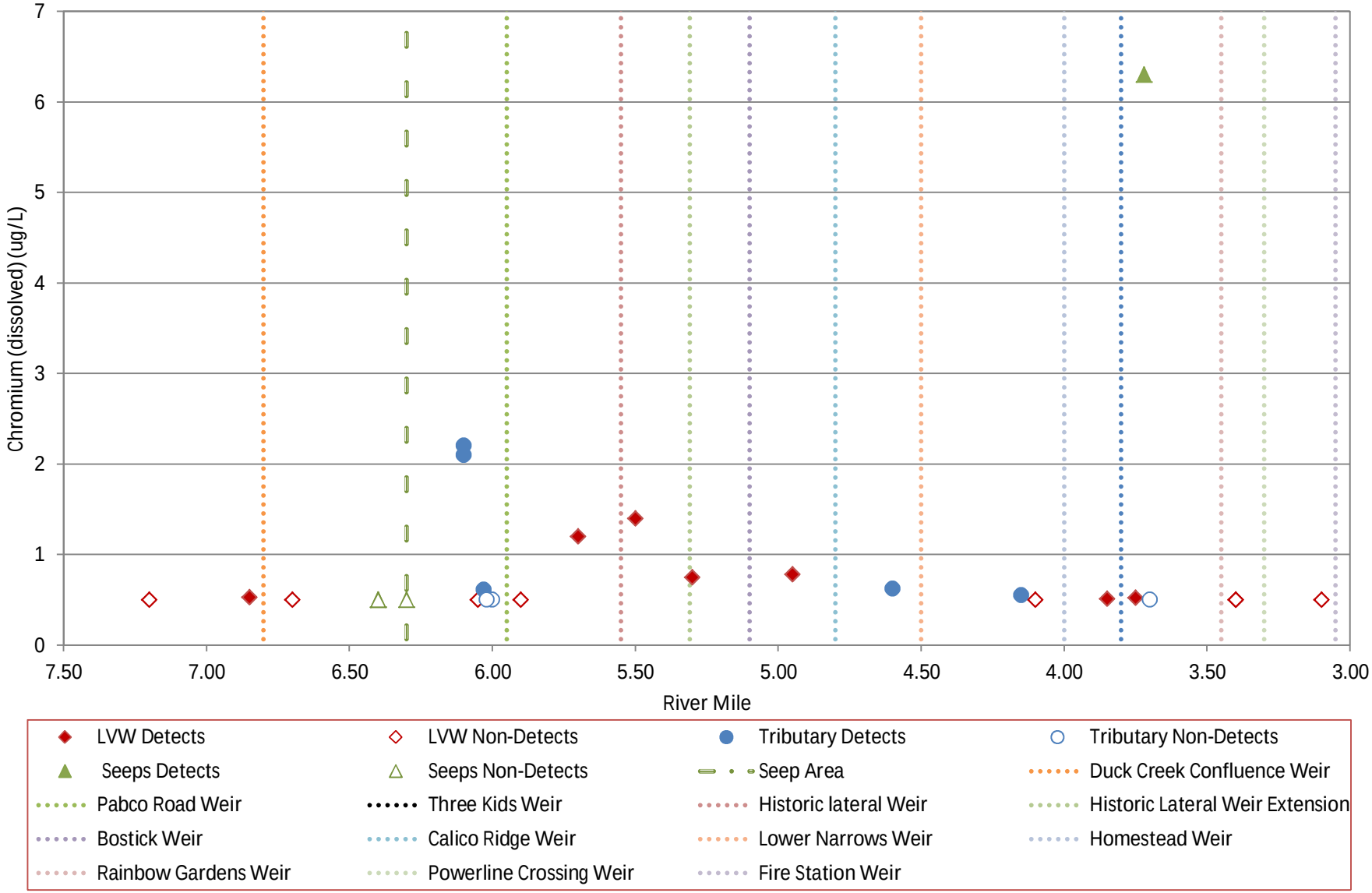
DISSOLVED CHROMIUM CONCENTRATIONS IN SURFACE WATER AND SEEPS

Date: 10/24/2016 Project: 60477365

AECOM **Figure 15**

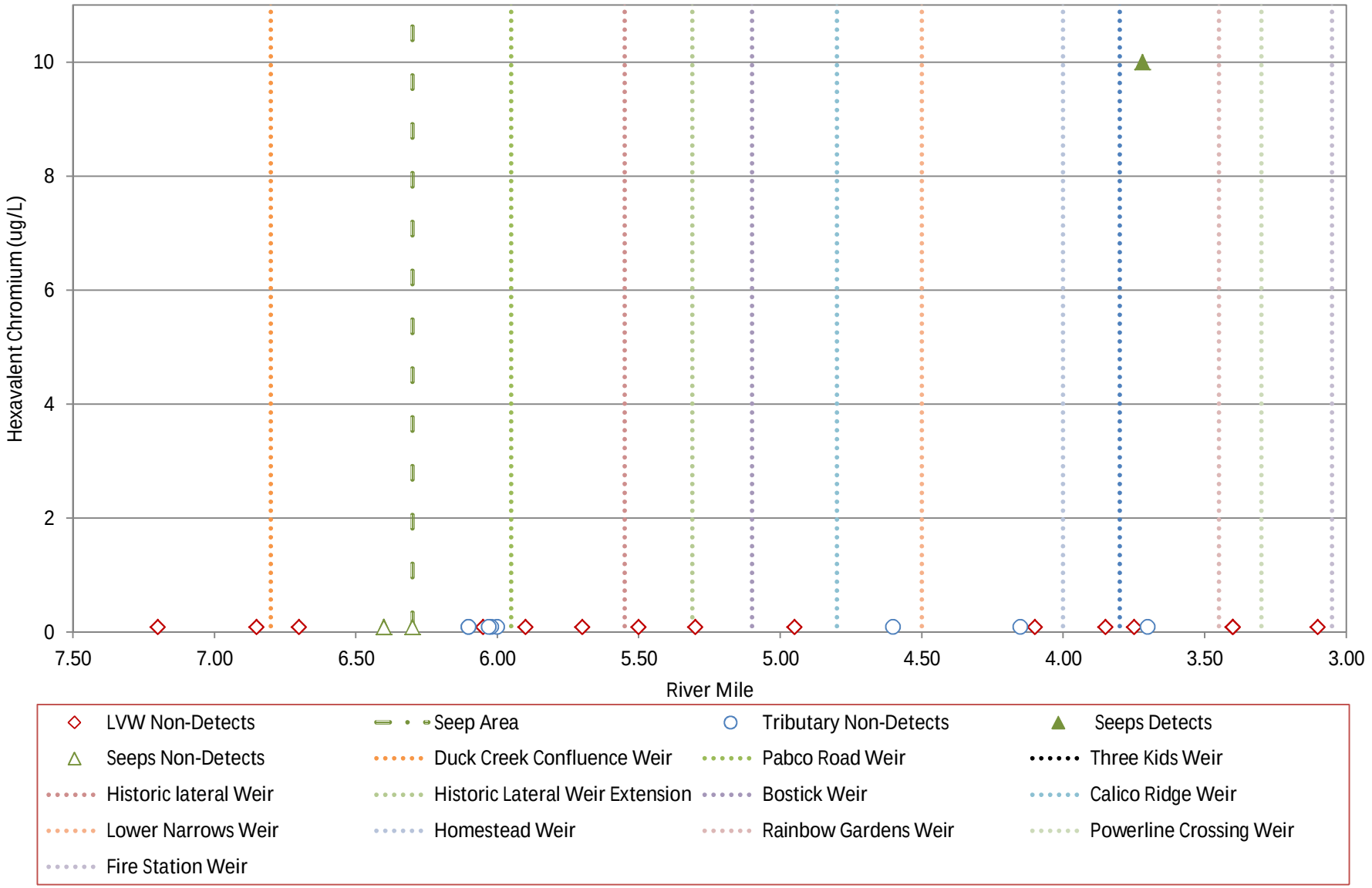
Path: J:\Client-Projects\NDEP\NERT_GW_RI\900-CAD\00-GIS\MXDs\Surface Sampling\SW Report\Fig15_SW Dissolved Chrom.mxd | Coordinate System: NAD 1983 StatePlane Nevada East FIPS 2701 Feet | User: ScopM1

Figure 16. Concentrations of Dissolved Chromium by River Mile

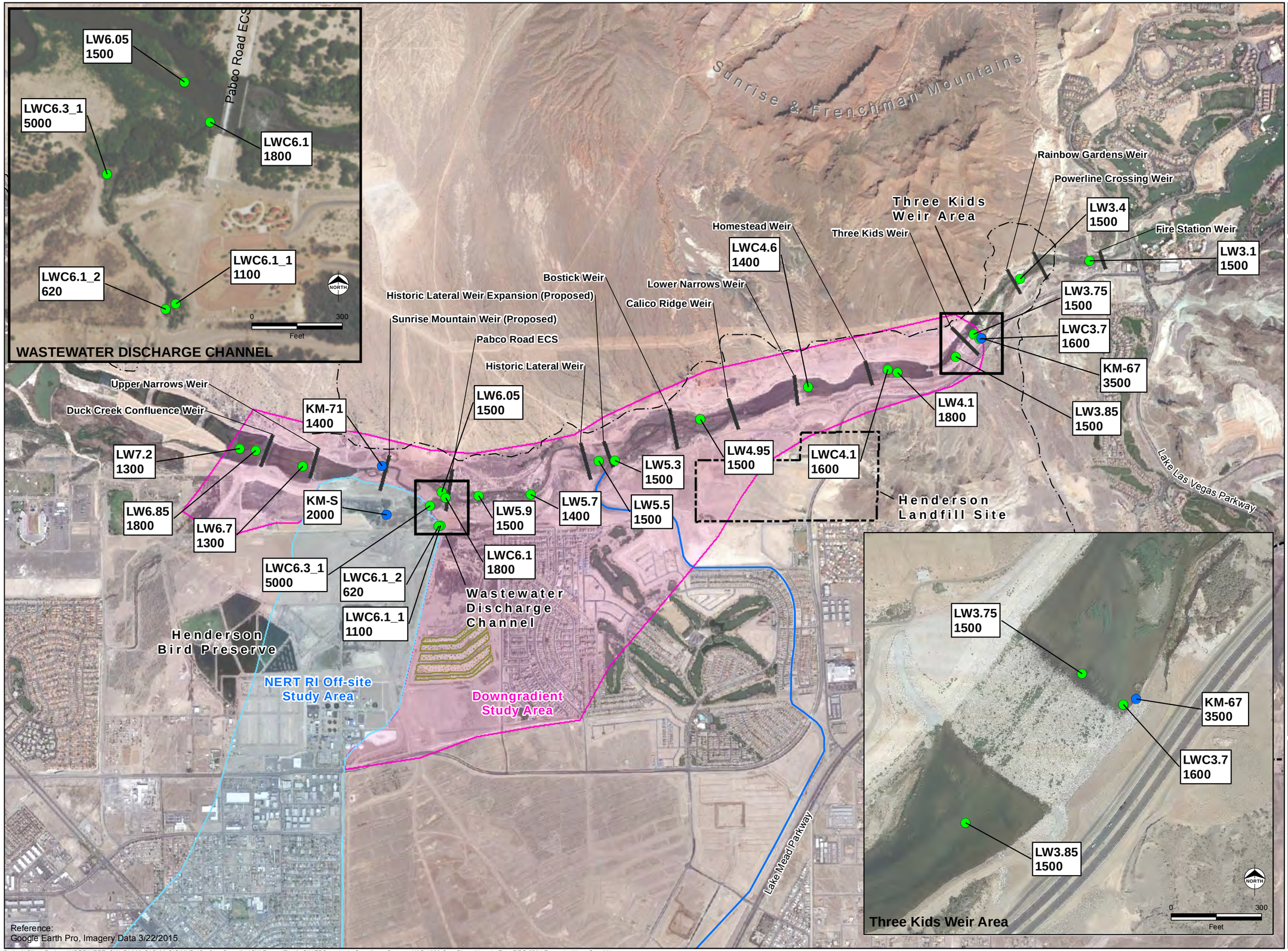


Note: Non-detects shown at detection limit.

Figure 17. Concentrations of Hexavalent Chromium by River Mile



Note: Non-detects shown at detection limit.



NERT RI
Downgradient Study Area

TOTAL DISSOLVED SOLIDS CONCENTRATIONS IN SURFACE WATER AND SEEPS

Date: 10/24/2016 Project: 60477365

AECOM

Figure 18

Figure 19. Concentrations of Total Dissolved Solids by River Mile

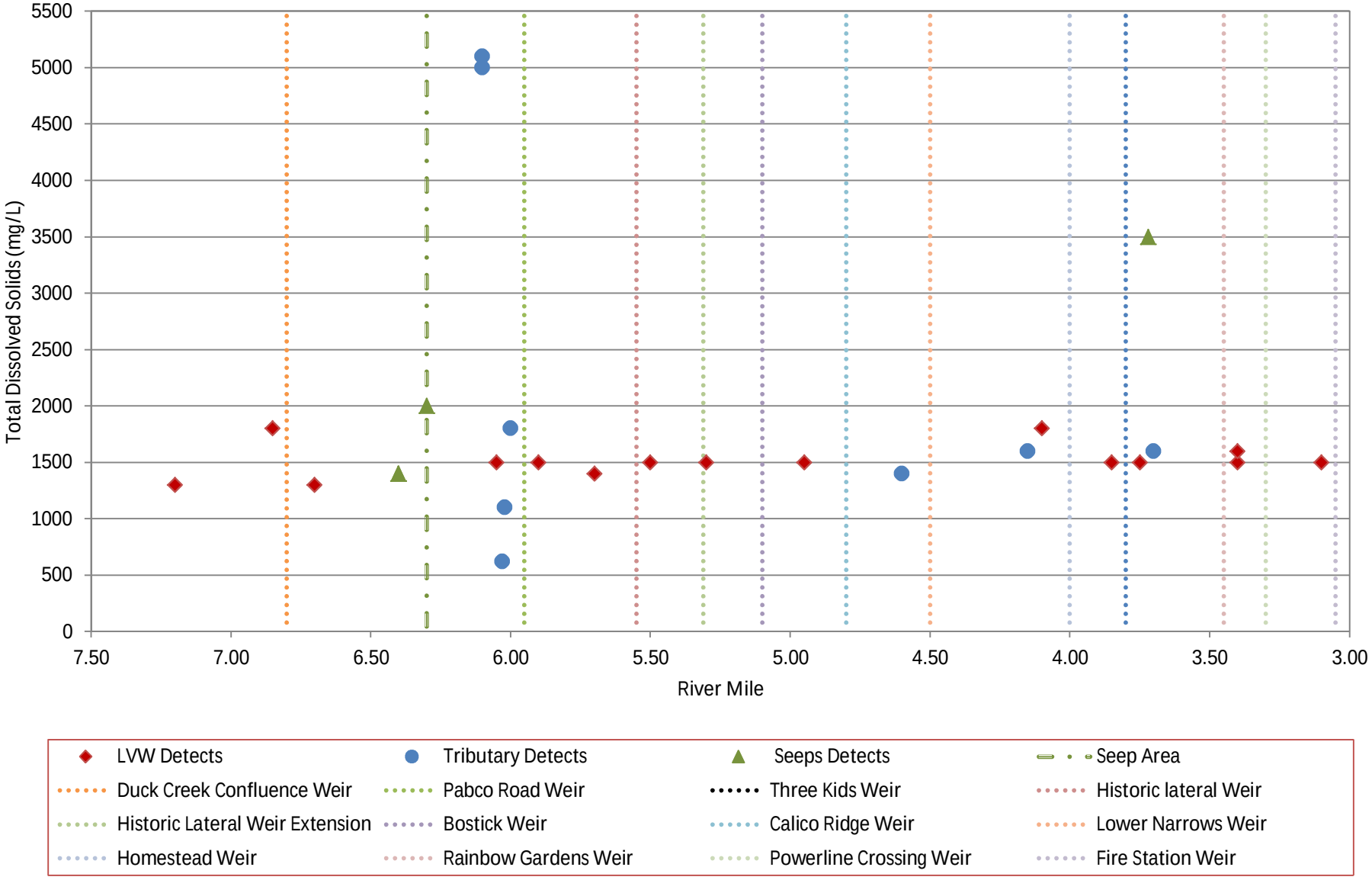


Figure 20. Concentrations of Chloride by River Mile

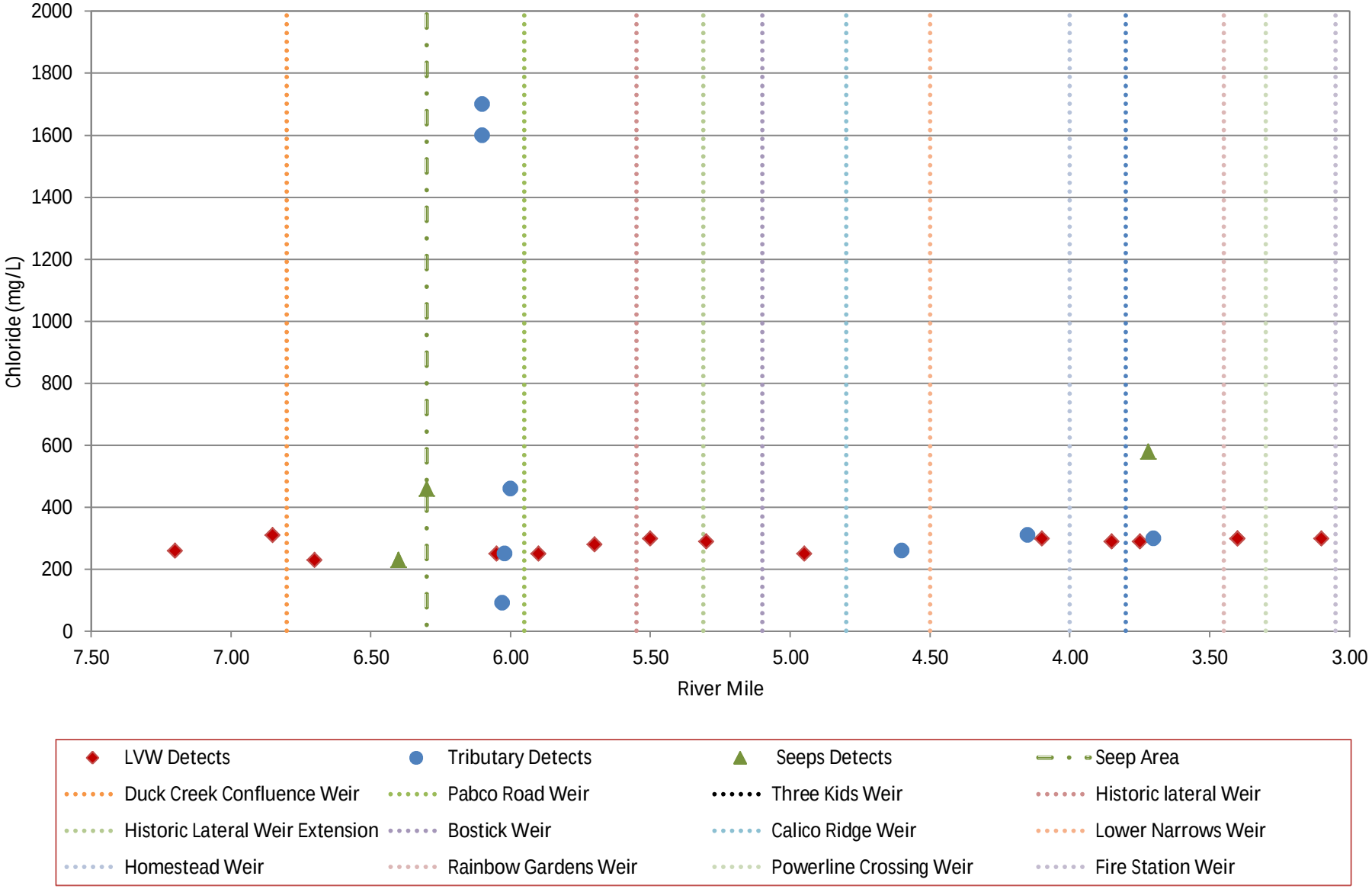
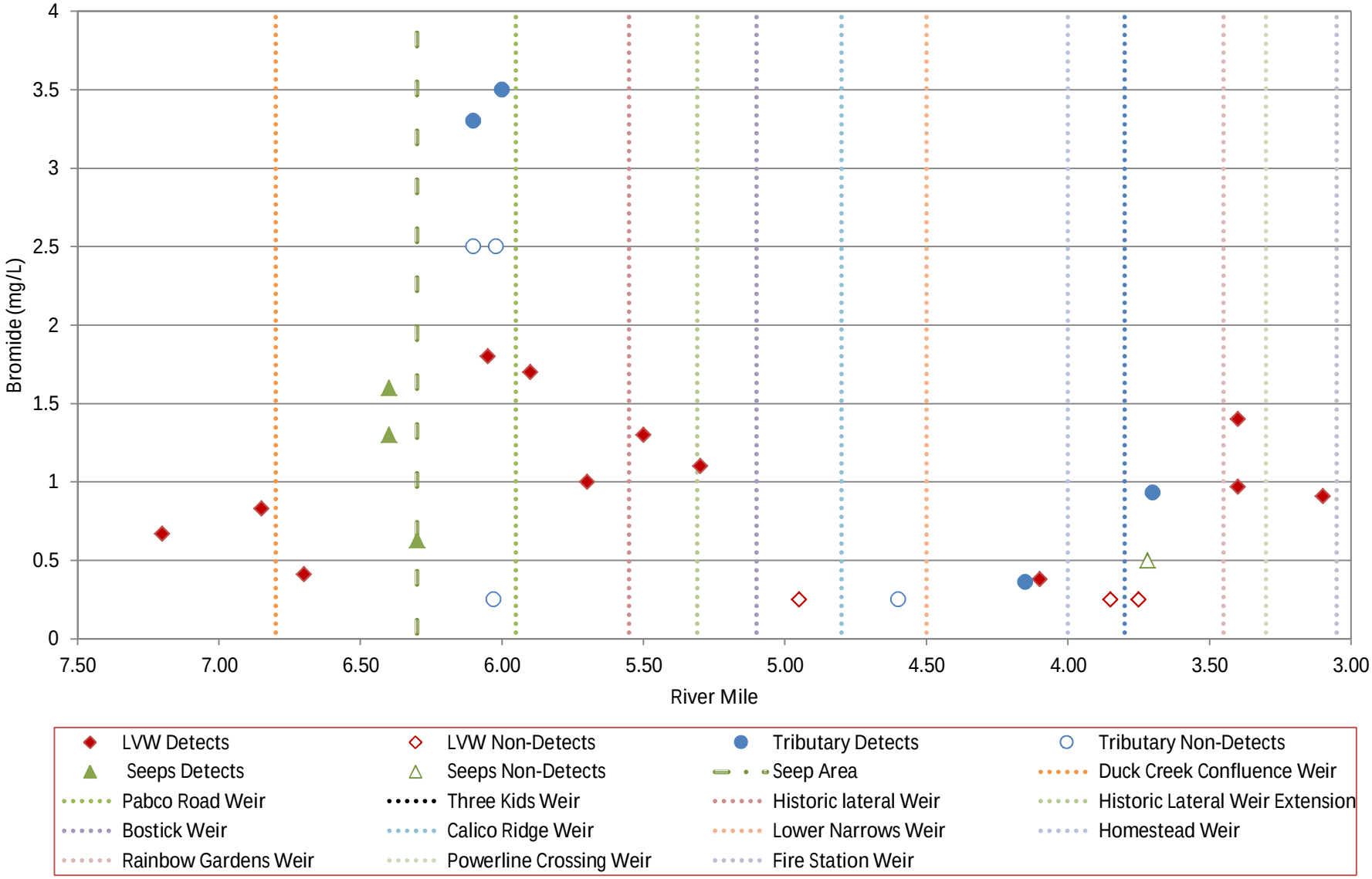
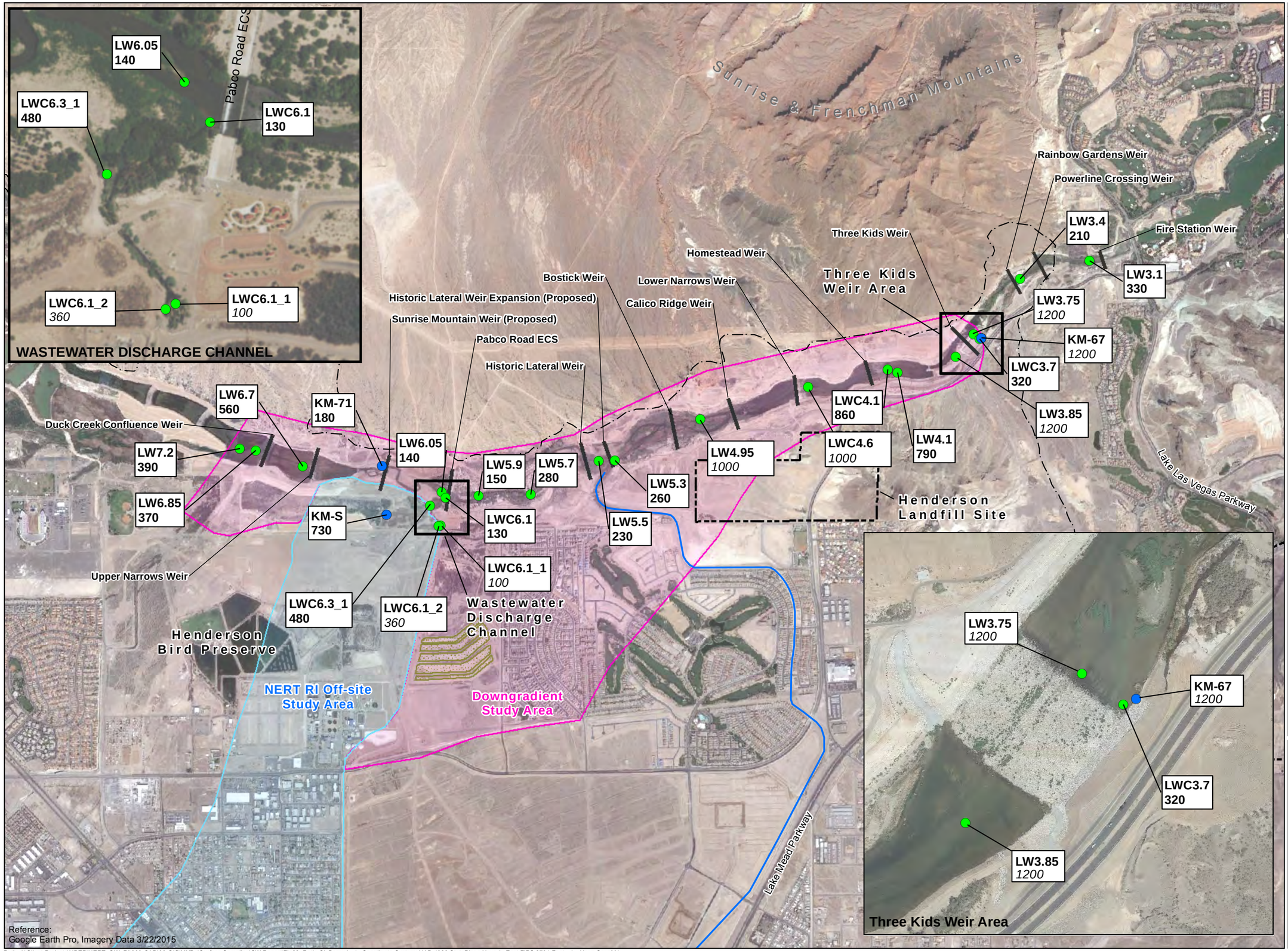


Figure 21. Concentrations of Bromide by River Mile

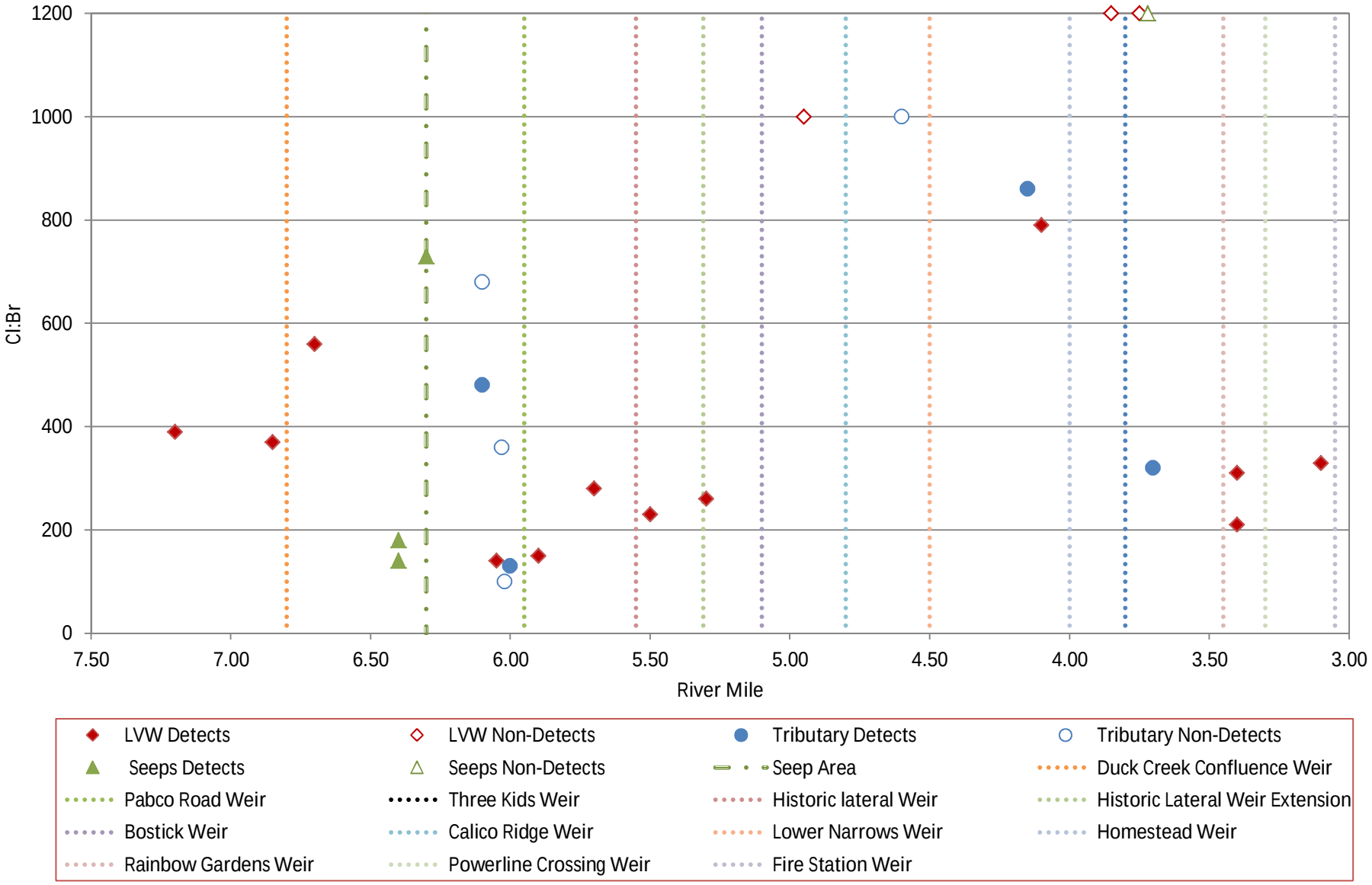


Note: Non-detects shown at detection limit.



Path: J:\Client-Projects\NDEP\NERT_GW_RI\900-CAD\00-GIS\MXDs\Surface Sampling\SW Report\Fig22_Ratio Cl_Br.mxd | Coordinate System: NAD 1983 StatePlane Nevada East FIPS 2701 Feet | User: ScopM1

Figure 23. Ratio of Chloride:Bromide by River Mile



Note: Ratio when Br was non-detect calculated using detection limit.

Tables

Table 1 Surface Water and Seep Sampling Locations
NERT Remedial Investigation - Downgradient Study Area
Henderson, Nevada

Surface Water Location Sample ID	Location	Actual Location	
		Easting	Northing
LW3.1	Downstream of Fire Station Weir	846958.85	26739306.65
LW3.4	Downstream of Rainbow Gardens Weir	845421.44	26738904.05
LWC3.7 (t/ss) GCS5 seep	Downstream of Three Kids Weir	844521.65	26737580.80
LW3.75	Downstream of Three Kids Weir	844384.39	26737682.02
LW3.85	Upstream of Three Kids Weir	843998.61	26737188.13
LW4.1	Upstream of Homestead Weir	842707.46	26736835.70
LWC4.1 (t/ss)	Upstream of Homestead Weir	842489.16	26736909.78
LWC4.6 (t/ss)	Upstream of Lower Narrows Weir	840732.03	26736516.33
LW4.95	Upstream of Calico Ridge Weir	838349.92	26735802.47
LW5.3	Downstream of Historic Lateral Weir	836457.93	26734887.70
LW5.5	Downstream of Historic Lateral Weir	836098.89	26734886.54
LW5.7	Upstream of Historic Lateral Weir	834598.21	26734139.10
LW5.9	Downstream of Pabco Weir	833446.98	26734111.91
LW6.05	Near Pabco Weir	832631.29	26734196.58
LWC6.1 (t/ss)	Wastewater Tributary Upstream of Pabco Road	832715.92	26734063.55
LWC6.1_1 (t/ss)	Wastewater Tributary Upstream of Pabco Road	832602.63	26733461.04
LWC6.1_2 (t/ss)	Wastewater Tributary Upstream of Pabco Road	832567.92	26733443.15
LWC6.3_1 (t/ss)	Wastewater Tributary Upstream of Pabco Road; NERT outfall	832373.92	26733891.44
LW6.7	Downstream of Duck Creek Confluence Weir	829554.84	26734766.59
LW6.85	Near Duck Creek Confluence Weir	828517.68	26735113.12
LW7.2	Upstream of Duck Creek Confluence Weir	828169.64	26735154.24
KM-67	Seep/Spring Near Three Kids Weir	844564.65	26737598.23
KM-71	Seep Upstream of Pabco Road on North Bank	831311.20	26734771.98
KM-S	Kerr McGee Seep	831415.66	26733690.61

Notes:
ID = Identification
t/ss - tributary/side stream

Table 2. Target Seep Locations
NERT Remedial Investigation - Downgradient Study Area
Henderson, Nevada

Seep ID	Seep (S), Spring (SP), Pit (P)	Location [1]	Description	Located and Sampled?
KM60	S	On peninsula of land; in 1999 on land on north side of LVW. This area has been regraded since 1999.	Target coordinate was near rip rap bank; not found.	No
KM59	P	In LVW; in 1999 on land on north side of wash.	Target location was in LVW; not found.	No
KM58	S	In LVW; in 1999 on land on north side of wash.	Target coordinate was on southern bank of LVW; not found.	No
KM57	SP	On weir; In 1999 on land on island on northern side of wash.	Target coordinate was on Upper Narrows Weir; seep not found.	No
KM56	S	In LVW; in 1999 on land on north side of wash.	Searched for on north side of LVW; overgrown vegetation/ rip rap embankment	No
KM71	S	In LVW; in 1999 on land on north side of wash.	Backwater channel seep on northern bank of LVW.	Yes
KM70	S	Appears to be at edge of LVW; in 1999 on land on north side of wash.	Located along new rip rap area; not found.	No
KM45	P	On land near Pabco Trailhead between Pabco Road and weir; in 1999 on land on south side of wash, on south edge of sand bar/flood plain.	Target coordinate in upland on north side of LVW. Overgrown with reeds.	Located. Dry and not sampled
KM55	S	Middle of graded road; in 1999 on land on south side of wash, on south edge of sand bar/flood plain.	Target coordinate on gravel road adjacent to bike path; not found.	No
KM93	S	In LVW; in 1999 on land on north side of wash, on south edge of sand bar/flood plain.	Target coordinate on north side of LVW; spring not found.	No
KM54	P	On island in LVW upstream of weir; in 1999 on south side of wash, in central portion of sand bar/flood plain.	Target coordinate on overgrown island; pit not located.	No
KM92	P	On south bank of LVW; in 1999 on south side of wash in floodplain with little vegetation.	Area not accessible (near Bostick Weir)	No
KM53	S	On island in middle of LVW; in 1999 on north side of wash, on south edge of sand bar/flood plain.	Area not accessible (near Bostick Weir)	No
KM91	S	In LVW; in 1999 in north side of wash, on north part of sand bar/flood plain.	Target coordinate was near vegetated island in LVW; not found.	No
KM65	SP	In LVW; in 1999 in north side of wash, dense vegetation.	Target coordinate was in LVW; not found.	No
KM90	S	In weir in LVW; in 1999 on land on north side of wash, on north edge of sand bar/flood plain.	Target coordinates were on north side LVW; not found.	No
KM66	S	In LVW; in 1999 on north side of wash.	Target coordinates were in LVW; not found.	No
KM67	SP	On land on south side of LVW; in 1999 on north side of wash, dense vegetation.	Seep submerged on south side of LVW.	Yes

Notes:
ID = Identification
LVW = Las Vegas Wash
1. Current and historical conditions are based on Google Earth images on 3/22/2015 and 11/11/1999. KMZ file of samples in LVW were imported and reviewed in Google Earth Pro.
2. Determination of whether a location is currently located on land is based on Google Earth image dated 3/22/2015 and an overlay of the historical sampling locations.

Table 3 Field Collected Water Quality Data
NERT Remedial Investigation - Downgradient Study Area
Henderson, Nevada

Location	Date and Time of Measurement	Total Depth (ft.)	Sample Depth (ft.)	Temperature (˚C)	Spec. Cond. (µS/cm)	pH	Turbidity (NTU)	Dissolved Oxygen	
								mg/L	% saturation
KM-67 (seep)	5/11/2016 8:50	1.5	~0.79	22.73	4167	7.03	0.4	0.63	7.4
KM-71 (seep)	5/16/2016 10:10	6	0.25	25.2	2092	7.41	0	0.52	6.4
KM-S (seep)	5/17/2016 11:08	4.1	2	19.47	3171	7.45	<1	4.07	51.4
LW3.1	5/10/2016 10:28	1	0.5	23.58	2188	8.11	9.8	9.32	111.3
LW3.4	5/10/2016 11:59	0.9	~0.45	25.13	2216	8.22	10.7	9.07	111
LW3.75	5/11/2016 8:20	2	~1	22.86	2186	8.03	9.8	9.5	111
LW3.85	5/11/2016 10:04	1.1	~0.5	23.87	2237	8.4	4.5	13.24	158
LW4.1	5/11/2016 11:35	0.75	~0.3	23.82	2306	8.12	12.4	9.85	118
LW4.95	5/12/2016 13:37	2	1	27.1	2345	8.54	8.8	9.94	126
LW5.3	5/13/2016 9:00	3.5	1.75	23.95	2289	7.85	6.5	8.15	97
LW5.5	5/13/2016 10:40	2.25	1	25.48	2319	8.19	5.5	8.7	107
LW5.7	5/13/2016 13:35	1.4	0.75	28.95	2217	8.53	11.4	8.97	117
LW5.9	5/16/2016 7:10	1.5	0.75	23.4	2230	7.68	12.7	7.8	89.7
LW6.05	5/16/2016 9:00	1.8	0.9	23.99	2290	8.03	8.3	9.15	109
LW6.7	5/17/2016 12:40	0.5	0.25	22.8	2057	8.32	12	9.35	109
LW6.85	5/18/2016 8:55	1.3	0.65	23.85	2570	8.32	10.1	11.78	140
LW7.2	5/18/2016 9:55	1.5	0.75	25.96	2016	8.39	6.8	10.95	135
LWC3.7 (t/ss) GCS5 seep	5/10/2016 14:16	0.45	~0.2	25.96	2284	8.12	21.6	10.57	131
LWC4.1 (t/ss)	5/11/2016 12:00	1.2	~0.6	24.05	2321	8.27	13.4	10.41	125
LWC4.6 (t/ss)	5/12/2016 9:00	5	0.25	23.28	2304	7.9	11.7	9.26	109
LWC6.1 (t/ss)	5/16/2016 11:48	2	1	27.53	3129	6.92	7.5	5.89	75.3
LWC6.1_1 (t/ss)	5/17/2016 8:47	7.5	0.75	25.81	1895	7.35	<1	7.42	92
LWC6.1_2 (t/ss)	5/17/2016 10:28	1	0.5	28.68	1068	8.37	<1	7.29	94.8
LWC6.3_1 (t/ss) NERT Outfall	5/17/2016 7:38	5	0.75	25.66	8152	6.33	35.1	9.43	108.4

Notes:
ft - feet
˚C - degrees Celsius
µS/cm - micro-Siemens per centimeter
NTU - Nephalometric Turbitiy Unit
mg/L - milligrams per Liter
Spec. Cond. - Specific Conductivity
t/ss - Tributary or side stream
% - Percent

Table 4 Analytical Methods for Surface Water Samples
NERT Remedial Investigation - Downgradient Study Area
Henderson, Nevada

Analytes	Matrix	Analytical Method	Analytical Laboratory
Perchlorate	Water	EPA Method 314.0 (1)	TestAmerica (Irvine, CA)
Chlorate	Water	EPA Method 300.1	TestAmerica (Irvine, CA)
Dissolved Chromium	Water	EPA Method 200.8 (ICP-MS) (2)	TestAmerica (Irvine, CA)
Hexavalent Chromium (dissolved)	Water	EPA Method 218.7 (2)	Silver State Analytical (Las Vegas, NV)
Total Dissolved Solids (TDS)	Water	SM 2540C	TestAmerica (Irvine, CA)
Chloride	Water	EPA Method 300.0	TestAmerica (Irvine, CA)
Bromide	Water	EPA Method 300.0	TestAmerica (Irvine, CA)

Notes:

EPA = United States Environmental Protection Agency

SM = Standard Method

All groundwater and surface water samples will be analyzed for the constituents listed above.

