

APPENDIX D

**QUALITY ASSURANCE/QUALITY CONTROL
EVALUATION OF ANALYTICAL DATA**

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**QUALITY ASSURANCE/QUALITY CONTROL
EVALUATION OF ANALYTICAL DATA**

June 2009

**FOR 2008 ANNUAL GROUNDWATER REPORT
FOR WATS AND EATS**

**FORMER NAVAL AIR STATION MOFFETT FIELD
MOFFETT FIELD, CALIFORNIA**

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**CONTRACT NO. N62473-07-D-3220
CTO NO. 0004**

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ABBREVIATIONS AND ACRONYMS

%D	percent difference
%R	percent recovery
Blaine Tech	Blaine Tech Services, Incorporated
CLP	Contract Laboratory Program
DQO	data quality objective
EATS	East-Side Aquifer Treatment System
EPA	U.S. Environmental Protection Agency
FWENC	Foster Wheeler Environmental Corporation
IR	Installation Restoration
LTGMP	Long-Term Groundwater Monitoring Plan
MEW	Middlefield-Ellis-Whisman
MDL	method detection limit
MS	matrix spike
MSD	matrix spike duplicate
NAS	Naval Air Station
NASA	National Aeronautics and Space Administration
ND	not detected
PRQL	project-required quantitation limit
QC	quality control
RPD	relative percent difference
RRF	relative response factor
SAP	Sampling and Analysis Plan
SES-TECH	Sealaska Environmental Services, LLC and Tetra Tech EC, Inc
VOC	volatile organic compound
WATS	West-Side Aquifers Treatment System

1.0 INTRODUCTION

This appendix summarizes the fulfillment of data quality objectives (DQOs) for the 2008 annual West-Side Aquifers Treatment System (WATS) and East-Side Aquifer Treatment System (EATS) groundwater monitoring event. Data for periods prior to 2008 were obtained from the National Aeronautics and Space Administration (NASA), the Middlefield-Ellis-Whisman (MEW) companies, and the Navy's previous consultants. All samples from 2008 WATS and EATS annual sampling events were collected and handled in accordance with the procedures detailed in the Sampling and Analysis Plan (SAP) for the *Final Sampling and Analysis Plan for Groundwater Sampling and Well Gauging at IR Sites 26 and 28, Former Naval Air Station Moffett Field, Moffett Field, California* (SES-TECH 2008). The chain-of-custody records and data validation reports are included in Appendix C of the 2009 Annual Groundwater Report for WATS and EATS. In addition, laboratory data are included on the CD submitted along with this report.

Groundwater was collected from 129 monitoring wells during the WATS (78 monitoring wells) and EATS (51 monitoring wells) annual sampling event. All samples were analyzed for volatile organic compounds (VOCs). All samples were analyzed by TestAmerica West Sacramento, a state of California-certified and Navy-evaluated laboratory. A third-party validation company, Laboratory Data Consultants, Inc., performed U.S. Environmental Protection Agency (EPA) Level III-equivalent or Level IV-equivalent data validation of all samples. Twenty percent of the analytical data were validated according to EPA Level IV-equivalent protocols, the remainder 80 percent were validated according to the EPA Level III-equivalent protocols. The validation was conducted in accordance with the *USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review* (EPA 1999) and the criteria specified in the Final SAP (SES-TECH 2008).

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2.0 DATA EVALUATION

The 2008 WATS and EATS annual sampling event at the former Naval Air Station (NAS) Moffett Field (Moffett) was conducted in accordance with the *Final Sampling and Analysis Plan for Groundwater Sampling and Well Gauging at IR Sites 26 and 28, Former Naval Air Station Moffett Field, Moffett Field, California* (SES-TECH 2008).

Samples were collected from seventy-nine selected WATS monitoring wells and fifty selected EATS monitoring wells. All groundwater samples were analyzed for volatile organic compounds (VOCs), the primary chemicals of concern. VOCs were analyzed by following EPA Method 8260B.

2.1 QUALITY CONTROL SAMPLING

Quality control (QC) samples were collected and used in conjunction with laboratory QC samples to evaluate the precision, accuracy, representativeness, completeness, and comparability. Guidance for evaluating the QC data is provided by the *USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review* (EPA 1999) and the *Final Sampling and Analysis Plan for Groundwater Sampling and Well Gauging at IR Sites 26 and 28, Former Naval Air Station Moffett Field, Moffett Field, California* (SES-TECH 2008). The following sections describe findings of the field and laboratory QC samples for the WATS and EATS annual sampling event.

