

SAP Worksheet #1 -- Title and Approval Page

**Final Addendum 4 to Final Amended
Sampling and Analysis Plan
(Field Sampling Plan and Quality Assurance Project Plan)
for Basewide Groundwater Monitoring Program**

**Hunters Point Naval Shipyard
San Francisco, California**

June 2012

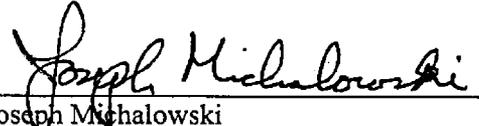
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Date

Approval Signature:  June 6, 2012
Joseph Michalowski
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Date

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TRANSMITTAL FORM



Date: 5 July, 2012

To: Diane Silva, Command Records Manager
 Naval Facilities Engineering Command, Southwest
 2965 Mole Rd., Bldg. 3519
 San Diego, CA 92136

Re: Contract No. N62473-09-D-2627 CTO #0003

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3	June 2012	Hard copy (ies) of: <i>Final Addendum 4 to Final Amended Sampling and Analysis Plan (Field Sampling Plan and Quality Assurance Project Plan) for Basewide Groundwater Monitoring Program, Hunters Point Naval Shipyard, San Francisco, California (June 2012)</i> DCN: CEKA-2627-0003-0007.A4 (Addendum 4 to DCN CEKA-3001-0000-0013)
3	June 2012	Compact disc(s) with electronic version of above- referenced document

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Remarks: Dear Ms. Silva,

Enclosed documents are for the Base Information and Administrative Record copies: Please contact Nicki Cook of CE2-Kleinfelder Joint Venture at (925) 400-4577 or via e-mail at cook@ce2corp.com if you have any questions or concerns.

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Signed: *Nicki Cook*
 Nicola Cook
 CE2 Corporation

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FINAL
SAMPLING AND ANALYSIS PLAN
(FIELD SAMPLING PLAN AND QUALITY ASSURANCE PROJECT PLAN)
FOR BASEWIDE GROUNDWATER MONITORING PROGRAM

DATED 05 MARCH 2009

THIS RECORD IS ENTERED IN THE DATABASE AND FILED AS

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**Final Addendum 4 to the Final Amended Sampling and Analysis Plan
(Field Sampling Plan and Quality Assurance Project Plan)
for
Basewide Groundwater Monitoring Program
Hunters Point Naval Shipyard – San Francisco, California**

Purpose: The purpose of this addendum is to update the Final Amended Sampling and Analysis Plan (Field Sampling Plan and Quality Assurance Project Plan) for the Basewide Groundwater Monitoring Program, Hunters Point Naval Shipyard, San Francisco, California (SAP), dated April 2011. All other information in the SAP and previous SAP Addenda 2 and 3 that are not discussed in this addendum remain unchanged and are being implemented.

Background: The SAP identifies the analytes to be monitored and the associated analytical methods, as a part of the groundwater monitoring program.

This SAP addendum provides updates to the lists of analytes and analytical methods for the BGMP.

Changes:

- 1- Iron (total) and manganese (total) have been added to the list of analytes for groundwater monitoring at select wells in Parcel B in order to support a proposed groundwater remedial action. The analytical method for these analyses is the same as for dissolved metals. However, multiple SAP WSs reference “dissolved” metals as a general reference, and these WSs have been revised to delete the reference to “dissolved”; however, those Parcel B wells that require dissolved and/or total metals analysis have been identified in WS# 15.1.

As a result, the following WSs have been revised: #12, #14, #15.1c, #19, #20, #28h, #30, and #36. For clarification and ease of use, these WSs have been recreated in their entirety.

- 2- The primary analytical method for low-level analysis of volatile organic compounds (VOCs) has been revised from “U.S. EPA 8260B SIM” to U.S. EPA 8260B-Low Level”. This change was made effective for the previous sampling event via a Field Change Request explaining the laboratory’s use of a new, more sensitive instrument that does not require the use of selective ion monitoring. All other SAP requirements will be met using this new instrumentation.

As a result, the following WSs have been revised: #15.1a, #15.2a, #15.3a, #15.4a, #15.5a, #15.6a, #15.7a, #19, #23, #28a, Table 28-1, and #30. For clarification and ease of use, these WSs have been recreated in their entirety.

- 3- Two VOCs have been added to the analyte list in two parcels (Parcels D-1 and G), to evaluate the potential presence of degradation products. These analytes were included in previous SAP documents, but were not included in Parcels D-1 and G.

The analytes to be included under the VOCs analysis: cis-1,2-Dichloroethene (Parcels D-1 and G); and vinyl chloride (Parcel G).

As a result, the following WSs have been revised: #15.3a and #15.6a. For clarification and ease of use, these WSs have been recreated in their entirety.

Other minor changes include:

- WS #12 (Trip Blank row): Added carbon dioxide.
- WS #15.5g (Parcel E-2): Revised to add sulfide, which was inadvertently not included in previous SAP documents (this analyte was included in the Final Amended SAP, but was not included for Parcel E-2).
- WS #19 (dissolved gases): Revised sample preservation requirements (previous SAP documents inadvertently omitted one preservation requirement).
- WS #19: Added a row for metals analysis by U.S. EPA Method 6010B (inadvertently omitted from Final Amended SAP).
- WS #20 (“No. of Source Blanks” column): Deleted “quarterly” from “1 per quarterly sampling event” to reflect the current semiannual sampling frequency.
- WS #20 (for alkalinity and dissolved gases): Revised entries for number of field duplicates, number of MS/MSDs, and/or number of equipment blanks, which were incorrectly stated in previous SAP-related documents.
- WS #28f: Revised TPH-extractable surrogate entries for “Method/SOP QC Acceptance Limits” field to reflect current analytical laboratory requirements.
- Table 28-1: Revised QC acceptance limits for organophosphorus pesticides to reflect current analytical laboratory requirements.
- References page has been updated to reflect updated DoD Quality Systems Manual (version 4.2).

SAP Worksheet #12 -- Measurement Performance Criteria Table – Field QC Samples

QC Sample ¹	Analytical Group	Frequency	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Trip Blank	Volatile Organic Compounds (VOCs) Total Petroleum Hydrocarbons (TPH) – purgeables Dissolved gases (carbon dioxide, ethane, ethene, and methane)	One per field team/VOCs, dissolved gases (ethane, ethene, and methane) and/or TPH-purgeables cooler/day	Accuracy/Bias Contamination	No target compounds \geq quantitation limit (QL)	S

QC Sample ¹	Analytical Group	Frequency	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Field Duplicate	VOCs Semivolatile Organic Compounds (SVOCs) Organochlorine (OC) pesticides Polychlorinated biphenyls (PCBs) Organophosphorus (OP) pesticides TPH - purgeables TPH – extractables Oil and grease Metals ² Chromium (hexavalent) Organotins (tributyltin) Alkalinity Cyanide Anions ³	One per every 10 field samples	Precision – Overall	≤ 30 relative percent difference (RPD)	S & A

QC Sample ¹	Analytical Group	Frequency	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Field Duplicate	Radionuclides (Cs-137; Pu-239; Ra-226; Sr-90) Ammonia, un-ionized Total Organic Carbon Dissolved gases (carbon dioxide, ethane, ethene and methane) ⁴ Sulfide Total suspended solids (TSS) Total Kjeldahl nitrogen (TKN)	One per every 10 field samples	Precision – Overall	≤ 30 RPD	S & A
Equipment Rinsate Blank	Varies ⁵ depending on the location where non-dedicated equipment was used, and field conditions encountered during sampling.	One per field team per set of non-dedicated equipment per day	Accuracy/Bias Contamination	No target compounds ≥ QL	S & A
Source Water Blank	Varies ⁵ depending on the location where non-dedicated equipment was used, and field conditions encountered during sampling.	One per quarterly sampling event per source water used to decontaminate equipment	Accuracy/Bias Contamination	No target compounds ≥ QL	S

Notes:

¹ Due to the range of analytical groups selected per sampling locations, the frequency of field duplicate and equipment rinsate blank analysis may vary. Selection of field duplicates and equipment rinsate blanks will target the most commonly used analytical methods.

- ² Suite of metals may include: aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium (total), cobalt, copper, iron, lead, manganese, mercury, molybdenum, nickel, selenium, silver, thallium, vanadium, and/or zinc.
- ³ Suite of anions may include: bromide, chloride, fluoride, nitrate, nitrite, phosphate, and/or sulfate.
- ⁴ There is no California or DoD Environmental Laboratory Accreditation Program (ELAP) accreditation for this analytical method. Analytes are used only for evaluating Monitoring Natural Attenuation (MNA) or effectiveness of groundwater treatability studies, and do not have Remediation Goals or Trigger Levels.
- ⁵ Equipment blank and source blank samples will not be analyzed for some analytes/parameters because they are naturally occurring at low levels in the source water used for equipment decontamination. See WS 20 for list of these analytes/parameters.

SAP Worksheet #14 -- Summary of Project Tasks

Field Tasks

Preparatory Activities: Prior to beginning field work, the BRAC Project Manager, Navy Resident Officer in Charge of Construction (ROICC), and the appropriate HPNS security and fire department personnel will be notified. Prior to conducting field activities, field personnel will review the applicable sections of the SAP (see WS 4 for specific WSs to be read) and sign the Project Personnel Sign-off Sheet (WS 4), read the SSHP, and attend required HPNS Radiation Awareness Training.

Mobilization: Mobilization activities will consist of site preparation, movement of equipment and materials to the site, and orientation and training of field personnel (including any on-site safety training/orientation).

Groundwater Sampling: Groundwater sampling will be conducted consistent with the procedures described in WS 17. Groundwater samples will be collected and submitted consistent with analytical method requirements (i.e. sample volume, container type, preservative) as described in WS 19.

NAPL Measurement: The presence and thickness of NAPL will be measured annually, in the wells listed in Table 17-4, consistent with the procedures described in WS 17.

Equipment Decontamination: Decontamination will be performed on non-disposable, reusable equipment as described in WS 17. Sample collection tubing will be used only at dedicated locations and will be disposed of as investigation-derived waste (IDW). Radiation screening will be performed on personnel, equipment, and tools that are used in Navy-designated Radiation Control Areas (RCAs), consistent with the protocols set forth by the Navy contractor in charge of performing radiation training and screening.

IDW Management: IDW generated during field activities will include purge water from well sampling, equipment decontamination water (rinsate), spent groundwater sampling tubing, and personnel protective equipment (e.g. gloves, Tyvek, etc.) WS 17 describes procedures for waste storage, labeling, manifesting, and disposal. The disposal of the waste will be coordinated with the Navy ROICC. For IDW generated in an RCA, the CE2-Kleinfelder JV will coordinate with the Navy and the Navy's radiation contractor regarding requirements for radiological screening of IDW before disposal.

Analysis Tasks: Groundwater samples will be analyzed for one or more of the following: metals (dissolved and/or total), VOCs, SVOCs, PCBs, OC and OP pesticides, alkalinity, anions, sulfide, dissolved gases, Dehalococcoides bacteria, radionuclides, ammonia (un-ionized), cyanide, oil and grease, organotins (tributyltin), TKN, total organic carbon, TSS, TPH-purgeables (gasoline), and TPH-extractables (diesel and motor oil). IDW characterization will include the following: chemical oxygen demand, flashpoint, and hydrogen ion concentration (pH). Groundwater water quality parameters will be measured during pre-sampling purging of groundwater monitoring wells, and may consist of the following parameters: pH, dissolved oxygen (DO), ferrous iron, specific conductance, turbidity, temperature and oxygen-reduction potential (ORP).

Quality Control Tasks: Groundwater samples may be accompanied by the following field QC samples: trip blanks, field duplicates, equipment rinsate blanks, and source water blanks. As appropriate to the analytical method, the following laboratory QC analyses will be performed: initial calibrations, continuing calibrations, tuning, method blanks, laboratory control samples, matrix spikes, matrix spike duplicates, laboratory duplicates, surrogates, internal standards, and other applicable QC in accordance with the analytical method. See WS 20 and WS 28.

Secondary Data: No secondary data will be used in reporting results from the BGMP.

Data Management Tasks:

Biological Data. Analytical data for Dehalococcoides bacteria analysis will be provided by the analytical laboratory in an abbreviated (Level II) data quality report in both hard copy and EDD formats. Consistent with NAVFAC Southwest Environmental Work Instruction (EWI) No. 6, *Environmental Data Management and Required Electronic Delivery Standards* (U.S. Navy, 2005), analytical data for Dehalococcoides bacteria will not be uploaded to the NIRIS database.

Chemical and Field Data. Chemical analytical data will be provided by the analytical laboratory in CLP-equivalent (Level IV) data quality reports in both hard copy and EDDs. Validated analytical data will be compiled in the CE2 Kleinfelder Joint Venture HPNS BGMP database, upon completion of the analytical data validation process. Field measurement data (water levels and groundwater stabilization parameters collected during well purging) and well logs will be recorded and stored in the project files by the CE2 Kleinfelder Joint Venture project team. Electronic and hard-copy laboratory reports will be archived for a minimum of 7 years. The EDDs will be prepared in the Naval Electronic Data Deliverable (NEDD) format after verification, validation, and peer review. The NEDDs will be submitted to the NIRIS database within 30 days after completion of the peer review of the validated analytical data.