(1) For this NERT RI Downgradient Study Area, field-filtering of surface water samples for perchlorate analysis is not required (NDEP, 2015).

(2) Sampling activities for the NERT RI Study Area include field-filtering surface water samples analyzed for chromium and hexavalent chromium using a 0.45 micron filter.

Sources:

NDEP. 2015. Email from James Dotchin, Chief Bureau of Industrial Site Cleanup, Nevada Division of Environmental Protection, re: Sterile Filtration Not Required for NERT Regional Groundwater RI Perchlorate Samples, November 18.

Table 5. Summary of Data Validation Results
NERT RI Downgradient Investigation
Henderson, Nevada

	Number	Analyses per sample	Results	Lab Qualified Results	Precent of Results that were Lab Qualified	All Qualified Results	Percent of all Results that were Qualified	Rejected Results	Precent of all Results that were Rejected
Primary Samples	24	7	168	19	11%	20	12%	0	0%
Quality Control Samples	7	7	49	2	4%	3	6%	0	0%
Total Samples	31	7	217	21	10%	23	11%	0	0%

Table 6. Analytical Resuls of Surface Water and Seep Sampling May 2016
NERT Remedial Investigation - Downgradient Study Area
Henderson, Nevada

Location	Sample ID	Sample Date	Sample Time	Bromide (mg/L)	Chlorate (µg/L)	Chloride (mg/L)	Chromium (µg/L)	Hexavalent Chromium (µg/L)	Perchlorate (µg/L)	Total Dissolved Solids (mg/L)
KM-67 (seep)	KM-67-20160511	05/11/16	08:57	ND (<0.5)	4400	580	6.3	10	1500	3500
KM-71 (seep)	KM-71-20160516	05/16/16	10:43	1.3	14 J	230	ND (<0.5)	ND (<0.090)	1.4 J	1400
KM-71 (seep)	KM-71-20160516-FD	05/16/16	10:43	1.6	14 J	230	ND (<0.5)	ND (<0.090)	1.7 J	1400
KM-S (seep)	KM-S-20160517	05/17/16	11:18	0.63 J	ND (<20)	460	ND (<0.5)	ND (<0.090)	85	2000
LW3.1	LW3.1-20160510	05/10/16	10:28	0.91	220	300	ND (<0.5)	ND (<0.090)	51	1500
LW3.4	LW3.4-20160510	05/10/16	11:59	1.4 J	210	300	ND (<0.5)	ND (<0.090)	52	1500
LW3.4	LW3.4-20160510-FD	05/10/16	11:59	0.97 J	220	300	ND (<0.5)	ND (<0.090)	56	1600
LW3.75	LW3.75-20160511	05/11/16	08:29	ND (<0.25)	160	290	0.52 J	ND (<0.090)	26	1500
LW3.85	LW3.85-20160511	05/11/16	10:09	ND (<0.25)	190	290	0.51 J	ND (<0.090)	35	1500
LW4.1	LW4.1-20160511	05/11/16	11:39	0.38 J	240	300	ND (<0.5)	ND (<0.090)	50	1800
LW4.95	LW4.95-20160512	05/12/16	13:42	ND (<0.25)	110	250	0.78 J	ND (<0.090)	15	1500
LW5.3	LW5.3-20160513	05/13/16	09:12	1.1	110	290	0.75 J	ND (<0.090)	23	1500
LW5.5	LW5.5-20160513	05/13/16	10:52	1.3	100	300	1.4 J	ND (<0.090)	19	1500
LW5.7	LW5.7-20160513	05/13/16	13:45	1.0	100	280	1.2 J	ND (<0.090)	8.3	1400
LW5.9	LW5.9-20160516	05/16/16	07:24	1.7	120	250	ND (<0.5)	ND (<0.090)	15	1500
LW6.05	LW6.05-20160516	05/16/16	09:14	1.8	130	250	ND (<0.5)	ND (<0.090)	17	1500
LW6.7	LW6.7-20160517	05/17/16	12:59	0.41 J	86	230	ND (<0.5)	ND (<0.090)	ND (<0.95)	1300
LW6.85	LW6.85-20160518	05/18/16	09:06	0.83	180	310	0.53 J	ND (<0.090)	1.0 J	1800
LW7.2	LW7.2-20160518	05/18/16	10:04	0.67	210	260	ND (<0.5)	ND (<0.090)	ND (<0.95)	1300
LWC3.7 (t/ss)	LWC3.7-20160510	05/10/16	14:08	0.93	260	300	ND (<0.5)	ND (<0.090)	61	1600
LWC4.1 (t/ss)	LWC4.1-20160511	05/11/16	12:18	0.36 J	210	310	0.55 J	ND (<0.090)	46	1600
LWC4.6 (t/ss)	LWC4.6-20160512	05/12/16	09:19	ND (<0.25)	230	260	0.62 J	ND (<0.090)	44	1400
LWC6.1 (t/ss)	LWC6.1-20160516	05/16/16	12:00	3.5	150	460	ND (<0.5)	ND (<0.090)	1.7 J	1800
LWC6.1_1 (t/ss)	LWC6.1_1-20160517	05/17/16	09:15	ND (<2.5)	240	250	ND (<0.5)	ND (<0.090)	7.3	1100
LWC6.1_2 (t/ss)	LWC6.1_2-20160517	05/17/16	10:37	ND (<0.25)	ND (<20)	91	0.61 J	ND (<0.090)	ND (<0.95)	620
LWC6.3_1 (t/ss) NERT Outfall	LWC6.3_1-20160517	05/17/16	07:38	3.3 J	ND (<20)	1600	2.2	ND (<0.090)	ND (<9.5)	5000
LWC6.3_1 (t/ss) NERT Outfall duplicate	LWC6.3_1-20160517-FD	05/17/16	07:38	ND (<2.5)	ND (<20)	1700	2.1	ND (<0.090)	ND (<9.5)	5100

ND - Not Detected above associated reporting limit
J - Associated concentration is estimated
µg/L - Micrograms per liter
mg/L - Milligrams per liter
t/ss-tributary or side stream

Table 7. Calculated Ratios of Chloride to Bromide
NERT Remedial Investigation - Downgradient Study Area
Henderson, Nevada

Location	Sample ID	Bromide Concentration (mg/L)	Chloride Concentration (mg/L)	Calculated Ratio Cl:Br
KM-67 (seep)	KM-67-20160511	ND (<0.5)	580	1160
KM-71 (seep)	KM-71-20160516	1.3	230	180
KM-71 (seep)	KM-71-20160516-FD	1.6	230	150
KM-S (seep)	KM-S-20160517	0.63 J	460	740
LW3.1	LW3.1-20160510	0.91	300	330
LW3.4	LW3.4-20160510	1.4 J	300	220
LW3.4	LW3.4-20160510-FD	0.97 J	300	310
LW3.75	LW3.75-20160511	ND (<0.25)	290	1160
LW3.85	LW3.85-20160511	ND (<0.25)	290	1160
LW4.1	LW4.1-20160511	0.38 J	300	790
LW4.95	LW4.95-20160512	ND (<0.25)	250	1000
LW5.3	LW5.3-20160513	1.1	290	270
LW5.5	LW5.5-20160513	1.3	300	240
LW5.7	LW5.7-20160513	1	280	280
LW5.9	LW5.9-20160516	1.7	250	150
LW6.05	LW6.05-20160516	1.8	250	140
LW6.7	LW6.7-20160517	0.41 J	230	570
LW6.85	LW6.85-20160518	0.83	310	380
LW7.2	LW7.2-20160518	0.67	260	390
LWC3.7 (t/ss) GCS5 seep	LWC3.7-20160510	0.93	300	330
LWC4.1 (t/ss)	LWC4.1-20160511	0.36 J	310	870
LWC4.6 (t/ss)	LWC4.6-20160512	ND (<0.25)	260	1040
LWC6.1 (t/ss)	LWC6.1-20160516	3.5	460	140
LWC6.1_1 (t/ss)	LWC6.1_1-20160517	ND (<2.5)	250	100
LWC6.1_2 (t/ss)	LWC6.1_2-20160517	ND (<0.25)	91	360
LWC6.3_1 (t/ss) NERT Outfall	LWC6.3_1-20160517	3.3 J	1600	490
LWC6.3_1 (t/ss) NERT Outfall duplicate	LWC6.3_1-20160517-FD	ND (<2.5)	1700	680

ND - Not Detected above associated reporting limit
J - Associated concentration is estimated
mg/L - Milligrams per liter
t/ss-tributary or side stream
Ratio calculated using detection limit when bromide was not detected

Appendix A

Daily Field Reports

DAILY ACTIVITY REPORT

DATE:	May 10, 2016
PROJECT NAME:	NERT Regional Groundwater RI Surface Water Sampling
SITES / LOCATIONS:	Las Vegas Wash

Day:	S	M	**T**	W	Th	F	S
Weather:	**Sunny**	Partly Sunny	Cloudy	Rain	Snow		
Temp °F:	63 to 88						
Wind:	**Still**	Moderate	High	Direction:			
Humidity:	**Dry**	Moderate	Humid	Rain			

PERSONNEL ON-SITE	Employer	Job Title
Ryan McCarthy	AECOM	Field Team Leader
C. Steve Howe	AECOM	Hydrologist

VISITORS ON-SITE	Employer	Purpose of Visit	Time In	Time Out

WORK COMPLETED

The field team completed the first day on the water. Samples were collected at three locations:

LWC3.7

LW3.4

LW3.1

A field duplicate was collected at LW3.4

Samples were relinquished to the laboratories at 15:20 (TA) and 15:41 (SS).

LIST SAFETY ACTIONS TAKEN TODAY/SAFETY INSPECTIONS CONDUCTED:

Daily boat safety inspection completed. Float plan filed. Daily health and safety briefing conducted.

SAFETY REQUIREMENTS HAVE BEEN MET

Yes No

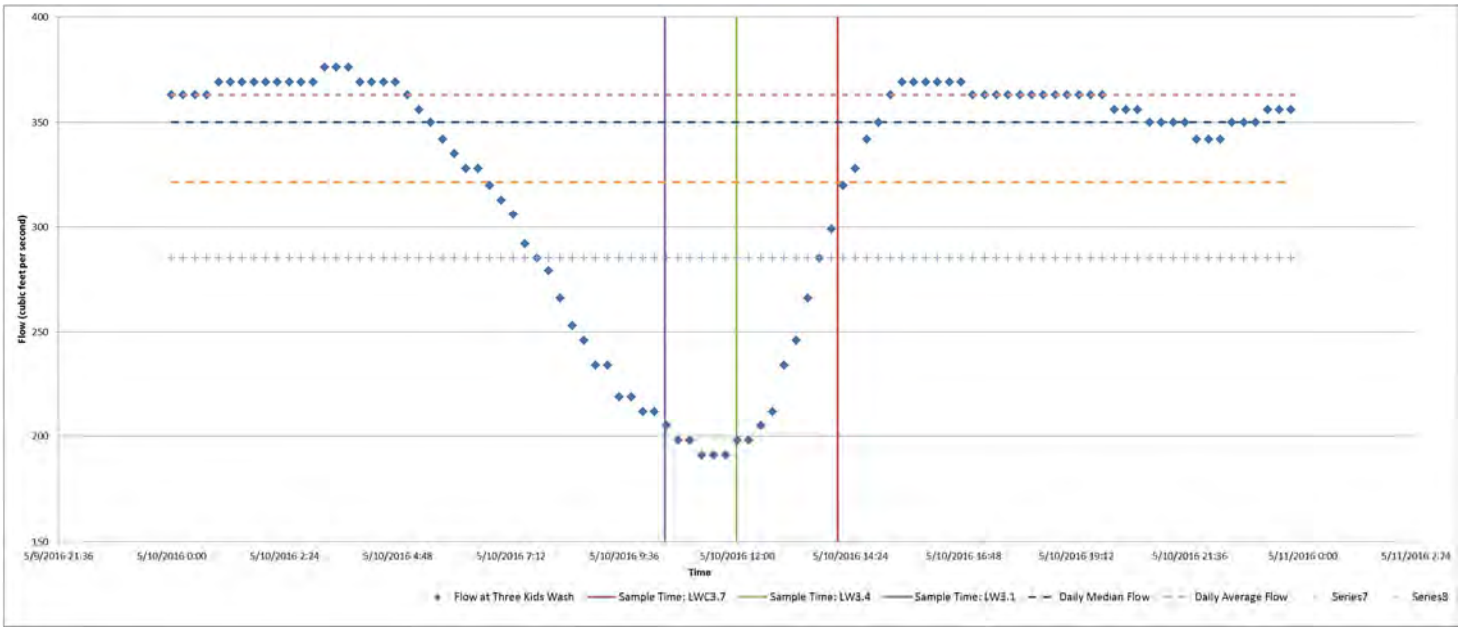
Equipment at the Site (includes Subcontractor supplied equipment):	Date Arrived	Date Removed
Canoe and sampling equipment (pump, YSI, etc)	05/10/2016	

Material/Supplies Received at the Site:

None

Field Activities and Remarks Not Presented Above:

Timing of samples in relation to flows at Three Kids Weir gage presented below



Name: Ryan McCarthy Date: 05/10/2016

DAILY ACTIVITY REPORT

DATE:	May 11, 2016
PROJECT NAME:	NERT Regional Groundwater RI Surface Water Sampling
SITES / LOCATIONS:	Las Vegas Wash

Day:	S	M	**T**	**W**	Th	F	S
Weather:	**Sunny**	Partly Sunny	Cloudy	Rain	Snow		
Temp °F:	65 to 89						
Wind:	**Still**	Moderate	High	Direction:			
Humidity:	**Dry**	Moderate	Humid	Rain			

PERSONNEL ON-SITE	Employer	Job Title
Ryan McCarthy	AECOM	Field Team Leader
C. Steve Howe	AECOM	Hydrologist

VISITORS ON-SITE	Employer	Purpose of Visit	Time In	Time Out

WORK COMPLETED

The field team completed the second day on the water. Samples were collected at four locations in the LVW and one seep:

LW4.1

LW3.85

LWC4.1

LW3.75

KM67 (seep; identified using differential conductivity readings)

No QC samples collected.

Samples were relinquished to the laboratories at 15:03 (TA) and 15:23 (SS).

Note: Game Warden stops field team at 14:15 while loading canoe onto car to inquire about activities. Field team indicated sampling water for NDEP.

LIST SAFETY ACTIONS TAKEN TODAY/SAFETY INSPECTIONS CONDUCTED:

Daily boat safety inspection completed. Float plan filed. Daily health and safety briefing conducted.

SAFETY REQUIREMENTS HAVE BEEN MET

Yes No

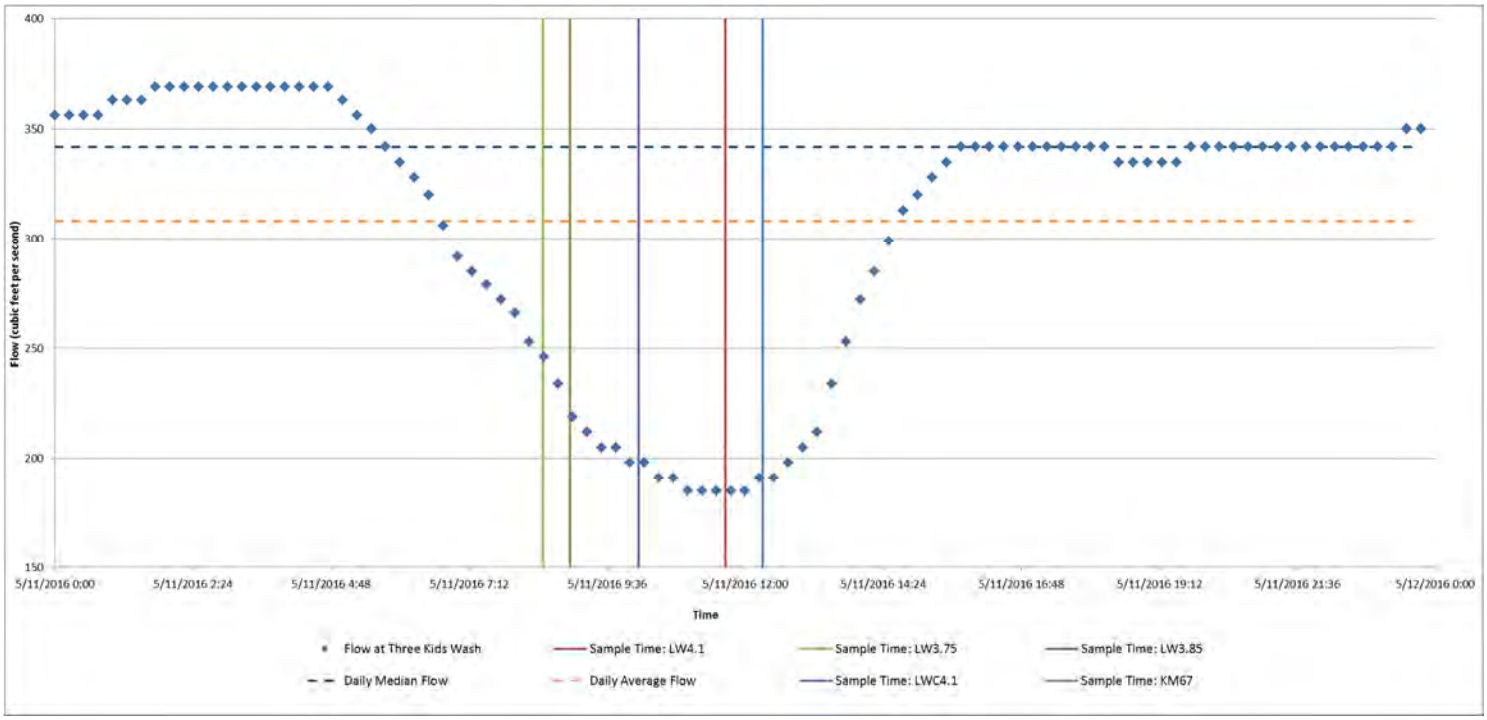
Equipment at the Site (includes Subcontractor supplied equipment):	Date Arrived	Date Removed
Canoe and sampling equipment (pump, YSI, etc)	05/10/2016	

Material/Supplies Received at the Site:

None

Field Activities and Remarks Not Presented Above:

Timing of samples in relation to flows at Three Kids Weir gage presented below



Name: Ryan McCarthy Date: 05/11/2016

DAILY ACTIVITY REPORT

DATE:	May 12, 2016
PROJECT NAME:	NERT Regional Groundwater RI Surface Water Sampling
SITES / LOCATIONS:	Las Vegas Wash

Day:	S	M	**T**	W	**Th**	F	S
Weather:	**Sunny**	Partly Sunny	Cloudy	Rain	Snow		
Temp °F:	65 to 97						
Wind:	**Still**	Moderate	High	Direction:			
Humidity:	**Dry**	Moderate	Humid	Rain			

PERSONNEL ON-SITE	Employer	Job Title
Ryan McCarthy	AECOM	Field Team Leader
C. Steve Howe	AECOM	Hydrologist

VISITORS ON-SITE	Employer	Purpose of Visit	Time In	Time Out

WORK COMPLETED

The field team completed the third day on the water. Samples were collected at two locations in the LVW:

LWC4.6

LW4.95

Seeps KM91 and KM53 were not found.

No QC samples collected.

Samples were relinquished to the laboratories at 15:20 (TA) and 15:33 (SS).

LIST SAFETY ACTIONS TAKEN TODAY/SAFETY INSPECTIONS CONDUCTED:

Daily boat safety inspection completed. Float plan filed. Daily health and safety briefing conducted.

SAFETY REQUIREMENTS HAVE BEEN MET

Yes No

Equipment at the Site (includes Subcontractor supplied equipment):	Date Arrived	Date Removed
Canoe and sampling equipment (pump, YSI, etc)	05/10/2016	

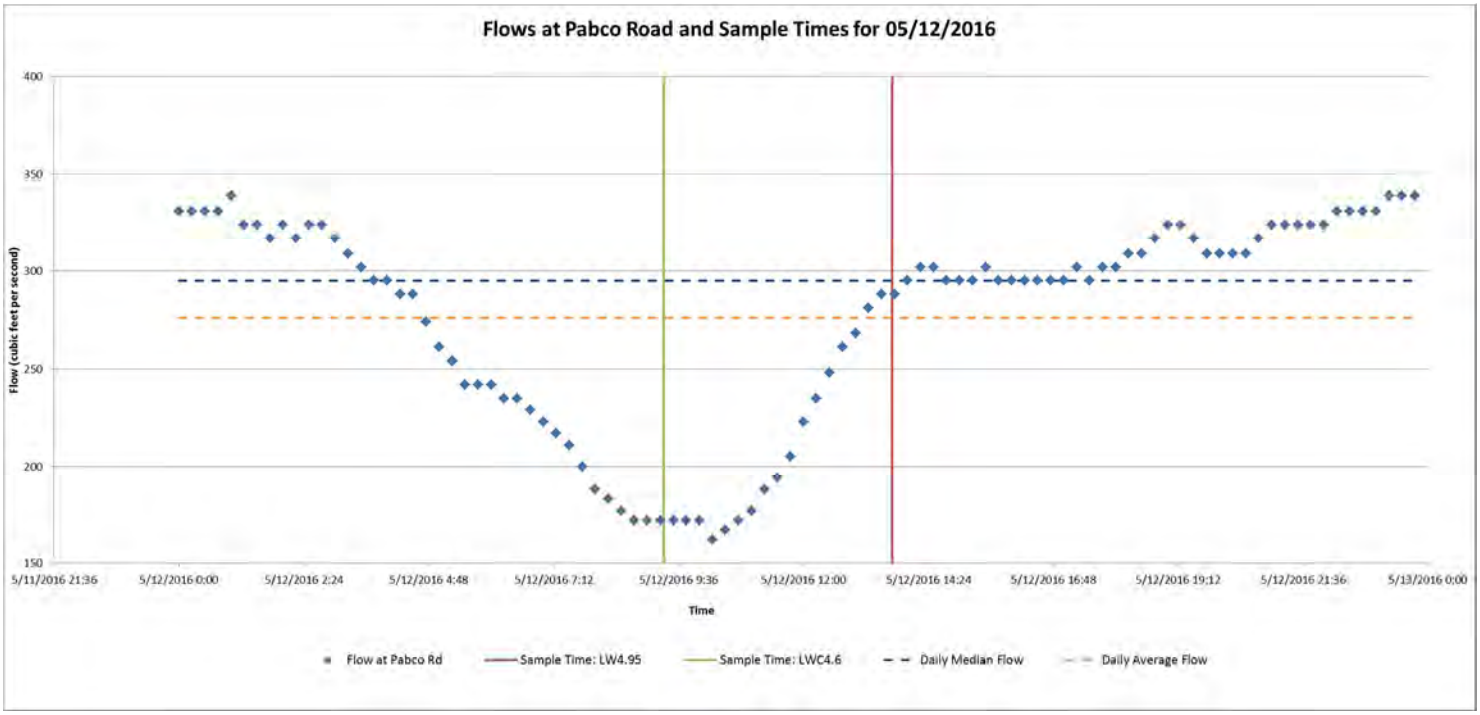
Material/Supplies Received at the Site:

None

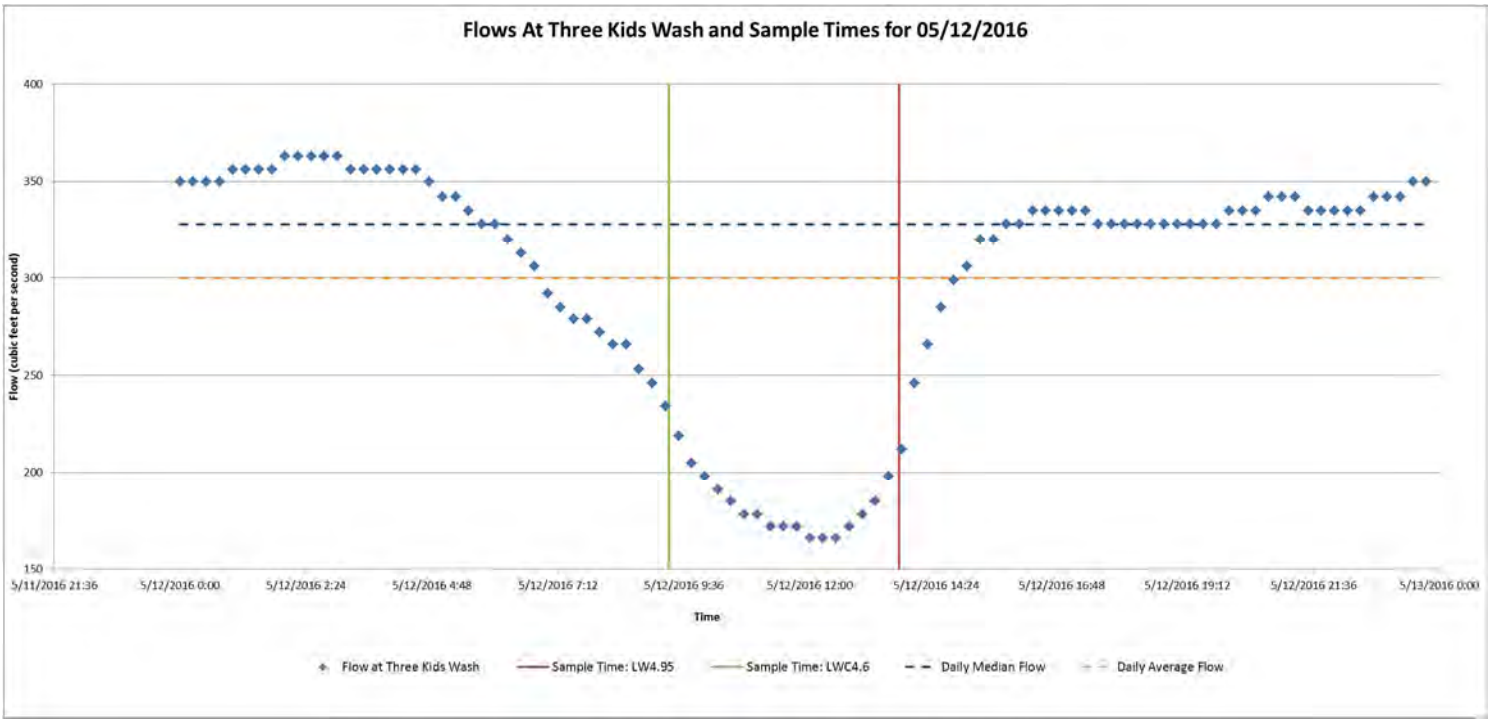
Field Activities and Remarks Not Presented Above:

Since the sampling occurred between the two USGS gages Pabco Road and Three Kids Wash, both are presented below.

Timing of samples in relation to flows at Pabco Road gage presented below



Timing of samples in relation to flows at Three Kids Wash gage presented below



Name: Ryan McCarthy Date: 05/12/2016

DAILY ACTIVITY REPORT

DATE:	May 13, 2016
PROJECT NAME:	NERT Regional Groundwater RI Surface Water Sampling
SITES / LOCATIONS:	Las Vegas Wash

Day:	S	M	**T**	W	Th	**F**	S
Weather:	**Sunny**	Partly Sunny	Cloudy	Rain	Snow		
Temp °F:	65 to 97						
Wind:	**Still**	Moderate	High	Direction:			
Humidity:	**Dry**	Moderate	Humid	Rain			

PERSONNEL ON-SITE	Employer	Job Title
Ryan McCarthy	AECOM	Field Team Leader
C. Steve Howe	AECOM	Hydrologist

VISITORS ON-SITE	Employer	Purpose of Visit	Time In	Time Out

WORK COMPLETED

The field team completed the fourth day on the water. Samples were collected at three locations in the LVW:

LW5.3

LW5.5

LW5.7

The location of KM5.5 adjusted to mid-channel below Historic Lateral weir.

AT KM5.7, flows and depth prevented wading or safe anchoring of canoe. Station moved toward northern bank.

Seeps KM54, KM93 and KM55 were not found.

No QC samples collected.

Samples were relinquished to the laboratories at 15:30 (TA) and 15:45 (SS).

LIST SAFETY ACTIONS TAKEN TODAY/SAFETY INSPECTIONS CONDUCTED:

Daily boat safety inspection completed. Float plan filed. Daily health and safety briefing conducted.

SAFETY REQUIREMENTS HAVE BEEN MET

Yes No

Equipment at the Site (includes Subcontractor supplied equipment):	Date Arrived	Date Removed
Canoe and sampling equipment (pump, YSI, etc)	05/10/2016	

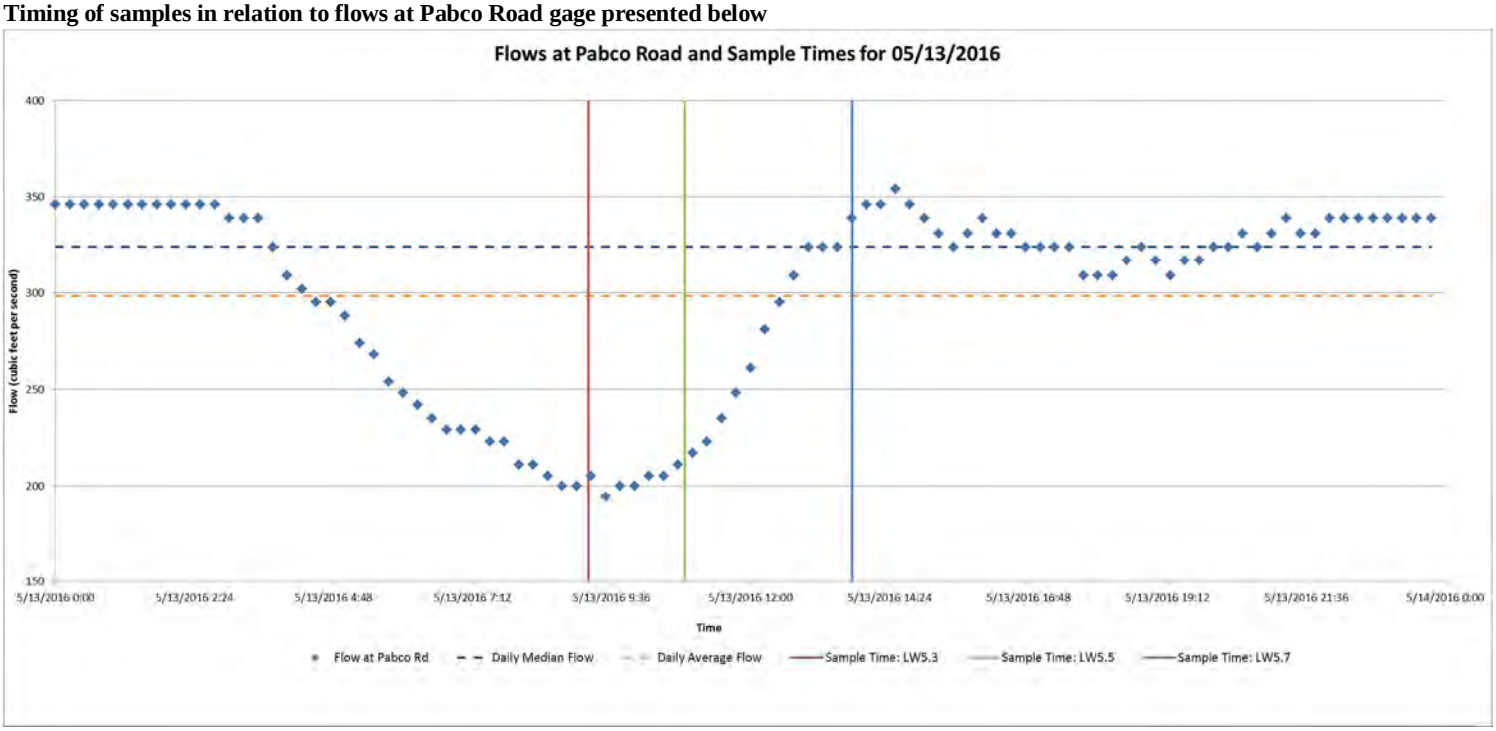
Material/Supplies Received at the Site:

None

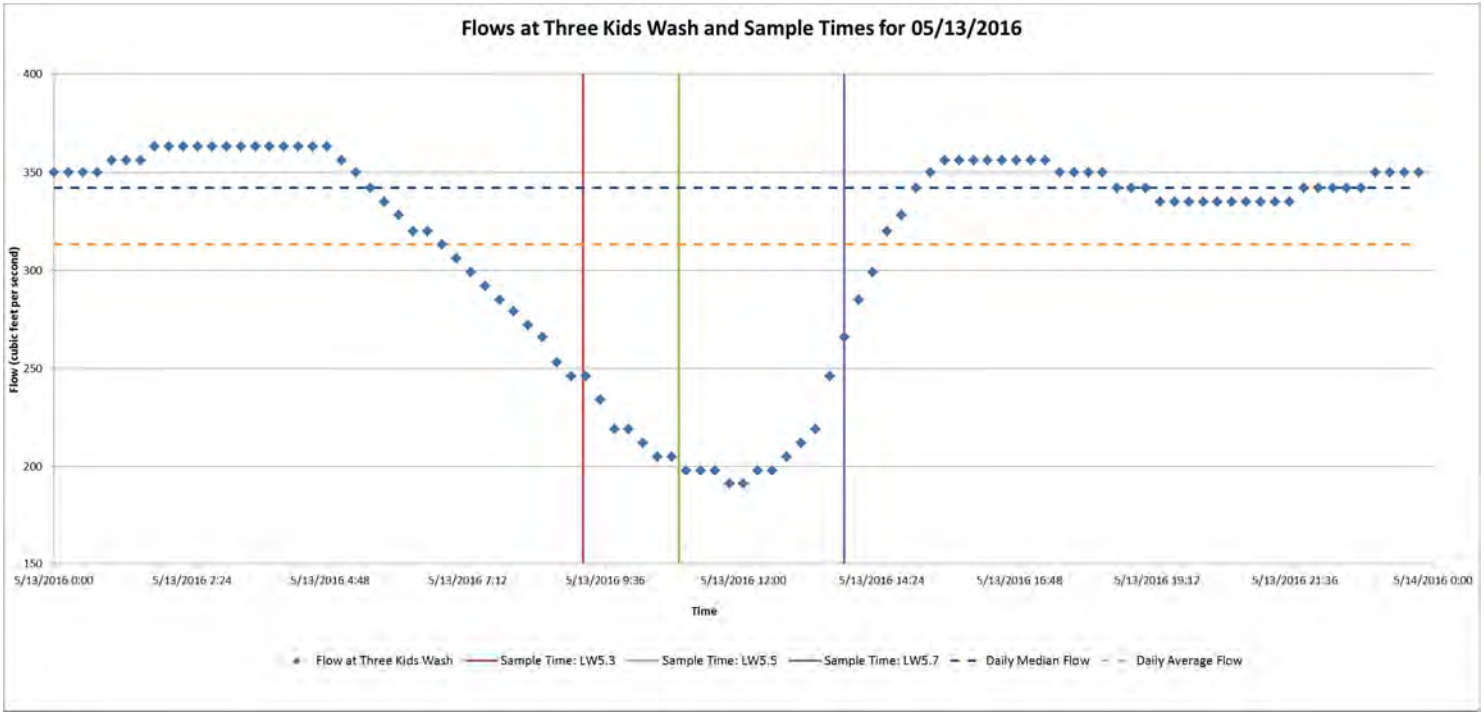
Field Activities and Remarks Not Presented Above:

Since the sampling occurred between the two USGS gages Pabco Road and Three Kids Wash, both are presented below.

Timing of samples in relation to flows at Pabco Road gage presented below



Timing of samples in relation to flows at Three Kids Wash gage presented below



Name: Ryan McCarthy Date: 05/13/2016

DAILY ACTIVITY REPORT

DATE:	May 16, 2016
PROJECT NAME:	NERT Regional Groundwater RI Surface Water Sampling
SITES / LOCATIONS:	Las Vegas Wash

Day:	S	**M**	**T**	W	Th	F	S
Weather:	**Sunny**	Partly Sunny	Cloudy	Rain	Snow		
Temp °F:	63 to 86						
Wind:	Still	Moderate	High	Direction:	**Light NNW**		
Humidity:	**Dry**	Moderate	Humid	Rain			

PERSONNEL ON-SITE	Employer	Job Title
Ryan McCarthy	AECOM	Field Team Leader
C. Steve Howe	AECOM	Hydrologist

VISITORS ON-SITE	Employer	Purpose of Visit	Time In	Time Out

WORK COMPLETED

The field team completed the fifth day on the water. Samples were collected at three locations in the LVW:

LW5.9

LW6.05

LWC6.1

The locations of LW6.04 and LWC6.1 were adjusted per prior conversation with Weiquan Dong. See below

Seeps KM45 and KM70 were not found. A seep was found (E831311.19686235 N26734771.979597) that was off-set from KM70 (E832164.452 N26734488.11) and KM71 (E831497.7854 N26734758.94) .A seep sample was collected at what was determined based on off-sets to be seep KM71. Plot of locations below.

A field dup was collected at KM71. MS/MSD samples were collected at LWC6.1. An equipment blank was collected associated with LWC6.1.A field blank was collected associated with LW3.1 (first sample collected in batch of 20 from 5/10/2016).

Samples were relinquished to the laboratories at 15:37 (TA) and 15:13 (SS).

LIST SAFETY ACTIONS TAKEN TODAY/SAFETY INSPECTIONS CONDUCTED:	SAFETY REQUIREMENTS HAVE BEEN MET
Daily boat safety inspection completed. Float plan filed. Daily health and safety briefing conducted.	**Yes** No

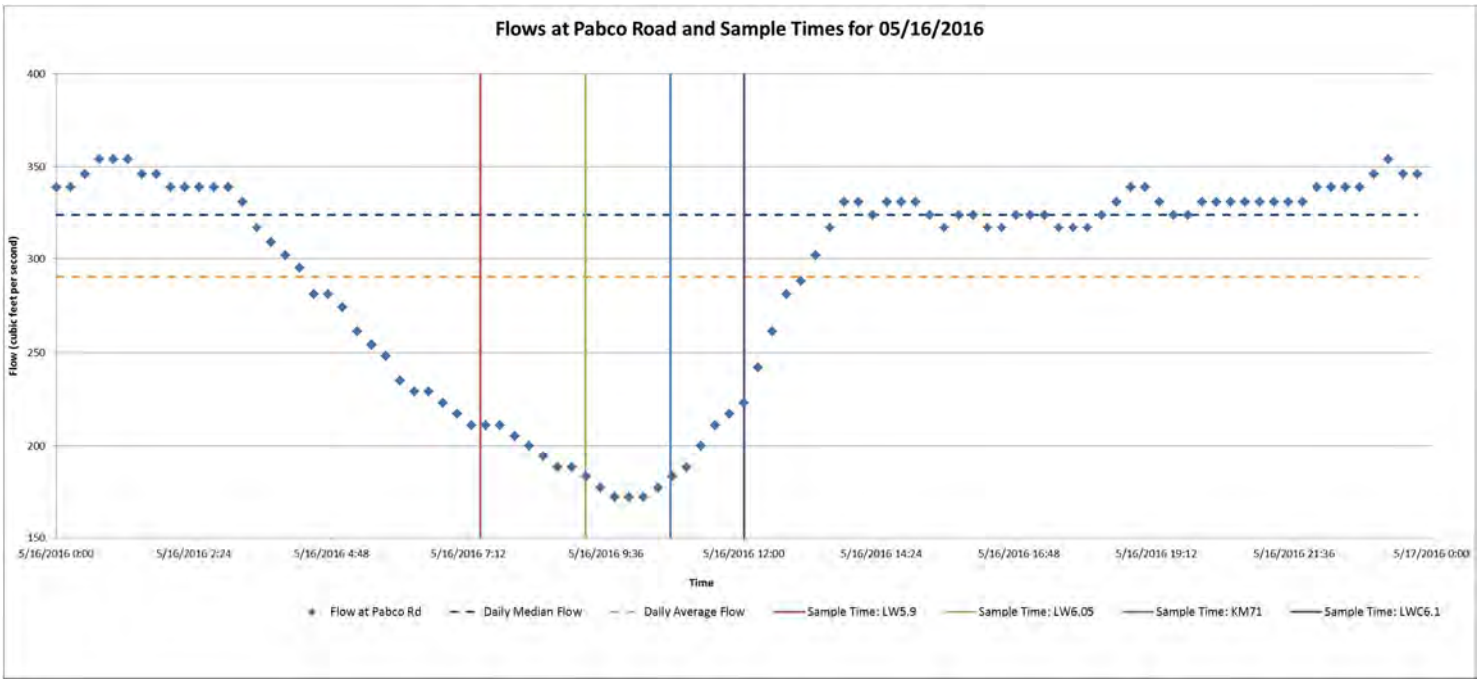
Equipment at the Site (includes Subcontractor supplied equipment):	Date Arrived	Date Removed
Canoe and sampling equipment (pump, YSI, etc)	05/10/2016	

Material/Supplies Received at the Site:

None

Field Activities and Remarks Not Presented Above:

Timing of samples in relation to flows at Pabco Road gage presented below



Name: Ryan McCarthy Date: 05/16/2016

DAILY ACTIVITY REPORT

DATE:	May 17, 2016
PROJECT NAME:	NERT Regional Groundwater RI Surface Water Sampling
SITES / LOCATIONS:	Las Vegas Wash

Day:	S	M	**T**	W	Th	F	S
Weather:	Sunny	Partly Sunny	**Cloudy**	Rain	Snow		
Temp °F:	66 to 75						
Wind:	Still	**Moderate**	High	Direction:	**WSW to NNW**		
Humidity:	**Dry**	Moderate	Humid	Rain	**Rain pending to west**		

PERSONNEL ON-SITE	Employer	Job Title
Ryan McCarthy	AECOM	Field Team Leader
C. Steve Howe	AECOM	Hydrologist

VISITORS ON-SITE	Employer	Purpose of Visit	Time In	Time Out
Weiquan Dong	NDEP	Observe sampling	08:10	09:35
Carlton Parker	NDEP	Observe sampling	08:10	09:35

WORK COMPLETED

The field team completed the sixth day in the field and on the water. Samples were collected at five locations:

LWC6.3_1

LWC6.1_1

LWC6.1_2

KM_S (the Kerr McGee seep)

LW6.7

The Kerr McGee seep was sampled after discussion with Weiquan Dong of NDEP. On the site visit May 9, 2016 and via email, he had expressed interest in AECOM sampling the seep. Since few other seeps were found, the field team asked if NDEP would want a sample from this seep and collected it upon approval from NDEP.

