MONITORING PLAN
FOR THE
BURRO CANYON OB/OD FACILITY
AT THE
NAVAL AIR WEAPONS STATION
CHINA LAKE, CA

MARCH 2017
FINAL

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1.0 INTRODUCTION

The Naval Air Weapons Station China Lake currently operates an Open Burn/Open Detonation (OB/OD) Facility for treatment of energetic hazardous wastes (EHW) generated from its Research, Development, Test and Evaluation mission. The OB/OD facility operates under a hazardous waste facility permit (#01-NC-06) issued from the Department of Toxic Substances Control (DTSC) on August 4, 2008 to comply with Title 22, CA Code of Regulations, Section 66264.600 (Miscellaneous Units). As part of the permit requirements for the facility's operations, a Unit Specific Special Condition states that the permittee shall implement DTSC-approved environmental monitoring programs. Compliance with that permit requirement includes preparation of this Monitoring Plan.

1.1 Location and History

NAWS China Lake is located in the upper Mojave Desert of California, 150 miles northeast of Los Angeles (Figure 1.0). The base consists of more than 1 million acres with restricted airspace several times that size extending over the surrounding area. Most of the land near NAWS China Lake is federally owned and managed by the Bureau of Land Management (BLM). The surrounding area is largely undeveloped and managed by the BLM for multiple uses, primarily recreation. Land uses include residential, agricultural holdings, and commercial enterprises in Ridgecrest, Inyokern, and Pearsonville. The facility lies within Inyo, San Bernardino, and Kern counties, and consists of two major areas: the China Lake Complex (North Range), and the Randsburg Wash Area (South Range) (Figure 2.0). The North Range contains most of the range and test facilities, in addition to the China Lake community.

The Burro Canyon OB/OD Treatment Facility (BCTF) is located on the China Lake North Range (Figure 3.0). It consists of approximately 15 acres of disturbed land in mountainous terrain. Open detonation (OD) is the preferred method of treatment and is conducted directly on the ground surface (i.e. waste is not buried). OBs are conducted in an elevated burn pan. The last OB event was conducted in August 1998. The facility has been in operation for over 40 years. Activities at the facility have only been monitored since implementation of environmental constraints via the RCRA regulation. Prior to those constraints, open burn activities were conducted directly on the ground.

1.2 Physiographic and Geologic Conditions

Burro Canyon is located at the eastern edge of the Indian Wells Valley, which lies near the southwestern boundary of the Basin and Range and the Mojave Desert

physiographic provinces. The valley contains deposits of unconsolidated alluvium ranging from alluvial fan gravel and boulder deposits to lacustrine clays. The average depth of basin fill is 2,000 feet, with a maximum of 6,500 feet. Mesozoic plutonic and metamorphic rocks underlie the alluvial basin fill material. The Indian Wells Valley is bordered on the west by the southern end of the Sierra Nevada, on the east by the Argus Range, on the south by the El Paso Mountains and the Spangler Hills and to the north by the White Hills (Figure 4.0).

The Pleistocene depositional history of the Indian Wells Valley is dominated by the ancestral Owens River, which was periodically impounded in the valley. The present China Lake playa is the dry remnant of one of several large lakes that existed along the Owens River during wetter climatic periods. China Lake acted as a vast settling pond for the sediment-laden Owens River, forming alluvial-fluvial-deltaic sediments in the northern portions of the valley. These sediments consist principally of lenticular beds of unconsolidated clay, silt, sand, and gravel derived from the Sierra Nevada and the surrounding mountain ranges. Sedimentation during the Holocene has been relatively minor and sporadic compared to the rapid deposition that occurred during the Pleistocene. Holocene deposits range from a few feet thick in the area around the China Lake playa, to over 200 feet of alluvial fan deposits along the margins of the basin. Deposition during these two epochs formed four sets of basin fill: (1) alluvial fan, (2) fluvial-alluvial-deltaic, (3) lacustrine, and (4) isolated evaporite deposits (Figure 5.0).

Burro Canyon is incised into granitic rock on the western flank of the Argus Range. Most of the BCTF is underlain by alluvial sediments consisting of heterogeneous, lenticular beds of unconsolidated silt, sand, gravel, and boulders from the surrounding mountains. Soil investigations at the site indicate that the soil is predominantly well-graded and poorly-graded, tan-colored, silty- to gravelly-sand. Borings drilled at the site have encountered large granitic boulders and cobble layers which resulted in extremely hard and slow drilling.

The BCTF is seven miles from the nearest base boundary to the east. The nearest base boundary in the dominant wind direction is 17 miles to the northeast, while the nearest town (Trona) is located 9 miles to the southeast. The nearest surface water is on the base and is four miles to the west. Mountains with rocky terrain surround the OD site, 1,400 feet higher than the site to the north and 700 feet higher to the south, creating a natural amphitheater. The mountainous terrain mitigates the noise and blast from the OD.

1.3 Hydrogeologic Conditions

Groundwater of varying quality exists within the sediments underlying the valley and is recharged primarily from the surrounding mountainous areas. In 1991, Berenbrock and Martin suggested two primary zones of groundwater occurrence in the basin; a shallow hydrogeologic zone (SHZ) and a deep hydrogeologic zone (DHZ). Subsequently, Tetra Tech EM, Inc. (2002) further divided the SHZ described by Berenbrock and Martin into the SHZ, comprised of unconfined silts and clays with localized, interfingering sand layers, and an underlying intermediate hydrogeologic zone (IHZ) comprised primarily of low-permeable lacustrine clays.

While groundwater in Burro Canyon exists primarily in shallow, locally-derived sediments bound on the sides and below by granitic-rock, ultimately the groundwater flows to the SHZ referenced above. In 2001, the SHZ was the focus of a background groundwater quality study. Samples were collected from 17 groundwater monitoring wells situated in the China Lake Complex. Sample locations were expected to reasonably reflect spatial and chemical variability within the shallow hydrogeologic zone. A detailed statistical analysis of this data was completed as part of the study (Tetra Tech EM Inc., 2001).

1.4 Description of OB/OD Activities

A complete and detailed description of all aspects of OB/OD events is provided in the BCTF Part B Permit Application. As defined in that application, the OD unit is specifically defined as the area within which detonations are performed and does not include surrounding areas potentially impacted by compounds migrating from the unit. The OB unit is west of the OD unit and is considered to include the OB pan and the area immediately surrounding the pan.

The DTSC requested that the following specific information be added to this Monitoring Plan:
Equipment used to deliver and unload EHW is listed in Section II.B.7 of the Permit Application.

- The average number of events from 2005 through 2015 is 7.3 events per year.
- Historical annual amounts of EHW treated (excluding the weight of casings) by OD are listed below:

YEAR	POUNDS	EVENTS
2005	53,500	9
2006	43,300	8

2007	60,400	9
2008	44,000	10
2009	36,900	8
2010	67,500	7
2011	61,900	7
2012	28,000	5
2013	52,600	6
2014	39,100	5
2015	45,400	6
AVER	49,400	7.3

- The last OB event was August of 1998.
- Grading occurs about once per year to once every 18 months. Depth of grading is about 1 foot.
- Traffic pattern of vehicles during an event setup is variable.
- The time that transpires between OD events and grading is variable.
- Estimated depth of craters from OD events is 2 to 6 feet. Average estimated depth of 17 OD craters measured from 2002 to 2004 was 3 feet. Average diameter was 28 feet.

2.0 OBJECTIVES

The objectives of this Monitoring Plan are:

Specify goals of the monitoring program
Specify action levels for each goal
Propose actions to be taken when action levels are reached
Provide a workplan to achieve each goal

3.0 GOALS OF THE MONITORING PROGRAM

The goals of the monitoring program for the OB/OD facility are:

1) Evaluate the health risk to OD operators
2) Evaluate soil for hazardous waste characteristics
3) Evaluate for potential vertical contaminant migration in soil
4) Evaluate for potential contamination from the OB pan
5) Evaluate for potential lateral contaminant migration via surface water

6) Evaluate for potential impacts to groundwater
7) Evaluate for potential wind-borne contaminant migration
8) Evaluate the risk to ecological receptors
9) Conduct a five-year review of the HRA

4.0 ACTION PLANS TO ACHIEVE GOALS

The plans to achieve each goal will include the following details:

- Approach – Planned actions to achieve the goal, including types of samples and general location of sampling.
- Frequency –Unless a deviation is described for a specific goal, the Standard Sampling Frequency will apply. The Standard Sampling Frequency will consist of sampling twice per year for two years, then once annually for three years, and then once every two years for the duration of the permit.
- Location – Specific sample locations, if applicable.
- Parameters – Target analytical compounds.
- Action Levels – Analyte concentrations or conditions that will trigger a decision.
- Proposed Mitigation – Action to be taken if action levels are reached.

A summary of this information for each goal is provided in Table 1.0.

4.1 GOAL #1 - Evaluate the Health Risk to OD Operators

APPROACH – Health risks to the OD operators will be evaluated by collecting soil samples in the OD work zone and surrounding area. The soil sampling plan will be based on the Interstate Technology & Regulatory Council's February 2012 "Incremental Sampling Methodology" guidance document. As stated in the ISM guidance, "Incremental sampling methodology (ISM) is a structured composite sampling and processing protocol that reduces data variability and provides a reasonably unbiased estimate of mean contaminant concentrations in a volume of soil targeted for sampling." ISM requires establishment of Decision Units (DUs). A DU is the smallest volume of soil for which a decision will be made based on ISM sampling.

The OD work zone was previously defined in the HW Facility Permit by the yellow polygon in Figure 6.0.The OD work zone represents surface soils that are highly disturbed by detonations (cratering) and subsequent grading operations. To simplify monitoring program management and the sampling process for this project, this area is

referred to as DU1 and the DU1 boundary is chosen as a 250-foot-diameter circle centered on the polygon (Figure 7).

Potential contamination due to detonations is expected to rapidly diminish with distance from the OD work zone. Consequently, areas immediately surrounding DU1 are expected to be less directly-affected by detonations but are areas where workers still may be exposed to potential contaminants by foot traffic, grading, etc. Therefore, DU2 is designated as the annulus between DU1 and a 500-foot-diameter circle surrounding DU1 (Figure 7).

The depth of both DU1 and DU2 is chosen to be 0 to 3-inches below ground surface (bgs), since the purpose of the DUs is to support evaluation of health risks to OD operators and the point of exposure will primarily be at the ground surface. Additional details of the DU1 and DU2 soil sampling methodology are provided in Section 8.0.

A minimum of three ISM samples will be collected from both DU1 and DU2 during each monitoring event for the duration of the permit. Each sample will consist of a minimum of 30 increments. The degree of analytical precision will be evaluated by calculating the relative standard deviation (RSD) for each sample set. The RSD methodology is described in more detail in Section 8.6.1. If more than 10% of analytes in DU1 and DU2 show more than 30% RSD, the number of increments and replicates per sample, the number of samples, and/or the sample size may be increased to increase precision. If modifying the sample protocol does not reduce the variation to less than 30% RSD, a plan for additional action to improve the analytical data precision will be submitted to the DTSC.

FREQUENCY – The frequency of soil sampling for this goal will follow the Standard Sampling Frequency.

LOCATION – During each monitoring event, increment and replicate sample sets will be collected from an equal number of equal-sized areas within both DU1 and DU2. Additional sampling details are outlined in Section 8.0.

PARAMETERS – Soil sample analytical parameters and methods are listed in Section 8.4, excluding TCLP and WET analysis. Consistent with Decision Mechanism 3 of the ISM guidance, the 95% upper confidence level (UCL) of the analytes from each DU will be calculated and compared to the action levels outlined below. The methodology for calculating the 95% UCL is further described in Section 8.6.1.

ACTION LEVELS – The EPA's November 2015 Regional Screening Levels (RSLs) will be used as action levels for this project. Because the OD facility is industrial in nature, analytical results from each sampling event will be compared to the "Industrial Soil" RSLs. The RSLs provide worst-case (i.e. most conservative), risk-based screening-level concentrations. Table 2.0 lists applicable RSLs for this project.

As indicated on Table 2.0, an RSL value is provided for only one dioxin/furan compound (2, 3, 7, 8-TCDD). However, Table 3.0 lists Toxicity Equivalence Factors (TEFs) for each dioxin/furan isomer. A surrogate RSL value (Toxicity Equivalence Quotient - TEQ) can be calculated for each isomer using the TEF value. Table 3.0 provides calculated TEQs for each isomer.

MITIGATION – If the 95% UCL of any analyte exceeds an action level for two consecutive sampling events, a limited health risk assessment (HRA) will be completed to determine more site-specific safe-exposure levels for the exceeding compounds. Until the HRA is completed, interim changes to facility operation will be developed (in consultation with the DTSC) and implemented to reduce potential worker exposure to contaminants. If the HRA finds that site-specific safe-exposure levels are exceeded, a workplan to permanently mitigate worker exposure will be submitted to the DTSC.

4.2 GOAL #2 – Evaluate Soil for Hazardous Waste Characteristics

APPROACH – Soil sample results obtained to support Goal #1 will also be used to support Goal #2. Details of the sampling methodology are provided in Sections 4.1 and Section 8.0.

FREQUENCY – Soil sampling for this goal will follow the Standard Sampling Frequency.

LOCATION – ISM samples will be collected from DU1 and DU2, as described in Sections 4.1 and 8.0.

PARAMETERS – Soil sample analytical parameters and methods are listed in Section 8.4. The 95% UCL of the analytes from each DU will be calculated and compared to the action levels outlined below.

In addition to the sample suite supporting Goal #1, leaching procedures (Federal Toxicity Characteristic Leaching Procedure (TCLP) and CA Waste Extraction Test (WET)) for metals will also be conducted, if needed. More specifically, the TCLP and the WET will

be conducted on those samples with total metal concentrations equal to or greater than 10 times the CA Soluble Threshold Limit Concentrations.

As described in Section 4.1, the only dioxin/furan compound assessed for this goal is 2,3,7,8-TCDD. Also note that perchlorate analysis does not apply to Goal #2 because it does not have a corresponding hazardous waste (HW) criterion.

ACTION LEVELS – The HW regulatory concentrations and applicable criteria listed in Table 4.0 are the action levels for Goal #2.

The only HW level established for dioxins/furan compounds is for total concentration of 0.01 mg/kg for 2,3,7,8-TCDD (CA Code of Regulations, Title 22, Section 66.261.24(a)(2)(B)). Note that HW regulatory levels have not been established for perchlorate and most explosive compounds. However, 10% or more explosives in soil are considered "explosive" (Army, 1987) (i.e. displays the reactivity characteristic). Therefore, 10% explosives is herein established as a hazardous waste threshold for this project.

MITIGATION – If the 95% UCL concentration of any analyte exceeds a HW action level during two consecutive sampling events, a workplan to address the exceedance will be submitted to the DTSC.

4.3 GOAL #3 - Evaluate for Potential Vertical Contaminant Migration in Soil

APPROACH – Potential vertical contaminant migration will be monitored by collecting six discreet soil samples beneath DU1 at a depth-range of 6 to 6.5 feet bgs.

FREQUENCY – If the action level outlined below is not exceeded, soil sampling for this goal will follow the Standard Sampling Frequency. If the action level is exceeded, subsequent sample events will proceed at 6 month intervals until the exceedance is effectively mitigated or addressed, with concurrence by the DTSC.

LOCATION – Boring locations for the six samples will be spaced evenly within the DU1 area, in a pattern similar to that shown on Figure 7.0, for each sample event. Additional details of the soil sampling methodology are provided in Section 8.0.

PARAMETERS – Soil sample analytical parameters and methods are listed in Section 8.4.

ACTION LEVELS – The EPA's November 2015 Regional Screening Levels (RSLs) will be used as action levels for explosives, PAHs, and dioxins. Because the OD facility is industrial in nature, analytical results from each sampling event will be compared to the "Industrial Soil" RSLs. The RSLs provide worst-case (i.e. most conservative), risk-based screening-level concentrations. Table 2.0 lists applicable RSLs for this project.

As indicated on Table 2.0, an RSL value is provided for only one dioxin/furan compound (2, 3, 7, 8-TCDD). However, Table 3.0 lists Toxicity Equivalence Factors (TEFs) for each dioxin/furan isomer. A surrogate RSL value (Toxicity Equivalence Quotient - TEQ) can be calculated for each isomer using the TEF value. Table 3.0 provides calculated TEQs for each isomer.

Analytical results of metals from each sampling event will be compared to the analytical results (Table 8.0) for metals of the 2 to 10 foot alluvial fan deposit samples in the 1998 background soil study (Tetra Tech EM Inc, 1998).

Analytical results of perchlorate from each sampling event will be compared to the analytical results (Table 8.0) for perchlorate from the 2003 background soil study (China Lake, 2003). Note that samples were analyzed by Method 314. Method 6850 is now the preferred method and referenced in this Plan.

At some future date China Lake may collect additional samples at 5 to 6 feet in the wash northeast of the BCTF and analyze those samples for metals and perchlorate for later use in a revision update of this Plan.

MITIGATION – If measured parameters exceed any action levels, the subsequent sampling event will include, in addition to the six regularly scheduled samples, three additional 6 to 6.5 feet deep soil samples collected around the location where the exceedances occurred and one 10 to 10.5 feet deep soil sample as close as practical to the exceedance location. All samples will be analyzed for the full analyte suite. If action levels are exceeded in any of the follow-up samples, then an action plan to further investigate the potential migration of contaminants will be prepared and submitted to the DTSC.

4.4 GOAL #4 – Evaluate for Potential Contamination from the Burn Pan

APPROACH – To evaluate whether use of the burn pan has caused soil contamination, ISM soil samples will be collected in an area immediately surrounding the burn pan, designated as DU3. Soil contamination is most likely to occur immediately around the

burn pan due to the mechanics of open burning. Therefore, DU3 is defined as the area extending from the outer edge of the pan to a distance of 10 feet in all directions. The location of the burn pan and DU3 is shown on Figure 7.

Initially, three ISM samples will be collected from DU3 and each sample will be comprised of a minimum of 30 increments. Increments will be collected at the ground surface where potential contamination is expected to be the highest. Additional details of sampling procedures are provided in Section 8.0.

If, after the initial monitoring event, less than 10% of analytes from DU3 show greater than 30% RSD, adequate precision of the sampling protocol will have been demonstrated and no additional samples will be collected at that DU unless the burn pan is used again. If more than 10% of analytes from the initial event show more than 30% RSD, DU3 will be sampled again during the next scheduled sampling event, and the number of increments and replicates per sample, the number of samples, and/or the sample size may be increased to improve the data precision. If modifying the sample protocol does not reduce the variation to less than 30% RSD, a plan for additional action to improve the analytical data precision will be submitted to the DTSC.

FREQUENCY – The burn pan was last used in August 1998 and future use of the burn pan is not planned. Therefore, only one initial sampling event will be performed after the monitoring plan is approved, subject to the analytical precision calculations described above. Another sampling event, consisting of three ISM samples similar to the initial sampling event, will also be implemented after each future use of the burn pan, coincident with the existing Standard Sampling Frequency schedule followed at that time.

LOCATION – During each monitoring event, a minimum of 30 increments and two additional replicate sets will be collected from DU3, for a total of three soil samples. Increments and replicates will be collected from a depth of 0 to 6-inches bgs. Additional details of the soil sampling methodology are provided in Section 8.0.

PARAMETERS – Soil sample analytical parameters and methods are listed in Section 8.4. The 95% UCL concentrations of the analytes will be calculated and compared to the action levels outlined below.

ACTION LEVELS – Action levels to meet this goal will be the same as those for both Goals #1 (RSLs) and #2 (HW criteria).

MITIGATION – If an action level from Goal #1 is exceeded, then mitigation outlined in Section 4.1 will be implemented. If an action level from Goal #2 is exceeded, then mitigation outlined in Section 4.2 will be implemented.

4.5 GOAL #5 – Evaluate for Potential Lateral Contaminant Migration via Surface Water

APPROACH – Potential downgradient migration of contaminants via surface water will be monitored by collecting discreet surface soil samples from the main wash adjacent to, and downgradient of, the BCTF. Since surface water only flows in the main wash during periods of heavy precipitation, surface water flow in the main wash is expected to be infrequent. Nevertheless, samples will be collected annually as outlined below.
FREQUENCY – A full set of soil samples will be collected annually.

LOCATION – As shown on Figure 8.0, five soil samples will be collected along the centerline of the wash, starting at a point due south of the burn pan and continuing down the wash with additional sampling points at 250 feet intervals. One additional soil sample will be collected in the smaller tributary wash that drains from north to south just west of the OB Pan, along with one field duplicate collected from the Main Wash. Additional details of the soil sampling methodology are provided in Section 8.0.

PARAMETERS - Soil sample analytical parameters and methods are listed in Section 8.4.

ACTION LEVELS – No concentration-based action levels are established for this goal. Action will be required if evidence collected from three or more sampling events indicates that downgradient migration is occurring. If any analytes are detected in the soil samples, the distribution of detected compounds will be represented graphically using concentration-vs-distance graphs, with distance being measured along the wash flow-line, and also in log-normal concentration-vs-time graphs for individual sample points where analytes are detected. Downgradient migration of contaminants will be indicated if a statistically-significant increasing analyte-concentration trend occurs at one or more sampling points over three or more sample events, or if one or more analytes are consistently (three or more events) detected at any sampling point where the analytes were not previously detected. An increasing analyte concentration trend will be indicated if a best-fit line through the concentration-vs-time data exhibits a positive slope.

MITIGATION – If sequential monitoring results from three or more events indicate contaminants are migrating laterally, an action plan to address the migration will be submitted to the DTSC.

4.6 GOAL #6 - Evaluate for Potential Impacts to Groundwater

APPROACH –Groundwater will be monitored by collecting groundwater samples from the monitoring well (BC1) associated with the OB/OD facility. Additional details of the sampling methodology are provided in Section 9.0.

FREQUENCY – Groundwater sampling for this goal will follow the Standard Sampling Frequency.

LOCATION – Groundwater samples will be collected from well BC1 (Figure 8.0).

PARAMETERS – Groundwater sample analytical parameters and methods are listed in Section 9.4.

ACTION LEVELS – Analytical results from the 2015 sampling event of the Burro Canyon well (Section 5.2) will be used as action levels, as summarized in Table 5.0. For any analyte that was not detected in the 2015 sampling event, the laboratory reporting limit will be used as the action level.

MITIGATION – If any action level from two consecutive sampling rounds is exceeded, an action plan will be prepared and submitted to the DTSC.

4.7 GOAL #7 – Evaluate for Potential Wind-Borne Contaminant Migration

APPROACH – Potential wind-borne contaminant migration will be evaluated by collecting surface soil samples, using the ISM protocol, in the predominant downwind direction from the OD unit. As shown on Figure 7, winds in the project area blow predominantly from the south-southwest.

The topography and surface geology of terrain down-wind of the OD unit is highly variable. In addition, the potential for downgradient contaminant migration is expected to diminish with distance. Therefore, sampling to support the goal of evaluating whether wind-borne contamination is occurring will focus on a representative area of exposed soil 100 feet x 100 feet in size directly downwind of the OD area. The representative area is

defined as DU4 and is not intended to represent the entire area of potential wind-borne contaminant migration.

Initially, three ISM samples will be collected from DU4 and each sample will be comprised of a minimum of 30 increments. Increments will be collected at the ground surface where potential contamination is expected to be the highest. Additional details of sampling procedures are provided in Section 8.0.

If, after the initial monitoring event, less than 10% of analytes show greater than 30% RSD, adequate precision of the sampling protocol will have been demonstrated and only one sample will be collected from DU4 during subsequent monitoring events. If more than 10% of analytes show greater than 30% RSD, the number of increments per sample, the number of samples, and/or the sample size may be increased to improve the data precision. If modifying the sample protocol does not reduce the variation to less than 30% RSD, a plan for additional action to improve the analytical data precision will be submitted to the DTSC.

FREQUENCY – The soil samples will be collected following the Standard Sampling Frequency.

LOCATION - Figure 7.0 shows the DU4 location. Samples will be collected within the 100 feet x 100 feet DU area.

PARAMETERS - Soil samples analytical parameters and methods are listed in Section 8.4. The 95% UCL concentrations of the analytes will be calculated and compared to the action levels outlined below.

ACTION LEVELS – The EPA's November 2015 Regional Screening Levels (RSLs) will be used as action levels for explosives, PAHs, and dioxins. Because the OD facility is industrial in nature, analytical results from each sampling event will be compared to the "Industrial Soil" RSLs. The RSLs provide worst-case (i.e. most conservative), risk-based screening-level concentrations. Table 2.0 lists applicable RSLs for this project.

As indicated on Table 2.0, an RSL value is provided for only one dioxin/furan compound (2, 3, 7, 8-TCDD). However, Table 3.0 lists Toxicity Equivalence Factors (TEFs) for each dioxin/furan isomer. A surrogate RSL value (Toxicity Equivalence Quotient - TEQ) can be calculated for each isomer using the TEF value. Table 3.0 provides calculated TEQs for each isomer.

Analytical results of metals from each sampling event will be compared to the analytical results for metals in Table 8.0. Table 8.0 consists of analytical results from: (1) the 0 to 2 foot alluvial fan deposit samples in the 1998 background soil study (Tetra Tech EM Inc, 1998) and (2) surface samples collected in 1996 at a location ~0.6 miles west of the BCTF (China Lake, 2003).

Analytical results of perchlorate from each sampling event will be compared to the analytical results (Table 8.0) for perchlorate from the 2003 background soil study (China Lake, 2003). Note that samples were analyzed by Method 314. Method 6850 is now the preferred method and referenced in this Plan.

At some future date China Lake may collect additional samples using ISM and analyze those samples for metals and perchlorate for later use in a revision update of this Plan.

MITIGATION – If an action level is exceeded during two consecutive sampling events, then an action plan addressing the exceedance will be prepared and submitted to the DTSC.

4.8 GOAL #8 – Evaluate the Risk to Ecological Receptors

APPROACH – Potential risks to ecological receptors will be evaluated by collecting soil samples, using ISM protocol, in approximately the same area used for the 1998 Ecological Risk Assessment Validation Study (ERA VS) (Montgomery Watson, 1998) (Section 5.3). The selected monitoring area is 100 feet x 100 feet in size and is defined as DU5. Similar to the DU4 for Goal #7, the DU5 area was chosen to be representative of potential ecological impact in an area where topography and surface geology is highly variable and is not intended to represent the entire area of potential ecological impact. Initially, three ISM samples will be collected from DU4 and each sample will be comprised of a minimum of 30 increments. Increments will be collected at the ground surface where potential contamination is expected to be the highest. Additional details of sampling procedures are provided in Section 8.0.

If, after the initial monitoring event, less than 10% of analytes show greater than 30% RSD, adequate precision of the sampling protocol will have been demonstrated and only one sample will be collected from DU5 during subsequent monitoring events. If more than 10% of analytes show greater than 30% RSD in either DU, the number of increments and replicates per sample, the number of samples, and/or the sample size may be increased to improve the data precision. If modifying the sample protocol does

not reduce the variation to less than 30% RSD, a plan for additional action to improve the analytical data precision will be submitted to the DTSC.

FREQUENCY – The soil samples will be collected following Standard Sampling Frequency.

LOCATION - Figure 7.0 indicates the DU5 location. Samples will be collected within the 100 feet x 100 feet DU area. Additional details of the soil sampling methodology are provided in Section 8.0.

PARAMETERS – Soil samples will be analyzed for cadmium, chromium (total), hexavalent chromium, copper, lead, mercury, zinc, and perchlorate by the methods listed in Section 8.4. These analytes were used to determine the risk to ecological receptors in the 2014 ERA VS.

ACTION LEVELS – The 95% UCL of analytes from soil sample results used in the 2014 ERA VS in the OD area (not the background area) (Table 6.0) will be used as action levels for this goal. This data set is a combination of analytical results from the 1998 ERA soil samples, along with the 2003 soil sampling event in the OD area and the wash.

MITIGATION - If an action level is exceeded, then an action plan addressing the exceedance will be prepared and submitted to the DTSC.

4.9 GOAL #9 – Conduct a Five-Year Review of the HRA

The hazardous waste facility permit under a Unit Specific Special Condition requires that every five years a review of the HRA be conducted. This review includes an evaluation of any new soil sampling data.

APPROACH – The HRA will be updated using results from soil samples collected in DU1 and DU2 to support Goal #1.

FREQUENCY – After each five-year time period, the most recent set of samples collected from DU1 and DU2 will be used for the HRA review.

LOCATION - ISM samples collected from DU1 and DU2, as described in Section 4.1, will be used for the HRA review.

PARAMETERS – Soil sample analytical parameters and methods are listed in Section 8.4. The 95% UCL of the analytes will be calculated and compared to the action levels outlined below.

ACTION LEVELS – At the five year mark required by the permit's Unit Specific Special Condition, the most recent set of analytical results from DU1and DU2 will be compared to the analytical results used in the 2007 HRA (URS, 2007) and also the 2014 HRA update report (URS, 2014a). The HRA dataset is presented in Table 7.0 and originates from the 2003 sixth soil investigation in the OD impact area.

MITIGATION –The HRA results will be evaluated. If an unacceptable health risk is indicated, the annual/event quantities used in the permit will be adjusted.

5.0 PREVIOUS WORK AT THE OB/OD FACILITY

5.1 Baseline Soil Characterization

China Lake has completed six soil investigations at the BCTF since 1989. Each investigation has varied in quantity of samples, sample depths, and analytical methods. A total of 107 soil samples were collected over the six investigations, 54 of these were subsurface. Most of the investigations included metal analysis, the third investigation analyzed only for petroleum hydrocarbons, and the sixth investigation added perchlorate and dioxin/furan analysis. Three of the six investigations included explosives. Statistical analysis of investigation results compared to background data, either for trends within investigations or differences between investigations, has not been performed.

The report titled, "Soil Investigation Summary Report (1989 – 2001) for the Burro Canyon OB/OD Facility at the Naval Air Weapons Station, China Lake, CA" dated January 2002 (China Lake, 2002) describes and summarizes the results of the first five soil investigations at the OB/OD Facility. This Monitoring Plan does not describe those investigations or summarize their analytical results. The sixth soil investigation is described in "Site Investigation Report for the Sixth Site Investigation (Soil Only) at the Burro Canyon OB/OD Facility, NAWS China Lake, CA, Version 1" (China Lake, 2003).

As part of the 2003 sixth soil investigation, 18 surface samples were collected in the "impact area". The "impact area" is indicated in Figure 9.0, is larger than the 1.03 acre OD unit defined in the Part B permit application, and includes most of the de-vegetated area around the OD unit. Additionally, 10 surface samples were collected in the Burro Canyon Wash (Figure 9.0). General results of 18 samples collected from the impact area follow:

- Metals - Out of a possible 342 results (18 samples of 19 analytes each), 110 results were above background levels from 1998 background soil study (described in Section 6.1.1);
- Perchlorate – Perchlorate was detected in all 18 samples from 0.2 mg/kg to 288 mg/kg;
- Dioxins/Furans – Out of a possible 450 results (18 samples of 25 analytes each), dioxins/furans were detected in 52 results from 0.002 ug/kg to 0.022 ug/kg; and
- Explosives - Out of a possible 252 results (18 samples of 14 analytes each), explosives were detected in 9 results from 2.1 mg/kg to 4.5 mg/kg.

General results of the 10 samples collected from the wash follow:

- Metals - Out of a possible 190 results (10 samples of 19 analytes each), 37 results were above background levels from 1998 background soil study (described in Section 6.1.1);
- Perchlorate – Perchlorate was detected in 6 samples from 0.56 mg/kg to 101 mg/kg;
- Dioxins/Furans – Out of a possible 250 results (10 samples of 25 analytes each), dioxins/furans were detected in 52 results from 0.001 ug/kg to 0.020 ug/kg; and
- Explosives - Out of a possible 240 results (10 samples of 14 analytes each), explosives were detected in 9 results from 2.0 mg/kg to 140 mg/kg.

A comparison of analytical results for the sixth soil investigation to the EPA Region 9 Industrial Preliminary Remediation Goals (PRGs) follows. (Note: subsequent to the 2003 sixth soil investigation, the EPA adopted RSLs instead of PRGs for screening levels in all EPA regions.)

- Metals – Metal results from samples collected from both the impact area and the wash were all below industrial PRGs;
- Perchlorate – Two results from the impact area samples and 1 results from the wash samples are greater than industrial PRGs;
- Dioxins/Furans – Comparison is not possible, because detection limits for all analytes are greater than industrial PRGs; and
- Explosives – Only one result for a sample collected in the wash is greater than industrial PRGs.

Lastly, all results for samples collected from both the impact area and the wash during the 2003 sixth soil investigation are below HW levels.

5.2 Baseline Groundwater Characterization

A groundwater monitoring well was installed on the western edge (slightly downgradient) of the OB/OD Facility in 2000 by the Navy Military Construction Battalion (i.e. the "Seabees"). The well location relative to the OB/OD Facility is shown on Figure 6.0. The recently revised well log and construction information are included in the "Revised Technical Memorandum Burro Canyon Monitoring Well OB/OD Site, NAWS, China Lake, CA, February 2015" (China Lake, 2015) in Appendix A.

A total of three groundwater samples were collected from the well and analyzed in 2003 and 2004. The groundwater investigation findings are summarized in the report entitled "Site Investigation Report for the Sixth Site Investigation (Groundwater Only) at the Burro Canyon OB/OD Facility, NAWS China Lake, CA, December 2005, Final" (China Lake, 2005). Depth to groundwater was measured at approximately 430 feet bgs. Analytical results indicated the following:

- Results of general parameters (alkalinity, pH, bicarbonate, etc.) and metals were the same as background samples from the 2001 background groundwater study (described in Section 6.2);
- Two analytes that are typically associated with explosives, 1,3-Dinitrobenzene and 2,6 Dinitrotoluene were detected below the reporting limit in samples but were also detected in the method blank, indicating the detections were likely due to a lab contaminant; and
- Four volatile and semi-volatile organic analytes were detected below the reporting limit but were flagged as probable lab contaminants.

In January of 2015 an additional groundwater sample was collected from the well and analyzed. The groundwater investigation findings are summarized in the report entitled "Revised Technical Memorandum Burro Canyon Monitoring Well OB/OD Site, NAWS, China Lake, CA, February 2015" (China Lake, 2015). Depth to groundwater was measured at 429 feet below top of casing. Analytical results indicate the following:

- None of the analytes exceeded statistical background concentrations. Where no background concentrations are provided, no MCLs or action levels were exceeded. Background concentrations were selected from the 95% upper confidence level for constituent concentrations in groundwater in the NAWS region, as reported in the *Site Investigation Report for the Sixth Site*

Investigation (Groundwater Only) at the Burro Canyon OB/OD Facility, NAWS China Lake, CA, December 2005.

- Toluene was detected at 1.4 micrograms per liter (ug/L), although this is an estimated concentration which is below the established reporting level for that constituent. Because toluene is a common laboratory contaminant (*USEPA Guidance for Data Useability in Risk Assessment: Quick Reference Fact Sheet, September 1990*) and no other aromatic compounds were detected, the toluene detection is considered anomalous.
- Perchlorate was detected at a concentration of 0.199 ug/L. Although background perchlorate concentrations were not estimated in the 2005 *Site Investigation Report*, perchlorate has been detected in several wells in the NAWS China Lake area at concentrations ranging from 1.2 to 6.2 milligrams per liter (1,200 to 6,200 ug/L) (*Personal communication from Greta Orris, United States Geological Survey, February 2004*). It is likely the perchlorate detected in water from the Burro Canyon monitoring well is naturally occurring.

5.3 Ecological Risk Assessment

The original Ecological Risk Assessment was conducted in two phases. The first phase, the Predictive Study, is documented in "Ecological Risk Assessment, Naval Air Weapons Station China Lake, May 1996". This phase quantitatively determines if OB/OD emissions adversely affect ecological receptors (plants, kangaroo rats, and red-tailed hawks). Results of the Predictive Study indicated potential health risks from Aluminum, Cadmium, Chromium, Copper, Lead, Mercury, and Zinc for the kangaroo rat and/or plant receptors.

The second phase of the original ERA, the Validation Study, is documented in "Ecological Risk Assessment Validation Study, Naval Air Weapons Station, China Lake, California, Revised Final, October 1998". This phase field validates the results of the Predictive Study. Field sampling was conducted in a grid just east (downwind) of the OD area and at a reference area in a geologically similar area (1.5 miles northwest of the BCTF). Samples collected included 25 soil samples, 7 plant tissue samples, and 12 small mammal (Kangaroo rat) tissue samples. The samples were analyzed for the above listed metals (Montgomery Watson, 1998).

The conclusions of the original ERA VS indicated the following:

Health risks predicted from the Predictive Study were not confirmed in the Validation Study;
Risks associated with the BCTF are similar to risks for the reference area;
Only risks from aluminum through the plant ingestion pathway for the kangaroo rats were greater at the BCTF than at the reference area. However, the following three points need to be considered:

1) Statistically, aluminum data sets from soil and plant samples are the same at the OB/OD facility and the reference area;
2) Kangaroo rats at the BCTF are slightly larger and heavier than those at the reference area; and
3) Kangaroo rats are exposed to an order of magnitude lower aluminum concentrations at the BCTF and reference area than other areas of the Mojave Desert.

The RCRA Part B permit that was issued in August 2008 by the CA DTSC requires that five years after its effective date: "…a review of all supporting documentation to ensure that the Permit continues to comply with current state of control and measurement technology as well as changes in applicable regulations" be completed. Therefore, the original ERA (Radian 1996 and Montgomery Watson 1998) was updated as part of the mandated five-year review cycle of supporting documentation. This updated ERA is documented in "Ecological Risk Assessment, Naval Air Weapons Station, China Lake, California, Final, March 2014".

Based on the types of listed species identified through the California Natural Diversity Database (CNDDB) search, and considering none of these species were sighted within a one-mile radius of the Site, with the exception of Nelson's bighorn sheep in 1970, the receptors of interest evaluated in the previous ERA were maintained for the updated ERA: terrestrial plants, Merriam's kangaroo rat, and red- tailed hawk. In addition to the soil and tissue data collected to support the previous ERA, soil data compiled in the years 2000, 2001, and 2003 from the OD Impact Area were incorporated into this updated ERA.

The chemicals of potential ecological concern (COPECs) that were included in the original ERA were maintained for this updated ERA and include cadmium, chromium, copper, lead, mercury, and zinc. Due to detections of perchlorate in soil samples collected subsequent to the original ERA, perchlorate was added as a COPEC. Site soil data are available for both total chromium and hexavalent chromium, and both data sets were evaluated. The only COPEC that was included in the original ERA, but

not in this updated ERA, is aluminum. Aluminum was not evaluated in this ERA due to the pH levels measured in soils at the BCTF, which range from 7.93 to 8.43. Levels of pH lower than 5.5, would indicate that aluminum should be included as a COPEC.

The findings of this ERA are consistent with the findings in the previous ERA, and conclude that no adverse effects are expected to result from the concentrations of metals in soils and tissue. The highest risk estimates occurred for terrestrial plants and herbivorous rodents, represented by Merriam's kangaroo rat, potentially exposed to perchlorate in soil and plant tissue. For this reason, a more thorough evaluation of the phytotoxicity data for perchlorate and of the models used to estimate concentrations of perchlorate in plant tissue potentially consumed by herbivores was conducted. In most of these areas with higher perchlorate concentration, plants are scarce within 200 feet of the point of detonation. The plant community outside of this area includes creosote bush, burro-bush, and other species that can thrive in the alkali playa habitat. No sensitive plant species were observed around the BCTF. Based on these additional considerations, the potential for adverse effects to the plant community is expected to be low and no further evaluation was necessary.

6.0 AVAILABLE BACKGROUND DATA

6.1 Soil

Three background data sets are available for concentrations of metals in the soil in the Burro Canyon area and are discussed below.

6.1.1 1998 Background Soil Study

A background geochemical soil study was conducted under the China Lake IRP (Tetra Tech EM Inc., 1998). The study was completed in an effort to develop a facility-wide, technically defensible background data set. DTSC was involved throughout development and preparation of the study. Samples were collected from eight different grids with varying geology. A detailed statistical analysis of this data was completed as part of the study.

The OB/OD Facility is situated within Grid C, "alluvial-fan deposits". Background metal concentrations in Grid C are presented in Table 8.0.

6.1.2 1996 Background Soil Samples

In 1996 four soil samples were collected in an effort to characterize the background metal concentrations of soil in the OB/OD Facility area. The samples were collected

~0.6 miles directly west of the Burro Canyon Facility. OD operations are conducted so that the plume is forced to move to the east of the facility (deeper into the canyon). Therefore, the location west of the facility was chosen as the direction opposite from the direction that the portion of the plume closest to the ground surface travels. Metal concentrations from the 1996 background samples are presented the 2003 Sixth Site Investigation report (China Lake, 2003).

6.1.3 Background Soil Samples from the 2003 Sixth Site Investigation

Ten background soil samples were collected from a 1000 foot by 1000 foot grid with 100 foot intervals in alluvial fan deposits northwest of the OB/OD Facility. Metal concentrations are presented the 2003 Sixth Site Investigation report (China Lake, 2003).

Analytical results for dioxins/furans for samples collected from the Background Area indicate that only one of the 11 samples collected contains dioxins/furans (one furan isomer only). Therefore, comparison of background values to samples collected for this Monitoring Plan is not necessary.

Analytical results for perchlorate for samples collected from the Background Area indicate no sample with a detectable concentration of perchlorate.

6.2 Groundwater

A Background Groundwater Study was also conducted under the China Lake IRP (Tetra Tech EM Inc., 2001). Like the soil study, the groundwater study was completed in an effort to develop a facility-wide, technically defensible background data set. DTSC was involved throughout development and preparation of the study. Due to the heterogeneity of geologic composition, groundwater composition varies greatly. Therefore, a single monitoring well cannot be used for accurate background concentrations. It is more accurate to use average base-wide data from the background groundwater study. Samples were collected from 17 groundwater monitoring wells situated on the China Lake North Range. Sample locations were expected to reasonably reflect spatial and chemical variability within the shallow hydrogeologic zone. A detailed statistical analysis of this data was completed as part of the study.

Background metal concentrations from the background groundwater study, along with other miscellaneous general mineral parameters, are presented in Table 9.0.