Documentation and Records: Groundwater level data from quarterly basewide measurement events will be recorded on Water Level Measurement Forms. Data generated during monitoring well purging and sampling will be recorded electronically using a field computer, and will be stored by the CE2 Kleinfelder Joint Venture. NAPL measurement data will be recorded on Immiscible Layer Measurement forms. Chain-of-custody records will be prepared and submitted with samples that are submitted to the analytical laboratory. See WS 29.

Assessment/Audit Tasks: A groundwater sampling Technical Systems Audit (TSA) will be conducted once per quarterly sampling event (see WS 31). A Quality Control Summary Report (QCSR) will be prepared for each semiannual groundwater monitoring report. Deviations from the SAP will be discussed in the semiannual groundwater monitoring reports.

Data Review Tasks: Each laboratory performing sample analyses will verify that data are complete and correct for samples submitted for analysis. Analytical data will be validated by a third-party analytical data validation subcontractor to assess whether the quality of the analytical data is adequate for the intended use(s), as defined by the precision, accuracy, representativeness, completeness, comparability, and sensitivity (PARCCS) parameters in this SAP. Analytical data usability will be assessed upon review of analytical data validation reports and field documentation in a QCSR that will be included in the semiannual groundwater monitoring report. The QCSR will include a discussion of data

limitations and a comparison against the DQOs. Analytical data will be presented in tables, figures and graphs. Analytical data for target analytes will be compared to well-specific and target analyte-specific Remediation Goals and Trigger Levels.

Data Validation: One hundred percent of the analytical data will be subject to a data quality assessment (i.e., review, verification, validation, and usability assessment), with approximately 80 percent of the Level III analytical data undergoing data validation and 20 percent of the Level IV analytical data undergoing validation. Analytical data validation will be conducted by a third-party data validation subcontractor. Validated data will be reviewed and evaluated during the usability assessment. Consistent with NAVFAC Southwest Environmental Work Instruction No. 1, Chemical Data Validation (U.S. Navy, 2001) for sites listed on the U.S. EPA's National Priorities List, analytical data generated for waste characterization purposes and source water analytical data will not be validated.

Reports: The final data and description of sampling activities will be reported in semiannual groundwater monitoring reports and/or Technical Memoranda. Any deviations from the requirements in this SAP will be documented in the reports.

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SAP Worksheet #15.1a -- Reference Limits and Evaluation Table

Parcel: B

Matrix: Water

Analytical Group: Volatile Organic Compounds – U.S. EPA 8260B and U.S. EPA 8260B-Low Level

Analyte	CAS Number	Project Action Limit (µg/L)	Project Action Limit Reference	Project Quantitation Limit Goal (µg/L)	Laboratory-specific	
					QLs (µg/L)	MDLs (µg/L)
Benzene ¹	71-43-2	0.5	Final RAMP ²	0.4	0.2	0.06
Bromodichloromethane	75-27-4	1.0	Final RAMP ²	0.8	0.5	0.14
Chloroethane	75-00-3	6.5	Final RAMP ²	1.5	0.5	0.21
Chlorobenzene	108-90-7	392	Final RAMP ²	1.0	0.5	0.21
Chloroform ¹	67-66-3	1.0	Final RAMP ²	0.4	0.2	0.06
Dichlorodifluoromethane (Freon 12)	75-71-8	14	Final RAMP ²	5.0	1.0	0.19
1,2-Dichlorobenzene	95-50-1	2,561	Final RAMP ²	10	0.5	0.17
1,4-Dichlorobenzene	106-46-7	2.1	Final RAMP ²	1.0	0.5	0.19
1,2-Dichloroethane ¹	107-06-2	2.3	Final RAMP ²	1.0	0.1	0.03
1,2-Dichloroethene (total)	540-59-0	209	Final RAMP ²	5.0	1.0	0.16
cis-1,2- Dichloroethene	156-59-2	209	Final RAMP ²	2.0	0.5	0.16
trans-1,2- Dichloroethene	156-60-5	182	Final RAMP ²	2.0	0.5	0.19
1,2-Dichloropropane	78-87-5	1.1	Final RAMP ²	0.7	0.5	0.17
Methylene Chloride	75-09-2	27	Final RAMP ²	10	5.0	0.35
Naphthalene	91-20-3	3.6	Final RAMP ²	2.5	1.2	0.36
Tetrachloroethene ¹	127-18-4	1.0	Final RAMP ²	0.6	0.3	0.08
1,2,4-Trichlorobenzene	120-82-1	66	Final RAMP ²	5.0	0.5	0.21

Analyte	CAS Number	Project Action Limit (µg/L)	Project Action Limit Reference	Project Quantitation Limit Goal (µg/L)	Laboratory-specific	
					QLs (µg/L)	MDLs (µg/L)
Trichloroethene	79-01-6	2.9	Final RAMP ²	1.0	0.5	0.16
Trichlorofluoromethane (Freon 11)	75-69-4	176	Final RAMP ²	5.0	0.5	0.24
1,2,4-Trimethylbenzene	95-63-6	25	Final RAMP ²	5.0	1.0	0.19
1,3,5-Trimethylbenzene	108-67-8	19	Final RAMP ²	5.0	1.0	0.12
Vinyl chloride ¹	75-01-4	0.5	Final RAMP ²	0.2	0.1	0.03

Notes:

¹ Analyte will be analyzed by U.S. EPA 8260B-Low Level.

² *Final Remedial Action Monitoring Plan - Parcel B (Excluding Installation Restoration Sites 7 and 18)* (December 10, 2010), Table 4.

Acronyms and Abbreviations:

CAS: Chemical Abstracts Service
 µg/L micrograms per liter
 QL Quantitation Limit
 MDL Method Detection Limit

SAP Worksheet #15.1c -- Reference Limits and Evaluation Table

Parcel: B

Matrix: Water

Analytical Group: Metals – U.S. EPA 6010B and U.S. EPA 7470A

Analyte	CAS Number	Project Action Limit (µg/L)	Project Action Limit Reference	Project Quantitation Limit Goal (µg/L)	Laboratory-specific	
					QLs (µg/L)	MDLs (µg/L)
Copper	7440-50-8	28.04	Final RAMP ¹ Final RAMP ³	10	5.0	0.97
Iron (total and dissolved)	7439-89-6	See note ⁴	See note ⁴	500	50	5.39
Lead	7439-92-1	14.44	Final RAMP ¹ Final RAMP ³	10	5.0	1.58
Manganese (total and dissolved)		See note ⁴	See note ⁴	50	5.0	1.23
Mercury ²	7439-97-6	0.6	Final RAMP ¹ Final RAMP ³	0.4	0.2	0.06
Nickel	7440-02-0	96.48	Final RAMP ¹ Final RAMP ³	10	5.0	0.39
Selenium	7782-49-2	14.5	Final RAMP ¹ Final RAMP ³	10	5.0	3.17

Notes:

All samples are for dissolved concentrations unless specified otherwise.

¹ Final Remedial Action Monitoring Plan - Parcel B (Excluding Installation Restoration Sites 7 and 18) (December 10, 2010), Table 4.

² Analyte will be analyzed by U.S. EPA 7470A.

³ Final Remedial Action Plan - Installation Restoration Sites 7 and 18- Parcel B (January 8, 2010), Table 4.

⁴ The analytes without a numerical value in the “Project Action Limit” column are for evaluating groundwater conditions prior to a groundwater remedial action, and do not have Project Action Limits. For these analytes, the Project Quantitation Limit Goal is the same as the laboratory-specific Quantitation Limit.

Acronyms and Abbreviations:

CAS: Chemical Abstracts Service
µg/L micrograms per liter
QL Quantitation Limit
MDL Method Detection Limit

SAP Worksheet #15.2a -- Reference Limits and Evaluation Table

Parcel: C

Matrix: Water

Analytical Group: Volatile Organic Compounds – U.S. EPA 8260B and U.S. EPA 8260B-Low Level

Analyte	CAS Number	Project Action Limit (µg/L)	Project Action Limit Reference	Project Quantitation Limit Goal (µg/L)	Laboratory-specific	
					QLs (µg/L)	MDLs (µg/L)
Benzene ^{1,2}	71-43-2	0.5	Final ROD ³	0.3	0.2	0.06
Bromodichloromethane ²	75-27-4	1.0	Final ROD ³	0.7	0.5	0.14
Carbon tetrachloride ^{1,2}	56-23-5	0.5	Final ROD ^{3,4}	0.2	0.1	0.03
Chloroethane ²	75-00-3	4.6	Final ROD ⁶	2.0	0.5	0.21
Chlorobenzene ²	108-90-7	70	Final ROD ⁶	5.0	0.5	0.21
Chloroform ^{1,2}	67-66-3	0.7	Final ROD ³	0.4	0.2	0.06
Dibromochloromethane	124-48-1	2.6	Final ROD ³	1.5	0.5	0.19
1,2-Dichlorobenzene ²	95-50-1	600	Final ROD ⁶	5.0	0.5	0.17
1,3-Dichlorobenzene	541-73-1	183	Final ROD ⁶	0.5	0.5	0.11
1,4-Dichlorobenzene ²	106-46-7	2.1	Final ROD ³	1.0	0.5	0.19
1,1-Dichloroethane ²	75-34-3	5.0	Final ROD ⁶	2.0	1.0	0.19
1,2-Dichloroethane ^{1,2}	107-06-2	0.5	Final ROD ⁶	0.2	0.1	0.03
1,2-Dichloroethene (total) ²	540-59-0	6.0	Final ROD ⁶	3.0	1.0	0.16
cis-1,2-Dichloroethene ²	156-59-2	6.0	Final ROD ⁶	2.0	0.5	0.16
trans-1,2-Dichloroethene ²	156-60-5	10	Final ROD ⁶	3.0	0.5	0.19
1,2-Dichloropropane ²	78-87-5	1.1	Final ROD ³	0.8	0.5	0.17
cis-1,3-Dichloropropene ⁵	10061-01-5	0.5	Final ROD ^{3,4}	0.5	0.5	0.15

Analyte	CAS Number	Project Action Limit (µg/L)	Project Action Limit Reference	Project Quantitation Limit Goal (µg/L)	Laboratory-specific	
					QLs (µg/L)	MDLs (µg/L)
trans-1,3-Dichloropropene ⁵	10061-02-6	0.5	Final ROD ^{3,4}	0.5	0.5	0.18
Isopropylbenzene	98-82-8	7.8	Final ROD ^{3,4}	3.0	1.0	0.16
Methylene Chloride ⁵	75-09-2	5.0	Final ROD ⁶	5.0	5.0	0.35
Naphthalene ⁵	91-20-3	0.093	Final ROD ⁶	1.2	1.2	0.36
1,1,2,2-Tetrachloroethane	79-34-5	3.0 ²	Final ROD ³	1.0	0.5	0.10
Tetrachloroethene ¹	127-18-4	0.54	Final ROD ³	0.4	0.3	0.08
1,2,4-Trichlorobenzene	120-82-1	70	Final ROD ⁶	10	0.5	0.21
1,1,2-Trichloroethane	79-00-5	4.0	Final ROD ³	1.5	0.5	0.20
Trichloroethene	79-01-6	2.9 ²	Final ROD ³	1.0	0.5	0.16
Trichlorofluoromethane (Freon 11)	75-69-4	180 ²	Final ROD ^{3,4}	5.0	0.5	0.24
1,2,3-Trichloropropane ⁵	96-18-4	0.5	Final ROD ³	1.0	1.0	0.39
1,2,4-Trimethylbenzene	96-63-6	12 ²	Final ROD ⁶	5.0	1.0	0.19
1,3,5-Trimethylbenzene	108-67-8	12 ²	Final ROD ⁶	5.0	1.0	0.12
Vinyl chloride ¹	75-01-4	0.5	Final ROD ³	0.2	0.1	0.03

Notes:

¹ Analyte will be analyzed by U.S. EPA 8260B-Low Level.

² The Remediation Goal or Trigger Level is the lowest value for this analyte in this Parcel. The Project Action Limit was set at the lowest Remediation Goal or Trigger Level for the purpose of establishing the appropriate (minimum) Project Quantitation Limit Goal, Quantitation Limit, and Method Detection Limit.

³ *Final Record of Decision for Parcel C* (September 30, 2010) Table 4, A-Aquifer "Residential Vapor Intrusion" exposure scenario.

⁴ *Final Record of Decision for Parcel C* (September 30, 2010) Table 4, A-Aquifer "Industrial Vapor Intrusion" exposure scenario.

⁵ Quantitation Limit listed for this analyte is the lowest achievable using best available technology; therefore, the Project Quantitation Limit Goal is set at the Quantitation Limit.

⁶ *Final Record of Decision for Parcel C* (September 30, 2010) Table 4, B-Aquifer (RU-C5 plume only) groundwater, "Residential Domestic Use" exposure scenario.