No other seeps located.

An MS and MSD were collected with LW6.7.

A field blank was collected associated with LW6.7 (first sample collected in second batch of 20).

An equipment blank was collected associated with LWC6.7.

A field duplicate was collected at LWC6.3_1.

This completes the necessary QC samples for the program.

Samples were relinquished to the laboratories at 15:00 (TA) and 15:30 (SS).

LIST SAFETY ACTIONS TAKEN TODAY/SAFETY INSPECTIONS CONDUCTED:	SAFETY REQUIREMENTS HAVE BEEN MET
Daily boat safety inspection completed. Float plan filed. Daily health and safety briefing conducted. Particular attention was given to the rain west of Henderson. Ryan McCarthy and Kristen Durocher were in contact all day to evaluate radar and chances of rain/flash flooding. USGS gages in Las Vegas (west of Henderson) were monitoring for increases in flow.	**Yes** No

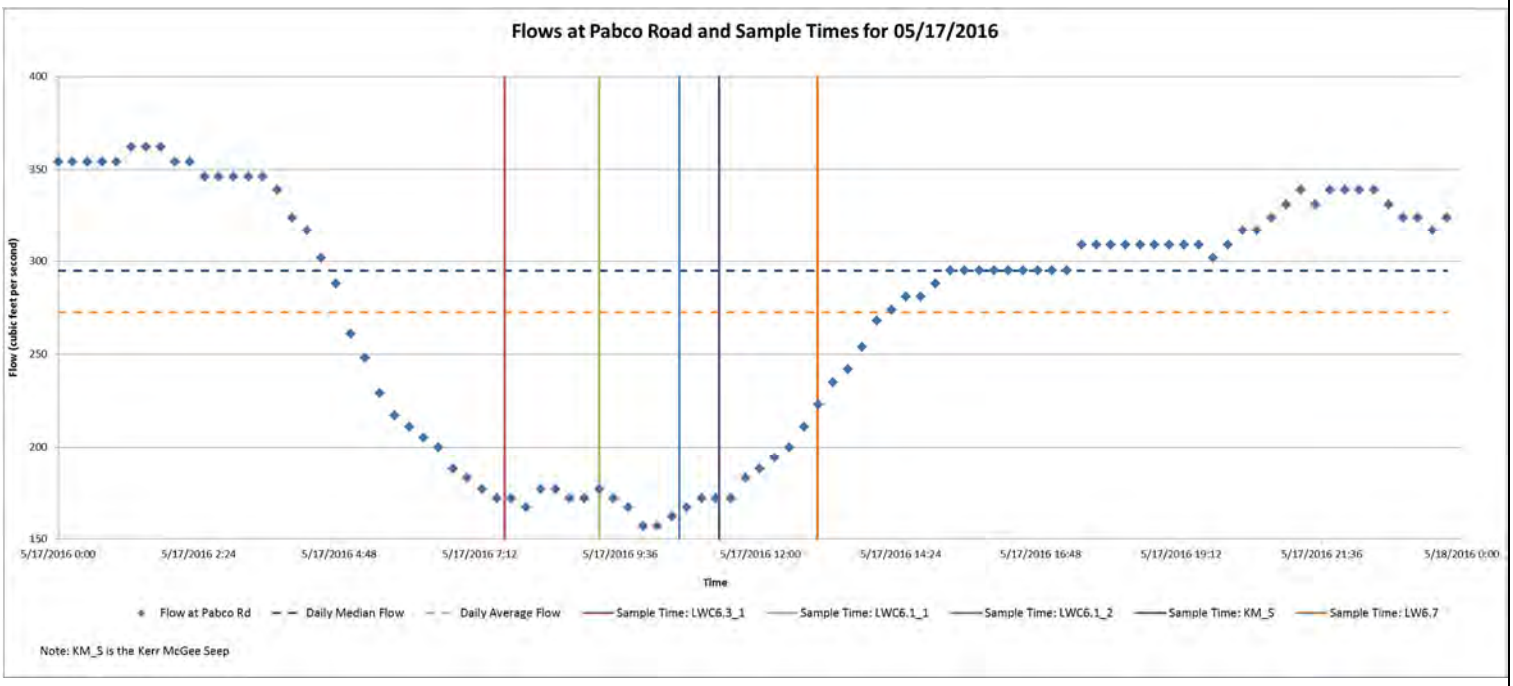
Equipment at the Site (includes Subcontractor supplied equipment):	Date Arrived	Date Removed
Canoe and sampling equipment (pump, YSI, etc)	05/10/2016	

Material/Supplies Received at the Site:

None

Field Activities and Remarks Not Presented Above:

Timing of samples in relation to flows at Pabco Road gage presented below



Name: Ryan McCarthy Date: 05/17/2016

DAILY ACTIVITY REPORT

DATE:	May 18, 2016
PROJECT NAME:	NERT Regional Groundwater RI Surface Water Sampling
SITES / LOCATIONS:	Las Vegas Wash

Day:	S	M	T	**W**	Th	F	S
Weather:	**Sunny**	Partly Sunny	Cloudy	Rain	Snow		
Temp °F:	62 to 86						
Wind:	**Still**	Moderate	High	Direction:			
Humidity:	**Dry**	Moderate	Humid	Rain			

PERSONNEL ON-SITE	Employer	Job Title
Ryan McCarthy	AECOM	Field Team Leader
C. Steve Howe	AECOM	Hydrologist

VISITORS ON-SITE	Employer	Purpose of Visit	Time In	Time Out

WORK COMPLETED

The field team completed the seventh day in the field and on the water. Samples were collected at two locations:

LW6.85

LW7.2

No other seeps located.

Samples were relinquished to the laboratories at 15:15 (TA) and 15:35 (SS).

This completed the field work for the SWP.

The canoe and paddles were left locked to the fence near the NERT trailer. Other equipment was given to Scott Heiny to hold at the AECOM office:

9 large filters

13 small filters

Anchor

Partial rolls of hard/ soft tubing

4 canoe straps

Throw bag

Voa vials (10) unused

Spool tape measure

5 gallon bucket

2 pair waders

Laminated map set

LIST SAFETY ACTIONS TAKEN TODAY/SAFETY INSPECTIONS CONDUCTED:

Daily boat safety inspection completed. Float plan filed. Daily health and safety briefing conducted. Particular attention was given to the rain west of Henderson. Ryan McCarthy and Kristen Durocher were in contact all day to evaluate radar and chances of rain/flash flooding. USGS gages in Las Vegas (west of Henderson) were monitoring for increases in flow.

SAFETY REQUIREMENTS HAVE BEEN MET

Yes No

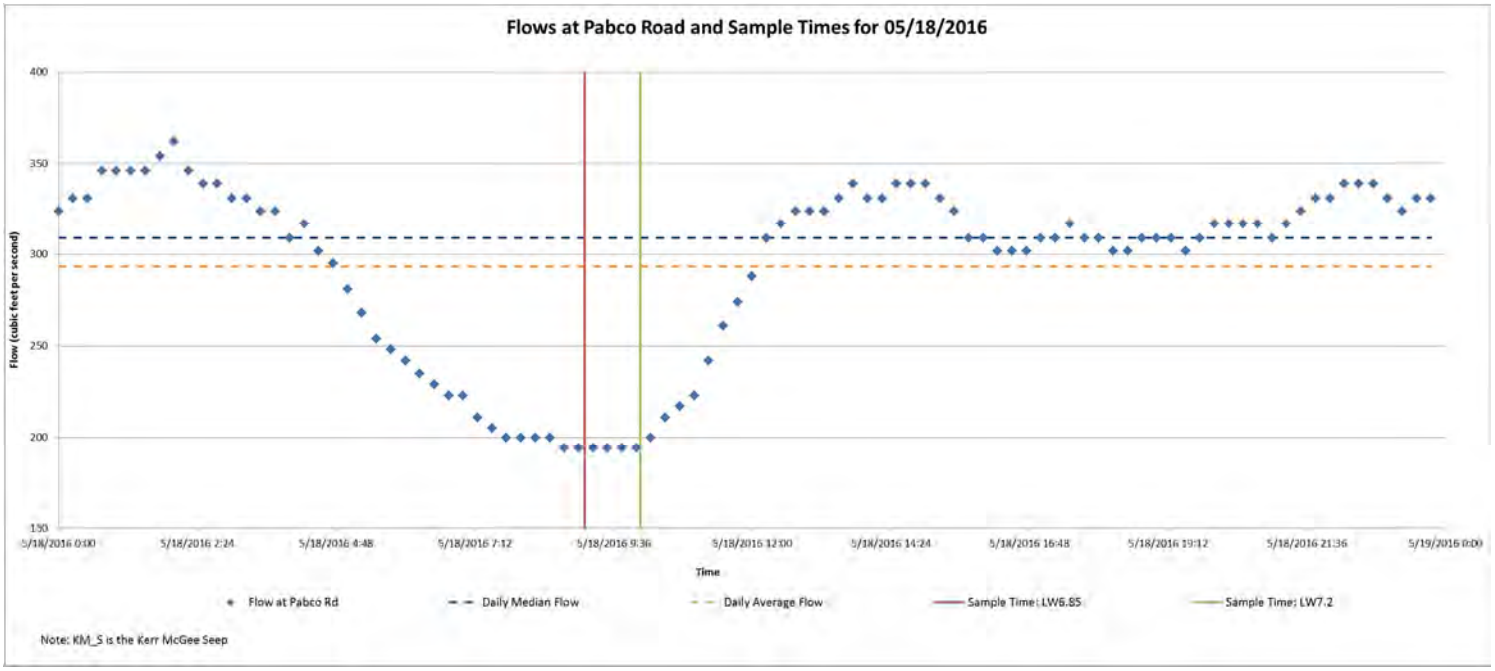
Equipment at the Site (includes Subcontractor supplied equipment):	Date Arrived	Date Removed
Canoe and sampling equipment (pump, YSI, etc)	05/10/2016	05/18/2016

Material/Supplies Received at the Site:

None

Field Activities and Remarks Not Presented Above:

Timing of samples in relation to flows at Pabco Road gage presented below



Name: Ryan McCarthy Date: 05/18/2016

Appendix B

Health and Safety Briefings

Attachment B – Tailgate Safety Briefing Sign-In Log

AECOM

Briefing Conducted By:	Signature:	Date:	Time:
RYAN MCCARTHY		5/10/16	0915

Project name:	Project Number:
NERT SW SAMPLING	60477365

This sign-in log documents the topics of the tailgate safety briefing and individual attendance at the briefing. Personnel who perform work operations onsite are required to attend each safety briefing and acknowledge their ability to ask questions and receipt of such briefings daily. **Please provide a brief narrative of the following topics as applicable to the Project**

Scope of Work	SURFACE WATER SAMPLING
HASP/JSA/THA review	ON WATER WORK
SOP Review	SAMPLING OF SW
PPE Requirements	PFD, SUN BLOCK, EYE PROTECTION
Incident Review Safety Alerts	
Other:	

Personnel Sign-in List

Printed Name and Company	Signature	Printed Name and Company	Signature
1. RYAN MCCARTHY / AECOM		7.	
2. STEVE HOWE / AECOM		8.	
3.		9.	
4.		10.	
5.		11.	
6.		12.	

Boat Safety Checklist

Keep this page with your boat, ready for inspection. By using this checklist, or one fine-tuned by yourself, you'll be sure that everything is on board and in good working order. Your passengers will appreciate knowing you're concerned about boating safety.

- [x] Float plan--let a friend or relative know when you're leaving, where you're going, when you expect to return, what to do if you don't, and a description of your boat
- [ ] Registration certificate or documentation N/A
- [x] Personal Flotation Devices (wearable and throw able)--USCG approved, good condition, readily accessible, assigned and fitted
- [ ] Fire Extinguishers--right number, size, and class for boat; charged, not corroded, nozzle clear, bracketed, readily accessible N/A
- [ ] Visual Distress Signals--current dates on flares, proper number, batteries good if lights or EPIRB N/A
- [x] Anchors and Line--adequate anchor for bottom, adequate line for water depth
- [ ] Bilge device --bilge pump operable, alternative bailing device available
- [x] Watch or clock--operable
- [ ] Bright flashlight or searchlight
- [ ] Navigation lights --tested and operable, spare bulbs
- [ ] Batteries--fully charged, encased in plastic boxes or terminals covered, securely fastened down
- [x] Sound-producing device--horn, whistle appropriate for boat
- [x] Alternate propulsion--paddle or oar
- [x] First Aid Kit 5/10/16
- [ ] Tools, spare outboard prop and lock nut
- [x] Compass
- [x] Sunscreen
- [ ] Weather Radio N/A

you'
kno

Daily Float Plan

Name of vessel's operator:	RYAN MCARTHY
Telephone Number:	603 770 4945
Name of Vessel:	CANOE
Registration No.:	
Description of Vessel: Type: Make: Color of Hull/Trim Most distinguishing identifiable feature:	YELLOW 16.9'

Rafts/Dinghies: Number: __ Size: __ Color: __

Radio/Communication Type: CELL PHONE

Number of persons onboard: 2

Name:	Age:	Address & Telephone:
RYAN MCARTHY	37	603 770 4945
STEVE HOME	53	603 263 2143

Engine Type:_____ H.P.:_____ Normal Fuel Supply (days):_____

Survival equipment on board: (check as appropriate)

☑ Life Jackets	☐ Flares	☐ Smoke Signals
☑ Medical Kit	☐ EPIRB	☒ Paddles
☑ Anchor	☑ Loran/GPS	☑ Life Ring

Trip: LAS VEGAS WASH (MULTIPLE LOCATIONS

Date & Time of Departure: 5/10/16 1000

Departure From: SHORE

Departure To: SHORE

Expected to arrive by: 1500 In no case later than: 1600

Date & Time of Arrival: 5/10/16 1500

Boat Lead Signature at Arrival: [signature]

Attachment B – Tailgate Safety Briefing Sign-In Log

AECOM

Briefing Conducted By:	Signature:	Date:	Time:
RYAN MCCARTHY		5/11/16	0730

Project name:	Project Number:
NERT SW SAMPLING	60477365

This sign-in log documents the topics of the tailgate safety briefing and individual attendance at the briefing. Personnel who perform work operations onsite are required to attend each safety briefing and acknowledge their ability to ask questions and receipt of such briefings daily. **Please provide a brief narrative of the following topics as applicable to the Project**

Scope of Work	SURFACE WATER SAMPLING
HASP/JSA/THA review	ON WATER WORK
SOP Review	SW SAMPLING
PPE Requirements	PFD, SUN BLOCK, EYE PROTECTION
Incident Review Safety Alerts	
Other:	UNEVEN FOOTING

Personnel Sign-in List

Printed Name and Company	Signature	Printed Name and Company	Signature
1. RYAN MCCARTHY / AECOM		7.	
2. STEVE HOWE / AECOM		8.	
3.		9.	
4.		10.	
5.		11.	
6.		12.	

Boat Safety Checklist

Keep this page with your boat, ready for inspection. By using this checklist, or one fine-tuned by yourself, you'll be sure that everything is on board and in good working order. Your passengers will appreciate knowing you're concerned about boating safety.

- [x] Float plan--let a friend or relative know when you're leaving, where you're going, when you expect to return, what to do if you don't, and a description of your boat
- [ ] Registration certificate or documentation N/A
- [x] Personal Flotation Devices (wearable and throw able)--USCG approved, good condition, readily accessible, assigned and fitted AG
- [ ] Fire Extinguishers--right number, size, and class for boat; charged, not corroded, nozzle clear, bracketed, readily accessible N/A
- [ ] Visual Distress Signals--current dates on flares, proper number, batteries good if lights or EPIRB
- [x] Anchors and Line--adequate anchor for bottom, adequate line for water depth
- [ ] Bilge device --bilge pump operable, alternative bailing device available
- [x] Watch or clock--operable
- [ ] Bright flashlight or searchlight
- [ ] Navigation lights --tested and operable, spare bulbs
- [ ] Batteries--fully charged, encased in plastic boxes or terminals covered, securely fastened down
- [x] Sound-producing device--horn, whistle appropriate for boat
- [x] Alternate propulsion--paddle or oar
- [x] First Aid Kit
- [x] Tools, ~~spare outboard prop and lock~~ nut
- [x] Compass
- [x] Sunscreen
- [ ] Weather Radio

5/11/16

Daily Float Plan

Name of vessel's operator:	RYAN MCCARTHY
Telephone Number:	603 770 4945
Name of Vessel:	CANOE - ~~OTHER~~
Registration No.:	
Description of Vessel: Type: Make: Color of Hull/Trim Most distinguishing identifiable feature:	YELLOW 16.9'

Rafts/Dinghies: Number: __ Size: __ Color: __

Radio/Communication Type: CELL PHONE

Number of persons onboard: 2

Name:	Age:	Address & Telephone:
RYAN MCCARTHY	37	603 770 4945
STEVE HOWE	53	603 263 2143

Engine Type:_____ H.P.:_____ Normal Fuel Supply (days):_____

Survival equipment on board: (check as appropriate)

☑ Life Jackets	☐ Flares	☐ Smoke Signals
☑ Medical Kit	☐ EPIRB	☑ Paddles
☑ Anchor	☑ Loran/GPS	☑ Life Ring

Trip: LAS VEGAS WASH - MULTIPLE LOCATIONS

Date & Time of Departure: 5/11/16 0800

Departure From: SHORE

Departure To: SHORE

Expected to arrive by: 1500 In no case later than: 1600

Date & Time of Arrival: 5/11/16 1430

Boat Lead Signature at Arrival: [signature]

Attachment B – Tailgate Safety Briefing Sign-In Log

AECOM

Briefing Conducted By:	Signature:	Date:	Time:
RYAN MCCARTHY		5/12/16	0800

Project name:	Project Number:
NERT SW SAMPLING	

This sign-in log documents the topics of the tailgate safety briefing and individual attendance at the briefing. Personnel who perform work operations onsite are required to attend each safety briefing and acknowledge their ability to ask questions and receipt of such briefings daily. **Please provide a brief narrative of the following topics as applicable to the Project**

Scope of Work	SW SAMPLING IN LV WASH
HASP/JSA/THA review	WORK ON WATER
SOP Review	SW SAMPLING
PPE Requirements	PFD, EYE PROTECTION, NITRILE GLOVES, SUNBLOCK * EXEMPT FROM STEELTOE BOOTS/HARDHAT
Incident Review Safety Alerts	
Other:	HEAT STRESS! UNEVEN FOOTING. LIFTING SAFETY

Personnel Sign-in List

Printed Name and Company	Signature	Printed Name and Company	Signature
1. RYAN MCCARTHY / AECOM		7.	
2. STEVE HOWE / AECOM		8.	
3.		9.	
4.		10.	
5.		11.	
6.		12.	

Boat Safety Checklist

Keep this page with your boat, ready for inspection. By using this checklist, or one fine-tuned by yourself, you'll be sure that everything is on board and in good working order. Your passengers will appreciate knowing you're concerned about boating safety.

☑ Float plan--let a friend or relative know when you're leaving, where you're going, when you expect to return, what to do if you don't, and a description of your boat

☐ Registration certificate or documentation N/A

☑ Personal Flotation Devices (wearable and throw able)--USCG approved, good condition, readily accessible, assigned and fitted

☐ Fire Extinguishers--right number, size, and class for boat; charged, not corroded, nozzle clear, bracketed, readily accessible N/A

☐ Visual Distress Signals--current dates on flares, proper number, batteries good if lights or EPIRB N/A

☑ Anchors and Line--adequate anchor for bottom, adequate line for water depth

☐ Bilge device --bilge pump operable, alternative bailing device available N/A

☑ Watch or clock--operable

☐ Bright flashlight or searchlight N/A

☐ Navigation lights --tested and operable, spare bulbs N/A

☐ Batteries--fully charged, encased in plastic boxes or terminals covered, securely fastened down N/A

☑ Sound-producing device--horn, whistle appropriate for boat

☑ Alternate propulsion--paddle or oar

☑ First Aid Kit

☑ Tools, ~~spare outboard prop and lock nut~~

☑ Compass

☑ Sunscreen

☑ ~~Weather Radio~~ CELL PHONE

5/12/16

Daily Float Plan

Name of vessel's operator:	RYAN MCCARTHY
Telephone Number:	603 770 4945
Name of Vessel:	MELLOW YELLOW
Registration No.:	
Description of Vessel: Type: WE-NO-NAH Make: NORTHFORK Color of Hull/Trim Most distinguishing identifiable feature:	YELLOW CANOE 16.9'

Rafts/Dinghies: Number: __ Size: __ Color: __

Radio/Communication Type: CELL PHONE

Number of persons onboard: 2

Name:	Age:	Address & Telephone:
RYAN MCCARTHY	37	603 770 4945
STEVE HOWE	53	603 263 2143

Engine Type:_____ H.P.:_____ Normal Fuel Supply (days):_____

Survival equipment on board: (check as appropriate)

☑ Life Jackets	☐ Flares	☐ Smoke Signals
☑ Medical Kit	☐ EPIRB	☑ Paddles
☑ Anchor	☑ Loran/GPS	☑ Life Ring

Trip: LAS VEGAS WASH / MULTIPLE LOCATIONS

Date & Time of Departure: 5/12/16 0900

Departure From: SHOKE

Departure To: SHOKE

Expected to arrive by: 1500 In no case later than: 1600

Date & Time of Arrival: 1445 5/12/16

Boat Lead Signature at Arrival: RM

Attachment B – Tailgate Safety Briefing Sign-In Log

AECOM

Briefing Conducted By:	Signature:	Date:	Time:
RYAN MCCARTHY		5/12/16	0745

Project name:	Project Number:
MERT SW SAMPLING	

This sign-in log documents the topics of the tailgate safety briefing and individual attendance at the briefing. Personnel who perform work operations onsite are required to attend each safety briefing and acknowledge their ability to ask questions and receipt of such briefings daily. **Please provide a brief narrative of the following topics as applicable to the Project**

Scope of Work	SW SAMPLING ON LU WASH
HASP/JSA/THA review	WORK ON WATER
SOP Review	SW SAMPLING
PPE Requirements	PFD, EYE PROTECTION, NITRILE GLOVES, SUNBLOCK * EXEMPT FROM STEELTOE/HARDHAT
Incident Review Safety Alerts	
Other:	HEAT STRESS! UNEVEN FOOTING LIFTING SAFETY

Personnel Sign-in List

Printed Name and Company	Signature	Printed Name and Company	Signature
1. RYAN MCCARTHY/AECOM		7.	
2. STEVE HOWE/AECOM		8.	
3.		9.	
4.		10.	
5.		11.	
6.		12.	

Boat Safety Checklist

Keep this page with your boat, ready for inspection. By using this checklist, or one fine-tuned by yourself, you'll be sure that everything is on board and in good working order. Your passengers will appreciate knowing you're concerned about boating safety.

- [x] Float plan--let a friend or relative know when you're leaving, where you're going, when you expect to return, what to do if you don't, and a description of your boat
- [ ] Registration certificate or documentation N/A
- [x] Personal Flotation Devices (wearable and throw able)--USCG approved, good condition, readily accessible, assigned and fitted
- [ ] Fire Extinguishers--right number, size, and class for boat; charged, not corroded, nozzle clear, bracketed, readily accessible N/A
- [ ] Visual Distress Signals--current dates on flares, proper number, batteries good if lights or EPIRB N/A
- [x] Anchors and Line--adequate anchor for bottom, adequate line for water depth
- [ ] Bilge device --bilge pump operable, alternative bailing device available N/A
- [x] Watch or clock--operable
- [ ] Bright flashlight or searchlight
- [ ] Navigation lights --tested and operable, spare bulbs
- [ ] Batteries--fully charged, encased in plastic boxes or terminals covered, securely fastened down
- [x] Sound-producing device--horn, whistle appropriate for boat
- [x] Alternate propulsion--paddle or oar
- [x] First Aid Kit
- [x] Tools, ~~spare outboard prop and lock nut~~
- [x] Compass
- [x] Sunscreen
- [x] ~~Weather Radio~~ CELL PHONE

5/13/16

Daily Float Plan

Name of vessel's operator:	RYAN MCCARTHY
Telephone Number:	603 770 4945
Name of Vessel:	MELLOW YELLOW
Registration No.:	
Description of Vessel: Type: WE-NO-NAH Make: Color of Hull/Trim NORTH FORK Most distinguishing identifiable feature:	YELLOW CANOE 16.9'

Rafts/Dinghies: Number: __ Size: __ Color: __

Radio/Communication Type:

Number of persons onboard:

Name:	Age:	Address & Telephone:
RYAN MCCARTHY	37	603 770 4945
STEVE HOWE	53	603 263 2143

Engine Type:_____ H.P.:_____ Normal Fuel Supply (days):_____

Survival equipment on board: (check as appropriate)

- [x] Life Jackets
- [ ] Flares
- [ ] Smoke Signals
- [x] Medical Kit
- [ ] EPIRB
- [x] Paddles
- [x] Anchor
- [x] Loran/GPS
- [x] Life Ring

Trip: LAS VEGAS WASH / MULTIPLE LOCATIONS

Date & Time of Departure: 5/13/16 0845

Departure From: SHORE

Departure To: SHORE

Expected to arrive by: 1500 In no case later than: 1600

Date & Time of Arrival: 1400 / 5/13/16

Boat Lead Signature at Arrival:

Attachment B – Tailgate Safety Briefing Sign-In Log

AECOM

Briefing Conducted By:	Signature:	Date:	Time:
RYAN MCCARTHY		5/12/16	0620

Project name:	Project Number:
NERT SW SAMPLING	60477365

This sign-in log documents the topics of the tailgate safety briefing and individual attendance at the briefing. Personnel who perform work operations onsite are required to attend each safety briefing and acknowledge their ability to ask questions and receipt of such briefings daily. **Please provide a brief narrative of the following topics as applicable to the Project**

Scope of Work	SW SAMPLING ON CU MASH
HASP/JSA/THA review	WORK ON WATER
SOP Review	SW SAMPLING
PPE Requirements	PFD, EYE PROTECTION, NITRILE GLOVES, SUNBLOCK, *EXEMPT FROM STEEL TOE/HARD HAT
Incident Review Safety Alerts	
Other:	HEAT STRESS, UNEVEN FOOTING, LIFTING SAFETY

Personnel Sign-in List

Printed Name and Company	Signature	Printed Name and Company	Signature
1. RYAN MCCARTHY / AECOM		7.	
2. STEVE HOWE / AECOM		8.	
3.		9.	
4.		10.	
5.		11.	
6.		12.	

Boat Safety Checklist

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- [ ] Fire Extinguishers--right number, size, and class for boat; charged, not corroded, nozzle clear, bracketed, readily accessible N/A
- [ ] Visual Distress Signals--current dates on flares, proper number, batteries good if lights or EPIRB N/A
- [x] Anchors and Line--adequate anchor for bottom, adequate line for water depth
- [ ] Bilge device --bilge pump operable, alternative bailing device available N/A
- [x] Watch or clock--operable
- [ ] Bright flashlight or searchlight
- [ ] Navigation lights --tested and operable, spare bulbs
- [ ] Batteries--fully charged, encased in plastic boxes or terminals covered, securely fastened down
- [x] Sound-producing device--horn, whistle appropriate for boat
- [x] Alternate propulsion--paddle or oar
- [x] First Aid Kit
- [x] Tools, ~~spare outboard prop and lock nut~~
- [x] Compass
- [x] Sunscreen
- [x] ~~Weather Radio~~ CELL PHONE

5/16/16

Daily Float Plan

Name of vessel's operator:	RYAN MCCARTHY
Telephone Number:	603 770 4945
Name of Vessel:	MELLOW YELLOW
Registration No.:	
Description of Vessel: Type: WE-NO-NAH Make: NORTHFORK Color of Hull/Trim Most distinguishing identifiable feature:	YELLOW CANOE 16.9'

Rafts/Dinghies: Number: __ Size: __ Color: __

Radio/Communication Type: CELL PHONE

Number of persons onboard:

Name:	Age:	Address & Telephone:
RYAN MCCARTHY	37	603 770 4945
STEVE HOWE	43	603 263 2143

Engine Type:_____ H.P.:_____ Normal Fuel Supply (days):_____

Survival equipment on board: (check as appropriate)

☑ Life Jackets	☐ Flares	☐ Smoke Signals
☑ Medical Kit	☐ EPIRB	☑ Paddles
☑ Anchor	☑ Loran/GPS	☑ Life Ring

Trip: LAS VEGAS WASH / MULTIPLE LOCATIONS

Date & Time of Departure: 5/16/16 0700

Departure From: SHORE

Departure To: SHORE

Expected to arrive by: 1400 In no case later than: 1600

Date & Time of Arrival: 5/16/16 1300

Boat Lead Signature at Arrival: [signature]

Attachment B – Tailgate Safety Briefing Sign-In Log

AECOM

Briefing Conducted By:	Signature:	Date:	Time:
RYAN MCCARTHY		5/17/16	0630

Project name:	Project Number:
NERT LV WASH SW SAMPLING	60477365

This sign-in log documents the topics of the tailgate safety briefing and individual attendance at the briefing. Personnel who perform work operations onsite are required to attend each safety briefing and acknowledge their ability to ask questions and receipt of such briefings daily. **Please provide a brief narrative of the following topics as applicable to the Project**

Scope of Work	SW SAMPLING OF LV WASH
HASP/JSA/THA review	ON WATER WORK
SOP Review	SW SAMPLING
PPE Requirements	SUNBLOCK, PFD, NITRILE GLOVES, EYE PROTECTION * EXEMPT FROM HARDHAT / STEELTOE
Incident Review Safety Alerts	
Other:	HEAT STRESS, LIFTING SAFETY, UNEVEN FOOTING, WILDLIFE (COYOTE), AND RAIN!

Personnel Sign-in List

Printed Name and Company	Signature	Printed Name and Company	Signature
1. RYAN MCCARTHY / AECOM		7.	
2. STEVE HOWE / AECOM		8.	
3.		9.	
4.		10.	
5.		11.	
6.		12.	

Boat Safety Checklist

Keep this page with your boat, ready for inspection. By using this checklist, or one fine-tuned by yourself, you'll be sure that everything is on board and in good working order. Your passengers will appreciate knowing you're concerned about boating safety.

- [x] Float plan--let a friend or relative know when you're leaving, where you're going, when you expect to return, what to do if you don't, and a description of your boat
- [ ] Registration certificate or documentation N/A
- [x] Personal Flotation Devices (wearable and throw able)--USCG approved, good condition, readily accessible, assigned and fitted
- [ ] Fire Extinguishers--right number, size, and class for boat; charged, not corroded, nozzle clear, bracketed, readily accessible N/A
- [ ] Visual Distress Signals--current dates on flares, proper number, batteries good if lights or EPIRB N/A
- [x] Anchors and Line--adequate anchor for bottom, adequate line for water depth
- [ ] Bilge device --bilge pump operable, alternative bailing device available
- [x] Watch or clock--operable
- [ ] Bright flashlight or searchlight
- [ ] Navigation lights --tested and operable, spare bulbs
- [ ] Batteries--fully charged, encased in plastic boxes or terminals covered, securely fastened down
- [x] Sound-producing device--horn, whistle appropriate for boat
- [x] Alternate propulsion--paddle or oar
- [x] First Aid Kit 5/17/16
- [x] Tools, ~~spare outboard prop and lock nut~~
- [x] Compass
- [x] Sunscreen
- [x] ~~Weather Radio~~ CELL PHONE

Stat. Num

Daily Float Plan

Name of vessel's operator:	RYAN MCCARTHY
Telephone Number:	603 770 4945
Name of Vessel:	MELLOW YELLOW
Registration No.:	
Description of Vessel: Type: WE-NO-NAH Make: NORTHFORK Color of Hull/Trim	YELLOW CANOE 16.9'
Most distinguishing identifiable feature:	

Rafts/Dinghies: Number: __ Size: __ Color: __

Radio/Communication Type: CELL PHONE

Number of persons onboard: 2

Name:	Age:	Address & Telephone
RYAN MCCARTHY	37	603 770 4945
STEVE HOWE	53	603 520-6169

Engine Type:_____ H.P.:_____ Normal Fuel Supply (days):_____

Survival equipment on board: (check as appropriate)

☑ Life Jackets	☐ Flares	☐ Smoke Signals
☑ Medical Kit	☐ EPIRB	☒ Paddles
☐ Anchor	☑ Loran/GPS	☑ Life Ring

Trip: MULTIPLE LOCATIONS IN W WASH

Date & Time of Departure: 5/17/16 1230

Departure From: SHORE

Departure To: SHORE

Expected to arrive by: 1400 In no case later than: 1500

Date & Time of Arrival: 5/17/16 1400

Boat Lead Signature at Arrival: RM

Attachment B – Tailgate Safety Briefing Sign-In Log

AECOM

Briefing Conducted By:	Signature:	Date:	Time:
RYAN MCCARTHY		5/18/16	0600

Project name:	Project Number:
NERT LU WASH SW SAMPLING	60477365

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SOP Review	SW SAMPLING
PPE Requirements	SUNBLOCK, PFD, NITRILE GLOVES, E/E PROTECTION * EXEMPT FROM HARDHAT/ STEELTOE
Incident Review Safety Alerts	
Other:	HEAT STRESS, LIFTING SAFETY, UNEVEN FOOTING

Personnel Sign-in List

Printed Name and Company	Signature	Printed Name and Company	Signature
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2. STEVE HOWE / AECOM		8.	
3.		9.	
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5.		11.	
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- [x] Alternate propulsion--paddle or oar
- [x] First Aid Kit
- [x] Tools, ~~spare outboard prop and lock nut~~
- [x] Compass
- [x] Sunscreen
- [x] Weather Radio CELL PHONE

5/18/16

Daily Float Plan

Name of vessel's operator:	RYAN MCARTHY
Telephone Number:	603 7704945
Name of Vessel:	MELLOW YELLOW
Registration No.:	
Description of Vessel: WE-NO-NAH Type: Make: NORTHFORK Color of Hull/Trim Most distinguishing identifiable feature:	YELLOW CANOE 16.9'

Rafts/Dinghies: Number: __ Size: __ Color: __

Radio/Communication Type: CELL PHONE

Number of persons onboard: 2

Name:	Age:	Address & Telephone:
RYAN MCARTHY	37	603 770 4945
STEVE HOME	53	603 520 0169

Engine Type:_____ H.P.:_____ Normal Fuel Supply (days):_____

Survival equipment on board: (check as appropriate)

☑ Life Jackets	☐ Flares	☐ Smoke Signals
☑ Medical Kit	☐ EPIRB	☑ Paddles
☑ Anchor	☑ Loran/GPS	☑ Life Ring

Trip: MULTIPLE LOCATIONS IN LU WASH

Date & Time of Departure: 5/18/16 0630

Departure From: SHORE

Departure To: SHORE

Expected to arrive by: 1300 In no case later than: 1500

Date & Time of Arrival: 5/18/16 1300

Boat Lead Signature at Arrival:

Appendix C

Log Books and Field Forms

CONTENTS

PAGE	REFERENCE	DATE

LAKE LAS VEGAS
SECURITY

HAROLD

SECURITAS
NV STATE LIC. # 1100
PATROL 1 (702) 249-5086
PATROL 2 (702) 249-5669
HENDERSON, NEVADA
AVAILABLE 24 HOURS 7 DAYS A WEEK

Location LV WASH Date 5/10/16

Project / Client NEDP

0630 R MCARTHY S, HOWE
AECOM MEET AT HOTEL

- SHAKE DOWN GEAR (GPS)
- BOTTLES, EQUIPMENT
- GET CABELS

TRAVEL TO SITE

0815 ON SITE AT
LOCATION 3.1 ADJACENT TO
FIRE STATION / CALIBRATE YSI
PREP GEAR ON BANK ACROSS
FROM FIRE STATION ACCESSED
THROUGH OPEN GATE (NEAR LAKE LAS VEGAS CIRCLE)
0905 LAKE LAS VEGAS COMMUNITY
PATROL STOPS BY TO CHECK
ON

Location LV WASH Date 5/10/16

Project / Client NEDP

ON OUR ACTIVITIES

1010 ON STATION 3.1 x-846959.368
y-2673936.914

12.0' DEEP
CURRENT APPROX 1.5 FPS

1026 PUMP ON

1028 SAMPLE TIME- 3.1

1036 PUMP OFF

COORDINATE SYSTEM IS NEVADA STATE PLANE FEET EAST

1125 AT STATION 3.4 THROUGH SINGLE CHAIN GATE

1155 DEPTH 0.90'

RMC PROFILE AT ~ 0.45'

Location LV WASH Date 5/10/16

Project / Client NEDP / MELT

TEMP - 25.13°C
SP CON - 2216 u/s
PH - 8.22
TURB - 10.7 NTU
DO - 111 % / 9.07 mg/L

1159 SAMPLE TIME - 3.4

1216 SAMPLE DONE / PUMP OFF
FIELD DUP COLLECTED

X- 845421.423
X- 2673804.019

ACCESSED THROUGH SINGLE CHAIN GATE. CAN DRIVE RIGHT TO WATER AT RAINBOW GARDENS WEIR

1405
LWL 3.7 0.45' DEEP

RMC

Location LV WASH Date 5/10/16

Project / Client NERT/NEDP

TEMP - 25.96°C ~ 0.2"

SP CON - 284 µ/s X - 844521.648

PH - 8.12 Y - 2673758O.803

TURB 21.6 NTU

DO 131 % / 10.57 mg/L

1408 PUMP ON / SAMPLE TIME LWC3.7

1416 SAMPLE COMPLETE

1430 PACK UP EQUIPMENT / LOAD CANOE

1500 DEPART FOR TEST AMERICA

1520 RELINQUISH SAMPLES AT TEST AMERICA

1541 RELINQUISH SAMPLES AT SILVER STATE

1630 BACK AT HOTEL

Location LV WASH Date 5/11/16

Project / Client NERT/NEDP

0600 RYAN MCARTHY / STEVE HOWE - NEVADA
MEET AT HOTEL
- SHAKE DOWN GEAR (GPS)
BOTTLES, EQUIPMENT
TRAVEL TO SITE

0745 ON SITE NEAR THREE KIDS WEIR - PREP GEAR
LOAD BOAT / CALIBRATE YSI
SITE TAILGATE BRIEFING
HEAD UP RIVER TO STATION 3.75 AND KM6 SEEP

0815 LOCATE SEEP KM67
TAKE PHOTOS AND WQ MEASUREMENTS
WILL SAMPLE

Location CC WASH Date 5/11/16

Project / Client MEDP/ MERT

0820 STATION 3.75 ~ 2.0' DEEP

WQ ~ 1'