7.0 PROJECT MANAGEMENT

The Navy's project coordinator for implementation of the monitoring program will be the RCRA Program Manager in the Environmental Management Division. If Contractor personnel are hired to assist with implementation of the Monitoring Plan, the project coordinator will be designated as the Engineer-in-Charge of all Contractor work. Contact with Contractor personnel will be done through the project coordinator. Both soil and groundwater samples will be analyzed by an appropriately credentialed laboratory under contract with the Navy.

8.0 SOIL SAMPLING PLAN

8.1 Rationale for Sampling

Location and number of soil samples to be collected for the purposes of this Monitoring Plan are summarized are discussed in Section 4.0.

8.2 Sample Collection Procedures

8.2.1 Decision Unit Sampling

Samples from the five designated DUs will be collected using Integrated Sampling Methodology (ISM), as outlined in the February 2012 ISM guidance. Each sample collected from a DU will be comprised of a minimum of 30 increments. If, after evaluation of the data, a requirement for greater precision or additional data is indicated, the number of samples, sample size, or number of increments/replicates may be increased. Any changes made to the sampling details will be made only after consultation with, and approval by, the DTSC.

Per the ISM guidance, increments and replicates will be collected from an equal number of approximately equal-size areas within the DU. Increment and replicate locations will follow a systematic random pattern. Prior to each sampling event, the locations of each DU will be located using a handheld GPS device rated for sub-meter accuracy. Field markers will be placed to aid in establishing the sampling pattern.

Initial locations within each increment sampling area will be determined in the field using either a random number generator or dice. Each sample will have a minimum field mass of 1,000 grams of material with a particle size of <2mm. Larger rocks and other debris (e.g. metal fragments) will be avoided, if possible. To ensure the minimum sample mass criterion is met, the increment mass will be calculated by dividing 1,000 grams by the

number of increments. The increment volume will then be calculated, considering the typical soil density in each DU and the estimated mass of >2mm particles in the soil, so that the final volume of <2mm material will provide the target mass per increment. The increment mass will not be measured in the field. Rather, a sample device will be chosen to provide equal increment volumes. Increments for each sample will be consolidated in the field in double plastic sample bags.

8.2.2 Discreet Sampling

Discreet samples will be collected to monitor for vertical and lateral contaminant migration, as outlined in Sections 4.3 and 4.5.

Samples to monitor for Goal #3 (vertical migration) will be collected at six evenly-spaced locations within the area of DU1. A hand auger will be used to drill to a depth of approximately 6 feet bgs and a single-tube, hammer-driven sampler will be driven from 6 to 6.5 feet bgs to extract the sample. If boring or sampler refusal is experienced, the boring location will be moved slightly and the boring re-drilled. The sampler will be equipped with 6-inch long x 1.5-inch diameter, re-cleaned, stainless steel sample tubes. The filled sample tubes will be sealed with Teflon sheets, plastic caps and tape, and placed in a plastic bag. The drill hole will be backfilled with hydrated bentonite chips or pellets to prevent potential surface contaminants from entering the hole. If an action level is exceeded, the same methodology will be used to collect a deeper sample as outlined in Section 4.3.

Samples to monitor for Goal #5 (lateral migration via surface water) will be collected at 200 foot intervals as outlined in Section 4.5. The samples will be collected directly at the ground surface using a decontaminated or clean, disposal sampling device. A minimum of 300 grams (~10.5 ounces) of soil from each location will be placed in pre-cleaned glass containers with twist-on, Teflon-lined lids. Large rocks and other debris (e.g. metal fragments) will be avoided, if possible.

8.3 Sample Labelling Procedures

A label will be placed on each sample container. The label will be marked with the sample date and time, the sampler's name, and sample identification number.
As shown below, sample identification numbers will start with "BC" to designate "Burro Canyon", followed by the sample set letter as listed below, and then the sample number.

GOAL	Sample Set	Location	Sample Number

			Identifiers
1) Evaluate OD Operator Health Risks	A	DU1	BC-A-*
1) Evaluate OD Operator Health Risks	B	DU2	BC-B-*
2) Evaluate for HW characteristics in soil	A & B	DU1, DU2	BC-A-* and BC-B-*
3) Evaluate vertical contaminant migration	C	Below DU1	BC-C-*
4) Evaluate contamination from OB pan	D	DU3	BC-D-*
5) Evaluate contaminant migration via surface water	E	Tributary wash and Main wash	BC-D-*
6) Evaluate impact to groundwater	N/A	Well BC1	BC1-*
7) Evaluate wind-borne contaminant migration	F	DU4	BC-F-*
8) Evaluate ecological receptor risk	G	DU5	BC-G-*
9) Review/update HRA	A & B	DU1, DU2	BC-A-* and BC-B-*

A chain of custody form will be completed for laboratory transfer. The form will include facility and sampler information, sample identification numbers, date/time, number of containers per sample, analytical methods requested and any special instructions or notes for the lab. All samples will be packed securely and shipped in coolers, along with ice and chain of custody forms, and maintained at 4°C or less. Samples will be shipped for next-day delivery to the laboratory.

A field log will be maintained that includes the following:

Project identification
Date
Weather conditions
Names of sampling personnel
PPE used
Sample identification number
Sample time

GPS coordinates
General location of sample
Any additional observations
Photographs
Deviations from workplan
Signature

8.4 Sample Analysis

The laboratory will process each ISM sample using EPA Method SW-846, Appendix B. All samples will be pre-sieved using a #10 sieve (<2 mm) and no portion of the samples will be ground.

All analytical work will be performed by a laboratory approved for the specific methods by the State of CA Department of Health Services Environmental Laboratory Accreditation Program. Preservation method, holding time, and minimum detection limits for each method is presented in Appendix B.

Soil samples will be analyzed for the parameters outlined in the following table. Samples will be analyzed by the following methods using standard EPA procedures as outlined in SW-846. Specific parameters required to meet each goal are outlined in Section 4.0.

Parameter	Method
Total CCR Metals (As, Sb, Ba, Be, Cd, Total Cr, Co, Cu, Pb, Mo, Ni, Ag, Tl, V, Zn)	EPA 6010B
Selenium	EPA 6020
Hexavalent Chromium*	EPA 7196
Mercury	EPA 7471B
Aluminum	EPA 6010B
Explosives	EPA 8330B
Perchlorate	EPA 6850
Dioxins	EPA 8290B
Polyaromatic Hydrocarbons	EPA 8027C or EPA 8310
pH	EPA 9045D
TCLP Extraction for Metals	EPA 1311
Waste Extraction Test for Metals	22 CCR

* Conduct only if total chromium exceeds background level. Method will be conducted until background levels for total chromium and/or hexavalent chromium are no longer exceeded.

8.5 Quality Assurance / Quality Control (QA/QC)

8.5.1 Statistical Analysis

A primary objective of QA/QC for the monitoring program is to achieve and demonstrate an acceptable degree of precision in establishing mean analyte concentrations in the areas of interest. For the five DUs in this project, the degree of precision between samples in each DU for all analytical results will be expressed as percent Relative Standard Deviation (RSD). RSD is calculated as follows:

$$RSD = 100\ (s) / x$$

Where:
s = standard deviation
x = sample mean (mean of increment and replicate ISM results)

Calculation of the RSD requires a minimum of three data points.

In addition to the RSD, the 95% UCL will be calculated for all detected analytes from ISM samples where at least three samples per sampling event are collected. The 95% UCL will be used as the best estimate of the analyte concentration mean. Because the soil and physical analyte distribution in all DUs are expected to be relatively

homogenous, thereby exhibiting a uniform data distribution, the Student's-t method will be used to calculate the 95% UCL.

8.5.2 Laboratory QA/QC

For analytical QA/QC, the laboratory will extract and analyze an additional replicate from one of the randomly-selected soil samples from DU1 or DU2 during each sampling event.

One field duplicate will also be collected from both sample set C (vertical definition) and sample set E (lateral definition). Each of these samples will be marked with "Dup" at the end of their sample identification numbers to designate them as duplicates.

Additional laboratory QA/QC information is provided in Appendix C.

9.0 GROUNDWATER SAMPLING PLAN

9.1 Background

The Burro Canyon monitoring well, herein referred to as well BC1, was installed in May 2000 to serve as a hydraulically downgradient compliance point for the OB/OD facility. The well was sampled in 2004 using micro-purge methodology. No work was done using the well for the following ten years. During 2014 and 2015, EMD investigated the integrity of well BC1 using a downhole video log, installed a sanitary seal and concrete slab for surface protection, over-purged the well using a temporarily installed submersible pump and collected a water sample. EMD found the well to be viable and recommended its continued use as a downgradient groundwater compliance point. Results of this recent work is summarized in the 2015 Revised Technical Memorandum (China Lake, 2015) presented in Appendix A.

9.2 Groundwater Sample Collection Procedures

9.2.1 Well Purging Method

A dedicated submersible pump will be installed in well BC1 with the pump intake set approximately midway within the well screen to provide samples that are representative of water across the entire well screen. Based on pump performance observed during well purging in 2014, the dedicated pump is expected to yield 5 to 6 gallons per minute (gpm) continuously throughout the purging process.

To monitor water levels within the well during purging, EMD will install a dedicated pressure transducer when the well is installed. A transducer with an operational life rating of at least 10 years will be selected. During each sampling event, drawdown will be monitored in real-time to confirm the well is not excessively dewatered during purging.

Based on observations summarized in the 2015 Revised Technical Memorandum (China Lake, 2015), well BC1 currently does not require development. If future observations indicate the need to re-develop the well, a workplan proposing a re-development procedure will be submitted to the DTSC for approval.

9.2.2 Well Purge Monitoring

Field measurements to monitor water stabilization during purging will be recorded approximately once every twenty five gallons or less using a flow-cell type, field-parameter analyzer. The water meter will be calibrated per the manufacturer's instructions prior to each sampling event on the day the well is sampled. Measured parameters will include temperature, pH, electrical conductivity (EC), oxidation-reduction potential (ORP) and dissolved oxygen (DO). Purging will be considered complete when field measurements meet the stabilization criteria summarized below, or until five well volumes are purged, whichever occurs first. All purged water will be containerized for characterization to determine the appropriate disposal method.

Stabilization Criteria with References for Water-Quality-Indicator Parameters	Stabilization Criteria
Temperature	± 3% of reading (minimum of ± 0.2° C)
pH	+/- 0.1
specific electrical conductance (SEC)	+/- 3%
oxidation-reduction potential (ORP)	+/- 10 millivolts
dissolved oxygen (DO)	+/- 0.3 milligrams per liter

From Representative Sampling of Groundwater for Hazardous Substances, Guidance Manual for Groundwater Investigations. DTSC, Revised February 2008.

9.2.3 Sampling and Sample Filtration

When the well has been adequately purged, sample containers will be filled directly from the pump discharge outlet. The portion of the sample to be analyzed for metals will be filtered in the field with a disposable 0.45 micron filter prior to filling the sample container. The disposable filter will be kept until sample analysis has been completed to determine an appropriate disposal method for the filter.

9.2.4 Purging and Sampling Data Recording

Groundwater purging and sampling data from each monitoring event will be recorded on a log that will be made available to the DTSC upon request. Applicable portions of the log will be submitted with the monitoring reports. The log will include the following data and/or information:

- Date and time of purging and sample collection
- Initial depth to water and periodic water levels during purging
- Water meter calibration data
- Time purging is started and stopped
- Periodic purge parameter data, including time and volume of water purged
- Final volume of purged water
- Sample identification number
- Names of sampling personnel
- Preservatives used
- Filtering dependent on the laboratory analysis method required
- Weather conditions
- PPE used
- Deviations from the workplan
- Any additional observations
- Sampler's signature

9.2.5 Wastewater Management

Purge water will be collected onsite in appropriate containers (e.g. 55-gallon drums) and marked with labels that state "Pending Analysis." If analyses indicate analyte concentrations are below action levels, purge water will be discharged to the ground. If analyte concentrations are above action levels but below HW criteria (Table 4.0), purge water will be discharged to the domestic sewer system. If concentrations exceed HW criteria, purge water will be treated/disposed as HW at an offsite facility.

9.2.6 Sample Handling

To eliminate cross-contamination between samples, all non-dedicated sampling equipment will be washed with distilled water and detergent, and then rinsed with distilled water. Rinsate will be collected and combined with wastewater generated from purging.

Samples will be collected in sterilized containers provided by the laboratory. Any necessary preservatives for the specific analytical method will be added by the laboratory prior to sampling. Preservation methods, sample volumes and type of container needed for the specific analytical methods are presented in Appendix B.

A label placed on each sample container will include the sample number, date, time, and the sampler's name. All sample containers will be placed in a cooler maintained at 4°C.

A chain of custody form will accompany the samples from the time of collection until delivery to the lab. The form will include facility and sampler information, sample numbers, dates and times of collection, the number of containers per sample, and analytical methods requested. The sample containers will be packed securely in coolers, along with ice and chain of custody forms. Samples will be shipped for next-day delivery to the laboratory.

9.3 Background Samples

No additional background samples will be collected as part of this Monitoring Plan. A sufficient number of samples were collected during the Background Groundwater Study (Tetra Tech EM Inc., 2001).

9.4 Sample Analysis

The groundwater samples will be analyzed by an accredited laboratory for the following parameters:

Parameter	Method
Total CCR Metals (As, Sb, Ba, Be, Cd, Total Cr, Co, Cu, Pb, Mo, Ni, Se, Ag, Tl, V, Zn)	EPA 6010B
Selenium	EPA 6020
Hexavalent Chromium*	EPA 7196
Mercury	EPA 7470B
Aluminum	EPA 6010
Explosives	EPA 8330B
Perchlorate	EPA 6850
Semi-Volatile Organic Compounds	EPA 8270C
Volatile Organic Compounds	EPA 8260B
General Mineral	
Ca, Mg, Na, K	EPA 6010B
pH	EPA 9040B
Chloride, Fluoride, Sulfate, Nitrate	EPA 300.0
Carbonate, Bicarbonate	EPA 310.0
Total Dissolved Solids	SM 2540

* Conduct only if total chromium exceeds background level. Method will be conducted only when the background level for total chromium and/or hexavalent chromium are exceeded.

Holding times and minimum detection limits for each method are presented in Appendix B.

9.5 Laboratory QA/QC

For QA/QC purposes, a trip blank provided by the laboratory will be analyzed only by EPA Method 8260 (Volatile Organics) along with each groundwater sample set.

10.0 OD-RELATED DATA

The following information will be recorded for each OD event. This data will be maintained under the appropriate event tab in the Operation Record binder. Each binder consists of one calendar year of events. This data will also be included in Monitoring Reports, as described in Section 11.0, and be available to regulatory inspectors.

- Event number with corresponding date;

- Explosive weight for the event. This weight includes the explosive weight of donor material but excludes the weight of the non-energetic component of the waste items (e.g. cardboard box);
- Horizontal coordinates of each OD crater using a global positioning system (GPS) device with sub-meter horizontal accuracy. Figures related to this data are listed in Section 11.0;
- Depth and horizontal dimensions of each OD crater. If the crater shape is oblong, the shortest and the longest diameters will be measured. Depths will be measured from the bottom of the crater to the ground surface. Soil that is pushed up along the edges of the crater to form a berm will not be included in the depth; and,
- One or two photographs of the crater.

11.0 MONITORING REPORT

All Monitoring Reports will be submitted to DTSC for review. Reports shall be submitted twice per year for the first two years of implementation and then once annually thereafter. At a minimum, each report will contain the following information:

- A description of monitoring activities. Note that deviations in monitoring activities presented in this Monitoring Plan are not allowed without prior DTSC approval or modification to the hazardous waste facility permit;
- A summary of analytical results in tabular form;
- A copy of all laboratory reports;
- Interpretations of analytical results and/or discussion with regard to each goal;
- A determination of whether action levels are met for each goal;
- A summary of planned mitigation actions for each goal, if needed;
- OD-related data collected as described in Section 10.0, along with a figure showing the locations of all OD craters from the previous year and a second figure showing all crater locations since collection of the crater location data; and
- Certification (signature and stamp) by CA Professional Engineer or Geologist, as required by Title 22, CA Code of Regulations, Section 66264.97(e)(1).

12.0 SCHEDULE

Within 30 days after approval of this workplan, EMD will order sampling and well supplies and begin scheduling installation of the dedicated submersible pump and

pressure transducer in well BC1. In order to monitor soil and groundwater on the same schedule, field activities for both will be scheduled to commence soon after the well pump is installed and functional. It is expected that sampling activities will begin within 120 days after approval of this document by the DTSC. The monitoring reports will be submitted to the DTSC within 60 days following each monitoring event. In case DTSC wishes to monitor the field activities, DTSC will be notified two weeks prior to the sampling events by the project coordinator.

13.0 REFERENCES

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TABLES

TABLE 1.0 - Summary of Monitoring Plan Goals

Goal	Location	# of Samples	Frequency	Parameters	Action Levels	Mitigation (in sequential order)
1) Health Risk to OD Operators	DU1 and DU2 (Figure 7.0) 0 to 3 inches	In each DU, 3 ISM samples consisting of a minimum of 30 increments Plus 1 lab duplicate	Standard Sampling Frequency (SSF) = 2X per year for 2 years, then 1X annually for 3 years, then 1X every 2 years	Section 8.4, excluding TCLP & WET	Industrial RSLs (Tables 2.0 & 3.0)	- If 95% UCL of any analyte exceeds action level for 2 consecutive sampling events, do limited HRA - Workplan to mitigate worker exposure
2) HW Characteristics	Same as Goal #1	Use Goal #1 samples	Use Goal #1 samples	Section 8.4 Do TCLP & WET metals, if needed Exclude perchlorate	HW regulatory levels (Table 4.0)	- If 95% UCL of any analyte exceeds action level for 2 consecutive sampling events, do workplan
3) Vertical Contaminant Migration	Spaced evenly w/in DU1 (Figure 7.0) 6 to 6.5 feet bgs	6 discreet samples Plus 1 field duplicate	SSF if action level not exceeded If action level exceeded, 6 month intervals until exceedance addressed	Section 8.4	- Metals – 1998 Study with 2 to 10 foot data set (Table 8.0) - Perchlorate – 2003 Study background data set (Table 8.0) - Explosives, PAHs, Dioxins – Industrial RSLs (Tables 2.0 & 3.0)	- 3 additional samples at 6 to 6.5 feet bgs around the location of exceedance & one at 10 to 10.5 feet bgs as close as practical to the location of exceedance - Action levels exceeded in followup samples, do action plan
4) Burn Pan	DU3 (10 feet in all directions from burn pan) (Figure 7.0) 0 to 6 inches	3 ISM samples consisting of a minimum of 30 increments each	One initial after approval of this Plan Then after each future use coincided with SSF	Section 8.4	Same as Goals #1 & #2	Same as Goals #1 & #2
5) Migration via Surface Water	Outside OD unit; Main wash & tributary wash (Figure 8.0)	- Main Wash - 4 discreet samples at 250 foot intervals - Tributary Wash – 1 sample - Field Duplicate – 1 sample	Annually	Section 8.4	Not concentration-based From 3 or more sample events, graph concentration-vs-distance and log-normal concentration-vs-time Increase trend if best-fit line on concentration-vs-time graph has positive slope	- 3 or more events indicate contaminant migrating, do action plan
6) Groundwater	Well BC-1 (Figure 8.0)	1 sample	SSF	Section 9.4	2015 Sampling Event (Table 5.0); See Section 5.2	- If 2 consecutive samples exceeded, do action plan

7) Wind-blown dust	DU4 (Figure 7.0) Ground Surface	3 ISM samples consisting of a minimum of 30 increments each	SSF	Section 8.4	Use Goal #3, but for metals use 1998 data set at 0 to 2 feet	- If 2 consecutive samples exceeded, do action plan
8) Ecological Receptors	DU5 (Figure 7.0) Ground Surface	3 ISM samples consisting of a minimum of 30 increments each	SSF	Cd, Cr (total), Hexavalent Cr, Cu, Pb, Hg, Zn and perchlorate from 2014 ERA Validation Study	95% UCL of 2014 ERA Validation Study at OD Area (Table 6)	- Do action plan
9) Five Year Review of HRA	Same as Goal #1	Use Goal #1 samples	Use Goal #1 samples	Section 8.4	Average soil sample results from 2007/2014 HRA (Table 7.0)	- If 95% UCL of analytes exceed action levels, at the 5 year mark evaluate HRA for changes to treatment quantities

TABLE 2.0 - Regional Screening Levels (Nov 2015) for Soil

ANALYTES	Residential	Industrial
METALS		
Aluminum	77,000	1,100,000
Antimony	31	470
Arsenic	0.68	3.0
Barium	15,000	220,000
Beryllium	160	2300
Cadmium	71	980
Total Chromium	210	450
Hexavalent Chromium	0.3	6.3
Cobalt	23	350
Copper	3100	47,000
Lead	400	800
Mercury	11	46
Molybdenum	390	5800
Nickel	840	12,000
Selenium	390	5800
Silver	390	5800
Thallium	0.78	12
Vanadium	390	5800
Zinc	23,000	350,000
ORGANICS		
Perchlorate	5.5	820
EXPLOSIVES		
HMX	3900	57,000
RDX	6.1	28
1,3,5-Trinitrobenzene	2200	32,000
1,3-Dinitrobenzene	6.3	82
Tetryl	-	-
Nitrobenzene	5.1	2.2
4-Amino-2,6-dinitrotoluene	-	-
2-Amino-4,6-dinitrotoluene	-	-
2,4,6-Trinitrotoluene	16	57
2,6-Dinitrotoluene	0.36	1.5
2,4-Dinitrotoluene	1.7	7.4
m-2-Nitrotoluene	6.3	82
o-4-Nitrotoluene	3.2	15
p-3-Nitrotoluene	34	140
DIOXINS/FURANS		
2,3,7,8-TCDD	.0000048	.000022

All Units = mg/Kg

TABLE 3.0 - Toxicity Equivalence Quotients for Dioxins/Furans Isomers in Soil

DIOXINS/FURANS (ug/Kg)	Toxicity Equivalence Factor	Toxicity Equivalence Quotient *	
		Residential PRG	Industrial PRG
2,3,7,8-TCDD	1	4.80E-06	2.20E-05
1,2,3,7,8-PeCDD	0.5	2.40E-06	1.10E-05
1,2,3,4,7,8-HxCDD	0.1	4.80E-07	2.20E-06
1,2,3,6,7,8-HxCDD	0.1	4.80E-07	2.20E-06
1,2,3,7,8,9-HxCDD	0.1	4.80E-07	2.20E-06
1,2,3,4,6,7,8-HpCDD	0.01	4.80E-08	2.20E-07
OCDD	0.001	4.80E-09	2.20E-08
2,3,7,8-TCDF	0.1	4.80E-07	2.20E-06
1,2,3,7,8-PeCDF	0.05	2.40E-07	1.10E-06
2,3,4,7,8-PeCDF	0.5	2.40E-06	1.10E-05
1,2,3,4,7,8-HxCDF	0.1	4.80E-07	2.20E-06
1,2,3,6,7,8-HxCDF	0.1	4.80E-07	2.20E-06
1,2,3,7,8,9-HxCDF	0.1	4.80E-07	2.20E-06
2,3,4,6,7,8-HxCDF	0.1	4.80E-07	2.20E-06
1,2,3,4,6,7,8-HpCDF	0.01	4.80E-08	2.20E-07
1,2,3,4,7,8,9-HpCDF	0.01	4.80E-08	2.20E-07
OCDF	0.001	4.80E-09	2.20E-08

All Units = mg/Kg

*** RSL for 2,3,7,8-TCDD x TEF = TEQ**

TABLE 4.0 - Hazardous Waste Regulatory Thresholds & Criteria

Total & Leachable Metals

CCR METAL	CA-Only TTLC (Total) mg/kg	CA-Only STLC (WET) mg/L	RCRA Leachable (TCLP) mg/L
Antimony (Sb)	500	15	-
Arsenic (Ar)	500	5.0	5.0
Barium (Ba)	10,000	100	100
Beryllium (Be)	75	0.75	-
Cadmium (Cd)	100	1.0	1.0
Total Chromium (Cr) 1:6 VI:III	2500	560	5
Chromium (VI)(Cr)	500	5	-
Cobalt (Co)	8000	80	-
Copper (Cu)	2500	25	-
Lead (Pb)	1000	5.0	5.0
Mercury (Hg)	20	0.2	0.2
Molybdenum (Mo)	3500	350	-
Nickel (Ni)	2000	20	-
Selenium (Se)	100	1.0	1.0
Silver (Ag)	500	5	5.0
Thallium (Tl)	700	7.0	-
Vanadium (V)	2400	24	-
Zinc (Zn)	5000	250	-

Other Criteria

Parameter	Regulatory Level
Nitroaromatic Explosives	Nothing specific for “reactivity” characteristic; 10% or more explosives in soil is considered “explosive”[a]
Dioxins/Furans 2,3,7,8-TCDD	CA-Only TTLC = 0.01 mg/kg CA-Only STLC = 0.001 mg/L
Perchlorate	Nothing Specific
2,4-Dinitrotoluene	TCLP = 0.13 mg/L
Nitrobenzene	TCLP = 2.0 mg/L

[a]Army, 1987. “Testing to Determine Relationship Between Explosive-Contaminated Sludge Components and Reactivity.” U.S. Army Toxic and Hazardous Materials Agency. January 1987.

TABLE 5.0 - Groundwater Action Levels

Sample Name: Well BC-1 **Sample Date: 6 Jan 2015**

Parameter	Concentration (mg/L)
Total Dissolved Solids	525*
Carbonate Alkalinity	<5*
Bicarbonate Alkalinity	69.9*
Chloride	172*
Fluoride	0.324*
Nitrate-N	0.912
Sulfate	83*
Volatile Organic Compounds	Toluene .0014 J All others: ND
Semi-Volatile Organic Compounds	ND
Explosives	ND
Perchlorate	0.000199
Hexavalent Chromium	<0.01*
Mercury	<0.0005
Aluminum	<0.200
Antimony	<0.100
Arsenic	0.00630 J
Barium	0.0774
Beryllium	<0.01
Cadmium	<0.01
Total Chromium	<0.01
Cobalt	<0.01
Copper	<0.01
Lead	<0.01
Molybdenum	0.0605
Nickel	<0.01
Selenium	<0.01
Silver	<0.01
Thallium	<0.01
Vanadium	0.0150
Zinc	0.0123 J
Calcium	63.5
Magnesium	<0.0100
Manganese	10.8
Potassium	7.05
Sodium	86.7
pH	7.88 (unitless)

* = Sample was received out of EPA's recommended temperature range
ND = No analytes detected
J = Analyte positively identified with the result less than the reporting limit but greater than the method detection limit; concentration is estimated
mg/L = milligrams per liter

SOURCE: "Revised Technical Memorandum, Burro Canyon Monitoring Well, Naval Air Weapons Station, China Lake, CA",. (Environmental Management Division, February 17, 2015)

TABLE 6.0 –Summary Statistics for Analytes from the 2014 Ecological Risk Assessment

Chemicals of Potential Ecological Concern	# of Samples	# of Hits	Frequency of Detection (%)	Minimum Detection Limit (mg/kg)	Maximum Detection Limit (mg/kg)	Minimum Detected Concentration (mg/kg)	Maximum Detected Concentration (mg/kg)	Mean Concentration (mg/kg)	Standard Deviation (mg/kg)	95% UCL (mg/kg)
Cadmium	59	32	54.24	0.10	0.6	0.15	4.6	0.861	1.10	1.11
Chromium (Total)	59	59	100	NA	NA	4.6	31.9	10.2	5.52	11.4
Hexavalent Cr	34	8	23.53	0.08	0.2	0.09	1	0.140	0.157	0.19
Copper	59	59	100	NA	NA	9.9	360	56.4	68.3	95.2
Lead	59	59	100	NA	NA	1.7	225	16.1	33.8	43.6
Mercury	59	25	42.4	0.0082	0.06	0.0092	0.09	0.0156	0.0165	0.0193
Perchlorate	26	24	92.31	0.009	0.009	0.019	288	35.3	61.3	88.9
Zinc	59	59	100	NA	NA	10.4	180	34.2	30.8	51.7

NA = Not Available
Mean and Standard Deviation calculated Kaplan-Meier (KM) Method for analytes with non-detects
mg/kg = milligrams per kilogram
UCL – 95% upper confidence limit on the mean

Source: “Ecological Risk Assessment Report Burro Canyon Treatment Facility OBOD Units, Naval Air Weapons Station, China Lake, CA.” (URS. March 2014), Table 4-1 (Combination of analytical results from the 1998 ERA soil samples, along with the 2003 soil sampling event in the OD area and the wash)

TABLE 7.0 – Soil Analytical Results Used in the 2007 / 2014 OB/OD Facility Health Risk Assessment

Chemical of Concern	CAS Number	Average Concentration
METALS		
Aluminum	7429905	5416
Antimony	7440360	1.4
Arsenic	7440382	2.3
Barium	7440393	87.8
Beryllium	7440417	0.20
Cadmium	7440439	1.15
Chromium III	16065831	11.9
Chromium (hex.)	18540299	0.08
Cobalt	7440484	4.47
Copper	7440508	72.1
Lead	7439921	31.0
Mercury	7439976	0.02
Molybdenum	7439987	1.15
Nickel and chemicals	7440020	8.72
Selenium	7782492	1.65
Thallium and chemicals	7446186	11.0
Vanadium and chemicals	7440622	29.7
Zinc	7440666	40.0
INORGANICS		
Perchlorate	7601903	45.5
DIOXINS/FURANS		
Tetrachlorodibenzo-p-Dioxin, 2,3,7,8-	1746016	0.00E+00
Pentachlorodibenzo-p-Dioxin, 1,2,3,7,8-	40321764	0.00E+00
Hexachlorodibenzo-p-Dioxin, 1,2,3,4,7,8-	39227286	0.00E+00
Hexachlorodibenzo-p-Dioxin, 1,2,3,6,7,8-	57653857	0.00E+00
Hexachlorodibenzo-p-Dioxin, 1,2,3,7,8,9-	19408743	0.00E+00
Heptachlorodibenzo-p-Dioxin, 1,2,3,4,6,7,8-	35822469	3.93E-06
Octachlorodibenzo-p-Dioxin, 1,2,3,4,6,7,8,9-	3268879	3.44E-05
Tetrachlorodibenzofuran, 2,3,7,8-	51207319	0.00E+00
Pentachlorodibenzofuran, 1,2,3,7,8-	57117416	0.00E+00
Pentachlorodibenzofuran, 2,3,4,7,8-	57117314	0.00E+00
Hexachlorodibenzofuran, 1,2,3,4,7,8-	70648269	1.01E-06
Hexachlorodibenzofuran, 1,2,3,6,7,8-	57117449	0.00E+00
Hexachlorodibenzofuran, 1,2,3,7,8,9-	72918219	0.00E+00
Hexachlorodibenzofuran, 2,3,4,6,7,8-	60851345	0.00E+00
Heptachlorodibenzofuran, 1,2,3,4,6,7,8-	67562394	3.06E-06
Heptachlorodibenzofuran, 1,2,3,4,7,8,9-	55673897	0.00E+00
Octachlorodibenzofuran, 1,2,3,4,6,7,8,9-	39001020	4.62E-06
Total TCDD	1746016	0.00E+00

TABLE 7.0 – Soil Analytical Results Used in the 2007 / 2014 OB/OD Facility Health Risk Assessment (Continued)

Chemical of Concern	CAS Number	Average Concentration
Total PeCDD	40321764	0.00E+00
Total HxCDD	19408743	0.00E+00
Total HpCDD	35822469	5.43E-06
Total TCDF	51207319	1.66E-06
Total PeCDF	57117314	0.00E+00
Total HxCDF	57117449	1.14E-06
Total HpCDF	67562394	3.04E-06
EXPLOSIVES		
Cyclotetramethylene Tetranitramine (HMX)	2691410	0.79
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	121824	2.15
Trinitrobenzene, 1,3,5-	99354	0.25
Dinitrobenzene, 1,3-	99650	0.03
Tetranitro-N-methylaniline, N,2,4,6-	479458	0.12
Nitrobenzene	98953	0.04
4-Amino-2,6-dinitrotoluene[3]	19406510	0.07
2-Amino-4,6-dinitrotoluene[3]	35572782	0.13
Trinitrotoluene, 2,4,6- (TNT)	118967	0.67
Dinitrotoluene, 2,6-	606202	0.06
Dinitrotoluene, 2,4-	121142	0.04
Nitrotoluene, o-	88722	0.06
Nitrotoluene, p-	99990	0.08
Nitrotoluene, m-	99081	0.08

Note that soil concentration data was used for crater, grading, and wind erosion emission calculations. Emission rates are then derived using the PM_{10} emission factor appropriate to the emission category.

Average Concentrations calculated from all values (including those values with any qualifier) and ½ detection limit.

Average Concentration units are mg/kg

Source: Table 2.0 (OD Impact Area) of China Lake, "Soil Investigation Report for the Sixth Site Investigation (Soil Only) at the Burro Canyon OB/OD Facility," October 2003.

TABLE 8.0 – Background Soil Analytical Results

METALS

Metal Analyte	0 - 2 Feet		2 - 10 Feet	
	Mean	Standard Deviation	Mean	Standard Deviation
Aluminum	6470	976	6290	1200
Antimony	NA	NA	NA	NA
Arsenic	2.4	0.6	2.5	0.5
Barium	91	12	94	16
Beryllium	NA	NA	NA	NA
Cadmium	NA	NA	NA	NA
Calcium	4060	5730	3990	1790
Chromium (Total)	8.2	3.0	7.9	2.4
Hexavalent Chromium	1.2*	-	1.1*	-
Cobalt	5.8	0.6	6.0	1.1
Copper	11.7	3.2	11.3	4.1
Iron	12930	2660	12320	2480
Lead	3.7	0.92	3.3	1.3
Magnesium	3470	387	3460	540
Manganese	262	63	264	89
Mercury	NA	NA	NA	NA
Molybdenum	NA	NA	NA	NA
Nickel	5.8	1.88	5.0	1.0
Potassium	1900	332	1900	386
Selenium	NA	NA	NA	NA
Silver	NA	NA	NA	NA
Sodium	NA	NA	NA	NA
Thallium	NA	NA	NA	NA
Vanadium	27.6	6.9	27.4	5.3
Zinc	24.6	4.1	24.2	5.4

*Calculated concentration from 7:1 ratio of total Cr to Hex Cr
All units are mg/Kg
NA = Not Analyzed
Alluvial Fan Deposit Samples Used

Source: "Geochemical Characterization Technical Memorandum; NAWS China Lake; Draft Final; Tetra Tech EM Inc; 1998

TABLE 8.0 – Background Soil Analytical Results (Continued)

METALS

Analyte	BC-1	BC-2	BC-3	BC-4	Mean
Antimony	<10.0	<10.0	<10.0	<10.0	<10.0
Arsenic	<5.0	<5.0	<5.0	<5.0	<5.0
Barium	44.0	41.0	51.5	38.9	43.85
Beryllium	<1.0	<1.0	<1.0	<1.0	<1.0
Cadmium	1.2	1.0	1.2	1.2	1.15
Chromium (Total)	3.1	3.2	3.2	3.6	3.28
Cobalt	1.8	1.7	2.0	1.5	1.75
Copper	9.1	9.0	9.4	8.8	9.08
Lead	<5.0	<5.0	<5.0	<5.0	<5.0
Mercury	<2.0	<2.0	<2.0	<2.0	<2.0
Molybdenum	<10.0	<10.0	<10.0	<10.0	<10.0
Nickel	2.8	3.1	3.2	2.9	3.0
Selenium	<5.0	<5.0	<5.0	<5.0	<5.0
Silver	<1.0	<1.0	<1.0	<1.0	<1.0
Thallium	<10.0	<10.0	<10.0	<10.0	<10.0
Vanadium	9.5	8.8	9.7	9.0	9.25
Zinc	15.3	17.0	17.6	24.5	18.6

Source: Table 10.0 (1996 Samples) of China Lake "Site Investigation Report for the Sixth Site Investigation (Soil Only) at the Burro Canyon OB/OD Facility," October 2003

PERCHLORATE

Sample ID #	Result
OD-BG-1	0.020B
OD-BG-2	0.027B
OD-BG-2LD	<0.009
OD-BG-3	<0.009
OD-BG-4	<0.009
OD-BG-5	<0.009
OD-BG-6	<0.009
OD-BG-7	<0.009
OD-BG-8	<0.009
OD-BG-9	<0.009
OD-BG-10A	<0.009
OD-BG-10B	<0.009

All units are mg/Kg
"B" Data Qualifier = The analyte was found in the associated method blank at a level that is significant relative to the sample result.

Source: Table 4.0 (Background Area) of China Lake "Site Investigation Report for the Sixth Site Investigation (Soil Only) at the Burro Canyon OB/OD Facility," October 2003.

TABLE 9.0 –Summary Statistics for Background Groundwater Analytical Results

Analyte	N	Det	ND	% Det	Arithmetic Mean [a]	SD	Geometric Mean [a]	Min. Reported Value [b]	Max. Reported Value [b]	95 UCL [c]	Median [d]	Population Distribution [e]
Aluminum	79	9	70	11.4%	NA	NA	NA	26 UJ	2,950	NA	NA	NA
Antimony	80	5	75	6.3%	NA	NA	NA	2.1 U	3.2 J	NA	NA	NA
Arsenic	80	64	16	80.0%	33.5	65.0	12.5	1.7 U	405	45.6	8.6	Unknown
Barium	80	75	5	93.8%	32	42	17.2	0.5 UJ	224	40.0	22.9	Unknown [f]
Beryllium	80	0	80	0.0%	NA	NA	NA	0.2 U	0.6 UJ	NA	NA	NA
Boron	80	80	0	100.0%	2,605	3,845	1,086	182	16,400	3,319	1,145	Unknown [f]
Cadmium	80	2	78	2.5%	NA	NA	NA	0.2 U	0.5 U	NA	NA	NA
Calcium	80	80	0	100.0%	75,120	120,558	36,937	1,010 J	598,000	97,554	35,500	Unknown [f]
Chromium	80	30	50	37.5%	NA	NA	NA	0.4 U	7.6 J	NA	NA	NA
Cobalt	79	3	76	3.8%	NA	NA	NA	0.3 U	1.4 J	NA	NA	NA
Copper	79	11	68	13.9%	NA	NA	NA	0.8 U	6.0 UJ	NA	NA	NA
Iron	79	26	53	32.9%	NA	NA	NA	9.6 U	3,850	NA	NA	NA
Lead	80	8	72	10.0%	NA	NA	NA	0.9 U	7.7	NA	NA	NA
Magnesium	80	77	3	96.3%	20,827	32,594	10,132	173 UJ	164,0001	26,892	12,400	Unknown
Manganese	79	41	38	51.9%	15	23	4.5	0.4 U	111	20.2	4.6	Unknown [f]
Mercury	80	2	78	2.5%	NA	NA	NA	0.10 U	0.17 J	NA	NA	NA
Molybdenum	80	63	17	78.8%	56.21	107.75	28.4	0.6 U	526	76.3	19.6	Unknown
Nickel	79	31	48	39.2%	NA	NA	NA	0.6 U	11.3 B	NA	NA	NA
Potassium	80	80	0	100.0%	15,389	12,360	11,860	2,210 J	51,100 J	17,688	10,100	Unknown
Selenium	65	15	50	23.1%	NA	NA	NA	2.1 UJ	9.2 J	NA	NA	NA
Silicon	80	80	0	100.0%	23,581	5,187	22,978	11,800 J	36,800	24,546	23,250	Normal
Silver	80	1	79	1.3%	NA	NA	NA	0.4 U	1.3 UJ	NA	NA	NA
Sodium	80	80	0	100.0%	223,214	391,794	120,467	36,000	1,950,000	296,120	122,000	Unknown
Thallium	80	0	80	0.0%	NA	NA	NA	1 U	5 UJ	NA	NA	NA
Vanadium	79	46	33	58.2%	7.0	8.4	3.3	0.6 U	52.5	8.5	4.7	Unknown [f]
Zinc	79	3	76	3.8%	NA	NA	NA	0.9 UJ	77.6	NA	NA	NA
Alkalinity as CaCO3	80	80	0	100.0%	246	276	195.3	71.1	1,560	298	181	Unknown
Alkalinity [f] as HCO3-	80	80	0	100.0%	300	337	238.1	87	1,902	363	220	Unknown
Bromide	75	60	15	80.0%	1.8	3.0	0.6	0.1 U	20 J	2.3	0.3	Unknown [s]
Chloride	80	80	0	100.0%	246	423	101.0	23.8	1,800	324	75.1	Unknown
Fluoride	76	55	21	72.4%	1.5	2.31	1.0	0.4	20 J	2.0	1.0	Unknown [s]
Nitrate	78	37	41	47.4%	NA	NA	NA	0.1 U	10	NA	NA	Unknown [s]
Nitrite	80	0	80	0.0%	NA	NA	NA	0.1 U	50 U	NA	NA	NA
Phosphate	80	2	78	2.5%	NA	NA	NA	0.1U	100U	NA	NA	NA
Sulfate	80	78	2	97.5%	229	431	88.6	0.20	2200J	310	112	Unknown
Sulfide	80	19	61	23.8%	NA	NA	NA	1.0 U	11.1	NA	NA	NA
Total Dissolved Solids	80	80	0	100.0%	1,029	1,134	699.6	250	5,000	1,240	570	Unknown
Total Suspended Solids	79	21	58	26.6%	NA	NA	NA	4.0 U	62	NA	NA	NA

“Notes” included on next page.