Acronyms and Abbreviations:

CAS: Chemical Abstracts Service

µg/L micrograms per liter

QL Quantitation Limit

MDL Method Detection Limit

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SAP Worksheet #15.3a -- Reference Limits and Evaluation Table

Parcel: D-1

Matrix: Water

Analytical Group: Volatile Organic Compounds – U.S. EPA 8260B and U.S. EPA 8260B-Low Level

Analyte	CAS Number	Project Action Limit (µg/L)	Project Action Limit Reference	Project Quantitation Limit Goal (µg/L)	Laboratory-specific	
					QLs (µg/L)	MDLs (µg/L)
Benzene ¹	71-43-2	0.5	Draft Final RAMP ²	0.4	0.2	0.06
Carbon tetrachloride ¹	56-23-5	0.5	Draft Final RAMP ²	0.2	0.1	0.03
Chloroform ¹	67-66-3	1.0	Draft Final RAMP ²	0.4	0.2	0.06
cis-1,2-Dichloroethene	156-59-2	See note ³	See note ³	2.0	0.5	0.16
Naphthalene	91-20-3	3.6	Draft Final RAMP ²	2.0	1.2	0.36
Tetrachloroethene ¹	127-18-4	0.54	Draft Final RAMP ²	0.4	0.3	0.08
Trichloroethene	79-01-6	2.9	Draft Final RAMP ²	1.0	0.5	0.16
Xylenes (total)	1330-20-7	337	Draft Final RAMP ²	20	0.5	0.19
Vinyl chloride ¹	75-01-4	See note ³	See note ³	0.2	0.1	0.03

Notes:

¹ Analyte will be analyzed by U.S. EPA 8260B-Low Level.

² *Final Remedial Action Monitoring Plan, Parcel D-1* (February 11, 2011), Table 3.

³ The analytes without a numerical value in the “Project Action Limit” column are for monitoring potential degradation products of RAMP-specified analytes. Project Action Limit is not established.

Acronyms and Abbreviations:

CAS: Chemical Abstracts Service
 µg/L micrograms per liter

QL: Quantitation Limit
 MDL: Method Detection Limit

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SAP Worksheet #15.4a -- Reference Limits and Evaluation Table

Parcel: E

Matrix: Water

Analytical Group: Volatile Organic Compounds – U.S. EPA 8260B and U.S. EPA 8260B-Low Level

Analyte	CAS Number	Project Action Limit (µg/L)	Project Action Limit Reference	Project Quantitation Limit Goal (µg/L)	Laboratory-specific	
					QLs (µg/L)	MDLs (µg/L)
Benzene ^{1,2}	71-43-2	0.5	Draft FS Report ³	0.4	0.2	0.06
Carbon tetrachloride ¹	56-23-5	0.5	Draft FS Report ⁴	0.2	0.1	0.03
Chloroform ^{1,2}	67-66-3	0.7	Draft FS Report ^{5,6}	0.4	0.2	0.06
cis-1,2-Dichloroethene	156-59-2	See note ⁹	See note ⁹	0.5	0.5	0.16
1,4-Dichlorobenzene ²	106-46-7	2.1	Draft FS Report ⁵	1.0	0.5	0.19
1,1-Dichloroethane	75-34-3	11	Draft FS Report ^{4,7}	2.0	1.0	0.19
1,2-Dichloroethene (total) ²	540-59-0	210	Draft FS Report ⁴	10	1.0	0.16
Isopropylbenzene	98-82-8	7.8	Draft FS Report ^{3,5,7}	4.0	1.0	0.16
Naphthalene ²	91-20-3	3.6	Draft FS Report ⁵	2.0	1.2	0.36
Tetrachloroethene ^{1,2}	127-18-4	0.5	Draft FS Report ⁵	0.4	0.3	0.08
trans-1,2- Dichloroethene	156-60-5	See note ⁹	See note ⁹	0.5	0.5	0.19
Trichloroethene ²	79-01-6	2.9	Draft FS Report ^{5,6}	1.0	0.5	0.16
Vinyl chloride ¹	75-01-4	0.5	Draft FS Report ^{4,8}	0.2	0.1	0.03

Notes:

¹ Analyte will be analyzed by U.S. EPA 8260B-Low Level.

² The Remediation Goal or Trigger Level value is the lowest for this analyte in this Parcel. The Project Action Limit was set at the lowest Remediation Goal or Trigger Level for the purpose of establishing the appropriate (minimum) Project Quantitation Limit Goal, Quantitation Limit, and Method Detection Limit.

³ *Draft Feasibility Study Report for Parcel E* (June 2009), Table 3-3, A-Aquifer, Industrial Vapor Intrusion, IR-12 Benzene Plume.

⁴ *Draft Feasibility Study Report for Parcel E* (June 2009), Table 3-3, A-Aquifer, Industrial Vapor Intrusion, Building 406 TCE Plume.

⁵ *Draft Feasibility Study Report for Parcel E* (June 2009), Table 3-3, A-Aquifer, Residential Vapor Intrusion, IR-04 TCE Plume.

⁶ *Draft Feasibility Study Report for Parcel E* (June 2009), Table 3-3, A-Aquifer, Residential Vapor Intrusion, IR-56 TCE Plume.

⁷ *Draft Feasibility Study Report for Parcel E* (June 2009), Table 3-3, A-Aquifer, Industrial Vapor Intrusion, IR-12 PCE Plume.

⁸ *Draft Feasibility Study Report for Parcel E* (June 2009), Table 3-4, B-Aquifer, Residential Domestic Use, Redevelopment Blocks 31B/36 & 43.

⁹ The analytes without a numerical value in the "Project Action Limit" column are for monitoring the effectiveness of a groundwater treatability study. Project Action Limit is not applicable. For this analyte, the Project Quantitation Limit Goal is the same as the laboratory-specific Quantitation Limit.

Acronyms and Abbreviations:

CAS: Chemical Abstracts Service
µg/L micrograms per liter
QL Quantitation Limit
MDL Method Detection Limit

SAP Worksheet #15.5a -- Reference Limits and Evaluation Table

Parcel: E-2

Matrix: Water

Analytical Group: Volatile Organic Compounds – U.S. EPA 8260B and U.S. EPA 8260B-Low Level

Analyte	CAS Number	Project Action Limit (µg/L)	Project Action Limit Reference	Project Quantitation Limit Goal (µg/L)	Laboratory-specific	
					QLs (µg/L)	MDLs (µg/L)
Benzene ¹	71-43-2	1.0	RI/FS Report ¹	0.5	0.2	0.06
Bromobenzene	108-86-1	See note ³	See note ³	0.5	0.5	0.16
Bromodichloromethane	75-27-4	See note ³	See note ³	0.5	0.5	0.14
Bromoform	75-25-2	See note ³	See note ³	0.5	0.5	0.14
Bromomethane	74-83-9	See note ³	See note ³	1.0	1.0	0.24
Carbon tetrachloride ¹	56-23-5	0.5	RI/FS Report ¹	0.3	0.1	0.03
Chloroethane	75-00-3	See note ³	See note ³	0.5	0.5	0.21
Chlorobenzene	108-90-7	See note ³	See note ³	0.5	0.5	0.21
Chloroform ¹	67-66-3	80	RI/FS Report ¹	2.0	0.2	0.06
Chloromethane	74-87-3	See note ³	See note ³	0.5	0.5	0.31
Dibromochloromethane	124-48-1	See note ³	See note ³	0.5	0.5	0.19
1,2-Dibromo-3-chloropropane	96-12-8	See note ³	See note ³	2.0	2.0	0.76
Dichlorodifluoromethane (Freon 12)	75-71-8	See note ³	See note ³	1.0	1.0	0.19
Dibromomethane	74-95-3	See note ³	See note ³	0.5	0.5	0.20
1,2-Dichlorobenzene	95-50-1	See note ³	See note ³	0.5	0.5	0.17
1,3-Dichlorobenzene	541-73-1	See note ³	See note ³	0.5	0.5	0.11
1,4-Dichlorobenzene	106-46-7	5.0	RI/FS Report ²	1.0	0.5	0.19

Analyte	CAS Number	Project Action Limit (µg/L)	Project Action Limit Reference	Project Quantitation Limit Goal (µg/L)	Laboratory-specific	
					QLs (µg/L)	MDLs (µg/L)
1,1-Dichloroethane	75-34-3	5.0	RI/FS Report ²	2.0	1.0	0.19
1,2-Dichloroethane ¹	107-06-2	0.5	RI/FS Report ²	0.2	0.1	0.03
1,1-Dichloroethene	75-35-4	See note ³	See note ³	0.5	0.5	0.30
cis-1,2- Dichloroethene	156-59-2	See note ³	See note ³	0.5	0.5	0.16
trans-1,2- Dichloroethene	156-60-5	See note ³	See note ³	0.5	0.5	0.19
1,2-Dichloropropane	78-87-5	See note ³	See note ³	0.5	0.5	0.17
cis-1,3-Dichloropropene	10061-01-5	See note ³	See note ³	0.5	0.5	0.15
trans-1,3-Dichloropropene	10061-02-6	See note ³	See note ³	0.5	0.5	0.18
Ethylbenzene	100-41-4	See note ³	See note ³	0.5	0.5	0.23
Methylene Chloride ⁴	75-09-2	5.0	RI/FS Report ²	5.0	5.0	0.35
Naphthalene ⁴	91-20-3	1.0	RI/FS Report ²	1.2	1.2	0.36
Methyl <i>tert</i> -butyl ether (MTBE)	1634-04-4	See note ³	See note ³	0.5	0.5	0.19
1,1,2,2-Tetrachloroethane	79-34-5	See note ³	See note ³	0.5	0.5	0.10
1,1,1,2-Tetrachloroethane	630-20-6	See note ³	See note ³	0.5	0.5	0.13
Tetrachloroethene ¹	127-18-4	5.0	RI/FS Report ²	0.6	0.3	0.08
Toluene	108-88-3	See note ³	See note ³	0.5	0.5	0.17
1,2,4-Trichlorobenzene	120-82-1	See note ³	See note ³	0.5	0.5	0.21
1,1,1-Trichloroethane	71-55-6	See note ³	See note ³	0.5	0.5	0.14
1,1,2-Trichloroethane	79-00-5	See note ³	See note ³	0.5	0.5	0.20
Trichloroethene	79-01-6	5.0	RI/FS Report ²	1.0	0.5	0.16
Trichlorofluoromethane (Freon 11)	75-69-4	See note ³	See note ³	0.5	0.5	0.24
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	See note ³	See note ³	0.5	0.5	0.21

Analyte	CAS Number	Project Action Limit (µg/L)	Project Action Limit Reference	Project Quantitation Limit Goal (µg/L)	Laboratory-specific	
					QLs (µg/L)	MDLs (µg/L)
(Freon 113)						
1,2,3-Trichloropropane ⁴	96-18-4	1.0	RI/FS Report ²	1.0	1.0	0.39
Vinyl chloride ¹	75-01-4	0.5	RI/FS Report ²	0.2	0.1	0.03
Xylenes (total)	1330-20-7	See note ³	See note ³	0.5	0.5	0.19

Notes:

¹ Analyte will be analyzed by U.S. EPA 8260B-Low Level.

² Draft Final Remedial Investigation/Feasibility Study Report for Parcel E-2 (February 2009), Table 7-15, B-Aquifer groundwater, "Domestic Use" exposure scenario.

³ The analytes without a numerical value in the "Project Action Limit" column are for investigations at Parcel E-2 for purposes of landfill impact monitoring. Project Action Limits for Parcel E-2 landfill monitoring analytes are not applicable. For these analytes, the Project Quantitation Limit Goal is the same as the laboratory-specific Quantitation Limit.

⁴ Quantitation Limit listed for this analyte is the lowest achievable using best available technology; therefore, the Project Quantitation Limit Goal was set at the Quantitation Limit.

Acronyms and Abbreviations:

CAS: Chemical Abstracts Service
 µg/L micrograms per liter
 QL Quantitation Limit
 MDL Method Detection Limit

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SAP Worksheet #15.5g -- Reference Limits and Evaluation Table

Parcel: E-2

Matrix: Water

Analytical Group: Anions – U.S. EPA 300.0 and SM4500S2F

Analyte	CAS Number	Project Action Limit (µg/L)	Project Action Limit Reference	Project Quantitation Limit Goal (µg/L)	Laboratory-specific	
					QLs (µg/L)	MDLs (µg/L)
Bromide	24959-67-9	See note ¹	See note ¹	500	500	50
Chloride	16887-00-6	See note ¹	See note ¹	1,000	1,000	80
Fluoride	16984-48-8	See note ¹	See note ¹	100	100	80
Nitrate	14797-55-8	See note ¹	See note ¹	200	200	10
Nitrite	14797-65-0	See note ¹	See note ¹	100	100	10
Phosphate	14265-44-2	See note ¹	See note ¹	200	200	70
Sulfate	14808-79-8	See note ¹	See note ¹	1,000	1,000	90
Sulfide ²	18496-25-8	See note ¹	See note ¹	2,000	2,000	600

Notes:

¹ The analytes without a numerical value in the “Project Action Limit” column are for investigations at Parcel E-2 for purposes of landfill impact monitoring. Project Action Limits for Parcel E-2 landfill monitoring analytes are not applicable. For these analytes, the Project Quantitation Limit Goal is the same as the laboratory-specific Quantitation Limit.