X - 844564.963
Y - 2673757.951

TEMP - 22.06°C
COND - 2186 µ/s
PH - 8.03
TURB - 9.8 NTU
DO - 111% / 9.50 mg/L

0828 PUMP ON / PURGE

0829 BEGIN SAMPLE 3.75

0835 SAMPLE COMPLETE

MOVE TO KM67 SEEP FOR SAMPLE

0850 WQ FOR KM67 ~1.5' total depth

~0.75' WQ MEASUREMENTS

RML

Location CC WASH Date 5/11/16

Project / Client MEDP/ MERT

X - 844564.963
Y - 2673757.951

TEMP - 22.73°C
SPCOND - 4167 µ/s
PH - 7.03
TURB - 0.4 NTU
DO - 7.49% / 0.63 mg/L

0856 PUMP ON / PURGE

0857 BEGIN SAMPLE KM67 SEEP

0903 SAMPLE COMPLETE

0915 BACK AT TRUCK MOVING TO 3.85

1004 STATION 3.85 Depth 1.1'
WQ - ~0.5'
TEMP - 23.87°C
SPCOND - 2237 µ/s
PH - 8.4
TURB - 4.5 NTU
DO - 158% / 13.24 mg/L

RMC

Location LV WASH

Project / Client NERT / MEDP

Date 5/11/16

1008 PUMP ON / PURGE

1009 SAMPLE 3.85

1016 SAMPLE COMPLETE

X - 843998.442
Y - 26737187.985

1030 WALKING SOUTHERN BANK OF WASH LOOKING FOR KM66 SEEP

1108 SEEP NOT LOCATED BASED ON VISUAL OBSERVATIONS + WQ MEASUMTS

1135 LOCATION 4.1 ~0.75' DEPTH

WQ - ~0.3'

TEMP - 23.87° C
Sp Con - 2306 u/s
pH - 8.17
TURB - 12.4
DO 118% / 9.85 mg/L

RMC

Location LV WASH

Project / Client NERT / MEDP

Date 5/11/16

1138 PUMP ON / PURGE

1139 SAMPLE 4.1

1146 SAMPLE COMPLETE

X - 842488.939
Y - 26736909.638

1200 MOVING TO LWC 4.1 ~1.2' Depth

WQ @ 0.6'

TEMP - 24.05° C
Sp Con - 2321 u/s
pH - 8.27
TURB - 13.4 NTU
DO - 125% / 10.41 mg/L

X - 842488.939
Y - 26736909.638

1217 PUMP ON / PURGE

1218 SAMPLE LWC 4.1

1224 SAMPLE COMPLETE

RMC

Location LW WASH Date 5/11/16

Project / Client NEDP/NERT

1320 LOOKING FOR KM6 ON NORTH BANK OF WASH CAN NOT LOCATE

1420 LOOKING FOR KM90 ON NORTH BANK OF WASH CAN NOT LOCATE

1415 PACKUP CAR/CANOE TO DRIVE SAMPLES OVER TO TEST AMERICA

PULLED OVER BY GAME WARDEN ASKING WHAT WE WERE DOING

1503 - RELINQUISH SAMPLES TO TEST AMERICA

1523 RELINQUISH SAMPLES TO SILVER STATE

1615 BACK AT HOTEL

Location LW WASH Date 5/12/16

Project / Client NEDP/NERT

0600 RYAN MCCARTHY/STEVE HOWE AECOM MEET AT HOTEL

SHAKE DOWN GEAR (GPS)

BOTTLES, ICE, EQUIPMENT

TRAVEL TO SITE

0630 COLLECT GPS POINTS AT ACCESS LOCATIONS ALONG WASH FOR STATIONS THAT HAVE BEEN SAMPLED IN ORDER TO FACILITATE NAVIGATION FOR FUTURE SAMPLING EVENTS

0730 ON SITE AT LWC 4.6

0800 SITE TAILGATE BRIEFING

- PREP GEAR / LOAD BOAT
- CALIBRATE YSI

RMC

Location LV WASH Date 5/11/16

Project / Client MDEP/NERT

1320 LOOKING FOR KM6 ON NORTH BANK OF WASH CAN NOT LOCATE

1430 LOOKING FOR KM90 ON NORTH BANK OF WASH CAN NOT LOCATE

1445 PICKUP CAR/CANOE TO DRIVE SAMPLES OVER TO TEST AMERICA

PULLED OVER BY GAME WARDEN ASKING WHAT WE WERE DOING

1503 - RELINQUISH SAMPLES TO TEST AMERICA

1523 RELINQUISH SAMPLES TO SILVER STATE

1615 BACK AT HOTEL

Location LV WASH Date 5/12/16

Project / Client MDEP/NERT

0600 RYAN MCCARTHY / STEVE HOWE AECOM MEET AT HOTEL

SHAKE DOWN GEAR (GPS) BOTTLES, ICE, EQUIPMENT

TRAVEL TO SITE

0630 COLLECT GPS POINTS AT ACCESS LOCATIONS ALONG WASH FOR STATIONS THAT HAVE BEEN SAMPLED IN ORDER TO FACILITATE NAVIGATION FOR FUTURE SAMPLING EVENTS)

0730 ON SITE AT LMC 4.6

0800 SITE TAILGATE BRIEFING

- PREP GEAR / LOAD BOAT + CALIBRATE YSI

LMC

Location LV WASH Date 5/12/16

Project / Client NERT / NEDP

0900 ON STATION LWL 4.6

0.5' TOTAL DEPTH

WQ @ 0.25'

X - 840732.032

TEMP - 23.28°C Y - 2673516.328

SP/COV - 234 µS 2304

pH - 7.90

TURB - 11.7 NTU

DO - 109% / 9.26 mg/L

0918 PUMP ON / PURGE

0919 SAMPLE LWL 4.6

0926 SAMPLE COMPLETE

0936 HUNTING AROUND FOR KM65 DESCRIPTION SAYS ON NORTH BANK HOWEVER COORDINATE FOR SPRING HAS US IN CHANNEL TAKING PICTURES OF BANK, ETC RMC

Location LV WASH Date 5/12/16

Project / Client NERT / NEDP

VEGETATED ISLAND IN WASH CHANNEL AS LANDMARK

1020 UNABLE TO FIND IT BASED ON WQ MEASUREMENTS

1045 IN WASH LOOKING FOR KM91 SEEP. VEGETATED ISLANDS IN WASH. BEAVER CHEW TREE STUMPS AT LOCATION, SUGGESTING HISTORIC SHORELINE

PADDLED CANOE AROUND VEGETATED ISLAND / SAND BAR LOOKING FOR WQ SIGNATURE

1120 CAN NOT FIND ANYTHING AT KM91. MOVING ON

1130 AT BOSTICK WEIR AREA LOOKING FOR ACCESS TO KM53 AND LWL 4.95

RMC

Location LV WASH Date 5/12/16

Project / Client NERT/ NEDP

1240 THINK ACCESS TO LOCATIONS IS DOABLE FROM CHANNEL N BOSTICK WEIR. HAVE TRAVERSED ENTIRE SOUTHERN SHORELINE LOOKING FOR ACCESS. HEAVY VEGETATION AND BIG RIPRAP SHORELINE

1337 LW 4.95 ~ 2' DEEP
COORDINATE HAD STATION IN UPLAND SO IT WAS RELOCATED TO CHANNEL

WQ @ 1.0

TEMP - 27.1 °C
SP/cond - 2345 u/s
PH - 8.54
TURB - 8.8 NTU
DO - 126% / 9.94 mg/L

X-838349.919
Y-2735802.475

1341 PURGE/PUMP ON

RMC

Location LV WASH Date 5/12/16

Project / Client NERT/ NEDP

1342 SAMPLE

1350 PUMP OFF/ SAMPLE COMPLETE

UNABLE TO LOCATE DEEP KM

1435 TALL REEDS/ ISLAND BACKCHANNEL

1445 PACK UP / OFFSITE

1515 RELINQUISH SAMPLES TO TEST AMERICA

1533 RELINQUISH SAMPLES TO SILVER STATE

1400 STOP TO GET MAP SET LAMINATED

1430 BACK AT HOTEL

Location LV WASH Date 5/13/16

Project / Client NDEP / NERT

0600 RYAN MCARTHY / STEVE HOWE - AECOM
MEET AT HOTEL

SHAKE DOWN GEAR

TRAVEL TO SITE

0700 AT KM53 AREA. EXTREMELY DENSE VEGETATION, PREVENTING ACCESS
DEL PHONE CALL W/ KRISTEN DROEGER
MOVING UP TO LW5.3

0745 AT KM53
- TAILGATE SITE BRIEFING
- PREP GEAR/LOAD BOAT
- CALIBRATE YSI

LOCATE ACCESS POINT EMBANKMENT

0900 WQ @ LW5.3
TOTAL DEPTH - 3.5
WQ @ ~1.75'

Location LV WASH Date 5/13/16

Project / Client NDEP / NERT

TEMP - 23.55°C
SpCon - 2289 µS
pH - 7.85
TURB - 6.5
DO - 97% / 8.5 mg/L

X - 836457.638
Y - 2673487.977

0911 PURGE/PUMP ON

0912 SAMPLE LW5.3

0918 SAMPLE COMPLETE

STATION LW 5.3 WAS DEEPEST YET ALL CANOE WORK, NO WADING. MOVING TO LW 5.5 USING SAME CANOE LAUNCH SPOT

1040 ADJUSTED LW5.5 BELOW WEIR 2.25' TOTAL DEPTH
WQ @ ~1.0'

Location LW WASH Date 5/13/16

Project / Client NDEP / NERT

TEMP – 25.48°C
SpCon – 2319 µS
PH – 8.19
TURB – 5.5 NTU
DO 107% / 8.70 mg/L

X – 836098.373
Y – 2734884.682

1051 PUMP ON / PURGE

1052 SAMPLE 5.5

1059 SAMPLE COMPLETE

ADJUSTED LOCATION APPROX MIDCHANNEL BELOW WEIR, WITHIN 10-12' OF SAND BAR, WHERE FLOW WAS WELL MIXED

COULD NOT LOCATE HISTORICAL LATERAL WEIR EXPANSION STRUCTURE.

1140 MOVING TO KM54

RMC

Location LW WASH Date 5/13/16

Project / Client NDEP / NERT

1244 ATTEMPTED TO FIND KM54 ON ISLAND. OVERGROWN WITH 10-12' REEDS, PIT NOT FOUND

1300 KM93 SEEP ON N. SIDE OF WASH. SAND BAR / ISLAND / FLOODPLAIN WALKED UP AND DOWN, SPRING NOT FOUND. VERY DRY UPLAND NO SPRING OBSERVED

1330 LW 5.7 Depth 1.4'
WQ ~ 0.75'

CHANNEL APPROX 4.0' AND CURRENT APPROX 2 FPS, UNABLE TO OCCUPY CENTER CHANNEL SO TAKE SAMPLE NEAR NORTH BANK

RMC

Location LV WASH

Project / Client NERT / NDEP Date 5/13/16

1335

TEMP 28.95 °C

SpCon 2217 µS

pH - 8.53

TURB - 11.4 NTU

DO - 117.3% / 8.57 mg/L

X - 834598.211

Y - 2673413 9.104

1344 PUMP ON / PURGE

1345 BEGIN SAMPLE S.7

1352 SAMPLE COMPLETE

MOVE TO KM55

1400 TARGET FOR KM55 ON GRAVEL ROAD ADJACENT TO BIKE PATH

WALKED FLOODPLAIN ALL THE WAY TO WASH AND EAST / WEST SEVERAL HUNDRED YARDS NO SIGN OF SCRP

RMV

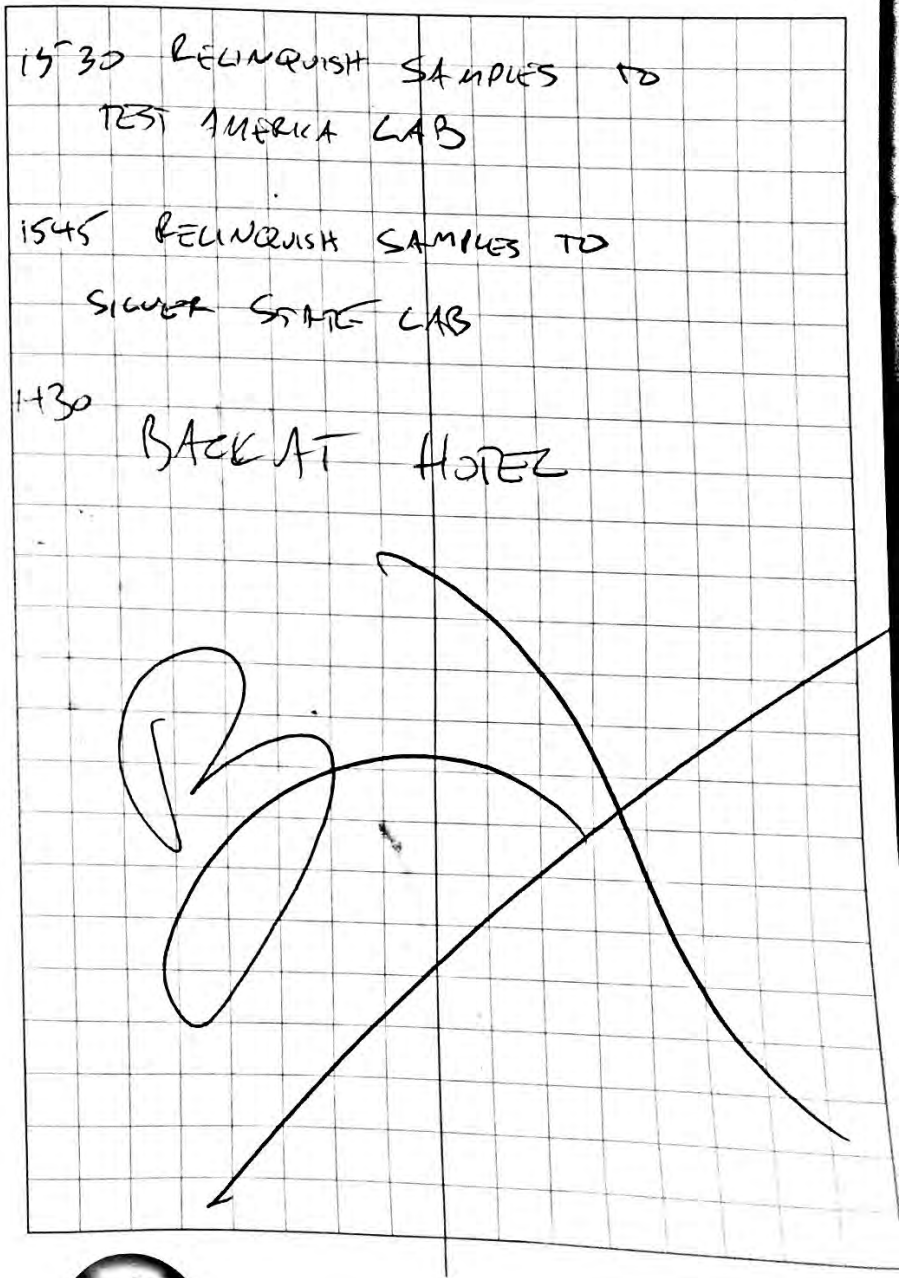
Location LV WASH Date 5/13/16

Project / Client NERT / NDEP

1530 RELINQUISH SAMPLES TO TEST AMERICA LAB

1545 RELINQUISH SAMPLES TO SILVER STATE LAB

1730 BACK AT HOTEL



Attachment B – Tailgate Safety Briefing Sign-In Log

AECOM

Briefing Conducted By:	Signature:	Date:	Time:
RYAN MCCARTHY		5/12/16	0745

Project name:	Project Number:
MERT SW SAMPLING	

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Incident Review Safety Alerts	
Other:	HEAT STRESS! UNEVEN FOOTING LIFTING SAFETY

Personnel Sign-in List

Printed Name and Company	Signature	Printed Name and Company	Signature
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2. STEVE HOWE/AECOM		8.	
3.		9.	
4.		10.	
5.		11.	
6.		12.	

24 Location LV WASH Date 5/16/16
Project / Client NERT / NDEP

0520 R. MCCARTHY / S. HOWE - AECOM
MEET AT HOTEL
SHAKE DOWN GEAR (GPS, BOTTLES, ETC)
TRAVEL TO SITE

0530 ON SITE AT PARK ADJACENT TO PABCO WEIR
PREP GEAR / LOAD BOAT
CALIBRATE YSI

TAILGATE SITE BRIEFING

0710 ON STATION LW 5.9
COORDINATE WANTED US ~50' INTO THE UPLAND / WOODED VEGETATION
ADJUSTED TO MID CHANNEL
STATION DEPTH - 11.5'
CURRENT ~ 2 FPS

Location LV WASH Date 5/16/16 25
Project / Client NERT / NDEP

WQ @ ~ 0.75'

TEMP - 23.40°C
SP/CON - 2230 µS
PH - 7.68
TURB - 12.7 NTU
DO% - 89.7% / 7.58 mg/L

X 833446.959
X -2673411.780

0723 - PUMP ON PURGE
0724 - SAMPLE @ LW 5.9
0736 SAMPLE COMPLETE

USING LOW CAPACITY FILTER, CLOGGED HALFWAY THROUGH FILTERED CHROMIUM
SWITCHED TO SECOND FILTER AND PURGED

0900 MOVE TO LW 6.05 - MOVE STATION UPRIVER OF WEIR

Location LV WASH

Project / Client NERT / NDEP Date 5/16/16

WQ @ LW 6.05 TOTAL DEPTH - 1.8'
WQ - ~0.9'

832631, 29114
X - ~~832716, 296~~ RMC
Y ~~26734063, 041~~ RMC
26734196, 5842166

TEMP - 23.99°C
SP/COND - 2290 u/s
pH - 8.03
TURB 8.3 NTU
DO - 109% / 9.15 mg/L

0913 PUMP ON / PURGE

0914 SAMPLE 6.05

0921 PUMP OFF / SAMPLE COMPLETE

USED HIGH VOLUME FILTER

0945 LOOKING FOR KM 4.5 SEEP
DESCRIPTION SAYS PIT ON SOUTH SIDE OF WASH COORDINATE PT US IN WETLAND ON NORTH SIDE OF WASH NEAR MEANDER IN STREAM

RMC

Location LV WASH Date 5/16/16

Project / Client NERT / NDEP

ENTIRE SOUTHERN BANK OVERGROWN WITH 6-10' REEDS

1010 PADDLED UP RIVER TO ~~KM 4.70~~ RMC KM 4.71
FOUND SEEP FROM NORTHERN BANK IN SMALL BACKCHANNEL APPROX 200' FROM TARGET COORDINATES

STATION DEPTH ~6" (0.5')
WQ ~3" - (0.25')

831311, 19686
X - ~~832716, 296~~ RMC
Y - ~~26734063, 041~~ RMC
26734771, 979577

TEMP - 25.20
SP/COND - 2092 u/s
PH - 7.41
TURB - 0.0 NTU
DO - 6.4% / 0.52 mg/L

1025 PARCO GAGE @ 5.96'

1042 PUMP ON / PURGE TUBING

1043 SAMPLE ~~KM 4.70~~ RMC KM 4.71 (FIELD DUP)

1056 SAMPLE COMPLETE

RMC

Location LV WASH

Project / Client ~~NERT~~ / NDEP Date 5/16/16

1140 PARGO CAGE AT 6.0'

1148 AT STREAM CHANNEL APPROX 10-15' FROM ~~LV~~ WASH LWC 6.1

2.0' STATION DEPTH

WQ ~ 1.0'

TEMP - 27.53° C
SP/COV - 3129 µ/s
PH - 6.92
TURB - 7.5 NTU
DO - 753%/5.89 mg/L

832715,91965
X -~~832716,296~~ RMC
X -~~26734065,041~~ RMC
26734063,54795

~~1145~~ RMC

1159 PUMP ON/PURGE

1200 SAMPLE LWC6.1 (MS/MSD)

1220 SAMPLE COMPLETE

RMC

Location LV WASH Date 5/16/16

Project / Client NERT / NDEP

1251 WHILE ATTEMPTING TO LOCATE KM70, WE FOUND KM71. KM70 WAS LOCATED ALONG AREA WITH NEW RIP RAP AND NO SEEP WAS OBSERVED. FIELD RECORDS/LABELS HAVE BEEN UPDATED/CORRECTED

LOAD UP CANOE/PACK UP

1440 COLLECT FIELD BLANK #1
LW 3,1-20160516-FB

1445 COLLECT EQUIPMENT BLANK #1
LWC 6.1-20160516-EB

1513 RELINQUISH SAMPLES TO SILVER STATE LAB

~~1547~~ RMC

1537 RELINQUISH SAMPLES TO TEST AMERICA LAB

1630 AT AECOM OFFICE

RMC

30 Location LV WASH Date 5/17/16

Project / Client NERT / NDEP

0500 RYAN MCCARTHY / STEVE HOWE (AECOM)
MEET AT HOTEL
SHAKE DOWN GEAR (GPS, BOTTLES, ICE)
TRAVEL TO SITE

0600 ON SITE AT PABCO TRAILHEAD
PREP GEAR / CALIBRATE YSI

0630 SITE TAILGATE BRIEFING
PREPARE TO SAMPLE THREE OUTFALLS NEAR PABCO WEIR

0730 AT STATION 6.3-1 (MAIN OUTFALL)
DEPTH ~1.5'
WQ@ 0.75'

TEMP 25.66°C
SP/CON 8157 u/s
PH - 6.33
TURB - 35.1
DO - 118.4% / 9.43 mg/L

Location LV WASH Date 5/17/16 31

Project / Client NERT / NDEP

0745 PUMP ON PURGE
0746 SAMPLE 6.3-1 (FD)
0758 SAMPLE COMPLETE

X_832373.921930
Y - 26733891.438658

0810 PR PONG AND CARSON PARKER FROM NDEP ARRIVE TO OBSERVE OUTFALL SAMPLING

0847 MOVED 6.1-1 (CITY OF HENDERSON OUTFALL)

TOTAL DEPTH 1.5'
X - 832604.811613
Y - 26733460.579401
AT CONFLUENCE OF TWO OUTFALLS WQ@ 0.75'

TEMP - 26.81°C
SP/CON - 1895 u/s
PH - 7.35
TURB < 1 NTU
DO - 92% / 7.42

RMS

Location LW WASH

Project / Client NCERT/NDEP

Date 5/17/16

SAMPLE AT 0.75'

PUMP ON/PURGE

0915 BEGIN SAMPLE 6.1_1

0922 SAMPLE COMPLETE

0935 DR. DONG + CARLTON PARKER OFFSITE, AGREE TO SAMPLE KM SEEP

1028 MOVE TO STATION LW 6.1_2

APPROX 1.0' TOTAL DEPTH
WQ ~ 0.5'

TEMP - 28.68°C
SP/COND - 1068 u/s
pH - 8.37
TURB - < 1 NTU
DO - 94.8% / 7.29 mg/L

X - 832567.91772
Y - 26733443.15505

RMC

Location LW WASH

Project / Client NCERT / NDEP

Date 5/17/16

1036 PURGE TUBING / PUMP ON

1037 SAMPLE TIME @ 6.1-2

1046 SAMPLE COMPLETE

1108 AT KERR MCGEE SEEP (KM_S)
SEEP CISTERN D/S OF ACTUAL SEEP / OPEN TO SEEP CHANNEL
TOTAL DEPTH IN CISTERN 4.1'
WQ @ 2.0'

TEMP - 19.47°C
SP/COND - 3171 u/s
~~pH~~ - 7.45
TURB - < 1 NTU
DO - ~~ESTIMATE~~ 51.4% / 4.67 mg/L

X - 831414.4105
Y - 26733695.20132

1117 BEGIN PUMP / PURGE

1118 SAMPLE KM_S

1125 SAMPLE COMPLETE

RMC

Location LV WASH Date 5/17/16

Project / Client NERT/NDEP

1240 WQ ~ LW6.7 STATION 0.5' DEEP

WQ ~ 0.25'

TEMP -22.8°C X - 829736.496980

SPCON - 2057 µ/s Y - 2734353.4925989

PH - 8.32

TURB - 12 NTU

DO - 109% / 9.35 mg/L

1258

PUMP ON / PURGE

1259 SAMPLE 6.7 (MS/MSD)

1318 SAMPLE COMPLETE

HEAD BACK TO BARO TRAILHEAD

COLLECT EQUIPMENT BLANK

LW6.7-20160517-EB

1356 USING LARGE CAPACITY FILTER

RMC

Location LV WASH Date 5/17/16

Project / Client NERT / NDEP

1420 PREP BOTTLES FOR FIELD BLANK

1440 COLLECT FIELD BLANK

LW6.7-20160517-FB

1500 RELINQUISH SAMPLES AT TEST AMERICA LAB

1530 RELINQUISH SAMPLES AT SILVER STATE LAB

1600 BACK AT HOTEL

RMC

Location LV WASH Date 5/18/16

Project / Client NERT / NDEP

0500 LYN MCARTHY / STEVE HOWE (NEVA)
MEET AT HOTEL

SHAKEDOWN GEAR (GPS EQUIPMENT, ICE)

0545 ONSITE AT PABCO ROAD TRAILHEAD
MOVE UP TO UPPER NARROWS WEIR

0600 UNLOAD BOAT / PACK GEAR

CALIBRATE YSI

SITE TAILGATE BRIEFING

0637 LOOKING FOR SEEP KM56
ON NORTH SIDE OF WASH, OVERGROWN VEGETATION / RIPRAP EMBANKMENT, COORDINATE WANTED US ON EASTERN SIDE OF SUNRISE WEIR? PHOTOS TAKEN

Location LV WASH Date 5/18/16

Project / Client NERT / NDEP

SEEP NOT FOUND

0705 WALKED ON / ALONG UPPER NARROWS WEIR LOOKING FOR KM57
NO WATER QUALITY SIGNAL OBSERVED IN FLOW THROUGH WEIR INDICATIVE OF SEEP. WERE POSITIONED WITHIN <5' OF TARGET COORDINATES
SEEP NOT FOUND

0800 LOOKING FOR SEEP KM58
TARGET COORDINATE SAYS TO LOOK ON SOUTH BANK OF WASH WHILE DESCRIPTION NOTES SEEP WAS LOCATED ON NORTH BANK. TOOK WATER QUALITY MEASUREMENTS AND PHOTOS
SEEP NOT FOUND

0855 ON STATION LW6.85
STATION DEPTH 13' RMC

Location LV WASH

Project / Client NERT / NDEP

Date 5/18/16

0900 WQ @ 0.65'

TEMP - 23.85°C
SP/COND - 2570 u/s
pH - 8.32
TURB - 10.1 NTU
DO - 140% / 11.78 mg/L

X - 828517.679988
Y - 26735113.12175

0905 PUMP ON / PURGE

0906 SAMPLE LW 6.85

0912 SAMPLE COMPLETE

0925 ON TARGET COORDINATE FOR KM59 DESCRIPTION SAYS NORTH BANK OF WASH. ACTUAL LOCATION IS APPROX MID-CHANNEL APPROX 20-25' UPRIVER OF WEIR. NO WATER QUALITY SIGNATURE OBSERVED, SEEP NOT FOUND, CHANNEL MAY HAVE MOVED

RMC

Location LV WASH

Project / Client NERT / NDEP

Date 5/18/16

0955 AT LW 7.2

STATION DEPTH - 1.5'
WQ @ - 0.75'

TEMP - 25.69°C
SP/COND - 2016 u/s
pH - 8.39
TURB - 6.8 NTU
DO - 135% / 10.95 mg/L

ADJUST LOCATION

X - 828169.6377533
Y - 26735154.24002ST

1003 PUMP ON / PURGE

1004 SAMPLE LW 7.2

1011 SAMPLE COMPLETE

1040 MOVE TO KM60 SEEP, TARGET COORDINATES DO NOT MATCH DESCRIPTION ISLANDS ON NORTH SIDE OF CHANNEL WALKED REGRADED "PENNINSULA" LOOKING FOR SEEP, FOUND SOME MOIST AREAS

RMC

Location LV WASH Date 5/18/16

Project / Client NERT/NDEP

ON GROUND, BUT NOTHING THAT COULD BE SAMPLED. SEEP NOT FOUND PHOTOS TAKEN. BANK HAD BEEN "RIP RAP-ED" SOMEWHAT RECENTLY

1110 PACK UP BOAT AND MOVE BACK TO PABCO TRAILHEAD

1125 EXAMINE AREA NEAR WHERE KM45 IS DEPICTED ON MAP POTENTIALLY FIND FIT/DAMP SOIL AREA. NO SAMPLE-ABLE FLOW/WATER OBSERVE WHITE PRECIPITATE ON DAMP SOIL - PHOTO/GPS POINT TAKEN

1215 PADDLE UP THE WASH TO RE-LOOK FOR KM70 AT BEND IN RIVER

RMC

Location LV WASH Date 5/18/16

Project / Client NERT/NDEP

1245 AFTER MULTIPLE WATER QUALITY MEASUREMENTS IN AREA OF KM70 UNABLE TO FIND EVIDENCE OF SEEP RETURN TO SHORE

1250 TALK WITH DR DONG (NDEP) RE: UNLOCKED GATE (LEAVE DUMMY LOCKED) INABILITY TO FIND SEEPS, AND PROGRAM BEING COMPLETED

1300 PACK UP TRUCK/CANOE OFFSITE PABCO TRAILHEAD

1430 DROP OFF CANOE WITH STEVE CLAWSIT - NERT AT HIS TRAILER

1515 RELINQUISH SAMPLES AT TEST AMERICA

1535 - RELINQUISH SAMPLES AT SILVER STATE

1435 BACK AT HOTEL TO PACK GEAR FOR SHIPPING

NERT Remedial Investigation
Downgradient Study Area - Surface Water

Date	5/10/16
Page	1 of 1

AECOM

Work Description	SW - LAS VEGAS WASH		
Field Team	RMC/CSH		
Weather Conditions	SUNNY		
Wind speed	< 5 mph	Air Temp	75

Water Quality Measurements

Station Number	Time	Station Coordinates X ~~Longitude~~	Station Coordinates Y ~~Latitude~~	Depth (ft)	Turbidity (NTU)	pH	Cond. SPµS	DO%/ mg/L	Temp C	Salinity	Station location notes
3.1	1010	846959	2673936	0.5	9.8	8.11	2088	111.3/9.32	23.58°		

RT I
NERT Remedial Investigation
Downgradient Study Area - Surface Water

Date	5/10/16
Page	1 of 1

AECOM

Work Description	NERT- LW WASH SW SAMPLING
Field Team	RMC / CSH
Weather Conditions	SUNNY-
Wind speed	
Air Temp	90° F

Water Quality Measurements

Station Number	Time	Station Coordinates		Depth (ft)	Turbidity (NTU)	pH	SP Cond.	DO%/ mg/L	Temp.	Salinity	Station location notes
		X ~~Longitude~~	Y ~~Latitude~~								
LW3.4	1155	845421	26738904	0.45	10.7	8.22	2216	111 / 9.07	25.13	—	

NERT Remedial Investigation
Downgradient Study Area - Surface Water

Date	5/10/16
Page	1 of 1

AECOM

Work Description: NERT - LV WASH SW SAMPLING
Field Team: RMC / CSH
Weather Conditions: SUNNY
Wind speed: <5 mPH   Air Temp: 90° F

Water Quality Measurements

Station Number	Time	Station Coordinates X ~~Longitude~~	Station Coordinates Y ~~Latitude~~	Depth (ft)	Turbidity (NTU)	pH	Sp Cond.	DO%/ mg/L	Temp.	Salinity	Station location notes
LW<3.7	1405	844521	26737580	0.2	21.6	8.12	2284	131/10.57	25.96		

NERT Remedial Investigation
Downgradient Study Area - Surface Water

Date	5/11/16
Page	1 of 1

AECOM

Work Description	NERT - LV WASH SW SAMPLING
Field Team	RMC / CSH
Weather Conditions	SUNNY
Wind speed	<5 MPH
Air Temp	90°F

Water Quality Measurements

Station Number	Time	Station Coordinates		Depth (ft)	Turbidity (NTU)	pH	Sp Cond.	DO%/ mg/L	Temp.	Salinity	Station location notes
		X ~~Longitude~~	Y ~~Latitude~~								
~~KM67~~ LW3.75	0820	844564	26737597	1.0	9.8	8.03	2186	111/9.5	22.86		

NERT Remedial Investigation
Downgradient Study Area - Surface Water

Date	5/11/16
Page	1 of 1

AECOM

Work Description: NERT - LV WASH SW SAMPLING
Field Team: RMC / CSH
Weather Conditions: SUNNY
Wind speed:
Air Temp: 90°F

Water Quality Measurements

Station Number	Time	Station Coordinates		Depth (ft)	Turbidity (NTU)	pH	SpCond.	DO%/ mg/L	Temp.	Salinity	Station location notes
		X ~~Longitude~~	Y ~~Latitude~~								
KM67	0850	844564	26737597	0.75	0.4	7.03	4167	7.4/0.63	22.73	—	

NERT Remedial Investigation
Downgradient Study Area - Surface Water

Date	5/11/16
Page	1 of 1

AECOM

Work Description	NERT – LV WASH SW SAMPLING
Field Team	RMC / CSH
Weather Conditions	SUNNY
Wind speed	
Air Temp	90°C

Water Quality Measurements

Station Number	Time	Station Coordinates		Depth (ft)	Turbidity (NTU)	pH	SP Cond.	DO%/ mg/L	Temp.	Salinity	Station location notes
		X ~~Longitude~~	Y ~~Latitude~~								
LW 3.85	1004	843998	26737187	0.5	4.5	8.4	2237	158/13.24	23.87	—	

NERT Remedial Investigation
Downgradient Study Area - Surface Water

Date	5/11/16
Page	1 of 1

AECOM

Work Description: NERT – LV WASH SW SAMPLING
Field Team: RMC / CSH
Weather Conditions: SUNNY
Wind speed:
Air Temp: 90°F

Water Quality Measurements

Station Number	Time	Station Coordinates		Depth (ft)	Turbidity (NTU)	pH	SP Cond.	DO%/ mg/L	Temp.	Salinity	Station location notes
		X ~~Longitude~~	Y ~~Latitude~~								
LW4.1	1135	842488	26736909	0.3	12.4	8.12	2306	118/9.85	23.82	—	
LWC4.1	1200	842488	26731909	0.6	13.4	8.27	2321	125/10.4	24.05	—	

NERT Remedial Investigation
Downgradient Study Area - Surface Water

Date	5/12/16
Page	1 of 1

AECOM

Work Description	NERT/NPDP - LW WASH SW SAMPLING		
Field Team	RMC / CSIT		
Weather Conditions	SUNNY		
Wind speed	<5	Air Temp	90°+

Water Quality Measurements

Station Number	Time	Station Coordinates		Depth (ft)	Turbidity (NTU)	pH	SP Cond.	DO%/ mg/L	Temp.	Salinity	Station location notes
		~~x Longitude~~	~~Y Latitude~~								
LW C4.6	0900	840732.032	2736516.328	0.25	11.7	7.9	2304	109/9.26	23.28		
LW 495	1337	838349.919	2735802.475	1.0	8.8	8.54	2345	126/9.94	27.10		

NERT Remedial Investigation
Downgradient Study Area - Surface Water

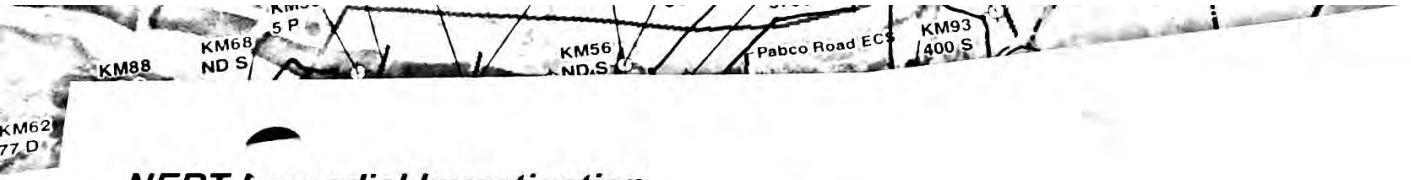
Date	5/13/16
Page	1 of 1

AECOM

Work Description	LV WASH SW SAMPLING		
Field Team	EMC/CSH		
Weather Conditions	SUNNY/HOT		
Wind speed		Air Temp	95+

Water Quality Measurements

Station Number	Time	Station Coordinates X ~~Longitude~~	Station Coordinates Y ~~Latitude~~	Depth (ft)	Turbidity (NTU)	pH	Sp Cond.	DO%/ mg/L	Temp.	Salinity	Station location notes
LW5.3	0900	836457	26734887	1.75	6.5	7.85	2289	97/8.15	23.95		
LW5.5											
↓	1040	836098	26734884	1.0	5.5	8.19	2319	107/8.7	25.48		
LW5.7	1355	834598	26734139	0.75	11.4	8.53	2217	117/8.97	28.95		



Date	5/16/16
Page	1 of 1

NERT Remedial Investigation
Downgradient Study Area - Surface Water

AECOM

Work Description	LW WASH SW SAMPLING
Field Team	RMC/CSH
Weather Conditions	SUNNY ~80°
Wind speed	Air Temp 80°F

Water Quality Measurements

Station Number	Time	Station Coordinates X ~~Longitude~~	Station Coordinates Y ~~Latitude~~	Depth (ft)	Turbidity (NTU)	pH	Cond. µS	DO% / mg/L	Temp.	Salinity	Station location notes
LW5.9	0710	833446	26734111	0.75	12.7	7.68	2230	89.7/7.88	23.4°C		
~~LW6.1~~											
LW6.05	0900	~~832716~~ 832631	~~26734063~~ 26734196	0.9	8.3	8.03	2290	109/9.15	23.99°C		
KM 71	1010	~~832716~~ 831311	~~26734063~~ 26734771	0.25	0.0	7.41	2092	6.4/0.52	25.20		
LW6.1	1148	~~832716~~ 832715	~~26734063~~ 26734063	1.0	7.5	6.92	3129	75.3/5.89	27.53		

NERT Remedial Investigation
Downgradient Study Area - Surface Water

Date	5/17/16
Page	1 of 1

AECOM

Work Description	LW WASH SW SAMPLING
Field Team	RMC / GSH
Weather Conditions	OVERCAST
Wind speed	5-10 MPH
Air Temp	~80°

Water Quality Measurements

Station Number	Time	Station Coordinates X ~~Longitude~~	Station Coordinates Y ~~Latitude~~	Depth (ft)	Turbidity (NTU)	pH	Cond µS/cm	DO% / mg/L	Temp.	Salinity	Station location notes
6.3_1	0738	832373	26733891	0.75	35.1	6.33	8157	118.4/9.43	25.66		
6.1_1	0847	832604	26733460	0.75	< 1	7.35	1895	92/7.42	25.81		
6.1_2	1028	832567	26733443	0.5	< 1	8.37	1068	94.8/7.29	28.68		
KM_5	1108	831414	26733695	2.0	< 1	7.45	3171	51.4/4.67	19.47		
6.7	1240	829736	26734352	0.25	12	8.32	2057	109/9.35	22.8		

NERT Remedial Investigation
Downgradient Study Area - Surface Water

Date	5/18/16
Page	1 of 1

AECOM

Work Description	SW SAMPLING IN LV WASH
Field Team	RMC/CSH
Weather Conditions	SUNNY
Wind speed	<5 mph
Air Temp	75°

Water Quality Measurements

Station Number	Time	Station Coordinates		Depth (ft)	Turbidity (NTU)	pH	Cond. uS	DO%/ mg/L	Temp.	Salinity	Station location notes
		X ~~Longitude~~	Y ~~Latitude~~								
LW6.85	0855	828517	26735113	0.65	10.1	8.32	2570	140/11.78	23.85°C	/	
LW7.2	0955	828169	26735154	0.75	6.8	8.39	2016	135/10.95	25.69	/	

5/10/16

NERT Water Quality Sonde Calibration Sheet

Calibration									Post Calibration			
YSI	lot number	expiration date	calibration standard	reading initial	reading adjusted	date	time	initials	initial reading	temp	time	initials
6024	E363-02	1/6/18	pH 7.0	7.05	7.00	5/10/16	0830	CSH				
	E362-04	12/29/17	pH 4.0	3.84	3.97							
	345-20	12/15/16	pH 10.0	10.10	10.00							
	E231-17	8/24/17	Cond. 1409	1383	1409							
			DO % 95	barometer reading		722.0						
	E231-01	8/20/20	Turbidity 0.0	-1.6	0.0	5/11/16						
			Turbidity 123.0									

5/11/16

Calibration									Post Calibration			
YSI	lot number	expiration date	calibration standard	reading initial	reading adjusted	date	time	initials	initial reading	temp	time	initials
6024	E363-02	1/6/18	pH 7.0	7.01	7.00	5/11/16	0710	CSH				
	E362-04	12/29/17	pH 4.0	3.99	4.00							
	345-20	12/15/16	pH 10.0	9.91	9.98							
	E231-17	8/24/17	Cond. 1409	1391	1409							
			DO % 95.5	barometer reading		725.1						
	E231-01	8/20/20	Turbidity 0.0	-0.3	0.0	5/11/16						
			Turbidity 123.0									

NERT Water Quality Sonde Calibration Sheet

Calibration									Post Calibration			
YSI	lot number	expiration date	calibration standard	reading initial	reading adjusted	date	time	initials	initial reading	temp	time	initials
60241	~~E231-17~~ CSH 5 1/6/18		pH 7.0	7.02	7.00	5/12/16	0815	CSH				
E363-02	E362-04	12/29/17	pH 4.0	4.01	4.00	"						
	345-20	12/15/16	pH 10.0	9.96	9.99							
	E231-17	8/24/17	Cond. 1409	1369	1409							
			DO % 96.8	barometer reading		725.4						
	E231-01	6/20/20	Turbidity 0.0	0.8	0.0	5/12/16	0815	CSH				
			Turbidity 123.0									

Calibration									Post Calibration			
YSI	lot number	expiration date	calibration standard	reading initial	reading adjusted	date	time	initials	initial reading	temp	time	initials
60241	E363-02	1/6/18	pH 7.0	7.02	7.00	5/13/16	0825	CSH				
	E363-04	12/29/17	pH 4.0	4.01	4.00	"	"	"				
	345-20	12/15/16	pH 10.0	9.92	10.00							
	231-17	8/24/17	Cond. 1409	1422	1410							
			DO % 95.0	barometer reading		721.4						
	E231-01	8/20/20	Turbidity 0.0	-0.4	0.0	5/13/16						
			Turbidity 123.0			5/13/16	X	X				

NERT Water Quality Sonde Calibration Sheet

Calibration									Post Calibration			
YSI	lot number	expiration date	calibration standard	reading initial	reading adjusted	date	time	initials	initial reading	temp	time	initials
60241	E363-02	1/6/18	pH 7.0	7.01	7.00	5/16/16	0615	CSH				
	E362-04	8/29/17	pH 4.0	4.05	4.00							
	345-20	12/15/16	pH 10.0	9.94	9.99							
	E231-17	8/24/17	Cond. 1409	1400	1409							
			DO % 94.2	barometer reading		715.4						
	E231-01	8/20/20	Turbidity 0.0	0.1	0.0	5/16/16						
			Turbidity 123.0									

Calibration									Post Calibration			
YSI	lot number	expiration date	calibration standard	reading initial	reading adjusted	date	time	initials	initial reading	temp	time	initials
			pH 7.0									
			pH 4.0									
			pH 10.0									
			Cond									
			DO %	barometer reading								
			Turbidity 0.0									
			Turbidity 123.0									

NERT Water Quality Sonde Calibration Sheet

Calibration									Post Calibration			
YSI	lot number	expiration date	calibration standard	reading initial	reading adjusted	date	time	initials	initial reading	temp	time	initials
00241	E363-02	1/16/18	pH 7.0	7.11	7.00	5/17/16	0610	CSH				
	E362-04	12/29/17	pH 4.0	3.99	4.00							
	345-20	12/15/16	pH 10.0	9.74	9.95							
	E231-17	8/24/17	Cond. 1409	1406	1409							
			DO % 94.3	barometer reading		716.7						
	E231-01	8/20/20	Turbidity 0.0	1.6*	0.0	5/17/16						
			Turbidity 123.0									

* some issues calibrating turbidity sensor, was reading higher with variability (20 ntu ± 10)

NERT Water Quality Sonde Calibration Sheet

Calibration									Post Calibration			
YSI	lot number	expiration date	calibration standard	reading initial	reading adjusted	date	time	initials	initial reading	temp	time	initials
00241	E363-02	1/16/18	pH 7.0	7.11	7.00	5/17/16	0610	CSH				
	E362-04	12/29/17	pH 4.0	3.99	4.00	〃	〃	〃				
	345-20	12/15/16	pH 10.0	9.74	9.95	〃	〃	〃				
	E231-17	8/24/17	Cond. 1409	1406	1409	〃	〃	〃				
			DO % 94.3	barometer reading		716.7	〃	〃				
	E231-01	8/20/20	Turbidity 0.0	1.6*	0.0	5/17/16	〃					
			Turbidity 123.0									

* some issues calibrating turbidity sensor, was reading higher with variability (20 ntu ± 10)

Calibration									Post Calibration			
YSI	lot number	expiration date	calibration standard	reading initial	reading adjusted	date	time	initials	initial reading	temp	time	initials
00241	E363-02	1/16/18	pH 7.0	7.03	7.00	5/18/16	0605	CSH				
	E362-01	12/29/17	pH 4.0	3.96	4.00	〃	〃	〃				
	345-20	12/15/16	pH 10.0	9.97	10.00	〃	〃	〃				
	E231-17	8/24/17	Cond. 1409	1384	1409	〃	〃	〃				
			DO % 94.5	barometer reading		718.8	〃	〃				
	E231-01	8/20/20	Turbidity 0.0 *	-9.5	0.0	5/18/16	〃					
			Turbidity 123.0									

* turbidity sensor reading low but significantly more stable. After calibration, holding near 0

Appendix D

Laboratory Reports and Chain-of-Custody Documentation (Provided as separate file due to large file size)

Appendix E

Data Validation Summary Report

AECOM Environment

Prepared for:
Nevada Division of Environmental Protection
Las Vegas, NV

Prepared by:
AECOM
Camarillo, CA
60477365
November 2016

Data Validation Summary Report
May 2016 Surface Water Sampling

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

Final

AECOM Environment

Prepared for:
Nevada Division of Environmental Protection
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Camarillo, CA
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November 2016

Data Validation Summary Report
May 2016 Surface Water Sampling

Final

Lily Bayati
Prepared By Lily Bayati

Sally W. Bilodeau
Reviewed By Sally Bilodeau

Contents

List of Attachments

List of Tables

List of Acronyms

CCB	Continuing Calibration Blank
DQO	Data Quality Objective
EB	Equipment Blank
EPA	Environmental Protection Agency
FB	Field Blank
FD	Field Duplicate
ICB	Initial Calibration Blank
LCS/LCSD	Laboratory Control Sample / Laboratory Control Sample Duplicate
MDL	Method Detection Limit
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/QC	Quality Assurance / Quality Control
QAPP	Quality Assurance Project Plan
RPD	Relative Percent Difference
SDG	Sample Delivery Group
SQL	Sample Quantitation Limit
TDS	Total Dissolved Solids

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 May 2016 surface water 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 April 7, 2016, Quality Assurance Project Plan (QAPP) and included the collection and analyses of 79 environmental and quality control (QC) samples. The analyses were performed by the following methods:

- Dissolved Chromium by Environmental Protection Agency (EPA) Method 200.8; and
- Wet Chemistry:
  - Hexavalent Chromium by EPA Method 218.7,
  - Chloride, and Bromide (Anions) by EPA Method 300.0,
  - Chlorate by EPA Method 300.1B,
  - Perchlorate by EPA Method 314.0, and
  - Total Dissolved Solids (TDS) by Standard Method 2540C.