TABLE 9.0 –Summary Statistics for Background Groundwater Analytical Results (Continued)

Analyte	N	Det	ND	% Det	Arithmetic Mean [a]	SD	Geometric Mean [a]	Minimum Reported Value [b]	Maximum Reported Value [b]	95 UCL [c]	Median [d]	Population Distribution [e]
Alkalinity as CaCO3	80	80	0	100.0%	246	276	195.3	71.1	1,560	298	181	Unknown
Alkalinity [f] as HCO3-	80	80	0	100.0%	300	337	238.1	87	1,902	363	220	Unknown
Bromide	75	60	15	80.0%	1.8	3.0	0.6	0.1 U	20 J	2.3	0.3	Unknown [s]
Chloride	80	80	0	100.0%	246	423	101.0	23.8	1,800	324	75.1	Unknown
Fluoride	76	55	21	72.4%	1.5	2.31	1.0	0.4	20 J	2.0	1.0	Unknown [s]
Nitrate	78	37	41	47.4%	NA	NA	NA	0.1 U	10	NA	NA	Unknown [s]
Nitrite	80	0	80	0.0%	NA	NA	NA	0.1 U	50 U	NA	NA	NA
Phosphate	80	2	78	2.5%	NA	NA	NA	0.1U	100U	NA	NA	NA
Sulfate	80	78	2	97.5%	229	431	88.6	0.20	2200J	310	112	Unknown
Sulfide	80	19	61	23.8%	NA	NA	NA	1.0 U	11.1	NA	NA	NA
Total Dissolved Solids	80	80	0	100.0%	1,029	1,134	699.6	250	5,000	1,240	570	Unknown
Total Suspended Solids	79	21	58	26.6%	NA	NA	NA	4.0 U	62	NA	NA	NA

Notes:

All concentrations are in µg/l

[a] No value presented for metals with less than 50 percent detection rate.

[b] Data qualifiers are defined as follows: U = Non-detected and the associated value is the method reporting limit, J = Estimated value and B = Reported value is between instrument detection limit and the method reporting limit.

[c] One-sided 95 percent upper confidence limit (UCL) on the arithmetic mean.

[d] 50th percentile of data; calculated using one-half the result as a replacement value for non-detected values.

[e] Based on Shapiro-Wilk tests.

[f] Analyte fails Shapiro-Wilk tests for normality and lognormality; however, data set visually approximates a lognormal distribution.

µg/L	Micrograms per liter
% Det	Detection rate as a percentage
Det	Number of detections
N	Total number of samples collected and analyzed for the constituent
NA	Not applicable due to low rate of detection
ND	Number of non-detections
SD	Standard deviation of untransformed data

Source: "Background Groundwater Chemistry Study Report, Naval Air Weapons Station, China Lake, CA." (Tetra Tech EMI, Inc. September 2001)

FIGURES

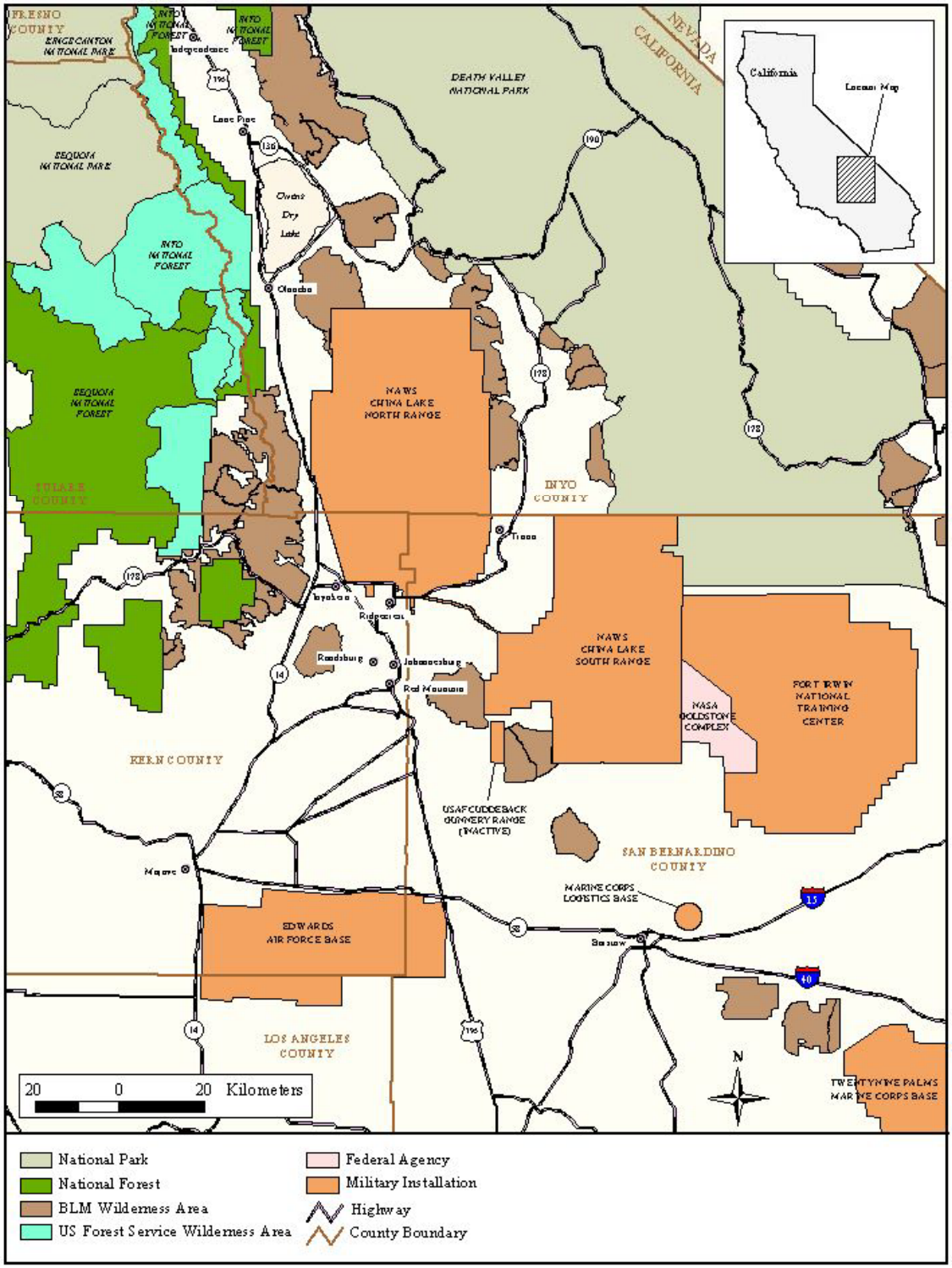

FIGURE 1.0. Site Location Map

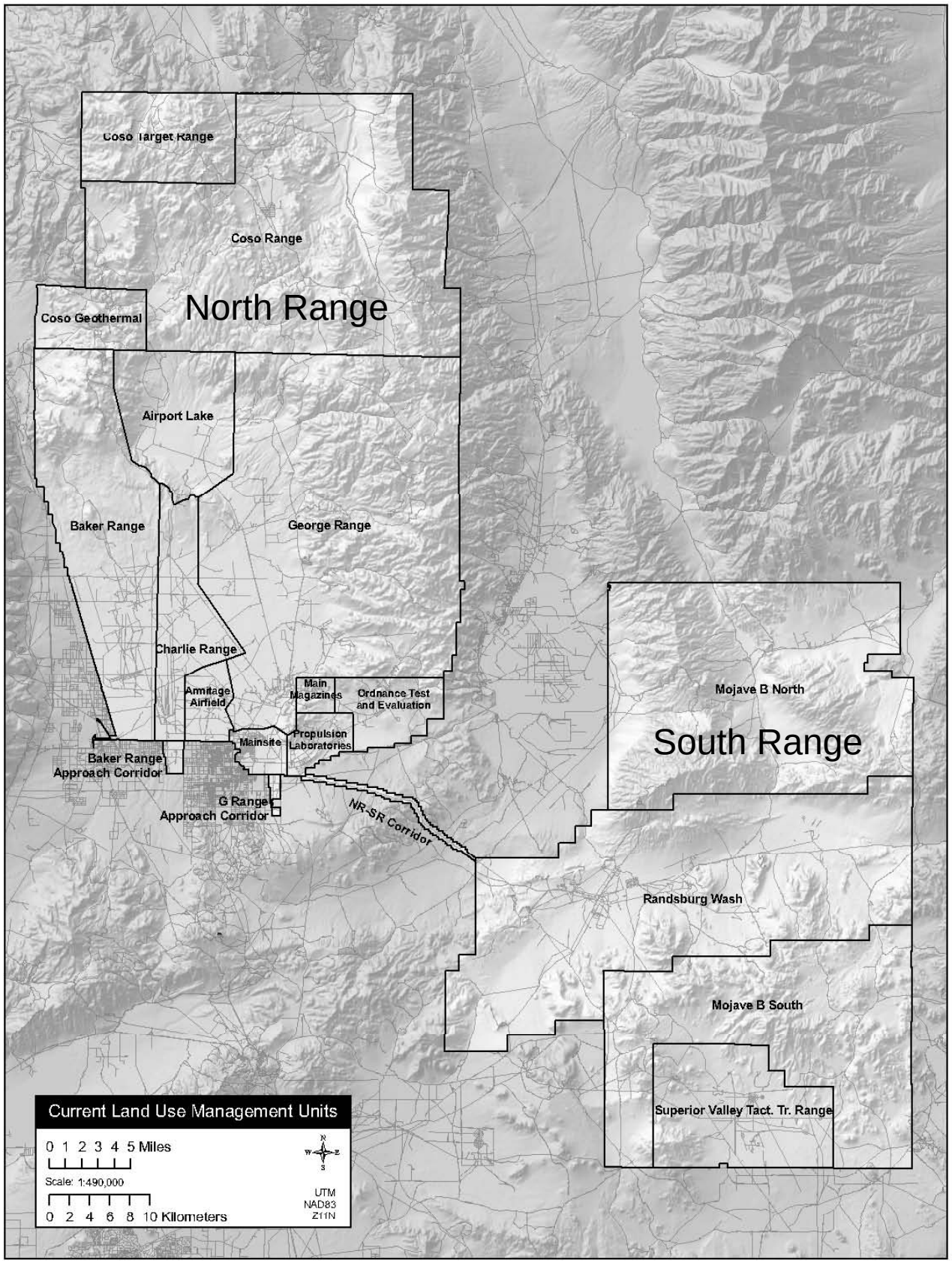

FIGURE 2.0. China Lake North & South Ranges

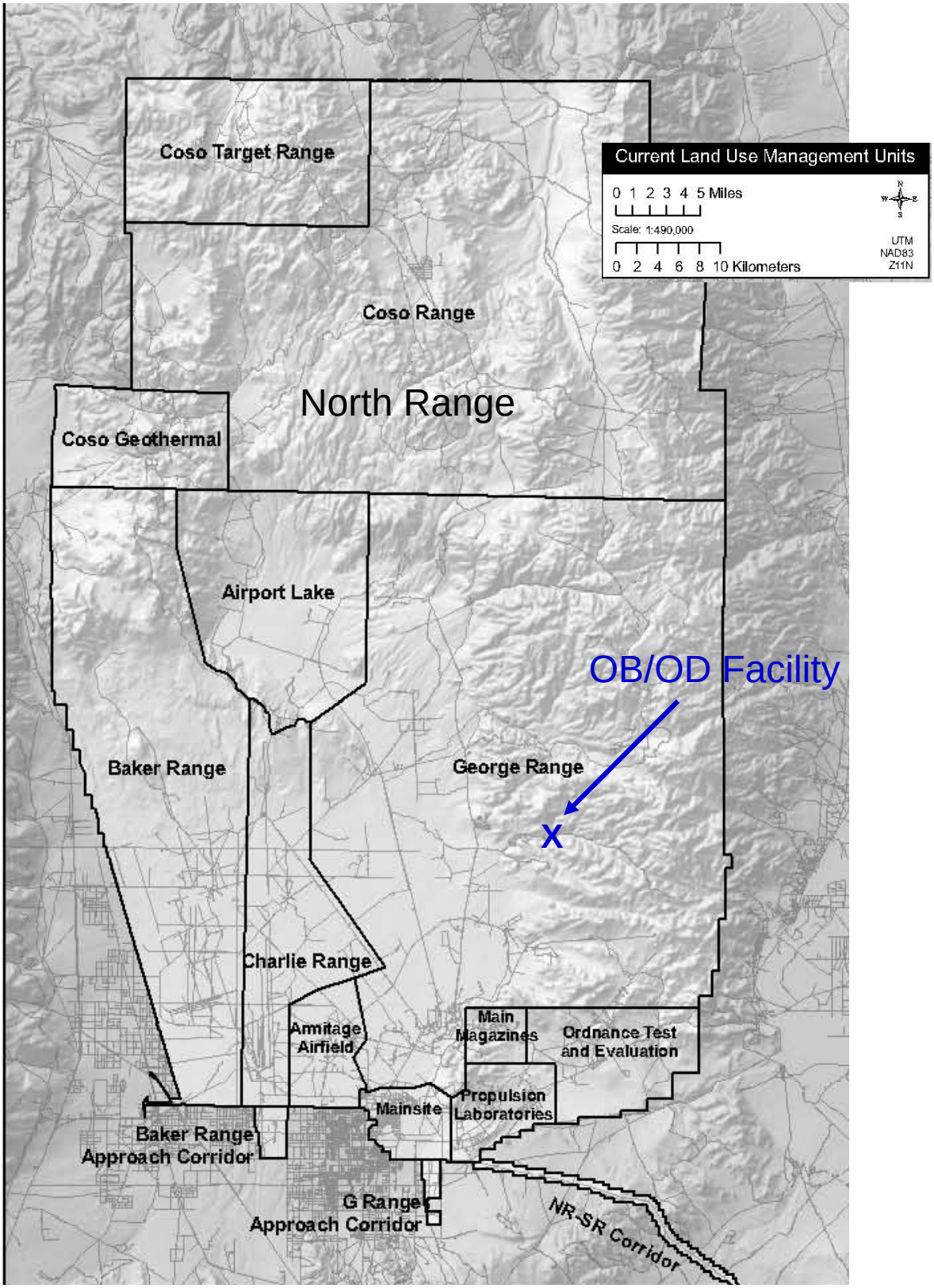

FIGURE 3.0. Location of OB/OD Facility

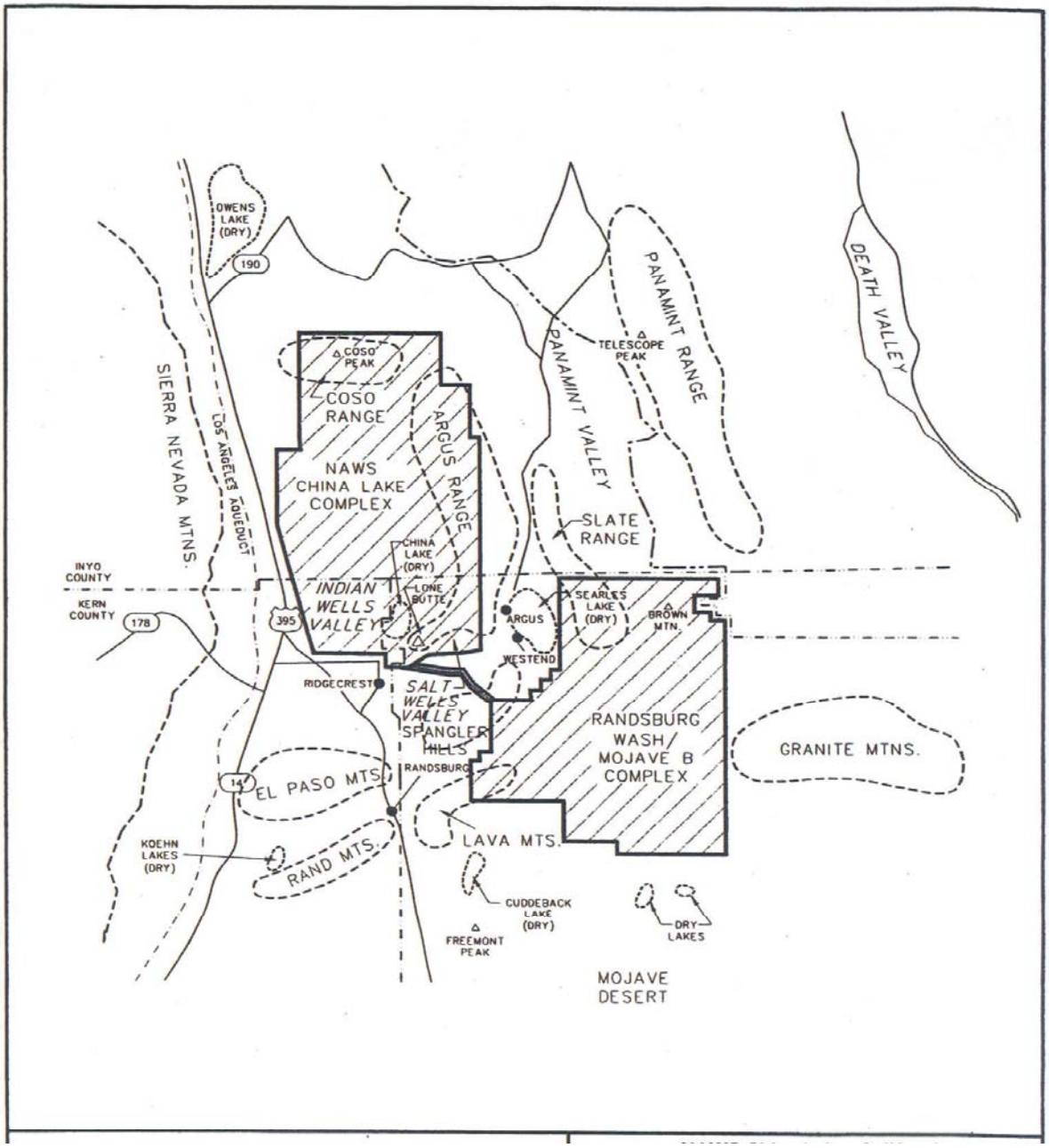

FIGURE 4.0. Physiographic Features of China Lake

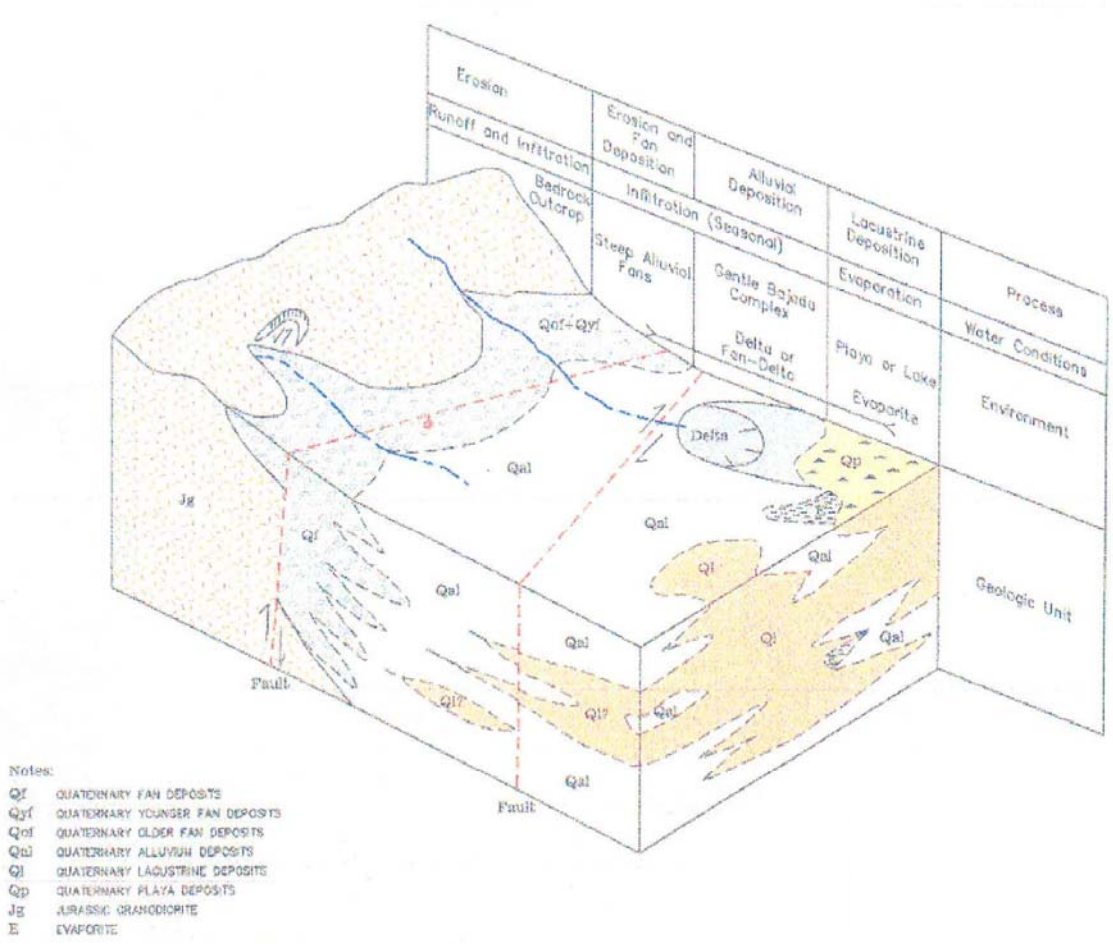

FIGURE 5.0. Conceptual Depositional Environments

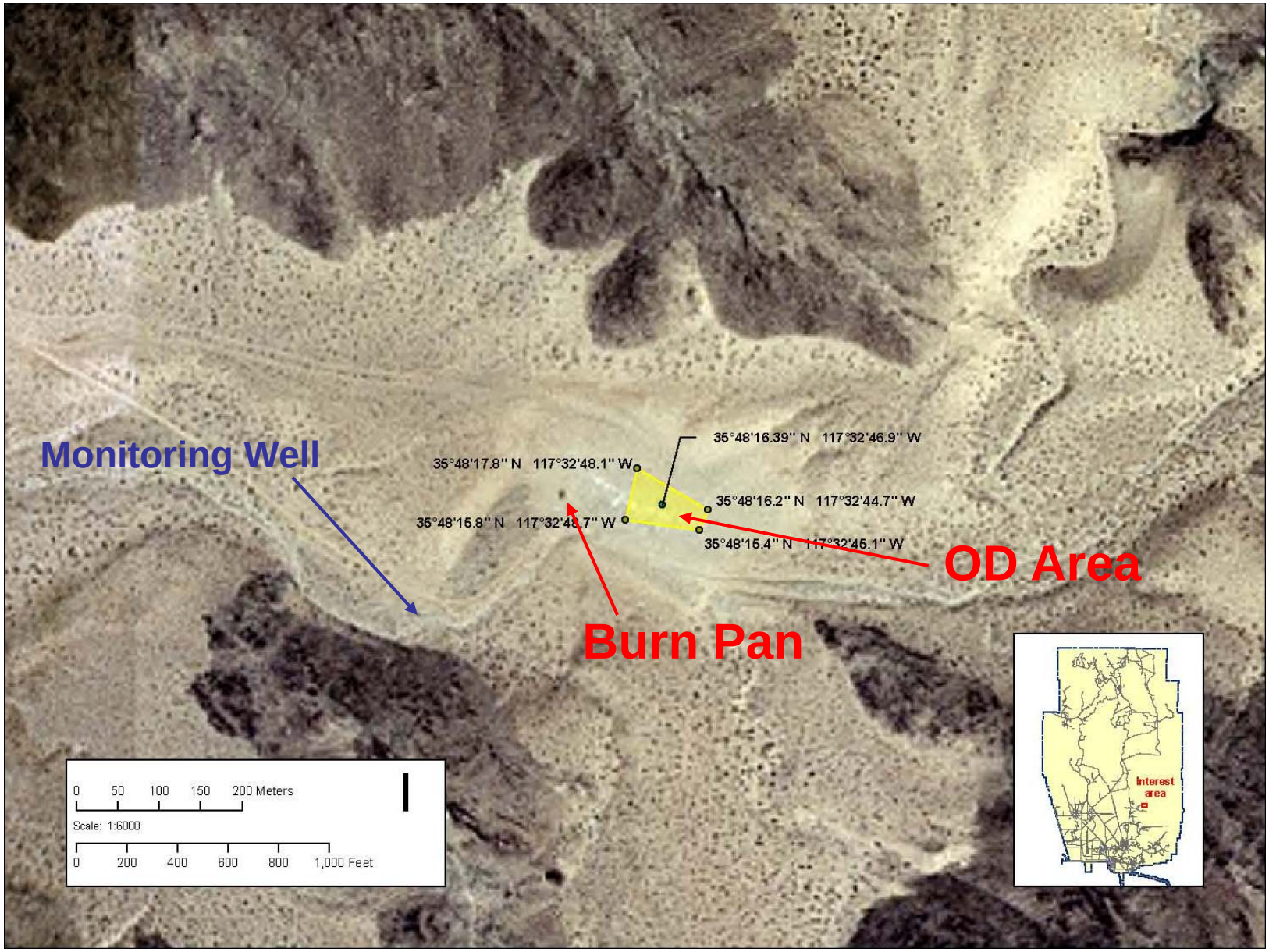

FIGURE 6.0. Layout of OB/OD Facility

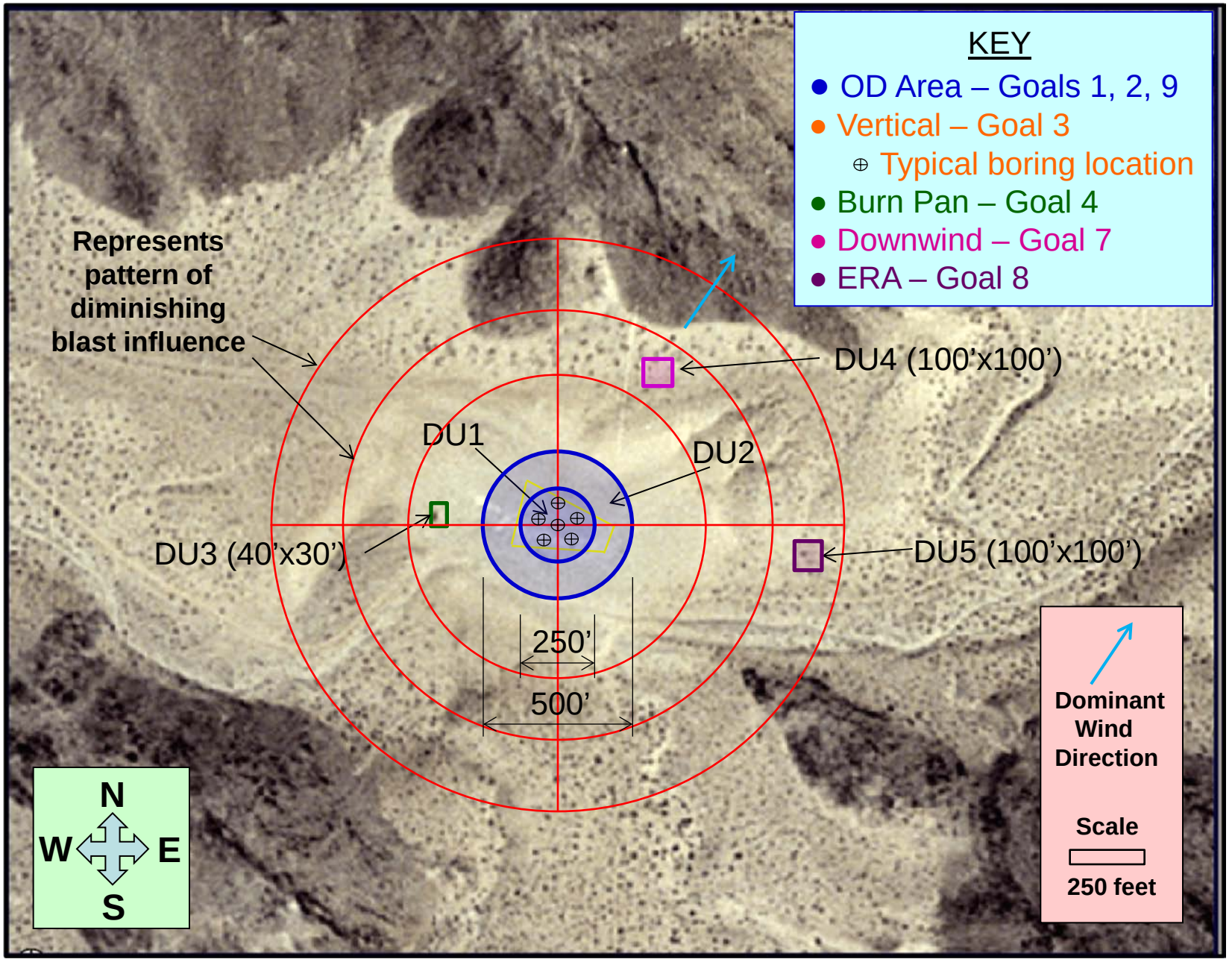

FIGURE 7.0. Decision Unit Locations

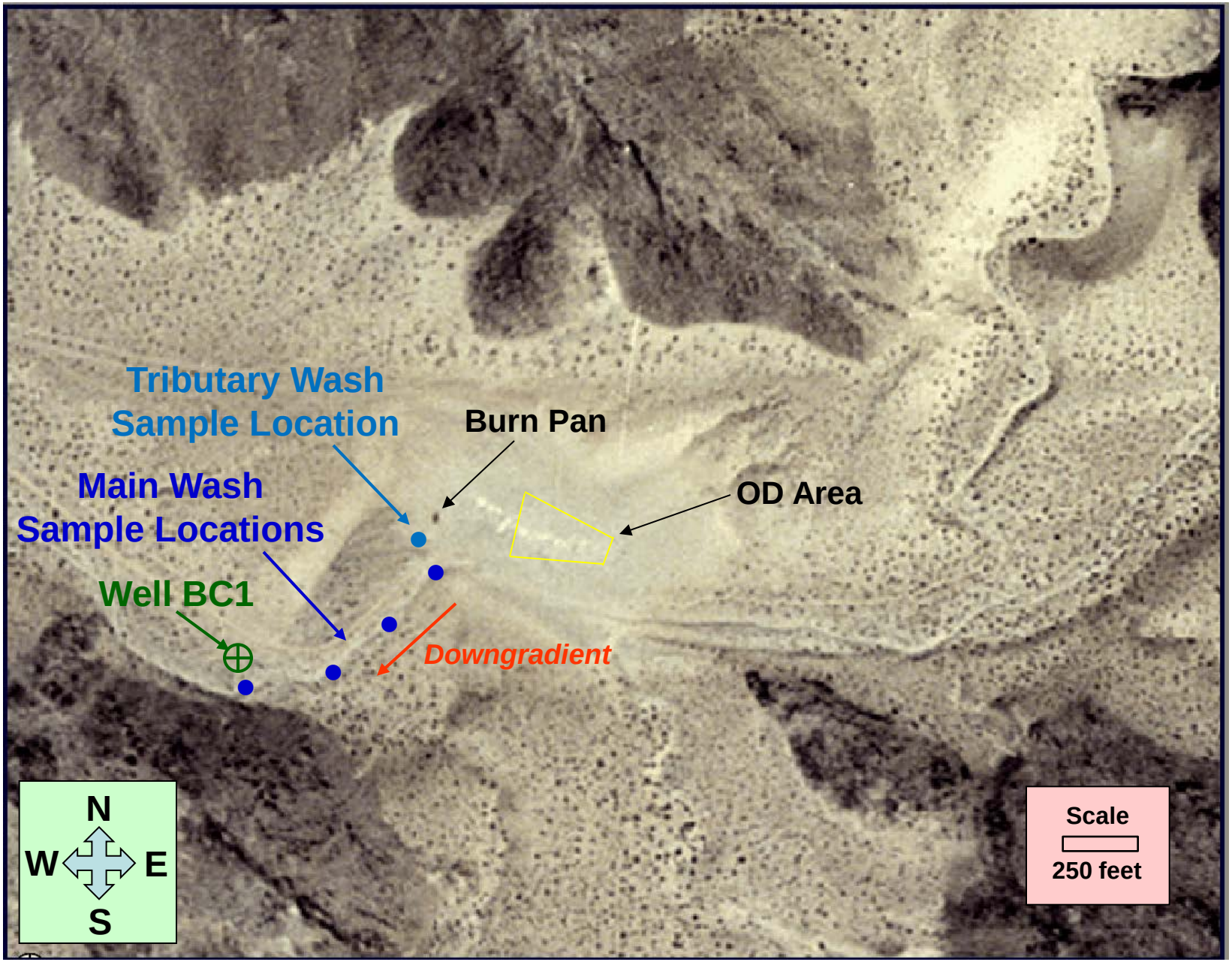

FIGURE 8.0. Well and Discreet Surface Sample Locations

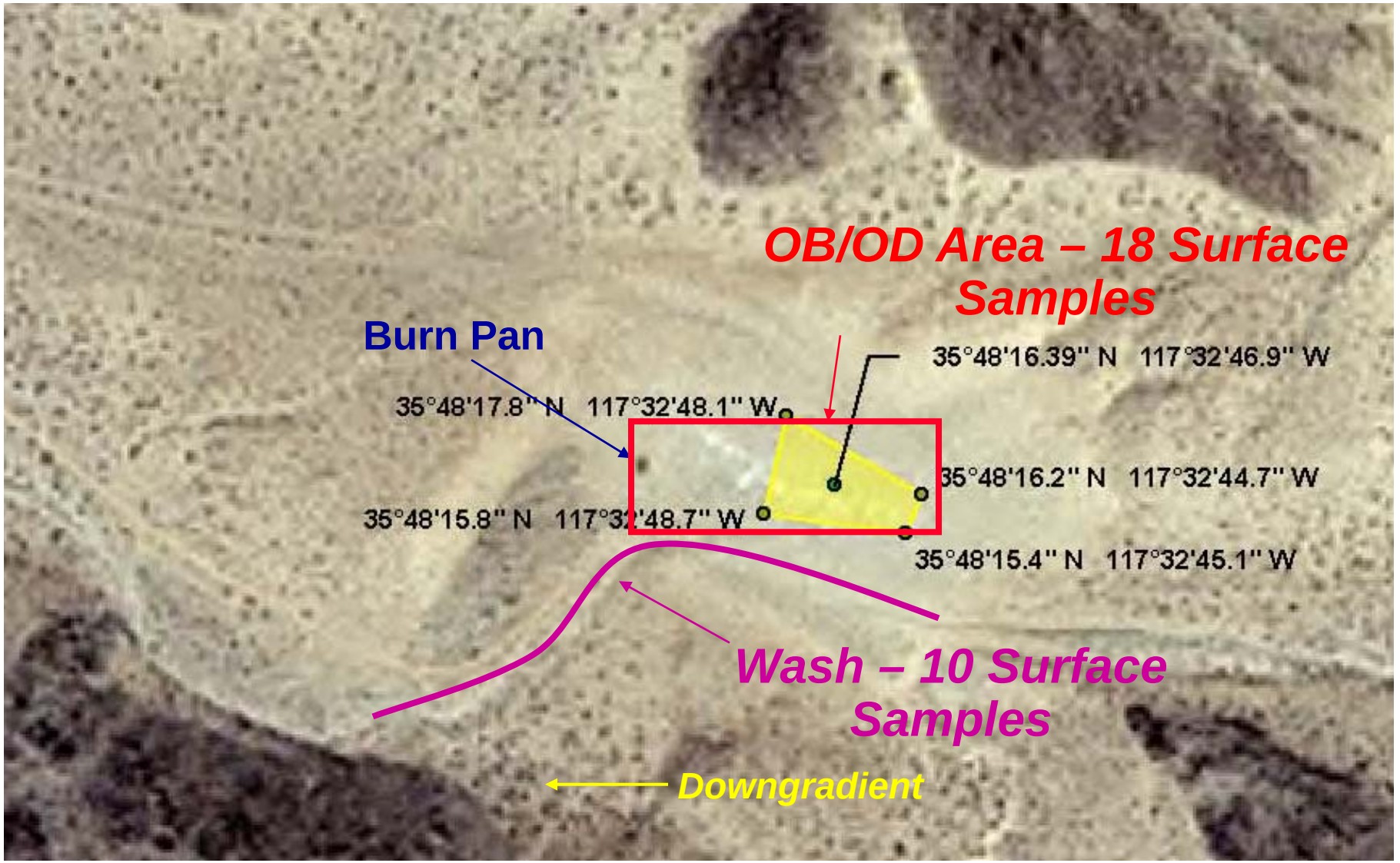

FIGURE 9.0. Sample Locations for 2003 Baseline Soil Investigation

APPENDICES

APPENDIX A

Revised Technical Memorandum, Burro Canyon Monitoring Well, Open Burn/Open Detonation Site

Revised Technical Memorandum

Burro Canyon Monitoring Well
Open Burn/Open Detonation Site

Naval Air Weapons Station
China Lake, California

February 17, 2015

Prepared By:

Environmental Management Division

NAVFAC Southwest

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ATTACHMENTS

1.0 - INTRODUCTION

At the request of the Department of Toxic Substances Control (DTSC), the Environmental Management Division (EMD) at NAWS China Lake recently performed several activities to investigate the construction and assess the integrity of the Burro Canyon monitoring well. A Technical Memorandum, dated January 5, 2015, summarized results and observations of those activities. After reviewing the memorandum, the DTSC concurred with the EMD's conclusion that the Burro Canyon well is suitable as a detection monitoring well for the open burn/open detonation (OB/OD) permitted unit but requested a revised technical memorandum with several formatting changes. This revised memorandum presents a summary of field activities and observations and provides a final revised well log.

2.0 - BACKGROUND

The Burro Canyon monitoring well was installed in May 2000 to serve as a hydraulically downgradient compliance point for the Open Burn/Open Detonation (OB/OD) site located upslope to the east. The well was installed in May 2000 by a crew of the U.S. Navy Mobile Construction Battalion (Seabees). A representative of Houghton HydroGeo-Logic, Inc. (HHGLI) in Bakersfield, CA logged the borehole cuttings and oversaw well construction. The well construction includes an 8-inch diameter, steel conductor casing, which also serves as a stand pipe to protect the 4-inch diameter polyvinyl chloride (PVC) well casing. Well construction information and a lithologic log for the well were provided in a March 14, 2001 report by Houghton HydroGeo-Logic, Inc.

In December 2012, a representative from the Geological Support Unit (GSU) at the DTSC observed that there was no grout seal between the well and conductor casings near the surface. In a March 11, 2013 letter, the DTSC requested a video log of the well to assess the integrity of the well prior to installing an appropriate grout seal.

3.0 - VIDEO LOG/WELL CONSTRUCTION DETAILS

On July 18, 2014, the EMD video logged the Burro Canyon monitoring well. A written summary of the video log was submitted to the DTSC in a memorandum dated July 21, 2014. No significant damage to the well casing or screen was observed in the video log and no existence of grout intrusion into the casing seams or well screen was observed. Existing construction details of the well are summarized below.

The total open depth of the well-casing/conductor-casing annulus, as measured using a weighted tape, was 105.2 feet below top of casing (BTOC). Centralizers are attached to the well casing at approximate depths of 2 and 25 feet BTOC. Additional centralizers may be present but these cannot be seen from the surface and the video camera could not be lowered into the annular space.

Water was encountered in the well at 431.5 feet BTOC. The water was very clear and colorless with occasional small clumps of what appeared to be brown algae associated with the screen slots.

The top of screen (top of slots within the upper-most 20-foot screen section) was observed at 477.5 feet BTOC. The bottom of lower-most screened section was observed at 536.6 feet BTOC (the bottom section seam is at 537.3 feet BTOC).

Blank casing exists from 537.3 feet BTOC to total depth. The total well depth is 558.1 feet BTOC.

4.0 - REVISED WELL LOG

The Burro Canyon well log prepared by HHGLI (Figure 1) differs from video log and field observations in the following ways:

Observed Construction:	HHGLI Well Log:
There is no apparent bentonite or grout seal between the well and conductor casings.	The well log shows a grout seal from 0 to 50 feet BTOC and a bentonite seal from 50 to 55 feet BTOC.
Centralizers are attached to the well casing.	No centralizers are shown on the well log.
The actual well screen interval is approximately 477 to 537 feet BTOC (60 feet).	The well log shows a screen interval of 460 to 580 feet BTOC (120 feet).
Blank casing extends below the well screen from approximately 537 feet BTOC to a total depth of 558.1 feet BTOC (~21 feet).	The well log shows blank casing extending from 580 feet BTOC to a total depth of 609 feet BTOC (29 feet).

Although we can only speculate as to the cause of the construction detail discrepancies, they may have resulted from miscounting of casing sections or miscommunication between the drillers and the HHGLI field representative during well construction. Given the drill-cuttings sample frequency (generally 5 foot intervals) and detailed soil texture descriptions, it is likely the borehole reached the stated depth of 605 feet BTOC. A revised well log based on EMD's recent field and video log observations is presented as Figure 2.

5.0 - PUMP TEST/OVERPURGE EVENT

As discussed in the April 10, 2014 teleconference between DTSC and EMD representatives, the EMD intended to purge 3 to 4 well-casing volumes using a relatively high pump-rate. The purpose of the aggressive purge event was to assess the function of the well and determine its viability as a compliance monitoring point.

On January 5, a new Grundfos 3-inch diameter, 2-phase pump with 1-inch discharge piping was installed in the well by a Seabee crew. Prior to installing the pump, depth to water was measured at roughly 430 feet BTOC using an electric water-level sounder. After the pump was installed, the crew attempted to re-insert the water-level sounder probe into the well to monitor water levels during pumping. However, after several unsuccessful attempts to negotiate the probe around the piping, power cable and wire rope supporting the pump, the probe became lodged in the well at roughly 200 feet BTOC and could not be retrieved. The pump was powered on and the well was pumped for 5 minutes. Once water reached the surface the pumping rate stabilized quickly at 5.5 gallons per minute (gpm). Approximately 15 gallons of water were removed before the pump was stopped.

On January 6, pumping for the purge event commenced at 14:00. The pump rate remained constant at approximately 5.5 gpm throughout the entire purge event. Water temperature, pH, electrical conductivity (EC), turbidity, dissolved oxygen and total dissolved solids (TDS) were measured at approximate 55 gallon intervals using a Horiba U-50 Series Multi Water Quality Checker. Measured parameters are listed on the attached field notes and presented graphically on Figure 3. Temperature, pH and dissolved oxygen were essentially stable during the latter part of the purge event. Although the multi-meter indicated measurable turbidity during the last three measurements, water was consistently very clear with no noticeable turbidity. The increase in turbidity measurements coincides directly with decreases in TDS and EC. Pumping was stopped at 15:24 after approximately 460 gallons of water (over five well-casing volumes) were purged

from the well. Purge water was stored onsite in nine labelled, 55-gallon, DOT metal drums. Calculations to determine the volume of water in the well casing are presented in Table 1.