² Analyte will be analyzed by SM4500S2F

Acronyms and Abbreviations:

CAS: Chemical Abstracts Service
 µg/L micrograms per liter

QL: Quantitation Limit
 MDL: Method Detection Limit

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SAP Worksheet #15.6a -- Reference Limits and Evaluation Table

Parcel: G

Matrix: Water

Analytical Group: Volatile Organic Compounds – U.S. EPA 8260B and U.S. EPA 8260B-Low Level

Analyte	CAS Number	Project Action Limit (µg/L)	Project Action Limit Reference	Project Quantitation Limit Goal (µg/L)	Laboratory-specific	
					QLs (µg/L)	MDLs (µg/L)
Benzene ¹	71-43-2	0.5	Final RAMP ²	0.4	0.2	0.06
Carbon tetrachloride ¹	56-23-5	0.5	Final RAMP ²	0.2	0.1	0.03
Chloroform ¹	67-66-3	1.0	Final RAMP ²	0.4	0.2	0.06
Naphthalene	91-20-3	3.6	Final RAMP ²	2.0	1.2	0.36
Tetrachloroethene ¹	127-18-4	0.54	Final RAMP ²	0.4	0.3	0.08
Trichloroethene	79-01-6	2.9	Final RAMP ²	1.0	0.5	0.16
Vinyl chloride ¹	75-01-4	0.5	Final RAMP ²	0.2	0.1	0.03
Xylenes (total)	1330-20-7	337	Final RAMP ²	10	0.5	0.19
Vinyl chloride ¹	75-01-4	See note ³	See note ³	0.2	0.1	0.03

Notes:

¹ Analyte will be analyzed U.S. EPA 8260B-Low Level.

² *Final Remedial Action Monitoring Plan, Parcel G* (October 4, 2010, Table 4).

³ The analytes without a numerical value in the “Project Action Limit” column are for monitoring potential degradation products of RAMP-specified analytes. Project Action Limit is not established.

Acronyms and Abbreviations:

CAS: Chemical Abstracts Service µg/L micrograms per liter
 MDL: Method Detection Limit QL Quantitation Limit

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SAP Worksheet #15.7a -- Reference Limits and Evaluation Table

Parcel: UC-2

Matrix: Water

Analytical Group: Volatile Organic Compounds – U.S. EPA 8260B-Low Level

Analyte	CAS Number	Project Action Limit (µg/L)	Project Action Limit Reference	Project Quantitation Limit Goal (µg/L)	Laboratory-specific	
					QLs (µg/L)	MDLs (µg/L)
Carbon tetrachloride	56-23-5	0.5	Final RAMP ¹	0.2	0.1	0.03
Chloroform	67-66-3	1.0	Final RAMP ¹	0.4	0.2	0.06

Notes:

¹ Final Remedial Action Monitoring Plan, Parcels UC-1 and UC-2 (December 22, 2010), Table 4.

Acronyms and Abbreviations:

CAS: Chemical Abstracts Service
µg/L micrograms per liter
QL Quantitation Limit
MDL Method Detection Limit

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SAP Worksheet #19 – Analytical SOP Requirements Table

Matrix	Analytical Group	Analytical and Preparation Method / SOP Reference	Containers (number, size, and type)	Sample volume (units)	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation / analysis)
Water	VOCs (standard and low level)	U.S. EPA 8260B and U.S. EPA 8260B-Low Level and 5030B <i>ANA8260B and ANA5030B</i>	(5) 40-mL VOA vials with Teflon-lined septum	20 mL	Zero headspace Hydrochloric acid (HCl) to pH ≤ 2 Cool to ≤ 6 °C (not frozen)	14 days (7 days if unpreserved)
Water	SVOCs	U.S. EPA 8270C and 3510C <i>ANA8270C and SEP004</i>	(1) 1,000-mL amber glass bottle	1,000 mL	Cool to ≤ 6 °C (not frozen)	7 days / 40 days
Water	SVOCs (low level)	U.S. EPA 8270C and 3510C <i>ANAPNASIM and SEP004</i>	(1) 1,000-mL amber glass bottle	1,000 mL	Cool to ≤ 6 °C (not frozen)	7 days / 40 days
Water	Organochlorine (OC) pesticides (low-level)	U.S. EPA 8081A and 3510C <i>ANA8081A; SEP009; and SEP025</i>	(1) 1,000-mL amber glass bottle	1,000 mL	Cool to ≤ 6 °C (not frozen)	7 days / 40 days
Water	Organophosphorus (OP) pesticides	U.S. EPA 8141A and 3510C <i>ANA8141A and SEP009</i>	(1) 1,000-mL amber glass bottle	1,000 mL	Cool to ≤ 6 °C (not frozen)	7 days / 40 days
Water	PCBs	U.S. EPA 8082 and 3510C <i>ANA8082 and SEP009</i>	(1) 1,000-mL amber glass bottle	1,000 mL	Cool to ≤ 6 °C (not frozen)	7 days / 40 days

Matrix	Analytical Group	Analytical and Preparation Method / SOP Reference	Containers (number, size, and type)	Sample volume (units)	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation / analysis)
Water	TPH-purgeables	U.S. EPA 8015B-G and 5030B <i>ANA8015G and ANA5030B</i>	(3) 40-mL VOA vials with Teflon-lined septum	10 mL	Zero headspace HCl to pH ≤ 2 Cool to ≤ 6 °C (not frozen)	14 days (7 days if unpreserved)
Water	TPH-extractables	U.S. EPA 8015B-D and 3510C <i>ANA8015BD and SEP011</i>	(2) 1,000-mL amber glass bottle	2,000 mL	Cool to ≤ 6 °C (not frozen)	7 days / 40 days
Water	Oil and grease	U.S. EPA 1664A <i>ANA1664A</i>	(1) 1,000-mL amber glass bottle	1,000 mL	Cool to ≤ 6 °C (not frozen) HCl or sulfuric acid (H ₂ SO ₄) to pH ≤ 2	28 days
Water	Metals (total and dissolved) ¹	U.S. EPA 6010B and U.S. EPA 6020A ² and 3010A <i>ANA6010BBPE, ANA6020, and PRE3010A</i>	(1) 500-mL polyethylene container	100 mL	nitric acid (HNO ₃) to pH < 2 (<i>post-filtering for dissolved metals</i>) Cool to ≤ 6 °C (not frozen)	6 months
Water	Mercury (dissolved)	U.S. EPA 7470A <i>ANA7470A and PRE7470A</i>	(1) 500-mL polyethylene container	100 mL	Filter then pH < 2 with HNO ₃ Cool to ≤ 6 °C (not frozen)	28 days
Water	Chromium (hexavalent)	U.S. EPA 7199 <i>ANA7199</i>	(1) 500-mL polyethylene container	10 mL	Cool to ≤ 6 °C (not frozen)	24 hours

Matrix	Analytical Group	Analytical and Preparation Method / SOP Reference	Containers (number, size, and type)	Sample volume (units)	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation / analysis)
Water	Organotins (tributyltin)	APPL SOP Tributyltin by GC/MS ³ <i>ANA TBT and SEP030</i>	(1) 1,000-mL amber glass bottle	1,000 mL	Cool to $\leq 6^{\circ}\text{C}$ (not frozen)	7 days / 40 days
Water	Cyanide	U.S. EPA 9014 / U.S. EPA 9010C <i>ANA9014 / 9010C</i>	(1) 250-mL polyethylene container	50 mL	sodium hydroxide (NaOH) to $\text{pH} \geq 12$ Cool to $\leq 6^{\circ}\text{C}$ (not frozen)	14 days
Water	Anions ⁵	U.S. EPA 300.0 <i>ANA300.0</i>	(1) 125-mL polyethylene container	25 mL	Cool to $\leq 6^{\circ}\text{C}$ (not frozen)	28 days (48 hours for nitrate, nitrite and phosphate)
Water	Alkalinity	SM2320B <i>ANA2320B</i>	(1) 250-mL polyethylene container	25 mL	Cool to $\leq 6^{\circ}\text{C}$ (not frozen)	14 days
Water	Total suspended solids (TSS)	SM2540D <i>SM2540D</i>	(1) 250-mL polyethylene container	100 mL	Cool to $\leq 6^{\circ}\text{C}$ (not frozen)	7 days
Water	Sulfide	SM4500S2F <i>ANA4500S2F</i>	(1) 500-mL polyethylene container	500 mL	NaOH + zinc acetate (ZnAc) to $\text{pH} > 12$ Cool to $\leq 6^{\circ}\text{C}$ (not frozen)	7 days
Water	Ammonia, un-ionized	U.S. EPA 350.1 <i>ANA350.1</i>	(1) 250-mL polyethylene container	50 mL	H_2SO_4 to $\text{pH} < 2$ Cool to $\leq 6^{\circ}\text{C}$ (not frozen)	28 days

Matrix	Analytical Group	Analytical and Preparation Method / SOP Reference	Containers (number, size, and type)	Sample volume (units)	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation / analysis)
Water	TKN	U.S. EPA 351.2 <i>ANA351.2</i>	(1) 250-mL polyethylene container	100 mL	H ₂ SO ₄ to pH < 2 Cool to ≤ 6 °C (not frozen)	28 days
Water	Cesium-137 (Cs-137)	U.S. EPA 901.0 modified <i>GL-RAD-A-013</i>	(1) 1,000-mL polyethylene container	1,000 mL	Filter; pH < 2 with HNO ₃	6 months
Water	Plutonium-239 (Pu-239)	DOE HASL-300 Pu-10 <i>GL-RAD-A-013</i>	(1) 1,000-mL polyethylene container	1,000 mL	Filter; pH < 2 with HNO ₃	6 months
Water	Radium-226 (Ra-226)	U.S. EPA 903.1 modified <i>GL-RAD-A-008</i>	(1) 1,000-mL polyethylene container	1,000 mL	Filter; pH < 2 with HNO ₃	6 months
Water	Strontium-90 (Sr-90)	U.S. EPA 905.0 modified <i>GL-RAD-A-004</i>	(1) 1,000-mL polyethylene container	1,000 mL	Filter; pH < 2 with HNO ₃	6 months
Water	Carbon dioxide (as a dissolved gas) ⁶	RSK 175 VOA-DISGAS	(3) 40 ml VOA vials	10 ml	Zero headspace; Cool to ≤ 6 °C (not frozen)	NA ⁷

Matrix	Analytical Group	Analytical and Preparation Method / SOP Reference	Containers (number, size, and type)	Sample volume (units)	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation / analysis)
Water	Dissolved gases (ethane, ethene and methane) ⁶	RSK 175 ANARSK175	(3) 40 ml VOA vials	10 ml	Zero headspace; filter; HCl to pH < 2; cool to ≤ 6 °C (not frozen)	14 days
Water	Dehalococcoides bacteria (16S rRNA; bvcA; vcrA; tceA) ⁶	815-B-04-0001 / Quantification of <i>Dehalococcoides</i> spp. 16S rRNA gene and the functional genes tceA, bvcA, and vcrA. Revision 4, 01/11/12	(2) 1,000 ml Nalgene	1,000 m	Glycerol Cool to 4 °C	36 hours if unpreserved; 3 days if preserved
Water	Total Organic Carbon	EPA 9060A ANA9060A	(2) 40 ml VOA vials	30 ml	Zero headspace; filter; H2SO4 to pH < 2 cool to ≤ 6 °C (not frozen)	28 days
Water	COD ⁴	SM 5220C <i>GEN-COD</i>	(1) 250-mL amber glass bottle	50 mL	Cool to ≤ 6 °C (not frozen)	28 days
Water	Flashpoint ⁴	U.S. EPA 1020A <i>GEN-120</i>	(1) 250-mL amber glass bottle	100 mL	Cool to ≤ 6 °C (not frozen)	28 days
Water	pH ⁴	U.S. EPA 9040C	(1) 500-mL polyethylene container	100 mL	Cool to ≤ 6 °C (not frozen)	24 hours

Notes:

- ¹ Includes one or more of the following metals: aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium (total), cobalt, copper, iron, lead, manganese, molybdenum, nickel, selenium, silver, thallium, vanadium, and/or zinc. Other metals are called out separately.
- ² Beryllium, cadmium and thallium will be analyzed by U.S. EPA 6020A.
- ³ The method is explained in *A Manual for the Analysis of Butyltins in Environmental Samples, Prepared for the Virginia Department of Environmental Quality, By the Virginia Institute of Marine Science, College of William and Mary, Gloucester Point, Virginia, November 1996.*
- ⁴ Analysis will be for IDW characterization only, and analytical results are not used for CERCLA decision making.
- ⁵ Includes: bromide, chloride, fluoride, nitrate, nitrite, phosphate, and sulfate.
- ⁶ There is no California or DoD Environmental Laboratory Accreditation Program (ELAP) accreditation for this analytical method. Analytes are used only for evaluating Monitoring Natural Attenuation (MNA) or the effectiveness of groundwater treatability studies, and do not have Remediation Goals or Trigger Levels.
- ⁷ There is no method holding time criteria established for carbon dioxide by RSK 175.

U.S. EPA methods are U.S. EPA SW-846, *Third Edition, Fourth Update (1989)*.

SM is *Standard Method for the Examination of Water and Wastewater, 21st Edition (2005)*.