Laboratory analytical services were provided by TestAmerica Laboratories, Inc. (Irvine, California) and Silver State Analytical Laboratories (Las Vegas, Nevada). 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, analysis, SDG, collection date, laboratory sample identification, matrix, and validation level. **Table 2** is a reference table that identifies the QC elements reviewed for each validation level per method, as applicable.

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. Consistent with the NDEP requirements, approximately 90 percent of the analytical data (58 out of 65 primary samples) were validated according to Stage 2B data validation procedures and 10 percent of the analytical data (7 out 65 primary samples) were validated according to Stage 4 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 April 2016; NDEP's Revised Guidance on Qualifying Data due to Blank Contamination for the BMI Complex and Common Areas, dated January 5 2012; EPA's Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, dated August 2014; and EPA's SW 846 Third Edition, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, EPA publication SW-846, Third Edition, Final Updates I (1993), II (1995), IIA (1994), IIB (1995), III (1997), IIIA (1999), IIIB (2005), IV (2008), and V (2015).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. Each analytical fraction has a separate section for each PARCCS criterion. These sections interpret specific QC deviations and their effects on both individual data points and the analyses as a whole. Section 5.0 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 sampling procedures and laboratory analyses contain potential sources of uncertainty, error, and/or bias, which affect the overall quality of a measurement. Errors for 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 also is an important factor in the ability to obtain precise and accurate results within a given medium.

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 2016), Functional Guidelines (EPA 2014), and EPA SW 846 Test Methods (EPA 2015). 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 associated numerical value is an estimated quantity. 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. The "J" qualification indicates the data fell outside of the QC limits or any result that is detected in an environmental sample and associated blank at less than the required action level, but the exceedance was not sufficient to cause rejection of the data.

R Rejected - The data are 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. The "R" designation is also applied to yield only one complete set of data for a given sample and eliminate redundant data.

U Nondetected - Analyses were performed for the compound or analyte, but it was not detected.

UJ Estimated/Nondetected - Analyses were performed for the compound or analyte, but it was not detected and the sample quantitation or detection limit is an estimated quantity due to poor accuracy or precision. This qualification is also used to flag possible false negative results in the case where low bias in the analytical system is indicated by low calibration response, surrogate, or other spike recovery.

DNR Do Not Report - A more appropriate result is reported from another analysis or dilution.

None Indicates the data were not significantly impacted by the finding; therefore, qualification was not required.

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 because 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 or J-	The UJ flag is used when a non-detected (U) flag is added to a biased (J-) or nonbiased flag (J).

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, and EPA Test Methods, 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 is a measure of the agreement or reproducibility of analytical results under a given set of conditions. It is a quantity that cannot be measured directly but is calculated from percent recovery data. Precision is expressed as the relative percent difference (RPD):

$$RPD = (D1-D2)/\{1/2(D1+D2)\} \times 100$$

where:

D1 = reported concentration for the sample

D2 = reported concentration for the duplicate

Precision is primarily assessed by calculating an RPD from the percent recoveries of the spiked compounds for each sample in the MS/MSD pair. In the absence of an MS/MSD pair, a laboratory duplicate or LCS/LCSD pair can be analyzed as an alternative means of assessing precision. An additional measure of sampling precision was obtained by collecting and analyzing FD samples, which were compared using the RPD result as the evaluation criteria.

MS and MSD samples are field samples spiked by the laboratory with target analytes prior to preparation and analysis. These samples measure the overall efficiency of the analytical method in recovering target analytes from an environmental matrix. A LCS is similar to an MS/MSD sample in that the LCS is spiked with the same target analytes prior to preparation and analysis. However, the LCS is prepared using a controlled interference-free matrix instead of a field sample aliquot. Laboratory reagent water is used to prepare an aqueous LCS. The LCS measures laboratory efficiency in recovering target analytes from an aqueous matrix in the absence of matrix interferences.

One primary sample is analyzed and accompanied by an unspiked laboratory duplicate. The data reviewer compares the reported results of the primary analysis and the laboratory duplicate, then calculates RPDs, which are used to assess laboratory precision.

Laboratory and field sampling precision are evaluated by calculating RPDs for aqueous field sample duplicate pairs. The sampler collects two field samples at the same location and under identically controlled conditions. The laboratory then analyzes the samples under identical conditions.

An RPD outside of the numerical QC limit in either MS/MSD samples or LCS/LCSD indicates imprecision. Imprecision is the variance in the consistency with which the laboratory arrives at a particular reported result. Thus, the actual analyte concentration may be higher or lower than the reported result.

Possible causes of poor precision include sample matrix interference, 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. As 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 of 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 percent recovery of each analyte spiked in MS/MSD samples and LCS/LCSDs is evaluated with the acceptance criteria specified by the previously noted documents. Spike recoveries outside of 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.

Initial and continuing calibration blanks (ICB/CCBs) consist of acidified laboratory-grade water, which are injected at the beginning and at a regular frequency during each 12-hour sample analysis run. These blanks estimate residual contaminants from the previous sample or standards analysis and measure baseline shifts that commonly occur in emission and absorption spectroscopy.

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 measures 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. The water is collected from each source water used during each sampling event. FBs were collected and analyzed for all target analytes.

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 were greater than the PQL and less than 10 times the blank contaminant value. The blanks and associated samples were evaluated according to the NDEP's Revised Guidance on Qualifying Data due to Blank Contamination for the BMI Complex and Common Areas (NDEP 2012).

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 EPA guidance (EPA 2014), sample results for analyses that were performed after the method holding time but less than two times the method holding time (if any) would be qualified as estimated (J- or UJ), and sample results for analyses that were performed after two times the method holding time 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 data sets can be compared with confidence only when precision, accuracy, and representativeness are known.

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. As specified in the project DQOs, the goal for completeness for target analytes in each analytical fraction is 90 percent.

Percent completeness (%C) is calculated using the following equation:

$$\%C = (T - R)/T \times 100$$

where:

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 MDL for this project. The laboratory uses a formatter that reports estimated values down to the MDL. 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 for metals analysis (dissolved chromium) and wet chemistry analyses (hexavalent chromium, bromide, chloride, chlorate, perchlorate, and TDS).

2.0 Metals

A total of 25 water samples and seven QC samples were analyzed for dissolved chromium by EPA Method 200.8. None of the 32 results were rejected based on holding time and/or QC exceedances. 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 Instrument Calibration

Initial and continuing calibration verification results provide a means of evaluating accuracy within a particular SDG. Correlation coefficient and percent recovery are the two major parameters used to measure the effectiveness of instrument calibration. The correlation coefficient indicates the linearity of the calibration curve. Percent recovery is used to verify the ongoing calibration acceptability of the analytical system. The most critical of the two calibration parameters, correlation coefficient, has the potential to affect data accuracy across an SDG when it is outside of the acceptable QC limits. Percent recovery exceedances suggest more routine instrumental anomalies, which typically impact all sample results for the affected analytes.

The correlation coefficients in all initial calibrations were within the acceptance criteria of greater than or equal to (≥) 0.995 and the percent recoveries in the continuing calibration verifications met the acceptance criteria of 90 to 110 percent.

2.1.2 Internal Standards

All internal standard relative intensities were within acceptance criteria.

2.1.3 MS/MSD Samples

MS/MSD percent recoveries were within acceptance criteria as stated in the QAPP; therefore, no chromium results were qualified based on this criterion. The details are presented in Attachment A, Section VI.

2.1.4 LCS/LCSD Samples

All LCS/LCSD percent recoveries and RPDs met acceptance criteria as stated in the QAPP.

2.1.5 Inductively Coupled Plasma/Mass Spectrometry Interference Check Samples

All validated Inductively Coupled Plasma/Mass Spectrometry interference check percent recoveries met acceptance criteria as stated in the QAPP.

2.1.6 FD Samples

The FDs were evaluated for acceptable precision with RPDs or difference in instances the results were less than five times the PQL for the compounds. When the sample or FD concentration is less than the PQL, the PQL is used for calculation purposes. All field duplicate RPDs were within the acceptance criteria. The FD RPDs are presented in detail in Attachment A, Section X.

2.1.7 Analyte Quantitation and Target Identification

Raw data were evaluated for the Stage 4 samples. All analyte quantitation and target identifications were acceptable.

2.2 Representativeness

2.2.1 Sample Preservation and Holding Times

The evaluation of holding times to verify compliance with the method was conducted. All samples met the 180-day analysis holding time criteria for dissolved chromium.

2.2.2 Blanks

Method blanks, ICB/CCBs, EBs, and FBs were analyzed to evaluate representativeness. The concentration for an individual target compound in any of the types of QA/QC blanks was used for data qualification.

If contaminants were detected in a blank, flags were assigned for the chemical analytical data during data validation based on the following criteria.

Results Below the PQL If a sample result and blank contaminant value were less than the PQL, the sample result was amended as non-detect (U) at the PQL.

Results Above the PQL If a sample result and blank contaminant value were greater than the PQL and less than 10 times the blank contaminant value, the sample result was qualified as detected estimated (J+) at the concentration reported in the sample results.

No Action If blank contaminant values were less than the PQL and associated sample results were greater than the PQL, or if blank contaminant values were greater than the PQL and associated sample results were greater than 10 times the blank contaminant value, the result was not amended.

2.2.2.1 Method and Calibration Blanks

Dissolved chromium was not detected in the method or calibration blanks for this analysis.

2.2.2.2 EBs and FBs

Dissolved chromium was not detected in EBs and FBs.

2.3 Comparability

The laboratory used standard analytical methods for all of the analyses. In all cases, the SQLs attained were at or below the PQLs. Data validation review indicates that target compounds detected below the PQLs flagged (J) by the laboratory should be considered estimated. The comparability of the metals data is regarded as acceptable.

2.4 Completeness

The completeness level attained for metal field samples was 100 percent; no results were rejected.

2.5 Sensitivity

The calibration was evaluated for instrument sensitivity and was determined to be technically acceptable. All laboratory PQLs met the specified requirements described in the QAPP.

3.0 Wet Chemistry

A total of 25 primary water samples and seven QCs were analyzed for hexavalent chromium by EPA Method 218.7; chloride and bromide by EPA Method 300.0; chlorate by EPA Method 300.1B; perchlorate by EPA Method 314.0; and TDS by Standard Method 2540C. All wet chemistry 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.

3.1 Precision and Accuracy

3.1.1 Instrument Calibration

As previously discussed in Section 2.1.1, initial and continuing calibration results provide a means of evaluating accuracy.

Instrument calibrations were evaluated for all wet chemistry methods. The correlation coefficients in the initial calibrations were within the acceptance criteria of ≥0.995, and the percent recoveries in the continuing calibration verifications met the acceptance criteria.

3.1.2 Surrogate

Surrogate (dichloroacetic acid) recoveries were evaluated for chlorate analysis by EPA Method 300.1B. All surrogate percent recoveries met the acceptance criteria as stated in the QAPP.

3.1.3 MS/MSD Samples

MS/MSD percent recoveries were within acceptance criteria as stated in the QAPP; therefore, no results were qualified based on this criterion. The details regarding the qualification of results are presented in Attachment B, Section VII.

3.1.4 Duplicate Samples

Duplicate samples were evaluated for TDS analysis by SM 2540c. All duplicate RPDs met the acceptance criteria as stated in the QAPP.

3.1.5 LCS Samples

LCS samples were evaluated for all wet chemistry methods. All LCS percent recoveries met the acceptance criteria as stated in the QAPP.

3.1.6 FD Samples

The FD samples were evaluated for acceptable precision with RPDs. Results for bromide were qualified in the following samples: LWC3.4-20160510 and LWC3.4-20160510-FD. The details regarding the qualification of results are presented in Attachment B, Section X.

3.1.7 Analyte Quantitation and Target Identification

Raw data were evaluated for the Stage 4 samples. All analyte quantitation and target identifications were acceptable. In instances where data exceeded the calibration range and was subsequently diluted, the data was

qualified as not reportable by the laboratory in order to yield only one complete set of data for a given sample. The details regarding the qualification of results are presented in Attachment B, Section XII.

3.2 Representativeness

3.2.1 Sample Preservation and Holding Times

The evaluation of holding times to verify compliance with all wet chemistry methods was conducted. All water samples met the 7-day analysis holding time criteria for TDS and hexavalent chromium and the 28-day analysis holding time criteria for chlorate, chloride, bromide, and perchlorate.

The details regarding sample preservation and holding times are presented in Attachment B, Section I.

3.2.2 Blanks

As previously discussed in Section 2.2.2, method blanks, ICB/CCBs, EBs, and FBs were analyzed to evaluate representativeness.

3.2.2.1 Method and Calibration Blanks

No data were qualified due to contaminants detected in the method or calibration blanks for this analysis.

3.2.2.2 EBs and FBs

No contaminants were detected in equipment blanks and field blanks.

3.3 Comparability

The laboratory used standard analytical methods for all of the analyses. In all cases, the SQLs 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.

3.4 Completeness

The completeness level attained for wet chemistry field samples was 100 percent; no results were rejected.

3.5 Sensitivity

The calibration was evaluated for instrument sensitivity and was determined to be technically acceptable. All laboratory PQLs met the specified requirements described in the QAPP.

4.0 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.

5.0 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.

5.1 Precision and Accuracy

Precision and accuracy were evaluated using data quality indicators such as calibration, surrogate, MS/MSD, duplicate, LCS/LCSD, and FD. The precision and accuracy of the data set were considered acceptable after incorporation of validation-qualified results.

5.2 Representativeness

All calibrations were performed as required and met the acceptance criteria. All surrogate, MS/MSD, duplicate, LCS, and FD percent recoveries and RPDs, met acceptance criteria with the exceptions noted in Sections 2.1.2, 3.1.3, and 3.1.6. 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.

5.3 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 with the exceptions noted in Section 3.2.1. The overall comparability is considered acceptable after incorporation of validation-qualified results.

5.4 Completeness

Of the 175 total analytes reported, 0 sample results were rejected. The completeness for the SDGs is as follows:

Parameter	Total Analytes	Number of Rejects	Percent Completeness
Metals	25	0	100
Wet Chemistry	150	0	100
Total	**175**	**0**	**100**

The percentage completeness met the 90-percent DQO goal.

5.5 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.

6.0 Conclusions and Recommendations

The analytical data quality assessment for the water sample laboratory analytical results generated during the May 2016 surface water 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 2B and Stage 4 data validation, all other results are considered valid and usable for all purposes.

7.0 References

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Tables

Table 1
Sample Cross Reference
NERT RI Downgradient Study Area
Henderson, Nevada

Sample Delivery Group	Client Sample Identification	Laboratory Sample Identification	Matrix	Sample Date	Quality Control Type	Validation Level	Bromide (E300)	Chlorate (E300.1)	Chloride (E300)	Chromium (E200.8)	Chromium, Hexavalent (E218.7)	Perchlorate (E314.0)	Total Dissolved Solids (SM2540C)
16-3418	LW3.1-20160510	16-3418-01A	W	05/10/16		Stage 2B					X		
16-3418	LW3.4-20160510	16-3418-02A	W	05/10/16		Stage 2B					X		
16-3418	LW3.4-20160510-FD	16-3418-03A	W	05/10/16	DUP	Stage 2B					X		
16-3418	LWC3.7-20160510	16-3418-04A	W	05/10/16		Stage 2B					X		
16-3463	KM67-20160511	16-3463-02A	W	05/11/16		Stage 2B					X		
16-3463	LW3.75-20160511	16-3463-01A	W	05/11/16		Stage 2B					X		
16-3463	LW3.85-20160511	16-3463-03A	W	05/11/16		Stage 2B					X		
16-3463	LW4.1-20160511	16-3463-04A	W	05/11/16		Stage 2B					X		
16-3463	LWC4.1-20160511	16-3463-05A	W	05/11/16		Stage 2B					X		
16-3489	LW4.95-20160512	16-3489-2A	W	05/12/16		Stage 2B					X		
16-3489	LWC4.6-20160512	16-3489-1A	W	05/12/16		Stage 2B					X		
16-3527	LW5.3-20160513	16-3527-01A	W	05/13/16		Stage 2B					X		
16-3527	LW5.5-20160513	16-3527-02A	W	05/13/16		Stage 2B					X		
16-3527	LW5.7-20160513	16-3527-03A	W	05/13/16		Stage 2B					X		
16-3557	KM71-20160516	16-3557-3A	W	05/16/16		Stage 2B					X		
16-3557	KM71-20160516-FD	16-3557-4A	W	05/16/16	DUP	Stage 2B					X		
16-3557	LW3.1-20160516-FB	16-3557-8A	W	05/16/16	TB	Stage 2B					X		
16-3557	LW5.9-20160516	16-3557-1A	W	05/16/16		Stage 2B					X		
16-3557	LW6.05-20160516	16-3557-2A	W	05/16/16		Stage 2B					X		
16-3557	LWC6.1-20160516	16-3557-5A	W	05/16/16		Stage 2B					X		
16-3557	LWC6.1-20160516-EB	16-3557-9A	W	05/16/16	FB	Stage 2B					X		
16-3595	KM-S-20160517	16-3595-5A	W	05/17/16		Stage 2B					X		
16-3595	LW6.7-20160517	16-3595-6A	W	05/17/16		Stage 2B					X		
16-3595	LW6.7-20160517-EB	16-3595-9A	W	05/17/16	FB	Stage 2B					X		
16-3595	LW6.7-20160517-FB	16-3595-10A	W	05/17/16	TB	Stage 2B					X		
16-3595	LWC6.1-1-20160517	16-3595-3A	W	05/17/16		Stage 2B					X		
16-3595	LWC6.1-2-20160517	16-3595-4A	W	05/17/16		Stage 2B					X		
16-3595	LWC6.3-1-20160517	16-3595-1A	W	05/17/16		Stage 2B					X		
16-3595	LWC6.3-1-20160517-FD	16-3595-2A	W	05/17/16	DUP	Stage 2B					X		
16-3632	LW6.85-20160518	16-3632-01A	W	05/18/16		Stage 2B					X		
16-3632	LW7.2-20160518	16-3632-02A	W	05/18/16		Stage 2B					X		
440-147074	LWC3.1-20160510	440-147074-4	W	05/10/16		Stage 2B	X	X	X	X		X	X
440-147074	LWC3.4-20160510	440-147074-3	W	05/10/16		Stage 2B	X	X	X	X		X	X
440-147074	LWC3.4-20160510-FD	440-147074-2	W	05/10/16	DUP	Stage 2B	X	X	X	X		X	X
440-147074	LWC3.7-20160510	440-147074-1	W	05/10/16		Stage 2B	X	X	X	X		X	X
440-147311	KM 67-20160511	440-147311-5	W	05/11/16		Stage 2B	X	X	X	X		X	X
440-147311	LW 3.75-20160511	440-147311-4	W	05/11/16		Stage 2B	X	X	X	X		X	X
440-147311	LW 3.8520160511	440-147311-2	W	05/11/16		Stage 2B	X	X	X	X		X	X
440-147311	LW 4.1-20160511	440-147311-1	W	05/11/16		Stage 2B	X	X	X	X		X	X
440-147311	LWC 4.1-20160511	440-147311-3	W	05/11/16		Stage 2B	X	X	X	X		X	X

Table 1
Sample Cross Reference
NERT RI Downgradient Study Area
Henderson, Nevada

Sample Delivery Group	Client Sample Identification	Laboratory Sample Identification	Matrix	Sample Date	Quality Control Type	Validation Level	Bromide (E300)	Chlorate (E300.1)	Chloride (E300)	Chromium (E200.8)	Chromium, Hexavalent (E218.7)	Perchlorate (E314.0)	Total Dissolved Solids (SM2540C)
440-147428	LW 4.95-20160512	440-147428-2	W	05/12/16		Stage 2B	X	X	X	X		X	X
440-147428	LWC 4.6-20160512	440-147428-1	W	05/12/16		Stage 2B	X	X	X	X		X	X
440-147491	LW5.3-20160513	440-147491-1	W	05/13/16		Stage 2B	X	X	X	X		X	X
440-147491	LW5.5-20160513	440-147491-3	W	05/13/16		Stage 2B	X	X	X	X		X	X
440-147491	LW5.7-20160513	440-147491-2	W	05/13/16		Stage 2B	X	X	X	X		X	X
440-147639	KM71-20160516	440-147639-3	W	05/16/16		Stage 2B	X	X	X	X		X	X
440-147639	KM71-20160516-FD	440-147639-4	W	05/16/16	DUP	Stage 2B	X	X	X	X		X	X
440-147639	LW5.9-20160516	440-147639-1	W	05/16/16		Stage 2B	X	X	X	X		X	X
440-147639	LW6.05-20160516	440-147639-2	W	05/16/16		Stage 2B	X	X	X	X		X	X
440-147639	LWL6.1-20160516	440-147639-5	W	05/16/16		Stage 2B	X	X	X	X		X	X
440-147788	KM-S-20160517	440-147788-4	W	05/17/16		Stage 2B	X	X	X	X		X	X
440-147788	LW 6.7-20160517	440-147788-5	W	05/17/16		Stage 2B	X	X	X	X		X	X
440-147788	LWC 6.1-1-20160517	440-147788-2	W	05/17/16		Stage 2B	X	X	X	X		X	X
440-147788	LWC 6.1-2-20160517	440-147788-3	W	05/17/16		Stage 2B	X	X	X	X		X	X
440-147788	LWC 6.3-1-20160517	440-147788-1	W	05/17/16		Stage 2B	X	X	X	X		X	X
440-147788	LWC 6.3.1-20160517-FD	440-147788-8	W	05/17/16	DUP	Stage 2B	X	X	X	X		X	X
440-147944	LW6.85-20160518	440-147944-1	W	05/18/16		Stage 2B	X	X	X	X		X	X
440-147944	LW7.2-20160518	440-147944-2	W	05/18/16		Stage 2B	X	X	X	X		X	X

Table 2
Validation Elements
NERT Downgradient Study Area
Henderson, Nevada

Stage 2B	Metals	Wet Chemistry
Sample Receipt & Technical Holding Time	√	√
Initial Calibration (ICAL)	√	√
Initial Calibration Verification (ICV)	√	√
Continuing Calibration Verification (CCV)	√	√
Laboratory Blanks	√	√
Initial Calibration Blank and Continuing Calibration Blank (ICB/CCB)	√	√
Field Blanks	√	√
Inductively Coupled Plasma (ICP) Interference Check Sample	√	n/a
Surrogate Spikes	n/a	√
Matrix Spike (MS), Matrix Spike Duplicate (MSD)	√	√
Laboratory Duplicate (DUP)	n/a	√
Laboratory Control Sample (LCS)/ Laboratory Control Sample Duplicate (LCSD)	√	√
Serial Dilution	√	n/a
Field Duplicate	√	√
Project Quantitation Limits (QL)	√	√
Multiple Results for One Sample	√	√
Sample Result Verification - -	- -	- -
Overall Data Usability Assessment	√	√

Stage 4	Metals	Wet Chemistry
Sample Receipt & Technical Holding Time	√	√
Initial Calibration (ICAL)	√	√
Initial Calibration Verification (ICV)	√	√
Continuing Calibration Verification (CCV)	√	√
Laboratory Blanks	√	√
Initial Calibration Blank and Continuing Calibration Blank (ICB/CCB)	√	√
Field Blanks	√	√
Inductively Coupled Plasma (ICP) Interference Check Sample	√	n/a
Surrogate Spikes	n/a	√
Matrix Spike (MS), Matrix Spike Duplicate (MSD)	√	√
Laboratory Duplicate (DUP)	n/a	√
Laboratory Control Sample (LCS)/ Laboratory Control Sample Duplicate (LCSD)	√	√
Serial Dilution	√	n/a
Field Duplicate	√	√
Project Quantitation Limits (QL)	√	√
Multiple Results for One Sample	√	√
Sample Result Verification	√	√
Overall Data Usability Assessment	√	√

Notes:

√ = Reviewed

n/a = Not applicable to method or not performed during this sampling event

-- = Not applicable for Stage 2B review

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 Identification	Sample Date	Method	Client Analyte Identification	Analyte	Laboratory Result	Laboratory Qualifier	SQL	PQL	Units	Validator Qualifier	Reason Code	Reason Code Definition	Qualification Finding	
16-3418	LW3.1-20160510	5/10/2016	E218.7	18540-29-9	Chromium, Hexavalent	0.090	U	0.090	1.0	ug/l					
16-3418	LW3.4-20160510	5/10/2016	E218.7	18540-29-9	Chromium, Hexavalent	0.090	U	0.090	1.0	ug/l					
16-3418	LW3.4-20160510-FD	5/10/2016	E218.7	18540-29-9	Chromium, Hexavalent	0.090	U	0.090	1.0	ug/l					
16-3418	LWC3.7-20160510	5/10/2016	E218.7	18540-29-9	Chromium, Hexavalent	0.090	U	0.090	1.0	ug/l					
16-3463	KM67-20160511	5/11/2016	E218.7	18540-29-9	Chromium, Hexavalent	10		0.090	1.0	ug/l					
16-3463	LW3.75-20160511	5/11/2016	E218.7	18540-29-9	Chromium, Hexavalent	0.090	U	0.090	1.0	ug/l					
16-3463	LW3.85-20160511	5/11/2016	E218.7	18540-29-9	Chromium, Hexavalent	0.090	U	0.090	1.0	ug/l					
16-3463	LW4.1-20160511	5/11/2016	E218.7	18540-29-9	Chromium, Hexavalent	0.090	U	0.090	1.0	ug/l					
16-3463	LWC4.1-20160511	5/11/2016	E218.7	18540-29-9	Chromium, Hexavalent	0.090	U	0.090	1.0	ug/l					
16-3489	LW4.95-20160512	5/12/2016	E218.7	18540-29-9	Chromium, Hexavalent	0.090	U	0.090	1.0	ug/l					
16-3489	LWC4.6-20160512	5/12/2016	E218.7	18540-29-9	Chromium, Hexavalent	0.090	U	0.090	1.0	ug/l					
16-3527	LW5.3-20160513	5/13/2016	E218.7	18540-29-9	Chromium, Hexavalent	0.090	U	0.090	1.0	ug/l					
16-3527	LW5.5-20160513	5/13/2016	E218.7	18540-29-9	Chromium, Hexavalent	0.090	U	0.090	1.0	ug/l					
16-3527	LW5.7-20160513	5/13/2016	E218.7	18540-29-9	Chromium, Hexavalent	0.090	U	0.090	1.0	ug/l					
16-3557	KM71-20160516	5/16/2016	E218.7	18540-29-9	Chromium, Hexavalent	0.090	U	0.090	1.0	ug/l					
16-3557	KM71-20160516-FD	5/16/2016	E218.7	18540-29-9	Chromium, Hexavalent	0.090	U	0.090	1.0	ug/l					
16-3557	LW3.1-20160516-FB	5/16/2016	E218.7	18540-29-9	Chromium, Hexavalent	0.090	U	0.090	1.0	ug/l					
16-3557	LW5.9-20160516	5/16/2016	E218.7	18540-29-9	Chromium, Hexavalent	0.090	U	0.090	1.0	ug/l					
16-3557	LW6.05-20160516	5/16/2016	E218.7	18540-29-9	Chromium, Hexavalent	0.090	U	0.090	1.0	ug/l					
16-3557	LWC6.1-20160516	5/16/2016	E218.7	18540-29-9	Chromium, Hexavalent	0.090	U	0.090	1.0	ug/l					
16-3557	LWC6.1-20160516-EB	5/16/2016	E218.7	18540-29-9	Chromium, Hexavalent	0.090	U	0.090	1.0	ug/l					
16-3595	KM-S-20160517	5/17/2016	E218.7	18540-29-9	Chromium, Hexavalent	0.090	U	0.090	1.0	ug/l					
16-3595	LW6.7-20160517	5/17/2016	E218.7	18540-29-9	Chromium, Hexavalent	0.090	U	0.090	1.0	ug/l					
16-3595	LW6.7-20160517-EB	5/17/2016	E218.7	18540-29-9	Chromium, Hexavalent	0.090	U	0.090	1.0	ug/l					
16-3595	LW6.7-20160517-FB	5/17/2016	E218.7	18540-29-9	Chromium, Hexavalent	0.090	U	0.090	1.0	ug/l					
16-3595	LWC6.1-1-20160517	5/17/2016	E218.7	18540-29-9	Chromium, Hexavalent	0.090	U	0.090	1.0	ug/l					
16-3595	LWC6.1-2-20160517	5/17/2016	E218.7	18540-29-9	Chromium, Hexavalent	0.090	U	0.090	1.0	ug/l					
16-3595	LWC6.3-1-20160517	5/17/2016	E218.7	18540-29-9	Chromium, Hexavalent	0.090	U	0.090	1.0	ug/l					
16-3595	LWC6.3-1-20160517-FD	5/17/2016	E218.7	18540-29-9	Chromium, Hexavalent	0.090	U	0.090	1.0	ug/l					
16-3632	LW6.85-20160518	5/18/2016	E218.7	18540-29-9	Chromium, Hexavalent	0.090	U	0.090	1.0	ug/l					
16-3632	LW7.2-20160518	5/18/2016	E218.7	18540-29-9	Chromium, Hexavalent	0.090	U	0.090	1.0	ug/l					
440-147074	LWC3.1-20160510	5/10/2016	E200.8	7440-47-3	Chromium	0.50	U	0.50	2.0	ug/l					
440-147074	LWC3.1-20160510	5/10/2016	E300	16887-00-6	Chloride	300		0.25	25	mg/l					
440-147074	LWC3.1-20160510	5/10/2016	E300	24959-67-9	Bromide	0.91		0.25	0.50	mg/l					
440-147074	LWC3.1-20160510	5/10/2016	E300.1	14866-68-3	Chlorate	220		100	200	ug/l					
440-147074	LWC3.1-20160510	5/10/2016	E314.0	14797-73-0	Perchlorate	51		0.95	4.0	ug/l					
440-147074	LWC3.1-20160510	5/10/2016	SM2540C	TDS	Total Dissolved Solids	1500		5.0	10	mg/l					
440-147074	LWC3.4-20160510	5/10/2016	E200.8	7440-47-3	Chromium	0.50	U	0.50	2.0	ug/l					
440-147074	LWC3.4-20160510	5/10/2016	E300	16887-00-6	Chloride	300		0.25	25	mg/l					
440-147074	LWC3.4-20160510	5/10/2016	E300	24959-67-9	Bromide	1.4		0.25	0.50	mg/l	J	fd	FD RPD >30%	RPD=36%	
440-147074	LWC3.4-20160510	5/10/2016	E300.1	14866-68-3	Chlorate	210		100	200	ug/l					
440-147074	LWC3.4-20160510	5/10/2016	E314.0	14797-73-0	Perchlorate	52		0.95	4.0	ug/l					
440-147074	LWC3.4-20160510	5/10/2016	SM2540C	TDS	Total Dissolved Solids	1500		5.0	10	mg/l					
440-147074	LWC3.4-20160510-FD	5/10/2016	E200.8	7440-47-3	Chromium	0.50	U	0.50	2.0	ug/l					
440-147074	LWC3.4-20160510-FD	5/10/2016	E300	16887-00-6	Chloride	300		0.25	25	mg/l					

Table 4
Qualified Results
NERT Downgradient Study Area
Henderson, Nevada

SDG	Client Sample Identification	Sample Date	Method	Client Analyte Identification	Analyte	Laboratory Result	Laboratory Qualifier	SQL	PQL	Units	Validator Qualifier	Reason Code	Reason Code Definition	Qualification Finding	
440-147074	LWC3.4-20160510-FD	5/10/2016	E300	24959-67-9	Bromide	0.97		0.25	0.50	mg/l	J	fd	FD RPD >30%	RPD=36%	
440-147074	LWC3.4-20160510-FD	5/10/2016	E300.1	14866-68-3	Chlorate	220		100	200	ug/l					
440-147074	LWC3.4-20160510-FD	5/10/2016	E314.0	14797-73-0	Perchlorate	56		0.95	4.0	ug/l					
440-147074	LWC3.4-20160510-FD	5/10/2016	SM2540C	TDS	Total Dissolved Solids	1600		5.0	10	mg/l					
440-147074	LWC3.7-20160510	5/10/2016	E200.8	7440-47-3	Chromium	0.50	U	0.50	2.0	ug/l					
440-147074	LWC3.7-20160510	5/10/2016	E300	16887-00-6	Chloride	300		0.25	25	mg/l					
440-147074	LWC3.7-20160510	5/10/2016	E300	24959-67-9	Bromide	0.93		0.25	0.50	mg/l					
440-147074	LWC3.7-20160510	5/10/2016	E300.1	14866-68-3	Chlorate	260		100	200	ug/l					
440-147074	LWC3.7-20160510	5/10/2016	E314.0	14797-73-0	Perchlorate	61		0.95	4.0	ug/l					
440-147074	LWC3.7-20160510	5/10/2016	SM2540C	TDS	Total Dissolved Solids	1600		5.0	20	mg/l					
440-147311	KM 67-20160511	5/11/2016	E200.8	7440-47-3	Chromium	6.3		0.50	2.0	ug/l					
440-147311	KM 67-20160511	5/11/2016	E300	16887-00-6	Chloride	580		0.50	50	mg/l					
440-147311	KM 67-20160511	5/11/2016	E300	24959-67-9	Bromide	0.50	U	0.50	1.0	mg/l					
440-147311	KM 67-20160511	5/11/2016	E300.1	14866-68-3	Chlorate	4400		200	400	ug/l					
440-147311	KM 67-20160511	5/11/2016	E314.0	14797-73-0	Perchlorate	1500		95	400	ug/l					
440-147311	KM 67-20160511	5/11/2016	SM2540C	TDS	Total Dissolved Solids	3500		5.0	50	mg/l					
440-147311	LW 3.75-20160511	5/11/2016	E200.8	7440-47-3	Chromium	0.52	J	0.50	2.0	ug/l	J	sp	Detect <PQL	-	-
440-147311	LW 3.75-20160511	5/11/2016	E300	16887-00-6	Chloride	290		0.25	25	mg/l					
440-147311	LW 3.75-20160511	5/11/2016	E300	24959-67-9	Bromide	0.25	U	0.25	0.50	mg/l					
440-147311	LW 3.75-20160511	5/11/2016	E300.1	14866-68-3	Chlorate	160		50	100	ug/l					
440-147311	LW 3.75-20160511	5/11/2016	E314.0	14797-73-0	Perchlorate	26		0.95	4.0	ug/l					
440-147311	LW 3.75-20160511	5/11/2016	SM2540C	TDS	Total Dissolved Solids	1500		5.0	10	mg/l					
440-147311	LW 3.8520160511	5/11/2016	E200.8	7440-47-3	Chromium	0.51	J	0.50	2.0	ug/l	J	sp	Detect <PQL	-	-
440-147311	LW 3.8520160511	5/11/2016	E300	16887-00-6	Chloride	290		0.25	25	mg/l					
440-147311	LW 3.8520160511	5/11/2016	E300	24959-67-9	Bromide	0.25	U	0.25	0.50	mg/l					
440-147311	LW 3.8520160511	5/11/2016	E300.1	14866-68-3	Chlorate	190		50	100	ug/l					
440-147311	LW 3.8520160511	5/11/2016	E314.0	14797-73-0	Perchlorate	35		0.95	4.0	ug/l					
440-147311	LW 3.8520160511	5/11/2016	SM2540C	TDS	Total Dissolved Solids	1500		5.0	10	mg/l					
440-147311	LW 4.1-20160511	5/11/2016	E200.8	7440-47-3	Chromium	0.50	U	0.50	2.0	ug/l					
440-147311	LW 4.1-20160511	5/11/2016	E300	16887-00-6	Chloride	300		0.25	25	mg/l					
440-147311	LW 4.1-20160511	5/11/2016	E300	24959-67-9	Bromide	0.38	J	0.25	0.50	mg/l	J	sp	Detect <PQL	-	-
440-147311	LW 4.1-20160511	5/11/2016	E300.1	14866-68-3	Chlorate	240		50	100	ug/l					
440-147311	LW 4.1-20160511	5/11/2016	E314.0	14797-73-0	Perchlorate	50		0.95	4.0	ug/l					
440-147311	LW 4.1-20160511	5/11/2016	SM2540C	TDS	Total Dissolved Solids	1800		5.0	20	mg/l					
440-147311	LWC 4.1-20160511	5/11/2016	E200.8	7440-47-3	Chromium	0.55	J	0.50	2.0	ug/l	J	sp	Detect <PQL	-	-
440-147311	LWC 4.1-20160511	5/11/2016	E300	16887-00-6	Chloride	310		0.25	25	mg/l					
440-147311	LWC 4.1-20160511	5/11/2016	E300	24959-67-9	Bromide	0.36	J	0.25	0.50	mg/l	J	sp	Detect <PQL	-	-
440-147311	LWC 4.1-20160511	5/11/2016	E300.1	14866-68-3	Chlorate	210		50	100	ug/l					
440-147311	LWC 4.1-20160511	5/11/2016	E314.0	14797-73-0	Perchlorate	46		0.95	4.0	ug/l					
440-147311	LWC 4.1-20160511	5/11/2016	SM2540C	TDS	Total Dissolved Solids	1600		5.0	10	mg/l					
440-147428	LW 4.95-20160512	5/12/2016	E200.8	7440-47-3	Chromium	0.78	J	0.50	2.0	ug/l	J	sp	Detect <PQL	-	-
440-147428	LW 4.95-20160512	5/12/2016	E300	16887-00-6	Chloride	250		0.25	25	mg/l					
440-147428	LW 4.95-20160512	5/12/2016	E300	24959-67-9	Bromide	0.25	U	0.25	0.50	mg/l					
440-147428	LW 4.95-20160512	5/12/2016	E300.1	14866-68-3	Chlorate	110		50	100	ug/l					
440-147428	LW 4.95-20160512	5/12/2016	E314.0	14797-73-0	Perchlorate	15		0.95	4.0	ug/l					