Because the water-level sounder could not be used during the purge event, EMD planned to rapidly remove the pump from the well and measure water-level recovery. However, as the crew began to retrieve the pump, the supporting wire rope detached from the pump. With some difficulty, the pump was ultimately retrieved over the next two hours using the discharge pipe and power cable. At 17:38, depth to water was measured at 429.0 feet BTOC.

The pump rate remained constant at 5.5 gpm throughout the entire purge event. This indicates no significant increase in hydraulic head, and therefore, no significant lowering of water levels within the well. In addition, water levels fully recovered within two hours of pumping over 5 well-casing volumes from the well. These observations indicate the well is capable of producing ample water to serve as a compliance point for the OB/OD site.

6.0 - GROUNDWATER SAMPLING/ANALYSIS

After the well was purged as described above, water samples were collected. Water for dissolved-metal analysis was first collected in a disposable pressure bailer and then expressed through a 0.45 micron filter into the sample containers. The remaining sample bottles were filled directly. All samples were transported by overnight courier to the analytical lab.

Analytical results are summarized in Table 2. Table 2 also lists background concentrations for several of the analytes and regulatory maximum contaminant levels (MCLs) or action levels for the remaining analytes. Background concentrations were selected from the 95% upper confidence level for constituent concentrations in groundwater in the NAWS region, as reported in the *Site Investigation Report for the Sixth Site Investigation (Groundwater Only) at the Burro Canyon OB/OD Facility, NAWS China Lake, CA, December 2005*. Where no background concentration was provided in the above report, the most stringent of California MCLs, Federal primary or secondary MCLs, and California Action Levels were listed for reference.

Without exception, none of the analytes exceeded statistical background concentrations. Where no background concentrations are provided, no MCLs or action levels were exceeded.

Toluene was detected at 1.4 micrograms per liter (ug/L), although this is an estimated concentration which is below the established reporting level for that constituent. Because toluene is a common laboratory contaminant (*USEPA Guidance for Data Useability in Risk*

Assessment: Quick Reference Fact Sheet, September 1990) and no other aromatic compounds were detected, the toluene detection is considered anomalous.

Perchlorate was detected at a concentration of 0.199 ug/L. Although background perchlorate concentrations were not estimated in the 2005 *Site Investigation Report*, perchlorate has been detected in several wells in the NAWS China Lake area at concentrations ranging from 1.2 to 6.2 milligrams per liter (1,200 to 6,200 ug/L) (*Personal communication from Greta Orris, United States Geological Survey, February 2004*). It is likely the perchlorate detected in water from the Burro Canyon monitoring well is naturally occurring.

The sample bottle received by the laboratory on January 7 was received at a temperature of 6.3° Celsius (C), which is above the USEPA recommended temperature of 4°C. However, according to the US EPA National Functional Guidelines for Inorganics data review (August 2014) the validation criteria for analytes is 10°C. Constituents analyzed from that sample bottle included hexavalent chromium, total dissolved solids, carbonate alkalinity, bicarbonate alkalinity, chloride, fluoride and sulfate. For hexavalent chromium in particular, Yvonne Yang (analyst at CB&I Federal Services) stated that "[s]torage stability studies have demonstrated that samples are stable for at least 14 days at both ambient temperature (25°C) and chilled temperature (6°C)" (personal communication). No temperature preservation is required for chloride or fluoride. Temperature preservation for TDS is recommended, but not required.

Based on the above discussion, no analytical results were compromised by elevated sample temperatures and no potential contaminants from the OB/OD are indicated in the analytical results.

7.0 – WELL SEAL

On January 29, 2015, EMD placed approximately 3 feet of fine sand by freefall from the surface, to act as a transition seal at the bottom of the well-casing-to-conductor-casing annulus (Casing Annulus). Above the transition seal, EMD placed approximately 1 cubic yard of neat cement grout, mixed onsite with approximately 6% bentonite. The grout was placed using a tremie pipe and gravity pressure. However, the grout did not fill the Casing Annulus as planned and, after it solidified, was measured at a depth of 39 feet BTOC. It is likely that a limited void space surrounded the borehole below the conductor casing and the grout filled that void before filling the Casing Annulus. On February 11, EMD filled the remaining Casing Annulus with neat cement grout, again mixed onsite with approximately 6% bentonite.

8.0 – WELLHEAD PROTECTION

EMD constructed a concrete pad around the wellhead standpipe with dimensions of 5-feet square and 4 inches thick. The pad slopes gently away from the standpipe. The standpipe is fitted with a locking metal lid and padlock. Figure 5 presents a photo of the completed wellhead pad.

9.0 - RECOMMENDATIONS

Based on the video log review and recent field observations, there are no significant reasons why the Burro Canyon monitoring well should not be used as a compliance groundwater monitoring point downgradient of the OB/OD Site. The July 2014 video log showed the well casing and screen is intact and not fouled by either grout or biological accumulations. Observations from the recent well purge event indicate the well produces ample water for any needed sampling. We therefore recommend continued use of the well for its intended purpose.

Respectfully,

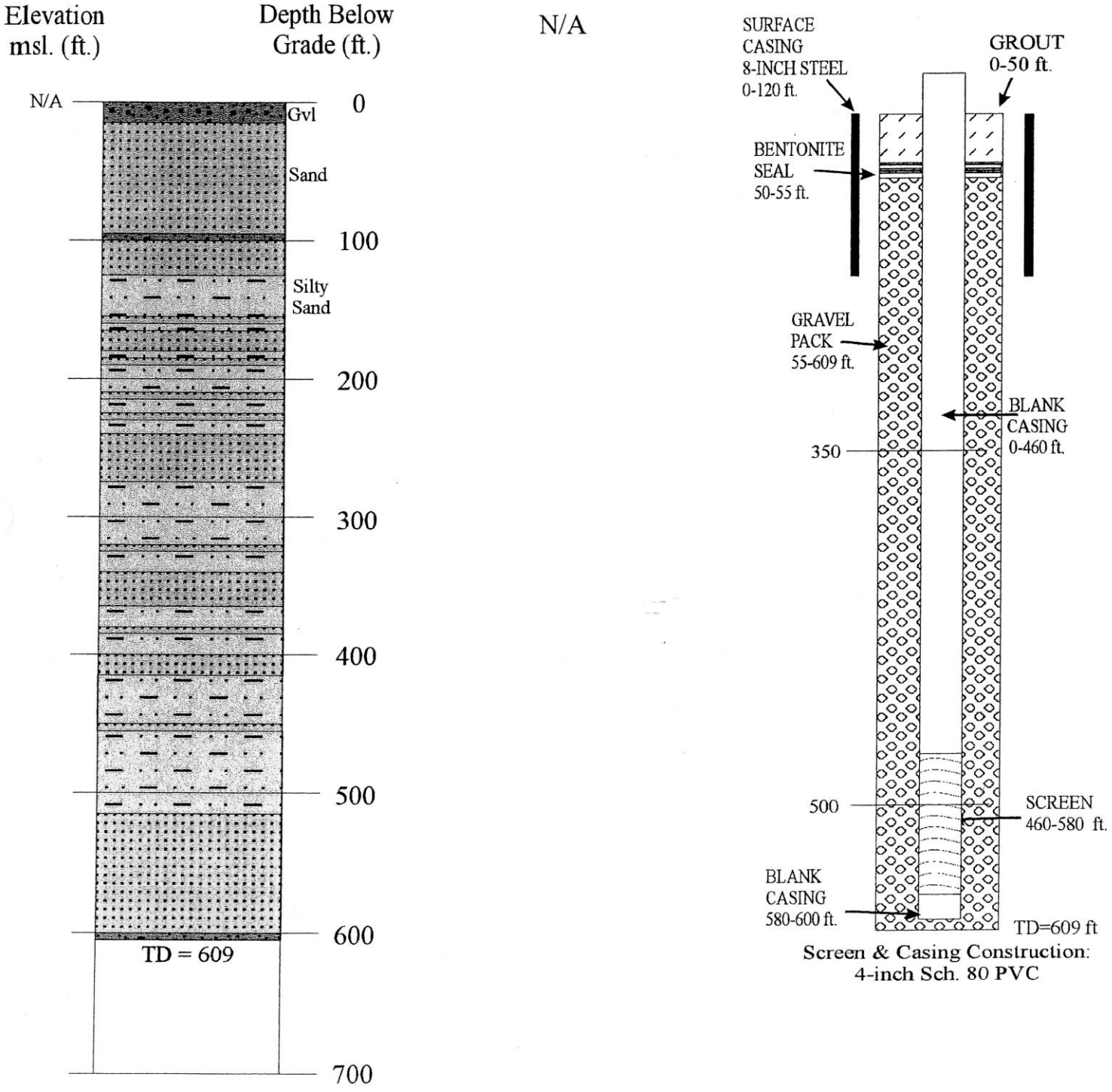
Stephan A. Bork, PG, CEG, CHG
Naval Air Weapons Station China Lake
Facilities Management Division, Requirements Branch
429 E. Bowen Ave., Bldg 981, MS 4005
China Lake, CA 93555-6100
Office: 760-939-2167

FIGURES

Figure 1 - Burro Canyon Monitoring Well - HHGLI, 2001 Well Log

Lithologic Log and Well Construction
Well Name: NAWS Burro Canyon
Location: N35° 48.261'/W117° 33.029'

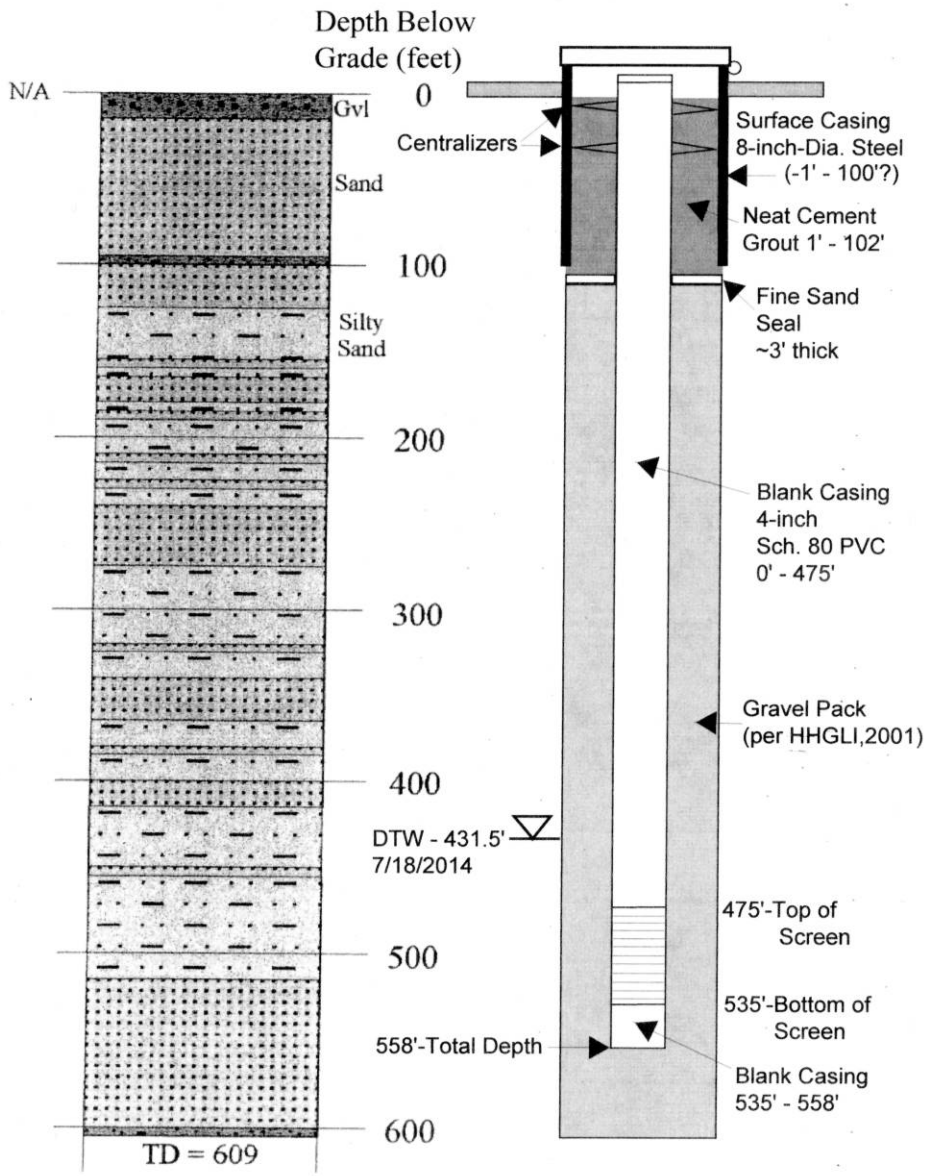
Lithologic Log | Electric Log | Well Construction



Houghton HydroGeo-Logic, Inc.
(661) 393-6218

Figure 2 - Burro Canyon Monitoring Well - Revised Well Log

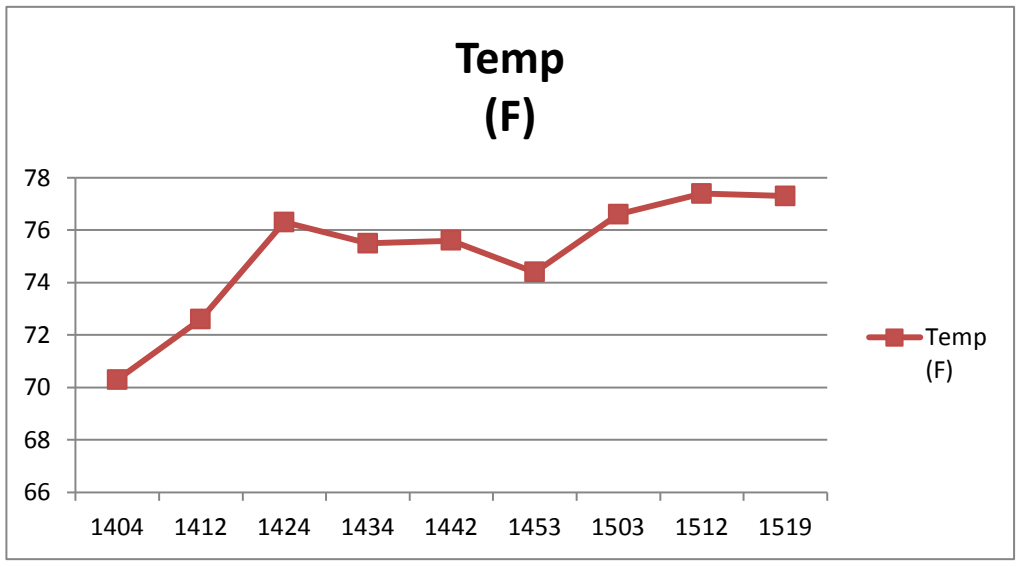
Lithologic Log and Well Construction
NAWS Burro Canyon Well
Location: N 35° 48.261', W 117° 33.029'

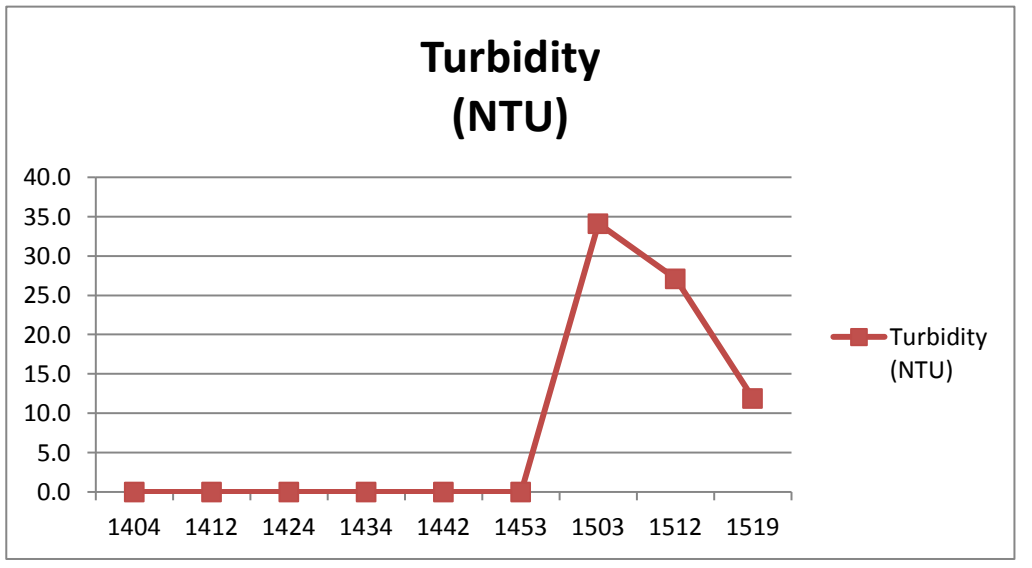


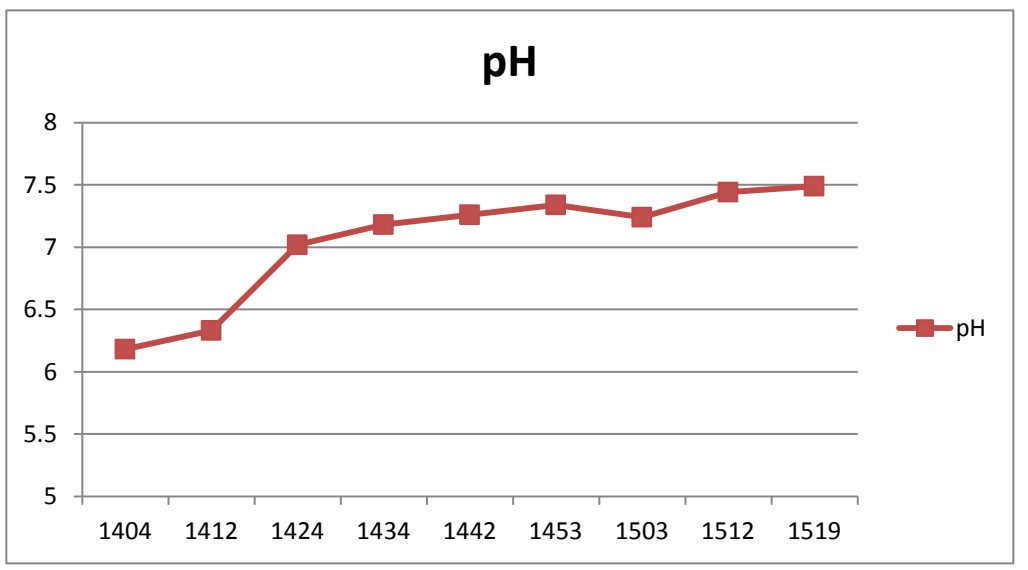
Lithologic log by Houghton HydroGeo-Logic, Inc. (2001).

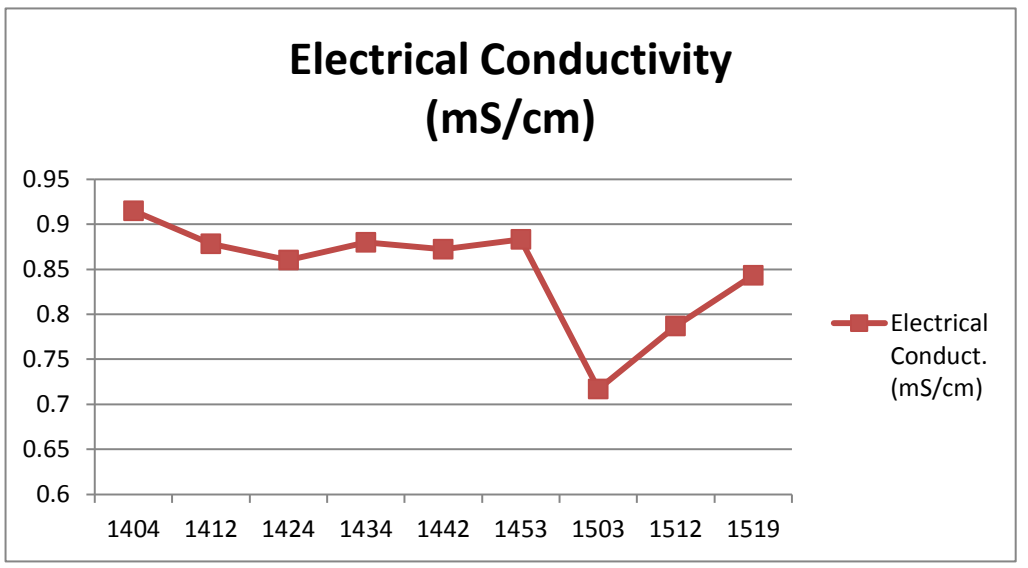
Well construction diagram is based on a July 18, 2014 video log and field observation by NAVFAC-SW EMD.

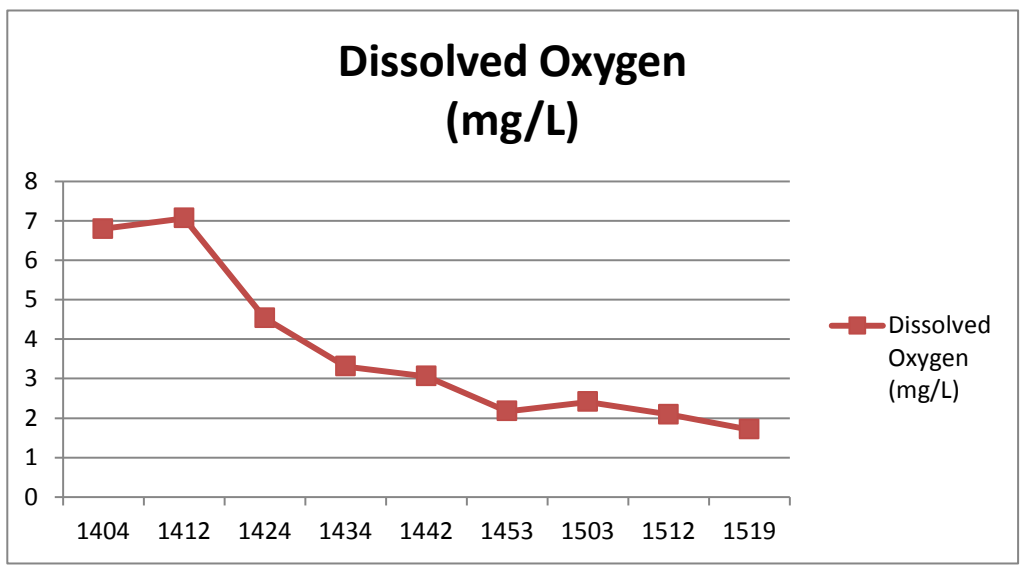
Figure 3 - Burro Canyon Well - Water Parameter Measurements, January 6, 2015

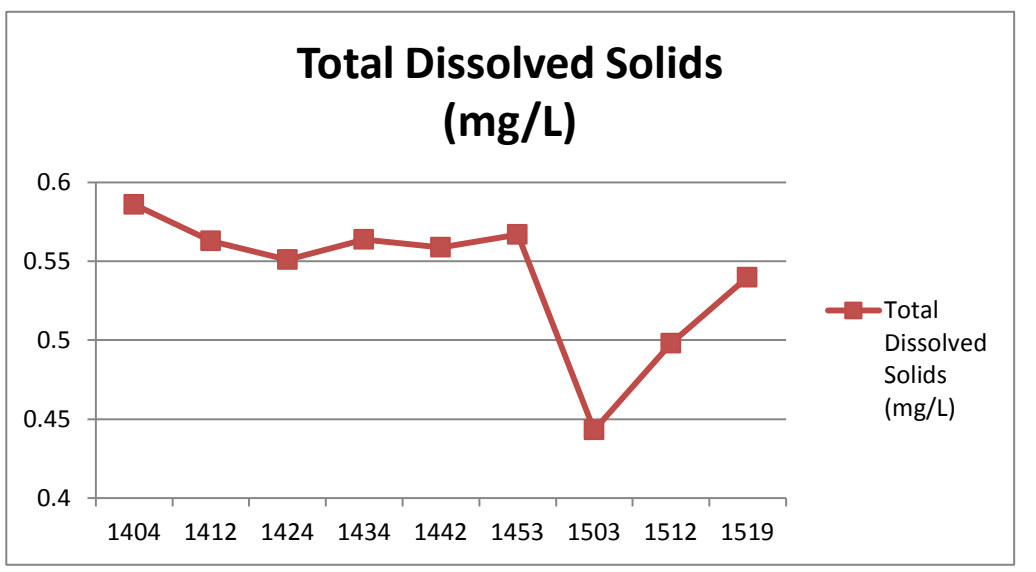












F = Degrees Fahrenheit
NTU = Nephelometric Turbidity Units
mS/cm = MilliSiemens per centimeter
mg/L = Milligrams per liter

Time	Temp (F)	pH	Electrical Conduct. (mS/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/L)	Total Dissolved Solids (mg/L)
1404	70.3	6.18	0.915	0.0	6.8	0.586
1412	72.6	6.33	0.878	0.0	7.07	0.563
1424	76.3	7.02	0.86	0.0	4.53	0.551
1434	75.5	7.18	0.88	0.0	3.31	0.564
1442	75.6	7.26	0.872	0.0	3.06	0.559
1453	74.4	7.34	0.883	0.0	2.17	0.567
1503	76.6	7.24	0.717	34.1	2.41	0.443
1512	77.4	7.44	0.787	27.1	2.09	0.498
1519	77.3	7.49	0.843	11.9	1.71	0.54

Figure 4 - Burro Canyon Wellhead & Pad

TABLES

Table 1 - Burro Canyon Monitoring Well - Purge Volume Calculations

pi * r^2 * H = Casing Volume

Well Casing ID:	0.33	feet
Well Casing Radius:	0.17	feet
Well Casing ID Area:	0.09	$feet^2$
Depth to Water:	430	feet (below top of casing)
Total Well Depth (feet below top of casing):	558.10	feet (below top of casing)
Water Column Length (feet):	128.10	feet
Total Water Volume in casing:	11.2	$feet^3$
Total Water Volume in casing:	83.6	gallons

Table 2 - Burro Canyon Monitoring Well - Groundwater Analytical Data

Sample Name: OD Well Sample Date: January 6, 2015

Parameter	Concentration (mg/L)	Background Level ** (mg/L)	Maximum Contaminant Level *** (mg/L)	Analytical Method
Total Dissolved Solids	525*	1,240		SM2540C
Carbonate Alkalinity	<5*	298		SM2320B
BiCarbonate Alkalinity	69.9*	363		SM2320B
Chloride	172*	324		EPA 300
Fluoride	0.324*	2		EPA 300
Nitrate-N	0.912		1	EPA 300
Sulfate	83*	310		EPA 300
Volatile Organic Compounds	Toluene .0014 J All others: ND		0.15	EPA 8260B
Semi-Volatile Organic Compounds	ND		Various	EPA 8270C
Explosives	ND		Various	EPA 8330
Perchlorate	0.000199	1.2-6.2 (USGS pers. comm.)	0.006	SW6850
Hexavalent Chromium	<0.01*		0.01	SW7196A
Mercury	<0.0005		0.002	SW7470A
Aluminum	<0.200		1	SW3010A/6010B
Antimony	<0.100		0.006	SW3010A/6010B
Arsenic	0.00630 J	45.6		SW3010A/6010B
Barium	0.0774	40.0		SW3010A/6010B
Beryllium	<0.01		0.004	SW3010A/6010B
Cadmium	<0.01		0.005	SW3010A/6010B
Total Chromium	<0.01		0.05	SW3010A/6010B
Cobalt	<0.01		None established	SW3010A/6010B
Copper	<0.01		1.3 (CAL)	SW3010A/6010B
Lead	<0.01		0.015 (CAL)	SW3010A/6010B
Molybdenum	0.0605	76.3		SW3010A/6010B
Nickel	<0.01		0.1	SW3010A/6010B
Selenium	<0.01		0.05	SW3010A/6010B
Silver	<0.01		0.1 (EPA Secondary MCL)	SW3010A/6010B
Thallium	<0.01		0.002	SW3010A/6010B
Vanadium	0.0150	8.5		SW3010A/6010B
Zinc	0.0123 J		5 (EPA secondary MCL)	SW3010A/6010B
Calcium	63.5	97,554		SW3010A/6010B
Magnesium	<0.0100	26,892		SW3010A/6010B
Manganese	10.8		0.05 (EPA Secondary MCL)	SW3010A/6010B
Pottasium	7.05	17,688		SW3010A/6010B
Sodium	86.7	296,120		SW3010A/6010B
pH	7.88 (unitless)		6.5 - 8.5 (unitless) (EPA Secondary MCL)	SW9040B

Notes:

* = Sample was received out of EPA's recommended temperature range.

** = Background levels (except perchlorate) chosen to equal 95% upper confidence level of background concentration data set from the October 2013 Monitoring Plan for the Burro Canyon OB/OD Facility.

*** = Federal Maximum Contaminant Level (MCL), or California MCL where more stringent, unless otherwise noted.

ND = No analytes detected.

RL = Reporting limit.

MDL = Method detection limit.

J = Analyte positively identified with the result less than the reporting limit but greater than the method detection limit; concentration is estimated.

mg/L = milligrams per liter

<*.* = Analyte not detected above the laboratory reporting limit

CAL = California Action Level under lead and copper rule.

ATTACHMENTS

ATTACHMENT - 1

Field Notes

WELL PURGING DATA SHEET

Page 1 of 1

Well No./Name: Borro Canyon

Date 1/5/2015

Weather/Temperature:

Owner: Location

Observers:

Top of Casing (TOC) Elevation: feet above mean sea level

Static Water Level: feet below TOC

Water Measurement Technique:

Observers: Cheef Starnes, Mike Stoner, Tom Kuntz, Stephan Bork

Time	Depth to Water (feet below TOC)	pH	Temperature (F)	Electrical Conductivity	Turbidity (NTU)	Comments:
start 15:07						5.0 gpm
off 15:12						Installed pump;
						pumped ~15 gals.
						Sounder stuck
						in well.
					DTW ≈	430' prior to
					installing	pump.

WELL PURGING DATA SHEET

Well No./Name: Burro Canyon Well

Date: 1/6/2015

Weather/Temperature: clear, calm, 80 °F

Owner: Department of Navy

Location: Burro Canyon, Argus Range, Inyo County, CA

Top of Casing (TOC) Elevation: _____ feet above mean sea level

Static Water Level: ~430 ft BTOC

Water Measurement Technique: Electric sounder

Observers: Stephan Bork, Mike Stoner, Tom Kuntz, Chief John Starnes

Time	Temperature (F)	pH	Electrical Conductivity (mS/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/L)	Total Dissolved Solids (mg/L)	Comments:
14:00							Pump started
14:04	70.3	6.48	0.915*	0.0*	6.80	0.586	55 sec/5 gal ≈ 5 gpm
14:12	72.6	6.33	0.878*	0.0*	7.07	0.563	*caps left on EC & Turb sensors 55 gals
14:24	76.3	7.02	0.860	0.0	4.53	0.551	~110 gal, 5 gpm (55 sec/5 gal)
14:34	75.5	7.18	0.880	0.0	3.31	0.564	~165 gal, 5 gpm (55 sec)
14:42	75.6	7.26	0.872	0.0	3.06	0.559	~220 gal, 5 gpm (55/sec)
14:53	74.4	7.34	0.883	0.0	2.17	0.567	~275 gal, 5 gpm (55 sec)
15:03	76.6	7.24	0.717	34.1	2.41	0.443	~330 gal, 5 gpm (55/sec) clear
15:12	77.4	7.44	0.787	27.1	2.09	0.498	~385 gal, 5 gpm clear water
15:19	77.3	7.49	0.843	11.9	1.71	0.540	~440 gal 5 gpm (55 sec) clear water
							Sampled
15:24							Pump stopped
17:38	NTW = 429.0'						Pump out ~17:36

ATTACHMENT – 2

Laboratory Report – Hexavalent Chromium

EMAX
LABORATORIES, INC.
1835 W. 205th Street
Torrance, CA 90501
Tel: (310) 618-8889
Fax: (310) 618-0818

Date: 01-08-2015
EMAX Batch No.: 15A440

Attn: Laurie Zellmer

Navy - Shaw PWC
NAS North Island, Bldg-M9
San Diego CA 92135
Task Order Number: 113

Subject: Laboratory Report
Project: NAWS China Lake
Contract #: N62473-10-D-4003

Enclosed is the Laboratory report for samples received on 01/07/15.
The data reported relate only to samples listed below :

Sample ID	Control #	Col Date	Matrix	Analysis
OD WELL	A440-01	01/06/15	WATER	CHROMIUM HEXAVALENT

The results are summarized on the following pages.

Please feel free to call if you have any questions concerning these results.

Sincerely yours,

Caspar J. Pang
Laboratory Director

This analytical report ends on page 15.

EMAX certifies that the results included in this report meets all NELAC requirements unless noted in the Case Narrative.

NELAC Certificate Number 02116CA

1440 12

CHINALAKE_X; OTHR;

NECARS INFO (CB&I use only)* CHINA LAKE NAWS

*EMAX/Sub-lab: CFSView EDDs

CB&I Federal Services

CHAIN OF CUSTODY

Company Name: CB&I Federal Services.
Address: Naval Air Station North Island, Bldg-M9
City / State / Zip: San Diego, CA 92135
Project Manager: Dustin Martinez
Phone/Fax Number: 619-545-8538 / 619-545-0793
Client Contact: Laurie Zellmer
Phone/Fax Number: 760-939-3219 / 760-939-2980

Due Date:
Task Order Number: 113
Project Name: China Lake
Project Location: Burro Canyon OBOD
Activity: NAWS
Lab Destination: EMAX
Lab Contact: Gale Luc
Lab Phone #: 310-618-8889 x106

Results Delivery: Emailed Faxed Picked Up
Instructions: NONE
Method of Shipment: Courier Fed Ex
Email Address: Lauren.Zellmer@navy.mil
Special

Sample Delivery Group	Sample ID	Collection Information: Date	Time	Matrix	Method/ SOP#:	No. of Bottles	Preservation Code / Bottle Type: Hex Chromium EPA 7196	~~TDS EPA 160.1~~ SP 1/7/14	~~Chloride, Fluoride EPA 300.0~~ SP 1/7/14	~~Sulfate, Nitrate EPA 300.0~~ SP 1/7/14	~~Alkalinity Bicarbonate EPA 310.0~~ SP 1/7/14	~~Alkalinity Carbonate EPA 310.0~~ SP 1/7/14	*LOG IN W/SAMPLE REF ChinaLake*
15A440	OD Well	1/6/15	1430	Water		1	X	X	X	X	X	X	

Sampler(s) Name(s): ~~OD & MS~~ Bob Kirk

Turnaround Time: ONE DAY for Hex Cr; ~~3-Day for all others~~ SP 1/7/14

Hours Sampling:

Condition upon Receipt: Temp 6.5 °C Received on Ice Y N Correct Container Y N Cooler Preserved Y N

Associated Forms: N Field Notes Y N BAC-T Form Y

Relinquished By:	Date:	Time:	Received By:	Date:	Time:
BOB KIRK	01/06/15	1530			
Relinquished By:	Date:	Time:	Received By:	Date:	Time:
Relinquished By:	Date:	Time:	Received By:	Date:	Time:

Matrices / Regulatory Programs

HAZ/GW (RCRA) WW (NPDES/CWA)
DW (SDWA) Solid (HUD) LIQ / Other

Bottle Type/Preservative Codes

1 = HCl	7 = $C_6H_8O_6$	C=40 ml
2 = $Na_2S_2O_3$	8 = $NaHSO_4*H_2O$	D=125 ml
3 = H_2SO_4	9 = HNO_3	E=250 ml
4 = NaOH	10 = Ice	F=500 ml
5 = NH_4Cl	A=Glass	G=1 Liter
6 = NaOH + ZoAC	B=HDPE	H=5 Liter

15R440
~~HA012~~ Fm 1/7/15

CB&I Federal Services

CHAIN OF CUSTODY

NECARS INFO (CB&I use only)* CHINALAKE_X; OTHR; CHINA_LAKE_NAWS

*EMAX/Sub-lab: CFSView EDDs

Company Name:	CB&I Federal Services.	**Due Date:**	
Address:	Naval Air Station North Island, Bldg-M9	**Task Order Number:**	113
City / State / Zip:	San Diego, CA 92135	**Project Name:**	China Lake
Project Manager:	Dustin Martinez	**Project Location:**	Burro Canyon OBOD
Phone/Fax Number:	619-545-8538 / 619-545-0793	**Activity:**	NAWS
Client Contact:	Laurie Zellmer	**Lab Destination:**	EMAX
Phone/Fax Number:	760-939-3219 / 760-939-2980	**Lab Contact:**	Gale Luc
		Lab Phone #:	310-618-8889 x106

Results Delivery: Emailed Faxed Picked Up Special
Instructions: NONE
Email Address: Lauren.Zellmer@navy.mil
Method of Shipment: Courier Fed Ex

		Collection Information					Preservation Code / Bottle Type	Requesting Testing Program / Contract ELIN														
Sample Delivery Group	Sample ID	Date	Time	Matrix	Method/ SOP#:	No. of Bottles		Hex Chromium EPA 7196	TDS EPA 160.1	Chloride, Fluoride EPA 300.0	Sulfate, Nitrate EPA 300.0	Alkalinity Bicarbonate EPA 310.0	Alkalinity Carbonate EPA 310.0				*LOG IN W/SAMPLE REF ChinaLake*					
	OD Well	1/6/15	1430	Water		1		X	X	X	X	X	X									

Sampler(s) Name(s): ~~SB & MS~~ Bob Kirk

Hours Sampling:

Turnaround Time: ONE DAY for Hex Cr; 3 Day for all others

Condition upon Receipt Cooler
Temp 6.2 °C Received on Ice Y N Correct Container Y N
Preserved Y N

Associated Forms BAC-T Form Y N Field Notes Y N

Relinquished By:	Date:	Time:	Received By:	Date:	Time:
BOB KIRK	01/06/15	1530			
Relinquished By:	Date:	Time:	Received By:	Date:	Time:
			FM Zamora	1/7/15	0925
Relinquished By:	Date:	Time:	Received By:	Date:	Time:

Matrices / Regulatory Programs

HAZ/GW (RCRA) WW (NPDES/CWA)
DW (SDWA) Solid (HUD) LIQ / Other

Bottle Type/Preservative Codes

1 = HCl	7 = $C_6H_8O_6$	C=40 ml
2 = $Na_2S_2O_3$	8 = $NaHSO_4{*}H_2O$	D=125 ml
3 = H_2SO_4	9 = HNO_3	E=250 ml
4 = NaOH	10 = Ice	F=500 ml
5 = NH_4Cl	A=Glass	G=1 Liter
6 = NaOH + ZoAC	B=HDPE	H=5 Liter

SAMPLE RECEIPT FORM 1

Reference Number: SM02.7.3

Type of Delivery	Airbill / Tracking Number	ECN 15A440
☑ Fedex ☐ UPS ☐ GSO ☐ Others	8065 0574 5456	Recipient FM/Lamba
☐ EMAX Courier ☐ Client Delivery		Date 1/7/15 Time 0925

COC INSPECTION

☑ Client Name	☑ Client PM/FC	☑ Sampler Name	☑ Sampling Date/Time	☑ Sample ID	☑ Matrix
☑ Address	☑ Tel # / Fax #	☐ Courier Signature	☑ Analysis Required	☑ Preservative (if any)	☑ TAT
Safety Issues (if any)	☐ High concentrations expected	☐ From Superfund Site	☐ Rad screening required		

Note:

PACKAGING INSPECTION

Container	☑ Cooler	☐ Box	☐ Other		
Condition	☑ Custody Seal	☑ Intact	☐ Damaged		
Packaging	☐ Bubble Pack	☐ Styrofoam	☐ Popcorn	☑ Sufficient	☐ _____
Temperatures (Cool, ≤6 °C but not frozen)	☑ Cooler 1 6.3 °C	☐ Cooler 2 _____ °C	☐ Cooler 3 _____ °C	☐ Cooler 4 _____ °C	☐ Cooler 5 _____ °C
	☐ Cooler 6 _____ °C	☐ Cooler 7 _____ °C	☐ Cooler 8 _____ °C	☐ Cooler 9 _____ °C	☐ Cooler 10 _____ °C
Thermometer:	*A - S/N* 130538305	*B - S/N* 140257078	*C - S/N* _____	*D - S/N* _____	

Comments: ☑ Temperature is out of range. PM was informed IMMEDIATELY. FM 1/7/15

Note:

DISCREPANCIES

LabSampleID	LabSampleContainerID	Code	ClientSample Label ID / Information	Corrective Action
1	1	D2	per label: Cr, (not cr6+ as coc)	R2

FM 1/7/15

☐ pH holding time requirement for water samples is 15 mins. Water samples for pH analysis are received beyond 15 minutes from sampling time.

NOTES/OBSERVATIONS: Sample arrived at 6.3°C (ice melted to water)
500 ml sub-sample was taken and assigned as 15A447 per PM FM 1/7/15

LEGEND:

☐ Continue to next page.

Code	Description- Sample Management	Code	Description-Sample Management	Code	Description-Sample Management
D1	Analysis is not indicated in _____	D13	Out of Holding Time	R1	Proceed as indicated in ☐ COC ☐ Label
D2	Analysis mismatch COC vs label	D14	Bubble is >6mm	R2	Refer to attached instruction
D3	Sample ID mismatch COC vs label	D15	No trip blank in cooler	R3	Cancel the analysis
D4	Sample ID is not indicated in _____	D16	Preservation not indicated in _____	R4	Use vial with smallest bubble first
D5	Container -[improper] [leaking] [broken]	D17	Preservation mismatch COC vs label	R5	Log-in with latest sampling date and time+1 min
D6	Date/Time is not indicated in _____	D18	Insufficient chemical preservative	R6	Adjust pH as necessary
D7	Date/Time mismatch COC vs label	D19	Insufficient Sample	R7	Filter and preserved as necessary
D8	Sample listed in COC is not received	D20	No filtration info for dissolved analysis	R8	_____
D9	Sample received is not listed in COC	D21	No sample for moisture determination	R9	_____
D10	No initial/date on corrections in COC/label	D22	_____	R10	_____
D11	Container count mismatch COC vs received	D23	_____	R11	_____
D12	Container size mismatch COC vs received	D24	_____	R12	_____

REVIEWS:

Sample Labeling FM 1/7/15 Date 01-07-15

SRF FM Date 1/7/15

PM _____ Date 1/8/15

EMAX LABORATORIES, INC.