Samples requiring filtering will be filtered prior to analysis, either in the field or by the analytical laboratory (see WS 17).

SAP Worksheet #20 – Field Quality Control Sample Summary Table

Matrix	Analytical Group	No. of Sampling Locations¹	No. of Field Duplicates	No. of MS/MSDs	No. of Source Blanks²	No. of Equip. Blanks	No. of VOA Trip Blanks	No. of PT Samples³	Total No. of Samples to Lab
Water	VOCs	TBD	1 per 10 field samples	1 per 20 field samples	1 per sampling event	1 per field team per set of non-dedicated field equipment per day	1 per cooler containing samples for volatile analyses	TBD	Samples + field QC
Water	SVOCs	TBD	1 per 10 field samples	1 per 20 field samples	1 per sampling event	1 per field team per set of non-dedicated field equipment per day	Not applicable	TBD	Samples + field QC
Water	OC Pesticides	TBD	1 per 10 field samples	1 per 20 field samples	1 per sampling event	1 per field team per set of non-dedicated field equipment per day	Not applicable	TBD	Samples + field QC
Water	OP Pesticides	TBD	1 per 10 field samples	1 per 20 field samples	1 per sampling event	1 per field team per set of non-dedicated field equipment per day	Not applicable	TBD	Samples + field QC

Matrix	Analytical Group	No. of Sampling Locations¹	No. of Field Duplicates	No. of MS/MSDs	No. of Source Blanks²	No. of Equip. Blanks	No. of VOA Trip Blanks	No. of PT Samples³	Total No. of Samples to Lab
Water	PCBs	TBD	1 per 10 field samples	1 per 20 field samples	1 per sampling event	1 per field team per set of non-dedicated field equipment per day	Not applicable	TBD	Samples + field QC
Water	TPH-purgeables	TBD	1 per 10 field samples	1 per 20 field samples	1 per sampling event	1 per field team per set of non-dedicated field equipment per day	1 per cooler containing samples for volatile analyses	TBD	Samples + field QC
Water	TPH-extractables	TBD	1 per 10 field samples	1 per 20 field samples	1 per sampling event	1 per field team per set of non-dedicated field equipment per day	Not applicable	TBD	Samples + field QC
Water	Oil and grease	TBD	1 per 10 field samples	1 per 20 field samples	1 per sampling event	1 per field team per set of non-dedicated field equipment per day	Not applicable	Not applicable	Samples + field QC

Matrix	Analytical Group	No. of Sampling Locations¹	No. of Field Duplicates	No. of MS/MSDs	No. of Source Blanks²	No. of Equip. Blanks	No. of VOA Trip Blanks	No. of PT Samples³	Total No. of Samples to Lab
Water	Metals ⁴	TBD	1 per 10 field samples	1 per 20 field samples	1 per sampling event	1 per field team per set of non-dedicated field equipment per day	Not applicable	TBD	Samples + field QC
Water	Chromium (hexavalent)	TBD	1 per 10 field samples	1 per 20 field samples	1 per sampling event	1 per field team per set of non-dedicated field equipment per day	Not applicable	Not applicable	Samples + field QC
Water	Organotins (tributyltin)	TBD	1 per 10 field samples	1 per 20 field samples	1 per sampling event	1 per field team per set of non-dedicated field equipment per day	Not applicable	Not applicable	Samples + field QC
Water	Cyanide	TBD	1 per 10 field samples	1 per 20 field samples	1 per sampling event	1 per field team per set of non-dedicated field equipment per day	Not applicable	TBD	Samples + field QC

Matrix	Analytical Group	No. of Sampling Locations ¹	No. of Field Duplicates	No. of MS/MSDs	No. of Source Blanks ²	No. of Equip. Blanks	No. of VOA Trip Blanks	No. of PT Samples ³	Total No. of Samples to Lab
Water	Anions ⁵	TBD	1 per 10 field samples	1 per 20 field samples	1 per sampling event	1 per field team per set of non-dedicated field equipment per day	Not applicable	TBD	Samples + field QC
Water	Alkalinity	TBD	1 per 10 field samples	1 per 20 field samples	1 per sampling event	1 per field team per set of non-dedicated field equipment per day	Not applicable	TBD	Samples + field QC
Water	Dissolved gases (ethane, ethene, and methane) ⁷	TBD	1 per 10 field samples	1 per 20 field samples	not applicable ⁸	not applicable ⁸	1 per cooler containing samples for volatile analyses	TBD	Samples + field QC
Water	Carbon dioxide (as a dissolved gas) ⁷	TBD	1 per 10 field samples	1 per 20 field samples	not applicable ⁸	not applicable ⁸	1 per cooler containing samples for volatile analyses	TBD	Samples + field QC
Water	Dehalococcoides bacteria (16S rRNA; bvcA; vcrA; tceA) ⁷	4	not applicable	not applicable	not applicable	not applicable	not applicable	not applicable	4

Matrix	Analytical Group	No. of Sampling Locations ¹	No. of Field Duplicates	No. of MS/MSDs	No. of Source Blanks ²	No. of Equip. Blanks	No. of VOA Trip Blanks	No. of PT Samples ³	Total No. of Samples to Lab
Water	Cesium-137 (Cs-137)	TBD	1 per 10 field samples	Not applicable	1 per sampling event	1 per field team per set of non-dedicated field equipment per day	Not applicable	Not applicable	Samples + field QC
Water	Plutonium-239 (Pu-239)	TBD	1 per 10 field samples	Not applicable	1 per sampling event	1 per field team per set of non-dedicated field equipment per day	Not applicable	Not applicable	Samples + field QC
Water	Radium-226 (Ra-226)	TBD	1 per 10 field samples	1 per 20 field samples ⁶	1 per sampling event	1 per field team per set of non-dedicated field equipment per day	Not applicable	Not applicable	Samples + field QC
Water	Strontium-90 (Sr-90)	TBD	1 per 10 field samples	Not applicable	1 per sampling event	1 per field team per set of non-dedicated field equipment per day	Not applicable	Not applicable	Samples + field QC
Water	Ammonia, un-ionized	TBD	1 per 10 field samples	1 per 20 field samples	not applicable ⁸	not applicable ⁸	Not applicable	Not applicable	Samples + field QC

Matrix	Analytical Group	No. of Sampling Locations ¹	No. of Field Duplicates	No. of MS/MSDs	No. of Source Blanks ²	No. of Equip. Blanks	No. of VOA Trip Blanks	No. of PT Samples ³	Total No. of Samples to Lab
Water	Sulfide	TBD	1 per 10 field samples	1 per 20 field samples	1 per sampling event	1 per field team per set of non-dedicated field equipment per day	Not applicable	Not applicable	Samples + field QC
Water	Total Organic Carbon	TBD	1 per 10 field samples	1 per 20 field samples	not applicable ⁸	not applicable ⁸	Not applicable	Not applicable	Samples + field QC
Water	TSS	TBD	1 per 10 field samples	1 per 20 field samples	not applicable ⁸	not applicable ⁸	Not applicable	Not applicable	Samples + field QC
Water	TKN	TBD	1 per 10 field samples	1 per 20 field samples	not applicable ⁸	not applicable ⁸	Not applicable	Not applicable	Samples + field QC
Water	Chemical oxygen demand ⁷	TBD	1 per 10 field samples	1 per 20 field samples	not applicable ⁸	not applicable ⁸	not applicable ⁸	TBD	Samples + field QC

Notes:

- ¹ TBDs = The number and type of QC samples will depend on the samples collected for a given sampling event. Since the number and type of samples for the BGMP can change in accordance with the process explained in WS 17, the number and type of QC samples can also change. The QC samples required for any quarter will be determined in accordance with this WS in conjunction with the current WS 18.
- ² Source blanks will be analyzed for the same analytes as the equipment blanks.
- ³ TBDs = These are eligible for a future Proficiency Test (PT) program that will be incorporated into this SAP through an Addendum that will discuss the PT program approach and criteria. PT samples are used to assess the performance of the laboratory (ies), and may be implemented upon direction by the Navy or in response to data quality or compliance issues that are identified.
- ⁴ Includes one or more of the following metals: aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium (total), cobalt, copper, iron, lead, manganese, mercury, molybdenum, nickel, selenium, silver, thallium, vanadium, and/or zinc. Other metals are called out separately.
- ⁵ Includes: bromide, chloride, fluoride, nitrate, nitrite, phosphate, and sulfate.

- ⁶ Only matrix spike analysis is performed per the method requirements.
- ⁷ There is no California or DoD Environmental Laboratory Accreditation Program (ELAP) accreditation for this analytical method. Analytes are used only for evaluating Monitoring Natural Attenuation (MNA) or the effectiveness of groundwater treatability studies, and do not have Remediation Goals or Trigger Levels.
- ⁸ Equipment blank and source blank samples will not be analyzed for this analyte/parameter because it is naturally occurring at low levels in the source water used for equipment decontamination.

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SAP Worksheet #23 – Analytical SOP References Table

Lab SOP Number	Title, Revision Date, and / or Number	Definitive or Screening Data	Matrix and Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work? (Y/N)
ANA8260B ¹	GC/MS Analysis by U.S. EPA Method 8260B, Revision (Rev.) 28, 09/17/09	definitive	Water / VOCs (standard and low level)	Purge/Trap + Gas Chromatography / Mass Spectroscopy (GC/MS)	APPL	N
ANA8270C	SVOCs by U.S. EPA Method 8270C, Rev. 13, 06/15/10	definitive	Water / SVOCs	GC/MS	APPL	N
ANAPNASIM	Polynuclear Aromatic Hydrocarbons by Selective Ion Monitoring; Modified U.S. EPA Method 8270C; Rev 5, 02/25/10	definitive	Water / SVOCs (low level)	GC/MS	APPL	N
ANA8081A	OCL Pesticides by U.S. EPA Method 8081A, Rev. 22, 09/14/09	definitive	Water / Organochlorine Pesticides (low level)	GC-Electron Capture Detector (ECD)	APPL	N
ANA8141A	OP Pesticides by U.S. EPA Method 8141A, Rev. 14, 09/21/09	definitive	Water / Organophosphorus Pesticides	GC-Nitrogen-Phosphorus Detector (NPD)	APPL	N
ANA8082	PCBs and Congeners by U.S. EPA Method 8082, Rev. 14, 09/14/09	definitive	Water / PCBs	GC-ECD	APPL	N

Lab SOP Number	Title, Revision Date, and / or Number	Definitive or Screening Data	Matrix and Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work? (Y/N)
ANASM2320B ⁷	Total Alkalinity Standard Method 2320B, Rev. 11, 04/01/10	definitive	Water / Alkalinity	Metrohm 809	APPL	N
ANA RSK175	Dissolved Gas Analysis in Water by Headspace Gas Chromatography, Rev. 3, 09/14/09	definitive	Water / Dissolved Gases (ethane, ethene, and methane) ⁷	Headspace GC-FID	APPL	N
VOA-DISGAS ⁷	Dissolved Gas Analysis in Aqueous Samples Using a Headspace Equilibrium Technique, Rev. 11, 12/10/10	definitive	Water / Carbon dioxide (as a dissolved gas) ⁷	Headspace GC-Thermal Conductivity Detector (TCD)	Columbia Analytical Services	N
ANA8015G	TPH by U.S. EPA Method 8015B, Rev. 10, 09/14/09	definitive	Water / TPH-purgeables	Purge/Trap + GC-Flame Ionization Detector (FID)	APPL	N
ANA8015BD	Total Extractable Petroleum Hydrocarbons – Diesel, Rev. 17, 09/14/09	definitive	Water / TPH-extractables	GC-FID	APPL	N ²
ANA1664A	HEM and SGT-HEM, U.S. EPA Method 1664A, Rev 3, 04/06/10	definitive	Water / Oil and grease	Gravimetric	APPL	N

Lab SOP Number	Title, Revision Date, and / or Number	Definitive or Screening Data	Matrix and Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work? (Y/N)
ANA6010BPE	Inductively-Coupled Plasma (ICP) by U.S. EPA Method 6010B – Three Point Curve, Rev. 13, 09/17/09	definitive	Water / Metals ³	Inductively-Coupled Plasma (ICP) – Atomic Emission Spectroscopy (AES)	APPL	N
ANA6020	ICP by U.S. EPA Method 6020, Rev. 16, 05/26/10	definitive	Water / Metals ³	ICP-MS	APPL	N
ANA7199	Hexavalent Chromium U.S. EPA Method 7199, Rev. 8, 04/06/10	definitive	Water / Chromium (hexavalent)	Ion Chromatography (IC), Photometric	APPL	N
ANA7470A	Analysis of Mercury by U.S. EPA Method 7470A, Rev. 20, 12/07/09	definitive	Water / Mercury (dissolved)	Cold Vapor Atomic Absorption (AA)	APPL	N
ANA TBT	APPL SOP Organotins by SIM by U.S. EPA Method 8270 modified, Rev. 2, 09/14/09	definitive	Water / Organotins (tributyltin)	GC/MS	APPL	N
ANA9010C / 9014	Total Cyanide by U.S. EPA Method 9010C/9014, Rev. 16, 04/19/10	definitive	Water / Cyanide	Distillation	APPL	N
ANA300.0	Inorganic Anion, U.S. EPA Method 300.0, Rev. 19, 04/06/10	definitive	Water / Anions ⁵	Ion chromatography	APPL	N