Table 4
Qualified Results
NERT Downgradient Study Area
Henderson, Nevada

SDG	Client Sample Identification	Sample Date	Method	Client Analyte Identification	Analyte	Laboratory Result	Laboratory Qualifier	SQL	PQL	Units	Validator Qualifier	Reason Code	Reason Code Definition	Qualification Finding	
440-147428	LW 4.95-20160512	5/12/2016	SM2540C	TDS	Total Dissolved Solids	1500		5.0	20	mg/l					
440-147428	LWC 4.6-20160512	5/12/2016	E200.8	7440-47-3	Chromium	0.62	J	0.50	2.0	ug/l	J	sp	Detect <PQL	-	-
440-147428	LWC 4.6-20160512	5/12/2016	E300	16887-00-6	Chloride	260		0.25	25	mg/l					
440-147428	LWC 4.6-20160512	5/12/2016	E300	24959-67-9	Bromide	0.25	U	0.25	0.50	mg/l					
440-147428	LWC 4.6-20160512	5/12/2016	E300.1	14866-68-3	Chlorate	230		50	100	ug/l					
440-147428	LWC 4.6-20160512	5/12/2016	E314.0	14797-73-0	Perchlorate	44		0.95	4.0	ug/l					
440-147428	LWC 4.6-20160512	5/12/2016	SM2540C	TDS	Total Dissolved Solids	1400		5.0	20	mg/l					
440-147491	LW5.3-20160513	5/13/2016	E200.8	7440-47-3	Chromium	0.75	J	0.50	2.0	ug/l	J	sp	Detect <PQL	-	-
440-147491	LW5.3-20160513	5/13/2016	E300	16887-00-6	Chloride	290		0.25	25	mg/l					
440-147491	LW5.3-20160513	5/13/2016	E300	24959-67-9	Bromide	1.1		0.25	0.50	mg/l					
440-147491	LW5.3-20160513	5/13/2016	E300.1	14866-68-3	Chlorate	110		50	100	ug/l					
440-147491	LW5.3-20160513	5/13/2016	E314.0	14797-73-0	Perchlorate	23		0.95	4.0	ug/l					
440-147491	LW5.3-20160513	5/13/2016	SM2540C	TDS	Total Dissolved Solids	1500		5.0	10	mg/l					
440-147491	LW5.5-20160513	5/13/2016	E200.8	7440-47-3	Chromium	1.4	J	0.50	2.0	ug/l	J	sp	Detect <PQL	-	-
440-147491	LW5.5-20160513	5/13/2016	E300	16887-00-6	Chloride	300		0.25	25	mg/l					
440-147491	LW5.5-20160513	5/13/2016	E300	24959-67-9	Bromide	1.3		0.25	0.50	mg/l					
440-147491	LW5.5-20160513	5/13/2016	E300.1	14866-68-3	Chlorate	100		50	100	ug/l					
440-147491	LW5.5-20160513	5/13/2016	E314.0	14797-73-0	Perchlorate	19		0.95	4.0	ug/l					
440-147491	LW5.5-20160513	5/13/2016	SM2540C	TDS	Total Dissolved Solids	1500		5.0	10	mg/l					
440-147491	LW5.7-20160513	5/13/2016	E200.8	7440-47-3	Chromium	1.2	J	0.50	2.0	ug/l	J	sp	Detect <PQL	-	-
440-147491	LW5.7-20160513	5/13/2016	E300	16887-00-6	Chloride	280		0.25	25	mg/l					
440-147491	LW5.7-20160513	5/13/2016	E300	24959-67-9	Bromide	1.0		0.25	0.50	mg/l					
440-147491	LW5.7-20160513	5/13/2016	E300.1	14866-68-3	Chlorate	100		50	100	ug/l					
440-147491	LW5.7-20160513	5/13/2016	E314.0	14797-73-0	Perchlorate	8.3		0.95	4.0	ug/l					
440-147491	LW5.7-20160513	5/13/2016	SM2540C	TDS	Total Dissolved Solids	1400		5.0	10	mg/l					
440-147639	KM71-20160516	5/16/2016	E200.8	7440-47-3	Chromium	0.50	U	0.50	2.0	ug/l					
440-147639	KM71-20160516	5/16/2016	E300	16887-00-6	Chloride	230		0.25	25	mg/l					
440-147639	KM71-20160516	5/16/2016	E300	24959-67-9	Bromide	1.3		0.25	0.50	mg/l					
440-147639	KM71-20160516	5/16/2016	E300.1	14866-68-3	Chlorate	14	J	10	20	ug/l	J	sp	Detect <PQL	-	-
440-147639	KM71-20160516	5/16/2016	E314.0	14797-73-0	Perchlorate	1.4	J	0.95	4.0	ug/l	J	sp	Detect <PQL	-	-
440-147639	KM71-20160516	5/16/2016	SM2540C	TDS	Total Dissolved Solids	1400		5.0	10	mg/l					
440-147639	KM71-20160516-FD	5/16/2016	E200.8	7440-47-3	Chromium	0.50	U	0.50	2.0	ug/l					
440-147639	KM71-20160516-FD	5/16/2016	E300	16887-00-6	Chloride	230		0.25	25	mg/l					
440-147639	KM71-20160516-FD	5/16/2016	E300	24959-67-9	Bromide	1.6		0.25	0.50	mg/l					
440-147639	KM71-20160516-FD	5/16/2016	E300.1	14866-68-3	Chlorate	14	J	10	20	ug/l	J	sp	Detect <PQL	-	-
440-147639	KM71-20160516-FD	5/16/2016	E314.0	14797-73-0	Perchlorate	1.7	J	0.95	4.0	ug/l	J	sp	Detect <PQL	-	-
440-147639	KM71-20160516-FD	5/16/2016	SM2540C	TDS	Total Dissolved Solids	1400		5.0	10	mg/l					
440-147639	LW5.9-20160516	5/16/2016	E200.8	7440-47-3	Chromium	0.50	U	0.50	2.0	ug/l					
440-147639	LW5.9-20160516	5/16/2016	E300	16887-00-6	Chloride	250		0.25	25	mg/l					
440-147639	LW5.9-20160516	5/16/2016	E300	24959-67-9	Bromide	1.7		0.25	0.50	mg/l					
440-147639	LW5.9-20160516	5/16/2016	E300.1	14866-68-3	Chlorate	120		50	100	ug/l					
440-147639	LW5.9-20160516	5/16/2016	E314.0	14797-73-0	Perchlorate	15		0.95	4.0	ug/l					
440-147639	LW5.9-20160516	5/16/2016	SM2540C	TDS	Total Dissolved Solids	1500		5.0	10	mg/l					
440-147639	LW6.05-20160516	5/16/2016	E200.8	7440-47-3	Chromium	0.50	U	0.50	2.0	ug/l					
440-147639	LW6.05-20160516	5/16/2016	E300	16887-00-6	Chloride	250		0.25	25	mg/l					

Table 4
Qualified Results
NERT Downgradient Study Area
Henderson, Nevada

SDG	Client Sample Identification	Sample Date	Method	Client Analyte Identification	Analyte	Laboratory Result	Laboratory Qualifier	SQL	PQL	Units	Validator Qualifier	Reason Code	Reason Code Definition	Qualification Finding	
440-147639	LW6.05-20160516	5/16/2016	E300	24959-67-9	Bromide	1.8		0.25	0.50	mg/l					
440-147639	LW6.05-20160516	5/16/2016	E300.1	14866-68-3	Chlorate	130		50	100	ug/l					
440-147639	LW6.05-20160516	5/16/2016	E314.0	14797-73-0	Perchlorate	17		0.95	4.0	ug/l					
440-147639	LW6.05-20160516	5/16/2016	SM2540C	TDS	Total Dissolved Solids	1500		5.0	10	mg/l					
440-147639	LWL6.1-20160516	5/16/2016	E200.8	7440-47-3	Chromium	0.50	U	0.50	2.0	ug/l					
440-147639	LWL6.1-20160516	5/16/2016	E300	16887-00-6	Chloride	460		0.50	50	mg/l					
440-147639	LWL6.1-20160516	5/16/2016	E300	24959-67-9	Bromide	3.5		0.50	1.0	mg/l					
440-147639	LWL6.1-20160516	5/16/2016	E300.1	14866-68-3	Chlorate	150		10	20	ug/l					
440-147639	LWL6.1-20160516	5/16/2016	E314.0	14797-73-0	Perchlorate	1.7	J	0.95	4.0	ug/l	J	sp	Detect <PQL	-	-
440-147639	LWL6.1-20160516	5/16/2016	SM2540C	TDS	Total Dissolved Solids	1800		5.0	10	mg/l					
440-147788	KM-S-20160517	5/17/2016	E200.8	7440-47-3	Chromium	0.50	U	0.50	2.0	ug/l					
440-147788	KM-S-20160517	5/17/2016	E300	16887-00-6	Chloride	460		0.50	50	mg/l					
440-147788	KM-S-20160517	5/17/2016	E300	24959-67-9	Bromide	0.63	J	0.50	1.0	mg/l	J	sp	Detect <PQL	-	-
440-147788	KM-S-20160517	5/17/2016	E300.1	14866-68-3	Chlorate	20	U	20	40	ug/l					
440-147788	KM-S-20160517	5/17/2016	E314.0	14797-73-0	Perchlorate	85		0.95	4.0	ug/l					
440-147788	KM-S-20160517	5/17/2016	SM2540C	TDS	Total Dissolved Solids	2000		5.0	20	mg/l					
440-147788	LW 6.7-20160517	5/17/2016	E200.8	7440-47-3	Chromium	0.50	U	0.50	2.0	ug/l					
440-147788	LW 6.7-20160517	5/17/2016	E300	16887-00-6	Chloride	230		0.25	25	mg/l					
440-147788	LW 6.7-20160517	5/17/2016	E300	24959-67-9	Bromide	0.41	J	0.25	0.50	mg/l	J	sp	Detect <PQL	-	-
440-147788	LW 6.7-20160517	5/17/2016	E300.1	14866-68-3	Chlorate	86		10	20	ug/l					
440-147788	LW 6.7-20160517	5/17/2016	E314.0	14797-73-0	Perchlorate	0.95	U	0.95	4.0	ug/l					
440-147788	LW 6.7-20160517	5/17/2016	SM2540C	TDS	Total Dissolved Solids	1300		5.0	10	mg/l					
440-147788	LWC 6.1-1-20160517	5/17/2016	E200.8	7440-47-3	Chromium	0.50	U	0.50	2.0	ug/l					
440-147788	LWC 6.1-1-20160517	5/17/2016	E300	16887-00-6	Chloride	250		2.5	25	mg/l					
440-147788	LWC 6.1-1-20160517	5/17/2016	E300	24959-67-9	Bromide	2.5	U	2.5	5.0	mg/l					
440-147788	LWC 6.1-1-20160517	5/17/2016	E300.1	14866-68-3	Chlorate	240		50	100	ug/l					
440-147788	LWC 6.1-1-20160517	5/17/2016	E314.0	14797-73-0	Perchlorate	7.3		0.95	4.0	ug/l					
440-147788	LWC 6.1-1-20160517	5/17/2016	SM2540C	TDS	Total Dissolved Solids	1100		5.0	10	mg/l					
440-147788	LWC 6.1-2-20160517	5/17/2016	E200.8	7440-47-3	Chromium	0.61	J	0.50	2.0	ug/l	J	sp	Detect <PQL	-	-
440-147788	LWC 6.1-2-20160517	5/17/2016	E300	16887-00-6	Chloride	91		0.25	10	mg/l					
440-147788	LWC 6.1-2-20160517	5/17/2016	E300	24959-67-9	Bromide	0.25	U	0.25	0.50	mg/l					
440-147788	LWC 6.1-2-20160517	5/17/2016	E300.1	14866-68-3	Chlorate	20	U	20	40	ug/l					
440-147788	LWC 6.1-2-20160517	5/17/2016	E314.0	14797-73-0	Perchlorate	0.95	U	0.95	4.0	ug/l					
440-147788	LWC 6.1-2-20160517	5/17/2016	SM2540C	TDS	Total Dissolved Solids	620		5.0	10	mg/l					
440-147788	LWC 6.3-1-20160517	5/17/2016	E200.8	7440-47-3	Chromium	2.2		0.50	2.0	ug/l					
440-147788	LWC 6.3-1-20160517	5/17/2016	E300	16887-00-6	Chloride	1600		2.5	250	mg/l					
440-147788	LWC 6.3-1-20160517	5/17/2016	E300	24959-67-9	Bromide	3.3	J	2.5	5.0	mg/l	J	sp	Detect <PQL	-	-
440-147788	LWC 6.3-1-20160517	5/17/2016	E300.1	14866-68-3	Chlorate	20	U	20	40	ug/l					
440-147788	LWC 6.3-1-20160517	5/17/2016	E314.0	14797-73-0	Perchlorate	9.5	U	9.5	40	ug/l					
440-147788	LWC 6.3-1-20160517	5/17/2016	SM2540C	TDS	Total Dissolved Solids	5000		5.0	100	mg/l					
440-147788	LWC 6.3.1-20160517-FD	5/17/2016	E200.8	7440-47-3	Chromium	2.1		0.50	2.0	ug/l					
440-147788	LWC 6.3.1-20160517-FD	5/17/2016	E300	16887-00-6	Chloride	1700		2.5	250	mg/l					
440-147788	LWC 6.3.1-20160517-FD	5/17/2016	E300	24959-67-9	Bromide	2.5	U	2.5	5.0	mg/l					
440-147788	LWC 6.3.1-20160517-FD	5/17/2016	E300.1	14866-68-3	Chlorate	20	U	20	40	ug/l					
440-147788	LWC 6.3.1-20160517-FD	5/17/2016	E314.0	14797-73-0	Perchlorate	9.5	U	9.5	40	ug/l					

Table 4
Qualified Results
NERT Downgradient Study Area
Henderson, Nevada

SDG	Client Sample Identification	Sample Date	Method	Client Analyte Identification	Analyte	Laboratory Result	Laboratory Qualifier	SQL	PQL	Units	Validator Qualifier	Reason Code	Reason Code Definition	Qualification Finding	
440-147788	LWC 6.3.1-20160517-FD	5/17/2016	SM2540C	TDS	Total Dissolved Solids	5100		5.0	100	mg/l					
440-147944	LW6.85-20160518	5/18/2016	E200.8	7440-47-3	Chromium	0.53	J	0.50	2.0	ug/l	J	sp	Detect <PQL	-	-
440-147944	LW6.85-20160518	5/18/2016	E300	16887-00-6	Chloride	310		0.25	25	mg/l					
440-147944	LW6.85-20160518	5/18/2016	E300	24959-67-9	Bromide	0.83		0.25	0.50	mg/l					
440-147944	LW6.85-20160518	5/18/2016	E300.1	14866-68-3	Chlorate	180		50	100	ug/l					
440-147944	LW6.85-20160518	5/18/2016	E314.0	14797-73-0	Perchlorate	1.0	J	0.95	4.0	ug/l	J	sp	Detect <PQL	-	-
440-147944	LW6.85-20160518	5/18/2016	SM2540C	TDS	Total Dissolved Solids	1800		5.0	20	mg/l					
440-147944	LW7.2-20160518	5/18/2016	E200.8	7440-47-3	Chromium	0.50	U	0.50	2.0	ug/l					
440-147944	LW7.2-20160518	5/18/2016	E300	16887-00-6	Chloride	260		0.25	25	mg/l					
440-147944	LW7.2-20160518	5/18/2016	E300	24959-67-9	Bromide	0.67		0.25	0.50	mg/l					
440-147944	LW7.2-20160518	5/18/2016	E300.1	14866-68-3	Chlorate	210		50	100	ug/l					
440-147944	LW7.2-20160518	5/18/2016	E314.0	14797-73-0	Perchlorate	0.95	U	0.95	4.0	ug/l					
440-147944	LW7.2-20160518	5/18/2016	SM2540C	TDS	Total Dissolved Solids	1300		5.0	10	mg/l					

Attachment A

Dissolved Chromium Data Validation

Dissolved Chromium by EPA Method 200.8

I. 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.

II. Instrument Calibration

Appropriate Inductively Coupled Plasma (ICP)/Mass Spectrometry tune, initial calibration (IC), initial calibration verification (ICV), and continuing calibration verification (CCV) were performed as required by the method. All results were within QC limits and compliance requirements were met.

III. Interference Check Sample (ICS) Analysis

ICS A and ICS AB solutions were analyzed at the proper frequency. All ICS results were within acceptance criteria.

IV. Laboratory Blanks

Laboratory instrument blanks, calibration blanks and method blanks were analyzed at the proper frequency as required by the method. No contaminants were found in the laboratory blanks.

V. Field Blanks

Samples LWC6.1-20160516-EB and LW6.7-20160517-EB were identified as equipment blanks. Chromium was not detected in the equipment blanks.

Samples LW3.1-20160516-FB and LW6.7-20160517-FB were identified as field blanks. Chromium was not detected in the field blanks.

VI. 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.

VII. Laboratory Duplicate Sample Analysis

Laboratory duplicate (DUP) analyses are not required by EPA Method 200.8 and therefore laboratory duplicate analyses were not performed for these SDGs.

VIII. ICP Serial Dilution

ICP serial dilution is not applicable to EPA Method 200.8 and therefore serial dilutions of client samples were not performed for these SDGs.

IX. Laboratory Control Samples

Laboratory control samples (LCS and LCSD) were prepared and analyzed the proper frequency as required by the method. Percent recoveries (%R) were within QC limits.

X. Field Duplicates

Samples LW3.4-20160510-FD, KM71-20160516-FD, and LWC 6.3-1-20160517-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.

SDG	Sample ID	Primary Conc.	Duplicate Conc.	RPD	RPD Limit	Flags	A or P
440-147074	LWC3.4-20160510	ND <0.5 ug/L	ND <0.5 ug/L	NC	<30		
440-147639	KM71-20160516	ND <0.5 ug/L	ND <0.5 ug/L	NC	<30		
440-147788	LWC 6.3-1-20160517	2.2	2.1	5	<30		

XI. Sample Result Verification

All sample result verifications were acceptable for samples which underwent Stage 4 validation. Raw data were not reviewed for Stage 2B validation.

XII. Overall Assessment of Data

All samples were analyzed as requested and all holding times were met. No 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.

May 2016 Surface Water Monitoring
Dissolved Chromium – 440-147074-2, 440-147311-2, 440-147428-2, 440-147491-2, 440-147639-2, 4440-147788-2, 440-147944-2

SDG	Client Sample ID	Analyte	Lab Result	Lab Qualifier	Units	Validator Qualifier	Reason Code Definition
440-147311	LW 3.75-20160511	Chromium	0.52	J	µg/L	J	Detect <PQL
440-147311	LW 3.8520160511	Chromium	0.51	J	µg/L	J	Detect <PQL
440-147311	LWC 4.1-20160511	Chromium	0.55	J	µg/L	J	Detect <PQL
440-147428	LW 4.95-20160512	Chromium	0.78	J	µg/L	J	Detect <PQL
440-147428	LWC 4.6-20160512	Chromium	0.62	J	µg/L	J	Detect <PQL
440-147491	LW5.3-20160513	Chromium	0.75	J	µg/L	J	Detect <PQL
440-147491	LW5.5-20160513	Chromium	1.4	J	µg/L	J	Detect <PQL
440-147491	LW5.7-20160513	Chromium	1.2	J	µg/L	J	Detect <PQL
440-147788	LWC 6.1-2-20160517	Chromium	0.61	J	µg/L	J	Detect <PQL
440-147944	LW6.85-20160518	Chromium	0.53	J	µg/L	J	Detect <PQL

No Sample Data Qualified in the following SDGs

May 2016 Surface Water Monitoring
Dissolved Chromium - 440-147074-2, 440-147639-2

Attachment B

Wet Chemistry Data Validation

Hexavalent Chromium by EPA Method 218.7
Chloride and Bromide by EPA Method 300.0
Chlorate by EPA Method 300.1B
Perchlorate by EPA Method 314.0
Total Dissolved Solids by Standard Method 2540C

I. 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.

II. Instrument Calibration

Initial and continuing calibrations were performed as required by the analytical method. All results were within QC limits and compliance requirements were met. The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were within QC limits.

III. ICP Interference Check Sample (ICS) Analysis

ICS analysis is not applicable for these methods.

IV. Laboratory Blanks

Laboratory instrument blanks, calibration blanks and method blanks were analyzed at the proper frequency as required by the method. No contaminants were found in the laboratory blanks.

V. Field Blanks

Samples LWC6.1-20160516-EB and LW6.7-20160517-EB were identified as equipment blanks. No contaminants were found in the equipment blanks.

Samples LW3.1-20160516-FB and LW6.7-20160517-FB were identified as field blanks. No contaminants were found in the field blanks.

VI. Surrogates

Surrogates were added to all samples analyzed for chlorate by EPA Method 300.1B. All surrogate recoveries (%R) were within QC limits and no results were qualified.

VII. 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.
MS/MSD recovery limits do not apply when the sample concentration is ≥ 4x the spike added. In such an event, the data was reported unflagged (*USEPA National Functional Guidelines)*. In addition, batch or non-project MS/MSD data were not evaluated.

VIII. 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.

IX. 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.

X. Field Duplicates

Samples LWC3.4-20160510-FD, KM71-20160516-FD, and LWC6.3-1-20160517-FD were identified as field duplicates. Acceptable field and analytical precision was demonstrated for all field duplicate pairs with the exception listed in the following table. When the sample or field duplicate concentration is <RL, the RL is used for calculation purposes.

SDG	Analyte	LWC3.4-20160510	FD	RPD	RPD Limit	Flags	A or P
440-147074	Chloride	300 mg/L	300 mg/L	0	<30%		
	Bromide	1.4 mg/L	0.97 mg/L	36%	<30%	**J**	A
	Chlorate	210 µg/L	220 µg/L	5%	<30%		
	Perchlorate	52 µg/L	56 µg/L	7%	<30%		
	TDS	1500 mg/L	1600 mg/L	6%	<30%		
16-3418	Hexavalent Chromium	ND <0.09 µg/L	ND <0.09 µg/L	NC	<30%		

SDG	Analyte	KM71-20160516	FD	RPD	RPD Limit	Flags	A or P
440-147639	Chloride	230 mg/L	230 mg/L	0	<30%		
	Bromide	1.3 mg/L	1.6 mg/L	21%	<30%		
	Chlorate	14 µg/L	14 µg/L	0	<30%		
	Perchlorate	1.4 µg/L	1.7 µg/L	19%	<30%		
	TDS	1400 mg/L	1400 mg/L	0	<30%		
16-3557	Hexavalent Chromium	ND <0.09 µg/L	ND <0.09 µg/L	NC	<30%		

SDG	Analyte	LWC6.3-1-20160517	FD	RPD	RPD Limit	Flags	A or P
440-147788	Chloride	1600 mg/L	1700 mg/L	6%	<30%		
	Bromide	3.3 mg/L	ND <5 mg/L	NC	<30%		
	Chlorate	ND <40 µg/L	ND <40 µg/L	NC	<30%		
	Perchlorate	ND <40 µg/L	ND <40 µg/L	NC	<30%		
	TDS	5000 mg/L	5100 mg/L	2%	<30%		
16-3595	Hexavalent Chromium	ND <0.09 µg/L	ND <0.09 µg/L	NC	<30%		

XI. Sample Result Verification

All sample result verifications were acceptable for samples which underwent Stage 4 validation. Raw data were not reviewed for Stage 2B validation.

XII. Overall Assessment of Data

All samples were analyzed as requested and all holding times were met. Due to field duplicate imprecision, the results for bromide for one field duplicate pair 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.

May 2016 Surface Water Monitoring
Wet Chemistry – 16-3418, 16-3463, 16-3489, 16-3527, 16-3595, 16-3632, 440-147074-1, 440-147311-1, 440-147428-1, 440-147491-1, 440-147639-1, 440-147788-1, and 440-147944-1

SDG	Client Sample ID	Analyte	Lab Result	Lab Qualifier	Units	Validator Qualifier	Reason Code Definition
440-147074	LWC3.4-20160510	Bromide	1.4		mg/L	J	Field duplicate imprecision RPD>30
440-147074	LWC3.4-20160510-FD	Bromide	0.97		mg/L	J	Field duplicate imprecision RPD>30
440-147311	LW4.1-20160511	Bromide	0.38	J	mg/L	J	Detected <PQL
440-147311	LWC4.1-20160511	Bromide	0.36	J	mg/L	J	Detected <PQL
440-147639	KM-71-20160516	Chlorate	14	J	µg/L	J	Detected <PQL
440-147639	KM-71-20160516	Perchlorate	1.4	J	µg/L	J	Detected <PQL
440-147639	KM-71-20160516-FD	Chlorate	14	J	µg/L	J	Detected <PQL
440-147639	KM-71-20160516-FD	Perchlorate	1.7	J	µg/L	J	Detected <PQL
440-147639	LWC6.1-20160516	Perchlorate	1.7	J	µg/L	J	Detected <PQL
440-147788	KM-S-20160517	Bromide	0.63	J	mg/L	J	Detected <PQL
440-147788	LW6.7-20160517	Bromide	0.41	J	mg/L	J	Detected <PQL
440-147788	LWC6.3_1-20160517	Bromide	3.3	J	mg/L	J	Detected <PQL
440-147944	LW6.85-20160518	Perchlorate	1.0	J	µg/L	J	Detected <PQL

No Sample Data Qualified in the following SDGs

May 2016 Surface Water Monitoring
Wet Chemistry – 16-3418, 16-3463, 16-3489, 16-3527, 16-3595, 16-3632, 440-147428-1, and 440-147491-1

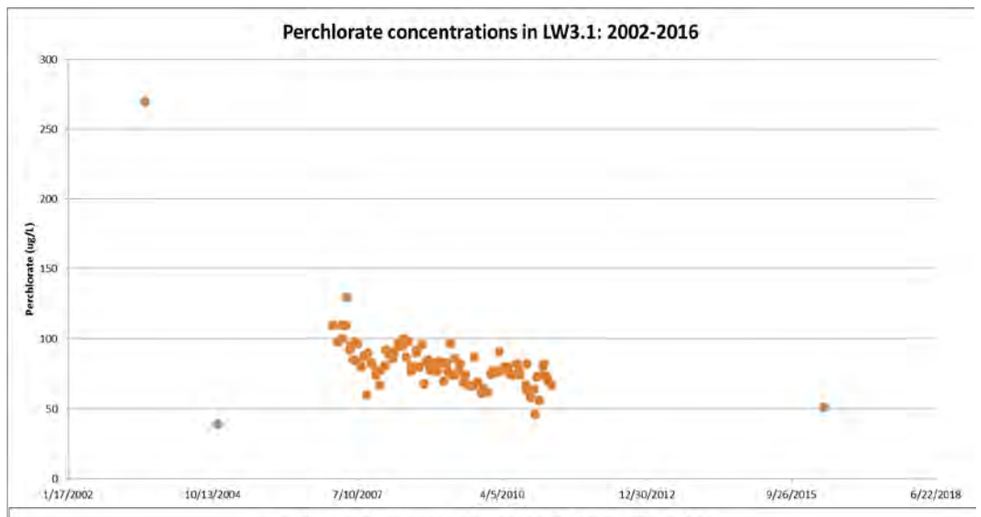
Appendix F

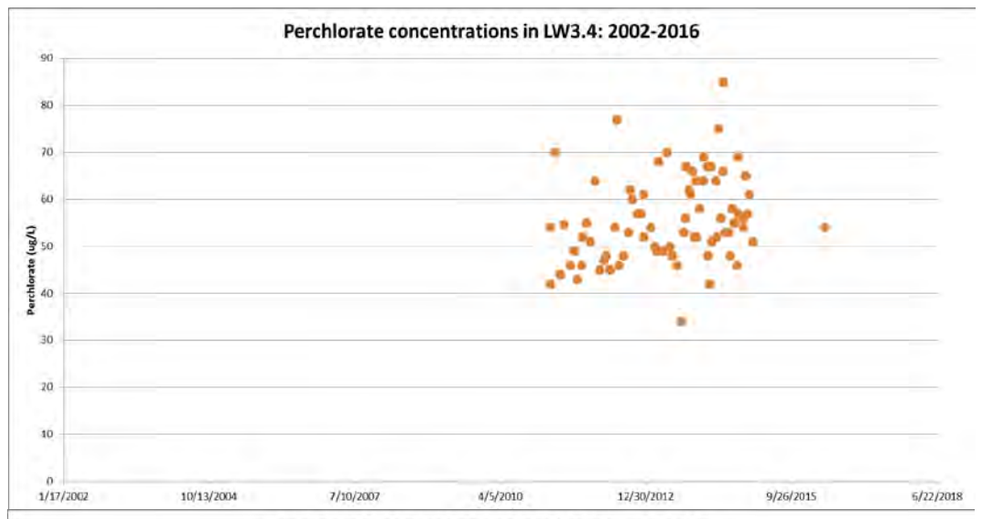
Concentrations of Key Constituents Over Time

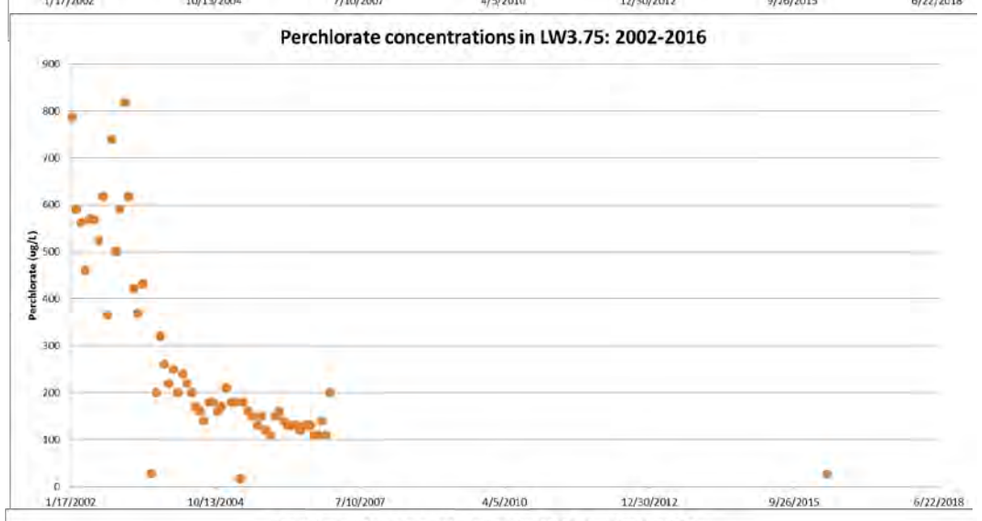
Appendix F - Concentrations of Key Constituents Over Time

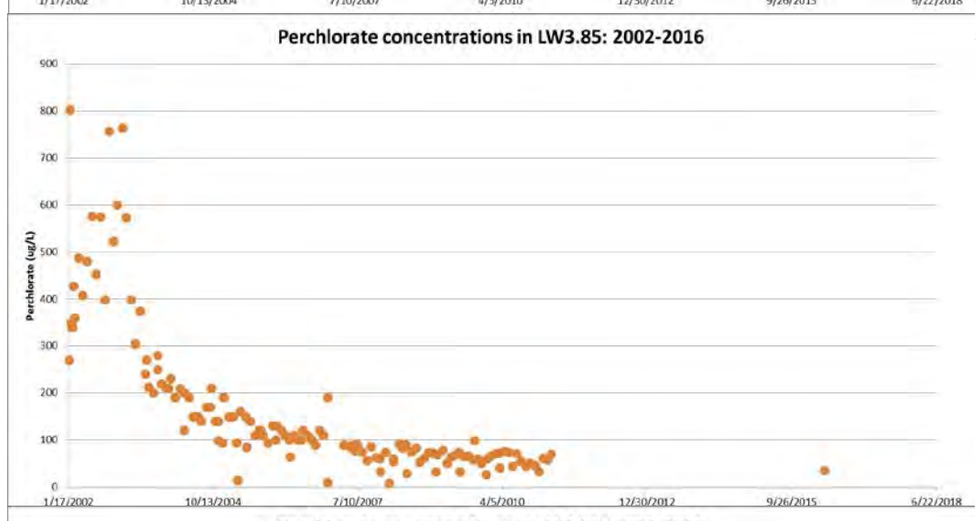
NERT Remedial Investigation - Downgradient Study Area