Reference No.: SM02.7.4

SAMPLE RECEIPT FORM 2

SAMPLES RECEIVED FOR ECN: 15A440

LAB SAMPLE ID (*)	LAB SAMPLE CONTAINER ID	COOLER#	CONTAINER TYPE								pH paper Lot #: N/A CHEMICAL PRESERVATIVE										Filtered	
			Jar	Amber	HDPE	Encore	Vial	Tube	Bag	Other	NONE	HCl (pH<2)	HNO_3 (pH<2)	H_2SO_4 (pH<2)	ZnAc +NaOH (pH>9)	ZnAc +NaOH (pH>12)	NaOH (pH>12)	$Na_2S_2O_3$	Methanol	NaHSO4	Other	Yes	No
01	* 1				✓						✓											
	* 2																					
	* 3																					
	* 4																					
	* 5																					
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	* 9																					
	* 0																					

1/7/15

Yunjen Young

From: Yunjen Young

Sent: Thursday, January 08, 2015 10:31 AM

To: 'Phuong, Sopheak (CFS)'; Tiffany Hsieh; Wong, Anthony (CFS); Cruz, Arsenio (CFS); Easter, Christopher D (CFS); Luke, Danielle C (CFS); Martinez, Dustin; 'James Webb (james.webb1.ctr@navy.mil)'; Nguyen, Johnny (CFS); Enriquez-Farrell, Keri B; Pisarek, Michael D (CFS); Ibarra, Ramon; 'Tracy Truong'

Cc: Gale Luc; Myo Aung

Subject: RE: 15A440 & 15A447_TO-113_MULTIPLE ISSUES

Hi all,

FYI, the label indicated for Cr analysis, whereas the COC indicated specifically Hex Cr only. We will proceed as indicated in COC unless informed otherwise.

Thanks,

Yunjen Young

Project Manager
EMAX Laboratories, Inc.
1835 W 205th St.
Torrance, CA 90501
Phone: (310) 618-8889 x103
E-mail: yyoung@emaxlabs.com

-----Original Message-----
From: Phuong, Sopheak (CFS) [mailto:sopheak.phuong@CBIFederalServices.com]
Sent: Wednesday, January 07, 2015 4:02 PM
To: Tiffany Hsieh; Wong, Anthony (CFS); Cruz, Arsenio (CFS); Easter, Christopher D (CFS); Luke, Danielle C (CFS); Martinez, Dustin; 'James Webb (james.webb1.ctr@navy.mil)'; Nguyen, Johnny (CFS); Enriquez-Farrell, Keri B; Pisarek, Michael D (CFS); Ibarra, Ramon; 'Tracy Truong'
Cc: Gale Luc; Myo Aung; Yunjen Young
Subject: RE: 15A440 & 15A447_TO-113_MULTIPLE ISSUES

Hi Tiffany,

Yes it is ok. Thanks.

V/r,
Sopheak Phuong

From: Tiffany Hsieh [mailto:THsieh@emaxlabs.com]
Sent: Wednesday, January 07, 2015 3:37 PM
To: Phuong, Sopheak (CFS); Wong, Anthony (CFS); Cruz, Arsenio (CFS); Easter, Christopher D (CFS); Luke, Danielle C (CFS); Martinez, Dustin; 'James Webb (james.webb1.ctr@navy.mil)'; Nguyen, Johnny (CFS); Enriquez-Farrell, Keri B; Pisarek, Michael D (CFS); Ibarra, Ramon; 'Tracy Truong'
Cc: Gale Luc; Myo Aung; Yunjen Young
Subject: RE: 15A440 & 15A447_TO-113_MULTIPLE ISSUES

Hi Sopheak,

One more thing. Is it ok if we proceed by SM method for the TDS and alkalinity?

Thanks,

Tiffany Hsieh
Project Coordinator
EMAX Laboratories, Inc.
1835 W. 205th Street
Torrance, CA 90501
Tel: (310) 618-8889 Ext. 103
Fax: (310) 618-0818
Email: thsieh@emaxlabs.com

From: Tiffany Hsieh
Sent: Wednesday, January 07, 2015 3:04 PM
To: 'Phuong, Sopheak (CFS)'; Wong, Anthony (CFS); Cruz, Arsenio (CFS); Easter, Christopher D (CFS); Luke, Danielle C (CFS); Martinez, Dustin; 'James Webb (james.webb1.ctr@navy.mil)'; Nguyen, Johnny (CFS); Enriquez-Farrell, Keri B; Pisarek, Michael D (CFS); Ibarra, Ramon; 'Tracy Truong'
Cc: Gale Luc; Myo Aung; Yunjen Young; Farina Madamba; Tu Nisamaneepong; Mary J Mendoza; Lucita Arzadon
Subject: RE: 15A440 & 15A447_TO-113_MULTIPLE ISSUES

Thank you Sopheak. We will keep the hex chrom on 15A440 (1 DAY TAT) and split off the TDS, anions, and alkalinity onto 15A447 (3 DAY TAT). Since only 1 bottle was received, we will have to aliquot the sample.

Tiffany Hsieh
Project Coordinator
EMAX Laboratories, Inc.
1835 W. 205th Street
Torrance, CA 90501
Tel: (310) 618-8889 Ext. 103
Fax: (310) 618-0818
Email: thsieh@emaxlabs.com

From: Phuong, Sopheak (CFS) [mailto:sopheak.phuong@CBIFederalServices.com]
Sent: Wednesday, January 07, 2015 1:52 PM
To: Tiffany Hsieh; Wong, Anthony (CFS); Cruz, Arsenio (CFS); Easter, Christopher D (CFS); Luke, Danielle C (CFS); Martinez, Dustin; 'James Webb (james.webb1.ctr@navy.mil)'; Nguyen, Johnny (CFS); Enriquez-Farrell, Keri B; Pisarek, Michael D (CFS); Ibarra, Ramon; 'Tracy Truong'
Cc: Gale Luc; Myo Aung; Yunjen Young
Subject: RE: TO-113_MULTIPLE ISSUES

Hi Tiffany,

Please see attached for revised COCs.

V/r,
Sopheak Phuong

From: Tiffany Hsieh [mailto:THsieh@emaxlabs.com]
Sent: Wednesday, January 07, 2015 12:08 PM
To: Tiffany Hsieh; Wong, Anthony (CFS); Cruz, Arsenio (CFS); Easter, Christopher D (CFS); Luke, Danielle

C (CFS); Martinez, Dustin; 'James Webb (james.webb1.ctr@navy.mil)'; Nguyen, Johnny (CFS); Enriquez-Farrell, Keri B; Pisarek, Michael D (CFS); Ibarra, Ramon; Phuong, Sopheak (CFS); 'Tracy Truong'
Cc: Gale Luc; Myo Aung; Yunjen Young
Subject: RE: TO-113_MULTIPLE ISSUES

Hi James,

Per our conversation, we will use 15A440. We will also proceed with analyses even though they were received out of temperature. Please let us know if otherwise. Have you heard back on item #3 and #4 yet? Our analysts would like to start working on those but we need to know to proceed with those analyses in terms of SDG and TAT.

Thanks,

Tiffany Hsieh
Project Coordinator
EMAX Laboratories, Inc.
1835 W. 205th Street
Torrance, CA 90501
Tel: (310) 618-8889 Ext. 103
Fax: (310) 618-0818
Email: thsieh@emaxlabs.com

From: Tiffany Hsieh
Sent: Wednesday, January 07, 2015 10:10 AM
To: Anthony Wong; Arsenio Cruz; Chris Easter; Danielle Luke; Dustin Martinez; James Webb (james.webb1.ctr@navy.mil); Johnny Nguyen; Keri Farrell; Michael Pisarek; Ramon Ibarra; Sopheak Phuong; Tracy Truong
Cc: Gale Luc; Myo Aung; Yunjen Young
Subject: TO-113_MULTIPLE ISSUES
Importance: High

Hi James,

We received the China Lake sample that includes the hex chrom by 7196 and have several urgent issues:

1. Please assign an SDG.
2. Sample was received out of temp (6.3C). Please advise on how to proceed.
3. This COC has two TATs: 1 DAY for hex chrom and 3 DAYS for TDS, anions, and alkalinity. We can only have one TAT per SDG/COC. Please advise if we are to proceed with all the analysis and on what TAT or if we should cancel all but hex chrom on a 1 DAY TAT.
4. The EPA method for TDS and alkalinity are deleted methods. Is it all right if we proceed by SM method?

Please advise ASAP. Our analyst is preparing to start the hex chrom soon.

Thanks,

Tiffany Hsieh
Project Coordinator
EMAX Laboratories, Inc.
1835 W. 205th Street
Torrance, CA 90501
Tel: (310) 618-8889 Ext. 103
Fax: (310) 618-0818

FedEx Express **NEW** Package US Airbill

FedEx Tracking Number 8065 0574 5456

1 From

Date 1/6/15

Sender's Name NAVAL AIR WEAPONS STATION Phone 760 939-321

Company NAVAL AIR WEAPONS STATION CHINA LAKE

Address 429 E. BOWEN Rd. Mail Stop Dept./Floor/St

City Ridgecrest State CA ZIP 93555-610

Your Internal Billing Reference

To

Recipient's Name Sample Receiving Phone

Company EMAX LABS, INC.

Address 1835 West 205th Street Dept./Floor/Suite/Rom

We cannot deliver to P.O. boxes or P.O. ZIP codes.

Address

Use this line for the HOLD location address or for continuation of your shipping address.

City Torrance CA ZIP 90501

HOLD Weekda
FedEx location addre
REQUIRED. NOT avai
FedEx First Overnight

HOLD Saturda
FedEx location address
REQUIRED. Available
FedEx Priority Overnigl
FedEx 2Day to select lo

fedex.com 1.800.GoFedEx 1.800.463.3339

RT B59 2 10:30 5456 01.07 ST 9

ORIGIN ID:IYKA

UNITED STATES US

SHIP DATE: 06JAN15
ACTWGT: 5.9 LB
CAD: /POS1525
DIMS: 10x7x6 IN

BILL SENDER

TO

EMAX LABS
1835 W 205TH ST

TORRANCE CA 90501

(310) 618-8889 REF:

INV:
PO: DEPT:

FedEx Express

TRK# 0200 8065 0574 5456

WED - 07 JAN 10:30A
PRIORITY OVERNIGHT

92 HHRA

90501
CA-US LAX

Rev. Date 1/12 • Part #167002 • ©2012 FedEx • PRINTED IN U.S.A. SRF

Part # 156297-435 RIT 09/14

REPORTING CONVENTIONS

DATA QUALIFIERS:

Lab Qualifier	Description
ND	Indicates that the analyte is non detect at the MDL.
J	Indicates that the analyte is positively identified with the result less than RL but greater than MDL; value is an estimated concentration.
B	Indicates that the analyte is found in the associated method blank at or above the RL as well as in the sample at above QC level.
E	Indicates that the result is above the maximum calibration range.
N	Indicates presumptive evidence of a compound.
*	Out of QC limit.

Note: The above qualifiers are used to flag the results unless the project requires a different set of qualification criteria.

ACRONYMS AND ABBREVIATIONS:

Quality Control	
MBLK	Method Blank
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
Others	
CRDL	Contract Required Detection Limit
RL	Reporting Limit
MRL	Method Reporting Limit
PQL	Practical Quantitation Limit
MDL	Method Detection Limit
DO	Diluted out

DATES

The date and time information for leaching and preparation reflect the beginning date and time of the procedure unless the method(s), protocol(s), or project(s) specifically requires otherwise.

REPORTING CONVENTIONS

Decimal places, trailing zeroes or the lack thereof appearing on the data should not be interpreted as indicative of the precision of the analytical procedure, but rather as a result of reporting format limitations.

SAMPLE RESULTS

Sample Summary Form

EMAX Laboratories Inc. Tel 310-6188889 NELAP Accreditation #: 02116CA

Client : Navy - Shaw PWC	Date Collected: 01/06/15 14:30
Project : NAWS China Lake	Date Received: 01/07/15
Batch No. : 15A440	Prject Code: PW10516_
Sample ID: OD WELL	Matrix : WATER
Lab Samp ID: A440-01 (Group)	% Moisture : NA

LabSmpID	Parameters	RefMethod	Result&Unit	DilF	RL	MDL	AnlDateTime	PrpDateTime	LabFileID	PrpBatch
A440-01_	Hexavalent Chromium(!)	SW7196A___	ND mg/L_____	1____	0.01___	0.004__	01/07/15 11:09	NA_____	15CRA00218_	CRA002W___

DilF: Dilution Factor
RL: Reporting Limit
MDL: Method Detection Limit

(!): Sample was received out of EPA's recommended temperature range.

QC SUMMARIES

EMAX QUALITY CONTROL DATA
LAB CONTROL SAMPLE ANALYSIS

CLIENT : NAVY - SHAW PWC
PROJECT : NAWS CHINA LAKE
BATCH NO. : 15A440
METHOD : METHOD SW7196A

MATRIX : WATER

DILUTION FACTOR:	1	1	1
SAMPLE ID :	MBLK1W	LCS1W	LCD1W
LAB SAMPLE ID :	CRA002WB	CSA002WL	CSA002WC
LAB FILE ID :	15CRA00209	15CRA00210	15CRA00211
DATE PREPARED :	NA	NA	NA
DATE ANALYZED :	01/07/1511:07	01/07/1511:08	01/07/1511:08
PREP BATCH :	CRA002W	CRA002W	CRA002W
CALIBRATION REF:	15CRA002	15CRA002	15CRA002

ACCESSION:

PARAMETER	MB RESULT (mg/L)	SPIKE AMT (mg/L)	BS RESULT (mg/L)	BS REC (%)	SPIKE AMT (mg/L)	BSD RESULT (mg/L)	BSD REC (%)	RPD (%)	QC LIMIT (%)	MAX RPD (%)
Hexavalent Chromium	ND	0.2	0.211	105	0.2	0.208	104	1	85-115	20

Analyst Summary Form

EMAX Laboratories Inc. Tel 310-6188889 NELAP Accreditation #: 02116CA

Client : NAVY - SHAW PWC
Project : NAWS CHINA LAKE
Project Code : PW10516_
Batch Number : 15A440

EMAXCODE	METHOD	ANALYST
7196	SW7196	GG

ATTACHMENT – 3

Laboratory Report - Alkalinity, Anions, TDS

LABORATORIES, INC.
1835 W. 205th Street
Torrance, CA 90501
Tel: (310) 618-8889
Fax: (310) 618-0818

Date: 01-12-2015
EMAX Batch No.: 15A447

Attn: Laurie Zellmer

Navy - Shaw PWC
NAS North Island, Bldg-M9
San Diego CA 92135
Task Order Number: 113

Subject: Laboratory Report
Project: NAWS China Lake
Contract #: N62473-10-D-4003

Enclosed is the Laboratory report for samples received on 01/07/15.
The data reported relate only to samples listed below :

Sample ID	Control #	Col Date	Matrix	Analysis
OD WELL	A447-01	01/06/15	WATER	TOTAL DISSOLVED SOLIDS
				CARBONATE ALKALINITY
				BICARBONATE ALKALINITY
				CHLORIDE BY IC
				FLUORIDE BY IC
				NITRATE-N BY IC
				SULFATE BY IC

The results are summarized on the following pages.

Please feel free to call if you have any questions concerning these results.

Sincerely yours,

Caspar J. Pang
Laboratory Director

This analytical report ends on page 20.

EMAX certifies that the results included in this report meets all NELAC requirements unless noted in the Case Narrative.

NELAC Certificate Number 02116CA

~~HEXCTD~~ FM 1/7/14

CHINALAKE_X; OTHR;

CHAIN OF CUSTODY

NECARS INFO (CB&I use only)* CHINA_LAKE_NAWS

*EMAX/Sub-lab: CFSView EDDs

CB&I Federal Services

Company Name: CB&I Federal Services.
Address: Naval Air Station North Island, Bldg-M9
City / State / Zip: San Diego, CA 92135
Project Manager: Dustin Martinez
Phone/Fax Number: 619-545-8538 / 619-545-0793
Client Contact: Laurie Zellmer
Phone/Fax Number: 760-939-3219 / 760-939-2980

Due Date:
Task Order Number: 113
Project Name: China Lake
Project Location: Burro Canyon OBOD
Activity: NAWS
Lab Destination: EMAX
Lab Contact: Gale Luc
Lab Phone #: 310-618-8889 x106

Results Delivery: Emailed Faxed Picked Up
Instructions: NONE
Email Address: Lauren.Zellmer@navy.mil
Method of Shipment: Courier Fed Ex
Special

Sample Delivery Group	Sample ID	Collection Information: Date	Time	Matrix	Method/ SOP#:	No. of Bottles	Preservation Code / Bottle Type: ~~Hex Chromium EPA 7196~~ SP 1/7/14	TDS EPA 160.1	Chloride, Fluoride EPA 300.0	Sulfate, Nitrate EPA 300.0	Alkalinity Bicarbonate EPA 310.0	Alkalinity Carbonate EPA 310.0	*LOG IN W/SAMPLE REF ChinaLake*
ISA447	OD Well	1/6/15	1430	Water		1	~~X~~	X	X	X	X	X	

Sampler(s) Name(s): ~~DB & MS~~ Bob Kirk
Turnaround Time: ~~ONE DAY for Hex Cr,~~ 3 Day for all others SP 1/7/14
Hours Sampling:

Condition upon Receipt: Cooler
Temp 6.3 °C Received on Ice Y N Correct Container Y N
Preserved Y N

Associated Forms: BAC-T Form Y N Field Notes Y N

Relinquished By:	Date:	Time:	Received By:	Date:	Time:
BOB KIRK	01/06/15	1530			
Relinquished By:	Date:	Time:	Received By:	Date:	Time:
Relinquished By:	Date:	Time:	Received By:	Date:	Time:

Matrices / Regulatory Programs

HAZ/GW (RCRA) WW (NPDES/CWA)
DW (SDWA) Solid (HUD) LIQ / Other

Bottle Type/Preservative Codes

1 = HCl	7 = $C_6H_8O_6$	C=40 ml
2 = $Na_2S_2O_3$	8 = $NaHSO_4{}^*H_2O$	D=125 ml
3 = H_2SO_4	9 = HNO_3	E=250 ml
4 = NaOH	10 = Ice	F=500 ml
5 = NH_4Cl	A=Glass	G=1 Liter
6 = NaOH + ZoAC	B=HDPE	H=5 Liter

15R440
HA012 Rm 1/7/15

CB&I Federal Services

CHAIN OF CUSTODY

NECARS INFO (CB&I use only)* CHINALAKE_X; OTHR; CHINA_LAKE_NAWS

*EMAX/Sub-lab: CFSView EDDs

Company Name:	CB&I Federal Services.	**Due Date:**	
Address:	Naval Air Station North Island, Bldg-M9	**Task Order Number:**	113
City / State / Zip:	San Diego, CA 92135	**Project Name:**	China Lake
Project Manager:	Dustin Martinez	**Project Location:**	Burro Canyon OBOD
Phone/Fax Number:	619-545-8538 / 619-545-0793	**Activity:**	NAWS
Client Contact:	Laurie Zellmer	**Lab Destination:**	EMAX
Phone/Fax Number:	760-939-3219 / 760-939-2980	**Lab Contact:**	Gale Luc
		Lab Phone #:	310-618-8889 x106

Results Delivery: Emailed Faxed Picked Up **Special Instructions:** NONE **Email Address:** Lauren.Zellmer@navy.mil

Method of Shipment: Courier Fed Ex

		Collection Information					Preservation Code / Bottle Type																
							Requesting Testing Program / Contract ELIN																
Sample Delivery Group	Sample ID	Date	Time	Matrix	Method/ SOP#:	No. of Bottles	Hex Chromium EPA 7196	TDS EPA 160.1	Chloride, Fluoride EPA 300.0	Sulfate, Nitrate EPA 300.0	Alkalinity Bicarbonate EPA 310.0	Alkalinity Carbonate EPA 310.0				*LOG IN W/SAMPLE REF ChinaLake*							
	OD Well	1/6/15	1430	Water		1	X	X	X	X	X	X											

Sampler(s) Name(s): ~~SD & MS~~ Bob Kirk

Hours Sampling:

Turnaround Time: ONE DAY for Hex Cr; 3 Day for all others

Condition upon Receipt Cooler
Temp 6.2 °C Received on Ice Y N Correct Container Y N
Preserved Y N

Associated Forms BAC-T Form Y N Field Notes Y N

Relinquished By:	Date:	Time:	Received By:	Date:	Time:
BOB KIRK	01/06/15	1530			
Relinquished By:	Date:	Time:	Received By:	Date:	Time:
			FMurgamba	1/7/15	0925
Relinquished By:	Date:	Time:	Received By:	Date:	Time:

Matrices / Regulatory Programs

HAZ/GW (RCRA) WW (NPDES/CWA)
DW (SDWA) Solid (HUD) LIQ / Other

Bottle Type/Preservative Codes

1 = HCl	7 = $C_6H_8O_6$	C=40 ml
2 = $Na_2S_2O_3$	8 = $NaHSO_4*H_2O$	D=125 ml
3 = H_2SO_4	9 = HNO_3	E=250 ml
4 = NaOH	10 = Ice	F=500 ml
5 = NH_4Cl	A=Glass	G=1 Liter
6 = NaOH + ZoAC	B=HDPE	H=5 Liter

SAMPLE RECEIPT FORM 1

Reference Number: SM02.7.3

Type of Delivery	Airbill / Tracking Number	ECN 15A447
☑ Fedex ☐ UPS ☐ GSO ☐ Others	Refer to 15A440	Recipient Fmadamba
☐ EMAX Courier ☐ Client Delivery		Date 1/7/15 Time 0925

COC INSPECTION

☑ Client Name	☑ Client PM/FC	☑ Sampler Name	☑ Sampling Date/Time	☑ Sample ID	☑ Matrix
☑ Address	☑ Tel # / Fax #	☐ Courier Signature	☑ Analysis Required	☑ Preservative (if any)	☑ TAT
Safety Issues (if any)	☐ High concentrations expected	☐ From Superfund Site	☐ Rad screening required		

Note: _____

PACKAGING INSPECTION

Container	☑ Cooler	☐ Box	☐ Other		
Condition	☑ Custody Seal	☑ Intact	☐ Damaged		
Packaging	☐ Bubble Pack	☐ Styrofoam	☐ Popcorn	☑ Sufficient	☐ _____
Temperatures (Cool, ≤6 °C but not frozen)	B ☑ Cooler 1 6.3 °C	☐ Cooler 2_____ °C	☐ Cooler 3_____ °C	☐ Cooler 4_____ °C	☐ Cooler 5_____ °C
	☐ Cooler 6_____ °C	☐ Cooler 7_____ °C	☐ Cooler 8_____ °C	☐ Cooler 9_____ °C	☐ Cooler 10_____ °C
Thermometer:	*A - S/N* 130538325	*B - S/N* 140252078	*C - S/N* _____	*D - S/N* _____	

Comments: ☐ **Temperature is out of range. PM was informed IMMEDIATELY.** Fm 1/7/15

Note: _____

DISCREPANCIES

LabSampleID	LabSampleContainerID	Code	ClientSample Label ID / Information	Corrective Action

Fm 1/7/15

☐ pH holding time requirement for water samples is 15 mins. Water samples for pH analysis are received beyond 15 minutes from sampling time.

NOTES/OBSERVATIONS: Refer to SRF1 of 15A440; Sample received at 6.3°C. 500ml sub-sample was taken from 15A440 and tagged as 15A447 per instruction by PM. Fm 1/7/15 1500H

LEGEND:

☐ Continue to next page.

Code	Description- Sample Management	Code	Description-Sample Management	Code	Description-Sample Management
D1	Analysis is not indicated in _____	D13	Out of Holding Time	R1	Proceed as indicated in ☐ COC ☐ Label
D2	Analysis mismatch COC vs label	D14	Bubble is >6mm	R2	Refer to attached instruction
D3	Sample ID mismatch COC vs label	D15	No trip blank in cooler	R3	Cancel the analysis
D4	Sample ID is not indicated in _____	D16	Preservation not indicated in _____	R4	Use vial with smallest bubble first
D5	Container -[improper] [leaking] [broken]	D17	Preservation mismatch COC vs label	R5	Log-in with latest sampling date and time+1 min
D6	Date/Time is not indicated in _____	D18	Insufficient chemical preservative	R6	Adjust pH as necessary
D7	Date/Time mismatch COC vs label	D19	Insufficient Sample	R7	Filter and preserved as necessary
D8	Sample listed in COC is not received	D20	No filtration info for dissolved analysis	R8	_____
D9	Sample received is not listed in COC	D21	No sample for moisture determination	R9	_____
D10	No initial/date on corrections in COC/label	D22	_____	R10	_____
D11	Container count mismatch COC vs received	D23	_____	R11	_____
D12	Container size mismatch COC vs received	D24	_____	R12	_____

REVIEWS:

Sample Labeling Fm Date 1/7/15

SRF Fm Date 1/7/15

PM _____ Date 1/8/15

EDD 01/15

EMAX LABORATORIES, INC.

Reference No.: SM02.7.4

SAMPLE RECEIPT FORM 2

SAMPLES RECEIVED FOR ECN: 15A447 (Split sample of 15A440)

LAB SAMPLE ID (*)	LAB SAMPLE CONTAINER ID	COOLER#	CONTAINER TYPE								pH paper Lot #:_____ CHEMICAL PRESERVATIVE										Filtered	
			Jar	Amber	HDPE	Encore	Vial	Tube	Bag	Other	NONE	HCl (pH<2)	HNO_3 (pH<2)	H_2SO_4 (pH<2)	ZnAc +NaOH (pH>9)	ZnAc +NaOH (pH>12)	NaOH (pH>12)	$Na_2S_2O_3$	Methanol	NaHSO4	Other	Yes	No
1	* 1				✓						✓											
	* 2																					
	* 3																					
	* 4																					
	* 5																					
	* 6																					
	* 7																					
	* 8																					
	* 9																					
	* 0																					
	* 1																					
	* 2																					
	* 3																					
	* 4																					
	* 5																					
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	* 9																					
	* 0																					
	* 1																					
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	* 3																					
	* 4																					
	* 5																					
	* 6																					
	* 7																					
	* 8																					
	* 9																					
	* 0																					

FM 1/7/15

Tiffany Hsieh

From: Phuong, Sopheak (CFS) [sopheak.phuong@CBIFederalServices.com]
Sent: Wednesday, January 07, 2015 4:02 PM
To: Tiffany Hsieh; Wong, Anthony (CFS); Cruz, Arsenio (CFS); Easter, Christopher D (CFS); Luke, Danielle C (CFS); Martinez, Dustin; 'James Webb (james.webb1.ctr@navy.mil)'; Nguyen, Johnny (CFS); Enriquez-Farrell, Keri B; Pisarek, Michael D (CFS); Ibarra, Ramon; 'Tracy Truong'
Cc: Gale Luc; Myo Aung; Yunjen Young
Subject: RE: 15A440 & 15A447_TO-113_MULTIPLE ISSUES

Hi Tiffany,

Yes it is ok. Thanks.

V/r,
Sopheak Phuong

From: Tiffany Hsieh [mailto:THsieh@emaxlabs.com]
Sent: Wednesday, January 07, 2015 3:37 PM
To: Phuong, Sopheak (CFS); Wong, Anthony (CFS); Cruz, Arsenio (CFS); Easter, Christopher D (CFS); Luke, Danielle C (CFS); Martinez, Dustin; 'James Webb (james.webb1.ctr@navy.mil)'; Nguyen, Johnny (CFS); Enriquez-Farrell, Keri B; Pisarek, Michael D (CFS); Ibarra, Ramon; 'Tracy Truong'
Cc: Gale Luc; Myo Aung; Yunjen Young
Subject: RE: 15A440 & 15A447_TO-113_MULTIPLE ISSUES

Hi Sopheak,

One more thing. Is it ok if we proceed by SM method for the TDS and alkalinity?

Thanks,

Tiffany Hsieh
Project Coordinator
EMAX Laboratories, Inc.
1835 W. 205th Street
Torrance, CA 90501
Tel: (310) 618-8889 Ext. 103
Fax: (310) 618-0818
Email: thsieh@emaxlabs.com

From: Tiffany Hsieh
Sent: Wednesday, January 07, 2015 3:04 PM
To: 'Phuong, Sopheak (CFS)'; Wong, Anthony (CFS); Cruz, Arsenio (CFS); Easter, Christopher D (CFS); Luke, Danielle C (CFS); Martinez, Dustin; 'James Webb (james.webb1.ctr@navy.mil)'; Nguyen, Johnny (CFS); Enriquez-Farrell, Keri B; Pisarek, Michael D (CFS); Ibarra, Ramon; 'Tracy Truong'
Cc: Gale Luc; Myo Aung; Yunjen Young; Farina Madamba; Tu Nisamaneepong; Mary J Mendoza; Lucita Arzadon
Subject: RE: 15A440 & 15A447_TO-113_MULTIPLE ISSUES

Thank you Sopheak. We will keep the hex chrom on 15A440 (1 DAY TAT) and split off the TDS, anions, and alkalinity onto 15A447 (3 DAY TAT). Since only 1 bottle was received, we will have to aliquot the sample.

Tiffany Hsieh

Project Coordinator
EMAX Laboratories, Inc.
1835 W. 205th Street
Torrance, CA 90501
Tel: (310) 618-8889 Ext. 103
Fax: (310) 618-0818
Email: thsieh@emaxlabs.com

From: Phuong, Sopheak (CFS) [mailto:sopheak.phuong@CBIFederalServices.com]
Sent: Wednesday, January 07, 2015 1:52 PM
To: Tiffany Hsieh; Wong, Anthony (CFS); Cruz, Arsenio (CFS); Easter, Christopher D (CFS); Luke, Danielle C (CFS); Martinez, Dustin; 'James Webb (james.webb1.ctr@navy.mil)'; Nguyen, Johnny (CFS); Enriquez-Farrell, Keri B; Pisarek, Michael D (CFS); Ibarra, Ramon; 'Tracy Truong'
Cc: Gale Luc; Myo Aung; Yunjen Young
Subject: RE: TO-113_MULTIPLE ISSUES

Hi Tiffany,

Please see attached for revised COCs.

V/r,
Sopheak Phuong

From: Tiffany Hsieh [mailto:THsieh@emaxlabs.com]
Sent: Wednesday, January 07, 2015 12:08 PM
To: Tiffany Hsieh; Wong, Anthony (CFS); Cruz, Arsenio (CFS); Easter, Christopher D (CFS); Luke, Danielle C (CFS); Martinez, Dustin; 'James Webb (james.webb1.ctr@navy.mil)'; Nguyen, Johnny (CFS); Enriquez-Farrell, Keri B; Pisarek, Michael D (CFS); Ibarra, Ramon; Phuong, Sopheak (CFS); 'Tracy Truong'
Cc: Gale Luc; Myo Aung; Yunjen Young
Subject: RE: TO-113_MULTIPLE ISSUES

Hi James,

Per our conversation, we will use 15A440. We will also proceed with analyses even though they were received out of temperature. Please let us know if otherwise. Have you heard back on item #3 and #4 yet? Our analysts would like to start working on those but we need to know to proceed with those analyses in terms of SDG and TAT.

Thanks,

Tiffany Hsieh
Project Coordinator
EMAX Laboratories, Inc.
1835 W. 205th Street
Torrance, CA 90501
Tel: (310) 618-8889 Ext. 103
Fax: (310) 618-0818
Email: thsieh@emaxlabs.com

From: Tiffany Hsieh
Sent: Wednesday, January 07, 2015 10:10 AM

To: Anthony Wong; Arsenio Cruz; Chris Easter; Danielle Luke; Dustin Martinez; James Webb (james.webb1.ctr@navy.mil); Johnny Nguyen; Keri Farrell; Michael Pisarek; Ramon Ibarra; Sopheak Phuong; Tracy Truong
Cc: Gale Luc; Myo Aung; Yunjen Young
Subject: TO-113_MULTIPLE ISSUES
Importance: High

Hi James,

We received the China Lake sample that includes the hex chrom by 7196 and have several urgent issues:

1. Please assign an SDG.
2. Sample was received out of temp (6.3C). Please advise on how to proceed.
3. This COC has two TATs: 1 DAY for hex chrom and 3 DAYS for TDS, anions, and alkalinity. We can only have one TAT per SDG/COC. Please advise if we are to proceed with all the analysis and on what TAT or if we should cancel all but hex chrom on a 1 DAY TAT.
4. The EPA method for TDS and alkalinity are deleted methods. Is it all right if we proceed by SM method?

Please advise ASAP. Our analyst is preparing to start the hex chrom soon.

Thanks,

Tiffany Hsieh
Project Coordinator
EMAX Laboratories, Inc.
1835 W. 205th Street
Torrance, CA 90501
Tel: (310) 618-8889 Ext. 103
Fax: (310) 618-0818
Email: thsieh@emaxlabs.com

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FedEx Express **NEW** Package US Airbill

FedEx Tracking Number 8065 0574 5456

1 From

Date 1/6/15

Sender's Name NAVAL AIR WEAPONS STATION Phone 760 939-321

Company NAVAL AIR WEAPONS STATION CHINA LAKE

Address 429 E. BOWEN Rd. Mail Stop Dept/Floor/S

City Ridgecrest State CA ZIP 93555-610

Your Internal Billing Reference

To

Recipient's Name Sample Receiving Phone

Company EMAX LABS, Inc.

Address 1835 West 205th Street Dept/Floor/Suite/Bom

We cannot deliver to P.O. boxes or P.O. ZIP codes.

Address

Use this line for the HOLD location address or for continuation of your shipping address.

City Torrance CA ZIP 90501

HOLD Weekda
FedEx location addre
REQUIRED. NOT avai
FedEx First Overnight

HOLD Saturda
FedEx location address
REQUIRED. Available t
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FedEx 2Day to select k

fedex.com 1.800.GoFedEx 1.800.463.3339

RT B59 2 10.30 5456 01.07 ST 9

ORIGIN ID:IYKA

UNITED STATES US

SHIP DATE: 06JAN15
ACTWGT: 5.9 LB
CAD: /POS1525
DIMS: 10x7x6 IN

BILL SENDER

Part # 156297-435 RIT 09/14

TO

EMAX LABS
1835 W 205TH ST

TORRANCE CA 90501

(310) 618-8889 REF:

INV: PO: DEPT:

FedEx Express

TRK# 0200 8065 0574 5456

WED - 07 JAN 10:30A
PRIORITY OVERNIGHT

92 HHRA

90501
CA-US LAX

Rev. Date 1/12 • Part #167002 • ©2012 FedEx • PRINTED IN U.S.A. SRF

REPORTING CONVENTIONS

DATA QUALIFIERS:

Lab Qualifier	Description
ND	Indicates that the analyte is non detect at the MDL.
J	Indicates that the analyte is positively identified with the result less than RL but greater than MDL; value is an estimated concentration.
B	Indicates that the analyte is found in the associated method blank at or above the RL as well as in the sample at above QC level.
E	Indicates that the result is above the maximum calibration range.
N	Indicates presumptive evidence of a compound.
*	Out of QC limit.

Note: The above qualifiers are used to flag the results unless the project requires a different set of qualification criteria.

ACRONYMS AND ABBREVIATIONS:

Quality Control	
MBLK	Method Blank
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
Others	
CRDL	Contract Required Detection Limit
RL	Reporting Limit
MRL	Method Reporting Limit
PQL	Practical Quantitation Limit
MDL	Method Detection Limit
DO	Diluted out

DATES

The date and time information for leaching and preparation reflect the beginning date and time of the procedure unless the method(s), protocol(s), or project(s) specifically requires otherwise.

REPORTING CONVENTIONS

Decimal places, trailing zeroes or the lack thereof appearing on the data should not be interpreted as indicative of the precision of the analytical procedure, but rather as a result of reporting format limitations.

SAMPLE RESULTS

Sample Summary Form

EMAX Laboratories Inc. Tel 310-6188889 NELAP Accreditation #: 02116CA

Client : Navy - Shaw PWC
Project : NAWS China Lake
Batch No. : 15A447
Sample ID: OD WELL
Lab Samp ID: A447-01 (Group)

Date Collected: 01/06/15 14:30
Date Received: 01/07/15
Prject Code: PW10516_
Matrix : WATER
% Moisture : NA

LabSmpID	Parameters	RefMethod	Result&Unit	DilF	RL	MDL	AnlDateTime	PrpDateTime	LabFileID	PrpBatch
A447-01I	Chloride-Cl_(!)	E300.0	172 mg/L	10	2.00	1.00	01/07/15 17:21	NA	AA05-29	ICA005W_
A447-01_	Fluoride-F_(!)	E300.0	0.324 mg/L	1	0.100	0.0500	01/07/15 11:32	NA	AA05-06	ICA005W_
A447-01_	Nitrate-N_(!)	E300.0	0.912 mg/L	1	0.100	0.0500	01/07/15 11:32	NA	AA05-06	ICA005W_
A447-01I	Sulfate_(!)	E300.0	83.0 mg/L	10	5.00	2.50	01/07/15 17:21	NA	AA05-29	ICA005W_
A447-01_	BICARBONATE ALKALINITY(!)	SM2320B	69.9 mg/L	1	5	5	01/08/15 18:47	NA	15E5A0130	ALA002W_
A447-01_	CARBONATE ALKALINITY_(!)_	SM2320B	ND mg/L	1	5	5	01/08/15 18:47	NA	15E5A0130	ALA002W_
A447-01_	TDS_(!)	SM2540C	525 mg/L	1	10	10	01/07/15 11:36	NA	15TDA00115_	TDA001W_

DilF: Dilution Factor
RL: Reporting Limit
MDL: Method Detection Limit

(!): Sample was analyzed out of EPA's recommended temperature range.