2.1.1 Field Duplicates

Field duplicates consist of two samples (an original and a duplicate) of the same matrix collected at the same time and location, to the extent possible, using the same sampling technique. The purpose of the field duplicate is to evaluate the precision of the overall sample collection and analysis process through the calculation of the relative percent difference (RPD) for duplicate pairs. Field duplicates were collected at a frequency of 1 per every 10 samples for VOC analysis. Thirteen field duplicates were collected and are identified in Table D.2-1.

The QC limit for RPD is 30 percent for field duplicate pairs with concentrations reported at or above the project reporting limits. Samples with reported analyte concentrations above the method detection limit (MDL) but below the reporting limit can produce greater variability, leading to greater RPDs. RPD values are non-representative when the following conditions exist:

- Both the original and duplicate results are less than five times the reporting limit.
- One or both results are qualified as estimated or rejected or are suspected of blank contamination.
- Both results are not detected at the reporting limit (not detected [ND] pairs).

Except for the following duplicate samples collected from monitoring wells: W9-10, 14D28A, WWR-1, W29-3, W9-2, EXW-5, and WU5-24, the RPD values for other wells were 30 percent or less. The concentrations detected in most of these duplicate pair samples were less than five times the reporting limit, which produce large RPD values, even though the concentrations are not significantly different between the original and duplicate samples. However, the RPD for trichloroethene in sample W29-3 was reported at 44 percent and this result was qualified “J” for estimated. No other samples were qualified as a result of field duplicate RPDs outside of QC limits.

2.1.2 Matrix Spike and Matrix Spike Duplicate Samples

Matrix spike and matrix spike duplicate (MS/MSD) samples are prepared by spiking the sample with a known amount of a target analyte. Once the spike is added to the MS/MSD sample, the sample is carried through the complete sample preparation process along with the other samples in the batch. The percent recoveries (%R) for the MS/MSD samples are calculated to measure the accuracy of the analytical method. RPD values of the %R of the MS/MSD samples are calculated to evaluate the analytical precision of the method. The Acceptance criteria for MS/MSD percent recoveries and RPDs are discussed in the Final SAP (SES-TECH 2008). The frequency requirement per the SAP is to collect one MS/MSD pair per every 20 samples. Seven MS/MSD samples were collected as identified in Table D.2-1. When MS and MSD analyses were not included in a sample delivery group (SDG), analyses of the laboratory control sample (LCS) and the laboratory control sample duplicate (LCSD) were performed at the required frequency. All the MS/MSD samples met the QC limits for %R and RPD, with the exceptions noted in Table D.2-3. Table D.2-3 summarizes results that were effected and qualified "J/UJ" due to MS/MSD outliers.

2.1.3 Trip Blanks

Trip blanks are prepared by the laboratory, carried into the field, and stored with water samples for VOC analysis. Trip blanks are used to determine if samples have been cross-contaminated with VOCs during sample collection and transportation to the laboratory. One trip blank was provided in each cooler that contained water samples for VOC analysis. A total of nineteen trip blanks was required and transported with the samples to the laboratory. The trip blank samples are identified in Table D.2-1.

Acetone, m,p-xylenes, o-xylene, and 2-butanone were detected at above MDL but below project-required quantitation limit (PRQL) in trip blanks; 4-IR28-201, 4-IR28-301, 4-IR28-401, 4-IR28-101, 4-IR28-302, 4-IR28-302, 4-IR26-100, 4-IR26-100, 4-IR26-200, 4-IR26-101, 4-IR26-201, 4-IR26-201, and 4-IR26-102. 2-Butanone was also detected in method blanks that contributed to detections in trip blanks 4-IR28-101, 4-IR28-201, 4-IR28-300, 4-IR28-301, and 4-IR28-401.

All positive results of detected compounds in the associated samples less than ten times the amount detected in trip blank were flagged as not detected (U), with results less than PRQL being raised to the PRQL. Table D.2-2 summarizes contaminants found in trip blanks and the effected samples that are qualified.