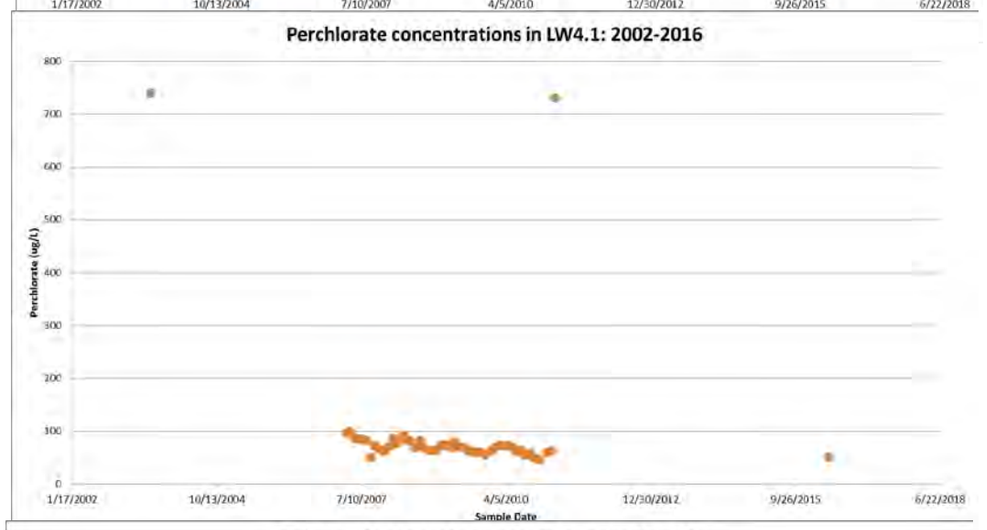
F1. PERCHLORATE

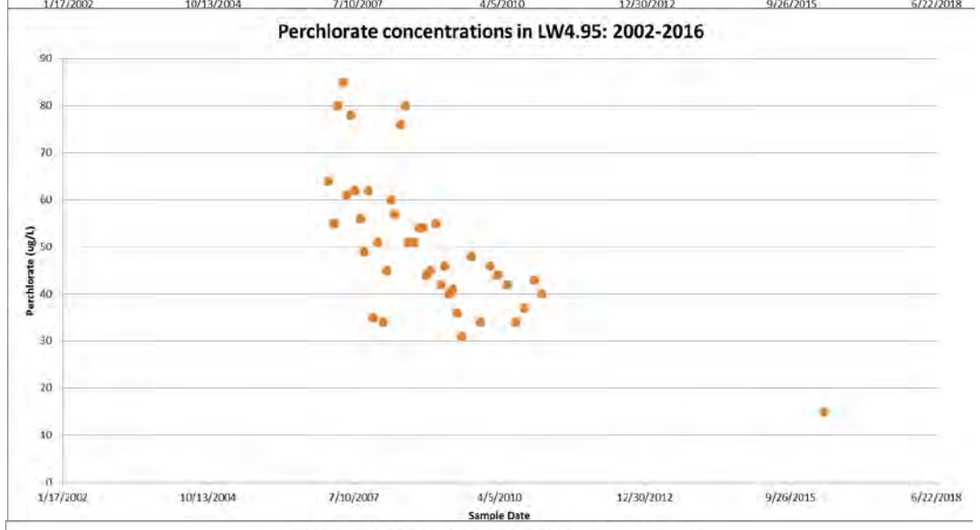


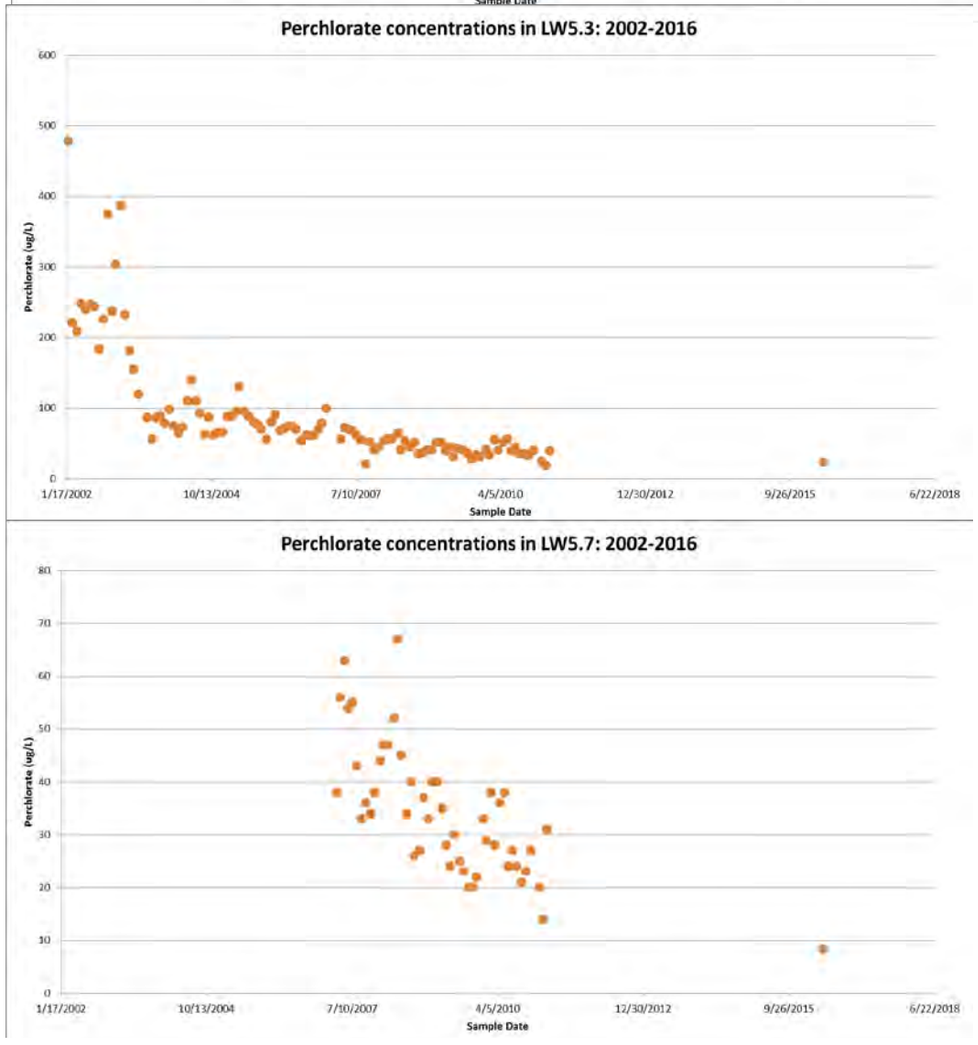


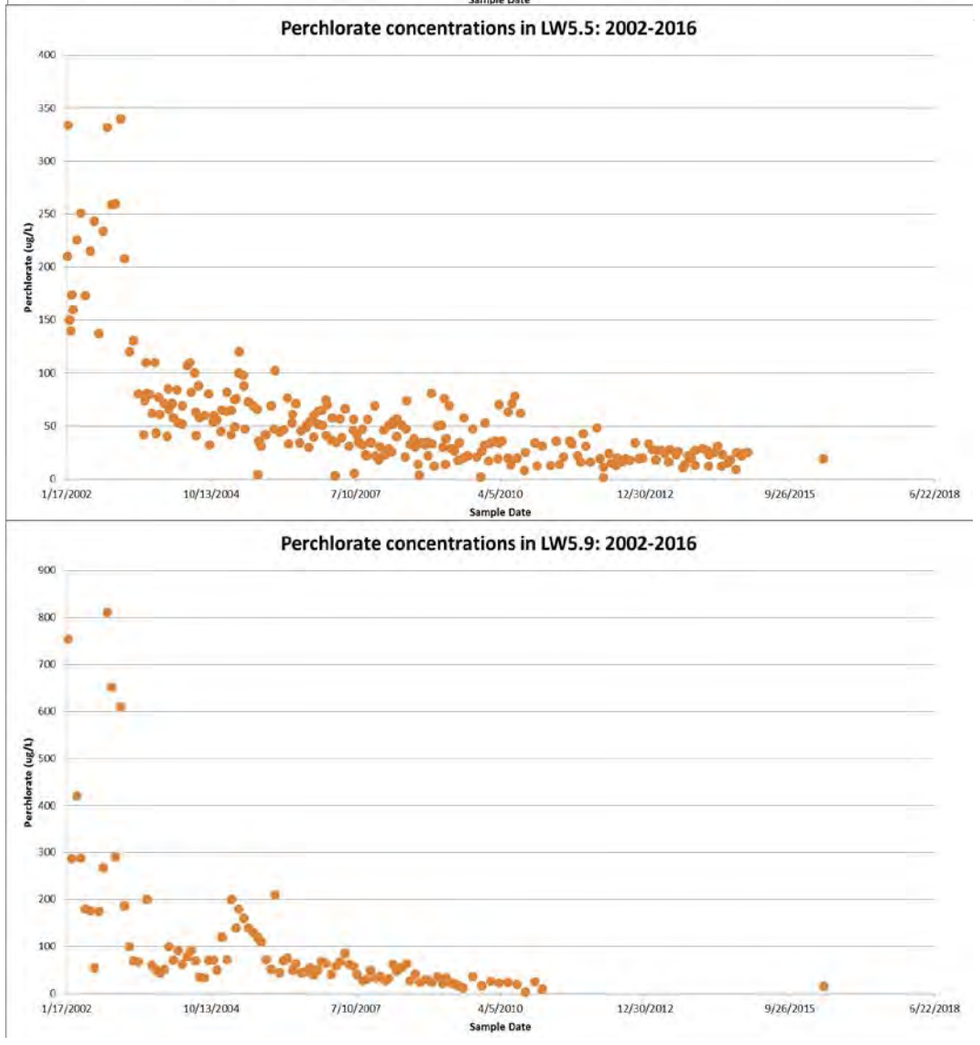






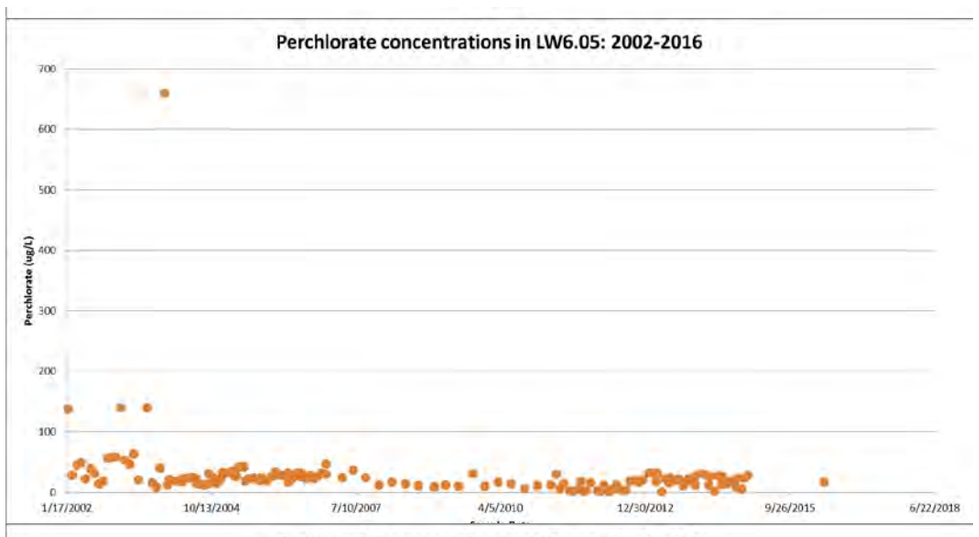


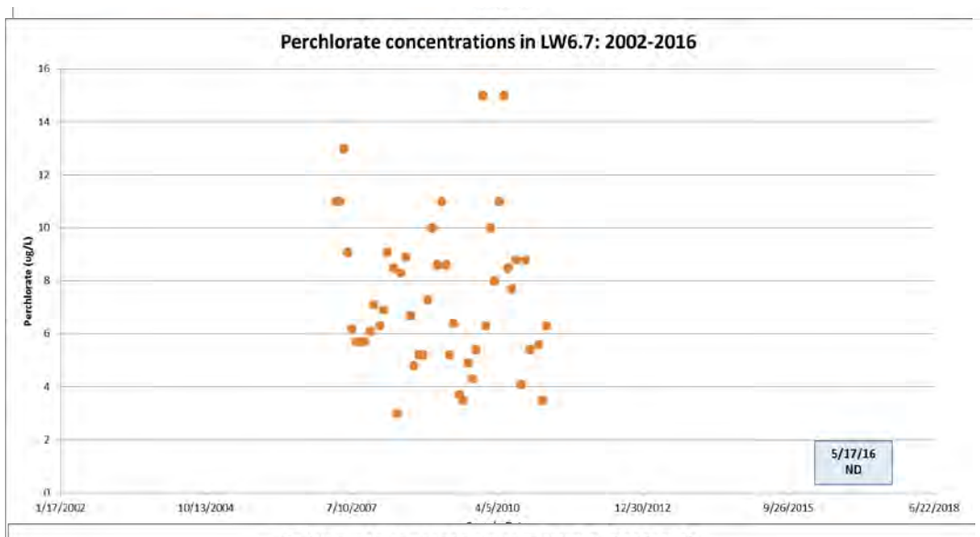


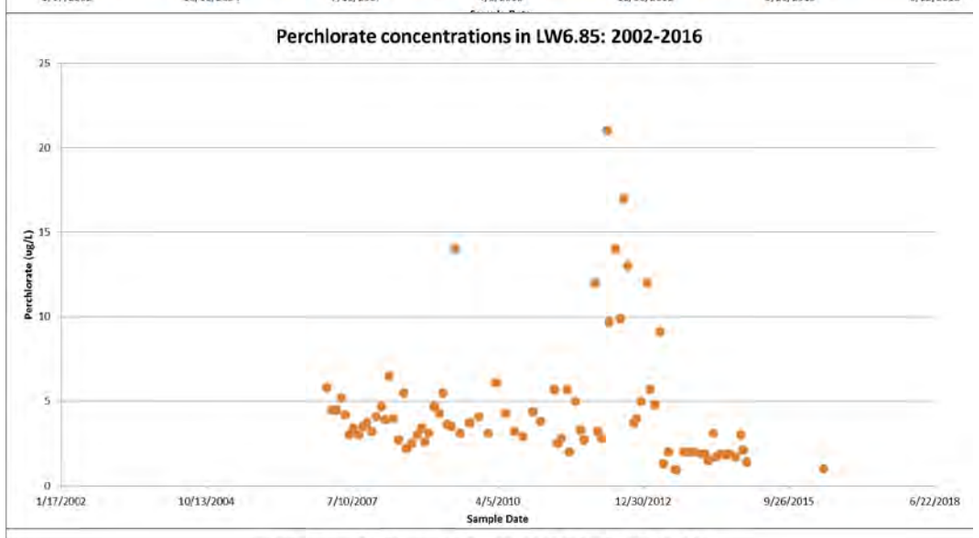


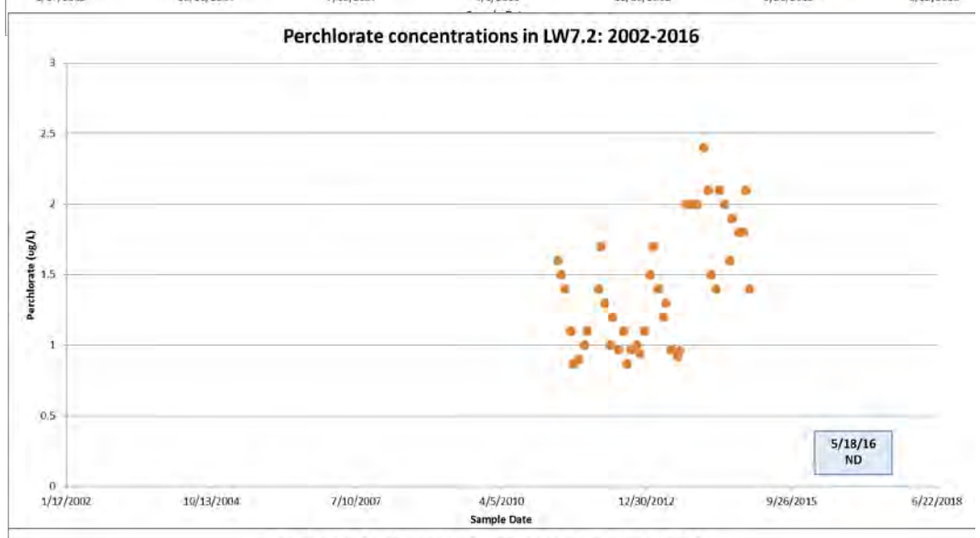
Appendix F - Concentrations of Key Constituents Over Time

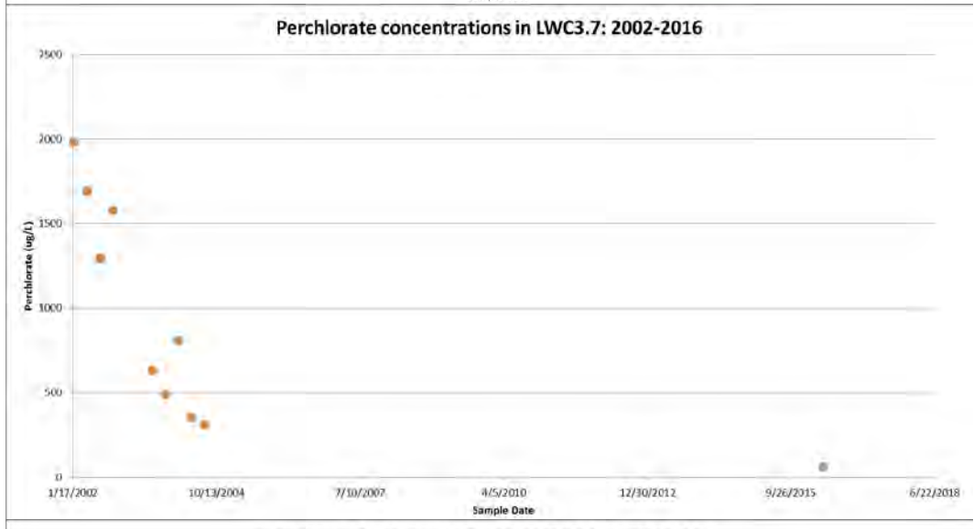
NERT Remedial Investigation - Downgradient Study Area

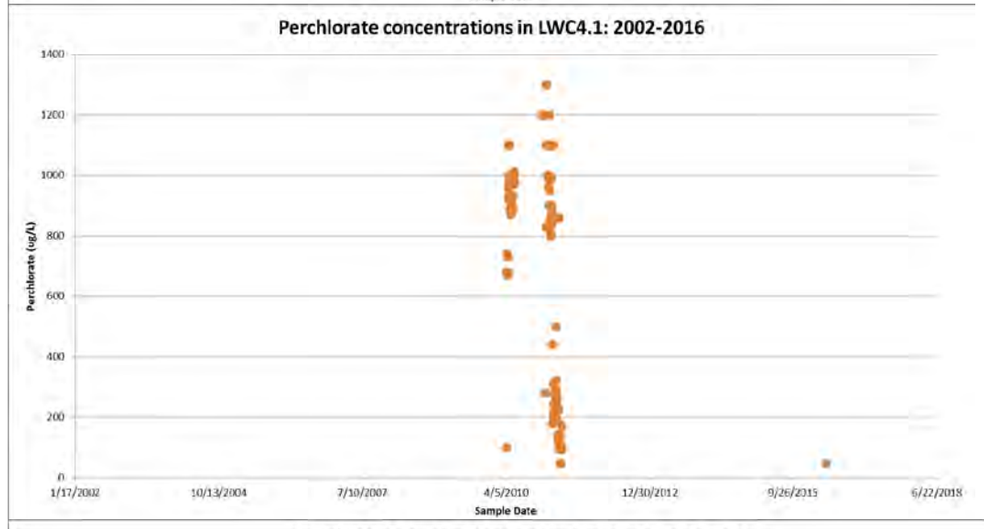


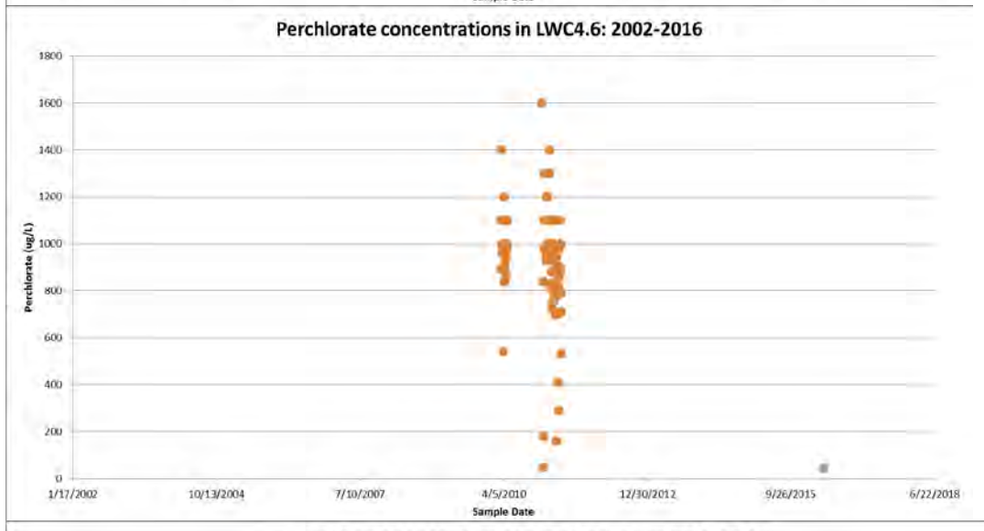


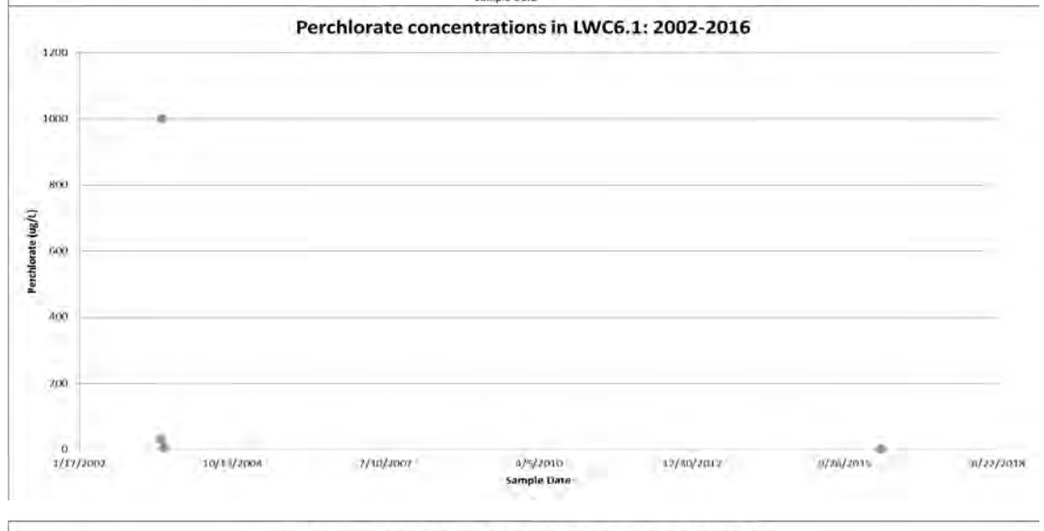


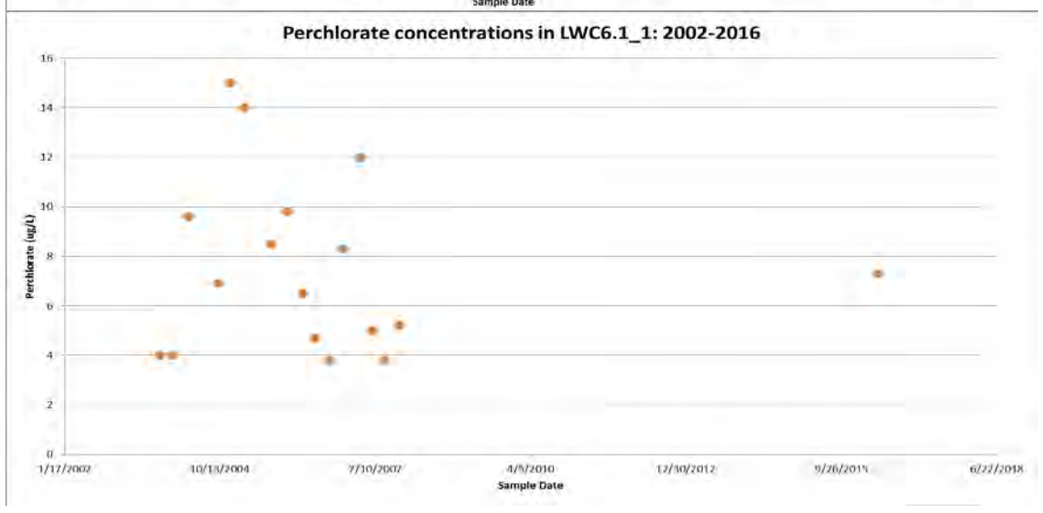


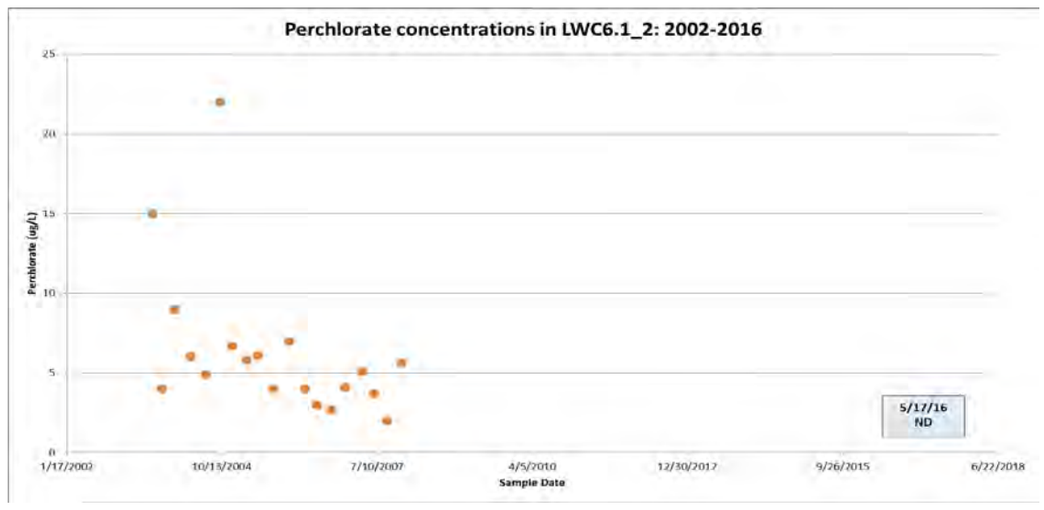






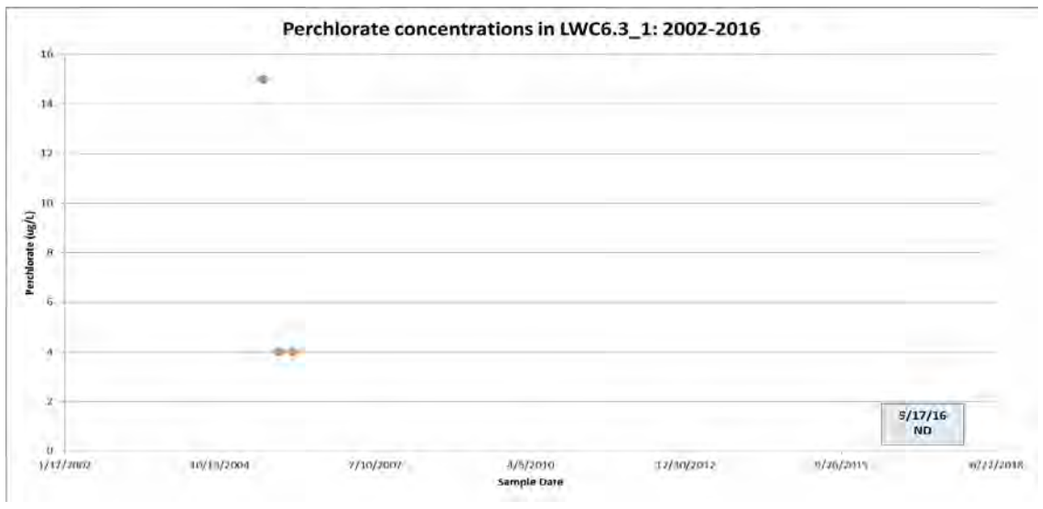


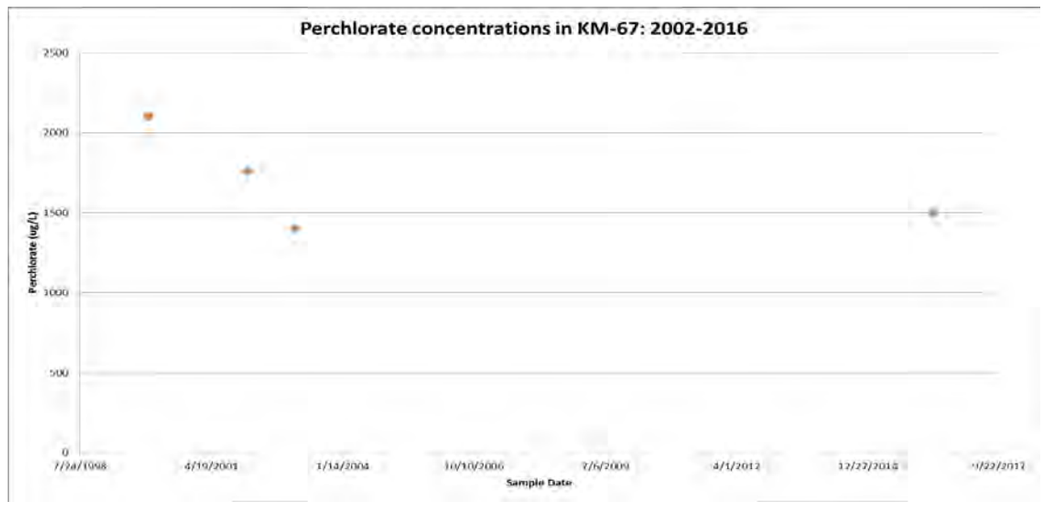


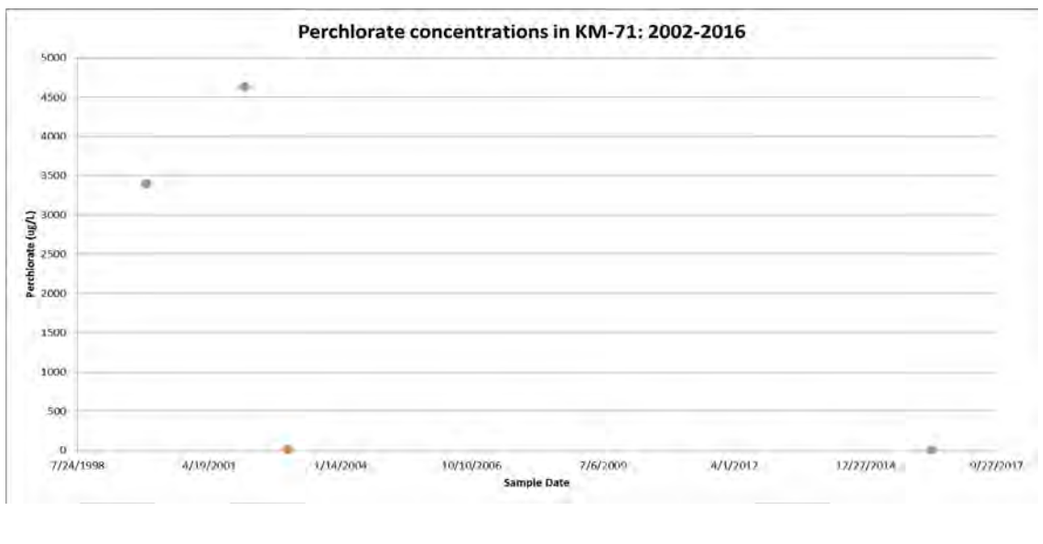


Appendix F - Concentrations of Key Constituents Over Time

NERT Remedial Investigation - Downgradient Study Area



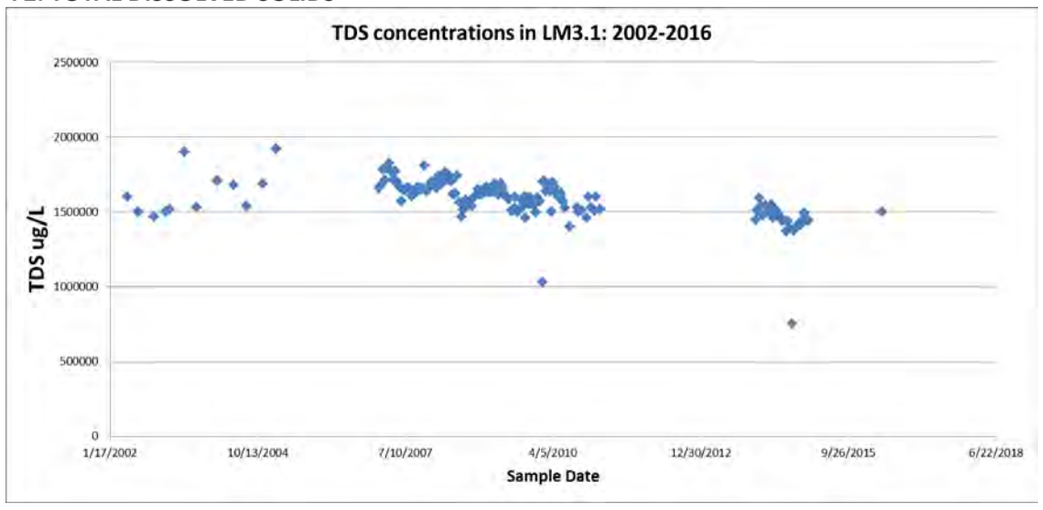


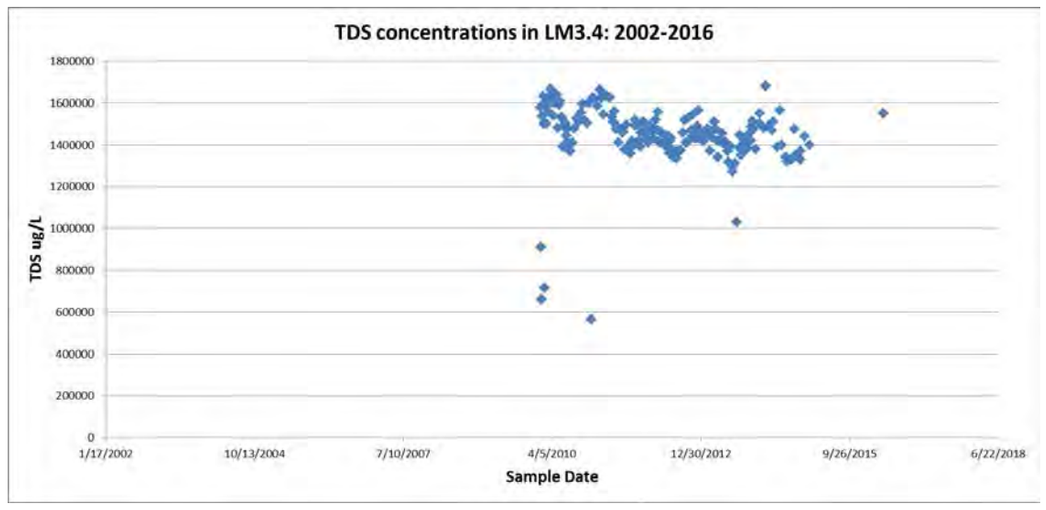


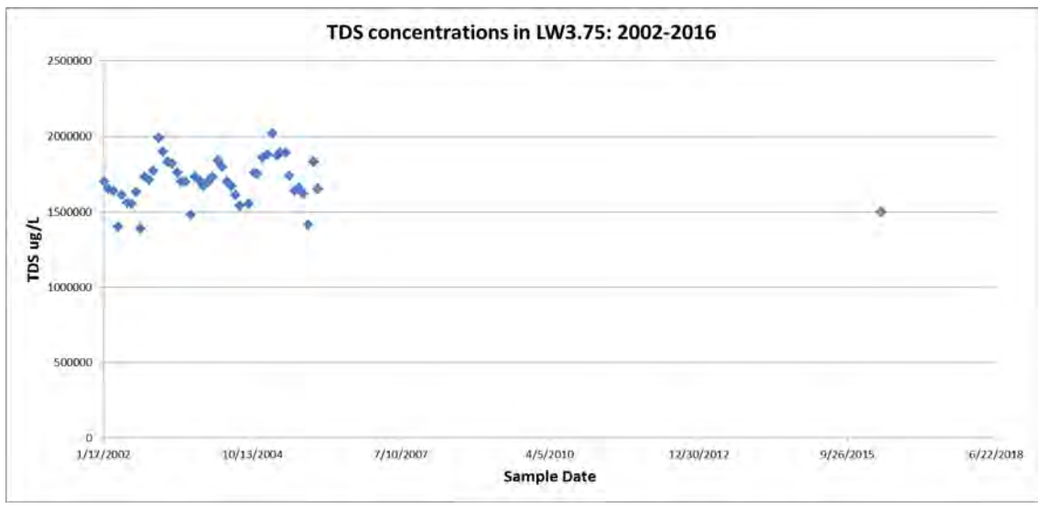
Appendix F - Concentrations of Key Constituents Over Time

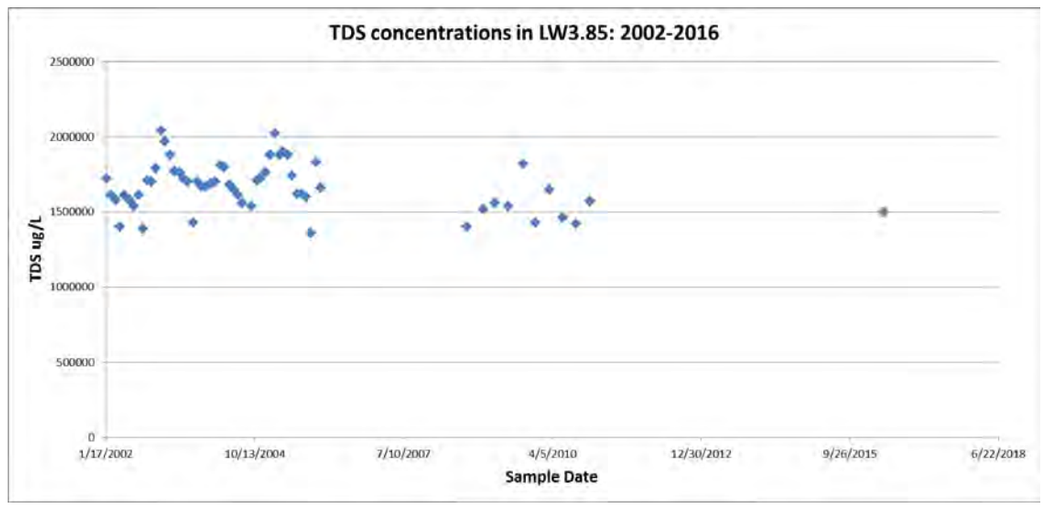
NERT Remedial Investigation - Downgradient Study Area