QC SUMMARIES

EMAX QUALITY CONTROL DATA
LCS/LCD ANALYSIS

CLIENT: NAVY - SHAW PWC
PROJECT: NAWS CHINA LAKE
BATCH NO.: 15A447
METHOD: METHOD E300.0

MATRIX:	WATER			% MOISTURE:	NA
DILUTION FACTOR:	1	1	1		
SAMPLE ID:	MBLK1W				
LAB SAMP ID:	ICA005WB	ICA005WL	ICA005WC		
LAB FILE ID:	AA05-03	AA05-04	AA05-05		
DATE EXTRACTED:	NA	NA	NA	DATE COLLECTED:	NA
DATE ANALYZED:	01/07/1510:47	01/07/1511:02	01/07/1511:17	DATE RECEIVED:	NA
PREP. BATCH:	ICA005W	ICA005W	ICA005W		
CALIB. REF:	AA05-01	AA05-01	AA05-01		

ACCESSION:

PARAMETER	BLNK RSLT (mg/L)	SPIKE AMT (mg/L)	BS RSLT (mg/L)	BS % REC	SPIKE AMT (mg/L)	BSD RSLT (mg/L)	BSD % REC	RPD (%)	QC LIMIT (%)	MAX RPD (%)
Chloride-Cl	ND	2	1.83	92	2	1.83	92	0	90-110	20

EMAX QUALITY CONTROL DATA
LCS/LCD ANALYSIS

CLIENT: NAVY - SHAW PWC
PROJECT: NAWS CHINA LAKE
BATCH NO.: 15A447
METHOD: METHOD E300.0

MATRIX:	WATER			% MOISTURE:	NA
DILUTION FACTOR:	1	1	1		
SAMPLE ID:	MBLK1W				
LAB SAMP ID:	ICA005WB	ICA005WL	ICA005WC		
LAB FILE ID:	AA05-03	AA05-04	AA05-05		
DATE EXTRACTED:	NA	NA	NA	DATE COLLECTED:	NA
DATE ANALYZED:	01/07/1510:47	01/07/1511:02	01/07/1511:17	DATE RECEIVED:	NA
PREP. BATCH:	ICA005W	ICA005W	ICA005W		
CALIB. REF:	AA05-01	AA05-01	AA05-01		

ACCESSION:

PARAMETER	BLNK RSLT (mg/L)	SPIKE AMT (mg/L)	BS RSLT (mg/L)	BS % REC	SPIKE AMT (mg/L)	BSD RSLT (mg/L)	BSD % REC	RPD (%)	QC LIMIT (%)	MAX RPD (%)
Fluoride-F	ND	2	2.07	103	2	2.06	103	0	90-110	20

EMAX QUALITY CONTROL DATA
LCS/LCD ANALYSIS

CLIENT: NAVY - SHAW PWC
PROJECT: NAWS CHINA LAKE
BATCH NO.: 15A447
METHOD: METHOD E300.0

MATRIX:	WATER			% MOISTURE:	NA
DILUTION FACTOR:	1	1	1		
SAMPLE ID:	MBLK1W				
LAB SAMP ID:	ICA005WB	ICA005WL	ICA005WC		
LAB FILE ID:	AA05-03	AA05-04	AA05-05		
DATE EXTRACTED:	NA	NA	NA	DATE COLLECTED:	NA
DATE ANALYZED:	01/07/1510:47	01/07/1511:02	01/07/1511:17	DATE RECEIVED:	NA
PREP. BATCH:	ICA005W	ICA005W	ICA005W		
CALIB. REF:	AA05-01	AA05-01	AA05-01		

ACCESSION:

PARAMETER	BLNK RSLT (mg/L)	SPIKE AMT (mg/L)	BS RSLT (mg/L)	BS % REC	SPIKE AMT (mg/L)	BSD RSLT (mg/L)	BSD % REC	RPD (%)	QC LIMIT (%)	MAX RPD (%)
Nitrate-N	ND	1	1.01	101	1	1.01	101	0	90-110	20

EMAX QUALITY CONTROL DATA
LCS/LCD ANALYSIS

CLIENT: NAVY - SHAW PWC
PROJECT: NAWS CHINA LAKE
BATCH NO.: 15A447
METHOD: METHOD E300.0

MATRIX:	WATER			% MOISTURE:	NA
DILUTION FACTOR:	1	1	1		
SAMPLE ID:	MBLK1W				
LAB SAMP ID:	ICA005WB	ICA005WL	ICA005WC		
LAB FILE ID:	AA05-03	AA05-04	AA05-05		
DATE EXTRACTED:	NA	NA	NA	DATE COLLECTED:	NA
DATE ANALYZED:	01/07/1510:47	01/07/1511:02	01/07/1511:17	DATE RECEIVED:	NA
PREP. BATCH:	ICA005W	ICA005W	ICA005W		
CALIB. REF:	AA05-01	AA05-01	AA05-01		

ACCESSION:

PARAMETER	BLNK RSLT (mg/L)	SPIKE AMT (mg/L)	BS RSLT (mg/L)	BS % REC	SPIKE AMT (mg/L)	BSD RSLT (mg/L)	BSD % REC	RPD (%)	QC LIMIT (%)	MAX RPD (%)
Sulfate	ND	5	4.73	95	5	4.73	95	0	90-110	20

EMAX QUALITY CONTROL DATA
LCS ANALYSIS

CLIENT : NAVY - SHAW PWC
PROJECT : NAWS CHINA LAKE
BATCH NO. : 15A447
METHOD : SM2540C

MATRIX : WATER
DILUTION FACTOR: 1 1
SAMPLE ID : MBLK1W LCS1W
LAB SAMPLE ID : TDA001WB TDA001WL
LAB FILE ID : 15TDA00101 15TDA00102
DATE PREPARED : NA NA
DATE ANALYZED : 01/07/1511:36 01/07/1511:36
PREP BATCH : TDA001W TDA001W
CALIBRATION REF: 15TDA001 15TDA001

ACCESSION:

PARAMETER	MB RESULT (mg/L)	SPIKE AMT (mg/L)	BS RESULT (mg/L)	BS REC (%)	QC LIMIT (%)
TDS	ND	1000	1010	101	80-120

EMAX QUALITY CONTROL DATA
SAMPLE DUPLICATE ANALYSIS

CLIENT : NAVY - SHAW PWC
PROJECT : NAWS CHINA LAKE
BATCH NO. : 15A447
METHOD : SM2540C

MATRIX : WATER

DILUTION FACTOR:	1	1
SAMPLE ID :	OD WELL	OD WELLDUP
LAB SAMPLE ID :	A447-01	A447-01D
LAB FILE ID :	15TDA00115	15TDA00116
DATE PREPARED :	NA	NA
DATE ANALYZED :	01/07/1511:36	01/07/1511:36
PREP BATCH :	TDA001W	TDA001W
CALIBRATION REF:	15TDA001	15TDA001

ACCESSION:

PARAMETER	PARENT RESULT (mg/L)	DUP RESULT (mg/L)	RPD (%)	MAX RPD (%)
TDS	525	532	1	20

Analyst Summary Form

EMAX Laboratories Inc. Tel 310-6188889 NELAP Accreditation #: 02116CA

Client : NAVY - SHAW PWC
Project : NAWS CHINA LAKE
Project Code : PW10516_
Batch Number : 15A447

EMAXCODE	METHOD	ANALYST
E-300CL	300	JC
E-300F	300.0	JC
E-300NO3	300	JC
E-300SO4	300	JC
SM-BALK	SW2320B	TK
SM-CALK	SM2320B	TK
SM-TDS	SM2540C	SY

ATTACHMENT – 4

Laboratory Report - Metals, VOCs, SVOCs, pH

EMAX
LABORATORIES, INC.
1835 W. 205th Street
Torrance, CA 90501
Tel: (310) 618-8889
Fax: (310) 618-0818

Date: 01-13-2015
EMAX Batch No.: 15A455

Attn: Laurie Zellmer

Navy - Shaw PWC
NAS North Island, Bldg-M9
San Diego CA 92135
Task Order Number: 113

Subject: Laboratory Report
Project: NAWS China Lake
Contract #: N62473-10-D-4003

Enclosed is the Laboratory report for samples received on 01/08/15.
The data reported relate only to samples listed below :

Sample ID	Control #	Col Date	Matrix	Analysis
OD WELL	A455-01	01/06/15	WATER	PERCHLORATE BY 6850
				METALS CAM
				MERCURY
				NITROAROMATICS & NITRAMINES
				SEMIVOLATILE ORGANICS BY GCMS
				VOLATILE ORGANICS BY GC/MS
				PH
				METALS BY ICP

The results are summarized on the following pages.

Please feel free to call if you have any questions concerning these results.

Sincerely yours,

Caspar J. Pang
Laboratory Director

This analytical report ends on page 37.

EMAX certifies that the results included in this report meets all NELAC requirements unless noted in the Case Narrative.

NELAC Certificate Number 02116CA

15A455

CB&I Federal Services

CHAIN OF CUSTODY

NECARS INFO (CB&I use only)*

Company Name: CB&I Federal Services.
Address: Naval Air Station North Island, Bldg-M9
City / State / Zip: San Diego, CA 92135
Project Manager: Dustin Martinez
Phone/Fax Number: 619-545-8538 / 619-545-0793
Client Contact: Laurie Tellmer
Phone/Fax Number: 760-939-3219

Due Date:
Task Order Number: TO-113
Project Name: China Lake
Project Location: Burro Canyon OBOD
Activity: BC OD well
Lab Destination: EMAX
Lab Contact: Gale Luc
Lab Phone #: 310-618-8889 x106

Results Delivery: Emailed discrepancies.

Special Instructions: Please contact CB&I for SDG # & follow COC for all collection

Preservation Code / Bottle Type

Requesting Testing Program / Contract #

Sample Delivery Group	Sample ID / Location	Collection Information: Date	Time	Matrix	Method/ SOP#:	No. of Bottles	Perchlorate E00803CM EPA 6850	Metals: Al, Ca, Mg, Na, Mn, K (6010) E00804AT	Title 22 Metals EPA(6010) E00804AE + Hg 7470	Explosives (8330) E00806AK	SVOCs (8270) E00806BK	VOCs (8260) E00807BC	pH (9040) E00803CN	Chloride, Fluoride, Nitrate, Nitrite (300.0)	Alkalinity, Carb	Alkalinity, Bicarbonate (2320B) E00803AL
	ODWell	1-6-15	15:25			8	X	X	X	X	X	X	X	X	X	X

Sampler(s) Name(s): Bork / Stoner

Turnaround Time: [redacted] 3 Day

Hours Sampling:

Condition upon Receipt
Cooler Temp ____ °C Received on Ice Y N Correct Container Y N
Preserved Y N Seal Intact Y N Tracking #:

Associated Forms
N Field Notes Y N SCUR Form Y N BAC-T Form Y Others Y N

Relinquished By:	Date:	Time:	Received By:	Date:	Time:
Stephan Bork	1/7/2015	15:30	FED EX		
				1/8/15	09:45

Matrices / Regulatory Programs

HAZ/GW (RCRA) WW (NPDES/CWA)
DW (SDWA) Solid (HUD) LIQ / Other

Bottle Type/Preservative Codes

1 = HCl	7 = $C_6H_8O_6$	C=40 ml
2 = $Na_2S_2O_3$	8 = $NaHSO_4{*}H_2O$	D=125 ml
3 = H_2SO_4	9 = HNO_3	E=250 ml
4 = NaOH	10 = Ice	F=500 ml
5 = NH_4Cl	A=Glass	G=1 Liter
6 = NaOH + ZoAC	B=HDPE	H=5 Liter

Temp 3.5°C

SAMPLE RECEIPT FORM 1

Reference Number: SM02.7.3

Type of Delivery	Airbill / Tracking Number	ECN 15A455
☑ Fedex ☐ UPS ☐ GSO ☐ Others	7724 9524 5044	Recipient Cecilia Chavez
☐ EMAX Courier ☐ Client Delivery		Date 01-08-15 Time 0945

COC INSPECTION

☑ Client Name	☑ Client PM/FC	☑ Sampler Name	☑ Sampling Date/Time	☑ Sample ID	☐ Matrix
☑ Address	☑ Tel # / Fax #	☐ Courier Signature	☑ Analysis Required	☐ Preservative (if any)	☑ TAT
Safety Issues (if any)	☐ High concentrations expected	☐ From Superfund Site	☑ Rad screening required		

Note: Corrections made to COC are not initialed /dated

PACKAGING INSPECTION

Container	☑ Cooler	☐ Box	☐ Other		
Condition	☑ Custody Seal	☑ Intact	☐ Damaged		
Packaging	☑ Bubble Pack	☐ Styrofoam	☐ Popcorn	☑ Sufficient	☑ plastic bag
Temperatures (Cool, ≤6 °C but not frozen)	☑ Cooler 1 3.5 °C	☐ Cooler 2_____ °C	☐ Cooler 3_____ °C	☐ Cooler 4_____ °C	☐ Cooler 5_____ °C
	☐ Cooler 6_____ °C	☐ Cooler 7_____ °C	☐ Cooler 8_____ °C	☐ Cooler 9_____ °C	☐ Cooler 10_____ °C
Thermometer:	*A - S/N* 130538505	*B - S/N* 140252070	*C - S/N* _____	*D - S/N* _____	

Comments: ☐ **Temperature is out of range. PM was informed IMMEDIATELY.** TM 10/22/14

Note: _____

DISCREPANCIES

LabSampleID	LabSampleContainerID	Code	ClientSample Label ID / Information	Corrective Action
1		D8	Did not rec a container for	R2
↓		↓	perchlorate or pH	R1 & 1/9/15
1	4	D2	per label: Metals (only) Hg	R1
↓	↓	↓	not req.	

cal 1/8/15

☐ pH holding time requirement for water samples is 15 mins. Water samples for pH analysis are received beyond 15 minutes from sampling time.

NOTES/OBSERVATIONS:

LEGEND:

☐ Continue to next page.

Code	Description- Sample Management	Code	Description-Sample Management	Code	Description-Sample Management
D1	Analysis is not indicated in _____	D13	Out of Holding Time	R1	Proceed as indicated in ☑ COC ☐ Label
D2	Analysis mismatch COC vs label	D14	Bubble is >6mm	R2	Refer to attached instruction
D3	Sample ID mismatch COC vs label	D15	No trip blank in cooler	R3	Cancel the analysis
D4	Sample ID is not indicated in _____	D16	Preservation not indicated in _____	R4	Use vial with smallest bubble first
D5	Container -[improper] [leaking] [broken]	D17	Preservation mismatch COC vs label	R5	Log-in with latest sampling date and time+1 min
D6	Date/Time is not indicated in _____	D18	Insufficient chemical preservative	R6	Adjust pH as necessary
D7	Date/Time mismatch COC vs label	D19	Insufficient Sample	R7	Filter and preserved as necessary
D8	Sample listed in COC is not received	D20	No filtration info for dissolved analysis	R8	_____
D9	Sample received is not listed in COC	D21	No sample for moisture determination	R9	_____
D10	No initial/date on corrections in COC/label	D22	_____	R10	_____
D11	Container count mismatch COC vs received	D23	_____	R11	_____
D12	Container size mismatch COC vs received	D24	_____	R12	_____

REVIEWS:

Sample Labeling _____ Date 1/8/15

SRF _____ Date 1/8/15

PM _____ Date 1/9/15

EMAX LABORATORIES, INC.

Reference No.: SM02.7.4

SAMPLE RECEIPT FORM 2

SAMPLES RECEIVED FOR ECN: 15A455

pH paper Lot #: HC413032

LAB SAMPLE ID (*)	LAB SAMPLE CONTAINER ID	COOLER#	CONTAINER TYPE								CHEMICAL PRESERVATIVE											Filtered	
			Jar	Amber	HDPE	Encore	Vial	Tube	Bag	Other	NONE	HCl (pH<2)	HNO_3 (pH<2)	H_2SO_4 (pH<2)	ZnAc +NaOH (pH>9)	ZnAc +NaOH (pH>12)	NaOH (pH>12)	$Na_2S_2O_3$	Methanol	NaHSO4	Other	Yes	No
1	* 1	1					✓					✓											
	* 2	1					✓					✓											
	* 3	1					✓					✓											
	* 4	1			✓								✓										
	* 5	1		✓							✓												
	* 6	1		✓							✓												
	* 7	1		✓							✓												
	* 8	1		✓							✓												
	* 9																						
	* 0																						
	* 1																						
	* 2																						
	* 3																						
	* 4																						
	* 5																						
	* 6																						
	* 7																						
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	* 1																						
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	* 4																						
	* 5																						
	* 6																						
	* 7																						
	* 8																						
	* 9																						
	* 0																						

8/08-15

Yunjen Young

From: Phuong, Sopheak (CFS) [sopheak.phuong@CBIFederalServices.com]
Sent: Thursday, January 08, 2015 1:26 PM
To: Tiffany Hsieh; Gale Luc; Myo Aung; Yunjen Young
Cc: James Webb (james.webb1.ctr@navy.mil); Martinez, Dustin
Subject: RE: 15A455_ TO-113_1 HR_MISSING SDG

Thanks for the update.

V/r,
Sopheak Phuong

-----Original Message-----
From: Tiffany Hsieh [mailto:THsieh@emaxlabs.com]
Sent: Thursday, January 08, 2015 1:09 PM
To: Phuong, Sopheak (CFS); Gale Luc; Myo Aung; Yunjen Young
Cc: James Webb (james.webb1.ctr@navy.mil); Martinez, Dustin
Subject: RE: 15A455_ TO-113_1 HR_MISSING SDG

Hi Sopheak,

We will analyze the perchlorate and pH from one of the amber bottles. If we run into any issues we will let you know.

Thanks,

Tiffany Hsieh
Project Coordinator
EMAX Laboratories, Inc.
1835 W. 205th Street
Torrance, CA 90501
Tel: (310) 618-8889 Ext. 103
Fax: (310) 618-0818
Email: thsieh@emaxlabs.com

-----Original Message-----
From: Phuong, Sopheak (CFS) [mailto:sopheak.phuong@CBIFederalServices.com]
Sent: Thursday, January 08, 2015 12:42 PM
To: Tiffany Hsieh; Gale Luc; Myo Aung; Yunjen Young
Cc: James Webb (james.webb1.ctr@navy.mil); Martinez, Dustin
Subject: RE: TO-113_1 HR_MISSING SDG

The client also suggested using the water from the hex cr analysis.

Additionally, they are under a regulatory time limit for this job. Thanks.

V/r,
Sopheak Phuong

-----Original Message-----
From: Phuong, Sopheak (CFS)
Sent: Thursday, January 08, 2015 12:37 PM
To: THsieh@emaxlabs.com; GLuc@emaxlabs.com; MAung@emaxlabs.com; YYoung@emaxlabs.com
Cc: James Webb (james.webb1.ctr@navy.mil); Martinez, Dustin
Subject: FW: TO-113_1 HR_MISSING SDG

Hi Tiffany,

Please see the client's response below.

V/r,
Sopheak Phuong

-----Original Message-----
From: Zellmer, Lauren A CIV NAVFACSW, GRDK39/OPDK [mailto:lauren.zellmer@navy.mil]
Sent: Thursday, January 08, 2015 12:32 PM
To: Phuong, Sopheak (CFS)
Cc: Bork, Stephan A CIV NAVFACSW, Requirements Branch; Stoner, Michael D CIV NAVFAC SW, CHLK
Subject: RE: TO-113_1 HR_MISSING SDG

We used the exact bottles that were provided to us from you folks. Resampling is not an option. I would think that you could use water sample from another unpreserved bottle?

-----Original Message-----
From: Phuong, Sopheak (CFS) [mailto:sopheak.phuong@CBIFederalServices.com]
Sent: Thursday, January 08, 2015 12:25 PM
To: Zellmer, Lauren A CIV NAVFACSW, GRDK39/OPDK; Stoner, Michael D CIV NAVFAC SW, CHLK
Subject: FW: TO-113_1 HR_MISSING SDG
Importance: High

Hi Lauren/Michael,

I received an email from the lab inquiring on how to proceed with samples for perchlorate and pH not being received in an unpreserved poly bottle. Please advise. Thanks.

V/r,

Sopheak Phuong

From: Tiffany Hsieh [mailto:THsieh@emaxlabs.com]
Sent: Thursday, January 08, 2015 12:18 PM
To: Phuong, Sopheak (CFS); Wong, Anthony (CFS); Cruz, Arsenio (CFS); Easter, Christopher D (CFS); Luke, Danielle C (CFS); Martinez, Dustin; James Webb (james.webb1.ctr@navy.mil); Nguyen, Johnny (CFS); Enriquez-Farrell, Keri B; Pisarek, Michael D (CFS); Ibarra, Ramon; Tracy Truong
Cc: Gale Luc; Myo Aung; Yunjen Young
Subject: RE: TO-113_1 HR_MISSING SDG
Importance: High

Hi Sopheak,

We did not receive an unpreserved poly bottle for the perchlorate and pH sample. Please advise on how to proceed at your earliest convenience.

Thanks,

Tiffany Hsieh

Project Coordinator

EMAX Laboratories, Inc.

1835 W. 205th Street

Torrance, CA 90501

Tel: (310) 618-8889 Ext. 103

Fax: (310) 618-0818

Email: thsieh@emaxlabs.com <mailto:thsieh@emaxlabs.com>

From: Phuong, Sopheak (CFS) [mailto:sopheak.phuong@CBIFederalServices.com]
Sent: Thursday, January 08, 2015 10:18 AM
To: Tiffany Hsieh; Wong, Anthony (CFS); Cruz, Arsenio (CFS); Easter, Christopher D (CFS); Luke, Danielle C (CFS); Martinez, Dustin; James Webb (james.webb1.ctr@navy.mil); Nguyen, Johnny (CFS); Enriquez-Farrell, Keri B; Pisarek, Michael D (CFS); Ibarra, Ramon; Tracy Truong
Cc: Gale Luc; Myo Aung; Yunjen Young
Subject: RE: TO-113_1 HR_MISSING SDG

Hi Tiffany,

Please use SDG 15A455. Revised COC attached.

V/r,

Sopheak Phuong

From: Tiffany Hsieh [mailto:THsieh@emaxlabs.com]
Sent: Thursday, January 08, 2015 10:02 AM
To: Wong, Anthony (CFS); Cruz, Arsenio (CFS); Easter, Christopher D (CFS); Luke, Danielle C (CFS); Martinez, Dustin; James Webb (james.webb1.ctr@navy.mil); Nguyen, Johnny (CFS); Enriquez-Farrell, Keri B; Pisarek, Michael D (CFS); Ibarra, Ramon; Phuong, Sopheak (CFS); Tracy Truong
Cc: Gale Luc; Myo Aung; Yunjen Young
Subject: TO-113_1 HR_MISSING SDG

Hi James,

Please assign an SDG to the attached COC at your earliest convenience.

Thanks,

Tiffany Hsieh

From: (760) 939-3378 Origin ID: IYKA
United States Navy
NAVAL AIR WARFARE CTR WEAPONS DIV
1 ADMINISTRATION CIRCLE

CHINA LAKE, CA 93555

FedEx Express

J142214092303uv

Ship Date: 07JAN15
ActWgt: 32.0 LB
CAD: 104939032/WSXI2900

Dims: 18 X 13 X 11 IN

Delivery Address Bar Code

Ref # N605305007S013XXX
Invoice #
PO #
Dept #

SHIP TO: (222) 222-2222 BILL SENDER

RECEIVING OFFICER
EMAX LABS INC
1835 WEST 205TH ST
ATTN SAMPLE RECEIVING
TORRANCE, CA 90501

THU - 08 JAN AA
STANDARD OVERNIGHT

TRK# 0201 **7724 9524 5044**

90501
CA-US

92 HHRA

LAX

522G1/8F15/8AC9

SHIP TO: (222) 222-2222
RECEIVING OFFICER
EMAX LABS INC
1835 WEST 205TH ST
ATTN SAMPLE RECEIVING
TORRANCE, CA 90501

SHIPPING CONTAINER TALLY → 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50

REQUISITION AND INVOICE/SHIPPING DOCUMENT

Form Approved
OMB No. 0704-0246
Expires Feb 28, 2006

PLEASE DO NOT RETURN YOUR FORM TO THIS ADDRESS. RETURN COMPLETED FORM TO THE ADDRESS IN ITEM 2.

1. FROM: *(Include ZIP Code)*
Naval Air Weapons Station
429 E Bowen Road, Stop 4014
China Lake, CA 93555

SHEET NO.	NO. OF SHEETS	5. REQUISITION DATE	6. REQUISITION NUMBER
1	1		01/07/2015

7. DATE MATERIAL REQUIRED *(YYYYMMDD)*: 01/08/2015

8. PRIORITY: OVERNIGHT

2. TO: *(Include ZIP Code)*
NAWS China Lake Shipping Dept.
Bldg. 01033
China Lake, CA 93555

9. AUTHORITY OR PURPOSE

10. SIGNATURE

11a. VOUCHER NUMBER & DATE *(YYYYMMDD)*

3. SHIP TO - MARK FOR
EMAX Labs, Inc
Attn: Sample Receiving
1835 West 205th Street
Torrance, CA 90501

12. DATE SHIPPED *(YYYYMMDD)*

b.

13. MODE OF SHIPMENT

14. BILL OF LADING NUMBER

15. AIR MOVEMENT DESIGNATOR OR PORT REFERENCE NO.

4. APPROPRIATIONS DATA
100000993323.0010

AMOUNT

ITEM NO. (a)	FEDERAL STOCK NUMBER, DESCRIPTION, AND CODING OF MATERIEL AND/OR SERVICES (b)	UNIT OF ISSUE (c)	QUANTITY REQUESTED (d)	SUPPLY ACTION (e)	TYPE CON-TAINER (f)	CON-TAINER NOS. (g)	UNIT PRICE (h)	TOTAL COST (i)
1	Cooler with samples and ice. 18" x 13" x 11" SD13	ea						

16. TRANSPORTATION VIA MATS OR MSTS CHARGEABLE TO

17. SPECIAL HANDLING

18. RECAPITULATION OF SHIPMENT

ISSUED BY	TOTAL CON-TAINERS	TYPE CON-TAINER	DESCRIPTION	TOTAL WEIGHT	TOTAL CUBE
CHECKED BY					
PACKED BY					
			← TOTAL →		

19. RECEIPT

	DATE *(YYYYMMDD)*	BY	
CONTAINERS RECEIVED EXCEPT AS NOTED			SHEET TOTAL 0.00
QUANTITIES RECEIVED EXCEPT AS NOTED	DATE *(YYYYMMDD)*	BY	GRAND TOTAL
POSTED	DATE *(YYYYMMDD)*	BY	20. RECEIVER'S VOUCHER NO.

DD FORM 1149, JUN 2003

51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

PREVIOUS EDITION IS OBSOLETE.

STLC and TTLC Limits

Compound	STLC (mg/L)	TTLC (mg/kg)*
Antimony	15	500
Arsenic	5	500
Barium	100	10,000
Beryllium	0.75	75
Cadmium	1	100
Chromium	5	2,500
Cobalt	80	8,000
Copper	25	2,500
Lead	5	1,000
Mercury	0.2	20
Molybdenum	350	3,500
Nickel	20	2,000
Selenium	1	100
Silver	5	500
Thallium	7	700
Vanadium	24	2,400
Zinc	250	5,000

Source: Barclays California Code of Regulations: Title 22, 66261.24.

Notes:
* - Based on wet weight.

If TTLC concentration is > 10x STLC Levels and < TTLC Levels, STLC should be performed.

TCLP Limits

Compound	TCLP (mg/L)
Metals	
Arsenic	5
Barium	100
Cadmium	1
Chromium	5
Lead	5
Mercury	0.2
Selenium	1
Silver	5

VOCs

Benzene	0.5
Carbon tetrachloride	0.5
Chlorobenzene	100
Chloroform	6
1,4 Dichlorobenzene	7.5
1,2 Dichloroethane	0.5
1,1-Dichloroethene	0.7
Methyl ethyl ketone (2-butanone)	200
Tetrachloroethene	0.7
Trichloroethene	0.5
Vinyl chloride	0.2

REPORTING CONVENTIONS

DATA QUALIFIERS:

Lab Qualifier	Description
ND	Indicates that the analyte is non detect at the MDL.
J	Indicates that the analyte is positively identified with the result less than RL but greater than MDL; value is an estimated concentration.
B	Indicates that the analyte is found in the associated method blank at or above the RL as well as in the sample at above QC level.
E	Indicates that the result is above the maximum calibration range.
N	Indicates presumptive evidence of a compound.
*	Out of QC limit.

Note: The above qualifiers are used to flag the results unless the project requires a different set of qualification criteria.

ACRONYMS AND ABBREVIATIONS:

Quality Control	
MBLK	Method Blank
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
Others	
CRDL	Contract Required Detection Limit
RL	Reporting Limit
MRL	Method Reporting Limit
PQL	Practical Quantitation Limit
MDL	Method Detection Limit
DO	Diluted out

DATES

The date and time information for leaching and preparation reflect the beginning date and time of the procedure unless the method(s), protocol(s), or project(s) specifically requires otherwise.

REPORTING CONVENTIONS

Decimal places, trailing zeroes or the lack thereof appearing on the data should not be interpreted as indicative of the precision of the analytical procedure, but rather as a result of reporting format limitations.

SAMPLE RESULTS

METHOD SW5030B/8260B
VOLATILE ORGANICS BY GC/MS

Client : NAVY - SHAW PWC	Date Collected: 01/06/15
Project : NAWS CHINA LAKE	Date Received: 01/08/15
Batch No. : 15A455	Date Extracted: 01/13/15 10:41
Sample ID: OD WELL	Date Analyzed: 01/13/15 10:41
Lab Samp ID: A455-01	Dilution Factor: 1
Lab File ID: RAB045	Matrix : WATER
Ext Btch ID: VOO3A05	% Moisture : NA
Calib. Ref.: RAB007	Instrument ID : T-003

PARAMETERS	RESULTS (ug/L)	RL (ug/L)	MDL (ug/L)
1,1,1-TRICHLOROETHANE	ND	5.0	1.0
1,1,2,2-TETRACHLOROETHANE	ND	5.0	1.0
1,1,2-TRICHLOROETHANE	ND	5.0	1.0
1,1-DICHLOROETHANE	ND	5.0	1.0
1,1-DICHLOROETHENE	ND	5.0	1.0
1,2-DICHLOROETHANE	ND	5.0	1.0
1,2-DICHLOROPROPANE	ND	5.0	1.0
2-BUTANONE	ND	10	5.0
2-HEXANONE	ND	10	5.0
4-METHYL-2-PENTANONE	ND	10	5.0
ACETONE	ND	10	5.0
BENZENE	ND	5.0	1.0
BROMODICHLOROMETHANE	ND	5.0	1.0
BROMOFORM	ND	5.0	1.0
BROMOMETHANE	ND	10	2.0
CARBON DISULFIDE	ND	5.0	1.0
CARBON TETRACHLORIDE	ND	5.0	1.0
CHLOROBENZENE	ND	5.0	1.0
CHLOROETHANE	ND	5.0	2.0
CHLOROFORM	ND	5.0	1.0
CHLOROMETHANE	ND	5.0	2.0
CIS-1,2-DICHLOROETHENE	ND	5.0	1.0
CIS-1,3-DICHLOROPROPENE	ND	5.0	1.0
DIBROMOCHLOROMETHANE	ND	5.0	1.0
ETHYLBENZENE	ND	5.0	1.0
M/P-XYLENES	ND	10	2.0
MTBE	ND	5.0	1.0
METHYLENE CHLORIDE	ND	10	1.0
O-XYLENE	ND	5.0	1.0
STYRENE	ND	5.0	1.0
TETRACHLOROETHENE	ND	5.0	1.0
TOLUENE	1.4J	5.0	1.0
TRANS-1,2-DICHLOROETHENE	ND	5.0	1.0
TRANS-1,3-DICHLOROPROPENE	ND	5.0	1.0
TRICHLOROETHENE	ND	5.0	1.0
VINYL CHLORIDE	ND	5.0	1.0

SURROGATE PARAMETERS	RESULTS	SPK_AMT	% RECOVERY	QC LIMIT
1,2-DICHLOROETHANE-D4	46.3	50.00	92.6	70-130
4-BROMOFLUOROBENZENE	47.9	50.00	95.8	70-130
TOLUENE-D8	50.0	50.00	99.9	70-130

METHOD SW3520C/8270C
SEMI VOLATILE ORGANICS BY GC/MS

Client : NAVY - SHAW PWC	Date Collected: 01/06/15
Project : NAWS CHINA LAKE	Date Received: 01/08/15
Batch No. : 15A455	Date Extracted: 01/08/15 14:45
Sample ID: OD WELL	Date Analyzed: 01/12/15 11:13
Lab Samp ID: A455-01	Dilution Factor: 1
Lab File ID: RAJ142	Matrix : WATER
Ext Btch ID: SVA009W	% Moisture : NA
Calib. Ref.: RLJ013	Instrument ID : T-OE4

PARAMETERS	RESULTS (ug/L)	RL (ug/L)	MDL (ug/L)
1,2,4-TRICHLOROBENZENE	ND	10	5.0
1,2-DICHLOROBENZENE	ND	10	5.0
1,3-DICHLOROBENZENE	ND	10	5.0
1,4-DICHLOROBENZENE	ND	10	5.0
2,4,5-TRICHLOROPHENOL	ND	10	5.0
2,4,6-TRICHLOROPHENOL	ND	10	5.0
2,4-DICHLOROPHENOL	ND	10	5.0
2,4-DIMETHYLPHENOL	ND	10	5.0
2,4-DINITROPHENOL	ND	20	5.0
2,4-DINITROTOLUENE	ND	10	5.0
2,6-DINITROTOLUENE	ND	10	5.0
2-CHLORONAPHTHALENE	ND	10	5.0
2-CHLOROPHENOL	ND	10	5.0
2-METHYLNAPHTHALENE	ND	10	5.0
2-METHYLPHENOL	ND	10	5.0
2-NITROANILINE	ND	10	5.0
2-NITROPHENOL	ND	10	5.0
3,3'-DICHLOROBENZIDINE	ND	10	5.0
3-NITROANILINE	ND	10	5.0
4,6-DINITRO-2-METHYLPHENOL	ND	20	5.0
4-BROMOPHENYL-PHENYL ETHER	ND	10	5.0
4-CHLORO-3-METHYLPHENOL	ND	10	5.0
4-CHLOROANILINE	ND	10	5.0
4-CHLOROPHENYL-PHENYL ETHER	ND	10	5.0
4-METHYLPHENOL (1)	ND	10	5.0
4-NITROANILINE	ND	10	5.0
4-NITROPHENOL	ND	20	5.0
ACENAPHTHENE	ND	10	5.0
ACENAPHTHYLENE	ND	10	5.0
ANTHRACENE	ND	10	5.0
BENZO(A)ANTHRACENE	ND	10	5.0
BENZO(A)PYRENE	ND	10	5.0
BENZO(B)FLUORANTHENE	ND	10	5.0
BENZO(K)FLUORANTHENE	ND	10	5.0
BENZO(G,H,I)PERYLENE	ND	10	5.0
BIS(2-CHLOROETHOXY)METHANE	ND	10	5.0
BIS(2-CHLOROETHYL)ETHER	ND	10	5.0
BIS(2-CHLOROISOPROPYL)ETHER	ND	10	5.0
BIS(2-ETHYLHEXYL)PHTHALATE	ND	10	5.0
BUTYLBENZYLPHTHALATE	ND	10	5.0
CHRYSENE	ND	10	5.0
DI-N-BUTYLPHTHALATE	ND	10	5.0
DI-N-OCTYLPHTHALATE	ND	10	5.0
DIBENZO(A,H)ANTHRACENE	ND	10	5.0
DIBENZOFURAN	ND	10	5.0
DIETHYLPHTHALATE	ND	10	5.0
DIMETHYLPHTHALATE	ND	10	5.0
FLUORANTHENE	ND	10	5.0
FLUORENE	ND	10	5.0
HEXACHLOROBENZENE	ND	10	5.0
HEXACHLOROBUTADIENE	ND	10	5.0
HEXACHLOROCYCLOPENTADIENE	ND	10	5.0
HEXACHLOROETHANE	ND	10	5.0
INDENO(1,2,3-CD)PYRENE	ND	10	5.0
ISOPHORONE	ND	10	5.0
N-NITROSO-DI-N-PROPYLAMINE	ND	10	5.0
N-NITROSODIPHENYLAMINE (2)	ND	10	5.0
NAPHTHALENE	ND	10	5.0
NITROBENZENE	ND	10	5.0
PENTACHLOROPHENOL	ND	20	5.0
PHENANTHRENE	ND	10	5.0
PHENOL	ND	10	5.0
PYRENE	ND	10	5.0

SURROGATE PARAMETERS	RESULTS	SPK_AMT	% RECOVERY	QC LIMIT
2,4,6-TRIBROMOPHENOL	48.3	60.00	80.5	50-130
2-FLUOROBIPHENYL	14.3	20.00	71.5	40-130
2-FLUOROPHENOL	35.1	60.00	58.6	30-130
NITROBENZENE-D5	14.6	20.00	73.0	40-130
PHENOL-D5	43.4	60.00	72.3	30-130
TERPHENYL-D14	15.7	20.00	78.3	50-130

(1): Cannot be separated from 3-Methylphenol
(2): Cannot be separated from Diphenylamine

METHOD SW8330
EXPLOSIVES

Client : NAVY - SHAW PWC	Date Collected: 01/06/15
Project : NAWS CHINA LAKE	Date Received: 01/08/15
Batch No. : 15A455	Date Extracted: 01/08/15 09:34
Sample ID: OD WELL	Date Analyzed: 01/08/15 16:53
Lab Samp ID: A455-01	Dilution Factor: 1
Lab File ID: XA08013A	Matrix : WATER
Ext Btch ID: EXA005W	% Moisture : NA
Calib. Ref.: XA08002A	Instrument ID : T-081

PARAMETERS	RESULTS (ug/L)	RL (ug/L)	MDL (ug/L)
HMX	ND	0.40	0.20
RDX	ND	0.40	0.20
1,3,5-TNB	ND	0.40	0.20
1,3-DNB	ND	0.40	0.20
TETRYL	ND	0.40	0.20
NITROBENZENE	ND	0.40	0.20
2,4,6-TNT	ND	0.40	0.20
4-AM-2,6-DNT	ND	0.40	0.20
2-AM-4,6-DNT	ND	0.40	0.20
2,6-DNT	ND	0.40	0.20
2,4-DNT	ND	0.40	0.20
2-NITROTOLUENE	ND	0.40	0.20
3-NITROTOLUENE	ND	0.40	0.20
4-NITROTOLUENE	ND	0.40	0.20

SURROGATE PARAMETERS	RESULTS	SPK_AMT	% RECOVERY	QC LIMIT
3,4-DINITROTOLUENE	4.18	4.000	105	70-130

Note: All positive results are confirmed by Biphenyl column

METHOD SW3010A/6010B
METALS BY TRACE ICP

Client	: NAVY - SHAW PWC	Date Collected:	01/06/15 15:25
Project	: NAWS CHINA LAKE	Date Received:	01/08/15
SDG NO.	: 15A455	Date Extracted:	01/09/15 10:37
Sample ID:	OD WELL	Date Analyzed:	01/09/15 16:47
Lab Samp ID:	A455-01	Dilution Factor:	1
Lab File ID:	ID8A007036	Matrix :	WATER
Ext Btch ID:	IPA007W	% Moisture :	NA
Calib. Ref.:	ID8A007030	Instrument ID :	EMAXTID8

PARAMETERS	RESULTS (mg/L)	RL (mg/L)	MDL (mg/L)
Aluminum	ND	0.200	0.0300
Calcium	63.5	1.00	0.100
Manganese	ND	0.0100	0.00300
Magnesium	10.8	1.00	0.100
Potassium	7.05	1.00	0.100
Sodium	86.7	1.00	0.100

METHOD SW3010A/6010B
METALS BY TRACE ICP

Client	: NAVY - SHAW PWC	Date Collected:	01/06/15 15:25
Project	: NAWS CHINA LAKE	Date Received:	01/08/15
SDG NO.	: 15A455	Date Extracted:	01/09/15 10:37
Sample ID:	OD WELL	Date Analyzed:	01/09/15 16:47
Lab Samp ID:	A455-01	Dilution Factor:	1
Lab File ID:	ID8A007036	Matrix :	WATER
Ext Btch ID:	IPA007W	% Moisture :	NA
Calib. Ref.:	ID8A007030	Instrument ID :	EMAXTID8

PARAMETERS	RESULTS (mg/L)	RL (mg/L)	MDL (mg/L)
Antimony	ND	0.100	0.0300
Arsenic	0.00630J	0.0100	0.00500
Barium	0.0774	0.0100	0.00200
Beryllium	ND	0.0100	0.00100
Cadmium	ND	0.0100	0.00200
Chromium	ND	0.0100	0.00300
Cobalt	ND	0.0100	0.00200
Copper	ND	0.0100	0.00300
Lead	ND	0.0100	0.00300
Molybdenum	0.0605	0.0100	0.00300
Nickel	ND	0.0100	0.00300
Selenium	ND	0.0100	0.00500
Silver	ND	0.0100	0.00300
Thallium	ND	0.0100	0.00500
Vanadium	0.0150	0.0100	0.00200
Zinc	0.0123J	0.0200	0.0100

Sample Summary Form

EMAX Laboratories Inc. Tel 310-6188889 NELAP Accreditation #: 02116CA

Client : Navy - Shaw PWC
Project : NAWS China Lake
Batch No. : 15A455
Sample ID: OD WELL
Lab Samp ID: A455-01 (Group)

Date Collected: 01/06/15 15:25
Date Received: 01/08/15
Prject Code: PW10516_
Matrix : WATER
% Moisture : NA

LabSmpID	Parameters	RefMethod	Result&Unit	DilF	RL	MDL	AnlDateTime	PrpDateTime	LabFileID	PrpBatch
A455-01_	Perchlorate	SW6850	0.199J ug/L	1	0.2	0.1	01/08/15 14:15	NA	15MA08014_	15PLA002W_
A455-01_	Mercury	SW7470A	ND ug/L	1	0.5	0.1	01/09/15 16:07	01/09/15 12:00	M47A005020_	HGA007W_
A455-01_	PH	SW9040B	7.88 pH	1	0.1	0.1	01/08/15 13:39	NA	15PHA00101_	PHA001W_

DilF: Dilution Factor
RL: Reporting Limit
MDL: Method Detection Limit

QC SUMMARIES

METHOD SW5030B/8260B
VOLATILE ORGANICS BY GC/MS

Client : NAVY - SHAW PWC	Date Collected: NA
Project : NAWS CHINA LAKE	Date Received: 01/13/15
Batch No. : 15A455	Date Extracted: 01/13/15 09:32
Sample ID: MBLK1W	Date Analyzed: 01/13/15 09:32
Lab Samp ID: VO03A05B	Dilution Factor: 1
Lab File ID: RAB041	Matrix : WATER
Ext Btch ID: VO03A05	% Moisture : NA
Calib. Ref.: RAB007	Instrument ID : T-003

PARAMETERS	RESULTS (ug/L)	RL (ug/L)	MDL (ug/L)
1,1,1-TRICHLOROETHANE	ND	5.0	1.0
1,1,2,2-TETRACHLOROETHANE	ND	5.0	1.0
1,1,2-TRICHLOROETHANE	ND	5.0	1.0
1,1-DICHLOROETHANE	ND	5.0	1.0
1,1-DICHLOROETHENE	ND	5.0	1.0
1,2-DICHLOROETHANE	ND	5.0	1.0
1,2-DICHLOROPROPANE	ND	5.0	1.0
2-BUTANONE	ND	10	5.0
2-HEXANONE	ND	10	5.0
4-METHYL-2-PENTANONE	ND	10	5.0
ACETONE	ND	10	5.0
BENZENE	ND	5.0	1.0
BROMODICHLOROMETHANE	ND	5.0	1.0
BROMOFORM	ND	5.0	1.0
BROMOMETHANE	ND	10	2.0
CARBON DISULFIDE	ND	5.0	1.0
CARBON TETRACHLORIDE	ND	5.0	1.0
CHLOROBENZENE	ND	5.0	1.0
CHLOROETHANE	ND	5.0	2.0
CHLOROFORM	ND	5.0	1.0
CHLOROMETHANE	ND	5.0	2.0
CIS-1,2-DICHLOROETHENE	ND	5.0	1.0
CIS-1,3-DICHLOROPROPENE	ND	5.0	1.0
DIBROMOCHLOROMETHANE	ND	5.0	1.0
ETHYLBENZENE	ND	5.0	1.0
M/P-XYLENES	ND	10	2.0
MTBE	ND	5.0	1.0
METHYLENE CHLORIDE	ND	10	1.0
O-XYLENE	ND	5.0	1.0
STYRENE	ND	5.0	1.0
TETRACHLOROETHENE	ND	5.0	1.0
TOLUENE	ND	5.0	1.0
TRANS-1,2-DICHLOROETHENE	ND	5.0	1.0
TRANS-1,3-DICHLOROPROPENE	ND	5.0	1.0
TRICHLOROETHENE	ND	5.0	1.0
VINYL CHLORIDE	ND	5.0	1.0

SURROGATE PARAMETERS	RESULTS	SPK_AMT	% RECOVERY	QC LIMIT
1,2-DICHLOROETHANE-D4	48.8	50.00	97.6	70-130
4-BROMOFLUOROBENZENE	46.7	50.00	93.4	70-130
TOLUENE-D8	49.3	50.00	98.5	70-130

EMAX QUALITY CONTROL DATA
LCS/LCD ANALYSIS

CLIENT: NAVY - SHAW PWC
PROJECT: NAWS CHINA LAKE
BATCH NO.: 15A455
METHOD: METHOD SW5030B/8260B

MATRIX: WATER % MOISTURE: NA

DILUTION FACTOR:	1	1	1		
SAMPLE ID:	MBLK1W				
LAB SAMP ID:	V003A05B	V003A05L	V003A05C		
LAB FILE ID:	RAB041	RAB039	RAB040		
DATE EXTRACTED:	01/13/1509:32	01/13/1508:24	01/13/1508:59	DATE COLLECTED:	NA
DATE ANALYZED:	01/13/1509:32	01/13/1508:24	01/13/1508:59	DATE RECEIVED:	01/13/15
PREP. BATCH:	V003A05	V003A05	V003A05		
CALIB. REF:	RAB007	RAB007	RAB007		