2.1.4 Equipment Rinsates

Field samples were collected using a non-dedicated bladder pumps during the 2008 annual event. Between each well, the bladder pump was decontaminated by following the decontamination procedures detailed in the Final SAP. At the end of each day, an equipment rinsate was collected per each sampling team. A total of eighteen equipment blanks and one source blank were sampled. The source water for equipment decontamination was provided by Blaine Tech Services, Incorporated (Blaine Tech), the subcontractor. The source water has gone through a deionized system maintained by Blaine Tech and the water was sampled on the first day of the annual event.

Acetone, 2-butanone, chlorobenzene, and/or chloroform were detected in almost all of equipment rinsates collected from November 21 through December 4, 2008. However, in the source blank, chlorobenzene, acetone, and chloroform were also detected at above the MDL and may have contributed to contamination

of the equipment rinsates. Blaine Tech has been notified and a certificate showing that the source water is free of contaminants will be provided in the future prior to start of the sampling events.

2.2 ANALYTICAL DATA QUALITY OBJECTIVES

The following sections describe the fulfillment of the analytical data quality objectives for the 2008 annual sampling event in terms of precision, accuracy, representativeness, completeness, and comparability parameters, as described in the Final SAP (SES-TECH 2008).

2.3 PRECISION AND ACCURACY

In accordance with the analytical methods and the Final SAP, the following parameters were evaluated during the validation process for precision and accuracy:

- Surrogates percent recovery
- Initial and continuing calibration criteria, including percent relative standard deviations, percent difference, and relative response factors
- Holding times, sample container, and preservative criteria for each analytical method

Associated samples were flagged “J/UJ” (i.e., estimated), if any of these parameters were outside of QC limits.

2.3.1 Technical Holding Times

Samples W29-3, W9SC-3, W9-21, and W9-45 were analyzed three days outside of the technical holding times. Effected analytes in these samples were flagged “J/UJ” as estimated. All other samples met the technical holding time.

2.3.2 Initial and Continuing Calibration Verifications

Initial and continuing calibrations were performed in accordance with laboratory SOPs. However, various analytes in all the samples were affected by either the initial calibration relative response factor (RRF) or the percent difference (%D) between continuing calibration RRF and initial calibration RRF not within the QC limits. Associated samples were flagged “J/UJ” for all affected compounds in all the samples.

2.3.3 Method Blanks

Method blanks for VOC analysis did not contain analytes equal to or above the reporting limit, with the exception of 2-butanone. 2-butanone results are qualified as “U” for the associated samples, when compound was not detected or if the compound concentrations were not greater than 10 times the concentrations found in the associated method blank. Groundwater samples affected by method blank contamination are listed in Table D.2-3.

2.3.4 Surrogate Percent Recovery

The percent recoveries of surrogates for all samples were within QC limits, except for the groundwater samples from monitoring wells; WNB-14, W9-20, and WIC-1. These sample results were qualified as estimated concentrations “J” and/or “UJ” for all target compounds.

2.4 REPRESENTATIVENESS

Representative data were obtained through systematic selection of sampling sites and analytical parameters to meet the data quality objectives of this project. Proper collection and handling of samples and use of established field and laboratory procedures were performed, as described in the Final SAP.

2.5 COMPLETENESS

The percent completeness is defined as the percentage of measurements that are judged to be valid. The completeness goal is to generate a sufficient amount of valid data to meet project objectives. Completeness is calculated and reported for each method, matrix, and analyte combination. The number of valid results divided by the number of possible individual analyte results, expressed as percentages, determines the completeness of the data set. For completeness requirements, valid results are all results not qualified with an "R" flag for rejected. The data completeness goal is 95 percent for water samples. No results were rejected for the 2008 annual event.

2.6 COMPARABILITY

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared with another. Sample data should be comparable with other measurements for similar samples and sample conditions. The objective for the Quality Assurance/QC program is to produce data with the greatest possible degree of comparability. The number of matrices that are sampled and the range of field conditions encountered are considered in determining comparability. Comparability is achieved by using standard methods for sampling and analysis, reporting data in standard units, normalizing results to standard conditions, and using standard and comprehensive reporting formats. Analytical techniques used for the 2008 annual event are comparable to those used for previous investigations at Moffett.

2.7 OVERALL ASSESSMENT OF DATA

The data collected from the 2008 annual groundwater monitoring event are valid and usable.