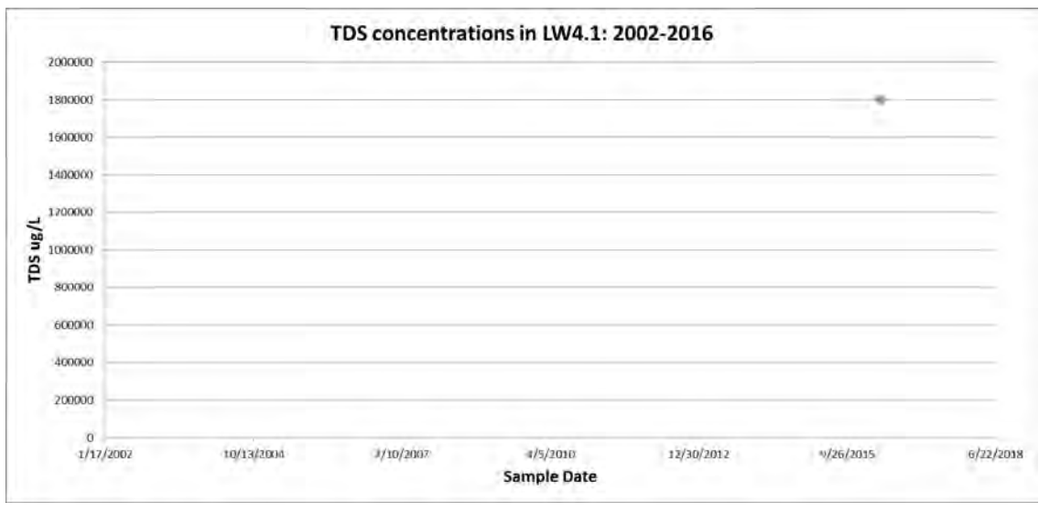
F2. TOTAL DISSOLVED SOLIDS

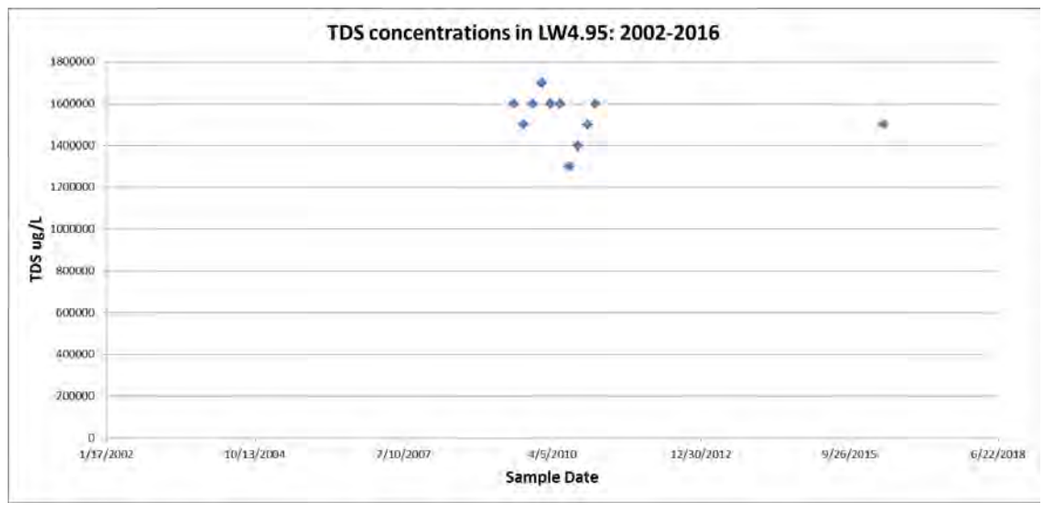


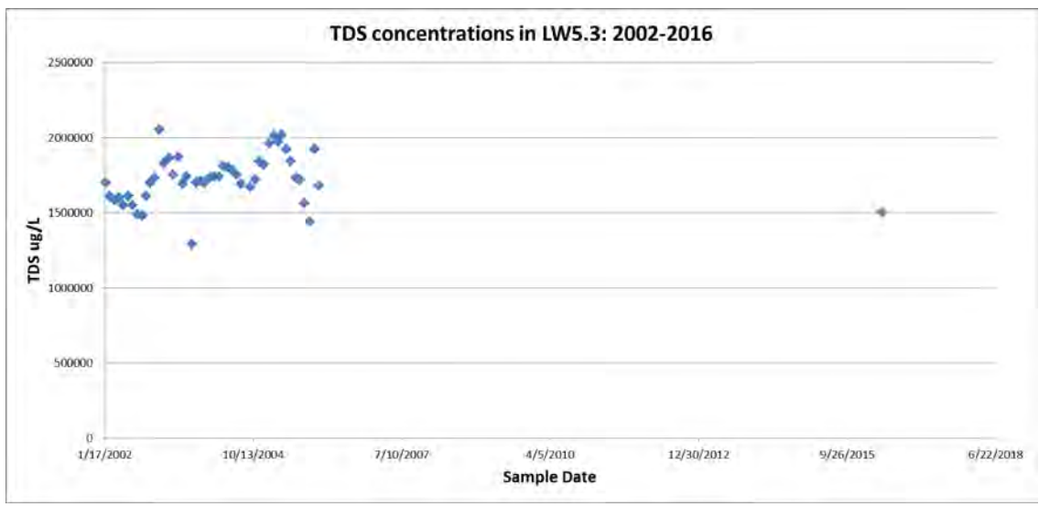


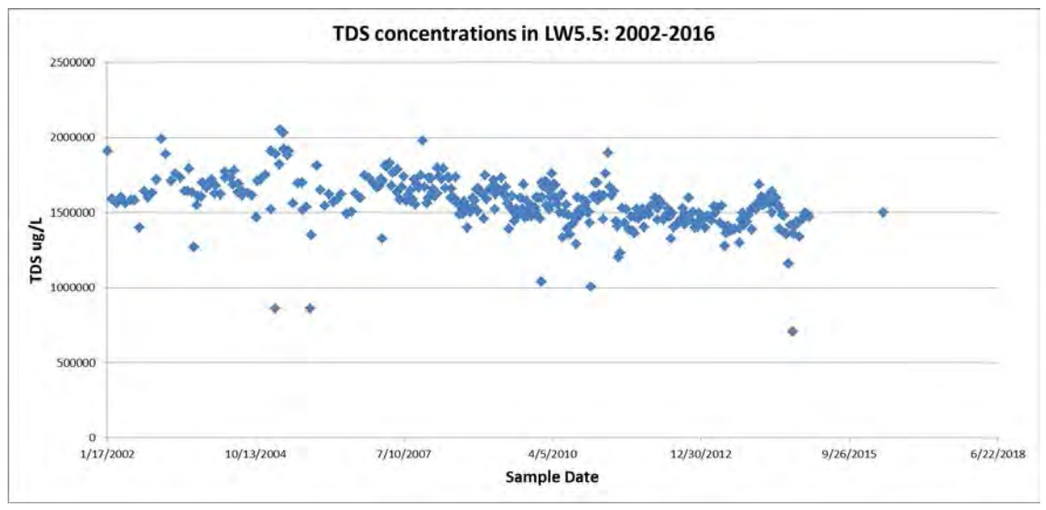


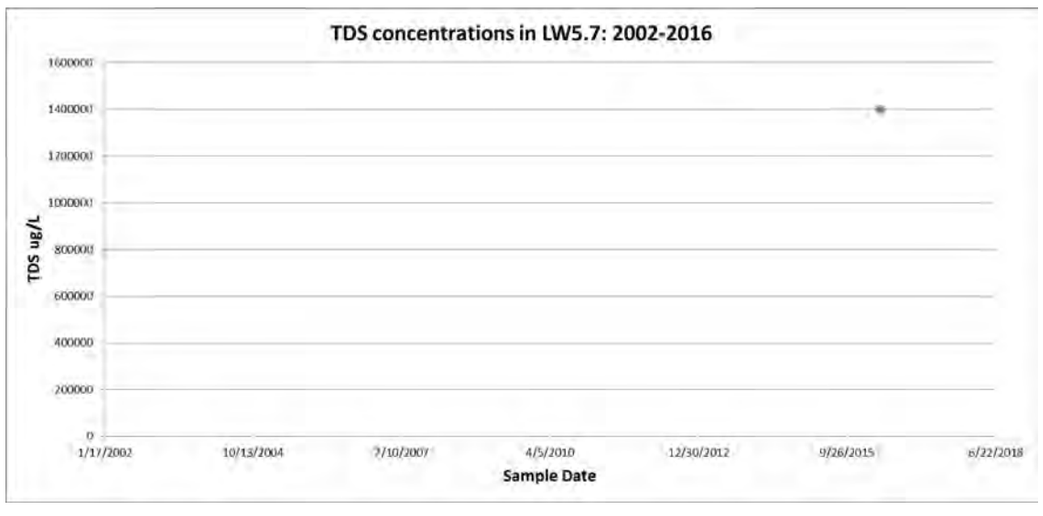


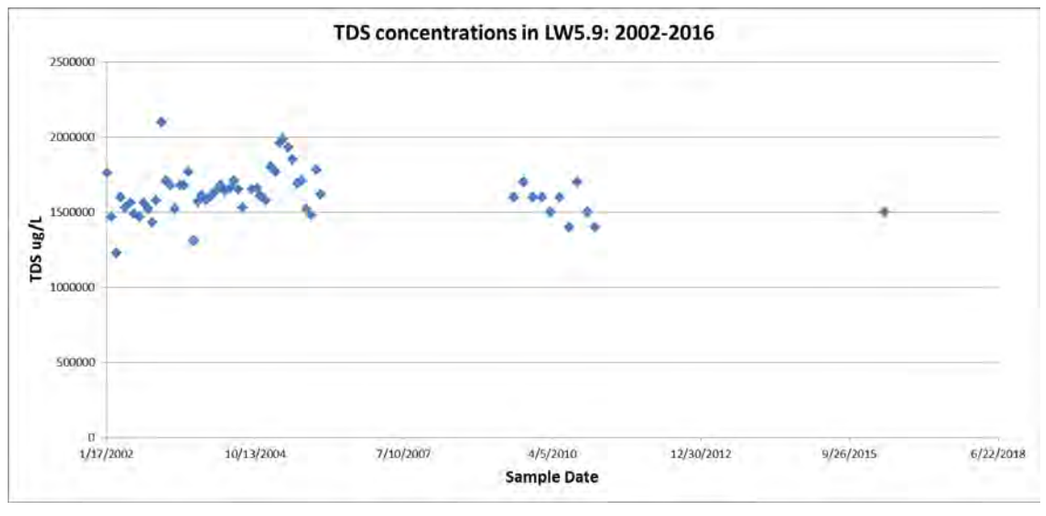






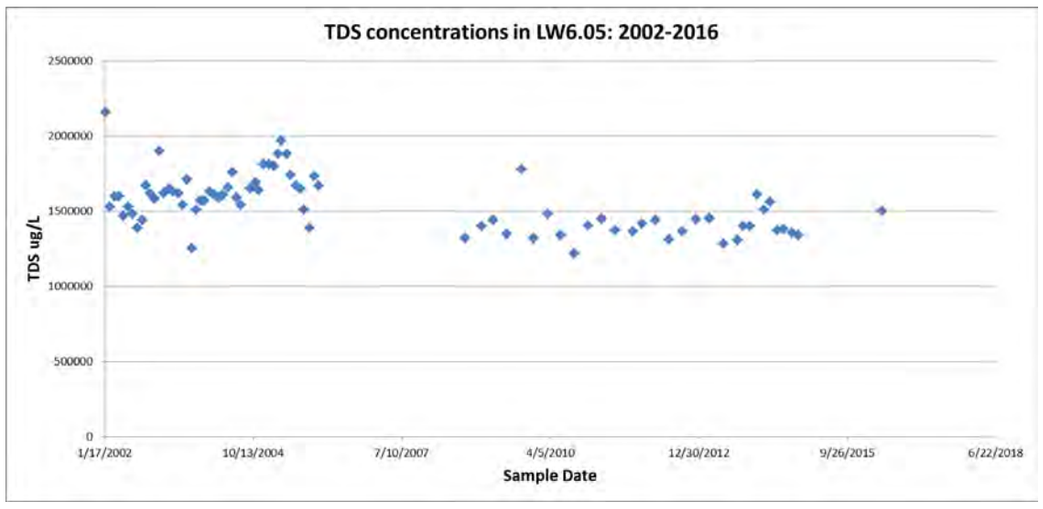


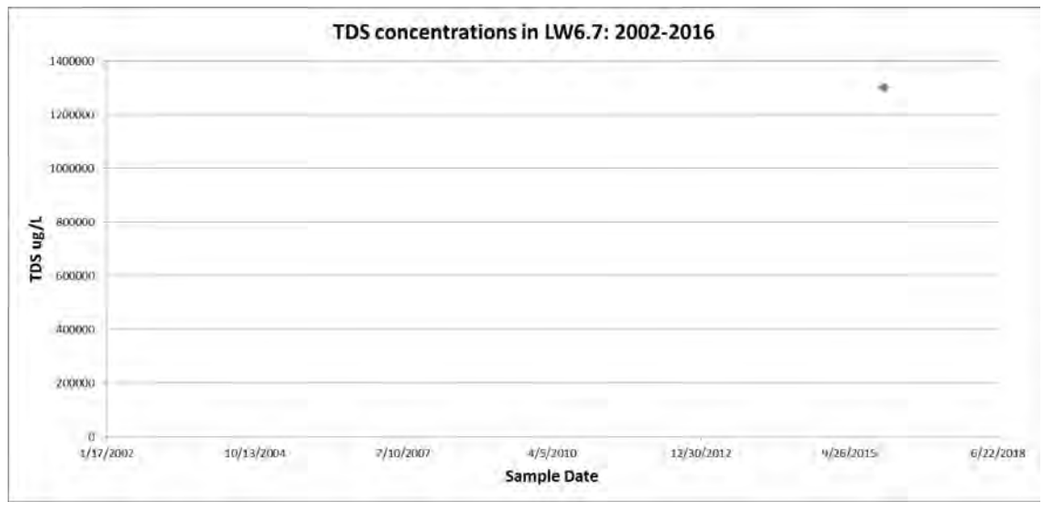


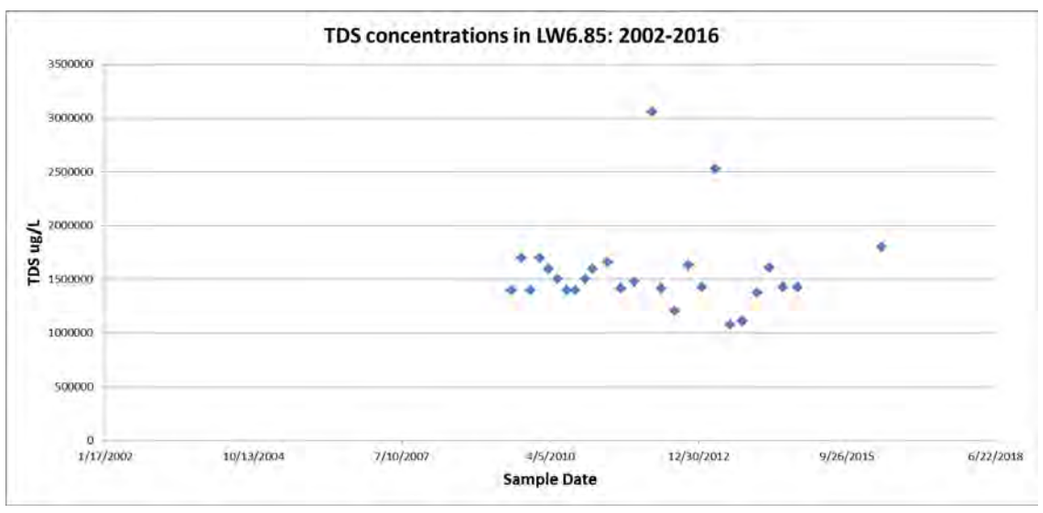


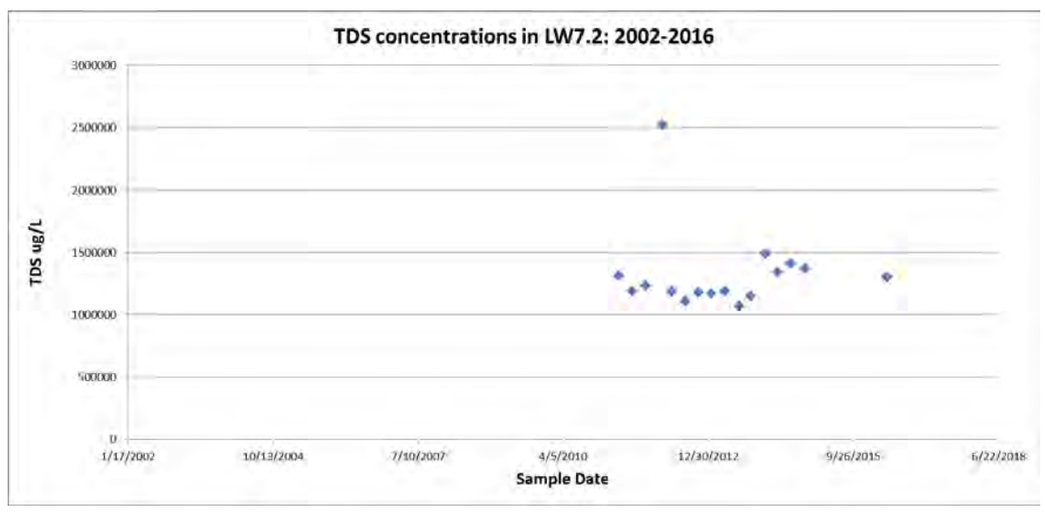
Appendix F - Concentrations of Key Constituents Over Time

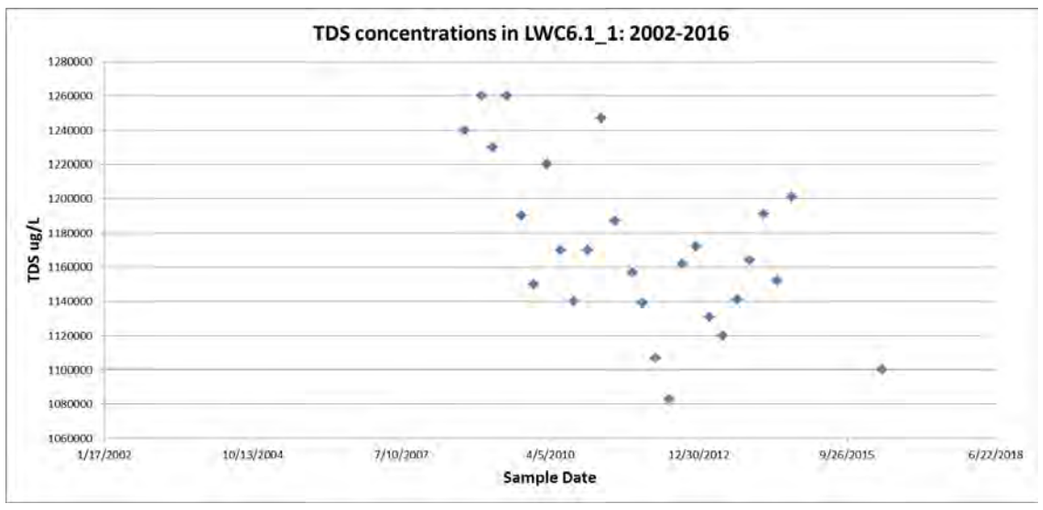
NERT Remedial Investigation - Downgradient Study Area

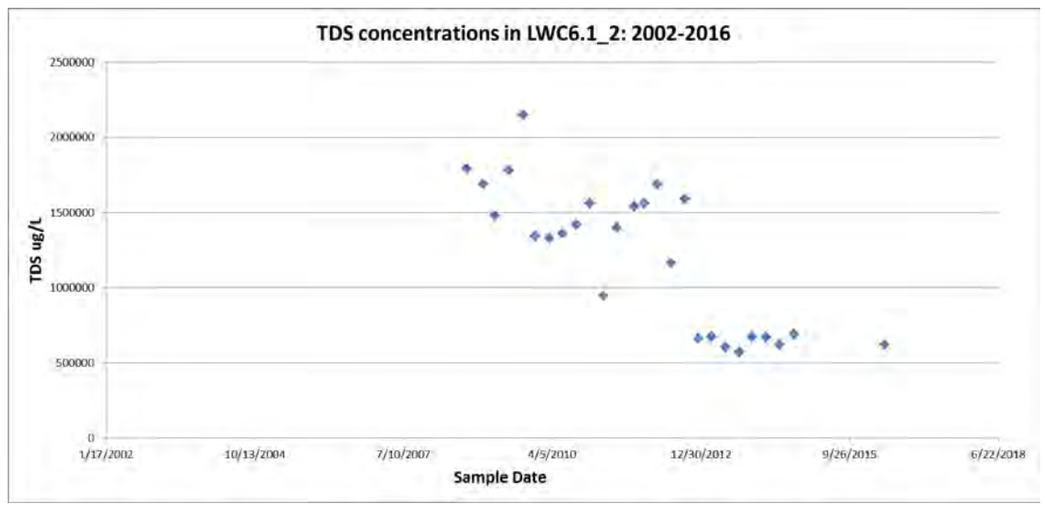


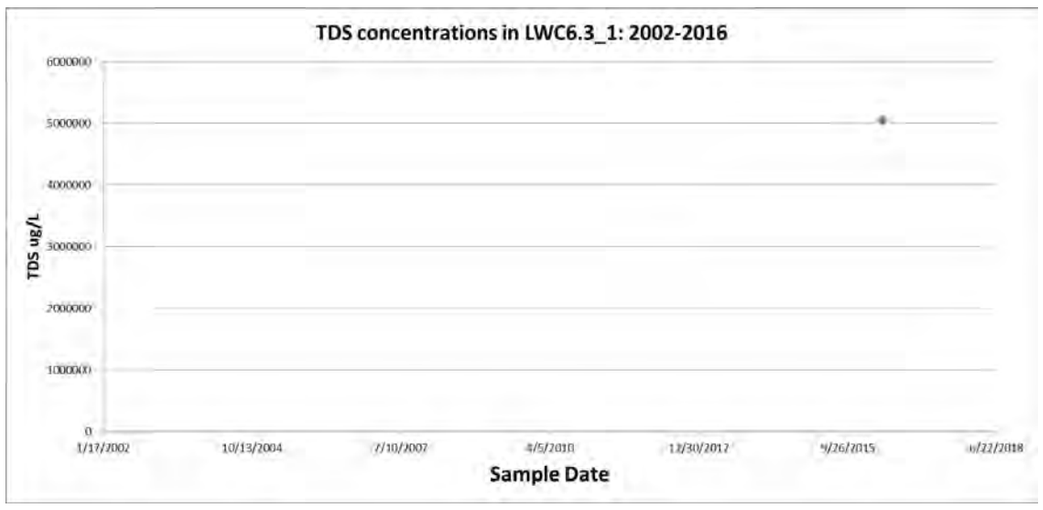








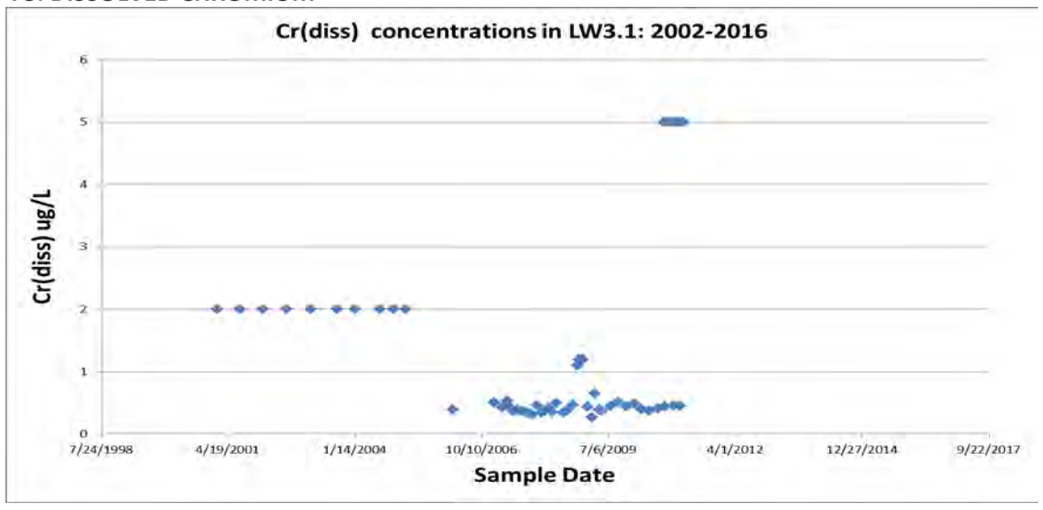


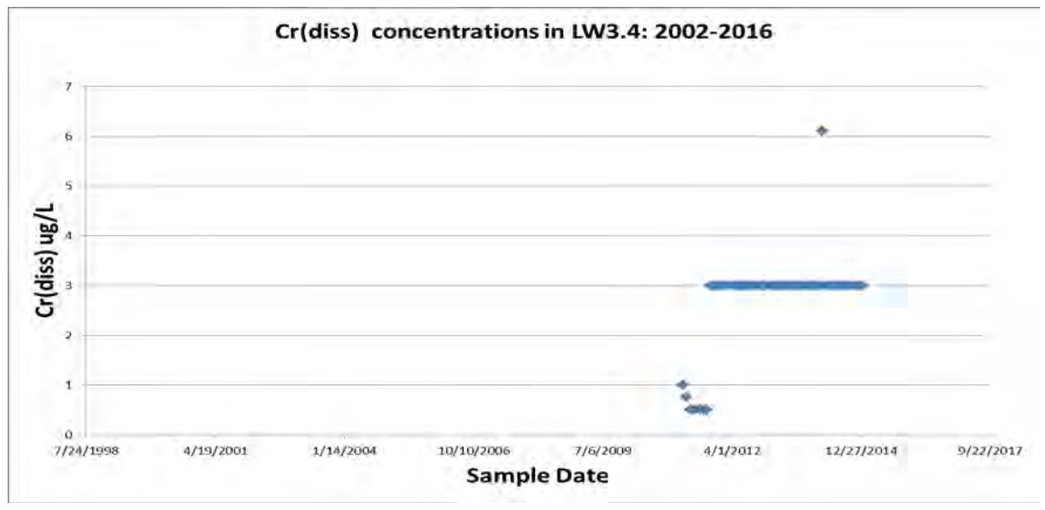


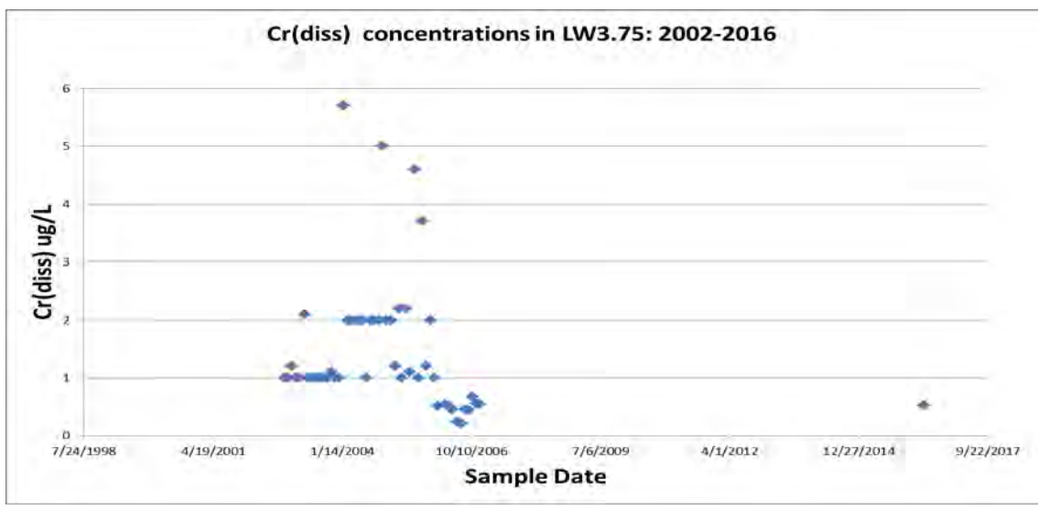
Appendix F - Concentrations of Key Constituents Over Time

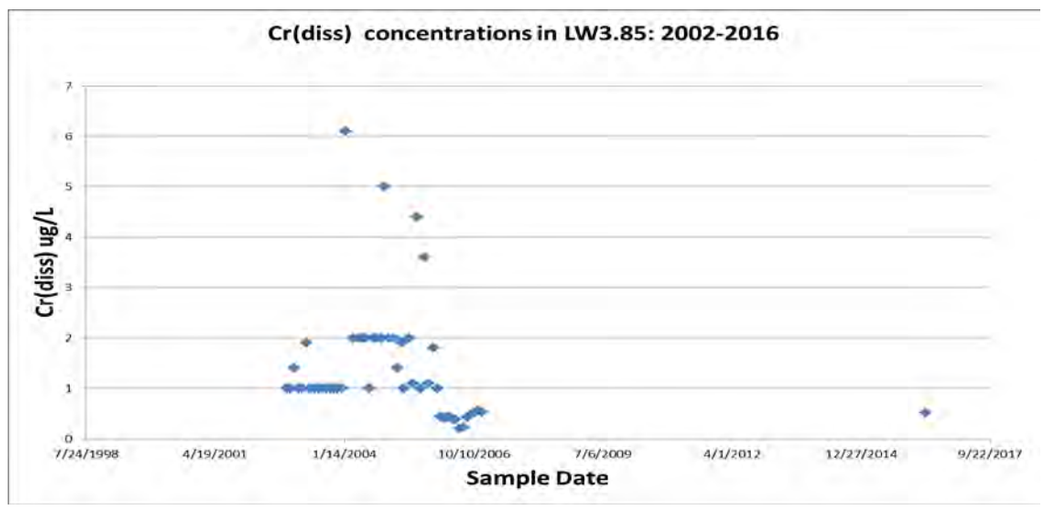
NERT Remedial Investigation - Downgradient Study Area

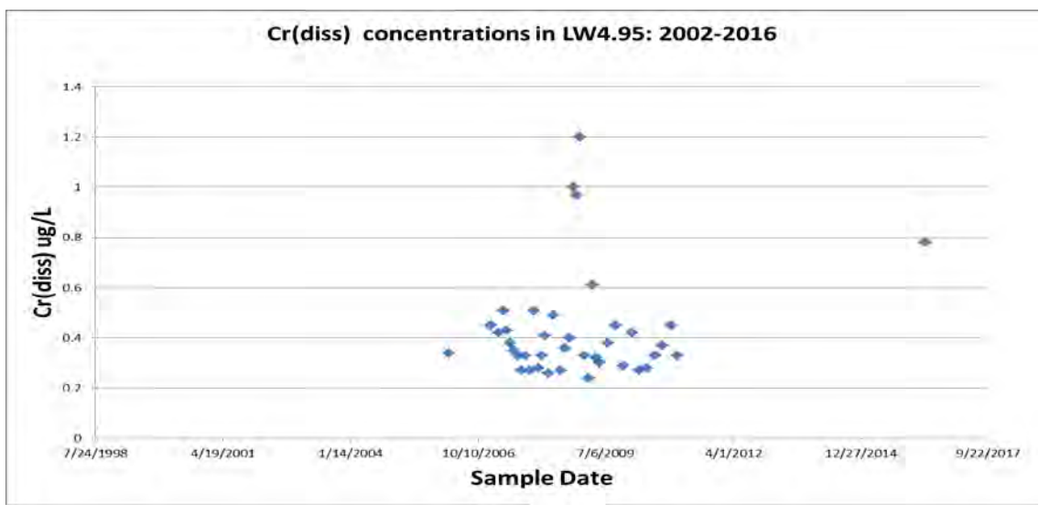
F3. DISSOLVED CHROMIUM

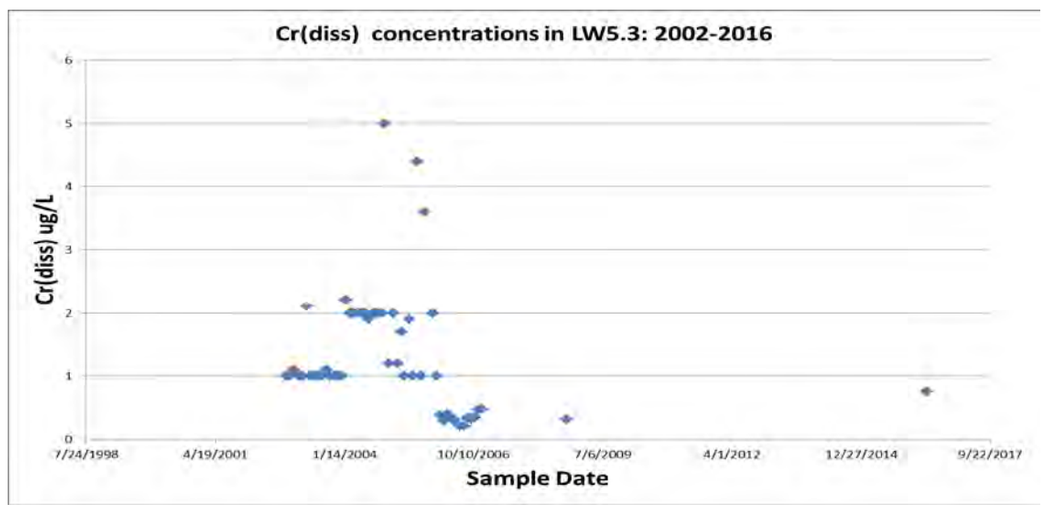


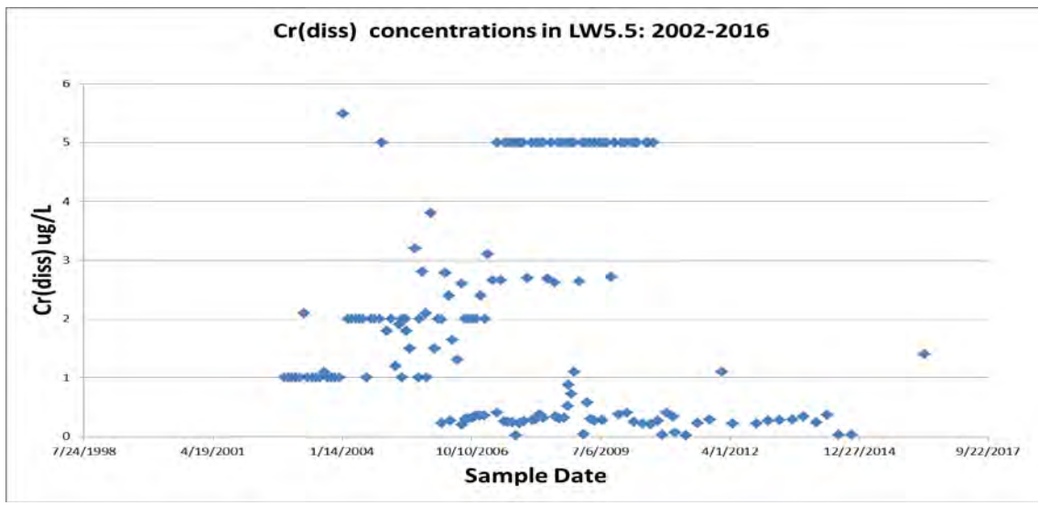


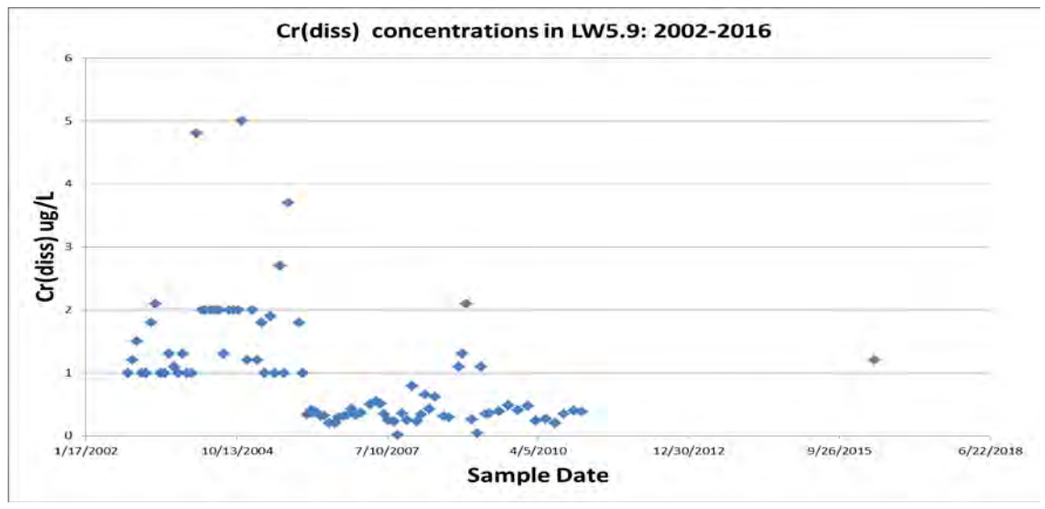


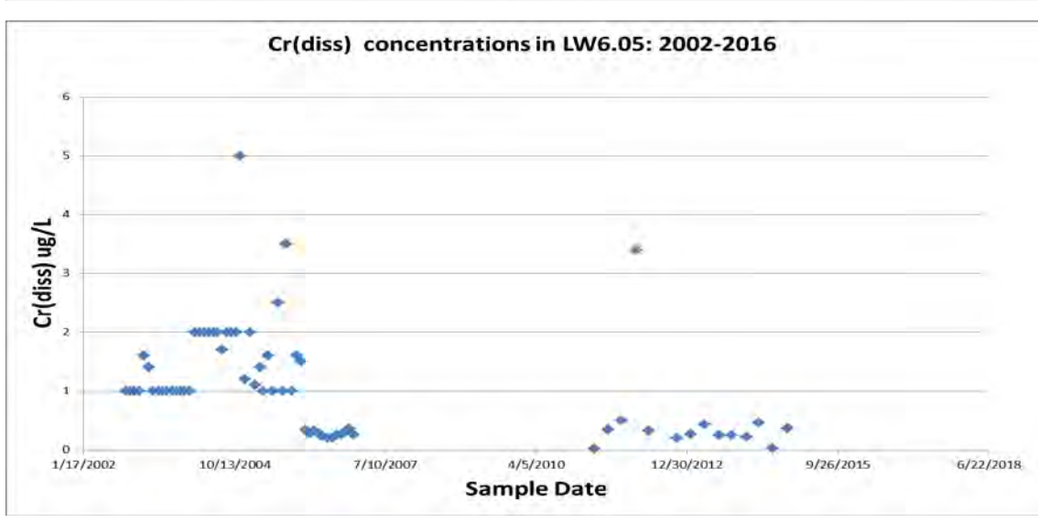


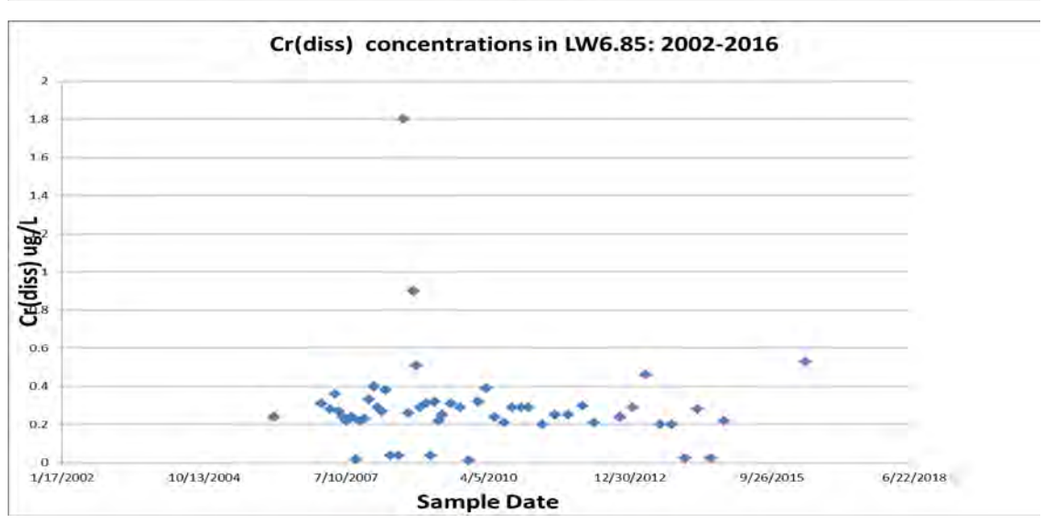






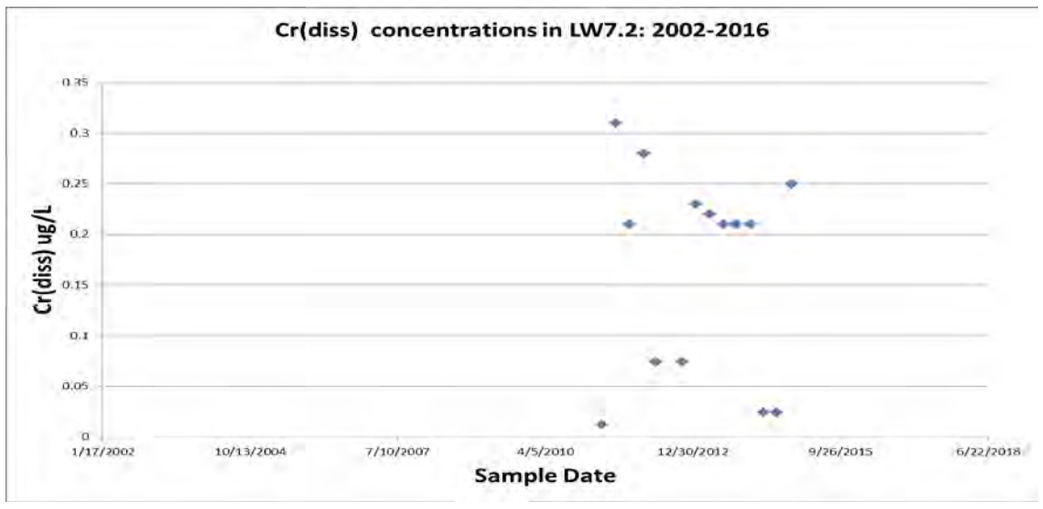


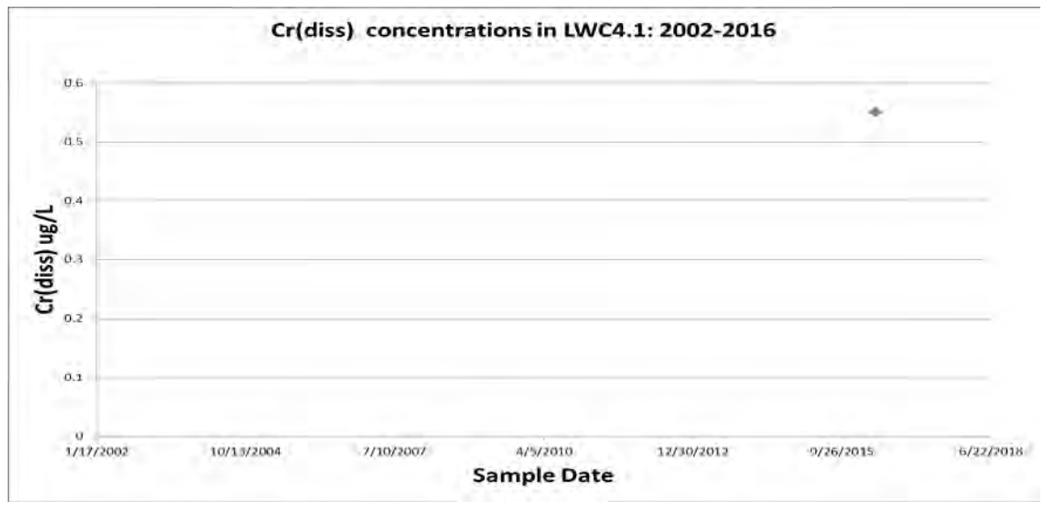


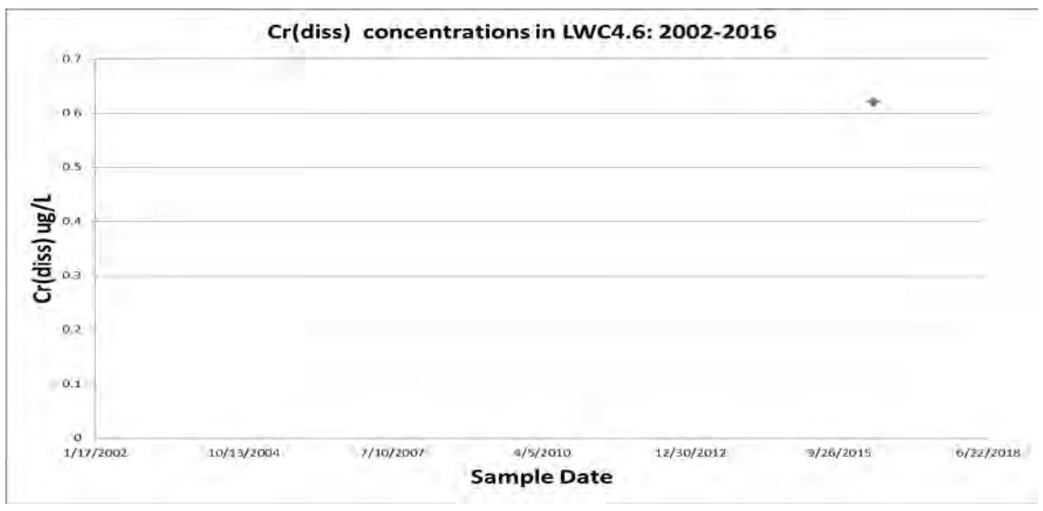


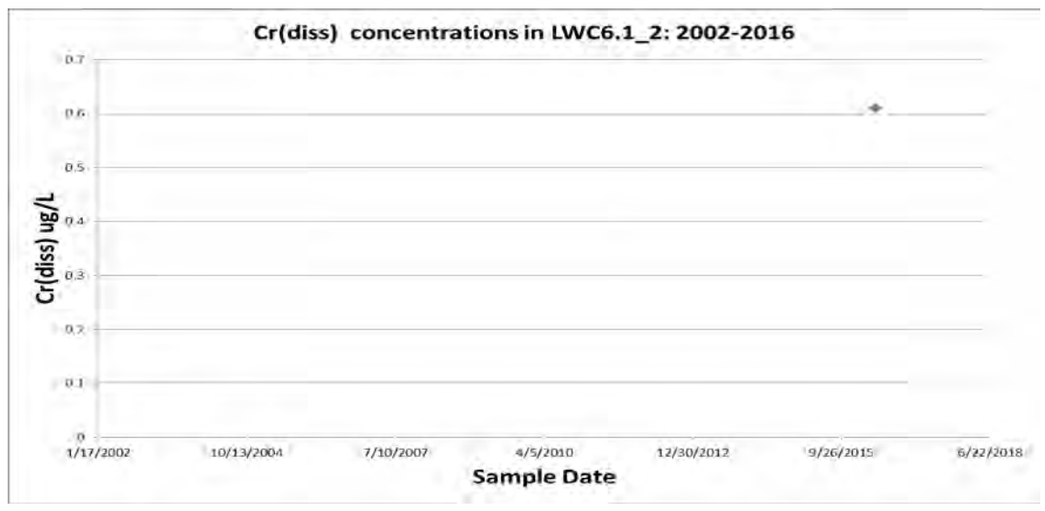
Appendix F - Concentrations of Key Constituents Over Time

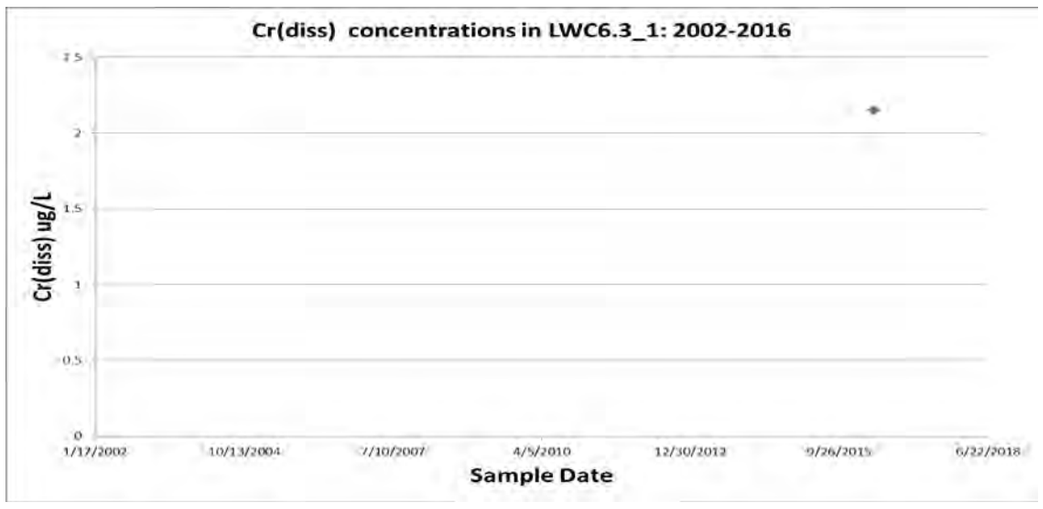
NERT Remedial Investigation - Downgradient Study Area











F4. HEXAVALENT CHROMIUM