ACCESSION:

PARAMETER	BLNK RSLT (ug/L)	SPIKE AMT (ug/L)	BS RSLT (ug/L)	BS % REC	SPIKE AMT (ug/L)	BSD RSLT (ug/L)	BSD % REC	RPD (%)	QC LIMIT (%)	MAX RPD (%)
1,1-Dichloroethene	ND	50.0	50.2	100	50.0	50.0	100	0	60-130	30
Benzene	ND	50.0	53.4	107	50.0	48.4	97	10	70-130	30
Chlorobenzene	ND	50.0	52.8	106	50.0	47.8	96	10	70-130	30
Toluene	ND	50.0	49.1	98	50.0	44.7	89	9	70-130	30
Trichloroethene	ND	50.0	52.9	106	50.0	46.6	93	13	70-130	30

SURROGATE PARAMETER	SPIKE AMT (ug/L)	BS RSLT (ug/L)	BS % REC	SPIKE AMT (ug/L)	BSD RSLT (ug/L)	BSD % REC	QC LIMIT (%)
1,2-Dichloroethane-d4	50.0	49.1	98	50.0	43.5	87	70-130
4-Bromofluorobenzene	50.0	49.8	100	50.0	43.2	86	70-130
Toluene-d8	50.0	50.4	101	50.0	45.5	91	70-130

METHOD SW3520C/8270C
SEMI VOLATILE ORGANICS BY GC/MS

Client : NAVY - SHAW PWC	Date Collected: NA
Project : NAWS CHINA LAKE	Date Received: 01/08/15
Batch No. : 15A455	Date Extracted: 01/08/15 14:45
Sample ID: MBLK1W	Date Analyzed: 01/12/15 10:14
Lab Samp ID: SVA009WB	Dilution Factor: 1
Lab File ID: RAJ139	Matrix : WATER
Ext Btch ID: SVA009W	% Moisture : NA
Calib. Ref.: RLJ013	Instrument ID : T-OE4

PARAMETERS	RESULTS (ug/L)	RL (ug/L)	MDL (ug/L)
1,2,4-TRICHLOROBENZENE	ND	10	5.0
1,2-DICHLOROBENZENE	ND	10	5.0
1,3-DICHLOROBENZENE	ND	10	5.0
1,4-DICHLOROBENZENE	ND	10	5.0
2,4,5-TRICHLOROPHENOL	ND	10	5.0
2,4,6-TRICHLOROPHENOL	ND	10	5.0
2,4-DICHLOROPHENOL	ND	10	5.0
2,4-DIMETHYLPHENOL	ND	10	5.0
2,4-DINITROPHENOL	ND	20	5.0
2,4-DINITROTOLUENE	ND	10	5.0
2,6-DINITROTOLUENE	ND	10	5.0
2-CHLORONAPHTHALENE	ND	10	5.0
2-CHLOROPHENOL	ND	10	5.0
2-METHYLNAPHTHALENE	ND	10	5.0
2-METHYLPHENOL	ND	10	5.0
2-NITROANILINE	ND	10	5.0
2-NITROPHENOL	ND	10	5.0
3,3'-DICHLOROBENZIDINE	ND	10	5.0
3-NITROANILINE	ND	10	5.0
4,6-DINITRO-2-METHYLPHENOL	ND	20	5.0
4-BROMOPHENYL-PHENYL ETHER	ND	10	5.0
4-CHLORO-3-METHYLPHENOL	ND	10	5.0
4-CHLOROANILINE	ND	10	5.0
4-CHLOROPHENYL-PHENYL ETHER	ND	10	5.0
4-METHYLPHENOL (1)	ND	10	5.0
4-NITROANILINE	ND	10	5.0
4-NITROPHENOL	ND	20	5.0
ACENAPHTHENE	ND	10	5.0
ACENAPHTHYLENE	ND	10	5.0
ANTHRACENE	ND	10	5.0
BENZO(A)ANTHRACENE	ND	10	5.0
BENZO(A)PYRENE	ND	10	5.0
BENZO(B)FLUORANTHENE	ND	10	5.0
BENZO(K)FLUORANTHENE	ND	10	5.0
BENZO(G,H,I)PERYLENE	ND	10	5.0
BIS(2-CHLOROETHOXY)METHANE	ND	10	5.0
BIS(2-CHLOROETHYL)ETHER	ND	10	5.0
BIS(2-CHLOROISOPROPYL)ETHER	ND	10	5.0
BIS(2-ETHYLHEXYL)PHTHALATE	ND	10	5.0
BUTYLBENZYLPHTHALATE	ND	10	5.0
CHRYSENE	ND	10	5.0
DI-N-BUTYLPHTHALATE	ND	10	5.0
DI-N-OCTYLPHTHALATE	ND	10	5.0
DIBENZO(A,H)ANTHRACENE	ND	10	5.0
DIBENZOFURAN	ND	10	5.0
DIETHYLPHTHALATE	ND	10	5.0
DIMETHYLPHTHALATE	ND	10	5.0
FLUORANTHENE	ND	10	5.0
FLUORENE	ND	10	5.0
HEXACHLOROBENZENE	ND	10	5.0
HEXACHLOROBUTADIENE	ND	10	5.0
HEXACHLOROCYCLOPENTADIENE	ND	10	5.0
HEXACHLOROETHANE	ND	10	5.0
INDENO(1,2,3-CD)PYRENE	ND	10	5.0
ISOPHORONE	ND	10	5.0
N-NITROSO-DI-N-PROPYLAMINE	ND	10	5.0
N-NITROSODIPHENYLAMINE (2)	ND	10	5.0
NAPHTHALENE	ND	10	5.0
NITROBENZENE	ND	10	5.0
PENTACHLOROPHENOL	ND	20	5.0
PHENANTHRENE	ND	10	5.0
PHENOL	ND	10	5.0
PYRENE	ND	10	5.0

SURROGATE PARAMETERS	RESULTS	SPK_AMT	% RECOVERY	QC LIMIT
2,4,6-TRIBROMOPHENOL	52.1	60.00	86.8	50-130
2-FLUOROBIPHENYL	17.5	20.00	87.4	40-130
2-FLUOROPHENOL	37.7	60.00	62.9	30-130
NITROBENZENE-D5	15.6	20.00	78.1	40-130
PHENOL-D5	46.6	60.00	77.7	30-130
TERPHENYL-D14	16.6	20.00	83.0	50-130

(1): Cannot be separated from 3-Methylphenol
(2): Cannot be separated from Diphenylamine

EMAX QUALITY CONTROL DATA
LCS/LCD ANALYSIS

CLIENT: NAVY - SHAW PWC
PROJECT: NAWS CHINA LAKE
BATCH NO.: 15A455
METHOD: METHOD SW3520C/8270C

MATRIX:	WATER			% MOISTURE:	NA
DILUTION FACTOR:	1	1	1		
SAMPLE ID:	MBLK1W				
LAB SAMP ID:	SVA009WB	SVA009WL	SVA009WC		
LAB FILE ID:	RAJ139	RAJ140	RAJ141		
DATE EXTRACTED:	01/08/1514:45	01/08/1514:45	01/08/1514:45	DATE COLLECTED:	NA
DATE ANALYZED:	01/12/1510:14	01/12/1510:34	01/12/1510:53	DATE RECEIVED:	01/08/15
PREP. BATCH:	SVA009W	SVA009W	SVA009W		
CALIB. REF:	RLJ013	RLJ013	RLJ013		

ACCESSION:

PARAMETER	BLNK RSLT (ug/L)	SPIKE AMT (ug/L)	BS RSLT (ug/L)	BS % REC	SPIKE AMT (ug/L)	BSD RSLT (ug/L)	BSD % REC	RPD (%)	QC LIMIT (%)	MAX RPD (%)
1,2,4-Trichlorobenzene	ND	40.0	31.7	79	40.0	29.2	73	8	30-130	30
1,4-Dichlorobenzene	ND	40.0	30.6	77	40.0	28.7	72	7	20-130	30
2,4-Dinitrotoluene	ND	40.0	34.5	86	40.0	32.0	80	7	40-130	30
2-Chlorophenol	ND	40.0	27.3	68	40.0	25.4	64	7	20-130	30
4-Chloro-3-Methylphenol	ND	40.0	33.2	83	40.0	29.1	73	13	30-130	30
4-Nitrophenol	ND	40.0	36.5	91	40.0	37.6	94	3	30-130	30
Acenaphthene	ND	40.0	32.8	82	40.0	30.8	77	7	30-130	30
n-Nitroso-di-n-propylamine	ND	40.0	27.6	69	40.0	25.7	64	7	30-130	30
Pentachlorophenol	ND	40.0	31.6	79	40.0	31.0	77	2	20-130	30
Phenol	ND	40.0	26.9	67	40.0	24.8	62	8	20-130	30
Pyrene	ND	40.0	33.3	83	40.0	29.6	74	12	50-130	30

SURROGATE PARAMETER	SPIKE AMT (ug/L)	BS RSLT (ug/L)	BS % REC	SPIKE AMT (ug/L)	BSD RSLT (ug/L)	BSD % REC	QC LIMIT (%)
2,4,6-Tribromophenol	60.0	53.1	89	60.0	51.5	86	50-130
2-Fluorobiphenyl	20.0	14.5	72	20.0	14.2	71	40-130
2-Fluorophenol	60.0	32.3	54	60.0	30.4	51	30-130
Nitrobenzene-d5	20.0	14.2	71	20.0	14.0	70	40-130
Phenol-d5	60.0	42.1	70	60.0	41.4	69	30-130
Terphenyl-d14	20.0	16.7	83	20.0	15.6	78	50-130

METHOD SW8330
EXPLOSIVES

Client : NAVY - SHAW PWC	Date Collected: NA
Project : NAWS CHINA LAKE	Date Received: 01/08/15
Batch No. : 15A455	Date Extracted: 01/08/15 09:34
Sample ID: MBLK1W	Date Analyzed: 01/08/15 15:19
Lab Samp ID: EXA005WB	Dilution Factor: 1
Lab File ID: XA08010A	Matrix : WATER
Ext Btch ID: EXA005W	% Moisture : NA
Calib. Ref.: XA08002A	Instrument ID : T-081

PARAMETERS	RESULTS (ug/L)	RL (ug/L)	MDL (ug/L)
HMX	ND	0.40	0.20
RDX	ND	0.40	0.20
1,3,5-TNB	ND	0.40	0.20
1,3-DNB	ND	0.40	0.20
TETRYL	ND	0.40	0.20
NITROBENZENE	ND	0.40	0.20
2,4,6-TNT	ND	0.40	0.20
4-AM-2,6-DNT	ND	0.40	0.20
2-AM-4,6-DNT	ND	0.40	0.20
2,6-DNT	ND	0.40	0.20
2,4-DNT	ND	0.40	0.20
2-NITROTOLUENE	ND	0.40	0.20
3-NITROTOLUENE	ND	0.40	0.20
4-NITROTOLUENE	ND	0.40	0.20

SURROGATE PARAMETERS	RESULTS	SPK_AMT	% RECOVERY	QC LIMIT
3,4-DINITROTOLUENE	4.73	4.000	118	70-130

Note: All positive results are confirmed by Biphenyl column

EMAX QUALITY CONTROL DATA
LCS/LCD ANALYSIS

CLIENT: NAVY - SHAW PWC
PROJECT: NAWS CHINA LAKE
BATCH NO.: 15A455
METHOD: METHOD SW8330

MATRIX: WATER % MOISTURE: NA
DILUTION FACTOR: 1 1 1
SAMPLE ID: MBLK1W
LAB SAMP ID: EXA005WB EXA005WL EXA005WC
LAB FILE ID: XA08010A XA08011A XA08012A
DATE EXTRACTED: 01/08/1509:34 01/08/1509:34 01/08/1509:34 DATE COLLECTED: NA
DATE ANALYZED: 01/08/1515:19 01/08/1515:50 01/08/1516:22 DATE RECEIVED: 01/08/15
PREP. BATCH: EXA005W EXA005W EXA005W
CALIB. REF: XA08002A XA08002A XA08002A

ACCESSION:

PARAMETER	BLNK RSLT (ug/L)	SPIKE AMT (ug/L)	BS RSLT (ug/L)	BS % REC	SPIKE AMT (ug/L)	BSD RSLT (ug/L)	BSD % REC	RPD (%)	QC LIMIT (%)	MAX RPD (%)
HMX	ND	4.00	3.20	80	4.00	3.10	77	3	70-130	30
RDX	ND	4.00	3.03	76	4.00	3.03	76	0	60-130	30
1,3,5-TNB	ND	4.00	3.21	80	4.00	3.34	83	4	70-130	30
1,3-DNB	ND	4.00	3.12	78	4.00	3.12	78	0	70-130	30
Tetryl	ND	4.00	3.50	88	4.00	3.43	86	2	70-130	30
Nitrobenzene	ND	4.00	2.91	73	4.00	3.00	75	3	70-130	30
2,4,6-TNT	ND	4.00	3.36	84	4.00	3.63	91	8	70-130	30
4-AM-2,6-DNT	ND	4.00	3.20	80	4.00	3.51	88	9	70-130	30
2-AM-4,6-DNT	ND	4.00	3.29	82	4.00	3.46	87	5	70-130	30
2,6-DNT	ND	4.00	3.37	84	4.00	3.35	84	1	70-130	30
2,4-DNT	ND	4.00	3.45	86	4.00	3.41	85	1	70-130	30
2-Nitrotoluene	ND	4.00	3.24	81	4.00	3.28	82	1	70-130	30
3-Nitrotoluene	ND	4.00	3.33	83	4.00	3.42	85	2	70-130	30
4-Nitrotoluene	ND	4.00	3.62	90	4.00	3.24	81	11	70-130	30

SURROGATE PARAMETER	SPIKE AMT (ug/L)	BS RSLT (ug/L)	BS % REC	SPIKE AMT (ug/L)	BSD RSLT (ug/L)	BSD % REC	QC LIMIT (%)
3,4-Dinitrotoluene	4.00	3.41	85	4.00	3.94	99	70-130

METHOD SW3010A/6010B
METALS BY TRACE ICP

Client	: NAVY - SHAW PWC	Date Collected:	NA
Project	: NAWS CHINA LAKE	Date Received:	01/09/15
SDG NO.	: 15A455	Date Extracted:	01/09/15 10:37
Sample ID:	MBLK1W	Date Analyzed:	01/09/15 16:33
Lab Samp ID:	IPA007WB	Dilution Factor:	1
Lab File ID:	ID8A007032	Matrix :	WATER
Ext Btch ID:	IPA007W	% Moisture :	NA
Calib. Ref.:	ID8A007030	Instrument ID :	EMAXTID8

PARAMETERS	RESULTS (mg/L)	RL (mg/L)	MDL (mg/L)
Aluminum	ND	0.200	0.0300
Calcium	ND	1.00	0.100
Manganese	ND	0.0100	0.00300
Magnesium	ND	1.00	0.100
Potassium	ND	1.00	0.100
Sodium	ND	1.00	0.100

EMAX QUALITY CONTROL DATA
LCS/LCD ANALYSIS

CLIENT: NAVY - SHAW PWC
PROJECT: NAWS CHINA LAKE
SDG NO.: 15A455
METHOD: METHOD SW3010A/6010B

MATRIX:	WATER			% MOISTURE:	NA
DILTN FACTR:	1	1	1		
SAMPLE ID:	MBLK1W				
CONTROL NO.:	IPA007WB	IPA007WL	IPA007WC		
LAB FILE ID:	ID8A007032	ID8A007033	ID8A007034		
DATIME EXTRCTD:	01/09/1510:37	01/09/1510:37	01/09/1510:37	DATE COLLECTED:	NA
DATIME ANALYZD:	01/09/1516:33	01/09/1516:37	01/09/1516:40	DATE RECEIVED:	01/09/15
PREP. BATCH:	IPA007W	IPA007W	IPA007W		
CALIB. REF:	ID8A007030	ID8A007030	ID8A007030		

ACCESSION:

PARAMETER	BLNK RSLT mg/L	SPIKE AMT mg/L	BS RSLT mg/L	BS % REC	SPIKE AMT mg/L	BSD RSLT mg/L	BSD % REC	RPD %	QC LIMIT %	MAX RPD %
Aluminum	ND	5	5.47	109	5	5.55	111	1	80-120	20
Calcium	ND	50	51.5	103	50	52.1	104	1	80-120	20
Manganese	ND	.5	.495	99	.5	.5	100	1	80-120	20
Magnesium	ND	50	47.4	95	50	47.9	96	1	80-120	20
Potassium	ND	50	50.5	101	50	51.1	102	1	80-120	20
Sodium	ND	50	53.3	107	50	53.9	108	1	80-120	20

EMAX QUALITY CONTROL DATA
MS/MSD ANALYSIS

CLIENT: NAVY - SHAW PWC
PROJECT: NAWS CHINA LAKE
SDG NO.: 15A455
METHOD: METHOD SW3010A/6010B

MATRIX:	WATER			% MOISTURE:	NA
DILTN FACTR:	1	1	1		
SAMPLE ID:	OD WELL				
CONTROL NO.:	A455-01	A455-01M	A455-01S		
LAB FILE ID:	ID8A007036	ID8A007038	ID8A007039		
DATIME EXTRCTD:	01/09/1510:37	01/09/1510:37	01/09/1510:37	DATE COLLECTED:	01/06/15 15:25
DATIME ANALYZD:	01/09/1516:47	01/09/1516:54	01/09/1516:58	DATE RECEIVED:	01/08/15
PREP. BATCH:	IPA007W	IPA007W	IPA007W		
CALIB. REF:	ID8A007030	ID8A007030	ID8A007030		

ACCESSION:

PARAMETER	SMPL RSLT mg/L	SPIKE AMT mg/L	MS RSLT mg/L	MS % REC	SPIKE AMT mg/L	MSD RSLT mg/L	MSD % REC	RPD %	QC LIMIT %	MAX RPD %
Aluminum	ND	5	5.53	111	5	5.51	110	0	75-125	20
Calcium	63.5	50	114	101	50	114	101	0	75-125	20
Manganese	ND	.5	.486	97	.5	.489	98	1	75-125	20
Magnesium	10.8	50	57.2	93	50	57.5	93	1	75-125	20
Potassium	7.05	50	59	104	50	59.2	104	0	75-125	20
Sodium	86.7	50	140	107	50	140	107	0	75-125	20

METHOD SW3010A/6010B
METALS BY TRACE ICP

Client	: NAVY - SHAW PWC	Date Collected:	NA
Project	: NAWS CHINA LAKE	Date Received:	01/09/15
SDG NO.	: 15A455	Date Extracted:	01/09/15 10:37
Sample ID:	MBLK1W	Date Analyzed:	01/09/15 16:33
Lab Samp ID:	IPA007WB	Dilution Factor:	1
Lab File ID:	ID8A007032	Matrix :	WATER
Ext Btch ID:	IPA007W	% Moisture :	NA
Calib. Ref.:	ID8A007030	Instrument ID :	EMAXTID8

PARAMETERS	RESULTS (mg/L)	RL (mg/L)	MDL (mg/L)
Antimony	ND	0.100	0.0300
Arsenic	ND	0.0100	0.00500
Barium	ND	0.0100	0.00200
Beryllium	ND	0.0100	0.00100
Cadmium	ND	0.0100	0.00200
Chromium	ND	0.0100	0.00300
Cobalt	ND	0.0100	0.00200
Copper	ND	0.0100	0.00300
Lead	ND	0.0100	0.00300
Molybdenum	ND	0.0100	0.00300
Nickel	ND	0.0100	0.00300
Selenium	ND	0.0100	0.00500
Silver	ND	0.0100	0.00300
Thallium	ND	0.0100	0.00500
Vanadium	ND	0.0100	0.00200
Zinc	ND	0.0200	0.0100

EMAX QUALITY CONTROL DATA
LCS/LCD ANALYSIS

CLIENT: NAVY - SHAW PWC
PROJECT: NAWS CHINA LAKE
SDG NO.: 15A455
METHOD: METHOD SW3010A/6010B

MATRIX:	WATER			% MOISTURE:	NA
DILTN FACTR:	1	1	1		
SAMPLE ID:	MBLK1W				
CONTROL NO.:	IPA007WB	IPA007WL	IPA007WC		
LAB FILE ID:	ID8A007032	ID8A007033	ID8A007034		
DATIME EXTRCTD:	01/09/1510:37	01/09/1510:37	01/09/1510:37	DATE COLLECTED:	NA
DATIME ANALYZD:	01/09/1516:33	01/09/1516:37	01/09/1516:40	DATE RECEIVED:	01/09/15
PREP. BATCH:	IPA007W	IPA007W	IPA007W		
CALIB. REF:	ID8A007030	ID8A007030	ID8A007030		

ACCESSION:

PARAMETER	BLNK RSLT mg/L	SPIKE AMT mg/L	BS RSLT mg/L	BS % REC	SPIKE AMT mg/L	BSD RSLT mg/L	BSD % REC	RPD %	QC LIMIT %	MAX RPD %
Antimony	ND	2.5	2.44	98	2.5	2.48	99	2	80-120	20
Arsenic	ND	.5	.529	106	.5	.537	107	2	80-120	20
Barium	ND	.5	.532	106	.5	.535	107	1	80-120	20
Beryllium	ND	.5	.519	104	.5	.522	104	1	80-120	20
Cadmium	ND	.5	.495	99	.5	.5	100	1	80-120	20
Chromium	ND	.5	.471	94	.5	.484	97	3	80-120	20
Cobalt	ND	.5	.47	94	.5	.476	95	1	80-120	20
Copper	ND	.5	.475	95	.5	.485	97	2	80-120	20
Lead	ND	.5	.494	99	.5	.498	100	1	80-120	20
Molybdenum	ND	.5	.532	106	.5	.538	108	1	80-120	20
Nickel	ND	.5	.515	103	.5	.521	104	1	80-120	20
Selenium	ND	.5	.539	108	.5	.543	109	1	80-120	20
Silver	ND	.5	.486	97	.5	.498	100	3	80-120	20
Thallium	ND	.5	.492	98	.5	.497	99	1	80-120	20
Vanadium	ND	.5	.478	96	.5	.488	98	2	80-120	20
Zinc	ND	.5	.521	104	.5	.529	106	2	80-120	20

EMAX QUALITY CONTROL DATA
MS/MSD ANALYSIS

CLIENT: NAVY - SHAW PWC
PROJECT: NAWS CHINA LAKE
SDG NO.: 15A455
METHOD: METHOD SW3010A/6010B

MATRIX:	WATER			% MOISTURE:	NA
DILTN FACTR:	1	1	1		
SAMPLE ID:	OD WELL				
CONTROL NO.:	A455-01	A455-01M	A455-01S		
LAB FILE ID:	ID8A007036	ID8A007038	ID8A007039		
DATIME EXTRCTD:	01/09/1510:37	01/09/1510:37	01/09/1510:37	DATE COLLECTED:	01/06/15 15:25
DATIME ANALYZD:	01/09/1516:47	01/09/1516:54	01/09/1516:58	DATE RECEIVED:	01/08/15
PREP. BATCH:	IPA007W	IPA007W	IPA007W		
CALIB. REF:	ID8A007030	ID8A007030	ID8A007030		

ACCESSION:

PARAMETER	SMPL RSLT mg/L	SPIKE AMT mg/L	MS RSLT mg/L	MS % REC	SPIKE AMT mg/L	MSD RSLT mg/L	MSD % REC	RPD %	QC LIMIT %	MAX RPD %
Antimony	ND	2.5	2.47	99	2.5	2.45	98	1	75-125	20
Arsenic	.0063J	.5	.544	108	.5	.54	107	1	75-125	20
Barium	.0774	.5	.603	105	.5	.606	106	1	75-125	20
Beryllium	ND	.5	.511	102	.5	.514	103	1	75-125	20
Cadmium	ND	.5	.488	98	.5	.487	97	0	75-125	20
Chromium	ND	.5	.483	97	.5	.479	96	1	75-125	20
Cobalt	ND	.5	.473	95	.5	.47	94	1	75-125	20
Copper	ND	.5	.487	97	.5	.486	97	0	75-125	20
Lead	ND	.5	.493	99	.5	.491	98	0	75-125	20
Molybdenum	.0605	.5	.6	108	.5	.593	106	1	75-125	20
Nickel	ND	.5	.516	103	.5	.513	103	1	75-125	20
Selenium	ND	.5	.536	107	.5	.533	107	1	75-125	20
Silver	ND	.5	.509	102	.5	.504	101	1	75-125	20
Thallium	ND	.5	.473	95	.5	.47	94	1	75-125	20
Vanadium	.015	.5	.505	98	.5	.501	97	1	75-125	20
Zinc	.0123J	.5	.537	105	.5	.534	104	1	75-125	20

EMAX QUALITY CONTROL DATA
LAB CONTROL SAMPLE ANALYSIS

CLIENT : NAVY - SHAW PWC
PROJECT : NAWS CHINA LAKE
BATCH NO. : 15A455
METHOD : SW7470A

MATRIX : WATER % MOISTURE: N/A

DILUTION FACTOR:	1	1	1
SAMPLE ID :	MBLK1W	LCS1W	LCD1W
LAB SAMPLE ID :	HGA007WB	HGA007WL	HGA007WC
LAB FILE ID :	M47A005011	M47A005012	M47A005013
DATE PREPARED :	01/09/1512:00	01/09/1512:00	01/09/1512:00
DATE ANALYZED :	01/09/1515:49	01/09/1515:51	01/09/1515:53
PREP BATCH :	HGA007W	HGA007W	HGA007W
CALIBRATION REF:	M47A005	M47A005	M47A005

ACCESSION:

PARAMETER	MB RESULT (ug/L)	SPIKE AMT (ug/L)	BS RESULT (ug/L)	BS REC (%)	SPIKE AMT (ug/L)	BSD RESULT (ug/L)	BSD REC (%)	RPD (%)	QC LIMIT (%)	MAX RPD (%)
Mercury	ND	2.50	2.30	92	2.50	2.23	89	3	80-120	20

EMAX QUALITY CONTROL DATA
LAB CONTROL SAMPLE ANALYSIS

CLIENT : NAVY - SHAW PWC
PROJECT : NAWS CHINA LAKE
BATCH NO. : 15A455
METHOD : SW6850

MATRIX : WATER % MOISTURE: NA

DILUTION FACTOR:	1	1	1
SAMPLE ID :	MBLK1W	LCS1W	LCD1W
LAB SAMPLE ID :	PLA002WB	PLA002WL	PLA002WC
LAB FILE ID :	15MA08007	15MA08008	15MA08009
DATE PREPARED :	NA	NA	NA
DATE ANALYZED :	01/08/1510:43	01/08/1510:58	01/08/1511:13
PREP BATCH :	15PLA002W	15PLA002W	15PLA002W
CALIBRATION REF:	15MA08004	15MA08004	15MA08004

ACCESSION:

PARAMETER	MB RESULT (ug/L)	SPIKE AMT (ug/L)	BS RESULT (ug/L)	BS REC (%)	SPIKE AMT (ug/L)	BSD RESULT (ug/L)	BSD REC (%)	RPD (%)	QC LIMIT (%)	MAX RPD (%)
Perchlorate	ND	2	1.93	96	2	1.95	98	1	80-120	20

EMAX QUALITY CONTROL DATA
MS/MSD ANALYSIS

CLIENT : NAVY - SHAW PWC
PROJECT : NAWS CHINA LAKE
BATCH NO. : 15A455
METHOD : SW6850

MATRIX	: WATER		% MOISTURE: NA
DILUTION FACTOR	: 1	1	1
SAMPLE ID	: OD WELL	OD WELLMS	OD WELLMSD
LAB SAMPLE ID	: A455-01	A455-01M	A455-01S
LAB FILE ID	: 15MA08014	15MA08015	15MA08016
DATE PREPARED	: NA	NA	NA
DATE ANALYZED	: 01/08/1514:15	01/08/1514:30	01/08/1514:45
PREP BATCH	: 15PLA002W	15PLA002W	15PLA002W
CALIBRATION REF	: 15MA08011	15MA08011	15MA08011

ACCESSION:

PARAMETER	PARENT RESULT (ug/L)	SPIKE AMT (ug/L)	MS RESULT (ug/L)	MS REC (%)	SPIKE AMT (ug/L)	MSD RESULT (ug/L)	MSD REC (%)	RPD (%)	QC LIMIT (%)	MAX RPD (%)
Perchlorate	0.199J	0.2000	0.361	81	0.2000	0.369	85	2	80-120	20

EMAX QUALITY CONTROL DATA
SAMPLE DUPLICATE ANALYSIS

CLIENT : NAVY - SHAW PWC
PROJECT : NAWS CHINA LAKE
BATCH NO. : 15A455
METHOD : SW9040B

MATRIX : WATER

DILUTION FACTOR:	1	1
SAMPLE ID :	OD WELL	OD WELLDUP
LAB SAMPLE ID :	A455-01	A455-01D
LAB FILE ID :	15PHA00101	15PHA00102
DATE PREPARED :	NA	NA
DATE ANALYZED :	01/08/1513:39	01/08/1513:43
PREP BATCH :	PHA001W	PHA001W
CALIBRATION REF:	15PHA001	15PHA001

ACCESSION:

PARAMETER	PARENT RESULT (pH Unit)	DUP RESULT (pH Unit)	DIFFERENCE (pH Unit)	MAX DIFF. (+/- pH Unit)
PH	7.88	7.84	.04	0.1

Analyst Summary Form

EMAX Laboratories Inc. Tel 310-6188889 NELAP Accreditation #: 02116CA

Client : NAVY - SHAW PWC
Project : NAWS CHINA LAKE
Project Code : PW10516_
Batch Number : 15A455

EMAXCODE	METHOD	ANALYST
6850	6850	CD
6MA6010	SW6010B	TH
8260	SW8260B	CM
8270	SW8270C	DJ
8330	SW8330A	LE
CAM6010	SW6010B	TH
SW-HG	SW7470A	NT
SW-PH	SW9040B	OD

APPENDIX B

Analytical Test Method Information

APPENDIX B – Laboratory Quality Assurance / Quality Control Objectives

PROCEDURE	Analytes	CONTAINER TYPE	SIZE	PRESERVATIVE	HOLDING TIME	MINIMUM QUANTITY
SOIL / SLUDGE						
EPA 6010B (Total Metals)	Al, As, Sb, Ba, Be, Cd, Total Cr, Co, Cu, Pb, Mo, Ni, Se, Ag, Tl, V, Zn	P, G	8 oz	Cool 4ºC	30 Days	5 grams
EPA 6020 (Total Metals)	Se	P, G	8 oz	Cool 4ºC	30 Days	5 grams
EPA 7196	Hexavalent Cr	P, G	8 oz	Cool 4ºC	30 Days	5 grams
EPA 7471B	Hg	P, G	2 oz	Cool 4ºC	28 Days	1 gram
EPA 8330B	Explosives (See List)	G	4 oz	Cool 4ºC	14 Days	10 grams
EPA 6850	Perchlorate	G	4 oz	Cool 4ºC	28 Days	10 grams
EPA 8290B	Dioxins	G	4 oz	Cool 4ºC	30 Days	30 grams
EPA 8027C / EPA 8310	Polyaromatic Hydrocarbons (See List)	G-TLC	8 oz	Cool 4ºC	14 Days	30 grams
EPA 9045D	pH	G-TLC	4 oz	Cool 4ºC	N/A	25 grams
EPA 1311 (Metals)	As, Ba, Cd, Total Cr, Pb, Hg, Se Ag	G-TLC	2 x 8 oz	Cool 4ºC	14 Days to Extraction (40 days to analysis after extraction)	100 grams
Waste Extraction Test (Metals)	Al, As, Sb, Ba, Be, Cd, Total Cr, Co, Cu, Pb, Hg, Mo, Ni, Se, Ag, Tl, V, Zn	G	4 oz	Cool 4ºC	28 Days	50 grams
WASTEWATER / WATER						
EPA 6010B (Total Metals)	Al, As, Sb, Ba, Be, Ca, Cd, Total Cr, Co, Cu, Pb, Mg, Mo, Ni, Se, Ag, Na, K, Tl, V, Zn	P, G	1 liter	HNO3	6 months	220 mL
EPA 6020 (Total Metals)	Se	P, G	1liter	HNO3	6 months	220 mL
EPA 7196	Cr VI	P, G	250 mL	Cool 4ºC	24 hours	10 mL

EPA 7471B	Hg	P, G	250 mL	HNO3	28 Days	20 mL
EPA 8330B	Explosives (See List)	AG	2 x 500 mL	-	7 Days	-
EPA 6850	Perchlorate	P	125 mL	-	28 Days	-
EPA 8027C / EPA 8310	Semi-Volatile Organic Compounds (See List)	G-TLC	2.5 liter	Cool 4ºC	14 Days to Extraction (40 days to analysis after extraction)	1 liter
EPA 8260B	Volatile Organic Compounds (See List)	G-TLC	3 x 40 mL	Cool 4ºC / HCL	14 Days	40 mL
EPA 9045D	pH	P, G	125 mL	-	Immediate	50 mL
EPA 300.0	Chloride, Fluoride, Sulfate, Nitrate	P, G	125 mL	-	-	25 mL
EPA 310.0	Carbonate, Bicarbonate	P, G	250 mL	Cool 4ºC	15 Days	100 mL
SM 2540	Total Dissolved Solids	P, G	250 mL	Cool 4ºC	7 Days	100 mL

P = Polyethylene
G = Glass
A = Amber
TLC = Teflon Lined Cap

LIST OF ANALYTES

Explosives

HMX
RDX
1,3,5-TNB
1,3-DNB
Tetryl
Nitrobenzene
2,4,6-TNT
4-AM-2,6-DNT
2-AM-4,6-DNT
2,6-DNT
2,4-DNT
2-Nitrotoluene
3-Nitrotoluene
4-Nitrotolueme
Nitrogylcerin
Pentaerythritol tetranitrate
3,5-Dinitroaniline

PAHs

Acenaphthene
Acenaphthylene
Anthracene
Benzo(a)anthracene
Benzo(a)pyrene
Benzo(b)fluoranthene
Benzo(g,h,i)perylene
Benzo(k)fluoranthene
Chrysene
Dibenzo(a,h)anthracene
Fluoranthene
Fluorene
Indeno(1,2,3-cd)pyrene
Naphthalene
Phenanthrene
Pyrene

SemiVOCs

1,2,4-TRICHLOROBENZENE
1,2-DICHLOROBENZENE
1,3-DICHLOROBENZENE
1,4-DICHLOROBENZENE
2,4,5-TRICHLOROPHENOL
2,4,6-TRICHLOROPHENOL
2,4-DICHLOROPHENOL
2,4-DIMETHYLPHENOL
2,4-DINITROPHENOL
2,4-DINITROTOLUENE
2,6-DINITROTOLUENE
2-CHLORONAPHTHALENE
2-CHLOROPHENOL
2-METHYLNAPHTHALENE
2-METHYLPHENOL
2-NITROANILINE
2-NITROPHENOL
3,3'-DICHLOROBENZIDINE
3-NITROANILINE
4,6-DINITRO-2-METHYLPHENOL
4-BROMOPHENYL-PHENYL ETHER
4-CHLORO-3-METHYLPHENOL
4-CHLOROANILINE
4-CHLOROPHENYL-PHENYL ETHER
4-METHYLPHENOL (1)
4-NITROANILINE
4-NITROPHENOL
ACENAPHTHENE
ACENAPHTHYLENE
ANTHRACENE
BENZO(A)ANTHRACENE
BENZO(A)PYRENE
BENZO(B)FLUORANTHENE
BENZO(K)FLUORANTHENE
BENZO(G,H,I)PERYLENE
BIS(2-CHLOROETHOXY)METHANE
BIS(2-CHLOROETHYL)ETHER
BIS(2-CHLOROISOPROPYL)ETHER
BIS(2-ETHYLHEXYL)PHTHALATE
BUTYLBENZYLPHTHALATE
CHRYSENE
DI-N-BUTYLPHTHALATE
DI-N-OCTYLPHTHALATE
DIBENZO(A,H)ANTHRACENE
DIBENZOFURAN
DIETHYLPHTHALATE
DIMETHYLPHTHALATE
FLUORANTHENE
FLUORENE
HEXACHLOROBENZENE
HEXACHLOROBUTADIENE
HEXACHLOROCYCLOPENTADIENE
HEXACHLOROETHANE
INDENO(1,2,3-CD)PYRENE
ISOPHORONE
N-NITROSO-DI-N-PROPYLAMINE
N-NITROSODIPHENYLAMINE (2)
NAPHTHALENE
NITROBENZENE
PENTACHLOROPHENOL
PHENANTHRENE
PHENOL
PYRENE
1,2-DIPHENYLHYDRAZINE (3)
BENZIDINE
N-NITROSODIMETHYLAMINE

VOCs

1,1,1-TRICHLOROETHANE
1,1,2,2-TETRACHLOROETHANE
1,1,2-TRICHLOROETHANE
1,1-DICHLOROETHANE
1,1-DICHLOROETHENE
1,2-DICHLOROETHANE
1,2-DICHLOROPROPANE
2-BUTANONE
2-HEXANONE
4-METHYL-2-PENTANONE
ACETONE
BENZENE
BROMODICHLOROMETHANE
BROMOFORM
BROMOMETHANE
CARBON DISULFIDE
CARBON TETRACHLORIDE
CHLOROBENZENE
CHLOROETHANE
CHLOROFORM
CHLOROMETHANE
CIS-1,2-DICHLOROETHENE
CIS-1,3-DICHLOROPROPENE
DIBROMOCHLOROMETHANE
ETHYLBENZENE
M/P-XYLENES
MTBE
METHYLENE CHLORIDE
O-XYLENE
STYRENE
TETRACHLOROETHENE
TOLUENE
TRANS-1,2-DICHLOROETHENE
TRANS-1,3-DICHLOROPROPENE
TRICHLOROETHENE
VINYL CHLORIDE

APPENDIX C

Laboratory Quality Assurance / Quality Control Objectives

QUALITY CONTROL OBJECTIVES (PRECISION, ACCURACY, AND MDLS)

The precision, accuracy, representativeness, completeness and comparability (PARCCs) of the analytical results define the overall data usability. The established Quality Control (QC) objectives for precision and accuracy are used to determine whether the data are of acceptable quality. These objectives are based on the laboratory's capabilities as indicated by historical data or results of replicate analyses of control samples. In cases where precision and accuracy objectives have not been established yet due to changes in the methodology, the objectives specified in the published method will be used. The QC objectives are defined below and the acceptable numeric values are shown in the tables in Appendix C.

1. Accuracy

Accuracy is a measure of the closeness of an individual measurement (or an average of multiple measurements) to the true or expected value. The average percent recovery of laboratory control samples is used to evaluate the accuracy of an analysis. This average is calculated from historical data or from replicate determinations which are done initially to evaluate the accuracy and precision of the analytical method. In addition, laboratory fortified (i.e. matrix spiked) samples are also measured; this indicates the accuracy or bias in the actual sample matrix.

The percent recovery (%R) is calculated as:

$$\%R = \frac{Amount\ Recovered}{True\ Value} \times 100$$

The average percent recovery $(\overline{\%R})$ is calculated as:

$$\overline{\%R} = \frac{\sum Ri}{N}$$

where:

R_i = The individual recovery values

N = Number of determinations

If a measurement process produces results whose mean is not the true or expected value, the process is said to be biased. Bias is the systematic error either inherent in a method of analysis (e.g., extraction efficiencies) or caused by an artifact of the measurement system (e.g., contamination). The laboratory will utilize several quality control measures to reduce analytical bias, including systematic analysis of method

blanks, laboratory control samples and independent calibration verification standards. Because bias can be positive or negative, and because several types of bias can occur simultaneously, only the net, or total, bias can be evaluated in a measurement.

2. Precision

Precision is a measure of the mutual agreement among individual measurements of the same parameters under prescribed similar conditions. It is a measure of the variability, or random error, in sampling, sample handling, and in laboratory analysis. The precision of an analytical method is calculated as the standard deviation of the percent recoveries calculated as described above in determining the accuracy of the method, and then expressed as percent relative standard deviation (RSD) of the recoveries.

The standard deviation(s) is calculated as:

$$S = \left[\frac{\Sigma(X_i - X)^2}{N - 1} \right]^{1/2}$$

where:

X_i = The individual recovery values
X = Arithmetic average of the recovery values
N = Number of determinations

Percent relative standard deviation (%RSD) is then calculated as:

$$\%RSD = \frac{S}{X} x100$$

where S and X are as defined above.

Method precision may also be calculated as the relative percent difference (RPD) between duplicate values. The RPD is calculated as follows:

$$RPD = \frac{D_1 - D_2}{(D_1 + D_2)} x200$$

where:

D_1 = First sample value
D_2 = Second sample value (duplicate)

3. Representativeness

Representativeness is the degree to which the sample aliquot that is analyzed gives results identical to analysis of the whole. The laboratory sample handling protocols will ensure that the sample given to the laboratory for analysis is as thoroughly homogenized as possible before the aliquot of sample is removed for analysis. Further, analytical SOP's will specify appropriate sample sizes to ensure that the sample aliquots analyzed are representative of the whole.

4. Completeness

Completeness is a measure of the amount of valid data that is obtained, compared to the amount that is expected. Completeness is calculated by dividing the number of samples having valid data by the total number of samples in the project, expressed as a percentage. The objective for completeness is 95% for aqueous samples and 90% for soil samples.

5. Comparability

Comparability expresses the confidence with which one data set can be compared to another. To ensure comparability, standard operating procedures are used for the preservation, handling, and analysis of all samples. Data is reported in consistent units by parameter/matrix.

6. Method Detection Limits (MDL)

The MDL is the minimum concentration above zero of a target that can be measured and reported with 99 percent confidence. MDL's can be calculated for either organic or inorganic analyses. MDL's are re-evaluated annually or more frequently at the Laboratory Director's discretion. To calculate the MDL, a standard solution is spiked into an interference free matrix (i.e. reagent water or Ottawa sand) and carried the entire analytical process including any sample preparation steps. The following steps used to calculate the MDL are based on the procedure outlined in 40 CFR Part 136, Appendix B:

1. A standard solution containing all of the target analyte(s) is prepared which will yield a final concentration 2 to 5 times the expected MDL.