All samples were collected in accordance to the criteria listed in the Final SAP. A total of 58 QC samples, including 19 trip blanks, 18 equipment blanks, 1 source blank, 13 field duplicates, and 7 MS/MSD samples were collected. All the samples were collected in containers listed in the SAPs and met technical holding times with the exception listed previously.

Some of the groundwater samples have high concentrations of cis-1,2-dichloroethene, trichloroethene, and tetrachloroethene, which require dilution in order to be within calibration range. For this report, compounds that were within calibration range are reported from the undiluted analysis and compounds that did not meet the calibration range were reported from the dilution runs.

Data were mostly qualified due to RRFs of various compounds in the initial and continuing calibration and surrogate standard recoveries not within QC criteria. The 2-butanone results in some samples were qualified as not detected (U) due to detection of these VOCs below PRQL in method blank and trip blank samples. The data were qualified based on guidelines described in the National Function Guidelines for organic data review (EPA 1999). All data were found to be of appropriate quality to support the data evaluation detailed in the 2008 Annual Groundwater Monitoring Report for WATS and EATS.

3.0 REFERENCES

- SES-TECH Remediation Services, 2008. Final Sampling and Analysis Plan for Groundwater Sampling and Well Gauging at IR Sites 26 and 28, Former Naval Air Station Moffett Field, Moffett Field, California. November.
- U.S. Environmental Protection Agency. 2004. USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review; EPA-540-R-04-004. October.
- U.S. Environmental Protection Agency. 1999. USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review.

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TABLES

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**2008 ANNUAL GROUNDWATER REPORT
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TABLE D.2-1
FIELD QUALITY CONTROL SAMPLES**

Field Duplicate Location	Trip Blanks	MS/MSD Location
W9-20	4-IR28-100	W9-9
W9-10	4-IR28-101	W29-1
EA1-5	4-IR28-200	14D28A
14D28A	4-IR28-201	WWR-3
WNX-3	4-IR28-202	WU5-10
WWR-1	4-IR28-300	W4-2
W29-3	4-IR28-301	WU5-16
W9-2	4-IR28-302	--
WU5-10	4-IR28-400	--
W4-2	4-IR28-401	--
EXW-1	4-IR28-402	--
EXW-5	4-IR26-200	--
WU5-24	4-IR26-100	--
--	4-IR26-101	--
--	4-IR26-102	--
--	4-IR26-103	--
--	4-IR26-201	--
--	4-IR26-202	--
--	4-IR26-203	--

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**2008 ANNUAL GROUNDWATER REPORT
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TABLE D.2-2
TRIP BLANK CONTAMINANTS SUMMARY**

Method Parameter	Trip Blank Contaminant	Affected Field Samples
VOCs	Acetone	14C33A 14D28A W29-1 W29-5 W29-7 W29-3 W9SC-3 W9SC-7 WU4-17 45B2 W88-1 W9-19 W9-21 W9-45 WU4-3 WU4-4 W2-3 WU5-13 WU5-23
	m,p-Xylenes o-Xylene	W9-26
	2-Butanone	WU5-1 WU5-2 W4-14 W6-2 WU5-13 WU5-23 WU5-25 WU5-8 WSW-5 WU5-12 WU5-14 WU5-17 W3-8

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**2008 ANNUAL GROUNDWATER REPORT
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TABLE D.2-3
METHOD BLANK CONTAMINANTS SUMMARY**

Method Parameter	Method Blank Contaminant	Affected Field Samples
VOCs	2-Butanone	14D28A 14D36A W29-1 W9-24 WU4-11 WU4-21 WU4-25 WWR-1 WWR-1 45B2 14D05A WU4-17 W88-1 W9-19 WU4-3 W9-33 W9SC-1

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**2008 ANNUAL GROUNDWATER REPORT
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TABLE D.2-4
MS/MSD OUTLIER SUMMARY**

Method Parameter	Analyte	Affected Field Samples	Qualifier
VOCs	1,1-Dichloroethene Acetone	W29-1	UJ
	1,1-Dichloroethene m,p-xylene	14D28A	J
	Styrene Vinyl Acetate	W4-2 WU5-10	J
	1,1,2,2-Tetrachloroethane 2-Butanone 2-Hexanone 4-Methyl-2-Pentanone Styrene Vinyl Acetate	WU5-16 W9-9	UJ

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