Lab SOP Number	Title, Revision Date, and / or Number	Definitive or Screening Data	Matrix and Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work? (Y/N)
GL-RAD-A-013	The Determination of Gamma Isotopes, Rev 20	definitive	Water / Cesium-137	Gamma spectroscopy	GEL	N
GL-RAD-A-011	The Isotopic Determination of Americium, Curium, Plutonium, and Uranium, Rev 20	definitive	Water / Plutonium-239	Alpha spectroscopy	GEL	N
GL-RAD-A-008	The Determination of Radium-226, Rev 13	definitive	Water / Radium-226	Ludlum Lucas Cell Counter	GEL	N
GL-RAD-A-004	The Determination of Strontium 89/90 in Water, Soil, Milk, Filters, Vegetation and Tissues, Rev 14	definitive	Water / Strontium-90	Gas Proportional	GEL	N
ANA350.1	Ammonia, U.S. EPA Method 350.1, Rev. 8, 07/09/08	definitive	Water / Ammonia, un-ionized	Colorimetric	APPL	N
ANA9060A	Total Organic Carbon in Water (Non-Purgeable Organic Carbon) SW846 Method 9060A, Rev. 7, 04/06/10	definitive	Water / Total Organic Carbon	TOC Analyzer	APPL	N
SM2540D	(TSS) Residue, Non-Filterable, SM2540D, Rev. 8, 48/06/10	definitive	Water / Total suspended solids (TSS)	Drying oven	APPL	N

Lab SOP Number	Title, Revision Date, and / or Number	Definitive or Screening Data	Matrix and Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work? (Y/N)
ANA4500S2F	Water Sulfide by Standard Methods 4500S2F, Rev. 9, 04/07/10	definitive	Water / Sulfide	Titrimetric / Colorimetric	APPL	N
ANA351.2	TKN, U.S. EPA Method 351.2, Rev. 11, 04/06/10	definitive	Water / Total Kjeldahl Nitrogen (TKN)	Colorimetric	APPL	N
GEN-COD	Chemical Oxygen Demand (COD), Rev. 8, 2/11/2010	definitive	Water / COD ⁶	COD reactor	Columbia Analytical Services	N
GEN-1020	Flashpoint Determination – Setaflash, Rev. 6, 11/20/2007	definitive	Water / Flashpoint ⁶	Seta Flash Closed Cup Tester	Columbia Analytical Services	N
ANA9040C	Aqueous and Multiphasic pH, EPA Method 9040C, Rev. 11, 09/15/09	definitive	Water / pH ⁶	Electrometric	APPL	N
Not applicable	Quantification of <i>Dehalococcoides</i> spp. 16S rRNA gene and the functional genes <i>tceA</i> , <i>bvcA</i> , and <i>vcrA</i> , Revision 4, 01/11/12	definitive	Water / <i>Dehalococcoides</i> bacteria ⁷	BioRad Chromo 4 qPCR gradient thermocycler	North Wind, Inc.	N

Notes:

Laboratory analytical SOPs are provided in Appendix A.

¹ VOCs will be analyzed by U.S. EPA 8260B except for 1,2-DCA, benzene, carbon tetrachloride, chloroform, PCE, and vinyl chloride, which will be analyzed by U.S. EPA 8260B-Low Level.

- ² Analytical method U.S. EPA method 8015B was not modified for the BGMP; the preparation method, U.S. EPA method 3510C was modified for TPH-extractables.
- ³ Includes: aluminum, antimony, arsenic, barium, chromium (total), cobalt, copper, iron, lead, manganese, molybdenum, nickel, selenium, silver, vanadium, and zinc. Other metals are called out separately.
- ⁴ Includes: beryllium, cadmium and thallium.
- ⁵ Includes: bromide, chloride, fluoride, nitrate, nitrite, phosphate, and sulfate.
- ⁶ Analysis will be for IDW characterization only, and analytical results are not used for CERCLA decision making.
- ⁷ There is no California or DoD Environmental Laboratory Accreditation Program (ELAP) accreditation for this analytical method. Analytes are used only for evaluating Monitoring Natural Attenuation (MNA) or the effectiveness of groundwater treatability studies, and do not have Remediation Goals or Trigger Levels.

SAP Worksheet #28 – Laboratory QC Samples Table

SAP Worksheet #28a – Laboratory QC Samples Table: Volatile Organic Compounds

Matrix	Water					
Analytical Group	VOCs					
Analytical Method / SOP Reference	U.S. EPA Methods 8260B and 8260B-Low Level / ANA8260B					
QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank (MB)	One per preparation/analytical batch	No target compounds > ½ QL. For common laboratory contaminants, no analytes > QL.	Re-extract or re-analyze samples associated with the MB except if the sample is non detect for the blank contaminants. Flag sample results for detects with a “B” laboratory qualifier if insufficient sample volume exists for reanalysis.	Laboratory Analyst	Accuracy/Bias	Detections less than QLs
Laboratory Control Sample (LCS)	One per preparation/analytical batch	Refer to Table 28-1 (QC Limits) The number of allowable marginal exceedances (ME) depends on the number of analytes, as follows: 1) >90 analytes in LCS, 5 analytes allowed in ME of the LCS control limit; 2) 71–90 analytes in LCS, 4 analytes allowed in ME of the LCS control limit; 3) 51–70 analytes in LCS, 3 analytes allowed in ME of the LCS control limit; 4) 31–50 analytes in LCS, 2 analytes allowed in ME of the LCS control limit; 5) 11–30 analytes in LCS, 1 analyte allowed in ME of the LCS control limit; 6) <11 analytes in LCS, no analytes allowed in ME of the LCS control limit.	Identify source of problem, such as: -inspect instrument for leaks; -check standard concentrations; or -check column resolution/presence of active sites. Identify and implement corrective measures specific to the cause of the problem. This may include preparation of new spiking standards, instrument recalibration, or sample reanalysis. Re-prep and reanalyze the LCS and all samples in the associated batch for failed analytes, if sufficient sample material is available. ME must be random (same analyte less than 2 out of 3 consecutive LCS). Source of the error located and corrective action taken with discussion in case narrative. If the LCS remains outside of acceptance criteria and may impact the quality of the data, a Quality Control Exception Report will be completed to document the nonconformance, consistent with laboratory SOP QC033 (Control of Nonconforming Environmental Test Work, Quality Control Exception Reports, and Recommendations for Corrective Action Reports) and the client will be contacted.	Laboratory Analyst	Accuracy	%R (Refer to Table 28-1)
Matrix Spike (MS)/MS Duplicate	One per preparation/analytical batch, designated project sample	Refer to Table 28-1 (QC Limits)	Examine the project-specific DQOs. Corrective action taken shall be documented, presented in case narrative, and appropriate data qualifying applied as necessary. Contact the client as to additional measures to be taken.	Laboratory Analyst	Precision/Accuracy	%R, RPD (Refer to Table 28-1)

Matrix	Water					
Analytical Group	VOCs					
Analytical Method / SOP Reference	U.S. EPA Methods 8260B and 8260B-Low Level / ANA8260B					
QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Internal Standards	Included in every sample	Fluorobenzene; Chlorobenzene-d5; 1,4-Dichlorobenzene-d4 Extracted Ion Current Profile (EICP) area within -50 to +100% of initial calibration (ICAL) midpoint standard	Inspect the GC/MS for malfunctions. Mandatory reanalysis of samples analyzed while system was malfunctioning. If the corrective action fails in the field samples, analytes associated with non-compliant IS will be flagged and explained in case narrative.	Laboratory Analyst	Precision/Accuracy	EICP area
Surrogates	Included in every sample	Refer to Table 28-1 (QC Limits)	Correct problem then re-prepare and reanalyze all failed samples with failed surrogates in the associated preparatory batch. If obvious chromatographic interference with surrogate present, reanalysis may not be necessary. Qualify all applicable data if acceptance criteria are not met, and explain in case narrative.	Laboratory Analyst	Accuracy/Bias	%R (Refer to Table 28-1)

SAP Worksheet #28f – Laboratory QC Samples Table: Total Petroleum Hydrocarbons – purgeables and extractables

Matrix	Water					
Analytical Group	TPH-purgeables and TPH-extractables					
Analytical Method / SOP Reference	U.S. EPA Method 8015B-G and 8015B-D / ANA8015G and ANA8015BD					
QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
MB	One per preparation/analytical batch	No target compounds > ½ QL. For common laboratory contaminants, no analytes > QL.	Re-extract or re-analyze samples associated with the MB except if the sample is non detect for the blank contaminants. Flag sample results for detects with a “B” laboratory qualifier if insufficient sample volume exists for reanalysis.	Laboratory Analyst	Accuracy/Bias	Detections less than QLs
LCS	One per preparation/analytical batch	TPH-purgeables: Gasoline 70-130 %R TPH-extractables: Diesel; Motor Oil 50-150 %R	Identify source of problem, such as: -inspect instrument for leaks; -check standard concentrations; or -check column resolution/presence of active sites. Identify and implement corrective measures specific to the cause of the problem. This may include preparation of new spiking standards, instrument recalibration, or sample reanalysis. Re-prepare and reanalyze the LCS and all samples in the associated batch for failed analytes, if sufficient sample material is available. If the LCS remains outside of acceptance criteria and may impact the quality of the data, a Quality Control Exception Report will be completed to document the nonconformance, consistent with laboratory SOP QC033 (Control of Nonconforming Environmental Test Work, Quality Control Exception Reports, and Recommendations for Corrective Action Reports) and the client will be contacted.	Laboratory Analyst	Accuracy	%R
MS/MSD	One per preparation/analytical batch, designated project sample	TPH-purgeables: Gasoline 70-130 %R RPD ≤ 20 TPH-extractables: Diesel and Motor Oil 50-150 %R RPD ≤ 30	Examine the project-specific DQOs. Corrective action taken shall be documented, presented in case narrative, and appropriate data qualifying applied as necessary. Contact the client as to additional measures to be taken.	Laboratory Analyst	Precision/Accuracy	%R, RPD

Matrix	Water					
Analytical Group	TPH-purgeables and TPH-extractables					
Analytical Method / SOP Reference	U.S. EPA Method 8015B-G and 8015B-D / ANA8015G and ANA8015BD					
QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Surrogates	Included in every sample	TPH-purgeables: Bromofluorobenzene 75-125 %R TPH-extractables: Octacosane 28-142 %R ortho-Terphenyl 49-128 %R	Correct problem then re-prepare and reanalyze all failed samples with failed surrogates in the associated preparatory batch. If obvious chromatographic interference with surrogate present, reanalysis may not be necessary. Qualify all applicable data if acceptance criteria are not met, and explain in case narrative.	Laboratory Analyst	Accuracy/Bias	%R

SAP Worksheet #28h – Laboratory QC Samples Table: Metals (total and dissolved)

Matrix	Water					
Analytical Group	Metals (total and dissolved)					
Analytical Method / SOP Reference	U.S. EPA Method 7470A / ANA7470A ¹ U.S. EPA Method 6010B / ANA6010BPE ² U.S. EPA Method 6020A / ANA6020 ³					
QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
MB	One per preparation/analytical batch	No analytes > ½ QL. For common laboratory contaminants, no analytes > QL.	Re-digest or re-analyze samples associated with the MB unless sample is non-detect or is 10 times the blank detection. If reanalysis cannot be performed, apply “B” laboratory qualifier and document in case narrative.	Laboratory Analyst	Accuracy/Bias	Detections less than QLs
Instrumentation Blank	As specified by method	No target compounds ≥ QL.	Re-digest or re-analyze samples associated with the MB unless sample is non-detect or is 10 times the blank detection. If reanalysis cannot be performed, apply “B” laboratory qualifier and document in case narrative.	Laboratory Analyst	Accuracy/Bias	Detections less than QLs

Matrix	Water					
Analytical Group	Metals (total and dissolved)					
Analytical Method / SOP Reference	U.S. EPA Method 7470A / ANA7470A ¹ U.S. EPA Method 6010B / ANA6010BPE ² U.S. EPA Method 6020A / ANA6020 ³					
QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
LCS	One per preparation/analytical batch	6020A metals: 80-120 % R 6010B metals: 75-120 %R Mercury: 85-115 %R For 6010B, the number of allowable ME depends on the number of analytes (per method), as follows: <ul style="list-style-type: none"> • 11–30 analytes in LCS, 1 analyte allowed in ME of the LCS control limit; • <11 analytes in LCS, no analytes allowed in ME of the LCS control limit. 	Identify source of problem, such as: -inspect instrument for physical interferences; -check standard concentrations; or -check for calculation errors. Identify and implement corrective measures specific to the cause of the problem. This may include preparation of new spiking standards, instrument recalibration, or sample reanalysis. Re-digest and reanalyze the LCS and all samples in the associated batch for failed analytes, if sufficient sample material is available. ME must be random (same analyte less than 2 out of 3 consecutive LCS). Source of the error located and corrective action taken with discussion in case narrative. If the LCS remains outside of acceptance criteria and may impact the quality of the data, a Quality Control Exception Report will be completed to document the nonconformance, consistent with laboratory SOP QC033 (Control of Nonconforming Environmental Test Work, Quality Control Exception Reports, and Recommendations for Corrective Action Reports) and the client will be contacted.	Laboratory Analyst	Accuracy	%R
MS/MSD	One per preparation/analytical batch, designated project sample	6020A metals: 80-120 %R / RPD 20 6010B metals: 75-125 %R / RPD 20 Mercury: 85-115 %R / RPD 15	Examine the project-specific DQOs. Corrective action taken shall be documented, presented in case narrative, and appropriate data qualifying applied as necessary. Contact the client as to additional measures to be taken.	Laboratory Analyst	Precision / Accuracy	%R, RPD

Matrix	Water					
Analytical Group	Metals (total and dissolved)					
Analytical Method / SOP Reference	U.S. EPA Method 7470A / ANA7470A ¹ U.S. EPA Method 6010B / ANA6010BPE ² U.S. EPA Method 6020A / ANA6020 ³					
QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Internal Standards ⁴	Included in every sample	Li, Sc, Y, In, Tb, Ho, Bi, Ge 30-120 %R	Re-analyze sample with a 1/5 dilution until internal standards meet acceptance criteria	Laboratory Analyst	Accuracy	%R
Serial Dilution	One per preparation batch	Five-fold dilution within ± 10% of original measurement	Perform post digestion spike	Laboratory Analyst	Precision	%R
Post Digestion Spike (PDS)	When dilution test fails or analyte concentration in all samples < 50x limit of detection	75-125 %R	Corrective action taken shall be documented, presented in case narrative, and appropriate data qualifying applied as necessary	Laboratory Analyst	Accuracy	%R

Notes:

¹ Includes: mercury.