2. An aliquot of the standard solution is added to a minimum of seven, separate portions of the interference free matrix and prepared for analysis according to the analytical method

3. Each of the seven samples are analyzed

4. The standard deviation for the seven measurements is calculated.

5. The MDL is equal to the standard deviation times the appropriate Student's t-factor for seven replicates (t = 3.143)

7. **Method Reporting Limits (MRL)**

The Method Reporting Limits (MRL's) are the routinely reported lower limits of quantitation which take into account day-to-day fluctuations in instrument sensitivity as well as other factors. The MRL is typically equal to the lowest standard used for calibration. All of the MRL's are greater than the laboratory-specific MDL.

8. Method Blank

A method blank is an analyte-free matrix, usually ASTM Type II water or Ottawa sand, to which all reagents are added in the same volumes or proportions as used in sample processing. The method blank shall be carried through the complete sample preparation and analytical procedure. Method blanks are analyzed at a rate of one per analytical batch or at least one per 20 samples. The method blank is analyzed to demonstrate that the analytical system itself is not contaminated with the analyte(s) being measured.

9. Calibration Blanks

Calibration Blanks (CB) are prepared along with calibration standards in order to create a calibration curve and consist of either analyte-free water or solvent. Calibration Blanks also provide the zero point of the calibration curve. Initial Calibration Blanks (ICB) and Continuing Calibration Blanks (CCB) are analyzed to verify the zero point of the analytical system.

The frequency of ICB's are once per calibration and CCB's once every ten samples or as specified in the analytical method or laboratory SOP. These calibration blanks are usually associated with inorganic method analyses only.

10. Surrogate Spike Compounds

For organic analyses, each standard, sample, and blank are spiked with one or more "surrogate" compounds prior to preparatory operations such as purging or extraction. These surrogate standards are chosen to have properties similar to sample analytes of interest, but are most likely absent from the native sample. This procedure is used to evaluate the efficiency of the analytical procedure in recovering the true amount of a known compound.

11. Laboratory Control Sample

A laboratory control sample (LCS) consists of a clean matrix, usually ASTM Type II water or Ottawa sand, to which a known amount of each target analyte(s) is added. The LCS can also be a reference standard purchased commercially. It is processed and analyzed like field samples in each analytical batch. It is used to monitor the performance of the entire analytical system.

12. Matrix Spiked Sample

To evaluate the effect of the sample matrix on the analytical methodology, a separate aliquot of sample is spiked with a standard mix of compounds specified in each standard operating procedure for organic analyses. For inorganic analyses, the spiking solution contains each analyte of interest. The matrix spiked sample is analyzed at a frequency of one per batch or one per 20 samples, whichever is more frequent. The percent recovery of each spiked compound is calculated.

13. Matrix Spiked Duplicate or Sample Duplicate

Duplicates are additional replicates of samples that are subjected to the same preparation and analytical steps as the other samples in the batch. Depending on the method of analysis, either a matrix spiked sample and sample duplicate or matrix spiked sample and matrix spiked duplicate are analyzed at a frequency of one per batch, or one per 20 samples, whichever is more frequent. The relative percent difference (RPD) between the duplicate sample analyses or MS/MSD is a measure of the precision for a given method and analytical batch.

14. Interference Check Samples

To verify interelement and background correction factors in ICP analyses. Interference Check Samples are analyzed at the beginning and end of each analytical run, or at least twice per 8-hour working shift, whichever is more frequent, before initial calibration verification is performed. The Interference Check Samples consist of two solutions, one containing the interferents and the other containing the analytes of interest mixed with the interferents. Both solutions are analyzed consecutively, starting with the one containing the interferents only, for all wavelengths used for each analyte reported by ICP.

15. Post Digestion Spikes

Post digestion spikes are samples prepared for metals analyses that have an analyte(s) added to the sample extract, after digestion, to determine if matrix effects may be a factor in the results. The spike addition should be added at a concentration near the midpoint of the calibration. A post digestion spike is analyzed with each batch of samples. Recovery criteria and corrective actions are specified for each method.

16. Calibration Standards

Calibration standards are solutions of known concentration prepared from primary standard solutions which are, in turn, prepared from stock standard materials. Calibration standards are used to calibrate the instrument response with respect to analyte concentration. Standards are analyzed in accordance with the requirements stated in the particular method being used.

17. Initial Calibration Verification Standards

The Initial Calibration Verification Standard (ICVS) is an independently prepared or second source standard obtained from another vendor or manufacturer, which is analyzed without previously going through the sample preparation procedure. Analysis of the ICVS is used to verify the standard calibration curve prior to sample analysis.

18. Continuing Calibration Verification Standards

Continuing calibration verification standards (CCVS) are midrange standards that are analyzed in order to verify that the calibration of the analytical system is still acceptable. The frequency of CCVS analysis is either once every ten samples, or as indicated in the method or laboratory SOP.

19. Internal Standards

In GC/MS analyses, or GC analyses where specified, the instrument's response to internal standards is monitored to provide additional assurance of control. The internal standard responses must meet the acceptance criteria for area and retention time established by the method, or the analytical system is deemed out of control. A system that is out of control is brought back into control by:

Quality Control Objectives for Surface and Groundwaters					
Parameter	**Method**	**Precision[a] (% RPD)**	**Accuracy[b] (% Recovery)**	**MDL (µg/L)**	**RL (ug/L)**
General Chemistry					
Acidity	305.1[c]	20	75 to 125	3000	10,000
Alkalinity	310.1[c]/2320B[d]	20	98 to 103	5000	10,000
Ammonia	350.2[c]	20	86 to 105	100	300
BOD_5 (total)	405.1[c]	20	83 to 127	2000	10,000
Bromide	300.0[g]9056[f]	20	89 to 106	80	100
Chloride	300.0[g]9056[f]	20	90 to 103	70	1000
Chloride	325.3[c]	20	97 to 104	4000	10,000
Chlorine, Total Residual	330.5[c]	20	ID	50	50
COD	410.4[c]	20	92 to 112	7000	25,000
Color	110.2[c]	NA	NA	5 units	5 units
Cyanide, Free	4500CNE[d]	20	70 to 130	7.0	50
Cyanide, Total	335.2[c]/9010/9014[f]	20	87 to 124	4.0	10
Dissolved Oxygen	360.1[c]/360.2[c]	20	NA	100	100
Fluoride	300.0[g]/9056[f]	20	89 to 104	110	250
Fluoride, Total	340.2[c]	20	87 to 110	40	100
Hardness	130.2[c]/2340C[d]	20	96 to 104	2000	10,000
Hexavalent chromium	7196[f]	20	92 to 109	4.0	20
Ignitability	1010[f]	20	NA	NA	NA
Iron, Ferrous	3500FE-D[d]	20	86 to 108	20	100
Nitrate	300.0[g]/9056[f]	20	87 to 102	40	100
Nitrate	353.3[c]/4500NO3E[d]	20	89 to 108	11	100
Nitrate and Nitrite	353.3[c]	20	94 to 106	11	100
Nitrite	300.0[g]/9056[f]	20	88 to 114	40	100
Nitrite	354.1[c]/4500NO3E[d]	20	91 to 112	2.0	20
Odor	140.1[c]	NA	NA	NA	NA
Oil and grease	413.1[c]/9070[f]	20	81 to 107	1000	10,000
Orthophosphate	300.0[g]/9056[f]	20	85 to 108	290	500
Orthophosphate	365.3[c]/4500PE[d]	20	92 to 105	10	50
Perchlorate	E314	20	80-120	0.1	4
PH	150.1[c]	20	99 to 102	NA	NA
Phenols	420.1[c]	20	87 to 112	20	100

Quality Control Objectives for Surface and Groundwaters					
Parameter	**Method**	**Precision[a] (% RPD)**	**Accuracy[b] (% Recovery)**	**MDL (µg/L)**	**RL (ug/L)**
Settleable Solids	160.5[c]	NA	NA	0.10 mL/hr/L	0.10 mL/hr/L
Specific Conductivity	120.1[c]/2510B[d]	20	97 to 101	10 umhos/cm	10 umhos/cm
Sulfate	300.0[g]/9056[f]	20	90 to 103	170	1000
Sulfate	375.4[c]/4500SO4E[d]	20	86 to 109	100	1000
Sulfide	376.1[c]	20	99 to 103	700	2000
Sulfite	377.1[c]	ID	ID	5000	5000
Surfactants (MBAS)	425.1[c]/5540C[d]	20	81 to 113	20	100
Tannins and Lignins	5550[d]	20	72 to 111	70	500
Total Dissolved Solids	160.1[c]/2540C[d]	20	91 to 103	9000	10,000
Total Kjeldahl Nitrogen	351.3[c]	20	91 to 106	170	300
Total Organic Carbon	415.1	20	70 to 130	100	1000
Total Phosphorus	365.2[c]	20	84 to 114	6.0	100
Total Recoverable Petroleum Hydrocarbons (TRPH)	418.1[c]	20	84 to 107	80	500
Total Solids	160.3[c]	20	NA	10,000	10,000
Total Suspended Solids	160.2[c]	20	68 to 92	5000	10,000
Total Volatile Solids	160.4[c]	20	NA	NA	NA
Turbidity	180.1[c]	20	96 to 105	0.04 NTU	0.5 NTU
Cations					
Aluminum	200.7[c]/6010[f]	20	91 to 102	15	60
Antimony	200.7[c]//6010[f]	20	90 to 103	14	45
Antimony	204.2[c]/3113B[d]/7041[f]	20	90 to 115	1.0	4.0
Arsenic	200.7[c]/6010[f]	20	93 to 106	9.0	45
Arsenic	206.2[c]/3113B[d]/7060[f]	20	85 to 126	1.0	2.0
Beryllium	200.7[c]/6010[f]	20	92 to 104	1.0	5.0
Barium	200.7[c]/6010[f]	20	93 to 104	2.0	5.0
Cadmium	200.7[c]/6010[f]	20	89 to 101	1.0	5.0
Cadmium	213.2[c]/3113B[d]/7131[f]	20	87 to 124	0.1	0.5
Calcium	200.7[c]/6010[f]	20	87 to 103	20	500
Chromium	200.7[c]/6010[f]	20	94 to 105	1.0	10
Chromium	218.2[c]/3113B[d]/7191[f]	20	82 to 121	0.4	5.0
Cobalt	200.7[c]/6010[f]	20	94 to 106	2.0	15

Quality Control Objectives for Surface and Groundwaters					
Parameter	**Method**	**Precision[a] (% RPD)**	**Accuracy[b] (% Recovery)**	**MDL (µg/L)**	**RL (ug/L)**
Copper	200.7[c]/6010[f]	20	91 to 104	1.0	10
Copper	220.2[c]/3113B[d]/7211[f]	20	81 to 117	0.3	2.5
Iron	200.7[c]/6010[f]	20	92 to 108	4.0	100
Lead	200.7[c]/6010[f]	20	90 to 104	30	50
Lead	239.2[c]/3113B[d]/7421[f]	20	92 to 124	0.3	2.0
Magnesium	200.7[c]/6010[f]	20	92 to 106	25	200
Manganese	200.7[c]/6010[f]	20	88 to 101	2.0	5.0
Mercury	245.1[c]/7470[f]	20	83 to 111	0.1	0.3
Molybdenum	200.7[c]/6010[f]	20	89 to 101	4.0	15
Nickel	200.7[c]/6010[f]	20	99 to 112	6.0	20
Potassium	200.7[c]/6010[f]	20	89 to 106	490	1000
Selenium	200.7[c]/6010[f]	20	90 to 103	21	100
Selenium	270.2[c]/3113B[d]/7740[f]	20	83 to 116	0.7	2.0
Silver	200.7[c]/6010[f]	20	91 to 104	3.0	10
Sodium	200.7[c]/6010[f]	20	93 to 107	31	500
Thallium	200.7[c]/6010[f]	20	85 to 100	19	50
Thallium	279.2[c]/7841[f]	20	92 to 122	1.0	5.0
Vanadium	200.7[c]/6010[f]	20	91 to 102	1.0	10
Zinc	200.7[c]/6010[f]	20	90 to 103	2.0	20
GC/MS Volatiles					
1,1,1,2-Tetrachloroethane	624[e]/8260[f]	20	81 to 118	0.10	1.0
1,1,1-Trichloroethane	624[e]/8260[f]	20	78 to 127	0.14	1.0
1,1,2,2-Tetrachloroethane	624[e]/8260[f]	20	71 to 118	0.11	1.0
1,1,2-Trichloroethane	624[e]/8260[f]	20	74 to 118	0.12	1.0
1,1-Dichloroethane	624[e]/8260[f]	20	77 to 126	0.14	1.0
1,1-Dichloroethene	624[e]/8260[f]	20	74 to 137	0.23	1.0
1,1-Dichloropropene	624[e]/8260[f]	20	79 to 132	0.13	1.0
1,2,3-Trichlorobenzene	624[e]/8260[f]	20	77 to 119	0.15	1.0
1,2,3-Trichloropropane	624[e]/8260[f]	20	76 to 119	0.18	1.0
1,2,4-Trichlorobenzene	624[e]/8260[f]	20	82 to 119	0.15	1.0
1,2,4-Trimethylbenzene	624[e]/8260[f]	20	84 to 121	0.11	1.0
1,2-Dibromo-3-chloropropane	624[e]/8260[f]	20	83 to 117	0.99	5.0

Quality Control Objectives for Surface and Groundwaters					
Parameter	**Method**	**Precision[a] (% RPD)**	**Accuracy[b] (% Recovery)**	**MDL (µg/L)**	**RL (ug/L)**
1,2-Dibromoethane	624[e]/8260[f]	20	82 to 118	0.13	1.0
1,2-Dichlorobenzene	624[e]/8260[f]	20	81 to 116	0.11	1.0
1,2-Dichloroethane	624[e]/8260[f]	20	78 to 125	0.11	1.0
1,2-Dichloropropane	624[e]/8260[f]	20	77 to 119	0.11	1.0
1,3,5-Trimethylbenzene	624[e]/8260[f]	20	84 to 122	0.12	1.0
1,3-Dichlorobenzene	624[e]/8260[f]	20	81 to 117	0.14	1.0
1,3-Dichloropropane	624[e]/8260[f]	20	78 to 117	0.13	1.0
1,4-Dichlorobenzene	624[e]/8260[f]	20	82 to 117	0.12	1.0
2,2-Dichloropropane	624[e]/8260[f]	20	65 to 143	0.10	1.0
2-Chlorotoluene	624[e]/8260[f]	20	82 to 122	0.12	1.0
4-Chlorotoluene	624[e]/8260[f]	20	82 to 120	0.13	1.0
Benzene	624[e]/8260[f]	20	78 to 121	0.14	1.0
Bromobenzene	624[e]/8260[f]	20	82 to 119	0.14	1.0
Bromochloromethane	624[e]/8260[f]	20	82 to 119	0.12	1.0
Bromodichloromethane	624[e]/8260[f]	20	78 to 121	0.13	1.0
Bromoform	624[e]/8260[f]	20	84 to 120	0.12	1.0
Bromomethane	624[e]/8260[f]	20	61 to 138	0.18	1.0
Carbon tetrachloride	624[e]/8260[f]	20	76 to 130	0.14	1.0
Chlorobenzene	624[e]/8260[f]	20	80 to 117	0.10	1.0
Chloroethane	624[e]/8260[f]	20	65 to 150	0.14	1.0
Chloroform	624[e]/8260[f]	20	77 to 122	0.14	1.0
Chloromethane	624[e]/8260[f]	20	63 to 145	0.17	1.0
Cis-1,2-Dichloroethene	624[e]/8260[f]	20	81 to 121	0.12	1.0
Cis-1,3-Dichloropropene	624[e]/8260[f]	20	81 to 123	0.11	1.0
Dibromochloromethane	624[e]/8260[f]	20	84 to 119	0.11	1.0
Dibromomethane	624[e]/8260[f]	20	77 to 116	0.11	1.0
Dichlorodifluoromethane	624[e]/8260[f]	20	51 to 139	0.12	1.0
Ethylbenzene	624[e]/8260[f]	20	80 to 121	0.14	1.0
Hexachlorobutadiene	624[e]/8260[f]	20	77 to 121	0.14	1.0
Isopropylbenzene	624[e]/8260[f]	20	83 to 122	0.10	1.0
m-,p-Xylenes	624[e]/8260[f]	20	81 to 119	0.23	1.0
Methyl tert-Butyl Ether	624[e]/8260[f]	20	79 to 132	0.11	1.0

Quality Control Objectives for Surface and Groundwaters					
Parameter	**Method**	**Precision[a] (% RPD)**	**Accuracy[b] (% Recovery)**	**MDL (µg/L)**	**RL (ug/L)**
Methylene chloride	624[e]/8260[f]	20	75 to 127	0.11	2.0
Naphthalene	624[e]/8260[f]	20	86 to 124	0.18	1.0
n-Butylbenzene	624[e]/8260[f]	20	83 to 123	0.13	1.0
n-Propylbenzene	624[e]/8260[f]	20	83 to 123	0.11	1.0
o-Xylenes	624[e]/8260[f]	20	82 to 121	0.13	1.0
p-Isopropyltoluene	624[e]/8260[f]	20	85 to 124	0.13	1.0
Sec-Butylbenzene	624[e]/8260[f]	20	82 to 120	0.11	1.0
Styrene	624[e]/8260[f]	20	82 to 120	0.11	1.0
Tert-Butylbenzene	624[e]/8260[f]	20	85 to 124	0.18	1.0
Tetrachloroethene	624[e]/8260[f]	20	81 to 120	0.12	1.0
Toluene	624[e]/8260[f]	20	79 to 119	0.12	1.0
Total Xylenes	624[e]/8260[f]	20	81 to 119	0.36	1.0
trans-1,2-Dichloroethene	624[e]/8260[f]	20	76 to 132	0.15	1.0
Trans-1,3-Dichloropropene	624[e]/8260[f]	20	78 to 122	0.13	1.0
Trichloroethene	624[e]/8260[f]	20	81 to 122	0.13	1.0
Trichlorofluoromethane	624[e]/8260[f]	20	69 to 138	0.13	1.0
Vinyl chloride	624[e]/8260[f]	20	68 to 140	0.13	1.0

Quality Control Objectives for Surface and Groundwaters					
Parameter	**Method**	**Precision[a] (% RPD)**	**Accuracy[b] (% Recovery)**	**MDL (µg/l)**	**RL (µg/l)**
GC/MS Semivolatiles					
1,2,4-Trichlorobenzene	625[e]/8270[f]	20	51 to 103	1.0	10
1,2-Dichlorobenzene	625[e]/8270[f]	20	49 to 95	0.6	10
1,2-Diphenylhydrazine	625[e]/8270[f]	20	41 to 125	0.8	10
1,3-Dichlorobenzene	625[e]/8270[f]	20	46 to 93	1.8	10
1,4-Dichlorobenzene	625[e]/8270[f]	20	47 to 93	1.1	10
2,4,5-Trichlorophenol	625[e]/8270[f]	20	65 to 111	2.6	50
2,4,6-Trichlorophenol	625[e]/8270[f]	20	70 to 112	1.2	10
2,4-Dichlorophenol	625[e]/8270[f]	20	73 to 108	1.2	10
2,4-Dimethylphenol	625[e]/8270[f]	20	71 to 120	1.9	10
2,4-Dinitrophenol	625[e]/8270[f]	20	29 to 127	7.0	50
2,4-Dinitrotoluene	625[e]/8270[f]	20	73 to 112	1.6	10
2,6-Dinitrotoluene	625[e]/8270[f]	20	73 to 111	1.8	10

Quality Control Objectives for Surface and Groundwaters					
Parameter	**Method**	**Precision[a] (% RPD)**	**Accuracy[b] (% Recovery)**	**MDL (µg/L)**	**RL (ug/L)**
2-Chloronaphthalene	625[e]/8270[f]	20	68 to 107	1.1	10
2-Chlorophenol	625[e]/8270[f]	20	72 to 111	1.3	10
2-Methylnaphthalene	625[e]/8270[f]	20	65 to 106	1.3	10
2-Methylphenol	625[e]/8270[f]	20	67 to 116	1.6	10
2-Nitroaniline	625[e]/8270[f]	20	71 to 106	3.7	50
2-Nitrophenol	625[e]/8270[f]	20	72 to 110	1.9	10
3,3-Dichlorobenzidine	625[e]/8270[f]	20	37 to 129	1.3	10
3-Nitroaniline	625[e]/8270[f]	20	71 to 106	2.5	50
4,6-Dinitro-2-methylphenol	625[e]/8270[f]	20	49 to 124	6.87	50
4-Bromophenyl phenyl ether	625[e]/8270[f]	20	73 to 108	1.6	10
4-Chloro-3-methylphenol	625[e]/8270[f]	20	72 to 111	1.8	10
4-Chloroaniline	625[e]/8270[f]	20	63 to 114	2.0	10
4-Chlorophenyl phenyl ether	625[e]/8270[f]	20	73 to 110	1.8	10
4-Methylphenol	625[e]/8270[f]	20	70 to 112	2.3	10
4-Nitroaniline	625[e]/8270[f]	20	70 to 109	4.1	50
4-Nitrophenol	625[e]/8270[f]	20	62 to 114	5.3	50
Acenaphthene	625[e]/8270[f]	20	73 to 107	0.5	10
Acenaphthylene	625[e]/8270[f]	20	72 to 106	1.4	10
Aniline	625[e]/8270[f]	20	25 to 125	3.1	10
Anthracene	625[e]/8270[f]	20	74 to 108	1.4	10
Benzo(a)anthracene	625[e]/8270[f]	20	73 to 109	1.1	10
Benzo(a)pyrene	625[e]/8270[f]	20	70 to 105	1.1	10
Benzo(b)fluoranthene	625[e]/8270[f]	20	72 to 111	1.0	10
Benzo(ghi)perylene	625[e]/8270[f]	20	70 to 110	4.5	10
Benzo(k)fluoranthene	625[e]/8270[f]	20	72 to 111	1.9	10
Benzoic acid	625[e]/8270[f]	20	10 to 128	4.1	50
Benzyl alcohol	625[e]/8270[f]	20	70 to 113	1.7	10
bis-(2-Chloroethoxy)methane	625[e]/8270[f]	20	74 to 109	1.7	10
bis(2-Chloroethyl)ether	625[e]/8270[f]	20	66 to 115	1.7	10
bis(2-Chloroisopropyl)ether	625[e]/8270[f]	20	60 to 107	1.4	10
bis(2-Ethylhexyl)phthalate	625[e]/8270[f]	20	72 to 115	1.4	10
Butyl benzyl phthalate	625[e]/8270[f]	20	72 to 113	0.6	10

Quality Control Objectives for Surface and Groundwaters					
Parameter	**Method**	**Precision[a] (% RPD)**	**Accuracy[b] (% Recovery)**	**MDL (µg/L)**	**RL (ug/L)**
Chrysene	625[e]/8270[f]	20	62 to 142	1.0	10
Dibenzo(a,h)anthracene	625[e]/8270[f]	20	71 to 125	1.3	10
Dibenzofuran	625[e]/8270[f]	20	74 to 108	1.2	10
Diethylphthalate	625[e]/8270[f]	20	76 to 111	1.4	10
Dimethylphthalate	625[e]/8270[f]	20	75 to 109	1.2	10
Di-n-butyl phthalate	625[e]/8270[f]	20	78 to 109	0.7	10
Di-n-octyl phthalate	625[e]/8270[f]	20	71 to 111	1.4	10
Fluoranthene	625[e]/8270[f]	20	73 to 114	1.7	10
Fluorene	625[e]/8270[f]	20	75 to 110	1.3	10
Hexachlorobenzene	625[e]/8270[f]	20	74 to 109	1.2	10
Hexachlorobutadiene	625[e]/8270[f]	20	47 to 97	1.4	10
Hexachlorocyclopentadiene	625[e]/8270[f]	20	22 to 83	5.9	10
Hexachloroethane	625[e]/8270[f]	20	45 to 89	1.2	10
Indeno(1,2,3-cd)pyrene	625[e]/8270[f]	20	70 to 110	2.3	10
Isophorone	625[e]/8270[f]	20	76 to 108	1.6	10
Naphthalene	625[e]/8270[f]	20	61 to 103	1.0	10
Nitrobenzene	625[e]/8270[f]	20	73 to 108	2.1	10
n-Nitrosodimethylamine	625[e]/8270[f]	ID	ID	2.6	10
n-Nitroso-di-n-propylamine	625[e]/8270[f]	20	71 to 109	1.8	10
n-Nitrosodiphenylamine	625[e]/8270[f]	20	68 to 105	1.7	10
Pentachlorophenol	625[e]/8270[f]	20	51 to 116	5.1	50
Phenanthrene	625[e]/8270[f]	20	74 to 110	1.2	10
Phenol	625[e]/8270[f]	20	70 to 114	1.4	10
Pyrene	625[e]/8270[f]	20	71 to 108	1.3	10

Quality Control Objectives for Soil, Sediment, and Waste					
Parameter	**Method**	**Precision[a] (% RPD)**	**Accuracy[b] (% Recovery)**	**MDL (mg/kg)**	**RL (mg/kg)**
General Analyses					
Cyanide, Total	9010[c]	20	88 to 121	0.10	0.50
Perchlorate	E314	20	75-125	0.02	0.1
PH	9045[c]	20	95 to 105	NA	NA
Total Recoverable Petroleum Hydrocarbons (TRPH)	418.1(Mod)[e]	20	72 to 125	1.5	25
Cations					
Aluminum	6010[c]	20	85 to 103	2.5	12
Antimony	6010[c]	20	84 to 97	1.6	9.0
Antimony	7041[c]	20	81 to 127	0.14	0.80
Arsenic	6010[c]	20	86 to 100	2.1	9.0
Arsenic	7061[c]	20	79 to 127	0.14	0.40
Beryllium	6010[c]	20	86 to 100	0.10	1.0
Barium	6010[c]	20	86 to 101	0.10	1.0
Cadmium	6010[c]	20	80 to 98	0.10	1.0
Cadmium	7131[c]	20	80 to 120	0.04	0.10
Calcium	6010[c]	20	89 to 115	10	100
Chromium	6010[c]	20	88 to 102	0.20	2.0
Chromium	7191[c]	20	80 to 120	0.05	0.50
Cobalt	6010[c]	20	86 to 102	0.40	3.0
Copper	6010[c]	20	84 to 99	0.20	2.0
Copper	7211[c]	20	80 to 120	NA	0.50
Iron	6010[c]	20	87 to 110	2.8	20
Lead	6010[c]	20	83 to 98	2.9	10
Lead	7421[c]	20	90 to 116	0.14	0.40
Magnesium	6010[c]	20	85 to 111	4.9	40
Manganese	6010[c]	20	83 to 97	0.10	1.0
Mercury	7471[c]	20	67 to 128	0.01	0.08
Molybdenum	6010[c]	20	83 to 97	0.20	3.0
Nickel	6010[c]	20	92 to 107	0.80	4.0
Potassium	6010[c]	20	81 to 103	35	200

Quality Control Objectives for Soil, Sediment, and Waste					
Parameter	**Method**	**Precision[a] (% RPD)**	**Accuracy[b] (% Recovery)**	**MDL (mg/kg)**	**RL (mg/kg)**
Selenium	6010[c]	20	84 to 97	2.5	20
Selenium	7741[c]	20	76 to 108	0.07	0.40
Silver	6010[c]	20	83 to 100	0.20	2.0
Sodium	6010[c]	20	88 to 103	10	100
Thallium	6010[c]	20	80 to 97	2.4	10
Thallium	7841[c]	20	82 to 117	0.14	0.50
Vanadium	6010[c]	20	86 to 98	0.20	2.0
Zinc	6010[c]	20	83 to 98	0.20	4.0

Quality Control Objectives for Soil, Sediment, and Waste					
Parameter	**Method**	**Precision[a] (% RPD)**	**Accuracy[b] (% Recovery)**	**MDL (mg/kg)**	**RL (mg/kg)**
GC/MS Volatiles					
1,1,1,2-Tetrachloroethane	8260[c]	30	62 to 108	0.00076	0.0050
1,1,1-Trichloroethane	8260[c]	30	65 to 135	0.00062	0.0050
1,1,2,2-Tetrachloroethane	8260[c]	30	64 to 135	0.00055	0.0050
1,1,2-Trichloroethane	8260[c]	30	65 to 135	0.00054	0.0050
1,1-Dichloroethane	8260[c]	30	62 to 135	0.00058	0.0050
1,1-Dichloroethene	8260[c]	30	65 to 135	0.00050	0.0050
1,1-Dichloropropene	8260[c]	30	65 to 135	0.00068	0.0050
1,2,3-Trichlorobenzene	8260[c]	30	65 to 147	0.00077	0.0050
1,2,3-Trichloropropane	8260[c]	30	65 to 135	0.00052	0.0050
1,2,4-Trichlorobenzene	8260[c]	30	65 to 145	0.00093	0.0050
1,2,4-Trimethylbenzene	8260[c]	30	65 to 135	0.00073	0.0050
1,2-Dibromo-3-chloropropane	8260[c]	30	49 to 135	0.0026	0.010
1,2-Dibromoethane	8260[c]	30	65 to 135	0.00050	0.0050
1,2-Dichlorobenzene	8260[c]	30	65 to 135	0.00072	0.0050
1,2-Dichloroethane	8260[c]	30	58 to 137	0.00061	0.0050
1,2-Dichloropropane	8260[c]	30	60 to 135	0.00055	0.0050
1,3,5-Trimethylbenzene	8260[c]	30	62 to 135	0.00071	0.0050
1,3-Dichlorobenzene	8260[c]	30	65 to 135	0.00078	0.0050
1,3-Dichloropropane	8260[c]	30	65 to 135	0.00060	0.0050
1,4-Dichlorobenzene	8260[c]	30	65 to 135	0.00081	0.0050
2,2-Dichloropropane	8260[c]	30	65 to 135	0.00057	0.0050
2-Chlorotoluene	8260[c]	30	63 to 135	0.00076	0.0050
4-Chlorotoluene	8260[c]	30	64 to 135	0.00073	0.0050
Benzene	8260[c]	30	65 to 135	0.00051	0.0050
Bromobenzene	8260[c]	30	65 to 135	0.00081	0.0050
Bromochloromethane	8260[c]	30	65 to 135	0.00047	0.0050
Bromodichloromethane	8260[c]	30	65 to 135	0.00055	0.0050
Bromoform	8260[c]	30	65 to 135	0.00049	0.0050
Bromomethane	8260[c]	30	62 to 135	0.00069	0.010
Carbon tetrachloride	8260[c]	30	52 to 135	0.00067	0.0050
Chlorobenzene	8260[c]	30	65 to 135	0.00068	0.0050

Quality Control Objectives for Soil, Sediment, and Waste					
Parameter	**Method**	**Precision[a] (% RPD)**	**Accuracy[b] (% Recovery)**	**MDL (mg/kg)**	**RL (mg/kg)**
Chloroethane	8260[c]	30	55 to 135	0.00047	0.010
Chloroform	8260[c]	30	64 to 135	0.00066	0.0050
Chloromethane	8260[c]	30	65 to 135	0.00065	0.010
Cis-1,2-Dichloroethene	8260[c]	30	65 to 135	0.00060	0.0050
cis-1,3-Dichloropropene	8260[c]	30	64 to 135	0.00062	0.0050
Dibromochloromethane	8260[c]	30	65 to 135	0.00056	0.0050
Dibromomethane	8260[c]	30	59 to 137	0.00058	0.0050
Dichlorodifluoromethane	8260[c]	30	65 to 135	0.00051	0.010
Ethylbenzene	8260[c]	30	65 to 135	0.00071	0.0050
Hexachlorobutadiene	8260[c]	30	65 to 135	0.00087	0.0050
Isopropylbenzene	8260[c]	30	65 to 135	0.00072	0.0050
m-,p-Xylenes	8260[c]	30	65 to 135	0.0014	0.0050
Methyl tert-Butyl Ether	8260[c]	30	50 to 150	0.00052	0.0050
Methylene chloride	8260[c]	30	65 to 135	0.00068	0.010
Naphthalene	8260[c]	30	65 to 135	0.00086	0.0050
n-Butylbenzene	8260[c]	30	65 to 135	0.00087	0.0050
n-Propylbenzene	8260[c]	30	65 to 135	0.00085	0.0050
o-Xylenes	8260[c]	30	65 to 135	0.00067	0.0050
p-Isopropyltoluene	8260[c]	30	65 to 135	0.00085	0.0050
Sec-Butylbenzene	8260[c]	30	65 to 135	0.00082	0.0050
Styrene	8260[c]	30	65 to 135	0.00067	0.0050
Tert-Butylbenzene	8260[c]	30	65 to 135	0.00077	0.0050
Tetrachloroethene	8260[c]	30	61 to 135	0.00073	0.0050
Toluene	8260[c]	30	64 to 135	0.00065	0.0050
Total Xylenes	8260[c]	30	65 to 135	0.0020	0.0050
trans-1,2-Dichloroethene	8260[c]	30	65 to 135	0.00055	0.0050
trans-1,3-Dichloropropene	8260[c]	30	56 to 135	0.00074	0.0050
Trichloroethene	8260[c]	30	61 to 135	0.00068	0.0050
Trichlorofluoromethane	8260[c]	30	57 to 135	0.00054	0.0050
Vinyl chloride	8260[c]	30	36 to 144	0.00051	0.010
GC/MS Semivolatiles					
1,2,4-Trichlorobenzene	8270[c]	30	52 to 108	0.071	0.33

Quality Control Objectives for Soil, Sediment, and Waste					
Parameter	**Method**	**Precision[a] (% RPD)**	**Accuracy[b] (% Recovery)**	**MDL (mg/kg)**	**RL (mg/kg)**
1,2-Dichlorobenzene	8270[c]	30	48 to 110	0.091	0.33
1,2-Diphenylhydrazine	8270[c]	30	44 to 119	0.089	0.33
1,3-Dichlorobenzene	8270[c]	30	47 to 106	0.086	0.33
1,4-Dichlorobenzene	8270[c]	30	47 to 107	0.078	0.33
2,4,5-Trichlorophenol	8270[c]	30	47 to 113	0.23	1.6
2,4,6-Trichlorophenol	8270[c]	30	46 to 116	0.082	0.33
2,4-Dichlorophenol	8270[c]	30	47 to 114	0.10	0.33
2,4-Dimethylphenol	8270[c]	30	35 to 142	0.096	0.33
2,4-Dinitrophenol	8270[c]	30	D to 189	0.16	1.6
2,4-Dinitrotoluene	8270[c]	30	40 to 122	0.088	0.33
2,6-Dinitrotoluene	8270[c]	30	40 to 122	0.083	0.33
2-Chloronaphthalene	8270[c]	30	50 to 113	0.072	0.33
2-Chlorophenol	8270[c]	30	45 to 117	0.082	0.33
2-Methylnaphthalene	8270[c]	30	52 to 112	0.099	0.33
2-Methylphenol	8270[c]	30	46 to 119	0.11	0.33
2-Nitroaniline	8270[c]	30	8 to 116	0.25	1.6
2-Nitrophenol	8270[c]	30	41 to 119	0.077	0.33
3,3-Dichlorobenzidine	8270[c]	30	D to 128	0.086	0.33
3-Nitroaniline	8270[c]	30	26 to 79	0.19	1.6
4,6-Dinitro-2-methylphenol	8270[c]	30	10 to 125	0.20	1.6
4-Bromophenyl phenyl ether	8270[c]	30	52 to 112	0.085	0.33
4-Chloro-3-methylphenol	8270[c]	30	47 to 117	0.10	0.33
4-Chloroaniline	8270[c]	30	D to 80	0.079	0.33
4-Chlorophenyl phenyl ether	8270[c]	30	54 to 112	0.095	0.33
4-Methylphenol	8270[c]	30	44 to 118	0.083	0.33
4-Nitroaniline	8270[c]	30	29 to 126	0.27	1.6
4-Nitrophenol	8270[c]	30	32 to 123	0.27	1.6
Acenaphthene	8270[c]	30	49 to 113	0.081	0.33
Acenaphthylene	8270[c]	30	50 to 113	0.085	0.33
Aniline	8270[c]	30	25 to 135	0.12	0.33

Quality Control Objectives for Soil, Sediment, and Waste					
Parameter	**Method**	**Precision[a] (% RPD)**	**Accuracy[b] (% Recovery)**	**MDL (mg/kg)**	**RL (mg/kg)**
Anthracene	8270[c]	30	53 to 111	0.091	0.33
Benzo(a)anthracene	8270[c]	30	53 to 112	0.081	0.33
Benzo(a)pyrene	8270[c]	30	45 to 114	0.090	0.33
Benzo(b)fluoranthene	8270[c]	30	46 to 115	0.10	0.33
Benzo(g,h,i)perylene	8270[c]	30	23 to 129	0.078	0.33
Benzo(k)fluoranthene	8270[c]	30	49 to 113	0.090	0.33
Benzoic acid	8270[c]	30	D to 143	0.19	1.6
Benzyl alcohol	8270[c]	30	28 to 128	0.093	0.33
bis-(2-Chloroethoxy)methane	8270[c]	30	45 to 115	0.086	0.33
bis(2-Chloroethyl)ether	8270[c]	30	43 to 112	0.094	0.33
Bis(2-Chloroisopropyl)ether	8270[c]	30	38 to 111	0.083	0.33
bis(2-Ethylhexyl)phthalate	8270[c]	30	28 to 129	0.10	0.33
Butyl benzyl phthalate	8270[c]	30	33 to 125	0.092	0.33
Chrysene	8270[c]	30	40 to 140	0.086	0.33
Dibenzo(a,c)anthracene	8270[c]	30	42 to 130	0.092	0.33
Dibenzofuran	8270[c]	30	53 to 113	0.088	0.33
Diethyl phthalate	8270[c]	30	49 to 117	0.10	0.33
Dimethyl phthalate	8270[c]	30	50 to 115	0.088	0.33
Di-n-butyl phthalate	8270[c]	30	42 to 120	0.11	0.33
Di-n-octyl phthalate	8270[c]	30	27 to 133	0.093	0.33
Fluoranthene	8270[c]	30	54 to 114	0.090	0.33
Fluorene	8270[c]	30	53 to 116	0.095	0.33
Hexachlorobenzene	8270[c]	30	53 to 112	0.082	0.33
Hexachlorobutadiene	8270[c]	30	51 to 108	0.084	0.33
Hexachlorocyclopentadiene	8270[c]	30	24 to 121	0.20	0.33
Hexachloroethane	8270[c]	30	45 to 106	0.081	0.33
Indeno(1,2,3-c,d)pryene	8270[c]	30	39 to 123	0.084	0.33
Isophorone	8270[c]	30	40 to 118	0.086	0.33
Naphthalene	8270[c]	30	49 to 111	0.077	0.33
Nitrobenzene	8270[c]	30	47 to 111	0.079	0.33

Quality Control Objectives for Soil, Sediment, and Waste					
Parameter	**Method**	**Precision[a] (% RPD)**	**Accuracy[b] (% Recovery)**	**MDL (mg/kg)**	**RL (mg/kg)**
n-Nitrosodimethylamine	8270[c]	30	27 to 135	0.099	0.33
n-Nitroso-di-n-propylamine	8270[c]	30	38 to 120	0.091	0.33
n-Nitrosodiphenylamine	8270[c]	30	49 to 116	0.093	0.33
Pentachlorophenol	8270[c]	30	27 to 116	0.18	1.6
Phenanthrene	8270[c]	30	53 to 113	0.083	0.33
Phenol	8270[c]	30	45 to 116	0.085	0.33
Pyrene	8270[c]	30	53 to 111	0.090	0.33

[a]Precision defined as relative percent difference between two values (i.e. MS/MSD).
[b]Accuracy defined as average percent recovery ± 3 times the standard deviation.
[c]Test Methods for Evaluating Solid Waste, SW-846, 3rd Edition, September 1986, Update I, July 1992, Update II, September 1994, and Update III, December 1996.
[d]California Department of Health Services Leaking Underground Fuel Tank Field Manual, May 1988.
[e]U.S. EPA. *Methods for Chemical Analysis of Water and Wastes.* PB 84-128677. March 1983.

Notes:
ID = Insufficient Data
NA = Not Applicable

SW-846 Method 8290B/Dioxins & Furans

Congener	CAS RN	Water (pg/L)	Soil (ng/Kg)
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	1746-01-6	10	1.0
1,2,3,7,8-Pentachlorodibenzo-p-dioxins (PeCDD)	40321-76-4	25	1.0
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	57653-85-7	25	2.5
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	39227-28-6	25	2.5
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	19408-74-3	25	2.5
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	35822-39-4	25	2.5
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	3268-87-9	50	5.0
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	51207-31-9	10	1.0
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	57117-41-6	25	1.0
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	57117-31-4	25	1.0
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	57117-44-9	25	2.5
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	72918-21-9	25	2.5
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	70648-26-9	25	2.5
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	60851-34-5	25	2.5
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	67562-39-4	25	2.5
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	55673-89-7	25	2.5
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	39001-02-0	50	5.0
PCDD/PCDF Screening Method 4425 or ASTM E1853M-98			
Dioxin/Furan Mixture		500	25

Nitroaromatics and Nitramines (Explosives)

		Water (ug/L)		Soil (mg/Kg)	
Analyte	**EPA Method**	**MRL**	**MDL**	**MRL**	**MDL**
HMX	8330	1	0.3	1	0.08
RDX	8330	1	0.2	1	0.09
1,3,5-Trinitrobenzene	8330	1	0.2	1	0.1
Tetryl	8330	1	0.8	1	0.08
1,3-Dinitrobenzene	8330	1	0.2	1	0.09
2,4,6-Trinitrotoluene	8330	1	0.2	1	0.1
Nitrobenzene	8330	1	0.6	1	0.08
4-Amino-2,6-dinitrotoluene	8330	1	0.2	1	0.08
2-Amino-4,6-dinitrotoluene	8330	1	0.3	1	0.08
2,6-Dinitrotoluene	8330	1	0.3	1	0.08
2,4-Dinitrotoluene	8330	1	0.4	1	0.08
2-Nitrotoluene	8330	1	0.7	1	0.2
4-Nitrotoluene	8330	1	0.7	1	0.2
3-Nitrotoluene	8330	1	0.6	1	0.2