² Includes: aluminum, antimony, arsenic, barium, chromium (total), cobalt, copper, iron, lead, manganese, molybdenum, nickel, selenium, silver, thallium, vanadium, and zinc.

³ Includes: beryllium, and cadmium, and thallium.

⁴ Applicable to U.S. EPA Method 6020A.

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Table 28-1. Method/SOP QC Acceptance Limits.

ANALYTE	Method/SOP QC Acceptance Limits	
	MS/LCS (%R)	MSD (RPD)
Volatile Organic Compounds (VOCs) by EPA Method 8260B		
1,1,1,2-Tetrachloroethane	80-130	≤ 30
1,1,1-Trichloroethane	65-130	≤ 30
1,1,2,2-Tetrachloroethane	65-130	≤ 30
1,1,2-Trichloroethane	75-125	≤ 30
1,1-Dichloroethane	70-135	≤ 30
1,1-Dichloroethene	70-130	≤ 30
1,2,3-Trichloropropane	75-125	≤ 30
1,2,4-Trichlorobenzene	65-135	≤ 30
1,2,4-Trimethylbenzene	75-130	≤ 30
1,3,5-Trimethylbenzene	75-130	≤ 30
1,2-Dibromo-3-chloropropane	50-130	≤ 30
1,2-Dichloroethene (total)	70-125	≤ 30
1,2-Dichlorobenzene	70-120	≤ 30
1,2-Dichloropropane	75-125	≤ 30
1,3-Dichlorobenzene	75-125	≤ 30
1,4-Dichlorobenzene	75-125	≤ 30
Bromobenzene	75-125	≤ 30
Bromodichloromethane	75-120	≤ 30
Bromoform	70-130	≤ 30
Bromomethane	30-145	≤ 30
Chlorobenzene	80-120	≤ 30
Chloroethane	60-135	≤ 30
Chloromethane	40-125	≤ 30
cis-1,2-Dichloroethene	70-125	≤ 30
cis-1,3-Dichloropropene	70-130	≤ 30
Dibromochloromethane	60-135	≤ 30
Dibromomethane	75-125	≤ 30
Dichlorodifluoromethane	30-155	≤ 30
Ethylbenzene	75-125	≤ 30
Freon-113	65-125	≤ 30
Isopropylbenzene	75-125	≤ 30
Methyl tert-butyl ether	65-125	≤ 30
Methylene chloride	55-140	≤ 30
Naphthalene	55-140	≤ 30
Toluene	75-120	≤ 30
trans-1,2-Dichloroethene	60-140	≤ 30
trans-1,3-Dichloropropene	55-140	≤ 30
Trichloroethene	70-125	≤ 30
Trichlorofluoromethane	60-145	≤ 30
Xylenes	80-120	≤ 30

Table 28-1. Method/SOP QC Acceptance Limits (continued)

ANALYTE	Method/SOP QC Acceptance Limits	
	MS/LCS (%R)	MSD (RPD)
VOCs by EPA Method 8260B-Low Level		
1,2-Dichloroethane	70-130	≤ 30
Benzene	80-120	≤ 30
Carbon Tetrachloride	65-140	≤ 30
Chloroform	65-135	≤ 30
Tetrachloroethene	45-150	≤ 30
Vinyl Chloride	50-145	≤ 30
VOC Surrogates (by EPA Methods 8260B and 8260B-Low Level)		
1,2-Dichloroethane-d4	70-120	not applicable
4-Bromofluorobenzene	75-120	not applicable
Dibromofluoromethane	85-115	not applicable
Toluene-d8	85-120	not applicable
Semivolatile Organic Compounds (SVOCs) by EPA Method 8270C		
2,4,6-Trichlorophenol	50-115	≤ 30
2,4-Dichlorophenol	50-105	≤ 30
2,4-Dimethylphenol	30-110	≤ 30
2,4-Dinitrophenol	15-140	≤ 30
2,4-Dinitrotoluene	50-120	≤ 30
2,6-Dinitrotoluene	50-115	≤ 30
2-Chloronaphthalene	50-105	≤ 30
2-Chlorophenol	35-105	≤ 30
2-Methylnaphthalene	45-105	≤ 30
2-Methylphenol	40-110	≤ 30
2-Nitrophenol	40-115	≤ 30
3,3-Dichlorobenzidine	20-110	≤ 30
4-Methylphenol	30-110	≤ 30
4,6-Dinitro-2-methylphenol	40-130	≤ 30
4-Bromophenyl phenyl ether	50-115	≤ 30
4-Chloro-3-methylphenol	45-110	≤ 30
4-Chlorophenyl phenyl ether	50-110	≤ 30
4-Nitrophenol	0-125	≤ 30
Acenaphthene	45-110	≤ 30
Acenaphthylene	50-105	≤ 30
Anthracene	55-110	≤ 30
Benzo (g,h,i) perylene	40-125	≤ 30
Benzoic acid	0-125	≤ 30
Benzyl alcohol	30-110	≤ 30

Table 28-1. Method/SOP QC Acceptance Limits (continued)

ANALYTE	Method/SOP QC Acceptance Limits	
	MS/LCS (%R)	MSD (RPD)
bis (2-chlorethoxy) methane	45-105	≤ 30
bis (2-chloroethyl) ether	35-110	≤ 30
bis (2-chloroisopropyl) ether	25-130	≤ 30
bis (2-ethylhexyl) phthalate	40-125	≤ 30
Butyl benzyl phthalate	45-115	≤ 30
Carbazole	50-115	≤ 30
Di-n-butyl phthalate	55-115	≤ 30
Di-n-octyl phthalate	35-135	≤ 30
Dibenzofuran	55-105	≤ 30
Diethyl phthalate	40-120	≤ 30
Dimethyl phthalate	25-125	≤ 30
Fluoranthene	55-115	≤ 30
Fluorene	50-110	≤ 30
Hexachlorobenzene	50-110	≤ 30
Hexachlorobutadiene	25-105	≤ 30
Hexachlorocyclopentadiene	25-105	≤ 30
Hexachloroethane	30-95	≤ 30
Isophorone	50-110	≤ 30
N-Nitrosodi-n-propylamine	35-130	≤ 30
N-Nitrosodimethylamine	25-110	≤ 30
N-Nitrosodiphenylamine	50-110	≤ 30
Nitrobenzene	45-110	≤ 30
Pentachlorophenol	40-115	≤ 30
Phenanthrene	50-115	≤ 30
Phenol	0-115	≤ 30
Pyrene	50-130	≤ 30
SVOC Surrogates		
2-fluorophenol	20-110	not applicable
2-fluorobiphenyl	50-110	not applicable
Nitrobenzene-d5	40-110	not applicable
Phenol-d6	10-115	not applicable
2,4,6-tribromophenol	40-125	not applicable
p-terphenyl-d14	50-135	not applicable
SVOCs by EPA Method 8270C-SIM		
Benzo(a)anthracene	55-110	≤ 30
Benzo(a)pyrene	55-110	≤ 30
Benzo(b)fluoranthene	45-120	≤ 30
Benzo(k)fluoranthene	45-125	≤ 30
Chrysene	55-110	≤ 30
Dibenz (a,h) anthracene	40-125	≤ 30
Indeno (1,2,3-cd) pyrene	45-125	≤ 30

Table 28-1. Method/SOP QC Acceptance Limits (continued)

ANALYTE	Method/SOP QC Acceptance Limits	
	MS/LCS (%R)	MSD (RPD)
SVOC Surrogates by EPA Method 8270C-SIM		
2-fluorobiphenyl	50-110	not applicable
Nitrobenzene-d5	40-110	not applicable
p-terphenyl-d14	50-135	not applicable
Organochlorine (OC) Pesticides by EPA Method 8081A (Low-Level)		
4,4-DDD	25-150	≤ 30
4,4-DDE	35-140	≤ 30
4,4-DDT	45-140	≤ 30
Aldrin	25-140	≤ 30
a-BHC	60-130	≤ 30
a-Chlordane	65-125	≤ 30
b-BHC	65-125	≤ 30
d-BHC	45-135	≤ 30
Dieldrin	60-130	≤ 30
Endosulfan I	50-110	≤ 30
Endosulfan II	30-130	≤ 30
Endosulfan sulfate	55-135	≤ 30
Endrin	55-135	≤ 30
Endrin aldehyde	55-135	≤ 30
Endrin ketone	75-125	≤ 30
g-BHC	25-135	≤ 30
g-Chlordane	60-125	≤ 30
Heptachlor	40-130	≤ 30
Heptachlor epoxide	60-130	≤ 30
Methoxychlor	55-150	≤ 30
Organophosphorus (OP) Pesticides by EPA Method 8141A		
Azinphosmethyl	12-169	≤ 30
Bolstar	33-149	≤ 30
Chlorpyrifos	62-149	≤ 30
Coumaphos	27-166	≤ 30
Demeton (Total)	10-184	≤ 30
Diazinon	59-150	≤ 30
Dichlorvos	10-189	≤ 30
Dimethoate	30-150	≤ 30
Disulfoton	46-120	≤ 30
Ethyl p-nitrophenyl thionobenzenephosphonate (EPN)	35-169	≤ 30
Ethion	47-137	≤ 30
Ethoprop	54-142	≤ 30
Fensulfothion	15-179	≤ 30
Fenthion	29-144	≤ 30
Famphur	23-199	≤ 30

Table 28-1. Method/SOP QC Acceptance Limits (continued)

ANALYTE	Method/SOP QC Acceptance Limits	
	MS/LCS (%R)	MSD (RPD)
Malathion	39-147	≤ 30
Merphos	45-155	≤ 30
Mevinphos	13-183	≤ 30
Naled	10-182	≤ 30
Parathion, Ethyl	35-138	≤ 30
Parathion, Methyl	33-136	≤ 30
Phorate	24-136	≤ 30
Ronnel	48-134	≤ 30
Stirophos	34-168	≤ 30
Sulfotepp	59-124	≤ 30
Tokuthion	49-140	≤ 30
Trichloronate	37-143	≤ 30

Abbreviations:

- %R: percent recovery
- MS/LCS: matrix spike/laboratory control sample
- MSD: matrix spike duplicate
- RPD: relative percent difference
- SIM: Selective Ion Monitoring

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SAP Worksheet #30 – Analytical Services Table

Matrix	Analytical Group	Sample Locations / ID Number	Analytical Method	Data Package Turnaround Time	Laboratory / Organization (name and address, contact person and telephone number)	Backup Laboratory / Organization (name and address, contact person and telephone number)
Water	VOCs	See WS 18	U.S. EPA 8260B U.S. EPA 8260B-Low Level	28 days	Agriculture & Priority Pollutant Laboratories, Inc. (APPL) 908 North Temperance Ave. Clovis, CA 93611 Diane Anderson (559) 275-2175	EMAX 1835 W. 205 th Street Torrance, CA 90501 Jim Carter (310) 618-0818
	SVOCs		U.S. EPA 8270C U.S. EPA 8270C-SIM			
	Organochlorine pesticides		U.S. EPA 8081A U.S. EPA 8081-Low Level			
	Organophosphorus pesticides		U.S. EPA 8141A			
	PCBs		U.S. EPA 8082			
	TPH-purgeables and TPH-extractables		U.S. EPA 8015B-G / U.S. EPA 8015B-D			
	Oil and grease		U.S. EPA 1664A			
	Metals ²		U.S. EPA 6010B U.S. EPA 6020A			
	Chromium (hexavalent)		U.S. EPA 7199			
	Mercury		U.S. EPA 7470A			
	Organotins, (tributyltin)		APPL SOP Tributyltin by GC-MS			
	Cyanide		U.S. EPA 9010C / U.S. EPA 9014			
	Anions		U.S. EPA 300.0			
Ammonia, un-ionized	U.S. EPA 350.1					

Matrix	Analytical Group	Sample Locations / ID Number	Analytical Method	Data Package Turnaround Time	Laboratory / Organization (name and address, contact person and telephone number)	Backup Laboratory / Organization (name and address, contact person and telephone number)
Water	Ethane, Ethene and Methane (as dissolved gases) ¹	See WS 18	RSK 175	28 days	APPL	EMAX
	Alkalinity		SM2320B			
	Total Organic Carbon		U.S. EPA 9060A			
	TSS		SM2540D			
	Sulfide		SM4500S2F			
	TKN		U.S. EPA 351.2			
	Radionuclides (Cs-137, Pu-239, Ra-226, and Sr-90)		U.S. EPA 901.0 modified DOE HASL-300 PU-10 U.S. EPA 903.1 modified U.S. EPA 905.0 modified	30 days	GEL Laboratories, LLC 2040 Savage Road Charleston, SC 29417 Ann M. Skradski (843) 769-7386	TestAmerica St. Louis Laboratory 13715 Rider Trail North Earth City, MO 63045 Elaine Wild (314) 298-8566

Matrix	Analytical Group	Sample Locations / ID Number	Analytical Method	Data Package Turnaround Time	Laboratory / Organization (name and address, contact person and telephone number)	Backup Laboratory / Organization (name and address, contact person and telephone number)
Water	Flashpoint	IDW characterization sample ³	U.S. EPA 1020A	28 days	Columbia Analytical Services, Inc. 1317 South 13th Avenue Kelso, Washington 98626	EMAX
	COD		SM 5220C		Lynda Huckestein (360) 577-7222	Not applicable ⁴
	Carbon Dioxide, (as dissolved gas) ¹	See WS 18	RSK 175		APPL	EMAX
	pH		EPA 150.2			
	Dehalococcoides bacteria ¹	See WS 18	Q-PCR	21 days	North Wind, Inc. Idaho State University Dept. of Biological Sciences- MCRF 650 Memorial Drive Pocatello, Idaho 83209-8007 Dana Swift (208) 557-7835	Not applicable ⁴

Notes:

Sample IDs will be assigned in the field based on the following convention: **XXYYA###** where **XX** = last two digits of year sampled (e.g. 07 for 2007); **YY** = week number (01 to 52); **A** = first initial of sampler's name or unique letter assigned to sampler; **###** = chronological number of sample taken by that sampler within the quarter (001, 002, 003...).

Field duplicates will be taken in accordance with the frequency designated in Worksheet 20.

Unless specified otherwise, laboratory(ies) will be certified by the California Department of Health Services Environmental Laboratory Accreditation Program (ELAP), or DoD ELAP, and National Environmental Laboratory Accreditation Program (NELAP) to perform analyses.

- ¹ There is no California or DoD Environmental Laboratory Accreditation Program (ELAP) accreditation for this analytical method. Analytes are used only for evaluating Monitoring Natural Attenuation (MNA) or the effectiveness of groundwater treatability studies, and do not have Remediation Goals or Trigger Levels.
- ² Includes one or more of the following metals: aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium (total), cobalt, copper, iron, lead, manganese, molybdenum, nickel, selenium, silver, thallium, vanadium, and/or zinc. Other metals are called out separately.
- ³ IDW characterization samples are not used for CERCLA decision making.
- ⁴ A backup laboratory is not identified for these analytical groups as these are specialized analyses performed on a limited number of samples.

SAP Worksheet #36 –Analytical Data Validation (Steps IIa and IIb) Summary Table

Step IIa / IIb	Matrix	Analytical Group	Validation Criteria	Data Validator (title and organizational affiliation)
IIa	Groundwater	VOCs (standard and low level)	<ul style="list-style-type: none"> • GC/MS Analysis by U.S. EPA Method 8260B, Rev 28, 09/17/09. • Applicable portions of this SAP • NAVFAC Southwest Environmental Work Instruction no. 1 • DoD Quality System Manual (QSM) version 4.2 	Laboratory Data Consultants (LDC)
IIa	Groundwater	SVOCs	<ul style="list-style-type: none"> • SVOCs by U.S. EPA Method 8270C, Rev. 13, 06/15/10. • Applicable portions of this SAP • NAVFAC Southwest Environmental Work Instruction no. 1 • DoD QSM version 4.2 	LDC
IIa	Groundwater	SVOCs (low level)	<ul style="list-style-type: none"> • Polynuclear aromatic hydrocarbons by selective ion monitoring; Modified EPA Method 8270C1; Rev 5, 02/25/10 • Applicable portions of this SAP • NAVFAC Southwest Environmental Work Instruction no. 1 • DoD QSM version 4.2 	LDC

Step IIa / IIb	Matrix	Analytical Group	Validation Criteria	Data Validator (title and organizational affiliation)
IIa	Groundwater	OC Pesticides	<ul style="list-style-type: none"> • OCL Pesticides by U.S. EPA Method 8081A, Rev. 22, 09/14/09. • Applicable portions of this SAP • NAVFAC Southwest Environmental Work Instruction no. 1. • DoD QSM version 4.2 	LDC
IIa	Groundwater	OP Pesticides	<ul style="list-style-type: none"> • OP Pesticides by U.S. EPA Method 8141A, Rev. 14, 09/21/09. • Applicable portions of this SAP • NAVFAC Southwest Environmental Work Instruction no. 1 • DoD QSM version 4.2 	LDC
IIa	Groundwater	PCBs	<ul style="list-style-type: none"> • PCBs and Congeners by U.S. EPA Method 8082, Rev. 14, 09/14/09. • Applicable portions of this SAP • NAVFAC Southwest Environmental Work Instruction no. 1 • DoD QSM version 4.2 	LDC
IIa	Groundwater	Metals ²	<ul style="list-style-type: none"> • ICP by U.S. EPA Method 6020, Rev. 16, 05/26/10. • Applicable portions of this SAP • NAVFAC Southwest Environmental Work Instruction no. 1 • DoD QSM version 4.2 	LDC

Step IIa / IIb	Matrix	Analytical Group	Validation Criteria	Data Validator (title and organizational affiliation)
IIa	Groundwater	Metals ²	<ul style="list-style-type: none"> • ICP by U.S. EPA Method 6010B – Three Point Curve, Rev. 13, 09/17/09 • Applicable portions of this SAP • NAVFAC Southwest Environmental Work Instruction no. 1 • DoD QSM version 4.2 	LDC
IIa	Groundwater	Mercury (dissolved)	<ul style="list-style-type: none"> • Analysis of Mercury by U.S. EPA Method 7470A, Rev. 20, 12/07/09. • Applicable portions of this SAP • NAVFAC Southwest Environmental Work Instruction no. 1. • DoD QSM version 4.2 	LDC
IIa	Groundwater	Chromium (hexavalent)	<ul style="list-style-type: none"> • Hexavalent Chromium U.S. EPA Method 7199, Rev. 8, 04/06/10 • Applicable portions of this SAP • NAVFAC Southwest Environmental Work Instruction no. 1. • DoD QSM version 4.2 	LDC
IIa	Groundwater	TPH - purgeables	<ul style="list-style-type: none"> • TPH by U.S. EPA Method 8015B, Rev. 10, 09/14/09 • Applicable portions of this SAP • NAVFAC Southwest Environmental Work Instruction no. 1 • DoD QSM version 4.2 	LDC

Step IIa / IIb	Matrix	Analytical Group	Validation Criteria	Data Validator (title and organizational affiliation)
IIa	Groundwater	TPH - extractables	<ul style="list-style-type: none"> • Total Extractable Petroleum Hydrocarbons – Diesel, Rev. 17, 09/14/09 • Applicable portions of this SAP • NAVFAC Southwest Environmental Work Instruction no. 1. • DoD QSM version 4.2 	LDC
IIa	Groundwater	Oil and grease	<ul style="list-style-type: none"> • HEM and SGT-HEM, U.S. EPA Method 1664A, Rev 3, 04/06/10 • Applicable portions of this SAP • NAVFAC Southwest Environmental Work Instruction no. 1 • DoD QSM version 4.2 	LDC
IIa	Groundwater	Cyanide	<ul style="list-style-type: none"> • Total Cyanide by U.S. EPA Method 9010C/9014, Rev. 16, 04/19/10. • Applicable portions of this SAP • NAVFAC Southwest Environmental Work Instruction no. 1 • DoD QSM version 4.2 	LDC
IIa	Groundwater	Organotins (tributyltin)	<ul style="list-style-type: none"> • Organotins by SIM by U.S. EPA Method 8270 modified, Rev. 2, 09/14/09. • Applicable portions of this SAP • NAVFAC Southwest Environmental Work Instruction no. 1 • DoD QSM version 4.2 	LDC

Step IIa / IIb	Matrix	Analytical Group	Validation Criteria	Data Validator (title and organizational affiliation)
IIa	Groundwater	Radionuclides (Cs-137, Pu-239, Ra-226, and Sr-90)	<ul style="list-style-type: none"> • Multi-Agency Radiological Laboratory Analytical Protocols Manual • U.S. EPA 901.0 modified • DOE HASL-300 PU-10 • U.S. EPA 903.1 modified • U.S. EPA 905.0 modified • Applicable portions of this SAP • NAVFAC Southwest Environmental Work Instruction no. 1 • DoD QSM version 4.2 	LDC
IIa	Groundwater	Alkalinity	<ul style="list-style-type: none"> • Total Alkalinity Standard Method 2320B, Rev. 11, 04/01/10 • Applicable portions of this SAP • NAVFAC Southwest Environmental Work Instruction no. 1 • DoD QSM version 4.2 	LDC
IIa	Groundwater	Ethane, Ethene, and Methane ¹	<ul style="list-style-type: none"> • Dissolved Gas Analysis in Water by Headspace Gas Chromatography, Rev. 9, 09/14/09 • Applicable portions of this SAP • NAVFAC Southwest Environmental Work Instruction no. 1 • DoD QSM version 4.2 	LDC

Step IIa / IIb	Matrix	Analytical Group	Validation Criteria	Data Validator (title and organizational affiliation)
IIa	Groundwater	Carbon Dioxide (as a dissolved gas) ¹	<ul style="list-style-type: none"> • Dissolved Gas Analysis in Aqueous Samples Using a Headspace Equilibrium Technique, Rev 11, 12/10/11 • Applicable portions of this SAP • NAVFAC Southwest Environmental Work Instruction no. 1 • DoD QSM version 4.2 	LDC
IIa	Groundwater	Total Organic Carbon	<ul style="list-style-type: none"> • Total Organic Carbon in Water (Non-Purgeable Organic Carbon) SW846 Method 9060A1, Rev 7, 04/06/10 • Applicable portions of this SAP • NAVFAC Southwest Environmental Work Instruction no. 1 • DoD QSM version 4.2 	LDC
IIa	Groundwater	Sulfide	<ul style="list-style-type: none"> • Water Sulfide by Standard Methods 4500S2F, Rev. 9, 04/07/10 • Applicable portions of this SAP • NAVFAC Southwest Environmental Work Instruction no. 1 • DoD QSM version 4.2 	LDC

Step IIa / IIb	Matrix	Analytical Group	Validation Criteria	Data Validator (title and organizational affiliation)
IIa	Groundwater	TSS	<ul style="list-style-type: none"> • (TSS) Residue, Non-Filterable, SM2540D, Rev. 8, 48/06/10 • Applicable portions of this SAP • NAVFAC Southwest Environmental Work Instruction no. 1 • DoD QSM version 4.2 	LDC
IIa	Groundwater	Ammonia, un-ionized	<ul style="list-style-type: none"> • Ammonia, U.S. EPA Method 350.1, Rev. 11, 03/25/10 • Applicable portions of this SAP • NAVFAC Southwest Environmental Work Instruction no. 1 • DoD QSM version 4.2 	LDC
IIa	Groundwater	Anions	<ul style="list-style-type: none"> • Inorganic Anion, U.S. EPA Method 300.0, Rev 19, 04/06/10 • Applicable portions of this SAP • NAVFAC Southwest Environmental Work Instruction no. 1 • DoD QSM version 4.2 	LDC
IIa	Groundwater	TKN	<ul style="list-style-type: none"> • TKN by U.S. EPA method 351.2, Rev. 11 04/06/10 • Applicable portions of this SAP • NAVFAC Southwest Environmental Work Instruction no. 1 • DoD QSM version 4.2 	LDC

Notes:

- ¹ There is no California or DoD Environmental Laboratory Accreditation Program (ELAP) accreditation for this analytical method. Analytes are used only for evaluating Monitoring Natural Attenuation (MNA) or the effectiveness of groundwater treatability studies, and do not have Remediation Goals or Trigger Levels.
- ² Includes one or more of the following metals: aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium (total), cobalt, copper, iron, lead, manganese, molybdenum, nickel, selenium, silver, thallium, vanadium, and/or zinc. Other metals are called out separately.

References

U.S. Department of Defense, 2010. "Quality Systems Manual for Environmental Laboratories – Version 4.2." October 25.

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